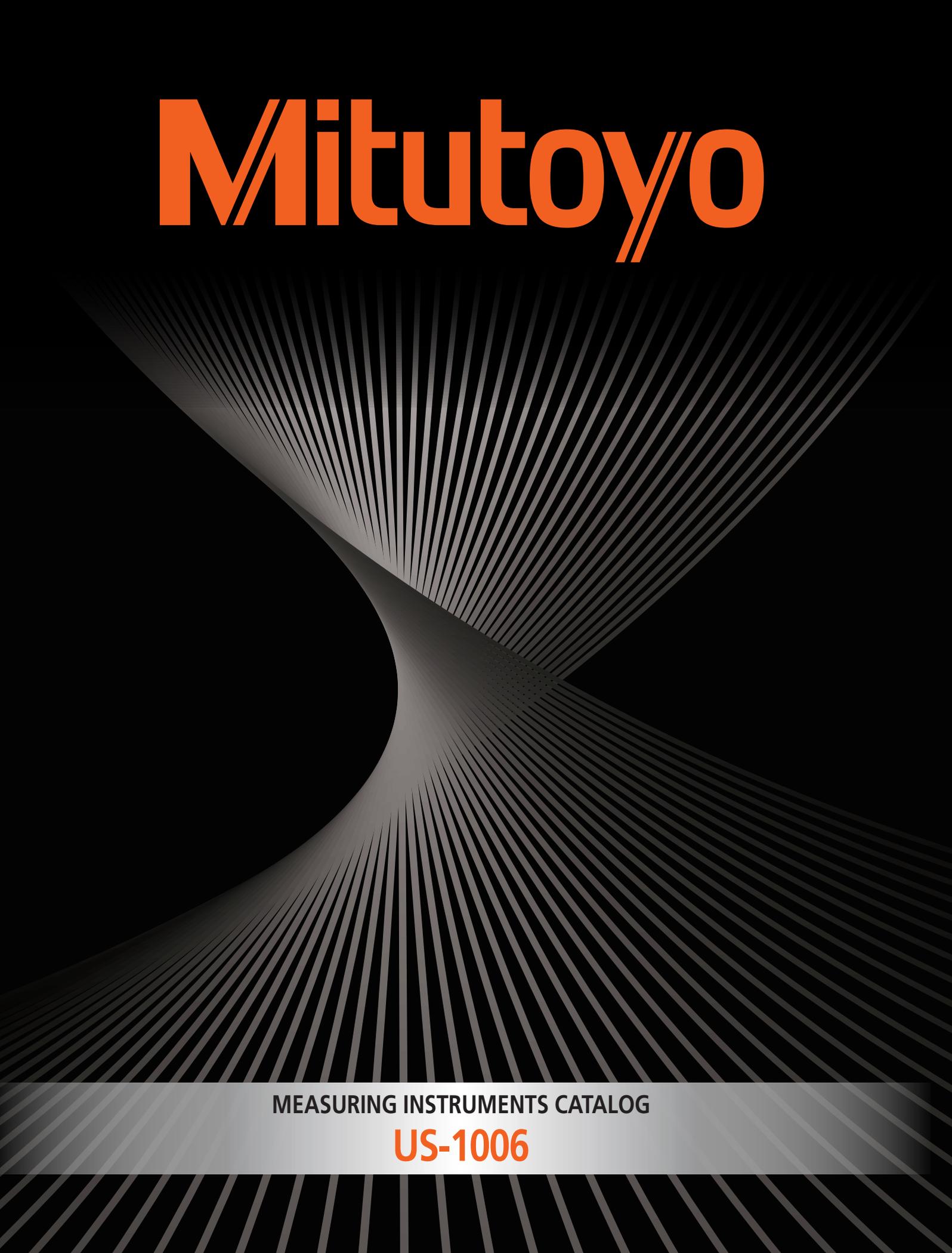


Mitutoyo



MEASURING INSTRUMENTS CATALOG

US-1006

Notes on Use

Export Compliance

All products in this catalog are subject to the Foreign Exchange and Foreign Trade Control laws of Japan, US Export Administration Regulations (EAR) or the Canadian Export and Import Permits Act. Re-export or relocation of any of these products may require prior approval by an appropriate governing authority. If a purchased product is exported or re-exported, even if it is not considered a regulated item by a governing authority, Mitutoyo would like to be made aware, as the customer service available for that product may be affected. If you have any questions, please consult your local Mitutoyo sales office.

Safety Caution

Carefully read the specifications and functions in this catalog before selecting products. Safety may be compromised if you use products for purposes other than those stated here.

Feel free to contact your nearest Mitutoyo sales center if you wish to use a product for other purposes or in a special environment.

Appearance and Specifications

Appearance and specifications are subject to change without prior notice for product improvement. The product names in this catalog are registered trademarks or trademarks of Mitutoyo or their respective companies.

Mitutoyo Precision Measuring Machines Trusted Throughout the World

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Aurora, IL 60502
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M³ Solution Center
Calibration Lab
Mitutoyo Institute of Metrology
CT Lab
Repair and Field Service



Mitutoyo America Corporation

Established in 1963, Mitutoyo America Corporation has locations all across the United States and Canada, including corporate offices, sales offices, M³ Solution Centers, calibration and repair laboratories, and research and development facilities. Mitutoyo America offers a full product line of precision measuring tools, instruments and equipment. Mitutoyo also provides comprehensive metrology services including product and technical support, state-of-the-art calibration and repair services, unmatched education and training programs and cutting-edge research and development.

As the leading metrology company in the world, Mitutoyo is committed to future product development that applies breakthrough technologies to its full range of dimensional measurement tools, instruments and systems. With the belief that providing high-quality metrology goods and services to its customers will, in turn, allow its customers to provide high-quality product to theirs, Mitutoyo continues to develop the most accurate and advanced metrology equipment available, all of which are made in our own manufacturing facilities. **"Precision is our profession"** is not just the company motto, but also the principle by which every Mitutoyo employee stands by when serving our customers.



Mitutoyo Mexico
Corporate Headquarters
Electrical Industry 15 Industrial Park,
Naucalpan de Juárez, Mexico 53370
(0155) 5312-5612



Seattle

Los Angeles

M³ Solution Centers

Mitutoyo tools and instruments can be seen and demonstrated conveniently at any one of eight Mitutoyo M³ Centers nationwide. These centers are fully equipped featuring operational models of the latest Mitutoyo tools and instruments. By appointment or walk-in basis, product demonstrations at M³ Solution Centers are carried out by our experienced, highly trained staff. Contact your Mitutoyo distributor or the Mitutoyo regional office near you for more information.



*M³ = Mitutoyo, Measurement, Metrology



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Repair and Field Service

Company Profile



M³ Solution Centers

Experience all Mitutoyo precision instruments, tools, equipment, services and more at Mitutoyo M³ Solution Centers located across the United States. Each Mitutoyo M³ Solution Center is staffed with highly skilled and experienced Mitutoyo application engineers and product specialists available to answer any questions you may have regarding Mitutoyo products and services. The Mitutoyo application engineers also provide hands-on demonstrations, offer training on all Mitutoyo tools, instruments and equipment, and can work with you to develop application-specific measurement solutions.

Customer Service & Sales Support

The dedication at Mitutoyo America Corporation goes well beyond manufacturing and providing the most comprehensive line of precision metrology products. The Mitutoyo customer service and sales support group ensures fast, dependable responses to all product-related questions and needs. Mitutoyo customer service representatives are friendly and knowledgeable, providing product specifications, availability, and pricing as well as recommending a local authorized Mitutoyo distributor when you need it over the phone or via email.

Technical Support Services

The Mitutoyo America Corporation Technical Support team is a nationwide group of product and software specialists who are just a phone call or email away. This dedicated team walks customers through instrument setup and helps troubleshoot measurement and software issues with years of knowledge and experience. This rapid, first-hand expertise shortens downtime, keeps measurement data traceable, and ultimately protects the precision measurement tools and software you rely on by ensuring your tools stay accurate and productive.

Software Application Training

To maximize the value of Mitutoyo precision instrument purchases, Mitutoyo America Corporation provides customized training for all Mitutoyo CMM, Vision, Form, and data management software (MeasurLink®) applications. Highly trained software instructors provide hands-on, one-on-one and group training with content appropriate for all customer needs. Training classes can be arranged at each of the Mitutoyo M³ Solution Centers located across the United States.





Mitutoyo Calibration Services

The US-based Mitutoyo Calibration Lab is A2LA accredited (certificate #0750.01) with ISO/IEC 17025 accreditation as proof Mitutoyo Calibration Services deliver uncompromising, unmatched calibration precision at the micron level. With two A2LA accredited calibration labs in the US, one in Aurora, IL, and the other in City of Industry (LA), CA, Mitutoyo is the most trusted provider of metrology tool, instrument, and equipment calibration in the nation, with the broadest dimensional-calibration capabilities to be found anywhere. Utilizing state-of-the-art measurement technologies, Mitutoyo can calibrate virtually any metrology tool. Our highly trained, accredited calibration technicians provide calibration services with NIST-traceable accuracy for any Mitutoyo metrology product along with other manufacturer's gages and gage blocks. Each instrument Mitutoyo America Corporation calibrates is returned with certification to prove your measuring instruments and equipment are as accurate as possible and audit ready. The Mitutoyo Canada Calibration Lab is CLAS accredited to ISO/IEC 17015 as well.



Field Service

Mitutoyo Field Services features highly trained and capable engineers who perform on-site installation, repairs, and A2LA-accredited calibration of all Mitutoyo precision measurement instruments and equipment. Members of the US-based Field Services team can get equipment back into production quickly and can certify calibration on any service visit by performing multi-point checks against NIST-traceable artifacts and issue certificates of calibration. Mitutoyo Field Services turns the potential logistical headache of crating and shipping critical measurement equipment for repair or calibration, and waiting for it to return, into a seamless, audit-ready on-site process. Service agreements are available at the time of equipment purchase. The Mitutoyo Canada Field Service team is also CLAS accredited to ISO/IEC 17025.

Repair Services

Highly skilled technicians in the US-based Mitutoyo Repair Services department are capable of repairing the full range of Mitutoyo precision tools and instruments. These repairs are done in-house in either the Aurora, IL, or City of Industry, CA, facilities, and are backed by a full 90-day warranty. When repairs are complete, the Repair Services team then runs the repaired instrument through the same NIST-traceable accuracy checks that are performed on newly produced Mitutoyo instruments at the factory. Repair services are also available from Mitutoyo Canada.

Parts Center

The Mitutoyo America Corporation parts center stocks more than 10,000 individual parts for Mitutoyo products. Same day and 24-hour shipping is available for most part requests. For CMM parts, a specialized group is available to provide additional CMM support services. A Mitutoyo product parts catalog is available via download from mitutoyo.co.jp.

Company Profile

Mitutoyo



Mitutoyo Institute of Metrology

The Mitutoyo Institute of Metrology is dedicated to advancing the knowledge and skills of professionals in dimensional metrology with a combination of in-person classes, virtual training, on-demand eLearning modules, and customized on-site programs.

The Mitutoyo Institute of Metrology offers a wide range of courses that cover everything from the fundamentals of measurement and GD&T to advanced CMM programming, form measurement, and statistical process control (SPC). Courses are designed and taught by experienced metrologists and application engineers; many of whom helped write industry standards or develop the software used in today's labs and shop floors.

The courses and training at the Mitutoyo Institute of Metrology are the best place to learn how to operate the measurement instruments and equipment properly, interpret results confidently and apply measurement principles to real-world manufacturing challenges. The Institute also plays a crucial role in helping quality professionals, engineers, and technicians stay current and competent on new technologies as they evolve more rapidly than ever. For companies, this means fewer measurement errors, stronger audit readiness, and a more capable workforce that can fully leverage the value of their investment in Mitutoyo equipment.



CT Lab/MEI (R&D and Software Development)

The Mitutoyo America Corporation CT Labs and Micro Encoder Inc. are part of an international network of Mitutoyo research and development facilities charged with developing breakthrough technologies for the full range of Mitutoyo dimensional measurement tools, instruments, systems, and the advancement of the field of metrology. Highly skilled developers and engineers utilize cutting-edge development tools to produce the most advanced and sophisticated metrology software and equipment available. Mitutoyo America Corporation is a Microsoft® Gold Certified Partner, providing the entire organization access to a host of Microsoft® development tools and support to ensure Mitutoyo software applications work reliably in Microsoft® OS and network environments.



Mitutoyo Custom Solutions

Mitutoyo Custom Solutions is a specialized engineering and integration service that designs, builds, and supports custom measurement systems tailored to the unique needs of complex manufacturing environments. While Mitutoyo offers the broadest catalog of off-the-shelf metrology tools in the market, not every quality measurement challenge is found in an off-the-shelf box.

The Custom Solutions team works directly with customers to understand the part geometry, tolerance requirements, workflow constraints, and automation goals, and then engineer tailored systems to solve this problem. This specialized team of application engineers can integrate anything from sensors, fixtures, stages, software, and data collection into existing production lines or automated cells to deliver a custom turnkey solution.



Contract Part Programming

Mitutoyo America Corporation features highly trained, experienced team of programmers to help when you need part-programming assistance.

From small revisions to major projects, the Mitutoyo Programming Team increases part programming precision and equipment efficiency, enabling the development of custom measurement programs specifically tailored to individual workpieces and applications. Trust the Mitutoyo experts to deliver the right programming optimizations and efficiency in your measurement process.



Contract Inspection

Mitutoyo America Corporation has three state-of-the-art facilities that provide accredited contract inspection services for your parts. Mitutoyo utilizes our own high-end, ultra-precise measuring equipment in our ISO/IEC 17025 accredited inspection labs, one in West Chester north of Cincinnati, OH, one just east of Los Angeles in City of Industry, CA, and one in Aurora, IL, for accredited measurement of your parts.

No matter how complex your parts are, Mitutoyo will inspect them utilizing the most sophisticated measuring equipment available. We provide all types of contract inspection services including CMM, Vision, Surface, Form, and Roundness inspections to help you achieve accurate part measurements. With access to cutting-edge measurement technologies and high-precision solutions, Mitutoyo Contract Inspection services meet rigorous quality control demands without requiring significant upfront investment.



My.Mitutoyo

My.Mitutoyo.com is the Mitutoyo America Corporation online customer support and self-service portal, designed to give users easy access to essential resources for managing Mitutoyo instruments and software.

My.Mitutoyo empowers users with 24/7 access to critical product and support information, reducing dependency on phone/email support queues and giving quality and maintenance teams more control over their equipment lifecycle, and assistance when it's needed every hour of every day. My.Mitutoyo streamlines administrative and compliance tasks by making service history and calibration records easily accessible. It also reduces downtime by simplifying how users get support or documentation for the tools they depend on daily.

My.Mitutoyo also plays an important role in proactive maintenance planning and quality system compliance. For organizations operating under ISO 9001, IATF 16949, or AS9100 standards, having instant access to digitally stored calibration certificates, service records, and product documentation supports smoother audits and ensures traceability without the burden of physical paperwork. Users can track calibration due dates, view historical service timelines, and even reference previous technical support interactions to ensure gages and instruments are up to date and performing to spec.

Mitutoyo customers can also register newly purchased tools on My.Mitutoyo which activates warranty coverage and make certain they receive timely notifications about updates, product advisories or service reminders relevant to that specific model of gage or instrument. Since My.Mitutoyo is integrated with the Mitutoyo technical support team, support tickets through the portal are routed more efficiently to the right technical support service team for faster turnaround and better case tracking.

My.Mitutoyo acts as a central hub where customers can:

- Register products for warranty and support
- Download software updates, drivers, and manuals
- Find the nearest authorized Mitutoyo dealer
- Access calibration certificates (for tools that have been serviced by Mitutoyo)
- View and manage service requests
- Submit support tickets or technical questions
- Browse FAQs and troubleshooting guides

Meaning of Symbols

ABSOLUTE Linear Encoder

ABSOLUTE™

ABSOLUTE is a trademark of Mitutoyo Corporation.

This is an electronic measuring scale that provides a direct readout of ABSOLUTE linear position when switched on, without needing to be zeroed or reset. Mitutoyo measuring instruments incorporating these scales provide the significant benefit of being always ready for measurement without the need of preliminary setting after switching on. There are three types of ABSOLUTE linear encoders depending on whether the method used is electrostatic, electromagnetic, or optical. They are widely used in various measuring instruments as measuring systems endowed with enhanced reliability of measured values.

Advantages:

1. No count error occurs even if you move the slider or spindle extremely rapidly.
2. You do not have to reset the system to zero when turning on the system after turning it off*1.
3. As this type of encoder can drive with less power than the incremental encoder, the battery life is prolonged to about 5 years (continuous operation of 18,000 hours)*2 under normal use.

*1 Unless the battery is removed.

*2 In the case of ABSOLUTE Digimatic calipers and ABSOLUTE coolant proof calipers.

IP Codes

These are codes that indicate the degree of protection provided (by an enclosure) for the electrical function of a product against the ingress of foreign bodies, dust and water as defined in IEC standards (IEC 60529: 2013) and JIS C 0920: 2003. [IEC: International Electrotechnical Commission]

IP65

IP66

IP67

IP67 G

IP is a trademark of Mitutoyo Corporation. The numerals and letters indicate protection levels.

(IP: International Protection) **IP** (Supplementary letter)

First characteristic numeral	Degrees of protection against solid foreign objects	
	Brief description	Definition
0	Unprotected	—
1	Protected against solid foreign objects of ≥ 50 mm and greater	A ≥ 50 mm object probe shall not fully penetrate enclosure*
2	Protected against solid foreign objects of ≥ 12.5 mm and greater	A ≥ 12.5 mm object probe shall not fully penetrate enclosure*
3	Protected against solid foreign objects of ≥ 2.5 mm and greater	A ≥ 2.5 mm object probe shall not fully penetrate enclosure*
4	Protected against solid foreign objects of ≥ 1.0 mm and greater	A ≥ 1.0 mm object probe shall not fully penetrate enclosure*
5	Protected against dust	Ingress of dust is not totally prevented, but dust that does penetrate must not interfere with satisfactory operation of the apparatus or impair safety.
6	Dust-proof	No ingress of dust allowed.

* The full diameter of the object probe shall not pass through an opening of the enclosure.

For details of the test conditions used in evaluating each degree of protection, please refer to IEC 60529 (JIS C 0920).

Second characteristic numeral	Degrees of protection against water	
	Brief description	Definition
0	Unprotected	—
1	Protected against vertical water drops	Vertically falling water drops shall have no harmful effects.
2	Protected against vertical water drops within a tilt angle of 15°	Vertically falling water drops shall have no harmful effects when the enclosure is tilted at any angle up to 15° on either side of the vertical.
3	Protected against spraying water	Water sprayed at an angle up to 60° either side of the vertical shall have no harmful effects.
4	Protected against splashing water	Water splashed against the enclosure from any direction shall have no harmful effects.
5	Protected against water jets	Water projected in jets against the enclosure from any direction shall have no harmful effects.
6	Protected against powerful water jets	Water projected in powerful jets against the enclosure from any direction shall have no harmful effects.
7	Protection against water penetration	Ingress of water in quantities causing harmful effects shall not be possible when the enclosure is temporarily immersed in water under standardized conditions of pressure and time.
8	Protected against the effects of continuous immersion in water	Ingress of water in quantities causing harmful effects shall not be possible when the enclosure is continuously immersed in water under conditions which shall be agreed between manufacturer and user but which are more severe than for IPX7.

Supplementary letter	Degrees of protection against oil	
	Abstract	
F	Oil-resistant	Drops or splashes of oil from any direction cause no harmful effects.
G	Oil-proof	Protection against entry of oil droplets or splashes from all directions.

The protection levels against oil are specified only in the appendix of JIS C 0920.

Digimatic S1



The proprietary Mitutoyo bidirectional serial communication protocol enables a connected PC to execute measurement data output, setting and control of a measuring instrument, and capture of information of a specific measuring instrument.

TÜV Rheinland certification marks



All products with the marks shown on the left have passed the IP test carried out by the German accreditation organization, TÜV Rheinland.

Measuring Instruments Shipped with Inspection Certificate



Mitutoyo guarantees product quality as a leading precision measuring instrument manufacturer and ships measuring instruments with an inspection certificate that includes inspection data so that customers can use them with confidence. Mitutoyo also calibrates the purchased measuring instruments and issues a calibration certificate, for a fee, that proves traceability to the relevant standard.

Note: For the meaning of the inspection marks shown at left, refer to the detailed description of each product.

MeasurLink® ENABLED marks



Products equipped with the measurement data output function can be connected to the measurement data network system MeasurLink®. MeasurLink® is a registered trademark of Mitutoyo Corporation in Japan and Mitutoyo America Corporation in the United States.

Installation of Main Unit Startup System



As a part of the enhancement of our export control system, the large CNC measuring machines (all the CNC Coordinate Measuring Machines, Vision Measuring Systems, and Form Measuring Machines) are now equipped with a Main Unit Startup System (relocation detecting system) before export.

This system is designed to take a machine out of operation upon detecting the mechanical shock that accompanies relocation. If you intend to relocate a measuring machine fitted with this system, please contact us beforehand so that our service engineers can assist you.

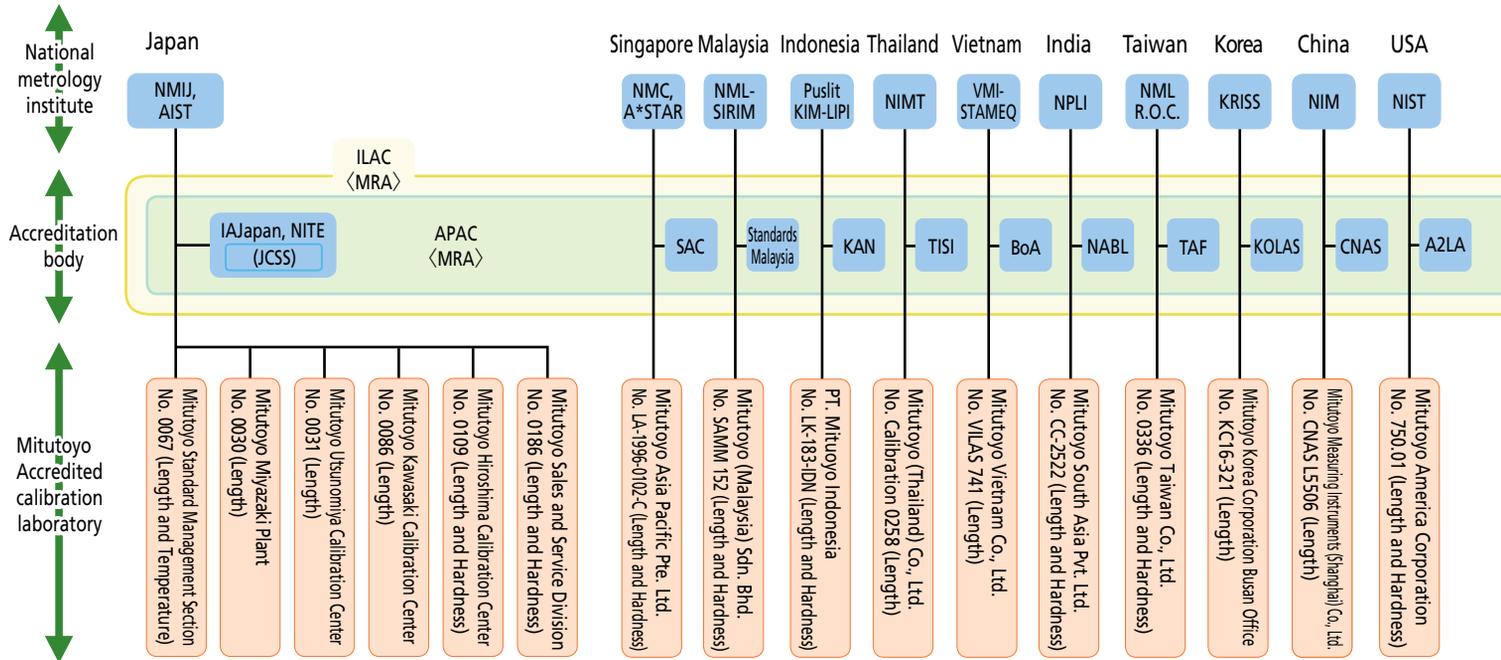
However, the system may be triggered in the event of a natural event such as a powerful earthquake. In this case, our service engineers will deal with the situation at the earliest opportunity.



Got Questions?

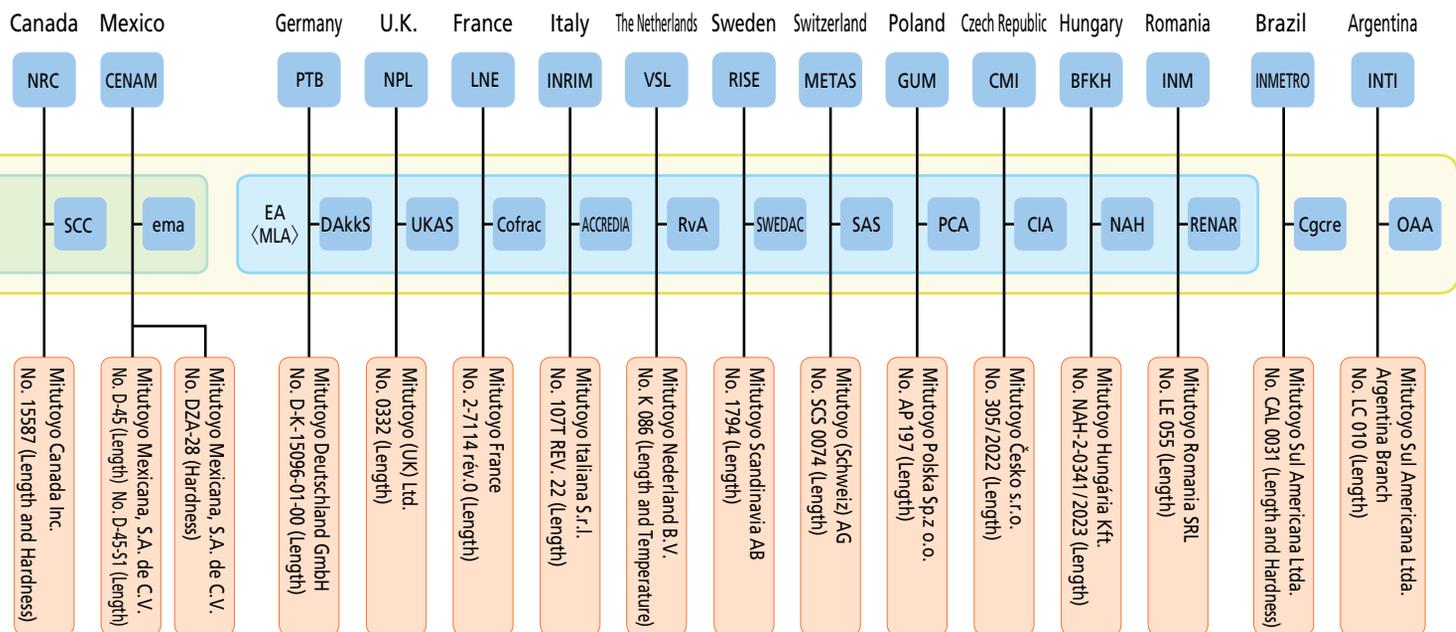
Calibration Laboratories Worldwide

Mitutoyo has built a network for comprehensive calibration support of precision measuring products in the global market. To provide calibration services on a global scale, Mitutoyo has gained ISO/IEC 17025 certification from the accreditation body in each country, and has issued calibration certificates carrying the mark of each accreditation body. In addition, the calibration certificates issued by each calibration laboratory are mutually recognized in the countries and commercial areas signed in the MRA (Mutual Recognition Arrangement) of ILAC (International Laboratory Accreditation Cooperation) and APAC (Asia Pacific Accreditation Cooperation), or the MLA (Multilateral Agreement) of EA (European co-operation for Accreditation).



- Japan
 - AIST : National Institute of Advanced Industrial Science and Technology
 - NMIJ : National Metrology Institute of Japan
 - IAJapan : International Accreditation Japan
 - NITE : National Institute of Technology and Evaluation
 - JCSS : Japan Calibration Service System
- Singapore
 - NMC, A*STAR : National Metrology Centre/Agency for Science, Technology and Research
 - SAC : Singapore Accreditation Council
- Malaysia
 - NML-SIRIM : National Metrology Laboratory-Standards and Industrial Research Institute of Malaysia
 - Standards Malaysia : Standards Malaysia
- Indonesia
 - Puslit KIM-LIPI : Research Center for Calibration, Instrumentation and Metrology- Indonesian Institute of Science
 - KAN : Komite Akreditasi Nasional
- Thailand
 - NIMT : National Institute of Metrology (Thailand)
 - TISI : Thai Industrial Standard Institute
- Vietnam
 - VMI-STAMEQ : Vietnam Metrology Institute, Directorate for Standards and Quality
 - BoA : BUREAU OF ACCREDITATION
- India
 - NPLI : National Physical Laboratory of India
 - NABL : National Accreditation Board for Testing and Calibration Laboratories
- Taiwan
 - NML R.O.C. : National Measurement Laboratory R.O.C.
 - TAF : Taiwan Accreditation Foundation
- Korea
 - KRISS : Korea Research Institute of Standards and Science
 - KOLAS : Korea Laboratory Accreditation Scheme
- China
 - NIM : National Institute of Metrology
 - CNAS : China National Accreditation Service for Conformity Assessment
- U.S.A.
 - NIST : National Institute of Standards and Technology
 - A2LA : American Association for Laboratory Accreditation
- Canada
 - NRC : National Research Council Canada/Institute for National Measurement Standards
 - SCC : Calibration Laboratory Assessment Service/Standards Council of Canada
- Mexico
 - CENAM : Centro Nacional de Metrología
 - ema : Entidad Mexicana de Acreditación, a.c.
- Germany
 - PTB : Physikalisch-Technische Bundesanstalt
 - DAkkS : Deutsche Akkreditierungsstelle GmbH
- U.K.
 - NPL : National Physical Laboratory
 - UKAS : United Kingdom Accreditation Service
- France
 - LNE : Laboratoire national de métrologie et d'essais
 - Cofrac : Comité français d'accréditation

Note: The above are domestic and international locations where Mitutoyo provides ISO/IEC 17025 accredited calibration services.
(As of July, 2024)



- Italy
INRIM : Istituto Nazionale di Ricerca Metrologica
ACCREDIA : L'ENTE ITALIANO DI ACCREDITAMENTO
- The Netherlands
VSL : Van Swinden Laboratorium
RvA : Raad voor Accreditatie
- Sweden
RISE : RISE Research Institutes of Sweden AB
SWEDAC : Swedish Board for Accreditation and Conformity Assessment
- Switzerland
METAS : The Federal Institute of Metrology
SAS : Swiss Accreditation Service
- Poland
GUM : Główny Urząd Miar - the National Metrology Institute in Poland
PCA : Polskie Centrum Akredytacji
- Czech Republic
CMI : Český Metrologický Institut
CIA : Český Institut pro Akreditaci
- Hungary
BFKH : Government Office of the Capital City Budapest
NAH : Nemzeti Akkreditáló Hatóság
- Romania
INM : Institutul National de Metrologie
RENAR : Asociația de Acordare din România

- Brazil
INMETRO : Instituto Nacional de Metrologia Qualidade e Tecnologia
Cgcre : Coordenação Geral de Acreditação do INMETRO
- Argentina
INTI : Instituto Nacional de Tecnología Industrial
OAA : Organismo Argentino de Acreditación

ILAC : International Laboratory Accreditation Cooperation
APAC : Asia Pacific Accreditation Cooperation
MRA : Mutual Recognition Arrangement
EA : European co-operation for Accreditation
MLA : Multilateral Agreement



Certificate of DAkkS accredited laboratory (Mitutoyo Deutschland in Germany)



Certificate of SAC accredited laboratory (Mitutoyo Asia Pacific in Singapore)



Certificate of A2LA accredited laboratory (Mitutoyo America in U.S.A.)



Certificate of RvA accredited laboratory (Mitutoyo Nederland in the Netherlands)



Certificate of CNAS accredited laboratory (Mitutoyo Measuring Instruments (Shanghai) in China)



Certificate of Cgcre accredited laboratory (Mitutoyo Sul Americana in Brazil)

Name of each National metrology institutes and Accreditation bodies are based on our survey. For the latest information, please refer to our website. <https://www.mitutoyo.co.jp>

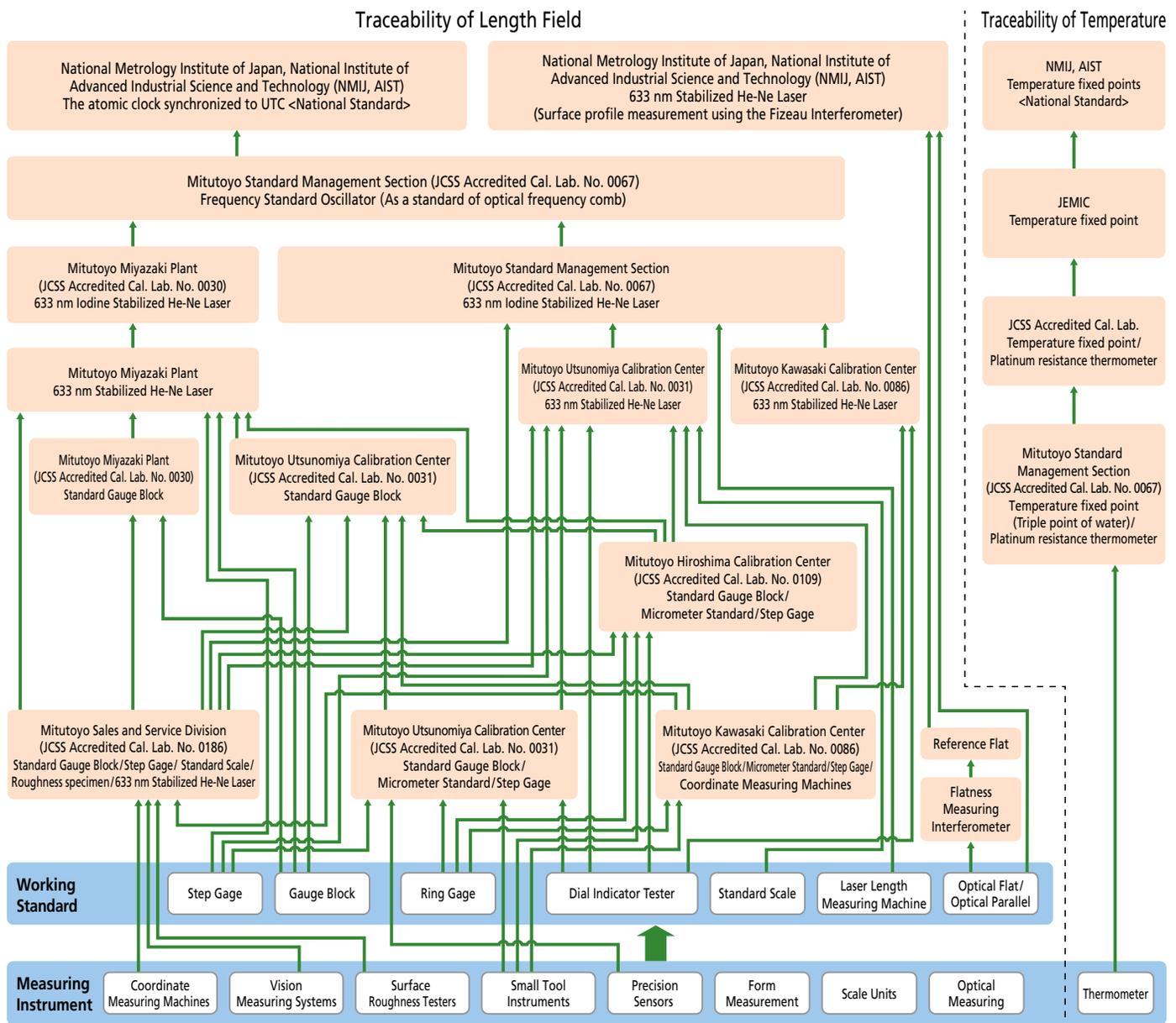
Traceability of Mitutoyo Standards

Mitutoyo ensures and maintains traceability of various types of precision measuring instruments by holding standards of length and other physical quantities that are directly traceable to the national standards for use in calibrating the working standards used for the calibration of measuring instrument products supplied to industry. Furthermore, Mitutoyo offers a temperature calibration service which is indispensable for high-accuracy length measurement.

The Mitutoyo traceability system with the optical frequency comb at the top level, ensuring performance equivalent to that of the Japan's national standard, and the calibration technology supporting this system are the basis of highly accurate and reliable products offered to customers.



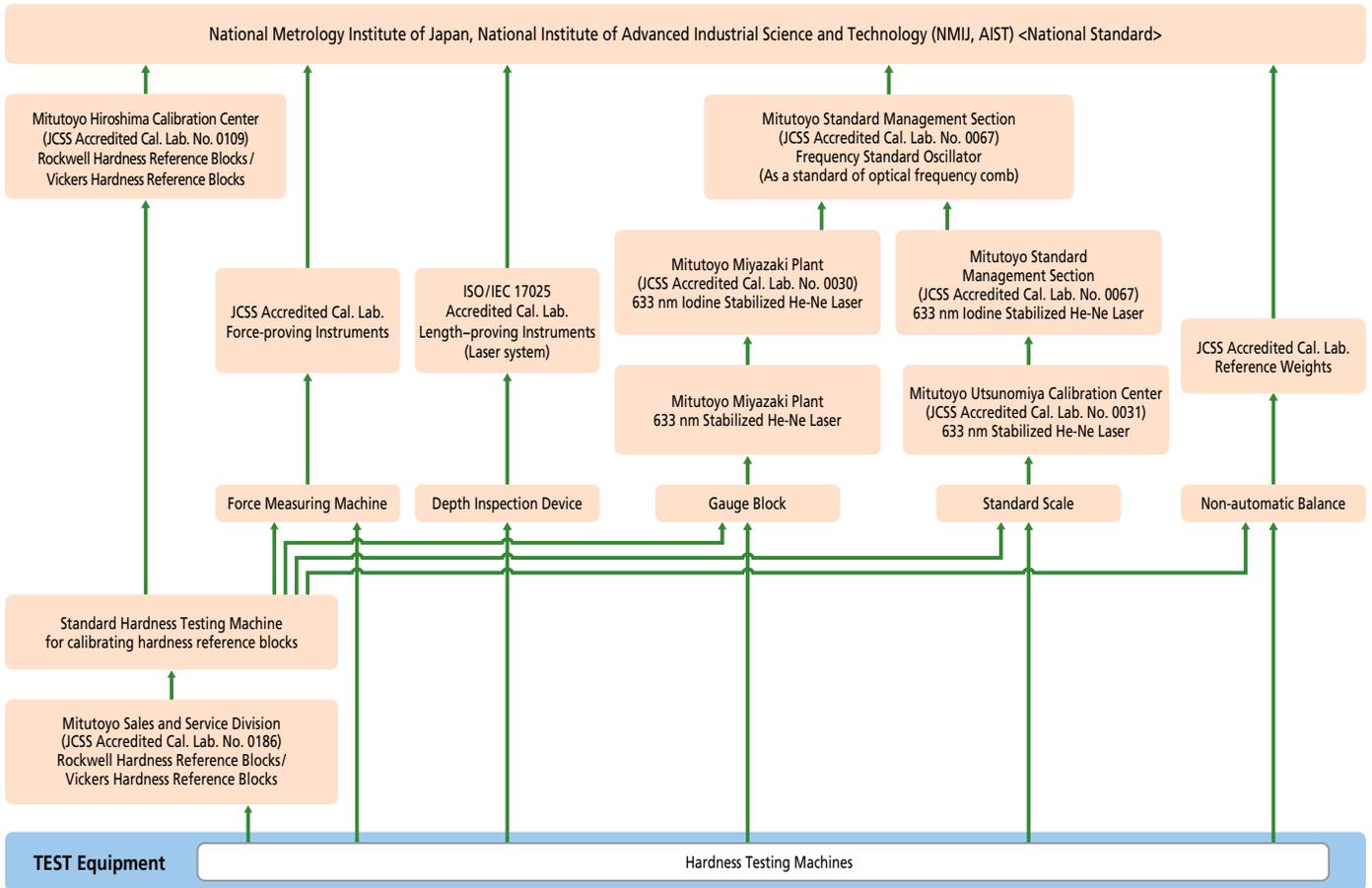
Certificate of JCSS accredited laboratory (Mitutoyo Standard Management Section)



Note: This chart shows a simplified traceability system of a part of Mitutoyo products. Detailed traceability charts are published for each product. (As of July, 2024)

For the latest information, please refer to our website. <https://www.mitutoyo.co.jp>

Traceability of Hardness Field



Note: This chart shows a simplified traceability system of a part of Mitutoyo products. Detailed traceability charts are published for each product. (As of July, 2024)

For the latest information, please refer to our website. <https://www.mitutoyo.co.jp>

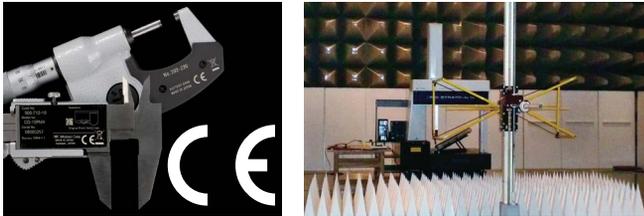


Response to Safety and Environmental Protection Regulations

To deliver safe and reliable products to our customers, Mitutoyo evaluates its products to ensure that they adhere to applicable product safety and environmental standards, including CE marking.

CE Marking

CE marking indicates that a product complies with the essential requirements of the relevant European health, safety and environmental protection legislation.



Conformity evaluation for CE marking (EMC Directives)

Major applicable Directives relating to Mitutoyo products

Applicable Directives	Applicable range
Machinery Directive	At least one part of a machine that may cause injury to the human body if it moves due to movement of an actuator such as a motor.
EMC Directive (Electromagnetic Compatibility Directive)	A product that may produce electromagnetic radiation or which is influenced by electromagnetic radiation from outside.
Low Voltage Directive	Equipment (device) that uses AC voltage of 50 to 1000 V or DC voltage of 75 to 1500 V.
Radio Equipment Directive	All electrical and electronic equipment that intentionally transmits and receives radio waves at frequencies below 3000 GHz.
RoHS Directive	Restriction of the use of certain hazardous substances in electrical and electronic equipment. Restricted substances and maximum concentration values tolerated by weight: <ul style="list-style-type: none"> · Lead (0.1%) · Cadmium (0.01%) · Mercury (0.1%) · Hexavalent chromium (0.1%) · Polybrominated biphenyls (PBB) (0.1%) · Polybrominated diphenyl ethers (PBDE) (0.1%) · Bis (2-ethylhexyl) phthalate (DEHP) (0.1%) · Butyl benzyl phthalate (BBP) (0.1%) · Dibutyl phthalate (DBP) (0.1%) · Diisobutyl phthalate (DIBP) (0.1%) Note: Our products fall under Cat.9 "Monitoring and control instruments including industrial monitoring and control instruments".

UKCA Marking

UKCA marking indicates that the products conform to the applicable requirements for products sold in Great Britain.



Response to WEEE Directive

The WEEE Directive*1 is a directive that mandates appropriate collection and recycling of electrical and electronic equipment waste.

The purpose of this directive is to increase the reuse and recycling of these products. To differentiate between equipment waste and household waste, a crossed-out wheeled-bin symbol  is marked on a product.

*1 WEEE Directive: Directive 2012/19/EU of the European Parliament and of the Council on waste electrical and electronic equipment.

Response to REACH Regulation

REACH Regulation*2 is a regulation governing registration, evaluation, authorization and restriction of chemical substances in Europe, and all products such as substances, mixtures and molded products (including accessories and packaging materials) are regulated.

Chemical substances scientifically proven to be substances that are hazardous to human health and the global environment (Candidate List of substances of very high concern for Authorisation (CLS)) are prohibited to be sold or information concerning them disclosed is mandated in Europe.

We will actively disclose information about our products and provide replacement if we find our products contain any of the listed substances.

*2 REACH Regulation: Regulation (EC) No1907/2006 of the European Parliament and of the Council concerning the Registration, Evaluation, Authorization and Restriction of Chemicals

Response to Management Methods for Restricted Use of Hazardous Substances in Electrical and Electronic Product (China RoHS 2)

We set the environmental protection use period regulated by China RoHS 2 per product and label with the marks shown on the right, together with a list of the contained substances.



"Environmental Protection Use Period" mark*3

*3 The environmental protection use period does not indicate the product warranty period.

Precautions to be taken when handling button cells



WARNING

Indicates a hazard with a medium level of risk which, if not avoided, could result in death or serious injury.

- KEEP batteries OUT OF REACH OF CHILDREN, ingestion can cause DEATH or serious injury.
Seek immediate medical attention if you suspect that a battery is swallowed or inserted inside any part of the body.
- Do not dismantle, heat or throw the battery in a fire.
- If alkaline solution leaks from the battery and contacts your skin or clothes, immediately wash the affected area with water. IF IN EYES, immediately rinse eyes cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing and summon immediate assistance from a doctor.
- Do not solder directly to a battery.
- Ensure batteries are inserted without coming into contact with metal parts of equipment.
- In case of disposal, insulate (+) and (-) terminals of a battery by applying an insulating material.



CAUTION

Indicates a hazard with a low level of risk which, if not avoided, could result in minor or moderate injury.

- Do not try to charge the battery as it is not chargeable. Install the battery with correct polarity. Failure to do so can cause battery leakage or burst resulting in damage to the instrument or personal injury.

NOTICE

Indicates a potentially hazardous situation which, if not avoided, may result in property damage.

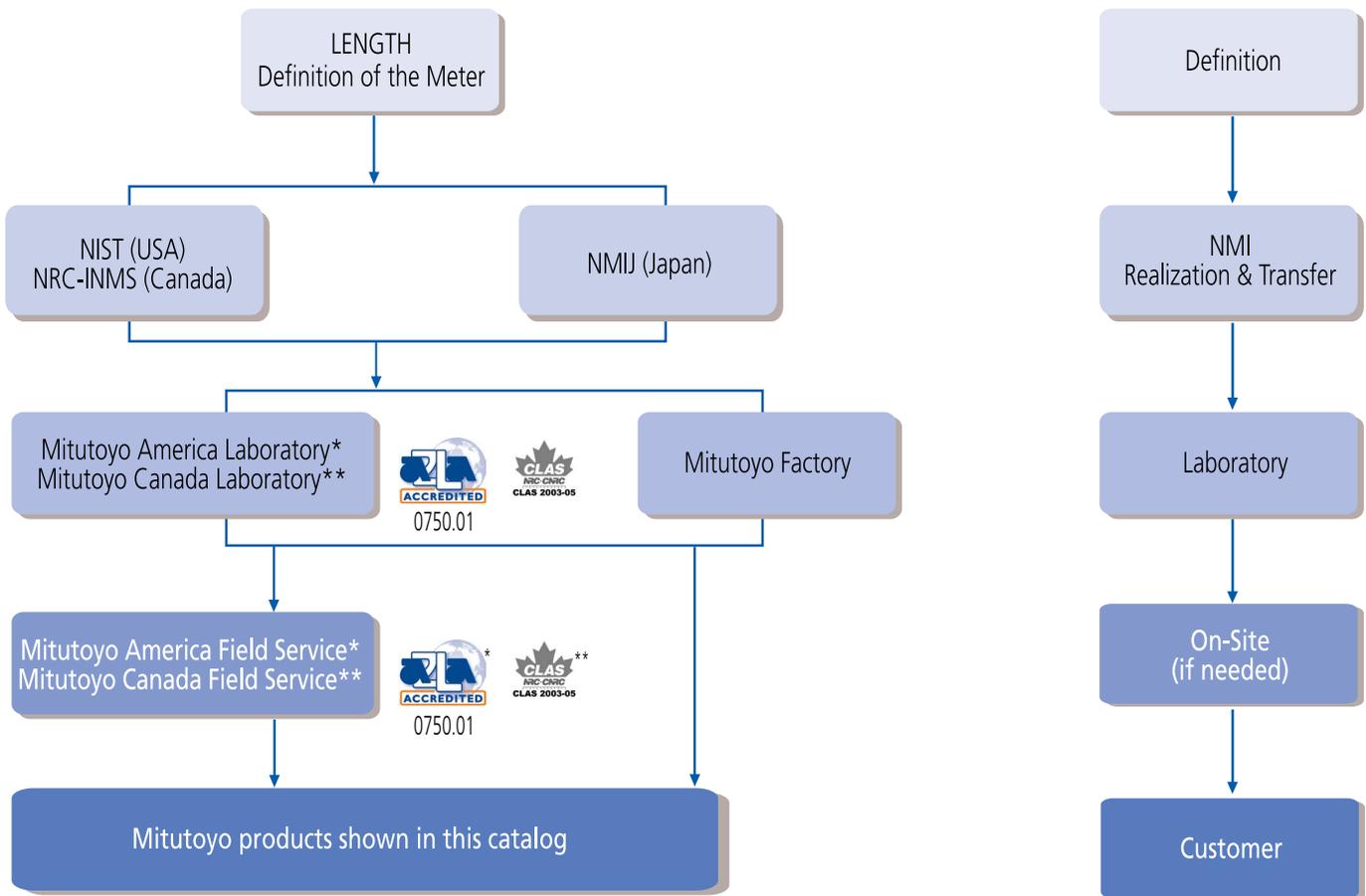
- Do not use new and used batteries together. Do not use different types of batteries together.
- Do not use nor leave batteries in direct sunlight nor in locations subject to high temperature or humidity.
- Avoid letting batteries contact water.
- Remove batteries from equipment that will not be used for a prolonged period.

Follow the regulations of each country when disposing of batteries.



Got Questions?

Traceability Mitutoyo North America



Traceability is an essential requirement for all measurements. At Mitutoyo, we consider providing traceability to our customers to be a critical part of our business. Traceability is often referred to as a "chain of comparisons," and that chain always starts with a precise definition. For length measurements, the meter is defined by how far light moves in a vacuum in a defined amount of time. The job of reducing that definition into a practical measurement belongs to the world's National Metrology Institutes (NMI). The NMI in the United States is the National Institute of Standards and Technology (NIST), where they realize and transfer the definition of length to physical measurements of gage blocks, line scales, and other primary standards. From there, traceable measurements at other laboratories and factories are possible. Mitutoyo factories and calibration labs regularly send their standards to NIST; however, traceability can also be established through other recognized NMIs, such as the National Metrology Institute of Japan (NMIJ). The world's leading NMIs, such as NIST and NMIJ, routinely participate in intercomparisons to ensure global traceability to the same unit of length.

The requirements for demonstrating traceability vary from industry to industry. In the past, some industries required NIST test numbers, but that practice is now obsolete and has been replaced in many industries by the much more demanding requirement of ISO 17025 accreditation. To meet these needs, Mitutoyo America offers our customers A2LA-accredited calibrations either in our labs (Certificate 0750.01), or at your facility (Certificate 0750.01). None of our competitors can match the range and accuracy of accredited calibration services offered by Mitutoyo. Not every quality system requires accreditation, and for the less demanding needs, our standard factory issued certificates can still be used to ensure the required traceability.

Whatever the measurement, whatever the requirements for traceability, Mitutoyo has the most technically advanced metrology products and calibration services to meet your specific needs.

Measuring instruments that include a certificate of inspection

As part of quality assurance, Mitutoyo will attach data at the time of factory shipment*1 to the products listed in page 14-10.*2

Also, if calibration of the measuring instrument is requested at the time of purchase, we will issue, at a separate charge, an inspection certificate that proves traceability with the reference gage. If you wish to request calibration, please contact your local Mitutoyo sales office.

*1 For some products whose purchase date cannot be identified, the inspection data at the time of factory shipment cannot be used in the inspection certificate. For details, please contact your local Mitutoyo sales office.

*2 The products are listed in the series name. There are some models that will not be accompanied with an inspection certificate.



- For the details of the inspection items to be included in the inspection certificate, please contact your local Mitutoyo sales office.
- If you have a request on inspection items, contact your local Mitutoyo sales office.

	Products Name	Page
Gage Blocks	Inch/Metric Rectangular Gage Block Sets	E-6 to E-8
	Micrometer Inspection Gage Block Sets	E-9
	Individual Inch/Metric Rectangular Gage Blocks	E-10 to E-12
	Gage Blocks with a Calibrated Coefficient of Thermal Expansion	E-13
	ZERO CERA Blocks (Ultra-low Thermal Expansion)	E-13
	Inch/Metric Square Gage Block Sets	E-17 to E-18
	Individual Inch/Metric Square Gage Blocks	E-19 to E-20
	Step Master	E-24
	Gage Block Comparator GBCD-100A	E-25
Gage Block Comparator GBCD-250	E-25	
Height Masters, Check Masters	Height Master	E-26
	Digital Height Master	E-27
	Riser Blocks	E-28
	Universal Height Master	E-29
	Check Master	E-30
Reference Gages	Standard Scales	E-32
	Working Standard Scales	E-32
	High Precision Square	E-33
	Black Granite Surface Plates	E-47
Micrometers (only for models with the range of 0 - 25 mm and 25 - 50 mm)	Ultra-high Accuracy Digimatic Micrometer	B-3
	High-speed and High-accuracy Digimatic Micrometer QuantuMike	B-5
	Coolant Proof Micrometers	B-7
	Digimatic Outside Micrometers	B-10
	Outside Micrometers	B-16
	Ratchet Thimble Micrometer	B-17
	Outside Micrometers	B-18
Calipers	IP67 ABSOLUTE Coolant Proof Caliper	D-3
	ABSOLUTE Digimatic Caliper	D-5
	Dial Caliper	D-8
High Precision Height Measuring Tools	Linear Height	D-49
	QM-Height	D-51
Caliper/Height Gage Checker	CERA Caliper Checker	D-62
Depth Gages	Depth Micro Checker	D-68

	Products Name	Page
Digimatic Indicators	High-performance ABS Digimatic Indicator ID-FNX	F-3
	ABSOLUTE Digimatic Indicator ID-CNX	F-5
	ABSOLUTE Digimatic Indicator ID-N/B	F-7
	ABSOLUTE Digimatic Indicator ID-SX2	F-9
	ABSOLUTE Digimatic Indicator ID-U	F-11
	ABSOLUTE Digimatic Indicator ID-CAX (Peak-Value Hold Type)	F-13
	ABSOLUTE Digimatic Indicator ID-CGX (Bore Gage Type)	F-15
	ABSOLUTE Digimatic Indicator ID-CRX (Calculation Type)	F-17
	ABSOLUTE Digimatic Indicator ID-CJX (Signal Output Function Type)	F-20
	Digimatic Indicator ID-H	F-22
	Dial Indicators	Dial Indicators
Dial Test Indicators	Dial Test Indicators	F-75
Indicator Calibration	i-Checker	F-87
	UDT-2 Calibration Tester	F-88
Inside Measuring Instruments	Digimatic Holtest	C-3
	Holtest	C-7
	Holtest (Type II)	C-11
	ABSOLUTE Borematic	C-13
	CERA Inside Micro Checker	C-30
Hardness Testing Machines	Rebound Type Portable Hardness Tester (HH-V400)	K-14
Linear Gages	High-accuracy/resolution Linear Gage LGH	G-9
Linear Scales	Linear Scales AT Series	H-13
	Linear Scales ST Series	H-19
Vision Measuring Systems	Quick Vision	M-3
	CNC Vision Measuring Machine with Micro-form Scanning Probe (MISCAN Vision System)	M-7
	Micro-form Measuring System UMAP	M-9
	QUICK SCOPE	M-13
	QUICK IMAGE	M-14
Form Measuring Systems	SURFTEST	J-3
	CONTRACER	J-8
	FORMTRACER	J-9
	ROUNDTTEST	J-21
	ROUNDTRACER	J-25
Hardness Testing Machines	Micro Vickers Hardness Testing Machine	K-4
	Vickers Hardness Testing Machine	K-6
	Rockwell Hardness Testing Machine	K-9

Note: Some products mentioned above will not be accompanied with an inspection certificate as standard.

Featured Products



SPC Data Management Software MeasurLink®

Refer to pages A-3 to A-10 for details.

Mitutoyo Certificate of Calibration
Calibration Date: 12/11/2024
Calibrator: N/A
Gage Description: Demo Purposes
Serial Number: 81588
Gage Name: 6" Mitutoyo Caliper
Calibrator Title: N/A

Standard	Size	Tolerance	Unit	As Found	As Left	As Left Result
6" Gage Block-00	0.0000	± 0.0010	in	0.0000		
6" Gage Block-00	1.0000	± 0.0010	in	0.0000		
6" Gage Block-00	2.0000	± 0.0010	in	0.0000	0.0000	Pass
6" Gage Block-00	4.0000	± 0.0010	in	0.0000		
6" Gage Block-00	6.0000	± 0.0010	in	0.0000		

Name	Cal Date	Due Date	Trace ID
6" Gage Block-00	09/24/2024	11/24/2025	122889

Statements of conformance are based on the test values and tolerances shown above and when accounting for the measurement uncertainty using a simple acceptance decision rule. The measurement uncertainty is the value which allows for the 4-sigma capability. This certificate represents an unqualified measurement of approximately 99% confidence level using a coverage factor of 4-sigma. The values shown above are not valid for calibration purposes only. As found is as indicated. These test values are traceable to the National Institute of Standards and Technology through the International Reference Service. Product: C1700-000, C-Environmental, 20-Expanded, C-1-120, Express-C, the 400 to 500. This is a calibration certificate for demonstration purposes only. The certificate shall not be reproduced except in full without the written permission of Mitutoyo America Corporation.

Mitutoyo America Corporation
965 Corporate
Blvd, Aurora, Illinois 60502
Phone: 888-648-8869

This calibration was performed for demonstration purposes only.

Page 1 of 1

Gage Calibration and Tracking Software MeasurLink® Gage Management

Refer to page A-9 for details.



Wireless Data Collection Systems U-WAVE

Refer to pages A-15 to A-22 for details.



USB Data Cables and Interfaces Input Tools, Multiplexers, and Data Logger/Printer

Refer to pages A-23 and A-27 for details.

A



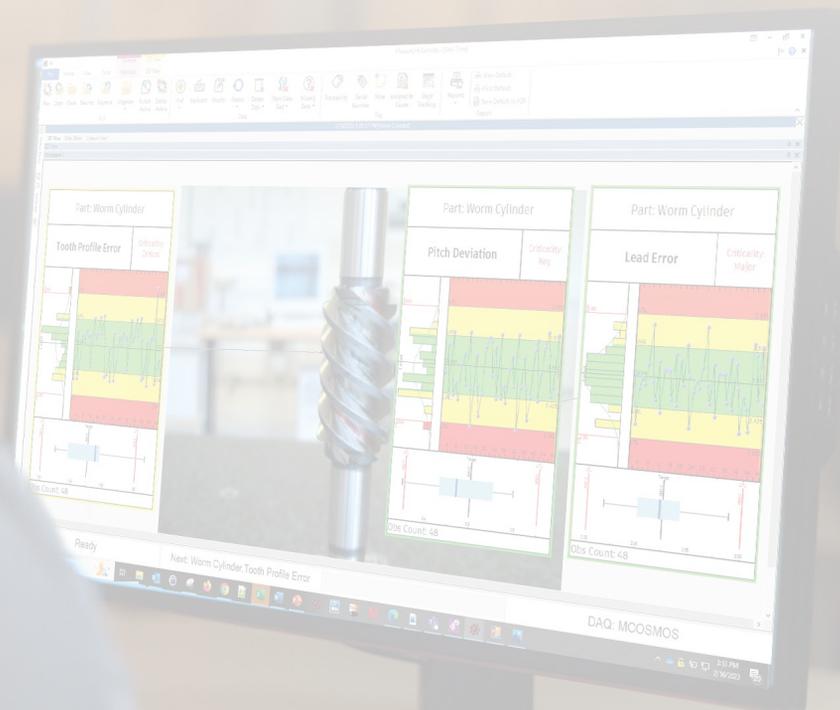
Cable Connection Guide Connection Cables and Applicable Gage Models

Refer to pages A-29 to A-30 for details.

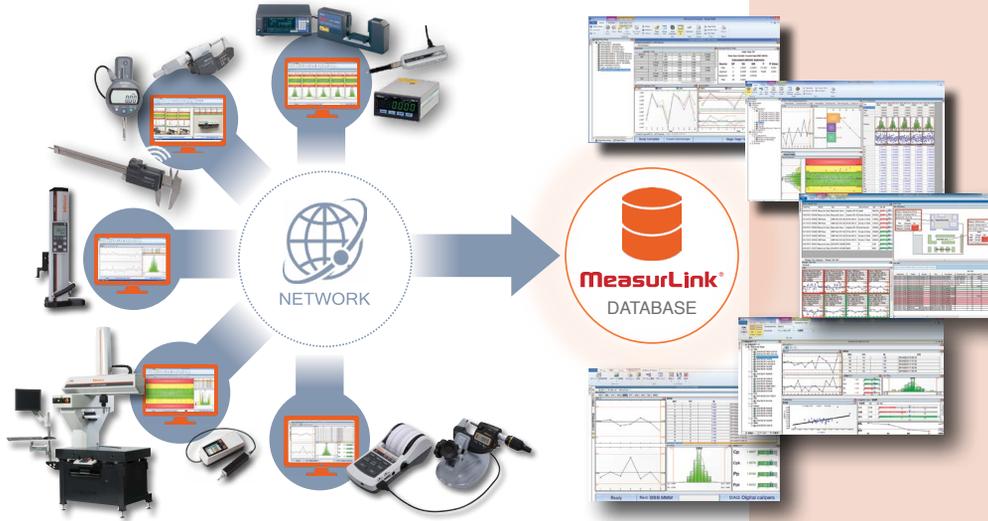
INDEX

Measurement Data Management

MeasurLink®	A-2-10
USB-ITPAK	A-11-14
U-WAVE Wireless	A-17-20
U-WAVE Bluetooth	A-21,22
Input Tools	A-23,24
Multiplexer - MIG-8USB, MIG-4USB	A-25
DP-1VA	A-26
Gage Selector 3	A-27
EC Counter	A-27
SPC Connecting Cables	A-28-30



ML10



THE BIG PICTURE

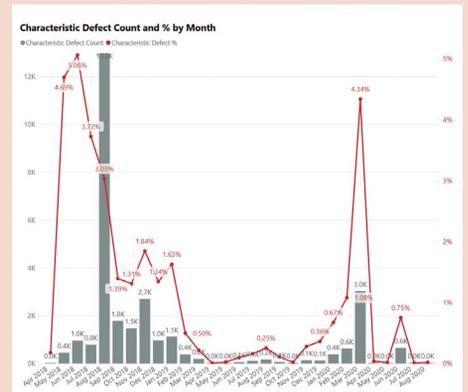
Scalable Data Acquisition, Management & Analysis

MeasurLink® is the dedicated Mitutoyo Data Collection and Real-Time SPC software used in all industries to collect and analyze data to improve manufacturing processes.

Assemble a software package from any of the MeasurLink® modules to satisfy your organization's specific needs, or select the Single Floating License to share and use all modules in the MeasurLink® suite.

- **Real-Time Standard** allows data collection from each tool and instrument while allowing real-time display of statistical processing data such as control charts, histograms and process capability indices.
- **Real-Time Professional** additionally supports filtering/filters, Import templates and DDE DAQ Sources (professional edition included in all workgroups).
- **Real-Time Professional 3D** additionally supports view of the workpiece using 3D CAD data (HOOPS).
- **Process Analyzer** is a powerful supervisory tool for viewing, analyzing and reporting on all data collected at any Real-Time station on the network. Additional charting options and management-friendly reports provide insight on the manufacturing process.
- **Process Manager** enables centralized monitoring of information from all MeasurLink® data collection terminals networked together on the shop floor.
- **Report Scheduler** automatically outputs reports created by Real-Time or Process Analyzer on a user defined schedule.
- **Gage Management** plans and implements a complete calibration schedule and incorporates a powerful retrieval function in addition to recording and managing the operational state of gages.
- **Gage R&R** is an evaluation and analysis software compliant with MSA required in ISO/TS 16949.

MeasurLink® can serve the smallest shop to the largest multi-national enterprise with the most ease of use and power available in SPC/data management software today.



MeasurLink® supports PowerBI.
See page A-7 for details.



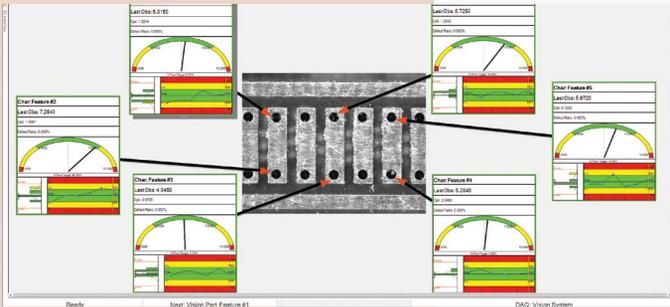
Refer to Bulletin No. (2188) for more details.

CONTINUOUS IMPROVEMENT WITH Statistical Process Control

MeasurLink® calculates and monitors statistical metrics, and it is an integral part of Six Sigma activities. This Real-Time monitoring allows users to control the quality of the product during production and prevent costly defects:

- Live statistical data testing
- Email alerts and alarms for out-of-control processes
- Real time Cp, Cpk, Pp and Ppk calculations
- Immediate pre-control, X-Bar R and IMR charting
- Assignable cause and corrective action data entry

MeasurLink® allows companies to control the quality of their processes by identifying and reducing process variation.



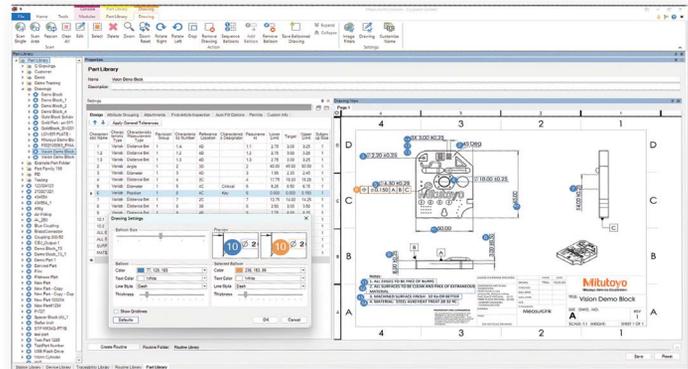
CONFORMANCE TO AS9102 Requirements

AS9100 requires a great focus on establishing and complying with design requirements. MeasurLink® supports First Article Inspection view in Real-Time or Process Analyzer to provide a clear and concise approach for completing FAI reports that align with the AS9102 requirements. This feature includes forms 1, 2, and 3 with options to export to Excel or PDF and allows users to search First Article Inspection information and production data in one location.

1	A	B	C	D	E	F	G
1	Part Number:	2. Part Name:	3. Serial Number:	4. FAIR Number:			
2	27543-01	M-Part 468-12	SN4096	213A			
3	5. Part Revision Level:	6. Drawing Number:	7. Drawing Revision Level:	8. Additional Changes:			
4	1	576324	B	N/A			
5	9. Manufacturing Process Reference:	10. Organization Name:	11. Supplier Code:	12. Purchase Order Number:			
6	19523	Mitutoyo America Corporation	546-21	60813			
7	13. Detail Part:	X	14. Full FAI:	X	Partial FAI:		
8	Assembly FAI:		Baseline Part Number (including revision level):	N/A			
9			Reason for Partial FAI:	N/A			
10	a) if above part number is a detail part only, go to field 20						
11	b) if above part number is an assembly, go to the "INDEX" section below.						
12	INDEX of part numbers or sub-assembly numbers required to make the assembly noted above.						
13	15. Part Number:	16. Part Name:	17. Part Serial Number:	18. FAIR Number:			
14	27434-12	Coupling 256-14	137-023	209A			
15							
16	19. Signature:	John Doe	20. Date:	09/08/2022			
17		X	FAI Complete	FAI Not Complete			
18	21. Reviewed By:	John Doe	22. Date:	09/12/2022			
19	23. Customer Approval:	John Doe	24. Date:	09/14/2022			

INTUITIVE DATA COLLECTION WITH OCR Auto-Ballooning

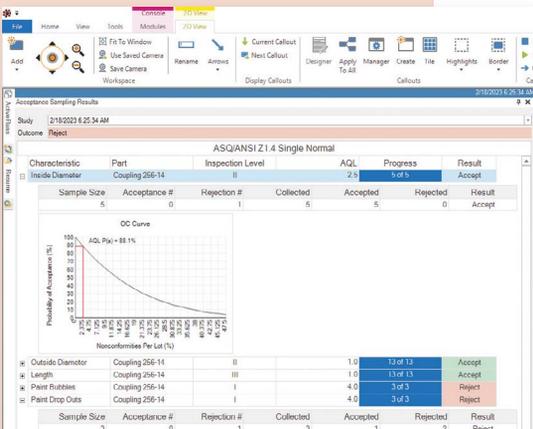
Scan 2D prints of an image or PDF to automatically create new parts. Optical Character Recognition (OCR) automates the process of ballooning drawings and populating characteristic tolerances, making the process more accurate and efficient than ever before.



THE ADVANTAGES OF Acceptance Sampling

MeasurLink®'s Acceptance Sampling uses C=0 or Z1.4 guidelines to determine inspection quantities. The inspection results will determine whether to accept or reject the entire material lot. Simply enter the lot size and sampling criteria to get started. This approach allows:

- Reduced cost of receiving inspection
- Increased confidence in supplier quality
- Faster reaction to supplier quality issues
- Less risk of supplier defects impacting other processes

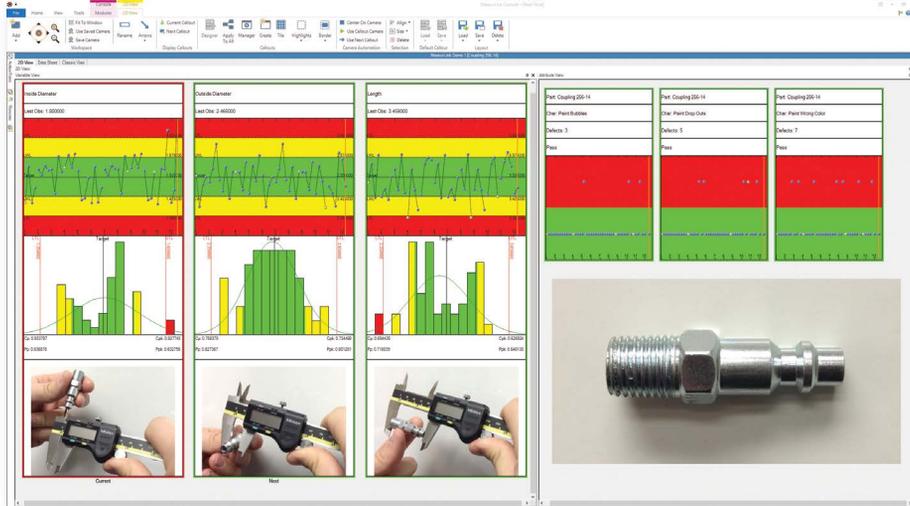


Real-Time

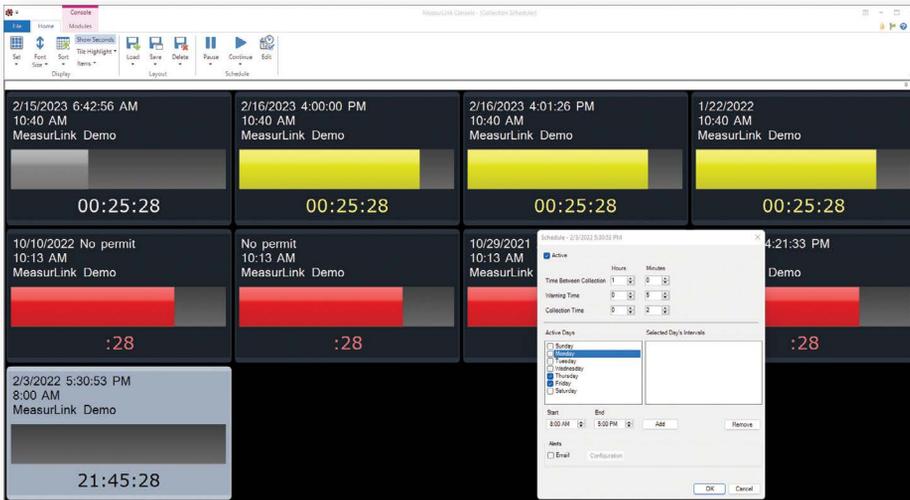
Data Collection Software for Operators and Inspectors

Use MeasurLink® Real-Time Standard Edition to acquire and analyze data in real-time and check variable and attribute inspection to control your process and minimize defects.

Designed to collect data at the point of manufacture, operators can be alerted of trends, cycles, and nonconformance as soon as they occur. A customizable user interface allows the user nearly infinite ways to view information specific to that process. MeasurLink® Real-Time has the ability to connect and acquire data from virtually any measuring device.



Views can be configured in many ways. Add images, prints, or videos to guide operators through inspection, or simply display a spreadsheet.



Schedule measurements by time so operators can see what is due for inspection in the easy-to-see Collection Scheduler dashboard.

Three Editions of Real-Time

Standard

Supports data collection from any tool that outputs data to a computer via USB, RS-232/Serial, or IoT standards (MQTT, MTConnect, OPC UA).

Professional

Supports data filtering and data collection from automated equipment such as CMMs, machine tool probes, or equipment that produces ASCII files (.txt, .csv, QIF).

Professional 3D

Includes all features of Real-Time Professional, including support for viewing 3D models during data collection.

Order No.	Description
64AAB836	MeasurLink® Real-Time Standard V10
64AAB837	MeasurLink® Real-Time Professional V10
64AAB838	MeasurLink® Real-Time Professional 3D V10
64AAB855F	MeasurLink® V10 Single Floating License

The single floating license is all-inclusive, it includes every module which can be used on any computer on the company network. Perfect for power users or anyone who wants to get the most improvement out of their manufacturing process. (Real-Time Professional 3D Edition is not included).

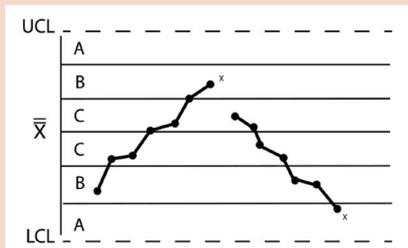


Got Questions?

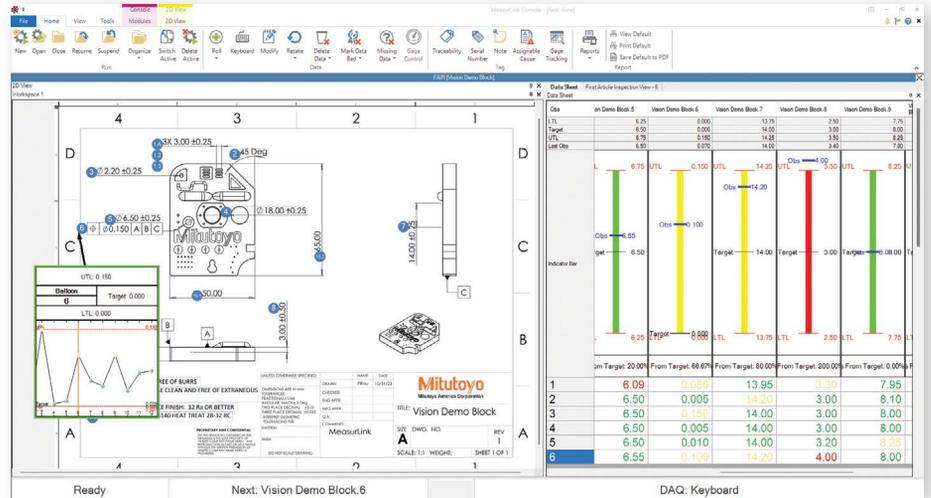
Pattern Detection

Many patterns can be detected and alerted including:

- Cycles
- Trends
- Freaks
- Mixtures
- Grouping or “bunching” of measurements
- Gradual change in level
- Sudden shift in level
- Instability (abnormally large fluctuations)
- Stratification (abnormally small fluctuations)
- Interactions (two or more variables acting together)
- Systematic variation
- Tendency of one chart to follow another
- Attribute data tests



MeasurLink® Real-Time can connect and acquire data from nearly any measuring device.



Scan a part print to bring it into MeasurLink® for easy ballooning and guidance during inspection.

- Collect more than measurement data (lot numbers, serial numbers, operators, machine lines, etc.)
- Barcode reader supported
- Assign causes to defects and provide corrective action instructions
- Configurable export options and report design
- Support for position tolerancing
- Password protected user accounts for data integrity
- 21 CFR Part 11 validation documents included
- Design and auto-trigger custom reports

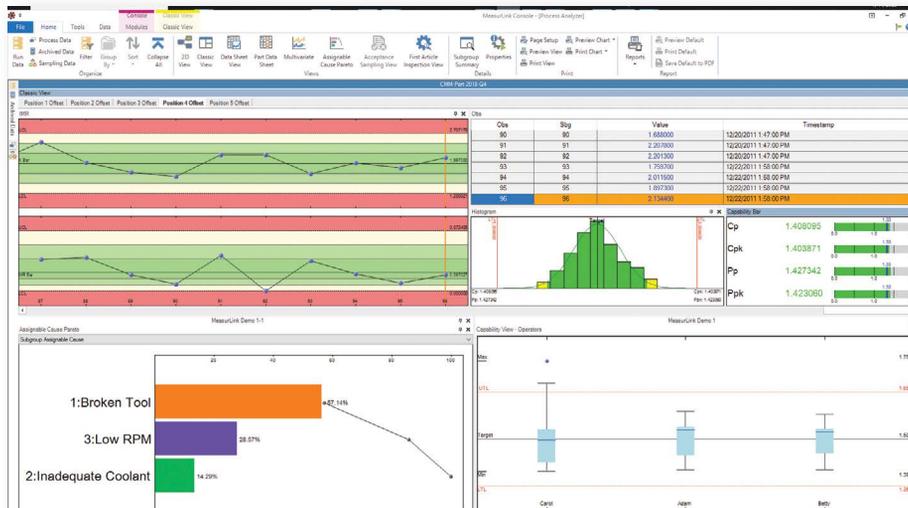
Obs	Coupling 256-14 Inside Diameter	Coupling 256-14 Outside Diameter	Coupling 256-14 Length	Coupling 256-14 Part Bubbles	Coupling 256-14 Paint Drop Outs
Material Lot #	N/A	N/A	N/A	N/A	N/A
Part Name	Coupling 256-14	Coupling 256-14	Coupling 256-14	Coupling 256-14	Coupling 256-14
Custom Text	Item Name	Item Name	Item Name	Item Name	Item Name
Obs Count	139	143	143	119	113
Defective Parts	46	46	46	46	46
Defect Ratio	5.755%	9.091%	7.692%	3.361%	2.521%
LTL	0.180000	0.422500	1.600000	N/A	N/A
Target	0.200000	0.432500	1.610000	N/A	N/A
UTL	0.220000	0.442500	1.620000	N/A	N/A
Maximum	0.292000	0.468500	1.700000	N/A	N/A
Minimum	0.100000	0.183500	0.840000	N/A	N/A
XD Bar	0.1932647	0.4219891	1.5014143	N/A	N/A
Range	0.1920000	0.2850000	0.8520000	N/A	N/A
Cp	0.670556	0.173806	0.124368	N/A	N/A
Cpk	0.444736	-0.008705	0.017589	N/A	N/A
Current User	N/A	N/A	N/A	N/A	N/A
Other Charts	[Small charts for each dimension]				
136	0.200000	0.432500	1.610000	Pass	Pass
137	0.170000	0.432500	1.590000	Pass	Pass
138	0.230000	0.432000	1.611000	Pass	Pass
139	0.210000	0.421000	1.610000	Pass	Pass
140	0.200000	0.432000	1.620000	Pass	Pass
141	0.210000	0.410000	1.620000	Pass	Pass
142	0.202000	0.432500	1.590000	Pass	Pass

Produce spreadsheets to easily see and generate raw data and statistics.

Process Analyzer Data Analysis Software for Engineers

Analyze data collected on all networked Real-Time stations in one place to identify problem areas, take corrective action, and improve the quality of your product. Inspection data can be merged, filtered, charted and printed to identify long-term trends and identify root causes for process improvement.

Process Analyzer is designed for viewing and manipulation of Real-Time data in a networked environment. It enables Quality Engineering to slice and dice data in meaningful ways that contribute to quality control initiatives.



Produce interactive reports by selecting data sets of data to analyze. Several analysis tools are available, such as: Capability Analysis, Normal Probability, What-If Analysis, XBarR, Histogram, Pareto and more.

- Visualize data easier than ever with one-click analysis tools
- Conduct historical review of lots and electronic signatures
- Create custom report designs
- Pinpoint problem areas with filter tools
- Auto-generate First Article Reports (AS9102)

Have a question about your quality? Process Analyzer has the answer.

Order No.	Description
64AAB855F	MeasurLink® V10 Single Floating License

The single floating license includes every module which can be used on any computer on the company network. Perfect for power users or anyone who wants to get the most improvement out of their manufacturing process. (Real-Time Professional 3D Edition is not included).

MeasurLink® Defect Analytics for PowerBI

Interactive, visual, and easily shareable across your organization

Unlock advanced data insights from your MeasurLink® data by transforming complex data into meaningful narratives.

Customizable dashboards enable you to:

- Make data-backed decisions faster than ever before
- Quickly identify trends
- Pinpoint issues

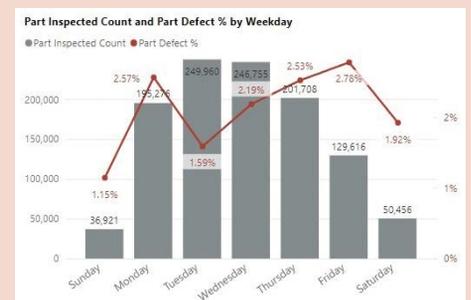
Achieve increased operational efficiency, improved product quality, and an enhanced competitive advantage.

You can leverage the system's full capabilities on any device, providing greater flexibility and responsiveness.



Try the interactive online demo here:

<https://measurlink.com/products/power-bi-measurlink>



SPECIFICATIONS

Order No.	Description
64AAB857	MeasurLink® Defect Analytics Report for Power BI

NOTE: The MeasurLink® Defect Analytics Report for Power BI is a report used in the Power BI application. This report is not included in workgroups or floating license options.

Report Scheduler

Automated Data Analysis and Reporting

This dynamic data reporting offers advanced filtering that can report on all data collected during a specified date range.

4 Easy Steps to Bring Analysis to You

1. Choose your report design
2. Set your conditions
3. Select your recipients
4. Create your schedule

A user can select which part numbers or batches they would like to report on before the measurement data exists. When the condition criteria is satisfied, users can receive a report with their analysis automatically, drastically saving them time from manually searching for and analyzing data.

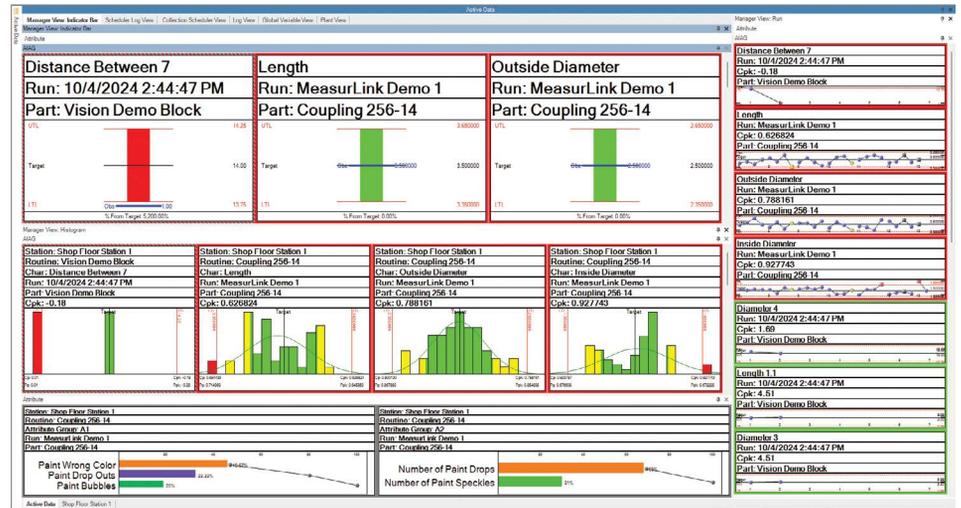
For example, a user can schedule an email report to run each weekend, for defective parts for any part number, so Monday morning there will be a report on all runs added the previous week to all stake holders.

Process Manager

Live Data Monitoring Dashboard

Monitor data as it is collected in Real-Time. Process Manager provides managers with the perfect tool to organize and maintain a shop-wide quality program at a glance. Display snapshot windows of characteristics that are currently being collected in MeasurLink® Real-Time. The data can be sorted by inspection station, capability or timestamp.

Easily see process information without walking from one inspection area to another by viewing current production across all machines. Show clients your quality operation for the entire facility.



Order No.	Description
64AAB855F	MeasurLink® V10 Single Floating License

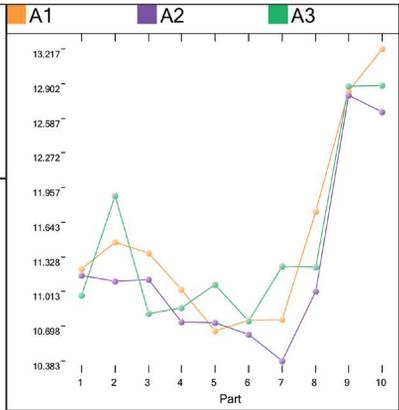
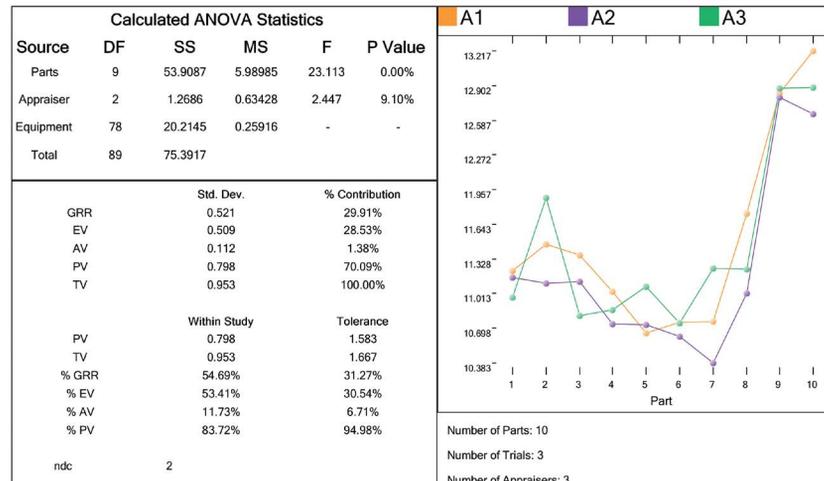
The single floating license includes every module which can be used on any computer on the company network. Perfect for power users or anyone who wants to get the most improvement out of their manufacturing process. (Real-Time Professional 3D Edition is not included).

Gage R&R

Measurement System Analysis

MeasurLink® Gage R&R supports all the MSA-4 Gage R&R studies. Use the study wizard to help define the study that needs to be performed.

Data can be captured directly from hand tools, CMMs and other equipment for improved efficiency. Additionally supports ISO 9001 ISO 17025, and ISO 22000 activities.



Number of Parts: 10
Number of Trials: 3
Number of Appraisers: 3



Where to Buy

Gage Management Gage Inventory and Calibration Control

Gage Management provides a method for maintaining, organizing and managing information about gages.

Information such as measurement specifications, calibration recall dates, Gage R&R dates and general event history is provided in an intuitive user interface with complete reporting abilities. Calibration procedure setup is easy and flexible.



Certificate of Calibration



Gage Description: Demo Purposes

Calibration Date: 12/11/2024

Calibrator: N/A

Serial Number: 81088

Gage Name: 6" Mitutoyo Caliper

Calibrator Title: N/A

Standard	Size	Tolerance	Unit	As Found	As Left	As Left Result
8" Gage Block-00	0.0000	± 0.0010	in	0.0000		
8" Gage Block-00	1.0000	± 0.0010	in	0.0000		
8" Gage Block-00	2.0000	± 0.0010	in	0.0020	0.0000	Pass
8" Gage Block-00	4.0000	± 0.0010	in	0.0000		
8" Gage Block-00	6.0000	± 0.0010	in	0.0000		

Name	Cal Date	Due Date	Trace ID
8" Gage Block-00	09/24/2024	11/24/2025	122889

Statements of conformance are based on the test values and tolerances shown above and when accounting for the measurement uncertainty using a simple acceptance decision rule. The measurement uncertainty = +/- 10um, which achieves better than a 4:1 test uncertainty ratio. The uncertainty represents an expanded uncertainty expressed at approximately a 95% confidence level using a coverage factor of k=2. The errors shown above are test values for verification purposes only. As-found = as-adjusted. These test values are traceable to the National Institute of Standards and Technology through the listed Mitutoyo reference standards. Procedure: CLTM-SREV. C. Environment: 20 degrees C +/- 0.50 degrees C, RH 40% to 50%. This is a calibration certificate for demonstration purposes only. This certificate shall not be reproduced except in full without the written permission of Mitutoyo America Corporation.

Mitutoyo America Corporation
965 Corporate Blvd, Aurora, Illinois 60502
Phone: 888-648-8869

This calibration was performed for demonstration purposes only.

Customized calibration certs can be designed per company requirements.

- Check in/check out
- Gage transfer history
- Print gage labels
- Store calibration certs
- Create calibration certs
- Create calibration procedures
- Auto email gages overdue for calibration
- Supports ISO 9001
- Reject data from uncalibrated tools when used with Real-Time
- Import gage list from legacy programs for easy transfer

SPECIFICATIONS

Order No.	Description
64AAB477	MeasurLink® 10 Gage Management
64AAB855F	MeasurLink® 10 Single Floating License




Preliminary Instructions and Notes

- Calibration shall be performed in an environment that conforms to Manufacturer Specifications.
- The caliper will hereafter be referred to as the Instrument Under Test (IUT).
- Verify that the IUT is clean.
- Visually examine the IUT for any condition that could cause errors in the calibration.
- If a malfunction occurs or a defect is observed while calibration is in progress, the calibration shall be discontinued and necessary corrective action taken; if corrective action affects a measurement function previously calibrated, the function shall be recalibrated before the remainder of the procedure implemented.
- Use extreme care when removing dirt, fingerprints and other foreign substances so that cleaning solutions do not enter internal portions of the IUT.

Detailed Procedure

- Examine all gaging surfaces for nicks, burrs, scratches, wear or other signs of mishandling that may affect accuracy of the instrument. Remove any positive surface imperfections utilizing a hard arkansas stone.
- Apply sufficient amounts of cleaning solution to dampen a lint free cloth. Carefully clean all exposed surfaces removing all foreign substances and particulate matter.
- Check O.D. jaws when in the closed position. Hold calipers to light source and visually examine for light between the jaws. Light will not be seen if jaws are parallel.
- Check I.D. knife-edge jaws for wear when in the closed position. Caliper must be positioned squarely in line of sight to detect air gaps or surface imperfections between jaws.

Verify zero setting of caliper by observing the indicated reading with jaws in the closed position. If caliper does not read 0.000, dial calipers can be easily adjusted to zero by loosening the bezel lock screw, then rotating bezel to align the zero graduation to the pointer.

Record measurements in data grid.

Result	Standard ID	Units	(+) Tolerance	Standard Size	(-) Tolerance	Data
				1.000000		
				3.000000		
				4.000000		
				6.000000		

Record Temperature

Record Pressure

Internal calibrations can be performed and traceable to NIST by creating custom calibration procedures for calibration technicians to follow.

MeasurLink® Group Licensing

SPECIFICATIONS

Order No.	Description
64AAB843	MeasurLink® 10 Site License - 30 Pack
64AAB844	MeasurLink® 10 Workgroup License - 15 Pack
64AAB846	MeasurLink® 10 Workgroup License - 10 Pack
64AAB847	MeasurLink® 10 Workgroup License - 5 Pack

MeasurLink® 10 Site License and Workgroups are bundled packages of licenses to install any combination of modules at a discounted price.

Order No.	Description
64AAB843F	MeasurLink® Authorization to Float V10, 30 Licenses
64AAB844F	MeasurLink® Authorization to Float V10, 15 Licenses
64AAB846F	MeasurLink® Authorization to Float V10, 10 Licenses
64AAB847F	MeasurLink® Authorization to Float V10, 5 Licenses

MeasurLink® 10 Floating License authorization packages do not add to the total license but are an add-on to Workgroups and Site Licenses to allow for concurrent users and use of all modules.

Order No.	Description
64AAB855F	MeasurLink® V10 Single Floating License

The single floating license includes every module which can be used on any computer on the company network. Perfect for power users or anyone who wants to get the most improvement out of their manufacturing process. (Real-Time Professional 3D Edition is not included.)

Order No.	Description
64AAB848	MeasurLink® 10 Academic License
64AAB854F	MeasurLink®, Authorization to Float V10, Academic License

MeasurLink® 10 Academic License a bundle package that provides universities and technical colleges with the ability to install up to and including 20 copies (any combination) of any application in the MeasurLink® 10 suite for educational purposes.

Note: Upgrade discounts are also available. Please contact our sales department for details.



Find a Distributor

Product Licensing Packages and Bundles

Mitutoyo is pleased to offer MeasurLink® without the need to purchase annual maintenance agreements. Mitutoyo offers different licensing options to support a variety of needs. Start small, go big, or anywhere in between! Workgroups are discounted packages for multi-license purchases.

Licensing Options

Workgroup license

Mix and match any licensed module to form a bundled package for increased flexibility and reduced cost-of-ownership. Workgroups come in packages of 5, 10, 15 and 30. (Real-Time Professional 3D is not included.)

15-License Workgroup Example: 10 Real-Time Professional, 3 Process Analyzer, 1 Process Manager, and 1 Gage Management.

Standalone license

Any Real-Time Edition can be used on a single station to test a pilot cell, solve a specific application or monitor a critical line. The Gage R&R module can be used on a standalone station to perform Gage R&R tests. Track gage inventory and calibration schedules with the Gage Management module.

Floating License Authorization

MeasurLink®'s Floating License Authorization is an add-on to Workgroups and Site Licenses. Choose a workgroup to establish your base number of licenses and convert a portion of, or all licenses, to the floating option. The number of floating licenses can be shared with anyone on the network and can use all modules (excluding Real-Time Professional 3D edition). Floating licenses are required for cloud or terminal server environments and will include a USB license dongle to manage available licenses.

Example - 15 License Workgroup + 5 Floating License Authorization: This is 15 total licenses, 10 licenses of Real-Time Professional and 5 floating licenses are shared among multiple users, using all module options.

Floating License Authorization Benefits include:

- Easier maintenance of installations
- Includes all modules, no need to choose
- Cost-effective way to include more users without purchasing additional licenses
- Can be added to an existing installation or integrated during the initial installation

Database Management System (DBMS) Requirements

MeasurLink® 10 ships with Microsoft® SQL Server Express Edition 2019. This edition can be used to support a standalone or multi-machine workgroup installation. (We recommend 5 licenses or fewer when using SQL Server Express.)

- MeasurLink® supports the following Microsoft® SQL Server versions:
Standard and Enterprise Editions: 2022, 2019, 2017, and 2016

Operating System Requirements

All MeasurLink® 10 products are supported on the following Microsoft® Windows

Operating System versions:

- All Windows® 10 versions (not including Mobile and IoT versions)
- All Windows® 11 versions (not including IoT versions)
- 64-bit operating systems required

USB-ITPAK V3.0

Data Collection Software for Excel

Measurement Data Collection Software USB-ITPAK V3.0

(IT-016U/IT-020U/USB-ITN/U-WAVE/DP-1VA LOGGER can be used to send the data to a Microsoft® Excel® worksheet.)

- **USB-ITPAK V3.0** creates a procedure to input data from gages equipped with Digimatic output to Excel spreadsheets via **264-020**, **USB-ITN** or **U-WAVE**. This optional software facilitates the daily inspection work for mass-produced products.

V3.0 (Free version)	Full Version	Function
—	✓	Sequential measurement: Inserts measurement data into the inspection certificate (Excel)
—	✓	Simultaneous measurement: Simultaneously collects measurement data from multiple measuring instruments mounted on a jig
—	✓	Individual measurement: Collects measurement data of separately conducted inspections into a single PC
✓	✓	Simple measurement function: Automatically sorts measurement data and inserts the data into different columns in Excel
✓ ¹	✓ ¹	Setting of measuring instrument: Sets the calibration year and month, preset values, zero-setting, etc. for a measuring instrument
✓ ¹	✓ ¹	Measurement history: Records operators and measuring tools used in measurement data

Symbol: ✓¹: Can be used only when connected with **USB-ITPAK V3.0**, **ID-CNX/ID-FNX** and **06AGQ001A**, **06AGQ001F/264-020**.

✓: Can be used — Cannot be used

Note 1: **V3.0** can be downloaded from our website.

Note 2: **V3.0**, full version can be used by purchasing **V3.0 (06AGR543)** and connecting a USB dongle to your PC.

Main features of USB-ITPAK V3.0

- **Setting of Microsoft Excel input:**
Designation of where to input (workbook, worksheet, cell range), cursor move (right, down), and others.
- **Selection of measuring method (3 modes available)**
1) Sequential measurement 2) Simultaneous measurement 3) Individual measurement.
- **Control item and instruction at data input**

Control item	Mouse operation	Function key	Foot switch + USB-FSW	Data switch when using U-WAVE	Data switch other than U-WAVE
Data output request	✓*1	✓*1	✓	✓*2	✓
Data cancel	✓*1	✓*1	✓	✓ Press and hold*2	
Data skip	✓*1	✓*1	✓		
Character input (example: OK or NG etc.)			✓ Pre-registered character strings		

*1 Not available during individual measurement.

*2 Not available during simultaneous measurement in the event driven mode.

Number of connectable gages

Available devices	Maximum number of connection (total of (1), (2), and (3))	Others
1) Input Tool/Input Tool Direct 2) USB-FSW 3) U-WAVE-R (Up to 100 gages connectable to each U-WAVE-R . U-WAVE-T ID: 00 to 99)	For Windows 2000/XP Up to 100 units*3 For Windows Vista/7/8/8.1/10 Up to 20 units*3 (For U-WAVE-R , plus 100 per unit in terms of available gages.)	• Maximum registration (total of (1), (2), and (3)) 400 units • Control/identification of connecting gage VCP (Virtual COM port) Switch from HID to VCP for (1) and (2). The VCP driver software is supplied with USB-ITPAK .

- **Data loading time:** when using **USB Input Tool** and **Input Tool Direct** cables, 0.2 s to 0.3 s per gage unit
U-WAVE event driven mode: 0.5 s data refresh interval

- **Timer input function** (only in simultaneous measurement)

Input interval (time): 0.1 s*4 to 24 hours at maximum

- **Measurement date/time display function** (available in sequential and simultaneous measurements)

The display format is subject to the setting of the Excel sheet.

*3 The actual number can be less depending on the system configuration.

*4 If a shorter time is set, a priority is given to the longer time compared with the actual communication time.

Optional Accessories for USB-ITPAK

USB Foot Switch Adapter USB-FSW

This USB adapter for connecting a PC is required when using the Foot Switch (**937179T**) in **USB-ITN**. A dedicated VCP driver for this adapter is included in **USB-ITPAK**.

Main specification

- With **USB-ITPAK**, application of the foot switch can be set.
- Data control: "Data request", "Data cancel", "Data skip"
- Character string input (e.g. GO/NG, etc.)

Note: **USB-FSW** is used for installation of the VCP driver.

Foot Switch Adapter USB-FSW



Overall length: 160 mm



Foot switch (937179T)

USB-FSW

Optional Accessories

Model	USB-ITPAK V3.0
Order No.	06AGR543 (USB dongle only)
Compatible OS (Windows)	Windows 10 and 11 (64 bit only)
Compatible Excel version	Excel 2010, 2013, 2016, Microsoft 365

Upgrading from **V1.0/V2.0** is not supported.

USB-ITPAK V3.0



Download software

USB dongle



A USB dongle must be connected to the PC running the software.

Operating environment

Compatible OS*1	USB-ITPAK V3.0: Windows 10 and 11 (64 bit only)
Supported Excel versions*2	USB-ITPAK V3.0: 2010, 2013, 2016 Microsoft 365
Hard disk	USB-ITPAK V3.0: Free space of more than 15 MB
CD-ROM drive	For program installation*4
USB port*3	2 ports or more
Monitor resolution	USB-ITPAK V3.0: 1024x768, 256 colors or more

*1 32-bit, 64-bit OS supported

*2 Operation with Excel for MAC OS is not guaranteed.

*3 A commercially available hub can be used.

(USB certified product is recommended)

*4 **V3.0** does not require a CD drive but does require an Internet connection for download.

Language support

- Operation language (15 languages)
Japanese, English, German, French, Spanish, Italian, Czech, Swedish, Turkish, Polish, Hungarian, Russian, Korean, Chinese (traditional/simplified)
- Operation manual (PDF file)
Japanese, English, German

Order No.

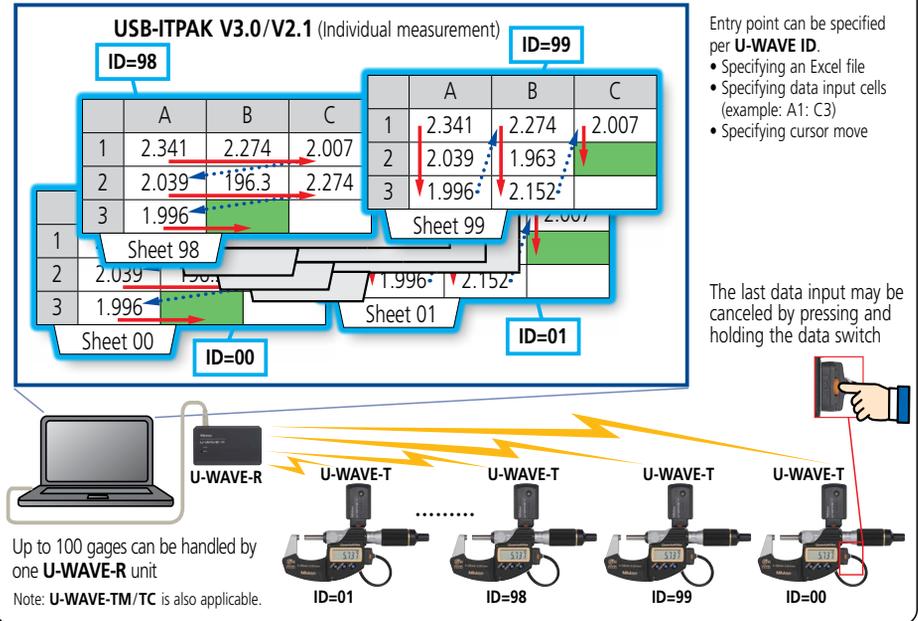
Model	USB-FSW
Order No.	06ADV384

Example of measurement using the U-WAVE Series wireless communication system

<Data sorting of individual measurements>

Data from multiple Digimatic gages (U-WAVE-T, U-WAVE-TM/TC) sent to separate Excel sheets

Measurement data from multiple measuring instruments can easily be sorted and inserted into the respective sheets in Excel.



<timer input + measurement date/time display during simultaneous measurement>

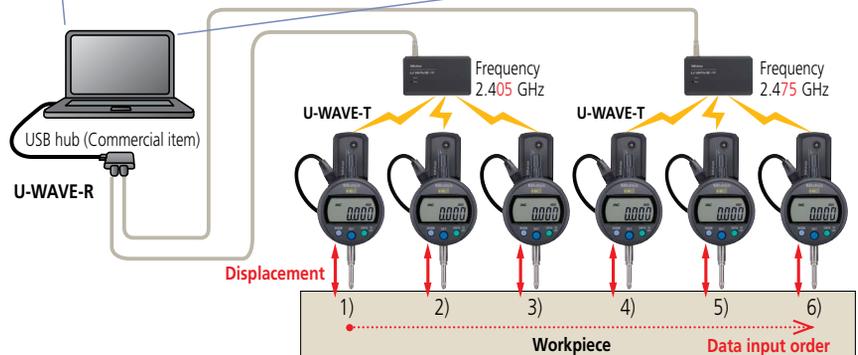
Automatically obtains displacement data in a certain input interval

The event-driven operation function of **U-WAVE** enables data collection at a preset time by timer.

USB-ITPAK V3.0/V2.1 simultaneous measurement + timer input (example: 5 s interval)

	A	B	C	D	E	F	G
1	Displacement 1)	Displacement 2)	Displacement 3)	Displacement 4)	Displacement 5)	Displacement 6)	Measurement date/time
2	0.281	0.162	0.121	0.051	0.011	-0.001	2013/4/1 7 30 00
3	0.279	0.152	0.133	0.064	0.018	-0.003	2013/4/1 7 30 05
4	0.265	0.149	0.142	0.089	0.021	-0.007	2013/4/1 7 30 10
5							
6							

The input interval can be arbitrarily set by 0.1 second intervals up to 24 hours. If a smaller value than the data loading time is set, the actual measurement time will be the input interval. With **U-WAVE**, an error (no data) may occur if less than 0.5 seconds is set for the input interval. This is because the data request signal is issued before the data comes in, based on the event driven data refresh interval that is set to 0.5 seconds (fixed).



Talk to Sales

USB-ITPAK V3.0

Data Collection Software for Excel

Measurement Data Management

USB-ITPAK V3.0 (IT-016U/IT-020U/USB-ITN/U-WAVE/DP-1VA LOGGER connectable)

A desired measurement sequence to collect data into Excel can be created by using USB-ITPAK with an input tool or U-WAVE.

Measurement applications of USB-ITPAK (Three examples of how USB-ITPAK can be deployed are shown below)

Sequential measurement Measurement values are collected from multiple measuring instruments as registered in the sequence

(Measurement example – see figure at right)

1) Measure outside diameter at X and Y of 5 workpieces with a micrometer.

2) Measure length H of 5 workpieces.

3) Inspect external view to check if there are any scratches or color shading and input "OK" or "NG".

* No data request for U-WAVE.

* Character strings Input "OK" Input "NG"

Cell that will receive next input is highlighted in green

	A	B	C	D	E	F
1	Setting	1	2	3	4	5
2	Dimension X	10.025	10.033	9.964	10.031	10.046
3	Dimension Y	9.982	10.017	10.008	9.996	10.027
4	Dimension H	29.97	30.02	30.07	29.96	30.04
5	External Appearance	OK	OK	NG		

When a measuring procedure is executed, a window is displayed. "Data request*", "Data cancel*", "Data skip*", "Aborting", "Complete" can be specified.

* These operations can be allocated to the function key or foot switch (via USB-FSW).

Simultaneous measurement Measurement values are input simultaneously from several Digimatic gages

U-WAVE-R

U-WAVE-T x2 pcs.

U-WAVE-T x2 pcs.

Simultaneous measurement of the heights A to D on the workpiece below.

Height A B C D

USB-FSW x2 pcs. + Foot switch x2 pcs.

Data request Data cancel

	A	B	C	D	E
1	Height A	Height B	Height C	Height D	
2	1	5.02	8.03	9.96	6.03
3	2	4.98	8.02	10.01	5.99
4	3	4.97	8.04	10.07	5.96
5	4				
6	5				

Individual measurement Several operators input measurement data asynchronously according to individually defined procedures from each Digimatic gage.

(Measurement example)
Two operators measure 6 workpieces
3 workpieces per operator

Operator 1

Operator 2

Workpiece Nos. 1 to 3

Workpiece Nos. 4 to 6

The last data input may be canceled by pressing and holding the data switch

	A	B	C	D	E	F	G
1	Setting	1	2	3	4	5	6
2	Dimension A	10.02	10.03	9.96	10.15	10.23	10.04
3	Dimension B	9.98	10.01	10.07	9.99	9.78	
4	Dimension C	10.15	10.14		9.96	10.27	

Operator 1 Operator 2

Notes on using USB-ITPAK V3.0:

Do not merge the cells in the specified range as a measurement data input. During measurement, the Microsoft Excel worksheet cannot be modified in any way apart from entering data. If you need to modify the sheet, it is necessary to abort or finish the measurement. U-WAVE fit Bluetooth® and U-WAVE Wireless cannot be used together.

USB-ITPAK V3.0

Data Collection Software for Excel

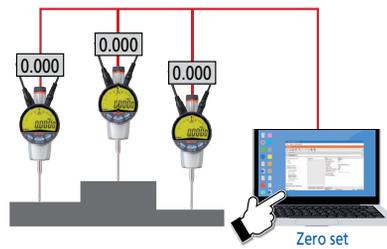
Bidirectional serial communication

With bidirectional serial communication (Digimatic S1) enabled measuring instruments, it is possible to use **USB-ITPAK V3.0** on a PC to control, configure, and collect information from the measuring instruments in addition to ordinary measurement data collection. This reduces labor and time for inspection and greatly increases efficiency.

Digimatic S1 applicable model Example of measurement using the ID-CNX/ID-FNX

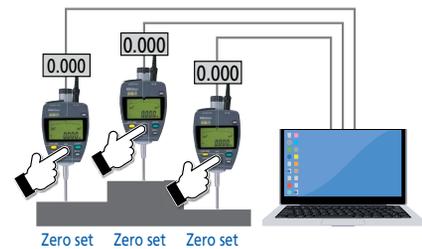
Function example (1) Control of ID-C/ID-F from PC

ID-CNX/ID-FNX + USB-ITPAK V3.0



- It is possible to zero-set or preset measuring instruments collectively from **USB-ITPAK V3.0** on a PC.

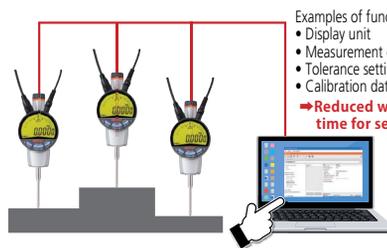
Instruments not supporting bidirectional serial communication + USB-ITPAK



- It is necessary to manually zero-set or preset measuring instruments individually.

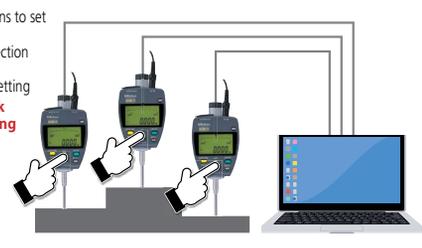
Function example (2) Measuring instrument setting

ID-CNX/ID-FNX + USB-ITPAK V3.0



- It is possible to set the functions of measuring instruments from **USB-ITPAK V3.0**.
- The settings of functions can be saved on a PC and copied to other measuring instruments.

Instruments not supporting bidirectional serial communication + USB-ITPAK



- It is necessary to manually change the settings.

Note: The above is possible only when bidirectional serial communication (Digimatic S1) enabled measuring instruments are used with USB Input Tool Direct or **264-020**. It is not possible with measuring instruments not supporting Digimatic S1 or **U-WAVE** Series.



Got Questions?

U-WAVE

Wireless Data Collection System

What is the U-WAVE Series?

- The **U-WAVE** Wireless Measurement Data Communication System quickly collects accurate measurement data from the on-site inspection process to help perform detailed analysis.
- Measurement results can be sent wirelessly and saved on a PC, smartphone or tablet. This is a smart system not requiring handwriting or manual input from a keyboard.

Acquire measurement data from various Digimatic gages equipped with U-WAVE.

Instantly transfer data wirelessly to your PC, smartphone or tablet.



You can choose from a variety of products and applications.

Stable communication is possible up to a maximum communication distance of 16-20 m*. Efficiency is greatly improved by being able to work without worrying about cable length or snags, etc.

- Freedom of movement
- Flexible layout of measurement site
- Human error during manual input is eliminated
- Stable wireless communication



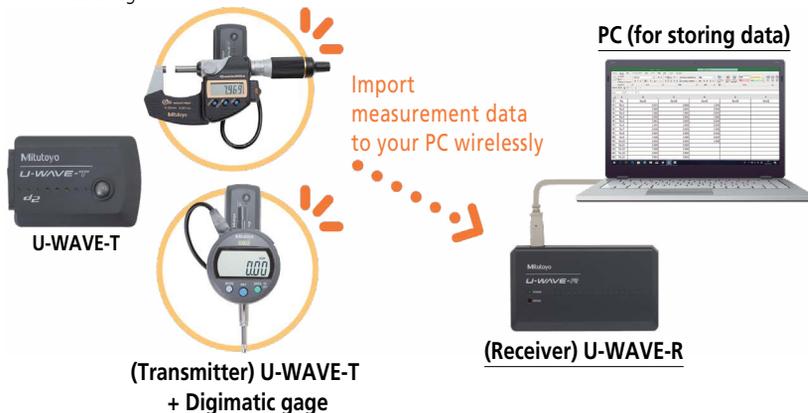
*May be affected by the electromagnetic environment.

Note: Receiver not necessary when using with **Mitutoyo Bluetooth® U-WAVE fit**

The following three types are currently available.

U-WAVE Wireless

The system consists of a "U-WAVE-R" receiver that connects to a PC and a "U-WAVE-T" transmitter that connects to a measuring instrument.



Function comparison table

	U-WAVE Wireless	U-WAVE Bluetooth
Communication protocol	Mitutoyo Original <based on IEEE80a2.15.4>	Bluetooth® 4.2
Communication distance	Approx. 20 m (line of sight)	Approx. 16 m (line of sight)
Communication frequency	2.405 to 2.475 GHz	2.402 to 2.480 GHz
Selectable frequency	Yes	Frequency hopping spread spectrum
Selectable control key	Yes (enter, tab, left, right, up, down)	No (simulates enter key only)
Battery life	Approx. 400,000 transmissions	Approx. 50,000 to 200,000 transmissions
Operating system	Windows	Windows, iOS, Android
U-Wave-R compatible	Required (P/N: 02AZD810D)	No
Maximum number of connections	100	7 (PC) 3 (mobile devices)
Operation modes	Keyboard emulator or VCP	
Measurement modes	Button or event driven (data request from PC or on timed interval)	
Long button press	Cancel data command	
LED	Data confirmation and low battery warning	
Data export	Microsoft® Excel® or SPC software applications	
Durability	Dust/waterproof and shop-hardened with proprietary fiber-reinforced plastic housing	
Dedicated application/software	U-WAVEPAK (included with U-WAVE receiver) USB-ITPAK	U-WAVEPAK-BW U-WAVEPAK-BM U-WAVE Navi USB-ITPAK



Find a Distributor

U-WAVE

Wireless Data Collection System

U-WAVE TIB

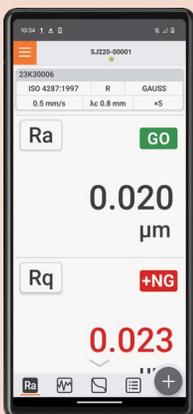
The all-in-one Bluetooth transmitter dedicated to the SJ-220 supports bidirectional communication. See section J for more details



With Wireless Unit for Measuring Instrument U-WAVE-TIB installed

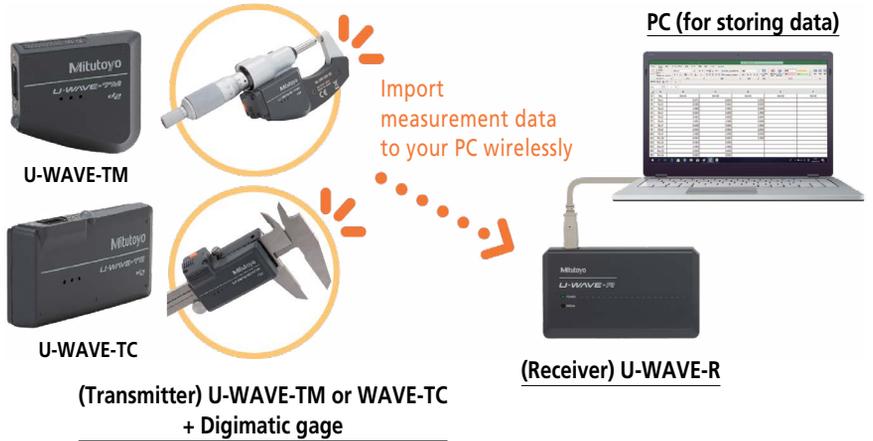


Bidirectional communication (BLE communication)



U-WAVE fit

Part of the **U-WAVE** Wireless system, these transmitters are smaller and thinner, and have improved operability, being designed specifically for use with small Digimatic gages.



U-WAVE Bluetooth®

This is a **Bluetooth®** version of **U-WAVE fit**. It can connect to a **Bluetooth®** enabled device such as a PC, smartphone, or tablet without going through a **U-WAVE-R** or similar dedicated receiver.

Note: Connectivity of the dedicated Mitutoyo **U-WAVE fit Bluetooth®** application and **U-WAVE-TMB/TCB** to every single Bluetooth® device is not guaranteed.



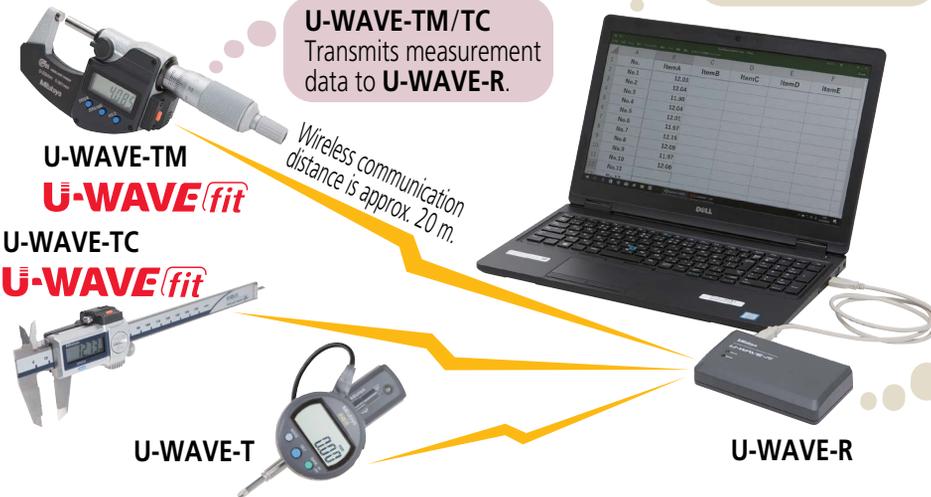
U-WAVE Wireless

Wireless Data Collection System

U-WAVE-TM/TC (U-WAVE fit)

- **U-WAVE fit** models are now smaller and thinner with improved operability, designed specifically for use with small Digimatic gages.
- The system using our proprietary transmission method features stable communication and low power consumption, resulting in improved work efficiency.
- The wireless system without cabling can keep the workplace tidy and increase workability during measurement.
- Up to 100 Digimatic gages can be registered to a single **U-WAVE-R**, and wireless communication distance is approx. 20 m. Therefore the measurement data can be managed centrally on the shop floor.
- Installing the optional **USB-ITPAK V3.0** software enables the use of Excel to improve measurement efficiency. It makes it possible to populate the data from multiple measuring instruments into separate spreadsheets or input the data collectively at the same time.

U-WAVE fit system configuration



U-WAVE-TM/TC (U-WAVE fit) System Communication Specifications

• Wireless communication

Wireless specifications	Original <based on IEEE802.15.4 (2.4 GHz)>
Wireless communication distance	Approx. 20 m (line of sight)
Wireless communication speed	250 kbps
Transmission output	2.5 mW (4 dBm) or less
Modulation method	DS-SS (Direct Sequence - Spread Spectrum) Resistant to interfering signals and noise
Communication frequency	2.405-GHz band (ISM band: Universal frequency)
Used band	15 channels (2.405 to 2.475 GHz at intervals of 5 MHz) The noise search function avoids interference with other communication devices.

A maximum of 100 Digimatic gages can be connected. Loads the data received from **U-WAVE-TM/TC/T** to a PC via USB.

Main specifications of U-WAVEPAK

- Setup of dedicated driver software (USB and virtual COM port)
- Initial setting of ID number and frequency selection (required only once for the first time)
- Load data to Microsoft Excel or Notepad through the data interface function



Need Support?

U-WAVE-R

Model	U-WAVE-R
Order No.	02AZD810D
Power source	USB bus power system
Number of U-WAVE-R units that can be connected to one PC	Up to 15
Number of U-WAVE-T units that can be connected	Up to 100
External dimensions (mm)	140×80×31.6
Mass (g)	130

U-WAVE-R main unit



USB2.0 cable (1 m) attached

U-WAVEPAK



U-WAVEPAK software (standard accessory)

System Environment:

- Compatible OS
- Windows 2000 Professional (SP4 or later)
- Windows XP Home Edition (SP2 or later)
- Windows XP Professional (SP2 or later)*
- Windows Vista*, Windows 7*, Windows 8/8.1*
- Windows 10*
- Windows 11 Version 1022B or later
- * 32-bit, 64-bit OS supported
- <Versions confirmed operational on Windows 10>
- **U-WAVEPAK Version1.020** or later

Connectability confirmed for tablet PC

- Microsoft Surface Pro 6 (the version whose operation on Windows 10 Professional is confirmed)
- Required environment: DVD drive (required for installation), USB port x2 ports or more

Note: Cannot be connected to a device other than a PC (such as **DP-1VA LOGGER**, sequencer etc.).

U-WAVEPAK software can be downloaded here.



U-WAVE Wireless

Wireless Data Collection System

Typical applications



U-WAVE-TM (264-622)



U-WAVE-TC (264-620)

Fit Transmitter/connecting unit



264-622



O2AZF310



264-621



O2AZF300

SPECIFICATIONS

IP67 type is resistant to water and dust ingress. Buzzer type notifies data reception by buzzer sound and LED.

Connectable measuring instruments	Micrometer		Caliper	
	U-WAVE-TM (IP67 type)	U-WAVE-TM (buzzer type)	U-WAVE-TC (IP67 type)	U-WAVE-TC (buzzer type)
Model	264-622	264-623	264-620	264-621
Order No.	264-622	264-623	264-620	264-621
Protection Rating	IP67	N/A	IP67	N/A
Data reception indication	LEDs	Buzzer and LEDs	LEDs	Buzzer and LEDs
Power source	Lithium battery CR2032x1			
Battery life	Approx. 400,000 times continuous data transmission			
External dimensions (mm)	41.9x12.9x38.8		56x11.45x30.4	
Mass (g)	18			

Fixed to transmission unit and inserted into output connector of Digimatic gage.

Order No.	O2AZF310	O2AZF300	O2AZF960	O2AZF700
Protection level	IP67	N/A	IP67	N/A
Mass (g)	6			10
Connectable transmitter	U-WAVE-TM/TC (IP67 type)	U-WAVE-TC (for standard type)	U-WAVE-TM (for QuantuMike*)	ID-CNX/ID-FNX (12.7mm type only)

Note 1: **O2AZF310** ensures water-proof performance only when attached to measuring instruments of IP67 type.

For information on supported connecting units, please contact your local Mitutoyo sales office.

Note 2: Water-proof performance is ensured only when attached to measuring instruments of IP67 type.

* **O2AZF960** is applicable to new models (293-14X-40/293-18X-40).

Compatibility of measuring tool and unit

Digimatic gage	Connecting unit/connecting cable	Transmitter	Receiver
Digimatic Micrometers	Standard type O2AZF310	Buzzer type U-WAVE-TM 264-623	 Design registered in Japan
	QuantuMike* O2AZF960	IP67 type U-WAVE-TM 264-622	
Digimatic Calipers	Standard type O2AZF300	Buzzer type U-WAVE-TC 264-621	
	Coolant-proof type O2AZF310	IP67 type U-WAVE-TC 264-620	
Digimatic Indicators and Others	ID-CNX/ID-FNX Series (12.7 mm type only) O2AZF700	Buzzer type U-WAVE-TM 264-623	
	Other Connecting cable Bracket	IP67 type U-WAVE-TM 264-622 Buzzer type U-WAVE-T 02AZD880G IP67 type U-WAVE-T 02AZD730G	

* **O2AZF960** is applicable to new models (293-14X-40/293-18X-40).

U-Wave Wireless

Wireless Data Collection System

Optional Accessories for U-WAVE

U-WAVE-T mounting bracket

Supports the **U-WAVE-T** on a Digimatic gage by detachable fastener. Batteries can be replaced without needing to detach the **U-WAVE-T** from the gage.

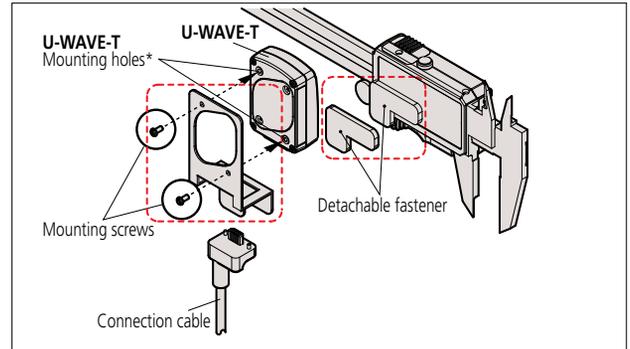


U-WAVE-T mounting bracket
02AZE200

Standard accessories

- Detachable fasteners: 1 set
- Mounting screw: 2 pcs.

Mounting diagram (02AZE200)



Note: In order to avoid loss of adhesion, do not allow oil or coolant to come into contact with the bonding surfaces of the detachable fasteners.

U-WAVE-TM/TMB mounting bracket for Digimatic indicator

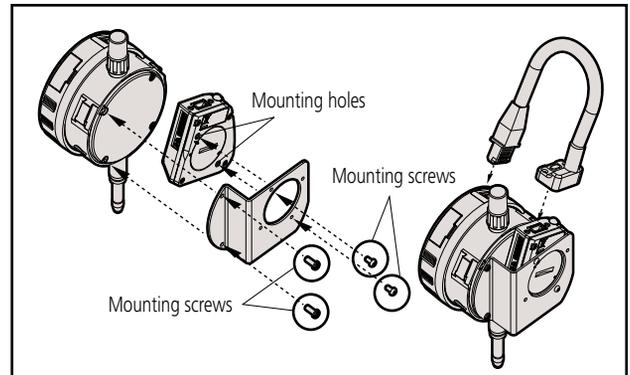
U-WAVE-TM/TMB mounting bracket for Digimatic indicator **02AZF670/02AZF675**

Standard accessories

- Mounting screw: 4 pcs.



Mounting diagram (02AZF670)



Find a Distributor

U-WAVE Bluetooth

Wireless Data Collection System

Wireless Measurement Data Communication System U-WAVE-TMB/TCB (U-WAVE fit Bluetooth®)

- Bluetooth® communication allows for wireless transmission of measurement data from Digimatic micrometers and calipers to PCs, smartphones, tablets and other such terminals.
- Bluetooth® communication does not require a conventional receiver unit (**U-WAVE-R**) which improves operability and reduces costs. Use in outdoor locations where PCs cannot be used can now be easily realized.
- U-WAVEPAK-BM** (free), the measurement support application software for smartphones is available for download from app stores (Google Play, Apple Store).
- U-WAVEPAK-BW** (free), the communication software for transferring measurement data to optional computer software (**USB-ITPAK**, **MeasurLink®**) is available for download from our company's website.
<https://www.mitutoyo.co.jp/eng/contact/products/u-wave/>

U- WAVEPAK-BM



U-WAVE fit Bluetooth® system configuration



No receiver is required, and one PC can connect up to seven units of U-WAVE fit Bluetooth®.

For Digimatic micrometers
U-WAVE-TMB



For Digimatic calipers
U-WAVE-TCB



Example of attaching the Digimatic indicator

Measurement Navigation Application Mitutoyo U-WAVE Navi

- The application is for designing measurement procedures that use **U-WAVE fit Bluetooth®**.
- Allows setting of measuring points, methods (which tool to use), cautions in each measuring process. By allowing the insertion of image files into procedures, it enables anyone to measure in the same way and correctly.
- Since it also allows for entering the inspectors' names, it can be used to keep records of "when, where, who" performed the measurement.
- Workpiece information, procedures, as well as measurement results, can be managed on the application. It can also output data in CSV format.



Mitutoyo U-WAVE Navi is available for free download from Google Play.

Master how to use both applications according to your purpose.

	Mitutoyo U-WAVE Navi	U-WAVEPAK-BM
Purpose	Using the application, create a measurement procedure, display and navigate the measurement, and manage the measurement results	Measure a workpiece continuously to perform a simple trend management
Possible actions (Functions)	Create/perform a measurement procedure (including Go/No-go judgement) Navigate a measurement procedure Manage/transfer a measurement procedure Display a list of measurement results Transfer a measurement result	Judgment Data logging Graphical display of measurement result Display the histogram of measurement results Transfer a measurement result (log data)
Display language	Japanese/English (Depends on the OS settings)	English
Compatible OS	Android 7.0 or later (iOS not supported)	Android 7.0 or later/iOS 10.0 or later

U-WAVE-TMB/TCB (U-WAVE fit Bluetooth®) System Communication Specifications

• Wireless Communication Specifications

Wireless communication	Bluetooth® 4.2 Low Energy
Wireless communication distance	Approx. 16 m (line of sight) Approx. 10 m (in a factory environment)
Transmission output	2.5 mW (5 dBm) or less (Class2)
Modulation method	FH-SS (Frequency-hopping spread spectrum)
Communication frequency	2.4 GHz band

Note 1: Connectivity of **U-WAVE-TMB/TCB** to every single Bluetooth® device is not guaranteed.

Optional Accessories

Model	USB-ITPAK V3.0
Order No.	06AGR543 (USB dongle only)
Compatible OS (Windows)	Windows 10 and 11 (64 bit only)
Compatible Excel version	Excel 2010, 2013, 2016, Microsoft 365

Note: Applicable only when **U-WAVEPAK-BW** is used.

USB-ITPAK V3.0



USB dongle



A USB dongle must be connected to the PC running the software

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Where to Buy

U-WAVE Bluetooth

Wireless Data Collection System

Typical applications



U-WAVE-TMB (264-626)



U-WAVE-TCB (264-625)

Transmitter / Receiver



SPECIFICATIONS

	For Digimatic micrometers		For Digimatic calipers	
Model	U-WAVE-TMB (IP67 type)	U-WAVE-TMB (buzzer type)	U-WAVE-TCB (IP67 type)	U-WAVE-TCB (buzzer type)
Order No.	264-626	264-627	264-624	264-625
Protection level	IP67	N/A	IP67	N/A
Data reception indication	LED	LED, buzzer	LED	LED, buzzer
Power source	Lithium battery CR2032x1			
Battery life	Windows OS: Approx. 3 months, iOS/Android: Approx. 1 year			
Mass (g)	18			

Choose a connecting unit compatible with your gage.

Order No.	02AZF310	02AZF300
Protection level	IP67	N/A
Mass (g)	6	
Connectable transmission unit	U-WAVE-TMB/TCB (IP67)	U-WAVE-TCB (for standard type)

Note: Water-proof performance is ensured only when attached to measuring instruments of IP67 type.

Compatibility of measuring tool and unit

Digimatic gage	Assembled appearance (Front/Back)	Connecting unit	Transmission unit
Micrometer	Standard	02AZF310	264-627 U-WAVE-TMB (buzzer type)
	Quantu-Mike ¹	02AZF960	264-626 U-WAVE-TMB (IP67 type)
Caliper	Standard	02AZF300	264-625 U-WAVE-TCB (buzzer type)
	Coolant-proof type	02AZF310	264-624 U-WAVE-TCB (IP67 type)
Digimatic indicator	ID-C, ID-F Series (new type only)	02AZF700 Type SF connector (for ID-C Series 12.7 mm type)	264-627 U-WAVE-TMB (buzzer type) 264-626 U-WAVE-TMB (IP67 type)
	Others	Connection cable Mounting bracket	02AZD880G U-WAVE-T (buzzer type) 02AZD730G U-WAVE-T (dust/water-proof type)

¹ 02AZF960 is applicable to new models (293-14X-40/293-18X-40).

USB Input Tool Direct Cable

USB Data Collection Cable

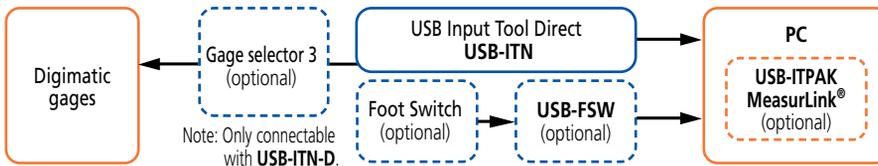
Digimatic Gage/PC Data Input Device USB Input Tool Direct USB-ITN

- Converts measurement data to keyboard signals and directly inputs them to spreadsheet software such as Excel and Notepad.
- When using with optional software (refer to page A-11), you can easily create Microsoft Excel worksheets, enabling further improvement of work efficiency.



USB-ITN

USB-ITN System Configuration



Data loading methods

- Data switch on the input tool (Type A/B/C/SF only)
- Data switch on the measuring gage
- Command transmission from a PC*

* Only available when using MeasurLink®, USB-ITPAK V3.0

1) Icon operation
2) Function key operation
3) Foot switch operation
One of the above operations

USB Input Tool Direct USB-ITN
Cable length: 2 m

Connector is plugged into a USB port on a PC

Type	Order No.	Data switch
A	06AFM380A	✓
B	06AFM380B	✓
C	06AFM380C	✓
D	06AFM380D	-
E	06AFM380E	-
F	06AFM380F	-
G	06AFM380G	-
SA	06AGQ001A	✓
SF	06AGQ001F	-

Foot Switch (optional)
937179T
Cable length: 2 m

Option for USB-ITN
USB Foot Switch Adapter USB-FSW
06ADV384

System Environment

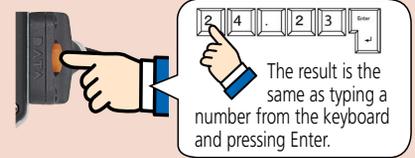
- Hardware: PC with USB socket (Type A)
- Supporting OS (USB-ITPAK V3.0): Windows 10 64 bit
- Software: Programs supporting keyboard input (Excel, Word, memo pad, etc.)

Measurement Data Collection Software
USB-ITPAK V3.0

(Refer to page A-11 for details)

- Note 1: When using a foot switch in combination with USB-ITN, the optional USB-FSW and USB-ITPAK V3.0/MeasurLink® are required.
- Note 2: When the measuring gage and USB-ITN have no data pushbuttons, the optional USB-ITPAK V3.0/MeasurLink® is required.
- Note 3: Refer to Pages A-28 through A-30 for connector tool type.

Input data to the PC with the push of a button



Just press the data button to send the displayed value to the PC.

Can be connected directly to a USB port on a PC with 1 cable



USB Input Tool Direct USB-ITN-B

Because the input tool is automatically recognized as an HID* keyboard device (a standard Windows driver) just by connecting it to a USB port, no special software is required.

* HID (Human Interface Device)

Main specification

- Output compatibility: USB2.0 or USB1.0
 - Supporting driver software: Switchable between 2 items below
 - 1) When using standalone: HID keyboard device*
 - 2) When using with USB-ITPAK V3.0/MeasurLink®: Virtual COM port (VCP)
 - Communication speed: 12 Mbps (Full Speed)
 - Power source: USB bus power
 - USB2.0 certificate
 - Conforms to EU EMC Directive
- * Since this device is compatible with Windows standard driver software, dedicated driver software is not required.
Note: Information regarding USB-ITPAK V3.0 can be downloaded from our website.



Got Questions?

USB and RS-232 Input Tool

Single Gage Data Collection Device

Main Specifications of 264-020

Output specification: USB2.0 or USB1.0
 Supported driver software: Changeable between two types
 1) Stand-alone: HID keyboard device*
 2) Using **USB-ITPAK V3.0/MeasurLink®**: Virtual COM port (VCP)
 Communication speed: 12 Mbps (Full Speed)
 Power source: USB bus power
 USB2.0 certificate
 Conforms to EMC Directive
 * This product is compatible with the standard driver software for Windows. No dedicated driver software is required.



The Input Tool, an HID* keyboard device (standard driver software for Windows) is **automatically recognized** when connected to a USB port.

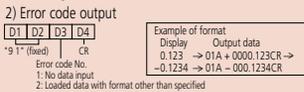
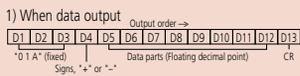
* HID (Human Interface Device)

Specifications of IT-007R RS-232C Communication

• Output specification: RS-232C compliant
 Communication method: Full duplex
 Communication speed: 2400 bps (fixed)
 Bit configuration: Start bit 1
 Data length 8
 (Most significant bit, 0 (fixed))
 Parity, None
 Stop bit 1

Flow control: None
 Home position: DCE (modem definition)

Data format



Data request signal

Data can be output by transmitting a character from the PC.

Connector specification and power supply from the PC

This product operates while accumulating the power supplied from the PC. A second or more input interval is required.

Pin No.	Symbol	in/out	Description of functions
1	(N.C.)	—	No connection
2	RXD	OUT	Data output from this product to the PC
3	TXD	IN	Data input from the PC to this product
4	DTR	IN	+12 V power supply from the PC*
5	GND	—	Ground
6	DSR	OUT	Not used
7	RTS	IN	+12 V power supply from the PC*
8	CTS	OUT	Not used
9	(N.C.)	—	No connection

* When connecting to a sequencer, a power supply is required.
 Input voltage: Supplied in the range 6 V to 16 V
 Power supply terminal: Supplied to pins 4 and 7
 Note: "4" and "6", "7" and "8" are connected with each other inside this product.

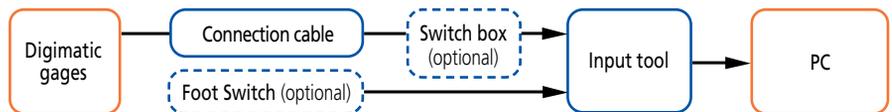
Measurement Data Input Tool Input Tool SERIES IT-020U/IT-007R

• **264-020 (IT-020U)** is an easy-to-use, expandable USB input tool with a large data switch and a foot switch connector.
264-007 (IT-007R) is an RS-232C communication-type input tool that can be controlled by data request commands from a PC.

• It can be connected to various types of measuring instruments using required SPC cables.(refer to pages A-29 to A-30)
 • When using with optional software (refer to page A-11), you can easily create Microsoft Excel worksheets, enabling further improvement of work efficiency.



264-020/264-007 System Configuration



Connect the Digimatic connector to the gage

Connection cable
 Refer to pages A-29 to A-30 for details.

Connector 9 types (A to G, SA and SF) +4 L types
 Cable length: 1 m or 2 m

USB keyboard signal conversion model
 Model: IT-020U
 264-020

Connect the unit to a USB port of the PC

System Environment

- Hardware: PC with USB socket (Type A)
- Supporting OS (**USB-ITPAK V3.0**): Windows 10 64 bit
- Software: Programs supporting keyboard input (Excel, Word, memo pad, etc.) **USB-ITPAK V3.0** (optional)

Note: Information regarding **USB-ITPAK V3.0** can be downloaded from our website.

Foot switch (optional)
 937179T

Connection cable 2 m

Gage selector 3 (optional)
 939039

This selector can connect up to 3 measuring gages and switching is available with the slide switches without changing connection cables.
 Connection cable (length: 1 m) between two input tools is a standard accessory (936937).

RS-232C communication conversion type
 Model: IT-007R
 264-007

Connect the unit to a serial port of the PC

System Environment

- Hardware: PC or sequencer with a serial port (D-sub 9 pin)
- Software: A program compatible with the RS-232C communication (such as a hyper terminal) is required.

Data output is available by transmitting data request commands from the PC.

Multiplexers

Multi-Gage Interface Unit

USB Multiplexers

- The ability to transfer data from the gage into any software such as Excel or MeasurLink®
- Simplifying multi-gage inspection stations to a single USB connection reduces the number of connections required to the PC
- Supports keyboard emulation (HID), Virtual COM Port (VCP) and RS232 connections
- MAX, MIN and TIR collection modes for a single gage or across all connected gages
- Data input from Digimatic, d2, and RS-232 devices
- Timed and continuous data streaming
- Map ports to specified spreadsheet columns or rows for organized data collection
- Date and timestamp for spreadsheets

SPECIFICATIONS

Model No.	Order No.	MIG Input				MIG Output		Power	
		# of Inputs	10-pin Digimatic	Serial RS232	Pass-Thru Port	USB	RS232	Power Supply	Supplies Power**
MIG-1USB	64AAB637	1	Y	-	-	HID/VCP	-	from USB port	-
MIG-2USB	64AAB638	2	Y	RS232 DB9M	Y	HID/VCP	RS232 DB9F	Power Adapter	Y
MIG-4USB	64AAB639	4	Y	RS232 DB9M	Y	HID/VCP	RS232 DB9F	Power Adapter	Y
MIG-8USB	64AAB640	8	Y	RS232 DB9M	Y	HID/VCP	RS232 DB9F	Power Adapter	Y

All MIG units include USB cable, RS-232C cable*, AC adapter*, and USB flash drive with additional drivers.

* MIG-1USB does not include RS-232C cable or AC adapter. Power is supplied by USB.

**MIG interfaces can have a feature where power can be supplied to gages or converter cables that can accept it, such as: 64PMT114, LGS Linear Gages, etc.



Technical Data

Data output: Via RS-232C interface / USB

Default Configuration

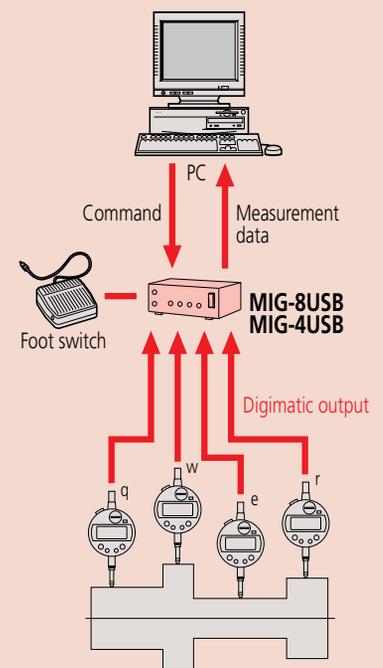
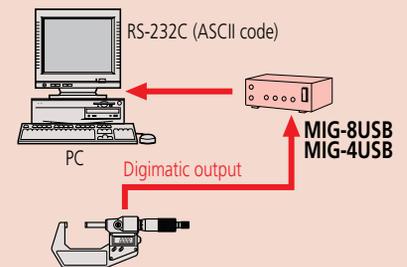
Data length: 8 bits
Start bit: 1 bit
Stop bit: 1 bit
Parity check: None
Baud rate: 9600

Standard Accessory

06AEG302JA: AC Adapter
RS232C: Cable (1.5m / 5ft)
USB Cable

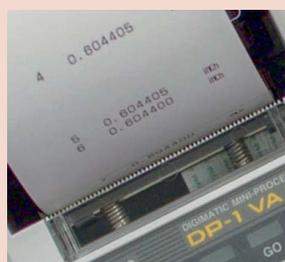
Optional Accessories

937179T: Foot switch





USB connection allows collected data to be easily transferred from the DP-1VA to the PC. The output is HID or VCP so data can be sent directly to Excel or data collection software such as IT-Pak or MeasurLink®.



Digimatic 2 function allows the high resolution of the gage to be output in its entirety in metric or inch.

Standard Accessory

06AEG302JA: AC Adapter

Optional Accessories

09EAA084*: RS-232C changing cable (1m, 9pin)

965516*: GO/±NG judgment cable

937179T: Foot switch

09EAA082: (10 rolls)

*It is impossible to use the both RS-232C cable and GO/±NG judgment cable at the same time.



■ USB cable (A-microB)
(optional)
06AFZ050



"d2" is the name for Mitutoyo Digimatic output compatible with up to 8 digits of I/O data.

DP-1VA Data Collection

- A gage with SPC output is connected to the DP-1VA with an SPC cable.
- The data for each part measured is printed or sent directly to a PC through a USB cable.
- This data can be triggered by the button on the gage, cable or the DP-1VA. An optional footswitch can also be used.

Data Logger:

- Data can be stored internally, printed and/or sent to a PC as it is measured or after all data has been collected.
- Up to 1,000 measurements can be stored.

Timer:

- Data collection can be triggered by a timer function. The DP-1VA can collect data unattended to measure changes over time.

Tolerance and SPC:

- Tolerances can be set in the unit and statistics can be calculated and printed directly from the DP-1VA.
- No additional software is required.



264-506A

SPECIFICATIONS

Order No.	264-506A
Data input	Digimatic, Digimatic 2, RS-232C input (for KA Counter Only)
Printing method	Thermal line printer
Character specifications	Total dot number: 384 dots/line Dot size: 8 dots/mm Normal font: 24 x 16 dots Large font: 36 x 24 dots
Print speed	0.8 s/line when using AC adapter
Print capacity	7,000 lines/roll with Large font 10,000 lines/roll with Normal font
Print data	Measuring data, Go/±No-go, number of data, maximum minimum value, range, average, standard deviation, number of defective, function defective, process capability index, histogram, D-chart, control chart generation for X-bar and central limit data, data and time
Printer paper	High durability thermal paper. (one roll included) Width: 58mm. Roll length: 48m
Power supply	100 V 50/60 Hz AC adapter (6 V, 2 A) AA alkaline batteries x4 (not included)
Battery life	About 10,000 lines at 20 C
Data processing capability	Mode 0: 100,000 data entries Mode 1, 2: 9,999 data entries Mode 3: sample size 10 x subgroup 9,999 = Total number of data entries: 99,990
Tolerance judgement	5 sets
Logging of measurement data	Max 1,000 points
Timer input	0.25 s, 1 s, 5 s, 30 s, 1 min, 30 min, 60 min
Data output	USB output RS-232C output at TTL level Tolerance judgment result output (-NG, GO, +NG)
Clock precision	+/-2 min max/month
Internal battery life	10 years
Operating temperature range	0 C to 45 C with AC adapter 10 C to 45 C with batteries
External Dimensions	94mm x 201mm x 75mm

Gage Selector 3

3-channel Switching Box for Data Transmission

- Three Digimatic gages can be connected.
- You can specify the gage which outputs the data with the channel switch.

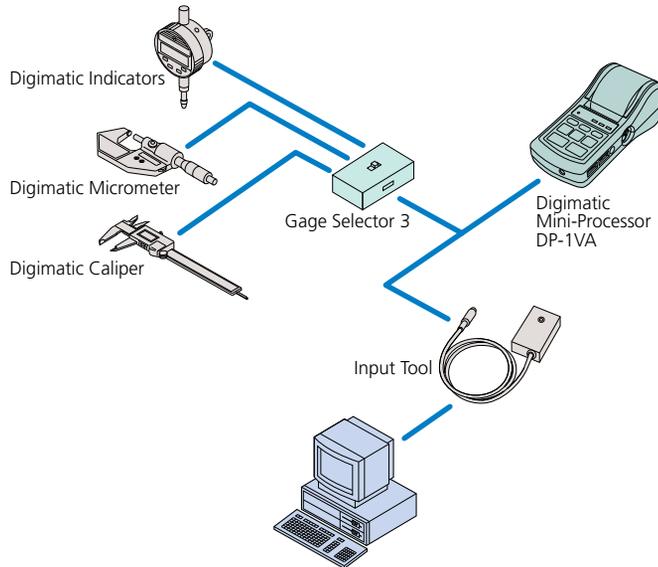


939039

SPECIFICATIONS

Order No.	Description
939039	Gage Selector 3

Examples of Connections



EC Counter SERIES 542 — Assembly-type Display Unit

- Compact panel mounting type and DIN size. It can be easily incorporated into each system.

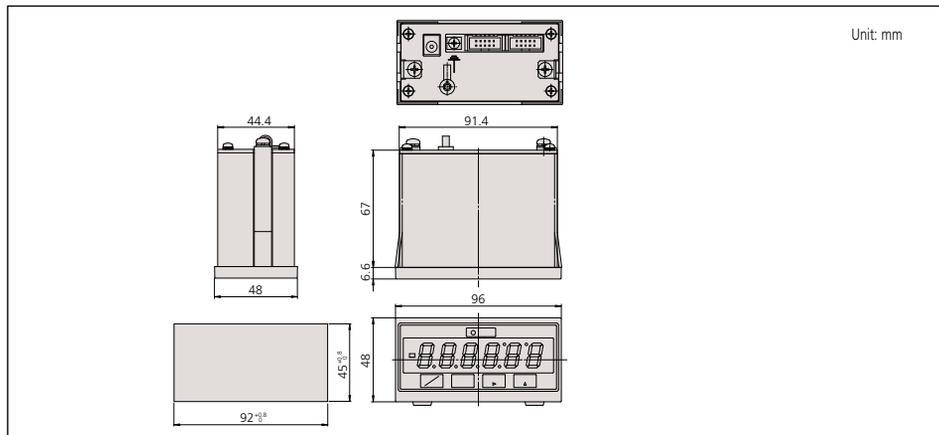


542-007A

SPECIFICATIONS

Order No.	Description
542-007A	EC Counter

DIMENSIONS



Technical Data

Connection: Up to three gages
 Signal: Digimatic code format
 Connection: Bidirectional
 External dimensions (W x D x H): 100 x 70 x 33mm

Technical Data

Applicable gage: LGD, LGS, All SPC output gages
 Resolution: .00005"/.0001"/0.001mm,
 .0005"/.001"/0.01mm
 No. of gage input: 1
 Display: 6-digit LED and a negative [-] sign
 Function: Preset
 Go/No-go judgment
 Output (open-collector): 3-step limit signal, normal signal
 External control: Preset, data hold
 Power supply: Via AC adaptor
 Dimensions (W x D x H): 96 x 48 x 84.6mm
 Mass: 50g

Standard Accessory

06AEG302JA: AC Adapter

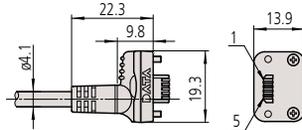
Measurement Data Management

Digimatic data cable specifications (Dimensions)

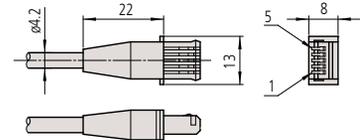
Gage connector dimensions

Unit: mm

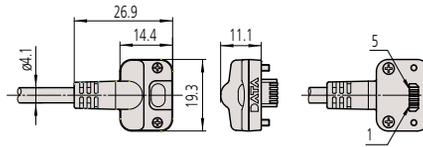
- A)** 1) 06AFM380A
2) 05CZA624 (1 m)
05CZA625 (2 m)



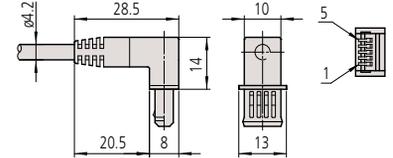
- F)** 1) 06AFM380F
2) 905338 (1 m)
905409 (2 m)



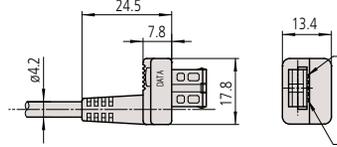
- B)** 1) 06AFM380B
2) 05CZA662 (1 m)
05CZA663 (2 m)



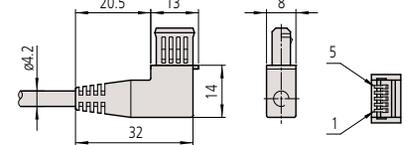
- FB)** 1) No applicable models
2) 905689 (1 m)
905690 (2 m)



- C)** 1) 06AFM380C
2) 959149 (1 m)
959150 (2 m)

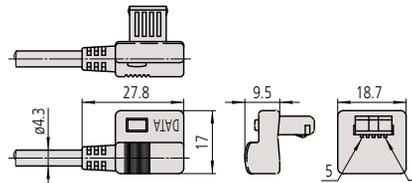


- FR)** 1) No applicable models
2) 905691 (1 m)
905692 (2 m)

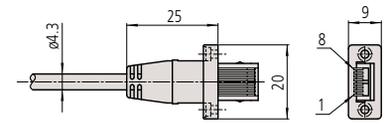


FL) and FR) is symmetrical and the same size.

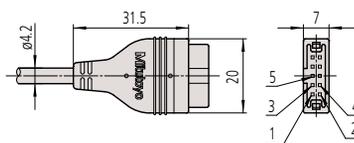
- CR)** 1) No applicable models
2) 04AZB512 (1 m)
04AZB513 (2 m)



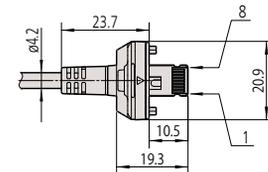
- G)** 1) 06AFM380G
2) 21EAA194 (1 m)
21EAA190 (2 m)



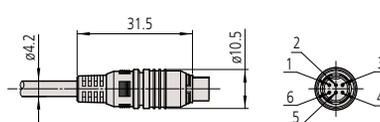
- D)** 1) 06AFM380D
2) 936937 (1 m)
965014 (2 m)



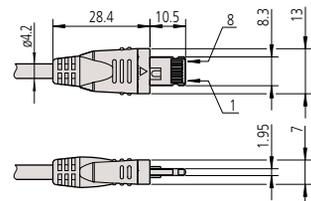
- SA)** 1) 06AGQ001A
2) 06AGL111 (1 m)
06AGL121 (2 m)



- E)** 1) 06AFM380E
2) 937387 (1 m)
965013 (2 m)



- SF)** 1) 06AGQ001F
2) 06AGL011 (1 m)
06AGL021 (2 m)



Note: (1), (2) and (3) are for connecting cables listed in A-29.



Talk to Sales

Cable Connection Guide

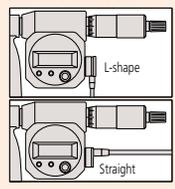
Connection cables and applicable gage models

A

1) USB Input Tool Direct USB-ITN 	Connector type	A) Water-proof type with output button	B) Water-proof type with output button	C) Straight type with output button	CR) L-shape type with output button, cable outlet on right	D) Flat 10-pin type
	Model Order No.	USB-ITN-A 06AFM380A	USB-ITN-B 06AFM380B	USB-ITN-C 06AFM380C	No applicable models USB-ITN-C can be used. See figure below	USB-ITN-D 06AFM380D
2) 264-020/264-007/DP-1VA LOGGER/MIG/EC Counter  Connector (A to G, SA and SF) Type D on the other end for all models	Connector type	A) Water-proof type with output button	B) Water-proof type with output button	C) Straight type with output button	CR) L-shape type with output button, cable outlet on right	D) Flat 10-pin type
	Order No.	1 m 05CZA624	05CZA662	959149	04AZB512	936937
		2 m 05CZA625	05CZA663	959150	04AZB513	965014
3) U-WAVE-T 	Connector type	A) Water-proof type with output button	B) Water-proof type with output button	C) Straight type with output button	CR) L-shape type with output button, cable outlet on right	D) Flat 10-pin type
	Standard	02AZD790A	02AZD790B	02AZD790C	No applicable models Type C can be used, but be careful of the cable when operating the thimble. (See figure below)	02AZD790D
	For foot switch	02AZE140A	02AZE140B	02AZE140C		02AZE140D

For connector types (circled in broken lines), select the model (A to G,SA,SF) that matches the connector shape of the Digimatic gage you are using.

Gage connectors on data cable The connector dimensions are given on page A-28.	Connector type	A) Water-proof type with output button	B) Water-proof type with output button	C) Straight type with output button	CR) L-shape type with output button, cable outlet on right	D) Flat 10-pin type
	Cable connector shape on Digimatic gage side					
Data switch	Available	Available	Available	Available	N/A	

Digimatic ports on gage Please note that some high-precision Digimatic gages are capable of displaying the measurement result to more than 6 digits. However, according to the Digimatic output specification, the result may be output in 6 digits only. Digimatic gages whose display may exceed 6 digits <ul style="list-style-type: none"> Laser Scan Micrometers Litematic Linear gage counter (EH) 	Picture of Digimatic port					
	Applicable models	<ul style="list-style-type: none"> Digimatic caliper 500-776/500-777, etc. 500-712-20/500-713-20, etc. 500-712 etc. 550-301-10/550-331-10, etc. 551-301-10/551-331-10, etc. 552-302-10/552-303-10, etc. 552-150-10/552-151-10, etc. 552-155-10/552-156-10, etc. 552-181-10/552-182-10, etc. 573-601/573-602, etc. Digimatic depth gage 571-251-10/571-252-10, etc. Digimatic scale unit 572-600, 572-601, etc. 	<ul style="list-style-type: none"> Digimatic micrometer 293-140-30/293-141-30, etc. 293-230-30 etc. 340-251-30/340-252-30 293-666-20/293-667-20, etc. 227-201-20/227-203-20, etc. 227-205-20/227-206-20, etc. 227-221-20 etc. 227-223-20 etc. 422-230-30/422-231-30, etc. 406-250-30/406-251-30, etc. 343-250-30/343-251-30, etc. 369-250-30/369-251-30, etc. 345-250-30/345-251-30, etc. 314-251-30/314-252-30, etc. Digimatic micrometer head 350-251-30/350-261-30, etc. Digimatic holtest 468-161/468-162, etc. Digimatic depth gage 329-250-30/329-251-30, etc. 	<ul style="list-style-type: none"> Digimatic caliper 500-150-30/500-151-30, etc. 500-500-10/500-501-10, etc. 500-443 etc. 573-118-10/573-119-10, etc. 573-116-10/573-117-10, etc. 573-191-30/573-291-30 573-181-30/573-182-30, etc. Digimatic depth gage 571-201-30/571-202-30, etc. Digimatic micrometer head 164-163/164-164 Digimatic scale unit 572-203-10/572-213-10 572-300-10/572-301-10, etc. 	<ul style="list-style-type: none"> Digimatic micrometer 293-582/293-583, etc. 389-514/389-714  <p>Type C straight connectors are available, but may interfere with thimble operation.</p>	<ul style="list-style-type: none"> Digimatic indicator ID-H ID-F (Note 1) High-precision height gage QMH-AX/BX Mu-checker Digital Mu Checker (Note 1) Laser scan micrometer LSM-9506 Linear gage counter EF/EH (Note 2) Surface roughness measuring machine SJ-210 (Note 4)/310/410 SJ-500/SV-2100 (Note 3) Hardness testing machines HM-210/220 HV-110/120 HR-530 HR-600

Cable Connection Guide

Connection cables and applicable gage models

A

E) Round 6-pin type	F) Flat straight type:	FB) Flat L-shape (cable outlet is back)	FR) Flat L-shape (cable outlet is right)	FL) Flat L-shape (cable outlet is left)	G) Flat straight water-proof type	SA) Water-proof straight model with output button	SF) Straight standard type
USB-ITN-E 06AFM380E	USB-ITN-F 06AFM380F	No applicable models USB-ITN-F is available.			USB-ITN-G 06AFM380G	USB-ITN-SA 06AGQ001A	USB-ITN-SF 06AGQ001F
E) Round 6-pin type	F) Flat straight type:	FB) Flat L-shape (cable outlet is back)	FR) Flat L-shape (cable outlet is right)	FL) Flat L-shape (cable outlet is left)	G) Flat straight water-proof type	SA) Water-proof straight model with output button	SF) Straight standard type
937387	905338	905689	905691	905693	21EAA194	06AGL111	06AGL011
965013	905409	905690	905692	905694	21EAA190	06AGL121	06AGL021
E) Round 6-pin type	F) Flat straight type:	FB) Flat L-shape (cable outlet is back)	FR) Flat L-shape (cable outlet is right)	FL) Flat L-shape (cable outlet is left)	G) Flat straight water-proof type	SA) Water-proof straight model with output button	SF) Straight standard type
02AZD790E	02AZD790F	No applicable models Use 02AZD790F or 02AZE140F			02AZD790G	No applicable models Use 02AZG011 or 02AZG021	02AZG011
02AZE140E	02AZE140F				02AZE140G		02AZG021

Note 1: **USB-ITN** is required to use in the combination with **USB-ITPAK**, when connected to D) **ID-F**, D) digital Mu-checker, **EB**, **EC-101D**, and F) **ID-U**, **ID-SS**, **ID-SX**.

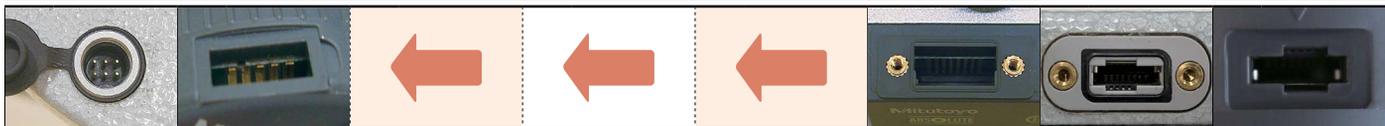
Note 2: **USB-ITN**, **USB Input Tool**, and **U-WAVE-T** cannot be used with D) **EF/EH** and D) **VL-B/S-B**.

Note 3: **USB-ITN** and **U-WAVE-T** cannot be used with D) **SJ-500/SV-2100**.

Note 4: **264-020** and **USB-ITN-SF** cannot be used with D) **SJ-210** and D) **EB**.



E) Round 6-pin type	F) Flat straight type:	FB) Flat L-shape (cable outlet is back)	FR) Flat L-shape (cable outlet is right)	FL) Flat L-shape (cable outlet is left)	G) Flat straight water-proof type	SA) Water-proof straight model with output button	SF) Straight standard type
							
N/A	N/A	N/A	N/A	N/A	N/A	Available	N/A



[Hardness testing machines] HM-102 HM-103 HM-320 HM-430 HM-411	<ul style="list-style-type: none"> • Digimatic indicator ID-CX, ID-C112AX, ID-C112RXB, ID-C112GXB, ID-U (Note 1), ID-SS (Note 1), ID-SX (Note 1) HDM-AX, HD-AX, HDS-HC, HDS-C • ABS borematic 568-361/568-362, etc. • Scale unit SD-E, SDV-E, SD-F, SDV-F 	<ul style="list-style-type: none"> • Digimatic bore gage 511-501/511-502, etc. • Hardness testing machines HH-300 	<ul style="list-style-type: none"> • Digimatic depth gage Digimatic type (ID-CX) 	<ul style="list-style-type: none"> • Digimatic indicator ID-N, ID-B 	<ul style="list-style-type: none"> • Digimatic micrometer QuantuMike (293-14X-40/293-18X-40) 	<ul style="list-style-type: none"> • Digimatic indicator ID-CNX, ID-FNX • Digimatic depth gage Digimatic type (ID-CNX) • Digimatic thickness gage Digimatic type (ID-CNX) • Surface roughness measuring machine SJ-220 • High-accuracy height gage LH-600F
--	---	---	--	--	--	---

[How to check the order No. of the connecting cable used for the measuring instrument]

- For models currently being sold
Please check the optional accessories for the applicable Digimatic gage in the general catalog.
- Regarding discontinued models not listed in the general catalog
Please contact Tech.Support@Mitutoyo.com

Quick Guide to Precision Measuring Instruments

Quality Control

Quality control (QC)

A system used to ensure products and services are produced to meet the quality standards of the producer and the customer.

Process quality control

Activities to reduce variation in product quality and output by a process and maintain reductions. Process improvement and standardization are promoted through these activities.

Statistical process control (SPC)

Process quality control through statistical methods.

Population

The entire batch, lot, or product stream in a defined time frame. A sample of this population is used to estimate process parameters.

Lot

Collection of product produced under the same conditions.

Sample

An item (or items) of product taken out of the population to analyze and monitor the process.

Sample size

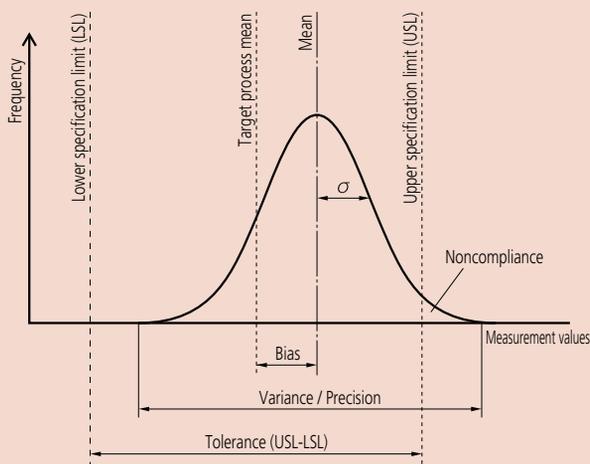
Number of items in the sample.

Bias

Value calculated by subtracting the true value from the mean of measurement values when multiple measurements are performed.

Variance / Precision

Variation in the measured values in relation to the mean for that characteristic. Standard deviation is usually used to represent the dispersion of values around the mean.



Histogram

A diagram that divides the range between the maximum and the minimum measurement values into several bins and shows the number of values (frequency) in each bin in the form of a bar graph. The histogram shows the spread, whether the center of the distribution is on target, and the shape of the data. A bell-curve-shaped distribution is ideal since it represents the normal distribution that is assumed in all statistical calculations.

Process capability

The ability of a process to consistently produce output that meets specified requirements once any causes of variation are eliminated and the process is in a state of statistical control. Process capability compares the natural variation of the process to the allowed tolerance.

Process capability index (PCI or Cp)

The index value is calculated by dividing the tolerance of a target characteristic by the process capability (6σ). The value calculated by dividing the difference between the mean (\bar{X}) and the standard value by 3σ may be used to represent this index in cases of a unilateral tolerance. The process capability index assumes that a characteristic follows the normal distribution.

Note: If a characteristic follows the normal distribution, 99.74% data is within the range $\pm 3\sigma$ from the mean.

Bilateral tolerance

USL: Upper specification limit
LSL: Lower specification limit

Unilateral tolerance ... If only the upper limit is stipulated

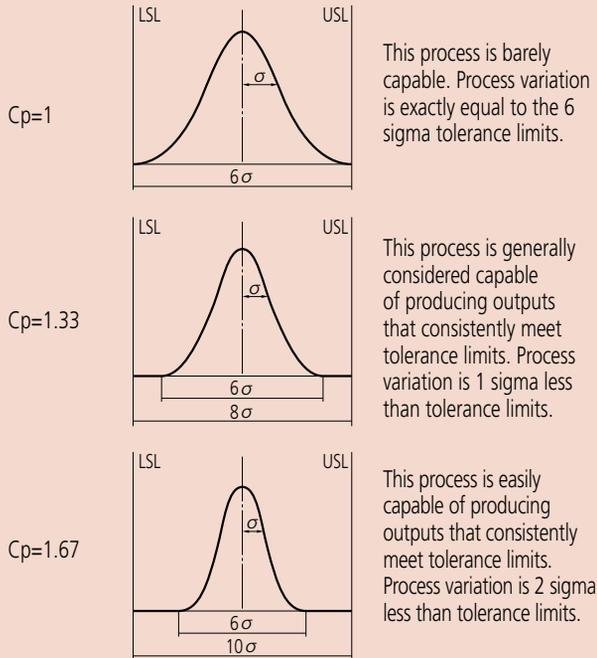
$$Cp = \frac{USL - LSL}{6\sigma}$$

Unilateral tolerance ... If only the lower limit is stipulated

$$Cp = \frac{USL - \bar{X}}{3\sigma}$$

$$Cp = \frac{\bar{X} - LSL}{3\sigma}$$

Specific examples of a process capability index (Cp) (bilateral tolerance)

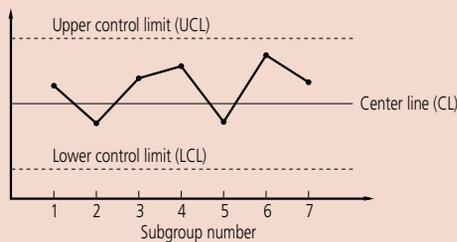


Note that Cp only represents the relationship between the tolerance limits and the process variation and does not consider the position of the process mean.

Note: A process capability index that takes the difference between the process mean from the target process mean into consideration is generally called Cpk, which is the upper tolerance (USL minus the mean) divided by 3σ (half of process capability) or the lower tolerance (the mean value minus LSL) divided by 3σ, whichever is smaller.

Control chart

Controls the process by separating process variation into chance cause variation and common cause variation. The control chart consists of one center line (CL) and the control limit lines statistically determined above and below it (UCL and LCL). It can be said that the process is in a state of statistical control if all points are within the upper and lower control limit lines without notable trends when the characteristic values that represent the process output are plotted. The control chart is a useful tool for controlling process output, and therefore quality.



Common Cause Variation

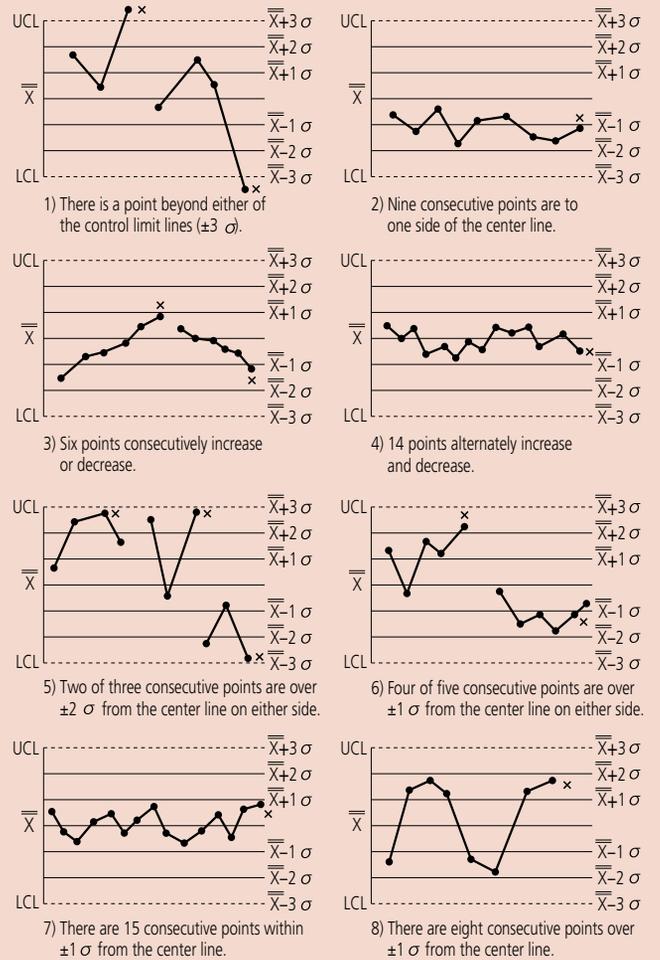
Common cause of variation is of relatively low importance. Common cause variation is technologically or economically impossible to eliminate even if they can be identified.

\bar{X} -R control chart

The process control that provides the most information on the process. The \bar{X} -R control chart consists of the \bar{X} control chart that uses the mean of each subgroup for control to monitor abnormal bias of the process mean and the R control chart that uses the range for control to monitor abnormal variation. Usually, both charts are used together.

How to read the control chart

Typical trends of successive point position in the control chart that are considered undesirable are shown below. These trends may indicate that a 'special cause' variation source is affecting the process output and that action from the process operator is required to remedy the situation. These rules only provide a guideline. Take the process-specific variation into consideration when actually making process adjustments. Assuming that the upper and the lower control limits are 3σ away from the center line, divide the control chart into six regions at intervals of 1σ to apply the following rules. These rules are applicable to the True, Xbar control chart. Note that these 'trend rules for action' were formulated assuming a normal distribution. Rules can be formulated to suit any other distribution.



Note: This part of 'Quick Guide to Precision Measuring Instruments' (09-31 to 09-32) has been written by Mitutoyo based on its own interpretation of the JIS Quality Control Handbook published by the Japanese Standards Association.

References

- JIS Quality Control Handbook (Japanese Standards Association)

- Z 8101: 1981
- Z 8101-1: 1999
- Z 8101-2: 1999
- Z 9020: 1999
- Z 9021: 1998

Featured Products



Ultra-high Accuracy Digimatic Micrometer MDH Series

Refer to page B-3 for details.



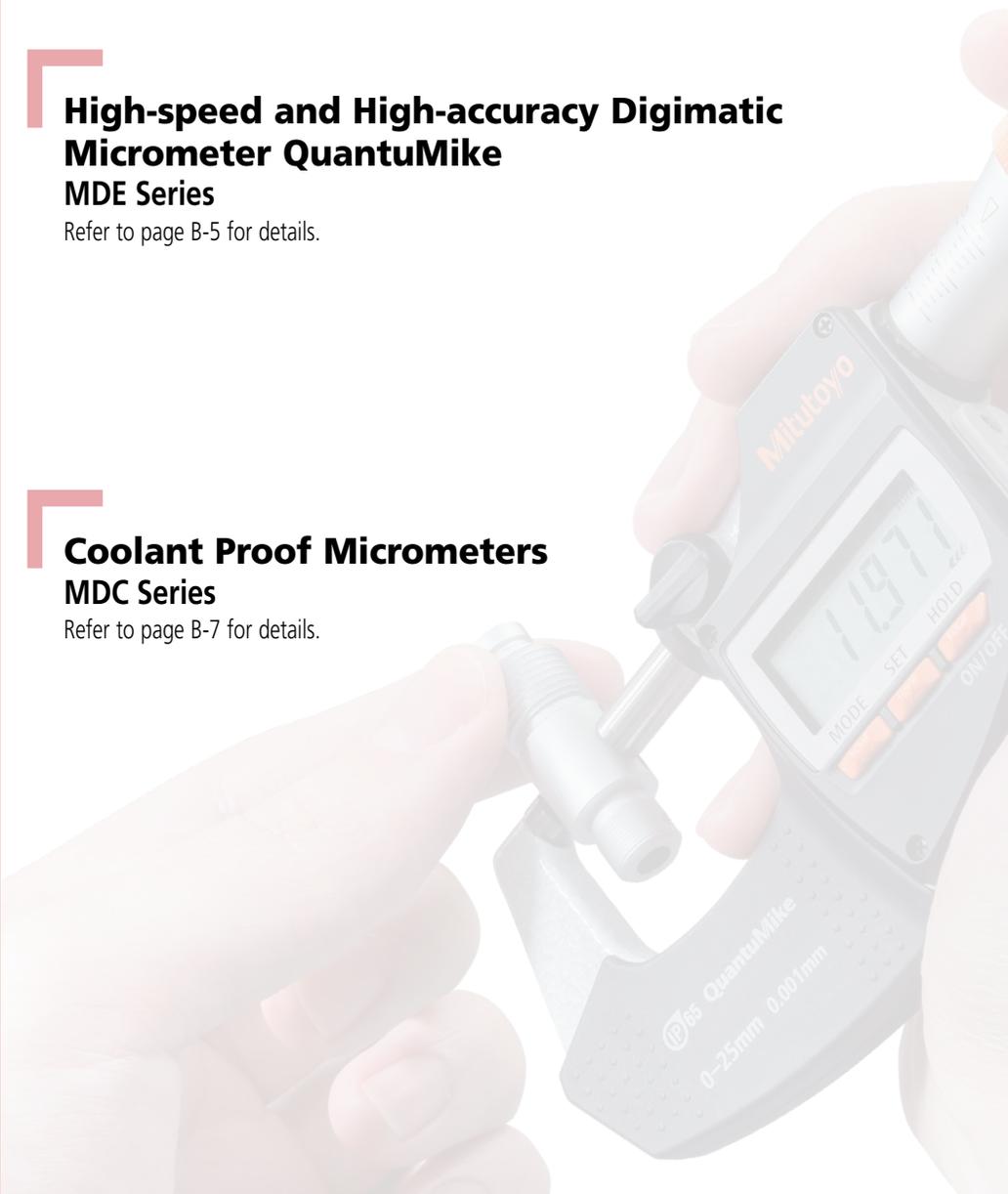
High-speed and High-accuracy Digimatic Micrometer QuantuMike MDE Series

Refer to page B-5 for details.



Coolant Proof Micrometers MDC Series

Refer to page B-7 for details.



B

Micrometers

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Measurement Data Network System

MeasurLink® is a measurement data management system based on databases (SQL Server). You can build a network to manage the measurement results and measuring instruments simply by combining the required functions.

MeasurLink® is a registered trademark of Mitutoyo Corporation in Japan and Mitutoyo America Corporation in the United States.

U-WAVE^{fit}

Measurement Data Wireless Communication System

Bluetooth® communication enables wireless transfer of measurement data from Digimatic micrometers and callipers to PCs, smartphones, tablets and such other devices.

IP65

IP Codes

The code indicates the degree of protection against the ingress of foreign materials and water as defined in the IEC standard (IEC 60529). The number indicates the protection level. (Refer to page 3)



TÜV Rheinland Certification Marks

All products with the marks have passed the IP test carried out by the German accreditation organization, TÜV Rheinland.

Measuring Instruments Shipped with Inspection Certificate

Mitutoyo guarantees product quality as a leading precision measuring instrument manufacturer and ships measuring instruments with an inspection certificate that includes inspection data so that customers can use them with confidence.

ABSOLUTE™

ABSOLUTE Linear Encoder

Mitutoyo developed the unique ABSOLUTE method to retain position information after the power is turned off. The origin is set once - thereafter the live position is displayed when the power is turned on.

DIGIMATIC S1

DIGIMATIC S1

Mitutoyo's proprietary bidirectional serial communication protocol enables a connected PC to execute measurement data output, setting and control of a measuring instrument, and capture of information of a specific measuring instrument.

Micrometers

MeasurLink¹ ENABLED
Data Management Software by Mitutoyo

ABSOLUTETM



Ultra-high Accuracy Digimatic Micrometer SERIES 293

- The flagship model, featuring unparalleled high accuracy and resolution.
- The accuracy of $\pm 0.5 \mu\text{m}$ is achieved with our innovative 5 μinch / $0.1 \mu\text{m}$ resolution ABS (ABSOLUTE) rotary sensor and screw machining technology.
- A highly rigid frame and high-performance constant-force mechanism allow stable measurements.
- Body heat transferred to the instrument is reduced by a (removable) heat shield, minimizing the error caused by thermal expansion of the frame when performing handheld measurements.
- Measuring faces: Carbide tipped.



293-130-20

SPECIFICATIONS

	Inch/Metric	Metric
Order No.	293-130-20	293-100-20
Measuring range	0 – 1 in	0 – 25 mm
Resolution	0.000005 in/0.00002 in 0.0001 mm/0.0005 mm (switchable)	0.0001 mm/0.0005 mm (switchable)
Accuracy*	± 0.00002 in	$\pm 0.5 \mu\text{m}$
Flatness	0.000012 in	0.3 μm
Parallelism	0.000024 in	0.6 μm
Measuring surface	$\varnothing 3.2$ mm	
Measuring force	7 to 9 N	
Position detection method	Electromagnetic induction type ABS rotary sensor	
Mass	405 g (445 g with heat shield attached)	
Power source	Lithium battery (CR2032) x1	
Battery life	Approx. two years when used under normal conditions	

* E_{MPE} (ISO 3611:2023 and ASME B89.1.13-2013)

Measurement example



Recommended micrometer stand: 156-101-10

Functions

Preset (ABS measurement system):

The measurement origin can be preset to any value within the display range for convenience in measuring.

Zero-setting (INC measurement system):

The display can be zeroed at any position of the spindle, making comparison measurement easier. Returning to the absolute-measurement mode is easily accomplished.

Hold:

The function that holds the display of value is useful when it is difficult to see the measured value at the measurement point. When the function is cancelled, the previous zero-set point or a measured value with reference to the origin is displayed.

Resolution switching:

The resolution of the display can be switched. If 0.1 μm measurement is not required, the resolution can be switched to 0.5 μm .

Function lock:

Functions such as preset or zero-set can be locked to avoid inadvertently changing the origin position.

On/off:

The power can be turned off after measurement is complete. Even after the power is turned off, the origin or last zero-set position remains in the memory.

Auto power off:

Even if the power is left on, the power turns off automatically if the micrometer is not used within a 20-minute period.

Measurement data output:

Measurement data can be output, allowing easy incorporation of this instrument into a statistical process control or measurement system.

Error alarm:

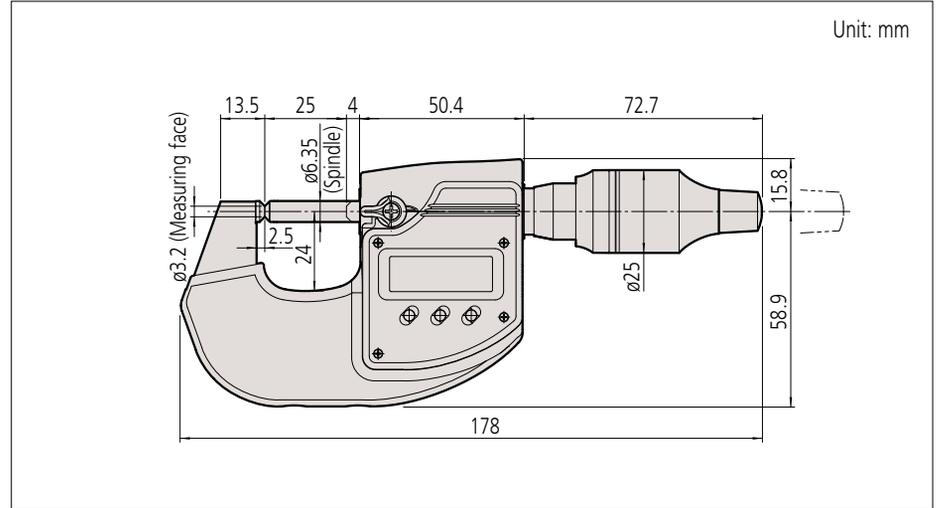
In the unlikely event of a display overflow or calculation error, an error message is displayed and measurement stops. Measurement cannot continue until the error is corrected.

Also, if the battery voltage drops below a certain point, the battery indicator will turn on before measurement becomes impossible, warning the user that the battery needs to be replaced.

Optional Accessories

Order No.	Type	Description
264-020	—	USB Input Tool Series USB Keyboard Signal Conversion Type IT-020U
05CZA662	B	Connection cable (1 m)
05CZA663	B	Connection cable (2 m)
06AFM380B	B	USB Input Tool Direct (2 m)
02AZD730G	IP67	U-WAVE-T
02AZD880G	Buzzer	U-WAVE-T
02AZE200	—	U-WAVE-T mounting bracket
02AZD790B	B	Connection cable for U-WAVE-T (160 mm)
02AZE140B	B	Connection cable for U-WAVE-T For foot switch

DIMENSIONS



Standard Accessories

Heat shield (**04AAB969A**: 293-100-20

04AAB969B: 293-130-20) ×1

Spanner (**200877**) ×1

Screwdriver (**04AAB985**) ×1

Cleaning paper for measuring faces 20 sheets

Inspection certificate



Note: To install the heat shield, use the screws attached to the bottom of the micrometer frame.



Find a Distributor

Micrometers

High-speed and High-accuracy Digimatic Micrometer QuantuMike SERIES 293 — IP65 Micrometer with 2 mm/rev Spindle Feed

Features

- 4x faster spindle speed
- Preset, Zero, Hold, Function Lock, Error display
- 1-pc Ratchet Thimble + Speeder
- Accuracy: $\pm 0.00005''$ / $0.001 \mu\text{m}$

New Features

- Go/No-go icons: At-a-glance verification
- Calibration date alerts: Warning and due date alerts
- Approach Speed Warning: Reduce over-torquing
- Calculation: Auto-calculate corrections and more
- S1 Digimatic output: Send measurement to Excel or easily program features with software (ITPak 3.0 or MeasurLink®)
- Auto power On/Off. Key customization



293-180-40

SPECIFICATIONS

Inch / Metric							
Order No.	Range (in)	Resolution	Measuring force (N)	Accuracy* (in)	Flatness (in)	Parallelism (in)	Mass (g)
293-180-40	0 - 1	0.00005 in/ 0.001 mm	7 to 12	± 0.00005	0.000012	0.00004	265
293-181-40	1 - 2						325
293-182-40	2 - 3			± 0.0001		465	
293-183-40	3 - 4					620	

Metric							
Order No.	Range (mm)	Resolution (mm)	Measuring force (N)	Accuracy* (μm)	Flatness (μm)	Parallelism (μm)	Mass (g)
293-140-40	0 - 25	0.001	7 to 12	± 1	0.3	1	265
293-141-40	25 - 50						325
293-142-40	50 - 75			± 2		2	465
293-143-40	75 - 100						620

• Power source: CR2032 battery (1 pc.), included as standard

* EMPE (ISO 3611:2023 and ASME B89.1.13-2013)

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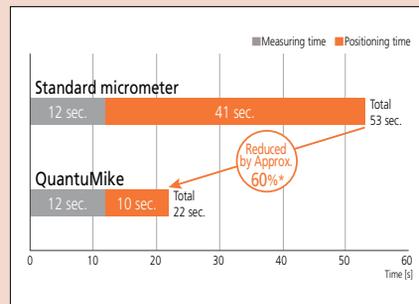


DIGIMATIC S1

Measurement example

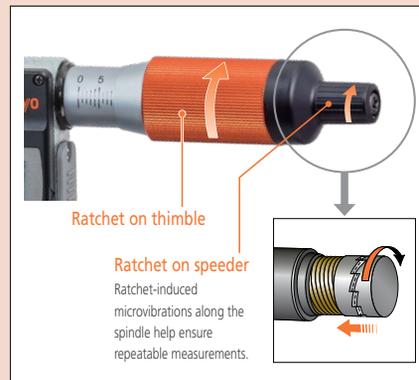


Comparison of time needed to measure a 6-stepped workpiece (with one hand)



* According to Mitutoyo comparison test data for measuring time on typical workpieces.

Ratchet thimble mechanism



Got Questions?

Functions

Preset (ABS measurement system):

The measurement origin can be preset to any value within the display range for convenience in measuring.

Zero-setting (INC measurement system):

The display can be zeroed at any position of the spindle, making comparison measurement easier. Returning to the absolute-measurement mode is easily accomplished.

Hold:

The function that holds the display of value is useful when it is difficult to see the measured value at the measurement point. When the function is cancelled, the previous zero-set point or a measured value with reference to the origin is displayed.

Calibration alert:

This function gives an alert when the instrument is approaching its calibration date and again on the actual calibration due date, helping to ensure better measuring instrument management by preventing missed calibrations.

Approach speed warning:

Reduces variation in measurement values and improves reliability of measurements.

Tolerance judgment:

The function determines whether a measured value is within the range between the upper and lower tolerance limits and displays the result with a tolerance judgment mark.

Function lock:

Functions such as preset or zero-set can be locked to avoid inadvertently changing the origin position.

Auto power ON/OFF:

The reading on the LCD disappears after this instrument is idle for approx. 20 minutes, but the origin point is retained. Turning the spindle causes the reading on the LCD to reappear.

Key customization:

Frequently used functions can be assigned to buttons and called back easily, improving work efficiency.

Measurement data output:

Measurement data can be output, allowing easy incorporation of this instrument into a statistical process control or measurement system.

Error display:

In the unlikely event of a display overflow or calculation error, an error message is displayed and measurement stops. Measurement cannot continue until the error is corrected. Also, if the battery voltage drops below a certain point, the battery indicator will turn on before measurement becomes impossible, warning the user that the battery needs to be replaced.

Optional Accessories

Order No.	Type	Description
264-020	—	USB Input Tool Series USB Keyboard Signal Conversion Type IT-020U
06AGL111	SA	Connection cable (1 m)
06AGL121	SA	Connection cable (2 m)
06AGQ001A	SA	USB Input Tool Direct (2 m)
264-622	IP67	U-WAVE-TM
264-623	Buzzer	U-WAVE-TM
264-626	IP67	U-WAVE-TMB
264-627	Buzzer	U-WAVE-TMB
02AZF960	IP67	Connecting unit for U-WAVE-TM/TMB

For additional accessories refer to pages B-70 - B76

New Digimatic S1 Output

S1 is the new Mitutoyo bidirectional output format that enables reading and writing information to the gages such as sending data, sending a zero command, calibration date warnings, and the ability to poll the serial number for smoother measurement operation. Communication supported by new Input Tools.

GO/NG icons

Displays tolerance judgment mark

Tolerance judgment function: ON



Auto-calculate

Calculates and displays correction value

Calculation function: ON

Correction value can be read directly



Customized key setting allows the user to easily switch between measurement values and calculation results with the press of a button.

Calibration alerts

Forewarning

Calendar icon flashes

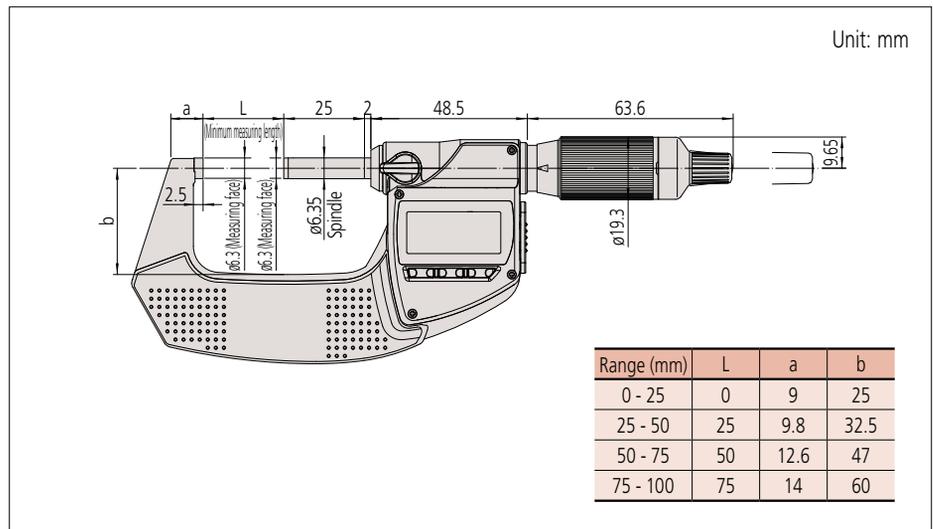


Due date

Entire display flashes



DIMENSIONS



Micrometers

Coolant Proof Micrometers SERIES 293 — IP65 Digimatic Micrometer

- Accurate and highly environmentally resistant, assisting with many types of measurements.
- Ratchet thimble provides better operability for one-handed operation.
- Oil-resistant material used for all plastic parts.
- Models equipped with a Digimatic output port can form part of a statistical process control or networked measurement system.
- Measuring faces: Carbide tipped.



293-330-30

SPECIFICATIONS

Order No.		Range (in)	Resolution	Accuracy* (in)	Parallelism (in)	Flatness (in)	Measuring force (N)	Remarks
—	293-349-30*	0 - 1	0.0001 in / 0.001 mm	±0.0001	0.00004	0.000012	7 - 12	Ratchet thimble
293-330-30	293-340-30*						5 - 10	Ratchet stop
293-334-30	293-344-30*						7 - 12	Ratchet thimble
293-335-30	293-348-30*						5 - 10	Friction thimble
293-331-30	293-341-30*	1 - 2	0.00005 in / 0.001 mm	±0.00005	0.00008	0.000012	5 - 10	Ratchet thimble
293-336-30	—						7 - 12	Friction thimble
—	293-345-30*	2 - 3	0.00005 in / 0.001 mm	±0.0001	0.00008	0.000012	7 - 12	Ratchet thimble
293-332-30	293-342-30*						5 - 10	Ratchet stop
—	293-346-30*	3 - 4	0.00005 in / 0.001 mm	±0.0001	0.00008	0.000012	7 - 12	Ratchet thimble
293-333-30	293-343-30*						5 - 10	Ratchet stop
—	293-347-30*	3 - 4	0.00005 in / 0.001 mm	±0.0001	0.00008	0.000012	7 - 12	Ratchet thimble

Order No.		Range (mm)	Resolution (mm)	Accuracy* (μm)	Parallelism (μm)	Flatness (μm)	Measuring force (N)	Constant measuring force
293-230-30	293-240-30*	0 - 25	0.001	±1	1	0.3	5 - 10	Ratchet stop
293-234-30	293-244-30*						7 - 12	Ratchet thimble
293-231-30	293-241-30*	25 - 50	0.001	±1	1	0.3	5 - 10	Ratchet stop
293-235-30	293-245-30*						7 - 12	Ratchet thimble
293-232-30	293-242-30*	50 - 75	0.001	±1	1	0.3	5 - 10	Ratchet stop
293-236-30	293-246-30*						7 - 12	Ratchet thimble
293-233-30	293-243-30*	75 - 100	0.001	±2	2	0.3	5 - 10	Ratchet stop
293-237-30	293-247-30*						7 - 12	Ratchet thimble

• Power source: SR44 battery (1 pc.), **938882** included as standard

* E_{MPE} (ISO 3611:2023 and ASME B89.1.13-2013)

*1 **293-349-30** does not include an Inspection Certificate

DIMENSIONS

Measuring range: 100 mm or less

Unit: mm

Range (mm)	L	a	b	c
0 - 25	0	6.5	25	2.5
25 - 50	25	7.3	32.5	
50 - 75	50	10.1	47	
75 - 100	75	11.5	60	
0 - 25	0	6.5	25	2.5
25 - 50	25	7.3	32.5	

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Functions

Origin point setting (ABS measurement system): Resets the ABS origin at the current spindle position to the minimum value of the measuring range and switches to ABS mode.

Zero-setting:

A brief press on the ZERO/ABS button sets display to zero at the current spindle position and switches to the incremental (INC) measuring mode. A longer press resets to the ABS measuring mode.

Hold:

The function that holds the display of value is useful when it is difficult to see the measured value at the measurement point. When the function is cancelled, the previous zero-set point or a measured value with reference to the origin is displayed.

Data output*:

Models equipped with this function have an output port for transferring measurement data to a Statistical Process Control (SPC) system.

* Only models with the data output function

Auto power ON/OFF:

The reading on the LCD disappears after this instrument is idle for about 20 minutes, but the reading and measurement mode are retained. Turning the spindle causes the reading to reappear.

Error alarm:

In case of an overflow on the LCD or a computing error, an error message appears on the LCD, and the measuring function stops. This prevents an instrument from giving an erroneous reading. Also, when the battery voltage drops to a certain level, the low-battery-voltage alarm indicator appears well before the micrometer becomes unusable.

Function lock:

This function allows the ORIGIN (origin point setting) function and the ZERO (zero-setting) function to be locked to prevent these points being reset accidentally.

Optional Accessories

For additional accessories refer to pages B-8, and B-70 - B76



Ratchet Stop (Ratchet speeder)



Ratchet Thimble (1-piece thimble & speeder)



Friction Thimble (No ratcheting action)



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Functions

Refer to page B-7.

Optional Accessories

Order No.	Type	Description
264-020	—	USB Input Tool Series USB Keyboard Signal Conversion Type IT-020U
05CZA662	B	Connection cable (1 m)
05CZA663	B	Connection cable (2 m)
06AFM380B	B	USB Input Tool Direct (2 m)
02AZD730G	IP67	U-WAVE-T
02AZD880G	Buzzer	U-WAVE-T
02AZE200	—	U-WAVE-T mounting bracket
02AZD790B	B	Connection cable for U-WAVE-T (160 mm)
02AZE140B	B	Connection cable for U-WAVE-T For foot switch
264-622	IP67	U-WAVE-TM
264-623	Buzzer	U-WAVE-TM
264-626	IP67	U-WAVE-TMB
264-627	Buzzer	U-WAVE-TMB
02AZF310	IP67	Connecting unit for U-WAVE-TM/TMB

Micrometers

Coolant Proof Micrometers SERIES 293 — IP65 Digimatic Micrometer

- Accurate and highly environmentally resistant, assisting with many types of measurements.
- Oil-resistant material used for all plastic parts.
- Measuring faces: Carbide tipped.
- All models equipped with a Digimatic output port can form part of a statistical process control or networked measurement system.
- With SPC data output.



293-350-30

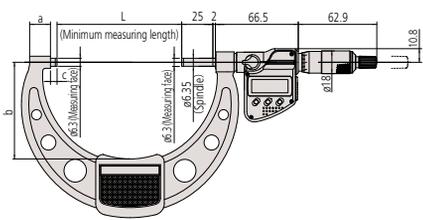
SPECIFICATIONS

Inch / Metric								
Order No.	Range (in)	Resolution	Measuring force (N)	Accuracy* (in)	Parallelism (in)	Flatness (in)	Constant measuring force	Mass (g)
293-350-30	4 - 5	0.0001 in / 0.001 mm	5 - 10	±0.0001	0.00012	0.000012	With ratchet stop	600
293-351-30	5 - 6							740
293-352-30	6 - 7							800
293-353-30	7 - 8			±0.00015	970			
293-354-30	8 - 9				1100			
293-355-30	9 - 10			±0.0002	1270			
293-356-30	10 - 11				1370			
293-357-30	11 - 12				1590			

Metric								
Order No.	Range (mm)	Resolution (mm)	Measuring force (N)	Accuracy* (μm)	Parallelism (μm)	Flatness (μm)	Constant measuring force	Mass (g)
293-250-30	100 - 125	0.001	5 - 10	±2	3	0.3	With ratchet stop	600
293-251-30	125 - 150							740
293-252-30	150 - 175			±3	4			800
293-253-30	175 - 200							970
293-254-30	200 - 225			±4	5			1100
293-255-30	225 - 250							1270
293-256-30	250 - 275							1370
293-257-30	275 - 300			1590				

• Power source: SR44 battery (1 pc.), **938882** included as standard
 Note: All digits of models over 125 mm (5 in) measuring range are presettable.
 * EMPE (ISO 3611:2023 and ASME B89.1.13-2013)

DIMENSIONS



Unit: mm

Range (mm)	L	a	b	c
100 - 125	100	16.7	76	5.3
125 - 150	125	18.8	90	5.7
150 - 175	150	19.1	103	6.1
175 - 200	175	18.2	115	6.3
200 - 225	200	16.8	126	6.7
225 - 250	225	18	139	5.5
250 - 275	250		152	6.5
275 - 300	275	166		



Talk to Sales

Micrometers

Digimatic Outside Micrometers SERIES 293

- All models have a measurement data output function that is useful for measuring large workpieces. This function allows you to easily send data via an optional communication cable or wireless system and import it to spreadsheet software or use it in various applications.
- This large Digimatic micrometer series is available in various sizes up to 20" / 500mm. It features a ratchet stop for constant measuring force.
- Measuring faces: Carbide tipped.
- With SPC data output.



293-782

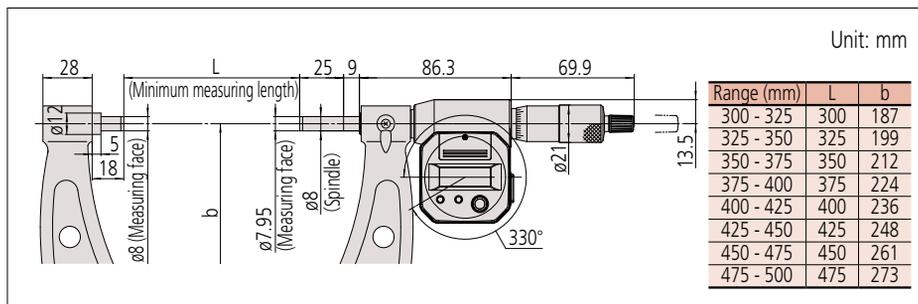
SPECIFICATIONS

Inch / Metric						
Order No.	Range (in)	Resolution	Measuring force (N)	Accuracy* (in)	Flatness (in)	Parallelism (in)
293-782	12 - 13	0.0001 in / 0.001 mm	10 - 15	±0.0003	0.000024	0.0002
293-783	13 - 14					
293-784	14 - 15					
293-785	15 - 16			±0.00035		0.00024
293-786	16 - 17					
293-787	17 - 18			±0.0004		0.00028
293-788	18 - 19					
293-789	19 - 20					

Metric						
Order No.	Range (mm)	Resolution (mm)	Measuring force (N)	Accuracy* (μm)	Flatness (μm)	Parallelism (μm)
293-582	300 - 325	0.001	10 - 15	±6	0.6	5
293-583	325 - 350					
293-584	350 - 375			±7		6
293-585	375 - 400					
293-586	400 - 425					
293-587	425 - 450			±8		7
293-588	450 - 475					
293-589	475 - 500					

• Power source: SR44 battery (2 pcs.), **938882** included as standard
* EMPE (ISO 3611:2023 and ASME B89.1.13-2013)

DIMENSIONS



Functions

Origin point setting (ABS measurement system): Resets the ABS origin at the current spindle position to the minimum value of the measuring range and switches to ABS mode.

Zero-setting (INC measurement system): A brief press on the ZERO/ABS button sets display to zero at the current spindle position and switches to the incremental (INC) measuring mode. A longer press resets to the ABS measuring mode.

Hold: The function that holds the display of value is useful when it is difficult to see the measured value at the measurement point. When the function is cancelled, the previous zero-set point or a measured value with reference to the origin is displayed.

Function lock: This function allows the PRESET (origin point setting) function and the ZERO (zero-setting) function to be locked to prevent these points being reset accidentally.

Auto power ON/OFF: The reading on the LCD disappears after this instrument is idle for about 20 minutes, but the reading and measurement mode are retained. Turning the spindle causes the reading to reappear.

Data output: Models equipped with this function have an output port for transferring measurement data to a Statistical Process Control (SPC) system.

Error alarm: In case of an overflow on the LCD or a computing error, an error message appears on the LCD, and the measuring function stops. This prevents an instrument from giving an erroneous reading. Also, when the battery voltage drops to a certain level, the low-battery-voltage alarm indicator appears well before the micrometer becomes unusable.

Optional Accessories

Order No.	Type	Description
264-020	—	USB Input Tool Series USB Keyboard Signal Conversion Type IT-020U
04AZB512	CR	Connection cable - L-Type (1 m)
04AZB513	CR	Connection cable - L-Type (2 m)
959149	C	Connection cable (1 m)
959150	C	Connection cable (2 m)
06AFM380C	C	USB Input Tool Direct (2 m)
02AZD730G	IP67	U-WAVE-T
02AZD880G	Buzzer	U-WAVE-T
02AZE200	—	U-WAVE-T mounting bracket
02AZD790C	C	Connection cable for U-WAVE-T (160 mm)
02AZE140C	C	Connection cable for U-WAVE-T For foot switch



Micrometers

Functions

Zero-setting:

A brief press on the ORIGIN button sets display to zero at the current spindle position (zero-setting), which allows easy comparison measurement.

Auto power ON/OFF:

The reading on the LCD disappears after this instrument is idle for about 20 minutes, but the reading is retained. Turning the spindle causes the reading on the LCD to reappear.

Error display:

In case of an overflow on the LCD or a computing error, an error message appears on the LCD, and the measuring function stops. This prevents an instrument from giving an erroneous reading. Also, when the battery voltage drops to a certain level, the low-battery-voltage alarm indicator appears well before the micrometer becomes unusable.

Optional Accessories

For additional accessories refer to pages B-8, and B-70 - B76



Ratchet Stop (Ratchet speeder)



Friction Thimble (No ratcheting action)

Digimatic Outside Micrometers SERIES 293

- Simple design with no data output for accuracy at a lower cost.
- Provided only with an origin-set button for easy origin setting, and an inch/mm conversion button for Inch type models.
- Equipped with Ratchet Stop or Friction Thimble for constant measuring force.
- Extended battery life of approximately 2.4 years, which helps reduce the number of battery replacements required.
- Measuring faces: Carbide tipped.
- Without SPC data output.



293-831-30

SPECIFICATIONS

Inch/Metric With ratchet stop

Order No.	Range (in)	Resolution	Measuring force (N)	Accuracy* (in)	Flatness (in)	Parallelism (in)	Mass (g)
293-831-30	0 - 1	0.00005 in/0.001 mm	5 - 10	±0.0001	0.000012	0.00008	270

Inch/Metric With friction thimble

Order No.	Range (in)	Resolution	Measuring force (N)	Accuracy* (in)	Flatness (in)	Parallelism (in)	Mass (g)
293-832-30	0 - 1	0.00005 in/0.001 mm	5 - 10	±0.0001	0.000012	0.00008	270

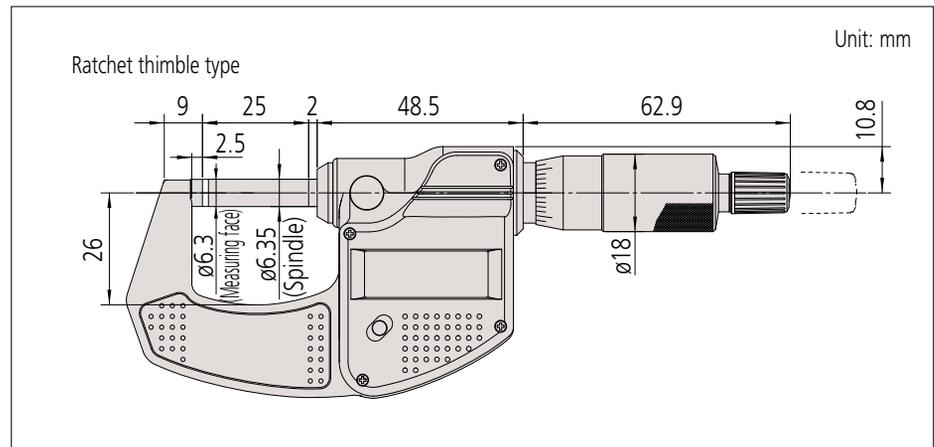
Metric With ratchet stop

Order No.	Range (mm)	Resolution (mm)	Measuring force (N)	Accuracy* (μm)	Flatness (μm)	Parallelism (μm)	Mass (g)
293-821-30	0 - 25	0.001	5 - 10	±2	0.3	2	270

• Power source: SR44 battery (1 pc.), **938882** included as standard

* E_{MPE} (ISO 3611:2023 and ASME B89.1.13-2013)

DIMENSIONS



Need Repair?

Micrometers

Quickmike SERIES 293 — IP65 ABSOLUTE Digimatic Micrometers

- The Quickmike provides a speedy spindle feed of 10 mm per thimble rotation which enables quick measurements of many different-sized features.
- Measuring faces: Carbide tipped.
- Equipped with Ratchet Stop style for constant measuring force.
- With SPC data output.



293-676-20

SPECIFICATIONS

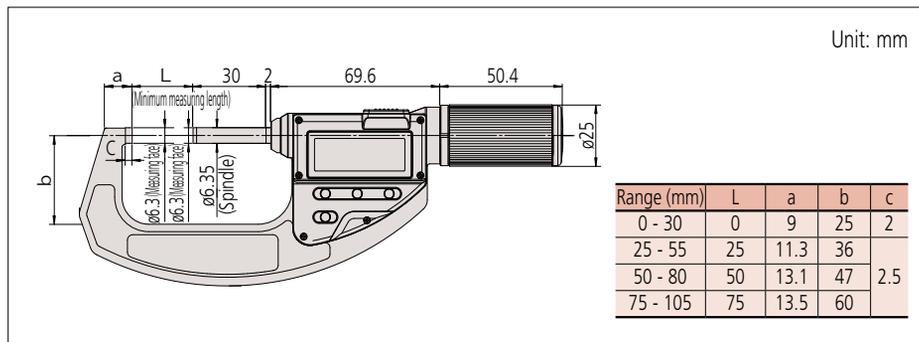
Inch / Metric		Resolution	Measuring force (N)	Accuracy* (in)	Flatness (in)	Parallelism (in)	Constant measuring force	Mass (g)
Order No.	Range (in)							
293-676-20	0 - 1.2	0.00005 in/ 0.001 mm	5 - 12	±0.0001	0.000012	0.00008	Yes	275
293-677-20	1 - 2.2							340
293-678-20	2 - 3.2			480				
293-679-20	3 - 4.2			585				

Metric		Resolution (mm)	Measuring force (N)	Accuracy* (μm)	Flatness (μm)	Parallelism (μm)	Constant measuring force	Mass (g)
Order No.	Range (mm)							
293-666-20	0 - 30	0.001	5 - 12	±2	0.3	2	Yes	275
293-667-20	25 - 55							340
293-668-20	50 - 80			480				
293-669-20	75 - 105			585				

- Power source: SR44 battery (1 pc.), **938882** included as standard
- Standard accessories: Setting standard, 1 pc. (except for measuring range 0 to 30 mm (0 to 1.2 in) models)

* E_{MPE} (ISO 3611:2023 and ASME B89.1.13-2013)

DIMENSIONS



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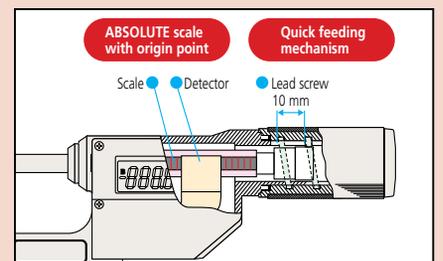
Measurement example



Optional Accessories

Order No.	Type	Description
264-020	—	USB Input Tool Series USB Keyboard Signal Conversion Type IT-020U
05CZA662	B	Connection cable (1 m)
05CZA663	B	Connection cable (2 m)
06AFM380B	B	USB Input Tool Direct (2 m)
02AZD730G	IP67	U-WAVE-T
02AZD880G	Buzzer	U-WAVE-T
02AZE200	—	U-WAVE-T mounting bracket
02AZD790B	B	Connection cable for U-WAVE-T (160 mm)
02AZE140B	B	Connection cable for U-WAVE-T For foot switch

Mechanism



Where to Buy

Measurement example



Functions

Adjustable measuring force mechanism, Origin point setting, Zero setting, Hold, Function Lock, Auto power off, Measurement data output, Error display

Optional Accessories

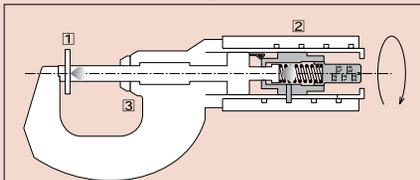
Order No.	Type	Description
264-020	—	USB Input Tool Series USB Keyboard Signal Conversion Type IT-020U
05CZA662	B	Connection cable (1 m)
05CZA663	B	Connection cable (2 m)
06AFM380B	B	USB Input Tool Direct (2 m)
02AZD730G	IP67	U-WAVE-T
02AZD880G	Buzzer	U-WAVE-T
02AZE200	—	U-WAVE-T mounting bracket
02AZD790B	B	Connection cable for U-WAVE-T (160 mm)
02AZE140B	B	Connection cable for U-WAVE-T For foot switch

Adjustable Measuring Force



To preset the measuring force, adjust the measuring force setting scale on the thimble with the screwdriver supplied.

Constant Measuring Force Mechanism



- Measuring force is generated by the action of trapping a workpiece between the spindle face and the anvil.
- The constant-force unit applies the specified measuring force.
- When the preset measuring force is reached, the count on the LCD is automatically held and the hold symbol appears.
(To cancel the hold, reverse the thimble more than 1/10 revolution and press the hold button.)

ABSOLUTE Digimatic Micrometers SERIES 227 — with Adjustable Measuring Force

- Digimatic micrometer equipped with a constant/low measuring force mechanism. The measurement-value hold function automatically retains the data at a specified measuring force. (Pressing with a larger force than the specified measuring force does not affect the measurement result).
- Suitable for measuring flexible workpieces such as electric wire, paper, and rubber.
- Non-rotating spindle reduces workpiece deformation.
- Measuring faces: Carbide tipped.
- With SPC data output.



227-201-20

SPECIFICATIONS

Inch/Metric

Order No.	Range (in)	Resolution	Measuring force (N)	Accuracy* (in)	Flatness (in)	Parallelism (in)	Measuring force (N)	Accuracy of the selected measuring force*1 (N)	Repeatability of measuring force*1 (N)	Mass (g)
227-211-20	0 - 0.6	0.00005 in/ 0.001 mm	0.5 - 2.5 (adjustable)	±0.0001	0.000012	0.00008	0.5, 1.0, 1.5, 2.0, 2.5	± (0.1+ the selected measuring force/10)	within 0.1	300
227-213-20	0.6 - 1.2									380
227-215-20	0 - 0.4	0.00005 in/ 0.001 mm	2 - 10 (adjustable)	±0.0001	0.000012	0.00008	2, 4, 6, 8, 10	± (0.4+ the selected measuring force/10)	within 0.4	345
227-216-20	0.4 - 0.8									425
227-217-20	0.8 - 1.2									415

Metric

Order No.	Range (mm)	Resolution (mm)	Measuring force (N)	Accuracy* (μm)	Flatness (μm)	Parallelism (μm)	Measuring force (N)	Accuracy of the selected measuring force*1 (N)	Repeatability of measuring force*1 (N)	Mass (g)
227-201-20	0 - 15	0.001	0.5 - 2.5 (adjustable)	±2	0.3	2	0.5, 1.0, 1.5, 2.0, 2.5	± (0.1+ the selected measuring force/10)	within 0.1	300
227-203-20	15 - 30									380
227-205-20	0 - 10	0.001	2 - 10 (adjustable)	±2	0.3	2	2, 4, 6, 8, 10	± (0.4+ the selected measuring force/10)	within 0.4	345
227-206-20	10 - 20									425
227-207-20	20 - 30									415

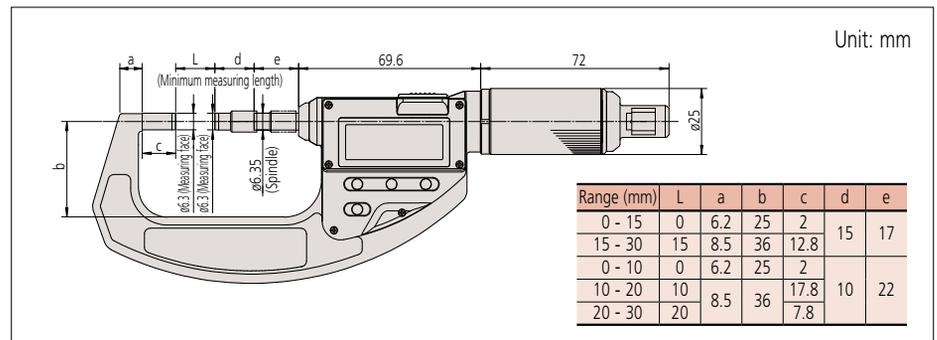
• Measurement posture: horizontal orientation only (Recommended spindle inclination: within ±3°)

• Power source: SR44 battery (1 pc.), 938882 included as standard

* EMPE (ISO 3611:2023 and ASME B89.1.13-2013)

*1 These values are guaranteed when micrometer is used in a horizontal orientation (within ±3 degrees)

DIMENSIONS



Micrometers

Outside Micrometers SERIES 406 — Non-rotating Spindle Type

- Non-rotating spindle eliminates torque on workpiece. Therefore, it is suitable for measuring flexible workpieces such as rubber and paper or thin workpieces such as film.
- Measuring faces: Carbide tipped.
- Equipped with Ratchet Stop for constant measuring force.
- With SPC data output.



406-350-30

SPECIFICATIONS

Inch / Metric					
Order No.	Range (in)	Resolution	Accuracy* (in)	Flatness (in)	Parallelism (in)
406-350-30	0 - 1	0.00005 in/ 0.001 mm	±0.00015	0.000012	0.00012
406-351-30	1 - 2				
406-352-30	2 - 3				
406-353-30	3 - 4		±0.0002	0.00016	

Metric					
Order No.	Range (mm)	Resolution (mm)	Accuracy* (µm)	Flatness (µm)	Parallelism (µm)
406-250-30	0 - 25	0.001	±3	0.3	3
406-251-30	25 - 50				
406-252-30	50 - 75				
406-253-30	75 - 100		±4	4	

• Power source: SR44 battery (1 pc.), **938882** included as standard

* E_{MPE} (ISO 3611:2023 and ASME B89.1.13-2013)

DIMENSIONS

Digimatic models up to 75 mm measuring range Unit: mm

Digimatic models over 75 mm measuring range

Range (mm)	L	a	b	c
0 - 25	0	9.8	32	2.5
25 - 50	25	12.6	47	
50 - 75	50	14	60	2.8
75 - 100	75	16.9	57	

Measurement example



Optional Accessories

Order No.	Type	Description
264-020	—	USB Input Tool Series USB Keyboard Signal Conversion Type IT-020U
05CZA662	B	Connection cable (1 m)
05CZA663	B	Connection cable (2 m)
06AFM380B	B	USB Input Tool Direct (2 m)
02AZD730G	IP67	U-WAVE-T
02AZD880G	Buzzer	U-WAVE-T
02AZE200	—	U-WAVE-T mounting bracket
02AZD790B	B	Connection cable for U-WAVE-T (160 mm)
02AZE140B	B	Connection cable for U-WAVE-T For foot switch
264-622	IP67	U-WAVE-TM
264-623	Buzzer	U-WAVE-TM
264-626	IP67	U-WAVE-TMB
264-627	Buzzer	U-WAVE-TMB
02AZF310	IP67	Connecting unit for U-WAVE-TM/TMB



Get a Quote



Applicable models: 0-12" (0-300mm):

340-251-30, 340-252-30, 340-351-30, 340-352-30

Technical Data

Accuracy: $\pm[.00016" + .00004 (L/3)"] L = \text{Max Range (Inch)}$

Measurement example



Optional Accessories

Order No.	Type	Description
264-020	—	USB Input Tool Series USB Keyboard Signal Conversion Type IT-020U
05CZA662	B	Connection cable (1 m) for 0 - 12 in models
05CZA663	B	Connection cable (2 m) for 12 - 36 in models
04AZB512	CR	Connection cable - L-Type (1 m) for 12 - 36 in models
04AZB513	CR	Connection cable - L-Type (2 m) for 12 - 36 in models
959149	C	Connection cable (1 m) for 12 - 36 in models
959150	C	Connection cable (2 m) for 12 - 36 in models
06AFM380B	B	USB Input Tool Direct (2 m) for 0 - 12 in models
06AFM380C	C	USB Input Tool Direct (2 m) for 12 - 36 in models
02AZD730G	IP67	U-WAVE-T
02AZD880G	Buzzer	U-WAVE-T
02AZD790B	B	Connection cable for U-WAVE-T (160 mm)
02AZE140B	B	Connection cable for U-WAVE-T For foot switch
02AZD790C	C	Connection cable for U-WAVE-T (160 mm)
02AZE140C	C	Connection cable for U-WAVE-T For foot switch
264-622	IP67	U-WAVE-TM*
264-623	Buzzer	U-WAVE-TM*
264-626	IP67	U-WAVE-TMB*
264-627	Buzzer	U-WAVE-TMB*
02AZF310	IP67	Connecting unit for U-WAVE-TM/TMB*

* Only 340-251-30, 340-252-30, 340-351-30 and 340-352-30 can be attached.

Micrometers

Outside Micrometers SERIES 340 — with Interchangeable Anvils

- Wide measuring range with interchangeable anvils.
- Measuring face of the spindle is carbide tipped (standard model).
- IP65 water/dust protection.
- Equipped with Ratchet Stop for constant measuring force.
- With SPC data output.



340-351-30



340-520

SPECIFICATIONS

Inch / Metric

Order No.	Range (in)	Resolution	Flatness (in)	Parallelism (in)	Interchangeable anvils	Setting Standard		Micrometer head stroke (in)
						Qty	Size (in)	
340-351-30*	0 - 6	0.00005 in/ 0.001 mm	0.000024	0.00012	6 pcs.	5	1 - 5	1
340-352-30*	6 - 12	0.0001 in/ 0.001 mm	0.00004	0.0002		6	6 - 11	
340-720	12 - 18			0.00028	12 - 17			
340-721	18 - 24			0.00036	18 - 23			
340-722	24 - 30			0.0004	24 - 29			
340-723	30 - 36			0.00044	30 - 35			

Metric

Order No.	Range (mm)	Resolution (mm)	Flatness (μm)	Parallelism (μm)	Interchangeable anvils	Setting Standard		Micrometer head stroke (mm)
						Qty	Size (mm)	
340-251-30*	0 - 75	0.001	0.6	2	6 pcs.	5	25 - 125	25
	75 - 150			3		150 - 275		
340-252-30*	150 - 300			5		300 - 375		
340-520	300 - 400	1.0	0.6	6	4 pcs.	4	400 - 475	
340-521	400 - 500			7		500 - 575		
340-522	500 - 600			8		600 - 675		
340-523	600 - 700			9		700 - 775		
340-524	700 - 800			10		800 - 875		
340-525	800 - 900			11		900 - 975		
340-526	900 - 1000			12				

* IP65 model.

- Power source for models up to 12 in.: SR44 battery (1 pc.), 938882 included as standard
- Power source for models over 12 in.: SR44 battery (2 pcs.), 938882 included as standard

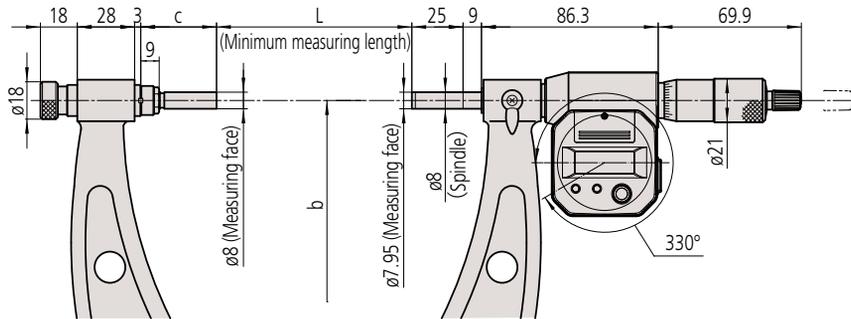
Micrometers

Outside Micrometers SERIES 340 — with Interchangeable Anvils

DIMENSIONS

Over 400 mm up to 1000 mm

Unit: mm



	L: Range (mm)					b
Range	300 - 400 mm models	300 - 325	325 - 350	350 - 375	375 - 400	224
Range	400 - 500 mm models	400 - 425	425 - 450	450 - 475	475 - 500	273
Range	500 - 600 mm models	500 - 525	525 - 550	550 - 575	575 - 600	332
Range	600 - 700 mm models	600 - 625	625 - 650	650 - 675	675 - 700	382
Range	700 - 800 mm models	700 - 725	725 - 750	750 - 775	775 - 800	430
Range	800 - 900 mm models	800 - 825	825 - 850	850 - 875	875 - 900	480
Range	900 - 1000 mm models	900 - 925	925 - 950	950 - 975	975 - 1000	530
	c: Overall (mm)	87	62	37	12	



Need Support?



Micrometers

Measurement example



Mechanism

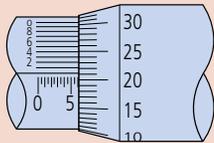
Ratchet stop type



Friction thimble type



Micrometer with Vernier scale (graduation: 0.001 mm)



Outside Micrometers SERIES 102

- Standard analog micrometer. Thanks to a heat-insulated frame, it is resistant to heat and therefore delivers accurate measurement results.
- Measuring faces: Carbide tipped.
- Tapered frame (behind anvil) for measuring in hard-to-reach places.
- Equipped with Ratchet Stop for constant measuring force.



Ratchet stop
102-327-10

SPECIFICATIONS

Inch

Order No.	Range (in)	Graduation (in)	Measuring force (N)	Accuracy* (in)	Flatness (in)	Parallelism (in)	Constant measuring force
102-327-10	0 - 1	0.0001	5 - 10	±0.0001	0.000024	0.00008	Ratchet stop
102-329-10							Friction thimble
102-328-10	1 - 2	0.0001	5 - 10	±0.0001	0.000024	0.00008	Ratchet stop
102-330-10							Friction thimble
102-331-10	2 - 3	0.0001	5 - 10	±0.00015	0.000024	0.00012	Ratchet stop
102-332-10	3 - 4						Ratchet stop

Metric

Order No.	Range (mm)	Graduation (mm)	Measuring force (N)	Accuracy* (µm)	Flatness (µm)	Parallelism (µm)	Constant measuring force
102-301	0 - 25	0.01	5 - 10	±2	0.6	2	Ratchet stop
102-302	25 - 50						
102-303	50 - 75						
102-304	75 - 100						

Metric With Vernier scale

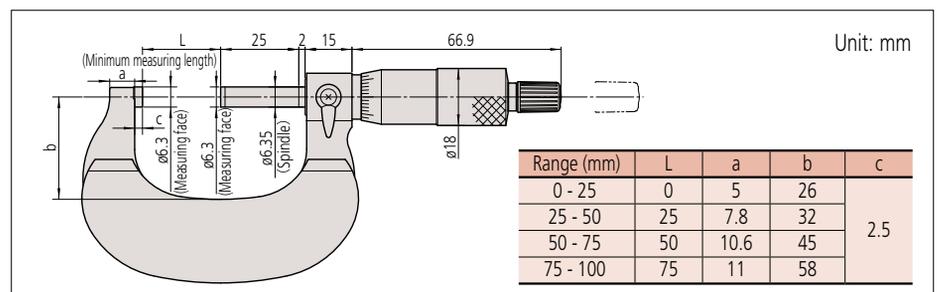
Order No.	Range (mm)	Graduation (mm)	Measuring force (N)	Accuracy* (µm)	Flatness (µm)	Parallelism (µm)	Constant measuring force
102-311	0 - 25	0.001	5 - 10	±1	0.3	1	Ratchet stop
102-313							Friction thimble
102-312	25 - 50	0.001	5 - 10	±2	0.3	1	Ratchet stop

Metric Micrometer set

Order No.	Range (mm)	Models included
102-911-40	0 - 100 (Four micrometers per set)	<ul style="list-style-type: none"> • 102-301 • 102-302 • 102-303 • 102-304 • 3 micrometer standards

* E-MPE (ISO 3611:2023 and ASME B89.1.13-2013)

DIMENSIONS



Micrometers

Ratchet Thimble Micrometer SERIES 102 — Outside Micrometers

- The ratchet thimble mechanism enables easy one-handed operation, useful for inspecting samples during the manufacturing process.
- Ratchet function works both from the thimble and the speeder.
- Tapered frame (behind anvil) for measuring in hard-to-reach places.
- Heat-insulated frame.
- Measuring faces: Carbide tipped.



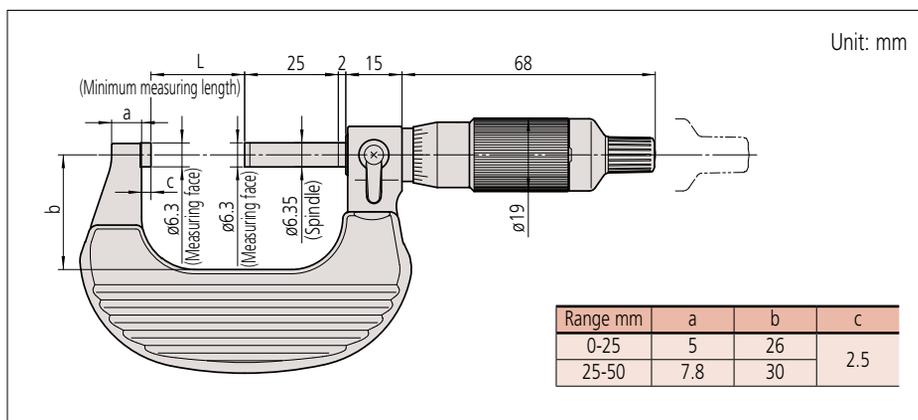
102-717

SPECIFICATIONS

Inch							
Order No.	Range (in)	Graduation (in)	Measuring force (N)	Accuracy* (in)	Flatness (in)	Parallelism (in)	Mass (g)
102-717	0 - 1	0.0001	5 - 10	±0.0001	0.000024	0.00008	180
102-718	1 - 2						270
Metric							
Order No.	Range (mm)	Graduation (mm)	Measuring force (N)	Accuracy* (μm)	Flatness (μm)	Parallelism (μm)	Mass (g)
102-701	0 - 25	0.01	5 - 10	±2	0.6	2	180
102-707		0.001					270
102-702	25 - 50	0.01	5 - 10	±2	0.6	2	180
102-708		0.001					270

* E_{MPE} (ISO 3611:2023 and ASME B89.1.13-2013)

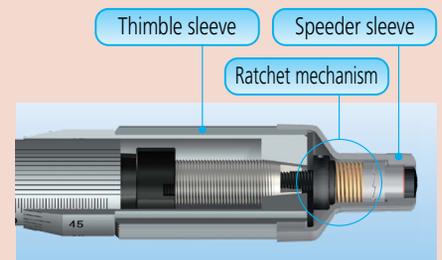
DIMENSIONS



Measurement example



Internal structure



Need Service?



Micrometers

Measurement example



Outside Micrometers SERIES 103

- This is a classic analog micrometer that represents the roots of our company's foundation.
- Measuring faces: Carbide tipped.

Inch		With ratchet stop				
Order No.	Range (in)	Graduation (in)	Accuracy* (in)	Flatness (in)	Parallelism (in)	Measuring force (N)
103-177	0 - 1	0.001	±0.0001	0.000024	0.00008	5 - 10
103-178	1 - 2					
103-131	0 - 1					
103-132	1 - 2					
103-217	2 - 3					
103-218	3 - 4					
103-219	4 - 5					
103-220	5 - 6					
103-221	6 - 7					
103-222	7 - 8					
103-223	8 - 9					
103-224	9 - 10	0.001	±0.00015	0.000024	0.00012	5 - 10
103-225	10 - 11					
103-226	11 - 12					
103-179	2 - 3					
103-180	3 - 4					
103-181	4 - 5					
103-182	5 - 6					
103-183	6 - 7					
103-184	7 - 8					
103-185	8 - 9					
103-186	9 - 10					
103-187	10 - 11					
103-188	11 - 12					
103-189	12 - 13	0.001	±0.0002	0.000024	0.00016	5 - 10
103-190	13 - 14					
103-191	14 - 15					
103-192	15 - 16					
103-193	16 - 17					
103-194	17 - 18					
103-195	18 - 19					
103-196	19 - 20					
103-197	20 - 21					
103-198	21 - 22					
103-199	22 - 23					
103-200	23 - 24	0.001	±0.00025	0.00004	0.0002	10 - 15
103-201	24 - 25					
103-202	25 - 26					
103-203	26 - 27					
103-204	27 - 28					
103-205	28 - 29					
103-206	29 - 30					
103-207	30 - 31					
103-208	31 - 32					
103-209	32 - 33					
103-210	33 - 34					
103-211	34 - 35	0.00004	±0.0003	0.00004	0.00024	10 - 15
103-212	35 - 36					
103-213	36 - 37					
103-214	37 - 38					
103-215	38 - 39					
103-216	39 - 40					
103-217	2 - 3					
103-218	3 - 4					
103-219	4 - 5					
103-220	5 - 6					
103-221	6 - 7					
103-222	7 - 8					
103-223	8 - 9					
103-224	9 - 10					
103-225	10 - 11					
103-226	11 - 12					
103-227	12 - 13					
103-228	13 - 14					
103-229	14 - 15					
103-230	15 - 16					
103-231	16 - 17					
103-232	17 - 18					
103-233	18 - 19					
103-234	19 - 20					
103-235	20 - 21					
103-236	21 - 22					
103-237	22 - 23					
103-238	23 - 24					
103-239	24 - 25					
103-240	25 - 26					
103-241	26 - 27					
103-242	27 - 28					
103-243	28 - 29					
103-244	29 - 30					
103-245	30 - 31					
103-246	31 - 32					
103-247	32 - 33					
103-248	33 - 34					
103-249	34 - 35					
103-250	35 - 36					
103-251	36 - 37					
103-252	37 - 38					
103-253	38 - 39					
103-254	39 - 40					

Inch		Tapered Frame with Ratchet Stop			
Order No.	Range (in)	Graduation (in)	Accuracy (in)	Measuring force (N)	
103-259	0 - 1	.001	±.0001	5 - 10	
103-260*	0 - 1	.0001	±.0001		
103-262*	1 - 2	.0001	±.0001		

Inch		With friction thimble				
Order No.	Range (in)	Graduation (in)	Accuracy* (in)	Flatness (in)	Parallelism (in)	Measuring force (N)
103-135	0 - 1	0.0001	±0.0001	0.000024	0.00008	5 - 10
103-136	1 - 2					

* EMPE (ISO 3611:2023 and ASME B89.1.13-2013)

* .0001 * Reading is obtained with Vernier

Micrometers



103-137



103-139-10

Metric With ratchet stop

Order No.	Range (mm)	Measuring force (N)	Graduation (mm)	Accuracy* (μm)	Flatness (μm)	Parallelism (μm)
103-129	0 - 25	5 - 10	0.001	±2	0.6	2
103-130	25 - 50					
103-139-10	50 - 75					
103-140-10	75 - 100			±3		
103-141-10	100 - 125					
103-142-10	125 - 150					
103-143-10	150 - 175			±4		
103-144-10	175 - 200					
103-145-10	200 - 225					
103-146-10	225 - 250			±5		
103-147-10	250 - 275					
103-148-10	275 - 300					
103-149	300 - 325	10 - 15	0.01	±6	1	5
103-150	325 - 350					
103-151	350 - 375					
103-152	375 - 400			±7		
103-153	400 - 425					
103-154	425 - 450					
103-155	450 - 475			±8		
103-156	475 - 500					
103-157	500 - 525					
103-158	525 - 550			±9		
103-159	550 - 575					
103-160	575 - 600					
103-161	600 - 625	±10				
103-162	625 - 650					
103-163	650 - 675					
103-164	675 - 700	±11				
103-165	700 - 725					
103-166	725 - 750					
103-167	750 - 775	±12				
103-168	775 - 800					
103-169	800 - 825					
103-170	825 - 850	±13				
103-171	850 - 875					
103-172	875 - 900					
103-173	900 - 925	±14				
103-174	925 - 950					
103-175	950 - 975					
103-176	975 - 1000	±15				12

Metric With ratchet stop

Order No.	Range (mm)	Measuring force (N)	Graduation (mm)	Accuracy* (μm)	Flatness (μm)	Parallelism (μm)
103-137	0 - 25	5 - 10	0.01	±2	0.6	2
103-138	25 - 50					
103-255	50 - 75		0.001	±3		
103-256	75 - 100					
103-257	100 - 125					
103-258	125 - 150					3

* E_{MPE} (ISO 3611:2023 and ASME B89.1.13-2013)



103-904-10

- Range: 0 - 6 in (6 pcs./set)
- Models included: 103-177, 103-178, 103-179, 103-180, 103-181, 103-182, 5 micrometer standards



103-905-10

- Range: 0 - 12 in (12 pcs./set)
- Models included: All micrometers of 103-904-10 and 103-906 in one set, 11 micrometer standards



103-906

- Range: 6 - 12 in (6 pcs./set)
- Models included: 103-183, 103-184, 103-185, 103-186, 103-187, 103-188, 6 micrometer standards

103-907-40

- Range: 0 - 6 in (6 pcs./set)
- Models included: 103-135, 103-136, 103-217, 103-218, 103-219, 103-220

103-908-40

- Range: 0 - 12 in (12 pcs./set)
- Models included: 103-135, 103-136, 103-217, 103-218, 103-219, 103-220, 103-221, 103-222, 103-223, 103-224, 103-225, 103-226

103-909

- Range: 6 - 12 in (6 pcs./set)
- Models included: 103-221, 103-222, 103-223, 103-224, 103-225, 103-226

103-929

- Range: 0 - 3 in (3 pcs./set)
- Models included: 103-177, 103-178, 103-179

103-930

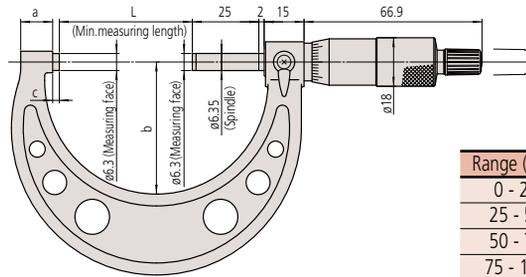
- Range: 0 - 4 in (4 pcs./set)
- Models included: 103-177, 103-178, 103-179, 103-180

Outside Micrometers SERIES 103

DIMENSIONS

103-137 and 103-138, Models 75 mm to 300 mm

Unit: mm

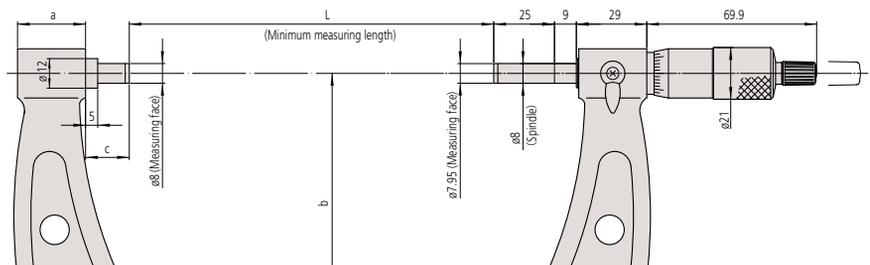


Range (mm)	L	a	b	c
0 - 25	0	9	28	2.5
25 - 50	25	10	38	
50 - 75	50	12	49	
75 - 100	75	14	60	
100 - 125	100	16.7	79	5.3
125 - 150	125	18.8	94	5.7
150 - 175	150	19.1	106	6.1
175 - 200	175	18.2	118	6.3
200 - 225	200	16.8	130	6.7
225 - 250	225	18	143	5.5
250 - 275	250		156	6.5
275 - 300	275		169	

DIMENSIONS

Models 325 mm to 1000 mm

Unit: mm



Range (mm)	L	a	b	c	
300 - 325	300	28	187	18	
325 - 350	325		199		
350 - 375	350		212		
375 - 400	375		224		
400 - 425	400		236		
425 - 450	425		248		
450 - 475	450		261		
475 - 500	475		273		
500 - 525	500		307		40
525 - 550	525				15
550 - 575	550		332		40
575 - 600	575				15
600 - 625	600				40
625 - 650	625		355		40
		15			

Range (mm)	L	a	b	c
650 - 675	650	28	382	40
675 - 700	675			15
700 - 725	700		405	40
725 - 750	725			15
750 - 775	750			40
775 - 800	775		430	15
800 - 825	800			40
825 - 850	825		455	15
850 - 875	850			40
875 - 900	875			15
900 - 925	900		505	40
925 - 950	925			15
950 - 975	950			40
975 - 1000	975		530	40
		15		



Need Calibration?

Micrometers

Digit Outside Micrometers SERIES 193

- Mechanical digit counter with .001 in counter resolution. The .0001 in graduations are obtained by using the Vernier scale.
- Measuring faces: Carbide tipped.



193-211

SPECIFICATIONS

Inch With friction thimble

Order No.	Range (in)	Accuracy* (in)	Flatness (in)	Parallelism (in)	Graduation (in)
193-211	0 - 1	±0.0001	0.000024	0.00008	0.0001*1
193-212	1 - 2				

Inch With ratchet stop

Order No.	Range (in)	Accuracy* (in)	Flatness (in)	Parallelism (in)	Graduation (in)
193-213	2 - 3	±0.0001	0.000024	0.00008	0.0001*1
193-214	3 - 4	±0.00015		0.00012	

Metric With ratchet stop

Order No.	Range (mm)	Accuracy* (μm)	Flatness (μm)	Parallelism (μm)	Graduation (mm)	
193-111	0 - 25	±2	0.6	2	0.001*1	
193-112	25 - 50					
193-113	50 - 75					
193-114	75 - 100	±3		3		
193-101	0 - 25	±2		0.6	2	0.01
193-102	25 - 50					
193-103	50 - 75					
193-104	75 - 100		±3		3	

Inch Micrometer set

Order No.	Range (in)	Models included	Flatness (in)	Parallelism (in)
193-923	0 - 3 (3 pcs./set)	• 193-211, 193-212, 193-213 • 2 micrometer standards	0.000024	0.00008

Metric Micrometer set

Order No.	Range (mm)	Models included	Flatness (μm)	Parallelism (μm)
193-901	0 - 75 (3 pcs./set)	• 193-101, 193-102, 193-103 • 2 micrometer standards	0.6	2
193-902	0 - 100 (4 pcs./set)	• 193-101, 193-102, 193-103, 193-104 • 3 micrometer standards		3

* EMPE (ISO 3611:2023 and ASME B89.1.13-2013)

*1 Reading is obtained with Vernier.

Measurement example



193-923

- Range: 0 - 3 in



193-902

- Range: 0 - 100 mm

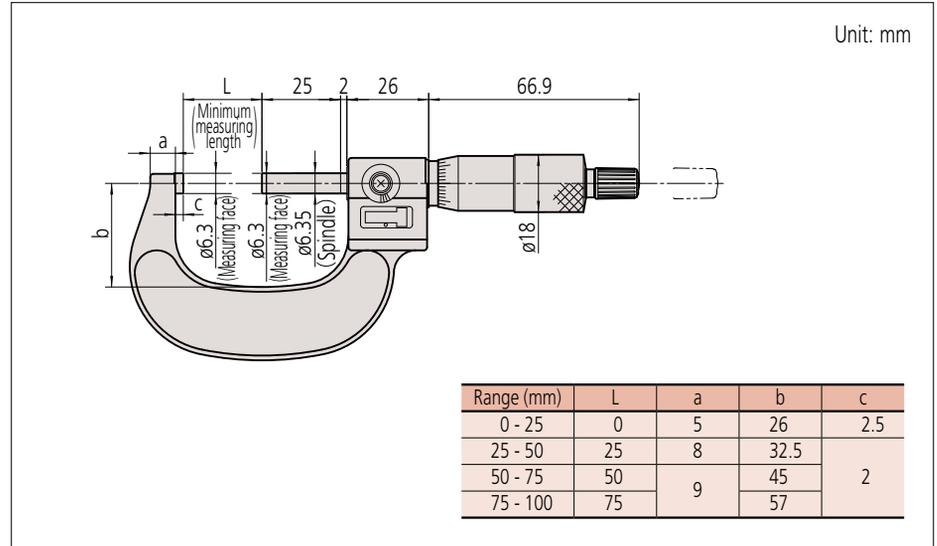


Find a Distributor

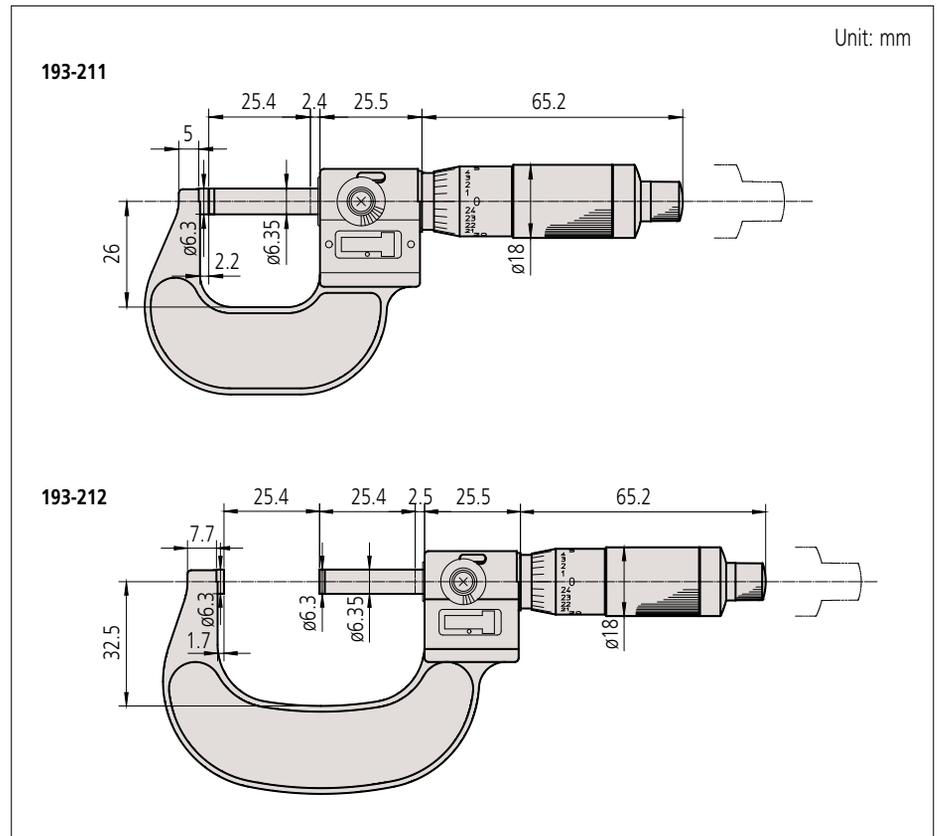
Micrometers

Digit Outside Micrometers SERIES 193

DIMENSIONS



DIMENSIONS

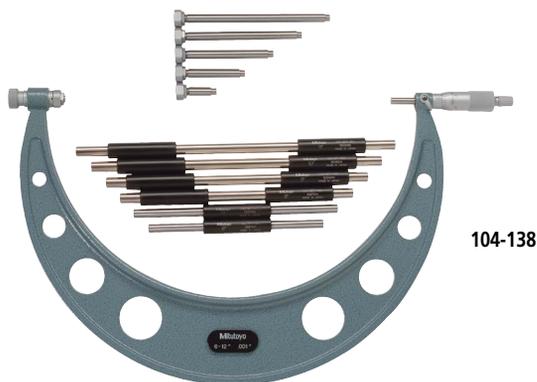


Micrometers

Outside Micrometers

SERIES 104 — with Interchangeable Anvils

- Wide measuring range with interchangeable anvils.
- Measuring face of the spindle is carbide tipped (standard model).
- Equipped with Ratchet Stop for constant measuring force.



104-138

Technical Data

Accuracy: $\pm[.00016'' + .00004 (L/3)']$ L = Max Range (Inch)

SPECIFICATIONS

Inch									
Order No.	Range (in)	Graduation (in)	Flatness (in)	Parallelism (in)	Interchangeable anvils	Setting Standard		Micrometer head stroke (in)	
						Qty	Size (in)		
Analog									
104-165	0 - 2	0.0001	0.000024	0.00008	1 pc.	1	1	1	
104-149	0 - 4	0.001		0.00024	0.00012	4 pcs.	3		1 - 3
104-137	0 - 6					6 pcs.	5		1 - 5
104-162	2 - 6				0.00016	4 pcs.	4		2 - 5
104-150	4 - 8					4 - 7			
104-138	6 - 12				0.0002	6 pcs.	6		6 - 11
104-151	8 - 12					8 - 11			
104-152	12 - 16				0.00024	4 pcs.	4		12 - 15
104-201	12 - 18					6 pcs.	6		12 - 17
104-153	16 - 20				0.00028	4 pcs.	4		16 - 19
104-202	18 - 24					6 pcs.	6		18 - 23
104-154	20 - 24				0.00032	4 pcs.	4		20 - 23
104-155	24 - 28					6 pcs.	6		24 - 27
104-203	24 - 30				0.00036	6 pcs.	6		24 - 29
104-156	28 - 32		4 pcs.			4	28 - 31		
104-204	30 - 36	0.00044	6 pcs.	6	30 - 35				
104-157	32 - 36		4 pcs.	4	32 - 35				
104-158	36 - 40	0.00048	4 pcs.	4	36 - 39				
104-205	36 - 42		6 pcs.	6	36 - 41				

Metric								
Order No.	Range (mm)	Graduation (mm)	Flatness (μm)	Parallelism (μm)	Interchangeable anvils	Setting Standard		Micrometer head stroke (mm)
						Qty	Size (mm)	
Analog								
104-171*	0 - 50	0.01	0.6	2	1 pc.	1	25	25
104-139A	0 - 100			3	4 pcs.	3	25 - 75	
104-135A	0 - 150				6 pcs.	5	25 - 125	
104-161A	50 - 150			4	4 pcs.	4	50 - 125	
104-140A	100 - 200				100 - 175			
104-136A	150 - 300			5	6 pcs.	6	150 - 275	
104-141A	200 - 300		200 - 275					
104-142A	300 - 400		1.0	6	4 pcs.	4	300 - 375	
104-143A	400 - 500			7			400 - 475	
104-144A	500 - 600			8			500 - 575	
104-145A	600 - 700			9			600 - 675	
104-146A	700 - 800			10			700 - 775	
104-147A	800 - 900	11		800 - 875				
104-148A	900 - 1000	12	900 - 975					

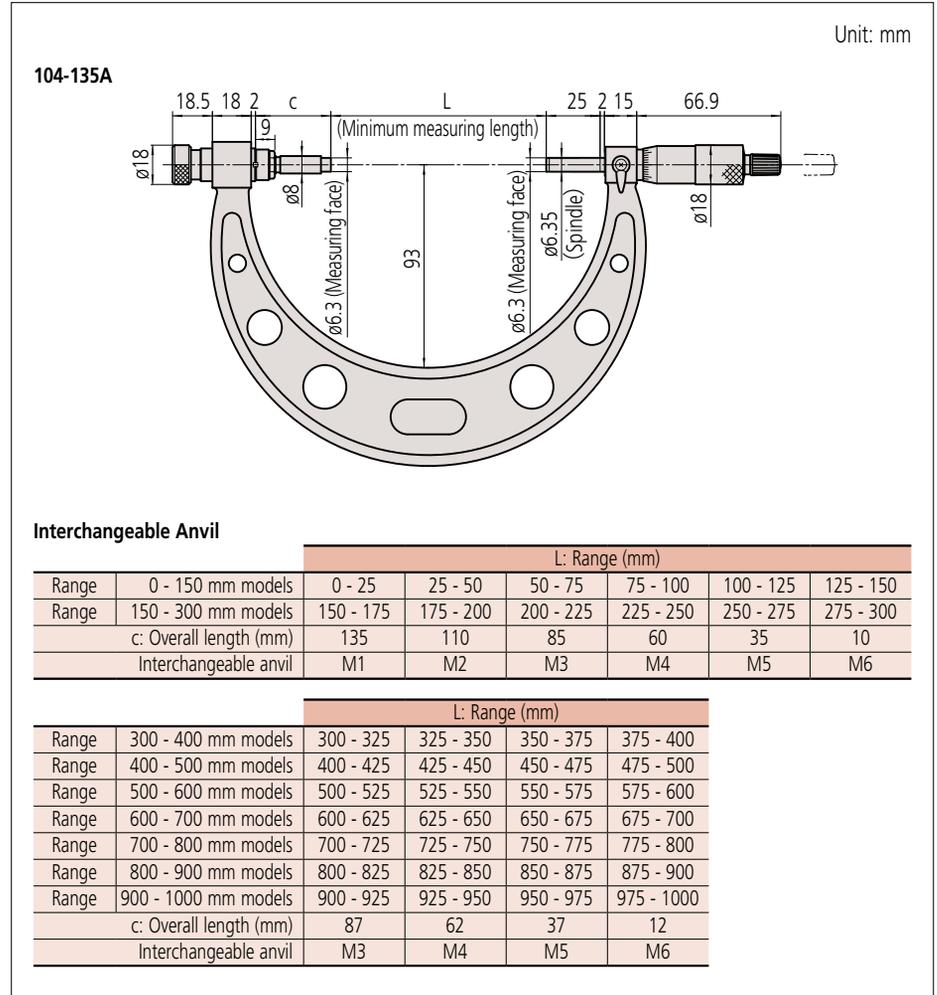
* The frame is fitted with a heat shield.



Got Questions?

Outside Micrometers SERIES 104 — with Interchangeable Anvils

DIMENSIONS



Micrometers

Outside Micrometers

SERIES 105 — with Anvil Extension Collars

- Adjustable measuring range with extension collars.
- 2 in/50 mm spindle stroke.
- Measuring faces: Carbide tipped.
- Equipped with Ratchet Stop for constant measuring force.



105-105

SPECIFICATIONS

Metric						
Order No.	Range (mm)	Graduation (mm)	Extension Collars	Setting Standard	Flatness (μm)	Parallelism (μm)
105-103	500 - 600	0.01	1 pc. (50 mm)	2 pcs.	1.3	8
105-104	600 - 700					9
105-105	700 - 800					10
105-106	800 - 900					11
105-107	900 - 1000					12

Technical Data

Accuracy: $\pm(6+R/75)\mu\text{m}$, R=max. range (mm)

Extension collar



Measuring range 700 to 750 mm with **105-105**



Measuring range 750 to 800 mm with **105-105**



Get a Quote

Micrometers

Technical Data

Accuracy: $\pm(6+R/75)\mu\text{m}$, R=max. range (mm)

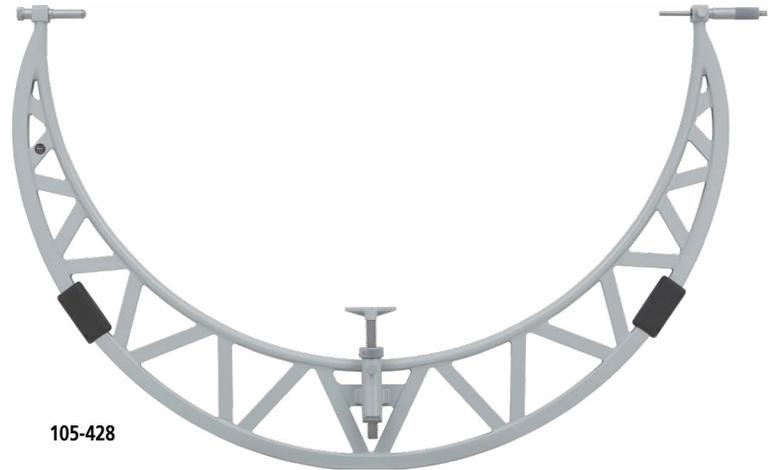
Measurement example



Outside Micrometers

SERIES 105 — with Anvil Extension Collars

- Square and round pipes are combined to create a lightweight, rigid frame.
- Wide measuring range with anvil extension collars.
- 2 in/50 mm spindle stroke.
- Includes workpiece stopper.
- Measuring faces: Carbide tipped.
- Equipped with Ratchet Stop for constant measuring force.



105-428

SPECIFICATIONS

Inch						
Order No.	Range (in)	Graduation (in)	Extension Collars	Setting Standard (pcs.)	Flatness (in)	Parallelism (in)
105-428	40 - 44	0.001	1 pc. (2 in)	2	0.000052	0.00052
105-429	44 - 48					0.00056
105-430	48 - 52					0.00060
105-431	52 - 56					0.00064
105-432	56 - 60					0.00068
105-433	60 - 64					0.00072
105-434	64 - 68					0.00076
105-435	68 - 72					0.00080
105-436	72 - 76					0.00084
105-437	76 - 80					0.00088

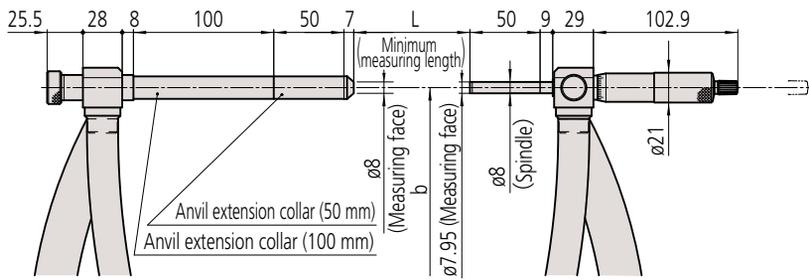
Metric						
Order No.	Range (mm)	Graduation (mm)	Extension Collars	Setting Standard (pcs.)	Flatness (μm)	Parallelism (μm)
(every 100 mm)						
105-408	1000 - 1100	0.01	1 pc. (50 mm)	2	1.3	13
105-409	1100 - 1200					14
105-410	1200 - 1300					15
105-411	1300 - 1400					16
105-412	1400 - 1500					17
105-413	1500 - 1600					18
105-414	1600 - 1700					19
105-415	1700 - 1800					20
105-416	1800 - 1900					21
105-417	1900 - 2000					22
(every 200 mm)						
105-418	1000 - 1200	0.01	2 pcs. (50 mm, 100 mm)	4 (every 50 mm)	1.3	14
105-419	1200 - 1400					16
105-420	1400 - 1600					18
105-421	1600 - 1800					20
105-422	1800 - 2000					22

Micrometers

DIMENSIONS

Over 1200 mm up to 2000 mm

Unit: mm



b: distance to workpiece stop

Range (mm)	L	b
1000 - 1200	1000	500 - 600
1200 - 1400	1200	600 - 700
1400 - 1600	1400	700 - 800
1600 - 1800	1600	800 - 900
1800 - 2000	1800	900 - 1000



Got Questions?

Micrometers

Measurement example



Limit Micrometers SERIES 113

- Can be used as a Go/No-go gage by setting the upper and lower limits.
- Provided with a standard bar for the 113-103
- Measuring faces: Carbide tipped.



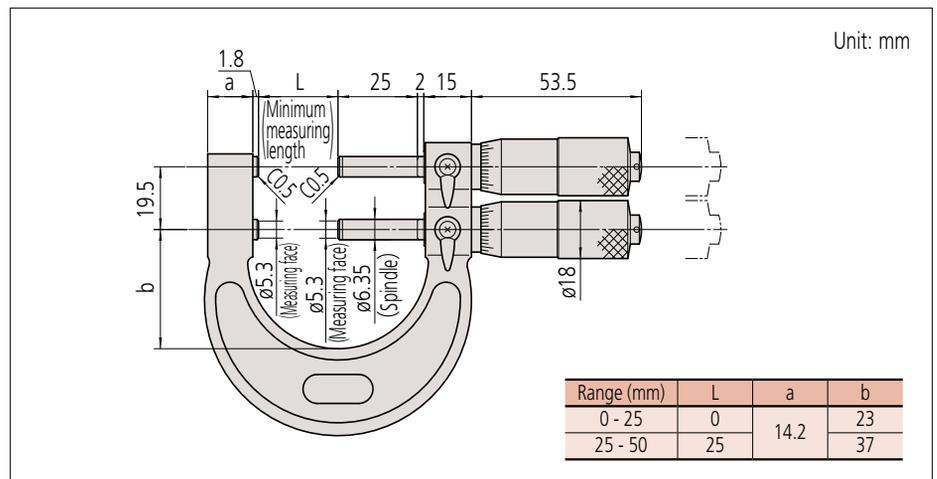
113-102

SPECIFICATIONS

Metric					
Order No.	Range (mm)	Graduation (mm)	Accuracy* (μm)	Flatness (μm)	Parallelism (μm)
113-102	0 - 25	0.01	± 3	0.6	3
113-103	25 - 50				

* EMPE (ISO 3611:2023 and ASME B89.1.13-2013)

DIMENSIONS



Micrometers

Caliper Type Micrometers SERIES 143

- Effective for measuring workpiece features where access is difficult with a standard micrometer.
- Measuring faces: Carbide tipped.
- Equipped with Ratchet Stop for constant measuring force.
- Includes standard bar (except 0-1 in and 0-25mm models)



143-121

SPECIFICATIONS

Inch					
Order No.	Range (in)	Graduation (in)	Accuracy* (in)	Flatness (in)	Parallelism (in)
143-121	0 - 1	0.001	±0.00025	0.000012	0.00012
143-122	1 - 2		±0.0003		
143-123	2 - 3		±0.00035		
Metric					
Order No.	Range (mm)	Graduation (mm)	Accuracy* (μm)	Flatness (μm)	Parallelism (μm)
143-101	0 - 25	0.01	±5	0.3	3
143-102	25 - 50		±6		
143-103	50 - 75		±7		4
143-104	75 - 100		±8		
143-105	100 - 125		±9		5
143-106	125 - 150				
143-107	150 - 175		±10		6
143-108	175 - 200				
143-109	200 - 225		±11		7
143-110	225 - 250				
143-111	250 - 275	±12			
143-112	275 - 300				

* EMPE (ISO 3611:2023 and ASME B89.1.13-2013)

DIMENSIONS

Analog
Measuring range up to 300 mm

Unit: mm

Range (mm)	L	a	b	C
Analog				
0 - 25	0	20.8	10.6	28.6
25 - 50	25			
50 - 75	50			
75 - 100	75			
100 - 125	100			
125 - 150	125			
150 - 175	150	16.3	15	32.5
175 - 200	175			
200 - 225	200			
225 - 250	225			
250 - 275	250			
275 - 300	275			



Need Repair?

Micrometers

Screw Thread Micrometers SERIES 125 — Fixed Anvil/Spindle Tip Type

- Directly indicates screw pitch diameter (no need for calculation).
- Fixed anvil type. Select the right model to meet the specifications of your screw thread.
- Equipped with Ratchet Stop for constant measuring force.
- Supplied with a setting standard for adjusting zero point for metric (unified) 60° threads (except 0-25 mm model).



125-103

SPECIFICATIONS

Metric			
Order No.	Range (mm)	Graduation (mm)	Thread to be measured (Metric/Unified)
125-101	0 - 25	0.01	0.4 - 0.5 mm/64 - 48 TPI
125-102			0.6 - 0.9 mm/44 - 28 TPI
125-103			1 - 1.75 mm/24 - 14 TPI
125-104			2 - 3 mm/13 - 9 TPI
125-105			3.5 - 5 mm/8 - 5 TPI
125-106	25 - 50		0.4 - 0.5 mm/64 - 48 TPI
125-107			0.6 - 0.9 mm/44 - 28 TPI
125-108			1 - 1.75 mm/24 - 14 TPI
125-109			2 - 3 mm/13 - 9 TPI
125-110			3.5 - 5 mm/8 - 5 TPI
125-111	50 - 75		0.6 - 0.9 mm/44 - 28 TPI
125-112			1 - 1.75 mm/24 - 14 TPI
125-113			2 - 3 mm/13 - 9 TPI
125-114			3.5 - 5 mm/8 - 5 TPI
125-115			5.5 - 7 mm/4.5 - 3.5 TPI
125-116	75 - 100	0.6 - 0.9 mm/44 - 28 TPI	
125-117		1 - 1.75 mm/24 - 14 TPI	
125-118		2 - 3 mm/13 - 9 TPI	
125-119		3.5 - 5 mm/8 - 5 TPI	
125-120		5.5 - 7 mm/4.5 - 3.5 TPI	

DIMENSIONS

125-101, 125-106

Range (mm)	L	a	b
0 - 25	0	13.8	25
25 - 50	25		32

125-111, 125-116 Unit: mm

Range (mm)	L	a	b
50 - 75	50	12	49
75 - 100	75	14	63

Technical Data

Accuracy: $\pm(2+R/75)\mu\text{m}$, R=max. range (mm)

Measurement example



Where to Buy



Applicable models: series 326

Optional Accessories (for series 326)

Order No.	Type	Description
264-020	—	USB Input Tool Series USB Keyboard Signal Conversion Type IT-020U
05CZA662	B	Connection cable (1 m)
05CZA663	B	Connection cable (2 m)
06AFM380B	B	USB Input Tool Direct (2 m)
02AZD790B	B	Connection cable for U-WAVE-T (160 mm)
02AZE140B	B	Connection cable for U-WAVE-T For foot switch
264-622	IP67	U-WAVE-TM
264-623	Buzzer	U-WAVE-TM
264-626	IP67	U-WAVE-TMB
264-627	Buzzer	U-WAVE-TMB
02AZF310	IP67	Connecting unit for U-WAVE-TM/TMB

• For Metric/Unified threads (pair)

Order No.	Matching anvils/spindle tips included (mm)
126-801	0.4 - 0.5/64 - 48 TPI
126-802	0.6 - 0.9/44 - 28 TPI
126-803	1 - 1.75/24 - 14 TPI
126-804	2 - 3/13 - 9 TPI
126-805	3.5 - 5/8 - 5 TPI
126-806	5.5 - 7/4.5 - 3.5 TPI
126-800	Set with one each of 126-801 to 126-806

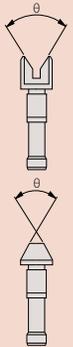
• For Whitworth threads (pair)

Order No.	Matching anvils/spindle tips included (mm)	Order No.	Matching anvils/spindle tips included (mm)
126-811	64 - 48 TPI	126-817	14 - 10 TPI
126-812	48 - 40 TPI	126-818	10 - 7 TPI
126-813	40 - 32 TPI	126-819	7 - 4.5 TPI
126-814	32 - 24 TPI	126-820	4.5 - 3.5 TPI
126-815	24 - 18 TPI	126-810	Set with one each of 126-811 to 126-820
126-816	18 - 14 TPI		

Technical description

• Anvils/spindle tips

• Allowable error of the angle of anvils and spindle tips



Type	Metric (Unified)	Whitworth (Unified)	Half angle error α
Pitch (mm), Nominal designation of threads per inch		W1	$\pm 30'$
	M1 (U1)	W2	$\pm 30'$
		W3	$\pm 20'$
	M2 (U2)	W4	$\pm 20'$
		W5	$\pm 15'$
	M3 (U3)	W6	$\pm 15'$
	M4 (U4)	W7	$\pm 10'$
		W8	$\pm 10'$
	M5 (U5)	W9	$\pm 10'$
	M6 (U6)	W10	$\pm 10'$

Note: This chart indicates the difference between the angle made by anvil's contact faces and spindle's axes and the half angle with error α . Metric/Unified $\theta=60^\circ$, Whitworth $\theta=55^\circ$

Micrometers

Screw Thread Micrometers SERIES 326, 126 — Interchangeable Anvil/Spindle Tip Type

- This is a screw thread micrometer with changeable anvil and spindle tips. It enables direct reading of screw pitch diameter. Both analog and digital types are available.
- Interchangeable anvil and spindle tips are optional. Select the right model to meet the specifications of your screw thread.
- Equipped with Ratchet Stop for constant measuring force.
- Supplied with a setting standard for adjusting zero point for metric (unified) 60° threads (except 0 - 1 in / 0 - 25mm models).
- With SPC data output.



326-351-30

SPECIFICATIONS

Inch/Metric			
Order No.	Range (in)	Resolution	Accuracy
326-351-30	0 - 1	0.00005 in/ 0.001 mm	$\pm 0.0002''$ $\pm 0.00025''$
326-352-30	1 - 2		
326-353-30	2 - 3		
326-354-30	3 - 4		

Metric			
Order No.	Range (mm)	Resolution (mm)	Accuracy
326-251-30	0 - 25	0.001	$\pm 4\mu\text{m}$ $\pm 5\mu\text{m}$
326-252-30	25 - 50		
326-253-30	50 - 75		
326-254-30	75 - 100		

• Power source: SR44 battery (1 pc.), **938882** included as standard

Measurement example



Interchangeable anvils/spindle tips (optional)

Micrometers

Screw Thread Micrometers

SERIES 126 — Interchangeable Anvil/Spindle Tip Type

- This is a screw thread micrometer with changeable anvil and spindle tips. It enables direct reading of screw pitch diameter. Both analog and digital types are available.
- Interchangeable anvil and spindle tips are optional. Select the right model to meet the specifications of your screw thread.
- Equipped with Ratchet Stop for constant measuring force.
- Supplied with a setting standard for adjusting zero point for metric (unified) 60° threads (except 0 -1 in / 0 - 25mm models).

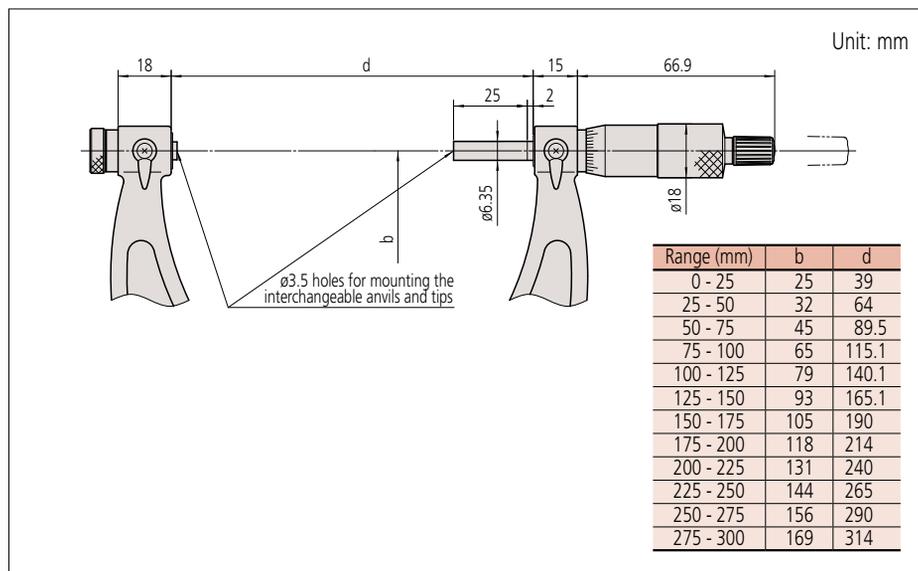


SPECIFICATIONS

Inch			
Order No.	Range (in)	Graduation (in)	Accuracy
126-137	0 - 1	0.001	±.0002"
126-138	1 - 2		
126-139	2 - 3		
126-140	3 - 4		±.00025"
126-141	4 - 5		
126-142	5 - 6		
126-143	6 - 7		±.0003"
126-901	0 - 1		
126-902	1 - 2		
126-903	2 - 3		±.0002"
126-904	3 - 4		
126-905	4 - 5		
126-906	5 - 6	±.00025"	

Metric			
Order No.	Range (mm)	Graduation (mm)	Accuracy
126-125	0 - 25	0.01	±4μm
126-126	25 - 50		
126-127	50 - 75		
126-128	75 - 100		±5μm
126-129	100 - 125		
126-130	125 - 150		
126-131	150 - 175		±6μm
126-132	175 - 200		
126-133	200 - 225		
126-134	225 - 250		±7μm
126-135	250 - 275		
126-136	275 - 300		

DIMENSIONS



Need Support?



Dust- and Water- Protected
www.tuv.com
ID 000949191

Measurement example



Optional Accessories

Order No.	Type	Description
264-020	—	USB Input Tool Series USB Keyboard Signal Conversion Type IT-020U
05CZA662	B	Connection cable (1 m)
05CZA663	B	Connection cable (2 m)
06AFM380B	B	USB Input Tool Direct (2 m)
02AZD730G	IP67	U-WAVE-T
02AZD880G	Buzzer	U-WAVE-T
02AZE200	—	U-WAVE-T mounting bracket
02AZD790B	B	Connection cable for U-WAVE-T (160 mm)
02AZE140B	B	Connection cable for U-WAVE-T For foot switch
264-622	IP67	U-WAVE-TM
264-623	Buzzer	U-WAVE-TM
264-626	IP67	U-WAVE-TMB
264-627	Buzzer	U-WAVE-TMB
02AZF310	IP67	Connecting unit for U-WAVE-TM/TMB

Disc Micrometers SERIES 323 — Rotating Spindle Type

- Measures “root tangent length” of spur gears and helical gears.
- Equipped with Ratchet Stop for constant measuring force.
- With SPC data output.
- .028” / 0.7mm (1mm: models over 100mm) edge thickness to enter narrow recesses.
- With standard bar (except 0 - 1 in / 0 - 25mm models)



323-350-30

SPECIFICATIONS

Inch / Metric							
Order No.	Range (in)	Resolution (in)	Accuracy* (in)	Flatness (in)	Parallelism (in)	Anvil dia. (in)	Measurable module
323-350-30	0 - 1	0.00005 in / 0.001 mm	±0.0002	0.00004	0.0002	ø0.787	0.5 - 6
323-351-30	1 - 2						
323-352-30	2 - 3		±0.0003				
323-353-30	3 - 4						

Metric							
Order No.	Range (mm)	Resolution (mm)	Accuracy* (µm)	Flatness (µm)	Parallelism (µm)	Anvil dia. (mm)	Measurable module
323-250-30	0 - 25	0.001	±4	1	4	ø20	0.5 - 6
323-251-30	25 - 50						
323-252-30	50 - 75		±6				
323-253-30	75 - 100						

• Power source: SR44 battery (1 pc.), **938882** included as standard
* EMPE (ISO 3611:2023 and ASME B89.1.13-2013)

DIMENSIONS

Unit: mm

Digimatic models up to 75 mm measuring range

Digimatic models up to 100 mm measuring range

Range (mm)	L	a	b	c	e	f	t
Digimatic (LCD)							
0 - 25	0	9.2	25	4.5	20	8	0.7
25 - 50	25	11	31	5.4			
50 - 75	50	12.2	50	5.5			
75 - 100	75	14	60				

Micrometers

Disc Micrometers SERIES 223, 123

- Can be used for making root tangent measurements on spur gears and helical gears.
- Equipped with Ratchet Stop for constant measuring force.



123-125



223-125

SPECIFICATIONS

Inch							
Order No.	Range (in)	Graduation (in)	Accuracy* (in)	Flatness (in)	Parallelism (in)	Anvil dia. (in)	Measurable module
Mechanical counter model							
223-125	0 - 1	0.001	±0.0002	0.00004	0.0002	ø0.787	0.5 - 6
Analog							
123-125	0 - 1	0.001	±0.0002	0.00004	0.0002	ø0.787	0.5 - 6
123-126	1 - 2				0.0003		
123-127	2 - 3		±0.0003	0.0003			
123-128	3 - 4						

Metric								
Order No.	Range (mm)	Graduation (mm)	Accuracy* (µm)	Flatness (µm)	Parallelism (µm)	Anvil dia. (mm)	Measurable module	
Mechanical counter model								
223-101	0 - 25	0.01	±4	1	4	ø20	0.5 - 6	
223-102	25 - 50							
Analog								
123-101	0 - 25	0.01	±4	1	4	ø20	0.5 - 6	
123-113* ¹					4			
123-102	25 - 50		±6	1.6	6	ø30	0.7 - 11	
123-114* ¹					6			
123-103	50 - 75		±7	1.6	7	ø30	0.7 - 11	
123-115* ¹					7			
123-104	75 - 100		±8	1.6	8	ø30	0.7 - 11	
123-116* ¹					8			
123-105	100 - 125		±9	1.6	1.6	9	ø30	0.7 - 11
123-106	125 - 150							
123-107	150 - 175							
123-108	175 - 200							
123-109	200 - 225							
123-110	225 - 250							
123-111	250 - 275							
123-112	275 - 300							

*EMPE (ISO 3611:2023 and ASME B89.1.13-2013)

*1 The measuring discs have carbide tips.



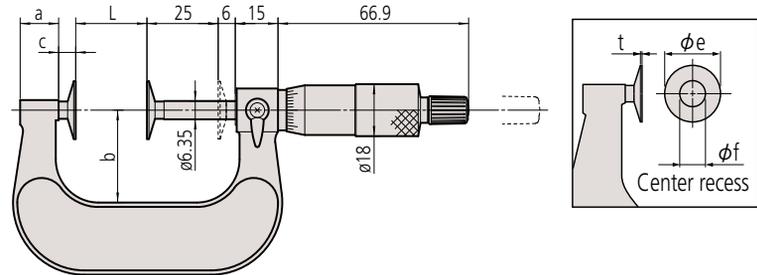
Need Service?

Disc Micrometers SERIES 223, 123

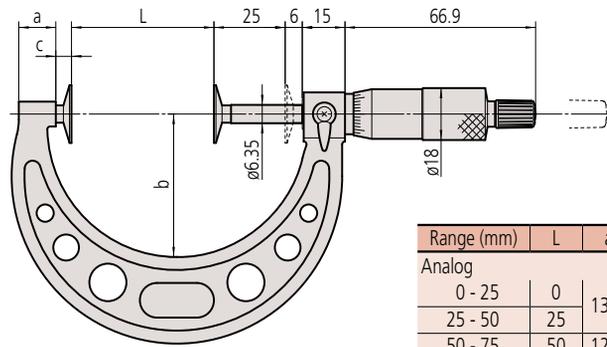
DIMENSIONS

Analog models up to 50 mm measuring range

Unit: mm



Analog models over 50 mm measuring range



Range (mm)	L	a	b	c	e	f	t
Analog							
0 - 25	0	13.8	25	5.7	20	8 (9.8)	0.7 (0.7)
25 - 50	25	32					
50 - 75	50	12	49				
75 - 100	75	14	63				
100 - 125	100	12	79	6	30	12	1
125 - 150	125	14.5	94				
150 - 175	150	15.2	106				
175 - 200	175	14.5	118				
200 - 225	200	13.5	130				
225 - 250	225		143				
250 - 275	250	14.5	156				
275 - 300	275		169				

Note: Data in () applies to those with carbide-faced disks.

Micrometers

MeasurLink¹ ENABLED
Data Management Software by Mitutoyo

U-WAVE^{fit}

IP65 ABSOLUTE™

Applicable models: 369-411-20/412-20

Disc Micrometers

SERIES 369 — Non-rotating Spindle Type

- Can be used for making root tangent measurements on spur gears and helical gears.
- Non-rotating spindle eliminates torque on workpiece.
- Measurable range of gear pitch: 0.5 to 6 module.
- Equipped with Ratchet Stop for constant measuring force.



Digimatic
369-350-30

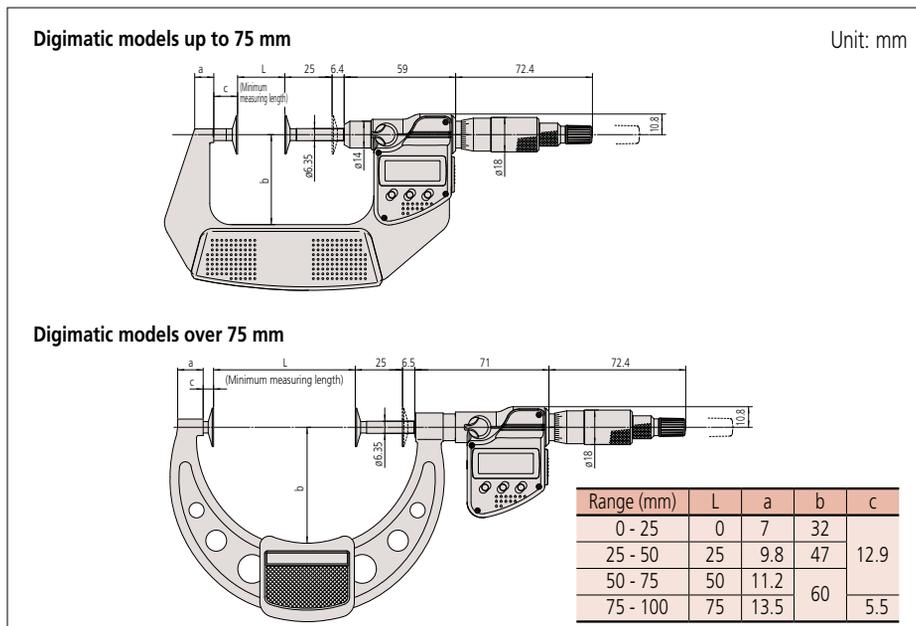
SPECIFICATIONS

Inch / Metric							
Order No.	Range (in)	Resolution	Anvil dia. (in)	Accuracy* (in)	Flatness (in)	Parallelism (in)	Measuring force (N)
With SPC data output							
369-350-30	0 - 1	0.00005 in/ 0.001 mm	ø0.787	±0.0002	0.00004	0.0002	3 - 8
369-351-30	1 - 2						
369-352-30	2 - 3			±0.0003			
369-353-30	3 - 4						
Metric							
Order No.	Range (mm)	Resolution (mm)	Anvil dia. (mm)	Accuracy* (µm)	Flatness (µm)	Parallelism (µm)	Measuring force (N)
With SPC data output							
369-250-30	0 - 25	0.001	ø20	±4	1	4	3 - 8
369-251-30	25 - 50						
369-252-30	50 - 75			±6			
369-253-30	75 - 100						

• Power source: SR44 battery (1 pc.), **938882** included as standard

* E_{MPE} (ISO 3611:2023 and ASME B89.1.13-2013)

DIMENSIONS



Measurement example



Optional Accessories

Order No.	Type	Description
264-020	—	USB Input Tool Series USB Keyboard Signal Conversion Type IT-020U
05CZA662	B	Connection cable (1 m)
05CZA663	B	Connection cable (2 m)
06AFM380B	B	USB Input Tool Direct (2 m)
02AZD730G	IP67	U-WAVE-T
02AZD880G	Buzzer	U-WAVE-T
02AZE200	—	U-WAVE-T mounting bracket
02AZD790B	B	Connection cable for U-WAVE-T (160 mm)
02AZE140B	B	Connection cable for U-WAVE-T For foot switch
264-622	IP67	U-WAVE-TM
264-623	Buzzer	U-WAVE-TM
264-626	IP67	U-WAVE-TMB
264-627	Buzzer	U-WAVE-TMB
02AZF310	IP67	Connecting unit for U-WAVE-TM/TMB

Disc Micrometers

SERIES 369, 227 — Non-rotating Spindle Type

- Can be used for making root tangent measurements on spur gears and helical gears.
- Heat-insulated frame, tapered (on the anvil side) for hard-to-reach places.
- Non-rotating spindle eliminates torque on workpiece.
- Measurable range of gear pitch: 0.5 to 6 module (**series 227**: 0.4 to 3 module).
- Equipped with Ratchet Stop for constant measuring force.



Quickmike type
369-421-20

SPECIFICATIONS

Inch / Metric							
Order No.	Range (in)	Resolution	Anvil dia. (in)	Accuracy* (in)	Flatness (in)	Parallelism (in)	Measuring force (N)
QuickMike type							
369-421-20	0 - 1.2	0.00005 in/	ø0.787	±0.0002	0.00004	0.0002	3 - 8
369-422-20	1 - 2.2	0.001 mm					
Metric							
Order No.	Range (mm)	Resolution (mm)	Anvil dia. (mm)	Accuracy* (µm)	Flatness (µm)	Parallelism (µm)	Measuring force (N)
QuickMike type							
369-411-20	0 - 30	0.001	ø20	±4	1	4	3 - 8
369-412-20	25 - 55						
QuickMike type adjustable measuring force							
227-221-20	0 - 15	0.001	ø14.3	±4	1	3	0.5 - 2.5
227-223-20	0 - 10						2 - 10

- Power source: SR44 battery (1 pc.), **938882** included as standard
- * E_{MPE} (ISO 3611:2023 and ASME B89.1.13-2013)

DIMENSIONS

Quickmike type

Unit: mm

Range (mm)	L	a	b	c
0 - 30	0	8.5	36	13.5
25 - 55	25	10.3	47	

Quickmike adjustable measuring force type

Range (mm)	L	a	b	c
0 - 15	0	6.2	25	5.2
0 - 10				



Need Calibration?

Micrometers

Disc Micrometers

SERIES 169 — Non-rotating Spindle Type

- Can be used for making root tangent measurements on spur gears and helical gears.
- Non-rotating spindle eliminates torque on workpiece.
- Measurable range of gear pitch: 0.5 to 6 module.
- Equipped with Ratchet Stop for constant measuring force.



169-203-10

SPECIFICATIONS

Inch							
Order No.	Range (in)	Graduation (in)	Anvil dia. (in)	Accuracy* (in)	Flatness (in)	Parallelism (in)	Measuring force (N)
Analog							
169-203-10	0 - 1	0.001	ø0.787	±0.0002	0.00004	0.0002	3 - 8
169-204-10	1 - 2			±0.0003		0.0003	
169-206-10	2 - 3						
169-208-10	3 - 4						

Metric							
Order No.	Range (mm)	Graduation (mm)	Anvil dia. (mm)	Accuracy* (µm)	Flatness (µm)	Parallelism (µm)	Measuring force (N)
Analog							
169-201-10	0 - 25	0.01	ø20	±4	1	4	3 - 8
169-202-10	25 - 50			±6		6	
169-205-10	50 - 75						
169-207-10	75 - 100						

* EMPE (ISO 3611:2023 and ASME B89.1.13-2013)

DIMENSIONS

Unit: mm

Analog models up to 50 mm

Analog models over 50 mm

Range (mm)	L	a	b	c	e	f	t
0 - 25	0	13.8	25	5.7	20	8	0.7
25 - 50	25		32				
50 - 75	50	12	49				
75 - 100	75	14	63				



Find a Distributor

Micrometers

MeasurLink ENABLED
Data Management Software by Mitutoyo

U-WAVE fit



Dust- and
Water-
Protected
www.bv.com
ID: 000040191

Gear Tooth Micrometers

SERIES 324 — Interchangeable Ball Anvil/Spindle Tip Type

- This specialized micrometer series measures gear over-pin diameters. Attach optional ball probes to each measuring face before use.
- Interchangeable ball anvils/spindle tips for various gear modules (0.5 to 5.25) are optional.
- With SPC data output.



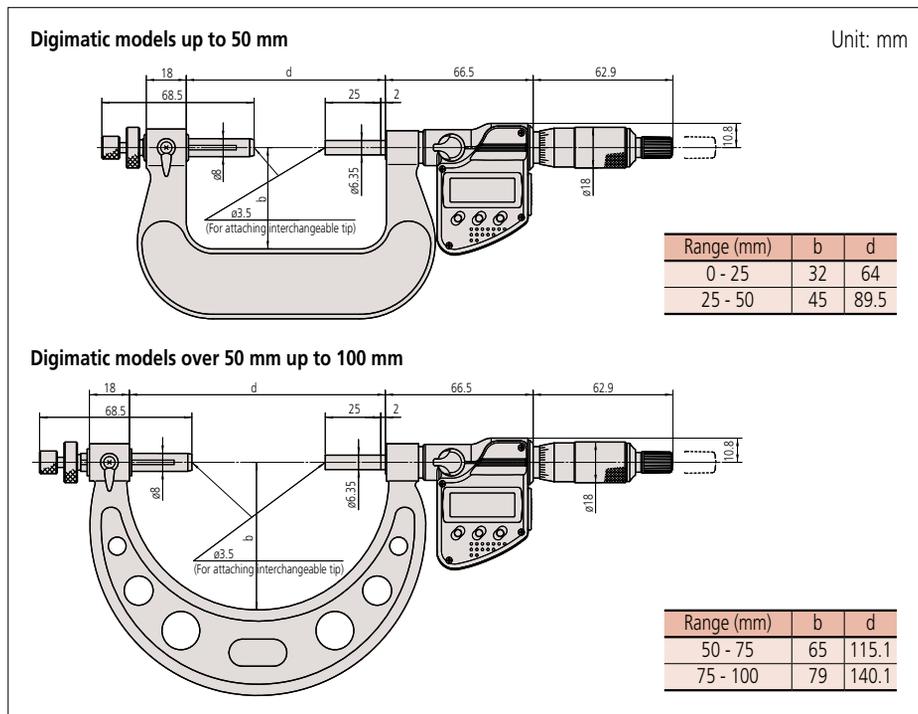
324-351-30

SPECIFICATIONS

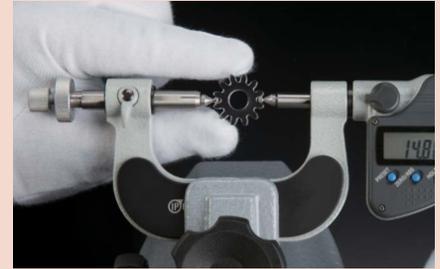
Inch/Metric				Metric			
Order No.	Range (in)	Resolution	Accuracy	Order No.	Range (mm)	Resolution (mm)	Accuracy
324-351-30	0 - 1	0.00005 in/ 0.001 mm	±.0002"	324-251-30	0 - 25	0.001	±4μm
324-352-30	1 - 2			324-252-30	25 - 50		
324-353-30	2 - 3			324-253-30	50 - 75		
324-354-30	3 - 4			324-254-30	75 - 100		

• Power source: SR44 battery (1 pc.), **938882** included as standard

DIMENSIONS



Measurement example



Optional Accessories

Order No.	Type	Description
264-020	—	USB Input Tool Series USB Keyboard Signal Conversion Type IT-020U
05CZA662	B	Connection cable (1 m)
05CZA663	B	Connection cable (2 m)
06AFM380B	B	USB Input Tool Direct (2 m)
02AZD730G	IP67	U-WAVE-T
02AZD880G	Buzzer	U-WAVE-T
02AZE200	—	U-WAVE-T mounting bracket
02AZD790B	B	Connection cable for U-WAVE-T (160 mm)
02AZE140B	B	Connection cable for U-WAVE-T For foot switch
264-622	IP67	U-WAVE-TM
264-623	Buzzer	U-WAVE-TM
264-626	IP67	U-WAVE-TMB
264-627	Buzzer	U-WAVE-TMB
02AZF310	IP67	Connecting unit for U-WAVE-TM/TMB

Micrometers

Optional Accessories

- Interchangeable ball anvil/spindle tip set

Order No.	Diameter* (mm)	Gear module	Dia. pitch
124-801	0.8	0.5 - 0.55	50
124-802	1.0	0.6 - 0.65	45
124-803	1.191 (³ / ₆₄ in)	0.7 - 0.8	35 - 30
124-821	1.5	0.9 - 1	28 - 26
124-804	1.588 (¹ / ₁₆ in)	0.9 - 1	28 - 26
124-805	2.0	1.25	22
124-806	2.381 (³ / ₃₂ in)	1.5	17
124-822	2.5	1.5	17
124-807	3.0	1.75	15
124-808	3.175 (¹ / ₈ in)	—	14
124-823	3.5	2	13
124-809	3.969 (⁵ / ₃₂ in)	2	13
124-810	4.0	2.25	11
124-824	4.5	2.5	10
124-811	4.763 (³ / ₁₆ in)	2.5	10
124-812	5.0	2.75	9
124-813	5.556 (⁷ / ₃₂ in)	3.0 - 3.25	8
124-814	6.0	3.5	7
124-815	6.35 (¹ / ₄ in)	3.75	7
124-816	7.0	4.0	6.5
124-817	7.144 (⁹ / ₃₂ in)	4.25	6
124-818	7.938 (⁵ / ₁₆ in)	4.5	5.5
124-819	8.0	4.75	5.5
124-820	8.731 (¹¹ / ₃₂ in)	5.0 - 5.25	5

Carbide-tipped for 2mm and smaller

Gear Tooth Micrometers

SERIES 124 — Interchangeable Ball Anvil/Spindle Tip Type

- Intended for making over-pin diameter measurements on gears using precision ball anvils/spindle tips (optional).
- Interchangeable ball anvils/spindle tips for various gear modules (0.5 to 5.25) are optional.
- Equipped with Ratchet Stop for constant measuring force.



124-173

SPECIFICATIONS

Metric			
Order No.	Range (mm)	Graduation (mm)	Accuracy
124-173	0 - 25	0.01	±4μm
124-174	25 - 50		
124-175	50 - 75		
124-176	75 - 100		
124-177	100 - 125		
124-178	125 - 150		±5μm
124-179	150 - 175		
124-180	175 - 200		
124-181	200 - 225		
124-182	225 - 250		
124-183	250 - 275	±6μm	
124-195	275 - 300		
			±7μm

DIMENSIONS

Unit: mm

Analog models up to 50 mm

Range (mm)	b	d
0 - 25	32	64
25 - 50	45	89.5

Analog models over 50 mm up to 300 mm

Range (mm)	b	d
50 - 75	65	115.1
75 - 100	79	140.1
100 - 125	93	165.1
125 - 150	105	190
150 - 175	118	214
175 - 200	131	240
200 - 225	144	265
225 - 250	156	290
250 - 275	169	314
275 - 300	187	352

(): 124-195



Got Questions?

Micrometers

Sheet Metal Micrometers SERIES 118

- The U-shaped micrometer is ideal for measuring the thickness of sheet metal at a considerable distance from the edge.
- Measuring faces: Carbide tipped.
- Profile of measuring faces: Flat-Flat, Spherical-Flat and Spherical-Spherical.
- Equipped with Ratchet Stop for constant measuring force.

Standard, Flat-Flat (F-F)



Spherical-Flat (S-F)



Spherical-Spherical (S-S)



SPECIFICATIONS

Inch							
Order No.	Range (in)	Graduation (in)	Accuracy* (in)	Flatness (in)	Parallelism (in)	Throat depth (in)	Measuring surfaces
Analog							
118-129	0 - 1	0.0001	±0.0002	0.000024	0.00012	6	F-F
118-116							S-F
118-120		S-S					
118-107	1 - 2	0.001	±0.00025	0.00004		12	F-F
118-112			±0.0002	0.000024		6	
Metric							
Order No.	Range (mm)	Graduation (mm)	Accuracy* (μm)	Flatness (μm)	Parallelism (μm)	Throat depth (mm)	Measuring surfaces
Analog							
118-101	0 - 25	0.01	±4	0.6	3	100	F-F
118-102						150	S-F
118-114							S-S
118-103			300	±5		1	F-F
118-110				±4		0.6	150
118-126	25 - 50						

* EMPE (ISO 3611:2023 and ASME B89.1.13-2013)

DIMENSIONS

Analog models

Unit: mm

Order No.	L	a	b	c
118-101	0	34	110	2.5
118-102		43	160	
118-114		43	160	
118-118	25	41	165	
118-110		41	165	



Talk to Sales

Micrometers

Sheet Metal Micrometer — Dial Reading Model SERIES 119

- Large diameter dial model enables easy and quick measurement of sheet metal thickness.
- Adjustable anvil.
- Measuring faces: Carbide tipped.
- Equipped with Ratchet Stop for constant measuring force.



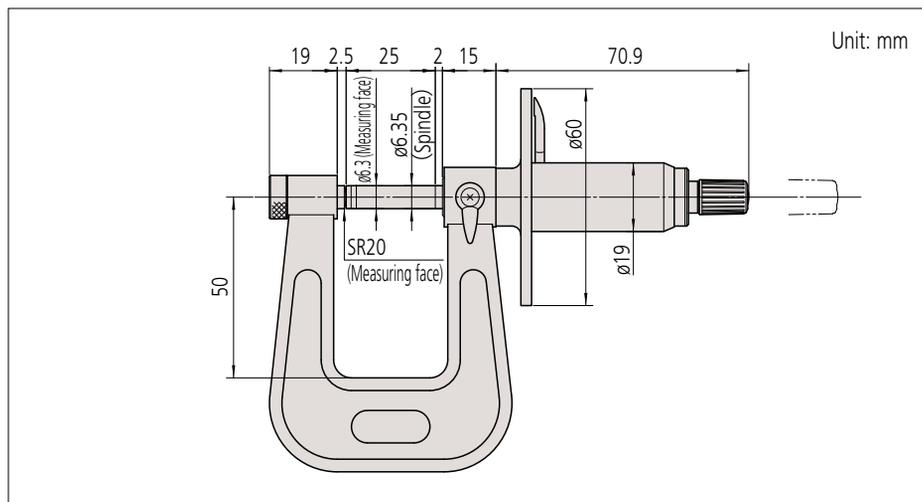
119-202

SPECIFICATIONS

Metric				
Order No.	Range (mm)	Graduation (mm)	Accuracy* (μm)	Throat depth (mm)
119-202	0 - 25	0.01	±4	50

* EMPE (ISO 3611:2023 and ASME B89.1.13-2013)

DIMENSIONS



Measurement example

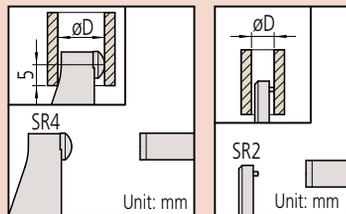




Dust- and Water- Protected
www.tuv.com
ID 000049191

Applicable models: series 395

Measurement example



Other than 115-101

115-101

Optional Accessories

Order No.	Type	Description
264-020	—	USB Input Tool Series USB Keyboard Signal Conversion Type IT-020U
05CZA662	B	Connection cable for series 395 (1 m)
05CZA663	B	Connection cable for series 395 (2 m)
06AFM380B	B	USB Input Tool Direct (2 m)
02AZD730G	IP67	U-WAVE-T
02AZD880G	Buzzer	U-WAVE-T
02AZE200	—	U-WAVE-T mounting bracket
02AZD790B	B	Connection cable for U-WAVE-T (160 mm)
02AZE140B	B	Connection cable for U-WAVE-T For foot switch
264-622	IP67	U-WAVE-TM
264-623	Buzzer	U-WAVE-TM
264-626	IP67	U-WAVE-TMB
264-627	Buzzer	U-WAVE-TMB
02AZF310	IP67	Connecting unit for U-WAVE-TM/TMB

Micrometers

Tube Micrometers SERIES 395, 115, 295

- The spherical anvil-type micrometer is convenient for measuring wall thickness of cylindrical workpieces. The spherical anvil comes into contact with a workpiece at a point instead of a surface area, thus increasing measurement accuracy.
- IP65 water/dust protection (series 395).
- Equipped with Ratchet Stop for constant measuring force.



395-351-30

SPECIFICATIONS

Inch / Metric

Order No.	Range (in)	Resolution	Accuracy* (in)	ϕD (in)	Flatness (in)
Digimatic					
395-351-30	0 - 1	0.00005 in/ 0.001 mm	± 0.0001	$\phi 0.59$	0.000012
395-352-30	1 - 2			$\phi 0.75$	
395-353-30	2 - 3			$\phi 0.75$	
395-354-30	3 - 4		± 0.00015	$\phi 0.79$	

Metric

Order No.	Range (mm)	Resolution (mm)	Accuracy* (μm)	ϕD (mm)	Flatness (μm)
Digimatic					
395-251-30	0 - 25	0.001	± 2	$\phi 15$	0.3
395-252-30	25 - 50			$\phi 19$	
395-253-30	50 - 75			$\phi 20$	
395-254-30	75 - 100		± 3		

- Power source: SR44 battery (1 pc.), **938882** included as standard
- * EMPE (ISO 3611:2023 and ASME B89.1.13-2013)



115-153



295-153

SPECIFICATIONS

Inch

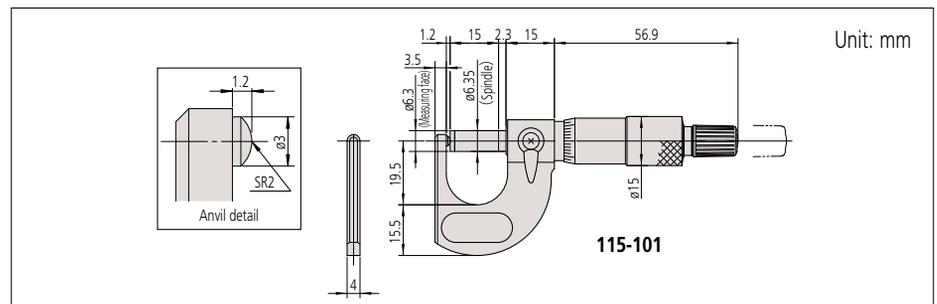
Order No.	Range (in)	Graduation (in)	Accuracy* (in)	ϕD (in)	Flatness (in)
Analog					
115-153	0 - 1	0.0001	± 0.00015	$\phi 0.40$	0.000024
Mechanical counter model					
295-153	0 - 1	0.0001	± 0.00015	$\phi 0.40$	0.000024

- * EMPE (ISO 3611:2023 and ASME B89.1.13-2013)

Metric

Order No.	Range (mm)	Graduation (mm)	Accuracy* (μm)	ϕD (mm)	Flatness (μm)
Analog					
115-101	0 - 15	0.01	± 3	$\phi 5.5$	0.6
115-115	0 - 25			$\phi 10$	
115-116	25 - 50			$\phi 11$	
115-117	50 - 75		± 4	$\phi 17$	
115-118	75 - 100			$\phi 18$	
Mechanical counter model					
295-115	0 - 25	0.01	± 3	$\phi 10$	0.6

DIMENSIONS





Applicable models: series 395

Measurement example



Type A (pin)

Type B (spherical)



Type C (cylindrical)



Type D (cylindrical)

Optional Accessories

Order No.	Type	Description
264-020	—	USB Input Tool Series USB Keyboard Signal Conversion Type IT-020U
05CZA662	B	Connection cable for series 395 (1 m)
05CZA663	B	Connection cable for series 395 (2 m)
06AFM380B	B	USB Input Tool Direct (2 m)
02AZD730G	IP67	U-WAVE-T
02AZD880G	Buzzer	U-WAVE-T
02AZE200	—	U-WAVE-T mounting bracket
02AZD790B	B	Connection cable for U-WAVE-T (160 mm)
02AZE140B	B	Connection cable for U-WAVE-T For foot switch
264-622	IP67	U-WAVE-TM
264-623	Buzzer	U-WAVE-TM
264-626	IP67	U-WAVE-TMB
264-627	Buzzer	U-WAVE-TMB
02AZF310	IP67	Connecting unit for U-WAVE-TM/TMB

Anvil shape

D: Minimum measurable inside diameter
L: Distance to spindle center

Anvil	øD	L
Type A	ø2.0	4
Type B	ø3.6	
Type C	ø4.8	12
Type D	ø8.2	22

Micrometers

Tube Micrometers

SERIES 395, 115, 295 — Spherical and Cylindrical Anvil Type

- Designed to measure the wall thickness of various tubing.
- Spindle face: Carbide tipped
- IP65 water/dust protection (series 395).
- Equipped with Ratchet Stop for constant measuring force.



395-363-30

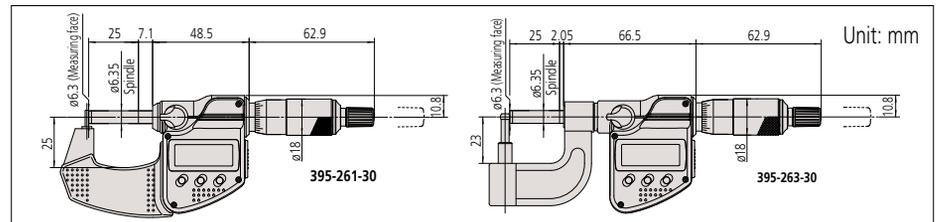
SPECIFICATIONS

Inch / Metric		Resolution	Accuracy* (in)	Remarks
Order No.	Range (in)			
Digimatic				
395-362-30	0 - 1	0.00005 in/ 0.001 mm	±0.00015	Type B
395-363-30				Type C
395-364-30				Type D

Metric		Resolution	Accuracy* (µm)	Remarks
Order No.	Range (mm)			
Digimatic				
395-261-30	0 - 25	0.001	±3	Type A
395-262-30				Type B
395-263-30				Type C
395-264-30				Type D

- Power source: SR44 battery (1 pc.), 938882 included as standard
- * EMPE (ISO 3611:2023 and ASME B89.1.13-2013)

DIMENSIONS



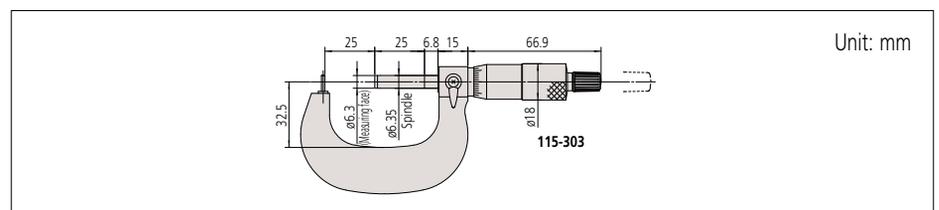
SPECIFICATIONS

Inch		Graduation	Accuracy* (in)	Remarks
Order No.	Range (in)			
Analog				
115-305	0 - 1	0.001	±0.00015	Type A
115-313				Type C
115-314				Type D

Metric		Graduation	Accuracy* (µm)	Remarks
Order No.	Range (mm)			
Analog				
115-302	0 - 25	0.01	±3	Type A
115-308				Type B
115-303				Type A
115-309	25 - 50			Type B
115-315	0 - 25			Type C
115-316				Type D

- * EMPE (ISO 3611:2023 and ASME B89.1.13-2013)

DIMENSIONS



Micrometers

Spline Micrometers SERIES 331

- The anvil and spindle have a small diameter for measuring splined shafts, slots and keyways.
- IP65 water/dust protection.
- Measuring faces: Carbide tipped.
- Equipped with Ratchet Stop for constant measuring force.



SPECIFICATIONS

Inch / Metric		Order No.	Range (in)	Resolution	Accuracy* (in)	Flatness (in)	Parallelism (in)	Measuring face
Digimatic								
		331-351-30	0 - 1	0.00005 in/ 0.001 mm	±0.0001	0.000012	0.00008	Type A
		331-352-30	1 - 2					
		331-353-30	2 - 3					
		331-354-30	3 - 4		±0.00015		0.00012	
		331-361-30	0 - 1		±0.0001		0.00008	Type B
		331-362-30	1 - 2					
		331-363-30	2 - 3	±0.00015	0.00012			
		331-364-30	3 - 4					

Metric		Order No.	Range (mm)	Resolution (mm)	Accuracy* (µm)	Flatness (µm)	Parallelism (µm)	Measuring face
Digimatic								
		331-251-30	0 - 25	0.001	±2	0.3	2	Type A
		331-252-30	25 - 50					
		331-253-30	50 - 75					
		331-254-30*	75 - 100		±3		3	
		331-261-30	0 - 25		±2		2	Type B
		331-262-30	25 - 50					
		331-263-30	50 - 75	±3	3			
		331-264-30*	75 - 100					

• Power source: SR44 battery (1 pc.), **938882** included as standard
 * E_{MPE} (ISO 3611:2023 and ASME B89.1.13-2013)

DIMENSIONS

Digimatic models
Models up to 75 mm measuring range

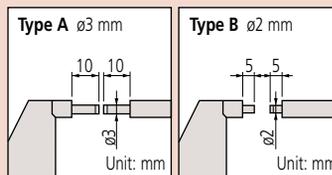
Unit: mm

Digimatic models
Models over 75 mm measuring range

Unit: mm

Range	a	b	c
0 - 1 in	7.3	32.5	17.5
1 - 2 in	10.1	47	
2 - 3 in	11.5	60	20.3
3 - 4 in	16.7	76	

Measurement example



Optional Accessories

Order No.	Type	Description
264-020	—	USB Input Tool Series USB Keyboard Signal Conversion Type IT-020U
05CZA662	B	Connection cable (1 m)
05CZA663	B	Connection cable (2 m)
06AFM380B	B	USB Input Tool Direct (2 m)
02AZD730G	IP67	U-WAVE-T
02AZD880G	Buzzer	U-WAVE-T
02AZE200	—	U-WAVE-T mounting bracket
02AZD790B	B	Connection cable for U-WAVE-T (160 mm)
02AZE140B	B	Connection cable for U-WAVE-T For foot switch
264-622	IP67	U-WAVE-TM
264-623	Buzzer	U-WAVE-TM
264-626	IP67	U-WAVE-TMB
264-627	Buzzer	U-WAVE-TMB
02AZF310	IP67	Connecting unit for U-WAVE-TM/TMB

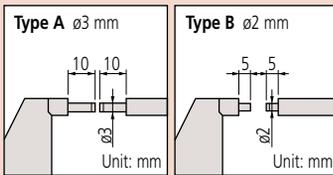
Micrometers

Spline Micrometers SERIES 111, 131

- The anvil and spindle have a small diameter for measuring splined shafts, slots and keyways.
- Equipped with Ratchet Stop for constant measuring force.
- Measuring faces: Carbide tipped.



111-166



SPECIFICATIONS

Inch						
Order No.	Range (in)	Graduation (in)	Accuracy* (in)	Flatness (in)	Parallelism (in)	Measuring face
Analog						
111-166	0 - 1	0.0001	±0.00015	0.000012	0.00008	Type A
Mechanical counter model						
131-166	0 - 1	0.0001	±0.00015	0.000012	0.00008	Type A
Metric						
Order No.	Range (mm)	Graduation (mm)	Accuracy* (μm)	Flatness (μm)	Parallelism (μm)	Measuring face
Analog						
111-215	0 - 25	0.01	±3	0.3	2	Type B
111-115	0 - 25					Type A
111-116	25 - 50				3	
111-117	50 - 75		4			
111-118	75 - 100				5	
111-119	100 - 125		±4			
111-120	125 - 150			±5		
111-121	150 - 175		±6			
111-122	175 - 200			3		
111-123	200 - 225		4			
111-124	225 - 250			5		
111-125	250 - 275		2			
111-126	270 - 300	Type A				
Mechanical counter model						
131-115	0 - 25	0.01	±3	0.3	2	Type A

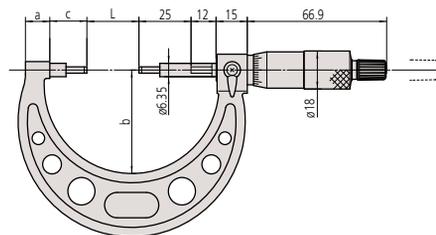
* E_{MPE} (ISO 3611:2023 and ASME B89.1.13-2013)

DIMENSIONS

Analog models

Models up to 300 mm measuring range

Unit: mm



Order No.	L	a	b	c
111-215	0	10	38	17.5
111-115				
111-116	25	12	49	21.1
111-117	50	14	60	
111-118	75	16.7	79	20.3
111-119	100	18.8	94	20.7
111-120	125	19.1	106	21.1
111-121	150	18.2	118	21.3
111-122	175	16.8	130	21.7
111-123	200	18	143	20.5
111-124	225		156	21.5
111-125	250		169	
111-126	275		181	



Where to Buy

Micrometers

Point Micrometers SERIES 342

- Pointed spindle and anvil for measuring the web thickness of drills, small grooves, keyways, and other hard-to-reach dimensions.
- The measuring points (carbide tipped) have approximately 0.3 mm radius.
- Measuring faces: Carbide tipped.
- IP65 water/dust protection
- Equipped with Ratchet Stop for constant measuring force.



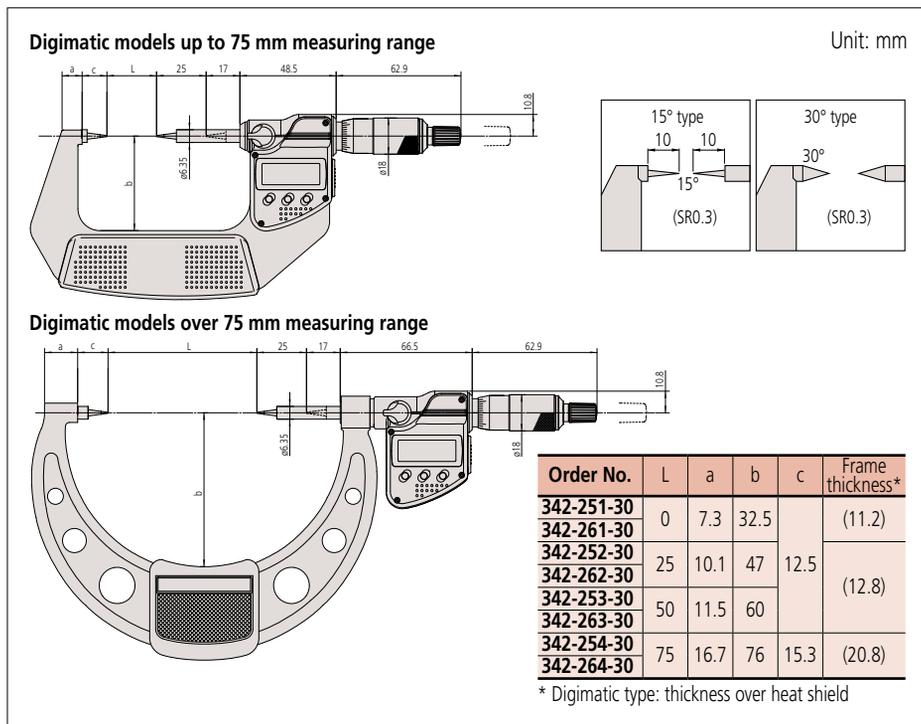
342-351-30

SPECIFICATIONS

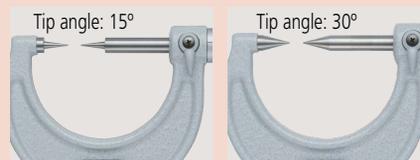
Inch / Metric					Metric				
Order No.	Range (in)	Resolution (in)	Accuracy* (in)	Point	Order No.	Range (mm)	Resolution (mm)	Accuracy* (μm)	Point
Digimatic (with carbide tip)					Digimatic (with carbide tip)				
342-351-30	0 - 1	0.00005 in/ 0.001 mm	±0.0001	15°	342-251-30	0 - 25	0.001	±2	15°
342-352-30	1 - 2				342-252-30	25 - 50			
342-353-30	2 - 3				342-253-30	50 - 75			
342-354-30	3 - 4		±0.00015	30°	342-254-30	75 - 100		±3	
342-361-30	0 - 1		±0.0001		342-261-30	0 - 25		±2	
342-362-30	1 - 2		±0.00015		342-262-30	25 - 50			
342-363-30	2 - 3	±0.0001	342-263-30	50 - 75					
342-364-30	3 - 4	±0.00015		342-264-30	75 - 100	±3			

• Power source: SR44 battery (1 pc.), **938882** included as standard
* E_{MPE} (ISO 3611:2023 and ASME B89.1.13-2013)

DIMENSIONS



Measurement example



Optional Accessories

Order No.	Type	Description
264-020	—	USB Input Tool Series USB Keyboard Signal Conversion Type IT-020U
05CZA662	B	Connection cable (1 m)
05CZA663	B	Connection cable (2 m)
06AFM380B	B	USB Input Tool Direct (2 m)
02AZD730G	IP67	U-WAVE-T
02AZD880G	Buzzer	U-WAVE-T
02AZE200	—	U-WAVE-T mounting bracket
02AZD790B	B	Connection cable for U-WAVE-T (160 mm)
02AZE140B	B	Connection cable for U-WAVE-T For foot switch
264-622	IP67	U-WAVE-TM
264-623	Buzzer	U-WAVE-TM
264-626	IP67	U-WAVE-TMB
264-627	Buzzer	U-WAVE-TMB
02AZF310	IP67	Connecting unit for U-WAVE-TM/TMB

Micrometers

Point Micrometers SERIES 112, 142

- Pointed spindle and anvil for measuring the web thickness of drills, small grooves, keyways, and other hard-to-reach dimensions.
- The measuring points have approximately 0.3 mm radius.
- Carbide measuring tips are also available.
- Equipped with Ratchet Stop for constant measuring force.



112-225



142-225

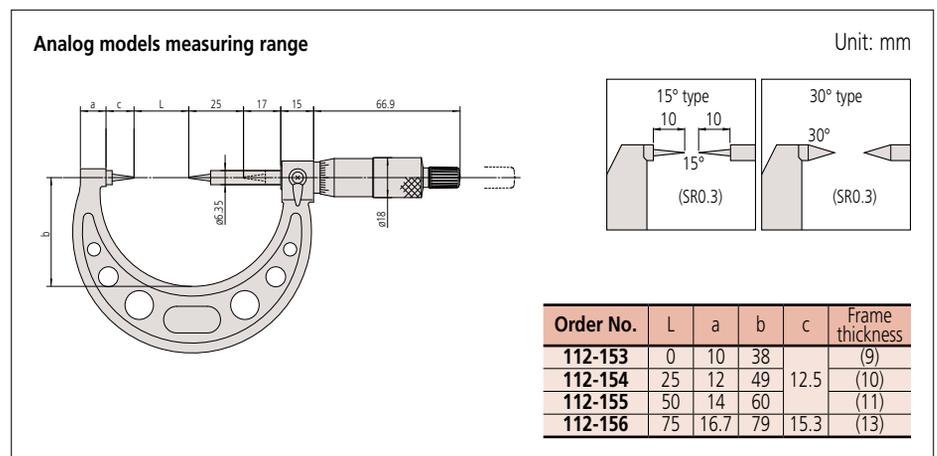
SPECIFICATIONS

Inch				
Order No.	Range (in)	Graduation (in)	Accuracy* (in)	Point
Analog				
112-177	0 - 1	0.001	±0.00015	15°
112-178	1 - 2			
112-225	0 - 1			30°
112-226	1 - 2			
Analog (With carbide tip)				
112-189	0 - 1	0.001	±0.00015	15°
112-190	1 - 2			
112-191	2 - 3			30°
112-237	0 - 1			
112-238	1 - 2			
Mechanical counter model				
142-177	0 - 1	0.001	±0.00015	15°
142-225				30°

* EMPE (ISO 3611:2023 and ASME B89.1.13-2013)

Metric				
Order No.	Range (mm)	Graduation (mm)	Accuracy* (μm)	Point
Analog				
112-153	0 - 25	0.01	±3	15°
112-154	25 - 50			
112-155	50 - 75		±4	30°
112-156	75 - 100			
112-201	0 - 25		±3	30°
112-202	25 - 50			
112-203	50 - 75	±4	30°	
112-204	75 - 100			
Analog (With carbide tip)				
112-165	0 - 25	0.01	±3	15°
112-166	25 - 50			
112-167	50 - 75		±4	30°
112-168	75 - 100			
112-213	0 - 25		±3	30°
112-214	25 - 50			
112-215	50 - 75	±4	30°	
112-216	75 - 100			
Mechanical counter model				
142-153	0 - 25	0.01	±3	15°
142-201				30°

DIMENSIONS



Get a Quote

Micrometers

V-Anvil Micrometers SERIES 314 — 3 Flutes

- Measures the outside diameter of cutting tools (such as taps, reamers, end mills) with an odd number of flutes.
- Carbide tipped spindle.
- Equipped with Ratchet Stop for constant measuring force.



314-351-30



314-353-30

SPECIFICATIONS

Inch / Metric For 3-flute cutting tools

Order No.	Range (in)	Resolution (in)	Accuracy* (in)	Anvil	Remarks
Digimatic					
314-351-30	0.05 - 0.6	0.00005 in/ 0.001 mm	±0.0002	60°	w/groove
314-352-30	0.4 - 1				
314-353-30	1 - 1.6		±0.00025		—
314-361-30	0.05 - 0.6		±0.0002		—
314-362-30	0.4 - 1				—

Metric For 3-flute cutting tools

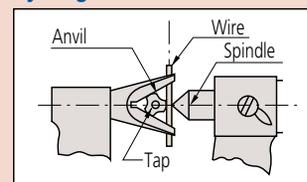
Order No.	Range (mm)	Resolution (mm)	Accuracy* (µm)	Anvil	Remarks
Digimatic					
314-251-30	1 - 15	0.001	±4	60°	w/groove
314-252-30	10 - 25		±5		
314-253-30	25 - 40		±4		—
314-261-30	1 - 15		±4		—
314-262-30	10 - 25				

* EMPE (ISO 3611:2023 and ASME B89.1.13-2013)

Measurement example



Pitch diameter measurement of tap by single-wire method



Optional Accessories

Order No.	Type	Description
264-020	—	USB Input Tool Series USB Keyboard Signal Conversion Type IT-020U
05CZA662	B	Connection cable (1 m)
05CZA663	B	Connection cable (2 m)
06AFM380B	B	USB Input Tool Direct (2 m)
02AZD730G	IP67	U-WAVE-T
02AZD880G	Buzzer	U-WAVE-T
02AZE200	—	U-WAVE-T mounting bracket
02AZD790B	B	Connection cable for U-WAVE-T (160 mm)
02AZE140B	B	Connection cable for U-WAVE-T For foot switch
264-622	IP67	U-WAVE-TM
264-623	Buzzer	U-WAVE-TM
264-626	IP67	U-WAVE-TMB
264-627	Buzzer	U-WAVE-TMB
02AZF310	IP67	Connecting unit for U-WAVE-TM/TMB

Micrometers

V-Anvil Micrometers SERIES 114 — 3 Flutes and 5 Flutes

- Measures the outside diameter of cutting tools (such as taps, reamers, end mills) with an odd number of flutes.
- Equipped with Ratchet Stop for constant measuring force.



114-135

SPECIFICATIONS

Inch For 3-flute cutting tools					
Order No.	Range (in)	Graduation (in)	Accuracy* (in)	Anvil	Remarks
Analog - Anvil, Spindle (with carbide tip)					
114-202	0.09 - 1	0.0001	±0.0002	60°	—
Analog - Spindle (with carbide tip)					
114-163	0.05 - 0.6	0.001	±0.0002	60°	—
114-113	1 - 1.6		±0.00025		—
114-114	1.6 - 2.2		±0.0003		—

Metric For 3-flute cutting tools						
Order No.	Range (mm)	Graduation (mm)	Accuracy* (μm)	Anvil	Remarks	
Analog - Anvil, Spindle (with carbide tip)						
114-204	2.3 - 25	0.01	±4	60°	—	
Analog - Spindle (with carbide tip)						
114-101	1 - 15	0.01	±4	60°	w/groove	
114-102	10 - 25				±5	—
114-103	25 - 40				±6	—
114-104	40 - 55				±7	—
114-105	55 - 70				±8	—
114-106	70 - 85				±9	—
114-107	85 - 100				±4	—
114-108	100 - 115				—	—
114-109	115 - 130				—	—
114-110	130 - 145				—	—
114-161	1 - 15				—	—
114-162	10 - 25	—	—			

Inch For 5-flute cutting tools					
Order No.	Range (in)	Graduation (in)	Accuracy* (in)	Anvil	Remarks
Analog - Anvil, Spindle (with carbide tip)					
114-135	0.09 - 1	0.0001	±0.0002	108°	—

Metric For 5-flute cutting tools						
Order No.	Range (mm)	Graduation (mm)	Accuracy* (μm)	Anvil	Remarks	
Analog - Anvil, Spindle (with carbide tip)						
114-137	2.3 - 25	0.01	±4	108°	—	
Analog - Spindle (with carbide tip)						
114-121	5 - 25	0.01	±4	108°	w/groove	
114-122	25 - 45				±5	—
114-123	45 - 65				±6	—
114-124	65 - 85				±7	—
114-165	5 - 25				±4	—

* EMPE (ISO 3611:2023 and ASME B89.1.13-2013)

DIMENSIONS

Unit: mm

For 3-flute cutting tools	
Range (mm)	(g)
10 - 25	6.2
25 - 40	19.14
40 - 55	32.13
55 - 70	45.12
70 - 85	58.11



Need Support?

Micrometers

Blade Micrometers

SERIES 422 — Non-rotating Spindle Type

- The anvil and the spindle have a blade for measuring the groove diameter of shafts, keyways and other hard-to-reach areas.
- Carbide-tipped measuring faces are available.
- Non-rotating spindle type.
- Equipped with Ratchet Stop for constant measuring force.



Digimatic
422-330-30



Quickmike type
422-421-20

SPECIFICATIONS

Inch / Metric					
Order No.	Range (in)	Resolution	Accuracy* (in)	Parallelism (in)	Remark
Digimatic					
422-330-30	0 - 1	0.00005 in/ 0.001 mm	±0.00015	0.00015	Type A
422-331-30	1 - 2				
422-332-30	2 - 3				
422-333-30	3 - 4				
422-360-30	0 - 1		±0.0002	0.0002	Type B
422-361-30	1 - 2				
422-370-30	0 - 1	±0.00015	0.00015		
422-371-30	0 - 1			Type C	
				Type D	

Metric					
Order No.	Range (mm)	Resolution (mm)	Accuracy* (µm)	Parallelism (µm)	Remark
Digimatic					
422-230-30	0 - 25	0.001	±3	3	Type A
422-231-30	25 - 50				
422-232-30	50 - 75				
422-233-30	75 - 100				
422-260-30	0 - 25		±3	3	Type B
422-261-30	25 - 50				
422-270-30	0 - 25				
422-271-30	0 - 25			Type C	
				Type D	

Inch / Metric Quickmike type					
Order No.	Range (in)	Resolution	Accuracy* (in)	Parallelism (in)	Remark
Digimatic					
422-421-20	0 - 1.2	0.00005 in/ 0.001 mm	±0.00015	0.00015	Type A
422-422-20	1 - 2.2				

Metric Quickmike type					
Order No.	Range (mm)	Resolution (mm)	Accuracy* (µm)	Parallelism (µm)	Remark
Digimatic					
422-411-20	0 - 30	0.001	±3	3	Type A
422-412-20	25 - 55				

• Power source: SR44 battery (1 pc.), **938882** included as standard
* EMPE (ISO 3611:2023 and ASME B89.1.13-2013)

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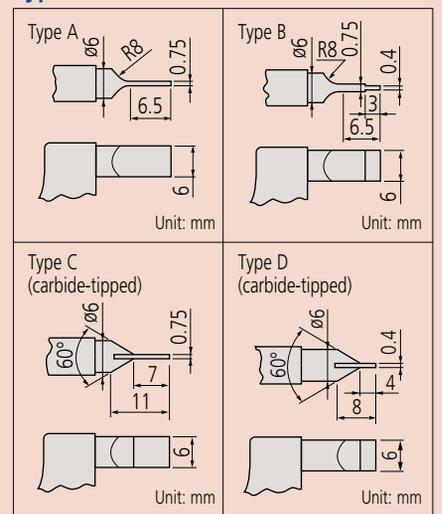
ABSOLUTETM

Applicable models:
series 422 Quickmike type

Measurement example



Type and dimensions



Optional Accessories

Order No.	Type	Description
05CZA662	B	Connection cable (1 m)
05CZA663	B	Connection cable (2 m)
06AFM380B	B	USB Input Tool Direct (2 m)
02AZD790B	B	Connection cable for U-WAVE-T (160 mm)
02AZE140B	B	Connection cable for U-WAVE-T For foot switch
264-622	IP67	U-WAVE-TM*
264-623	Buzzer	U-WAVE-TM*
264-626	IP67	U-WAVE-TMB*
264-627	Buzzer	U-WAVE-TMB*
02AZF310	IP67	Connecting unit for U-WAVE-TM/TMB*

* Only series 422 (except for Quickmike type) can be attached.

Micrometers

Blade Micrometers

SERIES 122 — Non-rotating Spindle Type

- The anvil and the spindle have a blade for measuring the groove diameter of shafts, keyways and other hard-to-reach areas.
- Carbide-tipped measuring faces are available.
- Equipped with Ratchet Stop for constant measuring force.
- Non-rotating spindle type.



122-125-10

SPECIFICATIONS

Inch					
Order No.	Range (in)	Graduation (in)	Accuracy* (in)	Parallelism (in)	Remark
Analog					
122-125-10	0 - 1	0.0001	±0.00015	0.00015	Type A
122-126-10	1 - 2				
122-127-10	2 - 3				
122-128-10	3 - 4		±0.0002	0.0002	
122-135-10	0 - 1		±0.00015	0.00015	Type B
122-151-10					Type D

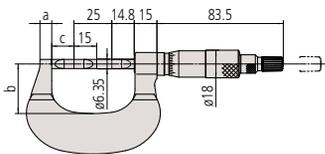
Metric						
Order No.	Range (mm)	Graduation (mm)	Accuracy* (μm)	Parallelism (μm)	Remark	
Analog						
122-101-10	0 - 25	0.01	±3	3	Type A	
122-102-10	25 - 50					
122-103-10	50 - 75			±4		4
122-104-10	75 - 100					
122-105-10	100 - 125					
122-106-10	125 - 150		±5	5		
122-107-10	150 - 175					
122-108-10	175 - 200		±6	6		
122-109-10	200 - 225					
122-110-10	225 - 250					
122-115-10	250 - 275		±3	3		Type B
122-116-10	275 - 300					
122-111-10	0 - 25					
122-112-10	25 - 50					
122-161-10	0 - 25					
122-162-10	25 - 50					
122-141-10	0 - 25			Type C		
122-142-10	25 - 50			Type D		

* E-MPE (ISO 3611:2023 and ASME B89.1.13-2013)

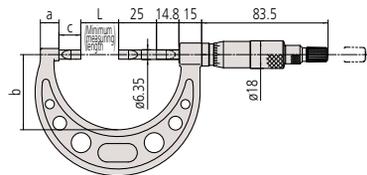
DIMENSIONS

Analog models up to 25 mm measuring range

Unit: mm

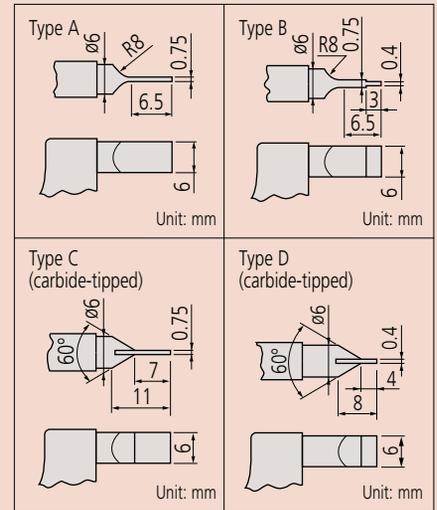


Analog models over 25 mm to 300 mm measuring range



Order No.	L	a	b	C
122-101-10	0	7.8	32	15
122-102-10	25	12.2	49	14.5
122-103-10	50	14.6	60	
122-104-10	75	16.7	79	17.5
122-105-10	100	18.8	94	17.9
122-106-10	125	19.1	106	18.3
122-107-10	150	18.2	118	18.5
122-108-10	175	16.8	130	18.9
122-109-10	200	18	143	17.7
122-110-10	225		156	
122-115-10	250		169	
122-116-10	275		181	

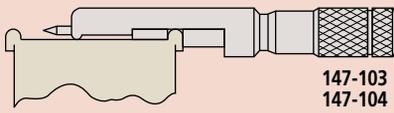
Type and dimensions



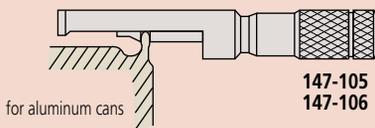
Need Calibration?

Micrometers

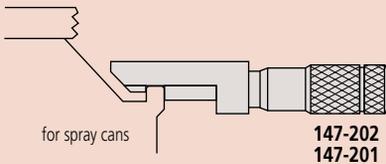
Measurement example



147-103
147-104



147-105
147-106



147-202
147-201

Measurement example



Can Seam Micrometers SERIES 147

- Measures the width, height, and depth of can seams.

SPECIFICATIONS

Inch				
Order No.	Range (in)	Graduation (in)	Accuracy* (in)	Remarks
147-104*1				—
147-106	0 - 0.5	0.001	±0.00015	for aluminum cans
147-201				for spray cans

* EMPE (ISO 3611:2023 and ASME B89.1.13-2013)

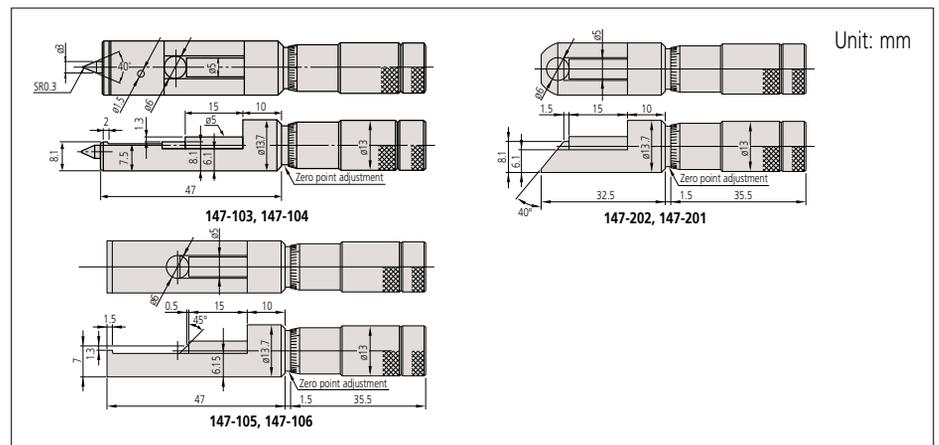
*1 For depth measurements up to .2 in / 5 mm.



147-104

Metric				
Order No.	Range (mm)	Graduation (mm)	Accuracy* (μm)	Remarks
147-103*1				—
147-105	0 - 13	0.01	±3	for aluminum cans
147-202				for spray cans

DIMENSIONS



Unit: mm

Hub Micrometers SERIES 147

- Measures hub thickness and shoulders inside a bore.
- Measuring faces: Carbide tipped.

SPECIFICATIONS

Inch					
Order No.	Range (in)	Graduation (in)	Accuracy* (in)	Flatness (in)	Parallelism (in)
147-351	0 - 1				
147-352	1 - 2	0.001	±0.0001	0.000024	0.00012
147-353	2 - 3				
147-354	3 - 4				

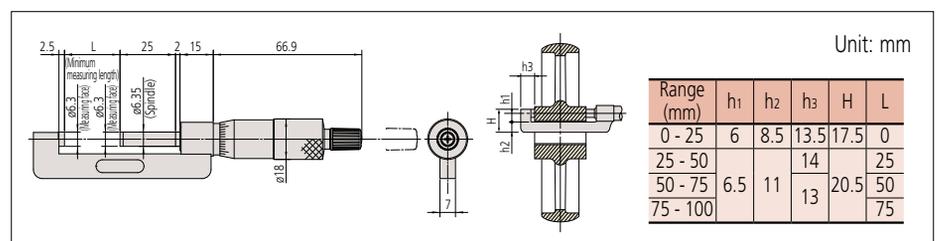
* EMPE (ISO 3611:2023 and ASME B89.1.13-2013)



147-351

- Equipped with Ratchet Stop for constant measuring force.

DIMENSIONS



Unit: mm

Micrometers

Crimp Height Micrometers SERIES 342

- Measures the height of crimp contacts.
- Point spindle
- IP65 water/dust protection.
- Equipped with Ratchet Stop for constant measuring force.
- With SPC output



Digimatic
342-371-30



Quickmike type
342-451-20

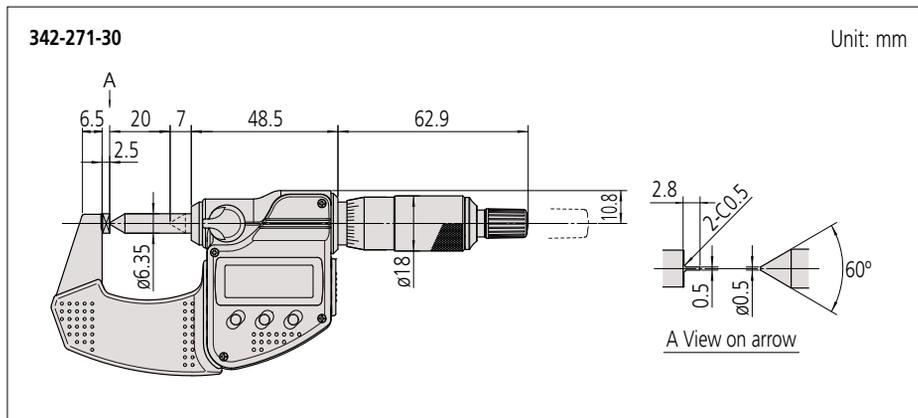
SPECIFICATIONS

Inch / Metric			
Order No.	Range (in)	Resolution	Accuracy* (in)
Digimatic			
342-371-30	0 - 0.8	0.00005 in/ 0.001 mm	±0.00015

Metric			
Order No.	Range (mm)	Resolution (mm)	Accuracy* (μm)
Digimatic			
342-271-30	0 - 20	0.001	±3
Quickmike			
342-451-20	0 - 15	0.001	±3

- Power source: SR44 battery (1 pc.), **938882** included as standard
- * E_{MPE} (ISO 3611:2023 and ASME B89.1.13-2013)

DIMENSIONS



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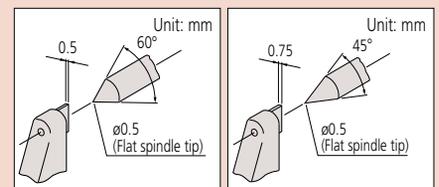
Dust-and-
Water-
Protected
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ID 000063013

ABSOLUTE[™]

Measurement example



Anvil and spindle tip detail



342-271-30, 342-371-30 342-451-20

Optional Accessories

Order No.	Type	Description
264-020	—	USB Input Tool Series USB Keyboard Signal Conversion Type IT-020U
05CZA662	B	Connection cable (1 m)
05CZA663	B	Connection cable (2 m)
06AFM380B	B	USB Input Tool Direct (2 m)
02AZD730G	IP67	U-WAVE-T
02AZD880G	Buzzer	U-WAVE-T
02AZE200	—	U-WAVE-T mounting bracket
02AZD790B	B	Connection cable for U-WAVE-T (160 mm)
02AZE140B	B	Connection cable for U-WAVE-T For foot switch
264-622	IP67	U-WAVE-TM*
264-623	Buzzer	U-WAVE-TM*
264-626	IP67	U-WAVE-TMB*
264-627	Buzzer	U-WAVE-TMB*
02AZF310	IP67	Connecting unit for U-WAVE-TM/TMB*

* 342-271-30 and 342-371-30 can be attached.
Not available for 342-451-20.

Micrometers

Crimp Height Micrometers SERIES 112,142

- Measures the height of crimp contacts.
- Point spindle
- Equipped with Ratchet Stop for constant measuring force.

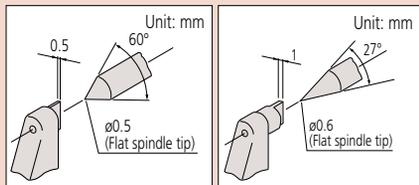


112-401



142-402

Anvil and spindle tip detail



112-401

142-402, 142-403

SPECIFICATIONS

Metric			
Order No.	Range (mm)	Graduation (mm)	Accuracy* (μm)
Mechanical counter model			
142-402	0 - 25	0.01	±3
142-403		0.001	

Metric			
Order No.	Range (mm)	Graduation (mm)	Accuracy* (μm)
Analog			
112-401	0 - 25	0.01	±3

* EMPE (ISO 3611:2023 and ASME B89.1.13-2013)



Find a Distributor

Micrometers

"Uni-Mike"

SERIES 317, 117 — Interchangeable Anvil Type

- Measures tubing thickness, shoulder-edge distance, rivet head height, etc., with interchangeable anvils (flat anvil, rod anvil, V-anvil).
- IP65 water/dust protection (series 317).
- Equipped with Ratchet Stop for constant measuring force.



SPECIFICATIONS

Inch / Metric				
Order No.	Range (in)	Resolution	Flatness (in)	Parallelism (in)
Digimatic				
317-351-30	0 - 1	0.00005 in/0.001 mm	0.000024 (Spindle face)/ 0.00008 (Anvil face)	0.00012
317-352-30	1 - 2			
Metric				
Order No.	Range (mm)	Resolution (mm)	Flatness (μm)	Parallelism (μm)
Digimatic				
317-251-30	0 - 25	0.001	0.6 (Spindle face)/ 2 (Anvil face)	3
317-252-30	25 - 50			

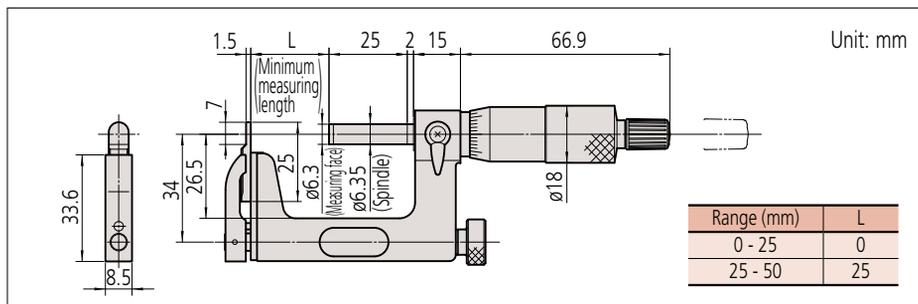
- Power source: SR44 battery (1 pc.), **938882** included as standard



SPECIFICATIONS

Inch				
Order No.	Range (in)	Graduation (in)	Flatness (in)	Parallelism (in)
Analog				
117-107	0 - 1	0.0001	0.000024 (Spindle face)/ 0.00008 (Anvil face)	0.00012
117-108	1 - 2			
Metric				
Order No.	Range (mm)	Graduation (mm)	Flatness (μm)	Parallelism (μm)
Analog				
117-101	0 - 25	0.01	0.6 (Spindle face)/ 2 (Anvil face)	3
117-102	25 - 50			

DIMENSIONS



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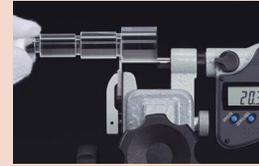
IP65

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Applicable models: series 317

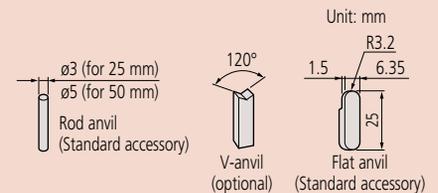
Measurement example



Shown with optional
round base: **950758**

Optional Accessories

Order No.	Type	Description
264-020	—	USB Input Tool Series USB Keyboard Signal Conversion Type IT-020U
05CZA662	B	Connection cable (1 m)
05CZA663	B	Connection cable (2 m)
06AFM380B	B	USB Input Tool Direct (2 m)
02AZD730G	IP67	U-WAVE-T
02AZD880G	Buzzer	U-WAVE-T
02AZE200	—	U-WAVE-T mounting bracket
02AZD790B	B	Connection cable for U-WAVE-T (160 mm)
02AZE140B	B	Connection cable for U-WAVE-T For foot switch
264-622	IP67	U-WAVE-TM
264-623	Buzzer	U-WAVE-TM
264-626	IP67	U-WAVE-TMB
264-627	Buzzer	U-WAVE-TMB
02AZF310	IP67	Connecting unit for U-WAVE-TM/TMB



Order No.	Item
201216	Flat anvil (standard accessory)
201217	Rod anvil (standard accessory for 117-101/ 117-107/317-251-30/317-351-30)
201379	Rod anvil (standard accessory for 117-102/ 117-108/317-252-30/317-352-30)
201218	V-anvil (optional)
950758	Round Base for 0 - 1 in / 0-25 mm ø58x14.2 mm (optional)

Micrometers

Measurement example



Typical indicator choice

- Dial indicator (0.01 mm): **2046AB**
- Dial indicator (0.001 mm): **2109AB-10**
- ABS Digimatic Indicator (0.01 mm): **543-710B**
- ABS Digimatic Indicator (0.005 mm): **543-700B**

Indicator Type Micrometers SERIES 107

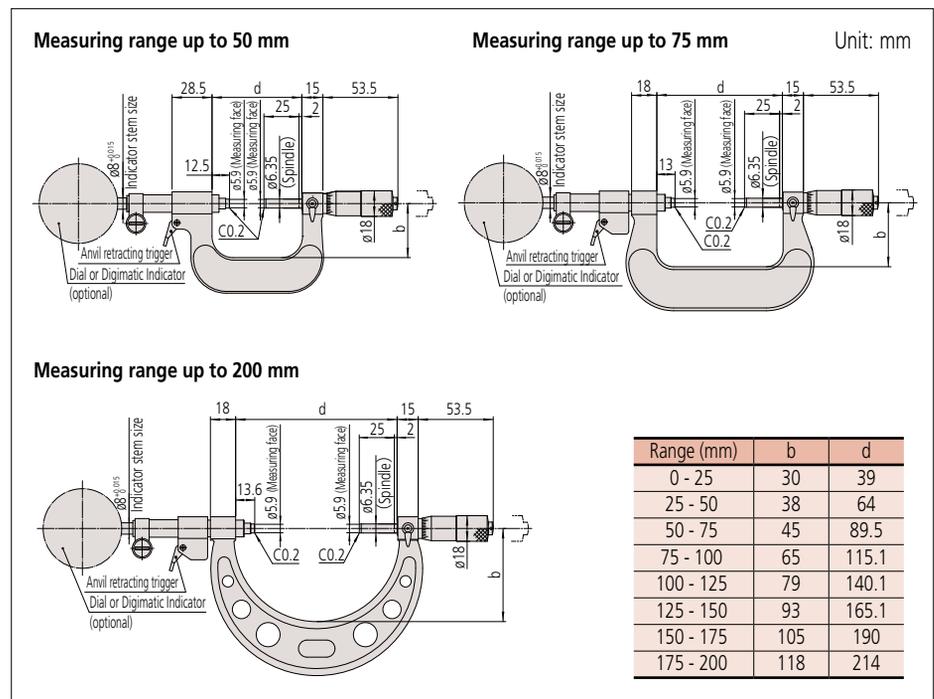
- Designed to mount an indicator for direct Go/±No-go judgment for mass-produced parts.
 - Anvil retracting trigger for quick measurement.
 - Measuring faces: Carbide tipped.
 - Various kinds of indicators and other gages* are available depending on the measurement type (accuracy required, measuring range, etc.).
 - Anvil stroke: 3 mm
- * Only stems of $\phi 8$ diameter are supported, but even these may not be supported by some models. Please contact the Mitutoyo Customer Support Center or visit the nearest M³ Solution Center for detailed specifications.



SPECIFICATIONS

Metric				
Order No.	Range (mm)	Flatness (μm)	Parallelism (μm)	Accuracy
107-201	0 - 25	0.6	2	$\pm 2\mu\text{m}$
107-202	25 - 50			
107-203	50 - 75			
107-204	75 - 100		3	$\pm 3\mu\text{m}$
107-205	100 - 125			
107-206	125 - 150			
107-207	150 - 175			
107-208	175 - 200	4	$\pm 4\mu\text{m}$	

DIMENSIONS



Got Questions?

Micrometers



Indicating Micrometers SERIES 510

- The micrometer with a built-in dial indicator enables accurate Go/No-go judgement without interruption. Pushing the retractable anvil button causes the anvil and pointer to move, enabling speedy measurements.
- Easy to use when operating one-handed due to retractable anvil.
- In the 1 inch measuring range, models are available that offer left or right positioning of the anvil-retraction button.
- Greatly improved accuracy: indication error and graduation of 0.00005 in.
- IP protection level: 54, coolant-splash resistant during grinding process.



510-131

SPECIFICATIONS

Inch										
Order No.	Range (in)	Flatness (in)	Parallelism (in)	Dispersion of indication (in)	Dial indication accuracy (in)	Indicating range (in)	Graduation (in)	Dial graduation (in)	Measuring force (N)	Anvil retraction button
510-131	0 - 1	0.000012	0.000024	0.00002	0.00005	±0.0023	0.0001	0.00005	5 - 10	Right side

Metric										
Order No.	Range (mm)	Flatness (μm)	Parallelism (μm)	Dispersion of indication (μm)	Dial indication accuracy (μm)	Indicating range (mm)	Graduation (mm)	Dial graduation (mm)	Measuring force (N)	Anvil retraction button
510-121	0 - 25	0.3	0.6	0.4	1	±0.06	0.001	0.001	5 - 10	Right side

DIMENSIONS

Up to 25 mm measuring range (anvil-retraction button on the right side) Unit: mm

Labels: Workpiece stop (optional), Retractable anvil button, Heat shield Thickness: t

Range (mm)	b	d	t
0 - 25	25	31.5	16.4

Measurement example



Workpiece stop (optional)

- Produces more stable measurement.
- Three types are available to suit workpieces of different sizes.

Unit: mm

Range	A	B
Workpiece stop A 04AZA124	ø16	23
Workpiece stop B 04AZA125	ø14	20.5
Workpiece stop C 04AZA126	ø14	15

Dmin: Minimum measurable diameter
Dmax: Maximum measurable diameter
C: Distance from the center of the workpiece to the upper surface of the workpiece stop

- Order No. **510-121, 510-141, 510-131, 510-151** Unit: mm

	Dmin	Dmax	C
Workpiece stop A	N/A	N/A	N/A
Workpiece stop B	4	16	5.0
Workpiece stop C	15	25	10.5

- **510-122 and 510-132**

	Dmin	Dmax	C
Workpiece stop A	25	37	15.5
Workpiece stop B	30	42	18.0
Workpiece stop C	41	50	23.5

- **510-123 and 510-133**

	Dmin	Dmax	C
Workpiece stop A	50	61	27.5
Workpiece stop B	54	66	30.0
Workpiece stop C	65	75	35.5

- **510-124 and 510-134**

	Dmin	Dmax	C
Workpiece stop A	75	87	40.5
Workpiece stop B	80	92	43.0
Workpiece stop C	91	100	48.2

Micrometers

Measurement example



510-151

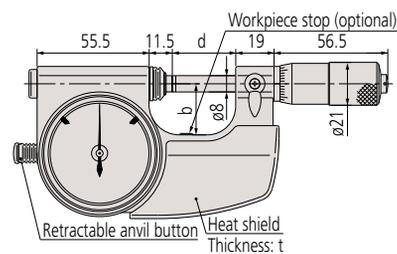
B

SPECIFICATIONS

Inch										
Order No.	Range (in)	Flatness (in)	Parallelism (in)	Dispersion of indication (in)	Dial indication accuracy (in)	Indicating range (in)	Graduation (in)	Dial graduation (in)	Measuring force (N)	Anvil retraction button
510-151	0 - 1	0.000012	0.000024	0.00002	0.00005	±0.0023	0.0001	0.00005	5 - 10	Left side
510-132	1 - 2		0.00004							
510-133	2 - 3									
510-134	3 - 4									
Metric										
Order No.	Range (mm)	Flatness (μm)	Parallelism (μm)	Dispersion of indication (μm)	Dial indication accuracy (μm)	Indicating range (mm)	Graduation (mm)	Dial graduation (mm)	Measuring force (N)	Anvil retraction button
510-141	0 - 25	0.3	0.6	0.4	1	±0.06	0.001	0.001	5 - 10	Left side
510-122	25 - 50		1							
510-123	50 - 75									
510-124	75 - 100									

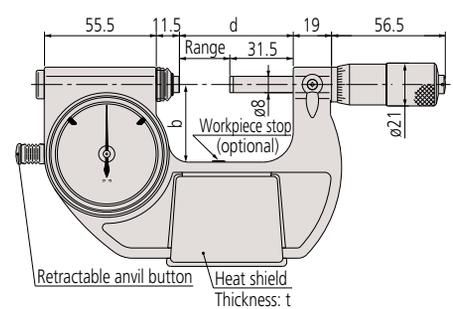
DIMENSIONS

Up to 25 mm measuring range
(anvil-retraction button on the left side)



Over 25 mm measuring range
(anvil-retraction button on the left side)

Unit: mm



Range (mm)	b	d	t
0 - 25	25	31.5	16.4
25 - 50	38	56.5	16
50 - 75	50	81.5	
75 - 100	63	106.5	



Talk to Sales

Micrometers

IP 54

Dial Snap Meters SERIES 523

- The snap meter with a built-in dial indicator enables accurate Go/No-go judgement without interruption. Pushing the retractable anvil button causes the anvil and pointer to move, enabling speedy measurements.
- Designed for use with a stand to enable a more stable measurement.
- Greatly improved accuracy: indication accuracy and graduation of .00005 in.
- IP protection level: 54, coolant-splash resistant during grinding process.
- Hard-coated crystal: enhanced oil and scratch resistance.



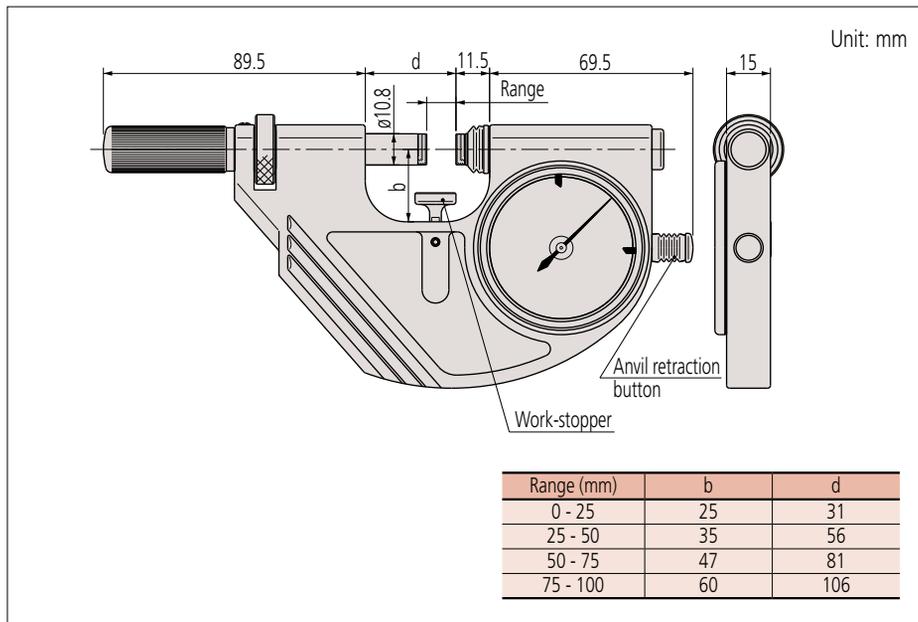
523-131

SPECIFICATIONS

Inch								
Order No.	Range (in)	Dial graduation (in)	Measuring force (N)	Flatness (in)	Parallelism (in)	Dispersion of indication (in)	Dial indication accuracy (in)	Indicating range (in)
523-131	0 - 1	0.00005	5 - 10	0.000012	0.000024	0.00002	0.00005	±0.0023
523-132	1 - 2				0.00004			
523-133	2 - 3							
523-134	3 - 4							

Metric								
Order No.	Range (mm)	Dial graduation (mm)	Measuring force (N)	Flatness (μm)	Parallelism (μm)	Dispersion of indication (μm)	Dial indication accuracy (μm)	Indicating range (mm)
523-121	0 - 25	0.001	5 - 10	0.3	0.6	0.4	1	±0.06
523-122	25 - 50				1			
523-123	50 - 75							
523-124	75 - 100							

DIMENSIONS



Measurement example



Need Repair?

Micrometers

Mounting example



ABS Digimatic Indicator



Linear Gage and counter

Typical indicators used with gage

- ID-C (20 pinch): **543-702B** (Ø3/8")
- LG100 (5 pinch): **542-192** & Counter **542-075A** & Conversion plug **21HZA195**

Note: an adapter sleeve may be needed to adapt for Ø8mm stem OD (on probe) to Ø3/8" ID (on Snap Meter)

Snap Meters SERIES 523

- The snap meter with an external indicator enables accurate Go/No-go judgement without interruption. Pushing the retractable anvil button causes the anvil and pointer to move, enabling speedy measurements.
- Select your preferred indicator. The measurement result can be externally output using an indicator with an output function.
- Measuring faces: Carbide tipped.



523-151
(Indicator: optional)

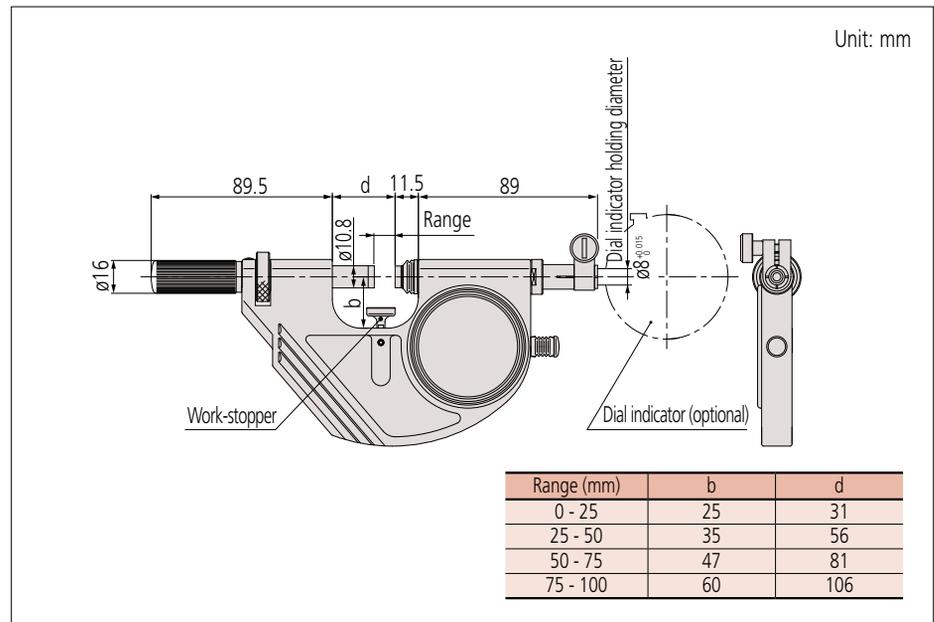
SPECIFICATIONS

Inch		Gage stem dia 3/8					
Order No.	Range (in)	Anvil movement (in)	Measuring force* (N)	Repeatability of indication (in)	Flatness (in)	Parallelism (in)	Mass (g)
523-151	0 - 1	0.078	5 - 10	0.00002	0.000012	0.000024	710
523-152	1 - 2						810
523-153	2 - 3					920	
523-154	3 - 4					1050	

Metric		Gage stem dia 8mm					
Order No.	Range (mm)	Anvil movement (mm)	Measuring force* (N)	Repeatability of indication (µm)	Flatness (µm)	Parallelism (µm)	Mass (g)
523-141	0 - 25	2	5 - 10	0.4	0.3	0.6	710
523-142	25 - 50						810
523-143	50 - 75					920	
523-144	75 - 100					1050	

* Measuring force before an indicator is mounted.
Measured at the position where the anvil is retracted by 1 mm from the free position without installing the indicator.

DIMENSIONS



Micrometers

Groove Micrometers SERIES 146

- Flanged spindle and anvil for measuring width and location of grooves inside bores and tubes.
- Two-directional ratchet stop.
- Non-rotating spindle.
- For OD and ID measurements, a master gage is required for adjusting the reference point (except for 0-1", [0 - 25 mm]).



146-231

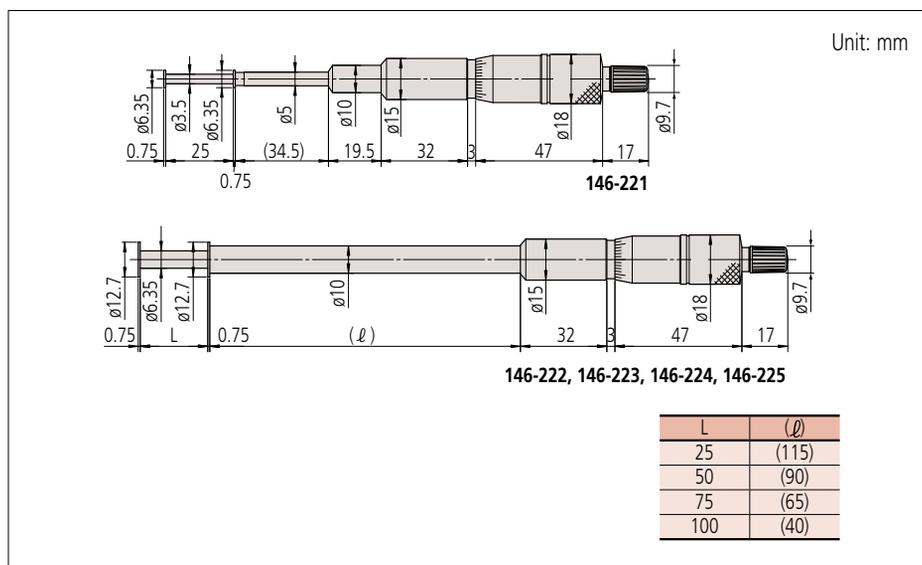
SPECIFICATIONS

Inch						
Order No.	Range Inside (in)	Range Outside (in)	Graduation (in)	Accuracy* (in)	Parallelism (in)	Flange (in)
146-231	0.055 - 1.05	0 - 1	0.001	±0.0004	0.0004	ø0.25
146-232	1.05 - 2.05	1 - 2				ø0.5
146-234	2.05 - 3.05	2 - 3				
146-235	3.05 - 4.05	3 - 4				

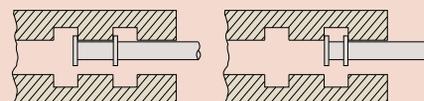
Metric						
Order No.	Range Inside (mm)	Range Outside (mm)	Graduation (mm)	Accuracy* (µm)	Parallelism (µm)	Flange (mm)
146-221	1.6 - 26.5	0 - 25	0.01	±10	10	ø6.35
146-222						ø12.7
146-223	26.5 - 51.5	25 - 50				
146-224	51.5 - 76.5	50 - 75				
146-225	76.5 - 101.5	75 - 100				

* E_{MPE} (ISO 3611:2023 and ASME B89.1.13-2013)

DIMENSIONS



Measurement example



Where to Buy

Measurement example



Functions

ABS measurement function:

After a data is displayed, next measurement can be performed without zero-setting. Also, the ABS origin point can be changed with ORIGIN switch.

INC measurement function:

Clears the displayed data at any point. The comparative measurement can be easily performed.

Low battery alarm:

Notifies that the battery is wearing down with "B" mark before becoming immeasurable. Thus, the timing for battery replacement can be confirmed in advance.

Typical applications:

Measurement of small workpieces:

Pearl, jewel, engine tappet shim, screws.

Measurement of thin workpieces:

Printing paper, polyethylene bags, sheet material, noodles and other food products, medium substrate, foil, thin plate, filter cloth and other medical supplies.

Measurement of thin lines and bars: Fishing line, dental reamers, spaghetti, drill for PCBs, wiring.

QUICKmini Thickness Gage SERIES 700

- Lightweight and palm-sized.
- Highly suitable for quick dimensional inspection of small, thin and delicate objects.



700-118-30

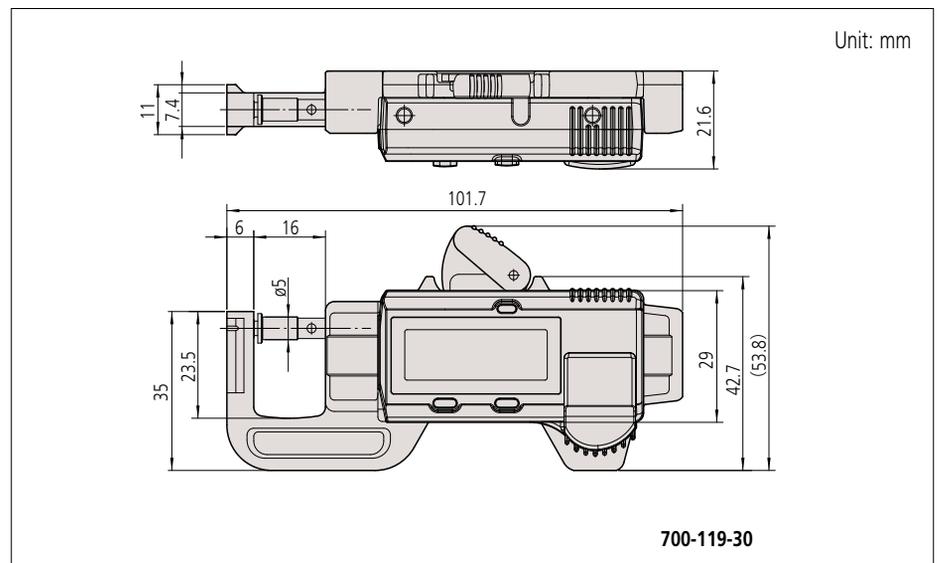
SPECIFICATIONS

Inch / Metric						
Order No.	Range (in)	Resolution	Accuracy* (in)	Maximum response speed	Measuring force (N)	Mass (g)
700-118-30	0 - 0.5	0.0005 in/0.01 mm	±0.001	Unlimited	2 or less	100
Metric						
Order No.	Range (mm)	Resolution (mm)	Accuracy* (mm)	Maximum response speed	Measuring force (N)	Mass (g)
700-119-30	0 - 12	0.01	±0.02	Unlimited	2 or less	100

• Power source: SR44 battery (1 pc.), **938882** included as standard

* E_{MPE} (ISO 3611:2023 and ASME B89.1.13-2013)

DIMENSIONS



Micrometers

Telescoping Gage Set SERIES 155

- These tools are for comparing and measuring the diameters of extremely small holes or the widths of narrow grooves that are hard to measure with the other measuring instruments.
- A spring-loaded plunger expands within a bore (or groove) and is locked in place allowing diameter measurements (or width) with an outside micrometer after extraction.



155-903

Typical application



SPECIFICATIONS

Inch	
Order No.	Range (in)
6-gage Set	
155-903	0.313 - 6
Gages included	
155-121	0.313 - 0.5
155-122	0.5 - 0.75
155-123	0.75 - 1.25
155-124	1.25 - 2.125
155-125	2.125 - 3.5
155-126	3.5 - 6
4-gage Set	
155-907	0.313 - 2.125
Gages included	
155-121	0.313 - 0.5
155-122	0.5 - 0.75
155-123	0.75 - 1.25
155-124	1.25 - 2.125

Metric	
Order No.	Range (mm)
6-gage Set	
155-905	8 - 150
Gages included	
155-127	8 - 12.7
155-128	12.7 - 19
155-129	19 - 32
155-130	32 - 54
155-131	54 - 90
155-132	90 - 150
5-gage Set	
155-904	0.5 - 6
Gages included	
155-122	0.5 - 0.75
155-123	0.75 - 1.25
155-124	1.25 - 2.125
155-125	2.125 - 3.5
155-126	3.5 - 6

DIMENSIONS

Unit: mm

Range (mm)	L	øD	ød ₁	ød ₂
8 - 12.7	110	5	4	3
12.7 - 19		5.5	5	3.5
19 - 32				
32 - 54	150	8	7.5	6
54 - 90				
90 - 150				



Need Support?

Micrometers

Optical Parallels SERIES 157

- Designed to inspect parallelism and flatness of measuring faces of micrometers.
- Each set consists of 4 sizes to enable testing parallelism at quarter-turn positions of the micrometer spindle.



SPECIFICATIONS

Inch						
Order No.	Range of micrometer to be checked (in)	Sizes of parallels included in set (in)	Diameter (mm)	Flatness (μm)	Parallelism (μm)	Remarks (mm)
157-901	0 - 1	0.5000, 0.5062, 0.5125, 0.5187	ø30	0.1	0.2	For 25
	1 - 2	1.0000, 1.0062, 1.0125, 1.0187				For 50

Metric						
Order No.	Range of micrometer to be checked (mm)	Sizes of parallels included in set (mm)	Diameter (mm)	Flatness (μm)	Parallelism (μm)	Remarks (mm)
157-903	0 - 25	12.00, 12.12, 12.25, 12.37	ø30	0.1	0.2	For 25
157-904	25 - 50	25.00, 25.12, 25.25, 25.37				For 50

Note: Also available individually, using the following Order No.

Inch		Inch	
Order No.	Thickness (in)	Order No.	Thickness (in)
157-109	0.5000	157-113	1.0000
157-110	0.5062	157-114	1.0062
157-111	0.5125	157-115	1.0125
157-112	0.5187	157-116	1.0187

Metric		Metric	
Order No.	Thickness (mm)	Order No.	Thickness (mm)
157-101	12.00	157-105	25.00
157-102	12.12	157-106	25.12
157-103	12.25	157-107	25.25
157-104	12.37	157-108	25.37

Optical Flats SERIES 158

- Used for inspecting the flatness of measuring faces with high accuracy.



SPECIFICATIONS

Inch			
Order No.	Thickness (in)	Diameter (in)	Flatness (in)
158-121	0.5	1.8	0.000008
158-122			0.000004
158-123	0.6	2.4	0.000008
158-124			0.000004

Metric			
Order No.	Thickness (mm)	Diameter (mm)	Flatness (μm)
158-117	12	45	0.2
158-118			0.1
158-119	15	60	0.2
158-120			0.1

Micrometers

Setting Standards for Outside Micrometers SERIES 167

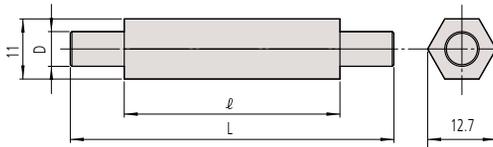
- Used for setting the zero point on outside micrometers.



167-148

SPECIFICATIONS and DIMENSIONS

167-101 to 167-103
167-141 to 167-143

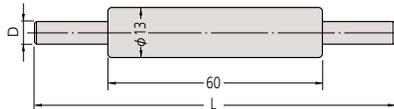


Unit: mm

Inch						
Order No.	Length $\langle L \rangle$ (in)	Accuracy (in)	Parallelism (in)	Flatness (in)	ℓ (mm)	Diameter $\langle D \rangle$ (in)
167-141	1	± 0.00005	0.00008	0.000012	18	0.25
167-142	2	± 0.0001			40	
167-143	3	± 0.0001				

Metric						
Order No.	Length $\langle L \rangle$ (mm)	Accuracy (μm)	Parallelism (μm)	Flatness (μm)	ℓ (mm)	Diameter $\langle D \rangle$ (mm)
167-101	25	± 1.5	2.0	0.3	18	6.35
167-102	50	± 2.0			40	
167-103	75	± 2.5				

167-104 to 167-107
167-144 to 167-147

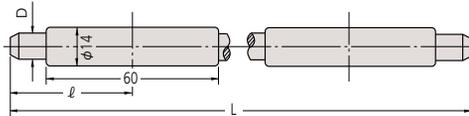


Unit: mm

Inch					
Order No.	Length $\langle L \rangle$ (in)	Accuracy (in)	Parallelism (in)	Flatness (in)	Diameter $\langle D \rangle$ (in)
167-144	4	± 0.0001	0.00008	0.000012	0.31
167-145	5	± 0.00015			
167-146	6				
167-147	7				

Metric					
Order No.	Length $\langle L \rangle$ (mm)	Accuracy (μm)	Parallelism (μm)	Flatness (μm)	Diameter $\langle D \rangle$ (mm)
167-104	100	± 3	2.0	0.3	7.9
167-105	125	± 3.5			
167-106	150	± 4			
167-107	175	± 4.5			

167-108 to 167-119
167-148 to 167-159



Unit: mm

Inch						
Order No.	Length $\langle L \rangle$ (in)	Accuracy (in)	Parallelism (in)	Flatness (in)	ℓ (mm)	Diameter $\langle D \rangle$ (in)
167-148	8	± 0.00015	0.00008	0.000012	47	0.37
167-149	9	± 0.0002			52	
167-150	10	± 0.0002			57	
167-151	11	± 0.0002			64	
167-152	12	± 0.00025			69	
167-153	13	± 0.00025			74	
167-154	14	± 0.00025			80	
167-155	15	± 0.00025			85	
167-156	16	± 0.00025			90	
167-157	17	± 0.00025			95	
167-158	18	± 0.00025			101	
167-159	19	± 0.0003				

Metric						
Order No.	Length $\langle L \rangle$ (mm)	Accuracy (μm)	Parallelism (μm)	Flatness (μm)	ℓ (mm)	Diameter $\langle D \rangle$ (mm)
167-108	200	± 5.0	2.0	0.3	47	9.4
167-109	225	± 5.5			52	
167-110	250	± 6.0			57	
167-111	275	± 6.5			64	
167-112	300	± 7			69	
167-113	325	± 7.5			74	
167-114	350	± 8			80	
167-115	375	± 8.5			85	
167-116	400	± 9			90	
167-117	425	± 9.5			95	
167-118	450	± 10			101	
167-119	475	± 10.5				

Typical application



Micrometer Inspection Gage Block Set

Refer to page B-13 for details.



516-152/153/154

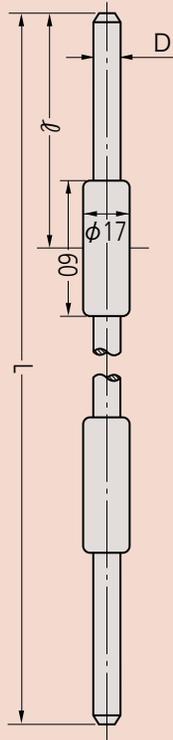


Micro Checker (holder only)
516-607

Micrometers

Setting Standards for Outside Micrometers SERIES 167

Unit: mm



167-120 to 167-404
167-160 to 167-443

Inch						
Order No.	Length <L> (in)	Accuracy (in)	Parallelism (in)	Flatness (in)	ℓ (mm)	Diameter <D> (in)
167-160	20	±0.0003	0.00008	0.00012	106	0.47
167-161	21				112	
167-162	22				117	
167-163	23				122	
167-164	24				128	
167-165	25				133	
167-166	26				138	
167-167	27				142	
167-168	28				147	
167-169	29				153	
167-170	30	±0.00035	0.00008	0.00012	158	0.47
167-171	31				164	
167-172	32				170	
167-173	33				175	
167-174	34				180	
167-175	35				185	
167-176	36				191	
167-177	37				196	
167-178	38				201	
167-179	39				207	
167-180	40	211				
167-405	41	±0.0004				
167-406	42					
167-407	43					
167-408	44					
167-409	45					
167-410	46					
167-411	47					
167-412	48					
167-413	49					
167-414	50					
167-415	51	±0.0004				
167-416	52					
167-417	53					
167-418	54					
167-419	55					
167-420	56					
167-421	57					
167-422	58					
167-423	59					
167-424	60					
167-425	61	±0.0004				
167-426	62					
167-427	63					
167-428	64					
167-429	65					
167-430	66					
167-431	67					
167-432	68					
167-433	69					
167-434	70					
167-435	71	±0.0004				
167-436	72					
167-437	73					
167-438	74					
167-439	75					
167-440	76					
167-441	77					
167-442	78					
167-443	79					

Metric						
Order No.	Length <L> (mm)	Accuracy (μm)	Parallelism (μm)	Flatness (μm)	ℓ (mm)	Diameter <D> (mm)
167-120	500	±11			106	11.9
167-121	525	±11.5			112	
167-122	550	±12			117	
167-123	575	±12.5			122	
167-124	600	±13			128	
167-125	625	±13.5			133	
167-126	650	±14			138	
167-127	675	±14.5			142	
167-128	700	±15			147	
167-129	725	±15.5			153	
167-130	750	±16	2.0	0.3	158	11.9
167-131	775	±16.5			164	
167-132	800	±17			170	
167-133	825	±17.5			175	
167-134	850	±18			180	
167-135	875	±18.5			185	
167-136	900	±19			191	
167-137	925	±19.5			196	
167-138	950	±20			201	
167-139	975	±20.5			207	
167-140	1000	±21	211			
167-365	1025	±21.5			217	
167-366	1050	±22			222	
167-367	1075	±22.5			227	
167-368	1100	±23			232	
167-369	1125	±23.5			238	
167-370	1150	±24			243	
167-371	1175	±24.5			248	
167-372	1200	±25			254	
167-373	1225	±25.5			259	
167-374	1250	±26			264	
167-375	1275	±26.5	269			
167-376	1300	±27	275			
167-377	1325	±27.5	280			
167-378	1350	±28	285			
167-379	1375	±28.5	291			
167-380	1400	±29	296			
167-381	1425	±29.5	301			
167-382	1450	±30	306			
167-383	1475	±30.5	312			
167-384	1500	±31	317			
167-385	1525	±31.5	322			
167-386	1550	±32	328			
167-387	1575	±32.5	333			
167-388	1600	±33	338			
167-389	1625	±33.5	343			
167-390	1650	±34	349			
167-391	1675	±34.5	354			
167-392	1700	±35	359			
167-393	1725	±35.5	364			
167-394	1750	±36	370			
167-395	1775	±36.5	375			
167-396	1800	±37	380			
167-397	1825	±37.5	386			
167-398	1850	±38	391			
167-399	1875	±38.5	396			
167-400	1900	±39	401			
167-401	1925	±39.5	407			
167-402	1950	±40	412			
167-403	1975	±40.5	417			
167-404	2000	±41	423			



Need Service?

Micrometers

Cylindrical Standards for Screw Thread Micrometers SERIES 167

- Used to set the zero point of screw thread micrometers.



167-297
(60° screw)

Inch		
Order No.	Length (in)	Accuracy (in)
Metric (unified) $\theta=60^\circ$		
167-294	1	± 0.00015
167-295	2	± 0.0002
167-296	3	± 0.00025
167-297	4	± 0.0003
167-298	5	± 0.00035
167-299	6	± 0.0004
Whitworth $\theta=55^\circ$		
167-283	1	± 0.00015
167-284	2	± 0.0002
167-285	3	± 0.00025
167-286	4	± 0.0003
167-287	5	± 0.00035
167-288	6	± 0.0004

Metric		
Order No.	Length (mm)	Accuracy (μm)
Metric (unified) $\theta=60^\circ$		
167-261	25	± 4
167-262	50	± 5
167-263	75	± 6
167-264	100	± 7
167-265	125	± 8
167-266	150	± 9
167-267	175	± 10
167-268	200	± 11
167-269	225	± 12
167-270	250	± 13
167-271	275	± 14
Whitworth $\theta=55^\circ$		
167-272	25	± 4
167-273	50	± 5
167-274	75	± 6
167-275	100	± 7
167-276	125	± 8
167-277	150	± 9
167-278	175	± 10
167-279	200	± 11
167-280	225	± 12
167-281	250	± 13
167-282	275	± 14

Setting Standards for V-anvil Micrometers SERIES 167

- Used for setting the zero point of V-anvil micrometers.



Inch			
Order No.	Diameter (in)	Accuracy (in)	Type
167-337	0.2	± 0.0001	Plug
167-338	0.4		
167-339	1		
167-340	1.6	± 0.00015	Ring

Metric			
Order No.	Diameter (mm)	Accuracy (μm)	Type
167-327	5	± 2	Plug
167-328	10		
167-329	25		
167-330	40	± 3	Ring
167-331	55		
167-332	70		
167-333	85		
167-334	100	± 5	Ring
167-335	115		
167-336	130		

Typical application

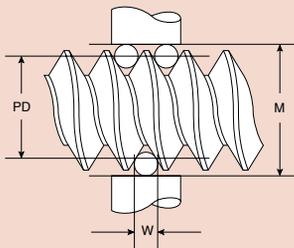


Typical application



Need Calibration?

Individual Holder and Wire Set



- PD = Pitch Diameter**
- M = Measurement over wires**
- W = Wire diameter**
- C = Constant**
- C = .86603 x Pitch (inches) -3W**
- P.D. = M-C**
- W = .57735 x P**

Applications

- Measure set of thread plug gages and working thread plug gages.
- Monitor the wear on working thread plug gages.
- Monitor and control pitch diameter variation during thread fabrication.
- Reduce measurement time to a fraction of the time normally taken using the traditional three wire method.
- Use in conjunction with Go/No-go thread ring gages to control thread size to the most demanding specifications.
- Determine out of roundness and taper that may exist in threaded parts.
- Applications for preplating and post plating thread measurement.

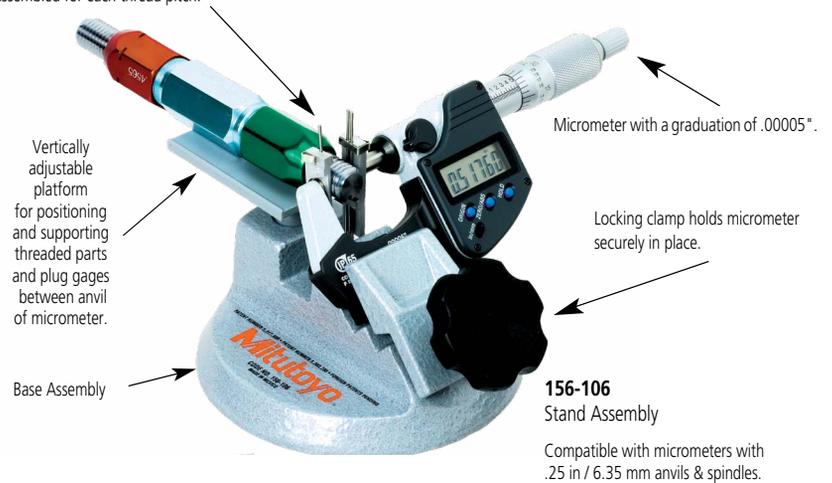
Tolerance of Wires:

- Diameter +/- .000010"
- Roundness +/- .000010"
- Surface finish 2 micro inches AA, lapped
- Hardness HRC 59-64
- Certification of accuracy included
- Traceable to NIST
- Meets or exceeds all ANSI and ISO specs

3-Wire Thread Measuring System

- Fast and accurate method of thread measuring available for use with micrometer

Wire holders and 3 thread measuring wires assembled for each thread pitch.



156-106
Stand Assembly

Compatible with micrometers with .25 in / 6.35 mm anvils & spindles.

Inch		
Order No. *1,*2	Thread Per Inch	Thread Measuring Wire Diameter
64AAA201	120	.00481
64AAA202	100	.00577
64AAA203	95	.00601
64AAA204	90	.00642
64AAA205	80	.00722
64AAA206	72	.00802
64AAA207	64	.00902
64AAA208	56	.01031
64AAA209	50	.01155
64AAA210	48	.01203
64AAA211	44	.01312
64AAA212	40	.01443
64AAA213	36	.01604
64AAA214	32	.01804
64AAA215	30	.01925
64AAA216	28	.02062
64AAA217	27	.02138
64AAA218	26	.02221
64AAA219	24	.02406
64AAA220	22	.02624
64AAA221	20	.02887
64AAA222	18	.03208
64AAA223	16	.03608
64AAA224	14	.04124
64AAA225	13	.04441
64AAA226	12	.04811
64AAA227	11.5	.05020
64AAA228	11	.05249
64AAA229	10	.05774
64AAA230	9	.06415
64AAA231	8	.07217
64AAA232	7.5	.07698
64AAA233	7	.08248
64AAA234	6	.09623
64AAA235	5.5	.10497
64AAA236	5	.11547

Metric			
Order No. *1	Pitch	mm Diameter	Inch Diameter
64AAA251	.2mm	.1155	.00455
64AAA252	.225mm	.1299	.00511
64AAA253	.25mm	.1443	.00568
64AAA254	.30mm	.1732	.00682
64AAA255	.35mm	.2021	.00796
64AAA256	.40mm	.2309	.00909
64AAA257	.45mm	.2598	.01023
64AAA258	.50mm	.2887	.01137
64AAA259	.55mm	.3175	.01250
64AAA260	.60mm	.3464	.01364
64AAA261	.70mm	.4041	.01591
64AAA262	.75mm	.4330	.01705
64AAA263	.80mm	.4619	.01818
64AAA264	.85mm	.4907	.01932
64AAA265	.90mm	.5196	.02046
64AAA266	1.00mm	.5774	.02273
64AAA267	1.25mm	.7217	.02841
64AAA268	1.50mm	.8660	.03410
64AAA269	1.75mm	1.0104	.03978
64AAA270	2.00mm	1.1547	.04546
64AAA271	2.50mm	1.4434	.05683
64AAA272	3.00mm	1.7321	.06819
64AAA273	3.50mm	2.0207	.07956
64AAA274	4.00mm	2.3094	.09092

*1 For 6.35mm Spindle Diameter holder only, add "H" suffix to Order No. (i.e. 64AAA201H)

*2 For 8mm Spindle Diameter holder only, add "H8" suffix to Order No. (i.e. 64AAA201H8)

*3 For 8mm Spindle Diameter holder only, add "H8" suffix to Order No. (i.e. 64AAA201H8)

Micrometers

Color-Coded Ratchets and Speeder Covers

- Ratchet and speeder covers in a choice of seven colors for use in instrument identification control schemes: red, blue, yellow, green, brown, black and gray.

Ratchet



Speeder



Standard outside micrometers

SPECIFICATIONS

Analog type: 12" (0 to 300 mm)

Order No.		Color	Material
Ratchet	Speeder		
04GZA239	04GAA260	Gray	Plastic
985056	301708	Black	
985061	301709	Red	
985081	301713	Blue	
985071	301711	Yellow	
985076	301712	Green	
985066	301710	Brown	
950700	—	Gray	Steel

Analog / Digimatic types: 12" - 40" (300 to 1000 mm)

Order No.		Color	Material
Ratchet	Speeder		
04GZA243	04GAA260	Gray	Plastic
—	301708	Black	
—	301709	Red	
—	301713	Blue	
—	301711	Yellow	
—	301712	Green	
—	301710	Brown	
950701	—	Gray	Steel

Digimatic type 12" (0 to 300 mm*)

Order No.*		Color	Material
Ratchet	Speeder		
04AZB661	04GAA260	Gray	Plastic
04GZA241	04GAA260	Gray	
—	301708	Black	
—	301709	Red	
—	301713	Blue	
—	301711	Yellow	
—	301712	Green	
—	301710	Brown	
951588	—	Gray	Steel

* Cannot be used for analog types.

Color-coded speeder covers



SPECIFICATIONS

Order No.	Color
04GAA899	Black
04GAA900	Red
04GAA901	Yellow
04GAA902	Green
04GAA903	Blue
04AAB208	Gray



QuantuMike



Find a Distributor

Micrometers

Typical application



156-101-10

Micrometer Stands SERIES 156

- Dedicated stand for micrometers.



156-101-10

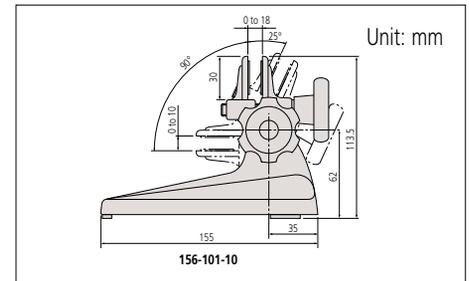
- Designed to allow benchtop use of hand-held micrometers or other gages which have frames suitable for gripping by the clamp. Reduces the influence of temperature changes due to body heat, enabling higher-accuracy measurement.

SPECIFICATIONS

Order No.	Measuring range of standard outside micrometer	Remarks
156-101-10	0.6- 4 in (15 - 100 mm)*	Adjustable angle type

* Items that cannot be mounted on these stands
(Order No. 406-353-30, 323-253-30, 331-254-30, 342-254-30, 342-264-30, 369-253-30, 422-332-30, 422-333-30, etc.)

DIMENSIONS



Typical application



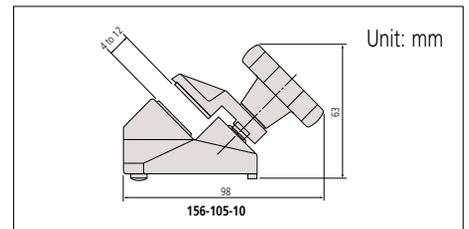
156-105-10

156-105-10

SPECIFICATIONS

Order No.	Measuring range of standard outside micrometer	Remarks
156-105-10	1, 2 in (25, 50 mm)	Fixed angle type

DIMENSIONS



Typical application



156-102



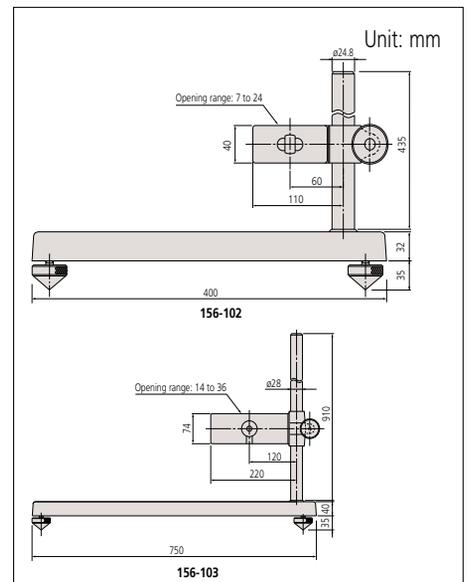
156-102

156-103

SPECIFICATIONS

Order No.	Measuring range of standard outside micrometer	Remarks
156-102	4 - 12 in (100 - 300 mm)	Vertical type
156-103	13 - 40 in (325 - 1000 mm)	Vertical type

DIMENSIONS



Tool Kits

Tool Kits

Durable zipper cases and classic wooden cases protect your tools with style. Versions include mechanical, standard Digimatic, or QuantuMike-based sets. QuantuMikes are just as accurate as standard Digimatic micrometers, but up to 4x faster.

Empty cases are also available as a new home for your existing tools!

- Rugged, impact-resistant build
- Case moulds for Digimatic and mechanical tools
- Long-life zippers and stain-resistant cover
- 2X magnet-backed slots for holding steel rules, spanners, thumb drives and more
- Handsome, solid mahogany
- Various sizes/capacities



64PKA288A

Order No.	64PKA288A (Soft Case Tool Kit) 64PKA152 (Wooden Tool Kit)
Item No.	Description
293-180-40	Digimatic Micrometer (Friction Thimble Type) (Range: 0 - 1" / 0 - 25.4mm, LCD Resolution: .00005" / 0.001mm)
500-196-30	Digimatic Caliper with ABSOLUTE Encoder (Range: 0 - 6" / 0 - 150mm, LCD Resolution: .0005" / 0.001mm)
64PMT183	Soft Case included with 64PKA288A
64PPP932	Mahogany Case included with 64PKA152



64PKA285

Order No.	64PKA285 (Soft Case Tool Kit) 64PKA076B (Wooden Tool Kit)
Item No.	Description
293-340-30	Digimatic Micrometer (Ratchet Stop Type) (Range: 0 - 1" / 0 - 25.4mm, LCD Resolution: .00005" / 0.001mm)
500-196-30	Digimatic Caliper with ABSOLUTE Encoder (Range: 0 - 6" / 0 - 150mm, LCD Resolution: .0005" / 0.001mm)
64PMT183	Soft Case included with 64PKA285
64PPP932	Mahogany Case included with 64PKA076B



64PKA286

Order No.	64PKA286 (Soft Case Tool Kit) 64PKA077B (Wooden Tool Kit)
Item No.	Description
293-348-30	Digimatic Micrometer (Friction Thimble Type) (Range: 0 - 1" / 0 - 25.4mm, LCD Resolution: .00005" / 0.001mm)
500-196-30	Digimatic Caliper with ABSOLUTE Encoder (Range: 0 - 6" / 0 - 150mm, LCD Resolution: .0005" / 0.001mm)
64PMT183	Soft Case included with 64PKA286
64PPP932	Mahogany Case included with 64PKA077B



64PKA152



64PKA076B



64PKA077B

Tool Kits



64PKA283



64PKA284

Order No.	64PKA283 (Soft Case Tool Kit)
Order No.	64PKA068B (Wooden Tool Kit)
Item No.	Description
103-135	Outside Micrometer (Friction Thimble Type) (Range: 0–1", Graduation: .0001")
505-742J	Dial Caliper (Range: 0–6", Dial Graduation: .001")
182-204	6" Full-Flexible Rule (3R)
64PMT183	Soft Case included with 64PKA283
64PPP932	Mahogany Case included with 64PKA068B



64PKA068A

Order No.	64PKA284 (Soft Case Tool Kit)
Order No.	64PKA080B (Wooden Tool Kit)
Item No.	Description
182-102	6" Steel Rule (16R)
103-177	Micrometer (Ratchet Thimble) (Range 0-1", Graduation .001")
505-740J	Dial Caliper (Range: 0–6", Dial Graduation: .001")
64PMT183	Soft Case included with 64PKA284
64PPP932	Mahogany Case included with 64PKA080B



64PKA080B

Order No.	64PKA069A (Inch Tool Kit)
Item No.	Description
103-135	Outside Micrometer (Friction Thimble Type) (Range: 0–1", Graduation: .0001")
182-202	6" Full-Flexible Rule (16R)
513-518T	Test Indicator Set (Range: .04", Graduation: .001")
505-742J	675 Dial Caliper (Range: 0–6", Dial Graduation: .001")
050501	Mahogany Case



64PKA069A

The basic measuring instruments recommended for vocational students and machinist apprentices are supplied in this kit.

Order No.	64PKA070A (Inch Tool Kit)
Item No.	Description
101-117	Outside Micrometer (Friction Thimble Type) (Range: 0–1", Graduation: .0001")
129-132	Depth Micrometer (with 6 pcs rods) (Range: 0–6", Graduation: .001")
182-202	Full-Flexible Rule (16R)
505-742J	Dial Caliper (Range: 0–6", Graduation: .001")
050503	Mahogany Case



64PKA070A

For operations where depth measurements are a primary concern, this kit is ideal for measuring depths to 6", in addition to providing the tools for regular precision measurements.



Got Questions?

Featured Products



Digimatic Micrometer Heads 350 Series

Refer to page B-81 for details.



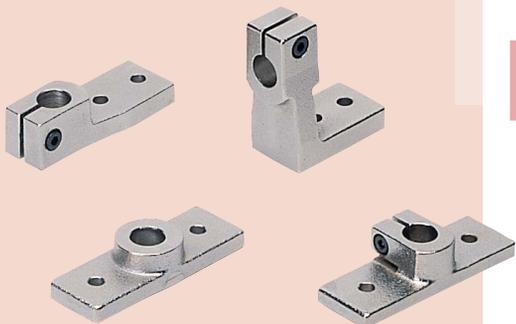
Fine Feed Micrometer Heads (0.1 mm/rev) 148 Series

Refer to page B-112 for details.



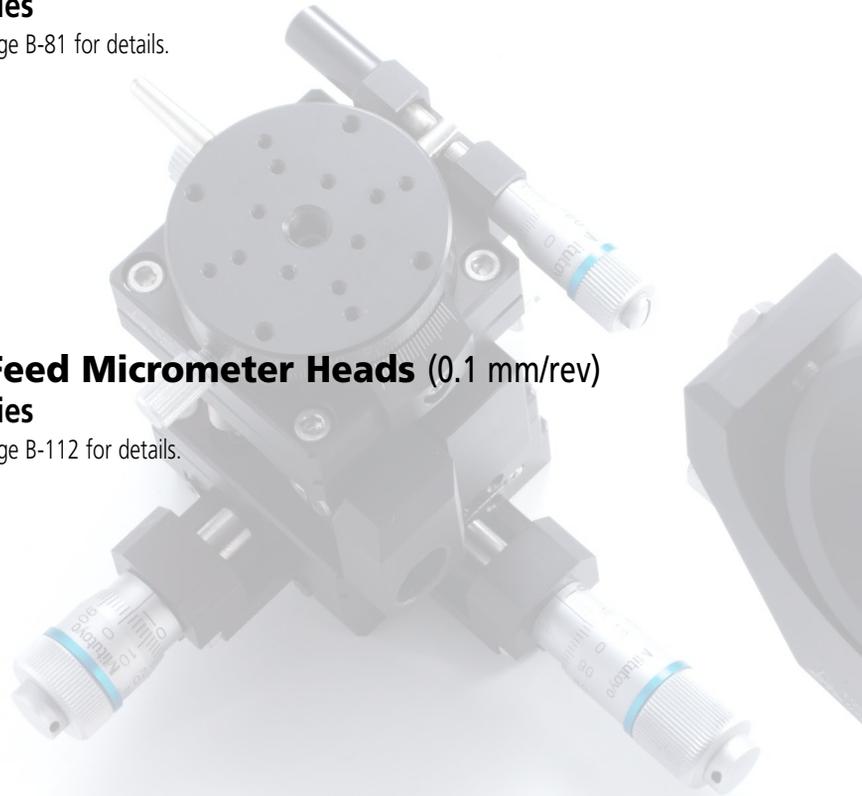
Micro Jack Series 7000

Refer to page B-121 for details.



Mounting Fixtures

Refer to page B-122 for details.



B

Micrometers Heads



Precision Lead Screws

Refer to page B-124 for details.



U-WAVE^{fit}

Measurement Data Wireless Communication System

Bluetooth® communication enables wireless transfer of measurement data from Digimatic micrometers and callipers to PCs, smartphones, tablets and such other devices.



IP Codes

The code indicates the degree of protection against the ingress of foreign materials and water as defined in the IEC standard (IEC 60529). The number indicates the protection level. (Refer to page 3)



TÜV Rheinland Certification Marks

All products with the marks have passed the IP test carried out by the German accreditation organization, TÜV Rheinland.

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Digimatic Micrometer Heads (Digital display)

Micrometer Head Selection Guide	B-81
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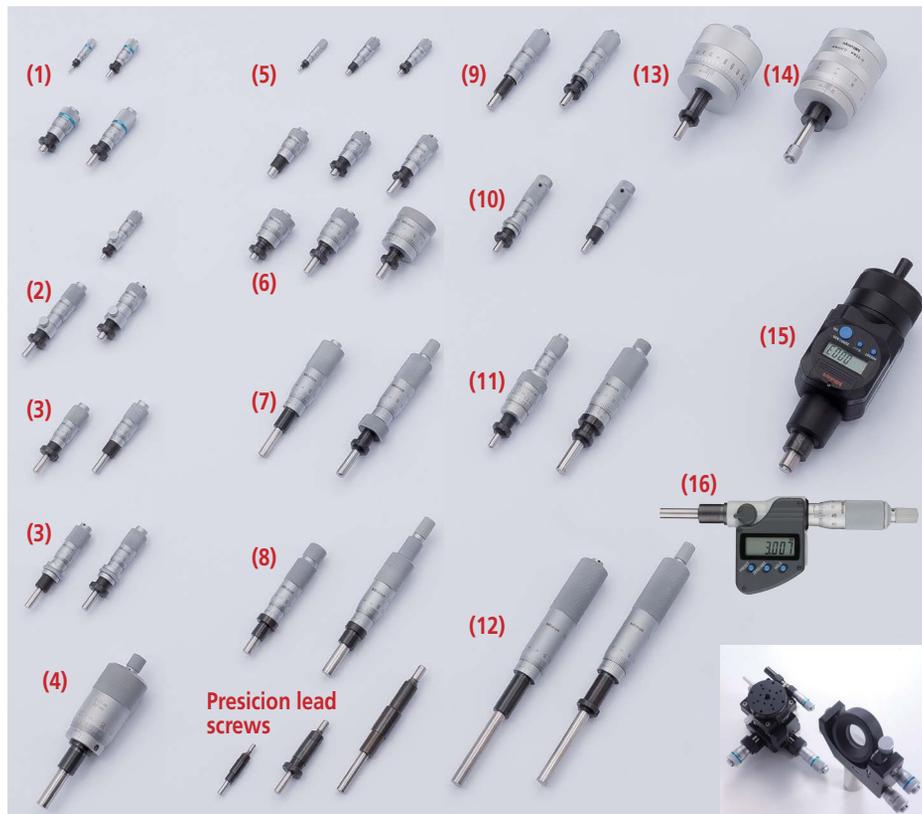
Micrometer Heads (Analog display/Standard type/High function type)

Small/Ultra-small Type	B-85
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Small Thimble Diameter Standard Type	B-93
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Micrometer Head

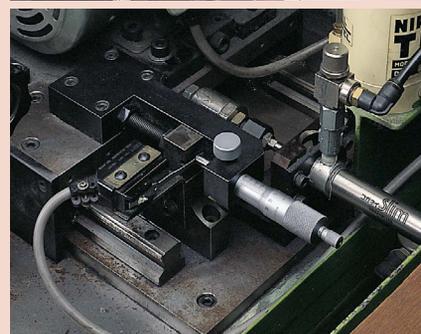
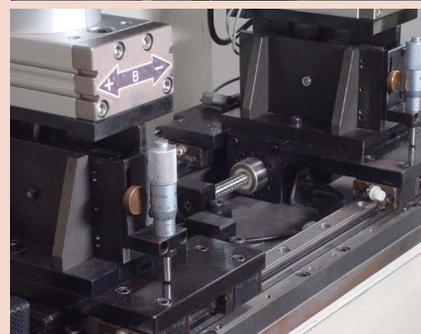
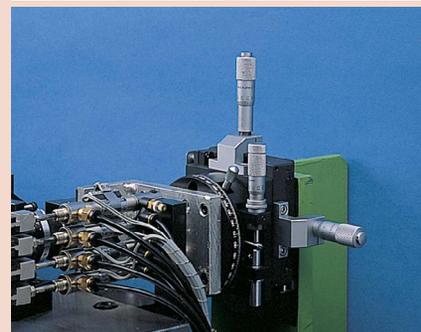
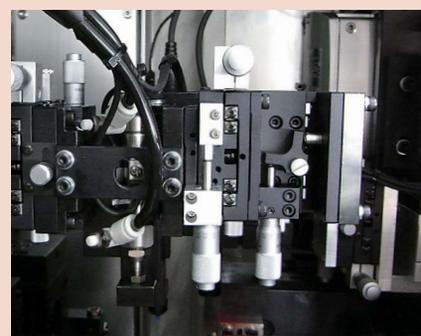


Precision lead screws

Also refer to "Quick Guide to Precision Measuring Instruments" brochure.

Range	Main feature of head	Series	Page
0.02 in / 1 mm	Differential Screw Thread Translator (Extra-Fine Feed) Type	110	B-37 to B-38
0.05 in / 2.5 mm	Differential Screw Thread Translator (Extra-Fine Feed) Type (11)		B-37 to B-38
0.2 in / 5 mm	Fine Spindle Feed of 0.1 mm/rev	148	B-34 to B-35
	Small/Ultra-small Type (5)		B-7 to B-8
0.25 in / 6.5 mm	Locking-screw Type (2)	148	B-28 to B-31
	Fine Spindle Feed of 0.1 mm/rev (1)		B-34 to B-35
	Fine Spindle Feed of 0.25 mm/rev		B-36
	Small/Ultra-small Type (5)		B-7 to B-8
10 mm	Short Thimble with Multiple Diameter Options (6)	152	B-9 to B-11
	Large Thimble Type (13)		B-39 to B-40
	Locking-screw Type (2)		B-28 to B-31
0.5 in / 13 mm	Fine Spindle Feed of 0.25 mm/rev	148	B-36
	Differential Screw Thread Translator (Extra-Fine Feed) Type (11)		B-37 to B-38
	Short Thimble with Multiple Diameter Options (6)	148	B-9 to B-11
	Small Standard Type (3)		B-12 to B-14
	Small Thimble Diameter Standard Type (10)		B-15 to B-17
0.5 in / 15 mm	Non-rotating Spindle Type (8)	153	B-32
	Quick Spindle Feed of 1 mm/rev (4)		B-33
	Small Standard Type with Carbide-tipped Spindle (9)		B-18 to B-19
1 in / 25 mm	Clear digital display, Non-rotating spindle and IP 65 rated version (16)	350	B-4 to B-6
	Clear digital display, Non-rotating spindle		
	Non-rotating Spindle Type (8)	153	B-32
	Quick Spindle Feed of 1 mm/rev		B-33
	Large Thimble Type	152	B-39 to B-40
	XY-Stage Type (14)		B-41
	High Accuracy and Resolution	153	B-42
	Digit Counter Type		B-43
	Medium-sized Standard Type (7)	150	B-20 to B-23
	Medium-sized Standard Type with 8 mm Diameter Spindle		B-24 to B-27
2 in / 50 mm	Digimatic (15)	164	B-4
	Large Thimble Type		B-39 to B-40
	Long Stroke Non-rotating Spindle		B-42
	Medium-sized Standard Type with 8 mm Diameter Spindle (12)		B-24 to B-27
60 - 75 mm	Micro Jack	7	B-43

Precision adjustment of mirror in holder



Micrometer Head

Digimatic Micrometer Heads SERIES 164, 350

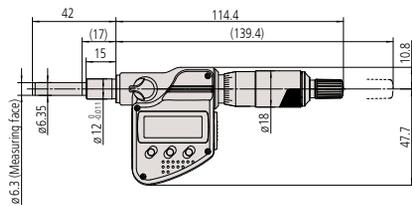
DIMENSIONS

Plain Stem

Unit: mm



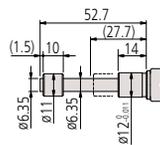
Plain stem
IP65



350-281-30
(Stem dia. 12 mm, water-proof type) Mass: 230 g



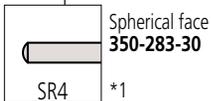
Plain stem
IP65



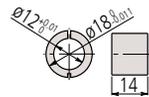
Equipped with a non-rotating device
350-261-30
(Stem dia. 12 mm, water-proof type)
Mass: 235 g



Spherical face
Plain stem
IP65



Spherical face
350-283-30
*1



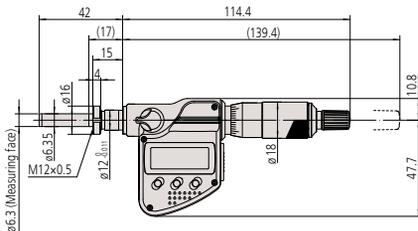
Bushings (standard accessory)
350-261-30

*1 Other dimensions are the same as **350-281-30**.
(): with spindle fully retracted.

Stem locknut



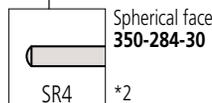
Stem locknut
IP65



• Fixture thickness: 11.5 mm
350-282-30 (Stem dia. 12 mm, equipped with locknut, water-proof type) Mass: 230 g



Stem locknut
Spherical face
IP65



Spherical face
350-284-30
*2

*2 Other dimensions are the same as **350-282-30**.
(): with spindle fully retracted.



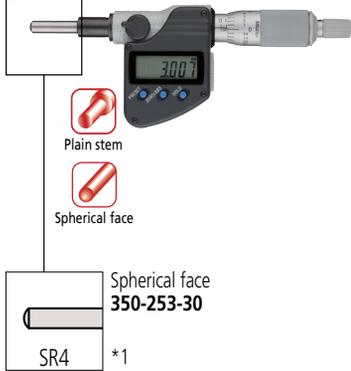
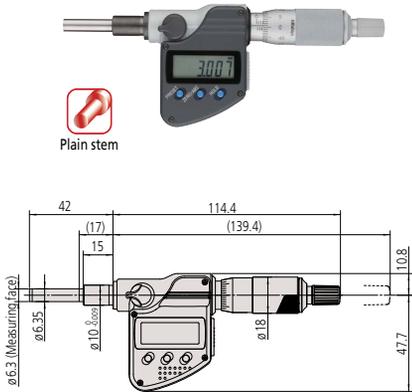
Find a Distributor

Micrometer Head

DIMENSIONS

Plain Stem

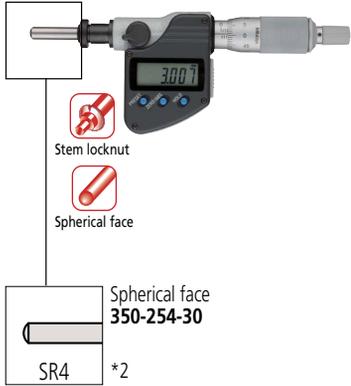
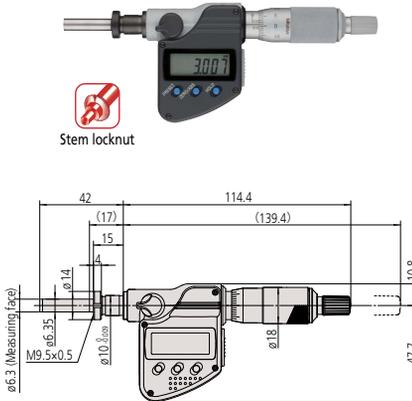
Unit: mm



350-251-30
(Stem dia. 10 mm, for general use) Mass: 230 g

*1 Other dimensions are the same as **350-251-30**.
(): with spindle fully retracted.

Stem Locknut



• Fixture thickness: 11.5 mm
350-252-30
(Stem dia. 10 mm, for general use) Mass: 230 g

*2 Other dimensions are the same as **350-252-30**.
(): with spindle fully retracted.

Micrometer Head

Micrometer Heads

SERIES 148 — Small/Ultra-small Type

- Miniature and light-weight micrometer heads for easier incorporation into machines, jigs and fixtures.

SPECIFICATIONS

Inch						
Order No.	Range (in)	Stem dia. (in)	Stem	Spindle end	Type	Accuracy (in)
148-217	0 - 0.2	0.156	Plain	Spherical (SR1.5)	Standard	±0.00025
148-218			W/clamp nut			
148-202-10	0 - 0.25	0.25	Plain	Flat		
148-204-10			W/clamp nut			
148-206-10	0 - 0.25	0.25	Plain	Spherical (SR3)		
148-208-10			W/clamp nut			
148-210-10	0 - 0.25	0.25	Plain	Flat	Reverse reading	
148-212-10			W/clamp nut			

Metric						
Order No.	Range (mm)	Stem dia. (mm)	Stem	Spindle end	Type	Accuracy (µm)
148-215	0 - 5	3.5	Plain	Spherical (SR1.5)	Standard	±5
148-216			W/clamp nut			
148-201-10	0 - 6.5	6	Plain	Flat		
148-203-10			W/clamp nut			
148-205-10	0 - 6.5	6	Plain	Spherical (SR3)		
148-207-10			W/clamp nut			
148-209-10	0 - 6.5	6	Plain	Flat	Reverse reading	
148-211-10			W/clamp nut			

- Graduation: 0.02 mm (148-215, 148-216), 0.01 mm or 0.001 in
- Measuring face: Material/Alloy tool steel, Hardness/60 HRC or more, Lapped
- Satin-chrome plated

DIMENSIONS

Plain Stem

148-215 Mass: 4 g

Unit: mm

Spherical face
148-205-10

SR3 *

148-201-10 Mass: 10 g

Reverse reading
148-209-10

* Other dimensions are the same as 148-201-10.
(): with spindle fully retracted.



Got Questions?

Micrometer Head

Micrometer Heads SERIES 148 — Small/Ultra-small Type

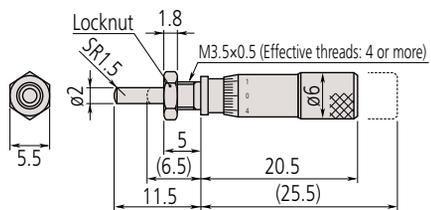
DIMENSIONS

Stem Locknut





 Stem locknut Spherical face



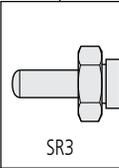
• Fixture thickness: 3 mm
148-216 Mass: 4 g

Unit: mm





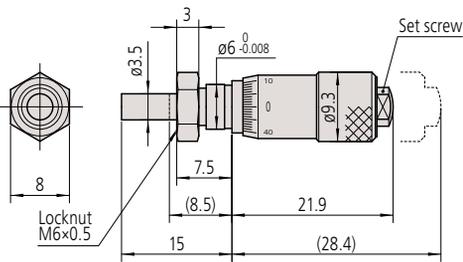
 Stem locknut Spherical face



Spherical face
148-207-10
 SR3 *



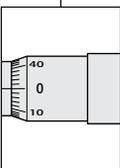

 Stem locknut



• Fixture thickness: 4 mm
148-203-10 Mass: 10 g




 Stem locknut



Reverse reading
148-211-10
 *

* Other dimensions are the same as **148-203-10**.
 (): with spindle fully retracted.

Micrometer Head

Micrometer Heads

SERIES 148 — Short Thimble with Multiple Diameter Options

- Short body design maintains measuring range for limited space applications.
- Three types of thimble diameters can be selected depending on applications.

B

SPECIFICATIONS

Inch							
Order No.	Range (in)	Graduation (in)	Accuracy (in)	Stem dia. (in)	Stem	Spindle end	Thimble dia. (in)
148-351-10	0 - 0.25	0.001	±0.0001	0.375	Plain	Flat	0.59
148-352-10					W/clamp nut		
148-353-10					Plain		
148-354-10					W/clamp nut		
148-357-10	0 - 0.5				Plain		0.59
148-358-10					W/clamp nut		
148-359-10					Plain		0.79
148-360-10					W/clamp nut		

- Spindle pitch: 0.025 in
- Measuring face: Material/Alloy tool steel, Hardness/60 HRC or more, Lapped
- Satin-chrome plated

Metric							
Order No.	Range (mm)	Graduation (mm)	Accuracy (μm)	Stem dia. (mm)	Stem	Spindle end	Thimble dia. (mm)
148-301-10	0 - 6.5	0.01	±2	9.5	Plain	Flat	15
148-302-10					W/clamp nut		
148-303-10					Plain		
148-304-10					W/clamp nut		
148-313-10	0 - 13				Plain	Spherical (SR4)	15
148-314-10					W/clamp nut	Flat	15
148-307-10					Plain		
148-308-10					W/clamp nut		
148-309-10	Plain	20					
148-310-10	W/clamp nut						
148-311-10	Plain						
148-312-10	W/clamp nut						

- Spindle pitch: 0.5 mm
- Measuring face: Material/Alloy tool steel, Hardness/60 HRC or more, Lapped
- Satin-chrome plated



148-301-10



148-303-10



148-305-10

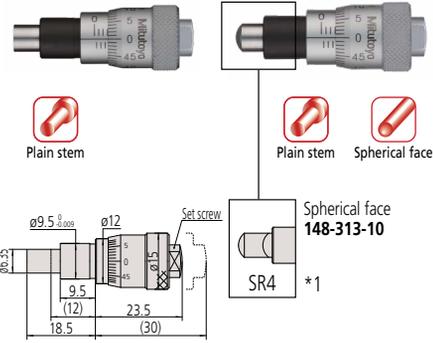


Talk to Sales

Micrometer Head

DIMENSIONS

Plain Stem

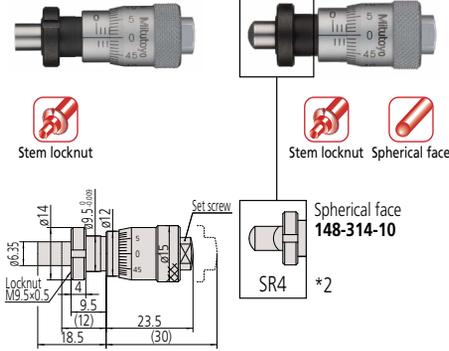


148-301-10
 Mass: 26 g
 Thimble diameter: 15

*1 Other dimensions are the same as **148-301-10**.

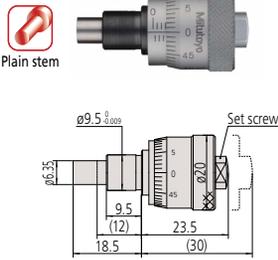
Stem Locknut

Unit: mm

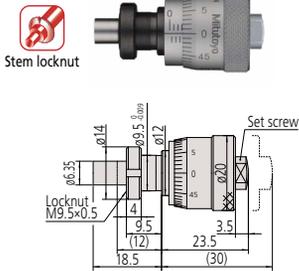


• Fixture thickness: 6 mm
148-302-10
 Mass: 26 g
 Thimble diameter: 15

*2 Other dimensions are the same as **148-302-10**.



148-303-10
 Mass: 39 g
 Thimble diameter: 20



• Fixture thickness: 6 mm
148-304-10
 Mass: 39 g
 Thimble diameter: 20

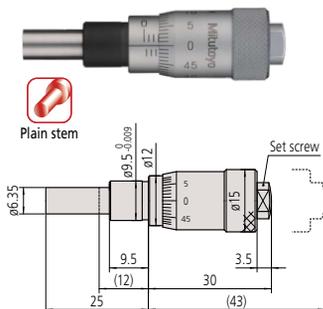
(): with spindle fully retracted.

Micrometer Head

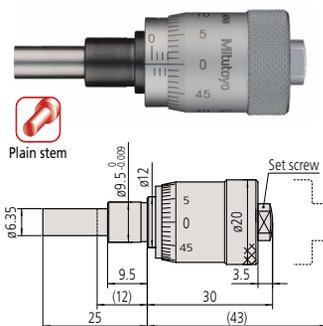
Micrometer Heads SERIES 148 — Short Thimble with Multiple Diameter Options

DIMENSIONS

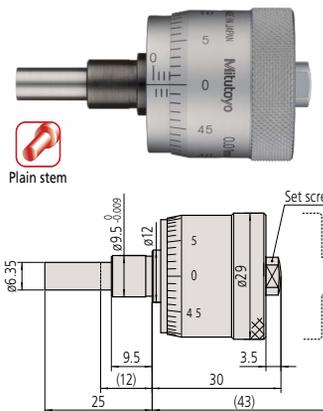
Plain Stem



148-307-10
Mass: 35 g Thimble diameter: 15



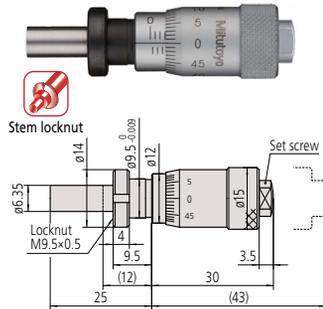
148-309-10
Mass: 55 g Thimble diameter: 20



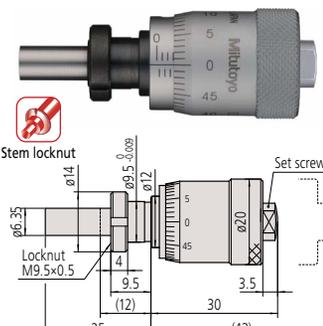
148-311-10
Mass: 103 g Thimble diameter: 29

Stem Locknut

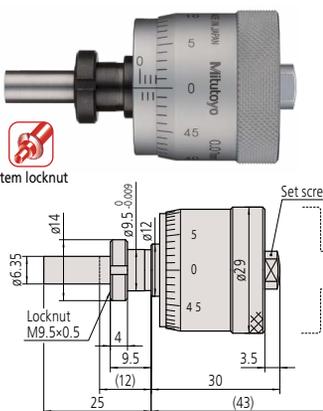
Unit: mm



• Fixture thickness: 6 mm
148-308-10
Mass: 35 g Thimble diameter: 15



• Fixture thickness: 6 mm
148-310-10
Mass: 55 g Thimble diameter: 20



• Fixture thickness: 6 mm
148-312-10
Mass: 103 g Thimble diameter: 29

(): with spindle fully retracted.



Need Repair?

Micrometer Head

Micrometer Heads SERIES 148 — Small Standard Type

- Measuring range: 13 mm

SPECIFICATIONS

Inch							
Order No.	Range (in)	Graduation (in)	Accuracy (in)	Stem dia. (in)	Stem	Spindle end	Graduation features
148-112-10	0 - 0.5	0.001	±0.0001	0.375	Plain	Flat	Standard
148-111-10					W/clamp nut		
148-123-10					Plain* ¹		
148-122-10					W/clamp nut* ¹		
148-811-10					Plain	Spherical (SR4)	
148-812-10					W/clamp nut		
148-813-10					Plain* ¹		
148-814-10					W/clamp nut* ¹		
148-831-10					Plain	Flat	Reverse reading
148-832-10					W/clamp nut		
148-833-10					Plain* ¹		
148-834-10					W/clamp nut* ¹		

- Spindle pitch: 0.025 in
- Measuring face: Material/Alloy tool steel, Hardness/60 HRC or more, Lapped
- Satin-chrome plated
- *¹ With spindle lock

Metric							
Order No.	Range (mm)	Graduation (mm)	Accuracy (μm)	Stem dia. (mm)	Stem	Spindle end	Graduation features
148-104-10	0 - 13	0.01	±2	9.5	Plain	Flat	Standard
148-103-10					W/clamp nut		
148-121-10					Plain*		
148-120-10					W/clamp nut*		
148-801-10					Plain	Spherical (SR4)	
148-802-10					W/clamp nut		
148-803-10					Plain*		
148-804-10					W/clamp nut*		
148-821-10					Plain	Flat	Reverse reading
148-822-10					W/clamp nut		
148-823-10					Plain*		
148-824-10					W/clamp nut*		

- Spindle pitch: 0.5 mm
- Measuring face: Material/Alloy tool steel, Hardness/60 HRC or more, Lapped
- Satin-chrome plated
- * With spindle lock

Micrometer Head

Micrometer Heads SERIES 148 — Small Standard Type

DIMENSIONS

Plain Stem Mass: 30 g Unit: mm

Plain stem

Plain stem Spherical face

Plain stem

Spherical face
148-801-10
SR4 *1

Reverse reading
148-821-10
*1

148-104-10

*1 Other dimensions are the same as **148-104-10**.

Plain Stem and Spindle Lock Mass: 40 g

Plain stem

Plain stem Spherical face

Plain stem

Spherical face
148-803-10
SR4 *2

Reverse reading
148-823-10
*2

148-121-10

*2 Other dimensions are the same as **148-121-10**.
(): with spindle fully retracted.



Where to Buy

Micrometer Head

DIMENSIONS

Stem Locknut Mass: 35 g Unit: mm

Technical drawing of Stem Locknut 148-802-10. Dimensions: $\phi 5$, $\phi 14$, 4, $\phi 9.5_{-0.009}^0$, 9.5 (14), 31.5 (44.5), 3.5, Locknut M9.5x0.5, Set screw, $\phi 13$.

Assembly options:

- Stem locknut
- Stem locknut Spherical face
- Stem locknut

Accessories:

- Spherical face **148-802-10** *1
- Reverse reading **148-822-10** *1

*1 Other dimensions are the same as **148-103-10**.

Stem Locknut and Spindle Lock Mass: 45 g

Technical drawing of Stem Locknut and Spindle Lock 148-120-10. Dimensions: $\phi 5$, $\phi 14$, 4, $\phi 9.5_{-0.009}^0$, $\phi 15$ Spindle lock, 9.5 (14), 40.1 (53.1), 3.5, Locknut M9.5x0.5, Set screw, $\phi 13$.

Assembly options:

- Stem locknut
- Stem locknut Spherical face
- Stem locknut

Accessories:

- Spherical face **148-804-10** *2
- Reverse reading **148-824-10** *2

*2 Other dimensions are the same as **148-120-10**.
(): with spindle fully retracted.

B

Micrometer Head

Micrometer Heads

SERIES 148 — Small Thimble Diameter Standard Type

- Measuring range: .5 in or 13 mm
- The thimble can be set to zero at any position by loosening the set screw.

B

SPECIFICATIONS

Inch								
Order No.	Range (in)	Graduation (in)	Accuracy (in)	Stem dia. (in)	Stem	Spindle end	Special features	
148-501	0 - 0.5	0.001	±0.0001	0.375	Plain	Flat	Standard	
148-507					W/clamp nut			
148-505					Plain* ¹			
148-502					W/clamp nut* ¹			
148-851					Plain	Spherical (SR4)		
148-852					W/clamp nut* ¹			
148-861					Plain	Flat		Reverse reading
148-862					W/clamp nut* ¹			

- Spindle pitch: 0.025 in
- Measuring face: Material/Alloy tool steel, Hardness/60 HRC or more, Lapped
- Satin-chrome plated

*¹ With spindle lock

Metric								
Order No.	Range (mm)	Graduation (mm)	Accuracy (μm)	Stem dia. (mm)	Stem	Spindle end	Special features	
148-503	0 - 13	0.01	±2	9.5	Plain	Flat	Standard	
148-508					W/clamp nut			
148-506					Plain* ¹			
148-504					W/clamp nut* ¹			
148-853					Plain	Spherical (SR4)		
148-854					W/clamp nut* ¹			
148-863					Plain	Flat		Reverse reading
148-864					W/clamp nut* ¹			
148-858* ²					W/clamp nut	Spherical (SR4)		Standard
148-866* ²					Plain* ¹	Flat		Reverse reading
148-856* ²					Plain* ¹	Spherical (SR4)		Standard
148-868* ²					W/clamp nut	Flat		Reverse reading

- Spindle pitch: 0.5 mm
- Measuring face: Material/Alloy tool steel, Hardness/60 HRC or more, Lapped
- Satin-chrome plated

*¹ With spindle lock

*² Made-to-order models



Get a Quote

Micrometer Head

DIMENSIONS

Plain Stem Mass: 35 g Unit: mm

Technical drawing of the plain stem micrometer head (148-503) showing dimensions and callouts:

- Dimensions: $\phi 5$, 9.5 (12), 37 (50), $\phi 9.5^{+0.009}$, $\phi 13$, Cap.
- Callouts: Plain stem, Spherical face 148-853, SR4 *1, Reverse reading 148-863 *1.

Plain Stem and Spindle Lock Mass: 35 g

Technical drawing of the plain stem and spindle lock micrometer head (148-506) showing dimensions and callouts:

- Dimensions: $\phi 5$, 9.5 (12), 45.6 (58.6), $\phi 9.5^{+0.009}$, $\phi 15$ Spindle lock, Cap.
- Callouts: Plain stem, Plain stem Spherical face, SR4 *2, Reverse reading 148-866 *2.

*1 Other dimensions are the same as 148-503.

*2 Other dimensions are the same as 148-506. (): with spindle fully retracted.

B

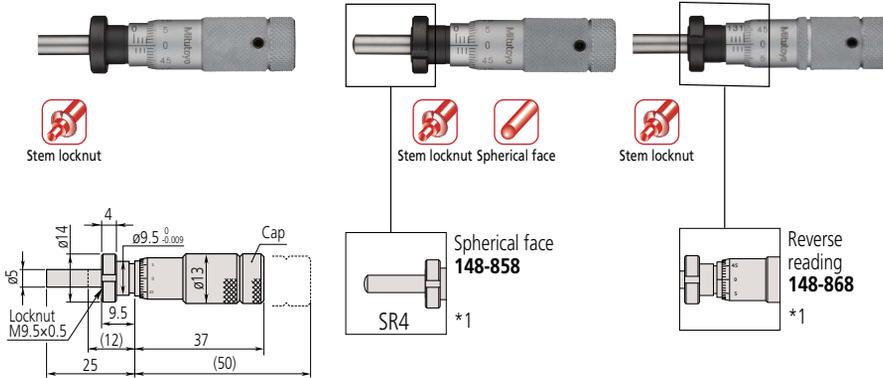
Micrometer Head

Micrometer Heads SERIES 148 — Small Thimble Diameter Standard Type

DIMENSIONS

Stem Locknut Mass: 40 g

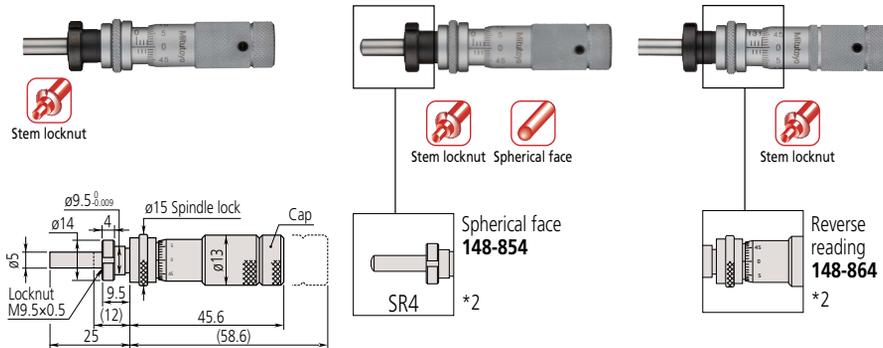
Unit: mm



• Fixture thickness: 6 mm
148-508

*1 Other dimensions are the same as **148-508**.

Stem Locknut and Spindle Lock Mass: 40 g



• Fixture thickness: 6 mm
148-504

*2 Other dimensions are the same as **148-504**.
() : with spindle fully retracted.



Need Support?

Micrometer Head

Micrometer Heads SERIES 148 — Locking-screw Type

- This model with enhanced clamping force created by a locking screw can be reliably used on positioning equipment or instruments constantly exposed to vibration.
- Position of the locking screw is the same as the sleeve index line.

Secure spindle



SPECIFICATIONS

Inch								
Order No.	Range (in)	Graduation (in)	Stem dia. (in)	Stem	Spindle end	Graduation features	Accuracy (in)	
148-230-10	0 - 0.25	0.001	0.25	Plain	Flat	Standard	±0.00025	
148-231-10				W/clamp nut				
148-232-10				Plain	Spherical (SR3)			
148-233-10	W/clamp nut							
148-160-10	0 - 0.5		0.375	Plain	Flat			±0.0001
148-161-10				W/clamp nut	Spherical (SR4)			
148-162-10		Plain						
148-163-10	0 - 0.25	0.375	W/clamp nut	Flat	±0.0001			
148-326-10			Plain					
148-327-10			W/clamp nut	Spherical (SR4)				
148-328-10	Plain							
148-329-10			W/clamp nut					

- Measuring face: Material/Alloy tool steel, Hardness/60 HRC or more, Lapped
- Satin-chrome plated

Metric								
Order No.	Range (mm)	Graduation (mm)	Stem dia. (mm)	Stem	Spindle end	Graduation features	Accuracy (µm)	
148-220-10	0 - 6.5	0.01	6	Plain	Flat	Standard	±5	
148-221-10				W/clamp nut				
148-222-10				Plain	Spherical (SR3)			
148-223-10	W/clamp nut							
148-150-10	0 - 13		9.5	Plain	Flat			±2
148-151-10				W/clamp nut	Spherical (SR4)			
148-152-10		Plain						
148-153-10	0 - 6.5	9.5	W/clamp nut	Flat	±2			
148-316-10			Plain					
148-317-10			W/clamp nut	Spherical (SR4)				
148-318-10	Plain							
148-319-10			W/clamp nut					

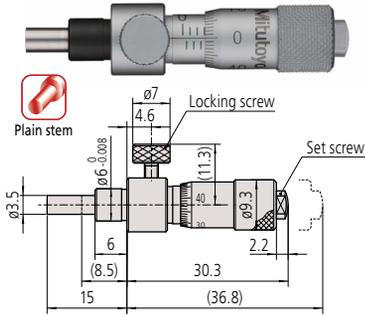
- Measuring face: Material/Alloy tool steel, Hardness/60 HRC or more, Lapped
- Satin-chrome plated

Micrometer Head

Micrometer Heads SERIES 148 — Locking-screw Type

DIMENSIONS

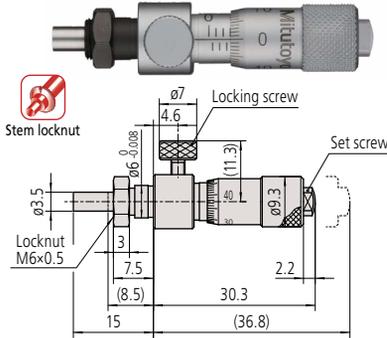
Plain Stem



148-220-10 Mass: 16 g

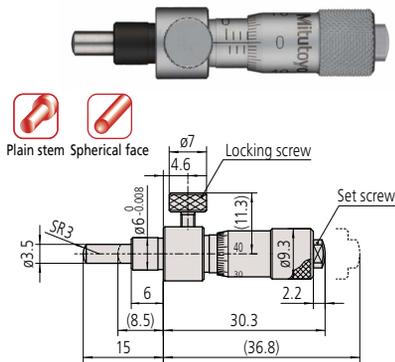
Stem Locknut

Unit: mm



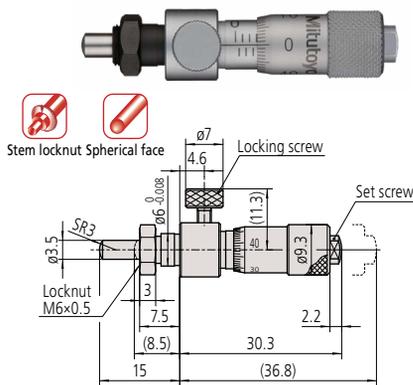
• Fixture thickness: 4 mm
148-221-10 Mass: 17 g

Plain Stem



Spherical face (SR3)
148-222-10 Mass: 16 g

Stem Locknut



Spherical face (SR3) • Fixture thickness: 4 mm
148-223-10 Mass: 17 g

(): with spindle fully retracted.

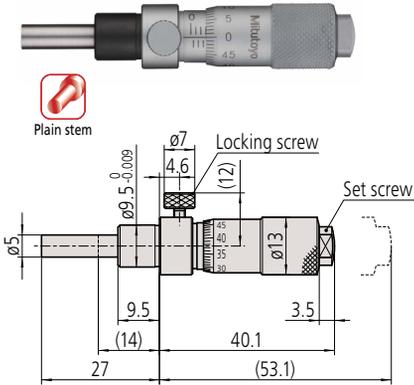


Need Service?

Micrometer Head

DIMENSIONS

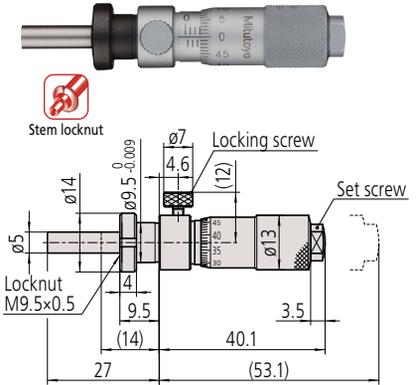
Plain Stem



148-150-10 Mass: 40 g

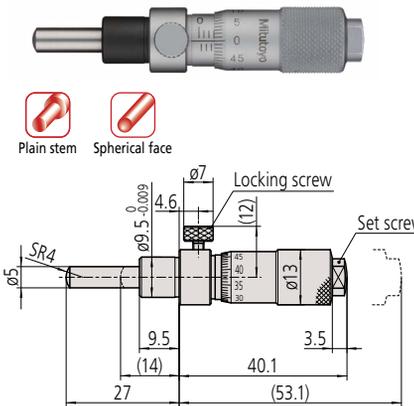
Stem Locknut

Unit: mm



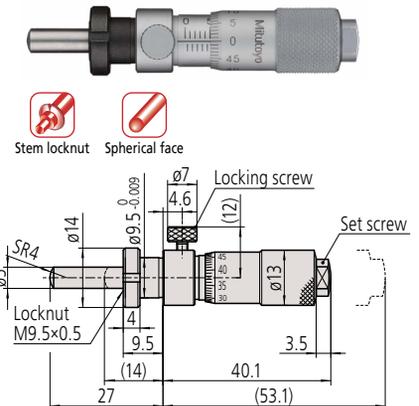
• Fixture thickness: 6 mm
148-151-10 Mass: 43 g

Plain Stem



Spherical face (SR4)
148-152-10 Mass: 40 g

Stem Locknut



Spherical face (SR4) • Fixture thickness: 6 mm
148-153-10 Mass: 43 g

(): with spindle fully retracted.

Micrometer Head

Micrometer Heads SERIES 148 — Locking-screw Type

DIMENSIONS

Plain Stem

Stem Locknut

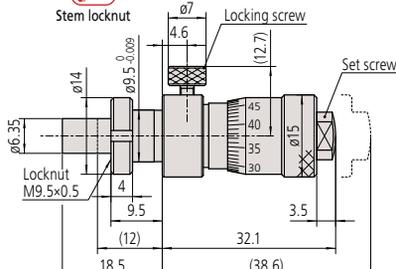
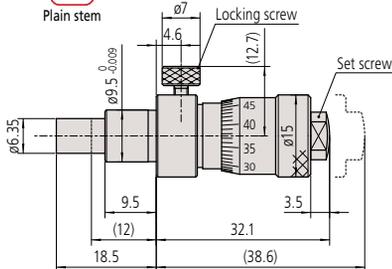
Unit: mm



Plain stem



Stem locknut



148-316-10 Mass: 40 g

• Fixture thickness: 6 mm
148-317-10 Mass: 43 g

Plain Stem

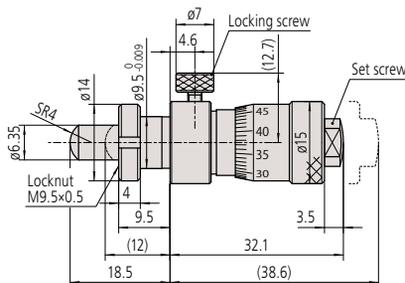
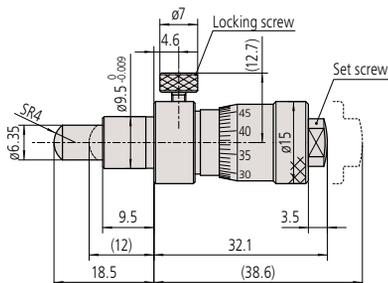
Stem Locknut



Plain stem Spherical face



Stem locknut Spherical face



Spherical surface (SR4)
148-318-10 Mass: 40 g

Spherical surface (SR4) • Fixture thickness: 6 mm
148-319-10 Mass: 43 g

(): with spindle fully retracted.



Need Calibration?

Micrometer Head

Spindle Pitch



Pitch=0.1 mm

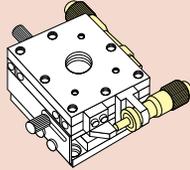


Pitch=0.5 mm

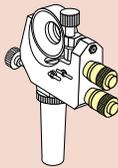
Typical Applications

- Semiconductor-wafer positioning machinery and optical component alignment units, etc.

- Precision X-Y table positioning



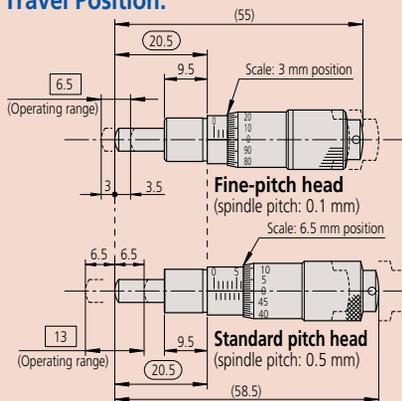
- Precision adjustment of mirror in holder



Precision adjustment of mirror in holder



Comparison of Mounting Dimensions Between a Fine-pitch Head and a Standard-pitch Head at the Mid-range Travel Position.



Note: While the fine-pitch micrometer head has a measuring range of 6.5 mm, the standard head has a larger range of 13 mm. When replacing a standard head, the fine-pitch type can use the common range in the middle of the spindle travel. The standard and compact types of fine-pitch head are otherwise completely interchangeable.

Micrometer Heads

SERIES 148 — Fine Spindle Feed of 0.1 mm/rev

- Fine spindle feeding of just 0.1 mm/rev (one fifth compared with standard model). Suitable for extra-fine adjustment and positioning.
- External dimensions are compatible with standard 0.5 mm pitch heads.
- Suitable for the fine feeding of precision stages on semiconductor equipment and optical-axis alignment device.

SPECIFICATIONS

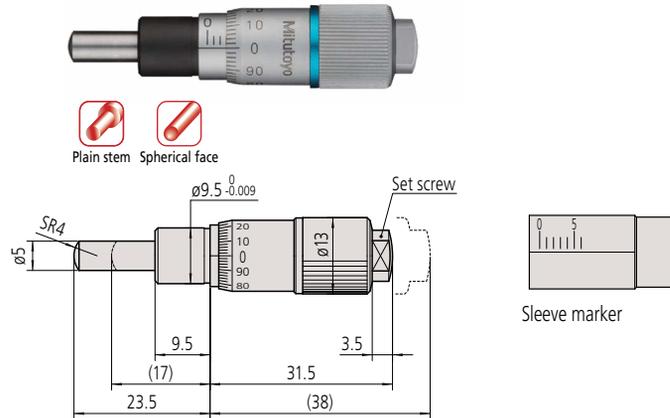
Metric								
Code No.	Range (mm)	Graduation (mm)	Stem dia. (mm)	Stem	Spindle end	Spindle pitch (mm)	Maximum permissible error J_{MPE} (μ m)	Special features
148-142-10	0 - 6.5	0.002	9.5	Plain	Spherical (SR4)	0.1	± 2	—
148-143-10				W/clamp nut				
148-342-10				Plain				
148-343-10			W/clamp nut					
148-242-10			6	Plain	Spherical (SR3)			
148-243-10				W/clamp nut			± 5	Small thimble diameter
148-244	0 - 5	0.004	3.5	Plain	Spherical (SR1.5)			
148-245					W/clamp nut			

- Measuring face: Material/Alloy tool steel, Hardness/60 HRC or more, Lapped
- Satin-chrome plated

DIMENSIONS

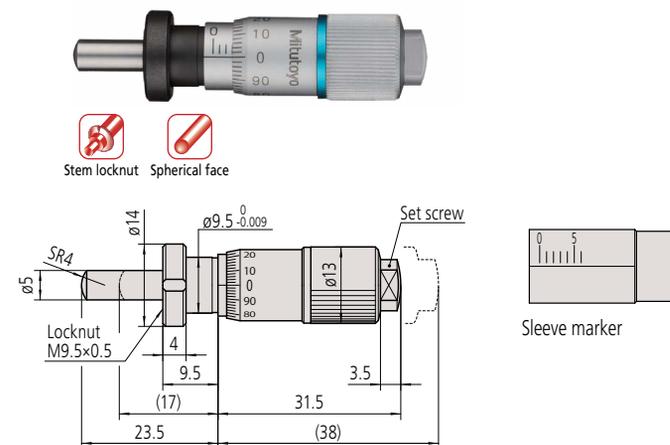
Plain Stem

Unit: mm



148-142-10 Mass: 31 g

Stem Locknut



• Fixture thickness: 6 mm
148-143-10 Mass: 34 g

() : with spindle fully retracted.

Micrometer Head

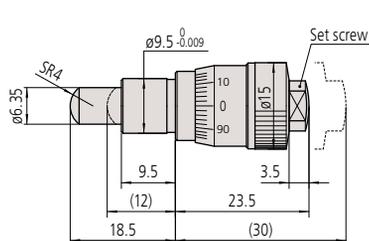
Micrometer Heads SERIES 148 — Fine Spindle Feed of 0.1 mm/rev

DIMENSIONS

Plain Stem



Plain stem Spherical face

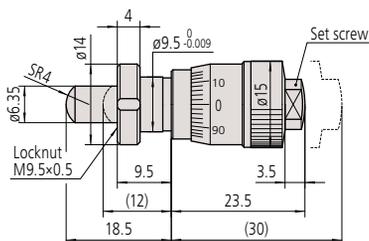


148-342-10 Mass: 29 g

Stem Locknut

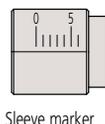


Stem locknut Spherical face



• Fixture thickness: 6 mm
148-343-10 Mass: 31 g

Unit: mm

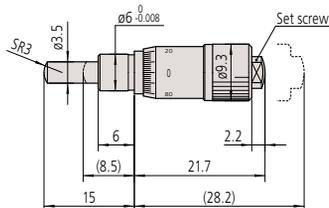


Sleeve marker

Plain Stem



Plain stem Spherical face

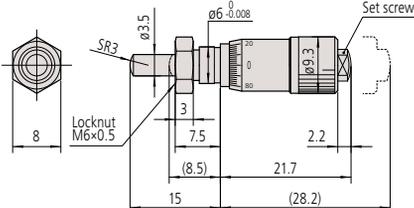


148-242-10 Mass: 10 g

Stem Locknut



Stem locknut Spherical face



• Fixture thickness: 4 mm
148-243-10 Mass: 10 g

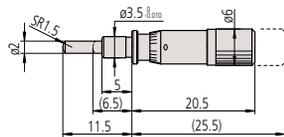


Sleeve marker

Plain Stem



Plain stem Spherical face

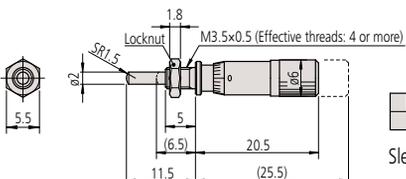


148-244 Mass: 4 g

Stem Locknut



Stem locknut Spherical face



• Fixture thickness: 3 mm
148-245 Mass: 5 g



Sleeve marker

(): with spindle fully retracted.



Find a Distributor

Micrometer Head

Micrometer Heads SERIES 148 — Fine Spindle Feed of 0.25 mm/rev

- Fine spindle feeding of just 0.25 mm/rev for fine adjustment and positioning.

SPECIFICATIONS

Metric							
Order No.	Range (mm)	Graduation (mm)	Stem dia. (mm)	Stem	Spindle end	Spindle pitch (mm)	Accuracy (μm)
148-132-10	0 - 13	0.01	9.5	Plain	Spherical (SR4)	0.25	±2
148-133-10				W/clamp nut			
148-322-10	0 - 6.5	0.01	9.5	Plain	Spherical (SR4)	0.25	±2
148-323-10				W/clamp nut			

- Measuring face: Material/Alloy tool steel, Hardness/60 HRC or more, Lapped
- Satin-chrome plated

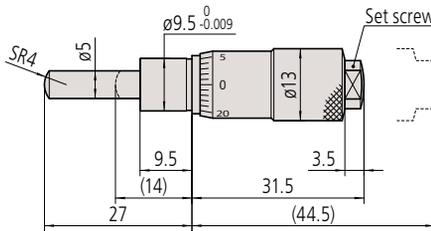
DIMENSIONS

Plain Stem






Plain stem Spherical face



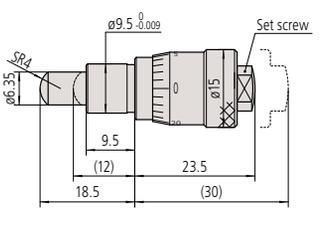
148-132-10 Mass: 30 g

Plain Stem






Plain stem Spherical face



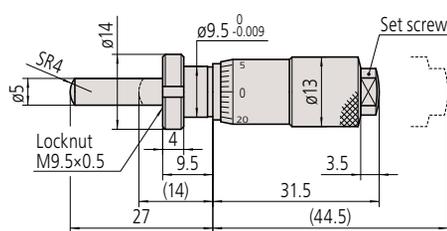
148-322-10 Mass: 30 g

Stem Locknut






Stem locknut Spherical face



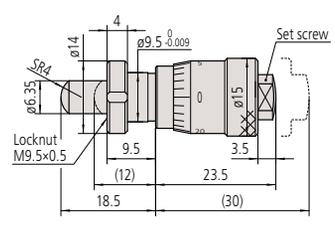
• Fixture thickness: 6 mm
148-133-10 Mass: 35 g

Stem Locknut






Stem locknut Spherical face



• Fixture thickness: 6 mm
148-323-10 Mass: 35 g

() : with spindle fully retracted.

Micrometer Head

Micrometer Heads SERIES 110 — Differential Screw Thread Translator (Extra-Fine Feed) Type

- Differential movements of spindle threads and units allow extra-fine spindle feeding (down to 0.025 mm/rev, .001 in/rev), resulting in high-resolution measurements.

SPECIFICATIONS

Inch					
Order No.	Range (in)		Graduation (in)		Graduation features
110-111	0 - 0.05		0.00002		Standard
110-112			0.000005		Fine
110-115-10	0 - 0.02		0.00002		Standard
110-116-10			0.000005		Fine
110-117-10			0.00002		Standard
110-118-10			0.000005		Fine
110-504-10	Thimble (fine)	0 - 0.006	Thimble (fine)	0.00002	Dual scales; 0.2 mm/0.006 in fine-feed range
	Thimble (coarse)	0 - 0.5	Thimble (coarse)	0.001	

Order No.	Stem dia. (in)	Stem	Spindle end	Accuracy*1 (in)
110-111	0.5	W/clamp nut	Flat (carbide tip)	±0.00025/±0.00006
110-112				
110-115-10				
110-116-10				
110-117-10				
110-118-10	Spherical (SR10) (carbide tip)	Spherical	±0.00015/±0.00006	
110-504-10				

Metric					
Order No.	Range (mm)		Graduation (mm)		Graduation features
110-101	0 - 2.5		0.001		Standard
110-102			0.0001		Fine
110-105-10	0 - 1		0.001		Standard
110-106-10			0.0001		Fine
110-107-10			0.001		Standard
110-108-10			0.0001		Fine
110-502-10	Thimble (fine)	0 - 0.2	Thimble (fine)	0.0005	Dual scales; 0.2 mm fine-feed range
	Thimble (coarse)	0 - 13	Thimble (coarse)	0.01	

Order No.	Stem dia. (mm)	Stem	Spindle end	Accuracy*1 (μm)
110-101	12	W/clamp nut	Flat (carbide tip)	±5/±1.5
110-102				
110-105-10				
110-106-10				
110-107-10				
110-108-10	Spherical (SR10) (carbide tip)	Spherical	±3/±1.5	
110-502-10				

- Measuring face: Material/Carbide tip (110-502-10/504-10 are alloy tool steel), Hardness/90 HRA or more (Only 110-502-10/504-10 are 60 HRC or more), Lapped
- Satin-chrome plated
- *1 Wide range/narrow range (Narrow range: 1 rev)



110-502-10



110-504-10



Got Questions?

Micrometer Head

DIMENSIONS

Unit: mm

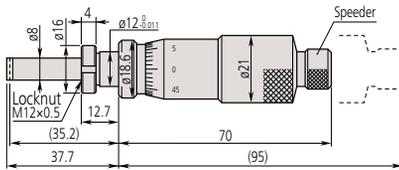
- Differential movement mechanism with double spindle.
- Non-rotating spindle.
- Fixture thickness: 9.5 mm



Equipped with Vernier scale



Stem locknut



110-101
110-102 Equipped with Vernier scale

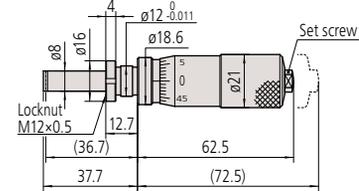
- Differential movement mechanism with double spindle.
- Non-rotating spindle.
- Fixture thickness: 9.5 mm



Equipped with Vernier scale



Stem locknut

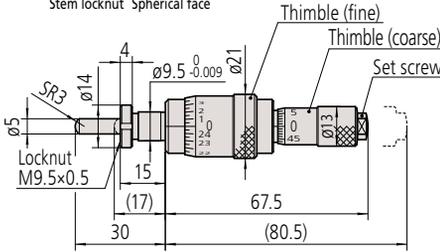


110-105-10
110-106-10 Equipped with Vernier scale Mass: 150 g

- Dual thimble
- Fixture thickness: 11.5 mm



Stem locknut Spherical face



110-502-10 Mass: 95 g

Spherical face



Equipped with vernier scale



Stem locknut Spherical face



110-107-10
110-108-10 Equipped with Vernier scale

() : with spindle fully retracted.

Micrometer Head

Micrometer Heads SERIES 149 — Small Standard Type with Carbide-tipped Spindle

- Carbide-tipped spindle provides high abrasion resistance.

SPECIFICATIONS

Inch								
Order No.	Range (in)	Graduation (in)	Accuracy (in)	Stem dia. (in)	Stem	Spindle end	Graduation features	
149-148-10	0 - 0.5	0.001	±0.0001	0.375	Plain	Flat (carbide tip)	Standard	
149-147-10					W/clamp nut			
149-185-10*3					Plain*1			
149-182-10					W/clamp nut*1	Spherical (SR4) (carbide tip)		
149-811-10					Plain			
149-812-10					W/clamp nut			
149-831-10*2					Plain	Flat (carbide tip)		Reverse reading
149-832-10*2					W/clamp nut			Standard
149-181*2					Plain*1			

Metric								
Order No.	Range (mm)	Graduation (mm)	Accuracy (µm)	Stem dia. (mm)	Stem	Spindle end	Graduation features	
149-132-10	0 - 15	0.01	±2	9.5	Plain	Flat (carbide tip)	Standard	
149-131-10					W/clamp nut			
149-183-10					Plain*1			
149-184-10					W/clamp nut*1	Spherical (SR4) (carbide tip)		
149-801-10					Plain			
149-802-10					W/clamp nut			
149-821-10					Plain	Flat (carbide tip)		Reverse reading
149-822-10					W/clamp nut			Standard
149-803-10*2					Plain*1			
149-804-10*2	W/clamp nut*1	Flat (carbide tip)	Reverse reading					
149-823-10*2	Plain*1							
149-824-10*2	W/clamp nut*1							

- Spindle pitch: 0.5 mm or 0.025 in
 - Measuring face: Material/Carbide tip, Hardness/90 HRA or more, Lapped
 - Satin-chrome plated
- *1 With spindle lock *2 Made-to-order models *3 W/ratchet (149-181) is available

DIMENSIONS

Plain Stem Mass: 55 g Unit: mm

Technical drawing of Plain Stem micrometer head (149-132-10) showing dimensions: $\phi 6.35$, 15, 3.5, 32, (17), 43.5, (58.5), $\phi 9.5 \pm 0.009$, and Set screw. Assembly options include Plain stem, Spherical face (SR4) *1, and Reverse reading *1.

Plain Stem and Spindle Lock Mass: 55 g

Technical drawing of Plain Stem and Spindle Lock micrometer head (149-183-10) showing dimensions: $\phi 6.35$, 9.5, 3.5, 26.5, (11.5), 49, (64), $\phi 9.5 \pm 0.009$, $\phi 15$ Spindle lock, and Set screw. Assembly options include Plain stem, Spherical face (SR4) *2, and Reverse reading *2.

*1 Other dimensions are the same as 149-132-10.
*2 Other dimensions are the same as 149-183-10.
() : with spindle fully retracted.



Talk to Sales

Micrometer Head

Micrometer Heads SERIES 149 — Small Standard Type with Carbide-tipped Spindle

DIMENSIONS

Stem Locknut Mass: 60 g Unit: mm

Stem locknut

Stem locknut Spherical face Stem locknut

Spherical face
149-802-10
SR4 *1

Reverse reading
149-822-10
*1

- Fixture thickness: 11.5 mm
149-131-10

*1 Other dimensions are the same as **149-131-10**.

Stem Locknut and Spindle Lock Mass: 60 g

Stem locknut

Stem locknut Spherical face Stem locknut

Spherical face
149-804-10
SR4 *2

Reverse reading
149-824-10
*2

- Fixture thickness: 6 mm
149-184-10

*2 Other dimensions are the same as **149-184-10**.
(): with spindle fully retracted.

B

Micrometer Head

Micrometer Heads SERIES 150 — Medium-sized Standard Type

- Measuring range: 1 in or 25 mm

SPECIFICATIONS

Inch							
Order No.	Range (in)	Graduation (in)	Accuracy (in)	Stem dia. (in)	Stem	Spindle end	Special features
150-208	0 - 1	0.001	±0.0001	0.375	Plain	Flat (carbide tip)	Standard
150-207					W/clamp nut		
150-213					Plain* ¹		
150-214					W/clamp nut* ¹	Spherical (SR4) (carbide tip)	
150-811					Plain		
150-812					W/clamp nut		
150-831		Plain			Reverse graduation		
150-832		W/clamp nut					
150-206		Plain					
150-205		0.0001			W/clamp nut	Flat (carbide tip)	W/Vernier (0.0001 in)
150-215					Plain* ¹		
150-216					W/clamp nut* ¹		
150-198-10		0.001			Plain		W/O ratchet stop
150-197-10					W/clamp nut		
150-217* ²					Plain* ¹		
150-218* ²					W/clamp nut* ¹		

- Spindle pitch: 0.025 in
- Measuring face: Material/Carbide tip (only long spindle model is alloy tool steel), Hardness/90 HRA or more (only long spindle model is 60 HRC or more), Lapped
- Satin-chrome plated
- *1 With spindle lock
- *2 Made-to-order models

Metric							
Order No.	Range (mm)	Graduation (mm)	Accuracy (μm)	Stem dia. (mm)	Stem	Spindle end	Special features
150-192	0 - 25	0.01	±2	10	Plain	Flat (carbide tip)	Standard
150-191					W/clamp nut		
150-209					Plain* ¹		
150-210					W/clamp nut* ¹	Spherical (SR4) (carbide tip)	
150-801					Plain		
150-802					W/clamp nut		
150-821		Plain			Reverse reading		
150-822		W/clamp nut					
150-190		Plain					
150-189		0.001			W/clamp nut	Flat (carbide tip)	W/Vernier (0.001 mm)
150-183* ²					Plain* ¹		
150-184					W/clamp nut* ¹		
150-196-10		0.01			Plain		W/o ratchet stop
150-195-10					W/clamp nut		
150-211-10					Plain* ¹		
150-212-10					W/clamp nut* ¹		
150-803* ²		0.001			Plain* ¹	Spherical (SR4) (carbide tip)	Standard
150-804* ²					W/clamp nut* ¹		
150-823* ²	Plain* ¹						
150-824* ²	W/clamp nut* ¹	Flat (carbide tip)	Reverse reading				

- Spindle pitch: 0.5 mm
- Measuring face: Material/Carbide tip (Only long spindle model is alloy tool steel), Hardness/90 HRA or more (Only long spindle model is 60 HRC or more), Lapped
- Satin-chrome plated
- *1 With spindle lock
- *2 Made-to-order models



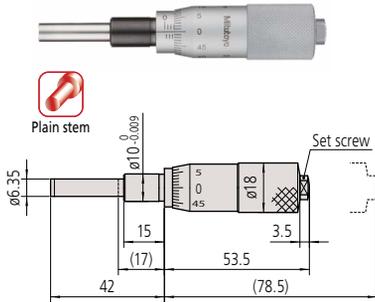
Need Repair?

Micrometer Head

Micrometer Heads SERIES 150 — Medium-sized Standard Type

DIMENSIONS

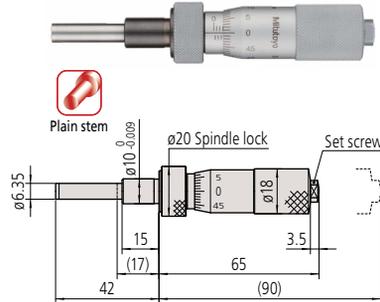
Plain Stem



150-196-10 Mass: 95 g

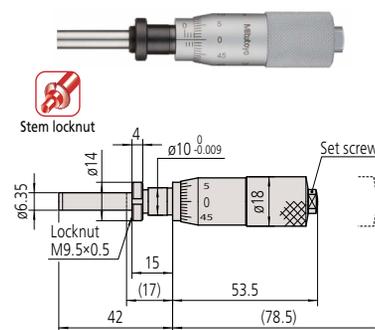
Plain Stem and Spindle Lock

Unit: mm



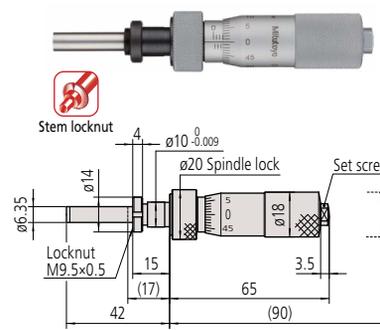
150-211-10 Mass: 115 g

Stem Locknut



Fixture thickness: 11.5 mm
150-195-10 Mass: 110 g

Stem Locknut and Spindle Lock



Fixture thickness: 11.5 mm
150-212-10 Mass: 115 g

(): with spindle fully retracted.

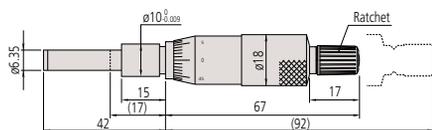
Micrometer Head

DIMENSIONS

Plain Stem Mass: 95 g



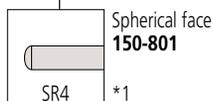
Plain stem



150-192



Plain stem Spherical face

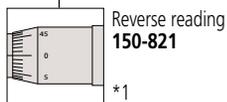


Spherical face
150-801

*1



Plain stem



Reverse reading
150-821

*1



Plain stem



Equipped with
Vernier scale
150-190

*1

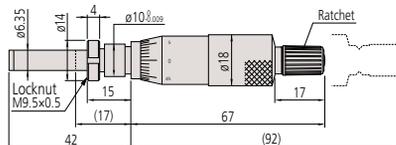
*1 Other dimensions are the same as **150-192**.

(): with spindle fully retracted. Unit: mm

Stem Locknut Mass: 100 g



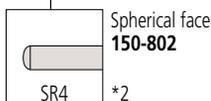
Stem locknut



• Fixture thickness: 11.5 mm
150-191



Stem locknut Spherical face

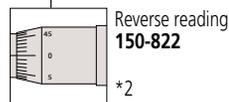


Spherical face
150-802

*2



Stem locknut

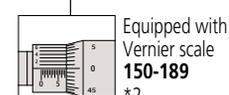


Reverse reading
150-822

*2



Stem locknut



Equipped with
Vernier scale
150-189

*2

*2 Other dimensions are the same as **150-191**.



Where to Buy

Micrometer Head

Micrometer Heads SERIES 150 — Medium-sized Standard Type

DIMENSIONS

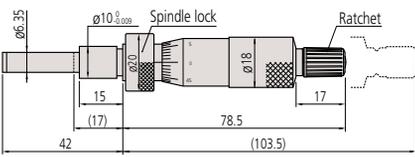
() : with spindle fully retracted. Unit: mm

Plain Stem and Spindle Lock

Mass: 110 g



Plain stem



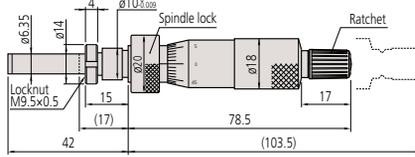
150-209

Stem Locknut and Spindle Lock

Mass: 115 g



Stem locknut



• Fixture thickness: 11.5 mm
150-210



Plain stem Spherical face



Spherical face
150-803
SR4 *1



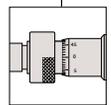
Stem locknut Spherical face



Spherical face
150-804
SR4 *2



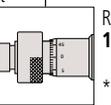
Plain stem



Reverse reading
150-823
*1



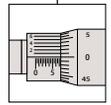
Stem locknut



Reverse reading
150-824
*2



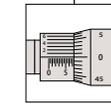
Plain stem



Equipped with Vernier scale
150-183
*1



Stem locknut



Equipped with Vernier scale
150-184
*2

*1 Other dimensions are the same as **150-209**. *2 Other dimensions are the same as **150-210**.

B

Micrometer Head

Micrometer Heads SERIES 151 — Medium-sized Standard Type with 8 mm Diameter Spindle

- Larger spindle (ø8 mm) for heavy-duty applications (normally ø6.35 mm).

B

SPECIFICATIONS

Inch									
Order No.	Range (in)	Graduation (in)	Accuracy (in)	Stem dia. (in)	Stem	Spindle end	Special features		
151-240	0 - 1	0.001	±0.0001	0.5	Plain	Flat (carbide tip)	—		
151-239					W/clamp nut				
151-238		0.0001			Plain		W/Vernier (0.0001 in)		
151-237					W/clamp nut				
151-241-10		0.001			0.001		Plain* ¹	W/o ratchet stop	
151-242-10							W/clamp nut* ¹		
151-243-10							Plain* ¹		W/o ratchet stop (0.0001 in)
151-244-10							W/clamp nut* ¹		
151-272		0 - 2			±0.0002		Plain	—	
151-271							W/clamp nut		

- Spindle pitch: 0.025 in
- Measuring face: Material/Carbide tip, Hardness/90 HRA or more, Lapped
- Satin-chrome plated
- *¹ With spindle lock

Metric									
Order No.	Range (mm)	Graduation (mm)	Accuracy (µm)	Stem dia. (mm)	Stem	Spindle end	Special features		
151-224	0 - 25	0.01	±2	12	Plain	Flat (carbide tip)	—		
151-223					W/clamp nut				
151-214		0.001			0.001		Plain* ¹	W/Vernier (0.001 mm)	
151-213							W/clamp nut* ¹		
151-222		0.01			0.01		Plain	W/o ratchet stop	
151-221							W/clamp nut		
151-212* ²							Plain* ¹		
151-211							W/clamp nut* ¹		
151-227-10		0 - 50			0.01		±4	Plain	—
151-228-10								W/clamp nut	
151-225-10	Plain* ¹		W/o ratchet stop						
151-226-10	W/clamp nut* ¹								
151-256	0 - 50	0.01	±4	Plain	—				
151-255				W/clamp nut					
151-260-10				Plain		W/o ratchet stop			
151-259-10				W/clamp nut					

- Spindle pitch: 0.5 mm
- Measuring face: Material/Carbide tip, Hardness/90 HRA or more, Lapped
- Satin-chrome plated
- *¹ With spindle lock
- *² Made-to-order models

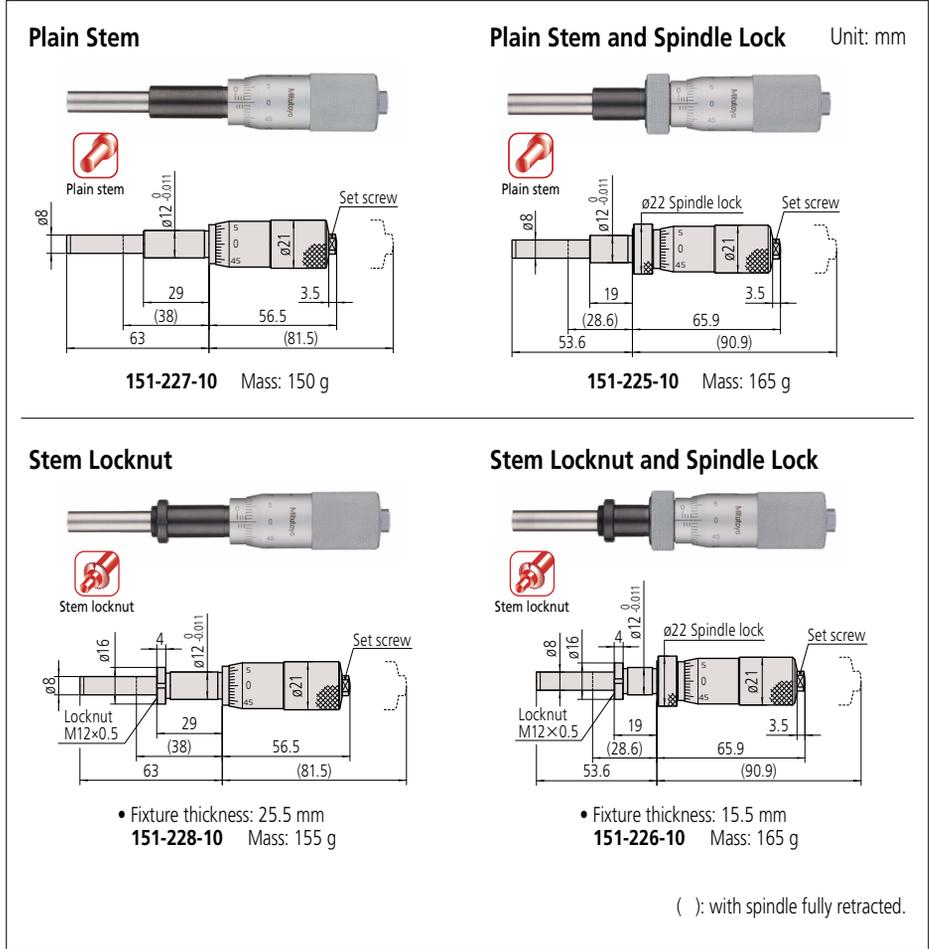


Get a Quote

Micrometer Head

Micrometer Heads SERIES 151 — Medium-sized Standard Type with 8 mm Diameter Spindle

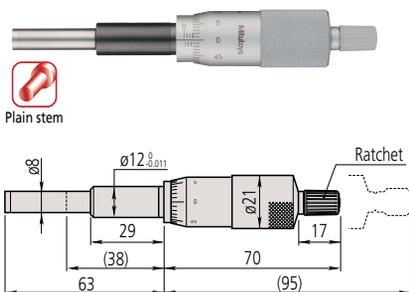
DIMENSIONS



Micrometer Head

DIMENSIONS

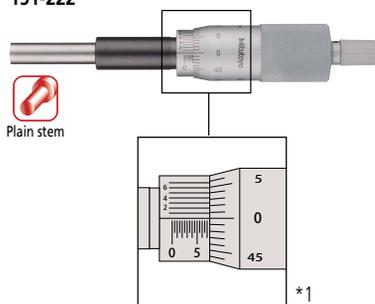
Plain Stem



151-224 Mass: 150 g

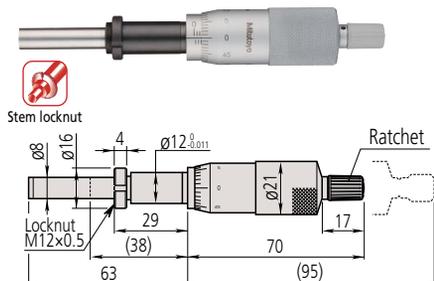
Equipped with Vernier scale 151-222

Unit: mm



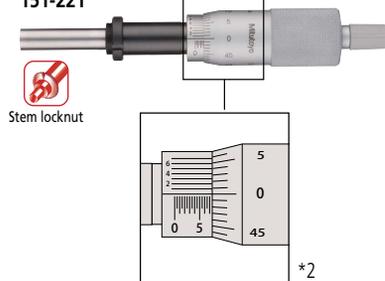
*1 Other dimensions are the same as **151-224**.

Stem Locknut



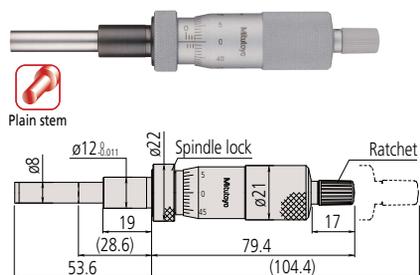
• Fixture thickness: 25.5 mm
151-223 Mass: 155 g

Equipped with Vernier scale 151-221



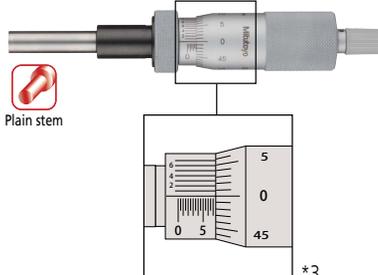
*2 Other dimensions are the same as **151-223**.

Stem Locknut and Spindle Lock



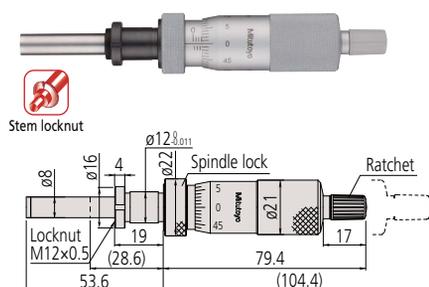
151-214 Mass: 160 g

Equipped with Vernier scale 151-212



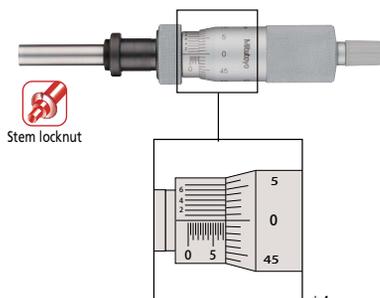
*3 Other dimensions are the same as **151-214**.

Stem Locknut and Spindle Lock



• Fixture thickness: 15.5 mm
151-213 Mass: 165 g

Equipped with Vernier scale 151-211



*4 Other dimensions are the same as **151-213**.
() : with spindle fully retracted.



Need Support?

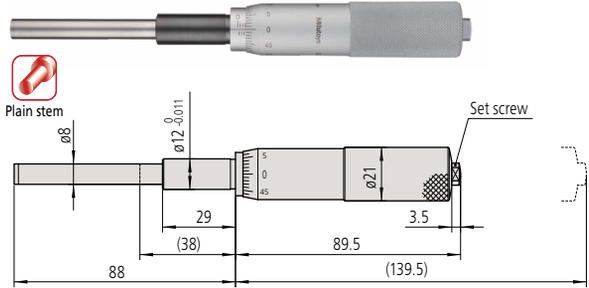
Micrometer Head

Micrometer Heads SERIES 151 — Medium-sized Standard Type with 8 mm Diameter Spindle

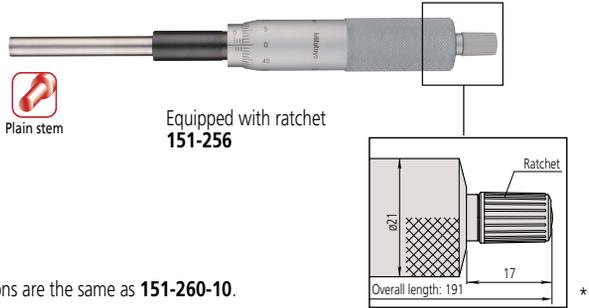
DIMENSIONS

Plain Stem

Unit: mm



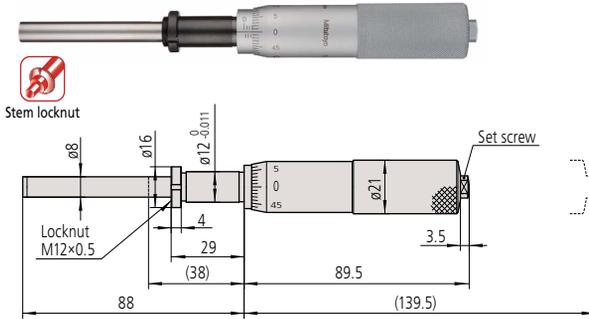
151-260-10 Mass: 240 g



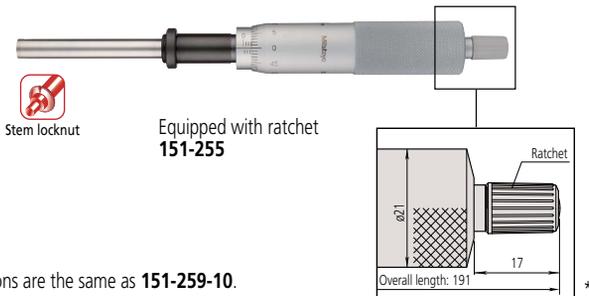
Equipped with ratchet
151-256

*1 Other dimensions are the same as **151-260-10**.

Stem Locknut



• Fixture thickness: 25.5 mm
151-259-10 Mass: 250 g



Equipped with ratchet
151-255

*2 Other dimensions are the same as **151-259-10**.
() : with spindle fully retracted.

Micrometer Head

Micrometer Heads

SERIES 153 — Non-rotating Spindle Type

- Micrometer head with non-rotating spindle.
- Torsion-free feed reduces workpiece deformation and wear.
- Allows highly accurate positioning.

SPECIFICATIONS

Inch								
Order No.	Range (in)	Graduation (in)	Graduation features	Stem dia. (in)	Stem	Spindle end	Spindle pitch (in)	Accuracy (in)
153-108	0 - 0.5	0.001	W/vernier (0.0001 in)	0.375	Plain	Flat (carbide tip)	0.025	±0.00015
153-205*1	0 - 1		Standard					
153-206*1		W/vernier (0.0001 in)						
153-207		Standard						
153-208		W/vernier (0.0001 in)						

Metric								
Order No.	Range (mm)	Graduation (mm)	Graduation features	Stem dia. (mm)	Stem	Spindle end	Spindle pitch (mm)	Accuracy (µm)
153-101	0 - 15	0.01	Standard	9.5	Plain	Flat (carbide tip)	0.5	±3
153-201*1	0 - 25		W/vernier (0.001 mm)					
153-202*1		Standard						
153-203		W/vernier (0.001 mm)						
153-204		Standard						

- Measuring face: Material/Carbide tip, Hardness/90 HRA or more, Lapped
- Satin-chrome plated
- *1 With ratchet stop

DIMENSIONS

Unit: mm



153-101 Mass: 70 g

153-201 Mass: 125 g



Equipped with ratchet and Vernier scale

153-202



Equipped with ratchet and Vernier scale

*1 Other dimensions are the same as 153-201.

153-203 Mass: 125 g



Without ratchet / Equipped with Vernier scale

153-204



Without ratchet / Equipped with Vernier scale

*2 Other dimensions are the same as 153-203. () : with spindle fully retracted.



Need Calibration?

Micrometer Head

Micrometer Heads SERIES 152 — Quick Spindle Feed of 1 mm/rev

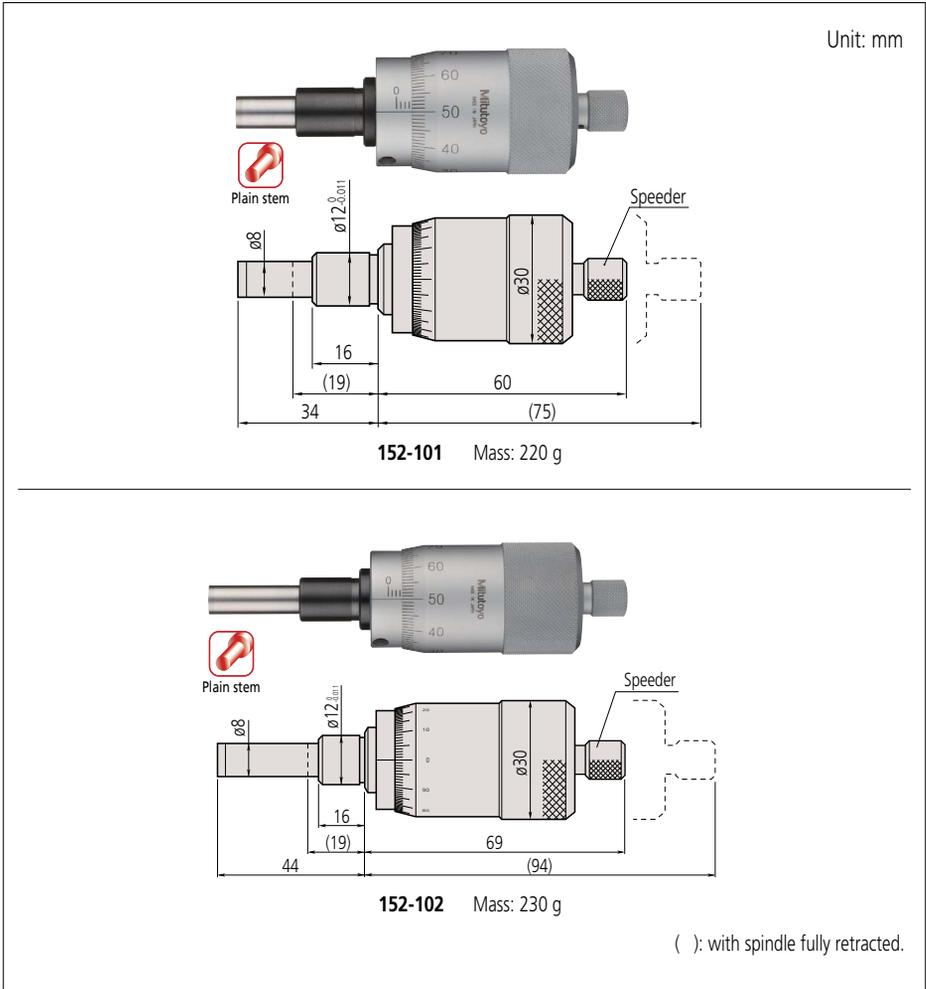
- This model enables double-speed spindle feeding of 1 mm/rev (compared with 0.5 mm/rev on typical products) to enable quick positioning.
- It also has a good load-bearing capacity.

SPECIFICATIONS

Metric							
Code No.	Range (mm)	Graduation (mm)	Stem dia. (mm)	Stem	Spindle end	Spindle pitch (mm)	Accuracy (μm)
152-101	0 - 15	0.01	12	Plain	Flat (carbide tip)	1	±2
152-102	0 - 25						

- Measuring face: Material/Carbide tip, Hardness/90 HRA or more, Lapped
- Satin-chrome plated

DIMENSIONS



Micrometer Head

Micrometer Heads SERIES 152 — Large Thimble Type

- Large-diameter thimble for fine adjustment and positioning.

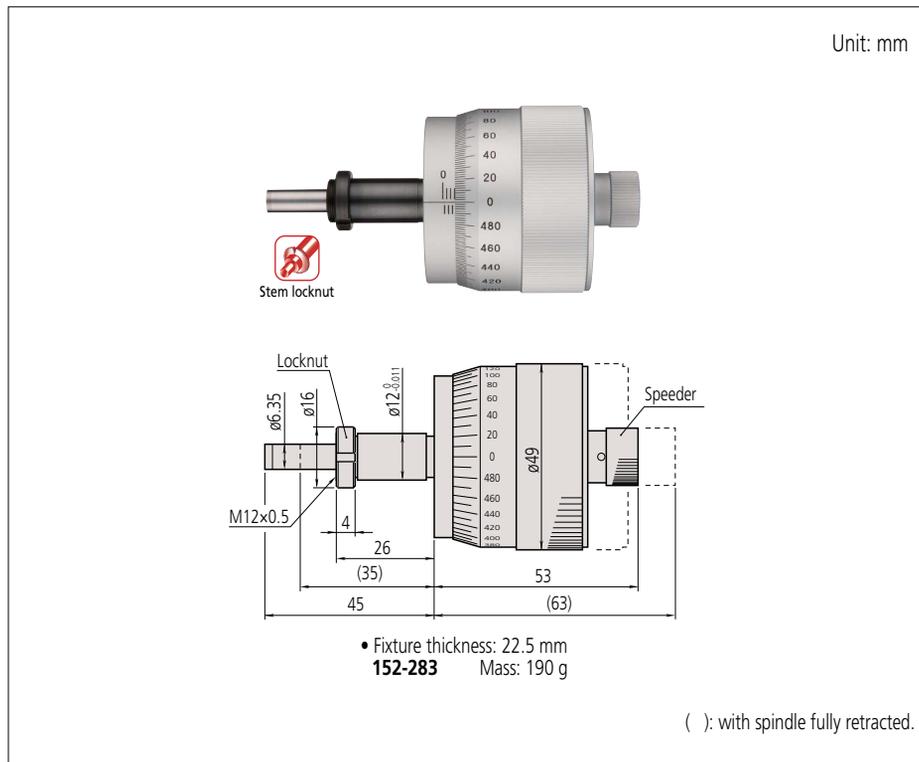
B

SPECIFICATIONS

Metric									
Code No.	Range (mm)	Graduation (mm)	Graduation features	Stem dia. (mm)	Stem	Spindle end	Spindle pitch (mm)	Accuracy (μm)	
152-283	0 - 10	0.002	Standard	12	W/clamp nut	Flat (carbide tip)	0.5	±2	
152-332	0 - 25				Plain			±4	
152-380	0 - 50		Bidirectional		±4				

- Measuring face: Material/Carbide tip, Hardness/90 HRA or more, Lapped
- Scale finishing: White anodized aluminum

DIMENSIONS

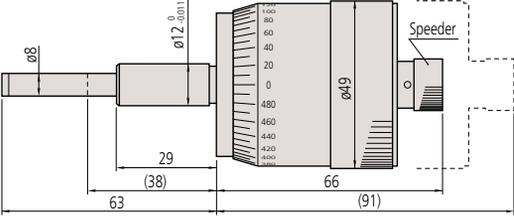


Find a Distributor

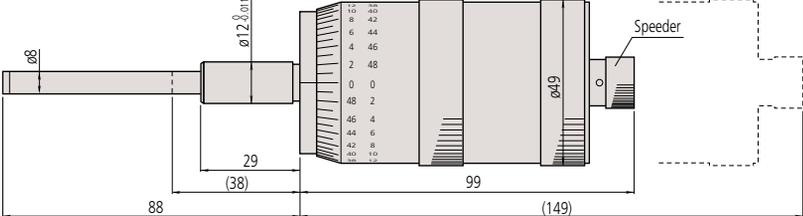
Micrometer Head

DIMENSIONS

Unit: mm



152-332 Mass: 310 g



152-380 Mass: 460 g

() : with spindle fully retracted.

B

Micrometer Head

Micrometer Heads SERIES 152 — XY-Stage Type

- Designed for cross-travel stage translation in the X and Y axes. Bidirectional graduation for easy reading in both directions.

SPECIFICATIONS

Metric							
Code No.	Range (mm)	Graduation (mm)	Graduation features	Stem dia. (mm)	Stem	Spindle pitch (mm)	Accuracy (μm)
152-390	0 - 25	0.005	for X-axis, bidirectional	18	Plain	1	± 2
152-389			for Y-axis, bidirectional				

- Measuring face: Material/Carbide tip (**152-389/390** are alloy tool steel), Hardness/90 HRA or more (**152-389/390** are 60 HRC or more), Lapped
- Scale finishing: White anodized aluminum

DIMENSIONS

Unit: mm

152-390 Mass: 270 g

- The thimble can be rotated to a better reading position while maintaining the spindle position.

152-389

* Other dimensions are the same as **152-390**.
() : with spindle fully retracted.



Got Questions?

Micrometer Head

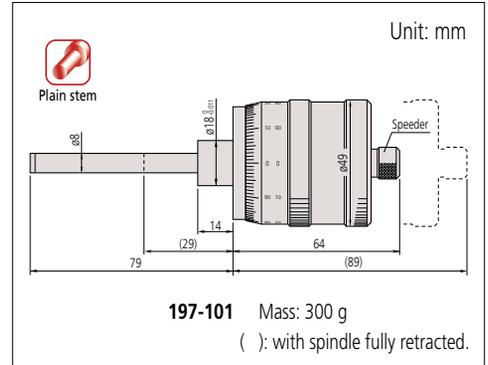
Micrometer Heads SERIES 197 — Long Stroke Non-rotating Spindle

- Large-thimble micrometer head with non-rotating spindle. Dual-spindle mechanism for quick feeding and bidirectional graduation for easy reading.
- Floating thimble allows easy zero setting at any spindle position.



197-101

DIMENSIONS



SPECIFICATIONS

Inch								
Order No.	Range	Graduation	Graduation features	Stem dia.	Stem	Spindle end	Spindle pitch	Accuracy
197-201	0 - 2 in	0.0002 in	Bidirectional	0.709 in	Plain	Flat (carbide tip)	0.05 in	± 0.0001 in

Metric								
Order No.	Range	Graduation	Graduation features	Stem dia.	Stem	Spindle end	Spindle pitch	Accuracy
197-101	0 - 50 mm	0.005 mm	Bidirectional	18 mm	Plain	Flat (carbide tip)	1 mm	$\pm 5 \mu\text{m}$

- Measuring face: Material/Carbide tip, Hardness/90 HRA or more, Lapped
- Scale finishing: White anodized aluminum

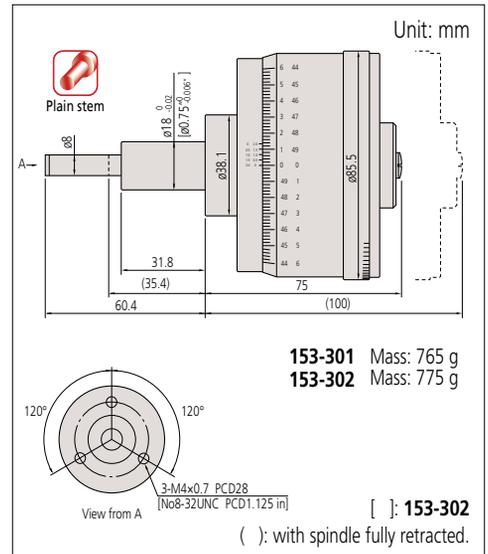
Micrometer Heads SERIES 153 — High Accuracy and Resolution

- Fine graduation and high accuracy model, suitable for inspection equipment.
- Non-rotating spindle type.



153-301

DIMENSIONS



SPECIFICATIONS

Inch								
Order No.	Range	Graduation	Graduation features	Stem dia.	Stem	Spindle end	Spindle pitch	Accuracy*
153-302	0 - 1 in	10 pinch (Vernier)	Bidirectional	0.75 in	Plain	Flat (carbide tip)	0.025 in	± 0.00005 in / ± 0.00003 in

Metric								
Order No.	Range	Graduation	Graduation features	Stem dia.	Stem	Spindle end	Spindle pitch	Accuracy*
153-301	0 - 25 mm	0.0005 mm (Vernier)	Bidirectional	18 mm	Plain	Flat (carbide tip)	0.5 mm	$\pm 1 / \pm 0.5 \mu\text{m}$

- Measuring face: Material/Carbide tip, Hardness/90 HRA or more, Lapped
- Scale finishing: White anodized aluminum
- * Wide range/narrow range

Micrometer Head

Micrometer Heads SERIES 250 — Digit Counter Type

- Digit counter for easy reading of spindle movement.



250-301

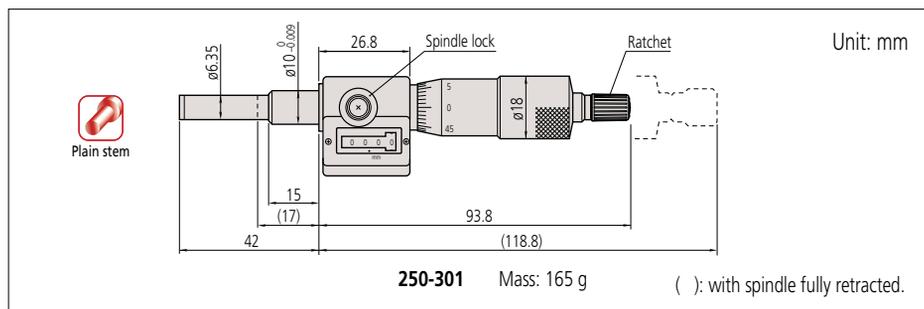
SPECIFICATIONS

Inch								
Order No.	Range (in)	Graduation (in)	Stem dia. (in)	Stem	Spindle end	Spindle pitch (in)	Graduation features	Accuracy (in)
250-312	0 - 1	0.0001	0.375	Plain	Flat (carbide tip)	0.025	Vernier scale	±.0001

Metric								
Order No.	Range (mm)	Graduation (mm)	Stem dia. (mm)	Stem	Spindle end	Spindle pitch (mm)	Graduation features	Accuracy (μm)
250-301	0 - 25	0.01	10	Plain	Flat (carbide tip)	0.5	—	±2

- Measuring face: Material/Carbide tip, Hardness/90 HRA or more, Lapped
- Satin-chrome plated

DIMENSIONS



Micro Jack SERIES 7

- Used for accurate leveling of machines, surface plates, and other precision instruments.
- Zero-setting is possible at any position.
- Easy adjustment under heavy load.



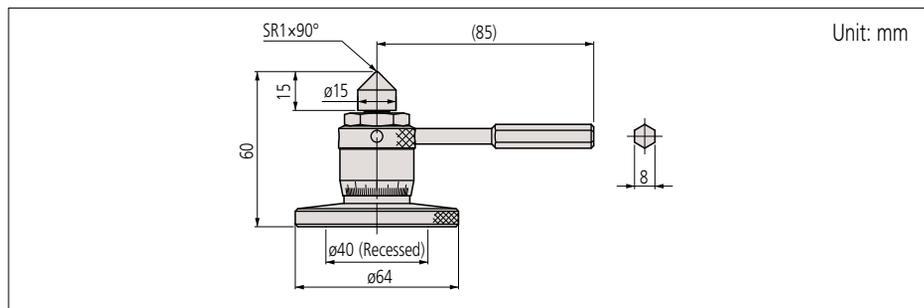
7850

SPECIFICATIONS

Metric				
Code No.	Range (mm)	Graduation (mm)	Remarks (kg)	Handle power at the max. loading (N)
7850	60 - 75	0.01	Max. load: 400	90

- Measuring face: Material/Alloy tool steel, Hardness/60 HRC or more, Lapped
- Satin-chrome plated

DIMENSIONS



Measurement example



Talk to Sales

Micrometer Head

Micrometer Head Mounting Fixtures

- The act of fabricating brackets to mount micrometer heads for each particular application can be laborious and costly. Mitutoyo offers various types of fixtures for micrometer heads to meet a range of applications. These fixtures are made of nickel-plated cast iron.

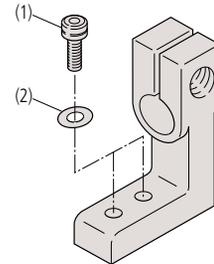
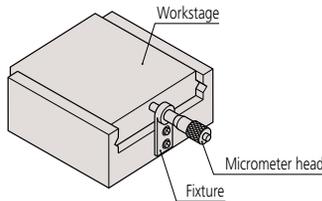


SPECIFICATIONS

Mounting hole size

Micrometer Head	Fixtures (Code No.)	Mounting hole size
148 Series	303560, 303562, 303564, 303566 303559, 303561, 303563, 303565	ø9.5×9.5 long for plain stem or stem locknut type micrometer heads
149 Series	303569, 303571, 303573, 303575 303568, 303570, 303572, 303574	ø9.5×15 long for plain stem or stem locknut type micrometer heads
150 Series	303579, 303581, 303583, 303585 303578, 303580, 303582, 303584	ø10×15 long for plain stem or stem locknut type micrometer heads

Note: Supplied with a socket head screw (M3×0.5×12) for fixtures to be used with a micrometer head without stem locknut (plain stem type micrometer head).



SPECIFICATIONS

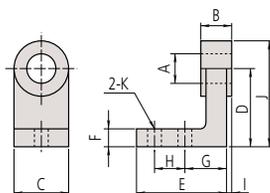
Recommended socket head screws for the fixtures

Fixtures (Order No.)	Socket head screw (1)	Washer (2)
303559, 303560, 303561, 303562, 303563, 303564 303565, 303566	M3×0.5×8 M3×0.5×12	Small, Nominal dia.: 3 Small, Nominal dia.: 3
303568, 303569, 303570, 303571, 303572, 303573 303578, 303579, 303580, 303581, 303582, 303583	M4×0.7×10	Small, Nominal dia.: 4
303574, 303575 303584, 303585	M4×0.7×12	Small, Nominal dia.: 4

Micrometer Head

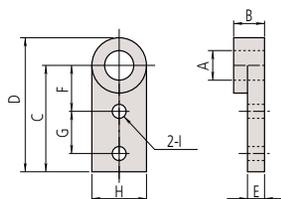
Micrometer Heads Mounting Fixtures

Fixtures for micrometer heads with stem locknut



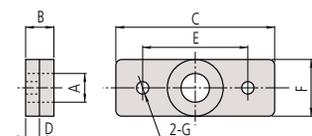
(Unit: mm)

Order No.	A	B	C	D	E	F	G	H	I	J	K
303559	ø9.5	6	15	20	24	5	11	8	0.5	27.5	ø3.4
303568	ø10	11.5	20	30	35	7	16	12	1.75	40	ø4.5
303578	ø10	11.5	20	30	35	7	16	12	1.75	40	ø4.5



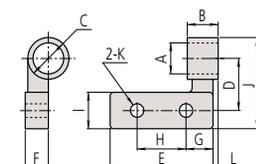
(Unit: mm)

Order No.	A	B	C	D	E	F	G	H	I
303563	ø9.5	6	30	37.5	4.5	15	10	15	ø3.4
303572	ø9.5	11.5	40	50	6.5	18	15	20	ø4.5
303582	ø10	11.5	40	50	6.5	18	15	20	ø4.5



(Unit: mm)

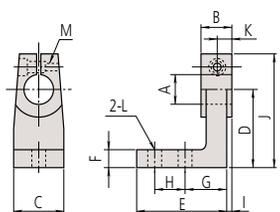
Order No.	A	B	C	D	E	F	G
303561	ø9.5	6	40	3.5	30	15	ø3.4
303570	ø9.5	11.5	60	5.5	40	20	ø4.5
303580	ø10	11.5	60	5.5	40	20	ø4.5



(Unit: mm)

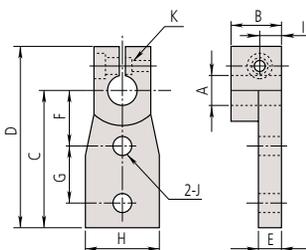
Order No.	A	B	C	D	E	F	G	H	I	J	K	L
303565	ø9.5	6	15	25	7.5	10	10	27.5	ø3.4	0.75		
303574	ø9.5	11.5	ø15	40	8.5	10	20	15	35	ø4.5	1.25	
303584	ø10	11.5	ø15	40	8.5	10	20	15	35	ø4.5	1.25	

Fixtures for plain stem type micrometer heads



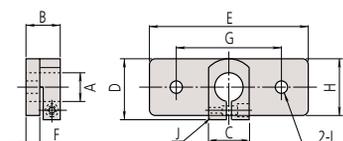
(Unit: mm)

Order No.	A	B	C	D	E	F	G	H	I	J	K	L	M
303560	ø9.5	9	15	20	23	5	11	8	1.5	3.25	4.5	ø3.4	M3x 0.5
303569	ø9.5	14.5	20	30	35	7	16	12	3.25	4.25	7.25	ø4.5	
303579	ø10	14.5	20	30	35	7	16	12	3.25	4.25	7.25	ø4.5	



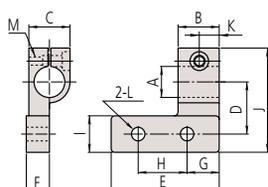
(Unit: mm)

Order No.	A	B	C	D	E	F	G	H	I	J	K
303564	ø9.5	9	30	42.5	4	15	10	15	4.5	ø3.4	M3x 0.5
303573	ø9.5	14.5	40	52.5	6	18	15	20	7.25	ø4.5	
303583	ø10	14.5	40	52.5	6	18	15	20	7.25	ø4.5	



(Unit: mm)

Order No.	A	B	C	D	E	F	G	H	I	J
303562	ø9.5	9	20	40	3	30	15	ø3.4	M3x 0.5	
303571	ø9.5	14.5	22.5	60	5	40	20	ø4.5		
303581	ø10	14.5	22.5	60	5	40	20	ø4.5		



(Unit: mm)

Order No.	A	B	C	D	E	F	G	H	I	J	K	L	M
303566	ø9.5	9	15	25	7.5	10	10	32.5	4.5	ø3.4	M3x 0.5		
303575	ø9.5	14.5	15	20	8.5	10	20	15	40	7.25			
303585	ø10	14.5	15	20	8.5	10	20	15	40	7.25			
303585	ø10	14.5	15	20	8.5	10	20	15	40	7.25			



Where to Buy

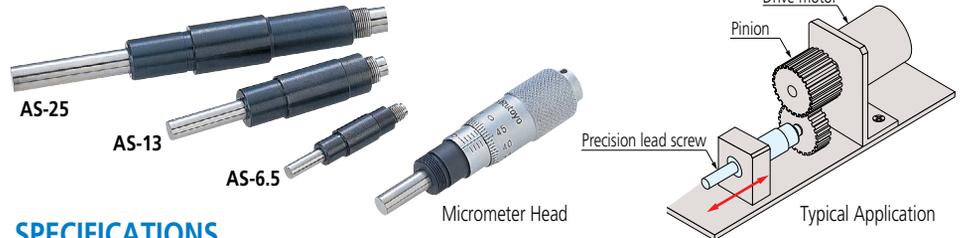
Micrometer Head

Main applications:

- Precision feed stages
- Fine adjustment of optical elements (mirrors, prisms)
- Fiber optic centering devices
- Various assembly and adjustment jigs

Precision Lead Screws

- Mitutoyo manufactures simple and economical precision lead screws for precise positioning mechanisms and fine-feed mechanisms, in addition to the conventional micrometer heads.
- Mitutoyo also manufactures lead screws with special specifications, such as 0.25 mm pitch as well as those with the standard 0.5 mm feed pitch and with dimensions and forms that meet customer's requirements.



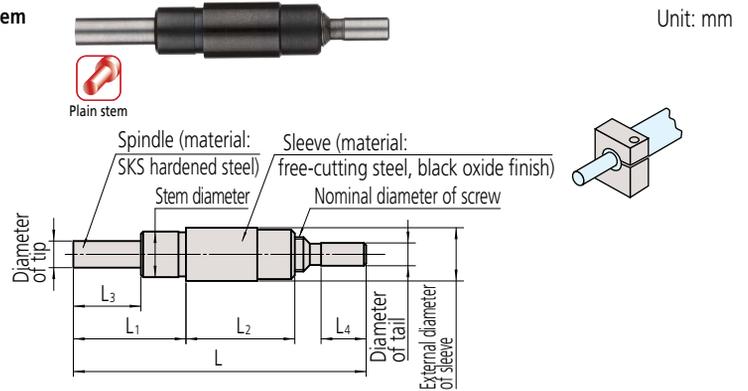
SPECIFICATIONS

Order No.	Model*	Range (mm)	Feed pitch (mm)	Feed accuracy (μm)	Stem diameter (mm)	Tip diameter (mm)	Tail diameter (mm)	Screw nominal diameter	Sleeve diameter (mm)	Measuring face	Mass (g)
04AZA160	AS-6.5	0 - 6.5	0.5	±5	ø6 ^{-0.008}	ø3.5	ø3 ^{-0.01}	M4.5x0.5	ø7	Hardened	10
04AZA161	BS-6.5										11
04AZA162	AS-13	0 - 13	0.5	±2	ø9.5 ^{-0.009}	ø5	ø5 ^{-0.012}	M7.35x0.5	ø10.5	Hardened	27
04AZA163	BS-13										30
04AZA164	AS-25	0 - 25	0.5	±2	ø10 ^{-0.009}	ø6.35	ø6 ^{-0.015}	M7.35x0.5	ø12	Carbide tip	61
04AZA165	BS-25										64

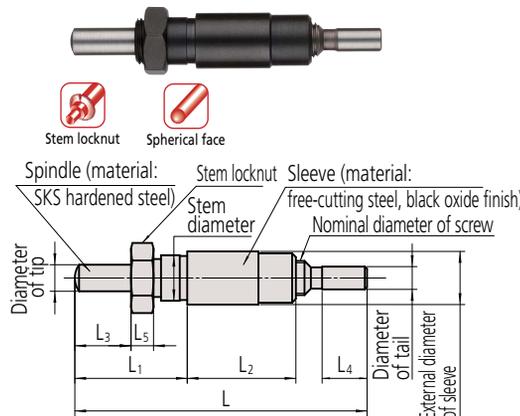
- Measuring face: Material/Alloy tool steel (**AS-25** and **BS-25** are Carbide tip), Hardness/60 HRC or more (**AS-25** and **BS-25** are 90 HRA or more), Lapped
- Durability: 100,000 operations are guaranteed (use condition: 4 kg load; 2 kg for **AS-6.5** and **BS-6.5**)
- * AS type: Flat spindle tip without nut, BS type: Spherical spindle tip with nut

DIMENSIONS

Type AS: Plain Stem



Type BS: Stem with Locknut



Order No.	L	L1	L2	L3	L4	L5
04AZA160	39	15	14.5	9	6	—
04AZA161	—	—	—	7.5	—	3
04AZA162	57.5	25	21.5	15.5	8	—
04AZA163	—	—	—	—	—	4
04AZA164	96.5	42	39.5	27	10	—
04AZA165	—	—	—	—	—	4

Featured Products



Digimatic Holtest 3 Contact Bore Gage

Refer to page C-3 for details.



Holtest 3 Contact Bore Gage

Refer to page C-7 for details.



ABSOLUTE Borematic 3 Contact Bore Gage

Refer to page C-13 for details.



Tubular Inside Micrometers

Refer to page C-17 for details.



Inside Micrometers (Caliper type)

Refer to page C-26 for details.



Bore Gages 2 Contact Bore Gage

Refer to page C-31 for details.



MeasurLink® ENABLED

Data Management Software by Mitutoyo

Measurement Data Network System

MeasurLink® is a measurement data management system based on databases (SQL Server). You can build a network to manage the measurement results and measuring instruments simply by combining the required functions.

MeasurLink® is a registered trademark of Mitutoyo Corporation in Japan and Mitutoyo America Corporation in the United States.



IP Codes

The code indicates the degree of protection against the ingress of foreign materials and water as defined in the IEC standard (IEC 60529). The number indicates the protection level. (Refer to page 3)



TÜV Rheinland Certification Marks

All products with the marks have passed the IP test carried out by the German accreditation organization, TÜV Rheinland.



Measuring Instruments Shipped with Inspection Certificate

Mitutoyo guarantees product quality as a leading precision measuring instrument manufacturer and ships measuring instruments with an inspection certificate that includes inspection data so that customers can use them with confidence.

ABSOLUTE™

ABSOLUTE Linear Encoder

Mitutoyo developed the unique ABSOLUTE method to retain position information after the power is turned off. The origin is set once - thereafter the live position is displayed when the power is turned on.

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Borematic

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Holtest

Digimatic Holtest SERIES 468 — Three-point Bore Micrometers

- These three-point bore Digimatic micrometers for inside measurement are suitable for highly accurate measurements.
- Can measure deep holes using an extension rod (optional).
- Can measure close to the bottom of a blind hole.
- Titanium-coated measuring pins provide excellent durability and impact resistance.
- Two values can be preset as a reference point, allowing you to store multiple measured values of setting rings and to quickly prepare for measurement.



SPECIFICATIONS

Inch / Metric				
Order No.	Range (in)	Resolution	Accuracy (in)	Extension Rod (optional)
468-261	0.275 - 0.35	0.00005 in/ 0.001 mm	±0.0001	952322 (100 mm)
468-262	0.35 - 0.425			
468-263	0.425 - 0.5			
468-264	0.5 - 0.65			
468-265	0.65 - 0.8			
468-266	0.8 - 1			
468-267	1 - 1.2			
468-268	1.2 - 1.6			
468-269	1.6 - 2			
468-270	2 - 2.5			
468-271	2.5 - 3	0.0001 in/ 0.001 mm	±0.0002	952621 (150 mm)
468-272	3 - 3.5			
468-273	3.5 - 4			
468-274	4 - 5			
468-275	5 - 6			
468-276	6 - 7			
468-277	7 - 8			
468-278	8 - 9			
468-279	9 - 10			
468-280	10 - 11			
468-281	11 - 12			

Metric				
Order No.	Range (mm)	Resolution (mm)	Accuracy (µm)	Extension Rod (optional)
468-161	6 - 8	0.001	±2	952322 (100 mm)
468-162	8 - 10			
468-163	10 - 12			
468-164	12 - 16			
468-165	16 - 20			
468-166	20 - 25			
468-167	25 - 30			
468-168	30 - 40			
468-169	40 - 50			
468-170	50 - 63			
468-171	62 - 75			
468-172	75 - 88			
468-173	87 - 100			
468-174	100 - 125			
468-175	125 - 150			
468-176	150 - 175			
468-177	175 - 200			
468-178	200 - 225			
468-179	225 - 250	±4	952622 (150 mm)	
468-180	250 - 275			
468-181	275 - 300			
			±5	952623 (150 mm)

- Power source: SR44 battery (1 pc.), **938882** included as standard (for operational checks)
 - Battery life: Approx. 1.2 years under normal use
- Note: Setting rings are optional.

DIMENSIONS

Unit: mm

Range	L2*	L1
6 - 8, 8 - 10, 10 - 12 mm	59	175 - 177
12 - 16, 16 - 20 mm	84	197 - 201
20 - 25, 25 - 30 mm	93	206 - 211
30 - 40, 40 - 50 mm	103	214 - 224
50 - 63, 62 - 75, 75 - 88, 87 - 100 mm	105	219 - 232
100 - 125, 125 - 150, 150 - 175, 175 - 200, 200 - 225, 225 - 250, 250 - 275, 275 - 300 mm	151	286 - 311

* L2 is maximum depth of measurement possible.
Note: External view differs depending on measurement range.

MeasurLink ENABLED
Data Management Software by Mitutoyo



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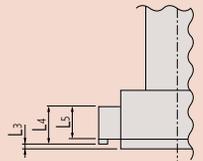


Measurement example



Reference dimensions when measuring a blind hole

Range (mm)	L3 (mm)	L4 (mm)	L5 (mm)
6 - 12	2 or below	—	2.5
12 - 20	0.3 or below	5.6	3.5
20 - 30		8.3	5.2
30 - 50		13.0	10.0
50 - 100	12.4 or below	17.0	14.0
100 - 300		21.0	13.8



Functions

- Zero-setting
- Origin restoration
- Data hold
- 2-point preset
- Function lock
- inch/mm readout (inch/mm type)
- Automatic power ON/OFF
- Error alarm
- Data output

Optional Accessories

Order No.	Type	description
264-020	—	USB Input Tool Series USB Keyboard Signal Conversion Type IT-020U
05CZA662	B	Connection cable (1 m)
05CZA663	B	Connection cable (2 m)
06AFM380B	B	USB Input Tool Direct (2 m)
02AZD730*	IP67	U-WAVE-T
02AZD880*	Buzzer	U-WAVE-T
02AZD790B	B	Connection cable for U-WAVE-T (160 mm)
02AZE140B	B	Connection cable for U-WAVE-T For foot switch

Mounting bracket (optional)

Bracket/plate that allows 468 series to be mounted in micrometer stands:

04AZB157



For special-order products, contact
Mitutoyo America

Optional Accessories

Order No.	Type	description
264-020	—	USB Input Tool Series USB Keyboard Signal Conversion Type IT-020U
05CZA662	B	Connection cable (1 m)
05CZA663	B	Connection cable (2 m)
06AFM380B	B	USB Input Tool Direct (2 m)
02AZD730G	IP67	U-WAVE-T
02AZD880G	Buzzer	U-WAVE-T
02AZD790B	B	Connection cable for U-WAVE-T (160 mm)
02AZE140B	B	Connection cable for U-WAVE-T For foot switch

Interchangeable Head Sets



468-971



468-972



468-973



468-974

Inch / Metric		
Set Order No.	Range (in)	Contents of set
468-976	0.275 - 0.5	Display unit 0.275 - 0.5 in 1 pc.
		Measuring head 0.275 - 0.35 in 1 pc.
		0.35 - 0.425 in 1 pc.
		0.425 - 0.5 in 1 pc.
		Setting ring (0.35 in DIA., 0.425 in DIA.) 1 pc. each
468-977	0.5 - 0.8	Extension rod (100 mm) 1 pc.
		Spanner 2 pcs.
		Hex wrench 1 pc.
		Phillips screwdriver 1 pc.
		Display unit 0.5 - 0.8 in 1 pc.
		Measuring head 0.5 - 0.65 in 1 pc.
		0.65 - 0.8 in 1 pc.
Setting ring (0.65 in DIA.) 1 pc.		
468-978	0.8 - 2	Extension rod (150 mm) 1 pc.
		Spanner 2 pcs.
		Hex wrench 1 pc.
		Phillips screwdriver 1 pc.
		Display unit 0.8 - 2 in 1 pc.
		Measuring head 0.8 - 1 in 1 pc.
		1 - 1.2 in 1 pc.
1.2 - 1.6 in 1 pc.		
1.6 - 2 in 1 pc.		
468-979	2 - 4	Setting ring (1 in DIA., 1.6 in DIA.) 1 pc. each
		Extension rod (150 mm) 1 pc.
		Spanner 2 pcs.
		Hex wrench 1 pc.
		Phillips screwdriver 1 pc.
		Display unit 2 - 4 in 1 pc.
		Measuring head 2 - 2.5 in 1 pc.
2.5 - 3 in 1 pc.		
3 - 3.5 in 1 pc.		
3.5 - 4 in 1 pc.		
468-976	0.275 - 0.5	Setting ring (0.35 in DIA., 0.425 in DIA.) 1 pc. each
		Extension rod (100 mm) 1 pc.
		Spanner 2 pcs.
		Hex wrench 1 pc.
		Phillips screwdriver 1 pc.

Metric		
Set Order No.	Range (mm)	Contents of set
468-971	6 - 12	Display unit 6 - 12 mm 1 pc.
		Measuring head 6 - 8 mm 1 pc.
		8 - 10 mm 1 pc.
		10 - 12 mm 1 pc.
		Setting ring (ø8, ø10) 1 pc. each
		Extension rod (100 mm) 1 pc.
		Spanner 2 pcs.
Hex wrench 1 pc.		
Phillips screwdriver 1 pc.		
468-972	12 - 20	Display unit 12 - 20 mm 1 pc.
		Measuring head 12 - 16 mm 1 pc.
		16 - 20 mm 1 pc.
		Setting ring (ø16) 1 pc.
		Extension rod (150 mm) 1 pc.
		Spanner 2 pcs.
		Hex wrench 1 pc.
Phillips screwdriver 1 pc.		
468-973	20 - 50	Display unit 20 - 50 mm 1 pc.
		Measuring head 20 - 25 mm 1 pc.
		25 - 30 mm 1 pc.
		30 - 40 mm 1 pc.
		40 - 50 mm 1 pc.
		Setting ring (ø25, ø40) 1 pc. each
		Extension rod (150 mm) 1 pc.
Spanner 2 pcs.		
Hex wrench 1 pc.		
Phillips screwdriver 1 pc.		
468-974	50 - 100	Display unit 50 - 100 mm 1 pc.
		Measuring head 50 - 63 mm 1 pc.
		62 - 75 mm 1 pc.
		75 - 88 mm 1 pc.
		87 - 100 mm 1 pc.
		Setting ring (ø62, ø87) 1 pc. each
		Extension rod (150 mm) 1 pc.
Spanner 2 pcs.		
Hex wrench 1 pc.		
Phillips screwdriver 1 pc.		



Find a Distributor

Holtest

Digimatic Holtest SERIES 468 — Three-point Bore Micrometers

Interchangeable Head Sets



Setting rings are supplied as standard
($\varnothing 125$, $\varnothing 175$) (Packed separately)

468-975

Accessories (optional)

Refer to page C-4.

Inch / Metric			Metric		
Set Order No.	Range (in)	Contents of set	Set Order No.	Range (mm)	Contents of set
468-980	4 - 8	Display unit	468-975	100 - 200	Display unit
		4 - 8 in			100 - 200 mm
		Measuring head			100 - 125 mm
		4 - 5 in			125 - 150 mm
		5 - 6 in			150 - 175 mm
		6 - 7 in			175 - 200 mm
		7 - 8 in			Setting ring ($\varnothing 125$, $\varnothing 175$)
		Setting ring			1 pc. each
		(5 in DIA., 7 in DIA.)			1 pc. each
Extension rod (150 mm)	1 pc.	Extension rod (150 mm)	1 pc.		
Spanner	2 pcs.	Spanner	2 pcs.		
Hex wrench	1 pc.	Hex wrench	1 pc.		
Phillips screwdriver	1 pc.	Phillips screwdriver	1 pc.		



Got Questions?

Accessories (optional)

Refer to page C-4.

Non-interchangeable Head Sets



468-981



468-982



468-983



468-984



468-985

Inch / Metric				Metric			
Set Order No.	Range (in)	Contents of set	Extension rod (optional)	Set Order No.	Range (mm)	Contents of set	Extension rod (optional)
468-986	0.275 - 0.5	Display unit	100 mm 1 pc.	468-981	6 - 12	Display unit	100 mm 1 pc.
		0.275 - 0.35 in 1 pc.				6 - 8 mm 1 pc.	
468-987	0.5 - 1	0.35 - 0.425 in 1 pc.	150 mm 2 pcs.*1	468-982	12 - 25	8 - 10 mm 1 pc.	150 mm 2 pcs.*1
		0.425 - 0.5 in 1 pc.				10 - 12 mm 1 pc.	
468-988	1 - 2	Setting ring (0.35 in DIA., 0.425 in DIA.) 1 pc. each	150 mm 1 pc.	468-983	25 - 50	Setting ring (ø16, ø20) 1 pc. each	150 mm 1 pc.
		Spanner 2 pcs.				25 - 30 mm 1 pc.	
468-989	2 - 3	Hex wrench 1 pc.	150 mm 1 pc.	468-984	50 - 75	30 - 40 mm 1 pc.	150 mm 1 pc.
		Phillips screwdriver 1 pc.				40 - 50 mm 1 pc.	
468-990	3 - 4	Spanner 1 pc.	150 mm 1 pc.	468-985	75 - 100	Setting ring (ø30, ø40) 1 pc. each	150 mm 1 pc.
		Hex wrench 1 pc.				75 - 88 mm 1 pc.	
		Phillips screwdriver 1 pc.				87 - 100 mm 1 pc.	

*1 Total 2 pcs. of extension rods: Order No. **952621** (for measuring range 12 to 16 mm, 16 to 20 mm) and Order No. **952622** (for measuring range 20 to 25 mm).
Two extension rods cannot be connected due to the different mounting positions.

Holtest

Holtest SERIES 368 — Three-point/Two-point Bore Micrometers

- These are standard analog three-point bore micrometers. (A two-point contact type with measuring range of .080 to .28 in diameter is available to measure extremely small holes.)
- Three-point bore micrometer allows stable measurement through self centering.
- Can measure close to the bottom of a blind hole.
- Titanium-coated measuring pins on the three-point type (over .28 in / 6 mm range models) provide excellent durability and impact resistance.
- Three-point type can measure deep holes by attaching an extension rod (optional).



368-001
(Two-point contact type)

368-168
(Three-point contact type)

368-174
(Three-point contact type)

Measurement example



SPECIFICATIONS

Inch				
Order No.	Range (in)	Graduation (in)	Accuracy (in)	Extension Rod (optional)
(Two-point)				
368-021	0.08 - 0.1	0.0001	±0.0001	—
368-022	0.1 - 0.12			
368-023	0.12 - 0.16			
368-024	0.16 - 0.2			
368-025	0.2 - 0.24			
368-026	0.24 - 0.28			
(Three-point)				
368-261	0.275 - 0.35	0.00015	±0.00015	952322 (100 mm)
368-262	0.35 - 0.425			
368-263	0.425 - 0.5			
368-264	0.5 - 0.65			
368-265	0.65 - 0.8			
368-266	0.8 - 1			
368-267	1 - 1.2	0.0002	±0.0002	952622 (150 mm)
368-268	1.2 - 1.6			
368-269	1.6 - 2			
368-270	2 - 2.5			
368-271	2.5 - 3			
368-272	3 - 3.5			
368-273	3.5 - 4	±0.00025	±0.00025	952623 (150 mm)
368-274	4 - 5			
368-275	5 - 6			
368-276	6 - 7			
368-277	7 - 8			
368-278	8 - 9			
368-279	9 - 10	±0.0003	±0.0003	
368-280	10 - 11			
368-281	11 - 12			

Metric				
Order No.	Range (mm)	Graduation (mm)	Accuracy (µm)	Extension Rod (optional)
(Two-point)				
368-001	2 - 2.5	0.001	±2	—
368-002	2.5 - 3			
368-003	3 - 4			
368-004	4 - 5			
368-005	5 - 6			
(Three-point)				
368-161	6 - 8	0.001	±3	952322 (100 mm)
368-162	8 - 10			
368-163	10 - 12			
368-164	12 - 16			
368-165	16 - 20			
368-166	20 - 25			
368-167	25 - 30	0.005	±3	952622 (150 mm)
368-168	30 - 40			
368-169	40 - 50			
368-170	50 - 63			
368-171	62 - 75			
368-172	75 - 88			
368-173	87 - 100	±4	±4	
368-174	100 - 125			
368-175	125 - 150			
368-176	150 - 175			
368-177	175 - 200			
368-178	200 - 225			
368-179	225 - 250	±5	±5	952623 (150 mm)
368-180	250 - 275			
368-181	275 - 300			
			±6	

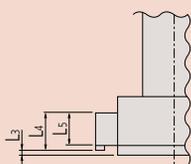


Talk to Sales



Reference dimensions when measuring a blind hole

Range (mm)	L3 (mm)	L4 (mm)	L5 (mm)
2 - 6	—	—	2
6 - 12	2 or below	—	2.5
12 - 20	0.3 or below	5.6	3.5
20 - 30		8.3	5.2
30 - 50		13.0	10.0
50 - 100		17.0	14.0
100 - 300	12.4 or below	21.0	13.8



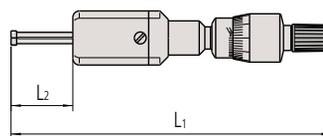
Typical application of Extension Rod



For special-order products, contact Mitutoyo America

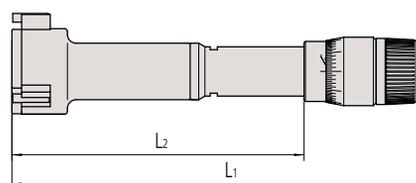
DIMENSIONS

Unit: mm



Range	L2	L1
2 - 2.5, 2.5 - 3 mm	12	103.5 - 104
3 - 4, 4 - 5, 5 - 6 mm	22	113 - 114

Note: External appearance differs depending on the measuring range.



Range	L2	L1
6 - 8, 8 - 10, 10 - 12 mm	59	102 - 104
12 - 16, 16 - 20 mm	82	126 - 130
20 - 25, 25 - 30 mm	94	137 - 142
30 - 40, 40 - 50 mm	102	145 - 155
50 - 63, 62 - 75, 75 - 88, 87 - 100 mm	105	150 - 163
100 - 125, 125 - 150, 150 - 175, 175 - 200, 200 - 225, 225 - 250, 250 - 275, 275 - 300 mm	161	227 - 252

Note: External appearance differs depending on the measuring range.

Holtest

Holtest SERIES 368 — Three-point/Two-point Bore Micrometers

Non-interchangeable Head Sets



368-906



368-907



368-911



368-912

Inch			
Set Order No.	Range (in)	Graduation (in)	Contents of set
(Two-point) 368-926	0.08 - 0.12		Micrometer head unit 0.08 - 0.1 in 1 pc. 0.1 - 0.12 in 1 pc. Setting ring (0.1 in DIA.) 1 pc. Hex wrench 1 pc.
368-927	0.12 - 0.28	0.0001	Micrometer head unit 0.12 - 0.16 in 1 pc. 0.16 - 0.2 in 1 pc. 0.2 - 0.24 in 1 pc. 0.24 - 0.28 in 1 pc. Setting ring 1 pc. each (0.16 in DIA., 0.24 in DIA.) Hex wrench 1 pc.
(Three-point) 368-916	0.275 - 0.5		Micrometer head unit 0.275 - 0.35 in 1 pc. 0.35 - 0.425 in 1 pc. 0.425 - 0.5 in 1 pc. Setting ring 1 pc. each (0.35 in DIA., 0.5 in DIA.) Extension rod (100 mm) 1 pc. Spanner 2 pcs. Hex wrench 1 pc.
368-917	0.5 - 0.8	0.0002	Micrometer head unit 0.5 - 0.65 in 1 pc. 0.65 - 0.8 in 1 pc. Setting ring (0.65 in DIA.) 1 pc. Extension rod (150 mm) 1 pc. Spanner 2 pcs. Hex wrench 1 pc.

Metric			
Set Order No.	Range (mm)	Graduation (mm)	Contents of set
(Two-point) 368-906	2 - 3		Micrometer head unit 2 - 2.5 mm 1 pc. 2.5 - 3 mm 1 pc. Setting ring (ø2.5) 1 pc. Hex wrench 1 pc.
368-907	3 - 6	0.001	Micrometer head unit 3 - 4 mm 1 pc. 4 - 5 mm 1 pc. 5 - 6 mm 1 pc. Setting ring (ø4, ø5) 1 pc. each Hex wrench 1 pc.
(Three-point) 368-911	6 - 12		Micrometer head unit 6 - 8 mm 1 pc. 8 - 10 mm 1 pc. 10 - 12 mm 1 pc. Setting ring (ø8, ø10) 1 pc. each Extension rod (100 mm) 1 pc. Spanner 2 pcs. Hex wrench 1 pc.
368-912	12 - 20	0.005	Micrometer head unit 12 - 16 mm 1 pc. 16 - 20 mm 1 pc. Setting ring (ø16) 1 pc. Extension rod (150 mm) 1 pc. Spanner 2 pcs. Hex wrench 1 pc.



Need Repair?

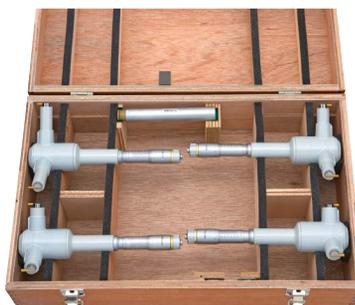
Non-interchangeable Head Sets



368-913



368-914



Setting rings are supplied as standard (ø125, ø175) (Packed separately)

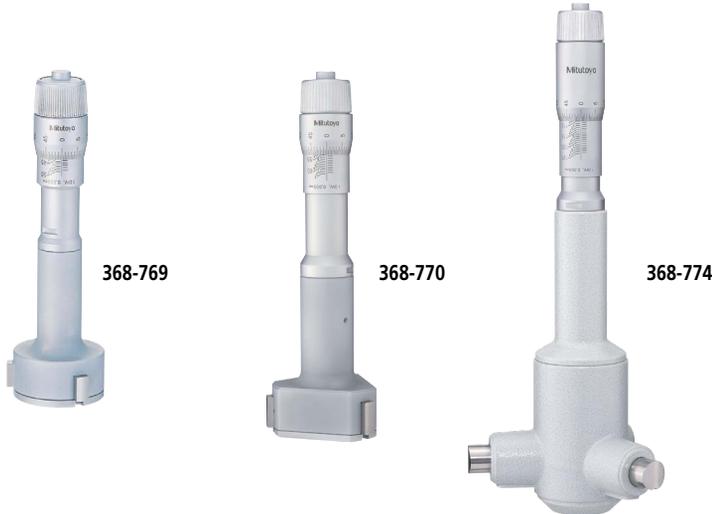
368-915

Inch				Metric			
Set Order No.	Range (in)	Graduation (in)	Contents of set	Set Order No.	Range (mm)	Graduation (mm)	Contents of set
368-918	0.8 - 2	0.0002	Micrometer head unit	368-913	20 - 50	0.005	Micrometer head unit
			0.8 - 1 in 1 pc.				20 - 25 mm 1 pc.
			1 - 1.2 in 1 pc.				25 - 30 mm 1 pc.
			1.2 - 1.6 in 1 pc.				30 - 40 mm 1 pc.
			1.6 - 2 in 1 pc.				40 - 50 mm 1 pc.
			Setting ring (1 in DIA., 1.6 in DIA.) 1 pc. each				Setting ring (ø25, ø40) 1 pc. each
			Extension rod (150 mm) 1 pc.				Extension rod (150 mm) 1 pc.
			Spanner 2 pcs.				Spanner 2 pcs.
			Hex wrench 1 pc.				Hex wrench 1 pc.
368-919	2 - 4	0.0002	Micrometer head unit	368-914	50 - 100	0.005	Micrometer head unit
			2 - 2.5 in 1 pc.				50 - 63 mm 1 pc.
			2.5 - 3 in 1 pc.				62 - 75 mm 1 pc.
			3 - 3.5 in 1 pc.				75 - 88 mm 1 pc.
			3.5 - 4 in 1 pc.				87 - 100 mm 1 pc.
			Setting ring (2.5 in DIA., 3.5 in DIA.) 1 pc. each				Setting ring (ø62, ø87) 1 pc. each
			Extension rod (150 mm) 1 pc.				Extension rod (150 mm) 1 pc.
			Spanner 2 pcs.				Spanner 2 pcs.
			Hex wrench 1 pc.				Hex wrench 1 pc.
368-920	4 - 8	0.0002	Micrometer head unit	368-915	100 - 200	0.005	Micrometer head unit
			4 - 5 in 1 pc.				100 - 125 mm 1 pc.
			5 - 6 in 1 pc.				125 - 150 mm 1 pc.
			6 - 7 in 1 pc.				150 - 175 mm 1 pc.
			7 - 8 in 1 pc.				175 - 200 mm 1 pc.
			Setting ring (5 in DIA., 7 in DIA.) 1 pc. each				Setting ring (ø125, ø175) 1 pc. each
			Extension rod (150 mm) 1 pc.				Extension rod (150 mm) 1 pc.
			Spanner 2 pcs.				Spanner 2 pcs.
			Hex wrench 1 pc.				Hex wrench 1 pc.

Holtest

Holtest (Type II) SERIES 368 — Three-point Bore Micrometers

- The Holtests (type II) have three contact points made of alloy steel for a more economically priced tool.
- Same accuracy as the titanium-coated Holtest models.
- Constant-force device allows stable measurement.
- Can measure deep holes using an extension rod (optional).

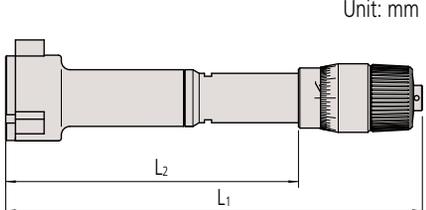


SPECIFICATIONS

Inch Individual					Metric Individual				
Order No.	Range (in)	Graduation (in)	Accuracy (in)	Extension Rod (optional)	Order No.	Range (mm)	Graduation (mm)	Accuracy (μm)	Extension Rod (optional)
368-864	0.5 - 0.65	0.0002	±0.00015	952621 (150 mm)	368-764	12 - 16	0.005	±3	952621 (150 mm)
368-865	0.65 - 0.8				368-765	16 - 20			
368-866	0.8 - 1				368-766	20 - 25			
368-867	1 - 1.2				368-767	25 - 30			
368-868	1.2 - 1.6				368-768	30 - 40			
368-869	1.6 - 2				368-769	40 - 50			
368-870	2 - 2.5		±0.00025	952622 (150 mm)	368-770	50 - 63		±4	952622 (150 mm)
368-871	2.5 - 3				368-771	62 - 75			
368-872	3 - 3.5				368-772	75 - 88			
368-873	3.5 - 4				368-773	87 - 100			
368-874	4 - 5				368-774	100 - 125			
368-875	5 - 6				368-775	125 - 150			
368-876	6 - 7		±0.0003	952623 (150 mm)	368-776	150 - 175		±5	952623 (150 mm)
368-877	7 - 8				368-777	175 - 200			
368-878	8 - 9				368-778	200 - 225			
368-879	9 - 10				368-779	225 - 250			
368-880	10 - 11	368-780			250 - 275				
368-881	11 - 12	368-781			275 - 300				

Note: Setting rings are optional.

DIMENSIONS



Range	L2	L1
12 - 16, 16 - 20	82	126 - 130
20 - 25, 25 - 30	94	137 - 142
30 - 40, 40 - 50	102	145 - 155
50 - 63, 62 - 75, 75 - 88, 87 - 100	105	150 - 163
100 - 125, 125 - 150, 150 - 175, 175 - 200	161	227 - 252
200 - 225, 225 - 250, 250 - 275, 275 - 300		

Note: External appearance differs depending on the measuring range.

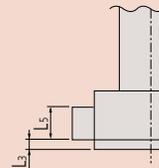


Measurement example



Reference dimensions when measuring a blind hole

Range (mm)	L3 (mm)	L5 (mm)
12 - 20	2.6 or below	3.5
20 - 30		5.2
30 - 50	3.4 or below	10.0
50 - 100		14.0
100 - 300	19.6 or below	13.8



For special-order products, contact Mitutoyo America



Where to Buy

Non-interchangeable Head Sets



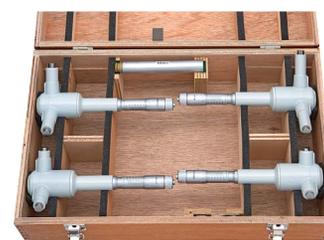
368-991



368-992



368-993



Setting rings are supplied as standard (ø125, ø175) (Packed separately)

368-994

Inch			
Order No.	Range (in)	Graduation (in)	Contents of set
368-995	0.5 - 0.8	0.0002	Micrometer head unit 0.5 - 0.65 in 1 pc. 0.65 - 0.8 in 1 pc. Setting ring (0.65 in DIA.) 1 pc. Extension rod (150 mm) 1 pc. Spanner 2 pcs. Hex wrench 1 pc.
			Micrometer head unit 0.8 - 1 in 1 pc. 1 - 1.2 in 1 pc. 1.2 - 1.6 in 1 pc. 1.6 - 2 in 1 pc. Setting ring (1 in DIA., 1.6 in DIA.) 1 pc. each Extension rod (150 mm) 1 pc. Spanner 2 pcs. Hex wrench 1 pc.
368-997	2 - 4	0.0002	Micrometer head unit 2 - 2.5 in 1 pc. 2.5 - 3 in 1 pc. 3 - 3.5 in 1 pc. 3.5 - 4 in 1 pc. Setting ring (2.5 in DIA., 3.5 in DIA.) 1 pc. each Extension rod (150 mm) 1 pc. Spanner 2 pcs. Hex wrench 1 pc.
368-998	4 - 8	0.0002	Micrometer head unit 4 - 5 in 1 pc. 5 - 6 in 1 pc. 6 - 7 in 1 pc. 7 - 8 in 1 pc. Setting ring (5 in DIA., 7 in DIA.) 1 pc. each Extension rod (150 mm) 1 pc. Spanner 2 pcs. Hex wrench 1 pc.

Metric			
Order No.	Range (mm)	Graduation (mm)	Contents of set
368-991	12 - 20	0.005	Micrometer head unit 12 - 16 mm 1 pc. 16 - 20 mm 1 pc. Setting ring (ø16) 1 pc. Extension rod (150 mm) 1 pc. Spanner 2 pcs. Hex wrench 1 pc.
			Micrometer head unit 20 - 25 mm 1 pc. 25 - 30 mm 1 pc. 30 - 40 mm 1 pc. 40 - 50 mm 1 pc. Setting ring (ø25, ø40) 1 pc. each Extension rod (150 mm) 1 pc. Spanner 2 pcs. Hex wrench 1 pc.
368-992	20 - 50	0.005	Micrometer head unit 50 - 63 mm 1 pc. 62 - 75 mm 1 pc. 75 - 88 mm 1 pc. 87 - 100 mm 1 pc. Setting ring (ø62, ø87) 1 pc. each Extension rod (150 mm) 1 pc. Spanner 2 pcs. Hex wrench 1 pc.
368-993	50 - 100	0.005	Micrometer head unit 100 - 125 mm 1 pc. 125 - 150 mm 1 pc. 150 - 175 mm 1 pc. 175 - 200 mm 1 pc. Setting ring (ø125, ø175) 1 pc. each Extension rod (150 mm) 1 pc. Spanner 2 pcs. Hex wrench 1 pc.
368-994	100 - 200	0.005	Micrometer head unit 100 - 125 mm 1 pc. 125 - 150 mm 1 pc. 150 - 175 mm 1 pc. 175 - 200 mm 1 pc. Setting ring (ø125, ø175) 1 pc. each Extension rod (150 mm) 1 pc. Spanner 2 pcs. Hex wrench 1 pc.

Borematic

ABSOLUTE Borematic SERIES 568 — ABSOLUTE Digimatic Snap-open Bore Gages

- Activation handle with precision-balanced spring allows for easier inside-diameter measurements.
- Titanium-coated measuring pins provide excellent durability and impact resistance.
- Three-point contact measuring head enables stable measurement.
- Can measure deep holes using an extension rod (optional).



568-469-10



568-467-10

Displays can rotate 330°

DIMENSIONS

Unit: mm

Range	L ₂	L ₁
6 - 8, 8 - 10, 10 - 12 mm	83	284
12 - 16, 16 - 20 mm	53	255
20 - 25, 25 - 30 mm	59	261
30 - 40, 40 - 50 mm	67	269
50 - 63, 62 - 75, 75 - 88, 87 - 100, 100 - 113, 112 - 125 mm	75	277

Note: External appearance differs depending on the measuring range.

MeasurLink¹ ENABLED
Data Management Software by Mitutoyo



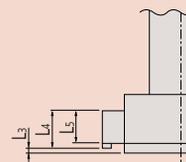
ABSOLUTE™

Measurement example



Reference dimensions when measuring a blind hole

Range (mm)	L ₃ (mm)	L ₄ (mm)	L ₅ (mm)
6 - 12	2 or below	—	2.5
12 - 20	0.3 or below	5.6	3.5
20 - 30		8.3	5.2
30 - 50		13.0	10.0
50 - 125		17.0	14.0



Functions

- Go/No-go judgment
- Go/No-go judgment zoom
- 2-Point preset
- Zero-setting
- Data hold, error alarm
- Low battery voltage alert
- Data output
- Function lock
- 330° rotary display
- ON/OFF function
- inch/mm conversion (inch/mm type)

Optional Accessories

Order No.	Type	description
264-020	—	USB Input Tool Series USB Keyboard Signal Conversion Type IT-020U
905338	F	Connection cable (1 m)
905409	F	Connection cable (2 m)
06AFM380F	F	USB Input Tool Direct (2 m)
02AZD730G	IP67	U-WAVE-T
02AZD880G	Buzzer	U-WAVE-T
02AZD790F	F	Connection cable for U-WAVE-T (160 mm)
02AZE140F	F	Connection cable for U-WAVE-T For foot switch

For special-order products, contact
Mitutoyo America

SPECIFICATIONS

Inch / Metric		Individual			
Order No.	Range (in)	Resolution	Accuracy (in)	Mass (g)	Extension Rod (optional)
568-461-10	0.275 - 0.35	0.00005 in/ 0.001 mm	±0.00025	480	952322 (100 mm)
568-462-10	0.35 - 0.425			485	
568-463-10	0.425 - 0.5			485	
568-464-10	0.5 - 0.65			475	952621 (150 mm)
568-465-10	0.65 - 0.8			480	
568-466-10	0.8 - 1			540	±0.0003
568-467-10	1 - 1.2		555		
568-468-10	1.2 - 1.6		565		
568-469-10	1.6 - 2		610	952623 (150 mm)	
568-470-10	2 - 2.5		730		
568-471-10	2.5 - 3		740		
568-472-10	3 - 3.5		790		
568-473-10	3.5 - 4		800		
568-474-10	4 - 4.5		900		
568-475-10	4.5 - 5		910		

Metric		Individual			
Order No.	Range (mm)	Resolution (mm)	Accuracy (µm)	Mass (g)	Extension Rod (optional)
568-361-10	6 - 8	0.001	±5	480	952322 (100 mm)
568-362-10	8 - 10			485	
568-363-10	10 - 12			485	
568-364-10	12 - 16			475	952621 (150 mm)
568-365-10	16 - 20			480	
568-366-10	20 - 25			540	±6
568-367-10	25 - 30		555		
568-368-10	30 - 40		565		
568-369-10	40 - 50		610	952623 (150 mm)	
568-370-10	50 - 63		730		
568-371-10	62 - 75		740		
568-372-10	75 - 88		790		
568-373-10	87 - 100		800		
568-374-10	100 - 113		900		
568-375-10	112 - 125		910		

- Power source: SR44 battery (1 pc.), **938882** included as standard (for operational checks)
 - Battery life: Approx. 5 years under normal use. Approx. 10,000 hours in continuous use.
- Note: Setting rings are optional.



Get a Quote

Borematic

MeasurLink ENABLED
Data Management Software by Mitutoyo

ABSOLUTE Borematic SERIES 568 — ABSOLUTE Digimatic Snap-open Bore Gages

Interchangeable-head Bore Gage Sets



568-924-10



568-926-10

Optional Accessories

Refer to page C-13.

Inch / Metric			
Order No.	Range (in)	Contents of set	
568-928-10	0.275 - 0.5	Display unit	1 pc.
		Measuring head	
		0.275 - 0.35 in	1 pc.
		0.35 - 0.425 in	1 pc.
		0.425 - 0.5 in	1 pc.
		Attachment	1 pc.
568-929-10	0.5 - 1	Setting ring (0.35 in DIA., 0.425 in DIA.)	1 pc. each
		Spanner	3 pcs.
		Display unit	1 pc.
		Measuring head	
568-930-10	1 - 2	0.5 - 0.65 in	1 pc.
		0.65 - 0.8 in	1 pc.
		0.8 - 1 in	1 pc.
		Attachment	2 pcs.
		Setting ring (0.65 in DIA., 0.8 in DIA.)	1 pc. each
		Spanner	2 pcs.
568-936 -10	2 - 4	Display unit	1 pc.
		Measuring head	
		2 - 2.5 in	1 pc.
		2.5 - 3 in	1 pc.
		3 - 3.5 in	1 pc.
		3.5 - 4 in	1 pc.
Attachment	1 pc.		
568-924-10	6 - 12	Setting ring (2.5 in DIA., 3.5 in DIA.)	1 pc. each
		Spanner	2 pcs.
		Display unit	1 pc.
		Measuring head	
568-925-10	12 - 25	25 - 30 mm	1 pc.
		30 - 40 mm	1 pc.
		40 - 50 mm	1 pc.
		Attachment	1 pc.
		Setting ring (ø16, ø20)	1 pc. each
		Spanner	2 pcs.
568-926-10	25 - 50	Display unit	1 pc.
		Measuring head	
		25 - 30 mm	1 pc.
		30 - 40 mm	1 pc.
		40 - 50 mm	1 pc.
		Attachment	1 pc.
568-927-10	50 - 100	Setting ring (ø30, ø40)	1 pc. each
		Spanner	2 pcs.
		Display unit	1 pc.
		Measuring head	
		50 - 63 mm	1 pc.
		62 - 75 mm	1 pc.
568-926-10	25 - 50	75 - 88 mm	1 pc.
		87 - 100 mm	1 pc.
		Attachment	1 pc.
		Setting ring (ø62, ø87)	1 pc. each
		Spanner	2 pcs.
		568-927-10	50 - 100
Measuring head			
50 - 63 mm	1 pc.		
62 - 75 mm	1 pc.		
75 - 88 mm	1 pc.		
87 - 100 mm	1 pc.		
Attachment	1 pc.		
568-927-10	50 - 100	Setting ring (ø62, ø87)	1 pc. each
		Spanner	2 pcs.
		Display unit	1 pc.
		Measuring head	
		50 - 63 mm	1 pc.
		62 - 75 mm	1 pc.
568-926-10	25 - 50	75 - 88 mm	1 pc.
		87 - 100 mm	1 pc.
		Attachment	1 pc.
		Setting ring (ø30, ø40)	1 pc. each
		Spanner	2 pcs.
		568-927-10	50 - 100
Measuring head			
50 - 63 mm	1 pc.		
62 - 75 mm	1 pc.		
75 - 88 mm	1 pc.		
87 - 100 mm	1 pc.		
Attachment	1 pc.		
568-927-10	50 - 100	Setting ring (ø62, ø87)	1 pc. each
		Spanner	2 pcs.
		Display unit	1 pc.
		Measuring head	
		50 - 63 mm	1 pc.
		62 - 75 mm	1 pc.
568-926-10	25 - 50	75 - 88 mm	1 pc.
		87 - 100 mm	1 pc.
		Attachment	1 pc.
		Setting ring (ø30, ø40)	1 pc. each
		Spanner	2 pcs.
		568-927-10	50 - 100
Measuring head			
50 - 63 mm	1 pc.		
62 - 75 mm	1 pc.		
75 - 88 mm	1 pc.		
87 - 100 mm	1 pc.		
Attachment	1 pc.		
568-927-10	50 - 100	Setting ring (ø62, ø87)	1 pc. each
		Spanner	2 pcs.
		Display unit	1 pc.
		Measuring head	
		50 - 63 mm	1 pc.
		62 - 75 mm	1 pc.
568-926-10	25 - 50	75 - 88 mm	1 pc.
		87 - 100 mm	1 pc.
		Attachment	1 pc.
		Setting ring (ø30, ø40)	1 pc. each
		Spanner	2 pcs.
		568-927-10	50 - 100
Measuring head			
50 - 63 mm	1 pc.		
62 - 75 mm	1 pc.		
75 - 88 mm	1 pc.		
87 - 100 mm	1 pc.		
Attachment	1 pc.		
568-927-10	50 - 100	Setting ring (ø62, ø87)	1 pc. each
		Spanner	2 pcs.
		Display unit	1 pc.
		Measuring head	
		50 - 63 mm	1 pc.
		62 - 75 mm	1 pc.
568-926-10	25 - 50	75 - 88 mm	1 pc.
		87 - 100 mm	1 pc.
		Attachment	1 pc.
		Setting ring (ø30, ø40)	1 pc. each
		Spanner	2 pcs.
		568-927-10	50 - 100
Measuring head			
50 - 63 mm	1 pc.		
62 - 75 mm	1 pc.		
75 - 88 mm	1 pc.		
87 - 100 mm	1 pc.		
Attachment	1 pc.		
568-927-10	50 - 100	Setting ring (ø62, ø87)	1 pc. each
		Spanner	2 pcs.
		Display unit	1 pc.
		Measuring head	
		50 - 63 mm	1 pc.
		62 - 75 mm	1 pc.



Need Support?

Non-interchangeable-head Snap-open Bore Gage Sets

Each set includes complete gages (display units and measuring heads for each size).



568-955-10



568-957-10



568-959-10

Inch / Metric		
Order No.	Range (in)	Contents of set
568-965-10	0.275 - 0.5	Display unit
		0.275 - 0.35 in 1 pc.
		0.35 - 0.425 in 1 pc.
		0.425 - 0.5 in 1 pc.
		Setting ring (0.35 in DIA., 0.425 in DIA.) 1 pc. each
568-966-10	0.5 - 1	Spanner 3 pcs.
		Display unit
		0.5 - 0.65 in 1 pc.
		0.65 - 0.8 in 1 pc.
		0.8 - 1 in 1 pc.
568-967-10	1 - 2	Setting ring (0.65 in DIA., 0.8 in DIA.) 1 pc. each
		Spanner 2 pcs.
		Display unit
		1 - 1.2 in 1 pc.
		1.2 - 1.6 in 1 pc.
568-968-10	2 - 3	1.6 - 2 in 1 pc. each
		Setting ring (1.2 in DIA., 1.6 in DIA.) 1 pc. each
		Spanner 2 pcs.
		Display unit
		2 - 2.5 in 1 pc.
568-969-10	3 - 4	2.5 - 3 in 1 pc.
		Setting ring (2.5 in DIA.) 1 pc.
		Spanner 2 pcs.
		Display unit
		3 - 3.5 in 1 pc.
568-965-10	6 - 12	3.5 - 4 in 1 pc.
		Setting ring (3.5 in DIA.) 1 pc.
		Spanner 2 pcs.
		Display unit
		75 - 88 mm 1 pc.

Metric		
Order No.	Range (mm)	Contents of set
568-955-10	6 - 12	Display unit
		6 - 8 mm 1 pc.
		8 - 10 mm 1 pc.
		10 - 12 mm 1 pc.
		Setting ring (ø8, ø10) 1 pc. each
568-956-10	12 - 25	Spanner 3 pcs.
		Display unit
		12 - 16 mm 1 pc.
		16 - 20 mm 1 pc.
		20 - 25 mm 1 pc.
568-957-10	25 - 50	Setting ring (ø16, ø20) 1 pc. each
		Spanner 2 pcs.
		Display unit
		25 - 30 mm 1 pc.
		30 - 40 mm 1 pc.
568-958-10	50 - 75	40 - 50 mm 1 pc.
		Setting ring (ø30, ø40) 1 pc. each
		Spanner 2 pcs.
		Display unit
		50 - 63 mm 1 pc.
568-959-10	75 - 100	62 - 75 mm 1 pc.
		Setting ring (ø62) 1 pc.
		Spanner 2 pcs.
		Display unit
		75 - 88 mm 1 pc.

Inside Micrometers

Tubular Inside Micrometers SERIES 133 — Single-rod Type

- Standard Single-rod Type inside micrometer.
- Carbide-tipped measuring faces.
- A reference gage is necessary for reference point setting.
- An optional reference gage, such as Gage Block Accessory Set, CERA inside Micro Checker or a setting ring, is required for accurately setting the micrometer before measuring. (refer to pages E-19 to E-22, C-30, and C-53 for details)



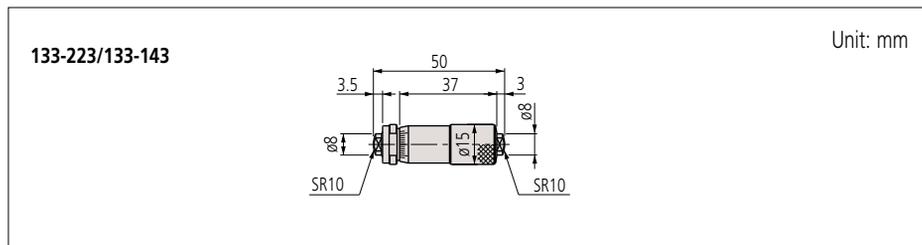
133-223

SPECIFICATIONS

Inch	Individual			
Order No.	Range (in)	Graduation (in)	Accuracy (in)	
133-223	2 - 3	0.001	±0.00015	

Metric	Individual			
Order No.	Range (mm)	Graduation (mm)	Accuracy (μm)	
133-143	50 - 75	0.01	±3	

DIMENSIONS



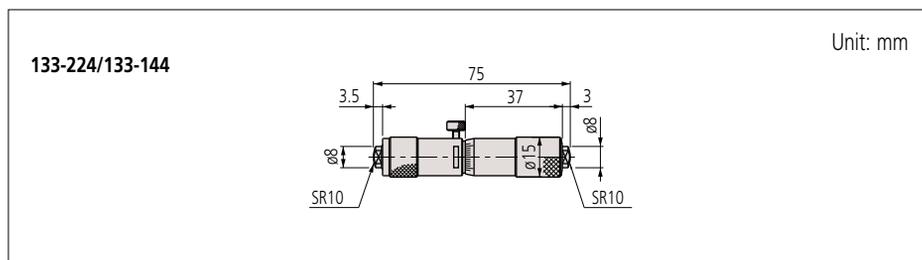
133-224

SPECIFICATIONS

Inch	Individual			
Order No.	Range (in)	Graduation (in)	Accuracy (in)	
133-224	3 - 4	0.001	±0.0002	

Metric	Individual			
Order No.	Range (mm)	Graduation (mm)	Accuracy (μm)	
133-144	75 - 100	0.01	±4	

DIMENSIONS



Measurement example



Need Service?

Inside Micrometers

Micrometer Set



- 133-903 (Inch)**
 • Range: 2 - 6 in (4 heads/set)
 • Models included:
133-223 133-224
133-225 133-226
 with fitted case
- 133-904 (Inch)**
 • Range: 2 - 12 in (10 heads/set)
 • Models included:
133-223 133-224
133-225 133-226
133-227 133-228
133-229 133-230
133-231 133-232
 with fitted case

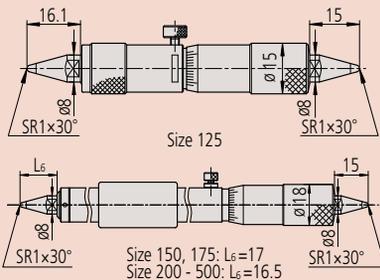


- 133-901 (Metric)**
 • Range: 50 - 150 mm (4 heads/set)
 • Models included:
133-143 133-144
133-145 133-146
 with fitted case
- 133-902 (Metric)**
 • Range: 50 - 300 mm (10 heads/set)
 • Models included:
133-143 133-144
133-145 133-146
133-147 133-148
133-149 133-150
133-151 133-152
 with fitted case

Special sizes and specifications other than standard can be custom made by special order. Please contact your nearest M³ Solution Center for more information.

Example

Measuring face: point
 For models with a measuring range 100 - 500 mm



133-227

SPECIFICATIONS

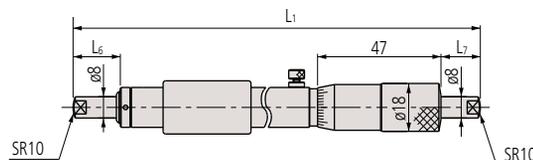
Inch		Individual	
Order No.	Range (in)	Graduation (in)	Accuracy (in)
133-225	4 - 5	0.001	±0.00025
133-226	5 - 6		
133-227	6 - 7		
133-228	7 - 8		
133-229	8 - 9		
133-230	9 - 10		
133-231	10 - 11	±0.0003	
133-232	11 - 12		

Metric		Individual	
Order No.	Range (mm)	Graduation (mm)	Accuracy (µm)
133-145	100 - 125	0.01	±5
133-146	125 - 150		
133-147	150 - 175		
133-148	175 - 200		
133-149	200 - 225		±6
133-150	225 - 250		
133-151	250 - 275		±7
133-152	275 - 300		
133-153	300 - 325		±8
133-154	325 - 350		
133-155	350 - 375		±9
133-156	375 - 400		
133-157	400 - 425		±10
133-158	425 - 450		
133-159	450 - 475		±11
133-160	475 - 500		
133-161	500 - 525	±12	
133-162	525 - 550		
133-163	550 - 575	±13	
133-164	575 - 600		
133-165	600 - 625	±14	
133-166	625 - 650		
133-167	650 - 675	±15	
133-168	675 - 700		
133-169	700 - 725	±16	
133-170	725 - 750		
133-171	750 - 775		
133-172	775 - 800		
133-173	800 - 825		
133-174	825 - 850		
133-175	850 - 875		
133-176	875 - 900		
133-177	900 - 925		
133-178	925 - 950		
133-179	950 - 975		
133-180	975 - 1000		

DIMENSIONS

133-145 to 133-180

Unit: mm



Order No.	L ₁	L ₆	L ₇
133-145	100	5	3
133-146	125	5	3
133-147	150	18	15
133-148	175	18	15
133-149	200	18	15
133-150	225	18	15
133-151	250	18	15
133-152	275	18	15
133-153	300	18	15
133-154	325	18	15
133-155	350	18	15
133-156	375	18	15
133-157	400	18	15
133-158	425	18	15
133-159	450	18	15
133-160	475	18	15
133-161	500	18	15
133-162	525	18	15
133-163	550	18	15
133-164	575	18	15
133-165	600	18	15
133-166	625	18	15
133-167	650	18	15
133-168	675	18	15
133-169	700	18	15
133-170	725	18	15
133-171	750	18	15
133-172	775	18	15
133-173	800	18	15
133-174	825	18	15
133-175	850	18	15
133-176	875	18	15
133-177	900	18	15
133-178	925	18	15
133-179	950	18	15
133-180	975	18	15

Inside Micrometers

Tubular Inside Micrometers SERIES 137, 337 — Extension-Rod Type

- Wide range of inside measurements possible by combining extension rods and anvils with the micrometer head.
- A reference gage is necessary for reference point setting.
- Two types of measuring faces are available: with or without carbide tip. (The SERIES 337 is only available with carbide tip.)
- An optional reference gage, such as Gage Block Accessory Set, CERA inside Micro Checker or a setting ring (nominal size 12 in or less), is required for accurately setting the micrometer before measuring (refer to pages E-14 to C-30, and C-53 for details).
- IP65 (water-proof) protection level that enables use in the presence of cutting fluid (for 337 Series).



337-304

SPECIFICATIONS

Inch / Metric						
Order No.	Range (in)	Resolution	Micrometer head stroke (in)	Extension rods		Display unit (in)
				Qty	Size (in)	
337-102	8 - 9	0.0001 in / 0.001 mm	1	—	—	8 - 9
337-303	8 - 40			6	1, 2, 4 (2 pcs.), 8, 12	
337-304	8 - 60			7	1, 2, 4, 8, 12 (3 pcs.)	

Metric						
Order No.	Range (mm)	Resolution (mm)	Micrometer head stroke (mm)	Extension rods		Display unit (mm)
				Qty	Size (mm)	
337-101	200 - 225	0.001	25	—	—	200 - 225
337-301	200 - 1000			6	25, 50, 100 (2 pcs.), 200, 300	
337-302	200 - 1500			7	25, 50, 100, 200, 300 (3 pcs.)	

- Power source: SR44 battery (1 pc.), **938882** included as standard (for operational checks)
- Battery life: Approx. 1.2 years under normal use

MeasurLink¹ ENABLED
Data Management Software by Mitutoyo



Applicable models:
SERIES 337

Technical Data

Inch Model
Accuracy: $\pm\{.00015+.00005n+.00005R/2\}''$
R=Maximum measuring length (inch)
n=Number of rods
Fraction rounded up

Metric Model
Accuracy: $\pm(3+n+L/50)\mu\text{m}$
L=Maximum measuring length (mm)
Fraction rounded up
n=Number of rods
Excluding quantizing error

Resolution: 0.001mm or .0001"/0.001mm
Display: LCD
Battery: SR44 (1 pcs.), **938882**

Measurement example



Functions

- Zero-setting
- Origin restoration
- Data hold
- 2-point preset
- Function lock
- Automatic power ON/OFF
- Error alarm
- Data output

Optional Accessories

Order No.	Type	description
264-020	—	USB Input Tool Series USB Keyboard Signal Conversion Type IT-020U
05CZA662	B	Connection cable (1 m)
05CZA663	B	Connection cable (2 m)
06AFM380B	B	USB Input Tool Direct (2 m)
02AZD730G	IP67	U-WAVE-T
02AZD880G	Buzzer	U-WAVE-T
02AZD790B	B	Connection cable for U-WAVE-T (160 mm)
02AZE140B	B	Connection cable for U-WAVE-T For foot switch

Inside Micrometers



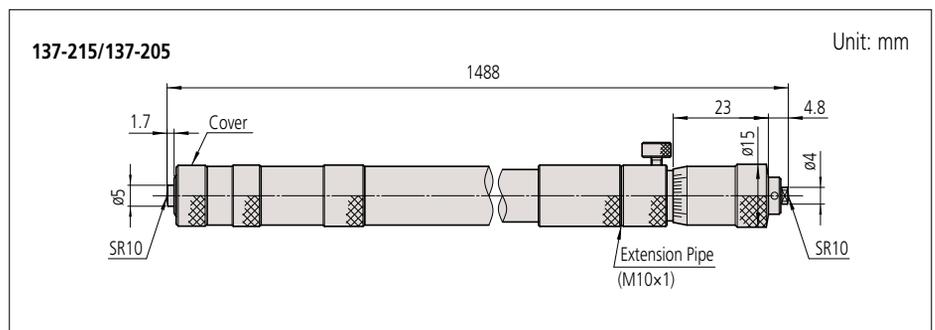
137-215

SPECIFICATIONS

Inch						
Order No.	Range (in)	Graduation (in)	Micrometer head stroke (in)	Extension rods		Main unit (in)
				Qty	Size (in)	
137-211	2 - 6	0.001	0.5	3	0.5, 1, 2	2 - 2.5
137-212	2 - 12			5	0.5, 1, 2 (2 pcs.), 4	
137-213	2 - 20			6	0.5, 1, 2 (2 pcs.), 4, 8	
137-214	2 - 40			8	0.5, 1, 2 (2 pcs.), 4, 8 (2 pcs.), 12	
137-215	2 - 60			10	0.5, 1, 2 (2 pcs.), 4, 8 (3 pcs.), 12 (2 pcs.)	
With carbide measuring face						
137-216	2 - 6	0.001	0.5	3	0.5, 1, 2	2 - 2.5
137-217	2 - 12			5	0.5, 1, 2 (2 pcs.), 4	
137-218	2 - 20			6	0.5, 1, 2 (2 pcs.), 4, 8	
137-219	2 - 40			8	0.5, 1, 2 (2 pcs.), 4, 8 (2 pcs.), 12	
137-220	2 - 60			10	0.5, 1, 2 (2 pcs.), 4, 8 (3 pcs.), 12 (2 pcs.)	

Metric						
Order No.	Range (mm)	Graduation (mm)	Micrometer head stroke (mm)	Extension rods		Main unit (mm)
				Qty	Size (mm)	
137-201	50 - 150	0.01	13	3	13, 25, 50	50 - 63
137-202	50 - 300			5	13, 25, 50 (2 pcs.), 100	
137-203	50 - 500			6	13, 25, 50 (2 pcs.), 100, 200	
137-204	50 - 1000			8	13, 25, 50 (2 pcs.), 100, 200 (2 pcs.), 300	
137-205	50 - 1500			10	13, 25, 50 (2 pcs.), 100, 200 (3 pcs.), 300 (2 pcs.)	
With carbide measuring face						
137-206	50 - 150	0.01	13	3	13, 25, 50	50 - 63
137-207	50 - 300			5	13, 25, 50 (2 pcs.), 100	
137-208	50 - 500			6	13, 25, 50 (2 pcs.), 100, 200	
137-209	50 - 1000			8	13, 25, 50 (2 pcs.), 100, 200 (2 pcs.), 300	
137-210	50 - 1500			10	13, 25, 50 (2 pcs.), 100, 200 (3 pcs.), 300 (2 pcs.)	

DIMENSIONS



Need Calibration?

Inside Micrometers

Tubular Inside Micrometers

SERIES 137 — Extension-rod Type (main unit)

- Micrometer head for Extension-rod Type inside micrometer.
- A reference gage is necessary for reference point setting.
- An optional reference gage, such as Gage Block Accessory Set or a setting ring, is required for accurately setting the micrometer before measuring (refer to pages E-14 to C-30, and C-53 for details).



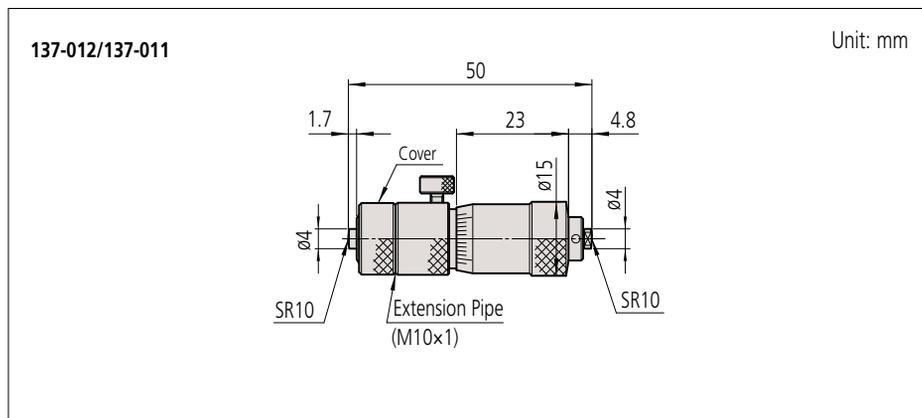
137-012

SPECIFICATIONS

Inch			
Order No.	Range (in)	Graduation (in)	Micrometer head stroke (in)
137-012	2 - 2.5	0.001	0.5
Carbide-tipped 137-014			

Metric			
Order No.	Range (mm)	Graduation (mm)	Micrometer head stroke (mm)
137-011	50 - 63	0.01	13
Carbide-tipped 137-013			

DIMENSIONS



Find a Distributor



Technical Data

Inch Model

Accuracy: $\pm(0.0015+0.0005n+0.0005R*/2)''$
R=Maximum measuring length (inch)
n=Number of rods
Fraction rounded up

Metric Model

Accuracy: $\pm(3+n+L/50)\mu\text{m}$
L=Maximum measuring length (mm)
Fraction rounded up
n=Number of rods
Excluding quantizing error

Resolution: 0.001mm or .0001"/0.001mm

Display: LCD

Battery: SR44 (1 pcs.), **938882**

Measurement example



Functions

- Zero-setting
- Origin restoration
- Data hold
- Function lock
- Automatic power ON/OFF
- 2-point Preset
- Error alarm
- Data output

Optional Accessories

Order No.	Type	description
264-020	—	USB Input Tool Series USB Keyboard Signal Conversion Type IT-020U
05CZA662	B	Connection cable (1 m)
05CZA663	B	Connection cable (2 m)
06AFM380B	B	USB Input Tool Direct (2 m)
02AZD730G	IP67	U-WAVE-T
02AZD880G	Buzzer	U-WAVE-T
02AZD790B	B	Connection cable for U-WAVE-T (160 mm)
02AZE140B	B	Connection cable for U-WAVE-T For foot switch

Inside Micrometers

Tubular Inside Micrometers SERIES 339 — Extension-pipe Type

- Wide range of inside measurements possible by combining extension pipes and anvils with the micrometer head.
- Carbide-tipped measuring faces.
- IP65 (water-proof) protection level that enables use in the presence of cutting fluid.
- A reference gage is necessary for reference point setting.



339-303

SPECIFICATIONS

Inch / Metric						
Order No.	Range (in)	Resolution	Micrometer head stroke (in)	Extension pipes		Display unit (in)
				Qty	Size (in)	
339-102	8 - 9	0.0001 in/ 0.001 mm	1	—	—	8 - 9
339-303	8 - 40			5	1, 2, 4, 8, 16	
339-304	8 - 80			8	1, 2, 4, 8 (2 pcs.), 16 (3 pcs.)	

Metric						
Order No.	Range (mm)	Resolution (mm)	Micrometer head stroke (mm)	Extension pipes		Display unit (mm)
				Qty	Size (mm)	
339-101	200 - 225	0.001	25	—	—	200 - 225
339-301	200 - 1000			5	25, 50, 100, 200, 400	
339-302	200 - 2000			8	25, 50, 100, 200 (2 pcs.), 400 (3 pcs.)	

- Power source: SR44 battery (1 pc.), **938882** included as standard (for operational checks)
- Battery life: Approx. 1.2 years under normal use

Inside Micrometers

Tubular Inside Micrometers SERIES 139, 140 — Extension-pipe Type

- Wide range of inside measurements possible by combining extension pipes and anvils with the micrometer head.
- An optional reference gage is required for accurately setting the micrometer before measuring.
- Carbide-tipped measuring faces.



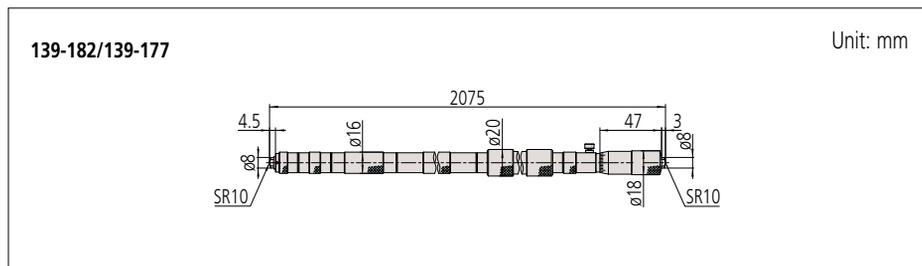
139-182

SPECIFICATIONS

Inch						
Order No.	Range (in)	Graduation (in)	Micrometer head stroke (in)	Extension pipes		Main unit (in)
				Qty	Size (in)	
139-178	4 - 20	0.001	1	4	1, 2, 4, 8	4 - 5
139-179	4 - 36			5	1, 2, 4, 8, 16	
139-180	4 - 52			6	1, 2, 4, 8, 16 (2 pcs.)	
139-181	4 - 68			7	1, 2, 4, 8, 16 (3 pcs.)	
139-182	4 - 84			8	1, 2, 4, 8, 16 (4 pcs.)	

Metric						
Order No.	Range (mm)	Graduation (mm)	Micrometer head stroke (mm)	Extension pipes		Main unit (mm)
				Qty	Size (mm)	
139-173	100 - 500	0.01	25	4	25, 50, 100, 200	100 - 125
139-174	100 - 900			5	25, 50, 100, 200, 400	
139-175	100 - 1300			6	25, 50, 100, 200, 400 (2 pcs.)	
139-176	100 - 1700			7	25, 50, 100, 200, 400 (3 pcs.)	
139-177	100 - 2100			8	25, 50, 100, 200, 400 (4 pcs.)	

DIMENSIONS



Got Questions?

Inside Micrometers



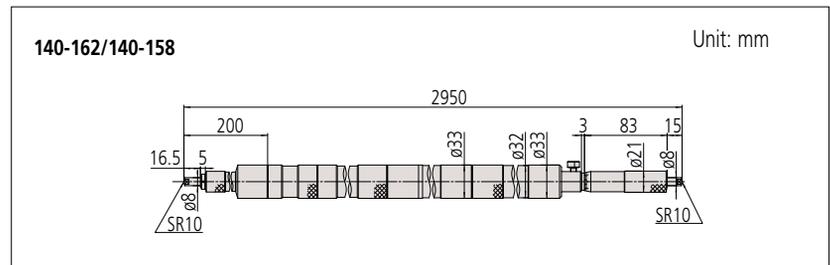
140-160

SPECIFICATIONS

Inch						
Order No.	Range (in)	Graduation (in)	Micrometer head stroke (in)	Extension pipes		Main unit (in)
				Qty	Size (in)	
140-161	40 - 80	0.001	2	5	2, 4 (2 pcs.), 8, 20	40 - 42
140-162	40 - 120			6	2, 4 (2 pcs.), 8, 20, 40	
140-163	40 - 160			7	2, 4 (2 pcs.), 8, 20, 40 (2 pcs.)	
140-164	40 - 200			8	2, 4 (2 pcs.), 8, 20, 40 (3 pcs.)	

Metric						
Order No.	Range (mm)	Graduation (mm)	Micrometer head stroke (mm)	Extension pipes		Main unit (mm)
				Qty	Size (mm)	
140-157	1000 - 2000	0.01	50	5	50, 100 (2 pcs.), 200, 500	1000 - 1050
140-158	1000 - 3000			6	50, 100 (2 pcs.), 200, 500, 1000	
140-159	1000 - 4000			7	50, 100 (2 pcs.), 200, 500, 1000 (2 pcs.)	
140-160	1000 - 5000			8	50, 100 (2 pcs.), 200, 500, 1000 (3 pcs.)	

DIMENSIONS



Inside Micrometers

Tubular Inside Micrometers

SERIES 139 — Extension-Pipe Type (main unit)

- Micrometer head for Extension-pipe Type inside micrometer.
- A reference gage is necessary for reference point setting.
- An optional reference gage, such as Gage Block Accessory Set, CERA Inside Micro Checker or a setting ring, is required for accurately setting the micrometer before measuring (refer to pages E-14 to C-30, and C-53 for details).



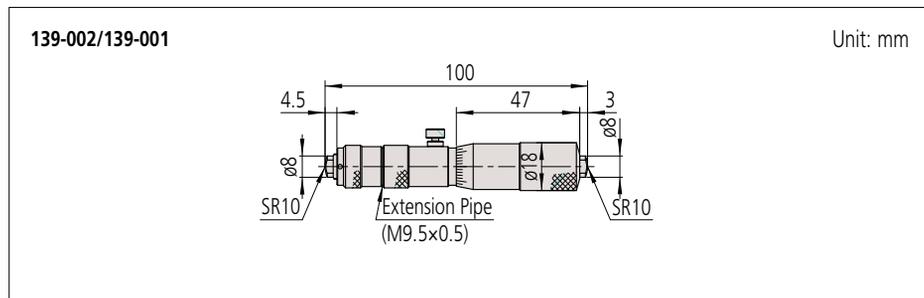
139-002

SPECIFICATIONS

Inch			
Order No.	Range (in)	Graduation (in)	Micrometer head stroke (in)
139-002	4 - 5	0.001	1

Metric			
Order No.	Range (mm)	Graduation (mm)	Micrometer head stroke (mm)
139-001	100 - 125	0.01	25

DIMENSIONS



Talk to Sales

Measurement example



Optional Accessories

Order No.	Type	description
264-020	—	USB Input Tool Series USB Keyboard Signal Conversion Type IT-020U
05CZA662	B	Connection cable (1 m)
05CZA663	B	Connection cable (2 m)
06AFM380B	B	USB Input Tool Direct (2 m)
02AZD730G	IP67	U-WAVE-T
02AZD880G	Buzzer	U-WAVE-T
02AZD790B	B	Connection cable for U-WAVE-T (160 mm)
02AZE140B	B	Connection cable for U-WAVE-T For foot switch
264-622	IP67	U-WAVE-TM
264-623	Buzzer	U-WAVE-TM
264-626	IP67	U-WAVE-TMB
264-627	Buzzer	U-WAVE-TMB
02AZF310	IP67	Connecting unit for U-WAVE-TM/TMB

Inside Micrometers SERIES 345 — Caliper Type

- Useful for measuring workpieces with grooves that cannot be measured by a two-point or three-point inside micrometer.
- Carbide-tipped measuring faces.
- Equipped with a constant measuring-force device.
- An optional reference gage, such as Gage Block Accessory Set, CERA Inside Micro Checker or a setting ring, is required for accurately setting the micrometer before measuring (refer to pages E-14 to C-30, and C-53 for details).



345-350-30

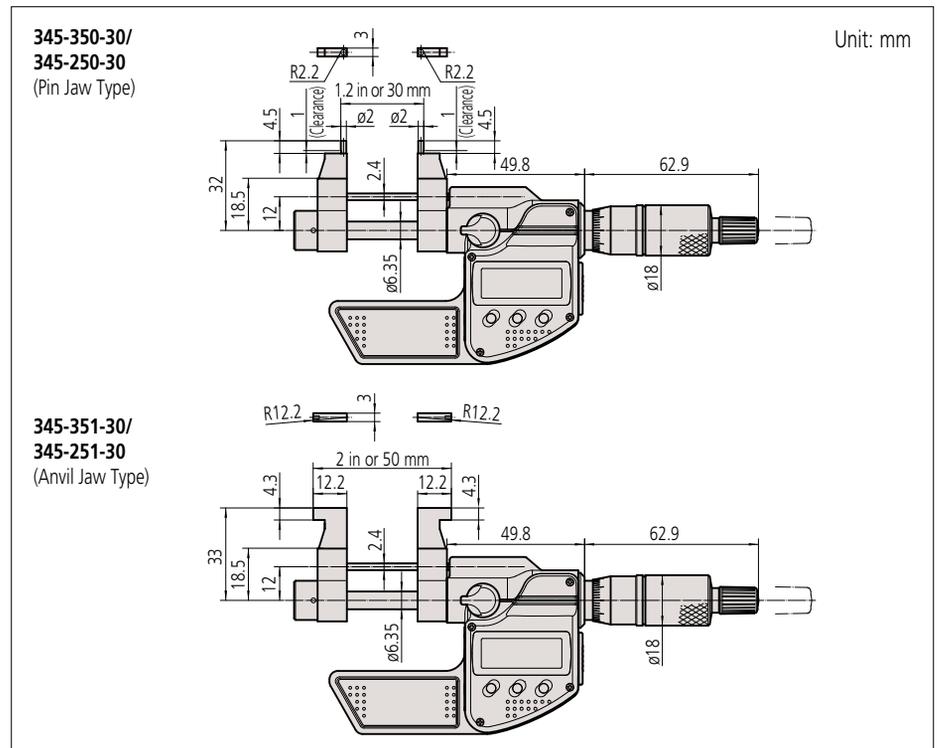
SPECIFICATIONS

Inch/Metric					
Order No.	Range (in)	Resolution	Accuracy (in)	Jaw	Mass (g)
345-350-30	0.2 - 1.2	0.00005 in/	±0.00025	Pin	320
345-351-30	1 - 2	0.001 mm	±0.0003	Anvil	325

Metric					
Order No.	Range (mm)	Resolution (mm)	Accuracy (μm)	Jaw	Mass (g)
345-250-30	5 - 30	0.001	±5	Pin	320
345-251-30	25 - 50		±6	Anvil	325

- Power source: SR44 battery (1 pc.), **938882** included as standard (for operational checks)
- Battery life: Approx. 2.4 years under normal use

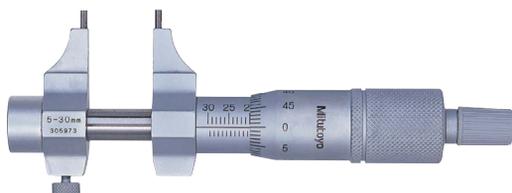
DIMENSIONS



Inside Micrometers

Inside Micrometers SERIES 145 — Caliper Type

- This is an analog version of the SERIES 345 caliper type micrometer for inside measurement.
- Carbide-tipped measuring faces.
- Equipped with a constant measuring-force device.
- An optional reference gage, such as Gage Block Accessory Set, CERA Inside Micro Checker or a setting ring, is required for accurately setting the micrometer before measuring (refer to pages E-14 to C-30, and C-53 for details).



145-185

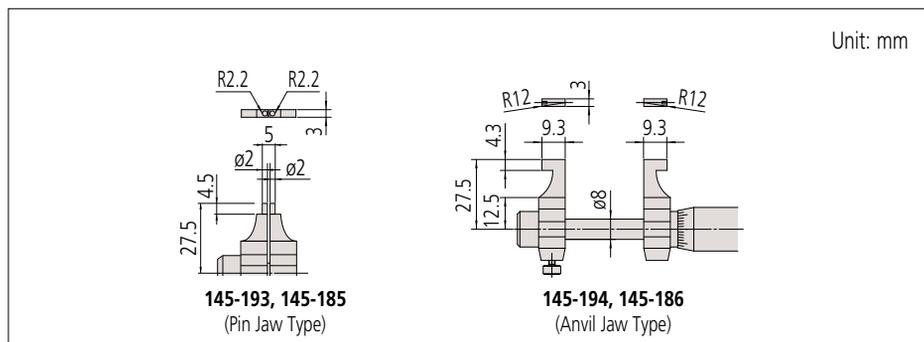
SPECIFICATIONS

Inch					
Order No.	Range (in)	Graduation (in)	Accuracy (in)	Jaw	Mass (g)
145-193	0.2 - 1.2	0.001	±0.00025	Pin	130
145-194	1 - 2		±0.0003	Anvil	140

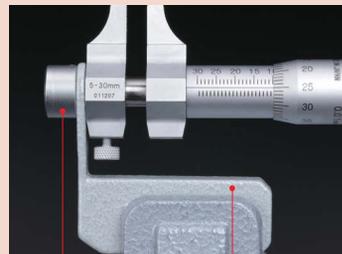
Metric					
Order No.	Range (mm)	Graduation (mm)	Accuracy (μm)	Jaw	Mass (g)
145-185	5 - 30	0.01	±5	Pin	130
145-186	25 - 50		±6	Anvil	140

Note: The minimum pitch circle measurement is $\varnothing 5$ mm with pin type (145-185, 145-193).

DIMENSIONS



Optional Accessories



Cap (300401)

Holder (300400)

Note 1: This instrument requires the cap and the holder for mounting on a micrometer stand.



Need Repair?

Inside Micrometers



145-195

SPECIFICATIONS

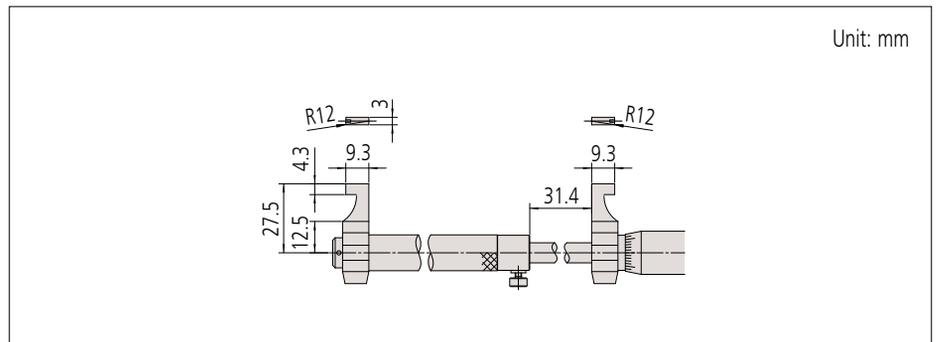
Inch

Order No.	Range (in)	Graduation (in)	Accuracy (in)	Jaw	Mass (g)
145-195	2 - 3	0.001	±0.00035	Anvil	160
145-196	3 - 4		±0.0004		180

Metric

Order No.	Range (mm)	Graduation (mm)	Accuracy (μm)	Jaw	Mass (g)
145-187	50 - 75	0.01	±7	Anvil	160
145-188	75 - 100		±8		180
145-189	100 - 125		±9		210
145-190	125 - 150		±10		230
145-191	150 - 175		±11		250
145-192	175 - 200		±12		270
145-217	200 - 225		±16		310
145-218	225 - 250		±21		330
145-219	250 - 275				350
145-220	275 - 300				370
145-221	300 - 325				390
145-222	325 - 350				410
145-223	350 - 375				430
145-224	375 - 400				450
145-225	400 - 425				470
145-226	425 - 450		490		
145-227	450 - 475	510			
145-228	475 - 500	530			

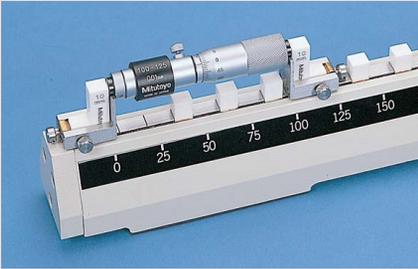
DIMENSIONS





Inside Micrometers

Measurement example



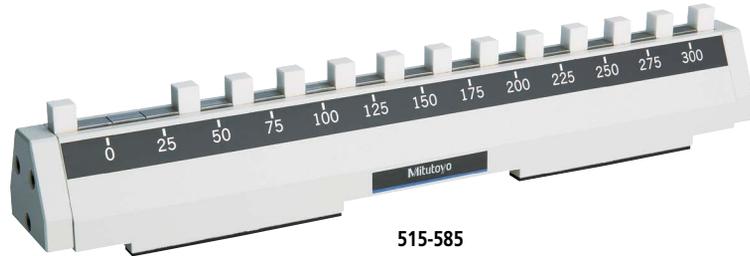
Standard accessory set



- Support clamps **940286*** Pair
 - Auxiliary block 10 mm **602195** 2 pcs.
 - Collar **602195** 2 pcs.
 - Clamp screwdriver **600324** 1 pc.
- * Order No. is equivalent to a pair (2 pcs.)

CERA Inside Micro Checker SERIES 515

- The Inside Micro Checker is designed to act as a setting standard for inside micrometers.
- Recommended for SERIES **133**, **139** and **145** (over 50 mm). Not applicable for SERIES **137**, **141**, **337** and **339**.

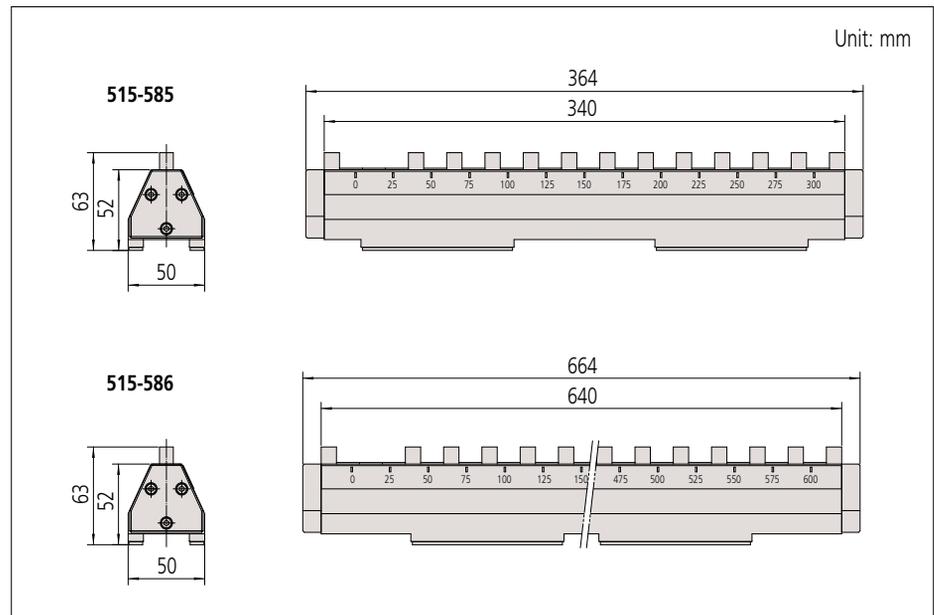


SPECIFICATIONS

Order No.	Length to check (mm)	Block pitch accuracy
515-585	25 - 300	$\pm(1 + L/150) \mu\text{m}$ L: Length to check (mm)
515-586	25 - 600	

Note: The bottom surface and the contact faces are not precisely perpendicular to each other if Height Masters are needed, refer to the E section.

DIMENSIONS



Bore Gages

Bore Gages — Split Ball Type SERIES 526 — for Extra Small Holes

- This bore gage is designed to measure small holes of .037 to .287 in diameter.
- For models where the dial indicator is optional, refer to page C-52 for recommended indicators.
- Optional stand (**215-120-10**) is available for efficient measurement of multiple small holes.



526-176-20

SPECIFICATIONS

Inch							
Order No.	Range (in)	Accuracy* (in)	Repeatability* (in)	Bore gage	Dial indicator	Dial protection cover	Setting ring
526-175-10	0.037 - 0.061	0.00016	0.00004	526-175-10	Not supplied	Not supplied	Not supplied
526-165-10	0.059 - 0.156	0.00016		526-165-10			
526-155-10	0.146 - 0.287	0.00024		526-155-10			
526-176-20	0.037 - 0.061	0.00016		526-175-10			
526-166-20	0.059 - 0.156	0.00016		526-165-10	2923AB-10 (Graduation: 0.0001 in)	21DZA000	Not supplied
526-156-20	0.146 - 0.287	0.00024		526-155-10			
526-175-11	0.037 - 0.061	0.00016		526-175-10	Not supplied	Not supplied	Supplied
526-165-11	0.059 - 0.156	0.00016		526-165-10			
526-155-11	0.146 - 0.287	0.00024		526-155-10	2923AB-10 (Graduation: 0.0001 in)	21DZA000	Supplied
526-176-21	0.037 - 0.061	0.00016		526-175-10			
526-166-21	0.059 - 0.156	0.00016		526-165-10			
526-156-21	0.146 - 0.287	0.00024		526-155-10			

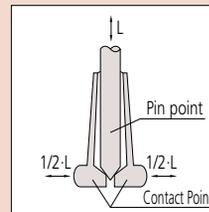
Metric							
Order No.	Range (mm)	Accuracy* (μm)	Repeatability* (μm)	Bore gage	Dial indicator	Dial protection cover	Setting ring
526-170-10	0.95 - 1.55	4	1	526-170-10	Not supplied	Not supplied	Not supplied
526-160-10	1.50 - 3.95	4		526-160-10			
526-150-10	3.70 - 7.30	6		526-150-10			
526-172-20	0.95 - 1.55	4		526-170-10			
526-162-20	1.50 - 3.95	4		526-160-10	2109AB-10 (Graduation: 0.001 mm)	21DZA000	Not supplied
526-152-20	3.70 - 7.30	6		526-150-10			
526-173-20	0.95 - 1.55	4		526-170-10	2046AB (Graduation: 0.01 mm)	21DZA000	Not supplied
526-163-20	1.50 - 3.95	4		526-160-10			
526-153-20	3.70 - 7.30	6		526-150-10	Not supplied	Not supplied	Supplied
526-170-11	0.95 - 1.55	4		526-170-10			
526-160-11	1.50 - 3.95	4		526-160-10	2109AB-10 (Graduation: 0.001 mm)	21DZA000	Supplied
526-150-11	3.70 - 7.30	6		526-150-10			
526-172-21	0.95 - 1.55	4	526-170-10				
526-162-21	1.50 - 3.95	4	526-160-10	2046AB (Graduation: 0.01 mm)	21DZA000	Supplied	
526-152-21	3.70 - 7.30	6	526-150-10				
526-173-21	0.95 - 1.55	4	526-170-10				
526-163-21	1.50 - 3.95	4	526-160-10				
526-153-21	3.70 - 7.30	6	526-150-10				

* Accuracy of the bore gage alone.
Note: Setting rings are not supplied with some models. Please purchase them separately if necessary. For details of setting rings, refer to page C-53.

Measurement example



Measurement Principle



Setting Rings (Inch)

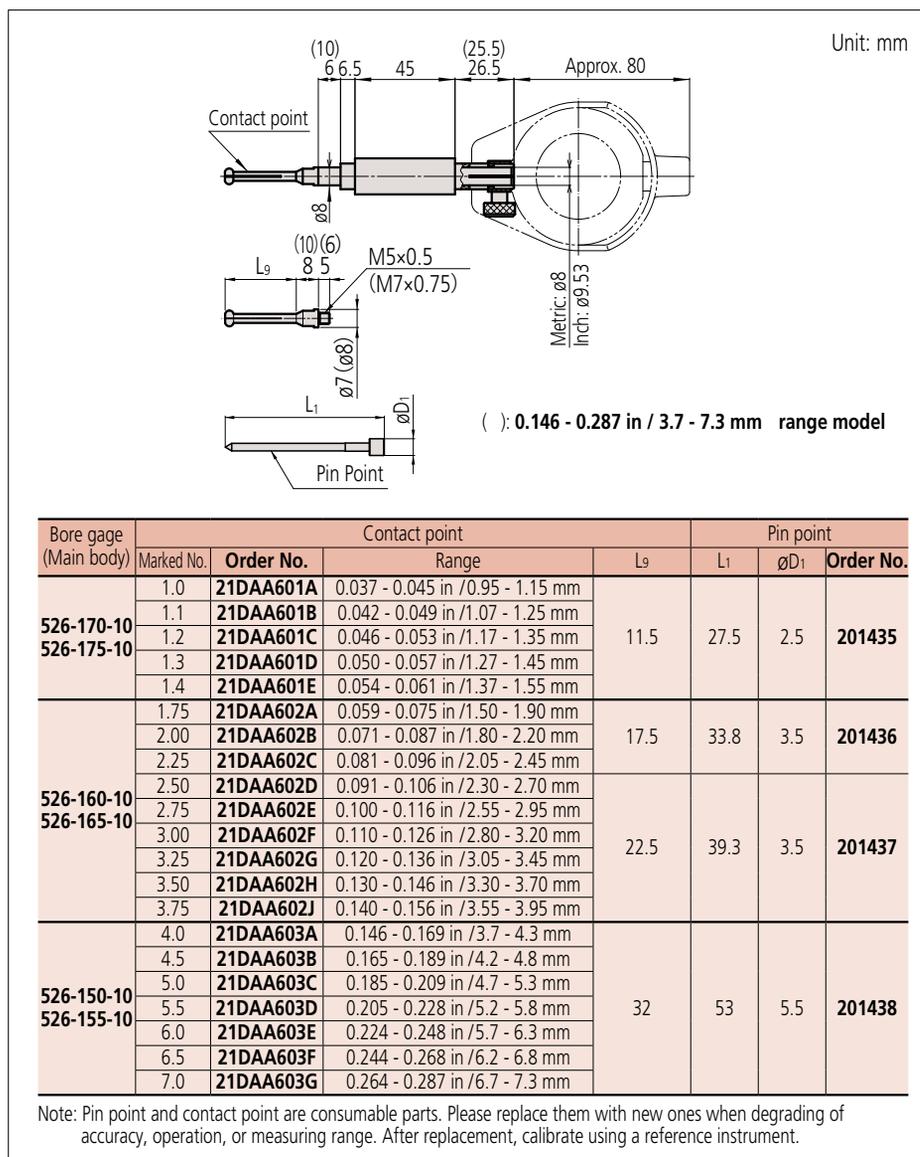
- Nominal size
- Order No. **526-175-11** etc.
 - 177-350: 0.040 in
 - 177-351: 0.045 in
 - 177-352: 0.050 in
 - 177-353: 0.055 in
 - 177-354: 0.060 in
 - Order No. **526-165-11** etc.
 - 177-355: 0.07 in
 - 177-356: 0.08 in
 - 177-357: 0.09 in
 - 177-358: 0.10 in
 - 177-359: 0.11 in
 - 177-360: 0.12 in
 - 177-361: 0.13 in
 - 177-362: 0.14 in
 - 177-363: 0.15 in
 - Order No. **526-155-11** etc.
 - 177-364: 0.16 in
 - 177-365: 0.18 in
 - 177-366: 0.20 in
 - 177-367: 0.22 in
 - 177-368: 0.24 in
 - 177-369: 0.26 in
 - 177-370: 0.28 in

Setting Rings (Metric)

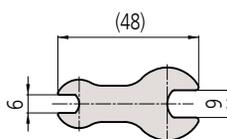
- Nominal size
- Order No. **526-170-11** etc.
 - 177-220: 1.0 mm
 - 177-222: 1.1 mm
 - 177-225: 1.2 mm
 - 177-227: 1.3 mm
 - 177-230: 1.4 mm
 - Order No. **526-160-11** etc.
 - 177-236: 1.75 mm
 - 177-239: 2.00 mm
 - 177-242: 2.25 mm
 - 177-208: 2.50 mm
 - 177-246: 2.75 mm
 - 177-248: 3.00 mm
 - 177-250: 3.25 mm
 - 177-252: 3.50 mm
 - 177-255: 3.75 mm
 - Order No. **526-150-11** etc.
 - 177-204: 4.0 mm
 - 177-257: 4.5 mm
 - 177-205: 5.0 mm
 - 177-263: 5.5 mm
 - 177-267: 6.0 mm
 - 177-271: 6.5 mm
 - 177-275: 7.0 mm

Bore Gages

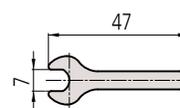
DIMENSIONS



Spanner
210188



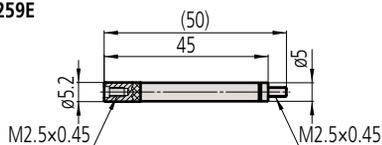
102148



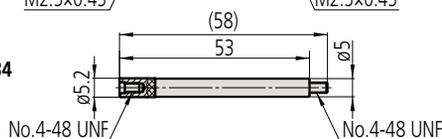
Unit: mm

Thickness: 1.5

Extension rod
21AAA259E



213634



Bore gage	Spanner	Extension rod
526-170-10	210188	21AAA259E
526-160-10		
526-150-10	102148	213634
526-175-10	210188	
526-165-10		
526-155-10	102148	

() : 0.146 - 0.287 in / 3.7 - 7.3 mm range model

Note: This is not a component for extending the probing depth. (Standard Accessory)



Get a Quote

Bore Gages

Bore Gages — Split Ball Type SERIES 526 — for Extra Small Holes

- This bore gage is designed to measure small holes of .3 to .7 in diameter.
- For models where the dial indicator is optional, refer to page C-52 for recommended indicators.
- Optional stand (**215-120-10**) is available for efficient measurement of multiple small holes.



526-123-20

SPECIFICATIONS

Inch							
Order No.	Range (in)	Accuracy* (in)	Repeatability* (in)	Bore gage	Dial indicator	Dial protection cover	Setting ring
526-103	0.3 - 0.4	0.00016	0.00008	526-103	Not supplied	Not supplied	Not supplied
526-104	0.4 - 0.7	0.00024		526-104			
526-122-20	0.3 - 0.4	0.00016		526-103	2923AB-10 (Graduation: 0.0001 in)	21DZA000	
526-123-20	0.4 - 0.7	0.00024		526-104			
526-119-20	0.3 - 0.4	0.00016		526-103	2922AB (Graduation: 0.0005 in)	21DZA000	
526-120-20	0.4 - 0.7	0.00024		526-104			

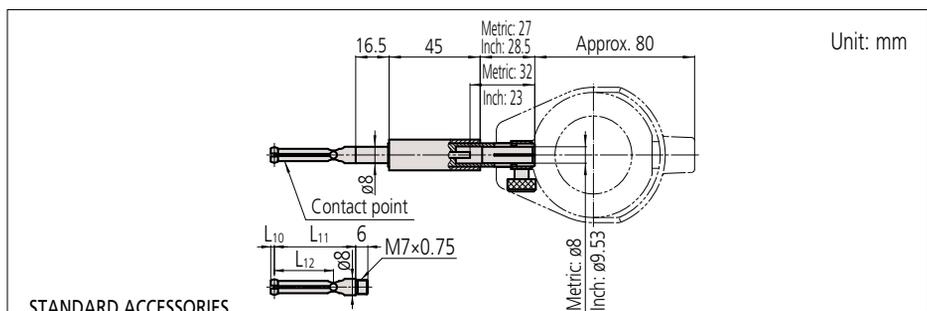
Metric							
Order No.	Range (mm)	Accuracy* (µm)	Repeatability* (µm)	Bore gage	Dial indicator	Dial protection cover	Setting ring
526-101	7 - 10	4	2	526-101	Not supplied	Not supplied	Not supplied
526-102	10 - 18	6		526-102			
526-124-20	7 - 10	4		526-101	2109AB-10 (Graduation: 0.001 mm)	21DZA000	
526-125-20	10 - 18	6		526-102			
526-126-20	7 - 10	4		526-101	2046AB (Graduation: 0.01 mm)	21DZA000	
526-127-20	10 - 18	6		526-102			

* Accuracy of the bore gage alone.

Note: Setting rings are not supplied.

Please purchase them separately if necessary. For details of the setting rings, refer to page C-53.

DIMENSIONS



Unit: mm

STANDARD ACCESSORIES

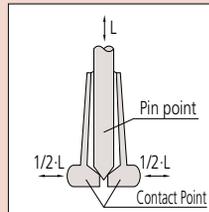
Bore gage (Main body)	Contact point						Spanner Order No.
	Marked No.	Order No.	Range	L10	L11	L12	
526-101 526-103	1	102469	0.28 - 0.30 in / 7.0 - 7.5 mm	1.8	40	29.2	102148
	2	102470	0.30 - 0.32 in / 7.5 - 8.0 mm				
	3	102471	0.32 - 0.34 in / 8.0 - 8.5 mm				
	4	102472	0.34 - 0.36 in / 8.5 - 9.0 mm				
	5	102473	0.36 - 0.38 in / 9.0 - 9.5 mm				
	6	102474	0.38 - 0.40 in / 9.5 - 10.0 mm				
526-102 526-104	1	102454	0.40 - 0.44 in / 10 - 11 mm	2.7	46	38	102148
	2	102455	0.44 - 0.48 in / 11 - 12 mm				
	3	102456	0.48 - 0.52 in / 12 - 13 mm				
	4	102457	0.52 - 0.56 in / 13 - 14 mm				
	5	102458	0.56 - 0.60 in / 14 - 15 mm				
	6	102459	0.60 - 0.64 in / 15 - 16 mm				
	7	102460	0.64 - 0.68 in / 16 - 17 mm				
	8	102461	0.68 - 0.72 in / 17 - 18 mm				

Note: Contact point is consumable part. Please replace it with new one when degrading of accuracy, operation, or measuring range.

Measurement example



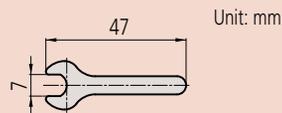
Measurement Principle



Setting rings

Refer to pages C-53 to C-56.

Spanner
102148

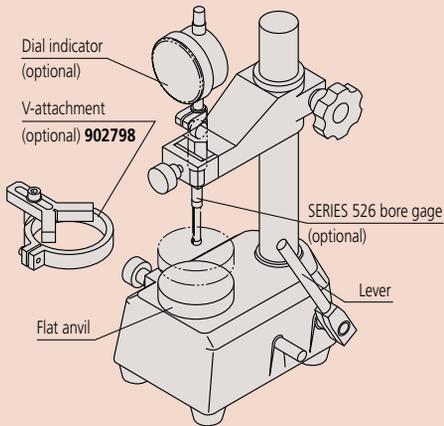


Thickness: 1.5

Bore Gages

Operating Method

- Pulling the lever forwards moves the platen upwards and the instrument goes into measurement mode.
- The V-attachment (optional) aids positioning the workpiece on the platen and is useful when measuring a large number of the same size of workpieces.



Bore Gage Stand SERIES 215

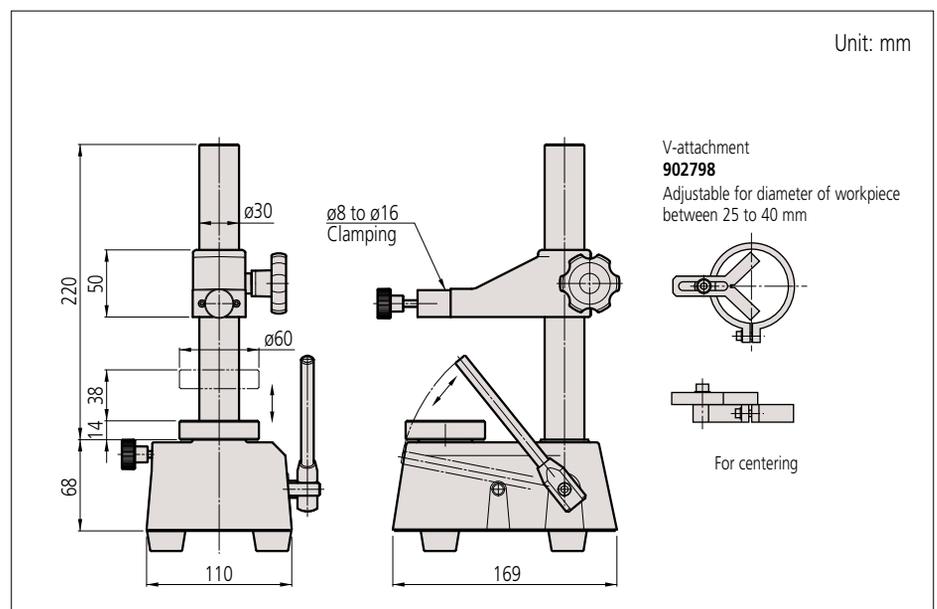
- Optimal for efficient measurement of multiple small holes with a bore gage. (SERIES 526)



SPECIFICATIONS

Order No.	Measuring table displacement (mm)	Measuring table
215-120-10	38	Anvil (ø60 mm)

DIMENSIONS



Need Support?

Bore Gages

Bore Gages SERIES 511 — for Small Holes

- This bore gage is designed to measure the diameters of very small holes.
- For models where the dial indicator is optional, refer to page C-52 for recommended indicators.
- Customized products with a longer rod below the grip or with a carbide anvil are available upon request.
- An optional setting ring is available for accurately setting the gage before measuring. Refer to pages C-53 to C-55.



511-201

Note: For models where the dial indicator is optional, refer to page C-52 for details.

SPECIFICATIONS

Inch							
Order No.	Range (in)	Stroke of contact point (in)	Accuracy* (in)	Repeatability* (in)	Adjacent error* (in)	Measuring force (N)	Guide force (N)
511-214	0.24 - 0.4	0.020	0.0002	0.00008	0.00008	2 or less	—
511-205	0.4 - 0.74	0.024					6 or less
511-212-20	0.24 - 0.4	0.020	0.0002	0.00008	0.00008	2 or less	—
511-206-20	0.4 - 0.74	0.024					6 or less
511-213-20	0.24 - 0.4	0.020	0.0002	0.00008	0.00008	2 or less	—
511-207-20	0.4 - 0.74	0.024					6 or less

Order No.	Contents of set					Probing depth (in)
	Bore gage	Dial indicator	Dial protection cover	Anvil	Interchangeable Washer	
511-214	511-214	Not supplied	Not supplied	9 pcs.	Not supplied	2
511-205	511-205				1 pc.	4
511-212-20	511-214	2923AB-10 (Graduation: 0.0001 in)	21DZA000	9 pcs.	Not supplied	2
511-206-20	511-205				1 pc.	4
511-213-20	511-214	2922AB (Graduation: 0.0005 in)	21DZA000	9 pcs.	Not supplied	2
511-207-20	511-205				1 pc.	4

Metric							
Order No.	Range (mm)	Stroke of contact point (mm)	Accuracy* (μm)	Repeatability* (μm)	Adjacent error* (μm)	Measuring force (N)	Guide force (N)
511-209	6 - 10	0.5	5	2	2	2 or less	—
511-201	10 - 18.5	0.6					6 or less
511-210-20	6 - 10	0.5	5	2	2	2 or less	—
511-203-20	10 - 18.5	0.6					6 or less
511-211-20	6 - 10	0.5	5	2	2	2 or less	—
511-204-20	10 - 18.5	0.6					6 or less

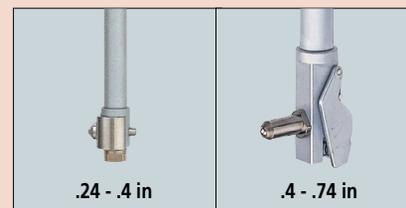
Order No.	Contents of set					Probing depth (mm)
	Bore gage	Dial indicator	Dial protection cover	Anvil	Interchangeable Washer	
511-209	511-209	Not supplied	Not supplied	9 pcs.	Not supplied	50
511-201	511-201				1 pc.	100
511-210-20	511-209	2109AB-10 (Graduation: 0.001 mm)	21DZA000	9 pcs.	Not supplied	50
511-203-20	511-201				1 pc.	100
511-211-20	511-209	2046AB (Graduation: 0.01 mm)	21DZA000	9 pcs.	Not supplied	50
511-204-20	511-201				1 pc.	100

* Accuracy of the bore gage alone.

Measurement example



Contact Points



Dial protection cover, recommended indicators

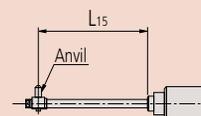
Refer to page C-52.

Setting rings

Refer to pages C-53 to C-56.

Special sizes and specifications other than standard can be custom made by special order. Please contact the nearest M³ Solution Center for more information.

Example

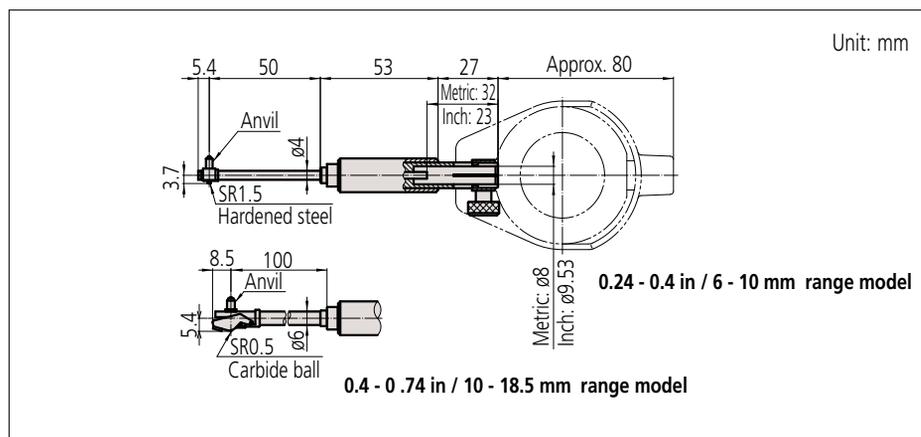


Length below the grip

Model	L15 (mm)
511-209	100, 150, 200, 250
511-201	50, 150, 200, 250, 300

Bore Gages

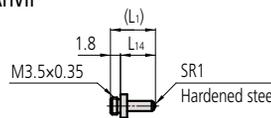
DIMENSIONS



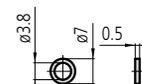
511-209/511-214
Anvil



511-201/511-205
Anvil



Interchangeable washer
(Supplied only with 511-201/511-205)



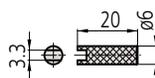
204355

STANDARD ACCESSORIES

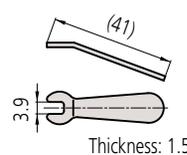
Bore gage (Main body)	Anvil					Interchangeable Washer	Spanner
	Marked No.	Order No.	Indication of measuring size	L ₁	L ₁₃	Order No.	Order No.
511-209 511-214	1	952168	0.24 in / 6.0 mm	4.7	1.2	Not supplied	206709
	2	952169	0.26 in / 6.5 mm	5.3	1.7		
	3	952170	0.28 in / 7.0 mm	5.8	2.2		
	4	952414	0.30 in / 7.5 mm	6.3	2.7		
	5	952415	0.32 in / 8.0 mm	6.8	3.2		
	6	952416	0.34 in / 8.5 mm	7.3	3.7		
	7	952417	0.36 in / 9.0 mm	7.8	4.2		
	8	952418	0.38 in / 9.5 mm	8.3	4.7		
	9	952419	0.40 in / 10.0 mm	8.8	5.2		

Bore gage (Main body)	Anvil					Interchangeable Washer	Spanner
	Marked No.	Order No.	Indication of measuring size	L ₁	L ₁₄	Order No.	Order No.
511-201 511-205	1	204356	0.40 in / 10 mm	3.8	2	204355	204354
	2	204357	0.44 in / 11 mm	4.8	3		
	3	204358	0.48 in / 12 mm	5.8	4		
	4	204359	0.52 in / 13 mm	6.8	5		
	5	204360	0.56 in / 14 mm	7.8	6		
	6	204361	0.60 in / 15 mm	8.8	7		
	7	204362	0.64 in / 16 mm	9.8	8		
	8	204363	0.68 in / 17 mm	10.8	9		
	9	204364	0.72 in / 18 mm	11.8	10		

Spanner
206709



204354



Unit: mm



Need Service?

Bore Gages

Bore Gages SERIES 511

- This is a bore gage for measuring .7 to 16 inch inside diameters. It is suitable for highly accurate measurements.
- Carbide-tipped contact point and anvil for durability and wear resistance.
- Optional extension rods can be attached for measuring deep holes.



511-753-20

SPECIFICATIONS

Inch								
Order No.	Range (in)	Stroke of contact point (in)	Accuracy* (in)	Repeatability* (in)	Adjacent error* (in)	Measuring force (N)	Guide force (N)	
511-731	0.7 - 1.4	0.047	0.00008	0.00002	0.00004	4 or less	6 or less	
511-732	1.4 - 2.5					5 or less	10 or less	
511-733	2.0 - 6.0	0.063				6 or less	15 or less	
511-734	4.0 - 6.5					4 or less	6 or less	
511-735	6.5 - 10.0					5 or less	10 or less	
511-736	10.0 - 16.0					6 or less	15 or less	
511-751-20	0.7 - 1.4	0.047	0.00008	0.00002	0.00004	4 or less	6 or less	
511-752-20	1.4 - 2.5					5 or less	10 or less	
511-753-20	2.0 - 6.0	0.063				6 or less	15 or less	
511-754-20	4.0 - 6.5					4 or less	6 or less	
511-755-20	6.5 - 10.0					5 or less	10 or less	
511-756-20	10.0 - 16.0					6 or less	15 or less	
511-741-20	0.7 - 1.4	0.047	0.00008	0.00002	0.00004	4 or less	6 or less	
511-742-20	1.4 - 2.5					5 or less	10 or less	
511-743-20	2.0 - 6.0	0.063				6 or less	15 or less	
511-744-20	4.0 - 6.5					4 or less	6 or less	
511-745-20	6.5 - 10.0					5 or less	10 or less	
511-746-20	10.0 - 16.0					6 or less	15 or less	
511-931-20	0.7 - 6.0	See SPECIFICATIONS of 511-731/732/733						
511-932-20								
511-935-10								

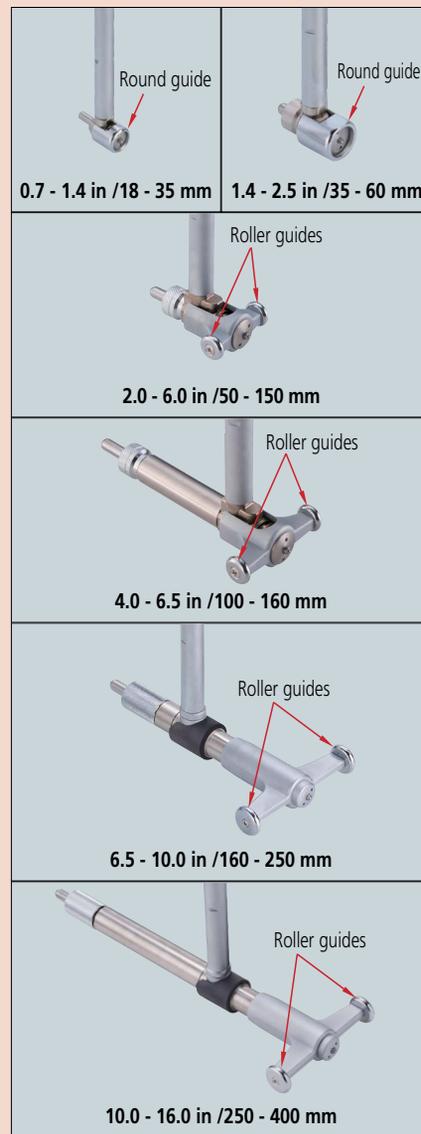
Order No.	Contents of set							Probing depth (in)	
	Bore gage	Dial indicator	Dial protection cover	Anvil	Interchangeable Washer	Sub-Anvil	Spanner		
511-731	511-731	Not supplied	Not supplied	9 pcs.	2 pcs.	Not supplied	1 pc.	4	
511-732	511-732			6 pcs.	4 pcs.				1 pc.
511-733	511-733			11 pcs.		Not supplied	6		
511-734	511-734			13 pcs.					7 pcs.
511-735	511-735			6 pcs.	10				
511-736	511-736			5 pcs.					
511-751-20	511-731	2923AB-10 (Graduation: 0.0001 in)	21DZA000	9 pcs.	2 pcs.	Not supplied		1 pc.	4
511-752-20	511-732			6 pcs.	4 pcs.				
511-753-20	511-733			11 pcs.		Not supplied	6		
511-754-20	511-734			13 pcs.				7 pcs.	
511-755-20	511-735			6 pcs.	10				
511-756-20	511-736			5 pcs.					
511-741-20	511-731	2922AB (Graduation: 0.0005 in)	21DZA000	9 pcs.	2 pcs.	Not supplied		1 pc.	4
511-742-20	511-732			6 pcs.	4 pcs.				
511-743-20	511-733			11 pcs.		Not supplied	6		
511-744-20	511-734			13 pcs.				7 pcs.	
511-745-20	511-735			6 pcs.	10				
511-746-20	511-736			5 pcs.					
511-931-20	Set of 2922AB	21DZA000	See SPECIFICATIONS of 511-731/732/733						
511-932-20	511-731/2923AB-10								
511-935-10	732/733/543-312B								

* Accuracy of the bore gage alone.

Note 1: A 2" sub-anvil is supplied with 511-733, and a 3" sub-anvil is supplied with 511-736.

Note 2: It is not permissible to use a sub-anvil other than as supplied as a standard accessory, or widen a measuring range by using multiple sub-anvils. (The measurement accuracy in such cases is not guaranteed).

Contact Points



Extension Rod

Refer to page C-51.

Dial protection cover, recommended indicators

Refer to page C-52.

Setting rings, Bore Gage Checker, i-Checker

Refer to pages C-53 to C-58.

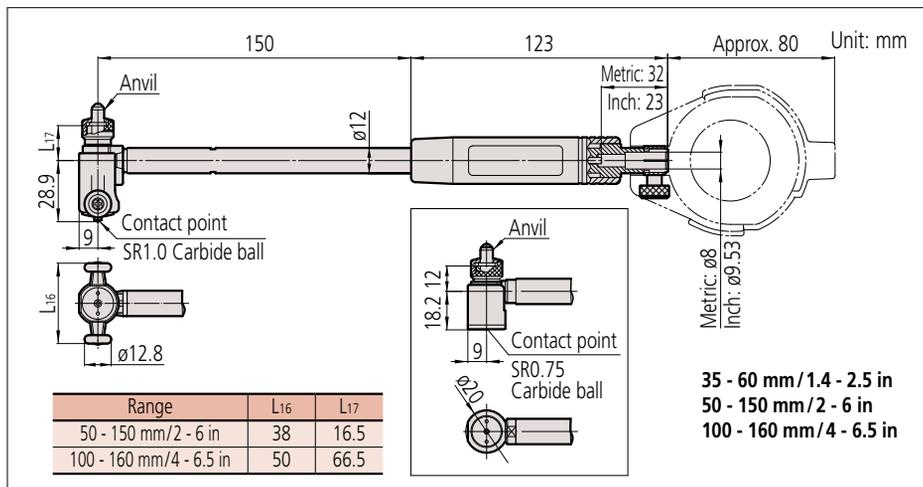


Need Calibration?

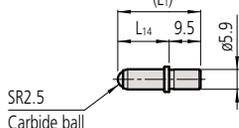
Bore Gages

Bore Gages SERIES 511

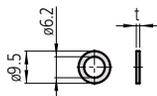
DIMENSIONS



Anvil



Interchangeable washer

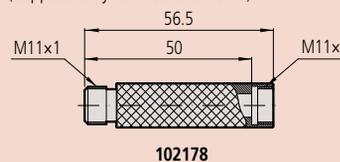


t (mm)	Order No.
0.5	205457
1	205458
2	205459
3	205460

Sub-anvil

(Supplied only for 511-703/733)

Unit: mm



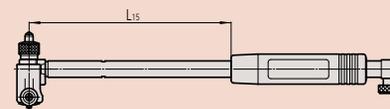
Note: It is not permissible to use a sub-anvil other than as supplied as a standard accessory or widen a measuring range by using multiple sub-anvils. (The measurement accuracy in such cases is not guaranteed.)

STANDARD ACCESSORIES

Bore gage (Main body)	Anvil				
	Marked No.	Order No.	Indication of measuring size	L1	L14
511-702 511-732	1	21DZA232A	1.38 in / 35 mm	15	5.5
	2	21DZA232B	1.57 in / 40 mm	20	10.5
	3	21DZA232C	1.77 in / 45 mm	25	15.5
	4	21DZA232D	1.97 in / 50 mm	30	20.5
	5	21DZA232E	2.17 in / 55 mm	35	25.5
	6	21DZA232F	2.36 in / 60 mm	40	30.5
511-703 511-733 () Using 50 mm / 2 in Sub-Anvil	1	21DZA232A	1.97 in (3.94 in) / 50 mm (100 mm)	15	5.5
	2	21DZA232B	2.17 in (4.13 in) / 55 mm (105 mm)	20	10.5
	3	21DZA232C	2.36 in (4.33 in) / 60 mm (110 mm)	25	15.5
	4	21DZA232D	2.55 in (4.53 in) / 65 mm (115 mm)	30	20.5
	5	21DZA232E	2.74 in (4.72 in) / 70 mm (120 mm)	35	25.5
	6	21DZA232F	2.93 in (4.92 in) / 75 mm (125 mm)	40	30.5
	7	21DZA232G	3.12 in (5.12 in) / 80 mm (130 mm)	45	35.5
	8	21DZA232H	3.31 in (5.31 in) / 85 mm (135 mm)	50	40.5
	9	21DZA232J	3.50 in (5.51 in) / 90 mm (140 mm)	55	45.5
	10	21DZA232L	3.69 in (5.71 in) / 95 mm (145 mm)	60	50.5
	11	21DZA232M	3.88 in (5.91 in) / 100 mm (150 mm)	65	55.5
511-704 511-734	1	21DZA232A	3.94 in / 100 mm	15	5.5
	2	21DZA232B	4.13 in / 105 mm	20	10.5
	3	21DZA232C	4.33 in / 110 mm	25	15.5
	4	21DZA232D	4.53 in / 115 mm	30	20.5
	5	21DZA232E	4.72 in / 120 mm	35	25.5
	6	21DZA232F	4.92 in / 125 mm	40	30.5
	7	21DZA232G	5.12 in / 130 mm	45	35.5
	8	21DZA232H	5.31 in / 135 mm	50	40.5
	9	21DZA232J	5.51 in / 140 mm	55	45.5
	10	21DZA232L	5.71 in / 145 mm	60	50.5
	11	21DZA232M	5.91 in / 150 mm	65	55.5
	12	21DZA232N	6.10 in / 155 mm	70	60.5
	13	21DZA232P	6.30 in / 160 mm	75	65.5

Special sizes and specifications other than standard can be custom made by special order. Please visit the nearest M³ Solution Center for more information.

Example



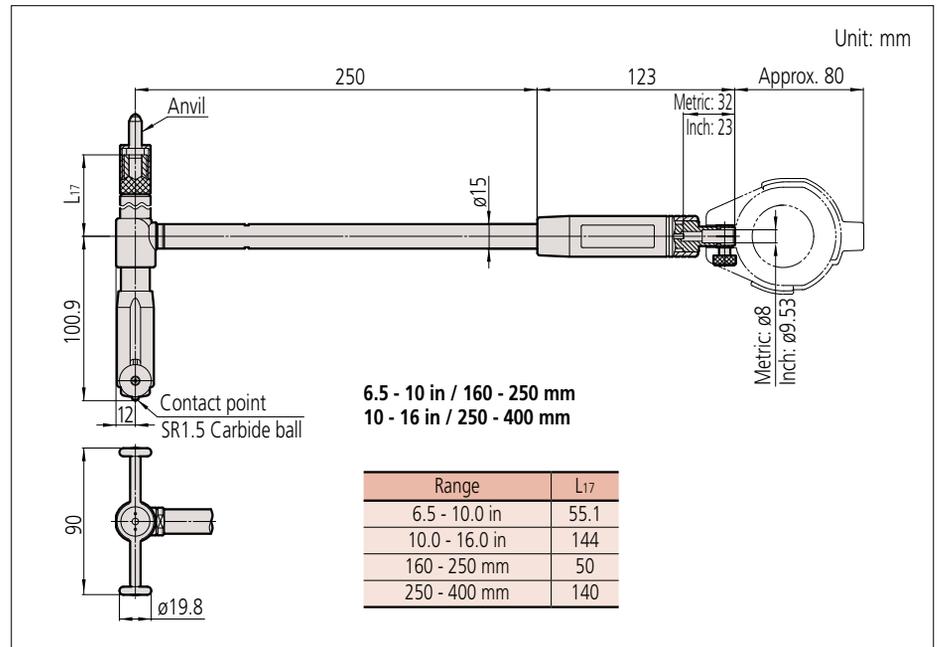
Length below the grip

Model	L15 (mm)
511-701	150, 200, 250, 300, 400, 500
511-702/703/704	100, 200, 250, 300, 400, 500, 600, 700, 800, 900, 1000
511-705/706	100, 150, 200, 300, 400, 500, 600, 700, 800, 900, 1000

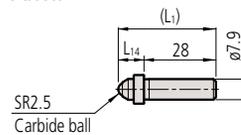
Note: The length over listed above is not available.

Bore Gages

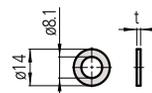
DIMENSIONS



Anvil



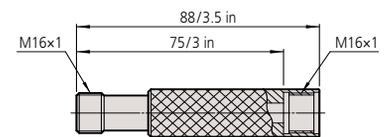
Interchangeable washer



t (mm)	Order No.
0.5	205467
1	205461
2	205462
3	205463
4	205464
5	205465
6	205466

Sub-anvil

Supplied only for **511-706 (202974)**
and **511-736 (202975)**



202974 (511-706)
202975 (511-736)

Note: It is not permissible to use a sub-anvil other than as supplied as a standard accessory, or widen a measuring range by using multiple sub-anvils. (The measurement accuracy in such cases is not guaranteed.)

STANDARD ACCESSORIES

Bore gage (Main body)	Anvil				
	Marked No.	Order No.	Indication of measuring size	L_1	L_{14}
511-705 511-735	1	21DZA241A	6.50 in / 160 mm	38	10
	2	21DZA241B	7.09 in / 175 mm	53	25
	3	21DZA241C	7.68 in / 190 mm	68	40
	4	21DZA241D	8.27 in / 205 mm	83	55
	5	21DZA241E	8.86 in / 220 mm	98	70
	6	21DZA241F	9.45 in / 235 mm	113	85
511-706 511-736 () Using 75 mm/3 in Sub-Anvil	1	21DZA241A	10.00 in (13.00 in) / 250 mm (325 mm)	38	10
	2	21DZA241B	10.59 in (13.59 in) / 265 mm (340 mm)	53	25
	3	21DZA241C	11.18 in (14.18 in) / 280 mm (355 mm)	68	40
	4	21DZA241D	11.77 in (14.77 in) / 295 mm (370 mm)	83	55
	5	21DZA241E	12.36 in (15.36 in) / 310 mm (385 mm)	98	70



Find a Distributor

Bore Gages

Bore Gages SERIES 511 — Short Leg Type

- This is a bore gage for measuring .7 to 6.5 in inside diameters.
- With a short length below the grip, a lightweight and easy-to-handle body makes it easier to insert the gage in a narrow space or perform measurements on a table.
- Carbide-tipped contact point and anvil for durability and wear resistance.



511-786-20

SPECIFICATIONS

Inch							
Order No.	Range (in)	Stroke of contact point (in)	Accuracy* (in)	Repeatability* (in)	Adjacent error* (in)	Measuring force (N)	Guide force (N)
511-781	0.7 - 1.4	0.047	0.00008	0.00002	0.00004	4 or less	6 or less
511-782	1.4 - 2.5					5 or less	10 or less
511-783	2.0 - 6.0	0.063	0.00008	0.00002	0.00004	4 or less	6 or less
511-784	4.0 - 6.5					5 or less	10 or less
511-791-20	0.7 - 1.4	0.047	0.00008	0.00002	0.00004	4 or less	6 or less
511-792-20	1.4 - 2.5					5 or less	10 or less
511-793-20	2.0 - 6.0	0.063	0.00008	0.00002	0.00004	4 or less	6 or less
511-794-20	4.0 - 6.5					5 or less	10 or less
511-786-20	0.7 - 1.4	0.047	0.00008	0.00002	0.00004	4 or less	6 or less
511-787-20	1.4 - 2.5					5 or less	10 or less
511-788-20	2.0 - 6.0	0.063	0.00008	0.00002	0.00004	4 or less	6 or less
511-789-20	4.0 - 6.5					5 or less	10 or less

Order No.	Contents of set							Probing depth (in)
	Bore gage	Dial indicator	Dial protection cover	Anvil	Interchangeable Washer	Sub-Anvil	Spanner	
511-781	511-781	Not supplied	Not supplied	9 pcs.	2 pcs.	Not supplied	1 pc.	2
511-782	511-782			6 pcs.	4 pcs.	1 pc.	Not supplied	
511-783	511-783			11 pcs.				
511-784	511-784			13 pcs.				
511-791-20	511-781	2923AB-10 (Graduation: 0.0001 in)	21DZA000	9 pcs.	2 pcs.	Not supplied	1 pc.	2
511-792-20	511-782			6 pcs.	4 pcs.	1 pc.	Not supplied	
511-793-20	511-783			11 pcs.				
511-794-20	511-784			13 pcs.				
511-786-20	511-781	2922AB (Graduation: 0.0005 in)	21DZA000	9 pcs.	2 pcs.	Not supplied	1 pc.	2
511-787-20	511-782			6 pcs.	4 pcs.	1 pc.	Not supplied	
511-788-20	511-783			11 pcs.				
511-789-20	511-784			13 pcs.				

* Accuracy of the bore gage alone.

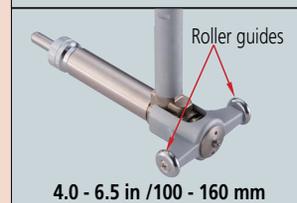
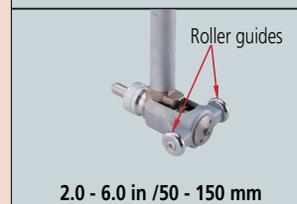
Note 1: A 2" sub-anvil is supplied with 511-783.

Note 2: It is not permissible to use a sub-anvil other than as supplied as a standard accessory, or widen a measuring range by using multiple sub-anvils. (The measurement accuracy in such cases is not guaranteed.)

Measurement example



Contact Points



Dial protection cover, recommended indicators

Refer to page C-52.

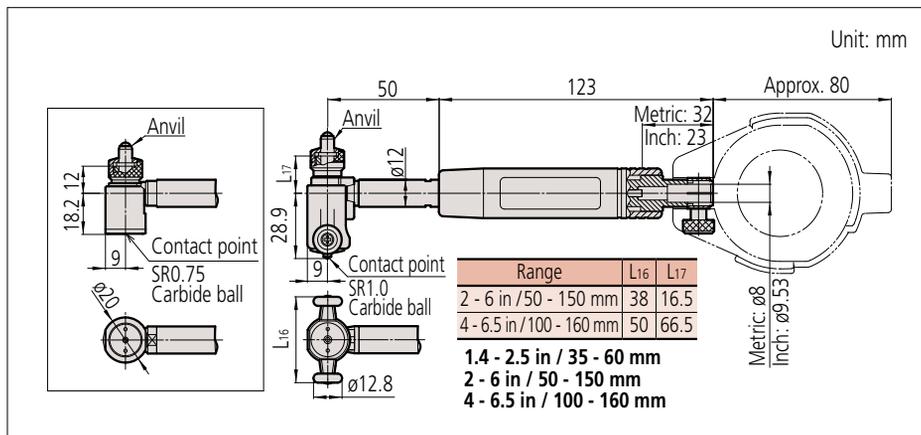
Setting rings, Bore Gage Checker, i-Checker

Refer to pages C-53 to C-58.

Bore Gages

Bore Gages SERIES 511 — Short Leg Type

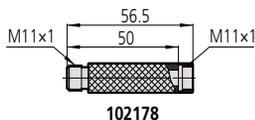
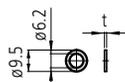
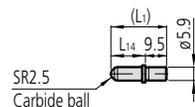
DIMENSIONS



Recommended Digimatic Indicators

Refer to page C-38.

Anvil Interchangeable washer Sub-anvil (Supplied only for **511-763** and **511-783**.)



t (mm)	Order No.
0.5	205457
1	205458
2	205459
3	205460

Note: It is not permissible to use a sub-anvil other than as supplied as a standard accessory, or widen a measuring range by using multiple sub-anvils. (The measurement accuracy in such cases is not guaranteed.)

STANDARD ACCESSORIES

Bore gage (Main body)	Anvil				
	Marked No.	Order No.	Indication of measuring size	L ₁	L ₁₄
511-762 511-782	1	21DZA232A	1.38 in / 35 mm	15	5.5
	2	21DZA232B	1.57 in / 40 mm	20	10.5
	3	21DZA232C	1.77 in / 45 mm	25	15.5
	4	21DZA232D	1.97 in / 50 mm	30	20.5
	5	21DZA232E	2.17 in / 55 mm	35	25.5
	6	21DZA232F	2.36 in / 60 mm	40	30.5
511-763 511-783 () Using 50 mm / 2 in Sub-Anvil	1	21DZA232A	1.97 in (3.94 in) / 50 mm (100 mm)	15	5.5
	2	21DZA232B	2.17 in (4.13 in) / 55 mm (105 mm)	20	10.5
	3	21DZA232C	2.36 in (4.33 in) / 60 mm (110 mm)	25	15.5
	4	21DZA232D	2.55 in (4.53 in) / 65 mm (115 mm)	30	20.5
	5	21DZA232E	2.74 in (4.72 in) / 70 mm (120 mm)	35	25.5
	6	21DZA232F	2.93 in (4.92 in) / 75 mm (125 mm)	40	30.5
	7	21DZA232G	3.12 in (5.12 in) / 80 mm (130 mm)	45	35.5
	8	21DZA232H	3.31 in (5.31 in) / 85 mm (135 mm)	50	40.5
	9	21DZA232J	3.50 in (5.51 in) / 90 mm (140 mm)	55	45.5
	10	21DZA232L	3.69 in (5.71 in) / 95 mm (145 mm)	60	50.5
	11	21DZA232M	3.88 in (5.91 in) / 100 mm (150 mm)	65	55.5
511-764 511-784	1	21DZA232A	3.94 in / 100 mm	15	5.5
	2	21DZA232B	4.13 in / 105 mm	20	10.5
	3	21DZA232C	4.33 in / 110 mm	25	15.5
	4	21DZA232D	4.53 in / 115 mm	30	20.5
	5	21DZA232E	4.72 in / 120 mm	35	25.5
	6	21DZA232F	4.92 in / 125 mm	40	30.5
	7	21DZA232G	5.12 in / 130 mm	45	35.5
	8	21DZA232H	5.31 in / 135 mm	50	40.5
	9	21DZA232J	5.51 in / 140 mm	55	45.5
	10	21DZA232L	5.71 in / 145 mm	60	50.5
	11	21DZA232M	5.91 in / 150 mm	65	55.5
	12	21DZA232N	6.10 in / 155 mm	70	60.5
	13	21DZA232P	6.30 in / 160 mm	75	65.5



Talk to Sales

Bore Gages

Measurement example



Dial protection cover, recommended indicators

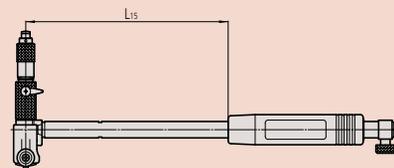
Refer to page C-52.

Setting rings, Bore Gage Checker, i-Checker

Refer to pages C-53 to C-58.

Special sizes and specifications other than standard can be custom made by special order. Please visit the nearest M³ Solution Center for more information.

Example



Length below the grip

Model	L ₁₅ (mm)
511-803/804	50, 100, 200, 250, 300, 400, 500, 600, 700, 800, 900, 1000
511-805/806/807/808	50, 100, 150, 200, 300, 400, 500, 600, 700, 800, 900, 1000

Note: The length over listed above is not available.

Bore Gages

SERIES 511 — with Micrometer Head

- Micrometer head is attached to the anvil for convenient and accurate dimensional measurements.
- Carbide-tipped contact point for durability and wear resistance.
- Wide-range mic head allows range adjustments to be made quickly and without spacers



511-853-20

SPECIFICATIONS

Inch							
Order No.	Range (in)	Stroke of contact point (in)	Accuracy* (in)	Repeatability* (in)	Adjacent error* (in)	Measuring force (N)	Guide force (N)
511-833	2.4 - 4.0	0.063	0.00008	0.00002	0.00004	5 or less	10 or less
511-834	4.0 - 6.4						
511-835	6.0 - 10.0					6 or less	15 or less
511-836	10.0 - 16.0						
511-837	16.0 - 24.0						
511-838	24.0 - 32.0	0.063	0.00008	0.00002	0.00004	5 or less	10 or less
511-853-20	2.4 - 4.0						
511-854-20	4.0 - 6.4					6 or less	15 or less
511-855-20	6.0 - 10.0						
511-856-20	10.0 - 16.0						
511-857-20	16.0 - 24.0	6 or less	20 or less				
511-858-20	24.0 - 32.0						
511-843-20	2.4 - 4.0			0.063	0.00008	0.00002	0.00004
511-844-20	4.0 - 6.4						
511-845-20	6.0 - 10.0	6 or less	15 or less				
511-846-20	10.0 - 16.0						
511-847-20	16.0 - 24.0						
511-848-20	24.0 - 32.0					20 or less	

Order No.	Contents of set						Probing depth (in)
	Bore gage	Dial indicator	Dial protection cover	Micrometer head	Sub-Anvil	Spanner	
511-833	511-833	Not supplied	Not supplied	1 pc.	2 pcs.	3 pcs.	6
511-834	511-834				3 pcs.		
511-835	511-835				4 pcs.	2 pcs.	10
511-836	511-836				3 pcs.		
511-837	511-837				2 pcs.		
511-838	511-838	2 pcs.	2923AB-10 (Graduation: 0.0001 in)	21DZA000	1 pc.	2 pcs.	4
511-853-20	511-833	2 pcs.			3 pcs.	6	
511-854-20	511-834	3 pcs.					
511-855-20	511-835	4 pcs.			2 pcs.	10	
511-856-20	511-836	3 pcs.					
511-857-20	511-837	2 pcs.					
511-858-20	511-838	2 pcs.	2922AB (Graduation: 0.0005 in)	21DZA000	1 pc.	3 pcs.	4
511-843-20	511-833	2 pcs.			3 pcs.	6	
511-844-20	511-834	3 pcs.					
511-845-20	511-835	4 pcs.			2 pcs.	10	
511-846-20	511-836	3 pcs.					
511-847-20	511-837	2 pcs.					
511-848-20	511-838	2 pcs.					

* Accuracy of the bore gage alone.

Note 1: Storage boxes for 511-837/838 models are made of wood. The boxes of other models are made of plastic.

Note 2: It is not permissible to expand measuring range using sub-anvils other than as supplied as standard accessories. (The measurement accuracy in such cases is not guaranteed.)

Bore Gages

Bore Gages SERIES 511 — with Micrometer Head

SPECIFICATIONS

Metric							
Order No.	Range (mm)	Stroke of contact point (mm)	Accuracy* (μm)	Repeatability* (μm)	Adjacent error* (μm)	Measuring force (N)	Guide force (N)
511-803	60 - 100	1.6	2	0.5	1	5 or less	10 or less
511-804	100 - 160						
511-805	150 - 250						
511-806	250 - 400						
511-807	400 - 600						
511-808	600 - 800	1.6	2	0.5	1	6 or less	20 or less
511-823-20	60 - 100						
511-824-20	100 - 160						
511-825-20	150 - 250						
511-826-20	250 - 400						
511-827-20	400 - 600	1.6	2	0.5	1	5 or less	10 or less
511-828-20	600 - 800						
511-813-20	60 - 100						
511-814-20	100 - 160						
511-815-20	150 - 250						
511-816-20	250 - 400	1.6	2	0.5	1	6 or less	15 or less
511-817-20	400 - 600						
511-818-20	600 - 800						

Order No.	Contents of set						Probing depth (mm)
	Bore gage	Dial indicator	Dial protection cover	Micrometer head	Sub-Anvil	Spanner	
511-803	511-803	Not supplied	Not supplied	1 pc.	2 pcs.	3 pcs.	150
511-804	511-804				3 pcs.	2 pcs.	
511-805	511-805				4 pcs.		
511-806	511-806				3 pcs.		
511-807	511-807				2 pcs.		
511-808	511-808	2 pcs.					
511-823-20	511-803	2109AB-10 (Graduation: 0.001 mm)	21DZA000	1 pc.	2 pcs.	3 pcs.	150
511-824-20	511-804				3 pcs.	2 pcs.	
511-825-20	511-805				4 pcs.		
511-826-20	511-806				3 pcs.		
511-827-20	511-807				2 pcs.		
511-828-20	511-808	2 pcs.					
511-813-20	511-803	2046AB (Graduation: 0.01 mm)	21DZA000	1 pc.	2 pcs.	3 pcs.	150
511-814-20	511-804				3 pcs.	2 pcs.	
511-815-20	511-805				4 pcs.		
511-816-20	511-806				3 pcs.		
511-817-20	511-807				2 pcs.		
511-818-20	511-808	2 pcs.					

* Accuracy of the bore gage alone.

Note 1: Storage boxes for 511-807/808 models are made of wood. The boxes of other models are made of plastic.

Note 2: It is not permissible to expand measuring range using sub-anvils other than as supplied as standard accessories.

(The measurement accuracy in such cases is not guaranteed).

Recommended Digimatic Indicators

Refer to page C-38.



Find a Distributor

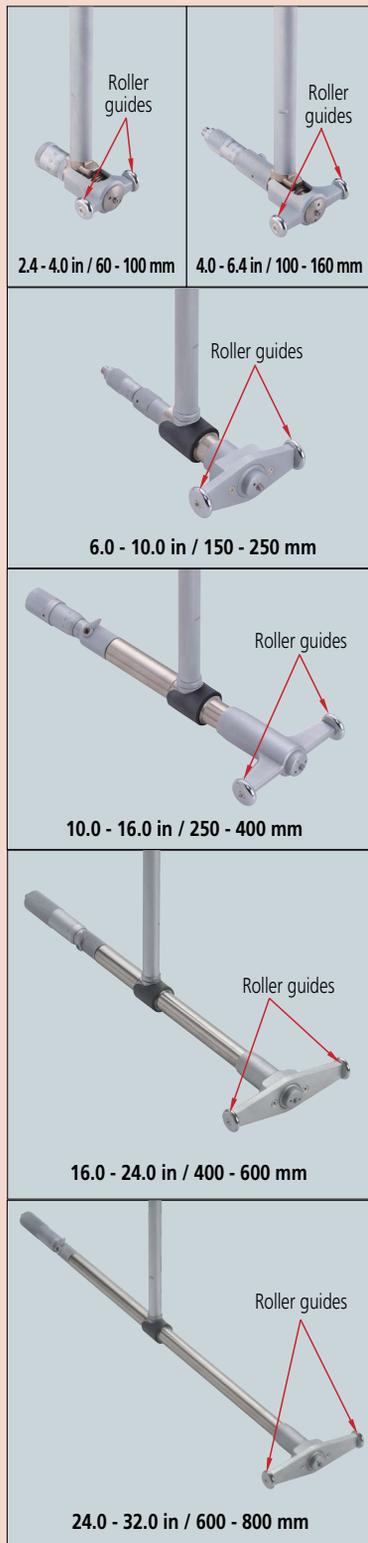
DIMENSIONS

Unit: mm

Range	L15	R1	L18	R2	L10	L16	øD1	øD2	L17
60 - 100 mm	150	SR8	28.9	SR1.0	9	38	ø12.8	ø12	7
100 - 160 mm						50			16.5
150 - 250 mm	250	SR10	100.9	SR1.5	12	78	ø19.8	ø15	25.1
250 - 400 mm						90			81
400 - 600 mm						120			85
600 - 800 mm						120			185
2.4 - 4 in	150	SR8	28.9	SR1.0	9	38	ø12.8	ø12	7
4 - 6.4 in						50			16.5
6 - 10 in	250	SR10	100.9	SR1.5	12	78	ø19.8	ø15	25.9
10 - 16 in						90			81
16 - 24 in						120			85
24 - 32 in						120			188.2

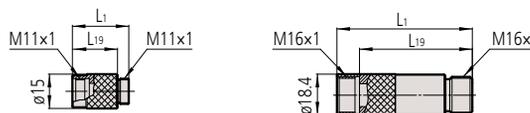
Bore Gages

Contact Points



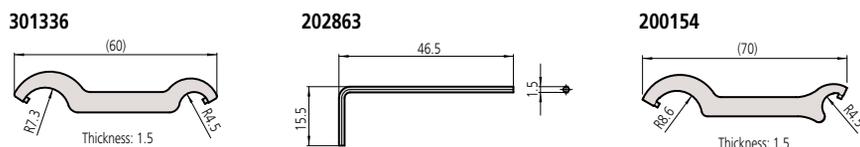
Sub-anvil

Unit: mm



Note: It is not permissible to use a sub-anvil other than as supplied as a standard accessory, or widen a measuring range by using multiple sub-anvils. (The measurement accuracy in such cases is not guaranteed.)

Spanner



SPECIFICATIONS ACCESSORIES

Bore gage (Main body)	Micrometer head			Sub-Anvil				Spanner
	Order No.	Stroke (in)	Screw size	Marked No. (in)	Order No.	L ₁ (in)	L ₁₉ (in)	Order No.
511-833	21DZA272	0.4	M11x1	0.4	208893	0.6	0.4	301336 (2 pcs.) 202863 (1 pc.)
				0.8	208895	1.0	0.8	
511-834	21DZA273	0.5	M11x1	0.4	208893	0.6	0.4	301336 (2 pcs.)
				0.8	208895 (2 pcs.)	1.0	0.8	
511-835	21DZA273	0.5	M11x1	0.4	208893	0.6	0.4	301336 (2 pcs.)
				0.8	208895 (2 pcs.)	1.0	0.8	
				2	21DAA493	2.2	2	
511-836	21DZA275	1.0	M16x1	1	208927	1.4	1	200154 (2 pcs.)
				2	208929 (2 pcs.)	2.4	2	
511-837	902313	2.0	M16x1	2	208929	2.4	2	200154 (2 pcs.)
				4	208933	4.4	4	
511-838	902313	2.0	M16x1	2	208929	2.4	2	200154 (2 pcs.)
				4	208933	4.4	4	

Bore gage (Main body)	Micrometer head			Sub-Anvil				Spanner
	Order No.	Stroke (mm)	Screw size	Marked No. (mm)	Order No.	L ₁ (mm)	L ₁₉ (mm)	Order No.
511-803	21DZA267	10	M11x1	10	208892	15	10	301336 (2 pcs.) 202863 (1 pc.)
				20	208894	25	20	
511-804	21DZA268	13	M11x1	10	208892	15	10	301336 (2 pcs.)
				20	208894 (2 pcs.)	25	20	
511-805	21DZA268	13	M11x1	10	208892	15	10	301336 (2 pcs.)
				20	208894 (2 pcs.)	25	20	
				50	21DAA492	55	50	
511-806	953118	25	M16x1	25	208926	35	25	200154 (2 pcs.)
				50	208928 (2 pcs.)	60	50	
511-807	953120	50	M16x1	50	208928	60	50	200154 (2 pcs.)
				100	208932	110	100	
511-808	953120	50	M16x1	50	208928	60	50	200154 (2 pcs.)
				100	208932	110	100	

Bore Gages

Bore Gages SERIES 511 — for Blind Holes

- This is a bore gage for measuring diameters near the bottom of a hole.
- Carbide-tipped contact point and anvil for durability and wear resistance.
- Optional extension rods can be attached for measuring deep holes.



511-438-20

SPECIFICATIONS

Inch															
Order No.	Range (in)	Stroke of contact point (in)	Accuracy* (in)	Repeatability* (in)	Adjacent error* (in)	Measuring force (N)	Guide force (N)	Contents of set					Probing depth (in)		
								Bore gage	Dial indicator	Dial protection cover	Anvil	Washer			
511-418	0.6 - 1.4	0.047	0.00016	0.00004	0.00004	4 or less	6 or less	511-418	Not supplied	Not supplied	11 pcs.	1 pc.	6		
511-419	1.4 - 2.4							511-419						6 pcs.	4 pcs.
511-420	2.0 - 6.0							5 or less						10 or less	
511-428-20	0.6 - 1.4	0.047	0.00016	0.00004	0.00004	4 or less	6 or less	511-418	2922AB (Graduation: 0.0005 in)	21DZA000	11 pcs.	1 pc.	6		
511-429-20	1.4 - 2.4							511-419						6 pcs.	4 pcs.
511-430-20	2.0 - 6.0							5 or less						10 or less	
511-438-20	0.6 - 1.4	0.047	0.00016	0.00004	0.00004	4 or less	6 or less	511-418	2923AB-10 (Graduation: 0.0001 in)	21DZA000	11 pcs.	1 pc.	6		
511-439-20	1.4 - 2.4							511-419						6 pcs.	4 pcs.
511-440-20	2.0 - 6.0							5 or less						10 or less	

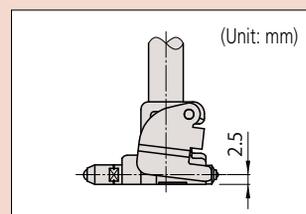
Metric															
Order No.	Range (mm)	Stroke of contact point (mm)	Accuracy* (μm)	Repeatability* (μm)	Adjacent error* (μm)	Measuring force (N)	Guide force (N)	Contents of set					Probing depth (mm)		
								Bore gage	Dial indicator	Dial protection cover	Anvil	Washer			
511-415	15 - 35	1.2	4	1	1	4 or less	6 or less	511-415	Not supplied	Not supplied	11 pcs.	1 pc.	150		
511-416	35 - 60							511-416						6 pcs.	4 pcs.
511-417	50 - 150							5 or less						10 or less	
511-425-20	15 - 35	1.2	4	1	1	4 or less	6 or less	511-415	2046AB (Graduation: 0.01 mm)	21DZA000	11 pcs.	1 pc.	150		
511-426-20	35 - 60							511-416						6 pcs.	4 pcs.
511-427-20	50 - 150							5 or less						10 or less	
511-435-20	15 - 35	1.2	4	1	1	4 or less	6 or less	511-415	2109AB-10 (Graduation: 0.001 mm)	21DZA000	11 pcs.	1 pc.	150		
511-436-20	35 - 60							511-416						6 pcs.	4 pcs.
511-437-20	50 - 150							5 or less						10 or less	

* Accuracy of the bore gage alone.

Note 1: A 10 mm (0.4 in) sub-anvil is supplied with 511-415/425-20/435-20/418/428-20/438-20 and a 50 mm (2 in) sub-anvil is supplied with 511-417/427-20/437-20/420/430-20/440-20.

Note 2: It is not permissible to use a sub-anvil other than as supplied as a standard accessory, or widen a measuring range by using multiple sub-anvils. (The measurement accuracy in such cases is not guaranteed).

Measurement example



Extension Rod

Refer to page C-51.

Dial protection cover, recommended indicators

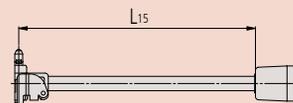
Refer to page C-52.

Setting rings, Bore Gage Checker, i-Checker

Refer to pages C-53 to C-58.

Special sizes and specifications other than standard can be custom made by special order. Please visit the nearest M³ Solution Center for more information.

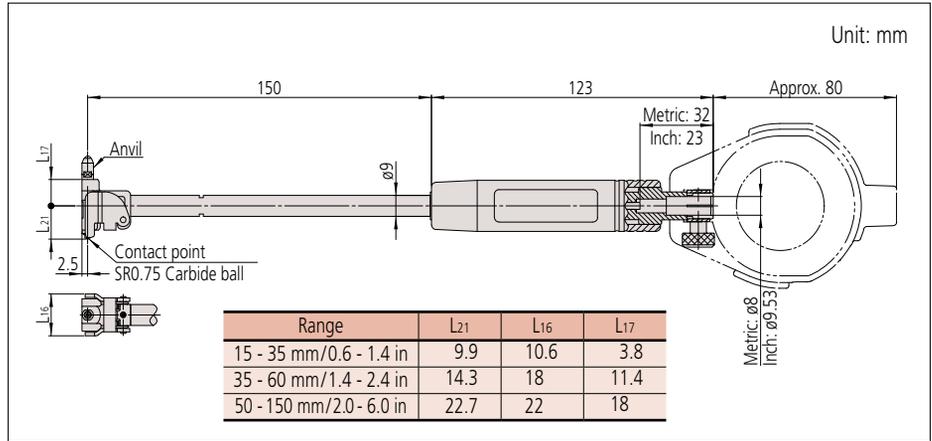
Example



Length below the grip

Model	L ₁₅ (mm)
511-415/416/417	50, 150, 200, 250, 300 400, 500

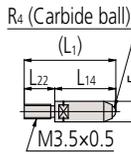
DIMENSIONS



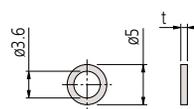
Contact Points



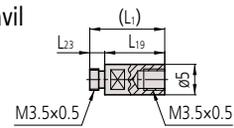
Anvil



Interchangeable washer

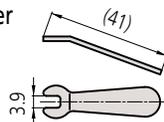


Sub-anvil

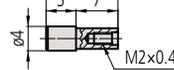


Note: It is not permissible to use a sub-anvil other than as supplied as a standard accessory, or widen a measuring range by using multiple sub-anvils. (The measurement accuracy in such cases is not guaranteed).

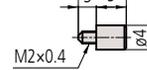
Spanner 204354



Washer holder 212202



Locking screw 212203



STANDARD ACCESSORIES

Bore gage (Main body)	Anvil							Interchangeable washer		Sub-Anvil		
	Marked No.	Order No.	Indication of measuring size	L1	L22	R4	L14	Order No.	t	Order No.	L23	L19
511-415 511-418 () Using 10 mm/0.4 in Sub-Anvil	1	21DZA376A	0.59 in (0.98 in) / 15 mm (25 mm)	4.5			2	212127	0.5 mm/0.02 in	21DAA563	2.5	10 mm/ 0.4 in
	2	21DZA376B	0.63 in (1.02 in) / 16 mm (26 mm)	5.5			3					
	3	21DZA376C	0.67 in (1.06 in) / 17 mm (27 mm)	6.5			4					
	4	21DZA376D	0.71 in (1.10 in) / 18 mm (28 mm)	7.5			5					
	5	21DZA376E	0.75 in (1.14 in) / 19 mm (29 mm)	8.5			6					
	6	21DZA376F	0.79 in (1.18 in) / 20 mm (30 mm)	9.5	2.5		7					
	7	21DZA376G	0.83 in (1.22 in) / 21 mm (31 mm)	10.5			8					
	8	21DZA376H	0.87 in (1.26 in) / 22 mm (32 mm)	11.5			9					
	9	21DZA376J	0.91 in (1.30 in) / 23 mm (33 mm)	12.5			10					
	10	21DZA376L	0.94 in (1.34 in) / 24 mm (34 mm)	13.5			11					
	11	21DZA376M	0.98 in (1.38 in) / 25 mm (35 mm)	14.5			12					
511-416 511-419	1	21DZA404A	1.38 in / 35 mm	17.5			10	212127 212128 212129 212130	0.5 mm/0.02 in 1.0 mm/0.04 in 2.0 mm/0.08 in 3.0 mm/0.12 in			
	2	21DZA404B	1.57 in / 40 mm	22.5			15					
	3	21DZA404C	1.77 in / 45 mm	27.5			20					
	4	21DZA404D	1.97 in / 50 mm	32.5	7.5	SR1.5	25					
	5	21DZA404E	2.17 in / 55 mm	37.5			30					
	6	21DZA404F	2.36 in / 60 mm	42.5			35					
511-417 511-420 () Using 50 mm/2 in Sub-Anvil	1	21DZA404A	1.97 in (3.94 in) / 50 mm (100 mm)	17.5			10	212127 212128 212129 212130	0.5 mm/0.02 in 1.0 mm/0.04 in 2.0 mm/0.08 in 3.0 mm/0.12 in	21DAA596	7.5	50 mm/ 2 in
	2	21DZA404B	2.17 in (4.13 in) / 55 mm (105 mm)	22.5			15					
	3	21DZA404C	2.36 in (4.33 in) / 60 mm (110 mm)	27.5			20					
	4	21DZA404D	2.56 in (4.53 in) / 65 mm (115 mm)	32.5			25					
	5	21DZA404E	2.76 in (4.72 in) / 70 mm (120 mm)	37.5			30					
	6	21DZA404F	2.95 in (4.92 in) / 75 mm (125 mm)	42.5	7.5	SR1.5	35					
	7	21DZA404G	3.15 in (5.12 in) / 80 mm (130 mm)	47.5			40					
	8	21DZA404H	3.35 in (5.31 in) / 85 mm (135 mm)	52.5			45					
	9	21DZA404J	3.54 in (5.51 in) / 90 mm (140 mm)	57.5			50					
	10	21DZA404L	3.74 in (5.71 in) / 95 mm (145 mm)	62.5			55					
	11	21DZA404M	3.94 in (5.91 in) / 100 mm (150 mm)	67.5			60					

Recommended Digimatic Indicators

Refer to page C-38.



Need Repair?

Bore Gages

Bore Gages

SERIES 511 — ABSOLUTE Digimatic Bore Gages

- An easy-to-use digital bore gage with preset and data output functions not available on analog models for use in various applications. Analog bar indicator allows for fast Go/No-go judgements.
- The minimum value holding function provides easy measurement of hole diameters.
- ABS (ABSOLUTE) type bore gages are not subject to overspeed error.
- The display and grip can be rotated up to 320° and the display can be inclined up to 90° so that it is easily readable from any direction.
- Up to four extension rods (optional) can be used for measuring at the bottom of a hole 2 m deep.



511-521

SPECIFICATIONS

Inch		
Order No.	511-521	511-522
Range	1.8 - 4.0 in	4.0 - 6.5 in
Stroke of contact point	0.048 in/1.2 mm	
Resolution	0.00005 in/0.001 mm	
Wide range accuracy	0.0001 in/0.003 mm or less	
Adjacent error	0.00008 in/0.002 mm or less	
Repeatability	0.0001 in/0.002 mm or less	
Measuring force	5 N or less	
Guide force	10 N or less	
Power source	SR44 battery (2 pcs.), 938882 included as standard (for operational checks)	
Battery life	Approx. 2,000 hours under normal use.	
Position detection method	ABSOLUTE electrostatic linear encoder	
Sampling frequency	50 times/s	
Dust / Water protection level	IP53 (IEC 60529, JIS C 0920)	
Display	<ul style="list-style-type: none"> • 7 segments 6 digits decimal numeric with minus sign, Unit (in/mm) • Tolerance judge indication • Analog indication 	
Net weight	500 g	570 g

Metric		
Order No.	511-501	511-502
Range	45 - 100 mm	100 - 160 mm
Stroke of contact point	1.2 mm	
Resolution	0.001 mm	
Wide range accuracy	0.003 mm or less	
Adjacent error	0.002 mm or less	
Repeatability	0.002 mm or less	
Measuring force	5 N or less	
Guide force	10 N or less	
Power source	SR44 battery (2 pcs.), 938882 included as standard (for operational checks)	
Battery life	Approx. 2,000 hours under normal use.	
Position detection method	ABSOLUTE electrostatic linear encoder	
Sampling frequency	50 times/s	
Dust / Water protection level	IP53 (IEC 60529, JIS C 0920)	
Display	<ul style="list-style-type: none"> • 7 segments 6 digits decimal numeric with minus sign, Unit (mm) • Tolerance judge indication • Analog indication 	
Net weight	500 g	570 g

Measurement example



Function

- Preset function
- Master value registration (3 values maximum)
- Tolerance judgment
- Upper/lower limit registration (3 values maximum)
- Minimum value holding
- Data output
- Display rotation (320°)
- Display inclination (90°, 7 steps)
- Low battery alarm display
- Error display

Extension Rod (optional)

250 mm (10 in): **21DZA089**
500 mm (20 in): **21DZA081**
Up to four extension rods can be jointed, and a maximum length of 2 m is allowed.

Optional Accessories

Order No.	Type	description
264-020	—	USB Input Tool Series USB Keyboard Signal Conversion Type IT-020U
905338	F	Connection cable (1 m)
905409	F	Connection cable (2 m)
06AFM380F	F	USB Input Tool Direct (2 m)
02AZD730G	IP67	U-WAVE-T
02AZD880G	Buzzer	U-WAVE-T
02AZD790F	F	Connection cable for U-WAVE-T (160 mm)
02AZE140F	F	Connection cable for U-WAVE-T For foot switch
02AZD810D	—	U-WAVE-R

Setting rings, Bore Gage Checker, i-Checker

Refer to pages C-53 to C-58.

Bore Gages

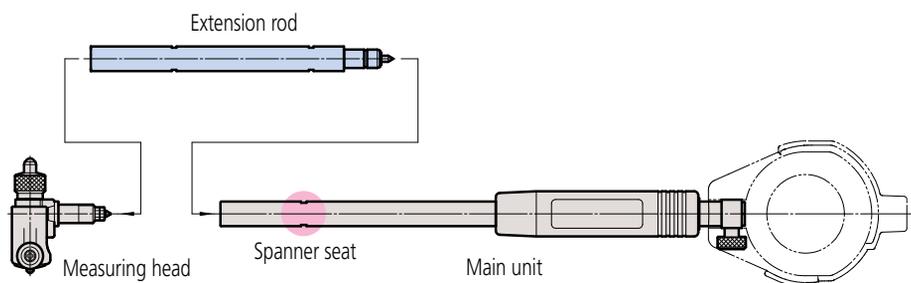
Extension Rod SERIES 511 — Accessories for Bore Gages

- Extension rods are available to assist in deep-hole measurement. (For applicable combination with bore gages, see the table below).

Note 1: When using a 500 mm (or longer) extension rod, use the bore gage in an upright position.

Note 2: Only one extension rod can be attached to a bore gage. It is not possible to use more than one extension rod.

Note 3: The extension rod cannot be used for products with a custom size or custom specifications.



SPECIFICATIONS

Applicable model Order No.	Extension rod length (mm)					Extension rod diameter (mm)	Spanner Order No.
	125	250	500	750	1000		
511-701/511-731	953549	953550	953551	—	—	ø9	102148 (2 pcs.)
511-415/511-418							
511-416/511-419							
511-417/511-420							
511-440-20/511-437-20	953552	953553	953554	953555	953556	ø12	212556 (2 pcs.)
511-702/511-732							
511-703/511-733							
511-704/511-734							
511-803/511-833							
511-804/511-834	953557	952361	953558	953559	953560	ø15	212556 (2 pcs.)
511-705/511-735							
511-706/511-736							
511-805/511-835							
511-806/511-836							
511-807/511-837							
511-808/511-838							

Note 1: Spanner is supplied as standard.

Note 2: 2 Spanners are included with each Extension Rod.



Get a Quote

Bore Gages

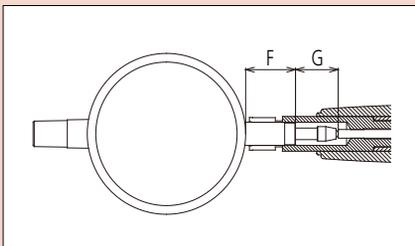
Recommended Indicators Accessories for Bore Gages

- These are the recommended indicators for bore gages. Select the best one for your application.

Note: Among indicators other than those recommended, the following types of indicator cannot be used.

- Indicators with a total length of F and G of less than 31.8 mm
- Indicators with a measuring range of more than 12.7 mm (ISO/JIS Type)/0.9 in (ASME/ANSI Type)
- Dust-proof and water-proof indicators with a spindle covered with rubber

Please contact us if you have any questions about products.



RECOMMENDED INDICATORS



543-312B-10
ABSOLUTE Digimatic Indicator
Designed for Bore Gages
Resolution .00005 in
Refer to page F-15 for details.



543-702 B
ABSOLUTE Digimatic Indicator
Resolution 20 µinch
Refer to page F-5 for details.



2923AB-10
Graduation .0001 in,
Refer to page F-41 for details.



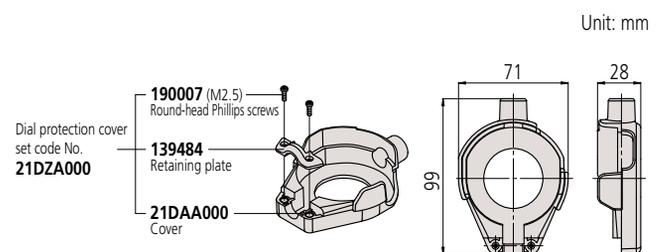
2922AB
Graduation .0005 in,
Refer to page F-41 for details.

DIAL PROTECTION COVER - 21DZA000

- The cover protects the indicator from unexpected impact while handling the bore gage.

- Can also be used for **543-312B-10**, an ABS Digimatic indicator, for bore gages.

Note: This protective cover is intended to be attached to a bore gage and cannot be used for a dial indicator or Digimatic indicator alone.



Bore Gages

Setting Rings

SERIES 177 — Accessories for Inside Micrometers, Holtest and Dial Bore Gages

- Used for quick and accurate setting of dial bore gages, Holtest, and inside micrometers.
- Actual diameter is marked in 10 μ inch / 0.001 mm increments. (Measuring position of dimension is the center of the height T).
- These Setting Rings are designed for reference setting of ID type gages. These follow Mitutoyo factory standards but do not follow the ASME B89.1.5 classification system. (i.e. do not follow Class XX, X, etc.).

Made-to-order

- Custom-made setting rings
Mitutoyo can manufacture settings rings to the size and design you need.
- Nominal size range
1 mm to 305 mm/0.04 in to 12 in (steel)
4 mm to 50 mm/0.16 in to 2 in (ceramic)
- Nominal size increment
0.01 mm (up to 45 mm)
0.02 mm (over 45 mm)
0.0001 in (inch)

Steel Setting Rings



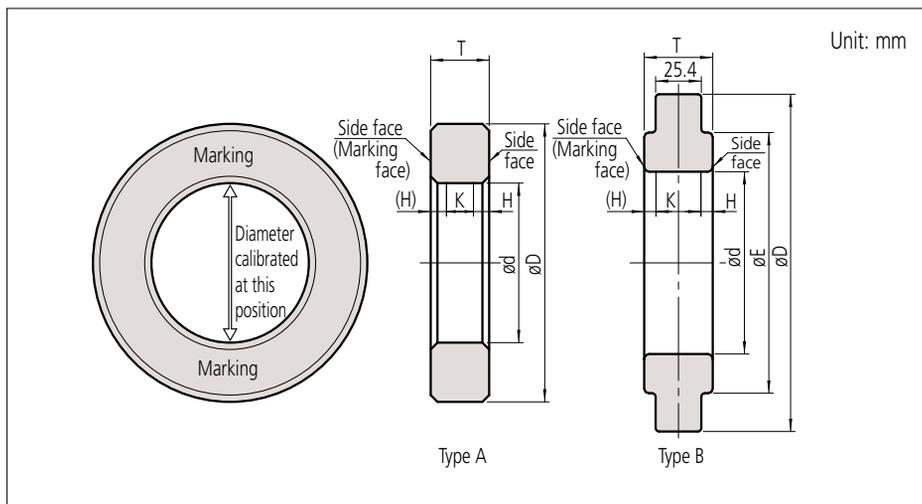
177-300

CERA Setting Rings



177-432

DIMENSIONS



Need Support?

SPECIFICATIONS

Steel Setting Rings

Order No.	Nominal size ϕ d (in)	Dimensions (mm)			Type	Accuracy				
		ϕ D	ϕ E	T		Max variation between nominal and actual marked diameter (in)	Uncertainty of marked diameter value*1 (in)	Roundness/Cylindricity*2 (in)	Distance from the side face H (mm)	Size of warranted calibration surface K (mm)
177-209	0.1	25	—	7	A	± 0.0004	0.00006	0.00004	1.7	3.6
177-206	0.16	25	—	7	A	± 0.0004	0.00006	0.00004	1.7	3.6
177-207	0.24	25	—	7	A	± 0.0004	0.00006	0.00004	1.7	3.6
177-281	0.275	25	—	7	A	± 0.0004	0.00006	0.00004	2.0	3.0
177-179	0.35	32	—	10	A	± 0.0004	0.00006	0.00004	2.0	6.0
177-283	0.425	32	—	10	A	± 0.0004	0.00006	0.00004	2.0	6.0
177-180	0.5	32	—	10	A	± 0.0004	0.00006	0.00004	2.0	6.0
177-181	0.6	38	—	10	A	± 0.0004	0.00006	0.00004	2.0	6.0
177-182	0.65	45	—	10	A	± 0.0004	0.00006	0.00004	2.0	6.0
177-183	0.7	45	—	10	A	± 0.0004	0.00006	0.00004	2.0	6.0
177-287	0.8	45	—	10	A	± 0.0004	0.00006	0.00004	2.0	6.0
177-184	1	53	—	15	A	± 0.0004	0.00006	0.00004	3.2	8.6
177-289	1.2	71	—	15	A	± 0.0004	0.00006	0.00004	3.2	8.6
177-185	1.4	71	—	15	A	± 0.0004	0.00006	0.00004	3.2	8.6
177-291	1.6	71	—	15	A	± 0.0004	0.00006	0.00004	3.2	8.6
177-186	1.8	85	—	15	A	± 0.0004	0.00006	0.00004	3.7	7.6
177-187	2	85	—	20	A	± 0.0008	0.00006	0.00004	3.7	12.6
177-293	2.4	112	—	20	A	± 0.0008	0.00006	0.00004	3.7	12.6
177-315	2.5	112	—	20	A	± 0.0008	0.00006	0.00006	4.2	11.6
177-188	2.8	112	—	20	A	± 0.0008	0.00006	0.00006	4.2	11.6
177-317	3	125	—	25	A	± 0.0008	0.00006	0.00006	4.2	16.6
177-295	3.2	125	—	25	A	± 0.0008	0.00006	0.00006	4.2	16.6
177-319	3.5	140	—	25	A	± 0.0008	0.00006	0.00006	4.2	16.6
177-189	3.6	140	—	25	A	± 0.0008	0.00006	0.00006	4.2	16.6
177-297	4	160	—	25	A	± 0.0008	0.00006	0.00008	4.2	16.6
177-299	5	210	168	38.1	B	± 0.0008	0.00010	0.00008	5.3	27.5
177-301	6	235	187	38.1	B	± 0.0008	0.00010	0.00008	5.3	27.5
177-303	7	260	215	38.1	B	± 0.0008	0.00010	0.00010	5.3	27.5
177-305	8	311	244	38.1	B	± 0.0008	0.00010	0.00010	5.3	27.5
177-307	9	337	264	38.1	B	± 0.0008	0.00010	0.00010	5.3	27.5
177-309	10	362	290	38.1	B	± 0.0008	0.00010	0.00012	5.3	27.5
177-311	11	413	321	38.1	B	± 0.0008	0.00010	0.00012	5.3	27.5
177-313	12	438	340	38.1	B	± 0.0008	0.00010	0.00012	5.3	27.5

*1 Actual diameter is marked in 10 μ m increments. (Dimension measuring position is the center of the height T.)

*2 Cylindricity is defined as per JIS B 0621 Definitions and designations of geometrical deviations, Section 4.4 "Cylindricity."
Cylindricity is measured using three cross-sections between the top and bottom face of a ring, namely, close to the face near each side and the center.

Bore Gages

Setting Rings SERIES 177 — Accessories for Inside Micrometers, Holtest and Dial Bore Gages

SPECIFICATIONS

Steel Setting Rings

Metric										
Order No.	Nominal size ϕ D (mm)	Dimensions (mm)			Type	Accuracy				
		ϕ D	ϕ E	T		Max variation between nominal and actual marked diameter (μ m)	Uncertainty of marked diameter value* ¹ (μ m)	Roundness/Cylindricity* ² (μ m)	Distance from the side face H (mm)	Size of warranted calibration surface K (mm)
177-220	1	20	—	4	A	± 10	1.5	1.0	1.6	0.8
177-222	1.1	20	—	4	A	± 10	1.5	1.0	1.6	0.8
177-225	1.2	20	—	4	A	± 10	1.5	1.0	1.6	0.8
177-227	1.3	20	—	4	A	± 10	1.5	1.0	1.6	0.8
177-230	1.4	20	—	4	A	± 10	1.5	1.0	1.6	0.8
177-236	1.75	25	—	5	A	± 10	1.5	1.0	1.6	1.8
177-239	2	25	—	5	A	± 10	1.5	1.0	1.6	1.8
177-242	2.25	25	—	5	A	± 10	1.5	1.0	1.6	1.8
177-208	2.5	25	—	7	A	± 10	1.5	1.0	1.7	3.6
177-246	2.75	25	—	7	A	± 10	1.5	1.0	1.7	3.6
177-248	3	25	—	7	A	± 10	1.5	1.0	1.7	3.6
177-250	3.25	25	—	7	A	± 10	1.5	1.0	1.7	3.6
177-252	3.5	25	—	7	A	± 10	1.5	1.0	1.7	3.6
177-255	3.75	25	—	7	A	± 10	1.5	1.0	1.7	3.6
177-204	4	25	—	7	A	± 10	1.5	1.0	1.7	3.6
177-257	4.5	25	—	7	A	± 10	1.5	1.0	1.7	3.6
177-205	5	25	—	7	A	± 10	1.5	1.0	1.7	3.6
177-263	5.5	25	—	7	A	± 10	1.5	1.0	1.7	3.6
177-267	6	25	—	7	A	± 10	1.5	1.0	1.7	3.6
177-271	6.5	25	—	7	A	± 10	1.5	1.0	1.7	3.6
177-275	7	25	—	7	A	± 10	1.5	1.0	1.7	3.6
177-125	8	32	—	10	A	± 10	1.5	1.0	2.0	6.0
177-279	9	32	—	10	A	± 10	1.5	1.0	2.0	6.0
177-126	10	32	—	10	A	± 10	1.5	1.0	2.0	6.0
177-284	12	32	—	10	A	± 10	1.5	1.0	2.0	6.0
177-132	14	38	—	10	A	± 10	1.5	1.0	2.0	6.0
177-177	16	45	—	10	A	± 10	1.5	1.0	2.0	6.0
177-133	17	45	—	10	A	± 10	1.5	1.0	2.0	6.0
177-285	18	45	—	10	A	± 10	1.5	1.0	2.0	6.0
177-286	20	45	—	10	A	± 10	1.5	1.0	2.0	6.0
177-139	25	53	—	15	A	± 10	1.5	1.0	3.2	8.6
177-288	30	71	—	15	A	± 10	1.5	1.0	3.2	8.6
177-140	35	71	—	15	A	± 10	1.5	1.0	3.2	8.6
177-290	40	71	—	15	A	± 10	1.5	1.0	3.2	8.6
177-178	45	85	—	15	A	± 10	1.5	1.0	3.7	7.6
177-146	50	85	—	20	A	± 20	1.5	1.0	3.7	12.6
177-292	60	112	—	20	A	± 20	1.5	1.0	3.7	12.6
177-314	62	112	—	20	A	± 20	1.5	1.5	3.7	12.6
177-147	70	112	—	20	A	± 20	1.5	1.5	3.7	12.6
177-316	75	125	—	25	A	± 20	1.5	1.5	4.2	16.6
177-294	80	125	—	25	A	± 20	1.5	1.5	4.2	16.6
177-318	87	140	—	25	A	± 20	1.5	1.5	4.2	16.6
177-148	90	140	—	25	A	± 20	1.5	1.5	4.2	16.6
177-296	100	160	—	25	A	± 20	1.5	2.0	4.2	16.6
177-298	125	210	168	38.1 (25.4)	B	± 20	2.5	2.0	5.3	27.5
177-300	150	235	187		B	± 20	2.5	2.0	5.3	27.5
177-302	175	260	215		B	± 20	2.5	2.5	5.3	27.5
177-304	200	311	244		B	± 20	2.5	2.5	5.3	27.5
177-306	225	337	264		B	± 20	2.5	2.5	5.3	27.5
177-308	250	362	290		B	± 20	2.5	3.0	5.3	27.5
177-310	275	413	321		B	± 20	2.5	3.0	5.3	27.5
177-312	300	438	340		B	± 20	2.5	3.0	5.3	27.5

*1 Actual diameter is marked in 0.001 mm increments. (Dimension measuring position is the center of the height T.)

*2 Cylindricity is defined as per JIS B 0621 Definitions and designations of geometrical deviations, Section 4.4 "Cylindricity."

Cylindricity is measured using three cross-sections between the top and bottom face of a ring, namely, close to the face near each side and the center.



Need Service?

SPECIFICATIONS

CERA Setting Rings

Inch

Order No.	Nominal size ϕ D (in)	Dimensions (mm)			Type	Accuracy				
		ϕ D	ϕ E	T		Max variation between nominal and actual marked diameter (in)	Uncertainty of marked diameter value*1 (in)	Roundness/Cylindricity*2 (in)	Distance from the side face H (mm)	Size of warranted calibration surface K (mm)
177-518	0.16	25	—	7	A	± 0.0004	0.00006	0.00004	1.7	3.6
177-520	0.24	25	—	7	A	± 0.0004	0.00006	0.00004	1.7	3.6
177-522	0.275	25	—	7	A	± 0.0004	0.00006	0.00004	1.7	3.6
177-523	0.35	32	—	10	A	± 0.0004	0.00006	0.00004	2.0	6.0
177-524	0.425	32	—	10	A	± 0.0004	0.00006	0.00004	2.0	6.0
177-525	0.5	32	—	10	A	± 0.0004	0.00006	0.00004	2.0	6.0
177-527	0.65	45	—	10	A	± 0.0004	0.00006	0.00004	2.0	6.0
177-529	0.8	45	—	10	A	± 0.0004	0.00006	0.00004	2.0	6.0
177-530	1	53	—	15	A	± 0.0004	0.00006	0.00004	3.2	8.6
177-531	1.2	71	—	15	A	± 0.0004	0.00006	0.00004	3.2	8.6
177-532	1.4	71	—	15	A	± 0.0004	0.00006	0.00004	3.2	8.6
177-533	1.6	71	—	15	A	± 0.0004	0.00006	0.00004	3.2	8.6
177-534	1.8	85	—	15	A	± 0.0004	0.00006	0.00004	3.7	7.6

Metric

Order No.	Nominal size ϕ D (mm)	Dimensions (mm)			Type	Accuracy				
		ϕ D	ϕ E	T		Max variation between nominal and actual marked diameter (μ m)	Uncertainty of marked diameter value*1 (μ m)	Roundness/Cylindricity*2 (μ m)	Distance from the side face H (mm)	Size of warranted calibration surface K (mm)
177-418	4	25	—	7	A	± 10	1.5	1.0	1.7	3.6
177-420	6	25	—	7	A	± 10	1.5	1.0	1.7	3.6
177-423	8	32	—	10	A	± 10	1.5	1.0	2.0	6.0
177-424	10	32	—	10	A	± 10	1.5	1.0	2.0	6.0
177-425	12	32	—	10	A	± 10	1.5	1.0	2.0	6.0
177-427	16	45	—	10	A	± 10	1.5	1.0	2.0	6.0
177-429	20	45	—	10	A	± 10	1.5	1.0	2.0	6.0
177-430	25	53	—	15	A	± 10	1.5	1.0	3.2	8.6
177-431	30	71	—	15	A	± 10	1.5	1.0	3.2	8.6
177-432	35	71	—	15	A	± 10	1.5	1.0	3.2	8.6
177-433	40	71	—	15	A	± 10	1.5	1.0	3.2	8.6
177-434	45	85	—	15	A	± 10	1.5	1.0	3.7	7.6

*1 Actual diameter is marked in 10 μ m / 0.001 mm increments. (Dimension measuring position is the center of the height T.)

*2 Cylindricity is defined as per JIS B 0621 Definitions and designations of geometrical deviations, Section 4.4 "Cylindricity." Cylindricity is measured using three cross-sections between the top and bottom face of a ring, namely, close to the face near each side and the center.

Bore Gages

Bore Gage Checker SERIES 515

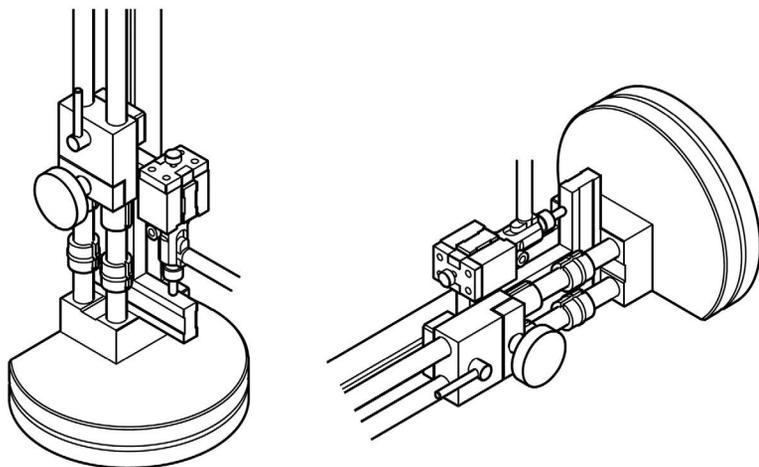
- This product is a precision device that uses gage blocks and plain jaws to perform base point adjustment (zero point adjustment) for a bore gage, previously performed using ring gages. For bore gages with measuring ranges of .7 in to 16 in (18 mm to 400 mm).
- Can be used in both vertical and horizontal positions.



515-590

SPECIFICATIONS

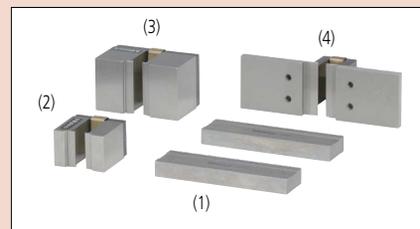
Order No.	Applicable range	Flatness of parallel jaw	Parallelism of parallel jaw
515-590	0.7 - 16 in (18 - 400 mm)	0.5 μ m	1 μ m



Measurement example



Standard Accessories



- (1) Parallel jaw 2 pcs. **630030**
 (2) Attachment A **940088**
 (3) Attachment B **940089**
 (4) Attachment C **940090**



Need Calibration?

Bore Gages

Bore Gage and Indicator Calibration i-Checker IC2000

- Refer to page F-87



Bore Gages



Digimatic Indicators



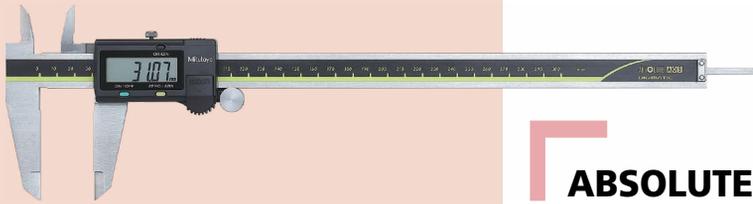
Dial Indicators

Featured Products



ABSOLUTE Coolant Proof Caliper SERIES 500 — IP67 Dust/Water Protection

Refer to page D-3 for details.



ABSOLUTE Digimatic Caliper SERIES 500 — ABSOLUTE Encoder Technology

Refer to page D-5 for details.



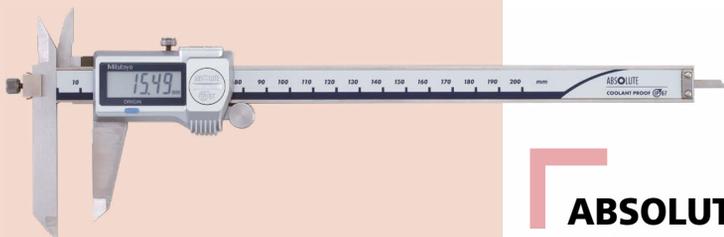
Dial Caliper Series 505 — Shock-resistant

Refer to page D-10 for details.



Carbon Fiber Calipers Series 552 — Wide-range, Lightweight, Durable Carbon Fiber Beams and Jaws with Steel or CERA Inserts/Contacts

Refer to page D-15 for details.



ABSOLUTE Digimatic Offset Caliper Series 573, 536 - Specialty Caliper Models

Refer to page D-29 for details.

D

Calipers

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Calipers

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Hook Type Vernier Caliper	D-43
Swivel Vernier Caliper	D-43
ABSOLUTE Low Force Caliper	D-44
ABSOLUTE Snap Caliper	D-45

MeasurLink[®] ENABLED

Data Management Software by Mitutoyo

Measurement Data Network System

MeasurLink[®] is a measurement data management system based on databases (SQL Server). You can build a network to manage the measurement results and measuring instruments simply by combining the required functions.

MeasurLink[®] is a registered trademark of Mitutoyo Corporation in Japan and Mitutoyo America Corporation in the United States.

U-WAVE^{fit}

Measurement Data Wireless Communication System

Bluetooth[®] communication enables wireless transfer of measurement data from Digimatic micrometers and calipers to PCs, smartphones, tablets and such other devices.

IP67

IP Codes

The code indicates the degree of protection against the ingress of foreign materials and water as defined in the IEC standard (IEC 60529). The number indicates the protection level. (Refer to page 3)



TÜV Rheinland Certification Marks

All products with the marks have passed the IP test carried out by the German accreditation organization, TÜV Rheinland.



Measuring Instruments Shipped with Inspection Certificate

Mitutoyo guarantees product quality as a leading precision measuring instrument manufacturer and ships measuring instruments with an inspection certificate that includes inspection data so that customers can use them with confidence.

ABSOLUTE[™]

ABSOLUTE Linear Encoder

Mitutoyo developed the unique ABSOLUTE method to retain position information after the power is turned off. The origin is set once - thereafter the live position is displayed when the power is turned on.



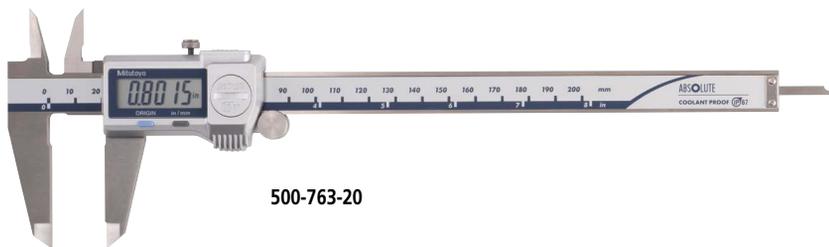
Calipers

ABSOLUTE Coolant Proof Caliper SERIES 500 — with Dust/Water Protection Conforming to IP67 Level

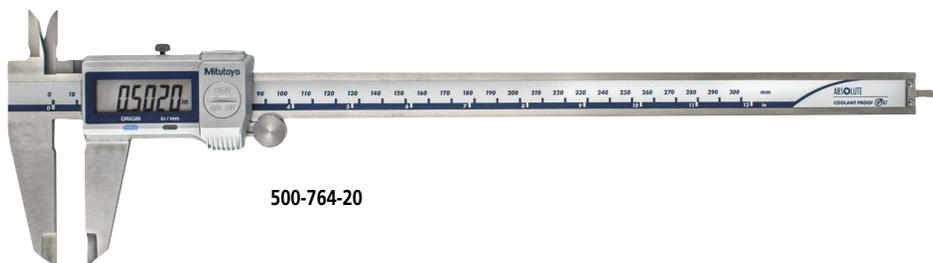
- Rated to IP67: can be used in workshop conditions exposed to coolant, water, dust or oil. The digital display can reduce human error by preventing incorrect reading of measurement results.
- Incorporates the Mitutoyo ABSOLUTE measurement system. No need to reset the origin after switching on. Eliminates overspeed errors.
- Battery cap does not require a screw driver for battery replacement.
- SPC data output models can be integrated into statistical process control and measurement systems. (Refer to section A).
- Carbide-tipped jaw calipers are optimal for rough finished parts, castings, grindingstones, etc.



500-762-20



500-763-20



500-764-20

MeasurLink¹ ENABLED
Data Management Software by Mitutoyo

U-WAVE^{fit}

ABSOLUTE™

IP67



Dust- and
Water-
Protected

www.tlv.com
ID: 000040042

Functions

- Origin-set: ABSOLUTE origin position can be changed.
- Data output: Models equipped with this function have an output port for transferring measurement data to a Statistical Process Control (SPC) system.
Note: Excludes models without measurement output data port. See SPECIFICATIONS on page D-4.
- Automatic power on/off: Turns off the LCD display if the caliper remains unused for approximately 20 minutes after measurement, although the origin is still memorized. Moving the slider restores the display.
- Alarm: Should a computing error occur, the display shows an error message causing the measurement function to stop. This prevents an instrument from giving an erroneous reading. Also, when the battery voltage drops to a certain level, the "B" mark appears to indicate low battery voltage before the measurement becomes unavailable.

Optional Accessories

(Note: Usable only for models with SPC data output. Refer to Section A for details.)

Order No.	Type	Description
264-020	—	USB Input Tool Series USB Keyboard Signal Conversion Type IT-020U
05CZA624	A	Connection cable for IT/DP/MUX (1 m)*1
05CZA625	A	Connection cable for IT/DP/MUX (2 m)*1
06AFM380A	A	USB Input Tool Direct (2 m)
02AZD730G	IP67	U-WAVE-T*2
02AZD880G	Buzzer	U-WAVE-T*2
02AZE200	—	U-WAVE-T mounting bracket
02AZD790A	A	Connection cable for U-WAVE-T (160 mm)
02AZE140A	A	Connection cable for U-WAVE-T For foot switch
264-620	IP67	U-WAVE-TC*2
264-621	Buzzer	U-WAVE-TC*2
264-624	IP67	U-WAVE-TCB*2
264-625	Buzzer	U-WAVE-TCB*2
02AZF310	IP67	Connecting unit for U-WAVE-TC/TCB

*1 Cannot be used for other than water resistant type Digital calipers with external output function.

*2 IP67 model is water/dust-proofed suitable for the factory floor. Buzzer type is not water/dust-proofed.

Calipers

SPECIFICATIONS

LCD



Remarkably easy-to-read display

IP67 protection level



Inch / Metric

Order No.	Range	Resolution	Accuracy*	SPC Output	Thumb roller	Remarks
500-720-20	0 - 6 in/ 0 - 150 mm	0.0005 in/ 0.01 mm	±0.001 in/ ±0.02 mm	—	—	Depth bar ø1.9mm
500-735-20						Carbided-tipped Jaws for O.D.
500-737-20						Carbided-tipped Jaws for O.D. & I.D.
500-762-20						
500-769-20						Depth bar ø1.9mm
500-731-20						Carbided-tipped Jaws for O.D.
500-733-20	Carbided-tipped Jaws for O.D. & I.D.					
500-752-20	0 - 8 in/ 0 - 200 mm	0.0005 in/ 0.01 mm	±0.001 in/ ±0.02 mm	—	✓	Depth bar ø1.9mm
500-768-20						Carbided-tipped Jaws for O.D.
500-736-20						Carbided-tipped Jaws for O.D. & I.D.
500-738-20						
500-763-20						Carbided-tipped Jaws for O.D.
500-732-20						Carbided-tipped Jaws for O.D. & I.D.
500-734-20	Depth bar ø1.9 mm					
500-753-20	0 - 12 in/ 0 - 300 mm		±0.0015 in/ ±0.03 mm	✓	—	
500-754-20						

Metric

Order No.	Range (mm)	Resolution (mm)	Accuracy (mm)*	SPC Output	Thumb roller	Remarks
500-712-20	0 - 150	0.01	±0.02	—	—	Depth bar ø1.9mm
500-719-20						Carbided-tipped Jaws for O.D.
500-721-20						Carbided-tipped Jaws for O.D. & I.D.
500-723-20						Carbided-tipped Jaws for O.D. & I.D.
500-727-20						
500-716-20						
500-702-20	0 - 200	0.01	±0.02	—	—	Depth bar ø1.9mm
500-706-20						
500-709-20						
500-717-20						
500-713-20						Carbided-tipped Jaws for O.D.
500-722-20						Carbided-tipped Jaws for O.D. & I.D.
500-724-20	Carbided-tipped Jaws for O.D. & I.D.					
500-728-20						
500-703-20	0 - 300	0.01	±0.03	—	—	
500-707-20						
500-714-20						
500-718-20						
500-704-20						
500-708-20						

• Power source: SR44 battery (1 pc.), **938882** included as standard (for operational checks)

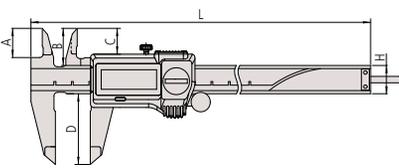
• Position detection method: ABSOLUTE electromagnetic induction linear encoder

• Battery life: Approx. 5 years under normal use

• Response speed: Unlimited

* E_{MPE} (ISO 13385-1:2019 and ASME B89.1.14-2018). Largest value across the measuring range. See page D-47 for MPE table.

DIMENSIONS



Range (mm)	A	B	C	D	H	L
0 - 6 in / 150 mm	16.5	21	14.6	40	16	233
0 - 8 in / 200 mm	20	24.5	18.1	50		290
0 - 12 in / 300 mm	22	27.5	19.8	64	20	404

Unit: mm

Outside jaw thickness = 3.5 mm for 0 to 150 mm/0 to 200 mm models
3.8 mm for 0 to 300 mm model

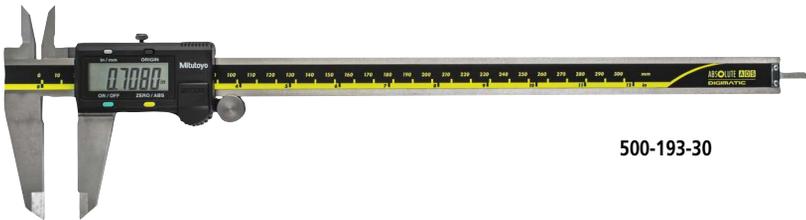
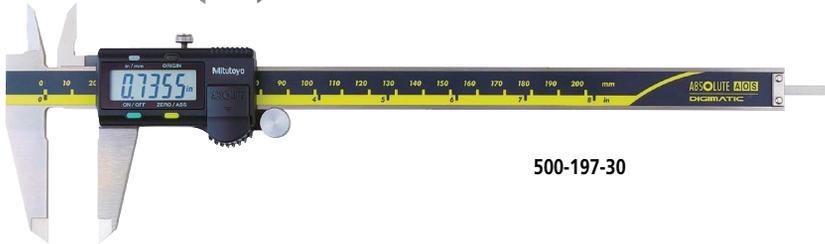
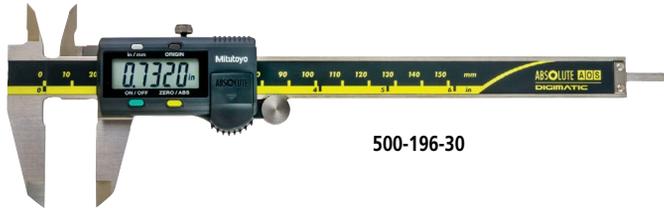


Find a Distributor

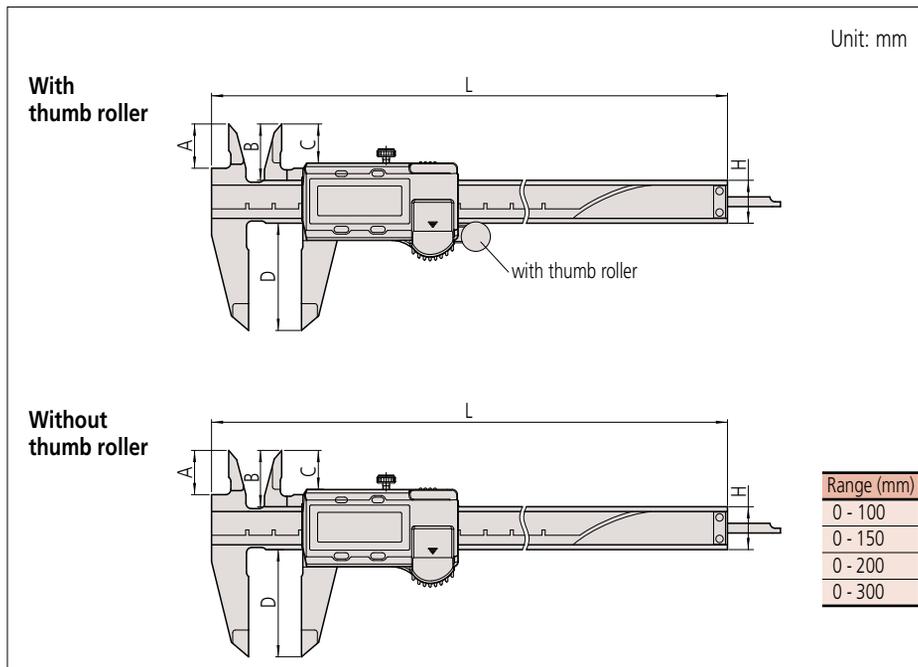
Calipers

ABSOLUTE Digimatic Caliper SERIES 500 — with Exclusive ABSOLUTE Encoder Technology

- This is a standard digital calliper. The digital display can reduce human error by preventing incorrect readings of measurement results.
- Incorporates the Mitutoyo ABSOLUTE measurement system. No need to reset the origin after switching on. Eliminates overspeed errors.
- Carbide-tipped jaw calipers are optimal for rough finished parts, castings, grinding stones, etc.
- SPC data output models can be integrated into statistical process control and measurement systems. (Refer to section A).



DIMENSIONS



Range (mm)	A	B	C	D	H	L
0 - 100	16.5	21	14.5	40	16	182
0 - 150						233
0 - 200	20	24.5	18	50		290
0 - 300	22	27.5	19.8	64	20	404

MeasurLink¹ ENABLED
Data Management Software by Mitutoyo

U-WAVE^{fit}

ABSOLUTETM



Functions

- ABSOLUTE measurement: after a data is displayed, next measurement can be performed without zero-setting. Also, the ABS origin point can be changed with ORIGIN switch.
- Incremental measurement: Sets the displayed value to zero (zero-setting) at any position, making comparative measurement easier.
- Low-voltage alert: notifies that the battery is worn with "B" mark before becoming immeasurable. Thus, the timing for battery replacement can be confirmed in advance.
- Data output: Models equipped with this function have an output port for transferring measurement data to a Statistical Process Control (SPC) system.
Note: Excludes models without measurement output data port. See SPECIFICATIONS on page D-6.
- Data hold: With the optional hold unit, the function can hold the displayed value (cannot be used with the output function).

Optional Accessories

(Note: Usable only for models with SPC data output. Refer to section A for details.)

Order No.	Type	Description
264-020	—	USB Input Tool Series USB Keyboard Signal Conversion Type IT-020U
959149	C	Connection cable for IT/DP/MUX (1 m)
959150	C	Connection cable for IT/DP/MUX (2 m)
06AFM380C	C	USB Input Tool Direct (2 m)
02AZD730G	IP67*	U-WAVE-T
02AZD880G	Buzzer	U-WAVE-T
02AZE200	—	U-WAVE-T mounting bracket
02AZD790C	C	Connection cable for U-WAVE-T (160 mm)
02AZE140C	C	Connection cable for U-WAVE-T For foot switch
264-620	IP67*	U-WAVE-TC
264-621	Buzzer	U-WAVE-TC
264-624	IP67*	U-WAVE-TCB
264-625	Buzzer	U-WAVE-TCB
02AZF300	Buzzer	Connecting unit for U-WAVE-TC/TCB

* IP-67 is applied to these **U-WAVE-T/-TC/-TCB**, but not to the calipers on page D-6 to D-7.

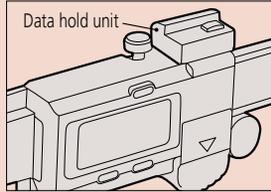
Jaw thickness: 3.5 mm for 0 to 100 mm/0 to 150 mm/0 to 200 mm models and 3.8 mm for 0 to 300 mm model

ABSOLUTE Digimatic Caliper SERIES 500 — with Exclusive ABSOLUTE Encoder Technology

• Data hold unit



959143



SPECIFICATIONS

Inch / Metric										
Order No.	Range	Resolution	Accuracy*	SPC Output	Thumb roller	Remarks				
500-170-30	0 - 4 in/	0.0005 in/ 0.01 mm	±0.001 in/ ±0.02 mm	✓	✓	Depth bar ø.075 in				
500-195-30	0 - 100 mm			—		Depth bar ø.075 in				
500-171-30	0 - 6 in/ 0 - 150 mm			±0.001 in/ ±0.02 mm		—	—	—	—	
500-174-30									—	Carbided-tipped Jaws for O.D.
500-175-30									—	Carbided-tipped Jaws for O.D. & I.D.
500-178-30									—	Depth bar ø.075 in
500-196-30									—	—
500-159-30									—	Carbided-tipped Jaws for O.D.
500-160-30									—	Carbided-tipped Jaws for O.D. & I.D.
500-191-30									—	—
500-202-30	0 - 8 in/ 0 - 200 mm			±0.001 in/ ±0.02 mm		—	—	—	—	
500-172-30									—	—
500-176-30									—	Carbided-tipped Jaws for O.D.
500-177-30									—	Carbided-tipped Jaws for O.D. & I.D.
500-197-30									—	—
500-163-30									—	Carbided-tipped Jaws for O.D.
500-164-30	—			Carbided-tipped Jaws for O.D. & I.D.						
500-204-30	0 - 12 in/ 0 - 300 mm			±0.0015 in/ ±0.03 mm		—	—	—	—	
500-173-30									—	—
500-167-30									—	Carbided-tipped Jaws for O.D.
500-168-30		—	Carbided-tipped Jaws for O.D. & I.D.							
500-193-30		—	—							
500-165-30		—	—							
500-166-30	—	—								

Metric									
Order No.	Range (mm)	Resolution (mm)	Accuracy (mm)*	SPC Output	Thumb roller	Remarks			
500-180-30	0 - 100	0.01	±0.02	—	—	Depth bar ø1.9mm			
500-150-30				✓	✓	Depth bar ø1.9mm			
500-201-30	0 - 150			±0.02	—	—	—	—	
500-181-30								—	—
500-184-30								—	Depth bar ø1.9mm
500-151-30								—	—
500-154-30								—	Carbided-tipped Jaws for O.D.
500-155-30								—	Carbided-tipped Jaws for O.D. & I.D.
500-158-30								—	Depth bar ø1.9mm
500-161-30								—	—
500-203-30	0 - 200			±0.02	—	—	—	—	
500-233-30								—	Depth bar ø1.9mm
500-234-30								—	Carbided-tipped Jaws for O.D.
500-182-30								—	Carbided-tipped Jaws for O.D. & I.D.
500-152-30								—	—
500-156-30								—	Carbided-tipped Jaws for O.D.
500-157-30	—			Carbided-tipped Jaws for O.D. & I.D.					
500-162-30	0 - 300			±0.03	—	—	—	—	
500-235-30								—	Carbided-tipped Jaws for O.D.
500-236-30								—	Carbided-tipped Jaws for O.D. & I.D.
500-153-30		—	—						
500-205-30	—	—							

• Power source: SR44 battery (1 pc.), **938882** included as standard (for operational checks)

• Battery life: Approx. 5 years under normal use

* *E_{MPE}* (ISO 13385-1:2019 and ASME B89.1.14-2018). Largest value across the measuring range. See page D-47 for MPE table.

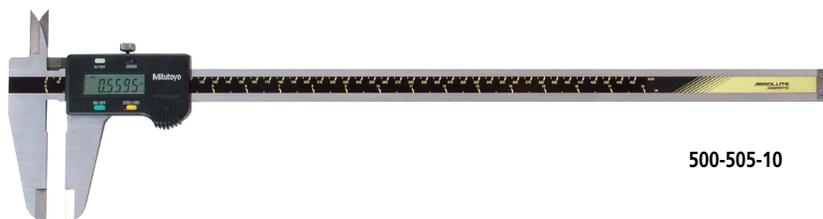


Got Questions?

Calipers

ABSOLUTE Digimatic Long Range Caliper SERIES 500 — with Exclusive ABSOLUTE Encoder Technology

- This is a long-scale digital caliper. The digital display can reduce human error by preventing incorrect reading of measurement results.
- Incorporates the Mitutoyo ABSOLUTE measurement system. No need to reset the origin after switching on. Eliminates overspeed errors.
- Data output function allows integration into statistical process control and measurement systems. (Refer to section A).



500-505-10

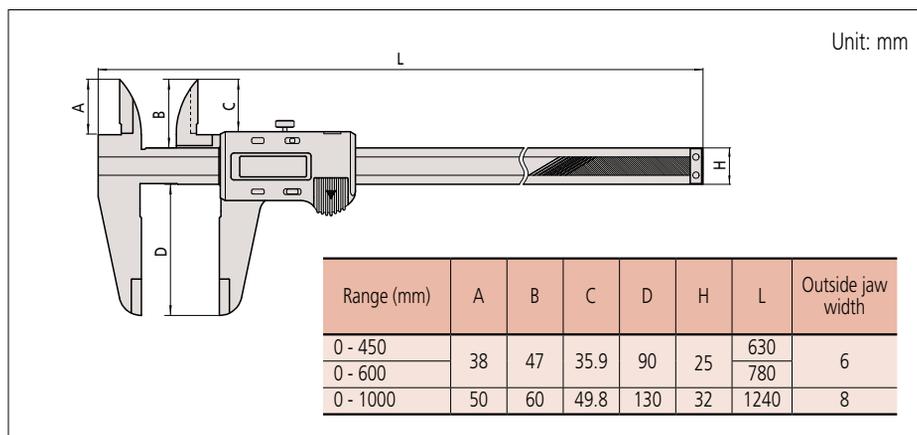
SPECIFICATIONS

Inch / Metric				
Order No.	Range	Resolution	Accuracy*	Mass (g)
500-505-10	0 - 18 in/0 - 450 mm	0.0005 in/0.01 mm	±0.002 in/±0.05 mm	1170
500-506-10	0 - 24 in/0 - 600 mm			1350
500-507-10	0 - 40 in/0 - 1000 mm		±0.003 in/±0.07 mm	3300

Metric				
Order No.	Range (mm)	Resolution (mm)	Accuracy (mm)*	Mass (g)
500-500-10	0 - 450	0.01	±0.05	1170
500-501-10	0 - 600			1350
500-502-10	0 - 1000		±0.07	3300

- Power source: SR44 battery (1 pc.), **938882** included as standard (for operational checks)
- Battery life: Approx. 3.5 years under normal use
- * E_{MPE} (ISO 13385-1:2019 and ASME B89.1.14-2018). Largest value across the measuring range. See page D-47 for MPE table.

DIMENSIONS

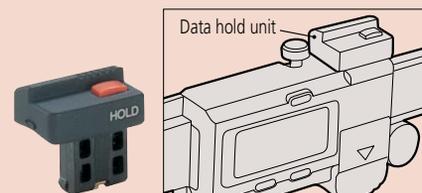


Optional Accessories

Order No.	Type	Description
264-020	—	USB Input Tool Series USB Keyboard Signal Conversion Type IT-020U
959149	C	Connection cable for IT/DP/MUX (1 m)
959150	C	Connection cable for IT/DP/MUX (2 m)
06AFM380C	C	USB Input Tool Direct (2 m)
02AZD730G	IP67*	U-WAVE-T
02AZD880G	Buzzer	U-WAVE-T
02AZE200	—	U-WAVE-T mounting bracket
02AZD790C	C	Connection cable for U-WAVE-T (160 mm)
02AZE140C	C	Connection cable for U-WAVE-T

* IP-67 is applied to this **U-WAVE-T**, but not to the calipers on page D-9.

• Data hold unit



959143



Talk to Sales



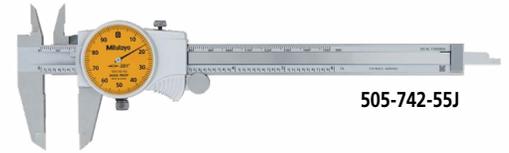
Calipers

Dial Caliper SERIES 505

- Can measure OD, ID, depth and steps.
- Easy-to-read font on dial and main scale.
- Improved finish on sliding surfaces for longevity.
- Thumb roller for smoother measurements.
- Lock screws for dial bezel and slider lock.
- Carbide-tipped models available.
- Supplied in a fitted plastic case.



505-742J



505-742-55J



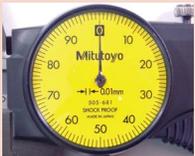
505-742-56J



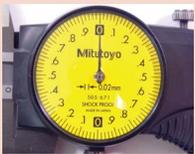
.100" per revolution



.200" per revolution

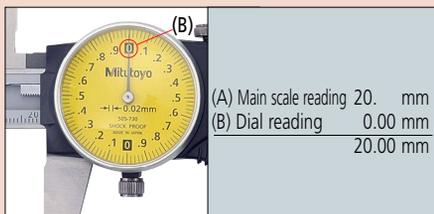


1mm per revolution



2mm per revolution

Reading



The series provides two types: Graduation 0.02 mm (2 mm/rev.) and Graduation 0.01 mm (1 mm/rev.).

SPECIFICATIONS

Inch				
Order No.	Range (in)	Graduation (in)	Accuracy (in)*	Remarks
505-742J*1	0 - 6	0.001, 0.1/rev	±0.001	—
505-742-51J				Blue Dial Face
505-742-52J				Purple Dial Face
505-742-53J				Green Dial Face
505-742-54J				Red Dial Face
505-742-55J				Orange Dial Face
505-742-56J				Black Dial Face
505-736*1				Carbide-tipped jaws for outside measurement
505-738*1				Carbide-tipped jaws for outside and inside measurement
505-740J				—
505-744	0 - 8	0.001, 0.2/rev	±0.002	Carbide-tipped jaws for outside measurement
505-741J		0.001, 0.1/rev		—
505-743J*1		0.001, 0.1/rev		Carbide-tipped jaws for outside measurement
505-737*1		0.001, 0.2/rev		Carbide-tipped jaws for outside and inside measurement
505-739*1		0.001, 0.2/rev		—
505-749	0 - 12	0.001, 0.1/rev	±0.002	—
505-746*1		0.001, 0.2/rev		Carbide-tipped jaws for outside measurement
505-750		0.001, 0.2/rev		—
505-747*1		0.001, 0.1/rev		Carbide-tipped jaws for outside measurement
505-748*1		0.001, 0.1/rev		Carbide-tipped jaws for outside and inside measurement

Metric				
Order No.	Range (mm)	Graduation (mm)	Accuracy (mm)*	Remarks
505-730	0 - 150	0.02, 2/rev	±0.03	—
505-734				Carbide-tipped jaws for outside measurement
505-735				Carbide-tipped jaws for outside and inside measurement
505-732*1	0 - 200	0.01, 1/rev	±0.02	—
505-733*1				—
505-731	0 - 300	0.02, 2/rev	±0.03	—
505-745				±0.04

* EMPE (ISO 13385-1:2019 and ASME B89.1.14-2018). Largest value across the measuring range. See page D-47 for MPE table.
*1 Silver cover type

DIMENSIONS

Unit: mm

Range (mm)	A	B	D	E	H	L
0 - 150	16.5	21	40	57.2	16	231
0 - 200	20	24.5	50			288
0 - 300	22	27.5	64	70.2	20	404

Outside jaw thickness: 3.5 mm
(505-745: 3.8 mm)

Calipers

Vernier Caliper SERIES 530 — Standard Model

- This is a standard analog caliper. It can measure the outside, inside, depth, and step.
- The small Vernier face angle (14°) provides easy reading.
- Carbide-tipped jaw calipers are optimal for rough finished parts, castings, grinding stones, etc.



530-105

SPECIFICATIONS

Inch		with inch/inch double scale			
Order No.	Range (in)	Graduation (in)	Accuracy (in)	Depth bar	Remarks
530-105	0 - 6	0.001 (1/128)	±0.001 (±0.5/128)	Blade	—
530-116	0 - 8				

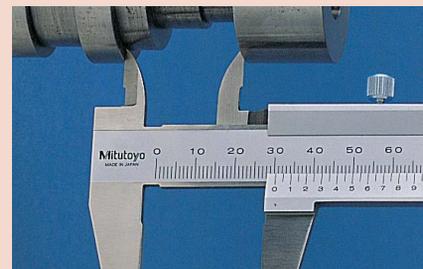
Metric/Inch		with metric/inch double scale			
Order No.	Range	Graduation	Accuracy	Depth bar	Remarks
530-104	0 - 150 mm/ 0 - 6 in	0.05 mm (1/128 in)	±0.05 mm/ ±0.5/128 in	Blade	—
530-316					Clamping screw below the slider
530-312		0.02 mm (0.001 in)	±0.03 mm/ ±0.001 in		High accuracy model
530-114	0 - 200 mm/ 0 - 8 in	0.05 mm (1/128 in)	±0.05 mm/ ±0.5/128 in	Blade	—
530-118		0.02 mm (0.001 in)	±0.03 mm/ ±0.001 in		High accuracy model
530-115	0 - 300 mm/ 0 - 12 in	0.05 mm (1/128 in)	±0.08 mm/ ±0.5/128 in	Blade	—
530-119		0.02 mm (0.001 in)	±0.04 mm/ ±0.0015 in		High accuracy model

Metric					
Order No.	Range (mm)	Graduation (mm)	Accuracy (mm)*	Depth bar	Remarks
530-101	0 - 150	0.05	±0.05	Blade	—
530-122		0.02	±0.03		High accuracy model
530-108	0 - 200	0.05	±0.05		—
530-123		0.02	±0.03	High accuracy model	
530-109	0 - 300	0.05	±0.08	Blade	—
530-124		0.02	±0.04		High accuracy model

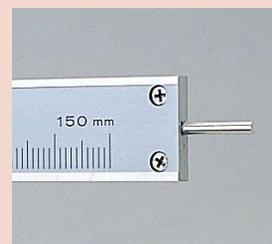
Order No.	Range (mm)	Graduation (mm)	Accuracy (mm)*	Depth bar	Remarks	
530-100	0 - 100	0.05	±0.05	—	—	
530-102	0 - 150			±0.05	ø1.9 mm rod	—
530-320				Carbide-tipped jaws for outside measurement	Blade	Carbide-tipped jaws for outside and inside measurement
530-335				Carbide-tipped jaws for outside measurement		
530-321	0 - 200			±0.08	—	Carbide-tipped jaws for outside measurement
530-322	0 - 300			±0.10	—	—
530-501	0 - 600			±0.15	—	—
530-502	0 - 1000			—	—	—

* E_{MPE} (ISO 13385-1:2019 and ASME B89.1.14-2018). Largest value across the measuring range. See page D-47 for MPE table.

Measurement example



Round depth bar type



530-102

Carbide-tipped jaws for outside measurement



530-320

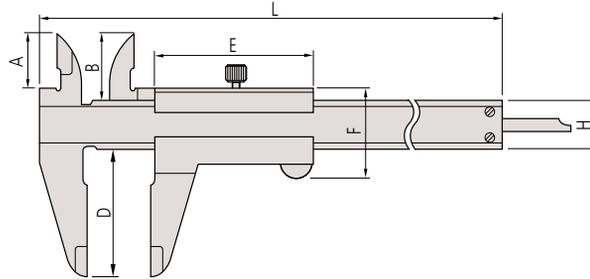


Need Repair?

Vernier Caliper SERIES 530 — Standard Model

DIMENSIONS

Unit: mm



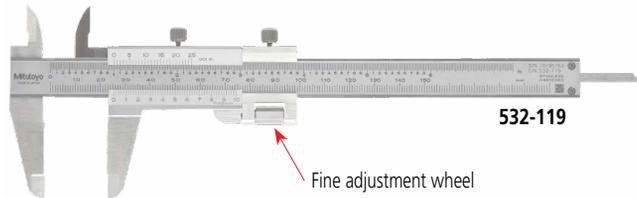
Range (mm)	A	B	D	E	F	H	L	Outside jaw thickness
0 - 100	17	21.5	40	53.5	30	16	182	3
0 - 150							229	
0 - 200							288	
0 - 300	22	27.5	64	66.5	36	20	404	3.8
0 - 600	38	47	90	89	50	25	780	6
0 - 1000	50	60	130	111	61	32	1240	8

Note: **530-100** and **530-102** incorporate a round depth bar ($\phi 1.9$ mm).
The depth bar shown in the illustration above is a different type.

Calipers

Vernier Caliper SERIES 532 — with Fine Adjustment

- Fine-adjustment thumbwheel aids slider positioning.



532-119

Fine adjustment wheel

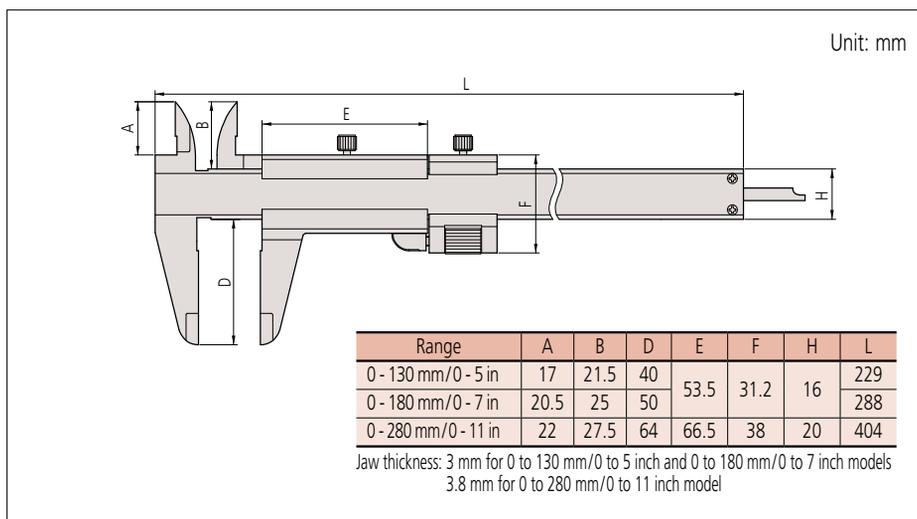
SPECIFICATIONS

Metric/Inch		with metric/inch double scale			
Order No.	Range	Graduation	Accuracy*	Depth bar	Remarks
532-119	0 - 130 mm/0 - 5 in	0.02 mm (0.001 in)	±0.03 mm/0.001 in	Blade	with fine adjustment
532-120	0 - 180 mm/0 - 7 in		±0.04 mm/0.0015 in		
532-121	0 - 280 mm/0 - 11 in				

Metric					
Order No.	Range (mm)	Graduation (mm)	Accuracy (mm)*	Depth bar	Remarks
532-101	0 - 130	0.02	±0.03	Blade	with fine adjustment
532-102	0 - 180		±0.04		
532-103	0 - 280				

* E_{MPE} (ISO 13385-1:2019 and ASME B89.1.14-2018). Largest value across the measuring range. See page D-47 for MPE table.

DIMENSIONS



Where to Buy

Vernier Caliper SERIES 531 — with Thumb Grip

- The slider position is fixed by an automatic clamp, and the measured value can be kept after a workpiece is removed.
- This feature is helpful when measuring at an invisible point of a workpiece or reading a value without a workpiece.



SPECIFICATIONS

Metric / Inch		with metric/inch double scale			
Order No.	Range	Graduation	Accuracy*	Depth bar	Remarks
531-122	0 - 150 mm / 0 - 6 in	0.05 mm (1/128 in)	±0.05 mm / ±0.5/128 in	Blade	with inch/mm conversion label
531-128		0.02 mm (0.001 in)	±0.03 mm / 0.001 in		High accuracy model
531-108	0 - 200 mm / 0 - 8 in	0.05 mm (1/128 in)	±0.05 mm / ±0.5/128 in		—
531-129		0.02 mm (0.001 in)	±0.03 mm / 0.001 in		High accuracy model
531-109	0 - 300 mm / 0 - 12 in	0.05 mm (1/128 in)	±0.08 mm / ±0.5/128 in		—
531-112		0.02 mm (0.001 in)	±0.04 mm / 0.0015 in		High accuracy model

Metric					
Order No.	Range (mm)	Graduation (mm)	Accuracy (mm)*	Depth bar	Remarks
531-101	0 - 150	0.05	±0.05	Blade	—
531-102	0 - 200		±0.08		
531-103	0 - 300				

* E_{MPE} (ISO 13385-1:2019 and ASME B89.1.14-2018). Largest value across the measuring range. See page D-47 for MPE table.

DIMENSIONS

Unit: mm

* (): Dimension in 0 to 300 mm / 0 to 12 inch model

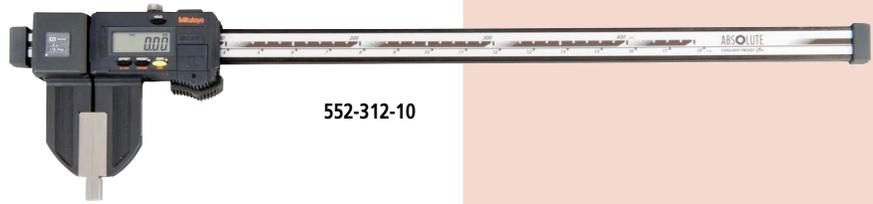
Range	A	B	D	H	L
0 - 150 mm / 0 - 6 in	17	21.5	40	16	229
0 - 200 mm / 0 - 8 in	20.5	25	50		288
0 - 300 mm / 0 - 12 in	22	27.5	64	20	404

Jaw thickness: 3 mm for 0 to 150 mm / 0 to 6 inch and 0 to 200 mm / 0 to 8 inch models
3.8 mm for 0 to 300 mm / 0 to 12 inch model

Calipers

ABSOLUTE Coolant Proof Carbon Fiber Caliper SERIES 552 — with Standard Jaws

- Rated to IP66: can be used in adverse environments where the caliper is subject to splashing by cutting fluid or coolant. The digital display can reduce human error by preventing incorrect reading of measurement results.
- Digimatic Calipers employ CFRP (Carbon-Fiber Reinforced Plastics) in the beam and jaws. Lightweight and easy to handle.



552-312-10

SPECIFICATIONS

Inch / Metric		Resolution	Accuracy*
Order No.	Range* ¹	0.0005 in/0.01 mm	±0.002 in/±0.04 mm
552-312-10	0 - 18 in/0 - 450 mm (0.504 - 18.5 in/12.8 - 462.7mm)		
552-313-10	0 - 24 in/0 - 600 mm (0.504 - 24.5 in/12.8 - 612.7 mm)		
552-314-10	0 - 40 in/0 - 1000 mm (1.004 - 41 in/25.5 - 1025.4 mm)		±0.002 in/±0.05 mm
552-315-10	0 - 60 in/0 - 1500 mm (1.004 - 61 in/25.5 - 1525.4 mm)		±0.004 in/±0.09 mm
552-316-10	0 - 80 in/0 - 2000 mm (1.004 - 81 in/25.5 - 2025.4 mm)	±0.005 in/±0.12 mm	

Metric		Resolution (mm)	Accuracy (mm)*
Order No.	Range (mm)* ¹	0.01	±0.04
552-302-10	0 - 450 (20.1 - 470)		
552-303-10	0 - 600 (20.1 - 620)		±0.05
552-304-10	0 - 1000 (20.1 - 1020)		±0.09
552-305-10	0 - 1500 (20.1 - 1520)		±0.12
552-306-10	0 - 2000 (20.1 - 2020)		

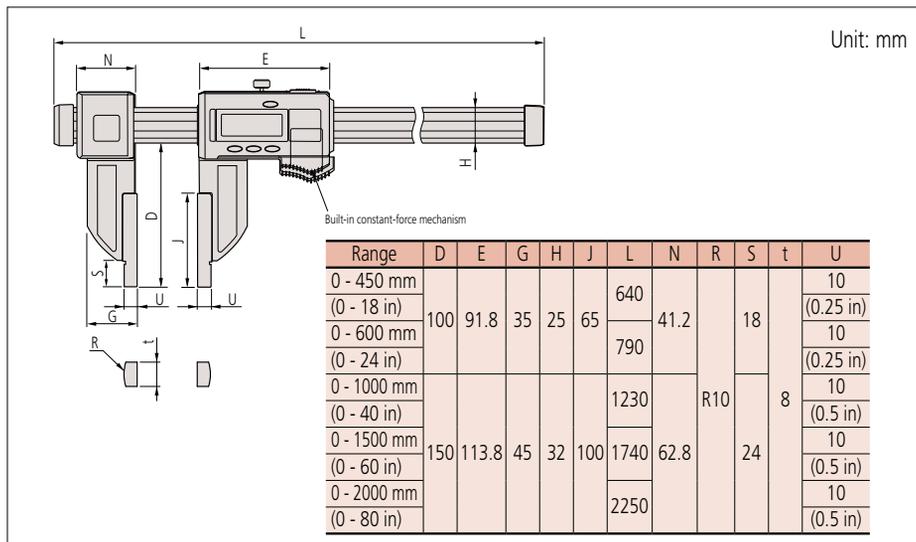
• Power source: SR44 battery (1 pc.), **938882** included as standard (for operational checks)

• Battery life: Approx. 5,000 hours in continuous use

* E_{MPE} (ISO 13385-1:2019 and ASME B89.1.14-2018). Largest value across the measuring range. See page D-47 for MPE table.

*1 (): Dimension in inside measurement

DIMENSIONS



Functions

- Zero-setting
- Data hold: Pressing the HOLD switch displays "H" on the LCD display and holds (retains) the display of value. Moving the slider in this state does not change the displayed value. Pressing the switch again cancels the state, allowing you to start measurement again.
- Offsetting: Pressing the OFFSET switch adds an offset for inside measurement to the displayed value so that you can directly obtain an inside measurement value.
- Presetting: This function presets a desired value as the displayed value at the origin. When using optional jaws, presetting an offset of the jaws enables you to directly obtain the necessary measurement value.
- Data output: Measurement data can be output, allowing easy incorporation of this instrument into a statistical process control or measurement system.
- Low-power and low-voltage alert: When the battery voltage becomes low, "B" appears on the LCD, signalling the need for battery replacement before the calliper stops working.
- Counting value composition error: If a measurement error occurs due to dirt on the scale, etc., an error message appears on the display and measurement stops.
- Automatic power on/off, inch/mm reading (inch/mm models): LCD display turns off after 20 minutes inactivity but the ABS scale unit origin is stored. Moving the slider restores the display.

Optional Accessories

Order No.	Type	Description
264-020	—	USB Input Tool Series USB Keyboard Signal Conversion Type IT-020U
05CZA624	A	Connection cable for IT/DP/MUX (1 m)
05CZA625	A	Connection cable for IT/DP/MUX (2 m)
06AFM380A	A	USB Input Tool Direct (2 m)
02AZD730G	IP67	U-WAVE-T
02AZD880G	Buzzer	U-WAVE-T
02AZE200	—	U-WAVE-T mounting bracket
02AZD790A	A	Connection cable for U-WAVE-T (160 mm)
02AZE140A	A	Connection cable for U-WAVE-T For foot switch



Functions

- Zero-setting
- Data hold: Pressing the HOLD switch displays "H" on the LCD display and holds (retains) the display of value. Moving the slider in this state does not change the displayed value. Pressing the switch again cancels the state, allowing you to start measurement again.
- Offsetting: Pressing the OFFSET switch adds an offset for inside measurement to the displayed value so that you can directly obtain an inside measurement value.
- Presetting: This function presets a desired value as the displayed value at the origin. When using optional jaws, presetting an offset of the jaws enables you to directly obtain the necessary measurement value.
- Data output: Measurement data can be output, allowing easy incorporation of this instrument into a statistical process control or measurement system.
- Low-power and low-voltage alert: When the battery voltage becomes low, "B" appears on the LCD, signalling the need for battery replacement before the calliper stops working.
- Counting value composition error: If a measurement error occurs due to dirt on the scale, etc., an error message appears on the display and measurement stops.
- Automatic power on/off, inch/mm reading (inch/mm models): LCD display turns off after 20 minutes inactivity but the ABS scale unit origin is stored. Moving the slider restores the display.

Optional Accessories

Order No.	Type	Description
264-020	—	USB Input Tool Series USB Keyboard Signal Conversion Type IT-020U
05CZA624	A	Connection cable for IT/DP/MUX (1 m)
05CZA625	A	Connection cable for IT/DP/MUX (2 m)
06AFM380A	A	USB Input Tool Direct (2 m)
02AZD730G	IP67	U-WAVE-T
02AZD880G	Buzzer	U-WAVE-T
02AZE200	—	U-WAVE-T mounting bracket
02AZD790A	A	Connection cable for U-WAVE-T (160 mm)
02AZE140A	A	Connection cable for U-WAVE-T For foot switch

ABSOLUTE Coolant Proof Carbon Fiber Caliper SERIES 552 — with Ceramic Jaws

- Digimatic Calipers employ CFRP (Carbon-Fiber Reinforced Plastics) in the beam and jaws. Lightweight and easy to handle.
- Rated to IP66: can be used in adverse environments where the caliper is subject to splashing by cutting fluid or coolant. The digital display can reduce human error by preventing incorrect reading of measurement results.
- Benefits of Zirconia Ceramic
 - Extremely high wear resistance, 3x better than carbide.
 - Corrosion proof – no oil needed.
 - Closest expansion coefficient to steel.
 - Anti-magnetic – keeps away steel dust.



552-165-10

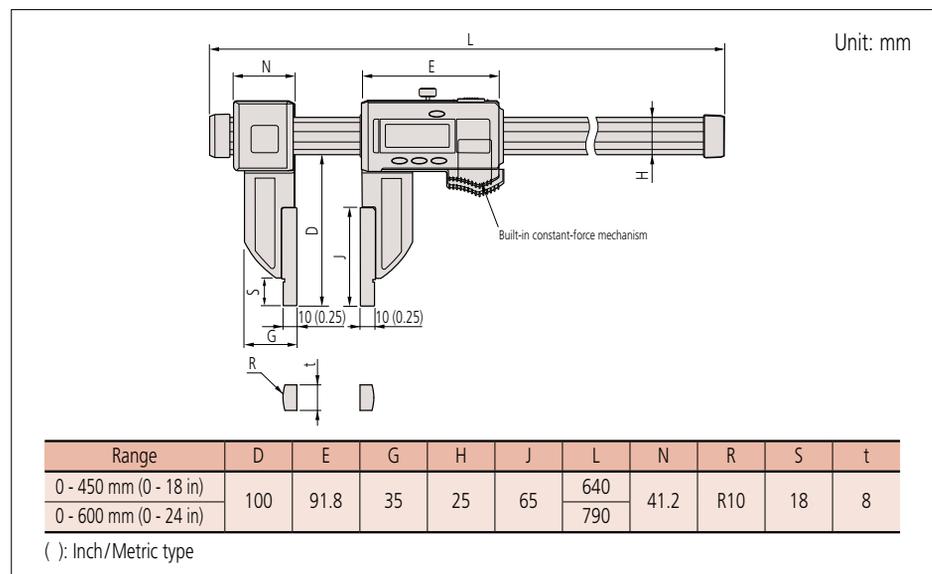
SPECIFICATIONS

Inch / Metric			
Order No.	Range* ¹	Resolution	Accuracy*
552-165-10	0 - 18 in/0 - 450 mm (0.504 - 18.5 in/12.8 - 462.7 mm)	0.0005 in/0.01 mm	±0.002 in/±0.04 mm
552-166-10	0 - 24 in/0 - 600 mm (0.504 - 24.5 in/12.8 - 612.7 mm)		

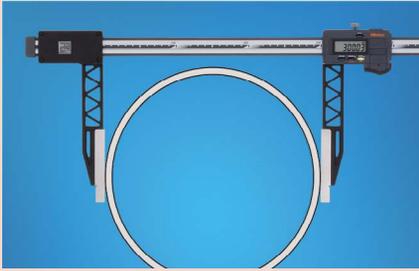
Metric			
Order No.	Range (mm)* ¹	Resolution (mm)	Accuracy (mm)*
552-155-10	0 - 450 (20.1 - 470)	0.01	±0.04
552-156-10	0 - 600 (20.1 - 620)		±0.04

- Power source: SR44 battery (1 pc.), **938882** included as standard (for operational checks)
- Battery life: Approx. 5,000 hours in continuous use
- Response speed: Unlimited
- Material of jaws: Zirconia
- * MPE (ISO 13385-1:2019 and ASME B89.1.14-2018). Largest value across the measuring range. See page D-47 for MPE table.
- *1 (): Dimension in inside measurement

DIMENSIONS



Measurement example



Functions

- Zero-setting
- Data hold: Pressing the HOLD switch displays "H" on the LCD display and holds (retains) the display of value. Moving the slider in this state does not change the displayed value. Pressing the switch again cancels the state, allowing you to start measurement again.
- Offsetting: Pressing the OFFSET switch adds an offset for inside measurement to the displayed value so that you can directly obtain an inside measurement value.
- Presetting: This function presets a desired value as the displayed value at the origin. When using optional jaws, presetting an offset of the jaws enables you to directly obtain the necessary measurement value.
- Data output: Measurement data can be output, allowing easy incorporation of this instrument into a statistical process control or measurement system.
- Low-power and low-voltage alert: When the battery voltage becomes low, "B" appears on the LCD, signalling the need for battery replacement before the calliper stops working.
- Counting value composition error: If a measurement error occurs due to dirt on the scale, etc., an error message appears on the display and measurement stops.
- Automatic power on/off, inch/mm reading (inch/mm models): LCD display turns off after 20 minutes inactivity but the ABS scale unit origin is stored. Moving the slider restores the display.

Optional Accessories

Order No.	Type	Description
264-020	—	USB Input Tool Series USB Keyboard Signal Conversion Type IT-020U
05CZA624	A	Connection cable for IT/DP/MUX (1 m)
05CZA625	A	Connection cable for IT/DP/MUX (2 m)
06AFM380A	A	USB Input Tool Direct (2 m)
02AZD730G	IP67	U-WAVE-T
02AZD880G	Buzzer	U-WAVE-T
02AZE200	—	U-WAVE-T mounting bracket
02AZD790A	A	Connection cable for U-WAVE-T (160 mm)
02AZE140A	A	Connection cable for U-WAVE-T For foot switch

ABSOLUTE Coolant Proof Carbon Fiber Caliper SERIES 552 — with Long Jaws

- Digimatic Calipers employ CFRP (Carbon-Fiber Reinforced Plastics) in the beam and jaws. Lightweight and easy to handle. The long jaw is suitable for measuring a large pipe diameter, etc.
- Rated to IP66: can be used in adverse environments where the caliper is subject to splashing by cutting fluid or coolant. The digital display can reduce human error by preventing incorrect reading of measurement results.



552-160-10

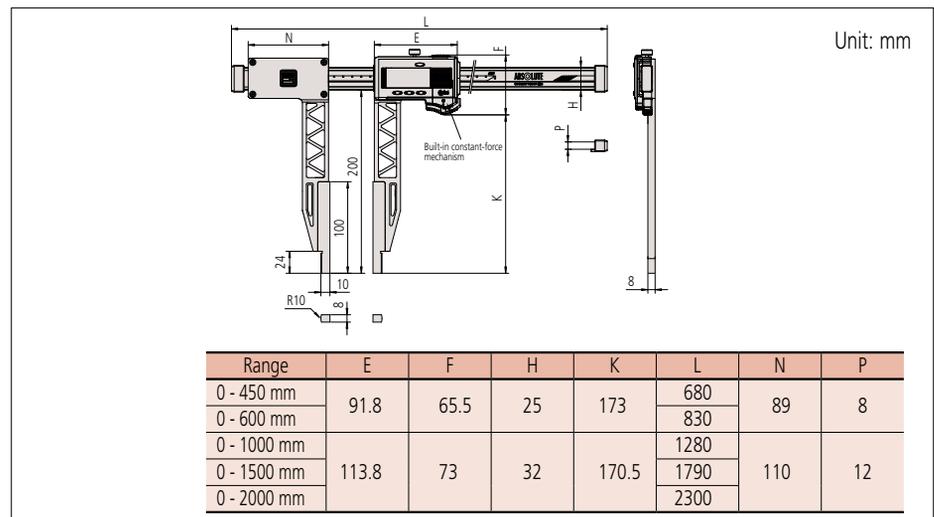
SPECIFICATIONS

Inch / Metric		Resolution	Accuracy*
Order No.	Range* ¹		
552-160-10	0 - 18 in/0 - 450 mm (0.504 - 18.5 in/12.8 - 462.7 mm)	0.0005 in/0.01 mm	±0.0025 in/±0.06 mm
552-161-10	0 - 24 in/0 - 600 mm (0.504 - 24.5 in/12.8 - 612.7 mm)		
552-162-10	0 - 40 in/0 - 1000 mm (1.004 - 41 in/25.5 - 1025.4 mm)		±0.003 in/±0.07 mm
552-163-10	0 - 60 in/0 - 1500 mm (1.004 - 61 in/25.5 - 1525.4 mm)		±0.0045 in/±0.11 mm
552-164-10	0 - 80 in/0 - 2000 mm (1.004 - 81 in/25.5 - 2025.4 mm)		±0.0055 in/±0.14 mm

Metric		Resolution (mm)	Accuracy (mm)*
Order No.	Range (mm)* ¹		
552-150-10	0 - 450 (20.1 - 470)	0.01	±0.06
552-151-10	0 - 600 (20.1 - 620)		
552-152-10	0 - 1000 (20.1 - 1020)		±0.07
552-153-10	0 - 1500 (20.1 - 1520)		±0.11
552-154-10	0 - 2000 (20.1 - 2020)		±0.14

- Power source: SR44 battery (1 pc.), 938882 included as standard (for operational checks)
- Battery life: Approx. 5,000 hours in continuous use
- * EMPE (ISO 13385-1:2019 and ASME B89.1.14-2018). Largest value across the measuring range. See page D-47 for MPE table.
- *1 (): Dimension in inside measurement

DIMENSIONS



Calipers

ABSOLUTE Coolant Proof Carbon Fiber Caliper SERIES 552 — with Interchangeable Jaws

- Digimatic Calipers employ CFRP (Carbon-Fiber Reinforced Plastics) in the beam and jaws. Lightweight and easy to handle. The range of applications can be expanded by using interchangeable jaws.
- Rated to IP66: can be used in adverse environments where the caliper is subject to splashing by cutting fluid or coolant. The digital display can reduce human error by preventing incorrect reading of measurement results.



SPECIFICATIONS

Inch / Metric			
Order No.	Range	Resolution	Accuracy*
552-191-10	0 - 18 in/0 - 450 mm	0.0005 in/0.01 mm	Accuracies will vary depending on jaws attached. See D-20.
552-192-10	0 - 24 in/0 - 600 mm		
552-193-10	0 - 40 in/0 - 1000 mm		
552-194-10	0 - 60 in/0 - 1500 mm		
552-195-10	0 - 80 in/0 - 2000 mm		

Metric			
Order No.	Range (mm)	Resolution (mm)	Accuracy (mm)*
552-181-10	0 - 450	0.01	Accuracies will vary depending on jaws attached. See D-20.
552-182-10	0 - 600		
552-183-10	0 - 1000		
552-184-10	0 - 1500		
552-185-10	0 - 2000		

- Power source: SR44 battery (1 pc.), **938882** included as standard (for operational checks)
- Battery life: Approx. 5,000 hours in continuous use
- * E_{MPE} (ISO 13385-1:2019 and ASME B89.1.14-2018). Largest value across the measuring range. See page D-47 for MPE table.

MeasurLink¹ ENABLED
Data Management Software by Mitutoyo

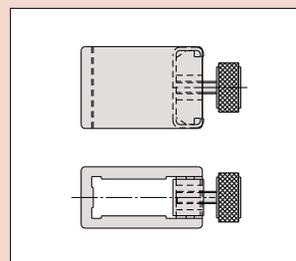
ABSOLUTE™



Functions

- Zero-setting
- Data hold: Pressing the HOLD switch displays "H" on the LCD display and holds (retains) the display of value. Moving the slider in this state does not change the displayed value. Pressing the switch again cancels the state, allowing you to start measurement again.
- Offsetting: Pressing the OFFSET switch adds an offset for inside measurement to the displayed value so that you can directly obtain an inside measurement value.
- Presetting: This function presets a desired value as the displayed value at the origin. When using optional jaws, presetting an offset of the jaws enables you to directly obtain the necessary measurement value.
- Data output: Measurement data can be output, allowing easy incorporation of this instrument into a statistical process control or measurement system.
- Low-power and low-voltage alert: When the battery voltage becomes low, "B" appears on the LCD, signalling the need for battery replacement before the calliper stops working.
- Counting value composition error: If a measurement error occurs due to dirt on the scale, etc., an error message appears on the display and measurement stops.
- Automatic power on/off, inch/mm reading (inch/mm models): LCD display turns off after 20 minutes inactivity but the ABS scale unit origin is stored. Moving the slider restores the display.

Standard Accessories (2 pcs.)



Jaw clamps: 05GZA033

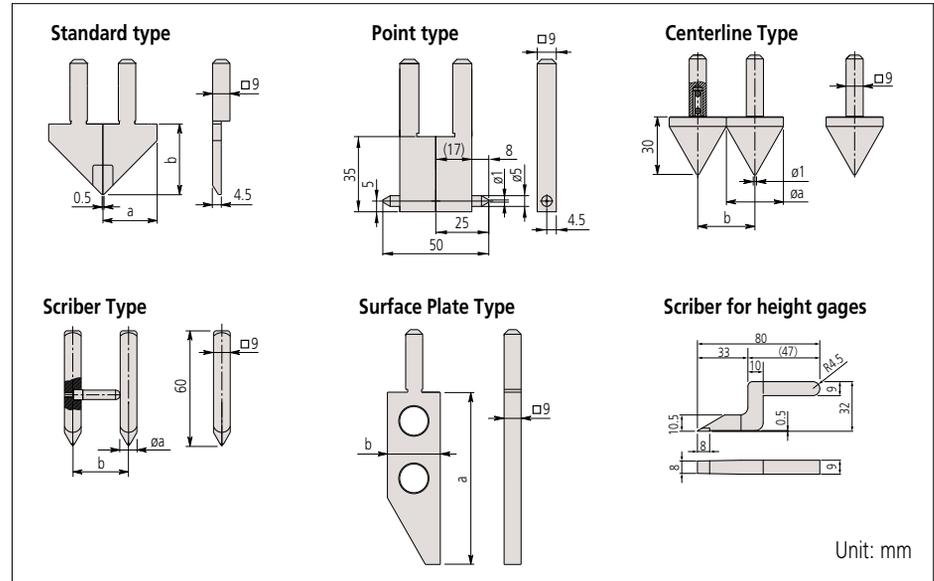
Optional Accessories

Order No.	Type	Description
264-020	—	USB Input Tool Series USB Keyboard Signal Conversion Type IT-020U
05CZA624	A	Connection cable for IT/DP/MUX (1 m)
05CZA625	A	Connection cable for IT/DP/MUX (2 m)
06AFM380A	A	USB Input Tool Direct (2 m)
02AZD730G	IP67	U-WAVE-T
02AZD880G	Buzzer	U-WAVE-T
02AZE200	—	U-WAVE-T mounting bracket
02AZD790A	A	Connection cable for U-WAVE-T (160 mm)
02AZE140A	A	Connection cable for U-WAVE-T For foot switch

Optional accessories

Interchangeable jaws

SPECIFICATIONS



Standard Type

Order No.	Components	a	b
07CZA056	Right (07CAA044), Left (07CAA045)	1.1 in (28 mm)	1.2 in (36 mm)

Note: 1 set

Point Type

Order No.	Components	a	b
07CZA059	07CZA048x2 pcs.	1 in	2 in
07CZA058	07CZA041x2 pcs.	25 mm	50 mm

Centerline Type

Order No.	Components	a	b
07CZA060	07CZA047x2 pcs.	1.2 in	1.2 in
07CZA057	07CZA039x2 pcs.	30 mm	30 mm

Scriber Type

Order No.	Components	a	b
07CZA061	Right (07CZA042), Left (07CZA049)	0.31 in	1.2 in
07CZA055	Right (07CZA042), Left (07CZA043)	8 mm	30 mm

Surface Plate Type

Order No.	a	b
07CZA044	3.5 in (90 mm)	1.1 in (28 mm)

Note: Note that the error arising from the combination of surface plates is outside the scope of accuracy guarantee.

Scriber for height gages

Order No.
07GZA000

Type	Applicable calipers	Range	Accuracy*
Standard type	552-191-10 (552-181-10)	0 - 18 in (0 - 450 mm)	±0.0025 in (±0.06 mm)
	552-192-10 (552-182-10)	0 - 24 in (0 - 600 mm)	
	552-193-10 (552-183-10)	0 - 40 in (0 - 1000 mm)	
	552-194-10 (552-184-10)	0 - 60 in (0 - 1500 mm)	
	552-195-10 (552-185-10)	0 - 80 in (0 - 2000 mm)	
Point type	552-191-10 (552-181-10)	Inside: 2.004 - 20 in (50.1 - 500 mm)	—
		Outside: 0 - 18 in (0 - 450 mm)	±0.0035 in (±0.09 mm)
	552-192-10 (552-182-10)	Inside: 2.004 - 26 in (50.1 - 650 mm)	—
		Outside: 0 - 24 in (0 - 600 mm)	±0.0035 in (±0.09 mm)
	552-193-10 (552-183-10)	Inside: 2.004 - 42 in (50.1 - 1050 mm)	—
		Outside: 0 - 40 in (0 - 1000 mm)	±0.0040 in (±0.10 mm)
552-194-10 (552-184-10)	Inside: 2.004 - 62 in (50.1 - 1550 mm)	—	
	Outside: 0 - 60 in (0 - 1500 mm)	±0.0055 in (±0.14 mm)	
552-195-10 (552-185-10)	Inside: 2.004 - 82 in (50.1 - 2050 mm)	—	
	Outside: 0 - 80 in (0 - 2000 mm)	±0.0070 in (±0.17 mm)	
Centerline type	552-191-10 (552-181-10)	1.204 - 19.2 in (30.1 - 480 mm)	—
	552-192-10 (552-182-10)	1.204 - 25.2 in (30.1 - 630 mm)	
	552-193-10 (552-183-10)	1.204 - 41.2 in (30.1 - 1030 mm)	
	552-194-10 (552-184-10)	1.204 - 61.2 in (30.1 - 1530 mm)	
	552-195-10 (552-185-10)	1.204 - 81.2 in (30.1 - 2030 mm)	
Scriber type	552-191-10 (552-181-10)	1.204 - 19.2 in (30.1 - 480 mm)	—
	552-192-10 (552-182-10)	1.204 - 25.2 in (30.1 - 630 mm)	
	552-193-10 (552-183-10)	1.204 - 41.2 in (30.1 - 1030 mm)	
	552-194-10 (552-184-10)	1.204 - 61.2 in (30.1 - 1530 mm)	
	552-195-10 (552-185-10)	1.204 - 81.2 in (30.1 - 2030 mm)	
Surface plate type + Scriber type for height gages	552-191-10 (552-181-10)	0 - 17.7 in (0 - 450 mm)	±0.0040 in (±0.10 mm)
	552-192-10 (552-182-10)	0 - 23.7 in (0 - 600 mm)	
	552-193-10 (552-183-10)	0 - 39.4 in (0 - 1000 mm)	
	552-194-10 (552-184-10)	0 - 59.4 in (0 - 1500 mm)	
	552-195-10 (552-185-10)	0 - 79.6 in (0 - 2000 mm)	
Surface plate type + Point type	552-191-10 (552-181-10)	Outside: 0 - 18 in (0 - 450 mm)	±0.0050 in (±0.12 mm)
	552-192-10 (552-182-10)	Outside: 0 - 24 in (0 - 600 mm)	
	552-193-10 (552-183-10)	Outside: 0 - 40 in (0 - 1000 mm)	
	552-194-10 (552-184-10)	Outside: 0 - 60 in (0 - 1500 mm)	
	552-195-10 (552-185-10)	Outside: 0 - 80 in (0 - 2000 mm)	
Surface plate type + Centerline type	552-191-10 (552-181-10)	0.6 - 18.6 in (15.1 - 465 mm)	—
	552-192-10 (552-182-10)	0.6 - 24.6 in (15.1 - 615 mm)	
	552-193-10 (552-183-10)	0.6 - 40.6 in (15.1 - 1015 mm)	
	552-194-10 (552-184-10)	0.6 - 60.6 in (15.1 - 1515 mm)	
	552-195-10 (552-185-10)	0.6 - 80.6 in (15.1 - 2015 mm)	

(): Inch/Metric models

*E_{MPE} (ISO 13385-1:2019 and ASME B89.1.14-2018). Largest value across the measuring range. See page D-47 for MPE table.



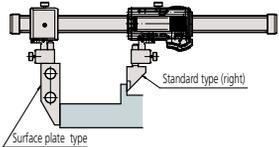
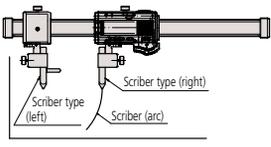
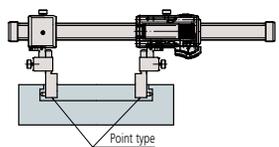
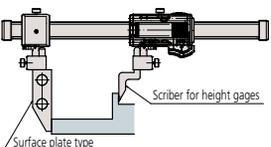
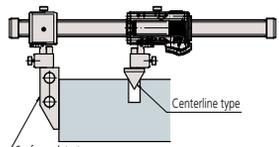
Need Support?

Calipers

Optional accessories

Interchangeable jaws

Typical applications

<p>Surface plate type + Standard type</p>  <p>Surface plate type</p> <p>Standard type (right)</p>	<p>Scriber type</p>  <p>Scriber type (left)</p> <p>Scriber type (right)</p> <p>Scriber (arc)</p>
<p>Point type</p>  <p>Point type</p>	<p>Surface plate type + Scriber for height gages</p>  <p>Surface plate type</p> <p>Scriber for height gages</p>
<p>Surface plate type + Centerline type</p>  <p>Surface plate type</p> <p>Centerline type</p>	<p>The above combinations are examples only. Contact us for advice on accuracy when using a contact point in a combination other than as shown above.</p>



Need Service?

Measurement example



Optional Accessories

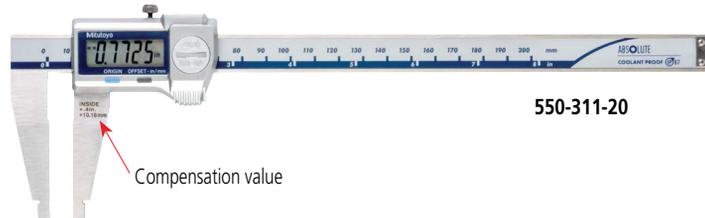
Order No.	Type	Description
264-020	—	USB Input Tool Series USB Keyboard Signal Conversion Type IT-020U
05CZA624	A	Connection cable for IT/DP/MUX (1 m)* ¹
05CZA625	A	Connection cable for IT/DP/MUX (2 m)* ¹
959149	C	Connection cable for IT/DP/MUX (1 m)* ²
959150	C	Connection cable for IT/DP/MUX (2 m)* ²
06AFM380A	A	USB Input Tool Direct (2 m)* ¹
06AFM380C	C	USB Input Tool Direct (2 m)* ²
02AZD730G	IP67	U-WAVE-T
02AZD880G	Buzzer	U-WAVE-T
02AZE200	—	U-WAVE-T mounting bracket
02AZD790A	A	Connection cable for U-WAVE-T (160 mm)* ¹
02AZE140A	A	Connection cable for U-WAVE-T * ¹ For foot switch
02AZD790C	C	Connection cable for U-WAVE-T (160 mm)* ²
02AZE140C	C	Connection cable for U-WAVE-T * ² For foot switch
264-620	IP67	U-WAVE-TC * ¹
264-621	Buzzer	U-WAVE-TC * ¹
264-624	IP67	U-WAVE-TCB * ¹
264-625	Buzzer	U-WAVE-TCB * ¹
02AZF310	IP67	Connecting unit for U-WAVE-TC/TCB * ¹

*1 For IP67 models (up to 300 mm)

*2 For series 550-2XX and 550-22X.

ABSOLUTE Digimatic Caliper SERIES 550 — with Nib Style Jaws

- This model can measure both inside and outside dimensions with a specially shaped jaw.
- The digital display can reduce human error by preventing incorrect reading of measurement results. **550-3XX-20** is rated at IP67 and therefore can be reliably used at the manufacturing site.
- Data output function allows integration into statistical process control and measurement systems. (Refer to section A).
- ID measurement value: displayed value + (a compensation value displayed on the main unit). OFFSET switch allows to input a compensation value so that the measurement value can be read directly (**Order No. 550-301-20, 550-331-20, 550-311-20 and 550-341-20**). Preset function allows to set a desired starting point (**550-331-20 and 550-341-20**).



550-311-20

SPECIFICATIONS

Inch/Metric		Resolution	Accuracy*	Remarks
Order No.	Range* ¹	0.0005 in/ 0.01 mm	±0.0015 in/ ±0.03 mm	IP67, with offset
550-311-20	0 - 8 in/0 - 200 mm (0.404 - 8.4 in/10.26 - 210.16 mm)			
550-341-20	0 - 12 in/0 - 300 mm (0.404 - 12.4 in/10.26 - 310.16 mm)		±0.002 in/ ±0.04 mm	IP67, with offset/preset function for easy inside measurement
550-223-10	0 - 18 in/0 - 450 mm (0.504 - 18.5 in/12.8 - 462.7 mm)		±0.002 in/ ±0.05 mm	—
550-225-10	0 - 24 in/0 - 600 mm (0.504 - 24.5 in/12.8 - 612.7 mm)			—
550-227-10	0 - 40 in/0 - 1000 mm (1.004 - 41 in/25.5 - 1025.4 mm)			±0.003 in/ ±0.07 mm

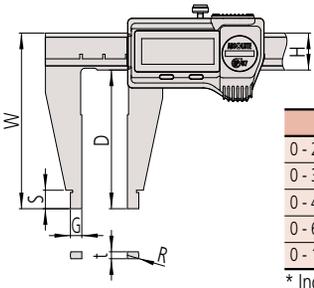
Metric		Resolution (mm)	Accuracy (mm)*	Remarks
Order No.	Range (mm)* ¹	0.01	±0.03	IP67, with offset
550-301-20	0 - 200 (10.1 - 210)			
550-331-20	0 - 300 (10.1 - 310)		±0.04	IP67, with offset/preset function for easy inside measurement
550-203-10	0 - 450 (20.1 - 470)		±0.05	—
550-205-10	0 - 600 (20.1 - 620)			—
550-207-10	0 - 1000 (20.1 - 1020)			±0.07

• Power source: SR44 battery (1 pc.), **938882** included as standard (for operational checks)

* EMPE (ISO 13385-1:2019 and ASME B89.1.14-2018). Largest value across the measuring range. See page D-47 for MPE table.

*1 () : Inside measurement

DIMENSIONS



Unit: mm

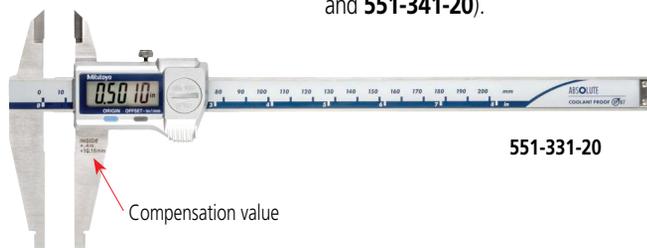
Range (mm)	D	G	S	W	H	t	R
0 - 200 (0 - 8 in)*	60	5 (5.08)*	8	76	16	3	5 (5.08)*
0 - 300 (0 - 12 in)*	75		12	95	20	3.8	
0 - 450 (0 - 18 in)*	100	10 (6.35)*	18	125	25	6	10 (6.35)*
0 - 600 (0 - 24 in)*			24	172	32	8	10 (12.7)*
0 - 1000 (0 - 40 in)*	140	10 (12.7)*	24	172	32	8	10 (12.7)*

* Inch model

Calipers

ABSOLUTE Digimatic Caliper SERIES 551 — with Nib Style and Standard Jaws

- This model has a smaller jaw for outside measurements and a larger jaw for inside and outside measurements. Use the jaws that are suitable for your application. The jaw for outside measurement has sharp tips that are helpful for measuring thin parts.
- The digital display can reduce human error by preventing incorrect reading of measurement results. **551-3XX-20** is rated at IP67 and therefore can be reliably used at the manufacturing site.
- Incorporates the Mitutoyo ABSOLUTE measurement system. No need to reset the origin after switching on.
- ID measurement value: displayed value + (a compensation value displayed on the main unit). OFFSET switch allows to input a compensation value so that the measurement value can be read directly (**Order No. 551-301-20, 551-331-20, 551-311-20 and 551-341-20**). Preset function allows to set a desired starting point (**Order No. 551-331-20 and 551-341-20**).



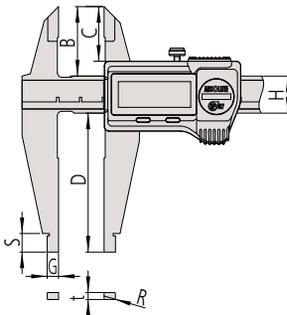
SPECIFICATIONS

Inch / Metric		Resolution	Accuracy*	Remarks
551-311-20	0 - 8 in/0 - 200 mm (0.404 - 8.4 in/10.26 - 210.16 mm)	0.0005 in/ 0.01 mm	±0.0015 in/ ±0.03 mm	IP67, with offset
551-341-20	0 - 12 in/0 - 300 mm (0.404 - 12.4 in/10.26 - 310.16 mm)		±0.002 in/ ±0.04 mm	IP67, with offset/preset function for easy inside measurement
551-224-10	0 - 20 in/0 - 500 mm (0.504 - 20.5 in/12.8 - 512.7 mm)		±0.0025 in/ ±0.06 mm	—
551-226-10	0 - 30 in/0 - 750 mm (0.504 - 30.5 in/12.8 - 762.7 mm)		±0.003 in/ ±0.07 mm	—
551-227-10	0 - 40 in/0 - 1000 mm (1.004 - 40.1 in/25.5 - 1025.4 mm)		—	—

Metric		Resolution (mm)	Accuracy (mm)*	Remarks
551-301-20	0 - 200 (10.1 - 210)	0.01	±0.03	IP67, with offset
551-331-20	0 - 300 (10.1 - 310)		±0.04	IP67, with offset/preset function for easy inside measurement
551-204-10	0 - 500 (20.1 - 520)		±0.06	—
551-206-10	0 - 750 (20.1 - 770)		±0.07	—
551-207-10	0 - 1000 (20.1 - 1020)		—	—

• Power source: SR44 battery (1 pc.), **938882** included as standard (for operational checks)
 * E_{MPE} (ISO 13385-1:2019 and ASME B89.1.14-2018). Largest value across the measuring range. See page D-47 for MPE table.
 *1 (): Inside measurement

DIMENSIONS



Unit: mm

Range (mm)	B	C	D	G	S	H	t	R
0 - 200 (0 - 8 in)*	30	23.6	60	5 (5.08)*	8	16	3	5 (5.08)*
0 - 300 (0 - 12 in)*	40	32.2	90	—	10	20	3.8	—
0 - 500 (0 - 20 in)*	56	44.9	150	10 (6.35)*	18	25	6	10 (6.35)*
0 - 750 (0 - 30 in)*	56			—	—	—	—	—
0 - 1000 (0 - 40 in)*	56	43.8	—	10 (12.7)*	20	32	8	10 (12.7)*

* Inch model

MeasurLink¹ ENABLED
Data Management Software by Mitutoyo

U-WAVE^{fit}

ABSOLUTE™



Qual- and
Wasser-
Protected



Measurement example



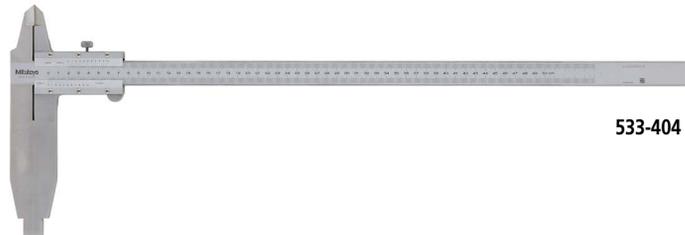
Optional Accessories

Order No.	Type	Description
264-020	—	USB Input Tool Series USB Keyboard Signal Conversion Type IT-020U
05CZA624	A	Connection cable for IT/DP/MUX (1 m)* ¹
05CZA625	A	Connection cable for IT/DP/MUX (2 m)* ¹
959149	C	Connection cable for IT/DP/MUX (1 m)* ²
959150	C	Connection cable for IT/DP/MUX (2 m)* ²
06AFM380A	A	USB Input Tool Direct (2 m)* ¹
06AFM380C	C	USB Input Tool Direct (2 m)* ²
02AZD730G	IP67	U-WAVE-T
02AZD880G	Buzzer	U-WAVE-T
02AZE200	—	U-WAVE-T mounting bracket
02AZD790A	A	Connection cable for U-WAVE-T (160 mm)* ¹
02AZE140A	A	Connection cable for U-WAVE-T * ¹ For foot switch
02AZD790C	C	Connection cable for U-WAVE-T (160 mm)* ²
02AZE140C	C	Connection cable for U-WAVE-T * ² For foot switch
264-620	IP67	U-WAVE-TC * ¹
264-621	Buzzer	U-WAVE-TC * ¹
264-624	IP67	U-WAVE-TCB * ¹
264-625	Buzzer	U-WAVE-TCB * ¹
02AZF310	IP67	Connecting unit for U-WAVE-TC/TCB * ¹

*¹ For IP67 models (up to 300 mm)
 *² For series **551-2XX** and **551-22X**.

Vernier Caliper SERIES 533 — with Nib Style and Standard Jaws

- Allows inside and outside measurements directly from the upper and lower Vernier scales.
- Main scale and Vernier scale with a satin chrome finish provides better readability.



533-404

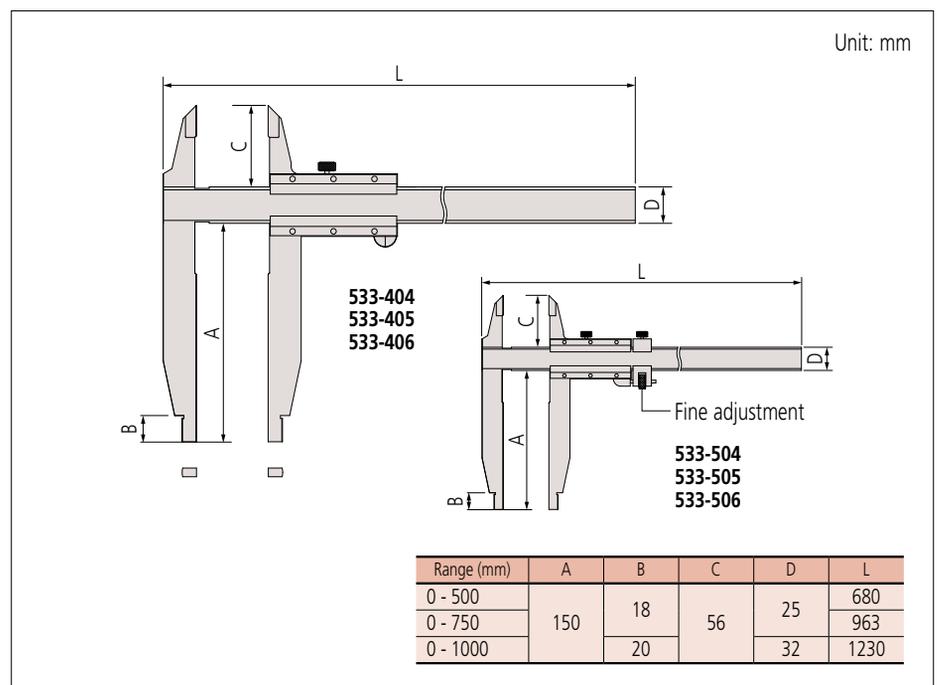
SPECIFICATIONS

Metric				
Order No.	Range (mm)*1	Resolution (mm)	Accuracy (mm)*	Remarks
533-404	0 - 500 (20.1 - 520)	0.05	±0.10	—
533-504		0.02	±0.05	with fine adjustment
533-505	0 - 750 (20.1 - 770)	0.05	±0.06	—
533-405			±0.12	
533-406	0 - 1000 (20.1 - 1020)	0.02	±0.15	with fine adjustment
533-506			±0.07	

* E_{MPE} (ISO 13385-1:2019 and ASME B89.1.14-2018). Largest value across the measuring range. See page D-47 for MPE table.

*1 (): Inside measurement

DIMENSIONS



Need Calibration?

Calipers

Vernier Caliper SERIES 160 — with Nib Style Jaws and Fine Adjustment

- The jaws' measuring faces have a radius for accurate inside diameter (ID) measurement. Inside and outside measurements can be read directly from the upper and lower slider graduations respectively.
- With fine adjustment (Order No. 160-127/128/101/104).



SPECIFICATIONS

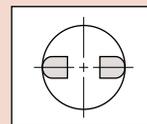
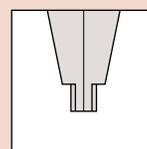
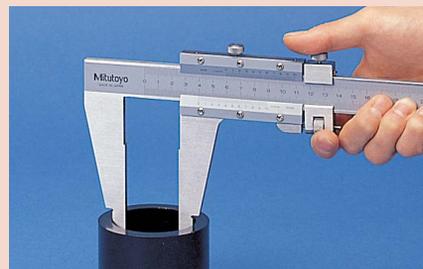
Inch				
Order No.	Range (in)*1	Minimum reading (in)	Accuracy (in)*	Remarks
160-124	0 (0.304) - 12	0.001	±0.0015	—
160-116	0 (0.504) - 18		±0.002	
160-102	0 (0.504) - 24		±0.003	
160-105	0 (1.004) - 40			

* E_{MPE} (ISO 13385-1:2019 and ASME B89.1.14-2018). Largest value across the measuring range. See page D-47 for MPE table.
*1 (): Minimum dimension in ID measurement

Inch / Metric with metric/inch double scale				
Order No.	Range*1	Minimum reading	Accuracy*	Remarks
160-125	0 - 12 in/0 - 300 mm (0.304 - 12 in/7.72 - 300 mm)	0.001 in/ 0.02 mm	±0.0015 in/ ±0.04 mm	+0.3 in/7.62 mm to reading in inside measurement
160-119	0 - 18 in/0 - 450 mm (0.504 - 18 in/12.8 - 450 mm)		±0.002 in/ ±0.05 mm	+0.5 in/12.7 mm to reading in inside measurement
160-103	0 - 24 in/0 - 600 mm (0.504 - 24 in/12.8 - 600 mm)		±0.003 in/ ±0.07 mm	+1 in/25.4 mm to reading in inside measurement
160-106	0 - 40 in/0 - 1000 mm (1.004 - 40 in/25.5 - 1000 mm)			

* E_{MPE} (ISO 13385-1:2019 and ASME B89.1.14-2018). Largest value across the measuring range. See page D-47 for MPE table.
*1 (): Minimum dimension in ID measurement

Measurement example



Radiused jaws for accurate ID measurement

Measurement example



Find a Distributor

Metric/Inch with metric/inch double scale

Order No.	Range* ¹	Minimum reading	Accuracy*	Remarks
160-150	0 - 300 mm/0 - 12 in (10.1 - 300 mm/0.398 - 12 in)	0.02 mm/ 0.001 in	±0.04 mm/ ±0.0015 in	+10 mm/0.394 in to reading in inside measurement
160-151	0 - 450 mm/0 - 18 in (20.1 - 450 mm/0.791 - 18 in)		±0.05 mm/ ±0.002 in	+20 mm/0.787 in to reading in inside measurement
160-153	0 - 600 mm/0 - 24 in (20.1 - 600 mm/0.791 - 24 in)		±0.07 mm/ ±0.003 in	
160-155	0 - 1000 mm/0 - 40 in (20.1 - 1000 mm/0.791 - 24 in)			

* E_{MPE} (ISO 13385-1:2019 and ASME B89.1.14-2018). Largest value across the measuring range. See page D-47 for MPE table.

*1 (): Minimum dimension in ID measurement

Metric

Order No.	Range (mm)* ¹	Minimum reading (mm)	Accuracy (mm)*	Remarks
160-130	0 (20.1) - 450	0.05	±0.10	without fine adjustment
160-131	0 (20.1) - 600		±0.15	
160-132	0 (20.1) - 1000			

* E_{MPE} (ISO 13385-1:2019 and ASME B89.1.14-2018). Largest value across the measuring range. See page D-47 for MPE table.

*1 (): Minimum dimension in ID measurement

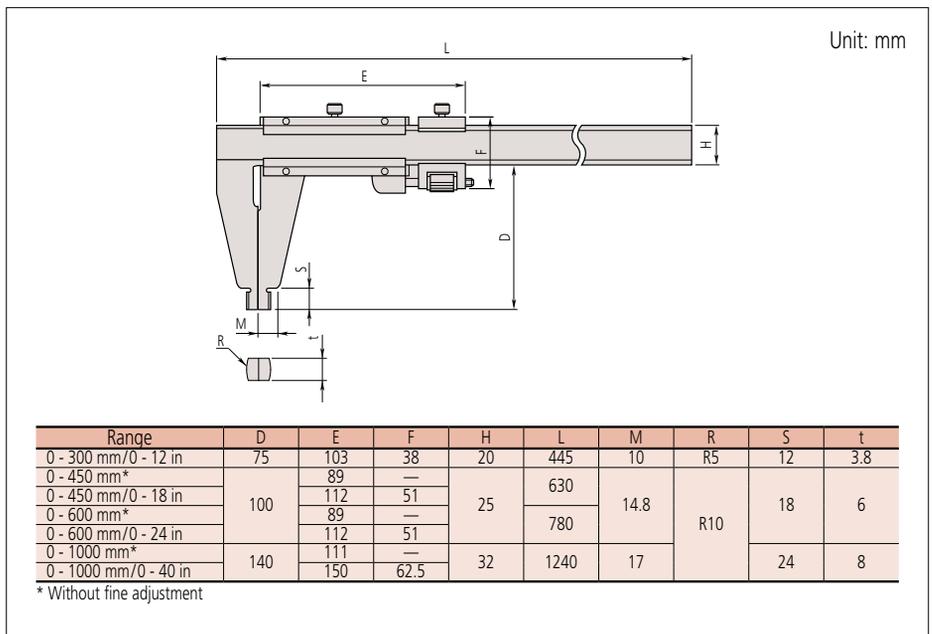
Metric

Order No.	Range (mm)* ¹	Minimum reading (mm)	Accuracy (mm)*	Remarks
160-127	0 (10.1) - 300	0.02	±0.04	with fine adjustment
160-128	0 (20.1) - 450		±0.05	
160-101	0 (20.1) - 600		±0.07	
160-104	0 (20.1) - 1000			

* E_{MPE} (ISO 13385-1:2019 and ASME B89.1.14-2018). Largest value across the measuring range. See page D-47 for MPE table.

*1 (): Minimum dimension in ID measurement

DIMENSIONS



Calipers

Long Jaw Vernier Caliper SERIES 534

- Long jaws for measuring hard-to-reach workpiece features. Suitable for measuring outside diameter of workpieces such as large pipes or spherical objects.
- Inside and outside measurements can be read directly from the upper and lower slider graduations respectively.



534-102

SPECIFICATIONS

Metric/Inch		with metric/inch double scale		
Order No.	Range*1	Graduation	Accuracy*	Remarks
534-101	0 - 300 mm/0 - 12 in (10.1 - 300 mm/0.398 - 12 in)	0.05 mm/ 1/128 in	±0.07 mm/ ±0.5/128 in	+10 mm/0.394 in to reading in inside measurement without fine adjustment
534-105	0 - 300 mm/0 - 12 in (10.1 - 300 mm/0.398 - 12 in)	0.02 mm/ 0.001 in	±0.04 mm/ ±0.0015 in	
534-102	0 - 500 mm/0 - 20 in (20.1 - 500 mm/0.791 - 20 in)	0.05 mm/ 1/128 in	±0.13 mm/ ±0.5/128 in	+20 mm/0.787 in to reading in inside measurement without fine adjustment
534-106		0.02 mm/ 0.001 in	±0.06 mm/ ±0.0025 in	
534-103	0 - 750 mm/0 - 30 in (20.1 - 750 mm/0.791 - 30 in)	0.05 mm/ 1/128 in	±0.16 mm/ ±1/128 in	
534-107		0.02 mm/ 0.001 in	±0.08 mm/ ±0.003 in	
534-104	0 - 1000 mm/0 - 40 in (20.1 - 1000 mm/0.791 - 40 in)	0.05 mm/ 1/128 in	±0.2 mm/ ±1/128 in	
534-108		0.02 mm/ 0.001 in	±0.1 mm/ ±0.004 in	

* E_{MPE} (ISO 13385-1:2019 and ASME B89.1.14-2018). Largest value across the measuring range. See page D-47 for MPE table.

*1 (): Minimum dimension in ID measurement

Note: For external dimensions, refer to page D-26.

Metric				
Order No.	Range (mm)*1	Graduation (mm)	Accuracy*	Remarks
534-109	0 (10.1) - 300	0.05	±0.07	without fine adjustment
534-110	0 (20.1) - 500		±0.13	

* E_{MPE} (ISO 13385-1:2019 and ASME B89.1.14-2018). Largest value across the measuring range. See page D-47 for MPE table.

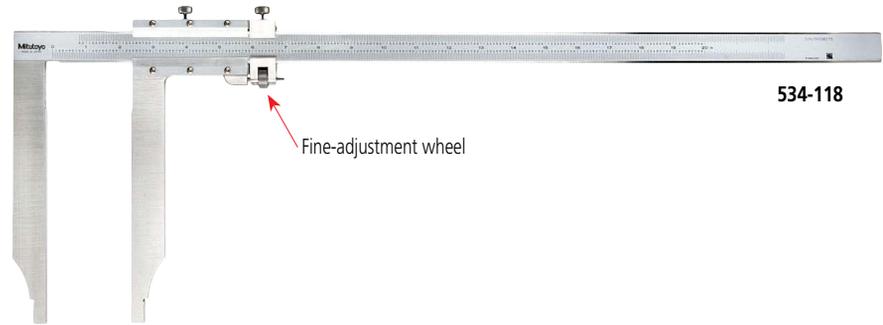
*1 (): Minimum dimension in ID measurement



Got Questions?

Long Jaw Vernier Caliper SERIES 534

- Long jaws for measuring hard-to-reach workpiece features. Suitable for measuring outside diameter of workpieces such as large pipes or spherical objects.
- Inside and outside measurements can be read directly from the upper and lower slider graduations respectively.
- Fine adjustment for more accurate measurement.



SPECIFICATIONS

Inch				
Order No.	Range (in)*1	Graduation (in)	Accuracy (in)*	Remarks
534-117	0 (0.304) - 12	0.001	±0.0015	with fine adjustment
534-118	0 (0.804) - 20		±0.0025	
534-119	0 (0.804) - 30		±0.003	
534-120	0 (0.804) - 40		±0.004	

* E_{MPE} (ISO 13385-1:2019 and ASME B89.1.14-2018). Largest value across the measuring range. See page D-47 for MPE table.

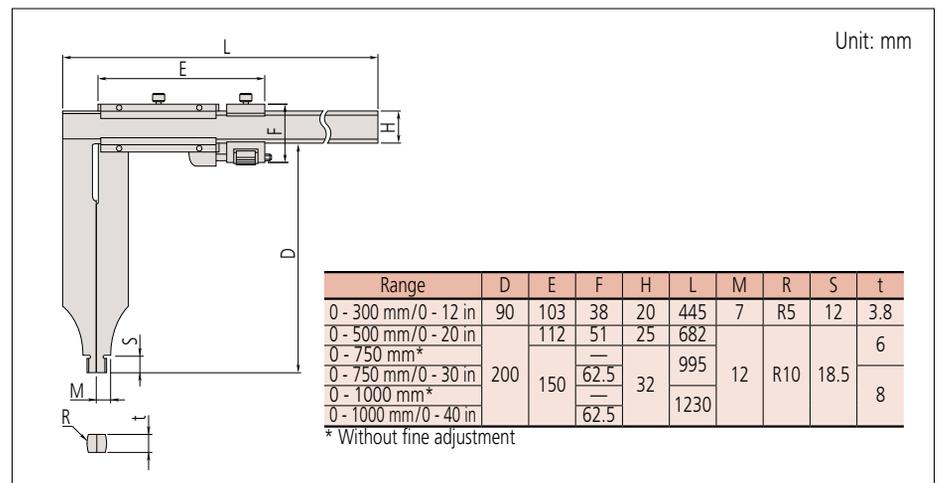
*1 (): Minimum dimension in ID measurement

Metric				
Order No.	Range (mm)*1	Graduation (mm)	Accuracy (mm)*	Remarks
534-113	0 (10.1) - 300	0.02	±0.04	with fine adjustment
534-114	0 (20.1) - 500		±0.06	
534-115	0 (20.1) - 750		±0.08	
534-116	0 (20.1) - 1000		±0.10	

* E_{MPE} (ISO 13385-1:2019 and ASME B89.1.14-2018). Largest value across the measuring range. See page D-47 for MPE table.

*1 (): Minimum dimension in ID measurement

DIMENSIONS



Calipers

Offset Caliper SERIES 573 — ABSOLUTE Digimatic Type

- The beam-mounted jaw can be adjusted to facilitate measurement of stepped sections.



573-701-20

SPECIFICATIONS

Inch / Metric		Digimatic model	
Order No.	Range	Resolution	Accuracy*
573-701-20	0 - 6 in/0 - 150 mm	0.0005 in/0.01 mm	±0.001 in/±0.02 mm
573-702-20	0 - 8 in/0 - 200 mm		
573-704-20	0 - 12 in/0 - 300 mm		

Metric		Digimatic model	
Order No.	Range (mm)	Resolution (mm)	Accuracy (mm)*
573-601-20	0 - 150	0.01	±0.02
573-611-20*1	0 - 150		
573-602-20	0 - 200		
573-612-20*1	0 - 200		
573-604-20	0 - 300		
573-614-20*1	0 - 300	±0.03	

- Power source: SR44 battery (1 pc.), **938882** included as standard (for operational checks)
- Battery life: Approx. 5 years under normal use
- * E_{MPE} (ISO 13385-1:2019 and ASME B89.1.14-2018). Largest value across the measuring range. See page D-47 for MPE table.
- *1 Without thumb roller

DIMENSIONS

Unit: mm

Order No.	Model	Range (mm)	A	B	C	D	G	H	N	W	t
573-601-20	Digimatic model	0 - 150	16.5	21	14.6	40	10	16	(18)	95	3.5
573-602-20		0 - 200	20	24.5	18.1	50			(4.5)		
573-604-20		0 - 300	22	27.5	19.8	64			(23.5)		

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Data Management Software by Mitutoyo

U-WAVE^{fit}

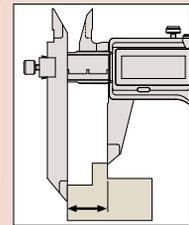
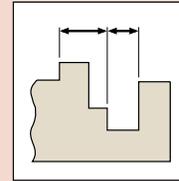
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Water-
Protected
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Measurement example

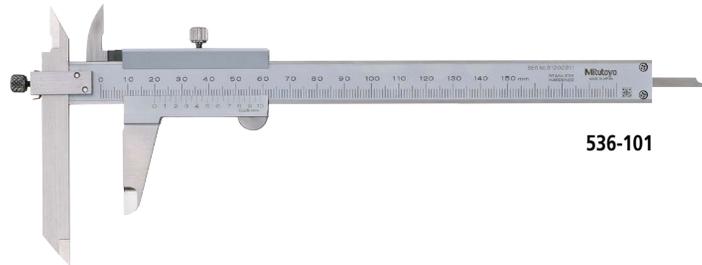


Optional Accessories

Order No.	Type	Description
264-020	—	USB Input Tool Series USB Keyboard Signal Conversion Type IT-020U
05CZA624	A	Connection cable for IT/DP/MUX (1 m)
05CZA625	A	Connection cable for IT/DP/MUX (2 m)
06AFM380A	A	USB Input Tool Direct (2 m)
02AZD730G	IP67	U-WAVE-T
02AZD880G	Buzzer	U-WAVE-T
02AZE200	—	U-WAVE-T mounting bracket
02AZD790A	A	Connection cable for U-WAVE-T (160 mm)
02AZE140A	A	Connection cable for U-WAVE-T For foot switch
264-620	IP67	U-WAVE-TC
264-621	Buzzer	U-WAVE-TC
264-624	IP67	U-WAVE-TCB
264-625	Buzzer	U-WAVE-TCB
02AZF310	IP67	Connecting unit for U-WAVE-TC/TCB

Offset Caliper SERIES 536 — Vernier Type

- The beam-mounted jaw can be adjusted to facilitate measurement of stepped sections.



536-101

SPECIFICATIONS

Metric		Analog model		
Order No.	Range (mm)	Graduation (mm)	Accuracy (mm)*	
			E_{MPE}	S_{MPE}
536-101	0 - 150	0.05	± 0.05	± 0.07
536-102	0 - 200		± 0.05	± 0.07
536-103	0 - 300		± 0.08	± 0.10

Metric		Analog model		
Order No.	Range (mm)	Graduation (mm)	Accuracy (mm)*	
			E_{MPE}	S_{MPE}
536-221	0 - 150	0.05	± 0.05	± 0.07
536-222	0 - 200		± 0.05	± 0.07
536-223	0 - 300		± 0.08	± 0.10

* E_{MPE} (ISO 13385-1:2019 and ASME B89.1.14-2018). Largest value across the measuring range. See page D-47 for MPE table.

DIMENSIONS

Unit: mm

Order No.	Model	Range (mm)	A	B	C	D	G	H	N	W	t
536-101	Analog model	0 - 150	17	21.5	17	40	10	16	(18)	95	3
536-102		0 - 200	20.5	25	20.5	50			(4)		
536-103		0 - 300	22	27.5	22	64			(23.5)		



Talk to Sales

Calipers

Offset Centerline Caliper SERIES 573 — ABSOLUTE Digimatic Type

- Specially designed for center-to-center hole diameter measurements on the same and offset planes. The beam-mounted jaw can be adjusted to facilitate the measurement of stepped sections.
- Direct reading of pitch measurement is available due to the offset-value setting function.



573-705-20

SPECIFICATIONS

Inch / Metric		Digimatic model	
Order No.	Range	Resolution	Accuracy*
573-705-20	0.404 - 6.4 in/10.26 - 160.16 mm	0.0005 in/0.01 mm	
573-706-20	0.404 - 8.4 in/10.26 - 210.16 mm		
573-708-20	0.404 - 12.4 in/10.26 - 310.16 mm		

Metric		Digimatic model	
Order No.	Range (mm)	Resolution (mm)	Accuracy (mm)*
573-605-20	10.1 - 160	0.01	
573-615-20*1	10.1 - 160		
573-606-20	10.1 - 210		
573-616-20*1	10.1 - 210		
573-608-20	10.1 - 310		
573-618-20*1	10.1 - 310		

- Power source: SR44 battery (1 pc.), **938882** included as standard (for operational checks)
- Battery life: Approx. 5 years under normal use
- * E_{MPE} (ISO 13385-1:2019 and ASME B89.1.14-2018). Largest value across the measuring range. See page D-47 for MPE table.
- *1 Without thumb roller

DIMENSIONS

Unit: mm

Range	H	W	t	Applicable hole
10.26 - 160.16 mm/0.404 - 6.4 in	16	75	3.5	ø1.5 - ø9.5 mm
10.26 - 210.16 mm/0.404 - 8.4 in				
10.26 - 310.16 mm/0.404 - 12.4 in	20	100	3.8	

MeasurLink¹ ENABLED
Data Management Software by Mitutoyo

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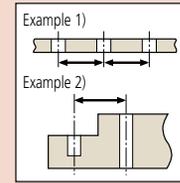
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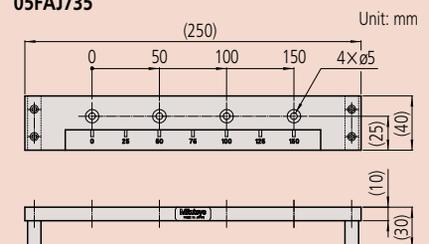
Measurement example



Optional Accessories

Order No.	Type	Description
264-020	—	USB Input Tool Series USB Keyboard Signal Conversion Type IT-020U
05CZA624	A	Connection cable for IT/DP/MUX (1 m)
05CZA625	A	Connection cable for IT/DP/MUX (2 m)
06AFM380A	A	USB Input Tool Direct (2 m)
02AZD730G	IP67	U-WAVE-T
02AZD880G	Buzzer	U-WAVE-T
02AZE200	—	U-WAVE-T mounting bracket
02AZD790A	A	Connection cable for U-WAVE-T (160 mm)
02AZE140A	A	Connection cable for U-WAVE-T For foot switch
264-620	IP67	U-WAVE-TC
264-621	Buzzer	U-WAVE-TC
264-624	IP67	U-WAVE-TCB
264-625	Buzzer	U-WAVE-TCB
02AZF310	IP67	Connecting unit for U-WAVE-TC/TCB

Inspection equipment for offset caliper 05FAJ735



Offset Centerline Caliper SERIES 536 — Vernier Type

- Specially designed for center-to-center hole diameter measurements on the same and offset planes. The beam-mounted jaw can be adjusted to facilitate the measurement of stepped sections.



536-105

SPECIFICATIONS

Order No.	Range (mm)	Graduation (mm)	Accuracy (mm)*
536-105	10.1 - 150	0.05	
536-106	10.1 - 200		
536-107	10.1 - 300		

* EMPE (ISO 13385-1:2019 and ASME B89.1.14-2018). Largest value across the measuring range. See page D-47 for MPE table.

DIMENSIONS

Unit: mm

Range (mm)	H	W	t	Applicable hole
10 - 150	16	75	3	ø1.5 - ø9.5 mm
10 - 200				
10 - 300	20	100	3.8	



Need Repair?

Calipers

ABSOLUTE Back-Jaw Centerline Caliper SERIES 573 — Center-to-center & Edge-to-center

- Specially designed to measure hole center-to-center and edge-to-center distances.
- Provided with jaws on the back of the slider, measurements can be read easily from above.
- Direct reading of pitch measurement is possible due to the offset-value setting function.

Edge-to-center distance type



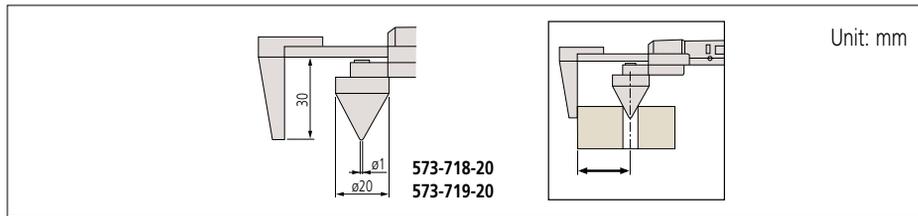
573-718-20

SPECIFICATIONS

Metric			
Order No.	Range (mm)	Resolution (mm)	Accuracy (mm)*
573-718-20*1	10.1 - 200	0.01	
573-719-20*1	10.1 - 300		

- Power source: SR44 battery (1 pc.), **938882** included as standard (for operational checks)
- * E_{MPE} (ISO 13385-1:2019 and ASME B89.1.14-2018). Largest value across the measuring range. See page D-47 for MPE table.
- *1 Applicable hole diameter: $\phi 1.5 - \phi 19.5$ mm

DIMENSIONS



Center-to-center distance type



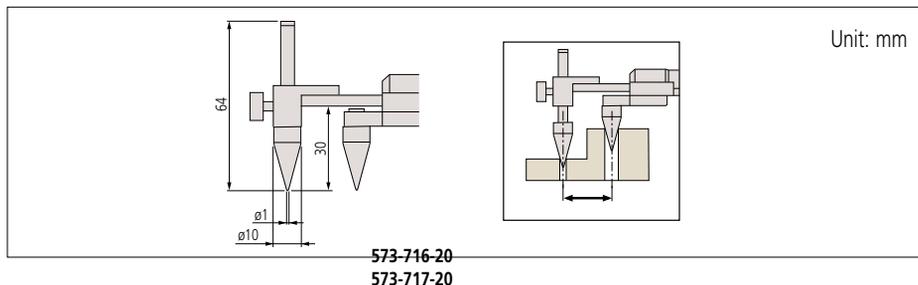
573-716-20

SPECIFICATIONS

Metric			
Order No.	Range (mm)	Resolution (mm)	Accuracy (mm)*
573-716-20*1	10.1 - 200	0.01	
573-717-20*1	10.1 - 300		

- Power source: SR44 battery (1 pc.), **938882** included as standard (for operational checks)
- * E_{MPE} (ISO 13385-1:2019 and ASME B89.1.14-2018). Largest value across the measuring range. See page D-47 for MPE table.
- *1 Applicable hole diameter: $\phi 1.5 - \phi 19.5$ mm

DIMENSIONS



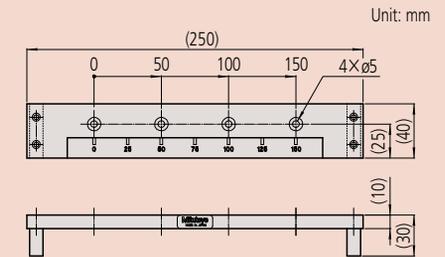
573-716-20
573-717-20

Optional Accessories

Order No.	Type	Description
264-020	—	USB Input Tool Series USB Keyboard Signal Conversion Type IT-020U
05CZA624	A	Connection cable for IT/DP/MUX (1 m)
05CZA625	A	Connection cable for IT/DP/MUX (2 m)
06AFM380A	A	USB Input Tool Direct (2 m)
02AZD730G	IP67	U-WAVE-T
02AZD880G	Buzzer	U-WAVE-T
02AZE200	—	U-WAVE-T mounting bracket
02AZD790A	A	Connection cable for U-WAVE-T (160 mm)
02AZE140A	A	Connection cable for U-WAVE-T For foot switch

Inspection equipment for Center-to-center type*

05FAJ735



* Inspection equipment for Edge-to-center type is available by special order.



Where to Buy

Measurement example

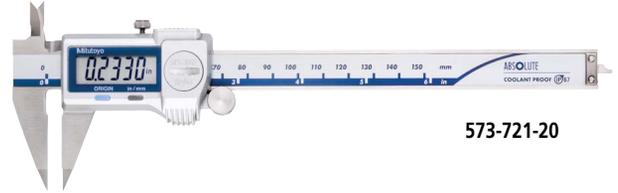


Optional Accessories (for series 573)

Order No.	Type	Description
264-020	—	USB Input Tool Series USB Keyboard Signal Conversion Type IT-020U
05CZA624	A	Connection cable for IT/DP/MUX (1 m)
05CZA625	A	Connection cable for IT/DP/MUX (2 m)
06AFM380A	A	USB Input Tool Direct (2 m)
02AZD730G	IP67	U-WAVE-T
02AZD880G	Buzzer	U-WAVE-T
02AZE200	—	U-WAVE-T mounting bracket
02AZD790A	A	Connection cable for U-WAVE-T (160 mm)
02AZE140A	A	Connection cable for U-WAVE-T For foot switch
264-620	IP67	U-WAVE-TC
264-621	Buzzer	U-WAVE-TC
264-624	IP67	U-WAVE-TCB
264-625	Buzzer	U-WAVE-TCB
02AZF310	IP67	Connecting unit for U-WAVE-TC/TCB

Point Caliper SERIES 573, 536 — ABSOLUTE Digimatic and Vernier Types

- Narrow-tip jaws fit into very small grooves and tracks, making many previously difficult outside measurements far easier to obtain.



573-721-20

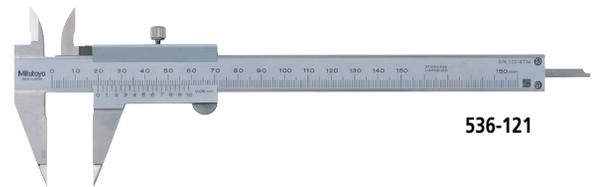
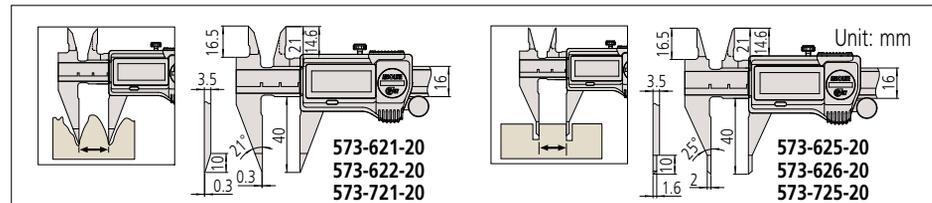
SPECIFICATIONS

Inch / Metric	Digimatic model		
Order No.	Range	Resolution	Accuracy*
573-721-20	0 - 6 in / 0 - 150 mm	0.0005 in / 0.01 mm	±0.001 in / ±0.02 mm
573-725-20			

Metric	Digimatic model		
Order No.	Range (mm)	Resolution (mm)	Accuracy (mm)*
573-621-20	0 - 150	0.01	±0.02
573-625-20	0 - 150		
573-622-20*1	0 - 150		
573-626-20*1	0 - 150		

- Power source: SR44 battery (1 pc.), **938882** included as standard (for operational checks)
 - Battery life: Approx. 5 years under normal use
 - With depth bar
- * E_{MPE} (ISO 13385-1:2019 and ASME B89.1.14-2018). Largest value across the measuring range. See page D-47 for MPE table.
*1 Without thumb roller

DIMENSIONS



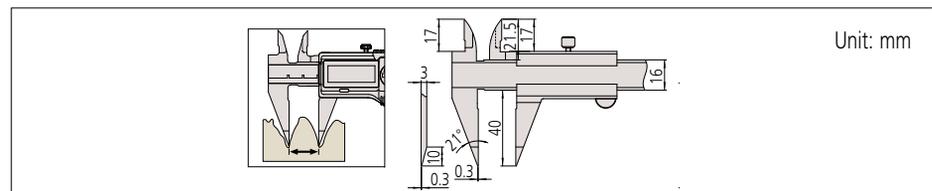
536-121

SPECIFICATIONS

Metric	Analog model		
Order No.	Range (mm)	Graduation (mm)	Accuracy (mm)*
536-121	0 - 150	0.05	±0.05

- With depth bar
- * E_{MPE} (ISO 13385-1:2019 and ASME B89.1.14-2018). Largest value across the measuring range. See page D-47 for MPE table.

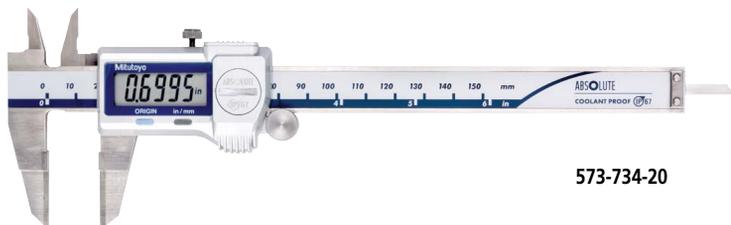
DIMENSIONS



Calipers

Blade Type Caliper SERIES 573 — ABSOLUTE Digimatic Type

- The thin blade-type jaws fit into very small grooves and make previously difficult outside measurements far easier to obtain.
- The outside measuring faces are carbide tipped.



573-734-20

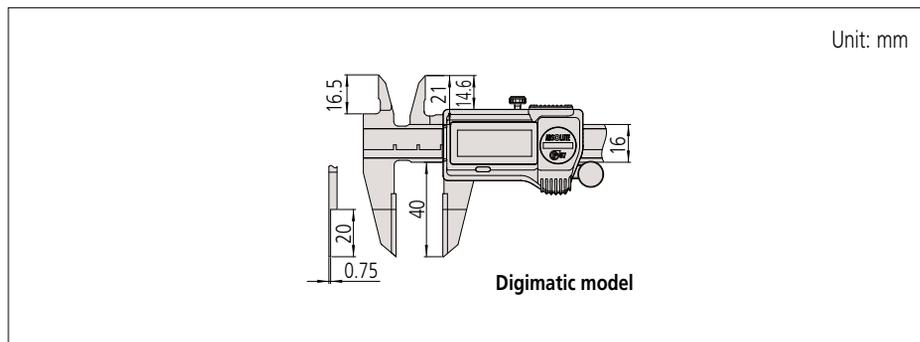
SPECIFICATIONS

Inch / Metric		Digimatic model	
Order No.	Range	Resolution	Accuracy*
573-734-20	0 - 6 in/0 - 150 mm	0.0005 in/0.01 mm	±0.001 in/±0.02 mm

Metric		Digimatic model	
Order No.	Range (mm)	Resolution (mm)	Accuracy (mm)*
573-634-20	0 - 150	0.01	±0.02
573-635-20*1	0 - 150		

- Power source: SR44 battery (1 pc.), **938882** included as standard (for operational checks)
- Battery life: Approx. 5 years under normal use
- * E_{MPE} (ISO 13385-1:2019 and ASME B89.1.14-2018). Largest value across the measuring range. See page D-47 for MPE table.
- *1 Without thumb roller

DIMENSIONS



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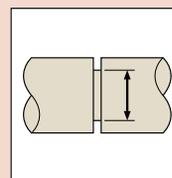
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Measurement example

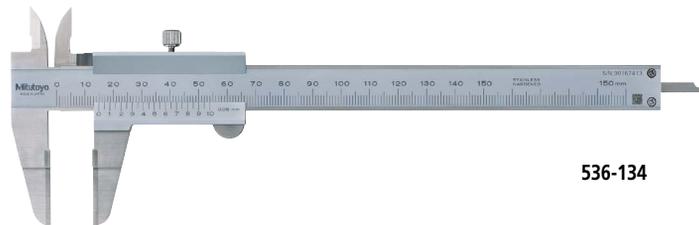


Optional Accessories (for series 573)

Order No.	Type	Description
264-020	—	USB Input Tool Series USB Keyboard Signal Conversion Type IT-020U
05CZA624	A	Connection cable for IT/DP/MUX (1 m)
05CZA625	A	Connection cable for IT/DP/MUX (2 m)
06AFM380A	A	USB Input Tool Direct (2 m)
02AZD730G	IP67	U-WAVE-T
02AZD880G	Buzzer	U-WAVE-T
02AZE200	—	U-WAVE-T mounting bracket
02AZD790A	A	Connection cable for U-WAVE-T (160 mm)
02AZE140A	A	Connection cable for U-WAVE-T For foot switch
264-620	IP67	U-WAVE-TC
264-621	Buzzer	U-WAVE-TC
264-624	IP67	U-WAVE-TCB
264-625	Buzzer	U-WAVE-TCB
02AZF310	IP67	Connecting unit for U-WAVE-TC/TCB

Blade Type Caliper SERIES 536 — Vernier Type

- The thin blade-type jaws fit into very small grooves and make previously difficult outside measurements far easier to obtain.
- The outside measuring faces are carbide tipped.



536-134

SPECIFICATIONS

Metric		Analog model	
Order No.	Range (mm)	Graduation (mm)	Accuracy (mm)*
536-134	0 - 150	0.05	±0.05
536-135	0 - 200		±0.05
536-136	0 - 300		±0.08

* *E*MPE (ISO 13385-1:2019 and ASME B89.1.14-2018). Largest value across the measuring range. See page D-47 for MPE table.

DIMENSIONS

Unit: mm

Analog model

Range (mm)	A	B	C	D	d	e	H	t
0 - 150	17	21.5	17	40	20	0.75	16	3
0 - 200	20.5	25	20.5	50	25			
0 - 300	22	27.5	22	64	30	1	20	3.8



Get a Quote

Calipers

ABSOLUTE Inside Caliper SERIES 573 — Knife-edge/Inside Groove/Point Jaw Type

- Specially designed for inside measurements. Select the right model for your workpiece shape.

Knife-edge type



573-742-20

Inside groove type



573-745-20

Point jaw type



573-746-20

SPECIFICATIONS

Inch / Metric		Digimatic model		
Order No.	Range	Resolution	Accuracy*	Remarks
573-742-20	0.4 - 8 in/ 10 - 200 mm	0.0005 in/ 0.01 mm		Knife-edge type, Measurable min.
573-745-20*2	0.404 - 6.4 in/ 10.26 - 160.16 mm			Inside groove type, Measurable min.
573-746-20*2	0.804 - 6.8 in/ 20.42 - 170.32 mm			Point jaw type, Measurable min.

Metric		Digimatic model		
Order No.	Range (mm)	Resolution (mm)	Accuracy (mm)*	Remarks
573-642-20	10 - 200	0.01		Knife-edge type, Measurable min.
573-643-20*1	10 - 200			Knife-edge type, Measurable min.
573-645-20*2	10.1 - 160			Inside groove type, Measurable min.
573-647-20*1	10.1 - 160			Inside groove type, Measurable min.
573-646-20*2	20.1 - 170			Point jaw type, Measurable min.
573-648-20*1	20.1 - 170			Point jaw type, Measurable min.

- Power source: SR44 battery (1 pc.), **938882** included as standard (for operational checks)
- Battery life: Approx. 5 years under normal use
- * E_{MPE} (ISO 13385-1:2019 and ASME B89.1.14-2018). Largest value across the measuring range. See page D-47 for MPE table.
- *1 Without thumb roller
- *2 Includes the offsetting function, which indicates the actual measurement value.

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ABSOLUTE™



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Wear-
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Measurement example



Optional Accessories

Order No.	Type	Description
264-020	—	USB Input Tool Series USB Keyboard Signal Conversion Type IT-020U
05CZA624	A	Connection cable for IT/DP/MUX (1 m)
05CZA625	A	Connection cable for IT/DP/MUX (2 m)
06AFM380A	A	USB Input Tool Direct (2 m)
02AZD730G	IP67	U-WAVE-T
02AZD880G	Buzzer	U-WAVE-T
02AZE200	—	U-WAVE-T mounting bracket
02AZD790A	A	Connection cable for U-WAVE-T (160 mm)
02AZE140A	A	Connection cable for U-WAVE-T For foot switch
264-620	IP67	U-WAVE-TC
264-621	Buzzer	U-WAVE-TC
264-624	IP67	U-WAVE-TCB
264-625	Buzzer	U-WAVE-TCB
02AZF310	IP67	Connecting unit for U-WAVE-TC/TCB

Note: **U-WAVE-TC/TCB** cannot be used with Knife-edge Type (573-642-20, 573-643-20 and 573-742-20).

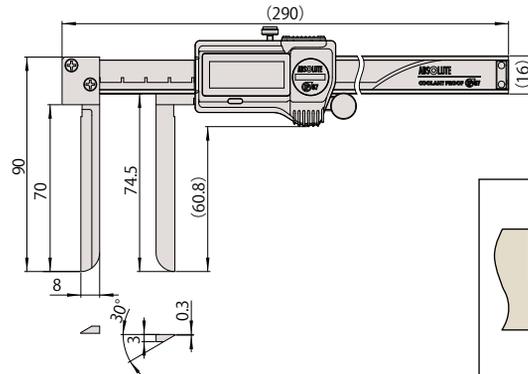


Need Support?

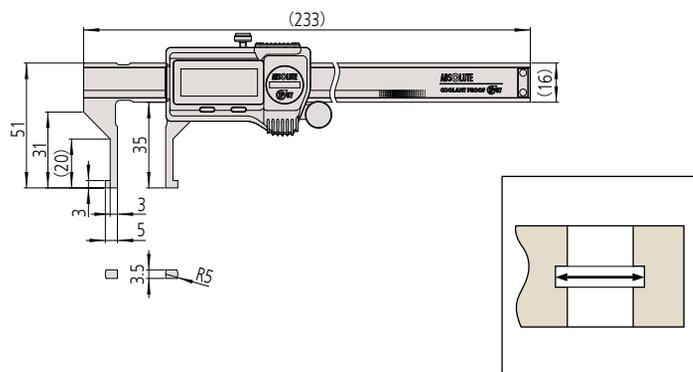
DIMENSIONS

Unit: mm

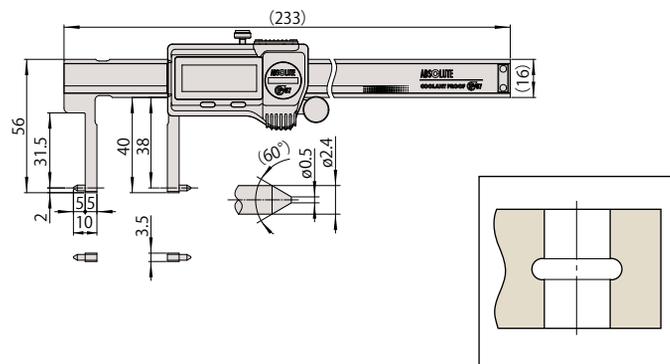
Knife-edge type: 573-642-20, 573-643-20, 573-742-20



Inside groove type: 573-645-20, 573-647-20, 573-745-20



Point jaw type: 573-646-20, 573-648-20, 573-746-20

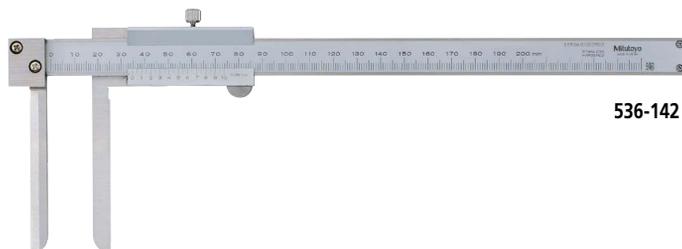


Calipers

ABSOLUTE Inside Caliper SERIES 536 — Knife-edge/Inside Groove/Point Jaw Type

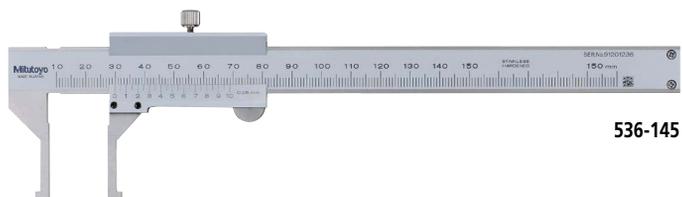
- Specially designed for inside measurement. Select the right model for your workpiece shape.

Knife-edge type



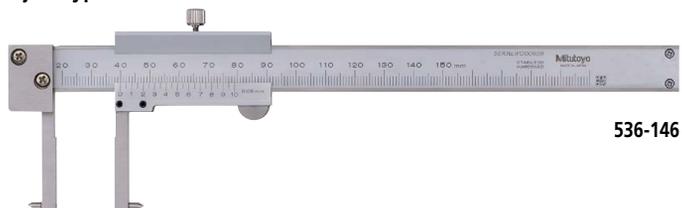
536-142

Inside groove type



536-145

Point jaw type



536-146

SPECIFICATIONS

Metric		Analog model		
Order No.	Range (mm)	Graduation (mm)	Accuracy (mm)*	Remarks
536-142	10 - 200	0.05	/	Knife-edge type, Measurable min.
536-145	10.1 - 150			Inside groove type, Measurable min.
536-146	20.1 - 150			Point jaw type, Measurable min.
536-147	30.1 - 300			Point jaw type, Measurable min.
536-148	70.1 - 450			Point jaw type, Measurable min.
536-149	70.1 - 600			Point jaw type, Measurable min.

* E_{MPE} (ISO 13385-1:2019 and ASME B89.1.14-2018). Largest value across the measuring range. See page D-47 for MPE table.

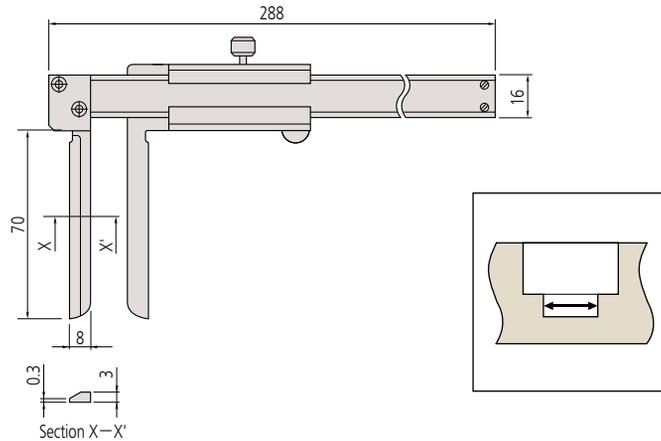


Need Service?

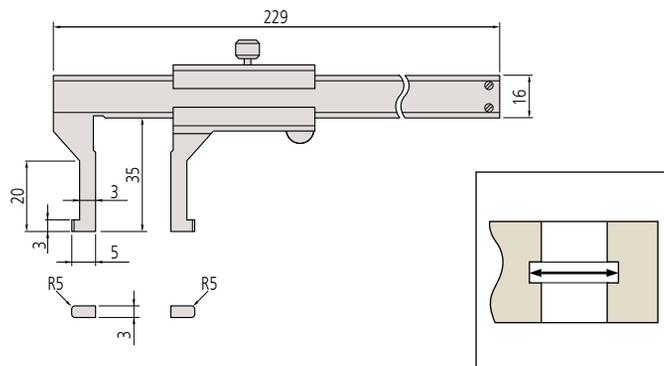
DIMENSIONS

Knife-edge type: 536-142

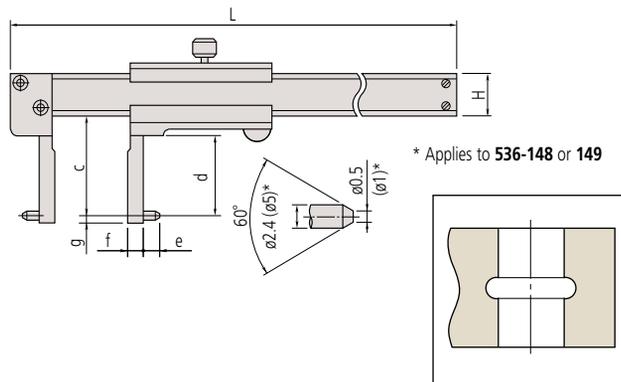
Unit: mm



Inside groove type: 536-145



Point jaw type: 536-146, 147, 148, 149



Range (mm)	c	d	e	f	g	H	L
150	38	31	5	5	2	16	229
300	98	89		10		20	403
450	145	136	10	25	5	25	610
600							750

Note: Models with a measuring range of more than 300 mm have slightly different appearance. For details, contact your nearest MP Solution Center

Calipers

Neck Caliper

SERIES 573, 536 — ABSOLUTE Digimatic and Vernier Types

- Can measure wall thickness, inside bores, and recesses.



573-651-20

SPECIFICATIONS

Inch / Metric				Metric			
Digimatic model				Digimatic model			
Order No.	Range	Resolution	Accuracy*	Order No.	Range (mm)	Resolution (mm)	Accuracy (mm)*
573-751-20	0 - 6 in/ 0 - 150 mm	0.0005 in/ 0.01 mm	±0.0015 in/ ±0.03 mm	573-651-20	0 - 150	0.01	±0.03
573-752-20*1	0 - 6 in/ 0 - 150 mm			573-652-20*1	0 - 150		
				573-653-20*2	0 - 150		
				573-654-20*1*2	0 - 150		

• Power source: SR44 battery (1 pc.), **938882** included as standard (for operational checks)

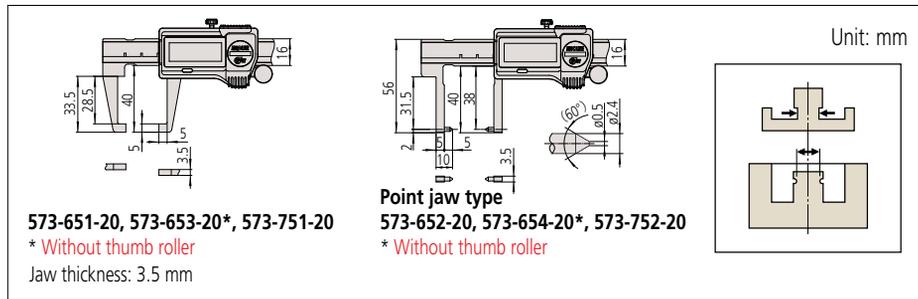
• Battery life: Approx. 5 years under normal use

* E_{MPE} (ISO 13385-1:2019 and ASME B89.1.14-2018). Largest value across the measuring range. See page D-47 for MPE table.

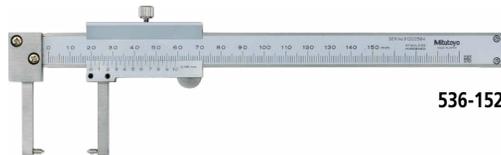
*1 Point jaw type

*2 Without thumb roller

DIMENSIONS



Point jaw type



536-152

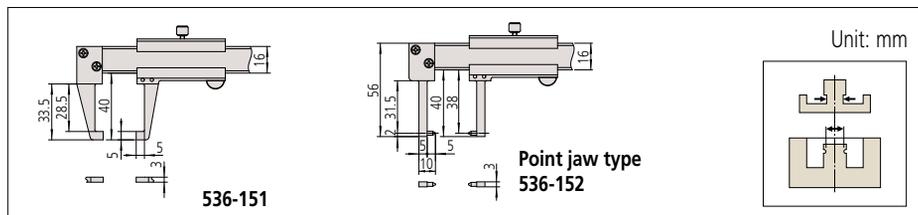
SPECIFICATIONS

Metric			
Analog model			
Order No.	Range (mm)	Graduation (mm)	Accuracy (mm)*
536-151	0 - 150	0.05	±0.05
536-152*1			

* E_{MPE} (ISO 13385-1:2019 and ASME B89.1.14-2018). Largest value across the measuring range. See page D-47 for MPE table.

*1 Point jaw type

DIMENSIONS



MeasurLink¹ ENABLED
Data Management Software by Mitutoyo

U-WAVE^{fit}

ABSOLUTE™



Oil- and
Water-
Protected
www.bsc.com
ID 0000045042



Measurement example



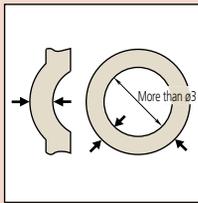
Optional Accessories (for series 573)

Order No.	Type	Description
264-020	—	USB Input Tool Series USB Keyboard Signal Conversion Type IT-020U
05CZA624	A	Connection cable for IT/DP/MUX (1 m)
05CZA625	A	Connection cable for IT/DP/MUX (2 m)
06AFM380A	A	USB Input Tool Direct (2 m)
02AZD730G	IP67	U-WAVE-T
02AZD880G	Buzzer	U-WAVE-T
02AZE200	—	U-WAVE-T mounting bracket
02AZD790A	A	Connection cable for U-WAVE-T (160 mm)
02AZE140A	A	Connection cable for U-WAVE-T For foot switch
264-620	IP67	U-WAVE-TC
264-621	Buzzer	U-WAVE-TC
264-624	IP67	U-WAVE-TCB
264-625	Buzzer	U-WAVE-TCB
02AZF310	IP67	Connecting unit for U-WAVE-TC/TCB



Need Calibration?

Measurement example



Optional Accessories (for series 573)

Order No.	Type	Description
264-020	—	USB Input Tool Series USB Keyboard Signal Conversion Type IT-020U
05CZA624	A	Connection cable for IT/DP/MUX (1 m)
05CZA625	A	Connection cable for IT/DP/MUX (2 m)
06AFM380A	A	USB Input Tool Direct (2 m)
02AZD730G	IP67	U-WAVE-T
02AZD880G	Buzzer	U-WAVE-T
02AZE200	—	U-WAVE-T mounting bracket
02AZD790A	A	Connection cable for U-WAVE-T (160 mm)
02AZE140A	A	Connection cable for U-WAVE-T For foot switch
264-620	IP67	U-WAVE-TC
264-621	Buzzer	U-WAVE-TC
264-624	IP67	U-WAVE-TCB
264-625	Buzzer	U-WAVE-TCB
02AZF310	IP67	Connecting unit for U-WAVE-TC/TCB

Tube Thickness Caliper SERIES 573, 536 — ABSOLUTE Digimatic and Vernier Types

- The beam-mounted jaw is a round bar that facilitates measurements of tube wall thickness.
- Data output function allows integration into statistical process control and measurement systems. (Refer to section A).



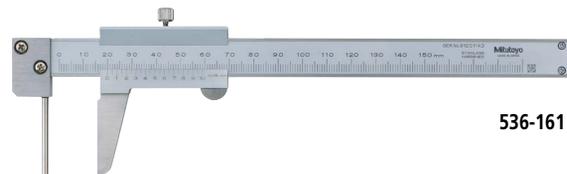
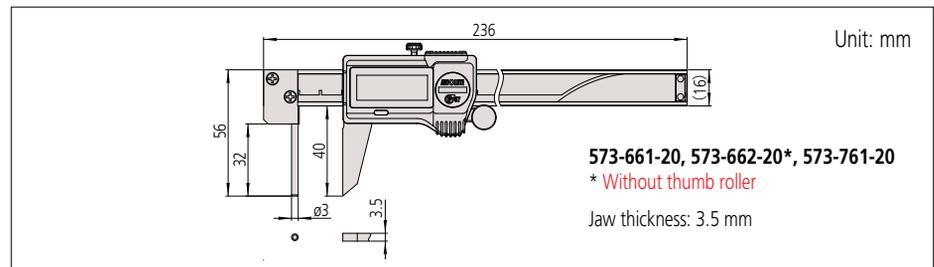
573-761-20

SPECIFICATIONS

Inch / Metric _____ Digimatic model				Metric _____ Digimatic model			
Order No.	Range	Resolution	Accuracy*	Order No.	Range (mm)	Resolution (mm)	Accuracy (mm)*
573-761-20	0 - 6 in/ 0 - 150 mm	0.0005 in/ 0.01 mm	±0.002 in/ ±0.05 mm	573-661-20	0 - 150	0.01	±0.05
				573-662-20*1	0 - 150		

- Power source: SR44 battery (1 pc.), **938882** included as standard (for operational checks)
- Battery life: Approx. 5 years under normal use
- * EMPE (ISO 13385-1:2019 and ASME B89.1.14-2018). Largest value across the measuring range. See page D-47 for MPE table.
- *1 Without thumb roller

DIMENSIONS

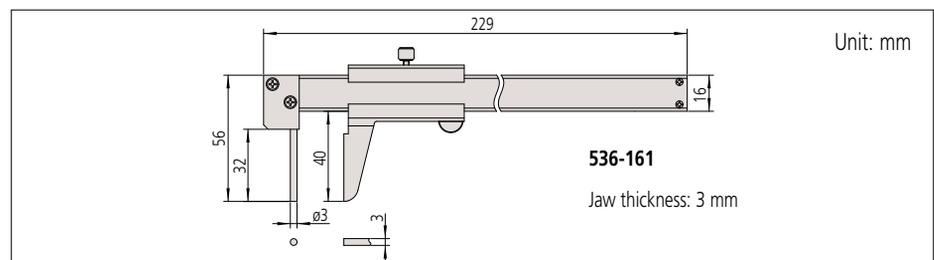


SPECIFICATIONS

Metric _____ Analog model			
Order No.	Range (mm)	Graduation (mm)	Accuracy (mm)*
536-161	0 - 150	0.05	±0.05

- * EMPE (ISO 13385-1:2019 and ASME B89.1.14-2018). Largest value across the measuring range. See page D-47 for MPE table.

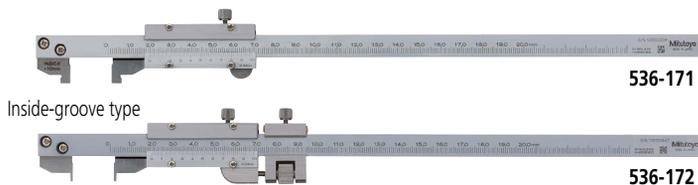
DIMENSIONS



Calipers

Hook Type Vernier Caliper SERIES 536

- Can measure width of grooves and lands inside bores and recesses.
- **536-172** is equipped with a fine-adjustment wheel to enable precise feed and adjustment.

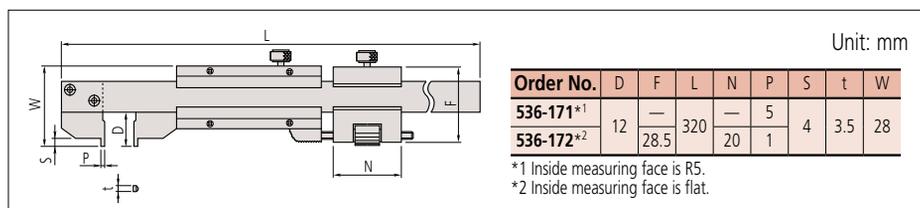


SPECIFICATIONS

Metric				
Order No.	Range (mm)*1	Graduation (mm)	Accuracy (mm)*	Remarks
536-171	0 - 200 (10.1 - 200)	0.02	±0.03	—
536-172	0 - 200 (2.1 - 200)			with fine adjustment

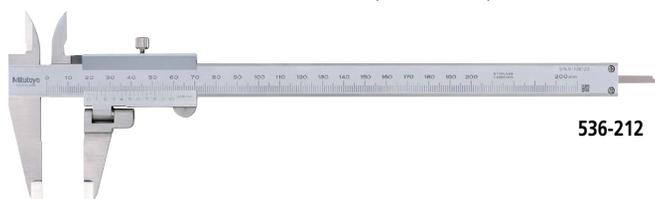
* E_{MPE} (ISO 13385-1:2019 and ASME B89.1.14-2018). Largest value across the measuring range. See page D-47 for MPE table.
*1 (): Dimension in inside measurement

DIMENSIONS



Swivel Vernier Caliper SERIES 536 — Moving/Swivel Jaw Type

- The moving jaw can be rotated to measure sectioned shafts.
- Can measure outside and inside dimensions, depth, and steps.

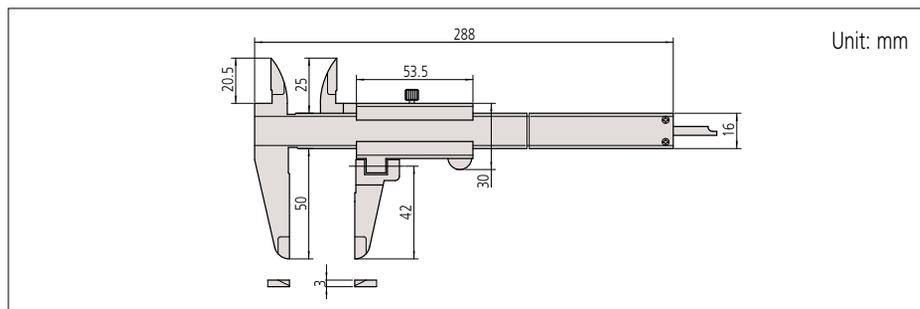


SPECIFICATIONS

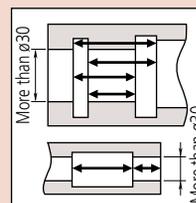
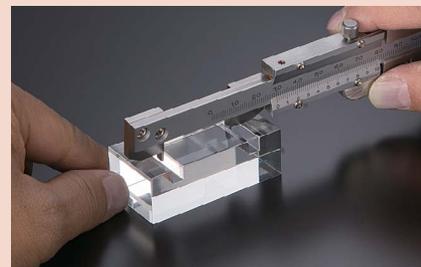
Metric				
Order No.	Range (mm)	Graduation (mm)	Accuracy (mm)*	Remarks
536-212	0 - 200	0.05	±0.05	with depth bar

* E_{MPE} (ISO 13385-1:2019 and ASME B89.1.14-2018). Largest value across the measuring range. See page D-47 for MPE table.

DIMENSIONS



Measurement example



Measurement example



Find a Distributor

Measurement example



Technical Explanation

Measurement procedure



A consistently low measuring force can be guaranteed by only taking measurements when the pointer is between the two fiducial lines.

Optional Accessories

Order No.	Type	Description
264-020	—	USB Input Tool Series USB Keyboard Signal Conversion Type IT-020U
959149	C	Connection cable for IT/DP/MUX (1 m)
959150	C	Connection cable for IT/DP/MUX (2 m)
06AFM380C	C	USB Input Tool Direct (2 m)
02AZD730G	IP67	U-WAVE-T
02AZD880G	Buzzer	U-WAVE-T
02AZE200	—	U-WAVE-T mounting bracket
02AZD790C	C	Connection cable for U-WAVE-T (160 mm)
02AZE140C	C	Connection cable for U-WAVE-T For foot switch
264-620	IP67	U-WAVE-TC
264-621	Buzzer	U-WAVE-TC
264-624	IP67	U-WAVE-TCB
264-625	Buzzer	U-WAVE-TCB
02AZF300	Buzzer	Connecting unit for U-WAVE-TC/TCB

ABSOLUTE Low Force Caliper SERIES 573

- Due to the low measuring force, this caliper is ideal for measuring elastic workpieces such as plastic and rubber parts.
- Easily allows fine feeding by using the thumb roller.
- Measuring force: 0.5 N to 1.0 N



573-291-30

SPECIFICATIONS

Inch / Metric

Order No.	Range	Resolution	Accuracy*
573-291-30	0 - 7 in/0 - 180 mm	0.0005 in/0.01 mm	±0.002 in/±0.05 mm

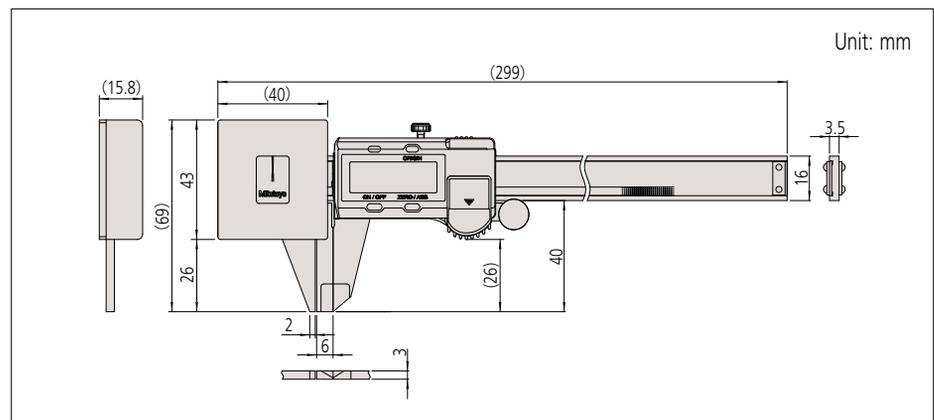
Metric

Order No.	Range (mm)	Resolution (mm)	Accuracy (mm)*
573-291-30	0 - 180	0.01	±0.05

- Power source: SR44 battery (1 pc.), **938882** included as standard (for operational checks)

* E_{MPE} (ISO 13385-1:2019 and ASME B89.1.14-2018). Largest value across the measuring range. See page D-47 for MPE table.
Note: Dedicated for outside measurement (depth bar is not fitted).

DIMENSIONS



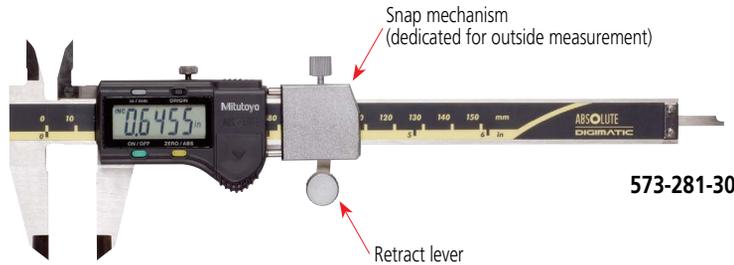
Calipers

MeasurLink¹ ENABLED
Data Management Software by Mitutoyo

ABSOLUTE™

ABSOLUTE Snap Caliper SERIES 573

- Features a 'snap action' movement control of the slider via a spring-loaded mechanism attached to a movable clamp on the beam.
- Enables quick and efficient repetitive Go/No-go inspection of a specific dimension on mass-produced parts by just moving a lever.
- The slider can be retracted by up to 2 mm from the measuring position.
- Measuring force: 7 to 14 N.



573-281-30

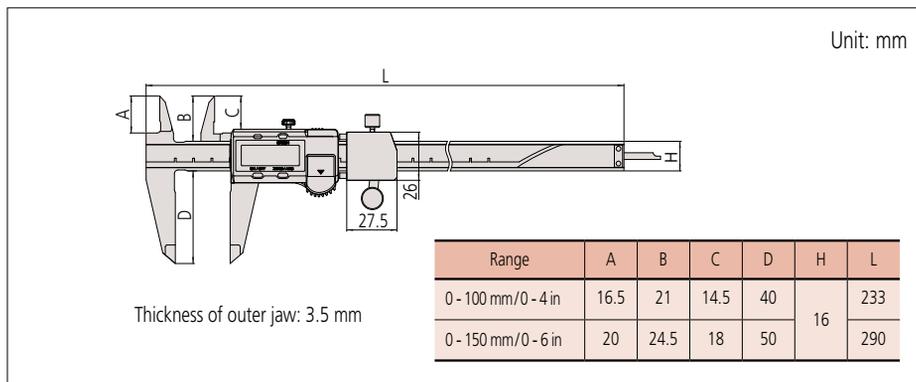
SPECIFICATIONS

Inch / Metric			
Order No.	Range	Resolution	Accuracy*
573-281-30	0 - 4 in/0 - 100 mm	0.0005 in/0.01 mm	±0.001 in/±0.02 mm
573-282-30	0 - 6 in/0 - 150 mm		
Metric			
Order No.	Range (mm)	Resolution (mm)	Accuracy (mm)*
573-181-30	0 - 100	0.01	±0.02
573-182-30	0 - 150		

• Power source: SR44 battery (1 pc.), **938882** included as standard (for operational checks)

* E_{MPE} (ISO 13385-1:2019 and ASME B89.1.14-2018). Largest value across the measuring range. See page D-47 for MPE table.

DIMENSIONS



Measurement example



Optional Accessories

Order No.	Type	Description
264-020	—	USB Input Tool Series USB Keyboard Signal Conversion Type IT-020U
959149	C	Connection cable for IT/DP/MUX (1 m)
959150	C	Connection cable for IT/DP/MUX (2 m)
06AFM380C	C	USB Input Tool Direct (2 m)
02AZD730G	IP67	U-WAVE-T
02AZD880G	Buzzer	U-WAVE-T
02AZE200	—	U-WAVE-T mounting bracket
02AZD790C	C	Connection cable for U-WAVE-T (160 mm)
02AZE140C	C	Connection cable for U-WAVE-T For foot switch

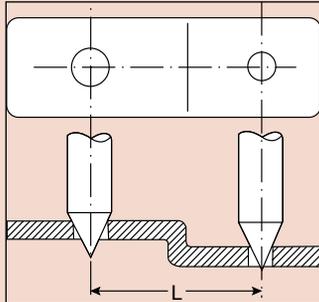


Got Questions?

Center Line Gage

Optional Accessories for Calipers

- Pairs of conical probes are specially designed for Digimatic, Dial and Vernier calipers to quickly measure centerline distances.



050001

Application for 4", 6" and 8" Vernier, Dial and Digimatic Calipers requiring dimensions over .375".



050018

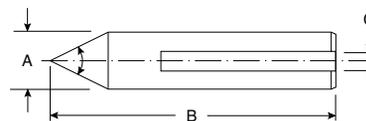
Application for 12" Vernier, Dial and Digimatic Calipers requiring dimensions over .5".

SPECIFICATIONS

Center Line Gage

Order No.	Description
050001	For 4, 6 and 8" Calipers
050018	For 12" Calipers

DIMENSIONS



	A	B	C
050001	.375"	2.187"	.141"
050018	.500"	2.75"	.154"

Depth Base Attachment

Optional Accessories for Caliper

- For 4", 6", 8", 12" / 100mm, 150mm, 200mm, 300mm, Vernier, Dial and Digital Calipers which have a depth measuring bar.
- Finely grounded base surface and secure locking clamp.

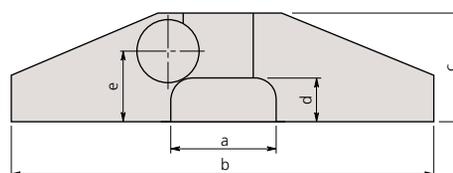


050084-10

SPECIFICATIONS

Inch / Metric		Remarks (applicable measuring range of caliper)
Size	Order No.	
3" / 75mm	050083-10	4", 6", 8" / 100mm, 150mm, 200mm
4" / 100mm	050084-10	4", 6", 8" / 100mm, 150mm, 200mm
5" / 125mm	050085-10	12" / 300mm

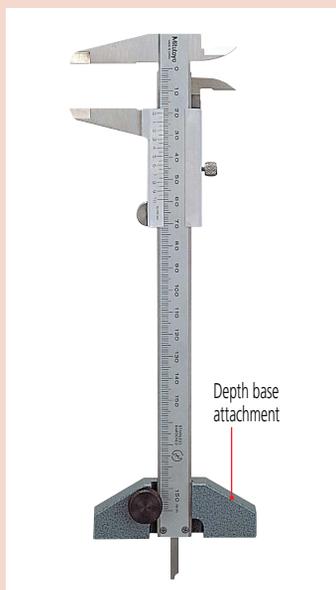
DIMENSIONS



Unit: mm

Size	a	b	c	d	e	t
3" / 75mm	25	75	26.5	13	18.5	12
4" / 100mm	25	100	26.5	13	18.5	12
5" / 125mm	30	125	28.5	13	20	14

t: Base thickness



Depth base attachment

Appendix: List of Maximum Permissible Errors (MPE)

0.01mm / 0.0005in

*L (mm)	EMPE (mm)	SMPE (mm)
0 ≤ L ≤ 200	±0.02	±0.04
200 < L ≤ 300	±0.03	±0.05
300 < L ≤ 400	±0.04	±0.06
400 < L ≤ 600	±0.05	±0.07
600 < L ≤ 800	±0.06	±0.08
800 < L ≤ 1000	±0.07	±0.09

*L (mm)	EMPE (mm)	SMPE (mm)
0 ≤ L ≤ 8	±0.0010	±0.0020
8 < L ≤ 16	±0.0015	±0.0025
16 < L ≤ 24	±0.0020	±0.0030
24 < L ≤ 32	±0.0025	±0.0035
32 < L ≤ 40	±0.0030	±0.0040

0.01mm / 0.0005in: 550-223-10, 550-225-10

*L (mm)	EMPE (mm)	SMPE (mm)
12.8 (0) ≤ L ≤ 200	±0.03	±0.03
200 < L ≤ 400	±0.04	±0.04
400 < L ≤ 600	±0.05	±0.05

*L (mm)	EMPE (mm)	SMPE (mm)
0.501 (0) ≤ L ≤ 8	±0.0015	±0.0015
8 < L ≤ 24	±0.0020	±0.0020

0.01mm / 0.0005in: 550-227-10

*L (mm)	EMPE (mm)	SMPE (mm)
12.8 (0) ≤ L ≤ 200	±0.02	±0.04
200 < L ≤ 400	±0.03	±0.05
400 < L ≤ 600	±0.05	±0.07
600 < L ≤ 800	±0.06	±0.08
800 < L ≤ 1000	±0.07	±0.09

*L (mm)	EMPE (mm)	SMPE (mm)
0.501 (0) ≤ L ≤ 8	±0.0015	±0.0015
8 < L ≤ 24	±0.0020	±0.0020
24 < L ≤ 32	±0.0025	±0.0025
32 < L ≤ 40	±0.0030	±0.0030

0.01mm / 0.0005in: 550-224-10, 551-226-10

*L (mm)	EMPE (mm)	SMPE (mm)
12.8 (0) ≤ L ≤ 200	±0.03	±0.03
200 < L ≤ 400	±0.04	±0.04
400 < L ≤ 600	±0.06	±0.06

*L (mm)	EMPE (mm)	SMPE (mm)
0.501 (0) ≤ L ≤ 8	±0.0015	±0.0015
8 < L ≤ 16	±0.0020	±0.0020
16 < L ≤ 30	±0.0025	±0.0025

0.01mm / 0.0005in: 550-227-10

*L (mm)	EMPE (mm)	SMPE (mm)
25.5 (0) ≤ L ≤ 200	±0.03	±0.03
200 < L ≤ 400	±0.04	±0.04
400 < L ≤ 800	±0.06	±0.06
800 < L ≤ 1000	±0.07	±0.07

*L (mm)	EMPE (mm)	SMPE (mm)
1.01 (0) ≤ L ≤ 8	±0.0015	±0.0015
8 < L ≤ 16	±0.0020	±0.0020
16 < L ≤ 32	±0.0025	±0.0025
32 < L ≤ 40	±0.0030	±0.0030

0.01mm / 0.0005in: 550-281-30, 573-283-30

*L (mm)	EMPE (mm)	SMPE (mm)
0 ≤ L ≤ 150	±0.02	±0.04

*L (mm)	EMPE (mm)	SMPE (mm)
0 ≤ L ≤ 6	±0.0010	±0.0020

0.01mm / 0.0005in: 550-291-30

*L (mm)	EMPE (mm)	SMPE (mm)
0 ≤ L ≤ 200	±0.05	—

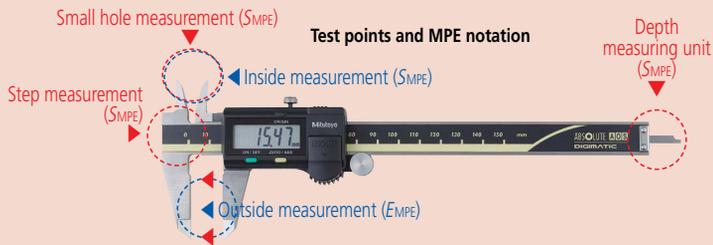
*L (mm)	EMPE (mm)	SMPE (mm)
0 ≤ L ≤ 8	±0.0020	—

Accuracy notation change (Regarding MPE notation)

The “instrumental error” used until now will change to “MPE (E_{MPE}/S_{MPE})”. Scale Shift Error (S_{MPE}) will describe the permissible error including those for depth and step. (Table 4)

Standards	E_{MPE}	S_{MPE}			
	Outside measurement	Inside measurement	Depth measurement	Step measurement	I.D. measurement
ISO13385-1:2019	Accuracy notation for outside measurement	Permissible values including those for all measurements: inside, depth, step, etc.			
ISO13385-1:2011 (JISB7507:2016)	Accuracy notation for outside measurement	Inside measurement = E_{MPE}	Depth, step, = $E_{MPE} + 0.02$ mm		

Maximum permissible error includes the repeatability and quantizing error.



Ex.) 200 mm caliper (Table 4-1)

Accuracy ± 0.02 mm (conventional notation)

Breakdown	Outside measurement	± 0.02
		Inside measurement

For depth and step measurement, add 0.02 mm to the outside measurement value.

S_{MPE} is described for measurements other than the outside measurement, but the maximum permissible error for inside measurement remains the same as before.

The permissible values for measurements other than the outside measurement (inside, depth, step, and inside diameter measurement) must be described as S_{MPE} in line with the ISO-2019 standard. Since the permissible values for depth and step measurement are larger than those for inside measurement, this could give an impression that accuracy has suffered. However, this is simply due to the change of notation in accordance with the ISO-2019 standard; neither has the accuracy of the inside measurement deteriorated nor has the product performance changed. (Table 6-1, 6-2)

(Table 6-1) Unit: mm

Measured length	Scale interval, graduation or resolution	
	0.05	0.02 or 0.01
50 or less	± 0.05	± 0.02
Over 50, 100 or less	± 0.06	± 0.03
Over 100, 200 or less	± 0.07	
Over 200, 300 or less	± 0.08	± 0.04

Note: E_{MPE} includes the measurement error arising from straightness, flatness and parallelism of the measuring surface.

Maximum permissible error E_{MPE} of Partial surface contact error in JIS B 7507

Ex.) Permissible values for a 200 mm caliper

(Table 6-2)

Measured length (mm)	Maximum permissible error (MPE)	
	E_{MPE} (mm)	S_{MPE} (mm)
$0 \leq L \leq 50$	± 0.02	± 0.04
$50 \leq L \leq 100$	± 0.02	± 0.04
$100 \leq L \leq 150$	± 0.02	± 0.04
$150 \leq L \leq 200$	± 0.02	± 0.04

Ex.) Breakdown of S_{MPE}

Inside measurement	Step measurement	Depth measurement	I.D. measurement
± 0.02	± 0.04	± 0.04	+0.01 -0.03

Accuracy notation change (for custom products)

The ISO-2019 standard stipulates the accuracy notation for compliant products. However, nothing is stipulated for custom products that are not compliant with said standard (such as calipers with dedicated measuring faces), so for these products the notation of accuracy is left to the discretion of each manufacturer. Mitutoyo, with many custom calipers, describes MPE for all of its calipers based on the following line of thinking. For example, MPE is “Scale Shift Error (S_{MPE})” for “calipers whose measuring face is other than the zero-setting face = calipers with exclusive measuring method” such as centerline calipers, inside calipers, etc. (Fig. 5, Table 7)

Accuracy is described using S_{MPE} measured not using the number of test points stipulated in the ISO-2019 standard, but rather with the same number of test points and testing method as before.

(Fig. 5) Non-ISO model (Ex.)

573-605-20



(Table 7-1)

Maximum permissible error (MPE)	
E_{MPE} (mm)	S_{MPE} (mm)
—	± 0.04

Number of test points: 3

573-646-20



(Table 7-2)

Maximum permissible error (MPE)	
E_{MPE} (mm)	S_{MPE} (mm)
—	± 0.03

Number of test points: 3

Featured Products



Linear Height High-Performance, Motorized 1D / 2D Measurement Height Gage

Refer to page L-49 for details.



QM-Height High-Performance Height Gage

Refer to page L-51 for details.



HDS Height Gage 570 Series Single Beam Height Gage

Refer to page L-55 for details.

Linear Height LH-500

Mitutoyo



D

Height Gages

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High-precision Height Gage

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Digimatic Height Gage

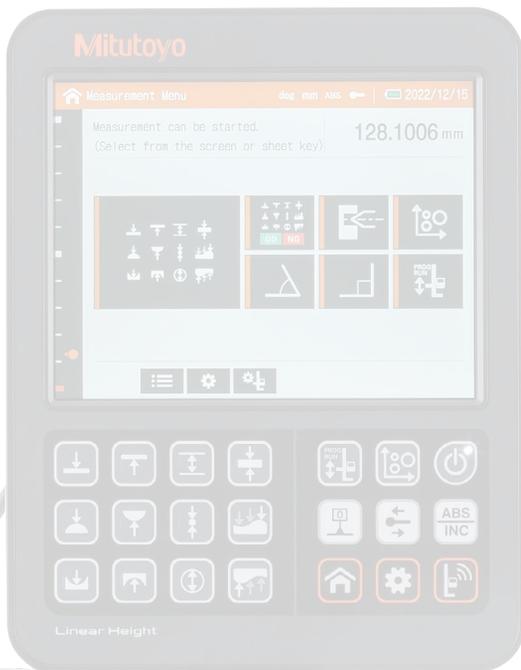
Digimatic Height Gage (Multi-function Type with SPC Data Output)	D-53
ABSOLUTE Digimatic Height Gage with Ergonomic Base	D-55
ABSOLUTE Digimatic Height Gage (Standard Model)	D-56

Height Gage

Vernier Height Gage	D-57
Dial Height Gage	D-59

Accessories, Options

Height Gage (Optional Accessories for Height Gages)	D-60
CERA Caliper Checker	D-62



MeasurLink® ENABLED

Data Management Software by Mitutoyo

Measurement Data Network System

MeasurLink® is a measurement data management system based on databases (SQL Server). You can build a network to manage the measurement results and measuring instruments simply by combining the required functions.

MeasurLink® is a registered trademark of Mitutoyo Corporation in Japan and Mitutoyo America Corporation in the United States.



Measuring Instruments Shipped with Inspection Certificate

Mitutoyo guarantees product quality as a leading precision measuring instrument manufacturer and ships measuring instruments with an inspection certificate that includes inspection data so that customers can use them with confidence.

ABSOLUTE™

ABSOLUTE Linear Encoder

Mitutoyo developed the unique ABSOLUTE method to retain position information after the power is turned off. The origin is set once - thereafter the live position is displayed when the power is turned on.

Height Gage

Linear Height SERIES 518 — High-performance 2D Measurement System

- This is a precision height gage featuring high accuracy and outstanding ease of use. It is useful not only in height measurement but also in a wide range of applications such as inspection of moulds and precision parts.
- Easy operation using keypad and touch screen navigation allows intuitive operation that is suitable even for beginners.
- The built-in scale is dirt-resistant and can be reliably used on shop floors.
- Various interfaces are available, including connection to a printer, a PC, and our wired or wireless communication system.
- Pneumatic full/semi-floating suspension system allows adjustment of air-cushion height.
- It is easily expandable to support various types of optional probes to meet your different measurement needs.



SPECIFICATIONS

Model	LH-600F		LH-600FG
Order No.	518-360-13		518-361-13
Power grip	Without power grip		With power grip
Measuring range (Stroke)	0 to 977 mm (600 mm) 0 to 38 in (24 in)		
Resolution	0.0001/0.001/0.01/0.1 mm (selectable) 0.000001/0.00001/0.0001/0.001 in (selectable) (43+L) μ m, L = Measuring length (inch) (1.1 + 0.6L/600) μ m, L = Measuring length (mm)		
Accuracy	Indication accuracy*1	Plane: 0.4 μ m (2 σ), Hole: 0.9 μ m (2 σ)	
	Repeatability*1		
	Perpendicularity (forward and backward)*2	5 μ m	
	Straightness (forward and backward)*2	4 μ m	
Driving method (speed)	Motor-driven (5, 10, 15, 20, 25, 30, 40 mm/s: 7 steps)/Manual		
Scale unit	Photoelectric incremental encoder STVC-20Z		
Measuring force	1 N (automatic constant-force function)		
Main unit moving mode	Full-floating (moving)/Semi-floating (measuring) Air bearing (built-in compressor)		
Display unit	8.4 inch touch-screen, LCD		
Adjustment of display unit	Stepless tilt adjustment: 0 to 40° Stepless swivel adjustment: -30 to 180°		
Preventive maintenance	Scale status notification, calibration schedule notification		
Probe diameter compensation	Semi-automatic compensation using the probe diameter calibration block (standard accessory) Compensation by inputting the probe diameter		
Power source	AC adapter 120V, 60 Hz/Battery (NiMH)		
Battery operation time*3	Battery powered (standard): 1-4 hours*4, powered by 2 batteries: 2-8 hours		
Battery charging time*5	Approx. 3.5 hours (can be used while charging)		
Dimensions (WxDxH)	238x492x996 mm		
Mass	26.1 kg		26.6 kg
Operating temperature/humidity ranges	5 to 40° C/20 to 80% RH (non-condensing)		
Data output	Digimatic D1/D2/S1 (bi-directional communication), RS232 (DB9)		

• Use in an environment that is as close as possible to 20° C, and subject to minimal temperature change over time.

*1: Indication accuracy and repeatability represent the values obtained when the standard ϕ 5 stepped probe is used.

*2: Guaranteed when using the Lever Head (519-521), Mu-Checker (519-562A) SPC cable (936937), and probe mounting adapter (932361).

*3: Battery life depends on duty cycle.

*4: One battery pack (12AAF712) is provided as standard.

*5: When ambient temperature is 30° C or higher, the battery may not charge sufficiently.

LH Communication-Tool V1.0 software for creating inspection reports and configuring system settings

You can easily create and save inspection reports and configure device parameters.

* Available at Mitutoyo website for free download.

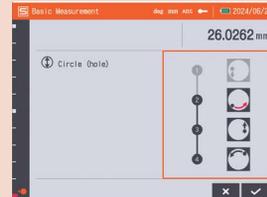
* To connect to a PC, use a USB cable (type A-B).



Adjustable to easy-to-see angle



Measurement guidance



Intuitive operation thanks to guidance.



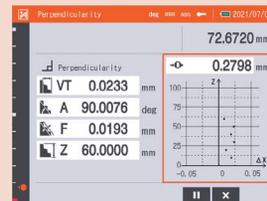
Home screen

Measurement menu display is easy to understand visually. The guidance makes it easy for first-time users to operate the system.



2D measurement - Pre-placement:

This function allows the user to register the hole position of the workpiece before measurement.



Perpendicular/straightness measurement - Graph creation:

You can check the measurement results of perpendicularity and straightness in real time during measurement (using optional indicator and indicator holder).



Part program measurement:

You can easily create, execute, edit, and even display the results of part programs.

Height Gage

DIMENSIONS

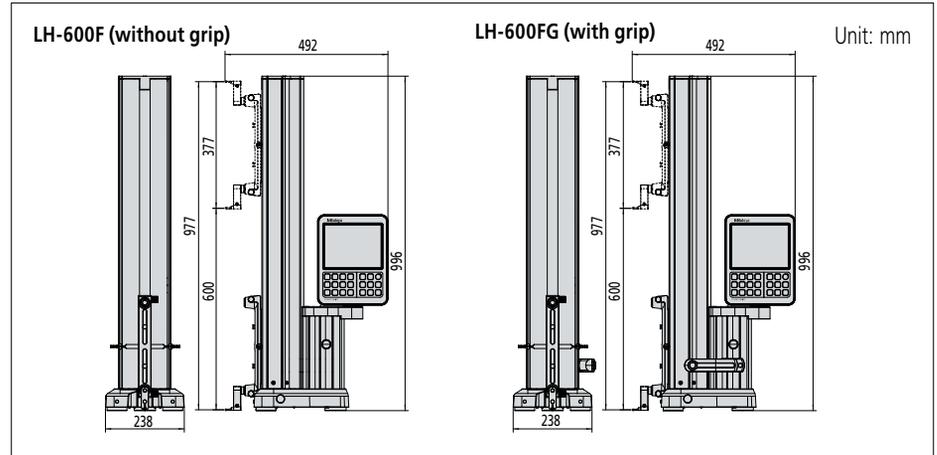
Optional products for outputting measurement data

Order No.	Product name
543-700B	Digimatic indicator (ID-C0512NXXB)
543-701B	Digimatic indicator (ID-C0512MNXB)
543-702B	Digimatic indicator (ID-C0512ENXB)
519-521	Lever head probe MLH-521
519-562A	Digital Mu Checker
936937	Digimatic cable (1 m)
965014	Digimatic cable (2 m)
264-505A	Digimatic mini processor (DP-1VA)
264-020	Input tool (IT-020U)
06AGQ001F	Input tool (USB-ITN-SF)
06AGL011	Bidirectional Digimatic S1 cable, Flat and straight (1 m)
06AGL021	Bidirectional Digimatic S1 cable, Flat and straight (2 m)
12AAJ088	Foot switch
02AZD810D	U-WAVE-R
02AZD730G	U-WAVE-T (IP67 type)
02AZD880G	U-WAVE-T (Buzzer type)
12AAY486	U-WAVE T mounting bracket
02AZG011	Bidirectional Digimatic S1 cable for U-WAVE-T (160 mm)
264-626	U-WAVE-TMB (IP67 type)
264-627	U-WAVE-TMB (Buzzer type)
12AAY482	Receipt printer (for North America)*1
12AAN052	Printer paper for receipt printer (set of 10)
12AAY485	Printer mounting attachment
12AAN146	Connection cable for printer (USB memory device)*2
12BAF812	USB cable (type A - type B) (2 m)

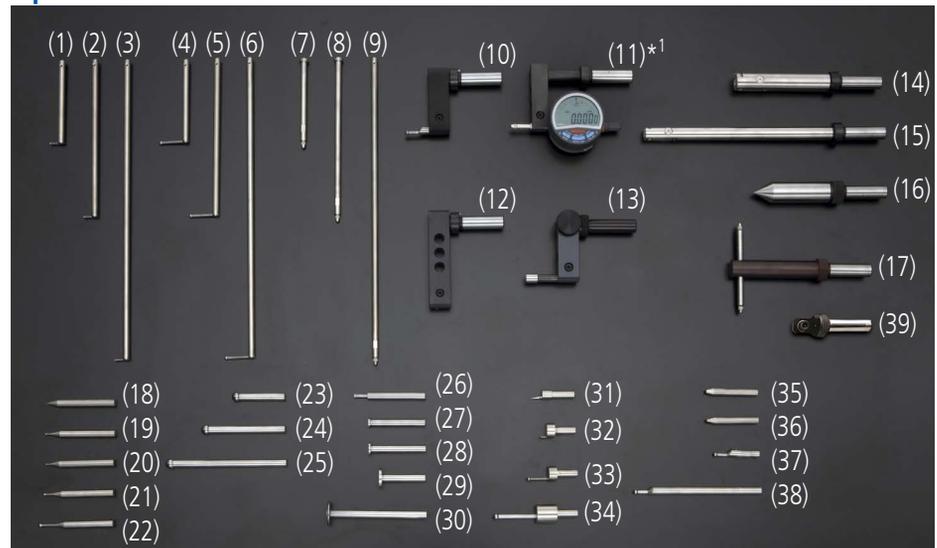
*1 A small printer (optionally battery-powered) that can be mounted on the main unit.

It includes a printer cable and mounting bracket.

*2 USB memory devices should be formatted with FAT16/32. NTFS and exFAT are not supported.



Optional Accessories



No.	Order No.	Item
(1)	12AAY602*	Depth stylus 70 ø2 ball
(2)	12AAY603*	Depth stylus 150 ø2 ball
(3)	12AAY604*	Depth stylus 300 ø2 ball
(4)	12AAY605*	Depth stylus 70 ø4 ball
(5)	12AAY606*	Depth stylus 150 ø4 ball
(6)	12AAY607*	Depth stylus 300 ø4 ball
(7)	12AAY599*	Depth stylus 70
(8)	12AAY600*	Depth stylus 150
(9)	12AAY601*	Depth stylus 300
(10)	12AAY343	ø5 stepped probe (standard accessory)
(11)	12AAA792	Dial indicator holder (mm type)*1
	12AAA837	Dial indicator holder (inch type)*1
(12)	12AAA793	Probe extension holder
(13)	12AAB136	ø10 mm cylindrical probe
(14)	12AAY595	Extension holder 100
(15)	12AAY596	Extension holder 200
(16)	12AAC073	Tapered probe (ø20)
(17)	12AAC072	Depth probe
(18)	12AAF666	ø1 mm ball probe (coaxial type)
(19)	957261	ø2 mm ball probe (coaxial type)

No.	Order No.	Item
(20)	12AAF667	ø2 mm ball probe (coaxial type) Ruby ball
(21)	957262	ø3 mm ball probe (coaxial type)
(22)	957263	ø4 mm ball probe (coaxial type)
(23)	12AAB552	ø10 mm ball probe (coaxial type)
(24)	12AAF668	ø10 mm ball probe (coaxial type) L: 82 mm
(25)	12AAF669	ø10 mm ball probe (coaxial type) L: 120 mm
(26)	12AAF670	ø5 mm disk probe
(27)	12AAF671	ø10 mm disk probe
(28)	957264	ø14 mm disk probe
(29)	957265	ø20 mm disk probe
(30)	12AAY598	ø25 disk stylus
(31)	12AAF672	ø1 mm ball offset probe
(32)	12AAF673	ø2 ball stylus (eccentric type)
(33)	12AAA788	ø4 mm ball offset probe
(34)	12AAA789	ø6 mm ball offset probe
(35)	226118	M3 CMM stylus adapter
(36)	226117	M2 CMM stylus adapter
(37)	05HAA394	ø5 ball stylus*2
(38)	12AAY597	ø5 ball stylus L130
(39)	932361	Mounting adapter for 519-521
	K650986	Small Styli Kit
	12AAF712	Additional battery pack
	12AAA879	Acrylic Demo Block

* Probe Extension Holder needed.

*1 A indicator is not included.

*2 The stylus is attached to ø5 stepped probe (12AAY343) and provided as standard.

Note 1: A gage block may be required for zero-setting depending on the probe and contact point.

Note 2: Refer to the 2341 catalog for more details.



Find a Distributor

Height Gage

QM-Height SERIES 518 — High-performance Height Gage

- This highly precise height gage is useful not only in height measurements but also in a wide range of applications such as measurement of steps, inside and outside diameters, and runouts.
- Easy-to-view, simple control panel enables most measurements to be made with a single keystroke. SPC (Digimatic) and RS-232C data output allow easy data management with a PC.
- Pneumatic floating models, which feature an air-suspension mechanism, can move smoothly on a surface plate (accuracy cannot be guaranteed for measurement while the unit is air-suspended).
- It features a long continuous operating time of approximately 1,200 hours with four AA alkaline batteries.
(Four commercially available NiMH/HR6 rechargeable batteries can also be used.)



SPECIFICATIONS

Order No.	Inch / Metric	64PKA094C	64PKA095C	64PKA129C	64PKA130C
Measuring range (stroke)		0 - 18 in (14 in) 0 to 465 mm (350 mm)	0 - 28 in (24 in) 0 to 715 mm (600 mm)	0 - 18 in (14 in) 0 to 465 mm (350 mm)	0 - 28 in (24 in) 0 to 715 mm (600 mm)
Resolution	Inch / Metric	0.001/0.005 mm 0.00005/0.0001/0.0002 in (Selectable)			
Accuracy	Indication accuracy*1	$\pm (2.4 + 2.1L/600) \mu\text{m}$			
	Repeatability*1	$2 \sigma \leq 1.8 \mu\text{m}$			
Perpendicularity*2		7 μm	12 μm	7 μm	12 μm
Guiding method		Roller bearing			
Drive method		Manual (wheel)			
Measurement principle		Electromagnetic induction absolute encoder			
Measuring force		1.5 \pm 0.5 N			
Data output ports		Digimatic / USB*3			
Air-floating system		Not included		Included (for positioning only)	
Power source		Alkaline AA / LR6 batteries x 4 (standard accessories) / AC adapter*4 / supports NiMH (HR6) rechargeable batteries x 4			
Battery life guidelines*5		Approx. 1,200 hours (without using the air-floating system)			
		Approx. 90 hours (when using the air-floating system)			
Mass		25 kg	29 kg	26 kg	30 kg
Dimensions (WxDxH)		Stroke 350 mm type: 280x273x784 mm Stroke 600 mm type: 280x273x1016 mm			
Operating temperature (recommended)		0 to 40° C (10 to 30° C)			
Operating humidity		20 to 80% RH (non-condensing)			
Storage temperature		-10 to 50° C			
Storage humidity		5 to 90% RH (non-condensing)			
Order No.	Base Model	518-241	518-243	518-245	518-247

• Standard Accessories: **05HZA148** ϕ 5 mm stepped probe, **12AAA715** probe diameter calibration block, alkaline batteries x 4 (AA/LR6) (For operational checks)

*1 Indication accuracy and repeatability represent the values obtained when the standard ϕ 5 stepped probe is used.

*2 Indicates the value obtained from the measurement of a straight surface placed perpendicular to the the base reference surface using the Lever Head (**519-521**), Mu-checker (**519-562A**) and probe mounting adapter (**932361**).

*3 Requires special communication driver.

These can be downloaded from the Mitutoyo web site. <https://www.mitutoyo.co.jp/eng/contact/products/usb/index.html>

*4 The AC adapter cannot be used to recharge rechargeable batteries.

*5 Battery life depends on the operating conditions.

MeasurLink¹ ENABLED
Data Management Software by Mitutoyo

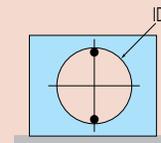


Measurement example

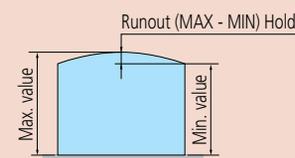
- Height measurement



- ID measurement



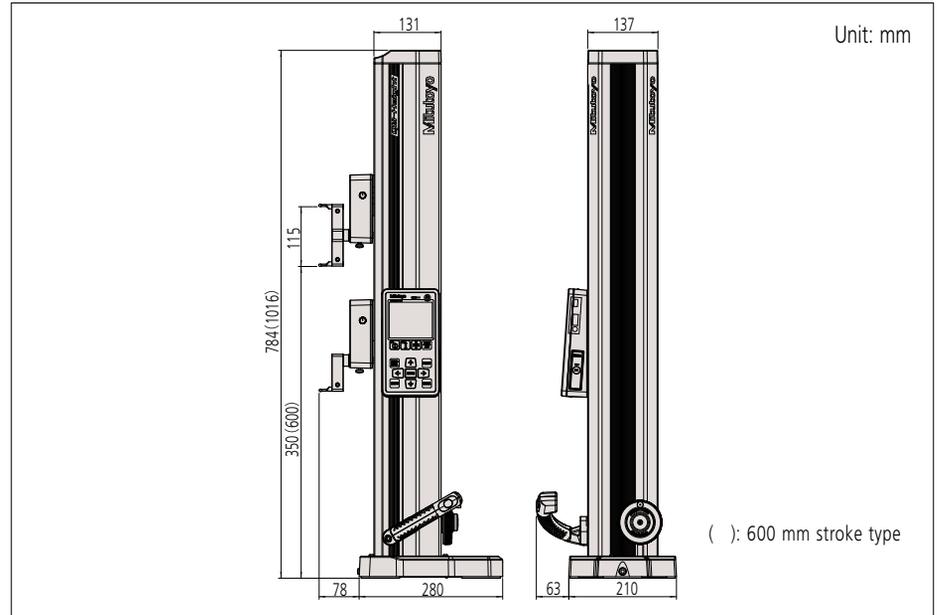
- Runout measurement



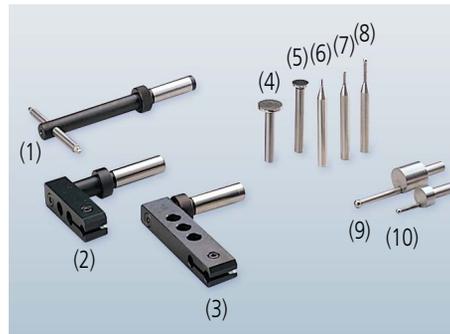
Got Questions?

Height Gage

DIMENSIONS



Optional Accessories



Optional accessories that enable centralized data management

Order No.	Item name
	Small printer equipped with Data Logger
264-505A	DP-1VA LOGGER
936937	Digimatic connection cable (1 m)
965014	Digimatic connection cable (2 m)
06AFZ050	USB cable (A-microB)
	Measurement Data Input Unit
06AFM380D	USB Input Tool Direct USB-ITN-D
	Measurement data wireless communication system
02AZD730G	U-WAVE-T (Transmission unit) (IP67 type)
02AZD880G	U-WAVE-T (Transmission unit) (Buzzer type)
02AZD790D	U-WAVE-T dedicated cable (Standard use)
02AZE140D	U-WAVE-T dedicated cable (For foot switch)
02AZD810D	U-WAVE-R
02AZE990	U-WAVE mounting bracket
	Measurement data collection software for Excel USB-IT PAK V2.1/V3.0
	Measurement data network system MeasurLink®

Contact points for a wide range of measurements

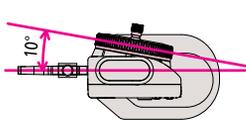
Item	Order No.	Description
		Depth probe
(1)	12AAC072	Depth probe
		Special holder
(2)	12AAA792	Holder for dial indicator
(3)	12AAA793	Holder (Long)
		Interchangeable contact points for ø5 mm stepped probe
(4)	957265	ø20 mm disk
(5)	957264	ø14 mm disk
(6)	957261	ø2 mm ball (coaxial type)
(7)	957262	ø3 mm ball (coaxial type)
(8)	957263	ø4 mm ball (coaxial type)
(9)	12AAA789	ø6 mm ball (eccentric type)
(10)	12AAA788	ø4 mm ball (eccentric type)
		AC Adapter
	06AGZ369JA	AC Adapter/U.S.
		Other
	05HZA173	Scriber*

* Used for measurements, cannot be used for scribing.
Note: A gage block may be required for zero-setting depending on the probe or contact point to be used.

Height Gage

Digimatic Height Gage SERIES 192 — Multi-function Type with SPC Data Output

- Long reach scriber type.
- Double-column structure ensures stable measurements.
- Ergonomic base fits comfortably in the hand.
- Inclined handle improves slider ergonomics.
- Coarse and Fine feed.
- 2 Preset reference heights.
- Bidirectional touch probe (optional) for more repeatable measurements.
- Provided with a long scriber (6 in / 150 mm).
- With SPC output.



192-670-10

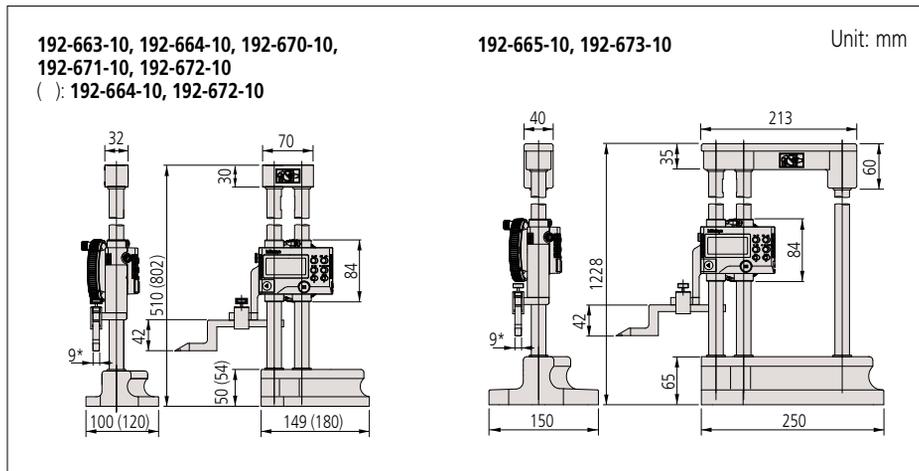
SPECIFICATIONS

Inch / Metric		Order No.	Range (in)	Resolution	Accuracy* (in)	Response speed (mm/s)	Height (mm)	Mass (kg)
		192-670-10	0 - 12	0.01 mm/0.005 mm (selectable)	±0.001	Approx. 500	510	5.7
		192-671-10	0 - 18	0.0005 in/0.0002 in (selectable)	±0.0015		649	7.5
		192-672-10	0 - 24	0.0005 in/0.0002 in (selectable)	±0.0015		802	8.3
		192-673-10	0 - 40	0.0005 in/0.0002 in (selectable)	±0.0025		1228	15.7

Metric		Order No.	Range (mm)	Resolution (mm)	Accuracy* (mm)	Response speed (mm/s)	Height (mm)	Mass (kg)
		192-663-10	0 - 300	0.01/0.005 (selectable)	±0.02	Approx. 500	510	5.7
		192-664-10	0 - 600		±0.04		802	8.3
		192-665-10	0 - 1000		±0.06		1228	15.7

- Power source: SR44 battery (1 pc.), **938882** included as standard (for operational checks)
- Battery life: Approx. 3,500 hours in continuous use
- * E_{MPE} (ISO 13325:2012). Largest value across the measuring range.

DIMENSIONS



*0.25 in for Inch models.

Functions (refer to page D-54)

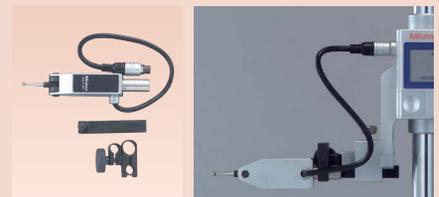
Standard Accessories

Order No.	Description	Models
905200	Scriber	192-663-10 192-664-10 192-665-10
905201	Scriber	192-670-10 192-671-10 192-672-10 192-673-10
05GZA033	Scriber clamp box	192-663-10 192-664-10 192-665-10
901385	Scriber clamp box	192-670-10 192-671-10 192-672-10 192-673-10

Optional Accessories

Order No.	Type	Description
264-020	—	USB Input Tool Series USB Keyboard Signal Conversion Type IT-020U
905338	F	Connection cable for IT/DP/MIG (1 m)
905409	F	Connection cable for IT/DP/MIG (2 m)
06AFM380F	F	USB Input Tool Direct (2 m)
02AZD730G	IP67	U-WAVE-T
02AZD880G	Buzzer	U-WAVE-T
02AZE200	—	U-WAVE-T mounting bracket
02AZD790F	F	Connection cable for U-WAVE-T (160 mm)
02AZE140F	F	Connection cable for U-WAVE-T for foot switch

- **Bidirectional touch-trigger probe:**
192-008 (inch), **192-007** (mm)
Improves accuracy in step, internal thickness, and outside width measurement by minimizing reproducibility error. A bidirectional touch-trigger probe is available as an optional accessory for **192-663-10, 192-664-10, 192-665-10, 192-670-10, 192-671-10, 192-672-10** and **192-673-10**.



Height Gage

Digimatic Height Gage SERIES 192 — Multi-function Type with SPC Data Output

Functions

- Origin-setting (ABS measurement mode): Any arbitrary value can be stored as the origin point.
- Zero-setting (INC measurement mode): Displayed value can be set to zero at any arbitrary position of the slider.
- Origin restoration: Previously set origin is restored when switching back to ABS mode.
- Presetting (ABS INC measurement mode): Displayed value can be set to any arbitrary value, including negative values.
- Measuring direction: Measuring direction can be switched at the press of a button.
- Data hold: Display value can be held. Reverts to ABS or INC mode when cancelled.
- Alarm: Error message is displayed when overflow or overspeed of displayed value arises and measurement is stopped.
- Data output: Allows integration into statistical process control and measurement systems (refer to Section A).
- Fine and coarse height adjustment through knob and wheel combination. Slider height adjustment wheel allows fine and coarse height adjustment.
- Probe-tip diameter compensation: An adjustment is applied to the raw measurement data to compensate for the effect of the size of the spherical contact point used by the bidirectional touch-trigger probe.
- Presetting (2 positions): With two preset functions, two reference heights can be used relative to a surface plate.

Standard Accessories

Order No.	Description	Models
07GZA000	Scriber	192-613-10
		192-614-10
		192-615-10
		192-630-10
900258	Scriber	192-630-10
		192-631-10
		192-632-10
		192-633-10
05GZA033	Scriber clamp box	192-613-10
		192-614-10
		192-615-10
		192-630-10
901385	Scriber clamp box	192-631-10
		192-632-10
		192-633-10
		192-630-10

Optional Accessories

Order No.	Type	Description
264-020	—	USB Input Tool Series USB Keyboard Signal Conversion Type IT-020U
905338	F	Connection cable for IT/DP/MIG (1 m)
905409	F	Connection cable for IT/DP/MIG (2 m)
06AFM380F	F	USB Input Tool Direct (2 m)
02AZD730G	IP67	U-WAVE-T
02AZD880G	Buzzer	U-WAVE-T
02AZE990	—	U-WAVE-T mounting bracket
02AZD790F	F	Connection cable for U-WAVE-T (160 mm)
02AZE140F	F	Connection cable for U-WAVE-T For foot switch

- Long reach scriber type.
- Double-column structure ensures stable measurements.
- Ergonomic base fits comfortably in the hand.
- Cannot be used with bidirectional touch-trigger probe.
- Inclined handle improves slider ergonomics.
- Coarse and Fine feed.
- 2 Preset reference heights.
- Bidirectional touch probe (optional) for more repeatable measurements.
- With SPC output.



192-630-10

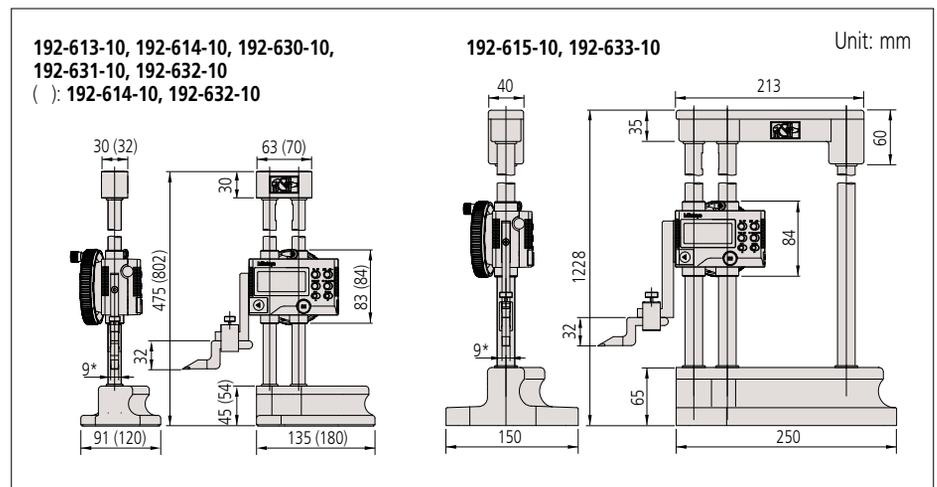
SPECIFICATIONS

Inch / Metric		Order No.	Range (in)	Resolution	Accuracy* (in)	Response speed (mm/s)	Height (mm)	Mass (kg)
		192-630-10	0 - 12	0.01 mm/0.005 mm	±0.001	Approx. 500	475	4.7
		192-631-10	0 - 18	(selectable)	±0.002		649	7.5
		192-632-10	0 - 24	0.0005 in/0.0002 in	±0.002		802	8.3
		192-633-10	0 - 40	(selectable)	±0.003		1228	15.7

Metric		Order No.	Range (mm)	Resolution (mm)	Accuracy* (mm)	Response speed (mm/s)	Height (mm)	Mass (kg)
		192-613-10	0 - 300	0.01/0.005 (selectable)	±0.02	Approx. 500	475	4.7
		192-614-10	0 - 600		±0.05		802	8.3
		192-615-10	0 - 1000		±0.07		1228	15.7

- Power source: SR44 battery (1 pc.), **938882** included as standard (for operational checks)
- Battery life: Approx. 3,500 hours in continuous use
- * E_{MPE} (ISO 13325:2012). Largest value across the measuring range.

DIMENSIONS



*0.25 in for Inch models.

Height Gage

ABSOLUTE Digimatic Height Gage SERIES 570 — with Ergonomic Base

- New standard model which features a prismatic column and offers excellent rigidity and accuracy.
- Allows smooth elevation by the slider adjustment wheel.
- **U-WAVE-T/TC/TCB** (wireless data transmitter) can be installed on the back of the display unit.



570-412



Equipped with **U-WAVE-T/TC/TCB**

Note: When attaching the **U-WAVE**, use commercially available double-sided tape, etc.

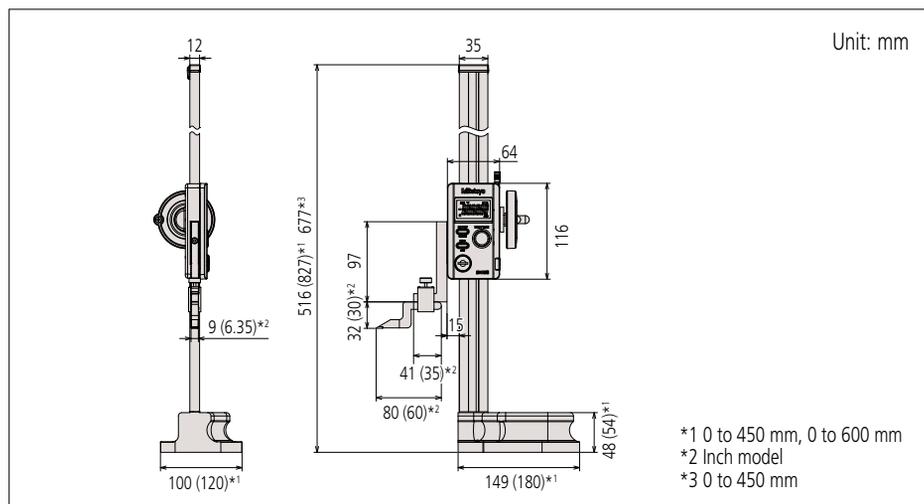
SPECIFICATIONS

Inch / Metric					
Order No.	Range	Resolution	Accuracy*	Response speed	Mass (kg)
570-412	0 to 12 in/0 to 300 mm	0.0005 in/ 0.01 mm	±0.0015 in/±0.03 mm	Unlimited	4.6
570-413	0 to 18 in/0 to 450 mm				5.9
570-414	0 to 24 in/0 to 600 mm				6.4

Metric						
Order No.	Range (mm)	Resolution (mm)	Accuracy* (mm)	Response speed	Mass (kg)	
570-402	0 - 300	0.01	±0.03	Unlimited	4.6	
570-404	0 - 600				±0.05	6.4

- Power source: SR44 battery (1 pc.), **938882** included as standard (for operational checks)
- Battery life: Approx. 5 years
- * E_{MPE} (ISO 13325:2012). Largest value across the measuring range.

DIMENSIONS



Measurement example



Functions

- **Origin-setting:**
Any convenient reference surface, such as a surface plate, etc., can be stored as the ABSOLUTE origin point.
- **ABSOLUTE measurement:**
After power is turned ON, measurement can be started without zero-setting if origin-setting was previously performed. ABSOLUTE origin position can be changed by ORIGIN button.
- **Incremental measurement:** Allows origin setting at any arbitrary position. In this case, the origin point is not stored after turning off the power.
- **Data hold**
Display value can be held.
- **Data output:**
Allows integration into statistical process control and measurement systems (refer to Section A).
- **Low-voltage alert:**
Low-voltage alert: If the battery voltage becomes low, a "B" appears in the display to alert the user before measurement is no longer possible so that the battery can be changed in good time.

Standard Accessories

Order No.	Description	Models
07ZA000	Scriber	570-402
		570-404
900258	Scriber	570-412
		570-413
		570-414
05GZA033	Scriber clamp box	570-402
		570-404
901385	Scriber clamp box	570-412
		570-413
		570-414

Optional Accessories

Order No.	Type	Description
264-020	—	USB Input Tool Series
		USB Keyboard Signal Conversion Type IT-020U
905338	F	Connection cable for IT/DP/MIG (1 m)
905409	F	Connection cable for IT/DP/MIG (2 m)
06AFM380F	F	USB Input Tool Direct (2 m)
02AZD730G	IP67	U-WAVE-T
02AZD880G	Buzzer	U-WAVE-T
02AZD790F	F	Connection cable for U-WAVE-T (160 mm)
264-620	IP67	U-WAVE-TC
264-621	Buzzer	U-WAVE-TC
264-624	IP67	U-WAVE-TCB
264-625	Buzzer	U-WAVE-TCB
902053	—	Clamp (with dovetail groove)*
953638	—	Holding bar*

* For mounting test indicators, etc. (refer to Section F for details.)

Functions

- Zero-setting
- +/- directional measurement
- Data hold
- Data output
- Presetting
- Inch/mm reading (inch/mm models)
- Preset value memory
- Origin restoration
- Low battery voltage alert
- Counting value composition error alert

Standard Accessories

Order No.	Description	Models
900173	Scriber	570-227 570-244
905200	Scriber	570-230 570-248
901338	Scriber clamp box	570-227 570-244
05GZA033	Scriber clamp box	570-230 570-248

Optional Accessories

Order No.	Type	Description
264-020	—	USB Input Tool Series USB Keyboard Signal Conversion Type IT-020U
905338	F	Connection cable (1 m)
905409	F	Connection cable (2 m)
06AFM380F	F	USB Input Tool Direct (2 m)
02AZD730G	IP67	U-WAVE-T
02AZD880G	Buzzer	U-WAVE-T
02AZE200	—	U-WAVE-T mounting bracket
02AZD790F	F	Connection cable for U-WAVE-T (160 mm)
02AZE140F	F	Connection cable for U-WAVE-T For foot switch

ABSOLUTE Digimatic Height Gage SERIES 570 — Standard Model

- Simple design is easy to use.
- Scriber is provided as a standard accessory.
- When a dial indicator or dial test indicator is used with 570-244 and 570-227 the holding bar 953639 (overall length 2 inch) is recommended.



SPECIFICATIONS

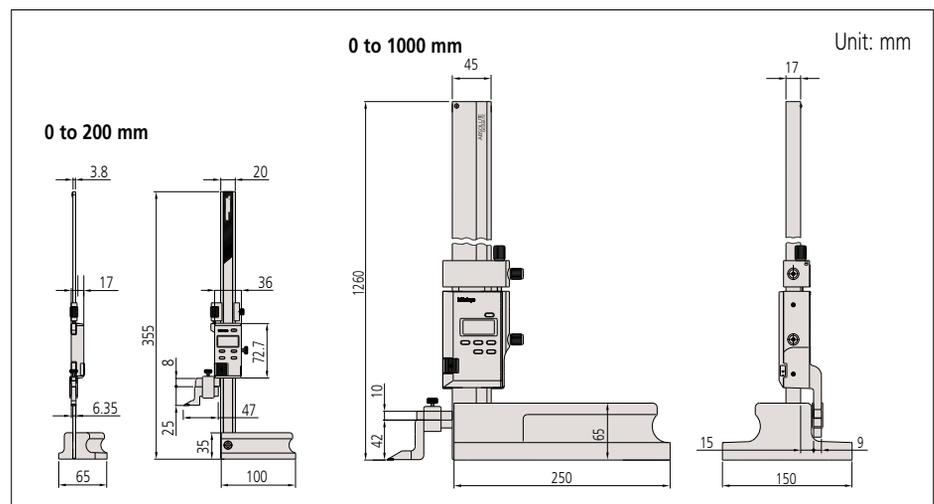
Inch / Metric						
Order No.	Range (in)	Resolution	Fine feed (in)	Accuracy* (in)	Height (mm)	Mass (kg)
570-244	0 - 8	0.0005 in/0.01 mm	0.16	±0.002	355	1.4
570-248	0 - 40		0.24	±0.003	1260	16.8

Metric						
Order No.	Range (mm)	Resolution (mm)	Fine feed (mm)	Accuracy* (mm)	Height (mm)	Mass (kg)
570-227	0 - 200	0.01	4	±0.03	355	1.4
570-230	0 - 1000		6	±0.07	1260	16.8

- Power source: SR44 battery (1 pc.), 938882 included as standard (for operational checks)
- Battery life: Approx. 5,000 hours under normal use

* EMPE (ISO 13325:2012). Largest value across the measuring range.

DIMENSIONS



Talk to Sales

Height Gage

Vernier Height Gage

SERIES 514, 506 — Standard Height Gage with Adjustable Main Scale

- Standard Vernier height gage. Fits comfortably in the hand and moves easily on the surface plate.
- Scriber is provided as a standard accessory.
- When installing a dial indicator or dial test indicator on **506-207**, ensure that the overall system can keep a good weight balance to ensure reliable measurement.
- The main scale slides and clamps within the column for quick and convenient zero-setting. (only for the **514** Series)



Standard Accessories

Order No.	Description	Models
900173	Scriber	506-207 506-208
07GZA000	Scriber	514-102 514-103 514-104 514-105 514-106 514-107
905200	Scriber	514-108 514-109
06AGR304	Scriber clamp box	506-207 506-208
05GZA033	Scriber clamp box	514-102 514-103 514-104 514-105 514-106 514-107 514-108 514-109

SPECIFICATIONS

Inch / Metric									
Order No.	Range (in)	Minimum reading	Scale adjustment (in)	Fine feed (in)	Accuracy* (in)	Height (mm)	Mass (kg)		
506-208	0 - 8	0.001 in/0.02 mm	—	0.16	±0.001	341	1.4		
514-103	0 - 12		0.6			0.27	±0.002	525	3.1
514-105	0 - 18			1340	20			675	3.4
514-107	0 - 24							870	7.4
514-109	0 - 40		1	0.24	±0.003	1340	20		

Metric									
Order No.	Range (mm)	Minimum reading (mm)	Scale adjustment (mm)	Fine feed (mm)	Accuracy* (mm)	Height (mm)	Mass (kg)		
506-207	0 - 200	0.02	—	4	±0.03	341	1.4		
514-102	0 - 300		15			7	±0.05	525	3.1
514-104	0 - 450			1340	20			675	3.4
514-106	0 - 600							870	7.4
514-108	0 - 1000		25	6	±0.07	1340	20		

• Reading magnifier (optional): **514-102, 104, 106: 07GZA003, 514-108: 07GZA015**

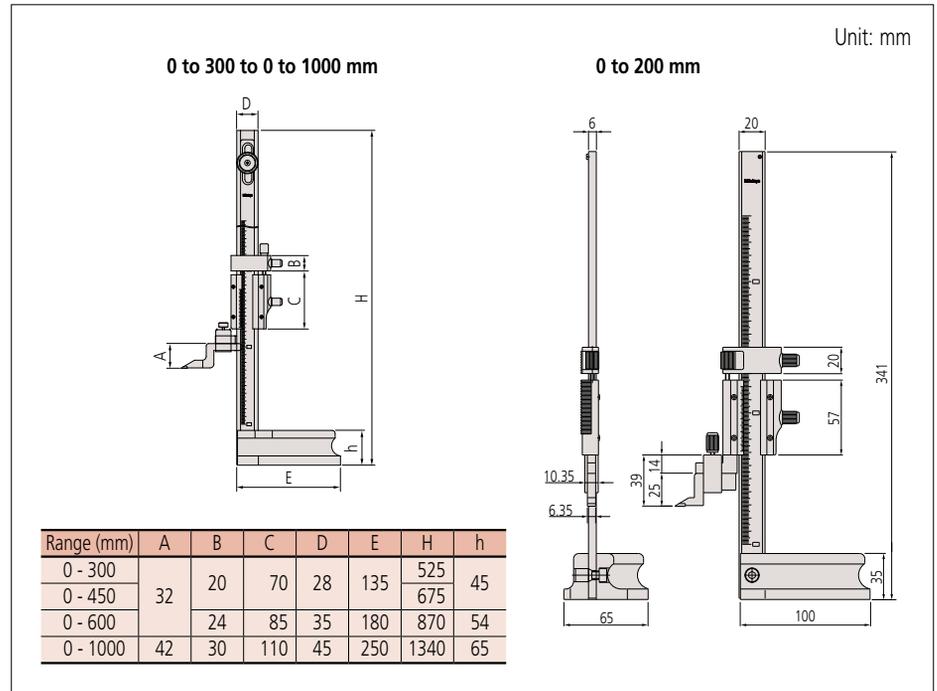
* E_{MPE} (ISO 13325:2012). Largest value across the measuring range.



Where to Buy

Height Gage

DIMENSIONS



D

Height Gage

Dial Height Gage SERIES 192 — with Mechanical Counter

- Easy and error-free reading with both up and down digital counters as well as a dial.
- The counters and dial can be re-zeroed at any scriber position.
- Provided with a feed wheel for easy coarse feeding.
- Carbide-tipped scriber is provided.



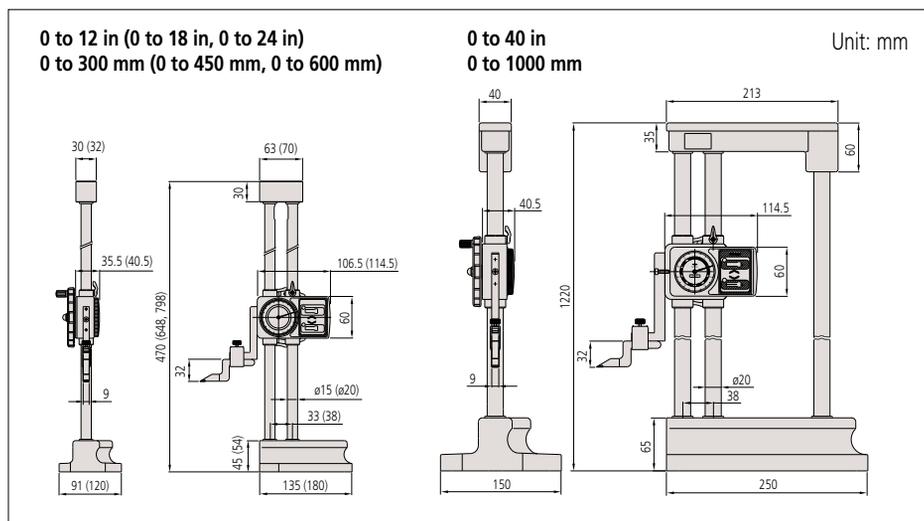
SPECIFICATIONS

Inch					
Order No.	Range (in)	Graduation (in)	Accuracy* (in)	Height (mm)	Mass (kg)
192-150	0 - 12	0.001	±0.0015	470	4.2
192-151	0 - 18		±0.002	648	9.2
192-152	0 - 24			798	9.8
192-153	0 - 40		±0.003	1220	17.0

Metric					
Order No.	Range (mm)	Graduation (mm)	Accuracy* (mm)	Height (mm)	Mass (kg)
192-130	0 - 300	0.01	±0.03	470	4.2
192-131	0 - 450		±0.05	648	9.2
192-132	0 - 600			798	9.8
192-133	0 - 1000		±0.07	1220	17.0

* E_{MPE} (ISO 13325:2012). Largest value across the measuring range.

DIMENSIONS



Standard Accessories

Order No.	Description	Models
07ZA000	Scriber	192-130 192-131 192-132 192-133
900258	Scriber	192-150 192-151 192-152 192-153
05GZA300	Scriber clamp box	192-130 192-131 192-132 192-133
901385	Scriber clamp box	192-150 192-151 192-152 192-153



Get a Quote

Height Gage

Height Gage Optional Accessories for Height Gages

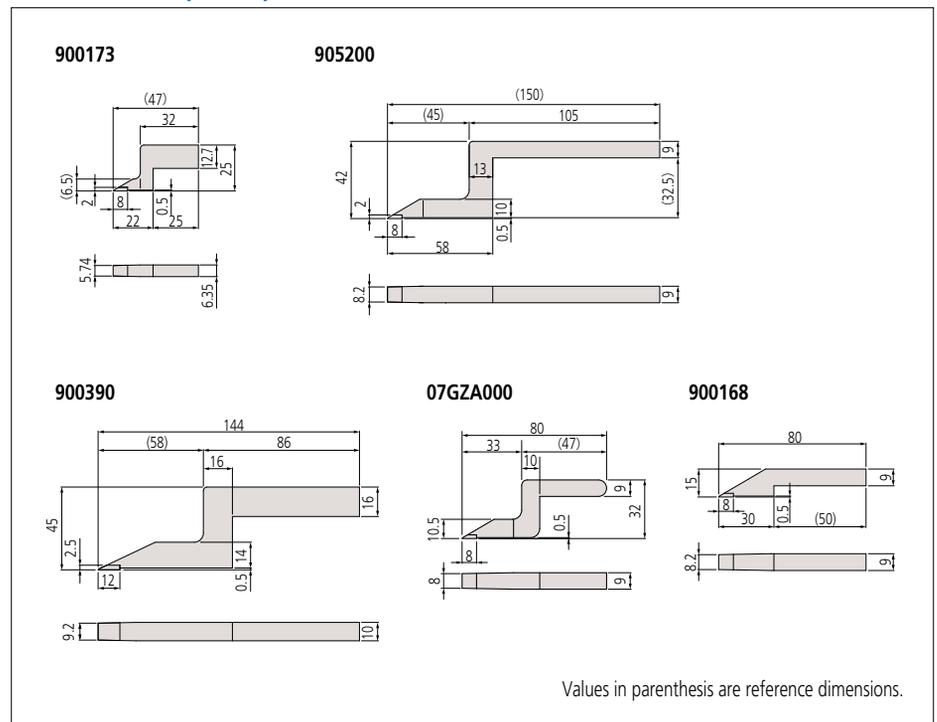
SPECIFICATIONS (Scriber)

Inch	
Order No.	Applicable Height Gages
900173	570 Series Digimatic Height Gages (570-227, 570-244)
	506 Series Vernier Height Gages (506-201/207/204, 506-208)
900258	192 Series Digimatic Height Gages (192-630-10, 192-631-10, 192-632-10, 192-633-10)
	570 Series Digimatic Height Gages (570-412, 570-413, 570-414)
905201	574 Series Heightmatic (574-212-1, 574-211-1, 574-210-1)
	192 Series Digimatic Height Gages (192-670-10, 192-671-10, 192-672-10, 192-673-10)
	570 Series Digimatic Height Gage (570-248)

Metric	
Order No.	Applicable Height Gages
07GZA000	192 Series Digimatic Height Gages (192-613-10, 192-614-10, 192-615-10)
	570 Series Digimatic Height Gages (570-302, 570-304)
	192 Series Dial Height Gages (192-130, 192-131, 192-132, 192-133)
	514 Series Vernier Height Gages (514-102, 514-104, 514-106, 514-103, 514-105, 514-107)
	570 Series Digimatic Height Gages (570-402/404)
900168	514 Series Vernier Height Gages (514-160/172)
905200	192 Series Digimatic Height Gages (192-663-10, 192-664-10, 192-665-10)
	570 Series Digimatic Height Gage (570-230)
900390	514 Series Vernier Height Gages (514-108, 514-109)
	514 Series Vernier Height Gage (514-170)

DIMENSIONS (Scriber)

Unit: mm



Height Gage

Height Gage Optional Accessories for Height Gages

Dial Test Indicators

- For information about the attachment of dial test indicators, refer to Section F.

Contact Sensor



900872

- This is a convenient sensor to be attached to both the workpiece*¹ and the height gage*², giving a lamp display when the scriber touches the workpiece.
- *1 Conductive workpieces only.
- *2 Attach to a conductive part.
- Magnet is incorporated.
- Battery (PR44, 2 pcs. required) is not included.
- Use it on a precision black granite surface plate (refer to Section A).

Center Probe



900581 (inch) 951144 (metric)

- Allows quick measurement of center-to-center distance between holes.
- Measurable hole diameters: 1 to 38 mm
- Mounting bar section: .25 x .5 in (Inch), 9x9 mm (metric)

Depth Gage Attachment



900878 (Inch) 900764 (metric)

- Attaches to a height gage for measuring groove and hole depth.
- Minimum hole diameter: 5.5 mm
- Maximum distance from the bottom of the holding bar to the contact point: 80 mm (metric type), 2.95 in (inch type)
- Dial indicator contact points are usable (refer to Section F).
- Mounting bar section: .25 x .5 in (inch) 9x9 mm (metric)
- Holding bar length: 4 in / 100 mm



Need Support?

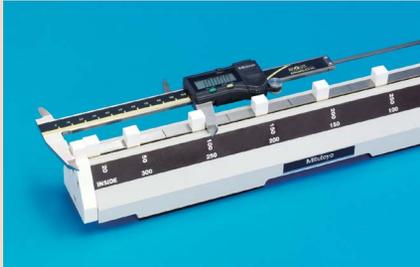


Height Gage

Benefits of CERA (Zirconia Ceramic) Gage Blocks*

- Extremely high wear resistance, 3x better than carbide.
- Corrosion proof – no oil needed.
- Closest expansion coefficient to steel.
- Anti-magnetic – keeps away steel dust.
- Crack and burr resistant.
- Low thermal conductivity – excellent dimensional stability under brief temperature changes (from handling, etc.)

Typical applications



Checking accuracy of caliper (outside measurement)



Checking accuracy of caliper (inside measurement)



Checking accuracy of height gage

CERA Caliper Checker SERIES 515

- Permanently wrung, high grade CERA gage blocks in a protective metal casing.
- Can also stand perpendicular to a surface for height gage inspection.
- Designed to inspect calipers.



SPECIFICATIONS

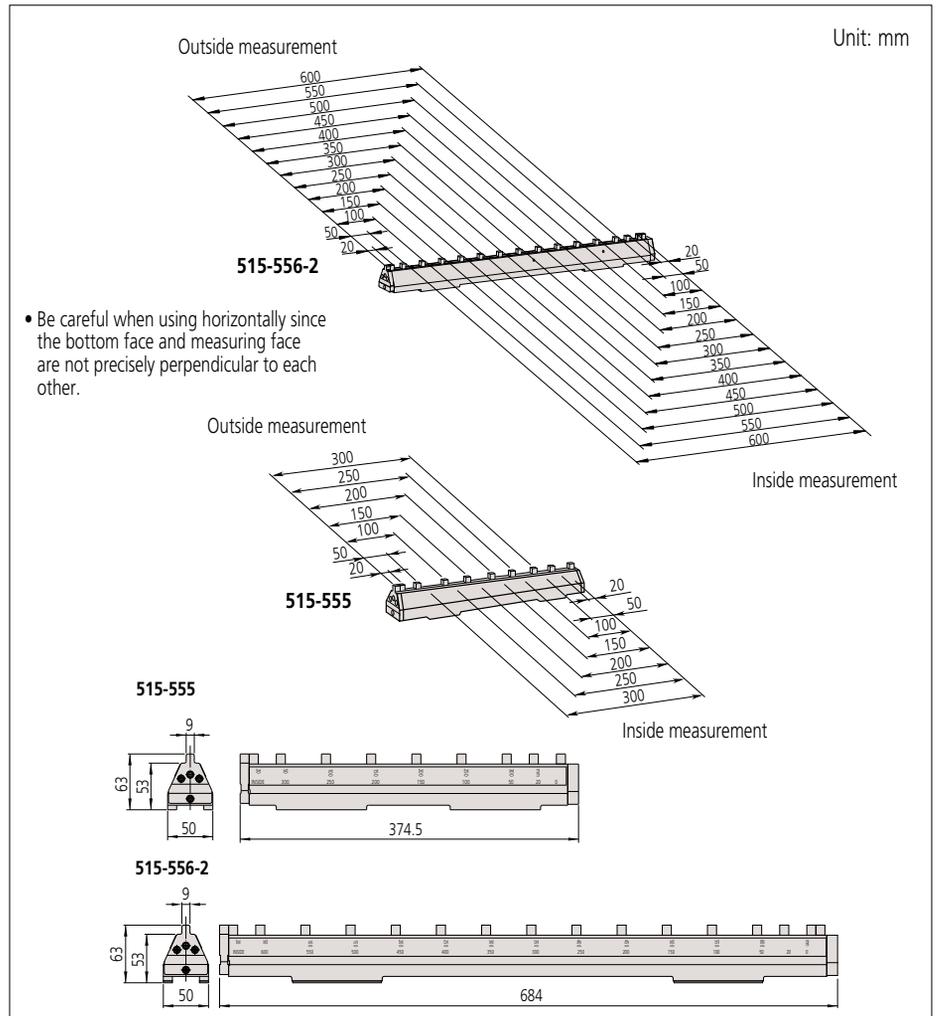
Inch						
Order No.	Range (in)	Block pitch accuracy*		Parallelism of blocks*		Mass (kg)
		1 - 12 in		1 - 12 in		
515-565	0 - 12	±0.0002 in		0.00008 in		4

Metric						
Order No.	Range (mm)	Block pitch accuracy*		Parallelism of blocks*		Mass (kg)
		20 - 300 mm	350 - 600 mm	20 - 300 mm	350 - 600 mm	
515-555	0 - 300	±5.0 μm	—	2.0 μm	—	4
515-556-2	0 - 600		±7.0 μm	—	4.0 μm	8.5

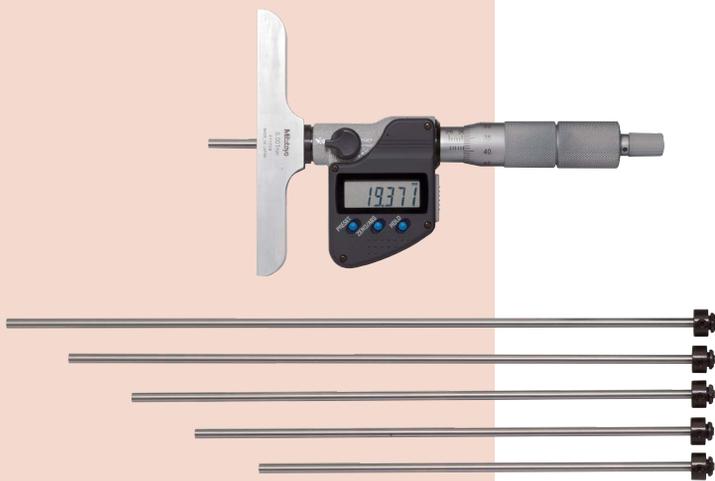
* The block accuracy and the parallelism of blocks are based on the following:

- Outside caliper and height gage: Lower end reference plane
- Inside caliper: Inside reference plane

DIMENSIONS



Featured Products



Depth Micrometer 329 Series Digimatic Depth Micrometer with Interchangeable Rods

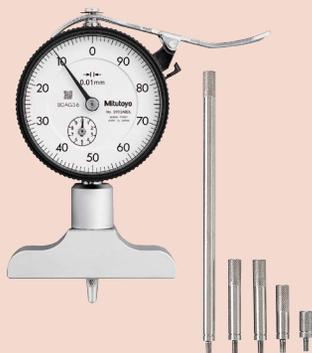
Refer to page D-65 for details.



ABSOLUTE Digimatic Depth Gage

571 Series Coolant Proof, Long Travel

Refer to page L-69 for details.



Dial Depth Gage

7000 Series with Interchangeable Rods and Contact Points

Refer to page L-81 for details.

D

Depth Gages

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Depth Micrometer

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MeasurLink® ENABLED

Data Management Software by Mitutoyo

Measurement Data Network System

MeasurLink® is a measurement data management system based on databases (SQL Server). You can build a network to manage the measurement results and measuring instruments simply by combining the required functions.

MeasurLink® is a registered trademark of Mitutoyo Corporation in Japan and Mitutoyo America Corporation in the United States.

U-WAVE^{fit}

Measurement Data Wireless Communication System

Bluetooth® communication enables wireless transfer of measurement data from Digimatic micrometers and callipers to PCs, smartphones, tablets and such other devices.

IP67

IP Codes

The code indicates the degree of protection against the ingress of foreign materials and water as defined in the IEC standard (IEC 60529). The number indicates the protection level. (Refer to page 3)



Dust- and Water-Protected

www.tuv.com
ID: 100000001

TÜV Rheinland Certification Marks

All products with the marks have passed the IP test carried out by the German accreditation organization, TÜV Rheinland.



Measuring Instruments Shipped with Inspection Certificate

Mitutoyo guarantees product quality as a leading precision measuring instrument manufacturer and ships measuring instruments with an inspection certificate that includes inspection data so that customers can use them with confidence.

ABSOLUTE™

ABSOLUTE Linear Encoder

Mitutoyo developed the unique ABSOLUTE method to retain position information after the power is turned off. The origin is set once - thereafter the live position is displayed when the power is turned on.

Depth Gage

Depth Micrometer SERIES 329, 129 — Interchangeable Rod Type

- Interchangeable rods provide a wide measuring range.
- Data output function (329 Series) allows integration into statistical process control and measurement systems (refer to section A).



SPECIFICATIONS

Inch / Metric		Order No.	Range (in)	Resolution	Base (in)	Accuracy	Base Flatness (in)	Rod Flatness (in)	Parallelism between reference face and measuring rod face (in)	Zero point error of rods (in)	No. of rods
Digimatic (LCD)											
		329-350-30	0 - 6	0.00005 in/ 0.001 mm	4x0.63	0.00015 in/ 3 μm	0.00008	0.000012	0.00035	±0.0002	6
		329-351-30	0 - 12	0.0001 in/ 0.001 mm					0.0005	±0.0003	12

Metric		Order No.	Range (mm)	Resolution (mm)	Base (mm)	Accuracy	Base Flatness (μm)	Rod Flatness (μm)	Parallelism between reference face and measuring rod face (μm)	Zero point error of rods (μm)	No. of rods
Digimatic (LCD)											
		329-250-30	0 - 150	0.001	101.6x16	3	2	0.3	7	±4	6
		329-251-30	0 - 300						10	±6	12

Inch		Order No.	Range (in)	Graduation (in)	Base (in)	Accuracy	Base Flatness (in)	Rod Flatness (in)	Parallelism between reference face and measuring rod face (in)	Zero point error of rods (in)	No. of rods
Analog											
		129-129	0 - 2	0.001	4x0.63	0.00015	0.00008	0.000012	0.00025	±0.00015	2
		129-126	0 - 3		2.5x0.63		0.00005				
		129-130			4x0.63		0.00008				
		129-127	0 - 4		2.5x0.63		0.00005				4
		129-131			4x0.63		0.00008				
		129-128	0 - 6		2.5x0.63		0.00005				6
		129-132			4x0.63		0.00008				
		129-149	0 - 12		2.5x0.63		0.00005				12
		129-150			4x0.63		0.00008				
		129-331*	0 - 4		2.4x0.63		0.00005				4
		129-332*	0 - 6								

* Half Base models

Metric		Order No.	Range (mm)	Graduation (mm)	Base (mm)	Accuracy	Base Flatness (μm)	Rod Flatness (μm)	Parallelism between reference face and measuring rod face (μm)	Zero point error of rods (μm)	No. of rods
Analog											
		129-154	0 - 25	0.01	63.5x16	3	1.3	0.3	5	±3	1
		129-155			101.6x16		2				
		129-109	0 - 50		63.5x16		1.3				2
		129-113			101.6x16		2				
		129-110	0 - 75		63.5x16		1.3				3
		129-114			101.6x16		2				
		129-111	0 - 100		63.5x16		1.3				4
		129-115			101.6x16		2				
		129-112	0 - 150		63.5x16		1.3				6
		129-116			101.6x16		2				
		129-152	0 - 300		63.5x16		1.3				12
		129-153			101.6x16		2				

- Power source: SR44 battery (1 pc.), **938882** included as standard (for operational checks)
- Battery life*: Approx. 2.4 years under normal use
- Standard Accessories: **301336** Spanner, **04GAA274** Spanner, **202863** Hex-Spanner

Functions of series 329

Origin point setting (ABS measurement system):

Resets the ABS origin at the current spindle position to the minimum value of the measuring range and switches to ABS mode.

Zero-setting (INC measurement system):

A brief press on the ZERO/ABS button sets display to zero at the current spindle position and switches to the incremental (INC) measuring mode. A longer press resets to the ABS measuring mode.

Hold:

Pressing the HOLD button freezes the current value in the display. This function is useful for preserving a measurement in situations of poor visibility where the instrument must be moved away from the workpiece before the reading can be recorded.

Data output:

Models equipped with this function have an output port for transferring measurement data to a Statistical Process Control (SPC) system.

Auto power ON/OFF:

The reading on the LCD disappears after this instrument is idle for about 20 minutes, but the reading and measurement mode are retained. Turning the spindle causes the reading to reappear.

Error alarm:

In case of an overflow on the LCD or a computing error, an error message appears on the LCD, and the measuring function stops. This prevents an instrument from giving an erroneous reading. Also, when the battery voltage drops to a certain level, the low-battery-voltage alarm annunciator appears well before the micrometer becomes unusable.

Function lock:

This function allows the PRESET (origin point setting) function and the ZERO (zero-setting) function to be locked to prevent these points being reset accidentally.

Optional Accessories

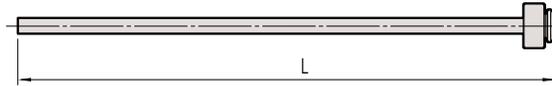
Order No.	Type	Description
264-020	—	USB Input Tool Series USB Keyboard Signal Conversion Type IT-020U
05CZA662	B	Connection cable (1 m)
05CZA663	B	Connection cable (2 m)
06AFM380B	B	USB Input Tool Direct (2 m)
02AZD730G	IP67	U-WAVE-T
02AZD880G	Buzzer	U-WAVE-T
02AZE200	—	U-WAVE-T mounting bracket
02AZD790B	B	Connection cable for U-WAVE-T (160 mm)
02AZE140B	B	Connection cable for U-WAVE-T For foot switch
264-622	IP67	U-WAVE-TM
264-623	Buzzer	U-WAVE-TM
264-626	IP67	U-WAVE-TMB
264-627	Buzzer	U-WAVE-TMB
02AZF310	IP67	Connecting unit for U-WAVE-TM

Depth Gage

Depth Micrometer SERIES 329, 129 — Interchangeable Rod Type

Interchangeable rod (Optional Accessories)

(Check and adjust the origin point before measurement)



129-127



129-131

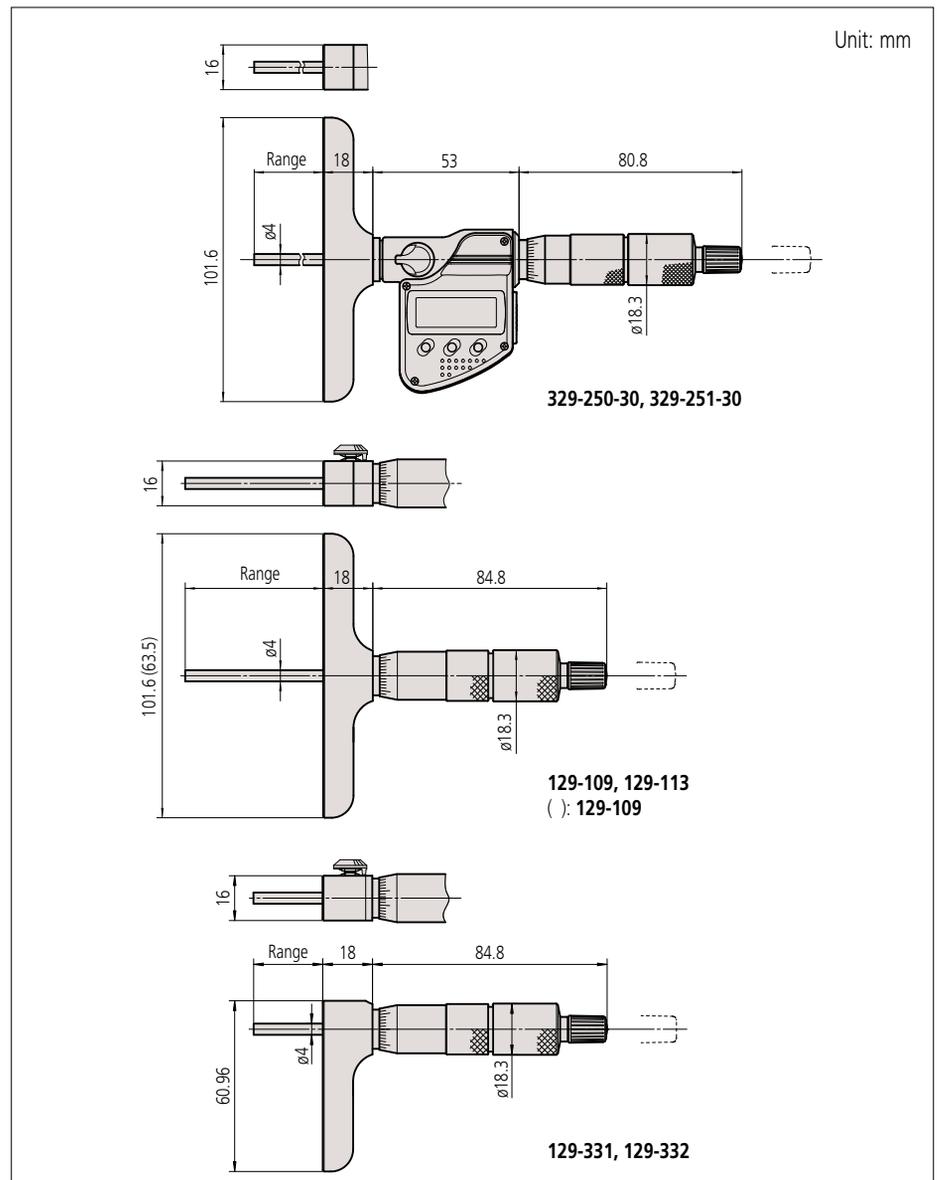


129-331

Range (in)		0 - 1	1 - 2	2 - 3	3 - 4	4 - 5	5 - 6	6 - 7	7 - 8	8 - 9	9 - 10	10 - 11	11 - 12
Analog models	Order No.	983502	983504	983506	983508	983510	983512	983526	983528	983530	983532	983534	983536
	L (mm)	104.3	129.7	155.1	180.5	205.9	231.3	256.7	282.1	307.5	332.9	358.3	383.7
Digimatic models	Order No.	983506	983508	983510	983512	983526	983528	983530	983532	983534	983536	981783	981784
	L (mm)	155.1	180.5	205.9	231.3	256.7	282.1	307.5	332.9	358.3	383.7	409.1	434.5

Range (mm)		0 - 25	25 - 50	50 - 75	75 - 100	100 - 125	125 - 150	150 - 175	175 - 200	200 - 225	225 - 250	250 - 275	275 - 300
Analog models	Order No.	983501	983503	983505	983507	983509	983511	983525	983527	983529	983531	983533	983535
	L (mm)	104	129	154	179	204	229	254	279	304	329	354	379
Digimatic models	Order No.	983505	983507	983509	983511	983525	983527	983529	983531	983533	983535	981781	981782
	L (mm)	154	179	204	229	254	279	304	329	354	379	404	429

DIMENSIONS



Depth Gage

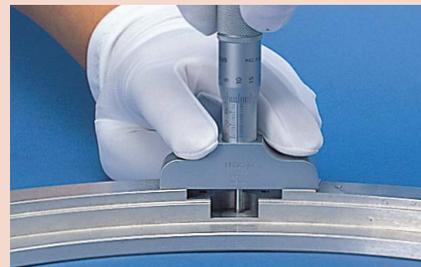
Depth Micrometer SERIES 128

- Measuring rod diameter: $\varnothing 4$ mm.
- With measuring rod clamp.
- Carbide-tipped measuring rod model is available.
- With ratchet stop for constant measuring force.

Note: The clamp is on rear surface.



Measurement example



SPECIFICATIONS

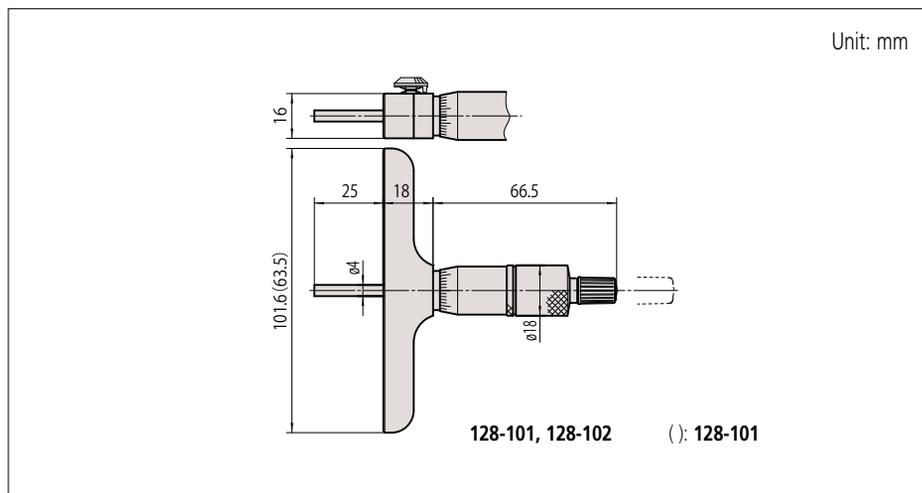
Inch							
Order No.	Range (in)	Graduation (in)	Accuracy	Base Flatness (in)	Rod Flatness (in)	Parallelism between reference face and measuring rod face (in)	Base (in)
128-105	0 - 1	0.001	± 0.00015	0.000052	0.000012	0.00025	2.5x0.63
128-106				0.00008			4x0.63

Metric							
Order No.	Range (mm)	Graduation (mm)	Accuracy	Base Flatness (μm)	Rod Flatness (μm)	Parallelism between reference face and measuring rod face (μm)	Base (mm)
128-101	0 - 25	0.01	± 3	1.3	0.3	5	63.5x16
128-103*				2			101.6x16
128-102							
128-104*							

• Standard Accessories: **301336** Spanner

* With carbide-tipped measuring rod

DIMENSIONS



Find a Distributor



Depth Gage

Measurement example



Depth Micro Checker SERIES 515

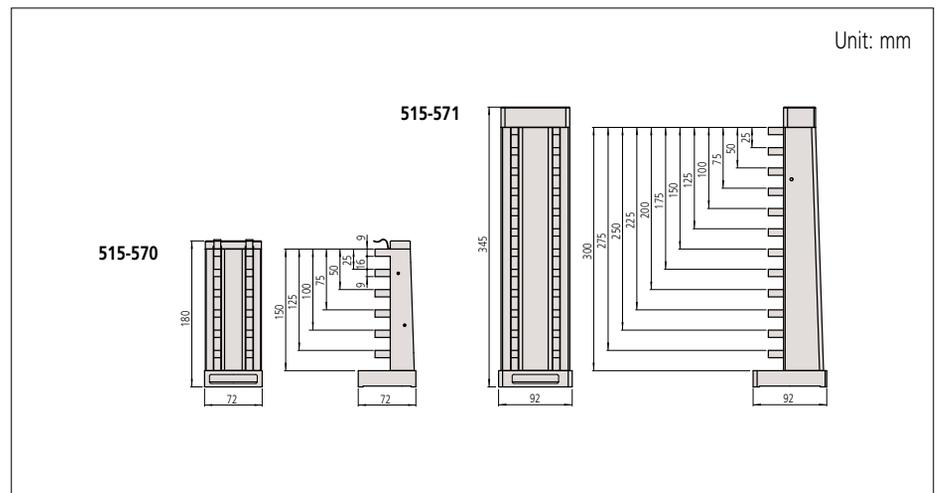
- The Depth Micro Checker is designed to efficiently check the zero point of a depth micrometer.



SPECIFICATIONS

Inch			
Order No.	Range (in)	Block pitch accuracy	Anvil block accuracy (μm)
515-575	0 - 6	$\pm(40 + L/0.15)$ μm, L = Length to check (in)	±20
Metric			
Order No.	Range (mm)	Block pitch accuracy	Anvil block accuracy (μm)
515-570	0 - 150	$\pm(1 + L/150)$ μm, L = Length to check (mm)	±0.5
515-571	0 - 300		

DIMENSIONS



Depth Gage

ABSOLUTE Digimatic Depth Gage SERIES 571

- Made of hardened stainless steel with micro-lapped base and measuring faces.
- Enables stable depth measurement with a resolution of .0005 in/0.01mm.
- Coolant proof type IP67 rated.
- Data output function allows integration into statistical process control and measurement systems (refer to catalog section A).
- Optional longer extension bases are available (refer to page D-78).



571-261-20

SPECIFICATIONS

Inch / Metric				
Order No.	Range (in)	Resolution	Base (WxT) (in)	Accuracy* (in)
571-261-20	0 - 6	0.0005 in/ 0.01mm	3.93x0.23	±0.001 in/±0.02 mm
571-262-20	0 - 8			
571-263-20	0 - 12			

Metric				
Order No.	Range (mm)	Resolution (mm)	Base (WxT) (mm)	Accuracy* (mm)
571-251-20	0 - 150	0.01	100x6	±0.02
571-252-20	0 - 200			
571-253-20	0 - 300			

- Dust/Water protection level: IP67⁺²
 - Power source: SR44 battery (1 pc.), **938882** included as standard (for operational checks)
 - Position detection method: ABSOLUTE electromagnetic inductive linear encoder
 - Battery life: Approx. 5 years
- *EMPE (ISO 13385-2:2020). Largest value across the measuring range

DIMENSIONS

Unit: mm

571-251-20, 571-252-20, 571-253-20,
571-261-20, 571-262-20, 571-263-20

Range (mm)	L	W	Base thickness
0 - 150	239	59.2	6
0 - 200	289		
0 - 300	403	71	6.3

Measurement example



Optional Accessories

Order No.	Type	Description
264-020	—	USB Input Tool Series USB Keyboard Signal Conversion Type IT-020U
05CZA624	A	Connection cable (1 m)
05CZA625	A	Connection cable (2 m)
06AFM380A	A	USB Input Tool Direct (2 m)
02AZD730G	IP67	U-WAVE-T
02AZD880G	Buzzer	U-WAVE-T
02AZE200	—	U-WAVE-T mounting bracket
02AZD790A	A	Connection cable for U-WAVE-T (160 mm)
02AZE140A	A	Connection cable for U-WAVE-T For foot switch
02AZE140C	C	Connection cable for U-WAVE-T For foot switch
264-620	IP67	U-WAVE-TC
264-621	Buzzer	U-WAVE-TC
264-624	IP67	U-WAVE-TCB
264-625	Buzzer	U-WAVE-TCB
02AZF310	IP67	Connecting unit for U-WAVE-TC/TCB
02AZF300	—	Connecting unit for U-WAVE-TC

ABSOLUTE Digimatic Depth Gage SERIES 571

- Made of hardened stainless steel with micro-lapped base and measuring faces.
- Enables stable depth measurement with a resolution of .0005 in/0.01mm.
- Optional longer extension bases are available (refer to page D-78).
- Data output function allows integration into statistical process control and measurement systems (refer to section A).



Optional Accessories

Order No.	Type	Description
264-020	—	USB Input Tool Series USB Keyboard Signal Conversion Type IT-020U
959149	C	Connection cable (1 m)
959150	C	Connection cable (2 m)
06AFM380C	C	USB Input Tool Direct (2 m)
02AZD730G	IP67	U-WAVE-T
02AZD880G	Buzzer	U-WAVE-T
02AZE200	—	U-WAVE-T mounting bracket
02AZE140A	A	Connection cable for U-WAVE-T For foot switch
02AZD790C	C	Connection cable for U-WAVE-T (160 mm)
02AZE140C	C	Connection cable for U-WAVE-T For foot switch
264-620	IP67	U-WAVE-TC
264-621	Buzzer	U-WAVE-TC*
264-624	IP67	U-WAVE-TCB
264-625	Buzzer	U-WAVE-TCB*
02AZF300	—	Connecting unit for U-WAVE-TC/TCB (for models with a range up to 300 mm/12 in)
959143	—	Data hold unit

* Cannot be used with 571-20X-10 and 571-21X-10.

SPECIFICATIONS

Inch / Metric					
Order No.	Range (in)	Resolution	Battery life	Base (WxT) (in)	Accuracy* (in)
571-211-30	0 - 6	0.0005 in/ 0.01mm	Approx. 5 years	3.93x0.23	±0.001 in/±0.02 mm
571-212-30	0 - 8			3.93x0.25	±0.0015 in/±0.03 mm
571-213-30	0 - 12		Approx. 3 years	9.8x0.39	±0.002 in/±0.05 mm
571-214-10*2	0 - 18				±0.0025 in/±0.06 mm
571-215-10*2	0 - 24	±0.0025 in/±0.07 mm			
571-216-10*2	0 - 30				
571-217-10*2	0 - 40				

Metric					
Order No.	Range (mm)	Resolution (mm)	Battery life	Base (WxT) (mm)	Accuracy* (mm)
571-201-30	0 - 150	0.01	Approx. 5 years	100x6	±0.02
571-202-30	0 - 200			100x6.3	±0.03
571-203-30	0 - 300		Approx. 3 years	250x10	±0.05
571-204-10*2	0 - 450				±0.06
571-205-10*2	0 - 600	±0.07			
571-206-10*2	0 - 750				
571-207-10*2	0 - 1000				

- Power source: SR44 battery (1 pc.), 938882 included as standard (for operational checks)
- Position detection method: Electrostatic capacity absolute sensor
- *EMPE (ISO 13385-2:2020). Largest value across the measuring range
- *1 Maximum permissible error, EMPE, is the term defined by ISO 13385-2:2011
- *2 Cannot be used with U-WAVE-TC

DIMENSIONS

Unit: mm

571-201-30, 571-202-30, 571-203-30,
571-211-30, 571-212-30, 571-213-30

Range (mm)	L	W	Base thickness
0 - 150	239	59.2	6
0 - 200	289		
0 - 300	403	71	6.3
0 - 450	635		
0 - 600	785	94	10
0 - 750	935		
0 - 1000	1200		

571-204-10, 571-205-10,
571-206-10, 571-207-10,
571-214-10, 571-215-10,
571-216-10, 571-217-10

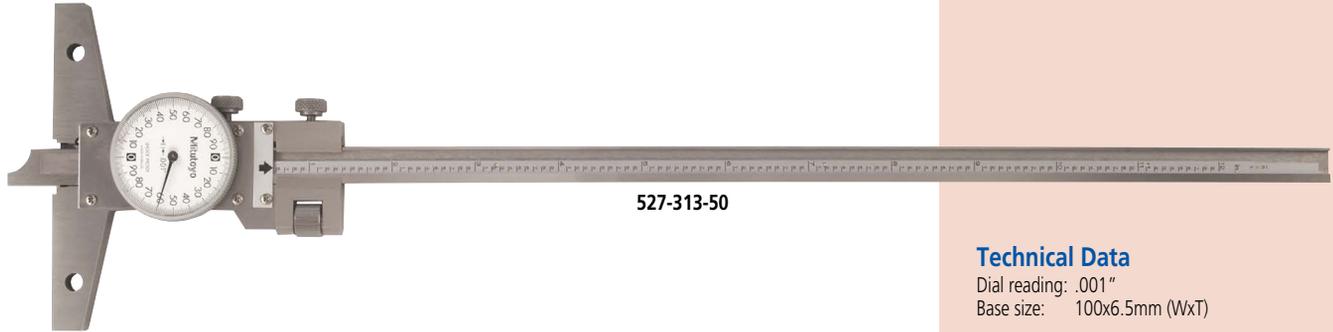


Got Questions?

Depth Gage

Dial Depth Gage SERIES 527 with Fine Adjustment

- Easier and faster reading of dial.
- Made of hardened stainless steel.
- Base and measuring faces are hardened and micro-lapped.
- Optional wider extension base are available (refer to page D-16).



527-313-50

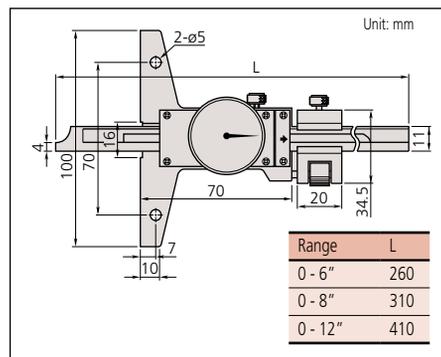
Technical Data

Dial reading: .001"
Base size: 100x6.5mm (WxT)

SPECIFICATIONS

Inch				
Range	Order No.	Dial reading	Accuracy	Mass (g)
0 - 6"	527-311-50	.001"	±.001"	280
0 - 8"	527-312-50	.001"	±.001"	300
0 - 12"	527-313-50	.001"	±.0015"	340

DIMENSIONS

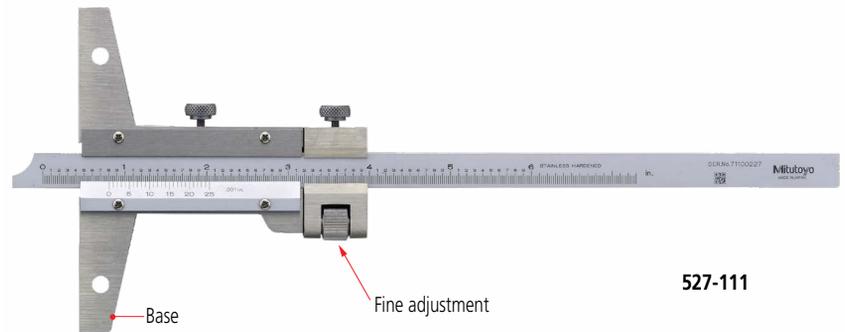
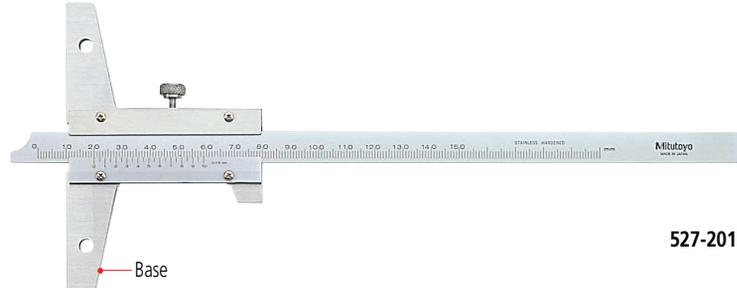


Talk to Sales

Depth Gage

Vernier Depth Gage SERIES 527

- Made of hardened stainless steel with micro-lapped base and measuring faces.
- Standard Vernier gage for depth measurement.
- Optional longer extension bases are available (refer to page D-78).



SPECIFICATIONS

Inch					
Order No.	Range (in)	Minimum reading (in)	Base (W×T) (in)	Accuracy* (in)	Remarks
527-111	0 - 6	0.001	3.93×0.25	±0.001	with fine adjustment
527-112	0 - 8			9.8×0.39	
527-113	0 - 12		±0.002		
527-114	0 - 24		±0.003		
527-115	0 - 40				

Metric					
Order No.	Range (mm)	Minimum reading (mm)	Base (W×T) (mm)	Accuracy* (mm)	Remarks
527-201	0 - 150	0.05	100×6.5	±0.05	—
527-202	0 - 200			250×10	
527-203	0 - 300		±0.10		
527-204	0 - 600		±0.15		
527-205	0 - 1000				

Metric					
Order No.	Range (mm)	Minimum reading (mm)	Base (W×T) (mm)	Accuracy* (mm)	Remarks
527-101	0 - 150	0.02	100×6.5	±0.03	with fine adjustment
527-102	0 - 200			250×10	
527-103	0 - 300		±0.05		
527-104	0 - 600		±0.07		
527-105	0 - 1000				

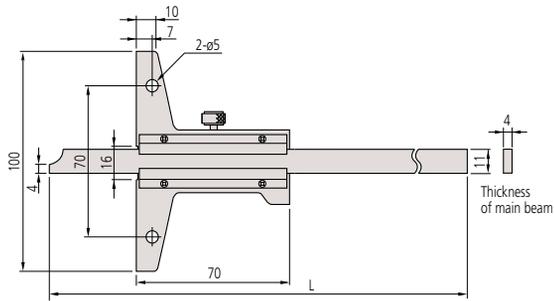
Metric					
Order No.	Range (mm)	Minimum reading (mm)	Base (W×T) (mm)	Accuracy* (mm)	Remarks
527-121	0 - 150	0.02	100×6.5	±0.03	—
527-122	0 - 200				
527-123	0 - 300				

*EMPE (ISO 13385-2:2020). Largest value across the measuring range

Depth Gage

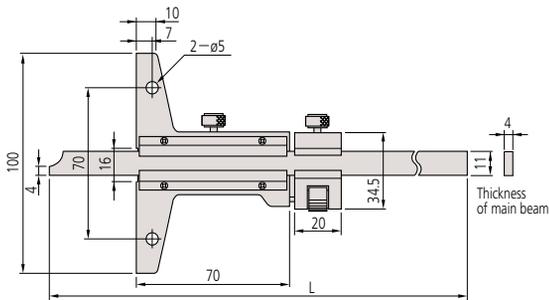
DIMENSIONS

Unit: mm



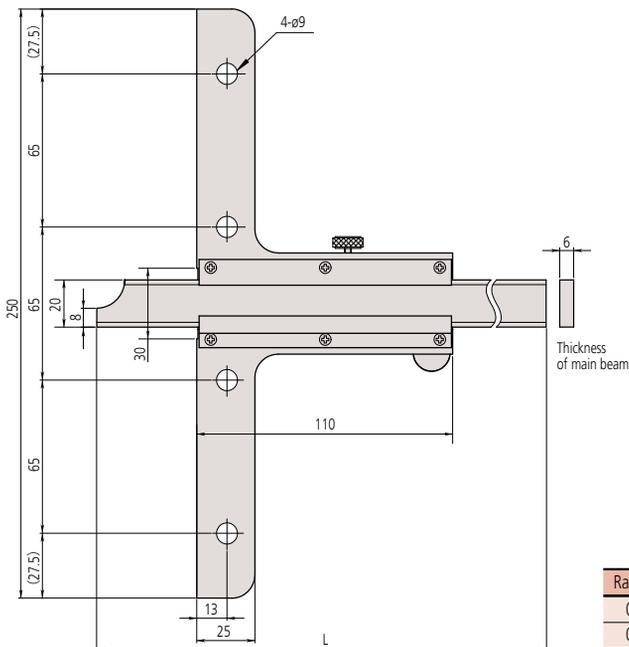
Range (mm)	L
0 - 150	260
0 - 200	310
0 - 300	410

527-201, 527-202, 527-203



Range (mm)	L
0 - 150	260
0 - 200	310
0 - 300	410

527-101, 527-102, 527-103,
527-111, 527-112, 527-113



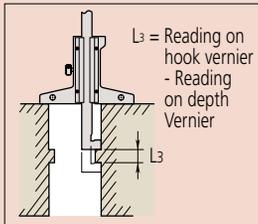
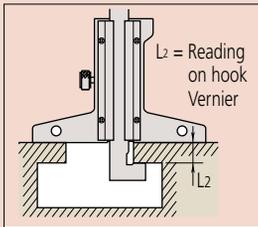
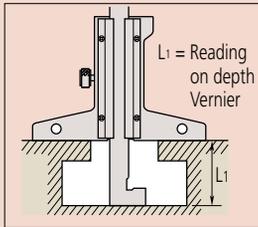
Range (mm)	L
0 - 600	800
0 - 1000	1200

527-204, 527-205, 527-104, 527-105,
527-114, 527-115



Need Repair?

Typical applications



Depth Gage SERIES 571 — Hook-end Type

- The end of the main scale is hook-shaped to allow depth and thickness measurements of a projected portion or lip in a hole, in addition to standard depth measurement.
- Made of hardened stainless steel with micro-lapped base and measuring faces.
- Direct reading of depth measurement is available due to the offset-value setting function.
- Coolant proof type IP67 rated.
- Optional longer extension bases are available (refer to page D-78).



SPECIFICATIONS

Inch / Metric		Resolution	Base (W×T) (mm)	Accuracy*
Order No.	Range: L1 (L2 and L3)			
571-264-20	0.4 in - 6.4 in (0 - 6 in)	0.0005 in/0.01 mm	100×6	±0.0015 in/±0.03 mm
571-265-20	0.4 in - 8.4 in (0 - 8 in)			

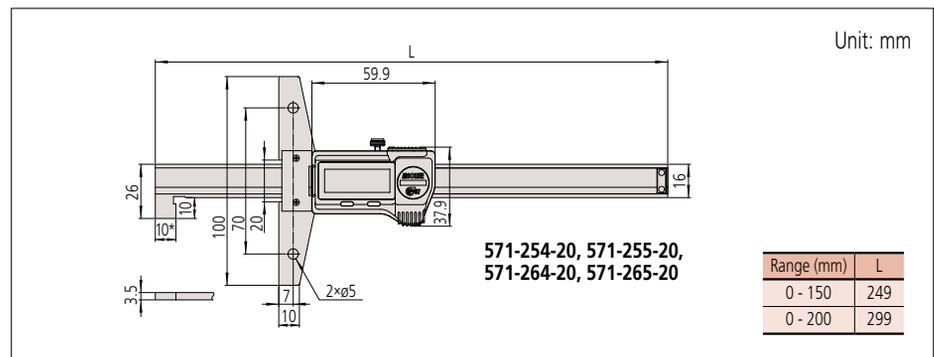
Metric		Resolution (mm)	Base (W×T) (mm)	Accuracy* (mm)
Order No.	Range (mm): L1 (L2 and L3)			
571-254-20	10.1 - 160 (0 - 150)	0.01	100×6	±0.03
571-255-20	10.1 - 210 (0 - 200)			

- Dust/Water protection level: IP67*2
 - Power source: SR44 battery (1 pc.), 938882 included as standard (for operational checks)
 - Position detection method: ABSOLUTE electromagnetic inductive linear encoder
 - Battery life: Approx. 5 years
- *EMPE (ISO 13385-2:2020). Largest value across the measuring range

Optional Accessories

Order No.	Type	Description
264-020	—	USB Input Tool Series USB Keyboard Signal Conversion Type IT-020U
05CZA624	A	Connection cable (1 m)
05CZA625	A	Connection cable (2 m)
06AFM380A	A	USB Input Tool Direct (2 m)
02AZD730G	IP67	U-WAVE-T
02AZD880G	Buzzer	U-WAVE-T
02AZE200	—	U-WAVE-T mounting bracket
02AZD790A	A	Connection cable for U-WAVE-T (160 mm)
02AZE140A	A	Connection cable for U-WAVE-T For foot switch
264-620	IP67	U-WAVE-TC
264-621	Buzzer	U-WAVE-TC
264-624	IP67	U-WAVE-TCB
264-625	Buzzer	U-WAVE-TCB
02AZF310	IP67	Connecting unit for U-WAVE-TC/TCB

DIMENSIONS

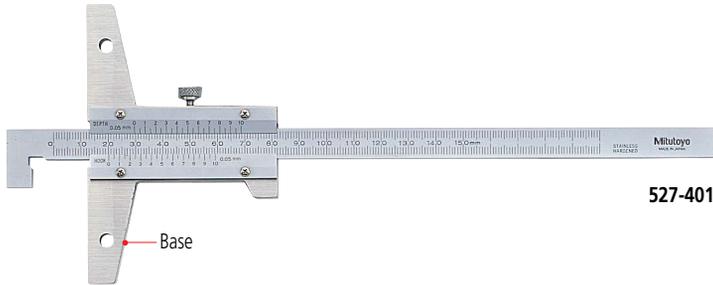


*0.4 in for Inch models.

Depth Gage

Depth Gage SERIES 527 — Hook-end Type

- The end of the main scale is hook-shaped to allow depth and thickness measurements of a projected portion or lip in a hole, in addition to standard depth measurement.
- Made of hardened stainless steel with micro-lapped base and measuring faces.
- Depth can be directly measured with the upper Vernier of the slider and thickness with the lower Vernier.
- Optional longer extension bases are available (refer to page D-16).



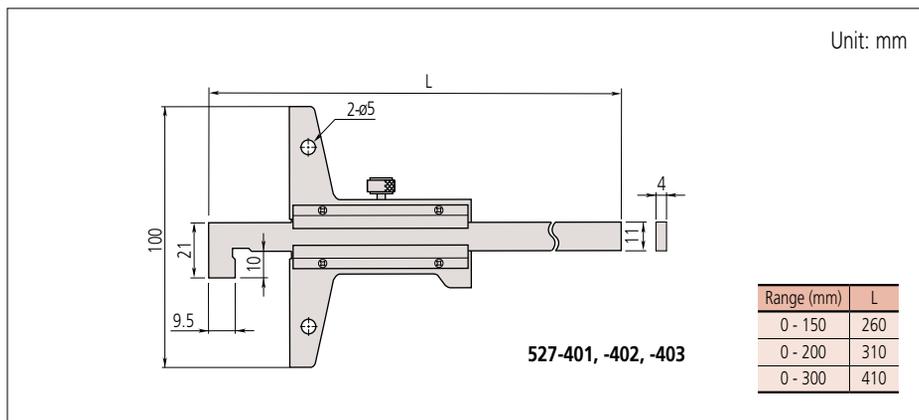
527-401

SPECIFICATIONS

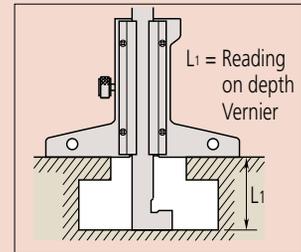
Metric				
Order No.	Range (mm): L ₁ (L ₂ and L ₃)	Resolution/Graduation (mm)	Base (W×T) (mm)	Accuracy* (mm)
527-401	10 - 150 (0 - 150)	0.05	100×6.5	±0.05
527-402	10 - 200 (0 - 200)			±0.08
527-403	10 - 300 (0 - 300)			±0.03
527-411	10 - 150 (0 - 150)	0.02		±0.03
527-412	10 - 200 (0 - 200)			±0.04
527-413	10 - 300 (0 - 300)			±0.04

*EMPE (ISO 13385-2:2020). Largest value across the measuring range

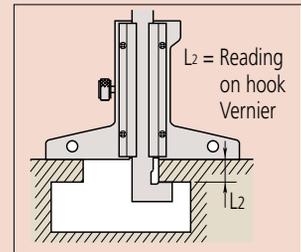
DIMENSIONS



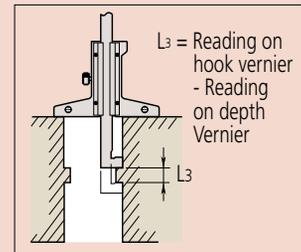
Typical applications



Vernier



Vernier



Vernier (both instances)



Where to Buy

Optional Accessories

Order No.	Type	Description
264-020	—	USB Input Tool Series USB Keyboard Signal Conversion Type IT-020U
05CZA624	A	Connection cable for IT/DP/MUX (1 m)
05CZA625	A	Connection cable for IT/DP/MUX (2 m)
06AFM380A	A	USB Input Tool Direct (2 m)
02AZD730G	IP67	U-WAVE-T
02AZD880G	Buzzer	U-WAVE-T
02AZE200	—	U-WAVE-T mounting bracket
02AZD790A	A	Connection cable for U-WAVE-T (160 mm)
02AZE140A	A	Connection cable for U-WAVE-T For foot switch
264-620	IP67	U-WAVE-TC
264-621	Buzzer	U-WAVE-TC
264-624	IP67	U-WAVE-TCB
264-625	Buzzer	U-WAVE-TCB
02AZF310	IP67	Connecting unit for U-WAVE-TC/TCB

Depth Gage SERIES 571 — Point-contact Type

- ABSOLUTE Point-type Digimatic Depth Gage is suitable for measuring inside narrow holes.
- Optional longer extension bases are available (refer to page D-78).
- Made of hardened stainless steel with micro-lapped base and measuring faces.
- Data output function allows integration into statistical process control and measurement systems (refer to catalog section A).
- Coolant proof type IP67 rated.



571-302-20

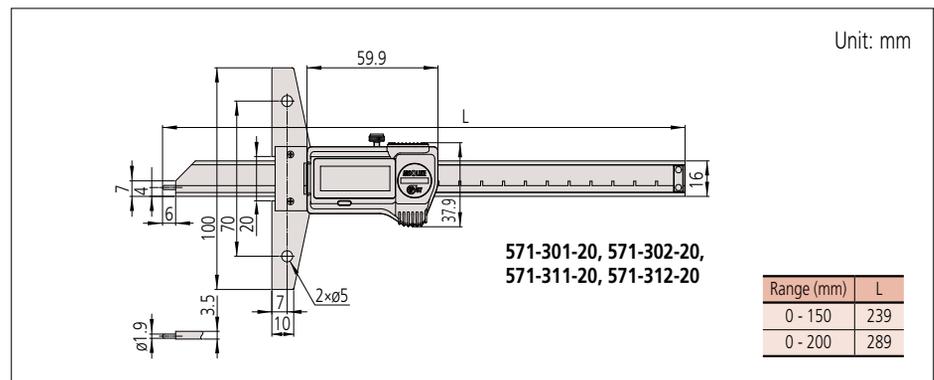
SPECIFICATIONS

Inch / Metric				
Order No.	Range	Resolution	Base (W×T) (mm)	Accuracy*
571-311-20	0 - 6 in / 0 - 150 mm	0.0005 in / 0.01 mm	100×6	±0.001 in / ±0.02 mm
571-312-20	0 - 8 in / 0 - 200 mm			

Metric				
Order No.	Range	Resolution (mm)	Base (W×T) (mm)	Accuracy* (mm)
571-301-20	0 - 150	0.01	100×6	±0.02
571-302-20	0 - 200			

- Dust/Water protection level: IP67*2
 - Power source: SR44 battery (1 pc.), 938882 included as standard (for operational checks)
 - Position detection method: ABSOLUTE electromagnetic inductive linear encoder
 - Battery life: Approx. 5 years
- *EMPE (ISO 13385-2:2020). Largest value across the measuring range

DIMENSIONS



Depth Gage

Mini Depth Gage SERIES 571

- Digital display with .0005 in / 0.01 mm resolution.
- Enables measurement of tread depth.
- Made of hardened stainless steel with micro-lapped base and measuring faces.
- ABSOLUTE Digimatic Depth Gage.
- Data output function allows integration into statistical process control and measurement systems (refer to catalog section A).
- Coolant proof type IP67 rated.



571-200-20

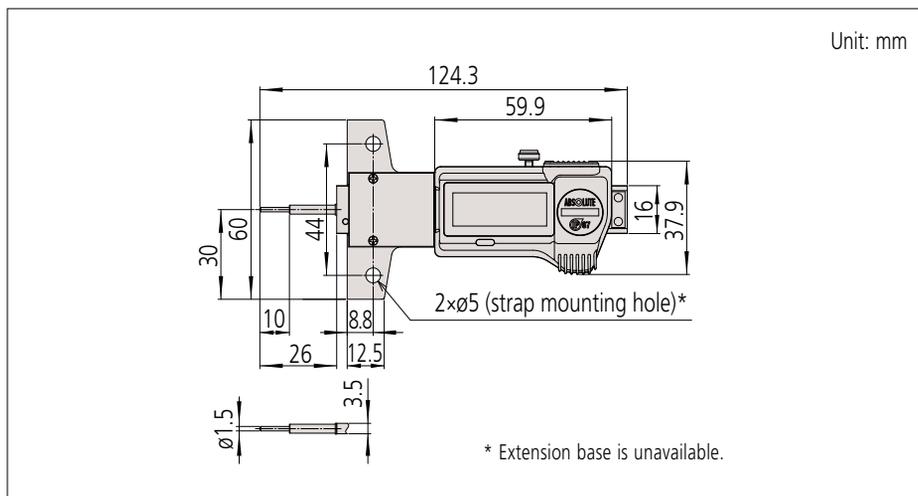
SPECIFICATIONS

Inch / Metric				
Order No.	Range (in)	Resolution (in)	Base (in)	Accuracy* (in)
571-200-20	0 - 1	0.0005	2.36	±0.001

Metric				
Order No.	Range (mm)	Resolution (mm)	Base (mm)	Accuracy* (mm)
571-100-20	0 - 25	0.01	60	±0.02

- Dust/Water protection level: IP67*2
- Power source: SR44 battery (1 pc.), **938882** included as standard (for operational checks)
- Position detection method: ABSOLUTE electromagnetic inductive linear encoder
- Battery life: Approx. 5 years under normal use.
- *EMPC (ISO 13385-2:2020). Largest value across the measuring range

DIMENSIONS



Measurement example

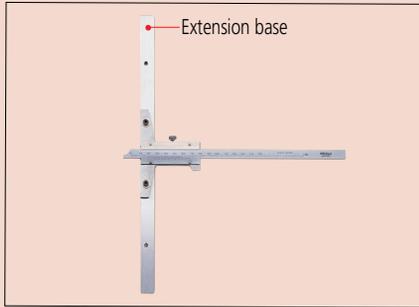


Optional Accessories

Order No.	Type	Description
264-020	—	USB Input Tool Series USB Keyboard Signal Conversion Type IT-020U
05CZA624	A	Connection cable for IT/DP/MUX (1 m)
05CZA625	A	Connection cable for IT/DP/MUX (2 m)
06AFM380A	A	USB Input Tool Direct (2 m)
02AZD730G	IP67	U-WAVE-T
02AZD880G	Buzzer	U-WAVE-T
02AZE200	—	U-WAVE-T mounting bracket
02AZD790A	A	Connection cable for U-WAVE-T (160 mm)
02AZE140A	A	Connection cable for U-WAVE-T For foot switch
264-620	IP67	U-WAVE-TC
264-621	Buzzer	U-WAVE-TC
264-624	IP67	U-WAVE-TCB
264-625	Buzzer	U-WAVE-TCB
02AZF310	IP67	Connecting unit for U-WAVE-TC/TCB

Depth Gage

Example of attaching the extension base



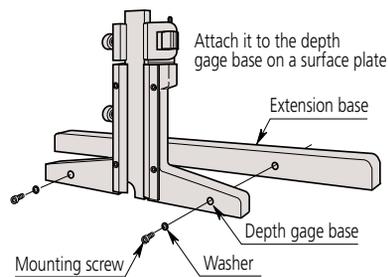
Special size / specifications

Extension bases, to size of specifications other than standard, available by special order. Please consult your nearest M³ Solution Center.

Example of special size

Measuring range of depth gage	L (mm)
12 in / 300 mm or less	400
	500
	600
18 in / 450 mm or more	400
	500
	600
	700
	800

Attaching the extension base



Extension Bases Optional Accessory for Depth Gage

- Attaches to the base (reference face) plate of a depth gage to extend its span.
- These Extension Bases can be attached to 12 in / 300 mm or less range models.
- For over 12 in / 300 mm range models, special-size extensions are available as shown on the left.

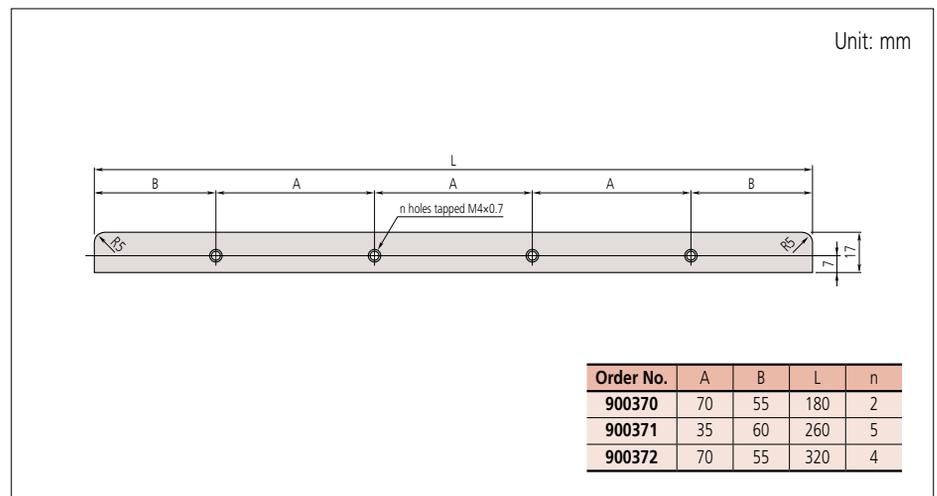


900372

SPECIFICATIONS

Inch				
Order No.	Size L (in)	Thickness (in)	Material	n
900367	7	0.3	Stainless Steel	2
900368	10			5
900369	12			4
Metric				
Order No.	Size L (mm)	Thickness (mm)	Material	n
900370	180	8	Stainless Steel	2
900371	260			5
900372	320			4

DIMENSIONS



Get a Quote

Depth Gage

Depth Gage Attachment Optional Accessory for Calipers

- Attaching this hardened depth gage attachment to the depth measurement face of the caliper makes depth measurement accurate and secure.



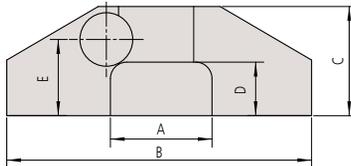
050084-10

SPECIFICATIONS

Metric		
Order No.	Size (mm)	Applicable measuring range of caliper
050083-10	3 in / 75	4 in, 6 in, 8 in, 100 mm, 150 mm, 200 mm
050084-10	4 in / 100	4 in, 6 in, 8 in, 100 mm, 150 mm, 200 mm
050085-10	5 in / 125	12 in (300 mm)

DIMENSIONS

Unit: mm



Size (mm)	A	B	C	D	E	T
3 in / 75	25	75	26.5	13	18.5	12
4 in / 100		100			20	14
5 in / 125	30	125	28.5			

T: Base thickness

Example of attaching the depth gage attachment



Need Support?

Functions

- Peak detection (MAX/MIN)
- Runout range measurement (MAX - MIN)
- Zero-setting (INC system)
- Presetting (ABS system)
- Measuring direction switching
- Tolerance judgment
- Resolution switching
(For 0.0005 mm or 0.00002 inch resolution type)
- Simple calculation: $f(x) = Ax$
- Function lock
- Calibration schedule warning
- Auto power OFF
- Data output
- Display value holding (when no external device is connected)
- 330° rotary display
- Low battery/voltage alarm display
- Error alarm display

Optional Accessories

Order No.	Type	Description
264-020	—	USB Input Tool Series
		USB Keyboard Signal Conversion
		Type IT-020U
06AGL011	SF	Connection cable (1 m)
06AGL021	SF	Connection cable (2 m)
06AGQ001F	SF	USB Input Tool Direct (2 m)
02AZG011	SF	Connection cable for U-WAVE-T (160 mm)
02AZG021	SF	Connection cable for U-WAVE-T (160 mm) For foot switch
264-622	IP67	U-WAVE-TM
264-623	Buzzer	U-WAVE-TM
02AZD810D	—	U-WAVE-R
02AZF670	—	U-WAVE-TM mounting bracket For Digimatic Indicator
264-626	IP67	U-WAVE-TMB
264-627	Buzzer	U-WAVE-TMB
02AZF700	—	Connecting unit for U-WAVE-TM/TMB (for ID-C/ID-F Series 12.7 mm/0.5 inch type only)

ABSOLUTE Digimatic Depth Gage SERIES 547

- Easy-to-read digital display effectively prevents misreading.
- An analog bar indicator on the LCD is convenient for observing subtle movements such as the approach to tolerance.
- Data output function allows integration into statistical process control and measurement systems (refer to catalog section A).



SPECIFICATIONS

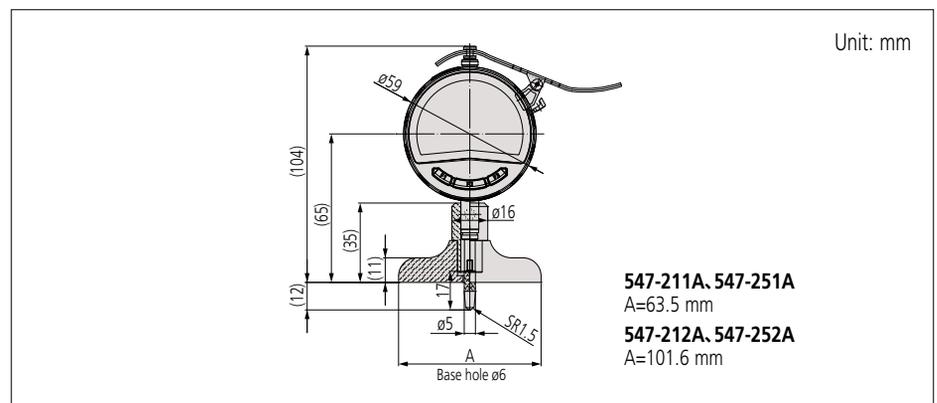
Inch / Metric		Resolution	Stroke (in)	Accuracy (in)	Measuring force (N)	Base		
Order No.	Range (in)					W (in)	T (in)	flatness (in)
547-217A	0 - 8	0.0005 in/0.01 mm	0.5	±0.001	1.5 or less	2.5	0.63	0.0002
547-218A						4		
547-257A		0.00002 in (0.00005/0.0001/0.0005 in 0.0005/0.001/0.01 mm selectable)		2.5				
547-258A				4		0.00008		

Order No.	Contact point	Extension rod	Indicator
547-217A	Provided with a carbide-tipped ball point (21JZA242)	4 pcs. (0.5 in, 1 in, 2 in, 4 in)	543-712B
547-218A			543-702B
547-257A			
547-258A			

Metric		Resolution (mm)	Stroke (mm)	Accuracy (µm)	Measuring force (N)	Base		
Order No.	Range (mm)					W (mm)	T (mm)	flatness (µm)
547-211A	0 - 200	0.01	12.7	±20	1.5 or less	63.5	16	5
547-212A						101.6		
547-251A		0.0005 (0.001/0.01 mm selectable)		63.5				
547-252A				101.6		2		

Order No.	Contact point	Extension rod	Indicator
547-211A	Provided with a carbide-tipped ball point (21JAA224)	5 pcs. (10, 20, 30, 30, 100 mm)	543-710B
547-212A			543-700B
547-251A			
547-252A			

DIMENSIONS



Dial Depth Gage

Dial Depth Gage SERIES 7

- Optimal for hole, narrow groove and step measurement.



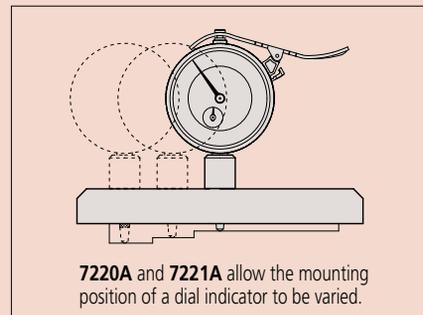
SPECIFICATIONS

Inch									
Order No.	Range (in)	Graduation (in)	Stroke (in)	Accuracy (in)	Measuring force (N)	Base			
						W (in)	T (in)	Flatness (in)	QTY of indicator mounting positions
7217A	0 - 8	0.001	1	±0.002	2.0	2.5	0.63	0.0002	1
7218A						4			
7237A			0.2		2.5				
7238A					4				

Order No.	Contact point	Extension rod	Indicator (dial indicator)
7217A	Provided with a carbide-tipped ball point (21JZA242: 0.7 in)	3 pcs. (1 in, 2 in, 4 in)	2904AB for Depth Gage
7218A		4 pcs. (0.5 in, 1 in, 2 in, 4 in)	1168A for Depth Gage (Back plunger type)
7237A			
7238A		Interchangeable contact point (21JZA243: 0.9 in)	

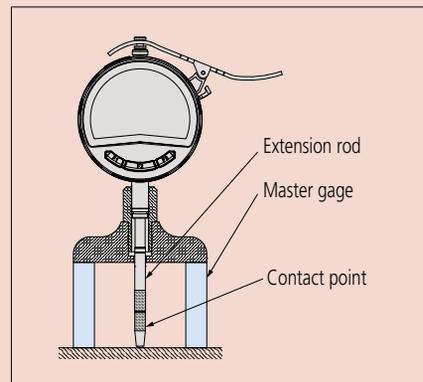
Metric									
Order No.	Range (mm)	Graduation (mm)	Stroke (mm)	Accuracy (µm)	Measuring force (N)	Base			
						W (mm)	T (mm)	Flatness (µm)	QTY of indicator mounting positions
7210A	0 - 10	0.01	10	±15	1.4	40	16	5	1
7211A	63.5								
7212A						101.6			
7213A	0 - 210					30			
7214A			101.6						
7220A	0 - 200		10	±15	1.4	100	18	2	
7221A						150			3
7222A	0 - 10		5	±15	1.4	ø16	16	1	
7223A		ø25							
7224A		ø40							
7231A	0 - 200					63.5			

Indicator Mounting Positions



7220A and 7221A allow the mounting position of a dial indicator to be varied.

When using an extension rod



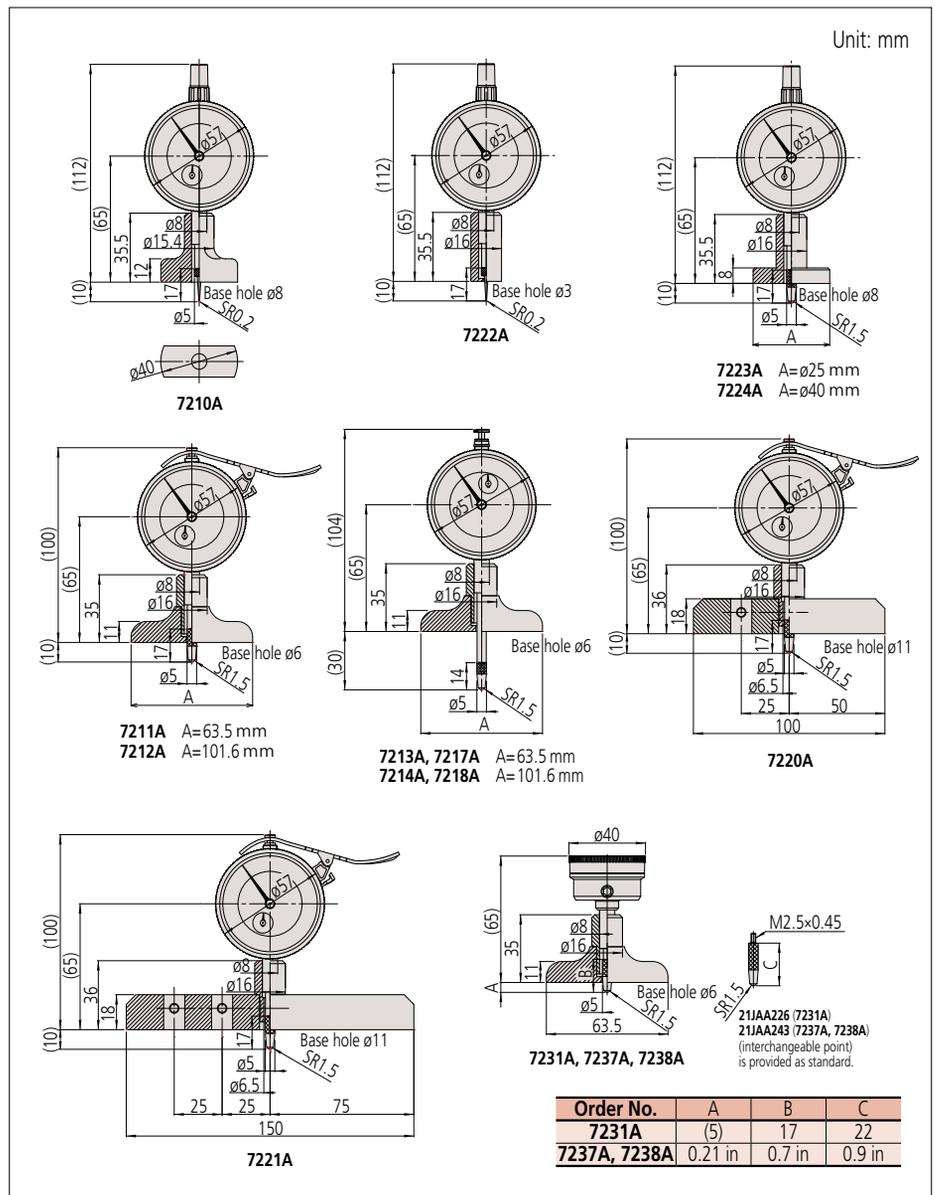
Need Calibration?

Dial Depth Gage

Order No.	Contact point	Extension rod	Indicator (dial indicator)
7210A	Provided with a needle point (137413)	—	2902AB for Depth Gage
7211A	Provided with a carbide-tipped ball point (21JAA224)	5 pcs. (10, 20, 30, 30, 100 mm)	2902AB for Depth Gage
7212A			
7213A	Provided with a carbide-tipped ball point (21JAA225)	3 pcs. (30, 60, 90 mm)	2952AB for Depth Gage
7214A			
7220A	Provided with a carbide-tipped ball point (21JAA224)	5 pcs. (10, 20, 30, 30, 100 mm)	2902AB for Depth Gage
7221A			
7222A	Provided with a needle point (137413)	—	2902AB for Depth Gage
7223A			
7224A			
7231A	Provided with a carbide-tipped ball point (21JAA224: 17 mm)	5 pcs. (10, 20, 30, 30, 100 mm) Interchangeable contact point (21JAA226)	1162A for Depth Gage (Back plunger type)

• Parallelism adjustment with the bottom face of the base is required when mounting a flat/needle or carbide-tipped contact point.

DIMENSIONS



Featured Products



81 piece, Inch, Rectangular, Steel Gage Block Set

Gage Block Sets - Steel and Ceramic - Inch and Metric

Refer to page E-6 for details.



GBCD-250 - Long Range Gage Block Comparator

Manual and Automated Gage Block Calibration Machines

Refer to page E-25 for details.



Digital Height Master - Staggered - Various Sizes

Refer to page E-27 for details.



Calibration Masters - High Precision Square

Refer to page E-33 for details.





Fixtures - Bench Centers

Refer to page E-46 for details.



Hardware - Pitch Gage

Refer to page E-42 for details.



Granite Surface Plates and Stands

Refer to page E-47 for details.

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Measuring Instruments Shipped with Inspection Certificate

Mitutoyo guarantees product quality as a leading precision measuring instrument manufacturer and ships measuring instruments with an inspection certificate that includes inspection data so that customers can use them with confidence.

Mitutoyo

114289

Gage Blocks

SERIES 516

Precision gage blocks are the primary standards vital to dimensional quality control in the manufacture of parts. Mitutoyo offers a complete selection of gage blocks available in a choice of rectangular or square, metric or inch and steel or CERA (ceramic) types.

Accuracy

Mitutoyo gage blocks guarantee such a high accuracy that users can use them without anxiety. Mitutoyo has established a traceability system for our measurement products, up to the Metrology Management Center of the National Institute of Advanced Industrial Science and Technology (AIST), and we have been certified by the Japanese government as an accredited laboratory.

Wringing

The lapping technique is one of several Mitutoyo specialties. Our advanced lapping technique, developed for more than a half century, allows us to achieve the best flatness and surface roughness needed for gage blocks.

Abrasion Resistance and Dimensional Stability

High-carbon, high-chrome steel is employed to sufficiently satisfy a variety of material characteristics required for gage blocks. A high degree of hardness, obtained by our heat treatment technology, as well as methodically repeated heat treatment, have successfully reduced deterioration change over time.

CERA Blocks

CERA blocks, made of ceramic materials with superior surface quality, were developed by Mitutoyo ultra-precision machining techniques and solves problems commonly associated with steel gage blocks.

1. Corrosion-Resistant

Anti-corrosion treatment is not required when handled normally (i.e. with fingers), resulting in simple maintenance and storage.

2. No Burrs Caused by Dents, etc.

Since the CERA Block is very hard it will not scratch and is highly resistant to burrs. If a burr is formed, it can easily be removed with a ceramic deburring stone (Ceraston).

3. Abrasion Resistant

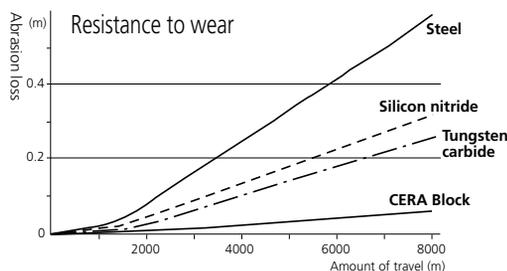
CERA Blocks have 10 times the abrasion resistance of steel gage blocks.

4. Dimensional Stability

CERA Blocks are free from dimensional change over time.

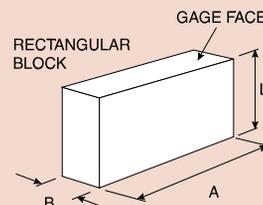
5. Marking

The black characters, indicating the nominal length, are inscribed by laser and are clearly visible against the white surface of the block.



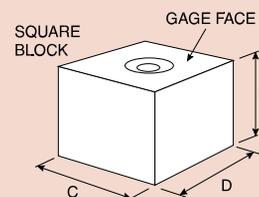
Selecting Gage Blocks

- Select gage blocks in accordance with the combination range required. If a large length is required, add a long block set.
- Select gage blocks in accordance with the minimum length step required. Add wear block sets if necessary.
- If a set containing a large number of gage blocks is selected, the number of combination gage blocks required for a length is reduced and the number of combinations is increased. The accuracy will be retained and damage will be reduced.
- The specific gage block set for micrometer inspection and caliper inspection is available.
- If using only one length repeatedly, it is a good idea to purchase discrete gage blocks.
- The 2mm-based gage blocks, which take the base of the minimum length step as 2mm, are easy to handle and will not warp, as compared to the 1mm-based gage blocks.



Rectangular Block

Gage Size	Face Width (A)	Face Depth (B)
Up to 2"	1.181"	.355"
Over .2" up to 40"	1.378"	.355"
Up to 10mm	30mm	9mm
Over 10mm up to 1000mm	35mm	9mm



Square Block

Gage Size	Face Width (C)	Face Depth (D)
Inch (up to 40")	.95"	.95"
Metric (up to 1000mm)	24.1mm	24.1mm



Find a Distributor

Gage Blocks

Grade and Application

Refer to the following table to select the gage block grade according to usage.

	Applications	Grade
Workshop use	• Mounting tools and cutters	AS-1 or AS-2
	• Manufacturing gages • Calibrating instruments	0 or AS-1
Inspection use	• Inspecting mechanical parts, tools, etc.	0 or AS-1
	• Checking the accuracy of gages • Calibrating instruments	00 or 0
Calibration use	• Checking the accuracy of gage blocks for workshop • Checking the accuracy of gage blocks for inspection • Checking the accuracy of instruments	K or 00
Reference use	• Checking the accuracy of gage blocks for calibration • For academic research	K

Grade AS-1:

These gage blocks are intended for shop-floor use to set and calibrate fixtures, as well as precision instruments.

Grade 0:

This grade is used within an inspection area to verify the accuracy of plug and snap gages, as well as for setting electronic measuring devices.

Grade 00:

These higher accuracy gages are intended for use within a controlled environment by skilled inspection staff. Mainly used as reference standards for setting high-precision measuring equipment and for the calibration of lower grade gage blocks.

Grade K:

Gage blocks of this accuracy are intended for use within a temperature-controlled inspection room or calibration laboratory. They should be used as masters with certificates against other gage blocks which are calibrated by comparison.

Combination of a Required Length

Multiple combinations of gage blocks can be used to make a required length. Care should be exercised in the following points.

1. Use as few gage blocks as possible to obtain the required length. (Select thick gage blocks whenever possible.)
2. Select gage blocks starting with the one that has the least significant digit required, and then work up to ones with more significant digits.
3. There are multiple combinations for the integer part of a length. To prevent wear as much as possible, do not always use the same gage blocks.

Example combination
Required length = 45.6785mm

For the 1mm-based gage block set (112 pcs.)

1.0005
1.008
1.17
17.5
+ 25
45.6785mm

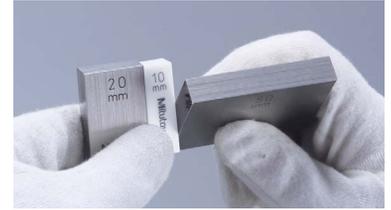
For the 2mm-based gage block set (112 pcs.)

2.0005
2.008
2.17
14.5
+ 25
45.6785mm

6. Anti-magnetic Nature Keeps Away Steel Powders

7. High Wringing Force

An even, dense tissue can maintain a strong wringing force.



8. Material of CERA block

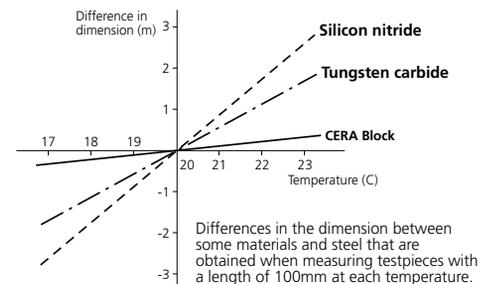
Property	Material	CERA Block (ZrO ₂)	Steel (Fe)	Carbide (WC-Co)	Silicon nitride (Si ₃ N ₄)
Hardness (HV)		1350	800	1650	1500
Coefficient of thermal expansion (10 ⁻⁶ /K)		9.3±0.5	10.8±0.5	5.5±1.0	2
Flexural strength by 3-point bending (MPa)		1270	1960	1960	580
Fracture toughness K1c (MPa•m ^{1/2})		7	120	12	6.5
Young's Modulus x104 (MPa)		20.6	20.6	61.8	28.4
Poisson's Ratio		0.3	0.3	0.2	0.3
Specific gravity		6.0	7.8	14.8	3.2
Thermal conductivity (W/m•k)		2.9	54.4	79.5	16.7

9. Closest Expansion Coefficient to Steel

The thermal expansion coefficient of a CERA Block is similar to that of a steel gage block.

10. Highly Resistant Against Drops and Other Shocks

The CERA block material is one of the toughest ceramics materials. It is extremely difficult to crack under normal use.



Features of Square Gage Blocks

1. Perfect wringing is possible using the center hole.

After wringing the square gage blocks, an optional tie rod can be inserted through the center hole to fix the blocks using a screw.

2. A height reference standard can easily be made.

A precision height reference standard can be made easily and inexpensively using accessories such as the plain jaw and block base.

3. A dedicated inspection jig can be easily made.

A dedicated inspection jig for periodic inspection of instruments can be made easily and inexpensively.

4. A wide measuring surface with cross section dimensions of [24.1 x 24.1mm / .95 x .95"] is available.

A square gage block can retain stable orientation both longitudinally and laterally. A wide range of application measurements can be made, including cutting tool positioning, angle measurement with a sine bar, taper measurement with a roller, and inspection of depth micrometers.



Long and Ultra-Thin Gage Blocks

Mitutoyo offers extra thin gage blocks from 0.10 mm to 0.99 mm (increments of 0.01 mm), as well as long gage blocks up to 1,000 mm as standard products.

Gage Blocks

SERIES 516

Accuracies of Mitutoyo Gage Blocks

All Mitutoyo gage blocks meet or exceed all known specifications. The flatness, parallelism and surface finish necessary to achieve the required accuracies are the same as or better than government requirements.

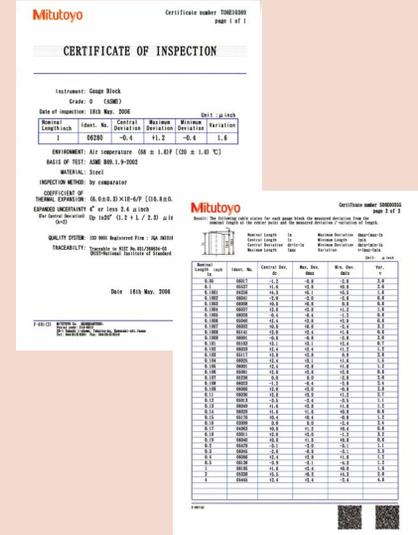
ASME (American Society of Mechanical Engineers) Deviations and Tolerance on Length for Metric and inch Gage Blocks: ASME B89.1.9-2023 (USA)

Nominal Length (l_n) in inches	Calibration Grade K		Grade 00		Grade 0		Grade AS-1		Grade AS-2	
	Limit Deviations of Length at any Point $\pm l_e$ $\mu\text{in.}$	Tolerance for the Variation In Length l_v $\mu\text{in.}$	Limit Deviations of Length at any Point $\pm l_e$ $\mu\text{in.}$	Tolerance for the Variation In Length l_v $\mu\text{in.}$	Limit Deviations of Length at any Point $\pm l_e$ $\mu\text{in.}$	Tolerance for the Variation In Length l_v $\mu\text{in.}$	Limit Deviations of Length at any Point $\pm l_e$ μm	Tolerance for the Variation In Length l_v μm	Limit Deviations of Length at any Point $\pm l_e$ $\mu\text{in.}$	Tolerance for the Variation In Length l_v $\mu\text{in.}$
$l_n \leq .05$	12	2	4	2	6	4	12	6	24	12
$.05 < l_n \leq .4$	10	2	3	2	5	4	8	6	18	12
$.45 < l_n \leq 1$	12	2	3	2	6	4	12	6	24	12
$1 < l_n \leq 2$	16	2	4	2	8	4	16	6	32	12
$2 < l_n \leq 3$	20	2	5	3	10	4	20	6	40	14
$3 < l_n \leq 4$	24	3	6	3	12	5	24	8	48	14
$4 < l_n \leq 5$	32	3	8	3	16	5	32	8	64	16
$5 < l_n \leq 6$	32	3	8	3	16	5	32	8	64	16
$6 < l_n \leq 7$	40	4	10	4	20	6	40	10	80	16
$7 < l_n \leq 8$	40	4	10	4	20	6	40	10	80	16
$8 < l_n \leq 10$	48	4	12	4	24	6	48	10	104	18
$10 < l_n \leq 12$	56	4	14	4	28	7	56	10	112	20
$12 < l_n \leq 16$	72	5	18	5	36	8	72	12	144	20
$16 < l_n \leq 20$	88	6	20	6	44	10	88	14	176	24
$20 < l_n \leq 24$	104	6	25	6	52	10	104	16	200	28
$24 < l_n \leq 28$	120	7	30	7	60	12	120	18	240	28
$28 < l_n \leq 32$	136	8	34	8	68	12	136	20	260	32
$32 < l_n \leq 36$	152	8	38	8	76	14	152	20	300	36
$36 < l_n \leq 40$	160	10	40	10	80	16	168	24	320	40

Nominal Length (l_n) in inches	Calibration Grade K		Grade 00		Grade 0		Grade AS-1		Grade AS-2	
	Limit Deviations of Length at any Point $\pm l_e$ μm	Tolerance for the Variation In Length l_v μm	Limit Deviations of Length at any Point $\pm l_e$ μm	Tolerance for the Variation In Length l_v μm	Limit Deviations of Length at any Point $\pm l_e$ μm	Tolerance for the Variation In Length l_v μm	Limit Deviations of Length at any Point $\pm l_e$ μm	Tolerance for the Variation In Length l_v μm	Limit Deviations of Length at any Point $\pm l_e$ μm	Tolerance for the Variation In Length l_v μm
$l_n \leq 0.5$	0.30	0.05	0.10	0.05	0.14	0.10	0.30	0.16	0.60	0.30
$0.5 < l_n \leq 10$	0.20	0.05	0.07	0.05	0.12	0.10	0.20	0.16	0.45	0.30
$10 < l_n \leq 25$	0.30	0.05	0.07	0.05	0.14	0.10	0.30	0.16	0.60	0.30
$25 < l_n \leq 50$	0.40	0.06	0.10	0.06	0.20	0.10	0.40	0.18	0.80	0.30
$50 < l_n \leq 75$	0.50	0.06	0.12	0.06	0.25	0.12	0.50	0.18	1.00	0.35
$75 < l_n \leq 100$	0.60	0.07	0.15	0.07	0.30	0.12	0.60	0.20	1.20	0.35
$100 < l_n \leq 150$	0.80	0.08	0.20	0.08	0.40	0.14	0.80	0.20	1.60	0.40
$150 < l_n \leq 200$	1.00	0.09	0.25	0.09	0.50	0.16	1.00	0.25	2.00	0.40
$200 < l_n \leq 250$	1.20	0.10	0.30	0.10	0.60	0.16	1.20	0.25	2.40	0.45
$250 < l_n \leq 300$	1.4	0.10	0.35	0.10	0.70	0.18	1.40	0.25	2.80	0.50
$300 < l_n \leq 400$	1.80	0.12	0.45	0.12	0.90	0.20	1.80	0.30	3.60	0.50
$400 < l_n \leq 500$	2.20	0.14	0.50	0.14	1.10	0.25	2.20	0.35	4.40	0.60
$500 < l_n \leq 600$	2.60	0.16	0.65	0.16	1.30	0.25	2.60	0.40	5.00	0.70
$600 < l_n \leq 700$	3.00	0.18	0.75	0.18	1.50	0.30	3.00	0.45	6.00	0.70
$700 < l_n \leq 800$	3.40	0.20	0.85	0.20	1.70	0.30	3.40	0.50	6.50	0.80
$800 < l_n \leq 900$	3.80	0.20	0.95	0.20	1.90	0.35	3.80	0.50	7.50	0.90
$900 < l_n \leq 1000$	4.20	0.25	1.00	0.25	2.00	0.40	4.20	0.60	8.00	1.00

Mitutoyo Gage Blocks and Inspection Certificates

A Certificate of Inspection is furnished with all Mitutoyo gage blocks with a serial number on the case and an identification number on each block. The deviation of each block is registered. For this inspection, each gage block is measured relative to the upper level master using a gage block comparator. Grade K gage blocks are manufactured by absolute measurement using an interferometer. The gage block set and discrete gage block are supplied with a Certificate of Calibration. The Certificate of Calibration specifies the deviation from the nominal length. (Comparative measurement, however, is performed for all square gage blocks.)



A Certificate of Accuracy, traceable to the NIST, is furnished with each gage block set and individual block.

Mitutoyo America Corporation Calibration Laboratory:

ISO 17025:2017 accredited calibration available
Calibration capability up to 1000mm/40" length
Low measurement uncertainty

Contact Information:

965 Corporate Blvd.
Aurora, Illinois 60502
Phone: (888) 648-8869 option 7
Fax: (630) 978-6477



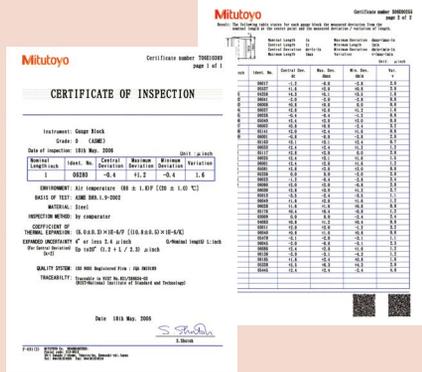
Find a Distributor



Gage Blocks

Inch Rectangular Gage Block Set SERIES 516 — Inch Block Set, Thin Block Set, Long Block Set, Wear Block Set

Provided with Inspection Certificate



SPECIFICATIONS

Inch Block Set

Blocks per set	Order No.			Grade	Blocks included in set		
	Steel	CERA	Steel/CERA		Size	Step	Qty.
81	516-549-56	516-557-56	—	K	.1001 - .1009	.0001	9
	516-901-26	516-301-26	—	00	.101 - .149	.001	49
	516-902-26	516-302-26	—	0	.05 - .95	.05	19
	516-903-26	516-303-26	—	AS-1	1 - 4	1	4
	516-904-26	516-304-26	—	AS-2			
35	516-550-56	516-558-56	—	K	.10005		1
	516-913-26	516-313-26	—	00	.1001 - .1009	.0001	9
	516-914-26	516-314-26	—	0	.101 - .109	.001	9
	516-915-26	516-315-26	—	AS-1	.11 - .19	.01	9
	516-916-26	516-316-26	—	AS-2	.1 - .3	.1	3
					5, 1, 2, 4		4

Thin Block Set

Blocks per set	Order No.		Grade	Blocks included in set		
	Steel	CERA		Size	Step	Qty.
28	516-551-56	—	K	.02005		1
	516-917-26	—	00	.0201 - .0209	.0001	9
	516-918-26	—	0	.021 - .029	.001	9
	516-919-26	—	AS-1	.01 - .09	.01	9
	516-920-26	—	AS-2			
10	516-926-26	—	0	.005 - .050	.005	10
	516-927-26	—	AS-1			

Long Block Set

Blocks per set	Order No.		Grade	Blocks included in set		
	Steel	CERA		Size	Step	Qty.
8	516-126-26	516-176-26	0	1-8	1	8
	516-127-26	516-177-26	AS-1			
8	—	516-564-56	K	5 - 7	1	3
	—	516-741-26	00			
	516-712-26	516-742-26	0			
	516-713-26	516-743-26	AS-1			

Wear Block Set

Blocks per set	Order No.		Grade	Blocks included in set	
	Carbide	CERA		Size	Qty.
2	516-809-26	516-836-26	0	.05	2
	516-808-26	516-837-26	AS-1		
2	516-805-26	516-834-26	0	.1	2
	516-804-26	516-835-26	AS-1		

Gage Blocks

Metric Rectangular Gage Block Set SERIES 516 — 1mm Base Block Set



Steel 112-block set



Steel 103-block set



Steel 47-block set



CERA 112-block set



CERA 56-block set

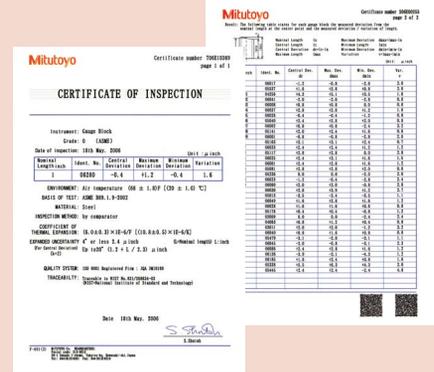
SPECIFICATIONS

1mm Base Block Set

Blocks per set	Order No.		Grade	Blocks included in set		
	Steel	CERA		Size	Step	Qty.
112	516-531-56	516-541-56	K	1.0005	—	1
	516-937-26	516-337-26	00	1.001 - 1.009	0.001	9
	516-938-26	516-338-26	0	1.01 - 1.49	0.01	49
	516-939-26	516-339-26	AS-1	0.5 - 24.5	0.5	49
	516-940-26	516-340-26	AS-2	25 - 100	25	4
103	516-533-56	516-542-56	K	1.005	—	1
	516-941-26	516-341-26	00	1.01 - 1.49	0.01	49
	516-942-26	516-342-26	0	0.5 - 24.5	0.5	49
	516-943-26	516-343-26	AS-1	25 - 100	25	4
	516-944-26	516-344-26	AS-2			
87	516-535-56	515-543-56	K	1.001 - 1.009	0.001	9
	516-945-26	516-345-26	00	1.01 - 1.49	0.01	49
	516-946-26	516-346-26	0	0.5 - 9.5	0.5	19
	516-947-26	516-347-26	AS-1	10 - 100	10	10
	516-948-26	516-348-26	AS-2			
56	516-536-56	516-544-56	K	0.5	—	1
	516-953-26	516-353-26	00	1.001 - 1.009	0.001	9
	516-954-26	516-354-26	0	1.01 - 1.09	0.01	9
	516-955-26	516-355-26	AS-1	1.1 - 1.9	0.1	9
	516-956-26	516-356-26	AS-2	1 - 24	1	24
47	516-537-56	516-545-56	K	1.005	—	1
	516-957-26	516-357-26	00	1.01 - 1.09	0.01	9
	516-958-26	516-358-26	0	1.1 - 1.9	0.1	9
	516-959-26	516-359-26	AS-1	1 - 24	1	24
	516-960-26	516-360-26	AS-2	25 - 100	25	4



Provided with Inspection Certificate



E



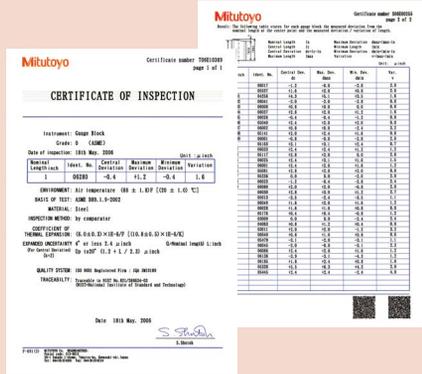
Got Questions?



Gage Blocks

Metric Rectangular Gage Block Set SERIES 516 — Long Block Set, Wear Block Set

Provided with Inspection Certificate



CERA 8-block set



Steel 8-block set

SPECIFICATIONS

Long Block Set

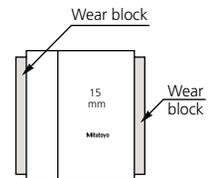
Blocks per set	Order No.		Grade ASME	Blocks included in set		
	Steel	CERA		Size	Step	Qty.
8	—	516-547-26	K	25-200	25	8
	—	516-164-26	00	—	—	—
	516-115-26	516-165-26	0	—	—	—
	516-116-26	516-166-26	AS-1	—	—	—
8	516-540-26	516-546-26	K	125 - 175	25	3
	516-701-26	516-731-26	00	200 - 250	50	2
	516-702-26	516-732-26	0	300 - 500	100	3
	516-703-26	516-733-26	AS-1	—	—	—



CERA 2-block set



Carbide 2-block set



SPECIFICATIONS

Wear Block Set

Blocks per set	Order No.		Grade ASME	Blocks included in set	
	Carbide	CERA		Size	Qty.
2	516-807-26	516-832-26	0	1	2
	516-806-26	516-833-26	AS-1	—	—
2	516-803-26	516-830-26	0	2	2
	516-802-26	516-831-26	AS-1	—	—

Gage Blocks

Micrometer Inspection Gage Block Sets SERIES 516

- Gage blocks for inspecting a variety of micrometers.
- Can be measured in both vertical and horizontal posture.
- Parallelism is measured by attaching the optical parallel (optional accessory) to the gage block set.

SPECIFICATIONS

Inch Block Set				
Blocks per set	Order No.		Grade	Blocks included in set
	Steel	CERA		
10	516-552-56	516-559-56	K	.105, .210, .315, .420, .500, .605, .710, .815, .920, 1"
	516-921-26	516-321-26	00	
	516-922-26	516-322-26	0	
	516-923-26	516-323-26	AS-1	
10	516-529-26*	516-319-26*	0	.087, .189, .307, .409, .472, .598, .669, .772, .890, 1" • Optical parallel (t = .5")
9	516-554-56	516-561-56	K	.0625, .100, .125, .200, .250, .300, .500, 1, 2"
	516-929-26	516-333-26	00	
	516-930-26	516-334-26	0	
	516-931-26	516-335-26	AS-1	
9	—	516-563-56	K	.0625, .100, .125, .200, .250, .300, .500, 1, 2"
	—	516-329-26	00	
	516-934-26	516-330-26	0	
	516-935-26	516-331-26	AS-1	

Metric Block Set				
Blocks per set	Order No.		Grade	Blocks included in set
	Steel	CERA		
10	516-103-26	516-152-26	0	1.00, 1.25, 1.50, 2, 3, 5, 10, 15, 20, 25mm
	516-101-26	516-153-26	AS-1	
10	516-106-26	516-156-26	0	2.5, 5.1, 7.7, 10.3, 12.9, 15, 17.6, 20.2, 22.8, 25mm • Optical parallel (t = 12mm)
	516-107-26	516-157-26	AS-1	

* For QuantuMike

Bore Gage Calibration Kit SERIES 516

SPECIFICATIONS

Blocks per set	Order No.	Grade	Blocks included in set
	Carbide		Size
9	516-120-26	0	.04", .08", .16", .2", .4", .8", 1", 2", 3" 619018 (plain jaw 2 pc. set) and 619004 (160mm holder)

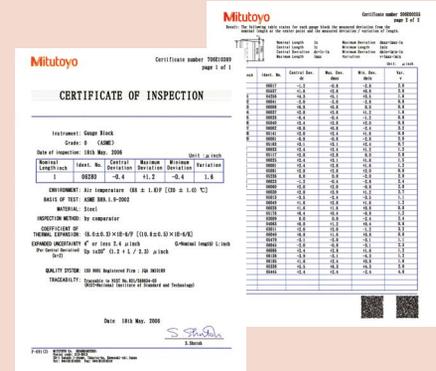
SPECIFICATIONS

Inch/Metric	Micro Checker (holder only)
Order No.	516-608
Applicable gage block set	516-921-26, 516-922-26, 516-923-26, 516-321-26, 516-322-26, 516-323-26
Applicable gage block size (inch)	.105, .210, .315, .420, .5, .605, .815, .920

Metric	Micro Checker (holder only)
Order No.	516-607
Applicable gage block set	516-106-26, 516-107-26, 516-156-26, 516-157-26
Applicable gage block size (mm)	2.5, 5.1, 7.7, 10.3, 12.9, 15, 17.6, 20.2, 22.8, 25



Provided with Inspection Certificate



Micro Checker



(Gage blocks are optional.)



Gage Blocks

Individual Metric Rectangular Gage Block

- If using only one length repeatedly, it is good practice to purchase discrete gage blocks.
- Each gage block is supplied with a Certificate of Inspection.
- Each Grade K gage block of ASME standard is specially supplied with a Certificate of Calibration, which certifies that the gage block was manufactured via interferometry.
- If desired nominal is not listed, please contact customer service for availability.



Suffix Number for Selecting Standard and Certificate Provided

ASME	
Grade	Steel, CERA
K	-516**
00	-521*
0	-531*
AS-1	-541*
AS-2	-551*

* provided with Inspection Certificate
 ** provided with Calibration Certificate and Inspection Certificate

Example: 611821-521
 0.1mm gage block in grade 00.

We make custom length gage blocks:
 0.1-1000mm



Inspection Certificate

SPECIFICATIONS

Metric Block

Length (mm)	Order No.		Length (mm)	Order No.		Length (mm)	Order No.	
	Steel	CERA		Steel	CERA		Steel	CERA
0.1	611821	—	0.53	611894	—	0.96	611937	—
0.11	611860	—	0.54	611895	—	0.97	611938	—
0.12	611861	—	0.55	611896	—	0.98	611939	—
0.13	611862	—	0.56	611897	—	0.99	611940	—
0.14	611863	—	0.57	611898	—	0.991	611551	613551
0.15	611822	—	0.58	611899	—	0.992	611552	613552
0.16	611864	—	0.59	611900	—	0.993	611553	613553
0.17	611865	—	0.6	611901	—	0.994	611554	613554
0.18	611866	—	0.61	611902	—	0.995	611555	613555
0.19	611867	—	0.62	611903	—	0.996	611556	613556
0.2	611823	—	0.63	611904	—	0.997	611557	613557
0.21	611868	—	0.64	611905	—	0.998	611558	613558
0.22	611869	—	0.65	611906	—	0.999	611559	613559
0.23	611870	—	0.66	611907	—	1	611611	613611
0.24	611871	—	0.67	611908	—	1.0005	611520	613520
0.25	611824	—	0.68	611909	—	1.001	611521	613521
0.26	611872	—	0.69	611910	—	1.002	611522	613522
0.27	611873	—	0.7	611911	—	1.003	611523	613523
0.28	611874	—	0.71	611912	—	1.004	611524	613524
0.29	611875	—	0.72	611913	—	1.005	611525	613525
0.3	611825	—	0.73	611914	—	1.006	611526	613526
0.31	611876	—	0.74	611915	—	1.007	611527	613527
0.32	611877	—	0.75	611916	—	1.008	611528	613528
0.33	611878	—	0.76	611917	—	1.009	611529	613529
0.34	611879	—	0.77	611918	—	1.01	611561	613561
0.35	611826	—	0.78	611919	—	1.02	611562	613562
0.36	611880	—	0.79	611920	—	1.03	611563	613563
0.37	611881	—	0.8	611921	—	1.04	611564	613564
0.38	611882	—	0.81	611922	—	1.05	611565	613565
0.39	611883	—	0.82	611923	—	1.06	611566	613566
0.4	611827	—	0.83	611924	—	1.07	611567	613567
0.41	611884	—	0.84	611925	—	1.08	611568	613568
0.42	611885	—	0.85	611926	—	1.09	611569	613569
0.43	611886	—	0.86	611927	—	1.1	611570	613570
0.44	611887	—	0.87	611928	—	1.11	611571	613571
0.45	611828	—	0.88	611929	—	1.12	611572	613572
0.46	611888	—	0.89	611930	—	1.13	611573	613573
0.47	611889	—	0.9	611931	—	1.14	611574	613574
0.48	611890	—	0.91	611932	—	1.15	611575	613575
0.49	611891	—	0.92	611933	—	1.16	611576	613576
0.5	611506	613506	0.93	611934	—	1.17	611577	613577
0.51	611892	—	0.94	611935	—	1.18	611578	613578
0.52	611893	—	0.95	611936	—	1.19	611579	613579



Talk to Sales

Gage Blocks

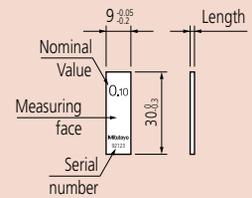


Length (mm)	Order No.		Length (mm)	Order No.		Length (mm)	Order No.	
	Steel	CERA		Steel	CERA		Steel	CERA
1.2	611580	613580	2.17	611717	—	13	611623	613623
1.21	611581	613581	2.18	611718	—	13.5	611653	613653
1.22	611582	613582	2.19	611719	—	14	611624	613624
1.23	611583	613583	2.2	611720	—	14.5	611654	613654
1.24	611584	613584	2.21	611721	—	15	611625	613625
1.25	611585	613585	2.22	611722	—	15.5	611655	613655
1.26	611586	613586	2.23	611723	—	16	611626	613626
1.27	611587	613587	2.24	611724	—	16.5	611656	613656
1.28	611588	613588	2.25	611725	—	17	611627	613627
1.29	611589	613589	2.26	611726	—	17.5	611657	613657
1.3	611590	613590	2.27	611727	—	17.6	611854	613854
1.31	611591	613591	2.28	611728	—	18	611628	613628
1.32	611592	613592	2.29	611729	—	18.5	611658	613658
1.33	611593	613593	2.3	611730	—	19	611629	613629
1.34	611594	613594	2.31	611731	—	19.5	611659	613659
1.35	611595	613595	2.32	611732	—	20	611672	613672
1.36	611596	613596	2.33	611733	—	20.2	611855	613855
1.37	611597	613597	2.34	611734	—	20.5	611660	613660
1.38	611598	613598	2.35	611735	—	21	611631	613631
1.39	611599	613599	2.36	611736	—	21.5	611661	613661
1.4	611600	613600	2.37	611737	—	22	611632	613632
1.41	611601	613601	2.38	611738	—	22.5	611662	613662
1.42	611602	613602	2.39	611739	—	22.8	611856	613856
1.43	611603	613603	2.4	611740	—	23	611633	613633
1.44	611604	613604	2.41	611741	—	23.5	611663	613663
1.45	611605	613605	2.42	611742	—	24	611634	613634
1.46	611606	613606	2.43	611743	—	24.5	611664	613664
1.47	611607	613607	2.44	611744	—	25	611635	613635
1.48	611608	613608	2.45	611745	—	25.25	611754	613754
1.49	611609	613609	2.46	611746	—	30	611673	613673
1.5	611641	613641	2.47	611747	—	35	611755	613755
1.6	611516	613516	2.48	611748	—	40	611674	613674
1.7	611517	613517	2.49	611749	—	41.3	611857	613857
1.8	611518	613518	2.5	611642	613642	45	611756	613756
1.9	611519	613519	2.6	611750	—	50	611675	613675
2	611612	613612	2.7	611751	—	60	611676	613676
2.0005	611690	—	2.8	611752	—	70	611677	613677
2.001	611691	—	2.9	611753	—	75	611801	613801
2.002	611692	—	3	611613	613613	80	611678	613678
2.003	611693	—	3.5	611643	613643	90	611679	613679
2.004	611694	—	4	611614	613614	100	611681	613681
2.005	611695	—	4.5	611644	613644	125	611802	613802
2.006	611696	—	5	611615	613615	131.4	611858	613858
2.007	611697	—	5.1	611850	613850	150	611803	613803
2.008	611698	—	5.5	611645	613645	175	611804	613804
2.009	611699	—	6	611616	613616	200	611682	613682
2.01	611701	—	6.5	611646	613646	250	611805	613805
2.02	611702	—	7	611617	613617	300	611683	613683
2.03	611703	—	7.5	611647	613647	400	611684	613684
2.04	611704	—	7.7	611851	613851	500	611685	613685
2.05	611705	—	8	611618	613618	600	611840	—
2.06	611706	—	8.5	611648	613648	700	611841	—
2.07	611707	—	9	611619	613619	750	611842	—
2.08	611708	—	9.5	611649	613649	800	611843	—
2.09	611709	—	10	611671	613671	900	611844	—
2.1	611710	—	10.3	611852	613852	1000	611845	—
2.11	611711	—	10.5	611650	613650			
2.12	611712	—	11	611621	613621			
2.13	611713	—	11.5	611651	613651			
2.14	611714	—	12	611622	613622			
2.15	611715	—	12.5	611652	613652			
2.16	611716	—	12.9	611853	613853			

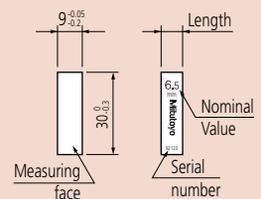
DIMENSIONS

Unit: mm

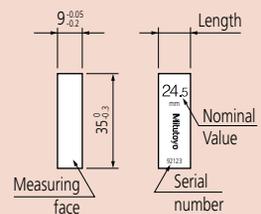
Nominal length:
0.1mm - 5.5mm



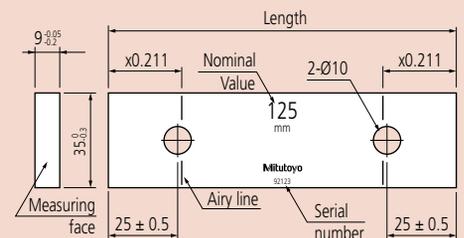
Nominal length:
6mm - 10mm



Nominal length:
10.3mm - 100mm



Nominal length 125mm - 1000mm



Metric Wear Block

Length (mm)	Order No. Tungsten carbide
1	612611
2	612612



Need Repair?



Gage Blocks

Suffix Number for Selecting Standard and Certificate Provided

ASME

Grade	Steel, CERA
K	-516**
00	-521*
0	-531*
AS-1	-541*
AS-2	-551*

* provided with Inspection Certificate
 ** provided with Calibration Certificate and Inspection Certificate

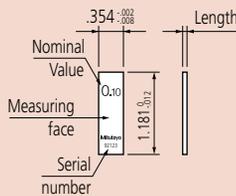
Example: 611310-521
 .1" gage block in grade 00.

We make custom length gage blocks:
 .004 - .20"

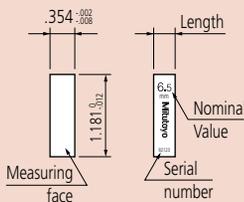
DIMENSIONS

Unit: Inch

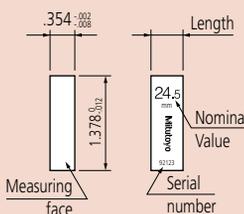
Nominal length:
 .004 - .25"



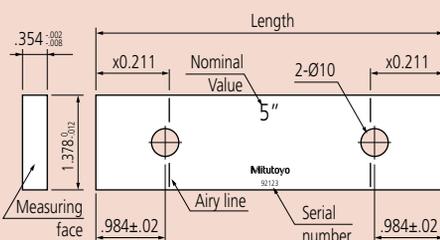
Nominal length:
 .3 - 4"



Nominal length:
 .45 - 4"



Nominal length 5 - 20"



Individual Inch Rectangular Gage Block

• If desired nominal is not listed, please contact customer service for availability.

SPECIFICATIONS

Inch Block

Length (inch)	Order No.	
	Steel	CERA
.004	611304	—
.005	611305	—
.006	611306	—
.007	611307	—
.008	611308	—
.009	611309	—
.01	611310	—
.011	611311	—
.012	611312	—
.013	611313	—
.014	611314	—
.015	611315	—
.016	611316	—
.017	611317	—
.018	611318	—
.019	611319	—
.02	611320	—
.02005	611240	—
.0201	611231	—
.0202	611232	—
.0203	611233	—
.0204	611234	—
.0205	611235	—
.0206	611236	—
.0207	611237	—
.0208	611238	—
.0209	611239	—
.021	611321	—
.022	611322	—
.023	611323	—
.024	611324	—
.025	611325	—
.026	611326	—
.027	611327	—
.028	611328	—
.029	611329	—
.03	611330	—
.031	611331	—
.03125 (1/32)	611101	613103
.032	611332	—
.033	611333	—
.034	611334	—
.035	611335	—
.036	611336	—
.037	611337	—
.038	611338	—
.039	611339	—
.04	611340	—
.041	611341	—
.042	611342	—
.043	611343	—
.044	611344	—
.045	611345	—
.046	611346	—
.046875 (3/64)	611102	613104
.047	611347	—
.048	611348	—
.049	611349	—
.05	611105	613105

Length (inch)	Order No.	
	Steel	CERA
.06	611106	—
.0625	611303	613303
.07	611107	—
.078125 (5/64)	611103	613100
.08	611108	—
.09	611109	—
.09375 (3/32)	611104	613101
.1	611191	613191
.100025	611111	613110
.10005	611135	613135
.100075	611112	613111
.1001	611121	613121
.1002	611122	613122
.1003	611123	613123
.1004	611124	613124
.1005	611125	613125
.1006	611126	613126
.1007	611127	613127
.1008	611128	613128
.1009	611129	613129
.101	611141	613141
.102	611142	613142
.103	611143	613143
.104	611144	613144
.105	611145	613145
.106	611146	613146
.107	611147	613147
.108	611148	613148
.109	611149	613149
.109375 (7/64)	611110	613102
.11	611150	613150
.111	611151	613151
.112	611152	613152
.113	611153	613153
.114	611154	613154
.115	611155	613155
.116	611156	613156
.117	611157	613157
.118	611158	613158
.119	611159	613159
.12	611160	613160
.121	611161	613161
.122	611162	613162
.123	611163	613163
.124	611164	613164
.125	611165	613165
.126	611166	613166
.127	611167	613167
.128	611168	613168
.129	611169	613169
.13	611170	613170
.131	611171	613171
.132	611172	613172
.133	611173	613173
.134	611174	613174
.135	611175	613175
.136	611176	613176
.137	611177	613177
.138	611178	613178

Length (inch)	Order No.	
	Steel	CERA
.139	611179	613179
.14	611180	613180
.141	611181	613181
.142	611182	613182
.143	611183	613183
.144	611184	613184
.145	611185	613185
.146	611186	613186
.147	611187	613187
.148	611188	613188
.149	611189	613189
.15	611115	613115
.16	611116	613116
.17	611117	613117
.18	611118	613118
.19	611119	613119
.2	611192	613192
.21	611221	613221
.25	611212	613212
.3	611193	613193
.315	611209	613209
.35	611213	613213
.375 (3/8)	611113	613112
.4	611194	613194
.420	611210	613210
.45	611214	613214
.5	611195	613195
.55	611215	613215
.6	611196	613196
.605	611211	613211
.65	611216	613216
.7	611197	613197
.710	611220	613220
.75	611217	613217
.8	611198	613198
.815	611226	613226
.85	611218	613218
.9	611199	613199
.920	611227	613227
.95	611219	613219
1	611201	613201
2	611202	613202
3	611203	613203
4	611204	613204
5	611205	613205
6	611206	613206
7	611207	613207
8	611208	613208
10	611222	613222
12	611223	613223
16	611224	613224
20	611225	613225

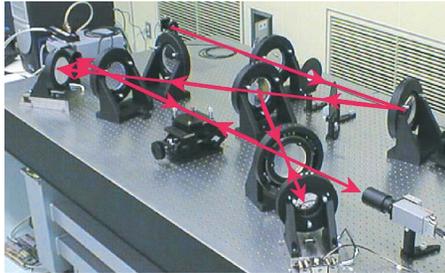
Inch Wear Block

Length (inch)	Order No.	
	Tungsten carbide	
.05	612105	
.1	612191	

Gage Blocks

Rectangular Gage Block with CTE Gage Blocks with Thermal Expansion Coefficient Data

- Mitutoyo offers top-level gage blocks (steel and ceramic) which are superior to K class blocks.

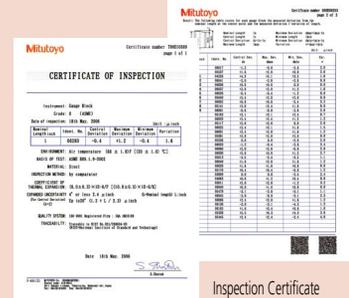


Double-faced interferometer (DFI)

- Comes with a highly accurate thermal expansion coefficient measured with a high-accuracy double-faced interferometer (DFI).
- The high-accuracy gage block interferometer (GBI) guarantees high dimensional accuracy.
- Mitutoyo offers rectangular gage blocks, having nominal values from 100 to 500mm
Grade: K class in ASME
Uncertainty of thermal expansion coefficient:
 $0.035 \times 10^{-6}/K$ ($k = 2$)
Uncertainty of dimension measurement:
30nm ($k = 2$), for 100mm block



Provided with Inspection Certificate



Inspection Certificate

SPECIFICATIONS

Inch Block with CTE		
Length (inch)	Order No. Steel	Order No. CERA
4	611204-51B	613204-51B
5	611205-51B	613205-51B
6	611206-51B	613206-51B
7	611207-51B	613207-51B
8	611208-51B	613208-51B
10	611222-51B	613222-51B
12	611223-51B	613223-51B
16	611224-51B	613224-51B
20	611225-51B	613225-51B

Metric Block with CTE		
Length (mm)	Order No. Steel	Order No. CERA
100	611681-51B	613681-51B
125	611802-51B	613802-51B
150	611803-51B	613803-51B
175	611804-51B	613804-51B
200	611682-51B	613682-51B
250	611805-51B	613805-51B
300	611683-51B	613683-51B
400	611684-51B	613684-51B
500	611685-51B	613685-51B

ZERO CERA Blocks

- Thermal expansion in the temperature range $20 \pm 1^\circ C$ less than $1/500$ that of steel ($0 \pm 0.02 \times 10^{-6}/K(20^\circ C)$)
- Almost no secular change both in dimension and coefficient of thermal expansion



- Complementary ultra-low thermal expansion and high specific rigidity (Young's Modulus/specific gravity)

SPECIFICATIONS

Metric Blocks			Length (mm)
Order No.			
JIS/ISO/DIN	BS	ASME	
617673-016	617673-116	617673-516	30
617675-016	617675-116	617675-516	50
617681-016	617681-116	617681-516	100
617682-016	617682-116	617682-516	200
617683-016	617683-116	617683-516	300
617684-016	617684-116	617684-516	400
617685-016	617685-116	617685-516	500
617840-016	617840-116	617840-516	600
617841-016	617841-116	617841-516	700
617843-016	617843-116	617843-516	800
617844-016	617844-116	617844-516	900
617845-016	617845-116	617845-516	1000
516-771-60	516-771-61	516-771-66	Above set



Where to Buy

Gage Blocks

Rectangular Gage Block Accessories SERIES 516 – For Gage Blocks over 100mm

- Specially designed for long gage blocks over 100mm, which have two holes on the body for coupling.



516-605

SPECIFICATIONS

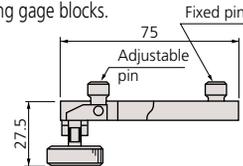
Accessories for gage blocks over 100mm

Order No. 516-605	Included in set
1 pc.	Holder A (619031)
1 pc.	Holder B (619032)
1 pc.	Holder C (619033)
1 pc.	Holder D (619034)
1 pc.	Holder E (619035)
3 pcs.	Adaptor (619036)
1 pc.	Holder base 35mm (619009)
2 pcs.	Half round jaw 12mm (619013)
1 pc.	Plain jaw (2 pc. set) (619018)
1 pc.	Scriber point (619019)

Note: These accessories can be used for inch rectangular gage blocks.

Holder A: 619031

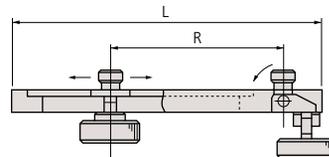
Used for coupling two long gage blocks.



Holder B and C:

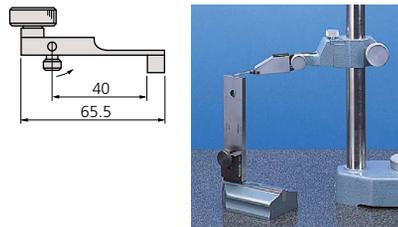
Used for coupling two long gage blocks together with other gage blocks up to 35mm (Holder B) or 140mm (Holder C). Also used for attaching jaws with two adaptors.

	Order No.	R (max.)	L
Holder B	619032	90mm	126mm
Holder C	619033	200mm	236mm



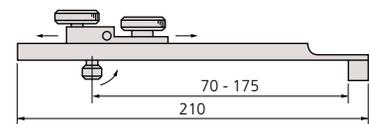
Holder D: 619034

Used for attaching to the holder base.



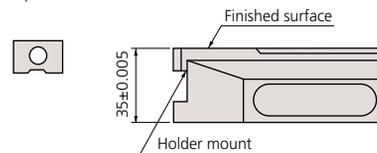
Holder E: 619035

Used for attaching to the holder base together with other gage blocks up to 125mm. Used for attaching jaws with one adaptor.

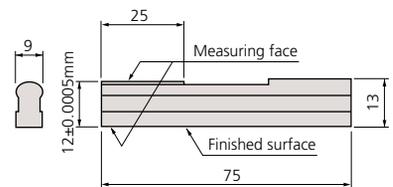


Holder base: 619009

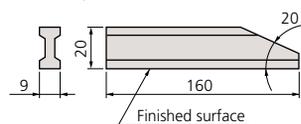
Adaptor: 619036



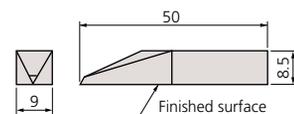
Half-round jaw: 619013



Plain jaw: 619018 (2 pc. set)



Scriber point: 619019



Gage Blocks

Rectangular Gage Block Accessories SERIES 516

To expand the variety of rectangular gage block (steel and CERA) applications, Mitutoyo offers the gage block accessories set. By assembling the items in the set, you can easily and quickly build up a precision measuring instrument.



516-602



516-601

SPECIFICATIONS

Assortment of Accessories

Order No.	Accessories	Metric Set Order No.		Accessory (s) included in a set
		516-601	516-602	
619002	Holder 60mm		•	1 pc.
619003	Holder 100mm	•	•	1 pc.
619004	Holder 160mm	•	•	1 pc.
619005	Holder 250mm	•	•	1 pc.
619009	Holder Base 35mm	•	•	1 pc.
619010	Half round jaw 2mm	•	•	2 pcs.
619011	Half round jaw 5mm	•	•	2 pcs.
619012	Half round jaw 8mm	•	•	2 pcs.
619013	Half round jaw 12mm	•	•	2 pcs.
619014	Half round jaw 20mm	•	•	2 pcs.
619018	Plain jaw (2 pc. set) 160mm	•		1 pc.
619019	Scriber point	•	•	1 pc.
619020	Center point	•	•	1 pc.
619021	Tram point	•		2 pcs.
619022	Triangular straightness edge 100mm	•	•	1 pc.
619023	Triangular straight edge 160mm	•		1 pc.
	Total Qty. in set	22 pcs.	14 pcs.	

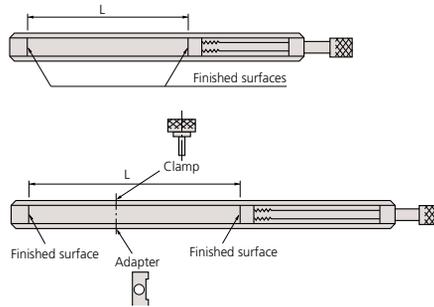


Get a Quote

Gage Blocks

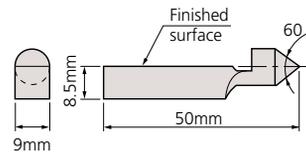
Rectangular Gage Block Accessories

Holder:
Used as a clamp if using plain jaws, scriber point, etc.

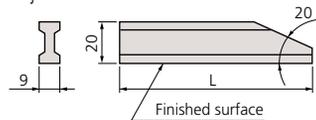


Order No.	L
619002	15 - 61mm
619003	4 - 106mm
619004	62 - 165mm
619005	153 - 256mm

Center point: 619020
Scribes a workpiece if used with the holder and holder base.



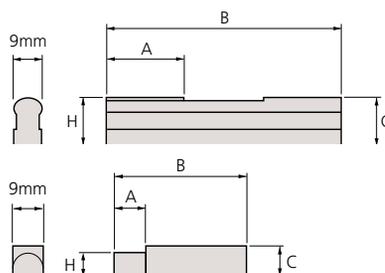
Plain jaw: 619018
Measures an outside or inside diameter if used with a pair of jaws and the holder.



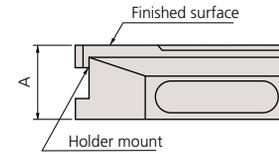
Order No.	L
619018*	160mm

* 2 pc. set

Half-round jaw:
Measures an outside or inside diameter if used with a pair of jaws and the holder.

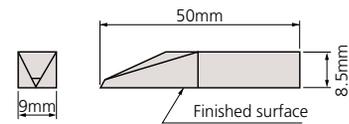


Holder base 35mm: 619009
Measures a height on the surface plate and scribes a workpiece if used with the holder.

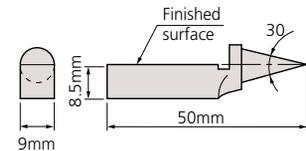


Order No.	A
619009	35±0.005mm

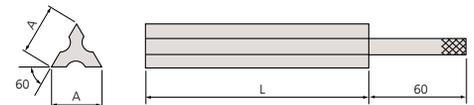
Scriber point: 619019
Scribes a workpiece if used with the holder and holder base.



Tram point: 619021
Inspects the scale of the height gage, etc., if used with the holder and holder base.



Triangular straight edge: Measures parallelism.



Order No.	L
619022	100mm
619023	160mm

Order No.	H	A	B	C
619010	2±0.0005mm	6mm	40mm	8mm
619011	5±0.0005mm	6mm	50mm	8mm
619012	8±0.0005mm	12mm	60mm	8mm
619013	12±0.0005mm	25mm	75mm	13mm
619014	20±0.0005mm	25mm	125mm	20.5mm

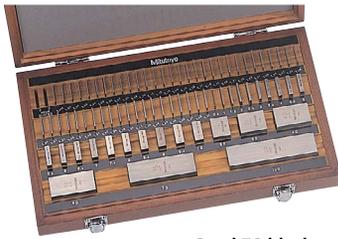
Gage Blocks

Metric Square Gage Block Set SERIES 516 — Metric Block Set, Long Block Set, Wear Block Set

A square gage block can retain stable orientation both longitudinally and laterally. A wide range of application measurements can be made, including cutting tool positioning, angle measurement with a sine bar, taper measurement with a roller, and inspection of depth micrometers.



Steel 32-block set



Steel 76-block set



Steel 103-block set



Steel 112-block set

SPECIFICATIONS

Metric Block Set

Blocks per set	Order No.		Grade	Blocks included in set		
	Steel	CERA		Size	Step	Qty.
112	516-437-26	—	00	1.0005	—	1
	516-438-26	—	0	1.001 - 1.009	0.001	9
	516-439-26	—	AS-1	1.01 - 1.49	0.01	49
	516-440-26	—	AS-2	0.5 - 24.5	0.5	49
	—	—	—	25 - 100	25	4
103	516-441-26	—	00	1.005	—	1
	516-442-26	—	0	1.01 - 1.49	0.01	49
	516-443-26	—	AS-1	0.5 - 24.5	0.5	49
	516-444-26	—	AS-2	25 - 100	25	4
	—	—	—	—	—	—
76	516-449-26	—	00	1.005	—	1
	516-450-26	—	0	1.01 - 1.49	0.01	49
	516-451-26	—	AS-1	0.5 - 9.5	0.5	19
	516-452-26	—	AS-2	10 - 40	10	4
	—	—	—	50 - 100	25	3
47	516-457-26	—	00	1.005	—	1
	516-458-26	—	0	1.01 - 1.09	0.01	9
	516-459-26	—	AS-1	1.1 - 1.9	0.1	9
	516-460-26	—	AS-2	1 - 24	1	24
	—	—	—	25 - 100	25	4
32	516-465-26	—	00	1.005	—	1
	516-466-26	—	0	1.01 - 1.09	0.01	9
	516-467-26	—	AS-1	1.1 - 1.9	0.1	9
	516-468-26	—	AS-2	1 - 9	1	9
	—	—	—	10 - 30	10	3
—	—	—	60	—	1	

Metric Long Block Set

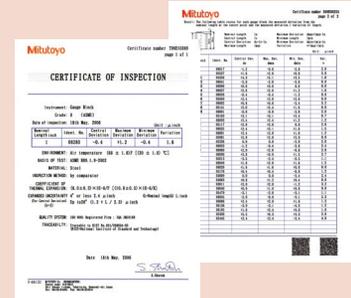
Blocks per set	Order No.		Grade	Blocks included in set		
	Steel	CERA		Size	Step	Qty.
8	516-751-26	—	00	125, 150, 175	25	3
	516-752-26	—	0	200, 250	50	2
	516-753-26	—	AS-1	300, 400, 500	100	3
	516-754-26	—	AS-2	—	—	—

Metric Wear Block Set

Blocks per set	Order No.		Grade	Blocks included in set		
	Carbide	CERA		Size	Step	Qty.
2	516-820-20	—	0	1	—	2
	516-821-20	—	AS-1	—	—	—



Provided with Inspection Certificate

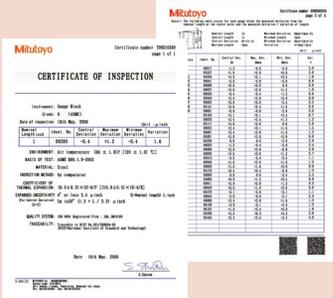


Need Support?



Gage Blocks

Provided with Inspection Certificate



Inch Square Gagen Block Set SERIES 516 — Inch Block Set, Long Block Set, Wear Block Set SPECIFICATIONS

Inch Block Set

Blocks per set	Order No.		Grade	Blocks included in set		
	Steel	CERA		Size	Step	Qty.
81	516-401-26	516-201-26	00	.1001 - .1009	.0001	9
	516-402-26	516-202-26	0	.101 - .149	.001	49
	516-403-26	516-203-26	AS-1	.05 - .95	.05	19
	516-404-26	516-204-26	AS-2	1 - 4	1	4
36	516-421-26	516-221-26	00	.05"		1
	516-422-26	516-222-26	0	.1001 - .1009	.0001	10
	516-423-26	516-223-26	AS-1	.101 - .109	.001	9
	516-424-26	516-224-26	AS-2	.11 - .19	.01	9
28	516-417-26	—	00	.02005"		1
	516-418-26	—	0	.0201 - .0209"	.0001	9
	516-419-26	—	AS-1	.021 - .029"	.001	9
	516-420-26	—	AS-2	.021 - .029"	.01	9
				1, 2, 4	1	3
				.10 - .090"		

Inch Long Block Set

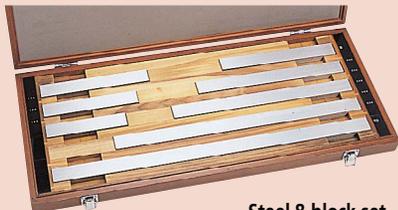
Blocks per set	Order No.		Grade	Blocks included in set		
	Steel	CERA		Size	Step	Qty.
8	516-762-26	—	0	5 - 7	1	3
	516-763-26	—	AS-1	8, 10, 12	2	3
				16, 20	4	2

Inch Wear Block Set

Blocks per set	Order No.		Grade	Blocks included in set		
	Carbide	CERA		Size	Step	Qty.
2	516-824-26	516-846-26	0	.05	—	2
	516-825-26	516-847-26	AS-1			
2	516-826-26	516-844-26	0	.1	—	2
	516-827-26	516-845-26	AS-1			



Steel 47-block set



Steel 8-block set

Carbide 2-block set



Carbide 2-block set

92 pcs. Gage Blocks with accessories set in wooden box

Blocks in set	Order No.	Grade	Blocks included in set			Individual No.	Description	Qty.	
			Steel	Size	Step				Qty
92	516-405-26	0		.0625		1	619052	Plain Jaw .500"	2
				.078125		1	619051	Half round jaw .250"	2
				.09375		1	619055	Holder base .500"	1
				.100025		1	619057	Flat head screw 1 1/4"	2
				.10005		1	619058	Flat head screw 5/8"	2
				.100075		1	619056	Stud	2
				.109375		1	619066	Knurled head screw	2
				.1001 - .1009	.0001	9	619059	Slotted head nut	2
				.101 - .149	.001	49	619062	Tie rod 3"	1
				.05 - .95	.05	19	619063	Tie rod 2 1/4"	1
				.16 - .19	.01	4	619064	Tie rod 1 1/2"	1
				1 4	1	4	619065	3/4"	1

Gage Blocks

Individual Metric Square Gage Block



SPECIFICATIONS

Metric Block

Length (mm)	Order No.		Length (mm)	Order No.		Length (mm)	Order No.	
	Steel	CERA		Steel	CERA		Steel	CERA
0.5	614506	—	1.33	614593	—	13	614623	—
1	614611	—	1.34	614594	—	13.5	614653	—
1.0005	614520	—	1.35	614595	—	14	614624	—
1.001	614521	—	1.36	614596	—	14.5	614654	—
1.002	614522	—	1.37	614597	—	15	614625	—
1.003	614523	—	1.38	614598	—	15.5	614655	—
1.004	614524	—	1.39	614599	—	16	614626	—
1.005	614525	—	1.4	614600	—	16.5	614656	—
1.006	614526	—	1.41	614601	—	17	614627	—
1.007	614527	—	1.42	614602	—	17.5	614657	—
1.008	614528	—	1.43	614603	—	18	614628	—
1.009	614529	—	1.44	614604	—	18.5	614658	—
1.01	614561	—	1.45	614605	—	19	614629	—
1.02	614562	—	1.46	614606	—	19.5	614659	—
1.03	614563	—	1.47	614607	—	20	614672	—
1.04	614564	—	1.48	614608	—	20.5	614660	—
1.05	614565	—	1.49	614609	—	21	614631	—
1.06	614566	—	1.5	614641	—	21.5	614661	—
1.07	614567	—	1.6	614516	—	22	614632	—
1.08	614568	—	1.7	614517	—	22.5	614662	—
1.09	614569	—	1.8	614518	—	23	614633	—
1.1	614570	—	1.9	614519	—	23.5	614663	—
1.11	614571	—	2	614612	—	24	614634	—
1.12	614572	—	2.5	614642	—	24.5	614664	—
1.13	614573	—	3	614613	—	25	614635	—
1.14	614574	—	3.5	614643	—	30	614673	—
1.15	614575	—	4	614614	—	40	614674	—
1.16	614576	—	4.5	614644	—	50	614675	—
1.17	614577	—	5	614615	—	60	614676	—
1.18	614578	—	5.5	614645	—	75	614801	—
1.19	614579	—	6	614616	—	100	614681	—
1.2	614580	—	6.5	614646	—	125	614802	—
1.21	614581	—	7	614617	—	150	614803	—
1.22	614582	—	7.5	614647	—	175	614804	—
1.23	614583	—	8	614618	—	200	614682	—
1.24	614584	—	8.5	614648	—	250	614805	—
1.25	614585	—	9	614619	—	300	614683	—
1.26	614586	—	9.5	614649	—	400	614684	—
1.27	614587	—	10	614671	—	500	614685	—
1.28	614588	—	10.5	614650	—			
1.29	614589	—	11	614621	—			
1.3	614590	—	11.5	614651	—			
1.31	614591	—	12	614622	—			
1.32	614592	—	12.5	614652	—			

Metric Wear Block

Length (mm)	Order No. Tungsten carbide
1	615611
2	615612



Suffix Number for Selecting Standard and Certificate Provided

ASME

Grade	Steel
K	—
00	-521*
0	-531*
AS-1	-541*
AS-2	-551*

* provided with Inspection Certificate

Example: 614611-521
1mm gage block in grade 00.

We make custom length gage blocks:
0.5 - 500mm.



Inspection Certificate



Need Service?



Gage Blocks

Individual Inch Square Gage Block

SPECIFICATIONS

Inch Block

Length (inch)	Order No.	
	Steel	CERA
.01	614310	—
.02005	614240	—
.0201	614231	—
.0202	614232	—
.0203	614233	—
.0204	614234	—
.0205	614235	—
.0206	614236	—
.0207	614237	—
.0208	614238	—
.0209	614239	—
.02	614320	—
.021	614321	—
.022	614322	—
.023	614323	—
.024	614324	—
.025	614325	—
.026	614326	—
.027	614327	—
.028	614328	—
.029	614329	—
.03	614330	—
.03125 (1/32)	614301	—
.04	614340	—
.046875 (3/64)	614302	—
.05	614105	616105
.06	614106	—
.0625	614303	616303
.07	614107	—
.078125 (5/64)	614304	—
.08	614108	—
.09	614109	—
.09375 (3/32)	614305	—
.1	614191	616191
.100025	614307	—
.10005	614135	616135
.100075	614308	—
.1001	614121	616121
.1002	614122	616122
.1003	614123	616123
.1004	614124	616124
.1005	614125	616125
.1006	614126	616126
.1007	614127	616127
.1008	614128	616128
.1009	614129	616129
.101	614141	616141
.102	614142	616142
.103	614143	616143
.104	614144	616144
.105	614145	616145

Length (inch)	Order No.	
	Steel	CERA
.106	614146	616146
.107	614147	616147
.108	614148	616148
.109	614149	616149
.109375 (7/64)	614306	—
.11	614150	616150
.111	614151	616151
.112	614152	616152
.113	614153	616153
.114	614154	616154
.115	614155	616155
.116	614156	616156
.117	614157	616157
.118	614158	616158
.119	614159	616159
.12	614160	616160
.121	614161	616161
.122	614162	616162
.123	614163	616163
.124	614164	616164
.125	614165	616165
.126	614166	616166
.127	614167	616167
.128	614168	616168
.129	614169	616169
.13	614170	616170
.131	614171	616171
.132	614172	616172
.133	614173	616173
.134	614174	616174
.135	614175	616175
.136	614176	616176
.137	614177	616177
.138	614178	616178
.139	614179	616179
.14	614180	616180
.141	614181	616181
.142	614182	616182
.143	614183	616183
.144	614184	616184
.145	614185	616185
.146	614186	616186
.147	614187	616187
.148	614188	616188
.149	614189	616189
.15	614115	616115
.16	614116	616116
.17	614117	616117
.18	614118	616118
.19	614119	616119
.2	614192	616192

Length (inch)	Order No.	
	Steel	CERA
.25	614212	616212
.3	614193	616193
.35	614213	616213
.375 (3/8)	614309	—
.4	614194	616194
.45	614214	616214
.5	614195	616195
.55	614215	616215
.6	614196	616196
.65	614216	616216
.7	614197	616197
.75	614217	616217
.8	614198	616198
.85	614218	616218
.9	614199	616199
.95	614219	616219
1	614201	616201
2	614202	616202
3	614203	616203
4	614204	616204
5	614205	—
6	614206	—
7	614207	—
8	614208	—
10	614222	—
12	614223	—
16	614224	—
20	614225	—

Suffix Number for Selecting Standard and Certificate Provided

ASME	Grade	Steel, CERA
	K	—
	00	-521*
	0	-531*
	AS-1	-541*
	AS-2	-551*

* provided with Inspection Certificate

Example: 614310-521
.01" gage block in grade 00.

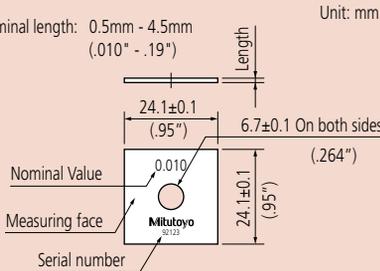
We make custom length gage blocks:
.01 - 20"



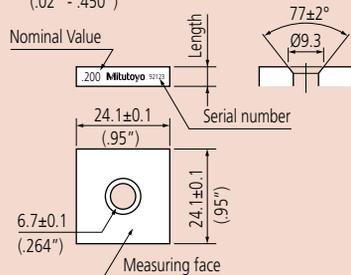
Inspection Certificate

DIMENSIONS

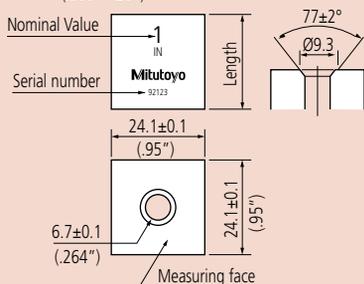
Nominal length: 0.5mm - 4.5mm
(.010" - .19")



Nominal length: 5mm - 14.5mm
(.02" - .450")



Nominal length: 15mm - 500mm
(.500" - 20")



Inch Wear Block

Length (inch)	Order No. Tungsten carbide
.05	615105
.1	615191

Gage Blocks

Square Gage Block Accessories SERIES 516

To expand the variety of square gage block applications, Mitutoyo offers the gage block accessories set. By assembling the items in the set, you can easily and quickly build up a precision measuring instrument.

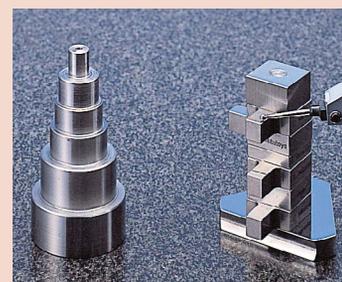
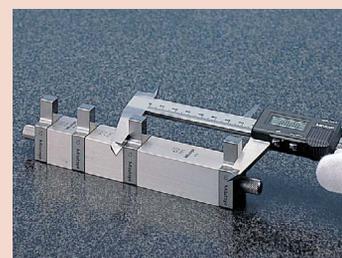


516-611

SPECIFICATIONS

Inch	
Order No. 516-612	Included in set
2 pcs.	Half round jaw .125" (619050)
2 pcs.	Half round jaw .25" (619051)
2 pcs.	Plain jaw (619052)
1 pc.	Center point (619053)
1 pc.	Scriber point (619054)
1 pc.	Block base (619055)
2 pcs.	Flat head screw 1-1/4" (619057)
2 pcs.	Flat head screw 5/8" (619058)
2 pcs.	Slotted head nut (619059)
2 pcs.	Adjustable tie rod 6" (619060)
2 pcs.	Adjustable tie rod 4-1/2" (619061)
1 pc.	Tie rod 3" (619062)
1 pc.	Tie rod 2-1/4" (619063)
1 pc.	Tie rod 1-1/2" (619064)
1 pc.	Tie rod 3/4" (619065)
2 pcs.	Stud (619056)
2 pcs.	Knurled head screw (619066)

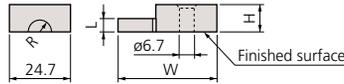
Metric	
Order No. 516-611	Included in set
2 pcs.	Half round jaw 2mm (619070)
2 pcs.	Half round jaw 5mm (619071)
2 pcs.	Plain jaw (619072)
1 pc.	Center point (619073)
1 pc.	Scriber point (619054)
1 pc.	Block base (619074)
2 pcs.	Flat head screw 1-1/4" (619057)
2 pcs.	Flat head screw 5/8" (619058)
2 pcs.	Slotted head nut (619059)
2 pcs.	Adjustable tie rod 6" (619060)
2 pcs.	Adjustable tie rod 4-1/2" (619061)
1 pc.	Tie rod 3" (619062)
1 pc.	Tie rod 2-1/4" (619063)
1 pc.	Tie rod 1-1/2" (619064)
1 pc.	Tie rod 3/4" (619065)
2 pcs.	Stud (619056)
2 pcs.	Knurled head screw (619066)



Need Calibration?

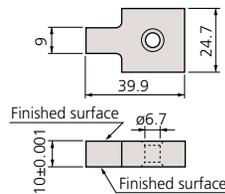
Gage Blocks

Half round jaw:
Used to measure an inside or outside diameter.

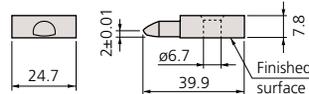


Order No.	R	L	W	H
619070	1.95mm	2mm	33.6mm	5.3mm
619071	4.95mm	5mm	39.9mm	10.3mm
619050	.123"	.125"	33.6mm	5.3mm
619051	.248"	.25"	39.9mm	10.3mm

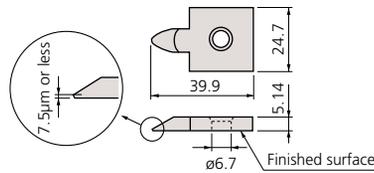
Plain jaw: **619072** (10mm), **619052** (.5")
Used to measure an inside or outside diameter.



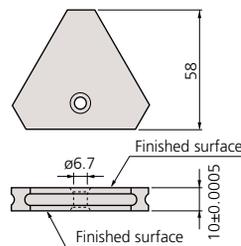
Center point: **619073** (2mm), **619053** (.1")
Used to scribe a workpiece.



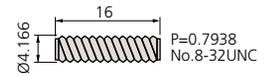
Scriber point: **619054**
Used to scribe a workpiece.



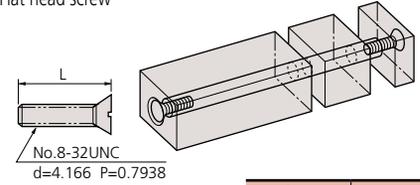
Base: **619074** (10mm), **619055** (.5")
Used as clamps by inserting them into the center hole of a square gage block.



Stud: **619056**

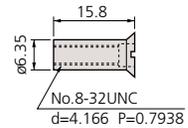


Flat head screw

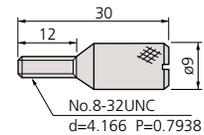


Order No.	L
619057	31.6mm
619058	15.8mm

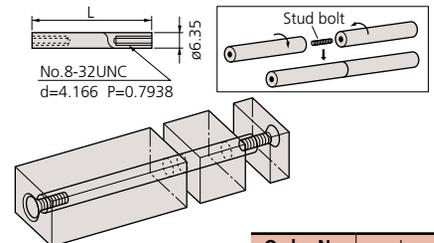
Slotted head nut: **619059**



Knurled head screw: **619066**

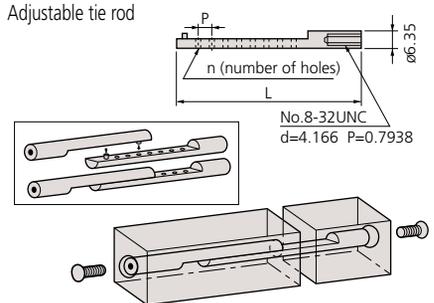


Tie rod



Order No.	L
619065	19mm
619064	38mm
619063	57mm
619062	76mm

Adjustable tie rod



Order No.	L	P	n
619060	124.5mm	6.35mm	14
619061	86.5mm	6.35mm	8

Gage Blocks

Ceraston

Accessory for Gage Blocks

- Alumina-ceramic grinding stone for removing burrs from hard materials such as ceramics that ordinary grinding stones cannot handle.
- Can be used both for steel gage blocks and CERA Blocks.



SPECIFICATIONS

Order No.	Dimensions (W x D x H)	Mass
601645	100 x 25 x 12mm	110g
601644	150 x 50 x 20mm	530g

Maintenance Kit for Gage Blocks SERIES 516

- Includes all necessary maintenance tools for daily care and storage of gage blocks.
- Supplied in a fitted wooden case for portable use.



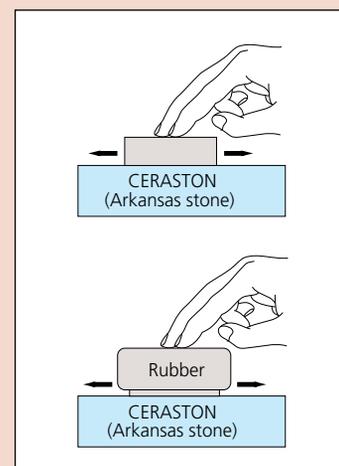
SPECIFICATIONS

Order No.	Assortment of tools and accessories
516-650E	Ceraston (601645): Used for removing burrs on the measuring surface.
	Optical flat (158-117): Used for checking whether burrs exist.
	Tweezers (600004): Used for handling thin gage blocks.
	Blower brush (600005): Used for blowing out dust on the measuring surface.
	Cleaning paper (600006): Used for wiping off rust preventive oil and contamination.
	Artificial leather mat (600007): Used as a gage block mat.
	Reagent bottle (600008): Bottle of wiping solution (100mL)
	Gloves



Removing burrs

- (1) Wipe any dust and oil films from the gage block and the Ceraston (or Arkansas stone) using a solvent.
- (2) Place the gage block on the Ceraston so that the measuring face that has burrs is on the abrasive surface of the stone. While applying light pressure, move the gage block to and fro about ten times (Fig. 1). Use a block rubber for thin gage blocks to apply even pressure (Fig. 2).
- (3) Check the measuring face for burrs with an optical flat. If the burrs have not been removed, repeat step (2). If burrs are too large, they may not be removed with a grinding stone. If so, discard the gage block.

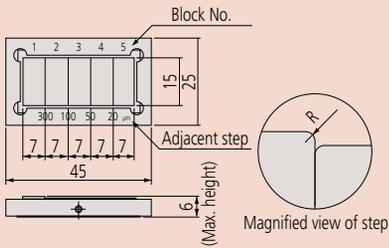


Note: The abrasive surface of a Ceraston must be made flat by lapping it from time to time. After lapping the Ceraston, the lapping powder must be completely removed from the surface to prevent the surface of the gage block from being scratched. Mitutoyo does not carry the Arkansas stone.



Gage Blocks

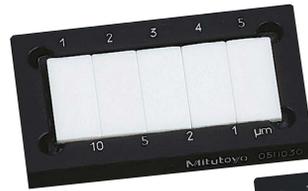
DIMENSION



Step Master SERIES 516

Step master is a master gage used for the z-axis (vertical direction) calibration of optical instruments.

- Each adjacent step is measured down to $0.01\mu\text{m}$ by using an interferometer within $\pm 0.20\mu\text{m}$ allowance.
- Steel and ceramic types are available.



516-498
Ceramic type



516-199
Steel type



SPECIFICATIONS

Metric

Order No.	Step value between adjacent blocks				Remarks
	No. 1 - No. 2	No. 2 - No. 3	No. 3 - No. 4	No. 4 - No. 5	
516-198	10 μm	5 μm	2 μm	1 μm	Steel type
516-199	300 μm	100 μm	50 μm	20 μm	Steel type
516-498	10 μm	5 μm	2 μm	1 μm	Ceramic type
516-499	300 μm	100 μm	50 μm	20 μm	Ceramic type

Available Dimension

Nominal size: .004 to 20" / 0.1 to 1000mm (steel)
.1 to 20" / 0.5 to 500mm (ceramic)

Nominal pitch: 0.0005mm (up to 100mm)
0.001mm (over 100mm)

Minimum section dimension:
Approx. .24 x .24" / 6 x 6mm

Maximum section dimension:
Approx. 5.5 x 5.5" / 140 x 140mm (steel)
Approx. 6.3" Dia. / $\phi 160\text{mm}$ (steel, cylindrical)
Approx. 3.94 x 1.97" / 100 x 50mm (ceramic)
Approx. .24" Dia. / $\phi 60\text{mm}$ (ceramic, cylindrical)

Accuracy: Gage Block Grade level

Special materials of low expansion glass and low expansion ceramic are available.

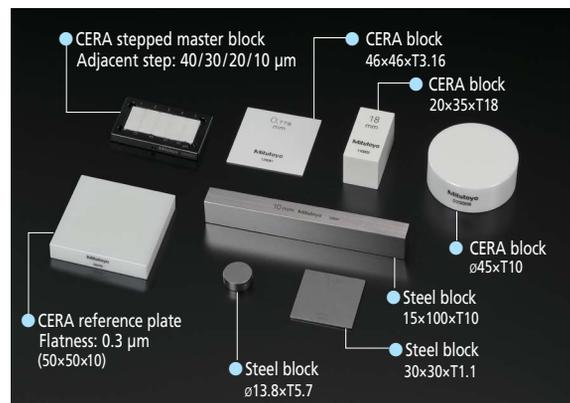
Made-to-order Block & Reference

- Mitutoyo can provide gage blocks and reference gages to your size and design.



- A: Ceramic rectangular gage block (21.94mm)
- B: Ceramic square gage block (2.1005mm)
- C: Steel square gage block (10.72mm)
- D: Steel square gage block (2.2065mm)
- E: Ceramic rectangular gage block (20.64mm)
- F: Steel rectangular gage block (31.5mm)
- G: Ceramic rectangular gage block (6.34mm)
- H: Steel rectangular gage block (3.603mm)
- I: Steel rectangular gage block (1.1505mm)
- J: Steel rectangular gage block (0.555mm)
- K: Steel rectangular gage block (6.156mm)
- L: Steel rectangular gage block (9.694mm)
- M: Steel rectangular gage block (10.02mm)

Special reference gages and step master (T: nominal size)



Unit: mm



Find a Distributor

Gage Block Calibration



Gage Block Comparator GBCD-250 SERIES 565 — Manual Comparator with Dual Gage Heads

- Gage blocks between 0.1mm and 250mm easily can be compared to master gage blocks sets.
- Rectangular gage block holder kit included
- Provided standard: Main Unit & Display Unit with User's manual, Certificate of Inspection, A2LA accredited Field Service Installation and NIST-traceable Certificate of Calibration
- This system employs two LGH, high accuracy, super wide-range gage heads (range = ± 3 mm)
- Wide-Range function allows an entire Gage Block set to be calibrated with as few as 7 Master Gage Blocks
- Dual head design allows accurate measurement, even when gage blocks have a slight curvature

SPECIFICATIONS

Inch / Metric	
Model No.	GBCD-250
Order No.	565-151A
Range	0.1mm - 250mm / .004 - 10"
Resolution	0.000001mm(0.01 μ m) / .000001in(.1 μ in)
Comparison accuracy in narrow range (20°C)	$\pm(0.03+0.3L/1000)\mu\text{m}^*$ L = Gage block length (mm)
Wide Range Accuracy (within +/-3mm range)	$\pm(0.06+0.3L/1000)\mu\text{m}$
Measuring units	Laser Hologage (upper and lower)
Operating condition	Temperature: 20°C \pm 1°C Humidity: 30% RH to 60% RH
Data output	Via SPC output port
Dimensions (W x D x H)	Main unit: 455 x 318 x 691mm Display unit: 345 x 397 x 187mm
Mass	Main unit: Approx. 52kg Display unit: Approx. 9kg

* 95% confidence interval (not including the calibration error of the standard gage block).



Standard Accessories

Main Unit – Long Range
Display Unit – EH-S counter with output
User's Manual
Installation - A2LA accredited Field Service installation
Certificate of Calibration - NIST-traceable
Certificate of Inspection from the factory

Optional Accessories

962723: Gage head calibration kit
02ASD130: Square gage block holder kit
02ASF040: Heat protection shield
02ASQ953: GBPAK-M tracking software
Supporting OS: Windows XP, Vista, 7, or 10
937179T: Foot Switch
936937: Connecting cable
PMICPU002 Dell CPU, 64 BIT, WIN10
PMIMON002 monitor, Dell 22" widescreen

Gage Block Comparator GBCD-100A SERIES 565 — Automatic-Type Comparator with Dual Gage Heads

The GBCD-100A Automatic Gage Block Comparator is an easy-to-operate dual-head gage block inspecting system. It automatically compares workpieces with a standard gage block and determines accuracies such as central length, maximum length, minimum length and parallelism through the operation of an optional personal computer.

SPECIFICATIONS

Model No.	GBCD-100A
Order No.	565-172
Resolution	0.00001mm (0.01 μ m) / .000001"
Range	0.5mm - 100mm / .02 - 4"
Measuring unit	Differential (dual-head) type Mu-Checker
Accuracy in narrow range (20°C)	$\pm(0.03+0.3L/1000)\mu\text{m}^*$ L = Gage block length (mm)
Measuring force	Upper gage head: 1N (100gf) Lower gage head: 0.6N (60gf)
Air requirement	400kPa (4kgf/cm ²)
Operating condition	Temperature: 20°C \pm 1°C Humidity: 58%RH \pm 15%RH
Dimensions (W x D x H)	Main unit: 710 x 366 x 783mm Electronic unit: 160 x 410 x 382mm
Mass	Main unit: 120kg Electronic unit: 14kg

* 95% confidence interval (not including the calibration error of the standard gage block).



Standard Accessories

Main Unit, Controller, GBPAK-A (software), User's Manual & Inspection Certificate.

Optional Accessories

516-146-E1: Gage block set for GBCD calibration
PMICPU002 Dell CPU, 64 BIT, WIN10
PMIMON002 monitor, Dell 22" widescreen



Reference Gages



Technical Data

Graduation: .00001" or 0.001mm
 Counter Resolution: .001" or 0.01mm
 Character Height: .16" / 4mm
 Micrometer Head
 Travel stroke: 1" or 20mm
 Pitch: .025"/rev or 0.5mm/rev
 Hysteresis: .00004" or 1µm
 Provided with inspection certificate.

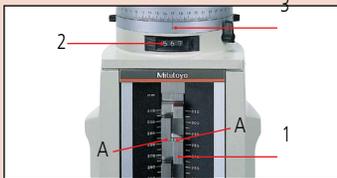
Standard Accessories

Reference Block: 11mm for 515-322
 Reference Block: .3" for 515-310, 515-311

Optional Accessories

515-112: Auxiliary block kit for bore gage (mm)
515-119: Auxiliary block kit for bore gage (for **515-310**)
515-121: Auxiliary block kit for bore gage (for **515-311**)
 ———: Riser block

Reading



Height A

1. Scale 280 mm
 2. Counter 5.67 mm
 3. Thimble 0.000 mm
-
- 285.670 mm

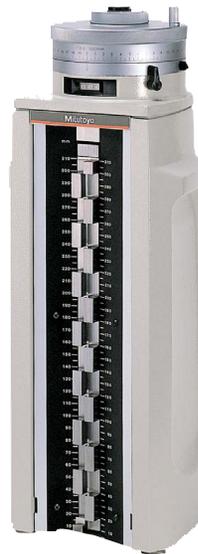


Got Questions?

Height Master SERIES 515

For calibrating and setting height gages.

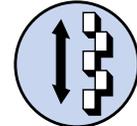
- Models with staggered arrangement of block stack have two measuring faces on the same level, one facing up and the other down (except for **515-310**).
- Each height master is supplied with a gage block for zero-setting.
- Supplied in fitted wooden case.



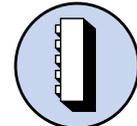
515-322



515-310



Staggered 20mm blocks (movable)



Vertical orientation



Riser block

SPECIFICATIONS

Inch							
Range (H)	Order No.	Block step	Graduation	Block Pitch Accuracy	Parallelism of Block	Micrometer Head Accuracy	Mass (kg)
.2" < H ≤ 12.2"	515-310	.5" (straight)	.00001"	±.00005"	.00004"	±.00005"	23
.2" < H ≤ 12.2"	515-311	1" (staggered)	.00001"	±.00005"	.00004"	±.00005"	23

Metric							
Range (H)	Order No.	Block step	Graduation	Block Pitch Accuracy	Parallelism of Block	Micrometer Head Accuracy	Mass (kg)
5 < H ≤ 310mm	515-322	20mm (staggered)	0.001mm	±1.5µm	1µm	±1µm	23

Reference Gages

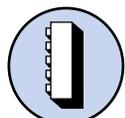
Digital Height Master SERIES 515

For calibrating and setting height gages.

- Standard model with a digital display, featuring all essential specifications required for versatile height standard.
- With SPC output.
- Each height master is supplied with a gage block for zero setting.



Staggered 20mm blocks (movable)



Vertical orientation



Riser block



515-374

SPECIFICATIONS

Inch / Metric							
Range (H)	Order No.	Block step	Resolution	Block Pitch Accuracy	Parallelism	Micrometer Head Accuracy	Mass (kg)
.5" < H ≤ 12"	515-375	1" (staggered)	.0001" / 0.001mm	±.0001"	.00005"	±.0001"	9.5
.5" < H ≤ 18"	515-377	1" (staggered)	.0001" / 0.001mm	±.0001"	.0001"	±.0001"	13.6
.5" < H ≤ 24"	515-379	1" (staggered)	.0001" / 0.001mm	±.0001"	.0001"	±.0001"	16.0

Metric							
Range (H)	Order No.	Block step	Resolution	Block Pitch Accuracy	Parallelism	Micrometer Head Accuracy	Mass (kg)
10 < H ≤ 310mm	515-374	20mm (staggered)	0.001mm	±1.5µm	2µm	±2µm	9.5
10 < H ≤ 460mm	515-376	20mm (staggered)	0.001mm	±2.5µm	2.5µm	±2µm	13.6
10 < H ≤ 610mm	515-378	20mm (staggered)	0.001mm	±3.5µm	2.5µm	±2.5µm	16.0



Technical Data

Resolution (LCD): .0001" or 0.001mm
 Graduation: .0001" or 0.002mm
 Character Height .21" / 5.4mm

Micrometer Head

Travel Stroke: 1" or 20mm
 Pitch: .025"/rev or 0.5mm/rev
 Hysteresis: .0001" for all inch models
 0.002mm for 300mm models
 0.0025mm for 450 & 600mm models
 Battery: SR44 (2 pcs.), **938882**
 Battery life: Approx. 1.8 years under normal use

Function

Zero-setting, Presetting, ABS/INC switching, Data hold, Data output, inch/mm conversion (on inch/metric models only)
 Alarm: Low voltage, Counting value composition error

Standard Accessories

Reference Block: 11mm for Metric Height Master **611621-031**
 Reference Block: .6" for for Inch Height Master **611196-531**
 Provided with inspection certificate.

Optional Accessories

- 515-111:** Auxiliary block kit for bore gage (mm)
- 515-120:** Auxiliary block kit for bore gage (inch)
- : Riser block (see page E-27.)
- 959149:** SPC cable (40" / 1m)
- 959150:** SPC cable (80" / 2m)
- 050019:** Fitted mahogany case for 12" / 300mm model
- 050059:** Fitted mahogany case for 18" / 450mm model
24" / 600mm model

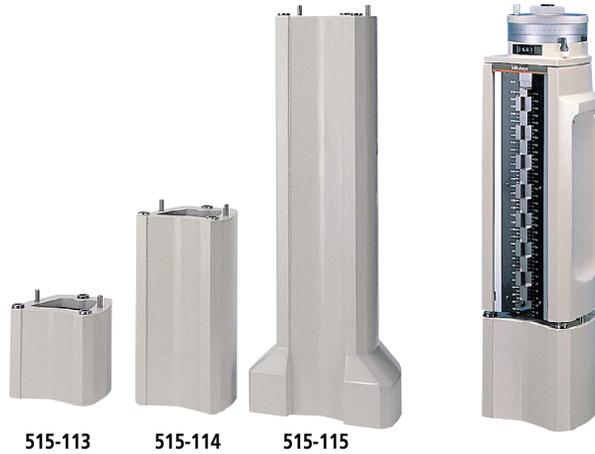


Talk to Sales

Reference Gages

Riser Blocks SERIES 515

- These riser blocks are specially designed for standard/Digimatic height masters.



515-113

515-114

515-115

SPECIFICATIONS

Inch			
Height	Order No.	Accuracy of height	Mass (kg)
6"	515-116	±20µin	5.7
12"	515-117	±40µin	11.3
24"	515-118	±80µin	31

Metric			
Height	Order No.	Accuracy of height	Mass (kg)
150mm	515-113	±0.6µm	5.7
300mm	515-114	±1.0µm	11.3
600mm	515-115	±2.0µm	31

Auxiliary Block Kit SERIES 515 — for Bore Gage

- Used for efficient zero-setting of dial bore gages and tubular inside micrometers (18 - 150mm) on a Height Master.



515-112

Bore gage zero-setting



SPECIFICATIONS

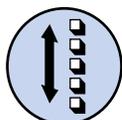
Inch	
Order No.	Applicable height master
515-119	Universal Height Master, Height Master (515-310)
515-120	Digimatic Height Master
515-121	Height Master (515-311)

Metric	
Order No.	Applicable height master
515-110	Universal Height Master
515-111	Digimatic Height Master
515-112	Height Master

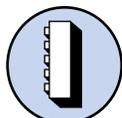
Reference Gages

Universal Height Master SERIES 515 — Use in Vertical and Horizontal Orientation

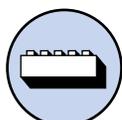
- The Universal Height Master is designed for both vertical and horizontal orientations, providing a wide range of applications, such as accuracy checking of machine tool table movements.
- Fitted wooden case supplied.



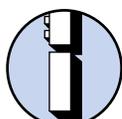
Single-row 10mm blocks (movable)



Vertical orientation



Horizontal orientation



Riser block

515-520

SPECIFICATIONS

Inch							
Range (R)	Order No.	Block step	Graduation	Block Pitch Accuracy	Parallelism of Block	Micrometer Head Accuracy	Mass (kg)
.2" < R ≤ 18.2"	515-512	.5" (straight)	.00001"	±.00005"	.00006"	±.00004"	42
.2" < R ≤ 24.2"	515-510	.5" (straight)	.00001"	±.0001"	.00006"	±.00004"	50
.2" < R ≤ 40.2"	515-513	.5" (straight)	.00001"	±.00015"	.00008"	±.00006"	63.5

Metric							
Range (R)	Order No.	Block step	Graduation	Block Pitch Accuracy	Parallelism of Block	Micrometer Head Accuracy	Mass (kg)
5 < R ≤ 610mm	515-520	10mm (straight)	0.001mm	±1.5µm	1.0µm	±1.2µm	42
5 < R ≤ 1010mm	515-523	10mm (straight)	0.001mm	±3.5µm	2.5µm	±1.5µm	63.5



Technical Data

Graduation: 0.001mm or .00001"
 Counter Resolution: .001" or 0.01mm
 Character Height: .16" / 4mm
 Block arrangement: Straight arrangement

Micrometer Head

Travel stroke: 1" or 20mm
 Pitch: .025"/rev or 0.5mm/rev
 Hysteresis: .00004" / 1.2µm up to 24.2" / 610mm
 .00006" / 1.5µm for 40.2" / 1010mm
 Block pitch accuracy: ±1.5µm (0 < R ≤ 310mm)
 ±2.5µm (310 < R ≤ 610mm)
 ±3.5µm (610 < R ≤ 1010mm)
 Parallelism of blocks: 1.0µm (0 < R ≤ 310mm)
 2.5µm (310 < R ≤ 1010mm)
 Provided with inspection certificate.

Optional Accessories

- 900574***: Supporting base for vertical operation
 Mass: 3kg
 (*supplied as a standard for **515-523** and **515-513**)
- 515-112**: Auxiliary block kit for bore gage (mm)
515-119: Auxiliary block kit for bore gage (inch)



Using in horizontal orientation



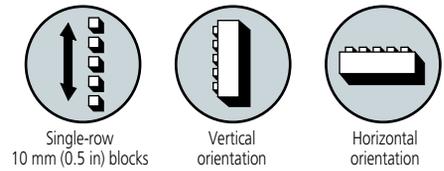
Supporting base



Reference Gages

High-Accuracy Check Master HMC-H SERIES 515

- Designed to check the accuracy of table movements of machine tools and calibrate CMMs. Permanently wrung stack of gage blocks is housed in a rigid frame.
- Can be used in either vertical or horizontal orientation.



SPECIFICATIONS

Inch					
Order No.	515-710	515-711	515-712	515-713	
Range (H)	12.5 in	18.5 in	24.5 in	40.5 in	
Block step	0.5 in				
Block pitch accuracy	$H \leq 12.5$ in	$\pm 100 \mu\text{m}$			
	$12.5 \text{ in} < H \leq 24.5$ in	—	—	$\pm 150 \mu\text{m}$	
	$24.5 \text{ in} < H \leq 40.5$ in	—	—	—	$\pm 200 \mu\text{m}$
Parallelism of blocks	$H \leq 12.5$ in	50 μm			
	$12.5 \text{ in} < H \leq 24.5$ in	—	60 μm		
	$24.5 \text{ in} < H \leq 40.5$ in	—	—	—	80 μm
Mass	7 kg	10 kg	13 kg	22 kg	

Metric					
Order No.	515-720	515-721	515-722	515-723	515-724
Range (H)	310 mm	450 mm	610 mm	1010 mm	1510 mm
Block step	10 mm				
Block pitch accuracy	$H \leq 310$ mm	$\pm 2.5 \mu\text{m}$			
	$310 < H \leq 610$ mm	—	$\pm 3.5 \mu\text{m}$		
	$610 < H \leq 1010$ mm	—	—	—	$\pm 5.0 \mu\text{m}$
Parallelism of blocks	$H \leq 310$ mm	1.2 μm			
	$310 < H \leq 610$ mm	—	1.5 μm		
	$610 < H \leq 1010$ mm	—	—	2.0 μm	
Mass	$1010 < H \leq 1510$ mm	—	—	—	2.5 μm
	Mass	7 kg	10 kg	13 kg	22 kg

Note 1: The block pitch accuracy and the parallelism of blocks are relative to the main unit reference surface.

Note 2: Supplied with a wooden storage case as standard.

Note 3: High-accuracy type is available by special order.



Need Repair?

Reference Gages

Square Master

SERIES 311 — Squareness / Straightness Measuring Instrument

- Squareness (perpendicularity) and straightness measurements can be performed accurately and efficiently by moving a lever.
- With a dial test indicator for reading displacements.
- Its own squareness is adjustable for high-accuracy measurement.



311-215



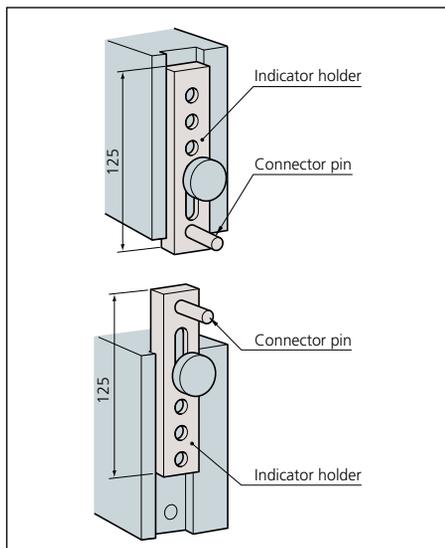
311-225



311-245

SPECIFICATIONS

Metric				
Vertical travel	Order No.	Squareness	Straightness	Mass (kg)
150mm	311-215	3 μ m	2 μ m	13.7
250mm	311-225	6 μ m	2.5 μ m	16.2
450mm	311-245	9 μ m	3.5 μ m	24



Technical Data

Squareness:	Refer to the list of specifications
Straightness:	Refer to the list of specifications
Dial test indicator provided	
Range:	0.2mm
Graduation:	0.002mm
Accuracy:	3 μ m

Optional Accessory

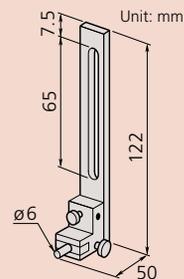
- : Riser blocks (see page E-27.)*
- 900571: Adjustable holder
- 900551: Extension holder
- 900565: Feeler**

*Not available for 450mm model.

**Adapter (902803) is required for metric model.

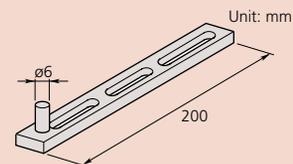
Adjustable holder

No.900571



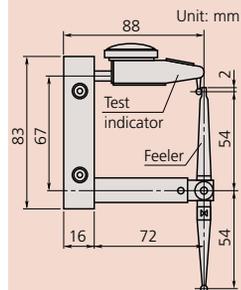
Extension holder

No.900551



Feeler

No.900565



Where to Buy



Reference Gages

Technical Data

Accuracy (at 20°C): $(0.5+L/1000)\mu\text{m}$,
 L = Measured length (mm)
 Glass material: Low expansion glass
 Thermal expansion coefficient: $8 \times 10^{-6}/\text{K}$
 Graduation: 1mm
 Graduation thickness: 4 μm
 Mass: 0.75kg (250mm), 1.8kg (500mm)

SPECIFICATIONS

Metric				
Range	Order No.	L	W	T
250mm	182-501-50	280mm	20mm	10mm
250mm	182-501-60*	280mm	20mm	10mm
500mm	182-502-50	530mm	30mm	20mm
500mm	182-502-60*	530mm	30mm	20mm

*with English JCSS certificate.

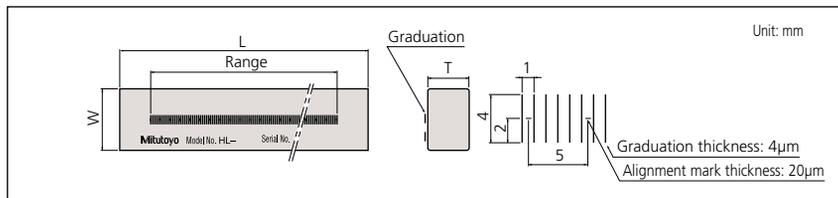
Standard Scales

SERIES 182 — Made of Low-Expansion Glass

- High-precision glass scales manufactured under the Mitutoyo leading-edge Linear Scale production technology.
- High accuracy is guaranteed to be used as a standard for calibrating graduated scales.



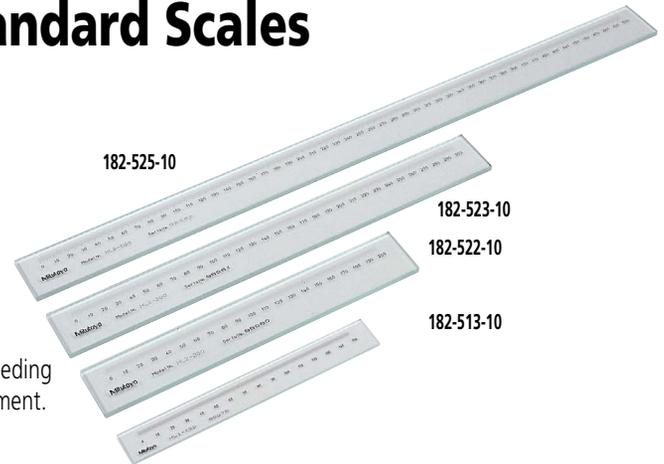
DIMENSIONS



Working Standard Scales

SERIES 182

- High-precision glass scales manufactured with Mitutoyo leading-edge linear scale production technology.
- Ideal for checking magnification accuracy of profile projectors and microscopes, and the table feeding accuracy of measuring equipment.



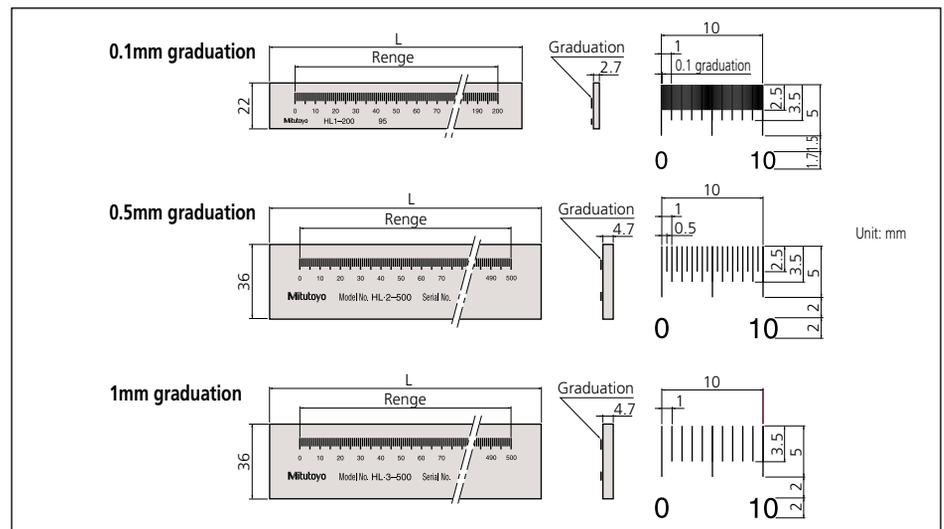
Technical Data

Accuracy (at 20°C): $(1.5+2L/1000)\mu\text{m}$,
 L = Measured length (mm)
 Glass material: Sodium glass
 Thermal expansion coefficient: $8.5 \times 10^{-6}/\text{K}$
 Graduation: 0.1mm (thickness: 20 μm)
 0.5mm (thickness: 50 μm)
 1mm (thickness: 100 μm)

SPECIFICATIONS

Metric				
Range	Order No.	Graduation	L	Mass
50mm	182-511-10	0.1mm	75mm	0.23kg
100mm	182-512-10	0.1mm	125mm	0.24kg
150mm	182-513-10	0.1mm	175mm	0.35kg
200mm	182-514-10	0.1mm	225mm	0.36kg
100mm	182-521-10	0.5mm	130mm	0.27kg
200mm	182-522-10	0.5mm	230mm	0.32kg
300mm	182-523-10	0.5mm	330mm	0.57kg
400mm	182-524-10	0.5mm	430mm	0.71kg
500mm	182-525-10	0.5mm	530mm	0.86kg
250mm	182-531-10	1mm	280mm	0.55kg
500mm	182-532-10	1mm	530mm	0.86kg
750mm	182-533-10	1mm	780mm	1.22kg
1000mm	182-534-10	1mm	1030mm	1.54kg

DIMENSIONS



Reference Gages

High-Precision Square Series 311

The High-Precision Square gage is used for inspecting the travel straightness and axial perpendicularity of moving elements on equipment, such as machine tools, CMMs, form measuring machines and semiconductor-related equipment.

- Four precision-lapped reference surfaces.
- Better than 1µm/300mm straightness and perpendicularity.



311-111



311-112



311-113

SPECIFICATIONS

Metric		
Order No.	Dimension (W x L x T)	Mass
311-111	90 x 110 x 25mm	1.5kg
311-112	160 x 210 x 25mm	5.0kg
311-113	260 x 310 x 30mm	14.0kg

* 311-113 is supplied with a removable handle.

Edge & Center Finders

- The Edge and Center Finders are hardened and ground on all surfaces.

SPECIFICATIONS

Order No.	Shank (DIA)	Tip (DIA)	Remarks
050101	3/8" (.375")	.20"	Edge Type
050102	1/2" (.50")	.20"	Edge Type
050103	3/8" (.375")	.20"	Center Type
050104	1/2" (.50")	.20"	Center Type
050105	.375"/10mm	10mm	Edge Type
050106	10mm	10mm	Edge Type
050109	1/2" (.50")	.50"	Edge Type
050110	1/2" (.50")	.20", .50"	Double Edge Finder



050101



050102



050103



050104



050105



050106



Get a Quote

Reference Gages

Digital Hand Tachometers SERIES 982

- New digital hand tachometers are compact and easy to handle.
- NIST certification is supplied with each digital hand tachometer.
- Model PH-200LC (982-552) has laser diode detection and a combination of contact and non-contact measurement.
- Supplied with plastic carrying case.



982-551

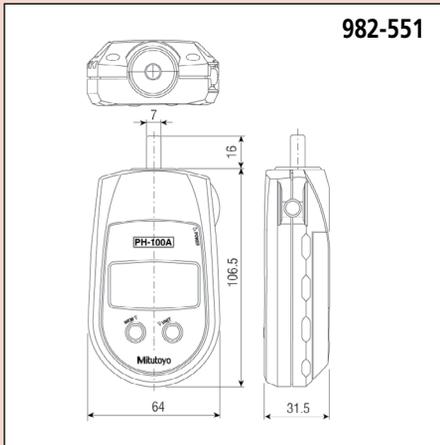


982-552

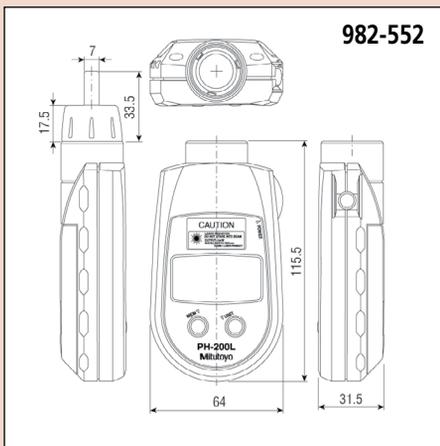
CAUTION

**LASER RADIATION
DO NOT STARE INTO BEAM
OUTPUT <1mW
WAVELENGTH 650nm
CLASS II LASER PRODUCT**

DIMENSIONS



982-551



982-552

SPECIFICATIONS

Order No.	982-551	982-552
Model No.	PH-100A	PH-200LC
Revolution per minute	1.0 – 25,000 rpm	—
Rotation speed	—	Non-contact: 6.0 – 99,999 rpm; Contact: 6.0 – 25,000 rpm
Measuring accuracy	1.0 – 599.9rpm: ±1rpm, 600.0 – 25,000 rpm: ±0.006% and ±0.5 digit	6.0 – 599.9 rpm: ±1rpm, 600.0 – 99,999 rpm ±0.006% and ±0.5 digit
Surface, Speed, Length	±0.4% and 1 digit	±0.4% and ±1 digit
Detection	Optical coupler, 20 pulses per revolution	Laser diode
Outside dimensions	4.83" L x 2.52" W x 1.24" H (122.5mm x 64mm x 31.5mm)	4.55" L x 2.52" W x 1.24" H Overall length with contact adapter: 149mm
Mass	170 g	160 g
Power	Battery: AA 3 pcs.	Battery: AA 3 pcs.

Optional Accessories for Digital Hand Tachometers

Order No.	Description	Dimension	Drawing
010049	Cone Adapter, Standard	D = 1/2"	
010051	Cone Adapter, 3/4"	D = 3/4"	
010052	Cone Adapter, 1-1/4"	D = 1-1/4" d = 1/2"	
010053	Funnel Adapter, Standard	D = 1/2"	
010054	Funnel Adapter, 3/4"	D = 3/4"	
010055	Measuring Wheel FPM (6" cir), Standard	D = 1.91"	
010056	Measuring Wheel FPM (12" cir)	D = 3.82"	
010057	Measuring Wheel YPM (0.1 yard cir)	D = 1.15"	
010058	Measuring Wheel MPM (0.1 meter cir)	D = 1.25"	
010059	Reflective Tabs 1/2" square (35 pcs)		
010060	Extension Shaft (3" length)		

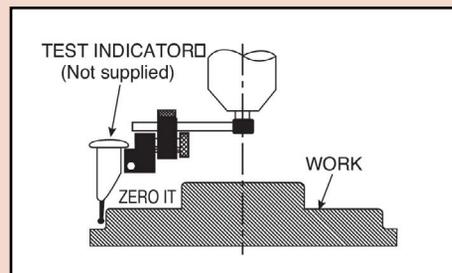
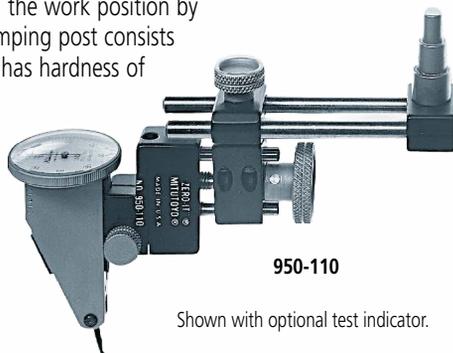
Gage Blocks

Zero-It SERIES 950

- "Zero-It" is specially designed for Mitutoyo Test Indicators with Dovetails, and functions as a quick and practical work positioning device.
- Attach "Zero-It" directly to the collet, then zero in the work position by reading Mitutoyo Test Indicator. The hardened clamping post consists of three ODs, from top, 1/4", 3/8" and 1/2", and has hardness of approximately 58 to 60 Rockwell C.

SPECIFICATIONS

Order No.	Coarse	Fine
950-110	10°	3/8"



Zero-Setter SERIES 950

- Fast and sure establishment of "0" reference point with built-in indicator.
- Spring loaded setting face to safe guard against damage from over run.
- Body dia. 1.44" (36.5mm) Wooden case included.



SPECIFICATIONS

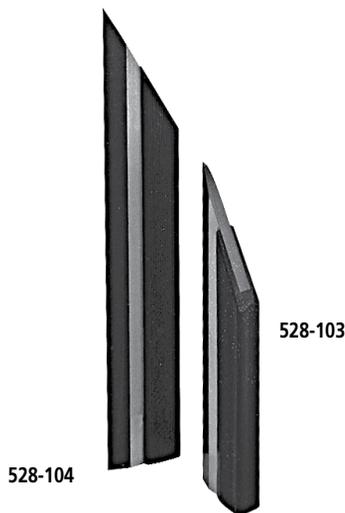
Order No.	Height	Graduation
950-111	1"	.0005"

Knife Edge Straight Edge SERIES 528

- The test edge is approximately .004" in thickness, a cross section of which has radius to provide a straight line contact with the work surface. Straightness is $\pm .00005$ ".
- For ease of inspection, the blade is dyed in black, and the upper edge is covered with a grip plate. The acute angle is 30 degrees.

SPECIFICATIONS

Order No.	Length	Cross section
528-100	2"/50 mm	25 x 6 mm
528-101	3"/75 mm	
528-102	4"/100 mm	
528-110	5"/125 mm	
528-103	6"/150 mm	
528-104	8"/200 mm	32 x 7 mm
528-105	12"/300 mm	
528-106	16"/400 mm	
528-107	20"/500 mm	50 x 10 mm



Need Support?

Gage Blocks

Precision Vices Series 930

- Made of hardened, precision ground tool steel.

SPECIFICATIONS

Order No.	Parallelism	Squareness
930-611	0.002 mm / 100 mm	0.005 mm / 100 mm
930-601		
930-602		
930-612		
930-606		
930-607		
930-630		
930-631		
930-632		
930-633		
930-616		0.03 mm / 100 mm



930-611



930-602



930-616



930-630



930-607



930-632



930-626



930-628



930-629



930-620

Precision Vices

Order No.	Description
930-611	30MM clamping width
930-601	80MM clamping width
930-602	120MM clamping width
930-612	150MM clamping width

Precision Vice - with hydraulic system for max clamping force of 14.7kN

Order No.	Description
930-616	150MM clamping width, hydraulic

Precision Vices - with pull down clamping action

Order No.	Description
930-606	80MM clamping width, vertical & horizontal vee
930-607	120MM clamping width, vertical & horizontal vee
930-630	25MM clamping width, vertical vee
930-631	50MM clamping width, horizontal vee
930-632	150MM clamping width, horizontal vee
930-633	200MM clamping width, no vee

Precision Sine Plates

Order No.	Description
930-626	Precision Sine Plate
930-628	Precision Sine Plate, compound axis
930-629	Precision Sine Plate, compound axis, magnetic chuck

Precision Sine Vices

Order No.	Description
930-620	Precision Sine Vice - 40mm Clamping Width
930-621	Precision Sine Vice - 80mm Clamping Width - type 1
930-622	Precision Sine Vice - 120mm Clamping Width
930-623	Precision Sine Vice - 50mm Clamping Width
930-624	Precision Sine Vice - 80mm Clamping Width - type 2
930-625	Precision Sine Vice - 80mm Clamping Width - compound

Reference Gages

Steel Rules SERIES 182

- Clear graduations on satin-chrome finish.
- Stainless tempered.



182-101



182-201



182-302

SPECIFICATIONS

Metric Wide Rigid Rules

Order No.	Graduations (mm)	Range (mm)	Width (mm)
182-111	1, 0.5 (on both faces)	150	19
182-131		300	25
182-151		450	30
182-171		600	30

Metric Fully-Flexible Rules

Order No.	Graduations (mm)	Range (mm)	Width (mm)
182-211	1, 0.5 (on both faces)	150	12
182-231		300	12
182-251		450	19
182-271		600	19

Inch/Metric Semi-Flexible Rules

Order No.	Graduations*	Range	Width (in)
182-302	1/16 in, 1/32 in, 1/64 in, 1 mm, 0.5 mm	6 in/150 mm	0.51
182-303		8 in/200 mm	0.51
182-305		12 in/300 mm	0.59
182-307		20 in/500 mm	0.59
182-309	40 in/1000 mm	0.59	

* Engraved on the front side only.

Inch/Metric Wide Rigid Rules

Order No.	Graduations	Range	Width (in)
182-105	1/32 in, 1/64 in, 1 mm, 0.5 mm	6 in/150 mm	0.75
182-125		12 in/300 mm	0.98
182-145		18 in/450 mm	1.18
182-165		24 in/600 mm	1.18
182-106	1/50 in, 1/100 in, 1 mm, 0.5 mm	6 in/150 mm	0.75
182-126		12 in/300 mm	0.98
182-107	1/10 in, 1/100 in, 1 mm, 0.5 mm	6 in/150 mm	0.75
182-108	1/10 in, 1/50 in, 1 mm, 0.5 mm	6 in/150 mm	0.75

Inch/Metric Fully-Flexible Rules

Order No.	Graduations	Range	Width (in)
182-205	1/32 in, 1/64 in, 1 mm, 0.5 mm	6 in/150 mm	0.47
182-225		12 in/300 mm	0.47
182-245		18 in/450 mm	0.75
182-265		24 in/600 mm	0.75
182-206	1/50 in, 1/100 in, 1 mm, 0.5 mm	6 in/150 mm	0.47
182-226		12 in/300 mm	0.47
182-207	1/10 in, 1/100 in, 1 mm, 0.5 mm	6 in/150 mm	0.47
182-208	1/10 in, 1/50 in, 1 mm, 0.5 mm	6 in/150 mm	0.47

Inch Wide Rigid Rules

Order No.	Graduations (in)	Range (in)	Width (in)
182-101	1/8, 1/16, 1/32, 1/64	6	0.75
182-121		12	0.98
182-141		18	0.71
182-161		24	1.18
182-102	1/50, 1/100, 1/32, 1/64	6	0.75
182-122		12	0.98
182-142		18	1.18
182-162		24	1.18
182-103	1/10, 1/100, 1/32, 1/64	6	0.75
182-123		12	0.98
182-143		18	1.18
182-163		24	1.18
182-104	1/10, 1/50, 1/32, 1/64	6	0.75
182-124		12	0.98

Inch Fully-Flexible Rules

Order No.	Graduations (in)	Range (in)	Width (in)
182-201	1/8, 1/16, 1/32, 1/64	6	0.47
182-221		12	0.47
182-241		18	1.18
182-261		24	0.75
182-202	1/50, 1/100, 1/32, 1/64	6	0.47
182-222		12	0.47
182-242		18	0.75
182-262		24	0.75
182-203	1/10, 1/100, 1/32, 1/64	6	0.47
182-223		12	0.47
182-243		18	0.75
182-263		24	0.75
182-204	1/10, 1/50, 1/32, 1/64	6	0.47
182-224		12	0.47



Need Service?

Reference Gages

Steel Rules

SERIES 182

- Clear graduations on satin-chrome finish.
- Stainless tempered.



182-265



182-223

SPECIFICATIONS

Full-Flexible Rules (thickness 1/64")

Order No.	Size	Graduations				Width	Accuracy (Length)
182-201	6"(4R)	1/8	1/16	1/32	1/64th	1/2"	+0.004" / -0.0035" (+0.1mm / -0.09mm)
182-202	6"(16R)	1/32	1/64	1/50	1/100th	1/2"	
182-203	6"(5R)	1/32	1/64	1/10	1/100th	1/2"	
182-204	6"(3R)	1/32	1/64	1/10	1/50th	1/2"	
182-205	6" x 150mm	1/32	1/64	1mm	0.5mm	1/2"	
182-206	6" x 150mm	1/50	1/100	1mm	0.5mm	1/2"	
182-207	6" x 150mm	1/10	1/100	1mm	0.5mm	1/2"	
182-208	6" x 150mm	1/10	1/50	1mm	0.5mm	1/2"	
182-211	150mm	1mm	0.5mm	1mm	0.5mm	12mm	+0.005" / -0.0035" (+0.13mm / -0.09mm)
182-221	12"(4R)	1/8	1/16	1/32	1/64th	1/2"	
182-222	12"(16R)	1/32	1/64	1/50	1/100th	1/2"	
182-223	12"(5R)	1/32	1/64	1/10	1/100th	1/2"	
182-224	12"(3R)	1/32	1/64	1/10	1/50th	1/2"	
182-225	12" x 300mm	1/32	1/64	1mm	0.5mm	1/2"	
182-226	12" x 300mm	1/50	1/100	1mm	0.5mm	1/2"	+0.006" / -0.0035" (+0.15mm / -0.09mm)
182-231	300mm	1mm	0.5mm	1mm	0.5mm	12mm	
182-141	18"(4R)	1/8	1/16	1/32	1/64	3/4"	
182-242	18"(16R)	1/32	1/64	1/50	1/100th	3/4"	
182-243	18"(5R)	1/32	1/64	1/10	1/100th	3/4"	
182-245	18" x 450mm	1/32	1/64	1mm	0.5mm	3/4"	+0.007" / -0.0035" (+0.18mm / -0.09mm)
182-251	450mm	1mm	0.5mm	1mm	0.5mm	18mm	
182-261	24"(4R)	1/8	1/16	1/32	1/64	3/4"	
182-262	24"(16R)	1/32	1/64	1/50	1/100th	3/4"	
182-263	24"(5R)	1/32	1/64	1/10	1/100th	3/4"	
182-264	24"(3R)	1/32	1/64	1/10	1/50th	3/4"	
182-265	24" x 600mm	1/32	1/64	1mm	0.5mm	3/4"	
182-271	600mm	1mm	0.5mm	1mm	0.5mm	18mm	

Semi-Flexible Rules

SERIES 182

- Engraved on frontside only



SPECIFICATIONS

Inch / Metric

Order No.	Size	Graduations				Width	Accuracy (Length)
182-301	4" x 100mm	1/2mm	1mm	1/32	1/64	1/16th	+0.004" / -0.0035" (+0.1mm / -0.09mm)
182-302	6" x 150mm	1/2mm	1mm	1/32	1/64	1/16th	
182-303	8" x 200mm	1/2mm	1mm	1/32	1/64	1/16th	+0.005" / -0.0035"
182-305	12" x 300mm	1/2mm	1mm	1/32	1/64	1/16th	+0.13mm / -0.09mm
182-307	20" x 500mm	1/2mm	1mm	1/32	1/64	1/16th	+0.007" / -0.0035" (+0.18mm / -0.09mm)
182-309	40" x 1000mm	1/2mm	1mm	1/32	1/64	1/16th	+0.008" / -0.004" (+0.2mm / -0.1mm)

Reference Gages

Thickness/Feeler Gages

SERIES 184

- Each leaf is marked with its thickness.
- Each leaf is detachable.

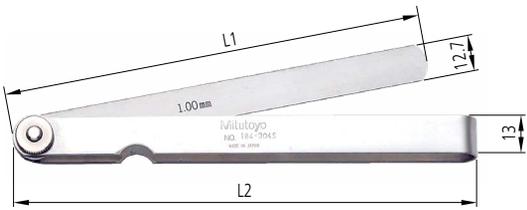


184-303S

SPECIFICATIONS

Metric			
Range	Order No.	Composition of leaves	Remarks
0.05 - 1mm	184-313S	28 leaves: 0.05 - 0.15mm by 0.01mm, 0.2 - 1mm by 0.05mm	—
	184-303S	28 leaves: 0.05 - 0.15mm by 0.01mm, 0.2 - 1mm by 0.05mm	Long leaf
0.05 - 1mm	184-304S	20 leaves: 0.05 - 1mm by 0.05mm	Long leaf
0.05 - 1mm	184-305S	13 leaves: 0.05 - 0.3mm by 0.05mm, 0.4 - 1mm by 0.1mm	—
	184-301S	13 leaves: 0.05 - 0.3mm by 0.05mm, 0.4 - 1mm by 0.1mm	Long leaf
0.05 - 0.8mm	184-306S	10 leaves: 0.05 - 0.2mm by 0.05mm, 0.3 - 0.8mm by 0.1mm	—
	184-308S	10 leaves: 0.05 - 0.2mm by 0.05mm, 0.3 - 0.8mm by 0.1mm	Long leaf
0.03 - 0.5mm	184-307S	13 leaves: 0.03 - 0.1mm by 0.01mm, 0.2 - 0.5mm by 0.1mm, 0.15mm	—
	184-302S	13 leaves: 0.03 - 0.1mm by 0.01mm, 0.2 - 0.5mm by 0.1mm, 0.15mm	Long leaf

DIMENSIONS



Unit: mm

Order No.	L1	L2
184-313S	100	106
184-303S	150	156
184-304S	150	156
184-305S	100	106
184-301S	150	156
184-306S	100	106
184-308S	150	156
184-307S	100	106
184-302S	150	156

Technical Data

Accuracy of Leaves Thickness

Nominal Thickness

Metric

0.01mm to less than 0.06mm:

0.06mm to less than 0.10mm:

0.10mm to less than 0.35mm:

0.35mm to less than 0.65mm:

0.65mm to less than 3.0mm:

Tolerance

±0.003mm

±0.004mm

±0.005mm

±0.008mm

±0.01mm



Need Calibration?

Reference Gages

Technical Data

Range:	-360° to +360°
Tolerance:	±2' (±0.03°)
Repeatability:	1'
Resolution:	1' (0.01°)
Battery:	Lithium Battery
Battery life:	2,000 hours

Function

Presetting

Standard Accessories

12" Blade (Code No. 187-103)
 Battery (CR2032) (Part No. 055AA217)
 Clamp box

Optional Accessories

187-104	6" blade
187-103	12" blade
187-105	Acute angle attachment
950749	Clamp box for Inch Height Gage
950750	Clamp box for Metric Height Gage
905338	Connecting cable (40' / 1m)
905409	Connecting cable (80' / 2m)

Digital Universal Protractor SERIES 187

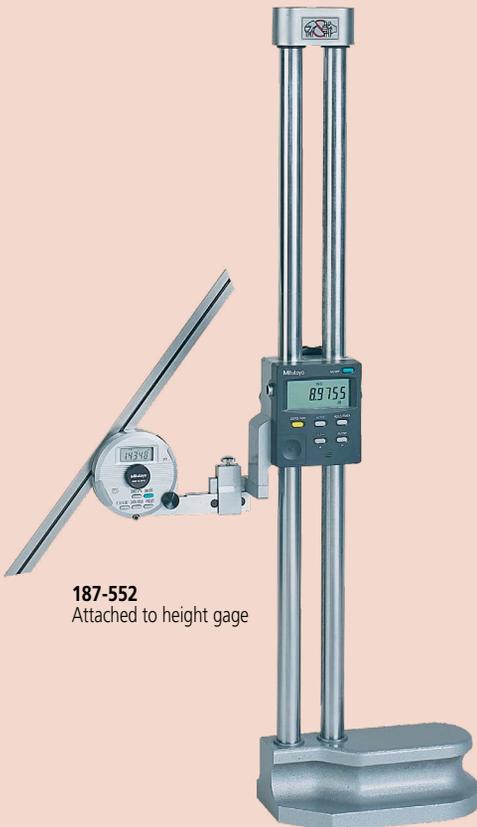
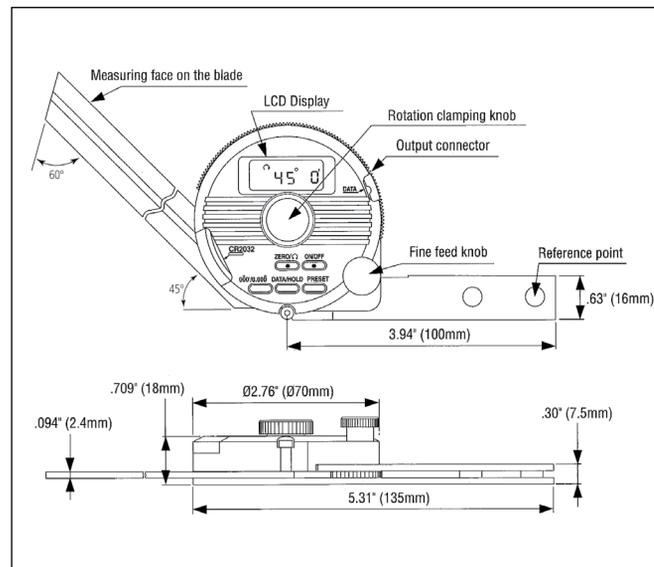
- Data output function make it easy to see the statistical data.
- Can be attached to height gages.
 gage holder (**950749**, inch or **950750**, metric)
- Setting preset value.
- Removable blade.



SPECIFICATIONS

Order No.	187-552	187-551	187-502	187-501
Blade	12" (187-103)	6" (187-104)	300 mm (187-107)	150 mm (187-106)
Display	LCD - 5 digit, (-) sign, character height 6.5mm			
Measuring range	-360° ~ +360°			
Resolution	1' (0.01°)			
Accuracy	± 2' (±0.03°)			
Repeatability	1' (0.01°)			
Mass	1.45 lbs (659g)			
Dust / Water protection level	IP40			
Function	Zero, Direction select, Data output / Data hold, Preset, Switchable Seagesimal or Decimal Notation			
Max. response speed	3 rps			
Battery	Lithium battery (CR2032) 1 pc. (Part No. 055AA217)			
Battery life	2,000 hours			
Alarm	Battery voltage low, Over speed error (Err)			
Temperature	Operation temperature: 0 to 40°C Storage temperature: -10 to 60°C			

DIMENSIONS



187-552
 Attached to height gage

Reference Gages

Universal Bevel Protractor SERIES 187

- High-precision angle gage for accurate angle measurement of machines, molds, and jigs.
- Can be attached to height gages.



187-904

SPECIFICATIONS

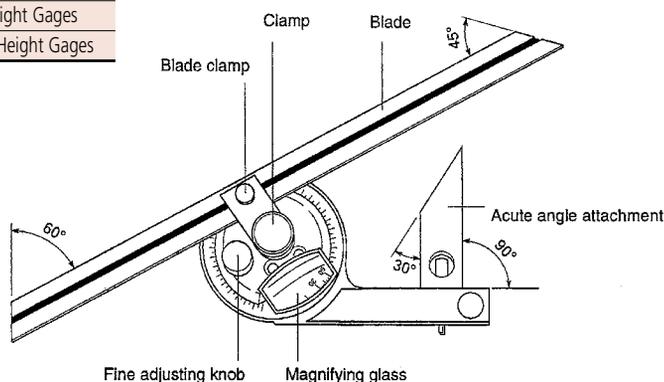
Inch		
Order No.	Blade length (in)	Remarks
187-902-10	6, 12	w/60°, 45°, 30° edges
187-904-10	6	w/60°, 45° edges
187-906-10	12	w/60°, 45° edges

Metric		
Order No.	Blade length (mm)	Remarks
187-901-10	150, 300	w/60°, 45°, 30° edges
187-907-10	150	w/60°, 45° edges
187-908-10	300	w/60°, 45° edges

Accessories and Parts

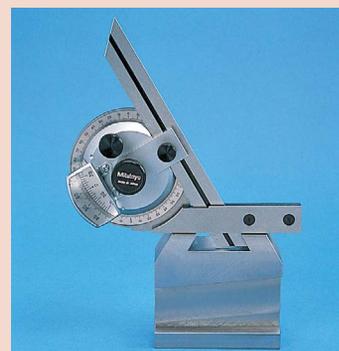
Order No.	Remarks
187-103	12" Blade
187-104	6" Blade
187-105	Acute angle attachment
950749	Clamp box for Inch Height Gages
950750	Clamp box for Metric Height Gages

DIMENSIONS



Technical Data

Graduation: 1°, 5min. (0° - 90° - 0°)
Accuracy: ±5'

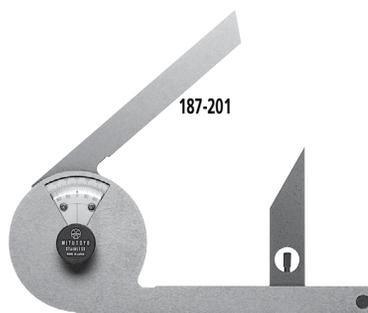


Bevel Protractor SERIES 187

- Consists of three sheets of stainless steel, the middle one of which is made for angle measurements.

SPECIFICATIONS

Order No.	Graduation	Remarks
187-201	1° / 5 min	Center black knob locks the blade position Protractor Graduation: 0°-90°, 90°-0°



187-201

Technical Data

Graduation: 5 min. (0° - 90° - 0°)
Blade edge angle: 30° and 60°
Diameter: 2.56" / 70mm

Reference Gages

Technical Data

Accuracy: ±.002"



186-110

Radius Gages SERIES 186

- Radius size is stamped on each gage.
- Both concave and convex radius gages become a pair.
- With a locking clamp.



186-105

SPECIFICATIONS

Inch			
Range	Order No.	Composition of leaves	Remarks
1/32" - 17/64"	186-103	16 leaves: 1/32" - 17/64" by 64ths	90° arc
1/32" - 1/4"	186-101	15 pairs: 1/32" - 1/4" by 64ths	180° arc
17/64" - 1/2"	186-102	16 pairs: 17/64" - 1/2" by 64ths	180° arc
9/32" - 33/64"	186-104	16 leaves: 9/32" - 33/64" by 64ths	90° arc

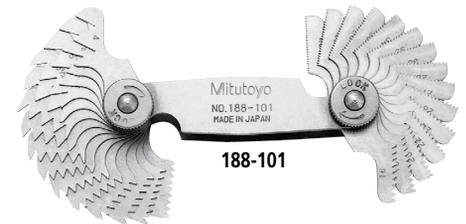
Metric			
Range	Order No.	Composition of leaves	Remarks
0.4 - 6mm	186-110	18 leaves: 0.4, 0.8, 1, 1.2, 1.5, 1.6mm, 1.75 - 3mm by 0.25mm, 3.5 - 6mm by 0.5mm	90° arc
1 - 7mm	186-105	34 pairs: 1 - 3mm by 0.25mm 3.5 - 7mm by 0.5mm	180° arc
7.5 - 15mm	186-106	32 pairs: 7.5 - 15mm by 0.5mm	180° arc
15.5 - 25mm	186-107	15 pairs: 15.5 - 20mm by 0.5mm, 21 - 25mm by 1mm	180° arc

Technical Data

TPI	Metric	Accuracy	
		Pitch (mm)	Angular (minutes)
4-6	6.35-4.23	±0.05	±35
7-12	3.63-2.12	±0.05	±40
13-25	1.95-1.02	±0.05	±45
26-48	0.98-0.53	±0.05	±50
60	0.42	±0.05	±60

Pitch Gages SERIES 188, 950

- Thread pitch size is stamped on each gage.
- Metric, Unified, and Whitworth screw pitch gages.



188-101

SPECIFICATIONS

Metric Screw Pitch Gages (60°)

Range	Order No.	Composition of leaves
0.25 - 2.5mm	188-153	28 leaves: 0.25, 0.30, 0.35, 0.40, 0.45, 0.50, 0.55, 0.60, 0.65, 0.70, 0.75, 0.80, 0.85, 0.90, 1.00, 1.10, 1.20, 1.25, 1.30, 1.40, 1.50, 1.60, 1.70, 1.75, 1.80, 1.90, 2.00, 2.50 mm
0.35 - 6mm	188-130	22 leaves: 0.35, 0.4, 0.45, 0.5, 0.6, 0.7, 0.75, 0.8, 1, 1.25, 1.5, 1.75, 2, 2.5, 3, 3.5, 4, 4.5, 5, 5.5, 6mm and 60° angle gage
0.4 - 7mm	188-122	21 leaves: 0.4, 0.5, 0.7, 0.75, 0.8, 0.9, 1, 1.25, 1.5, 1.75, 2, 2.5, 3, 3.5, 4, 4.5, 5, 5.5, 6, 6.5, 7mm
0.4 - 7mm	188-121	18 leaves: 0.4, 0.5, 0.75, 1, 1.25, 1.5, 1.75, 2, 2.5, 3, 3.5, 4, 4.5, 5, 5.5, 6, 6.5, 7mm

Unified Screw Pitch Gages (60°)

Range	Order No.	Composition of leaves
4 - 42 TPI	188-111	30 leaves: 4, 4-1/2, 5, 5-1/2, 6, 7, 8, 9, 10, 11, 11-1/2, 12, 13, 14, 15, 16, 18, 20, 22, 24, 26, 27, 28, 30, 32, 34, 36, 38, 40, 42 TPI

Note: Metric and Unified Pitch Gage Set (**188-151**) is available. It consists of **188-122** (Metric) and **188-111** (Unified).

Metric and Unified Screw Pitch Gage Set (60°)

Range	Order No.	Composition of leaves
0.4 - 7mm / 4 - 42 TPI	188-151	51 leaves: Set of 188-122 and 188-111
0.5 - 6mm / 4 - 56 TPI	188-152	28 leaves: 4, 6, 8, 10, 11, 11-1/2, 12, 13, 16, 20, 28, 32, 40, 56 TPI 0.50, 0.75, 1.00, 1.25, 1.50, 1.75, 2.00, 2.50, 3.00, 3.50, 4.00, 4.50, 5.00, 6.00 mm

Whitworth Screw Pitch Gages (55°)

Range	Order No.	Composition of leaves
4 - 42 TPI	188-101	30 leaves: 4, 4-1/2, 5, 5-1/2, 6, 7, 8, 9, 10, 11, 11-1/2, 12, 13, 14, 15, 16, 18, 20, 22, 24, 26, 27, 28, 30, 32, 34, 36, 38, 40, 42 TPI
4 - 60 TPI	188-102	28 leaves: 4, 4-1/2, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 16, 18, 19, 20, 22, 24, 25, 26, 28, 30, 32, 34, 36, 40, 48, 60 TPI



Find a Distributor

Reference Gages

Radius Gages-Sets

SERIES 186

Radius Gages are recommended for checking or laying out concave or convex radii. An individual gage for each dimension makes it possible to verify radius or fillet dimensions easier, faster and more accurately in machining, layout, inspection and pattern-making work. The measuring surfaces are precisely finished with smooth, accurate edges. Radius gages are available separately or in six sets. Each radius gage has five measuring locations, and it is identified with its particular radius dimensions. The gages have a satin or dull-chrome finish.

The holding cases, provided to protect the sets of radius gages, have indexed pockets to facilitate the selection of the proper size gage. A 4" long holder is furnished with Set No. 186-901 to make it possible to check radii in confined or hard-to-reach locations.

SPECIFICATIONS

Inch			
Order No.	No. of Leaves	Sizes	Remarks
186-901	25	1/64"-17/64" by 64ths and 9/32"-1/2" by 32nds	Holder
186-903	17	1/64"-17/64" by 64ths	
186-904	8	9/32"-1/2" by 32nds	
186-905	8	9/16"-1" by 16ths	
186-906	26	.010-.030" by .005" .040-.100" by .010" .120-.300" by .020" .350-.500" by .050"	
186-907	10	.550-1" by .050"	

Replacement handle: 950753

Metric			
Order No.	No. of Leaves	Sizes	Remarks
186-902	26	0.5 - 13mm by 0.5mm	90° arc

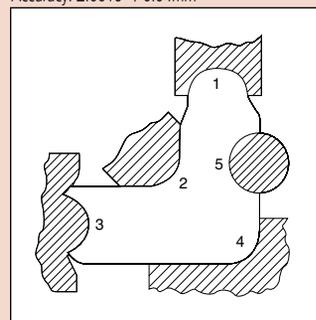
Decimal			
Radius	Part No.	Radius	Part No.
.010"	211798	.240"	211816
.015"	211799	.260"	211817
.020"	211800	.280"	211818
.025"	211801	.300"	211819
.030"	211802	.350"	211820
.040"	211803	.400"	211821
.050"	211804	.450"	211822
.060"	211805	.500"	211823
.070"	211806	.550"	211824
.080"	211807	.600"	211825
.090"	211808	.650"	211826
.100"	211809	.700"	211827
.120"	211810	.750"	211828
.140"	211811	.800"	211829
.160"	211812	.850"	211830
.180"	211813	.900"	211831
.200"	211814	.950"	211832
.220"	211815	1.000"	211833

Fraction			
Radius	Part No.	Radius	Part No.
1/64"	201441	5/16"	201459
1/32"	201442	11/32"	201460
3/64"	201443	3/8"	201461
1/16"	201444	13/32"	201462
5/64"	201445	7/16"	201463
3/32"	201446	15/32"	201464
7/64"	201447	1/2"	201465
1/8"	201448	9/16"	211790
9/64"	201449	5/8"	211791
5/32"	201450	11/16"	211792
11/64"	201451	3/4"	211793
3/16"	201452	13/16"	211794
13/64"	201453	7/8"	211795
7/32"	201454	15/16"	211796
15/64"	201455	1"	211797
1/4"	201456		
17/64"	201457		
9/32"	201458		



186-901

Accuracy: ±.0016" / 0.04mm



5 concave and convex radii per leaf.



Got Questions?

Reference Gages

Digital Protractor SERIES 950

These digital protractors present inclination values on an easy-to-read LCD. The measurements are generated by an electronic gravity sensor and processed by the latest low-power electronic circuit technology.

- Full 360° range (90° x 4).
- Machined aluminum frame.

- Alternate reference (zero).
- Reading hold.
- Simple calibration requiring no special fixtures.
- Display remains upright to view at all angles. (950-317, Pro 360 Model).
- RS232C output. (950-318 Pro 3600 Model).
- Supplied in fitted carrying case.



Front View



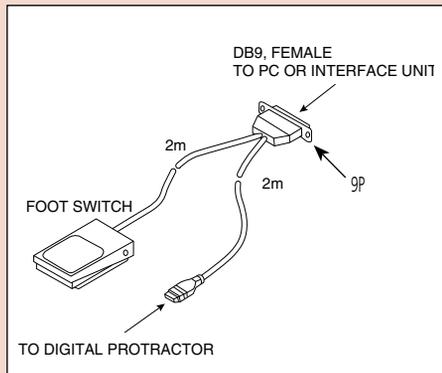
950-317 Back View



950-318 Back View

Optional Accessories

50AAA983A RS-232C Output cable w/foot switch



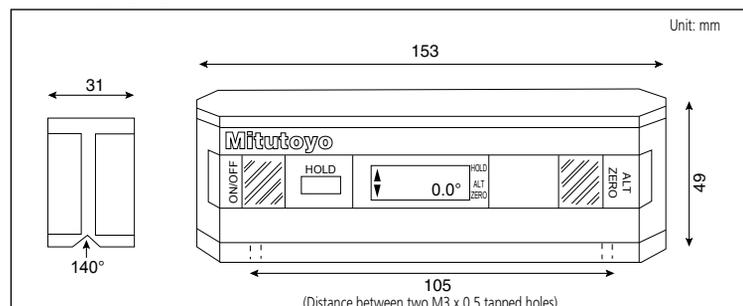
50AAA983A RS-232C Output cable w/foot switch 10P-9P

SPECIFICATIONS

Order No.	950-317	950-318
Model	Pro 360	Pro 3600
Range	360° (90°x4)	360° (90°x4)
Resolution	0.1°	0.01° (0° to 9.99°) 0.1° (10° to 90°)
Accuracy*1	±0.1° Level ±10°, Plumb ±10° ±0.2° Maximum error	±0.05° (0° to 10°) ±0.1° (80° to 90°) ±0.2° (10° to 80°)
Repeatability	±0.1°	±0.05°
Cross Axis Error	Minimal	Minimal
Battery Life	500 Hrs. Standard 9-Volt Battery	500 Hrs. Standard 9-Volt Battery
Temperature Operation	-5°C to 50°C (23° to 122°F)	-5°C to 50°C (23° to 122°F)
Storage	-20°C to 65°C (-4°F to 149°F)	-20°C to 65°C (-4°F to 149°F)
Weight	289g (10.2oz.)	295g (10.4oz.)
Output	N/A	RS-232C Compatible
Standard Accessories	Plastic Case	Plastic Case

*1 ± Represents clockwise or counter-clockwise slope.

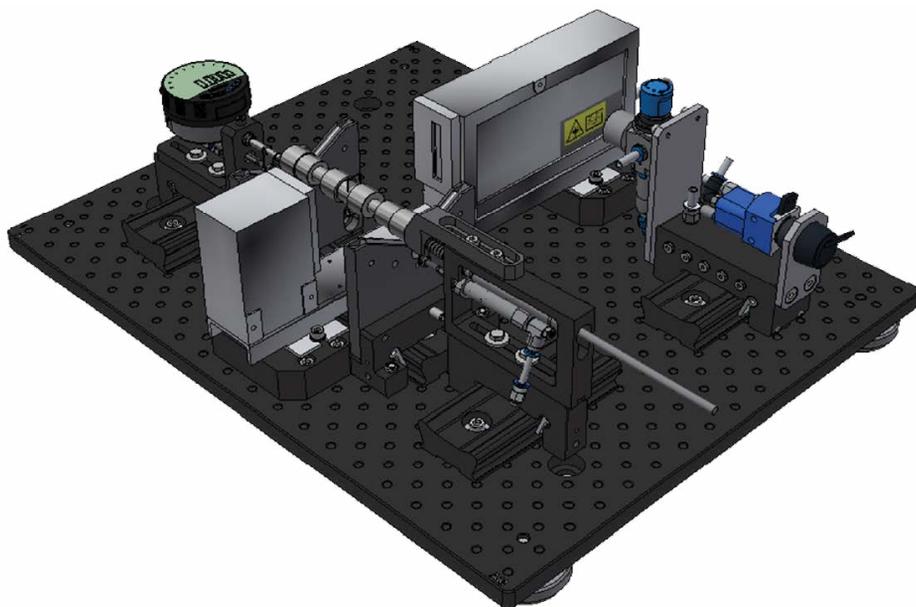
DIMENSIONS



Fixtures

Shaft Measuring Kits

The Shaft Measurement System is easy-set-up, easy-to-use, modular fixture kit that can be used for measuring diameters, runouts and lengths of cylindrical components. Modules are available for mounting Indicators, Linear Gages, and Laser Scan Micrometers. Modules attach to and can be adjusted along Rails that can be mounted to various positions on the Base Plate. Each module has everything needed to measure, such as gage mounts, pneumatic overcome assembly (tubing, etc.), contact point for pneumatic fork, mounts for rail system/gage (Indicators, Linear Gages and Laser Scan Micrometers are optional). The pneumatic system will retract spindles when air is cut to help avoid potential damage to components. When air is supplied the pneumatic retraction is overcome, so each spindle contacts the component using its own spring force. Mounting a sample component is simple using optional V-blocks or center supports. Contact Mitutoyo America for more information.



Components

Part No.	Accessories
K551376	Measuring module for LG200 series, pencil probe Linear Gages
K551377	Measuring module for LG100 series Linear Gages, digimatic indicators (Ø8mm stems only)
K551382	Base plate SMK (incl. feet)
K551591	Mounting brackets for Mitutoyo LSM 503S
K551378	Pneumatic control Shaft Measuring Kit
K551594	V-block ø1 to ø 20mm (K551593 required)
K551592	Stop bracket included screw
K551593	Support for V-block
K551364	Top profile rail L=175mm
K551362	Top profile rail L=125mm
K580770	Demo workpiece for SMK



Talk to Sales

Bench Center

- Provides precision measurement of concentricity verification on cylindrical parts using optional indicators, test indicators, or Linear Gages
- Indicator/gage clamp for 3/8" & 8mm diameter stems
- Quick release lever allows for fast loading/unloading of parts
- Repositioning of the indicator mounting and head assemblies is fast and easy using the locking levers
- Contact Mitutoyo America for more information



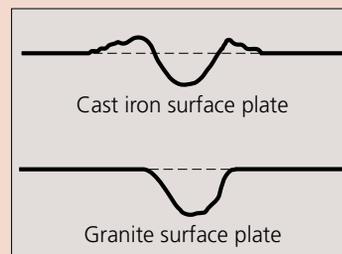
Shown with optional indicator, 543-702B



Black Granite Surface Plate

Black Granite Surface Plate SERIES 517

- Natural granite seasoned for thousands of years is free from deterioration or dimensional change over time.
- Granite surface plates have many advantages over cast iron surface plates: Twice as hard as cast iron. Minimal changes in dimension due to temperature changes. Free from wringing, so there is no interruption of work. Free from burrs or protrusions because of the fine grain structure and insignificant stickiness; this ensures a high degree of flatness over a long service life and causes no damage to other parts or instruments.
- Trouble-free operation for use with magnetic materials.
- Long life and rust-free, resulting in low maintenance costs.
- Mitutoyo granite surface plates meet or exceed federal specification GGG-P-463c. Each surface plate is shipped with a Certificate of Accuracy which guarantees its accuracy and verifies its traceability to NIST.
- All plates from 48"x108" and larger are machine base gray granite. Smaller plates are black granite.
- Surface plates, to size of specifications other than standard, available by special order.
- All Mitutoyo surface plates shipped F.O.B. Santa Fe Springs, CA



SPECIFICATIONS

Inch 100 lbs.-Load / sq. ft. no ledge

Size	AA Laboratory Grade				A Inspection Grade				B Shop Grade			
	H	Acc.*	Order No.	Wt. (lbs)	H	Acc.*	Order No.	Wt. (lbs)	H	Acc.*	Order No.	Wt. (lbs)
8 x 12"	3"	50	517-700-10	30	2"	100	517-800-10	25	2"	200	517-900-10	25
9 x 12"	3"	50	517-701-10	40	3"	100	517-801-10	40	2"	200	517-901-10	30
12 x 12"	3"	50	517-702-10	50	3"	100	517-802-10	50	3"	200	517-902-10	50
12 x 18"	4"	50	517-703-10	100	4"	100	517-803-10	100	4"	200	517-903-10	100
18 x 18"	4"	50	517-704-10	150	4"	100	517-804-10	150	3"	200	517-904-10	100
18 x 24"	4"	65	517-705-10	200	4"	130	517-805-10	200	4"	260	517-905-10	200
24 x 24"	5"	70	517-706-10	310	4"	140	517-806-10	259	3"	280	517-906-10	200
24 x 36"	6"	85	517-708-10	600	5"	170	517-808-10	500	4"	340	517-908-10	400
24 x 48"	8"	150	517-709-10	1000	6"	300	517-809-10	800	5"	600	517-909-10	650
30 x 48"	8"	150	517-711-10	1300	6"	300	517-811-10	1000	6"	600	517-911-10	1000
36 x 36"	6"	100	517-713-10	900	5"	200	517-813-10	780	5"	400	517-913-10	700
36 x 48"	8"	150	517-714-10	1500	6"	300	517-814-10	1200	6"	600	517-914-10	1200
36 x 60"	12"	200	517-715-10	2850	10"	400	517-815-10	2350	8"	800	517-915-10	1900
36 x 72"	12"	250	517-716-10	3400	10"	500	517-816-10	2850	8"	1000	517-916-10	2300
48 x 48"	8"	200	517-717-10	2025	6"	400	517-817-10	1525	6"	800	517-917-10	1500
48 x 60"	12"	250	517-718-10	3800	10"	500	517-818-10	3150	8"	1000	517-918-10	2525
48 x 72"	12"	300	517-719-10	4500	10"	600	517-819-10	3800	8"	1200	517-919-10	3050
48 x 96"	14"	400	517-721-10	7000	12"	800	517-821-10	6050	10"	1600	517-921-10	5150

* Accuracies shown in microinches (µin)



Where to Buy

Steel Stands

Steel Stands SERIES 517

Steel stands for supporting black granite surface plates, at working levels, are available either stationary or with casters. Sizes and weights are given below.

SPECIFICATIONS

Size	Stationary		With Casters	
	Order No.	Wt.	Order No.	Wt.
12 x 18"	517-950-10	42lbs	517-950-11	46lbs
18 x 18"	517-951-10	46lbs	517-951-11	50lbs
18 x 24"	517-952-10	50lbs	517-952-11	56lbs
24 x 24"	517-954-10	65lbs	517-954-11	69lbs
24 x 36"	517-956-10	73lbs	517-956-11	77lbs
24 x 48"	517-957-10	90lbs	517-957-11	94lbs
30 x 48"	517-961-10	95lbs	517-961-11	99lbs
36 x 36"	517-963-10	95lbs	517-963-11	99lbs
36 x 48"	517-964-10	105lbs	517-964-11	109lbs
36 x 60"	517-965-10	160lbs	517-965-11	164lbs
36 x 72"	517-966-10	180lbs	517-966-11	184lbs
48 x 48"	517-967-10	190lbs	517-967-11	194lbs
48 x 60"	517-968-10	200lbs	517-968-11	204lbs
48 x 72"	517-969-10	205lbs	517-969-11	209lbs
48 x 96"	517-971-10	335lbs	517-971-11	339lbs



Note: Working height is 36" unless otherwise specified.

E

Featured Products



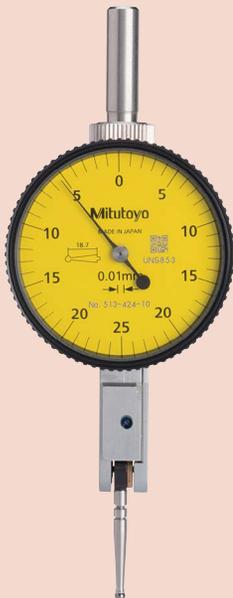
ABSOLUTE Digimatic Indicator ID-CNX (Digimatic S1 supported)

Refer to page F-5 for details.



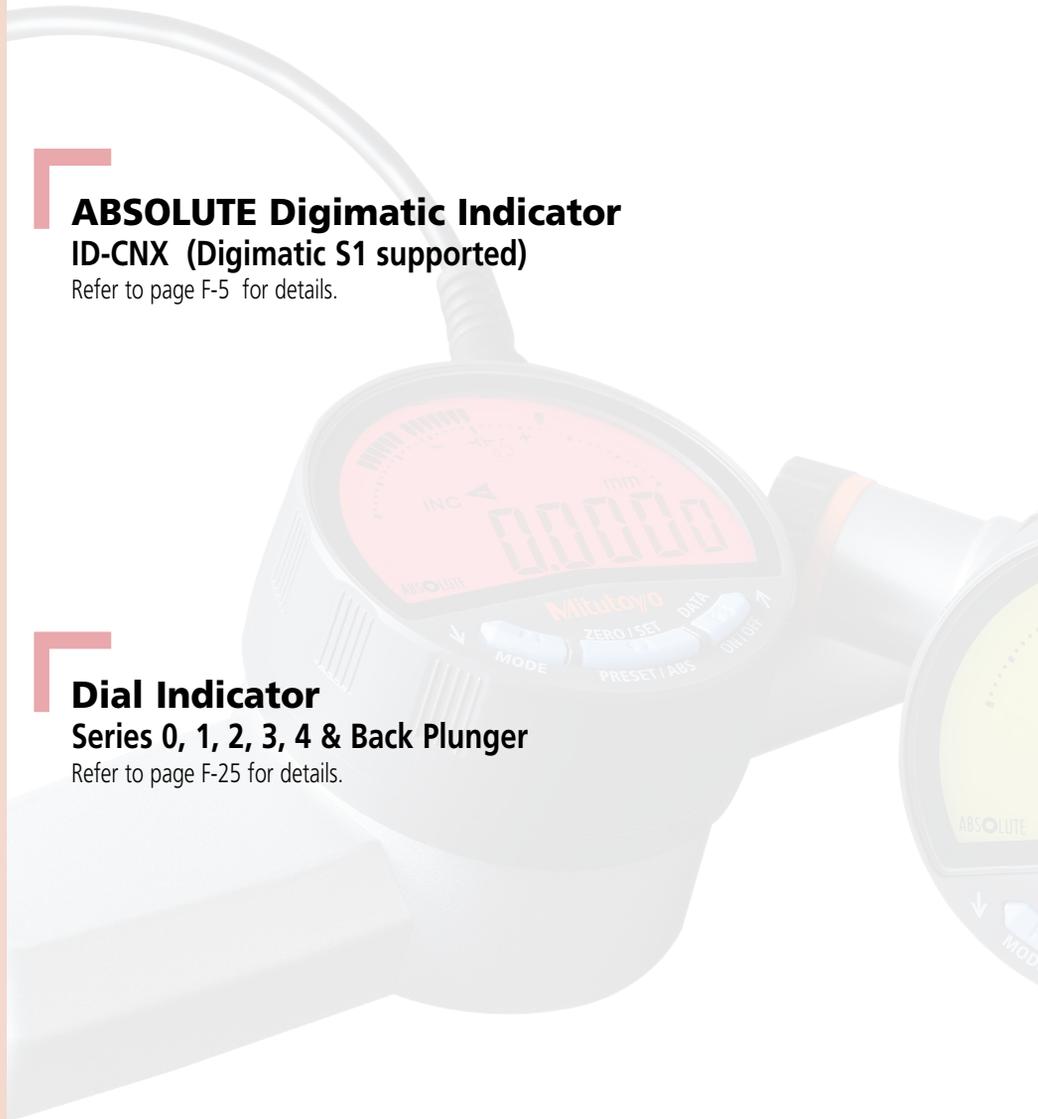
Dial Indicator Series 0, 1, 2, 3, 4 & Back Plunger

Refer to page F-25 for details.



Dial Test Indicator Series 513 — Standard, 20° tilted, Vertical, Horizontal, Universal & Pocket Type

Refer to page F-75 for details.



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MeasurLink® ENABLED

Data Management Software by Mitutoyo

Measurement Data Network System

MeasurLink® is a measurement data management system based on databases (SQL Server). You can build a network to manage the measurement results and measuring instruments simply by combining the required functions.

MeasurLink® is a registered trademark of Mitutoyo Corporation in Japan and Mitutoyo America Corporation in the United States.



IP Codes

The code indicates the degree of protection against the ingress of foreign materials and water as defined in the IEC standard (IEC 60529). The number indicates the protection level. (Refer to page 3)



TÜV Rheinland Certification Marks

All products with the marks have passed the IP test carried out by the German accreditation organization, TÜV Rheinland.



Measuring Instruments Shipped with Inspection Certificate

Mitutoyo guarantees product quality as a leading precision measuring instrument manufacturer and ships measuring instruments with an inspection certificate that includes inspection data so that customers can use them with confidence.

ABSOLUTE™

ABSOLUTE Linear Encoder

Mitutoyo developed the unique ABSOLUTE method to retain position information after the power is turned off. The origin is set once - thereafter the live position is displayed when the power is turned on.

DIGIMATIC S1

DIGIMATIC S1

Mitutoyo's proprietary bidirectional serial communication protocol enables a connected PC to execute measurement data output, setting and control of a measuring instrument, and capture of information of a specific measuring instrument.

Precautions for use (Preload)



Origin setting of Digimatic Indicators

Repeatability in the range of 0.2 mm from the lowest rest point is not guaranteed for Digimatic indicators. When setting the origin or presetting a specific value, be sure to preload the spindle at least 0.2 mm from the lowest rest point.

Indicators

High-performance ABS Digimatic Indicator ID-FNX (Digimatic S1 supported) SERIES 543 — with Back-lit LCD Screen

- ID-F Series is a next-generation indicator with various new functions, supporting bidirectional communication. With the addition of the appropriate data cable and software, remote zero setting and gage setting can all be implemented from a connected PC, thereby improving your work efficiency.
- This series adopts an external power supply to operate a bright backlit display. The display color helps you make tolerance judgment at a glance.

Green indication for GO judgment Red indication for \pm NG judgment



- The next calibration due date can be set with an alarm to improve instrument management.
- The ABS (ABSOLUTE) scale restores the last origin position* automatically when the indicator is turned on, and realizes high reliability by eliminating over-speed errors.

* Refer to "Precautions for use" on page F-2.



SPECIFICATIONS

Inch / Metric		ASME/ANSI/AGD Type						
Order No.	Range	Resolution	Accuracy (in)*	Hysteresis	Repeatability	Measuring force (N)	Power source	Mass (g)
543-856-A	0.5 in / 12.7 mm	0.00002/0.00005 / 0.0001 / 0.0005 / 0.001 in, 0.005/0.001 / 0.01 mm (selectable)	± 0.00010	0.00008	0.00008	1.5 or less	AC adapter (5.9 V)	200
543-856B-A (flat back)	1.5 or less					170		
543-852A	1 in / 25.4 mm					1.8 or less		240
543-854A	2 in / 50.8 mm		± 0.00016			2.3 or less		330
543-858A	50.8 mm		± 0.00012					

Metric		ISO/JIS Type						
Order No.	Range (mm)	Resolution (mm)	Accuracy (mm)*	Hysteresis H_{MPE}	Repeatability R_{MPE}	Measuring force (N)	Power source	Mass (g)
543-855-A	12.7	0.0005 / 0.001 / 0.01 (selectable)	0.0025	0.002	0.002	1.5 or less	AC adapter (5.9 V)	180
543-855B-A (flat back)						1.5 or less		170
543-851A	25.4		0.004			1.8 or less		240
543-853A	50.8		0.003			2.3 or less		330
543-857A								

Included Power Adapter: **06AGZ369JA**

MeasurLinkTM ENABLED
Data Management Software by Mitutoyo

ABSOLUTETM



DIGIMATIC S1

Functions

- Peak detection (MAX/MIN)
 - Runout range measurement (MAX - MIN)
- Note: Peak detection
- 1) Sampling rate:
 - Resolution 0.0005 mm 50 readings/s
 - Resolution 0.001 mm, 0.01 mm 500 readings/s
 - 2) Capturing speed:
 - Resolution 0.0005 mm 50 μ m/s
 - Resolution 0.001 mm, 0.01 mm 500 μ m/s
- Zero-setting (INC system)
 - Presetting (ABS system)
 - Measuring direction switching
 - Tolerance judgment
 - Resolution switching
 - Simple calculation $f(x) = Ax$
 - Analog resolution selection
 - Data hold (when not connected to an external device)
 - Function Lock
 - Calibration schedule warning
 - Data output
 - Display rotation (330°)
 - Error alarm display

F



Refer to the Indicators Brochure (2340) for more details.



Video



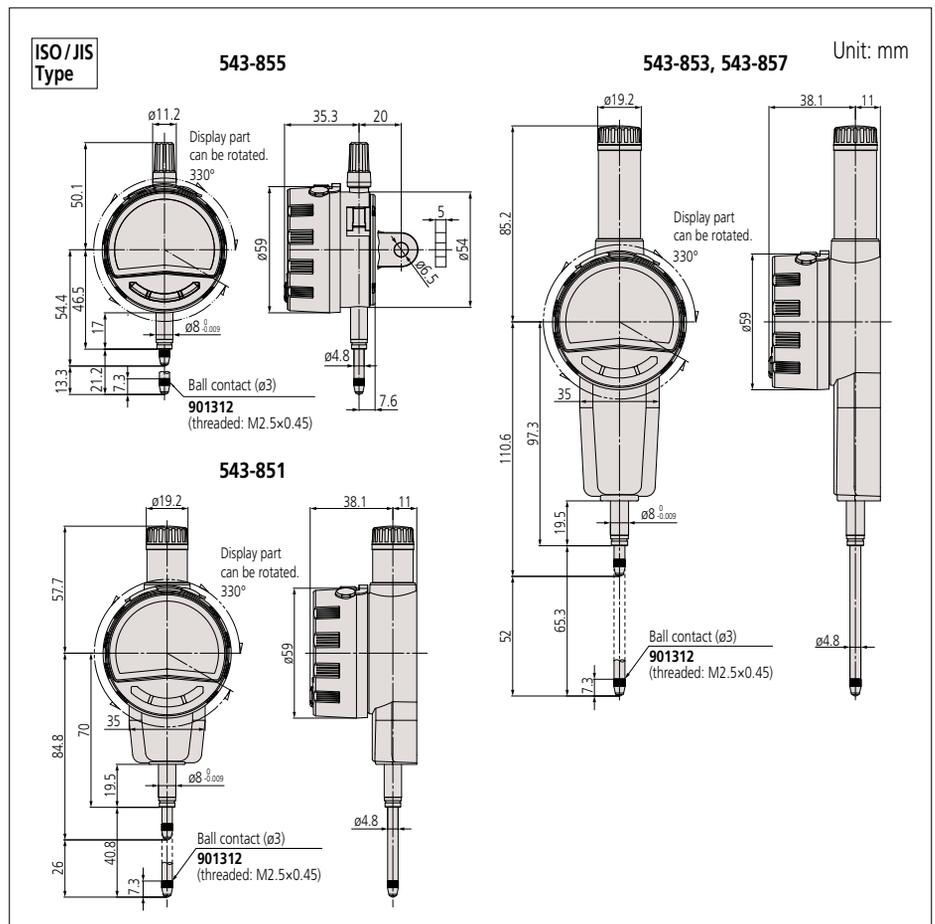
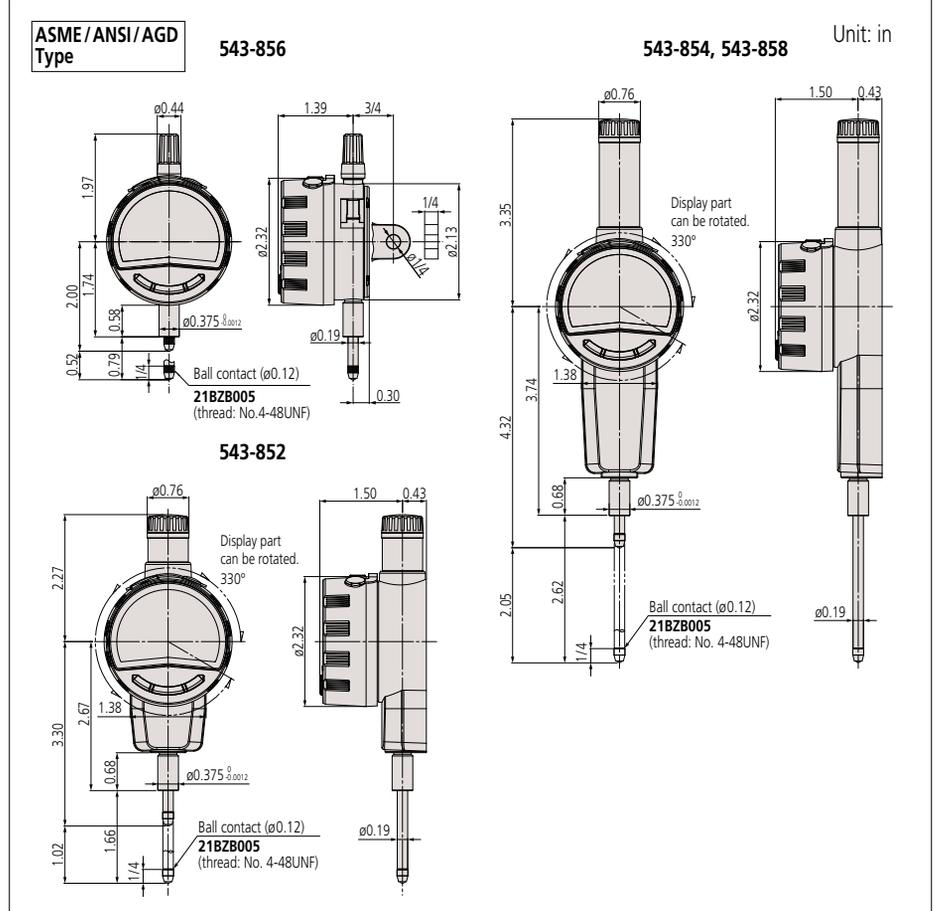
Find a Distributor

DIMENSIONS

Optional Accessories

Order No.	Type	Description
264-020	—	USB Input Tool Series USB Keyboard Signal Conversion Type IT-020U
06AGL011	SF	Connection cable (1 m)
06AGL021	SF	Connection cable (2 m)
06AGQ001F	SF	USB Input Tool Direct (2 m)
02AZG011	SF	Connection cable for U-WAVE-T (160 mm)
02AZG021	SF	Connection cable for U-WAVE-T For foot switch
264-622	IP67	U-WAVE-TM
264-623	Buzzer	U-WAVE-TM
02AZD810D	—	U-WAVE-R
264-626	IP67	U-WAVE-TMB
264-627	Buzzer	U-WAVE-TMB
02AZF700	—	Connecting unit for U-WAVE-TM/TMB (for ID-F/ID-C Series 12.7 mm/0.5 inch type only)
02AZF670	—	U-WAVE-TM/TMB mounting bracket: for Digimatic Indicators

- Lifting Options
Lifting lever:
21EZA198 (0.5 inch / 12.7 mm type)
Lifting cable (mounts to spindle stop screw):
21JZA295 Lifting cable (with auto-stop function):
0.5 inch / 12.7 mm type
21JZA301 (overall length 300 mm) 0.5 inch/12.7 mm type
Lifting knob:
21EZA105 (0.5 inch / 12.7 mm type)
21EZA197 (1 inch / 25.4 mm type)
21EZA200 (2 inch / 50.8 mm type)
Lifting lever: **21EAA426**
(supplied with 25.4 mm and 50.8 mm models as standard.)
- Auxiliary spindle spring:
02ACA571 (1 inch / 25.4 mm type)
02ACA773 (2 inch / 50.8 mm type)
- Measurement data collection software
USB-ITPAK V3.0: 06AGR543
- Contact points for Mitutoyo's Digimatic indicators (optional)
Refer to pages F-63 to F-68 for details.
- Interchangeable back covers (optional)
Refer to pages F-69 to F-70 for details.
- Measuring stands (optional)
Refer to pages F-97 to F-103 for details.



Indicators

ABSOLUTE Digimatic Indicator ID-CNX (Digimatic S1 supported) SERIES 543 — Standard Type

- ID-C Series is a next-generation indicator with many new functions, supporting bidirectional communication. With the addition of the appropriate data cable and software, remote zero setting and gage setting can all be implemented from a connected PC, thereby improving your work efficiency.
- The digital display and analog bar indications help you to intuitively read the approach to the origin and tolerance values.
- The ABS (ABSOLUTE) scale restores the last origin position* automatically when the indicator is turned on, and realizes high reliability by eliminating over-speed errors.



Measuring range
0.5 inch
543-702-02

Measuring range
1 inch
543-722B-02

- The next calibration due date can be set with an alarm to improve instrument management.
- Equipped with a data output port that enables incorporation into measurement networking and statistical process control systems. (Refer to the A section)

* Refer to "Precautions for use" on page F-2.

SPECIFICATIONS

Inch / Metric		ASME/ANSI/AGD Type							
Order No.		Range	Resolution	Accuracy (mm)	Hysteresis	Repeatability	Measuring force (N)	Mass (g)	
w/lug	Flat back							w/lug	Flat back
543-702-02	543-702B-02	0.5 in/ 12.7 mm	0.00002/0.00005/ 0.0001/0.0005 in, 0.0005/0.001/ 0.01 mm (selectable)	±0.00012	0.00008	0.00008	1.5 or less	195	165
543-707-02*	543-707B-02*	1 in/25.4 mm					0.4 to 0.7	190	160
—	543-722B-02	2 in/50.8 mm		±0.00020			1.8 or less	—	195
—	543-732B-02	2 in/50.8 mm					2.3 or less	—	260
543-712-02	543-712B-02	0.5 in/ 12.7 mm	0.0005 in/0.01 mm	±0.0010	0.0010	0.0005	0.9 or less	190	160
543-717-02*	543-717B-02*	1 in/25.4 mm					0.2 to 0.5	185	155
—	543-727B-02	2 in/50.8 mm					1.8 or less	—	190
—	543-737B-02	2 in/50.8 mm					2.3 or less	—	245

Inch / Metric		ISO/JIS Type								
Order No.		Range	Resolution	Accuracy (mm)	Hysteresis H_{MPE}	Repeatability R_{MPE}	Measuring force (N)	Mass (g)		
w/lug	Flat back							w/lug	Flat back	
543-701-02	543-701B-02	0.5 in/12.7 mm	0.00002/0.00005/ 0.0001/0.0005 in, 0.0005/0.001/ 0.01 mm (selectable)	0.003	0.002	0.002	1.5 or less	175	165	
543-706-02*	543-706B-02*						0.4 to 0.7	170	160	
—	543-721B-02	1 in/25.4 mm					1.8 or less	—	195	
—	543-731B-02	2 in/50.8 mm		0.005			2.3 or less	—	260	
543-711-02	543-711B-02	0.5 in/12.7 mm	0.0005 in/ 0.01 mm	0.02	0.02	0.01	0.9 or less	170	160	
543-716-02*	543-716B-02*						0.2 to 0.5	165	155	
—	543-726B-02						1 in/25.4 mm	1.8 or less	—	190
—	543-736B-02						2 in/50.8 mm	2.3 or less	—	245

Metric		ISO/JIS Type							
Order No.		Range (mm)	Resolution (mm)	Accuracy (mm)	Hysteresis H_{MPE}	Repeatability R_{MPE}	Measuring force (N)	Mass (g)	
w/lug	Flat back							w/lug	Flat back
543-700-02	543-700B-02	12.7	0.0005/ 0.001/0.01 (selectable)	0.003	0.002	0.002	1.5 or less	175	165
543-705-02*	543-705B-02*						0.4 to 0.7	170	160
—	543-720B-02						1.8 or less	—	195
—	543-730B-02	50.8		0.005			2.3 or less	—	260
543-710-02	543-710B-02	12.7	0.01	0.02	0.02	0.01	0.9 or less	170	160
543-715-02*	543-715B-02*						0.2 to 0.5	165	155
—	543-725B-02						1.8 or less	—	190
—	543-735B-02						2.3 or less	—	245

- Power source: CR2032 battery (1 pc.), included as standard
- Battery life: Approx. 2,700 hours of continuous use. Approx. 2.5 years under normal use. (Depends on use of the indicator. The above values are reference values.)

* Low Measuring force.

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DIGIMATIC S1

Functions

- Peak detection (MAX/MIN)
- Runout range measurement (MAX - MIN)
- Zero-setting (INC system)
- Presetting (ABS system)
- Measuring direction switching
- Tolerance judgment
- Resolution switching (For 0.0005 mm or 0.00002 inch resolution type)
- Simple calculation: $f(x) = Ax$
- Function Lock
- Calibration schedule warning
- Auto power OFF
- Data output
- Display value holding (when no external device is connected)
- 330° rotary display
- Low battery/voltage alarm display
- Error alarm display

Example of ID-CNX installed on optional bore gage



Note: Direction setting, etc. is necessary when ID-CNX is used with a bore gage. Refer to the operation manual for details.

Spindle orientation for measurement

- Standard models with measuring range 12.7 mm: Usable in all orientations.
- Models with measuring range 25.4 or 50.8 mm: Usable between the contact point pointing downward and spindle in horizontal orientation. To use the contact point pointing upward, the auxiliary spindle spring (optional) is required.
- Low measuring force model: See "Setting measuring force on low measuring force models" below.

Setting measuring force on low measuring force models

The measuring force of models with low measuring force can be set by combining standard accessory springs and weights.

- 543-715(B)/716(B)/717(B)

Spindle orientation	Spring	Weight (approximately 0.1 N)	Maximum measuring force (N)
Pointing vertically downward	Yes	Yes	0.5 or less
	Yes	No	0.4 or less
	No	Yes	0.3 or less
	No	No	0.2 or less
Horizontal	Yes	No	0.3 or less

Note: Operation using configurations other than shown above is not guaranteed.

- 543-705(B)/706(B)/707(B)

Spindle orientation	Spring	Weight (approximately 0.1 N)	Maximum measuring force (N)
Pointing vertically downward	Yes	Yes	0.7 or less
	Yes	No	0.6 or less
	No	Yes	0.4 or less
	No	No	Not guaranteed

Note: Operation using configurations other than shown above is not guaranteed.



Refer to the Indicators Brochure (2340) for more details.



DIMENSIONS

Optional Accessories

Order No.	Type	Description
264-020	—	USB Input Tool Series USB Keyboard Signal Conversion Type IT-020U
06AGL011	SF	Connection cable (1 m)
06AGL021	SF	Connection cable (2 m)
06AGQ001F	SF	USB Input Tool Direct (2 m)
02AZG011	SF	Connection cable for U-WAVE-T (160 mm)
02AZG021	SF	Connection cable for U-WAVE-T For foot switch
264-622	IP67	U-WAVE-TM
264-623	Buzzer	U-WAVE-TM
02AZD810D	—	U-WAVE-R
264-626	IP67	U-WAVE-TMB
264-627	Buzzer	U-WAVE-TMB
02AZF700	—	Connecting unit for U-WAVE-TM/TMB (for ID-F/ID-C Series 12.7 mm / 0.5 inch type only)
02AZF670	—	U-WAVE-TM/TMB mounting bracket: for Digimatic Indicators

Connecting unit
fitted to an indicator
(12.7 mm type)

Typical application of
U-WAVE-TM/TMB mounting bracket
(with **543-725B**)



- Lifting
Lifting lever: **21EZA198** (0.5 inch / 12.7 mm type)
Lifting cable:
21JZA295 Stroke 12.7 mm: 0.5 inch / 12.7 mm type
(This cannot be used on low measuring force model.)
With auto-stop function:
21JZA301 (overall length 300 mm) 0.5 inch / 12.7 mm type
(This cannot be used on low measuring force model.)
Lifting knob:
21EZA105 (0.5 inch / 12.7 mm type)
(This cannot be used on low measuring force model.)
21EZA197 (1 inch / 25.4 mm type)
21EZA200 (2 inch / 50.8 mm type)
Lifting lever: **21EAA426**
(supplied with 25.4 mm and 50.8 mm models as standard.)
- Auxiliary spindle spring:
02ACA571 (1 inch / 25.4 mm type*)
02ACA773 (2 inch / 50.8 mm type*)

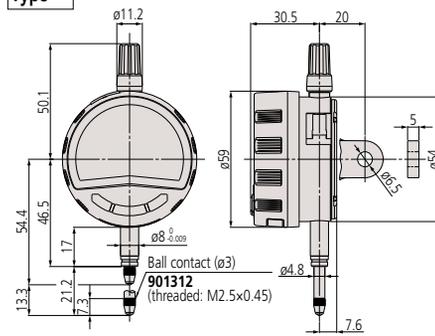
*Required when orienting the indicator upside down.

- Measurement data collection software
USB-ITPAK V3.0: 06AGR543
- Contact points for Mitutoyo's Digimatic indicators (optional)
Refer to pages F-63 to F-68 for details.
- Interchangeable back covers (optional)
Refer to pages F-69 to F-70 for details.
- Measuring stands (optional)
Refer to pages F-97 to F-103 for details.

12.7 mm range models

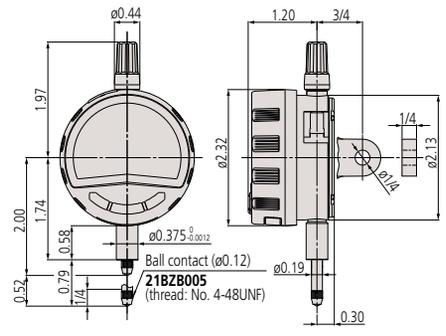
Unit: mm

ISO/JIS
Type



ASME/ANSI/AGD
Type

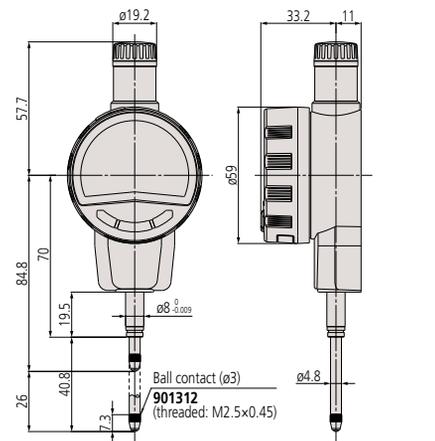
Unit: in



25.4 mm range models

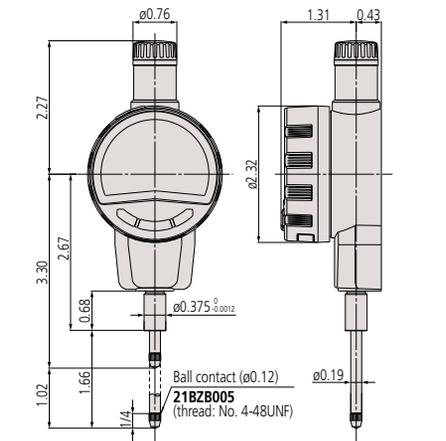
Unit: mm

ISO/JIS
Type



ASME/ANSI/AGD
Type

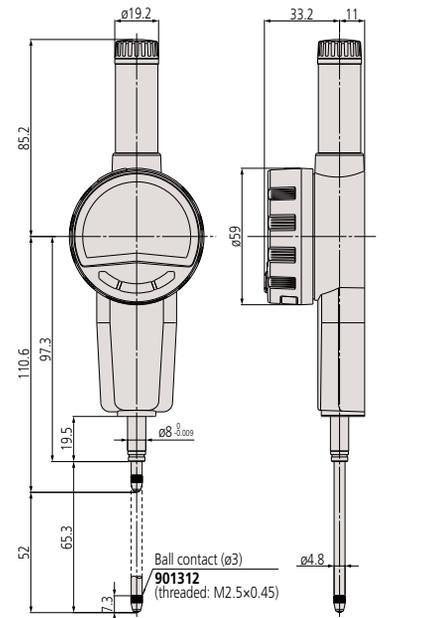
Unit: in



50.8 mm range models

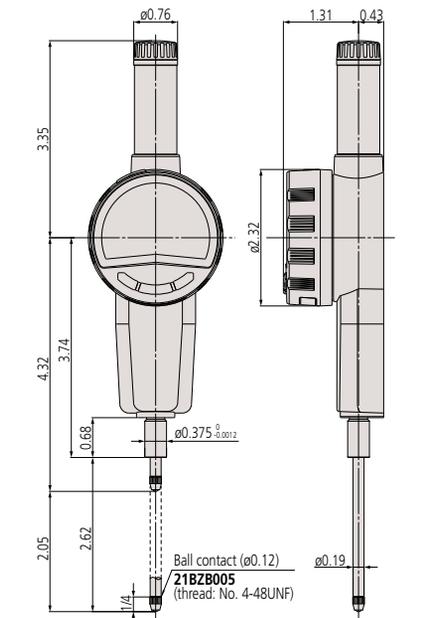
Unit: mm

ISO/JIS
Type



ASME/ANSI/AGD
Type

Unit: in



Note: Products with a Order No. suffixed "B" have a plain back, and other models have a center-lug back. Refer to pages F-69 to F-70 for details of the backs.

Indicators

ABSOLUTE Digimatic Indicator ID-N/B SERIES 543 — with Dust/Water Protection Conforming to IP66

- Slim body design (body width: only 35 mm). Rated to IP66: Can be used confidently even in adverse environments.
- The ABS (ABSOLUTE) scale restores the last origin position* automatically when the indicator is turned on, and realizes high reliability by eliminating over-speed errors.
- Back plunger design (ID-B) is widely used for dial indicators. A 5 mm-stroke plunger with a higher degree of accuracy has been implemented by adopting a direct reading scale for plunger displacement.
- Tolerance judgment can be performed by setting upper and lower tolerance limits.
- Equipped with a data output port that enables incorporation into measurement networking and statistical process control systems. (Refer to the A section)

* Refer to "Precautions for use" on page F-2.



SPECIFICATIONS

Inch / Metric		ASME/ANSI/AGD Type					
Order No.	Range (in)	Resolution	Accuracy (in)	Hysteresis	Repeatability	Measuring force (N)	Remarks
543-571	0.5	0.0005 in/ 0.01 mm	±0.0010	0.0010	0.0005	2.5 or less	Slim type
543-581	0.2					2.0 or less	Back Plunger type
543-576	0.5	0.00005/ 0.0005 in, 0.001/ 0.01 mm (selectable)	±0.00010	0.00010	0.00010	2.5 or less	Slim type
543-586	0.2					2.0 or less	Back Plunger type

Metric		ISO/JIS Type					
Order No.	Range (mm)	Resolution (mm)	Accuracy (mm)	Hysteresis H_{MPE}	Repeatability R_{MPE}	Measuring force (N)	Remarks
543-570	12.7	0.01	0.02	0.02	0.01	2.5 or less	Slim type
543-580	5.08					2.0 or less	Back Plunger type
543-575	12.7	0.001/0.01 (selectable)	0.003/0.01	0.002	0.002	2.5 or less	Slim type
543-585	5.08					2.0 or less	Back Plunger type

• Power source: SR44 battery (1 pc.), **938882** included as standard

Bifurcated connection cable with zero-setting terminal (optional)

21EAA210 (1 m), **21EAA211** (2 m)

Two of the wires inside the cable are separated for zero setting without touching the SET switch on the main body. Use these wires in combination with commercially available switches. Zero setting is performed by briefly connecting these two wires together (less than a second), and ABS preset & recall by connecting for a second or more.



SPC cable



Bifurcated connection cable with zero-setting terminal

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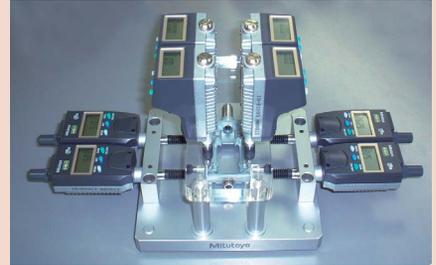
ABSOLUTE™



Applicable models:
543-57X

Applicable models:
543-58X

Typical application



Functions

- Zero-setting (INC system)
- Presetting (ABS system)
- Measuring direction switching
- Tolerance judgment
- Display readout reversal
- Resolution switching (For 0.001 mm or 0.00005 in resolution type)
- Data output
- Display value holding (when no external device is connected)
- Low battery voltage alarm display
- Error alarm display

Optional Accessories

Order No.	Type	Description
264-020	—	USB Input Tool Series USB Keyboard Signal Conversion Type IT-020U
21EAA194	G	Connection cable (1 m)
21EAA190	G	Connection cable (2 m)
06AFM380G	G	USB Input Tool Direct (2 m)
02AZD730G	IP67	U-WAVE-T
02AZD880G	Buzzer	U-WAVE-T
02AZD790G	G	Connection cable for U-WAVE-T (160 mm)
02AZE140G	G	Connection cable for U-WAVE-T For foot switch
264-622	IP67	U-WAVE-TM
264-623	Buzzer	U-WAVE-TM
02AZD810D	—	U-WAVE-R
264-626	IP67	U-WAVE-TMB
264-627	Buzzer	U-WAVE-TMB
02AZF675	—	U-WAVE-TM/TMB mounting bracket: for ID-N (Slim Type)*

* Cannot be used with **ID-B** (Back Plunger Type) since it may apply stress to the cable.

Typical application



Rated to IP66 water-and dust-proofing standard, and oil resistance improved.



Optional Accessories

- Lug
21EZA145 (ISO/JIS type)
21EZA146 (ASME/ANSI/AGD type)
- Contact points for Mitutoyo's Digimatic indicators (optional)
Refer to pages F-63 to F-68 for details.
- Lifting knob (only for ID-N)
21EZA105 (ISO/JIS type)
21EZA150 (ASME/ANSI/AGD type)
Spindle can be manually lifted. Remove the spindle cap for ID-N and attach the lifting knob to the spindle. Note that water resistance is not maintained in this configuration.

Typical application using the lifting knob



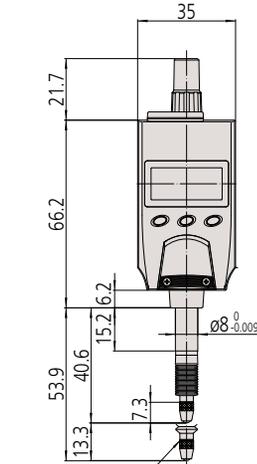
- Rubber boot
For oil resistance (NBR) **21EAA423** (for ID-N)
21AAB562 (for ID-B)
- For durability (silicone) **238774** (for ID-N)
21EAA212 (for ID-B)

DIMENSIONS

Slim Type

ID-N

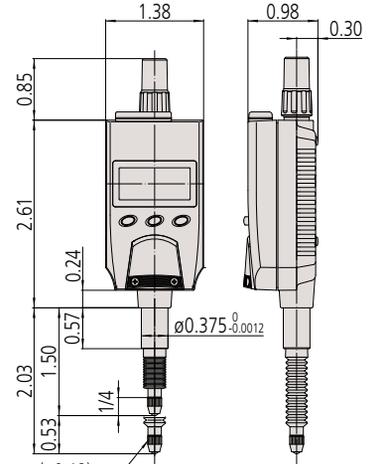
ISO/JIS Type



Ball contact (ø3)
901312
(thread: M2.5×0.45)

Unit: mm

ASME/ANSI/AGD Type



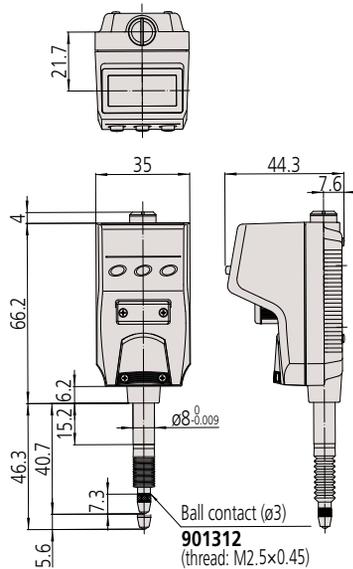
Ball contact (ø0.12)
21BZB005
(thread: No. 4-48UNF)

Unit: in

Back plunger Type

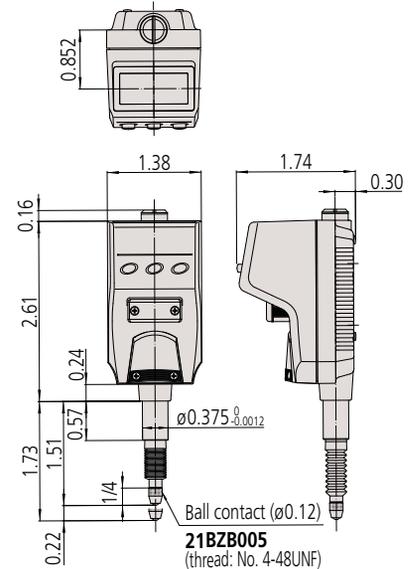
ID-B

ISO/JIS Type



Ball contact (ø3)
901312
(thread: M2.5×0.45)

ASME/ANSI/AGD Type



Ball contact (ø0.12)
21BZB005
(thread: No. 4-48UNF)

Indicators

ABSOLUTE Digimatic Indicator ID-SX2 SERIES 543

- A standard model of indicator that is reliable and easy to use with basic functions.
- This model consumes less power than other advanced models and can operate longer without frequent battery replacement.
- The ABS (ABSOLUTE) scale restores the last origin position* automatically when the indicator is turned on, and realizes high reliability by eliminating over-speed errors.
- Equipped with a data output port that enables incorporation into measurement networking and statistical process control systems. (Refer to the A section)

* Refer to "Precautions for use" on page F-2.



543-792-10

SPECIFICATIONS

Inch / Metric		ASME/ANSI/AGD Type									
Order No.	Range	Resolution	Accuracy (in)	Hysteresis	Repeatability	Measuring force (N)	Back type	Battery life*	Mass (g)	Dust/Water protection level	
543-792-10	0.5 in/ 12.7 mm	0.00005 in/ 0.001 mm	±0.00010	0.00010	0.00010	1.5 or less	With lug	Approx. 18,000 hours (Continuous use) Approx. 5 years (Normal use)	165	IP42	
543-792B-10		Flat					140				
543-793-10		With lug					165				
543-793B-10		Flat					140				
543-796-10		With lug					155				
543-796B-10		Flat					155				
543-783-10	0.0005 in/ 0.01 mm	0.0005 in/ 0.01 mm	±0.0010	0.0010	0.0005	1.5 or less	With lug	Approx. 20,000 hours (Continuous use) Approx. 5 years (Normal use)	165	IP42	
543-783B-10							Flat		140		

Inch / Metric		ISO/JIS Type																
Order No.	Range	Resolution	Accuracy (mm)	Hysteresis H_{MPE}	Repeatability R_{MPE}	Measuring force (N)	Back type	Battery life*	Mass (g)	Dust/Water protection level								
543-791-10	0.5 in/ 12.7 mm	0.00005 in/ 0.001 mm	0.003	0.002	0.002	1.5 or less	With lug	Approx. 18,000 hours (Continuous use) Approx. 5 years (Normal use)	150	IP42								
543-791B-10							Flat		140									
543-795-10							With lug		155									
543-795B-10							Flat		155									
543-782-10							0.0005 in/ 0.01 mm		0.0005 in/ 0.01 mm		0.02	0.02	0.01	1.5 or less	With lug	Approx. 20,000 hours (Continuous use) Approx. 5 years (Normal use)	150	IP42
543-782B-10															Flat		140	

Metric		ISO/JIS Type															
Order No.	Range (mm)	Resolution (mm)	Accuracy (mm)* ¹	Hysteresis H_{MPE}	Repeatability R_{MPE}	Measuring force (N)	Back type	Battery life*	Mass (g)	Dust/Water protection level							
543-790-10	12.7	0.001	0.003	0.002	0.002	1.5 or less	With lug	Approx. 18,000 hours (Continuous use) Approx. 5 years (Normal use)	150	IP42							
543-790B-10							Flat		140								
543-794-10							With lug		155								
543-794B-10							Flat		155								
543-781-10							0.01		0.02		0.02	0.01	1.5 or less	With lug	Approx. 20,000 hours (Continuous use) Approx. 5 years (Normal use)	150	IP42
543-781B-10														Flat		140	

• Power source: SR44 battery (1 pc.), **938882** included as standard

* The battery life varies, depending on the number of times a Digimatic indicator is used as well as the way it is used. The values listed above are approximations.

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IP53



Applicable models:
See SPECIFICATIONS

Functions

- Origin set (Zero-setting)
- Measuring direction switching
- Data output
- Low battery voltage alarm display
- Error alarm display

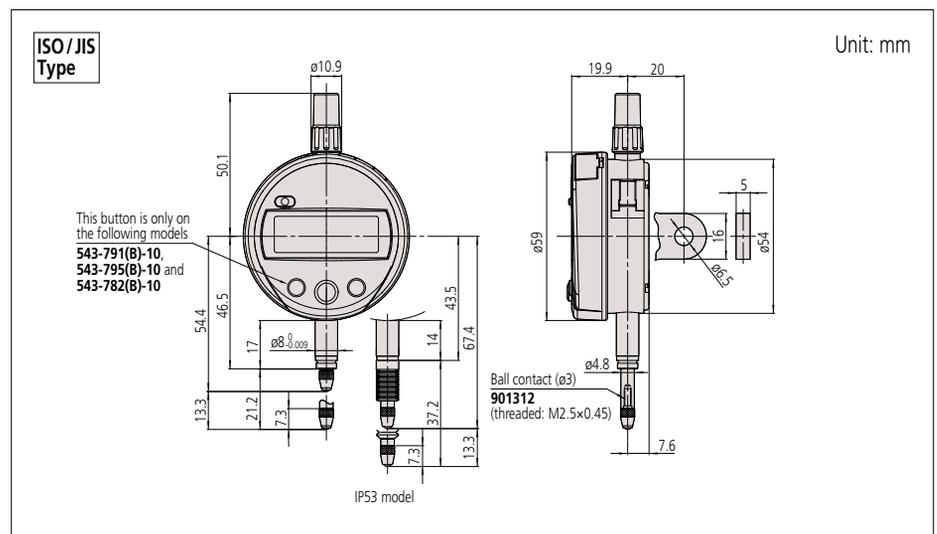
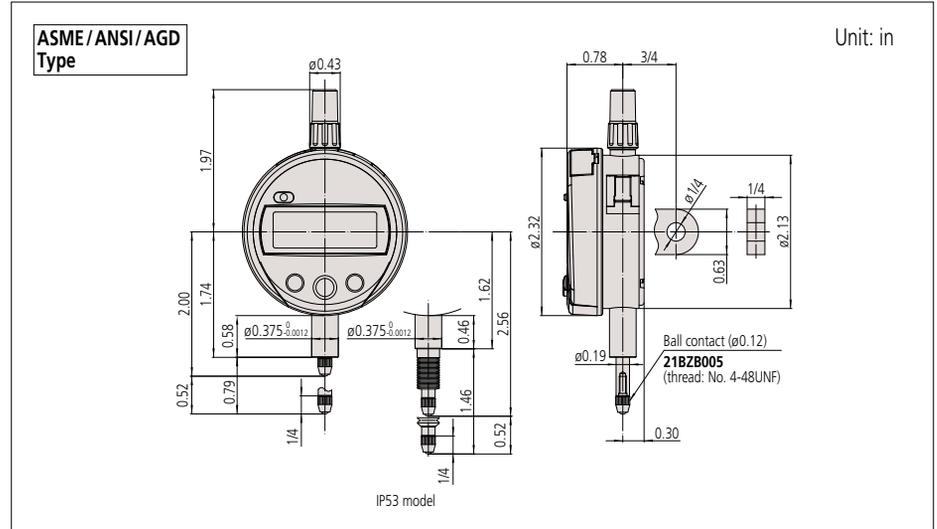
Optional Accessories

Order No.	Type	Description
264-020	—	USB Input Tool Series USB Keyboard Signal Conversion Type IT-020U
905338	F	Connection cable (1 m)
905409	F	Connection cable (2 m)
06AFM380F	F	USB Input Tool Direct* (2 m)
02AZD790F	F	Connection cable for U-WAVE-T (160 mm)
02AZE140F	F	Connection cable for U-WAVE-T For foot switch
264-622	IP67	U-WAVE-TM
264-623	Buzzer	U-WAVE-TM
02AZD810D	—	U-WAVE-R
264-626	IP67	U-WAVE-TMB
264-627	Buzzer	U-WAVE-TMB
02AZF670	—	U-WAVE-TM/TMB mounting bracket: for Digimatic Indicators

* Please separately purchase **USB-ITPAK** since there is no data output switch on the measurement instrument. (Refer to Section A for details.)

- Lifting
Lifting lever **21EZA198**
Lifting knob **21EZA105**
Lifting cable **21JZA295**
With auto-stop function:
21JZA301 (overall length 300 mm)
- Contact points for Mitutoyo's Digimatic indicators (optional)
Refer to pages F-63 to F-68 for details.
- Interchangeable back covers (optional)
Refer to pages F-69 to F-70 for details.
- Measuring stands (optional)
Refer to Section A for details.

DIMENSIONS



Got Questions?

Indicators

ABSOLUTE Digimatic Indicator ID-U SERIES 575 — Slim and Economical Design

- Cost-effective and user-friendly type with basic functions.
- Battery life: approx. 20,000 hours in continuous use.
- The ABS (ABSOLUTE) scale restores the last origin position* automatically when the indicator is turned on, and realizes high reliability by eliminating over-speed errors.
- Equipped with a data output port that enables incorporation into measurement networking and statistical process control systems. (Refer to the A section)

* Refer to "Precautions for use" on page F-2.



575-123

SPECIFICATIONS

Inch / Metric		ASME / ANSI / AGD type				
Order No.	Range	Resolution	Accuracy (in)	Hysteresis	Repeatability	Measuring force (N)
575-123	1 in / 25.4 mm	0.0005 in / 0.01 mm	±0.0010	0.0010	0.0005	1.8 or less

Inch / Metric		ISO / JIS Type				
Order No.	Range	Resolution	Accuracy (mm)	Hysteresis H_{MPE}	Repeatability R_{MPE}	Measuring force (N)
575-122	1 in / 25.4 mm	0.0005 in / 0.01 mm	0.02	0.02	0.01	1.8 or less

Metric		ISO / JIS Type				
Order No.	Range (mm)	Resolution (mm)	Accuracy (mm)	Hysteresis H_{MPE}	Repeatability R_{MPE}	Measuring force (N)
575-121	25.4	0.01	0.02	0.02	0.01	1.8 or less

- Power source: SR44 battery (1 pc.), **938882** included as standard
- Battery life varies depending on use frequency and method

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Function

- Origin set (Zero-setting)
- Measuring direction switching
- Data output
- Low battery voltage alarm display
- Error alarm display

Optional Accessories

Order No.	Type	Description
264-020	—	USB Input Tool Series USB Keyboard Signal Conversion Type IT-020U
905338	F	Connection cable (1 m)
905409	F	Connection cable (2 m)
06AFM380F	F	USB Input Tool Direct* (2 m)
02AZD730G	IP67	U-WAVE-T
02AZD880G	Buzzer	U-WAVE-T
02AZD790F	F	Connection cable for U-WAVE-T (160 mm)
02AZE140F	F	Connection cable for U-WAVE-T For foot switch
02AZD810D	—	U-WAVE-R
02AZE200	—	U-WAVE-T mounting bracket

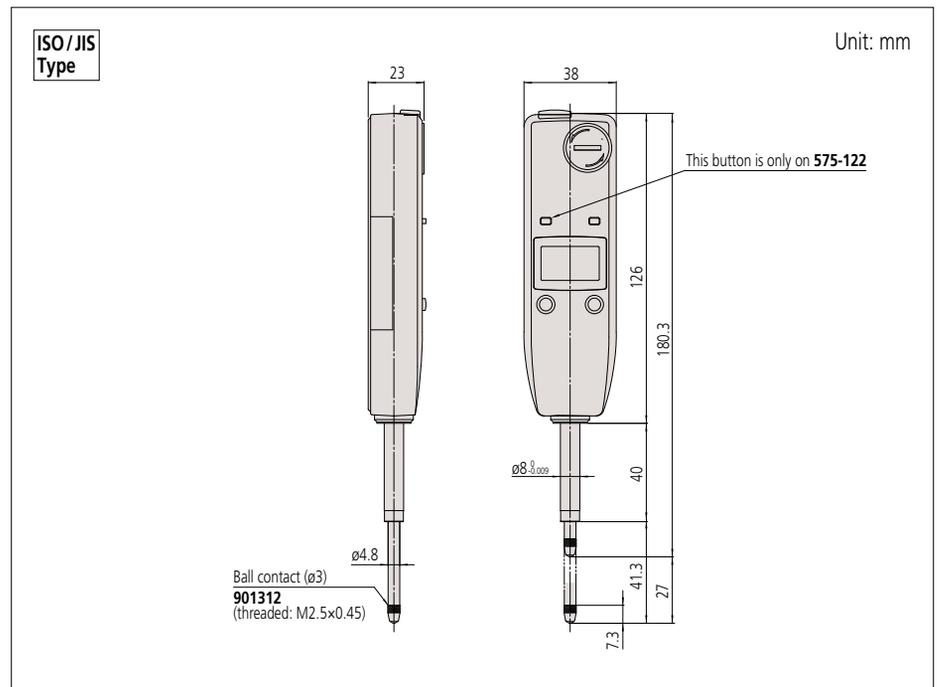
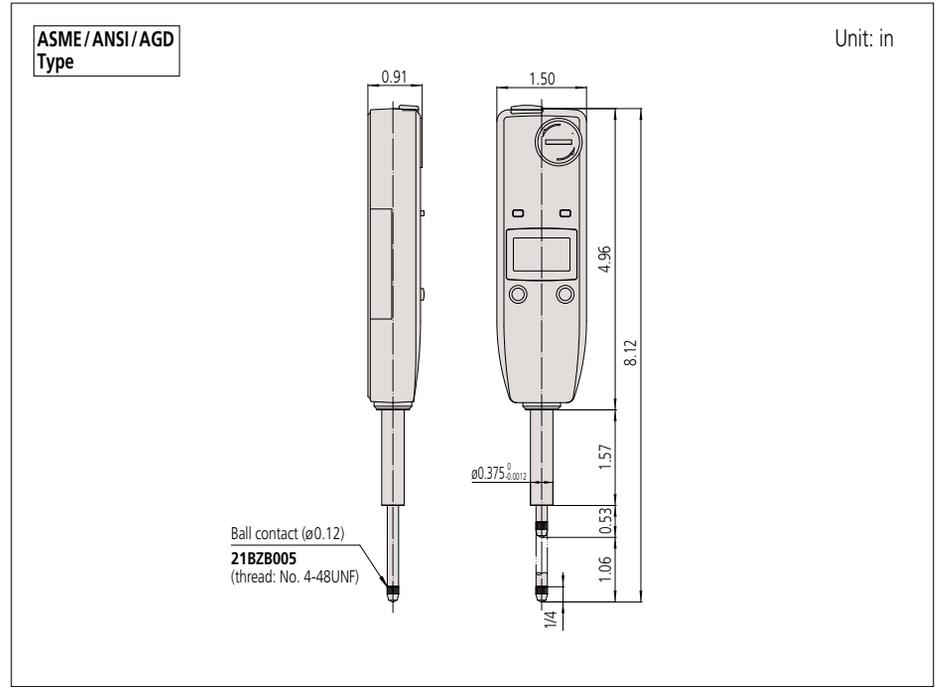
* Please separately purchase **USB-ITPAK** since there is no data output switch on the measurement instrument. (Refer to the A section for details.)

- Spindle lifting cable (stroke: 10 mm): **21JZA295**
- With auto-stop function:
21JZA301 (overall length 300 mm)
- Contact points for Mitutoyo's Digimatic indicators (optional)
Refer to pages F-63 to F-68 for details.
- Measuring stands (optional)
Refer to pages F-97 to F-103 for details.



Talk to Sales

DIMENSIONS



Indicators

ABSOLUTE Digimatic Indicator ID-CAX SERIES 543 — Peak-Value Hold Type

- The Peak Hold-Type Digimatic Indicator. GO/NG judgment is performed by setting the upper and lower tolerances for max., min. and runout values.*1
- Five buttons, status icons, and clear button indications allow easy operation and various functions.
- Wide display and new analog bar graph are standard on all models.
- The ABS (ABSOLUTE) scale restores the last origin position*2 automatically when the indicator is turned on, and realizes high reliability by eliminating over-speed errors.
- Equipped with a data output port that enables incorporation into measurement networking and statistical process control systems. (Refer to the A section)
- By using the parameter setup kit (optional) and the dedicated software, the functions and the parameters can be configured using a computer.

*1 Tolerance judgment results cannot be output.

*2 Refer to "Precautions for use" on page F-2.



543-302-10

SPECIFICATIONS

Inch / Metric		ASME / ANSI / AGD type						
Order No.	Range	Resolution	Accuracy (in)	Hysteresis	Repeatability	Measuring force (N)	Battery life (normal use)	Mass (g)
543-302-10	0.5 in / 12.7 mm	0.00005 / 0.0001 / 0.0005 in, 0.001 / 0.01 mm (selectable)	±0.00010	0.00010	0.00010	1.5 or less	Approx. 1 year	195
543-302B-10 (flat back)		170						

Inch / Metric		ISO / JIS Type						
Order No.	Range	Resolution	Accuracy (mm)	Hysteresis H_{MPE}	Repeatability R_{MPE}	Measuring force (N)	Battery life (normal use)	Mass (g)
543-301-10	0.5 in / 12.7 mm	0.00005 / 0.0001 / 0.0005 in, 0.001 / 0.01 mm (selectable)	0.003	0.003	0.002	1.5 or less	Approx. 1 year	180
543-301B-10 (flat back)		170						

Metric		ISO / JIS Type						
Order No.	Range (mm)	Resolution (mm)	Accuracy (mm)	Hysteresis H_{MPE}	Repeatability R_{MPE}	Measuring force (N)	Battery life (normal use)	Mass (g)
543-300-10	12.7	0.001 / 0.01 (selectable)	0.003	0.003	0.002	1.5 or less	Approx. 1 year	180
543-300B-10 (flat back)								170

- Power source: CR2032 battery (1 pc.), included as standard

MeasurLink¹ ENABLED
Data Management Software by Mitutoyo

ABSOLUTE™



Functions

- Peak detection (MAX/MIN)
- Runout (MAX - MIN) Hold
- Note: Peak detection
 - 1) Sampling rate: 50 readings/s
 - 2) Capturing speed: 50 μm/s (max.)
- Zeroret (INC system)
- Preset function (ABS system)
- Measuring direction switching
- Tolerance judgment (3 pairs of ABS, INC memory function)
- Resolution selection
- Simple calculation $f(x) = Ax$
- Analog bar resolution selection
- Key lock
- in/mm conversion (inch/mm type)
- Display hold (when no external device is connected)
- Data output
- External PC setting input
- Display rotation (330°)
- Low battery voltage alarm display
- Error alarm display

Optional Accessories

Order No.	Type	Description
264-020	—	USB Input Tool Series USB Keyboard Signal Conversion Type IT-020U
905338	F	Connection cable (1 m)
905409	F	Connection cable (2 m)
06AFM380F	F	USB Input Tool Direct (2 m)
02AZD790F	F	Connection cable for U-WAVE-T (160 mm)
02AZE140F	F	Connection cable for U-WAVE-T For foot switch
264-622	IP67	U-WAVE-TM
264-623	Buzzer	U-WAVE-TM
02AZD810D	—	U-WAVE-R
264-626	IP67	U-WAVE-TMB
264-627	Buzzer	U-WAVE-TMB
02AZF670	—	U-WAVE-TM/TMB mounting bracket: for Digimatic Indicators

- Lifting
Lifting lever **21EZA198**
Lifting knob **21EZA105**
 - Parameter setup kit: **21EZA313**
- Note: Parameter setting software (can be downloaded for free from the Mitutoyo website) is also required.



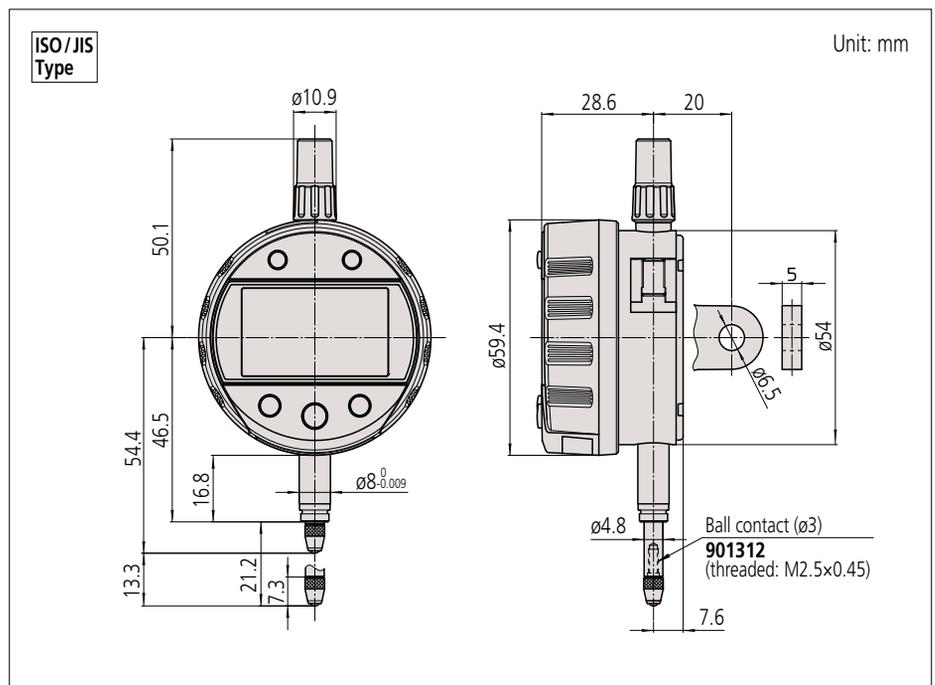
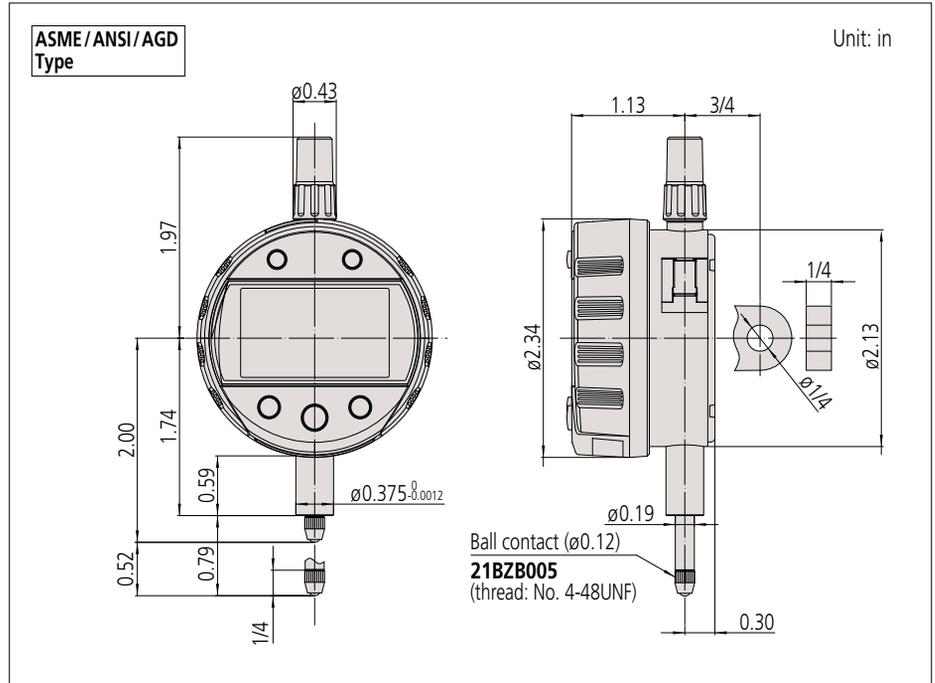
Parameter setup kit



Parameter setting software

- Contact points for Mitutoyo's Digimatic indicators (optional)
Refer to pages F-63 to F-68 for details.
- Interchangeable back covers (optional)
Refer to pages F-69 to F-70 for details.
- Measuring stands (optional)
Refer to pages F-97 to F-103 for details.

DIMENSIONS



Need Repair?

Indicators

ABSOLUTE Digimatic Indicator ID-CGX SERIES 543 — Bore Gage Type

- Dedicated to inside diameter measurement with minimum-value holding and tolerance judgment functions*.
Use together with a Mitutoyo bore gage (refer to pages C-31 to C-48 for details).
- Five buttons, status icons, and clear button indications allow easy operation and various functions.
- Wide display and analog bar graph are standard on all models.
- Up to three sets of master values and upper/lower tolerance values can be stored to simplify the master setting.
- By using the parameter setup kit (optional) and the dedicated software, the functions and the parameters can be configured using a computer.
* Tolerance judgment results cannot be output.



543-312B-10

SPECIFICATIONS

Inch / Metric		ASME / ANSI / AGD type						
Order No.	Range	Resolution	Accuracy (in)	Hysteresis	Repeatability	Measuring force (N)	Battery life (normal use)	Mass (g)
543-312B-10	0.5 in / 12.7 mm	0.00005 / 0.0001 / 0.0005 in, 0.001 / 0.01 mm (selectable)	±0.00010	0.00010	0.00010	1.5 or less	Approx. 1 year	170

Inch / Metric		ISO / JIS Type						
Order No.	Range	Resolution	Accuracy (mm)	Hysteresis H_{MPE}	Repeatability R_{MPE}	Measuring force (N)	Battery life (normal use)	Mass (g)
543-311B-10	0.5 in / 12.7 mm	0.00005 / 0.0001 / 0.0005 in, 0.001 / 0.01 mm (selectable)	0.003	0.003	0.002	1.5 or less	Approx. 1 year	170

Metric		ISO / JIS Type						
Order No.	Range (mm)	Resolution (mm)	Accuracy (mm)	Hysteresis H_{MPE}	Repeatability R_{MPE}	Measuring force (N)	Battery life (normal use)	Mass (g)
543-310B-10	12.7	0.001 / 0.01 (selectable)	0.003	0.003	0.002	1.5 or less	Approx. 1 year	170

- Power source: CR2032 battery (1 pc.), included as standard

MeasurLink¹ ENABLED
Data Management Software by Mitutoyo

ABSOLUTE™



Example of use with a bore gage (sold separately)



Functions

- Minimum value detection
Note: Peak detection
 - 1) Sampling rate: 50 readings/s
 - 2) Capturing speed: 50 μm/s (max.)
- Preset (3 Preset values can be stored)
- Tolerance judgment
(3 sets of upper and lower limits can be stored)
- Resolution selection
- Analog bar resolution selection
- Key lock
- Display hold (when no external device is connected)
- Data saving/calling
(when no external device is connected)
- Data output
- External PC setting input
- Display rotation (330°)
- Low battery voltage alarm display
- Error alarm display

Optional Accessories

Refer to page F-13.

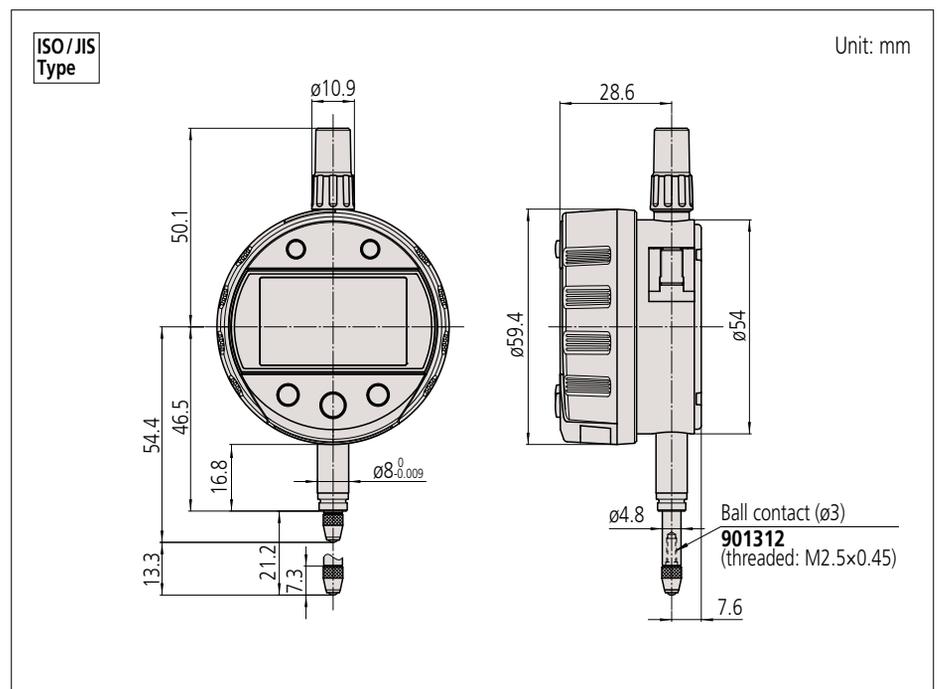
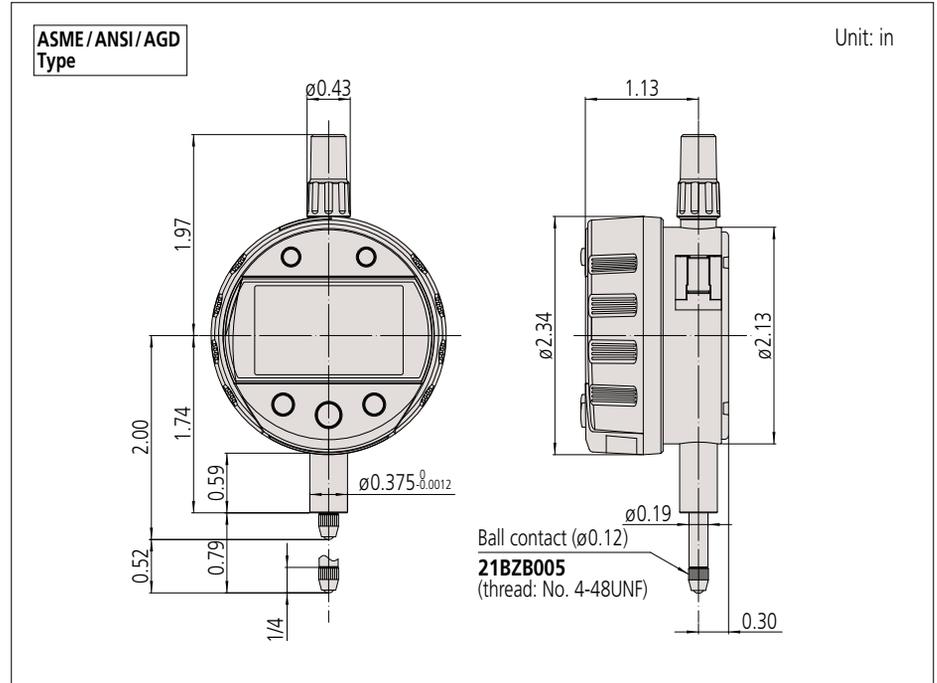
- Parameter setup kit (optional)
Refer to page F-13 for details.

The ABSOLUTE Digimatic Bore Gage



ABSOLUTE Digimatic Bore Gages, which integrate the display with a bore gage measuring unit, are also available. Refer to pages C-49 and C-50 for details.

DIMENSIONS



Where to Buy

Indicators

ABSOLUTE Digimatic Indicator ID-CRX SERIES 543 — Calculation Type

- This expandable indicator incorporates an internal calculation function that operates from plunger displacement. Using dedicated fixtures and setting the calculation coefficients, you can read your measurements directly without the need for conversions.
- By using the parameter setup kit (optional) and the dedicated software, the functions and the parameters can be configured using a computer.
- Five buttons, status icons, and clear button indications allow easy operation and various functions.



543-342B-10

SPECIFICATIONS

Inch / Metric		ASME/ANSI/AGD type						
Order No.	Range	Resolution (selectable)	Accuracy (in)	Hysteresis	Repeatability	Measuring force (N)	Battery life (normal use)	Mass (g)
543-342B-10	0.5 in / 12.7 mm	12 steps	±0.00010	0.00010	0.00010	1.5 or less	Approx. 1 year	170
543-592B-10	1 in / 25.4 mm					1.8 or less		190
543-597B-10	2 in / 50.8 mm					2.3 or less		260

Inch / Metric		ISO/JIS Type						
Order No.	Range	Resolution (selectable)	Accuracy (mm)	Hysteresis H_{MPE}	Repeatability R_{MPE}	Measuring force (N)	Battery life (normal use)	Mass (g)
543-341B-10	0.5 in / 12.7 mm	12 steps	0.003	0.003	0.002	1.5 or less	Approx. 1 year	170
543-591B-10	1 in / 25.4 mm					1.8 or less		190
543-596B-10	2 in / 50.8 mm					2.3 or less		260

Metric		ISO/JIS Type						
Order No.	Range (mm)	Resolution (selectable)	Accuracy (mm)	Hysteresis H_{MPE}	Repeatability R_{MPE}	Measuring force (N)	Battery life (normal use)	Mass (g)
543-340B-10	12.7	12 steps	0.003	0.003	0.002	1.5 or less	Approx. 1 year	170
543-590B-10	25.4					1.8 or less		190
543-595B-10	50.8					2.3 or less		260

- Power source: CR2032 battery (1 pc.), included as standard

MeasurLinkTM ENABLED
Data Management Software by Mitutoyo

ABSOLUTETM



Typical application



Functions

- Calculation $f(x') = Ax' + B + Cx'^{-1}$
($x' = x + \text{offset}$)
- Peak detection (MAX/MIN)
- Runout (MAX - MIN) Hold
- Note: Peak detection
 - 1) Sampling rate: 10 readings/s
 - 2) Capturing speed: 10 $\mu\text{m/s}$ (max.)
- Settings can be changed to:
 - 1) Sampling rate: 50 readings/s
 - 2) Capturing speed: 50 $\mu\text{m/s}$ (max.)
- Zero-setting (INC system)
- Preset (ABS system)
- Tolerance judgment
(3 pairs of ABS, INC memory function)
- Analog bar resolution selectable
- Key lock
- Display hold (when no external device is connected)
- Data output
- External PC setting input
- Display rotation (330°)
- Low battery voltage alarm display
- Error alarm display
- Resolution switching*

Resolution (mm)			Resolution (in)		
0.0002	0.005	0.1	0.00001	0.0002	0.005
0.0005	0.01	0.2	0.00002	0.0005	0.01
0.001	0.02	0.5	0.00005	0.001	0.02
0.002	0.05	1	0.0001	0.002	0.05

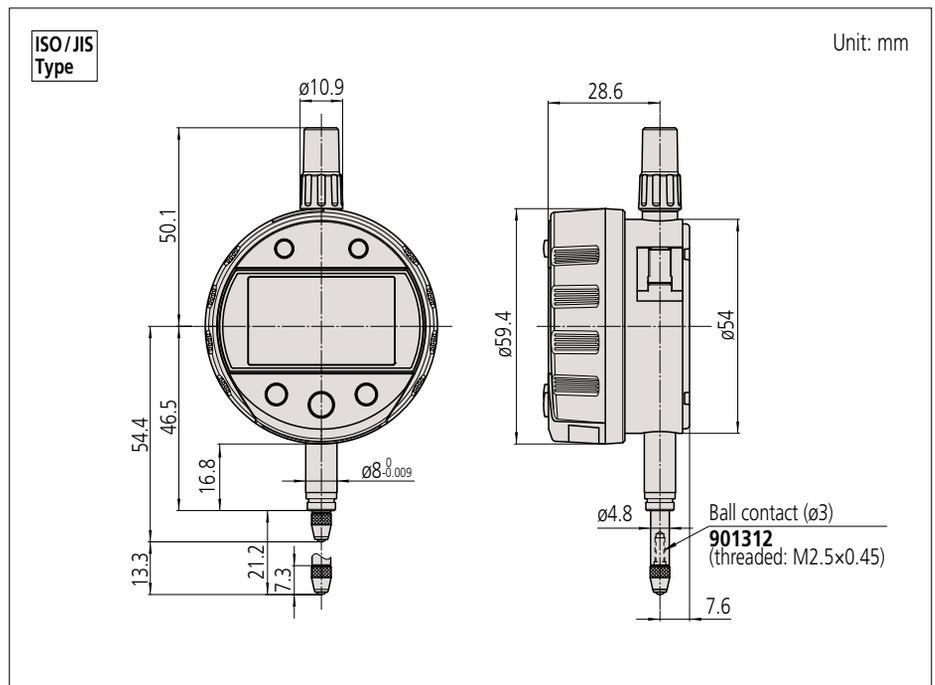
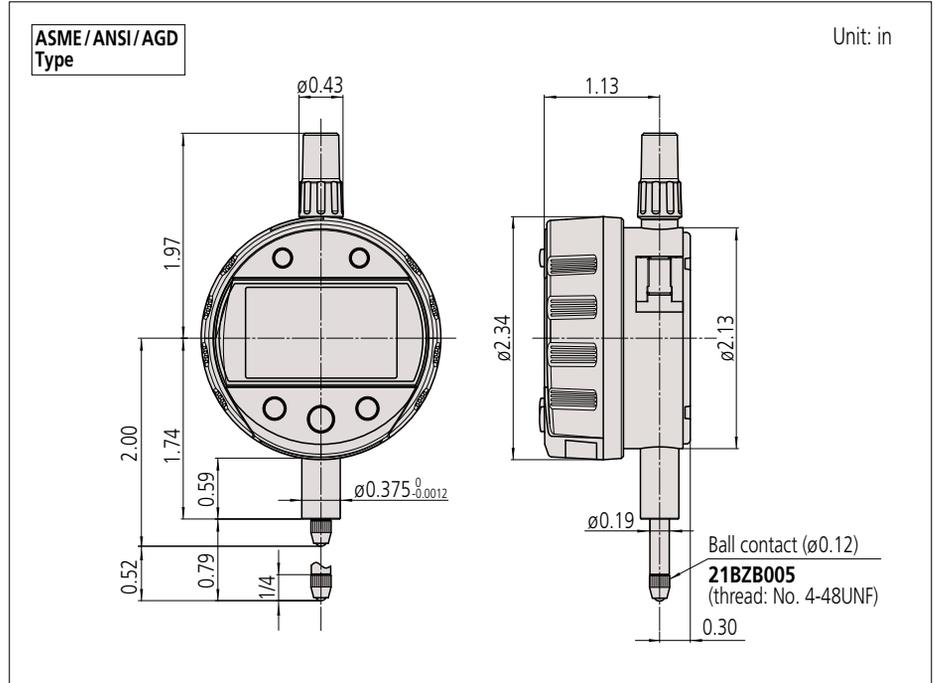
* Since the calculation resolution is one micrometer (0.001 mm), using sub-micrometer resolution settings may result in the 4th-place digit being unreliable, particularly when B is set to a very low value and C=0. It does not change at all with certain combinations of calculation coefficient (for example, A=1, B=C=0). The 3rd-place digit representing micrometers (if displayed) is always reliable.

Optional Accessories

Refer to page F-13.

- Lifting
 - Lifting lever **21EZA198** (0.5 inch / 12.7 mm type)
 - Lifting knob **21EZA105** (0.5 inch / 12.7 mm type)
 - 21EZA197** (1 inch / 25.4 mm type)
 - 21EZA200** (2 inch / 50.8 mm type)
- Parameter setup kit (optional)
Refer to page F-13 for details.

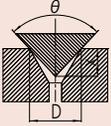
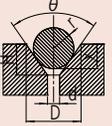
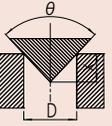
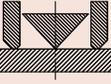
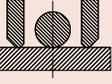
DIMENSIONS

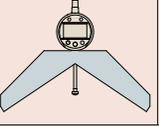
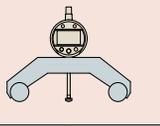
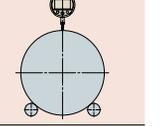
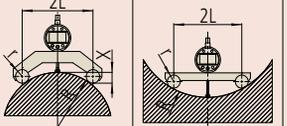
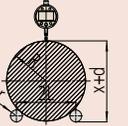
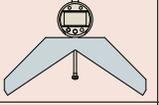
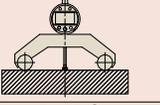
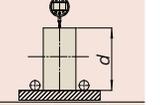


Get a Quote

Indicators

Examples of measuring various features

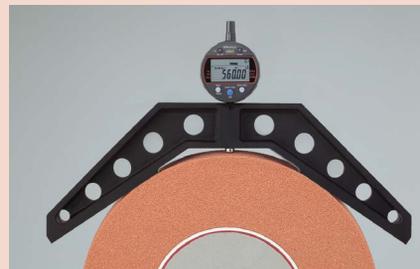
Item		D=Countersink diameter/Groove width; H=Countersink depth/Groove depth			
Fixture type*1					
Contact point		Cone	Ball	Cone	
Measuring method x: Spindle displacement					
Calculation		D=Ax	D=Ax+B	H=Ax+B	D=Ax
Coefficient values	A	$-2 \tan \frac{\theta}{2}$	$-2 \tan \frac{\theta}{2}$	-1	$-2 \tan \frac{\theta}{2}$
	B	0	$2r \left(\frac{1}{\cos \frac{\theta}{2}} - \tan \frac{\theta}{2} \right)$	$r \left(\frac{1}{\sin \frac{\theta}{2}} - 1 \right) - \frac{d}{2 \tan \frac{\theta}{2}}$	0
	C	0	0	0	0
Origin offset value (function ON/OFF)		d (OFF)	0 (OFF)	0 (OFF)	0 (OFF)
ORIGIN-set position (x=0 position)					
Displayed measurement value at ORIGIN-set position (Value displayed when x=0)		0	Value of coefficient B	0	0

Item		R=Outside radius of round object	R=Inside radius of round object	R=Outside radius of round object
Fixture type*1				
Contact point			-	
Measuring method x: Spindle displacement				
Calculation		R=Ax	R=Ax+B+Cx ⁻¹	R=A(x+d)+B+C(x+d) ⁻¹
Coefficient values	A	$\frac{\sin \frac{\theta}{2}}{1 - \sin \frac{\theta}{2}}$	$\frac{1}{2}$	$-\frac{1}{2}$
	B	0	-r	r
	C	0	$\frac{L^2}{2}$	$-\frac{L^2}{2}$
Origin offset value (function ON/OFF)		d (OFF)	0 (OFF)	0 (OFF)
ORIGIN-set position (x=0 position)				
Displayed measurement value at ORIGIN-set position (Value displayed when x=0)		0	Err 30*2 (Overflow error of Display value)	Depends on value of d

*1 A dedicated fixture for a workpiece can be made to order.

*2 The error is cleared when the measured value returns to the displayable range as a result of moving the spindle.

Custom fixture examples



Need Support?

Functions

- Signal output (-NG/OK/+NG, N-ch open drain, logical invert is available)
- Remote control (peak start preset/zero-set)
- Peak detection (MAX/MIN)
- Runout range measurement (MAX - MIN)
- Zero-setting (INC system)
- Presetting (ABS system)
- Measuring direction switching
- Tolerance judgment (3 pairs of ABS, INC memory function)
- Resolution switching
- Simple calculation: $f(x) = Ax$
- Key lock
- Calibration mode (Signal output in Digimatic code format)
- Error alarm display

Optional Accessories

- Lifting*
 - Lifting lever **21EZA198**
 - Lifting knob **21EZA105**
- * Dust-water protection is not guaranteed.
- Digimatic power supply unit: **21EZA345A**
Used in the calibration mode when executing automatic inspection using i-Checker **IC2000**.
In such a case, purchase connection cable **21EAA194** (1 m), or **21EAA190** (2 m).
Note: It can't be used as a power source when using in the normal mode.
- Contact points for Mitutoyo's Digimatic indicators (optional)
Refer to pages F-63 to F-68 for details.
- Interchangeable back covers (optional)
Refer to pages F-69 to F-70 for details.

Output signals and display

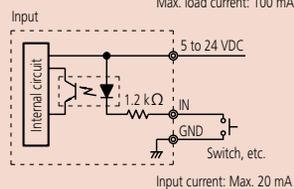
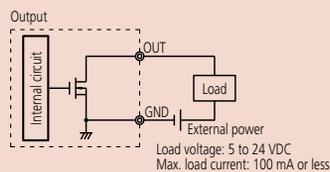
Wire	- NG	OK	+ NG	ABS data composition error
Orange (- NG)	Low	High	High	High
Green (OK)	High	Low	High	High
Brown (+ NG)	High	High	Low	High
LED	Red	Green	Red	Red flashing
Display	◀	○	▶	"x.xxE" indication

Note: Logical invert is available.

I/O Specifications

Wire	Signal	I/O	Description
Black	- V (GND)	—	Connected to minus (-) terminal
Red	+ V	—	Power supply (5 to 24 VDC)
Orange	- NG	0	Tolerance judgment result output: Only the terminal corresponding to a judgment result is set to the low level.
Green	OK	0	
Brown	+ NG	0	
Yellow	PRESET_RECALL ZERO	I	External input terminal: If the relevant terminal is set to the low level, its signal becomes true.
Blue	PEAK_START	I	
Shield	FG	—	Connected to GND (Earth)

Note: Measurement data cannot be output.



ABSOLUTE Digimatic Indicator ID-CJX SERIES 543 — Signal Output Function Type

- Powered by external devices / machines.
See optional accessories for Mitutoyo power supply options.
- Enables the Go/No-go judgment result to be output to external equipment. Output is enabled by directly connecting to an external device such as a sequencer, contributing to automation of measurement processes. It also supports logical invert of signal output.
- The Go/No-go judgment result is also indicated by the green/red LED and the signs on display.
- A peak detection function is equipped for measuring and judging peak values such as MAX, MIN, or Runout.
- The ABS (ABSOLUTE) scale restores the last origin position* automatically when the indicator is turned on, and realizes high reliability by eliminating over-speed errors.

* Refer to "Precautions for use" on page F-2.



543-350-10

SPECIFICATIONS

Inch / Metric ASME/ANSI /AGD type

Order No.	Range	Resolution	Accuracy (in)	Hysteresis	Repeatability	Measuring force (N)	Mass (g)
543-352-10	0.5 in / 12.7 mm	0.00005 / 0.0001 / 0.0005 in, 0.001 / 0.01 mm (selectable)	±0.00010	0.00010	0.00010	2.5 or less	295
543-352B-10 (flat back)		285					

Inch / Metric ISO/JIS Type

Order No.	Range	Resolution	Accuracy (mm)	Hysteresis H_{MPE}	Repeatability R_{MPE}	Measuring force (N)	Mass (g)
543-351-10	0.5 in / 12.7 mm	0.00005 / 0.0001 / 0.0005 in, 0.001 / 0.01 mm (selectable)	0.003	0.003	0.002	2.5 or less	295
543-351B-10 (flat back)		285					

Metric ISO/JIS Type

Order No.	Range (mm)	Resolution (mm)	Accuracy (mm)	Hysteresis H_{MPE}	Repeatability R_{MPE}	Measuring force (N)	Mass (g)
543-350-10	12.7	0.001 / 0.01 (selectable)	0.003	0.003	0.002	2.5 or less	295
543-350B-10 (flat back)							285

Note 1: Display readout does not rotate.

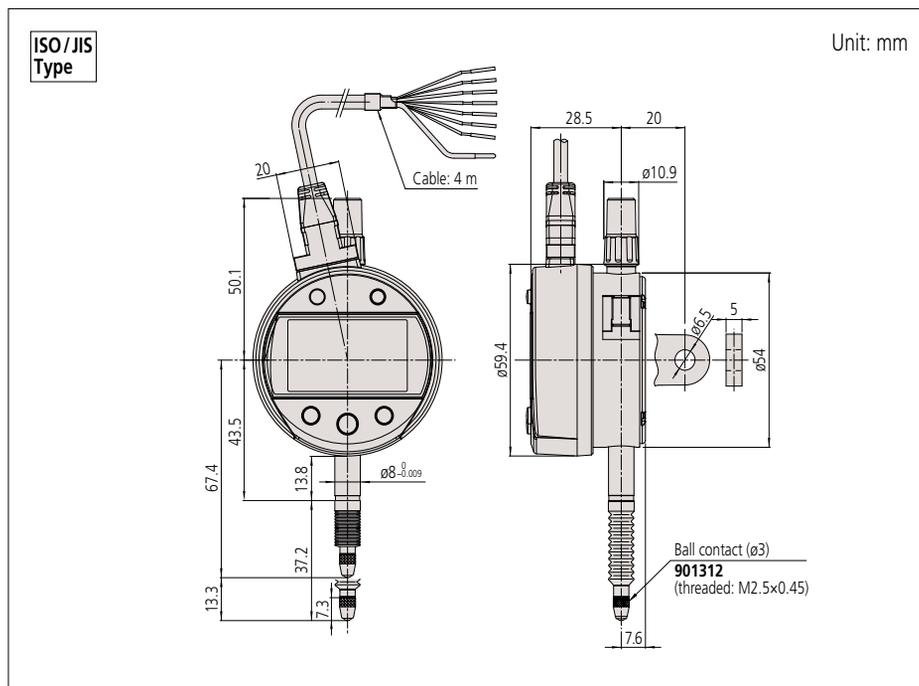
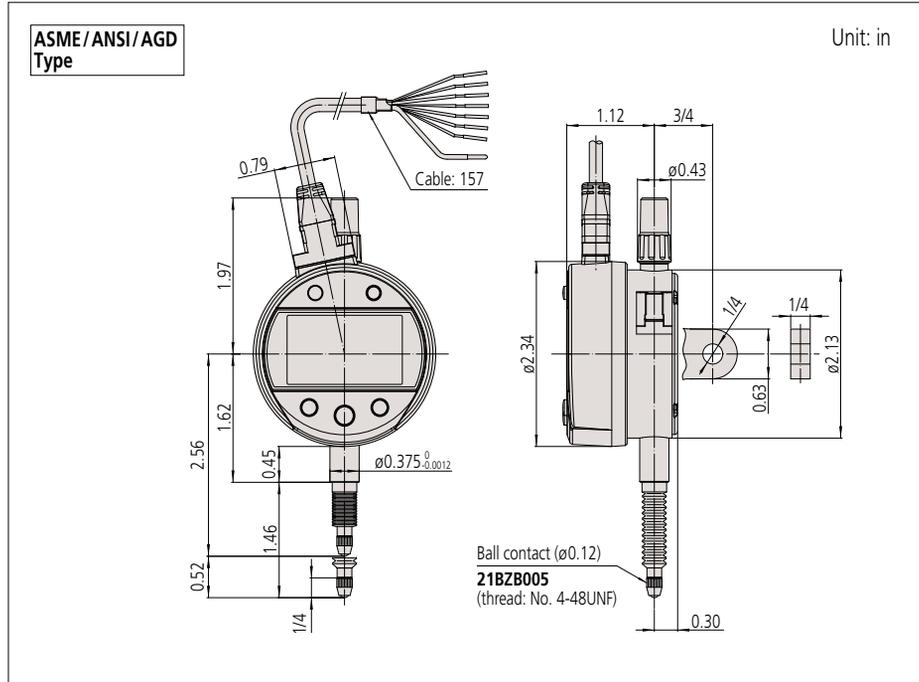
Note 2: MAX/MIN holding: sample rate is 100 readings/s; max. rate of change of reading is 100 μm/s or less.

Note 3: Standard contact point: **901312** (ISO/JIS type), **21BZB005** (ANSI/AGD type)

Indicators

ABSOLUTE Digimatic Indicator ID-CJX SERIES 543 — Signal Output Function Type

DIMENSIONS



Need Service?

Application example using comparator stand



Comparator stand
215-505-10

Optional Accessories

Order No.	Type	Description
264-020	—	USB Input Tool Series USB Keyboard Signal Conversion Type IT-020U
936937	D	Connection cable (1 m)
965014	D	Connection cable (2 m)
06AFM380D	D	USB Input Tool Direct (2 m)
02AZD730G	IP67	U-WAVE-T
02AZD880G	Buzzer	U-WAVE-T
02AZD790D	D	Connection cable for U-WAVE-T (160 mm)
02AZE140D	D	Connection cable for U-WAVE-T For foot switch
02AZD810D	—	U-WAVE-R
02AZE200	—	U-WAVE-T mounting bracket

- Remote controller: **21EZA099**
- Lifting cable: **21JZA295** (stroke 30 mm)
- With auto-stop function:
21JZA301 (overall length 300 mm)
- Lifting knob: **21EZA101**



Lifting knob

- RS-232C Connection cable (2 m): **21EAA131**
- Lug-on-center back:
101040 (ISO/JIS type)
101306 (ASME/ANSI/AGD type)
- Contact points for Mitutoyo's Digimatic indicators (optional)
Refer to pages F-63 to F-68 for details.
- Granite comparator stands (optional)
Refer to page F-101 for details.
- Comparator stands (optional)
Refer to page F-102 for details.

Digimatic Indicator ID-H SERIES 543 — High Accuracy and High Functionality Type

- This digital indicator offers the excellent accuracy, functionality and high resolution expected with top-of-the-line indicators.
- Take advantage of its high accuracy backed up by 20 μinch / 0.5 μm resolution, remote control functionality via a handheld controller (or an RS-232C interface) and easy runout measurements with the well-established analog bar display.
- The maximum, minimum, or runout value (MAX - MIN) can be measured.
- An advanced, remote control system can be implemented with the built-in RS-232C interface and a PC.
- With the optional remote controller, operations such as zero-setting and presetting can be made without touching the indicator body, thereby enabling more stable and high accuracy measurement.



Remote controller (optional)



543-564A

SPECIFICATIONS

Inch / Metric		ASME/ANSI/AGD Type					
Order No.	Range	Resolution	Accuracy (in)	Hysteresis	Repeatability	Measuring force (N)	Mass (g)
543-562A	1.2 in/ 30.48 mm	0.00002/ 0.00005/ 0.0001 in, 0.0005/ 0.001 mm (selectable)	±0.00006	0.00006	0.00004	2.0 or less	300
543-564A	2.4 in/ 60.96 mm		±0.00010	0.00010		2.5 or less	

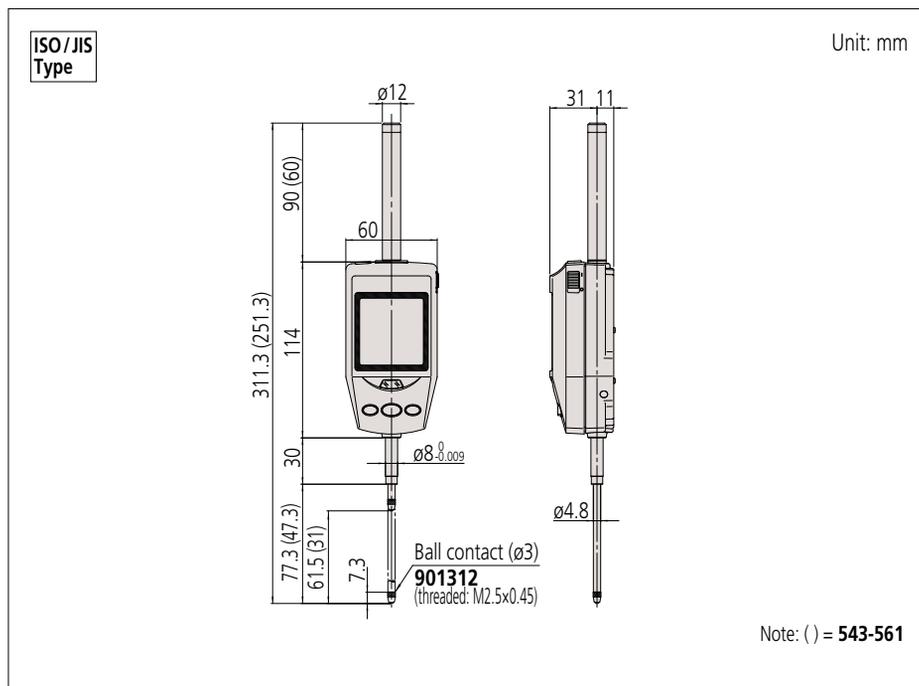
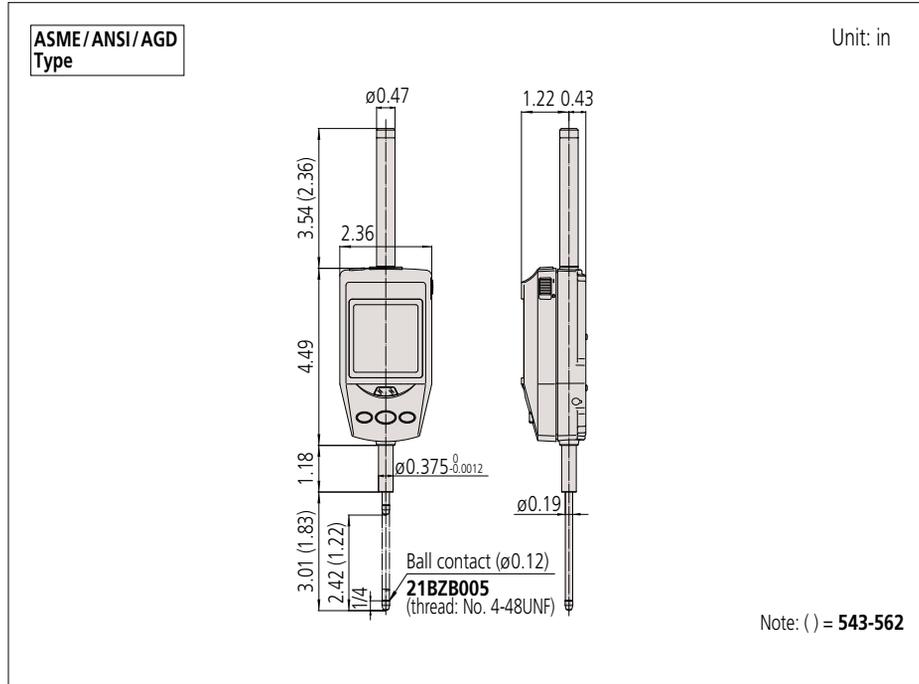
Metric		ISO/JIS Type					
Order No.	Range (mm)	Resolution (mm)	Accuracy (mm)	Hysteresis H_{MPE}	Repeatability R_{MPE}	Measuring force (N)	Mass (g)
543-561A	30.48	0.0005/ 0.001 (selectable)	0.0015	0.0015	0.001	2.0 or less	290
543-563A	60.96		0.0025	0.0025		2.5 or less	305

- Power source: 5.9 V DC (via AC adapter) **06AGZ369A***

Indicators

Digimatic Indicator ID-H SERIES 543 — High Accuracy and High Functionality Type

DIMENSIONS



Need Calibration?

Functions

- Preset
- Tolerance judgment (3 steps)

EC Counter SERIES 542 — Low-cost, Modular Type Display Unit

- The counter can be connected to a gage that has a data output function, such as a Digimatic indicator or linear gage.
- 3 sets of limiting values can be displayed and output.
- Compact size (DIN 96x48 mm)

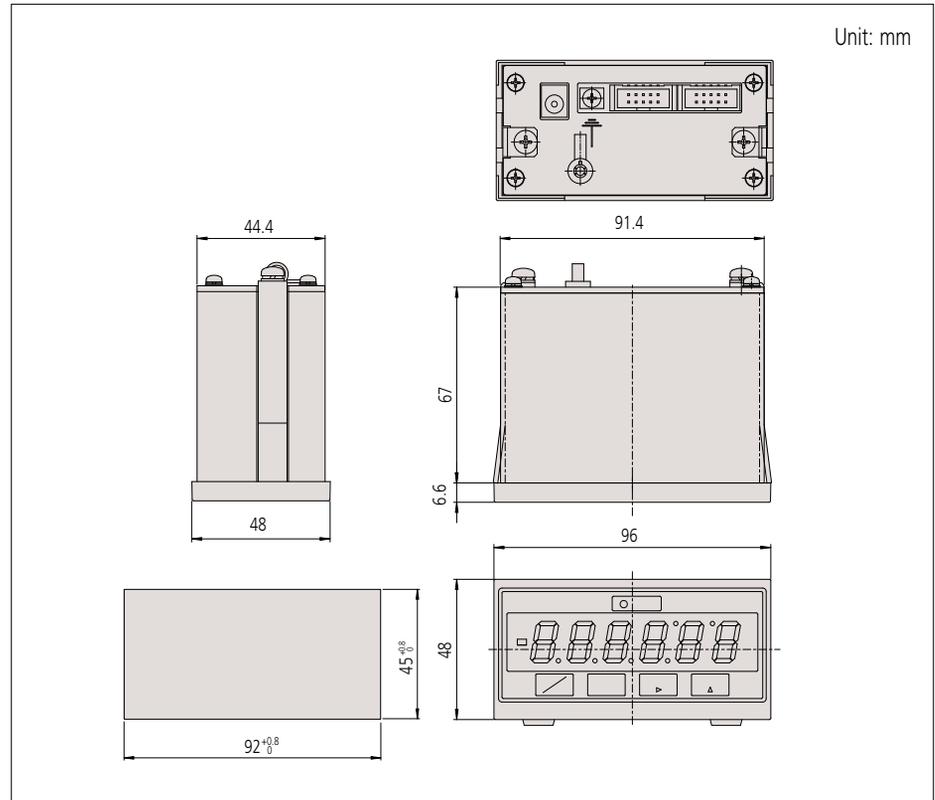
542-007



SPECIFICATIONS

Order No.	542-007A
Resolution () indicates maximum display range	0.0005 in (±99.9995 in) 0.001 in (±999.999 in) 0.00005 in (±9.99995 in) 0.0001 in (±99.999 in) 0.01 mm (±9999.99) 0.001 mm (±9999.999) [automatic setting by gage]
Tolerance judgment display	LED display (3 steps: Amber, Green, Red)
External output (switching type)	Tolerance judgment output: -NG, OK, +NG (open-collector) Data output: Digimatic output
Control input	External PRESET, external HOLD
Operating temperature	0 to 40 °C (RH 20 to 80%, no condensation)
Storage temperature	-10 to 50 °C (RH 20 to 80%, no condensation)
External dimensions	96 (W) x48 (H) x84.6 (D) mm
Power Source	AC adapter: 12BAR954 AC cable: 12BAK730
Standard Accessories	AC adapter, AC cable, rubber feet
Mass	500 g

DIMENSIONS



Dial Indicators

Dial Indicators

Mitutoyo Dial Indicators have long been used by many of our customers. In full recognition of their needs, we have devoted ourselves to the research and development necessary to produce high-quality and high-accuracy dial indicators. Due to the recent re-acknowledgement of the importance of measurement technologies, the demands on dial indicators are many and varied: installation in measuring jigs, mounting in countless types of precision equipment, etc. We offer numerous models with various types of dial faces, measuring ranges, graduation styles and environmental resistance ratings. The stems, which ensure the fixture reliability, and the spindles, which are the basis of accuracy, have excellent resistance against harsh use thanks to the hardened stainless steel construction. 0.01 mm resolution dial indicators have a main gear made of stainless steel with high resistance to wear and deformation. 0.001 mm graduation dial indicators employ a sector gear made of a special alloy in order to further increase the resistance to wear. Many models employ an O-ring to ensure airtightness between the outer frame and the bezel in order to prevent water or oil penetration from the front. Mitutoyo Dial Indicators are manufactured and inspected according to JIS B 7503:2017. (Inspection orientation: vertical)

Important factors in choosing a dial indicator: the size (bezel diameter), resolution (graduation) and measuring range. Use the table on the right to help choose a suitable model for your application.

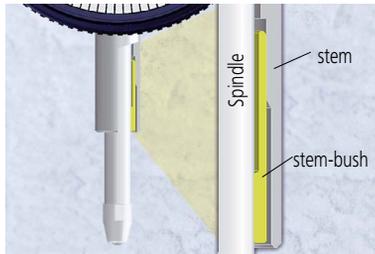
FEATURES: A Series (SERIES 2, 3, 4)



- No through screw-holes on the frame for high oil- and dust-resistance. The bezel clamp (optional) can be attached either to the right or left side.
- Improved impact- and oil-resistant materials are employed in the bezel. Easier reading is due to the improved shape of the crystal face.



- The spindle lifting lever (optional: **21EZA198**) can be attached to either the right or left side providing high operability and smooth movement. This lever can be easily installed and removed.



- Revolutionary stem-bush design for trouble-free stem clamping (longer clamping range; maximum tightening torque at the clamping point with M5 screw: 150 N·cm).



- The optional limit hands (1) can be moved without interfering with the optional bezel clamp (2).

- Application of anti-stain and anti-reflective coating improves scale visibility.



<Conventional model>



<New model>

Parts of a dial indicator



Feature icons

Icon	Feature description
	Continuous scale
	Balanced scale
	Reverse reading type, Suitable for depth and step measurement.
	One revolution type for easy and error-free reading
	Double scale spacing type, easy-on-the-eyes
	Shockproof
	Waterproof (IP63)
	Waterproof (IP64)
	With damper at top rest point
	With damper at lowest rest point
	Jeweled bearing
	Peak retaining
	Dustproof
	With coaxial revolution counter
	Back Plunger
	Adjustable hand

Note: Mitutoyo produces ASME-compatible products. Contact us for details.



Dial Indicators

SERIES 1 — Compact Type, Extra Small Diameter

- These compact, space-saving dial indicators make it easy to incorporate into gaging jigs.
- The indicator is highly durable thanks to its oil- and water-tight design, quenched hardened stainless-steel, carbide contact point, and a grand gear made of wear- and deformation-resistant material.
- Application of an anti-reflective and hard surface coating improves scale visibility along with scratch and chemical resistance.



SPECIFICATIONS

Inch		Stem $\phi 3/8"$, #4-48 UNF		Accuracy (in)		Repeat-ability (in)	Dial reading	Measuring force (N)
Order No.	Graduation (in)	Range (range/rev) (in)	First 1 Rev/2.5 Rev/10 Rev	Retrace				
1921A-10	1921AB-10	0.001	0.1 (0.04)	$\pm 0.001 / \pm 0.001 / -$	0.0002	± 0.0002	0-20-0	1.8 or less
1923A-10	1923AB-10	0.0005	0.05 (0.02)	$\pm 0.0005 / \pm 0.005 / -$	0.00016	± 0.0001	0-10-0	1.8 or less
1925A-10	1925AB-10	0.0001	0.025 (0.01)	$\pm 0.0002 / \pm 0.0002 / -$	0.0001	± 0.00003	0-5-0	1.8 or less

Metric		Stem $\phi 8\text{mm}$, M2.5x0.45 Thread		Accuracy (μm)				Hysteresis	Repeat-ability	Dial reading	Measuring force (N)
Order No.	Graduation (mm)	Range (range/rev) (mm)	1/10 Rev	1/2 Rev	1 Rev	Measuring range					
1911A-10	1911AB-10	0.01	2.5 (1)	8	9	10	12	4	3	0-50-0	1.8 or less
1913A-10	1913AB-10	0.002	0.5 (0.2)	2.5	4	5	6	2.5	1	0-100-0	1.8 or less
1003A	1003AB	0.01	4 (1)	8	10	11	13	4	3	0-50-0	1.4 or less



Find a Distributor

Dial Indicators



SERIES 1 — Compact Type, Extra Small Diameter

DIMENSIONS

ISO/JIS Type

Unit: mm

ANSI/AGD Type

Unit: in

1911A-10/1913A-10

1003A

1921A-10/1923A-10/1925A-10

Unit: in

Order No.	A	B	C	D	E	F	G	H	I	Mass (g)	
										w/lug	Flat-back
1921A-10	0.61	1.58	1.22	0.5	3/4	0.59	0.37	1.18	0.27	55	51
1923A-10	0.61	1.51	1.22	0.5	3/4	0.59	0.31	1.18	0.27	55	51
1925A-10	0.61	1.48	1.22	0.5	3/4	0.59	0.28	1.18	0.27	55	51

Unit: mm

Order No.	A	B	C	D	E	F	G	H	I	Mass (g)	
										w/lug	Flat-back
1911A-10	15.5	42	31	12.7	19.4	15.1	11.5	30	6	55	51
1913A-10	15.5	39.5	31	12.7	19.4	15.1	8.9	30	6	55	51
1003A	18	40.3	36	13.5	15	9.5	12.8	32	6	51	48

Note 1: Limit hands, bezel clamps and lifting levers cannot be installed.
 Note 2: The shoulder on a contact point (standard accessory) acts as a stop to prevent spindle overrun that may otherwise damage the indicator. When replacing it with an optional contact point with a connector not exceeding $\varnothing 7$ mm in outside diameter, insert a washer (with $\varnothing 7$ mm outside diameter, $\varnothing 3$ mm inside diameter, and approximately 0.5 mm thickness) above the contact point.
 Note 3: Being fixed by only two retaining screws, the back cannot be rotated by 90° to change the orientation of the lug.

Balanced scale



Graduation: 0.01 mm, Measuring range: 2.5 mm **1911A-10**
 Jeweled bearing

Balanced scale



Graduation: 0.002 mm, Measuring range: 0.5 mm **1913A-10**
 Jeweled bearing

Balanced scale



Graduation: 0.01 mm, Measuring range: 4 mm **1003A**



Got Questions?



Dial Indicators

SERIES 1 — Compact Type, Small Diameter

- Compact dial indicators ideal for restricted-space applications in gaging jigs.
- The indicator is highly durable thanks to its oil- and water-tight design, quenched hardened stainless-steel, carbide contact point, and a grand gear made of wear- and deformation-resistant material.
- Application of an anti-reflective and hard surface coating improves scale visibility along with scratch and chemical resistance.



1044A

SPECIFICATIONS

Inch		Stem $\phi 3/8"$, #4-48 UNF		Accuracy (in)		Repeat-ability (in)	Dial reading	Measuring force (N)
Order No.	Order No.	Graduation (in)	Range (range/rev) (in)	First 1 Rev/2.5 Rev/10 Rev	Retrace			
1410A	1410AB	0.001	0.25 (0.1)	$\pm 0.001/\pm 0.001/-$	0.0002	± 0.0002	0-100	1.4 or less
1411A	1411AB	0.001	0.25 (0.1)	$\pm 0.001/\pm 0.001/-$	0.0002	± 0.0002	0-50-0	1.4 or less
1410A-10	1410AB-10	0.001	0.25 (0.1)	$\pm 0.001/\pm 0.001/-$	0.0002	± 0.0002	0-100	1.4 or less
1780A	1780AB	0.001	0.125 (0.05)	$\pm 0.001/\pm 0.001/-$	0.0002	± 0.0002	0-50	1.4 or less
1781A	1781AB	0.001	0.125 (0.05)	$\pm 0.001/\pm 0.001/-$	0.0002	± 0.0002	0-25-0	1.4 or less
1506A	1506AB	0.0005	0.125 (0.05)	$\pm 0.0005/\pm 0.0005/-$	0.00016	± 0.0001	0-50	1.4 or less
1507A	1507AB	0.0005	0.125 (0.05)	$\pm 0.0005/\pm 0.0005/-$	0.00016	± 0.0001	0-25-0	1.4 or less
1670A	1670AB	0.0005	0.1 (0.04)	$\pm 0.0005/\pm 0.0005/-$	0.00016	± 0.0001	0-40	1.4 or less
1671A	1671AB	0.0005	0.1 (0.04)	$\pm 0.0005/\pm 0.0005/-$	0.00016	± 0.0001	0-20-0	1.4 or less
1802A-10	1802AB-10	0.0001	0.025 (0.01)	$\pm 0.0001/\pm 0.0001/-$	0.0001	± 0.00003	0-10	1.5 or less
1803A-10	1803AB-10	0.0001	0.025 (0.01)	$\pm 0.0001/\pm 0.0001/-$	0.0001	± 0.00003	0-5-0	1.5 or less

Metric		Stem $\phi 8\text{mm}$, M2.5x0.45 Thread		Accuracy (μm)				Hysteresis	Repeat-ability	Dial reading	Measuring force (N)
Order No.	Order No.	Graduation (mm)	Range (range/rev) (mm)	1/10 Rev	1/2 Rev	1 Rev	Measuring range				
1013A-10	1013AB-10	0.002	1 (0.2)	2.5	4	5	6	2.5	1	0-100-0	1.5 or less
1040A	1040AB	0.01	3.5 (0.5)	8	10	11	13	4	3	$\pm 0-50$	1.4 or less
1041A	1041AB	0.01	3.5 (0.5)	8	10	11	13	4	3	0-25-0	1.4 or less
1044A	1044AB	0.01	5 (1)	8	10	11	13	4	3	$\pm 0-100$	1.4 or less
1044A-15	1044AB-15	0.01	5 (1)	8	10	11	13	4	3	$\pm 0-100$	0.4 or less*
1044A-60	1044AB-60	0.01	5 (1)	8	10	11	13	4	3	$\pm 0-100$	2.0 or less
1045A	1045AB	0.01	5 (1)	8	10	11	13	4	3	0-50-0	1.4 or less
1109A-10	1109AB-10	0.001	1 (0.2)	2.5	3.5	4.5	5	2	1	0-100-0	1.5 or less
1124A	1124AB	0.005	3.5 (0.5)	6	9	10	12	3.5	3	$\pm 0-50$	1.4 or less

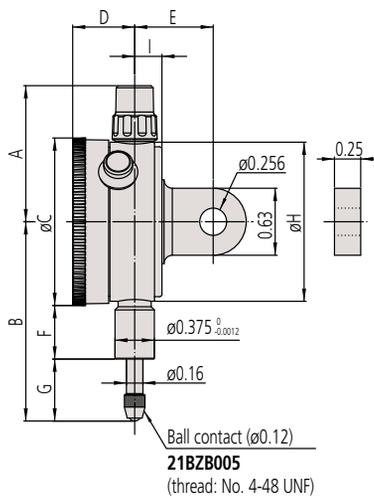
* For low measuring force type, use in the vertical orientation.

Dial Indicators

SERIES 1 — Compact Type, Small Diameter

DIMENSIONS

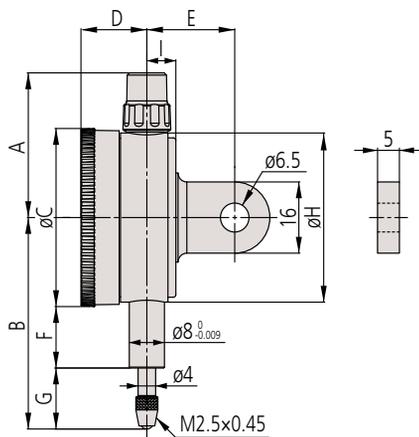
ANSI/AGD
Type



Order No.	A	B	C	D	E	F	G	H	I
1410A	1.28	1.87	1.57	0.59	3/4	0.50	0.58	1.50	0.26
1411A	1.28	1.87	1.57	0.59	3/4	0.50	0.58	1.50	0.26
1410A-10	1.28	1.87	1.57	0.59	3/4	0.50	0.58	1.50	0.26
1780A	1.28	1.74	1.57	0.59	3/4	0.50	0.44	1.50	0.26
1781A	1.28	1.74	1.57	0.59	3/4	0.50	0.44	1.50	0.26
1506A	1.28	1.74	1.57	0.59	3/4	0.50	0.44	1.50	0.26
1507A	1.28	1.74	1.57	0.59	3/4	0.50	0.44	1.50	0.26
1670A	1.28	1.71	1.57	0.59	3/4	0.50	0.42	1.50	0.26
1671A	1.28	1.71	1.57	0.59	3/4	0.50	0.42	1.50	0.26
1802A-10	1.28	1.63	1.57	0.59	3/4	0.50	0.33	1.50	0.26
1803A-10	1.28	1.63	1.57	0.59	3/4	0.49	0.33	1.50	0.26

Note: Refer to pages F-63 to F-68 for details of contact points.

ISO/JIS
Type



Order No.	A	B	C	D	E	F	G	H	I
1013A-10	32.5	49	40	15	20	13.8	15.2	38	6.6
1040A	32.5	46	40	15	20	13.8	12.2	38	6.6
1041A	32.5	46	40	15	20	13.8	12.2	38	6.6
1044A	32.5	47.5	40	15	20	13.8	13.7	38	6.6
1044A-15*	32.5	47.5	40	15	20	13.8	13.7	38	6.6
1044A-60	32.5	57	40	15	20	12.2	24.8	38	6.6
1045A	32.5	47.5	40	15	20	13.8	13.7	38	6.6
1109A-10	32.5	49	40	15	20	13.8	15.2	38	6.6
1124A	32.5	46	40	15	20	13.8	12.2	38	6.6

* Use in the vertical orientation (contact point downward) for the low measuring force model.

Note: Refer to pages F-63 to F-68 for details of contact points.



Optional Accessories

- Limit hand (2 pcs.): **21AAB363**



- Bezel clamp: **21RZA149**



Talk to Sales

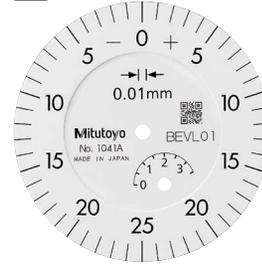
Dial Indicators

 Continuous scale



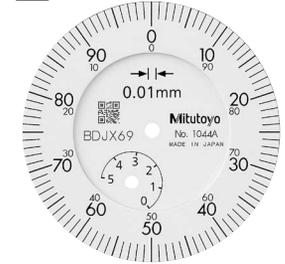
Graduation: 0.01 mm,
Measuring range: 3.5 mm  Double scale
spacing

 Balanced scale



Graduation: 0.01 mm,
Measuring range: 3.5 mm  Double scale
spacing

 Continuous scale



Graduation: 0.01 mm,
Measuring range: 5 mm  Jeweled
bearing

 Balanced scale



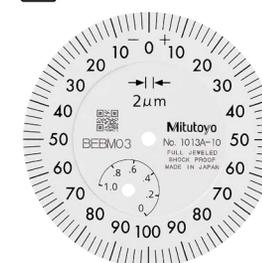
Graduation: 0.01 mm,
Measuring range: 5 mm

 Balanced scale



Graduation: 0.001 mm,
Measuring range: 1 mm  Shockproof
 Jeweled
bearing

 Balanced scale



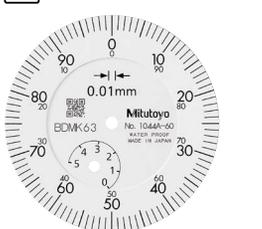
Graduation: 0.002 mm,
Measuring range: 1 mm  Shockproof
 Jeweled
bearing

 Continuous scale



Graduation: 0.005 mm,
Measuring range: 3.5 mm

 Continuous scale



Graduation: 0.01 mm,
Measuring range: 5 mm  Waterproof

FEATURES

Inch ANSI/AGD type ISO/JIS type

Order No.					
w/lug	Flat-back				
1410A	1410AB	✓			
1411A	1411AB		✓		
1410A-10	1410AB-10	✓		✓	
1780A	1780AB	✓			
1781A	1781AB		✓		
1506A	1506AB	✓			
1507A	1507AB		✓		
1670A	1670AB	✓			
1671A	1671AB		✓		
1802A-10	1802AB-10	✓		✓	✓
1803A-10	1803AB-10		✓	✓	✓

Metric

Order No.						
w/lug	Flat-back					
1013A-10	1013AB-10	✓	✓	✓	✓	
1040A	1040AB	✓		✓		
1041A	1041AB		✓	✓		
1044A	1044AB	✓				
1044A-15	1044AB-15	✓				✓
1044A-60	1044AB-60	✓				✓
1045A	1045AB		✓			
1109A-10	1109AB-10		✓	✓	✓	
1124A	1124AB	✓				

Dial Indicators



SERIES 1 — Compact One Revolution Type for Error-free Reading

- The one revolution dial indicator (compact type) prevents the possibility of reading errors.
- Proprietary Mitutoyo shock-proof mechanism is incorporated, providing improved resistance to shock due to sudden spindle retraction caused by impact.
- The indicator is highly durable thanks to its oil- and water-tight design, quenched hardened stainless-steel, carbide contact point, and a grand gear made of wear- and deformation-resistant material.
- Application of an anti-reflective and hard surface coating improves scale visibility along with scratch and chemical resistance.
- The red dead zone in the middle of the dial face is separated from the bezel and doesn't cover the graduations. Therefore, users can always see the range where accuracy is not guaranteed even if the bezel is rotated.



1929A

One revolution type Back Plunger dial gages are also available. (Refer to pages F-58 to F-59 for details.)



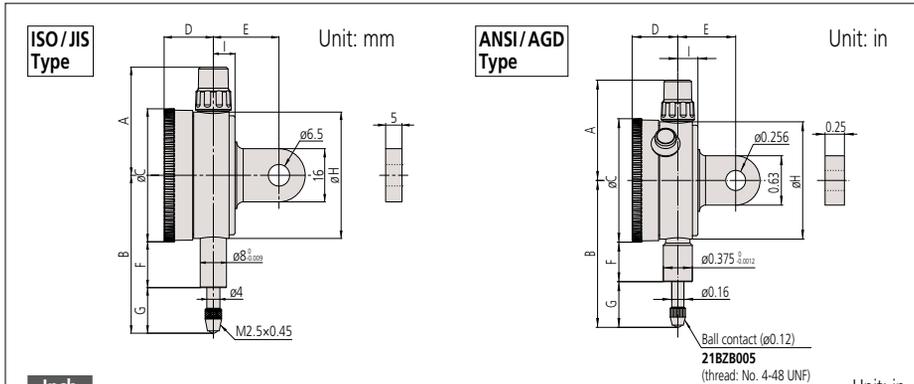
2990A-10

SPECIFICATIONS

Inch		Stem $\phi 3/8"$, #4-48 UNF		Accuracy (in)		Repeat-ability (in)	Dial reading	Measuring force (N)
Order No.	Graduation (in)	Range (range/rev) (in)	First 1 Rev/2.5 Rev/10 Rev	Retrace				
1909A-62	1909AB-62	0.0005	0.04 (0.056)	± 0.0005 / — / —	0.00016	± 0.0001	20-0-20	1.4 or less
1910A-72	1910AB-72	0.0001	0.006 (0.008)	± 0.0001 / — / —	0.0001	± 0.00003	3-0-3	1.5 or less

Metric		Stem $\phi 8$ mm, M2.5x0.45 Thread		Accuracy (μ m)		Hysteresis	Repeat-ability	Dial reading	Measuring force (N)	
Order No.	Graduation (mm)	Range (range/rev) (mm)	1/10 Rev	1/2 Rev	1 Rev					
1929A	1929AB	0.01	1 (1.4)	7	—	—	4	3	50-0-50	1.4 or less
1929A-62	1929AB-62	0.01	1 (1.4)	7	—	—	4	3	50-0-50	1.4 or less
1900A-10	1900AB-10	0.001	0.1 (0.14)	2.5	—	—	5	2	50-0-50	1.5 or less
1900A-72	1900AB-72	0.001	0.1 (0.14)	2.5	—	—	5	2	50-0-50	1.5 or less

DIMENSIONS



Order No.	A	B	C	D	E	F	G	H	I	Mass (g)	
										w/lug	Flat-back
1909A-62	1.28	1.64	1.57	0.59	0.75	0.50	0.35	1.50	0.26	90	70
1910A-72	1.28	1.61	1.57	0.59	0.75	0.50	0.31	1.50	0.26	90	70

Order No.	A	B	C	D	E	F	G	H	I	Mass (g)	
										w/lug	Flat-back
1929A	32.5	47.5	40	15	20	13.8	13.7	38	6.6	90	70
1929A-62	32.5	47.5	40	15	20	13.8	13.7	38	6.6	90	70
1900A-10	32.5	53.5	40	15	20	13.8	19.7	38	6.6	95	75
1900A-72	32.5	53.5	40	15	20	13.8	19.7	38	6.6	95	75

Note: Refer to pages F-63 to F-68 for details of contact points.

Special specifications

Upon request, we can manufacture custom types with changed graduation numbers, graduation lines, dead zones, etc. Please contact your nearest M³ Solution Center for more information.

Dial Indicators

Optional Accessories

- Limit hand (2 pcs.), Bezel clamp
Refer to page F-49 for details.

 **Balanced scale**



- Graduation: 0.001 mm,
Measuring range: 0.1 mm
-  **1900A-10**
 -  **One revolution**
 -  **Shockproof**
 -  **Jeweled bearing**
 - 1900A-72**
 -  **One revolution**
 -  **Shockproof**
 -  **Dustproof**
 -  **Jeweled bearing**

 **Balanced scale**



- Graduation: 0.01 mm,
Measuring range: 1 mm
-  **1929A**
 -  **One revolution**
 -  **Shockproof**
 - 1929A-62**
 -  **One revolution**
 -  **Shockproof**
 -  **Dustproof**

FEATURES

Inch		ANSI/AGD type		ISO/JIS type	
Order No.					
w/lug	Flat-back				
1909A-62	1909AB-62	✓	✓	✓	✓
1910A-72	1910AB-72	✓	✓	✓	✓

Metric		ANSI/AGD type		ISO/JIS type	
Order No.					
w/lug	Flat-back				
1929A	1929AB	✓	✓	✓	✓
1929A-62	1929AB-62	✓	✓	✓	✓
1900A-10	1900AB-10	✓	✓	✓	✓
1900A-72	1900AB-72	✓	✓	✓	✓



Need Repair?

F

Dial Indicators

Back Plunger Type Dial Indicators SERIES 1

- Back plunger type dial indicators are suitable for mounting onto leveling machine tool tables or inspection jigs, and for use in situations where standard dial indicators are difficult to read.
- Models **1960A** and **1961A**, which use proprietary Mitutoyo shock-proofing mechanism, have excellent durability and shock resistance.



1160A



SPECIFICATIONS

Inch Stem $\phi 3/8"$, #4-48 UNF □ ANSI/AGD type □ ISO/JIS type

Order No.	Graduation (in)	Range (range/rev) (in)	Accuracy (in)		Repeatability (in)	Dial reading	Measuring force (N)
			First 1 Rev/2.5 Rev/10 Rev	Retrace			
1961A	0.001	0.04 (0.05)	$\pm 0.001/-/-$	0.0002	± 0.0002	20-0-20	1.4 or less
1166A	0.001	0.2 (0.05)	$\pm 0.001/\pm 0.001/\pm 0.001$	0.00033	± 0.0002	$\pm 0-50$	1.4 or less
1167A	0.001	0.2 (0.05)	$\pm 0.001/\pm 0.001/\pm 0.001$	0.00033	± 0.0002	0-25-0	1.4 or less
1168A	0.001	0.2 (0.05)	$\pm 0.001/\pm 0.001/\pm 0.001$	0.00033	± 0.0002	50-0	1.4 or less

Metric Stem $\phi 8$ mm, M2.5x0.45 Thread

Order No.	Graduation (mm)	Range (range/rev) (mm)	Accuracy (μ m)				Hysteresis	Repeat-ability	Dial reading	Measuring force (N)
			1/10 Rev	1/2 Rev	1 Rev	Measuring range				
1960A	0.01	1 (1.27)	8	—	—	14	4	3	50-0-50	1.4 or less
1160A	0.01	5 (1)	8	12	14	16	4	3	$\pm 0-100$	1.4 or less
1162A	0.01	5 (1)	8	12	14	16	4	3	100-0	1.4 or less

Note 1: The bezel clamp cannot be used.

Holding bar (optional)

Order No.	ϕD (mm)	L (mm)
21AAA166	$\phi 6$	42
136567	$\phi 6$	81
124625	$\phi 6.35$	81
21AAA167	$\phi 6.35$	42
21AAA168	$\phi 8$	42
136568	$\phi 8$	81

Note: ϕD and L: detail shown in drawing below.

Optional Accessories

- Limit hand (2 pcs.): **21AAB363**



DIMENSIONS

ISO/JIS Type Unit: mm

ANSI/AGD Type Unit: in

Order No.	A	B	C	E	F	G	H	Mass (g) (Bar excluded)
1160A	40	22.7	35	21.8	25	13.8	43.3	80
1162A	40	22.7	35	21.8	25	13.8	43.3	80
1960A	40	22.7	35	21.8	28.7	12.8	46	80

Order No.	A	B	C	E	F	G	H	Mass (g) (Bar excluded)
1166A	1.57	0.89	1.38	7/8	0.98	0.51	1.67	80
1167A	1.57	0.89	1.38	7/8	0.98	0.51	1.67	80
1168A	1.57	0.89	1.38	7/8	0.98	0.51	1.67	80
1961A	1.57	0.89	1.38	7/8	0.98	0.43	1.59	80

Note 1: Contact point (standard accessory) for all products in this page has a role as a top dead point stopper. When replacing it with an optional contact point with a connector not exceeding $\phi 7$ mm in outside diameter, insert a washer (with $\phi 7$ mm outside diameter, $\phi 3$ mm inside diameter, and approximately 0.5 mm thickness) above the contact point.

Note 2: Refer to pages F-63 to F-68 for details of contact points.



Where to Buy

Dial Indicators



Continuous scale



Graduation: 0.01 mm,
Measuring range: 5 mm

1160A

Back Plunger



Reverse reading



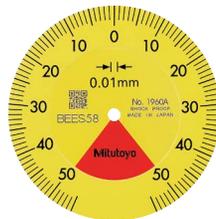
Graduation: 0.01 mm,
Measuring range: 5 mm

1162A

Back Plunger



Balanced scale



Graduation: 0.01 mm,
Measuring range: 1 mm

1960A

One revolution

Shockproof

Back Plunger

FEATURES

Inch ANSI/AGD type ISO/JIS type

Order No.						
1961A		✓	✓	✓		✓
1166A	✓					✓
1167A		✓				✓
1168A					✓	✓

Metric

Order No.						
1960A		✓	✓	✓		✓
1160A	✓					✓
1162A				✓		✓

Dial Indicators



SERIES 2 — Standard Type, 0.01 mm Graduation

- This model is the most popular Mitutoyo indicator with excellent accuracy and durability. Standard 0.01 mm graduation dial indicators have a bezel with an outside diameter of 57 mm.
- The indicator is highly durable thanks to its oil- and water-tight design, quenched hardened stainless-steel, carbide contact point, and a grand gear made of wear- and deformation-resistant material.
- Application of an anti-reflective and hard surface coating improves scale visibility along with scratch and chemical resistance.



2046A

SPECIFICATIONS

Stem $\varnothing 8$ mm, M2.5x0.45 Thread ISO/JIS type

Order No.		Graduation (mm)	Range (range/rev) (mm)	Accuracy (μm)			Measuring range	Hysteresis	Repeat-ability	Dial reading	Measuring force (N)
w/lug	Flat-back			1/10 Rev	1/2 Rev	1 Rev					
2046A	2046AB	0.01	10 (1)	5	9	10	13	3	3	$\pm 0-100$	1.4 or less
2046A-09	2046AB-09	0.01	10 (1)	5	9	10	15	3	3	$\pm 0-100$	1.4 or less
2047A	2047AB	0.01	10 (1)	5	9	10	13	3	3	0-50-0	1.4 or less
2902A	2902AB	0.01	10 (1)	5	9	10	13	3	3	100-0	1.4 or less
2310A-10	2310AB-10	0.01	10 (1)	5	9	10	15	3	3	$\pm 0-100$	1.4 or less
2044A	2044AB	0.01	5 (1)	5	9	10	12	3	3	$\pm 0-100$	1.4 or less
2044A-09	2044AB-09	0.01	5 (1)	5	9	10	12	3	3	$\pm 0-100$	1.4 or less
2045A	2045AB	0.01	5 (1)	5	9	10	12	3	3	0-50-0	1.4 or less

DIMENSIONS

ISO/JIS Type Unit: mm

Order No.	A	B	C	D	E	F	G	H	I	Mass (g)	
										w/lug	Flat-back
2046A	47.2	65.2	57	18.1	20	16.9	19.8	52	7.6	144	135
2046A-09	47.2	65.2	57	18.1	20	16.9	19.8	52	7.6	146	137
2047A	47.2	65.2	57	18.1	20	16.9	19.8	52	7.6	144	135
2902A	47.2	65.2	57	18.1	20	16.9	19.8	52	7.6	144	135
2310A-10	47.2	65.2	57	18.1	20	16.9	19.8	52	7.6	146	137
2044A	47.2	65.2	57	18.1	20	16.9	19.8	52	7.6	145	136
2044A-09	47.2	65.2	57	18.1	20	16.9	19.8	52	7.6	147	138
2045A	47.2	65.2	57	18.1	20	16.9	19.8	52	7.6	145	136

Note: Refer to pages F-63 to F-68 for details of contact points.



Get a Quote

Dial Indicators

Optional Accessories

- Limit hand (2 pcs.): **21AZB195**



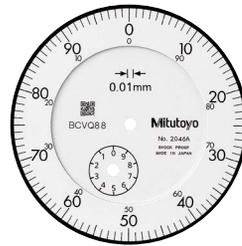
- Bezel clamp: **21AZB148**



SERIES 2 — Standard Type, 0.01 mm Graduation



Continuous scale



Graduation: 0.01 mm,
Measuring range: 10 mm

2046A

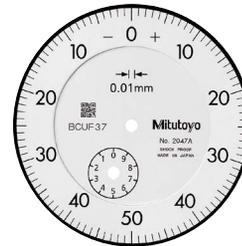
With damper at top rest point

2046A-09

Shockproof



Balanced scale



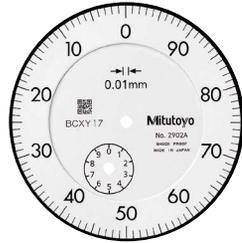
Graduation: 0.01 mm,
Measuring range: 10 mm

2047A

With damper at top rest point



Reverse reading type. Suitable for depth and step measurement.



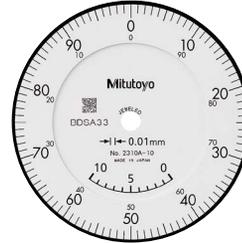
Graduation: 0.01 mm,
Measuring range: 10 mm

2902A

With damper at top rest point



Continuous scale



Graduation: 0.01 mm,
Measuring range: 10 mm

2310A-10

With coaxial revolution counter

Jeweled bearing



Continuous scale



Graduation: 0.01 mm,
Measuring range: 5 mm

2044A

With damper at top rest point

2044A-09

With damper at top rest point

Shockproof



Balanced scale



Graduation: 0.01 mm,
Measuring range: 5 mm

2045A

With damper at top rest point

FEATURES

Metric

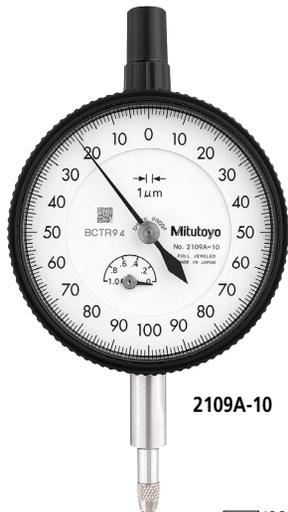
ISO/JIS type

Order No.												
w/lug	Flat-back											
2046A	2046AB	✓							✓			
2046A-09	2046AB-09	✓				✓						
2047A	2047AB			✓	✓				✓			
2902A	2902AB					✓			✓			
2310A-10	2310AB-10	✓									✓	✓
2044A	2044AB	✓							✓			
2044A-09	2044AB-09	✓				✓						
2045A	2045AB			✓	✓				✓			

Dial Indicators

SERIES 2 — Standard Type, 0.001 mm & 0.005 mm Graduation

- Standard 0.001 mm and 0.005 mm graduation dial indicators have a bezel with an outside diameter of 57 mm. These indicators provide excellent accuracy and durability.
- The indicator is highly durable thanks to its oil- and water-tight design, quenched hardened stainless-steel, carbide contact point, and a grand gear made of wear- and deformation-resistant material.
- Application of an anti-reflective and hard surface coating improves scale visibility along with scratch and chemical resistance.
- The indicator uses jeweled bearings, providing excellent indication sensitivity and durability.



2109A-10

SPECIFICATIONS

Metric Stem $\varnothing 8$ mm, M2.5x0.45 Thread □ ISO/JIS type

Order No.		Graduation (mm)	Range (range/rev) (mm)	Accuracy (μ m)			Measuring range	Hysteresis	Repeat-ability	Dial reading	Measuring force (N)
w/lug	Flat-back			1/10 Rev	1/2 Rev	1 Rev					
2109A-10	2109AB-10	0.001	1 (0.2)	2	3	4	5	2	0.5	0-100-0	1.5 or less
2110A-10	2110AB-10	0.001	1 (0.1)	2	3	4	5	2	0.5	± 0 -100	1.8 or less
2113A-10	2113AB-10	0.001	2 (0.2)	2	4	5	7	2	0.5	0-100-0	1.5 or less
2118A-10	2118AB-10	0.001	5 (0.2)	3.5	5	6	10	3	1	0-100-100	1.5 or less
2119A-10	2119AB-10	0.001	5 (0.2)	3.5	5	6	10	3	1	0-100-0	1.5 or less
2124A-10	2124AB-10	0.005	5 (0.5)	5	8	9	12	3	3	± 0 -50	1.5 or less

DIMENSIONS

ISO/JIS Type

Unit: mm

Order No.	A	B	C	D	E	F	G	H	I	Mass (g)	
										w/lug	Flat-back
2109A-10	47.2	60.5	57	18.1	20	16.9	15.1	52	7.6	148	139
2110A-10	47.2	66.5	57	18.1	20	16.9	21.1	52	7.6	149	140
2113A-10	47.2	61	57	18.1	20	16.9	15.6	52	7.6	148	139
2118A-10	47.2	60.7	57	18.1	20	16.9	15.3	52	7.6	146	137
2119A-10	47.2	60.7	57	18.1	20	16.9	15.3	52	7.6	146	137
2124A-10	47.2	60.7	57	18.1	20	16.9	15.3	52	7.6	146	137

Note: Refer to pages F-63 to F-68 for details of contact points.



Optional Accessories

- Limit hand (2 pcs.): **21AZB195**



- Bezel clamp: **21AZB148** (for metric type)
21RZA065* (for inch type)
*Included with ANSVAGD models



21AZB148



Need Support?

Dial Indicators

SERIES 2 — Standard Type, 0.001 mm & 0.005 mm Graduation

Optional Accessories

- Limit hand (2 pcs.): **21AZB195**

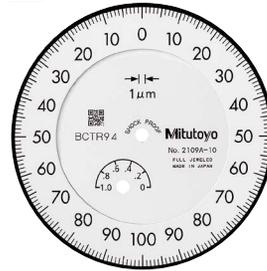


- Bezel clamp: **21AZB148** (for metric type)
21RZA065* (for inch type)
*Included with ANSI/AGD models



21AZB148

 **Balanced scale**



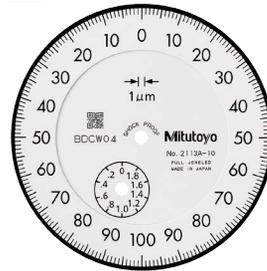
Graduation: 0.001 mm, Measuring range: 1 mm
 **Shockproof**
 **Jeweled bearing**

 **Continuous scale**



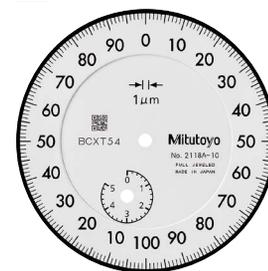
Graduation: 0.001 mm, Measuring range: 1 mm
 **Double scale spacing**
 **Shockproof**
 **Jeweled bearing**

 **Balanced scale**



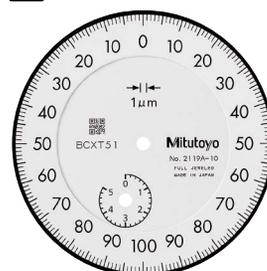
Graduation: 0.001 mm, Measuring range: 2 mm
 **Shockproof**
 **Jeweled bearing**

 **Continuous scale**



Graduation: 0.001 mm, Measuring range: 5 mm
 **Jeweled bearing**

 **Balanced scale**



Graduation: 0.001 mm, Measuring range: 5 mm
 **Jeweled bearing**

 **Continuous scale**



Graduation: 0.005 mm, Measuring range: 5 mm
 **Jeweled bearing**

FEATURES

Metric		ISO/JIS type					
Order No.							
w/lug	Flat-back						
2109A-10	2109AB-10		✓	✓		✓	
2110A-10	2110AB-10	✓		✓		✓	✓
2113A-10	2113AB-10		✓	✓		✓	
2118A-10	2118AB-10	✓				✓	
2119A-10	2119AB-10		✓			✓	
2124A-10	2124AB-10	✓				✓	

Dial Indicators



SERIES 2 — Water-proof Type, 0.01 mm & 0.001 mm Graduation

- Standard 0.01 mm and 0.001 mm graduation dial indicators have a highly water-resistant bezel with an outside diameter of 57 mm.
- O-rings and rubber bellows are used to prevent water and oil penetration.
- Excellent in accuracy and durability.
- The indicator is highly durable thanks to its oil- and water-tight design, quenched hardened stainless-steel, carbide contact point, and a grand gear made of wear- and deformation-resistant material.
- Application of an anti-reflective and hard surface coating improves scale visibility along with scratch and chemical resistance.



2046A-60

SPECIFICATIONS

Metric		Stem ø8mm, M2.5x0.45 Thread		ISO/JIS type								
Order No.		Graduation (mm)	Range (range/rev) (mm)	Accuracy (µm)			Measuring range	Hysteresis	Repeat-ability	Dial reading	Measuring force (N)	
w/lug	Flat-back		1/10 Rev	1/2 Rev	1 Rev							
2046A-60	2046AB-60	0.01	10 (1)	5	9	10	13	3	3	±0-100	2.5 or less	
2044A-60	2044AB-60	0.01	5 (1)	5	9	10	12	3	3	±0-100	2.5 or less	
2109A-70	2109AB-70	0.001	1 (0.2)	2	3	4	5	2	0.5	0-100-0	2.0 or less	
2110A-70	2110AB-70	0.001	1 (0.1)	2	3	4	5	2	0.5	±0-100	2.0 or less	

DIMENSIONS

ISO/JIS Type

Unit: mm

Order No.	A	B	C	D	E	F	G	H	I	Mass (g)	
										w/lug	Flat-back
2046A-60	47.2	74.7	57	18.1	20	12.3	33.9	52	7.6	147	138
2044A-60	47.2	70	57	18.1	20	12.3	29.2	52	7.6	147	138
2109A-70	47.2	65.3	57	18.1	20	12.3	24.5	52	7.6	149	140
2110A-70	47.2	67.5	57	18.1	20	12.3	26.7	52	7.6	150	141

Note: Refer to pages F-63 to F-68 for details of contact points.

Optional Accessories

- Limit hand (2 pcs.): **21AZB195**



- Bezel clamp: **21AZB148** (for metric type)
21RZA065* (for inch type)
*Included with ANSVAGD models



21AZB148



Need Service?

Dial Indicators

SERIES 2 — Water-proof Type, 0.01 mm & 0.001 mm Graduation

Optional Accessories

- Limit hand (2 pcs.): **21AZB195**



- Bezel clamp: **21AZB148** (for metric type)
21RZA065* (for inch type)
*Included with ANSI/AGD models



21AZB148



Continuous scale



Graduation: 0.01 mm,
Measuring range: 10 mm

2046A-60

- Waterproof
- With damper at top rest point



Continuous scale



Graduation: 0.01 mm,
Measuring range: 5 mm

2044A-60

- Waterproof
- With damper at top rest point



Balanced scale



Graduation: 0.001 mm,
Measuring range: 1 mm

2109A-70

- Waterproof
- Shockproof
- Jeweled bearing



Continuous scale



Graduation: 0.001 mm,
Measuring range: 1 mm

2110A-70

- Waterproof
- Double scale spacing
- Shockproof
- Jeweled bearing

FEATURES

Metric		ISO/JIS type						
Order No.								
w/lug	Flat-back							
2046A-60	2046AB-60	✓			✓	✓		
2044A-60	2044AB-60	✓			✓	✓		
2109A-70	2109AB-70		✓	✓	✓		✓	
2110A-70	2110AB-70	✓		✓	✓		✓	✓

Dial Indicators

SERIES 2 — Standard Type, Inch Reading

SPECIFICATIONS

Inch		Stem $\varnothing 3/8"$, #4-48 UNF		ANSI/AGD type				
Order No.		Graduation (in)	Range (range/rev) (in)	Accuracy (in)		Repeat-ability (in)	Dial reading	Measuring force (N)
w/lug	Flat-back			First 1 Rev/2.5 Rev/10 Rev	Retrace			
2414A	2414AB	0.001	0.5 (0.1)	$\pm 0.001/\pm 0.001/\pm 0.001$	0.0002	± 0.0002	$\pm 0-100$	1.8 or less
2415A	2415AB	0.001	0.5 (0.1)	$\pm 0.001/\pm 0.001/\pm 0.001$	0.0002	± 0.0002	0-50-0	1.8 or less
2914A	2914AB	0.001	0.5 (0.1)	$\pm 0.001/\pm 0.001/\pm 0.001$	0.0002	± 0.0002	100-0	1.8 or less
2506A	2506AB	0.0005	0.125 (0.05)	$\pm 0.0005/\pm 0.0005/-$	0.00016	± 0.0001	$\pm 0-50$	1.8 or less
2507A	2507AB	0.0005	0.125 (0.05)	$\pm 0.0005/\pm 0.0005/-$	0.00016	± 0.0001	0-25-0	1.8 or less
2514A	2514AB	0.0005	0.5 (0.05)	$\pm 0.0005/\pm 0.0005/\pm 0.0015$	0.00016	± 0.0001	$\pm 0-50$	1.8 or less
2922A	2922AB	0.0005	0.125 (0.05)	$\pm 0.0005/\pm 0.0005/-$	0.00016	± 0.0001	0-25-0	1.8 or less
2356A-10	2356AB-10	0.0001	0.25 (0.01)	$\pm 0.0002/\pm 0.0002/\pm 0.0003/ \pm 0.0004$ (First 20rev)/ ± 0.0005 (Over 20rev)	0.0001	± 0.00003	0-10	2.0 or less
2358A-10	2358AB-10	0.0001	0.5 (0.01)	$\pm 0.0002/\pm 0.0002/\pm 0.0003/ \pm 0.0004$ (First 20rev)/ ± 0.0008 (Over 20rev)	0.00015	± 0.00003	0-10	2.0 or less
2802A-10	2802AB-10	0.0001	0.025 (0.01)	$\pm 0.0001/\pm 0.0001/-$	0.0001	± 0.00003	0-10	2.0 or less
2803A-10	2803AB-10	0.0001	0.025 (0.01)	$\pm 0.0001/\pm 0.0001/-$	0.0001	± 0.00003	0-5-0	2.0 or less
2804A-10	2804AB-10	0.0001	0.05 (0.01)	$\pm 0.0001/\pm 0.0001/\pm 0.0002$	0.0001	± 0.00003	0-10	2.0 or less
2805A-10	2805AB-10	0.0001	0.05 (0.01)	$\pm 0.0001/\pm 0.0001/\pm 0.0002$	0.0001	± 0.00003	0-5-0	2.0 or less
2905A-10	2905AB-10	0.0001	0.05 (0.01)	$\pm 0.0001/\pm 0.0001/\pm 0.0002$	0.0001	± 0.00003	10-0	2.0 or less
2923A-10	2923AB-10	0.0001	0.05 (0.01)	$\pm 0.0001/\pm 0.0001/\pm 0.0002$	0.0001	± 0.00003	0-5-0	2.0 or less

FEATURES

Inch							
Order No.		3	R	D	S	T	I
w/lug	Flat-back						
2414A	2414AB				✓		✓
2415A	2415AB					✓	✓
2914A	2914AB		✓				✓
2506A	2506AB				✓		✓
2507A	2507AB					✓	✓
2514A	2514AB				✓		✓
2922A	2922AB					✓	✓
2356A-10	2356AB-10			✓	✓		✓
2358A-10	2358AB-10			✓	✓		✓
2802A-10	2802AB-10	✓		✓	✓		
2803A-10	2803AB-10	✓		✓		✓	
2804A-10	2804AB-10	✓		✓	✓		
2805A-10	2805AB-10	✓		✓		✓	
2905A-10	2905AB-10	✓	✓	✓			
2923A-10	2923AB-10	✓		✓		✓	



2416A



2358A-10



2923A-10

Optional Accessories

- Limit hand (2 pcs.): **21AZB195**



- Bezel clamp: **21AZB148** (for metric type)
21RZA065* (for inch type)
*Included with ANSI/AGD models



21AZB148

Dial Indicators

SERIES 2 — Standard Type, Inch Reading

Optional Accessories

- Limit hand (2 pcs.): **21AZB195**



- Bezel clamp: **21AZB148** (for metric type)
21RZA065* (for inch type)
*Included with ANSI/AGD models

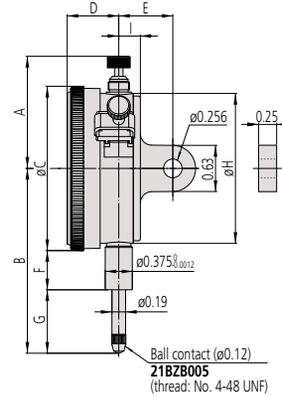


21AZB148

DIMENSIONS

ANSI/AGD
Type

Unit: in



Order No.	A	B	C	D	E	F	G	H	I	Mass (g)	
										w/lug	Flat-back
2414A	1.53	2.52	2.24	0.71	3/4	0.54	0.87	2.05	0.30	164	139
2415A	1.53	2.52	2.24	0.71	3/4	0.54	0.87	2.05	0.30	164	139
2914A	1.53	2.52	2.24	0.71	3/4	0.54	0.87	2.05	0.30	164	139
2506A	1.86	2.14	2.24	0.71	3/4	0.54	0.48	2.05	0.30	164	139
2507A	1.86	2.14	2.24	0.71	3/4	0.54	0.48	2.05	0.30	164	139
2514A	1.53	2.52	2.24	0.71	3/4	0.54	0.87	2.05	0.30	164	139
2922A	1.86	2.14	2.24	0.71	3/4	0.54	0.48	2.05	0.30	164	139
2356A-10	1.86	2.25	2.24	0.71	3/4	0.54	0.59	2.05	0.30	163	138
2358A-10	1.53	2.50	2.24	0.71	3/4	0.54	0.85	2.05	0.30	164	139
2802A-10	1.86	2.02	2.24	0.71	3/4	0.54	0.37	2.05	0.30	164	139
2803A-10	1.86	2.02	2.24	0.71	3/4	0.54	0.37	2.05	0.30	164	139
2804A-10	1.86	2.04	2.24	0.71	3/4	0.54	0.38	2.05	0.30	166	141
2805A-10	1.86	2.04	2.24	0.71	3/4	0.54	0.38	2.05	0.30	166	141
2905A-10	1.86	2.04	2.24	0.71	3/4	0.54	0.38	2.05	0.30	164	139
2923A-10	1.86	2.04	2.24	0.71	3/4	0.54	0.38	2.05	0.30	164	139



Need Calibration?

Dial Indicators

SERIES 2 — Standard One Revolution Type for Error-free Reading

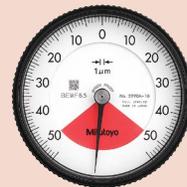
- The one revolution dial indicator prevents the possibility of reading errors.
- Proprietary Mitutoyo shock-proof mechanism is incorporated, providing improved resistance to shock due to sudden spindle retraction caused by impact.
- The indicator is highly durable thanks to its oil- and water-tight design, quenched hardened stainless-steel, carbide contact point, and a grand gear made of wear- and deformation-resistant material.
- Application of an anti-reflective and hard surface coating improves scale visibility along with scratch and chemical resistance.
- The red dead zone in the middle of the dial face is separated from the bezel and doesn't cover the graduations. Therefore, users can always see the range where accuracy is not guaranteed even if the bezel is rotated.



2900A-10



One revolution type Back Plunger dial gages are also available. (Refer to pages F-58 to F-59 for details.)



2990A-10

Optional Accessories

- Limit hand (2 pcs.): **21AZB195**



- Bezel clamp: **21AZB148** (for metric type)
21RZA065* (for inch type)
*Included with ANSI/AGD models



21AZB148

SPECIFICATIONS

Inch		Stem $\varnothing 3/8"$, #4-48 UNF		Accuracy (in)		Repeat-ability (in)	Dial reading	Measuring force (N)
Order No.	Order No.	Graduation (in)	Range (range/rev) (in)	First 1 Rev/2.5 Rev/10 Rev	Retrace			
2909A-62	2909AB-62	0.0005	0.04/0.05	± 0.0005 / — / —	0.00016	± 0.0001	20-0-20	2.5 or less
2910A-10	2910AB-10	0.0001	0.008/0.01	± 0.0001 / — / —	0.0001	± 0.00003	4-0-4	1.8 or less

Metric		Stem $\varnothing 8$ mm, M2.5x0.45 Thread		Accuracy (μ m)				Hysteresis	Repeat-ability	Dial reading	Measuring force (N)
Order No.	Order No.	Graduation (mm)	Range (range/rev) (mm)	1/10 Rev	1/2 Rev	1 Rev	Measuring range				
2928A	2928AB	0.1	4 (5)	20	—	—	40	20	20	2-0-2	1.4 or less
2929A	2929AB	0.01	0.8 (1)	5	—	—	8	3	3	40-0-40	1.4 or less
2929A-62	2929AB-62	0.01	0.8 (1)	5	—	—	8	3	3	40-0-40	2.0 or less
2959A	2959AB	0.01	1.6 (2)	5	—	—	10	3	3	80-0-80	1.4 or less
2900A-10	2900AB-10	0.001	0.08 (0.1)	2	—	—	3	2	0.5	40-0-40	1.5 or less
2900A-72	2900AB-72	0.001	0.08 (0.1)	2	—	—	3	2	0.5	40-0-40	2.0 or less
2901A-10	2901AB-10	0.001	0.16 (0.2)	2	—	—	4	2	0.5	80-0-80	1.5 or less

Special specifications

Upon request, we can manufacture custom types with changed graduation numbers, graduation lines, dead zones, etc. Please contact your nearest M³ Solution Center for more information.

Dial Indicators

SERIES 2 — Standard One Revolution Type for Error-free Reading

Optional Accessories

- Limit hand (2 pcs.): **21AZB195**



- Bezel clamp: **21AZB148** (for metric type)
21RZA065* (for inch type)
*Included with ANSI/AGD models

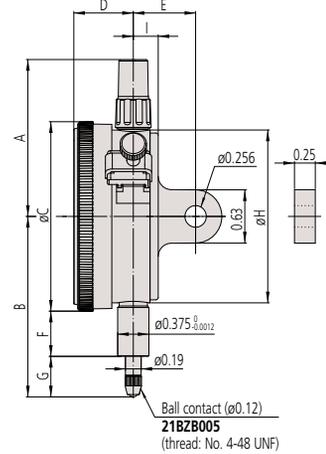


21AZB148

DIMENSIONS

ANSI / AGD
Type

Unit: in

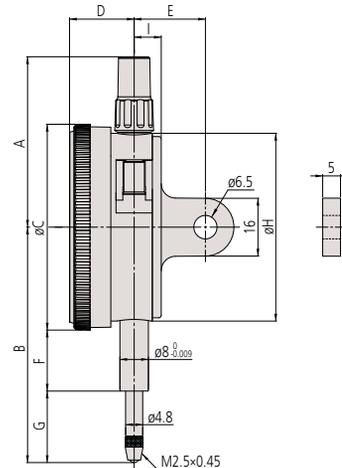


Order No.	A	B	C	D	E	F	G	H	I	Mass (g)	
										w/lug	Flat-back
2909A-62	1.86	2.04	2.24	0.71	3/4	0.54	0.39	2.05	0.30	163	138
2910A-10	1.86	2.02	2.24	0.71	3/4	0.54	0.36	2.05	0.30	164	139

Note: Refer to pages F-63 to F-68 for details of contact points.

ISO / JIS
Type

Unit: mm



Order No.	A	B	C	D	E	F	G	H	I	Mass (g)	
										w/lug	Flat-back
2928A	47.2	65.2	57	18.1	20	16.9	19.8	52	7.6	145	136
2929A	47.2	65.2	57	18.1	20	16.9	19.8	52	7.6	145	136
2929A-62	47.2	65.2	57	18.1	20	16.9	19.8	52	7.6	145	136
2959A	47.2	65.2	57	18.1	20	16.9	19.8	52	7.6	145	136
2900A-10	47.2	66	57	18.1	20	16.9	20.6	52	7.6	149	140
2900A-72	47.2	66	57	18.1	20	16.9	20.6	52	7.6	149	140
2901A-10	47.2	66.1	57	18.1	20	16.9	20.7	52	7.6	149	140

Note: Refer to pages F-63 to F-68 for details of contact points.



Find Training

Dial Indicators

 **Balanced scale**

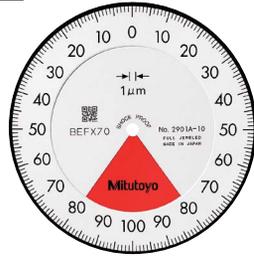


Graduation: 0.001 mm,
Measuring range: 0.08 mm

2900A-10

-  One revolution
-  Shockproof
-  Jeweled bearing
- 2900A-72**
-  One revolution
-  Shockproof
-  Dustproof
-  Jeweled bearing

 **Balanced scale**

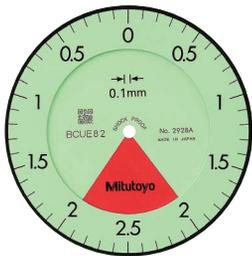


Graduation: 0.001 mm,
Measuring range: 0.16 mm

2901A-10

-  One revolution
-  Shockproof
-  Jeweled bearing

 **Balanced scale**



Graduation: 0.1 mm,
Measuring range: 4 mm

2928A

-  One revolution
-  Shockproof

 **Balanced scale**

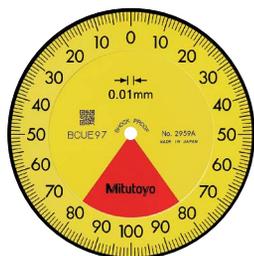


Graduation: 0.01 mm,
Measuring range: 0.8 mm

2929A

-  One revolution
-  Shockproof
- 2929A-62**
-  One revolution
-  Shockproof
-  Dustproof

 **Balanced scale**



Graduation: 0.01 mm,
Measuring range: 1.6 mm

2959A

-  One revolution
-  Shockproof

FEATURES

Inch ANSI/AGD type ISO/JIS type

Order No.							
w/lug	Flat-back						
2909A-62	2909AB-62	✓	✓	✓		✓	
2910A-10	2910AB-10	✓	✓	✓			✓

Metric

Order No.							
w/lug	Flat-back						
2928A	2928AB	✓	✓	✓			
2929A	2929AB	✓	✓	✓			
2929A-62	2929AB-62	✓	✓	✓		✓	
2959A	2959AB	✓	✓	✓			
2900A-10	2900AB-10	✓	✓	✓			✓
2900A-72	2900AB-72	✓	✓	✓		✓	✓
2901A-10	2901AB-10	✓	✓	✓			✓

Optional Accessories

- Limit hand (2 pcs.): **21AZB195**



- Bezel clamp: **21AZB148** (for metric type)
21RZA065* (for inch type)
*Included with ANSVAGD models



21AZB148

F



Find a Distributor

Optional Accessories

- Limit hand (2 pcs.): **21AZB195**



- Bezel clamp: **21AZB148** (for metric type)
21RZA065* (for inch type)
*Included with ANSI/AGD models



21AZB148

SERIES 2 — Standard One Revolution Type for Error-free Reading, Water-proof Type

- The one revolution dial indicator with improved water resistance prevents the possibility of reading errors.
- Proprietary Mitutoyo shock-proof mechanism is incorporated, providing improved resistance to shock due to sudden spindle retraction caused by impact.
- It is highly durable thanks to a hardened stainless-steel stem and spindle, carbide probe, and a large gear made of wear- and deformation-resistant materials.
- Application of an anti-reflective and hard surface coating improves scale visibility along with scratch and chemical resistance.
- The red dead zone in the middle of the dial face is separated from the bezel and doesn't cover the graduations. Therefore, users can always see the range where accuracy is not guaranteed even if the bezel is rotated.



2929A-60

SPECIFICATIONS

Inch		Stem $\phi 3/8"$, #4-48 UNF		Accuracy (in)		Repeat-ability (in)	Dial reading	Measuring force (N)
Order No.	Graduation (in)	Range (range/rev) (in)	First 1 Rev/2.5 Rev/10 Rev	Retrace	ANSI/AGD type			
2910A-72	2910AB-72	0.0001	0.008/0.01	± 0.0001 / — / —	0.0001	± 0.00003	4-0-4	2.5 or less

Metric		Stem $\phi 8$ mm, M2.5x0.45 Thread		Accuracy (μ m)				Hysteresis	Repeat-ability	Dial reading	Measuring force (N)
Order No.	Graduation (mm)	Range (range/rev) (mm)	1/10 Rev	1/2 Rev	1 Rev	Measuring range					
2929A-60	2929AB-60	0.01	0.8 (1)	5	—	—	8	3	3	40-0-40	2.0 or less
2900A-70	2900AB-70	0.001	0.08 (0.1)	2	—	—	3	2	0.5	40-0-40	2.0 or less

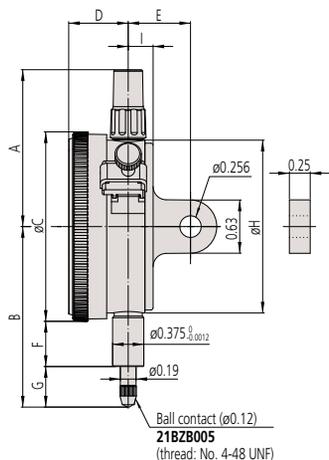
Special specifications

Upon request, we can manufacture custom types with changed graduation numbers, graduation lines, dead zones, etc. Please contact your nearest M³ Solution Center for more information.

Dial Indicators

DIMENSIONS

ANSI/AGD
Type

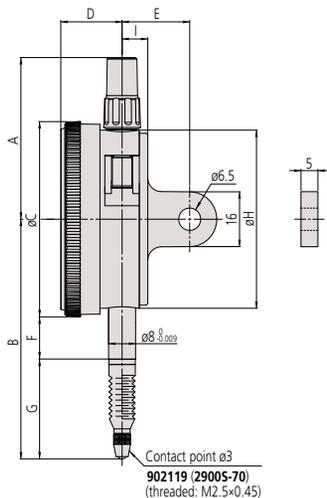


Unit: in

Order No.	A	B	C	D	E	F	G	H	I	Mass (g)	
										w/lug	Flat-back
2910A-72	1.86	2.02	2.24	0.71	3/4	0.54	0.36	2.05	0.30	150	141

Note: Refer to pages F-63 to F-68 for details of contact points.

ISO/JIS
Type



Unit: mm

Order No.	A	B	C	D	E	F	G	H	I	Mass (g)	
										w/lug	Flat-back
2929A-60	47.2	70	57	18.1	20	12.3	29.2	52	7.6	146	137
2900A-70	47.2	67	57	18.1	20	12.3	26.2	52	7.6	150	141

Note: Refer to pages F-63 to F-68 for details of contact points.

Optional Accessories

- Limit hand (2 pcs.): **21AZB195**



- Bezel clamp: **21AZB148** (for metric type)
21RZA065* (for inch type)
*Included with ANSI/AGD models



21AZB148



Got Questions?

Dial Indicators

Optional Accessories

- Limit hand (2 pcs.): **21AZB195**



- Bezel clamp: **21AZB148** (for metric type)
21RZA065* (for inch type)
*Included with ANSI/AGD models

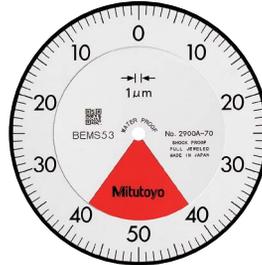


21AZB148

SERIES 2 — Standard One Revolution Type for Error-free Reading, Water-proof Type



Balanced scale



Graduation: 0.001 mm,
Measuring range: 0.08 mm

2900A-70

One revolution

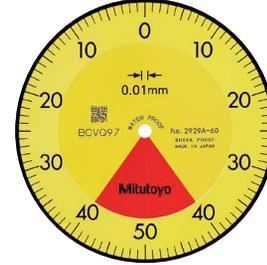
Shockproof

Waterproof

Jeweled bearing



Balanced scale



Graduation: 0.01 mm,
Measuring range: 0.8 mm

2929A-60

One revolution

Shockproof

Waterproof

FEATURES

Inch		<input type="checkbox"/> ANSI/AGD type	<input type="checkbox"/> ISO/JIS type						
Order No.									
w/lug	Flat-back								
2910A-72	2910AB-72	✓	✓	✓		✓	✓		
Metric									
Order No.									
w/lug	Flat-back								
2929A-60	2929AB-60	✓	✓	✓	✓				
2900A-70	2900AB-70	✓	✓	✓	✓			✓	

Dial Indicators

SERIES 2 — Standard One Revolution Type for Error-free Reading, Lightweight Type

- The one revolution dial indicator (lightweight type) prevents the possibility of reading errors.
- Proprietary Mitutoyo shock-proof mechanism is incorporated, providing improved resistance to shock due to sudden spindle retraction caused by impact.
- Lightweight type (70 g).
- It is highly durable thanks to a hardened stainless-steel stem and spindle, carbide probe, and a large gear made of wear- and deformation-resistant materials.
- Application of an anti-reflective and hard surface coating improves scale visibility along with scratch and chemical resistance.
- The red dead zone in the middle of the dial face is separated from the bezel and doesn't cover the graduations. Therefore, users can always see the range where accuracy is not guaranteed even if the bezel is rotated.



2972AB



Optional Accessory

- Limit hand (2 pcs.): **21AZB195**



SPECIFICATIONS

Inch		Stem $\varnothing 3/8"$, #4-48 UNF		Accuracy (in)		Repeat-ability (in)	Dial reading	Measuring force (N)
w/lug	Flat-back	Graduation (in)	Range (range/rev) (in)	First 1 Rev/2.5 Rev/10 Rev	Retrace			
—	2976AB	0.0005	0.02 (0.028)	± 0.0005 / — / —	0.00016	± 0.0001	10-0-10	1.4 or less
—	2977AB	0.0005	0.04 (0.055)	± 0.0005 / — / —	0.00016	± 0.0001	20-0-20	1.4 or less
—	2978AB	0.001	0.06 (0.079)	± 0.001 / — / —	0.0002	± 0.0002	30-0-30	1.4 or less

Metric		Stem $\varnothing 8$ mm, M2.5x0.45 Thread		Accuracy (μ m)				Hysteresis	Repeat-ability	Dial reading	Measuring force (N)
w/lug	Flat-back	Graduation (mm)	Range (range/rev) (mm)	1/10 Rev	1/2 Rev	1 Rev	Measuring range				
—	2971AB	0.01	0.5 (0.7)	5	—	—	8	3	3	25-0-25	1.4 or less
—	2972AB	0.01	1 (1.4)	5	—	—	8	3	3	50-0-50	1.4 or less
—	2973AB	0.02	1.6 (2)	8	—	—	16	6	5	80-0-80	1.4 or less

Special specifications

Upon request, we can manufacture custom types with changed graduation numbers, graduation lines, dead zones, etc. Please contact your nearest M³ Solution Center for more information.

Dial Indicators

SERIES 2 — Standard One Revolution Type for Error-free Reading, Lightweight Type

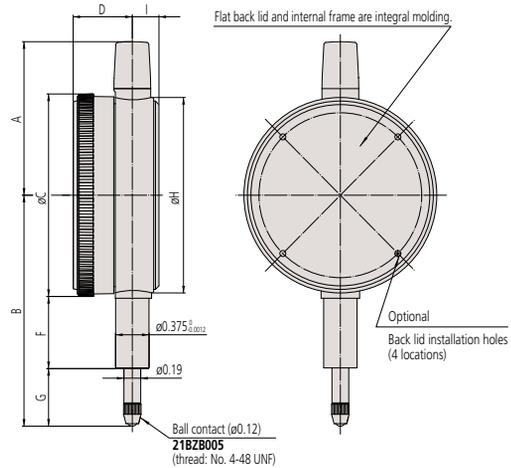
DIMENSIONS

Optional Accessory

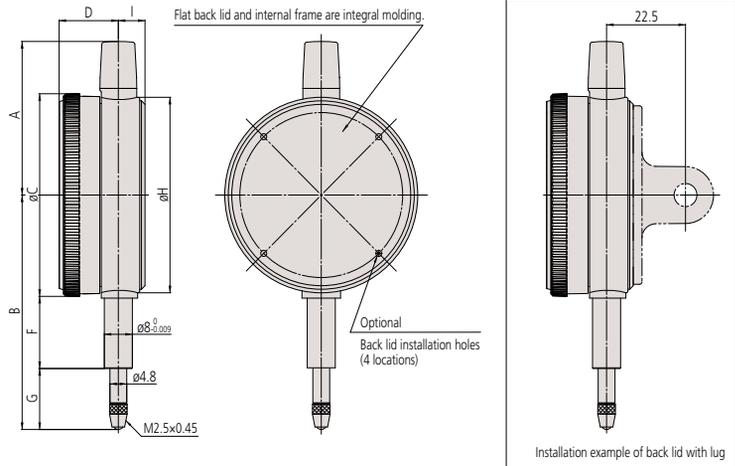
- Limit hand (2 pcs.): 21AZB195



ANSI/AGD
Type



ISO/JIS
Type



Note 1: When installing an optional back (refer to pages F-69 to F-70 for details) 4 retaining screws must also be obtained (546666: Self-tapping screw only for plastic).

Do not apply a tightening torque of more than 20 N·cm in order to avoid stripping the screw threads.

Note 2: An optional lifting lever, release or bezel clamp cannot be installed.

Inch

Order No.	A	B	C	D	F	G	H	I	Mass (g)
2976AB	1.70	2.55	2.24	0.67	0.80	0.63	2.17	0.30	70
2977AB	1.70	2.56	2.24	0.67	0.80	0.64	2.17	0.30	
2978AB	1.70	2.57	2.24	0.67	0.80	0.65	2.17	0.30	

Metric

Order No.	A	B	C	D	F	G	H	I	Mass (g)
2971AB	43.2	65.6	57	16.9	20.3	16.8	55	7.6	70
2972AB	43.2	66	57	16.9	20.3	17.2	55	7.6	
2973AB	43.2	66.3	57	16.9	20.3	17.5	55	7.6	

Note: Refer to pages F-63 to F-68 for details of contact points.



Talk to Sales

Dial Indicators

 **Balanced scale**



Graduation: 0.01 mm, Measuring range: 0.5 mm

 One revolution
 Shockproof
 Dustproof

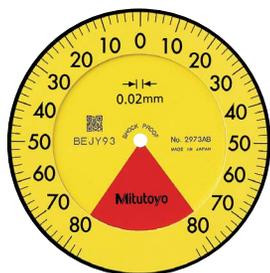
 **Balanced scale**



Graduation: 0.01 mm, Measuring range: 1 mm

 One revolution
 Shockproof
 Dustproof

 **Balanced scale**



Graduation: 0.02 mm, Measuring range: 1.6 mm

 One revolution
 Shockproof
 Dustproof

FEATURES

Inch ANSI/AGD type ISO/JIS type

Order No.					
w/lug	Flat-back				
—	2976AB	✓	✓	✓	✓
—	2977AB	✓	✓	✓	✓
—	2978AB	✓	✓	✓	✓

Order No.					
w/lug	Flat-back				
—	2971AB	✓	✓	✓	✓
—	2972AB	✓	✓	✓	✓
—	2973AB	✓	✓	✓	✓

Optional Accessory

- Limit hand (2 pcs.): **21AZB195**



F



Need Repair?



Dial Indicators

Optional Accessory

- Limit hand (2 pcs.): **21AZB195**



SERIES 2 — Long Stroke Type

- Long stroke dial indicators with measuring range of 20 mm or more have a $\varnothing 57$ mm bezel.
- The indicator is highly durable thanks to its oil- and water-tight design, quenched hardened stainless-steel, carbide contact point, and a grand gear made of wear- and deformation-resistant material.
- Application of an anti-reflective and hard surface coating improves scale visibility along with scratch and chemical resistance.
- The lifting lever (optional) cannot be used with models that are water-proof or which have a measurement range of 30 mm.



SPECIFICATIONS

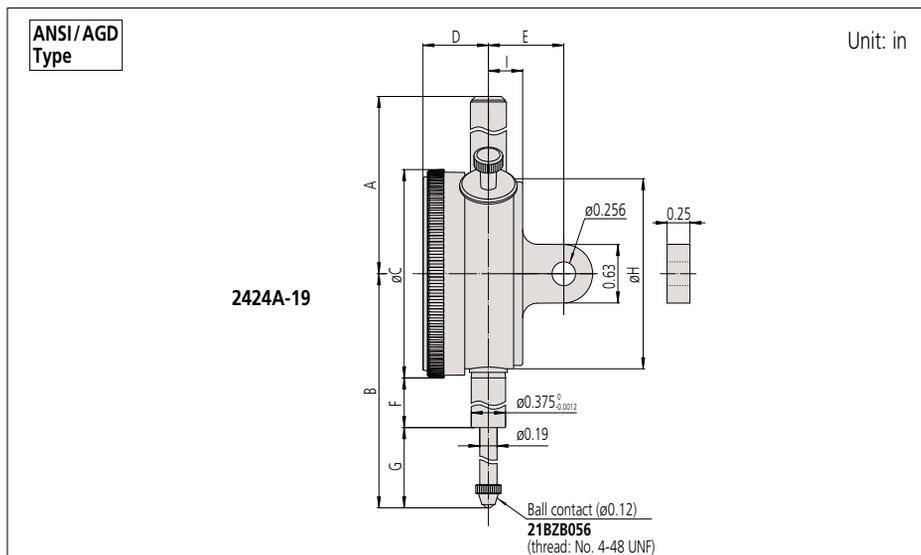
Inch		Stem $\varnothing 3/8"$, #4-48 UNF		ANSI/AGD type		ISO/JIS type			
Order No.		Graduation (in)	Range (range/rev) (in)	Accuracy (in)		Repeatability (in)	Dial reading	Measuring force (N)	
w/lug	Flat-back			First 1 Rev/2.5 Rev/10 Rev	Retrace				
2416A	2416AB	0.001	1 (0.1)	$\pm 0.001/\pm 0.001/\pm 0.002$	0.0002	± 0.0002	$\pm 0-100$	1.8 or less	
2416A-06	2416AB-06	0.001	1 (0.1)	$\pm 0.001/\pm 0.001/\pm 0.002$	0.0002	± 0.0002	$\pm 0-100$	1.8 or less	
2416A-10	2416AB-10	0.001	1 (0.1)	$\pm 0.001/\pm 0.001/\pm 0.002$	0.0002	± 0.0002	$\pm 0-100$	1.8 or less	
2417A	2417AB	0.001	1 (0.1)	$\pm 0.001/\pm 0.001/\pm 0.002$	0.0002	± 0.0002	0-50-0	1.8 or less	
2424A-19	2424AB-19	0.001	2 (0.1)	$\pm 0.001/\pm 0.001/\pm 0.002/\pm 0.003$ (First 20 Rev)	0.00033	± 0.0002	$\pm 0-100$	2.5 or less	
2776A	2776AB	0.0005	1 (0.05)	$\pm 0.0005/\pm 0.0005/\pm 0.0015/\pm 0.002$ (First 20 Rev)	0.0002	± 0.0001	$\pm 0-50$	2.5 or less	
2904A	2904AB	0.001	1 (0.1)	$\pm 0.001/\pm 0.001/\pm 0.002$	0.0002	± 0.0002	100-0	1.8 or less	

Metric		Stem $\varnothing 8$ mm, M2.5x0.45 Thread		ANSI/AGD type		ISO/JIS type					
Order No.		Graduation (mm)	Range (range/rev) (mm)	Accuracy (μ m)				Hysteresis	Repeatability	Dial reading	Measuring force (N)
w/lug	Flat-back			1/10 Rev	1/2 Rev	1 Rev	Measuring range				
2050A	2050AB	0.01	20 (1)	8	10	15	20	5	4	$\pm 0-100$	2.0 or less
2050A-60*	2050AB-60*	0.01	20 (1)	8	10	15	20	5	4	$\pm 0-100$	2.5 or less
2050A-19	2050AB-19	0.01	20 (1)	8	10	15	20	5	4	$\pm 0-100$	2.0 or less
2320A-10	2320AB-10	0.01	20 (1)	8	10	15	20	5	4	$\pm 0-100$	2.0 or less
2052A	2052AB	0.01	30 (1)	10	12	15	25	7	5	$\pm 0-100$	2.5 or less
2052A-19	2052AB-19	0.01	30 (1)	10	12	15	25	7	5	$\pm 0-100$	2.5 or less
2330A-10	2330AB-10	0.01	30 (1)	10	12	15	25	7	5	$\pm 0-100$	2.5 or less
2952A	2952AB	0.01	30 (1)	10	12	15	25	7	5	100-0	2.5 or less

* **2050A-60** and **2050AB-60** are water-proof types that use a rubber bellows to cover the spindle. Note that the outer diameter of the bellows ($\varnothing 9.5$) is larger than that of the stem ($\varnothing 8$).

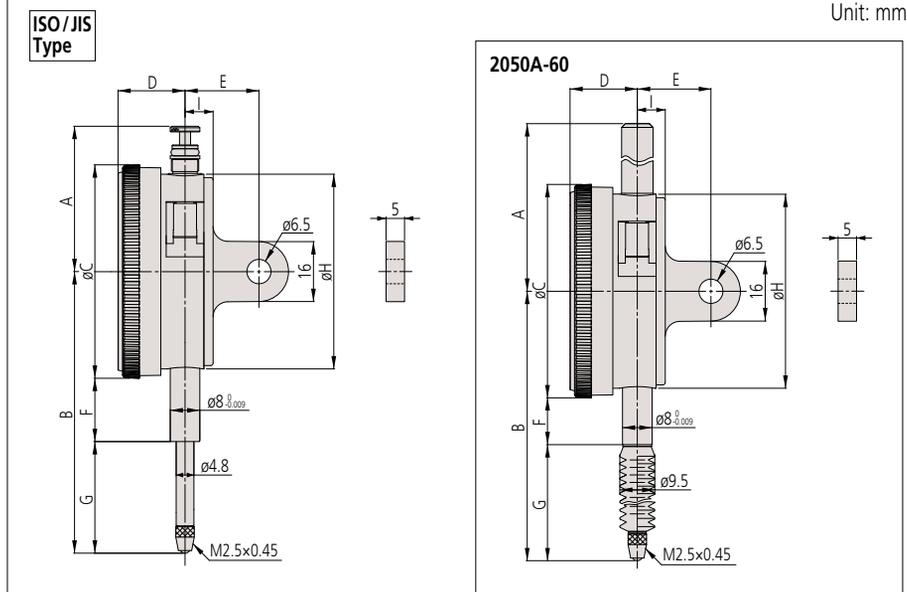
Dial Indicators

DIMENSIONS



Order No.	A	B	C	D	E	F	G	H	I	Mass (g)	
										w/lug	Flat-back
2416A	1.53	3.02	2.24	0.71	3/4	0.54	1.37	2.05	0.30	164	139
2416A-06	1.53	3.02	2.24	0.71	3/4	0.54	1.37	2.05	0.30	164	139
2416A-10	1.53	3.02	2.24	0.71	3/4	0.54	1.37	2.05	0.30	164	139
2417A	1.53	3.02	2.24	0.71	3/4	0.54	1.37	2.05	0.30	164	139
2424A-19	4.67	5.61	2.24	0.71	5/6	2.14	2.35	2.05	0.37	248	239
2776A	1.53	3.02	2.24	0.71	3/4	0.54	1.37	2.05	0.30	164	139
2904A	1.53	3.02	2.24	0.71	3/4	0.54	1.37	2.05	0.30	164	139

Note: Refer to pages F-63 to F-68 for details of contact points.



Order No.	A	B	C	D	E	F	G	H	I	Mass (g)	
										w/lug	Flat-back
2050A	38.5	75.2	57	18.1	20	16.9	29.8	52	7.6	149	140
2050A-60	58.2	87.2	57	18.1	20	12.3	46.4	52	7.6	155	146
2050A-19	38.5	75.2	57	18.1	20	16.9	29.8	52	7.6	149	140
2320A-10	38.5	75.2	57	18.1	20	16.9	29.8	52	7.6	150	141
2052A	38.5	88.7	57	18.1	20	16.9	43.3	52	7.6	152	143
2052A-19	38.5	88.7	57	18.1	20	16.9	43.3	52	7.6	152	143
2330A-10	38.5	88.7	57	18.1	20	16.9	43.3	52	7.6	153	144
2952A	38.5	88.7	57	18.1	20	16.9	43.3	52	7.6	152	143

Note: Refer to pages F-63 to F-68 for details of contact points.

Optional Accessories

- Limit hand (2 pcs.): 21AZB195



- Bezel clamp: 21AZB148 (for metric type)
21RZA065* (for inch type)
21RZA067 (included with 2424A(B)-19)
*Included with ANSI/AGD models



21AZB148



Where to Buy

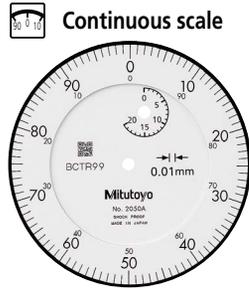
Dial Indicators

Optional Accessory

- Limit hand (2 pcs.): 21AZB195



SERIES 2 — Long Stroke Type



Graduation: 0.01 mm,
Measuring range: 20 mm

2050A

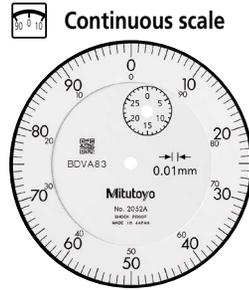
- With damper at lowest rest point

2050A-19

- Shockproof
- Jeweled bearing
- With damper at lowest rest point

2050A-60

- Waterproof



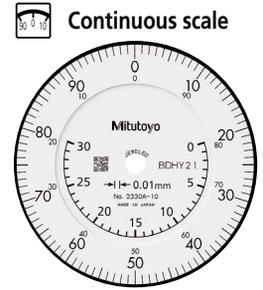
Graduation: 0.01 mm,
Measuring range: 30 mm

2052A

- With damper at lowest rest point

2052A-19

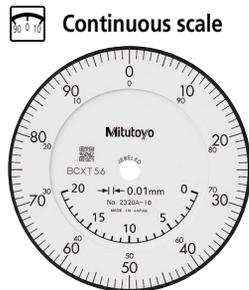
- Shockproof
- Jeweled bearing
- With damper at lowest rest point



Graduation: 0.01 mm,
Measuring range: 30 mm

2330A-10

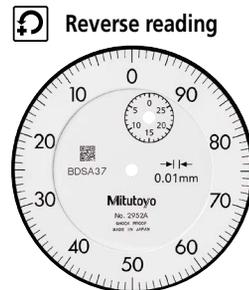
- With coaxial revolution counter
- With damper at lowest rest point
- Jeweled bearing



Graduation: 0.01 mm,
Measuring range: 20 mm

2320A-10

- With coaxial revolution counter
- With damper at lowest rest point
- Jeweled bearing



Graduation: 0.01 mm,
Measuring range: 30 mm

2952A

- With damper at lowest rest point

FEATURES

Inch		ANSI/AGD type		ISO/JIS type				
Order No.	Order No.	Flat-back	30 0 10	10 0 10	Reverse	Jeweled bearing	Shockproof	Waterproof
2416A	2416AB	✓						
2416A-06	2416AB-06	✓						
2416A-10	2416AB-10	✓				✓		
2417A	2417AB		✓					
2424A-19	2424AB-19	✓		✓		✓		✓
2776A	2776AB	✓						
2904A	2904AB				✓			

Metric		ANSI/AGD type		ISO/JIS type				
Order No.	Order No.	Flat-back	30 0 10	10 0 10	Reverse	Jeweled bearing	Shockproof	Waterproof
2050A	2050AB	✓						
2050A-60	2050AB-60	✓				✓		
2050A-19	2050AB-19	✓			✓	✓	✓	
2320A-10	2320AB-10	✓				✓	✓	✓
2052A	2052AB	✓				✓		
2052A-19	2052AB-19	✓			✓	✓	✓	
2330A-10	2330AB-10	✓				✓	✓	✓
2952A	2952AB				✓	✓		

Dial Indicators



Metric Dial Indicators — ANSI / AGD Type

SPECIFICATIONS

Metric		SERIES 1		Stem $\varnothing 3/8"$, #4-48 UNF		ANSI/AGD type		
Order No.		Graduation (mm)	Range (range/rev) (mm)	Accuracy (μm)		Repeat-ability (μm)	Dial reading	Measuring force (N)
w/lug	Flat-back			First 1 Rev/2.5 Rev/10 Rev	Retrace			
1230A-01	1230AB-01	0.01	2.5 (1)	$\pm 10/\pm 10/-$	3	± 2	0-100	1.4 or less
1231A-01	1231AB-01	0.01	2.5 (1)	$\pm 10/\pm 10/-$	3	± 2	0-50-0	1.4 or less
1044A-01	1044AB-01	0.01	5 (1)	$\pm 10/\pm 10/\pm 13$	3	± 3	$\pm 0-100$	1.4 or less
1045A-01	1045AB-01	0.01	5 (1)	$\pm 10/\pm 10/\pm 13$	3	± 3	0-50-0	1.4 or less
1010A-11	1010AB-11	0.002	0.5 (0.2)	$\pm 2/\pm 2/-$	2	± 1	0-20	1.5 or less
1011A-11	1011AB-11	0.002	0.5 (0.2)	$\pm 2/\pm 2/-$	2	± 1	0-10-0	1.5 or less

Metric		SERIES 2		Stem $\varnothing 3/8"$, #4-48 UNF		ANSI/AGD type		
Order No.		Graduation (mm)	Range (range/rev) (mm)	Accuracy (μm)		Repeat-ability (μm)	Dial reading	Measuring force (N)
w/lug	Flat-back			First 1 Rev/2.5 Rev/10 Rev	Retrace			
2231A-01	2231AB-01	0.01	2.5 (1)	$\pm 10/\pm 10/-$	3	± 3	0-50-0	1.4 or less
2046A-01	2046AB-01	0.01	10 (1)	$\pm 10/\pm 10/\pm 13$	3	± 3	$\pm 0-100$	1.4 or less
2046A-11	2046AB-11	0.01	10 (1)	$\pm 10/\pm 10/\pm 13$	3	± 3	$\pm 0-100$	1.4 or less
2047A-01	2047AB-01	0.01	10 (1)	$\pm 10/\pm 10/\pm 13$	3	± 3	0-50-0	1.4 or less
2047A-11	2047AB-11	0.01	10 (1)	$\pm 10/\pm 10/\pm 13$	3	± 3	0-50-0	1.4 or less
2902A-01	2902AB-01	0.01	10 (1)	$\pm 10/\pm 10/\pm 13$	3	± 3	100-0	1.4 or less
2050A-01	2050AB-01	0.01	20 (1)	$\pm 10/\pm 10/\pm 15/\pm 20$ (20 Rev)	4	± 3	$\pm 0-100$	2.0 or less
2056A-01	2056AB-01	0.01	25 (1)	$\pm 10/\pm 10/\pm 15/\pm 20$ (20 Rev)/ ± 25 (Over 20 Rev)	4	± 3	$\pm 0-100$	2.5 or less
2109A-11	2109AB-11	0.001	1 (0.2)	$\pm 3/\pm 3/\pm 4$	2	± 0.3	0-10-0	1.5 or less
2119A-11	2119AB-11	0.001	5 (0.2)	$\pm 7/\pm 7/\pm 8/\pm 10$ (20 Rev)/ ± 10 (Over 20 Rev)	2.5	± 0.3	0-10-0	1.5 or less

FEATURES

Metric		ANSI/AGD type						
Order No.		Flat-back	60°	Diamond	63	60	60	60
w/lug	Flat-back							
1230A-01	1230AB-01							
1231A-01	1231AB-01							
1044A-01	1044AB-01							
1045A-01	1045AB-01							
1010A-11	1010AB-11			✓				✓
1011A-11	1011AB-11			✓				✓

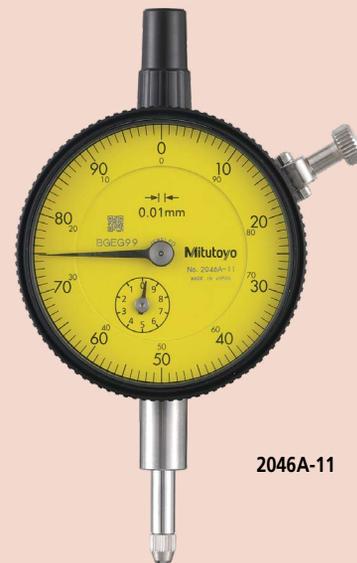
Metric		ANSI/AGD type								
Order No.		Flat-back	60°	Diamond	63	60	60	60	60	60
w/lug	Flat-back									
2231A-01	2231AB-01									
2046A-01	2046AB-01									
2046A-11	2046AB-11			✓						
2047A-01	2047AB-01									
2047A-11	2047AB-11			✓						
2902A-01	2902AB-01									✓
2050A-01	2050AB-01									
2056A-01	2056AB-01									
2109A-11	2109AB-11			✓					✓	
2119A-11	2119AB-11			✓						

Optional Accessories

- Backs (See pages F-69 to F-70)
- Contact points (See pages F-63 to F-68)



1010AB-11



2046A-11



Get a Quote



Dial Indicators

Optional Accessories

- Limit hand (2 pcs.), Bezel clamp
Refer to page F-27 for details.

SERIES 2 — Special Dial Indicators

Adjustable hand dial indicator

- The hand position can be adjusted independently of the vertical movement of the spindle by rotating the top knob.



2048A-10

SPECIFICATIONS

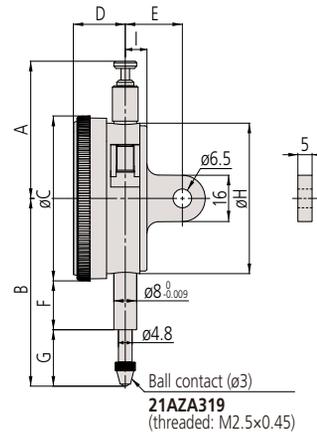
Metric

Order No.		Graduation (mm)	Range (range/rev) (mm)	Accuracy (μm)			Measuring range	Hysteresis	Repeat-ability	Dial reading	Measuring force (N)
w/lug	Flat-back			1/10 Rev	1/2 Rev	1 Rev					
2048A-10	2048AB-10	0.01	10 (1)	5	9	10	15	3	3	±0-100	1.4 or less

DIMENSIONS

ISO / JIS Type

Unit: mm



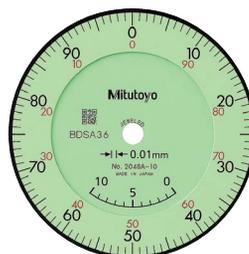
Order No.	A	B	C	D	E	F	G	H	I	Mass (g)	
										w/lug	Flat-back
2048A-10	47.4	64.9	57	18.1	20	16.9	19.5	52	7.6	144	135

Note: The shoulder on a contact point (standard accessory) acts as a stop to prevent spindle overrun that may otherwise damage the indicator. When replacing it with an optional contact point with a connector not exceeding ø7 mm in outside diameter, insert a washer (with ø7 mm outside diameter, ø3 mm inside diameter, and approximately 0.5 mm thickness) above the contact point.



Continuous scale

Graduation: 0.01 mm,
Measuring range: 10 mm



2048A-10

With coaxial revolution counter

Adjustable hand

Jeweled bearing

FEATURES

Metric

Order No.		With coaxial revolution counter	Adjustable hand	Jeweled bearing	Limit hand
w/lug	Flat-back				
2048A-10	2048AB-10	✓	✓	✓	✓

Dial Indicators



SERIES 2 — Special Dial Indicators

- A mechanism holds the pointer and the spindle at the position of maximum depression and hence displays the maximum value.

Note: Clearance of peak hold: Push the nut in the direction of the arrow indicated in the dimensional drawing for **2046A-80**.



2046A-80

Optional Accessories

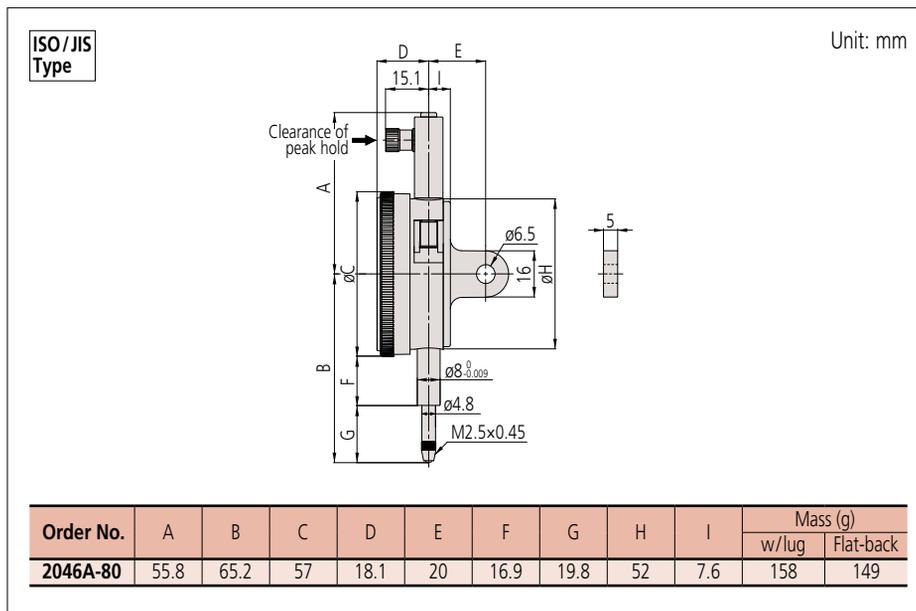
- Limit hand (2 pcs.), Bezel clamp
- Refer to page F-27 for details.

SPECIFICATIONS

Metric		Stem $\varnothing 8\text{mm}$, M2.5x0.45 Thread		ISO/JIS type							
Order No.		Graduation (mm)	Range (range/rev) (mm)	Accuracy (μm)			Measuring range	Hysteresis	Repeat-ability	Dial reading	Measuring force (N)
w/lug	Flat-back			1/10 Rev	1/2 Rev	1 Rev					
2046A-80	2046AB-80	0.01	10 (1)	5	9	10	15	—	—	$\pm 0-100$	5.0 or less

Note: Completed products inspection is performed in the vertical orientation (contact point downward) and the stated accuracy is guaranteed.

DIMENSIONS



Continuous scale



Graduation: 0.01 mm,
Measuring range: 10 mm

2046A-80

Peak retaining

FEATURES

Metric					
Order No.					
w/lug	Flat-back				
2046A-80	2046AB-80	✓		✓	



Need Support?



Dial Indicators

Back Plunger Type Dial Indicators SERIES 2

- The one revolution dial indicator (back plunger type) prevents the possibility of reading errors.
- Back plunger type dial indicators are suitable for mounting onto leveling machine tool tables or inspection jigs, and for use in situations where standard dial indicators are difficult to read.
- Proprietary Mitutoyo shockproof mechanism provides excellent durability and shock resistance.
- Model **2990A-10** provides 0.001 mm graduation.
- The red dead zone in the middle of the dial face is separated from the bezel and doesn't cover the graduations. Therefore, users can always see the range where accuracy is not guaranteed even if the bezel is rotated.



2960A



Holding bar (optional)

Order No.	øD (mm)	L (mm)
21AAA166	ø6	42
136567	ø6	81
124625	ø6.35	81
21AAA167	ø6.35	42
21AAA168	ø8	42
136568	ø8	81

Note: øD and L: detail shown in drawing below.

Optional Accessory

- Limit hand (2 pcs.)
Refer to page F-41 for details.

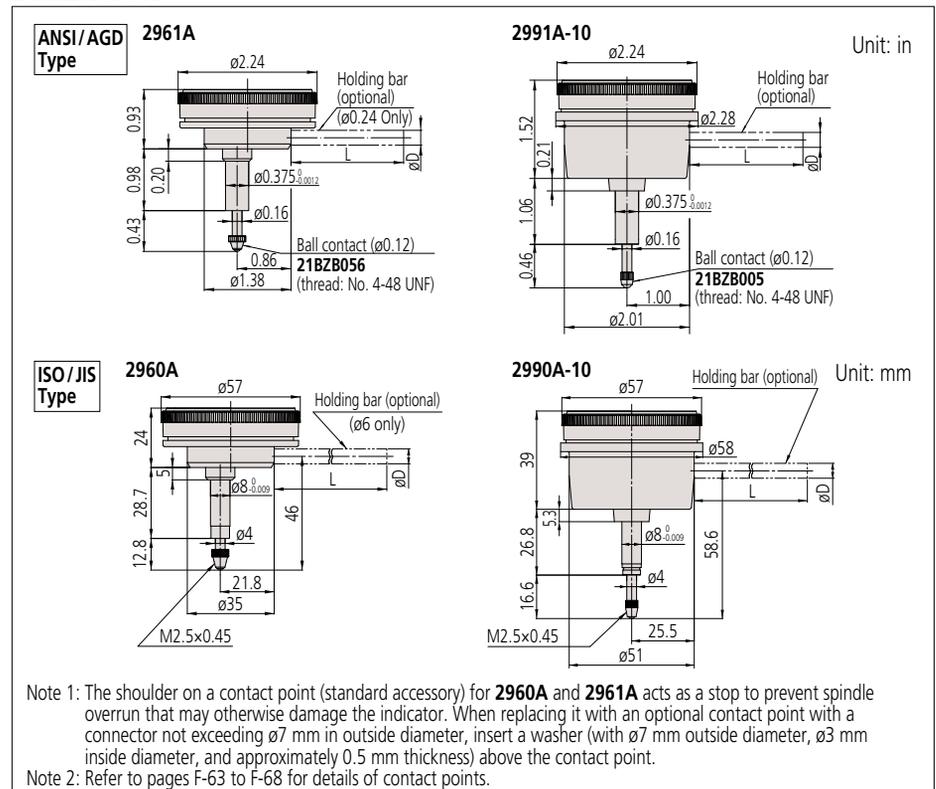
SPECIFICATIONS

Inch		Stem ø3/8", #4-48 UNF		Accuracy (in)		ANSI/AGD type		ISO/JIS type	
Order No.	Graduation (in)	Range (range/rev) (in)	Accuracy (in)		Repeatability (in)	Dial reading	Measuring force (N)		
			First 1 Rev/2.5 Rev/10 Rev	Retrace					
2961A	0.0005	0.04 (0.05)	±0.0005/—/—	0.00016	±0.0001	20-0-20	1.4 or less		
2991A-10	0.0001	0.008 (0.01)	±0.0002/—/—	0.0001	±0.00005	4-0-4	1.5 or less		

Metric		Stem ø8mm, M2.5x0.45 Thread		Accuracy (µm)		ANSI/AGD type		ISO/JIS type		
Order No.	Graduation (mm)	Range (range/rev) (mm)	Accuracy (µm)		Repeatability	Dial reading	Measuring force (N)			
			1/10 Rev	1/2 Rev				1 Rev		
2960A	0.01	1 (1.27)	8	—	—	14	4	3	50-0-50	1.4 or less
2990A-10	0.001	0.1 (0.14)	2.5	—	—	5	2	1	50-0-50	1.5 or less

Note 1: The bezel clamp cannot be used.

DIMENSIONS

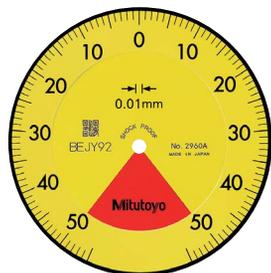


Special specifications

Upon request, we can manufacture custom types with changed graduation numbers, graduation lines, dead zones, etc. Please contact your nearest M³ Solution Center for more information.

Dial Indicators

 **Balanced scale**



Graduation: 0.01 mm,
Measuring range: 1 mm

2960A

-  **One revolution**
-  **Shockproof**
-  **Back Plunger**

 **Balanced scale**



Graduation: 0.001 mm,
Measuring range: 1 mm

2990A-10

-  **One revolution**
-  **Shockproof**
-  **Back Plunger**
-  **Jeweled bearing**

F

FEATURES

Inch ANSI/AGD type ISO/JIS type

Order No.					
2961A	✓	✓	✓		✓
2991A-10	✓	✓	✓	✓	✓

Metric

Order No.					
2960A	✓	✓	✓		✓
2990A-10	✓	✓	✓	✓	✓



Need Service?



Dial Indicators

Optional Accessories

- Limit hand (2 pcs.), Bezel clamp
Refer to page F-31 for details.

SERIES 3, 4 — Long Stroke Type, Large Diameter

- Dial indicators with a large-diameter dial face for easy reading.
- The indicator is highly durable thanks to its oil- and water-tight design, quenched hardened stainless-steel, carbide contact point, and a grand gear made of wear- and deformation-resistant material.
- Application of an anti-reflective and hard surface coating improves scale visibility along with scratch and chemical resistance.



3109A-10



4046A



3058A-19

SPECIFICATIONS

Inch Stem $\varnothing 3/8"$, #4-48 UNF ANSI/AGD type ISO/JIS type

Order No.		Graduation (in)	Range (range/rev) (in)	Accuracy*2 (in)		Repeat-ability (in)	Dial reading	Measuring force (N)
w/lug	Flat-back			First 1 Rev/2.5 Rev/10 Rev	Retrace			
3414A	3414AB	0.001	0.5 (0.1)	$\pm 0.001/\pm 0.001/\pm 0.001$	0.0002	± 0.0002	$\pm 0-100$	1.8 or less
3415A	3415AB	0.001	0.5 (0.1)	$\pm 0.001/\pm 0.001/\pm 0.001$	0.0002	± 0.0002	0-50-0	1.8 or less
3416A	3416AB	0.001	1 (0.1)	$\pm 0.001/\pm 0.001/\pm 0.002$	0.0002	± 0.0002	$\pm 0-100$	1.8 or less
3417A	3417AB	0.001	1 (0.1)	$\pm 0.001/\pm 0.001/\pm 0.002$	0.0002	± 0.0002	0-50-0	1.8 or less
3424A-19	3424AB-19	0.001	2 (0.1)	$\pm 0.001/\pm 0.001/\pm 0.002$ / ± 0.003 (20 Rev)	0.00033	± 0.0002	$\pm 0-100$	3.0 or less
3426A-19*1	3426AB-19*1	0.001	3 (0.1)	$\pm 0.001/\pm 0.001/\pm 0.002/\pm 0.003$ (20 Rev)/ ± 0.005 (Over 20 Rev)	0.00033	± 0.0002	$\pm 0-100$	3.0 or less
3428A-19*1	3428AB-19*1	0.001	4 (0.1)	$\pm 0.001/\pm 0.001/\pm 0.002/\pm 0.003$ (20 Rev)/ ± 0.005 (Over 20 Rev)	0.00033	± 0.0002	$\pm 0-100$	3.5 or less
3802A-10	3802AB-10	0.0001	0.025 (0.01)	$\pm 0.0001/\pm 0.0001/-$	0.0001	± 0.00003	0-10	2.0 or less
3803A-10	3803AB-10	0.0001	0.025 (0.01)	$\pm 0.0001/\pm 0.0001/-$	0.0001	± 0.00003	0-5-0	2.0 or less
4887A-19*1	4887AB-19*1	0.001	3 (0.1)	$\pm 0.001/\pm 0.001/\pm 0.002/\pm 0.003$ (20 Rev)/ ± 0.005 (Over 20 Rev)	0.00033	± 0.0002	$\pm 0-100$	3.0 or less

Metric Stem $\varnothing 8$ mm, M2.5x0.45 Thread

Order No.		Graduation (mm)	Range (range/rev) (mm)	Accuracy (μ m)				Hysteresis	Repeat-ability	Dial reading	Measuring force (N)
w/lug	Flat-back			1/10 Rev	1/2 Rev	1 Rev	Measuring range				
3046A	3046AB	0.01	10 (1)	5	9	10	15	3	3	$\pm 0-100$	1.4 or less
3047A	3047AB	0.01	10 (1)	5	9	10	15	3	3	0-50-0	1.4 or less
3050A	3050AB	0.01	20 (1)	8	10	15	20	5	4	$\pm 0-100$	2.0 or less
3052A-19	3052AB-19	0.01	30 (1)	10	12	15	25	7	5	$\pm 0-100$	2.5 or less
3058A-19	3058AB-19	0.01	50 (1)	10	12	15	30	8	5	$\pm 0-100$	3.0 or less
3060A-19*1	3060AB-19*1	0.01	80 (1)	12	17	20	45	9	5	$\pm 0-100$	3.0 or less
3062A-19*1	3062AB-19*1	0.01	100 (1)	12	17	20	50	9	5	$\pm 0-100$	3.5 or less
3109A-10	3109AB-10	0.001	1 (0.2)	2	3.5	4	5	2	0.5	0-100-0	1.5 or less
4046A	4046AB	0.01	10 (1)	5	9	10	15	3	3	$\pm 0-100$	1.4 or less

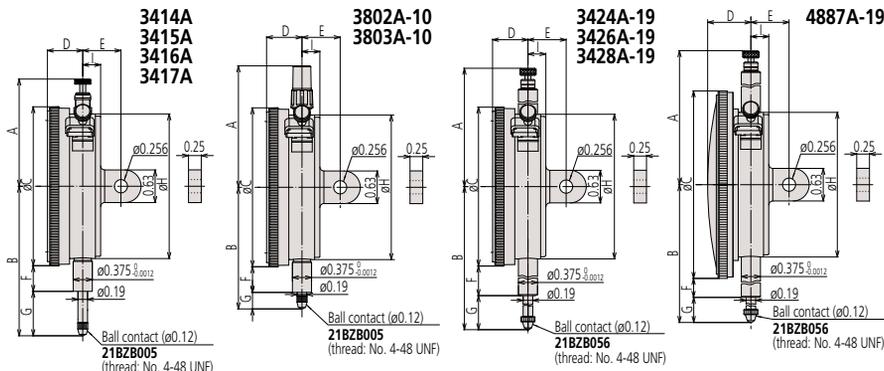
*1 Use in a vertical orientation (contact point downward) for the long stroke model.

Dial Indicators

DIMENSIONS

ANSI/AGD
Type

Unit: in



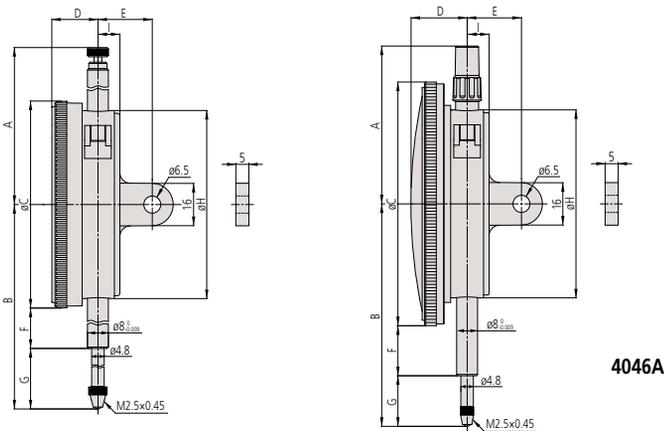
Order No.	A	B	C	D	E	F	G	H	I
3414A	2.07	2.89	3.07	0.70	3/4	0.50	0.86	2.80	0.35
3415A	2.07	2.89	3.07	0.70	3/4	0.50	0.86	2.80	0.35
3416A	2.07	3.39	3.07	0.70	3/4	0.50	1.36	2.80	0.35
3417A	2.07	3.39	3.07	0.70	3/4	0.50	1.36	2.80	0.35
3424A-19*	3.31	5.88	3.07	0.70	3/4	1.99	2.35	2.80	0.35
3426A-19*	4.84	7.80	3.07	0.70	3/4	2.91	3.35	2.80	0.35
3428A-19*	5.67	9.63	3.07	0.70	3/4	3.74	4.35	2.80	0.35
3802A-10	2.41	2.35	3.07	0.70	3/4	0.50	0.32	2.80	0.35
3803A-10	2.41	2.35	3.07	0.70	3/4	0.50	0.32	2.80	0.35
4887A-19*	4.84	7.80	3.62	0.85	3/4	2.63	3.35	2.80	0.35

* The shoulder on a contact point (standard accessory) acts as a stop to prevent spindle overrun that may otherwise damage the indicator. When replacing it with an optional contact point with a connector not exceeding $\varnothing 7$ mm in outside diameter, insert a washer (with $\varnothing 7$ mm outside diameter, $\varnothing 3$ mm inside diameter, and approximately 0.5 mm thickness) above the contact point.

Note: Refer to pages F-63 to F-68 for details of contact points.

ISO/JIS
Type

Unit: mm



Order No.	A	B	C	D	E	F	G	H	I
3046A	59.6	75.5	78	17.7	21	15.9	20.6	71	9
3047A	59.6	75.5	78	17.7	21	15.9	20.6	71	9
3050A	52.6	94	78	17.7	21	25.9	29.1	71	9
3052A-19*	72.9	104.3	78	17.7	21	25.9	39.4	71	9
3058A-19*	81.9	142.3	78	17.7	21	43.9	59.4	71	9
3060A-19*	120.9	202.3	78	17.7	21	73.9	89.4	71	9
3062A-19*	141.9	243.3	78	17.7	21	94.9	109.4	71	9
3109A-10	59.6	79	78	17.7	21	25.9	14.1	71	9
4046A	59.6	84	92	21.5	21	18.9	19.1	71	9

* The shoulder on a contact point (standard accessory) acts as a stop to prevent spindle overrun that may otherwise damage the indicator. When replacing it with an optional contact point with a connector not exceeding $\varnothing 7$ mm in outside diameter, insert a washer (with $\varnothing 7$ mm outside diameter, $\varnothing 3$ mm inside diameter, and approximately 0.5 mm thickness) above the contact point.

Note: Refer to pages F-63 to F-68 for details of contact points.



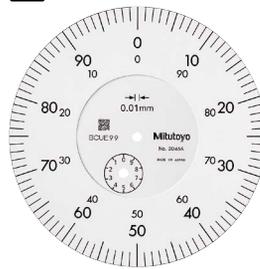
Need Calibration?

Dial Indicators

SERIES 3, 4 — Long Stroke Type, Large Diameter



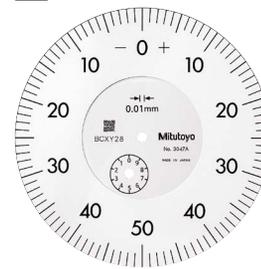
Continuous scale



Graduation: 0.01 mm, 3046A
Measuring range: 10 mm



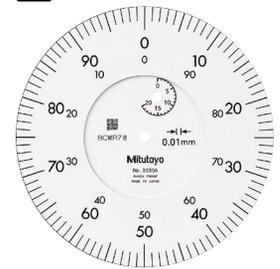
Balanced scale



Graduation: 0.01 mm, 3047A
Measuring range: 10 mm



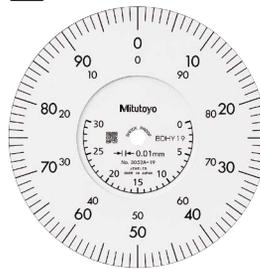
Continuous scale



Graduation: 0.01 mm, 3050A
Measuring range: 20 mm



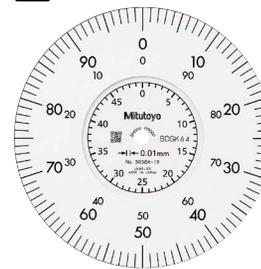
Continuous scale



Graduation: 0.01 mm, 3052A-19
Measuring range: 30 mm



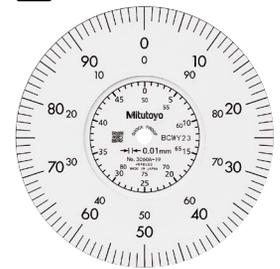
Continuous scale



Graduation: 0.01 mm, 3058A-19
Measuring range: 50 mm



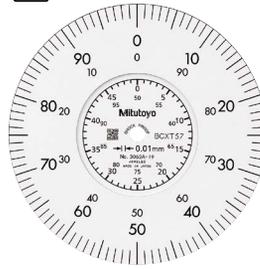
Continuous scale



Graduation: 0.01 mm, 3060A-19
Measuring range: 80 mm



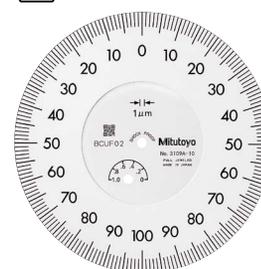
Continuous scale



Graduation: 0.01 mm, 3062A-19
Measuring range: 100 mm



Balanced scale



Graduation: 0.001 mm, 3109A-10
Measuring range: 1 mm



Continuous scale



Graduation: 0.01 mm, 4046A
Measuring range: 10 mm

FEATURES

Inch		ANSI/AGD type					
Order No.							
w/lug	Flat-back						
3414A	3414AB	✓					
3415A	3415AB		✓				
3416A	3416AB	✓					
3417A	3417AB		✓				
3424A-19	3424AB-19	✓		✓	✓	✓	✓
3426A-19	3426AB-19	✓		✓	✓	✓	✓
3428A-19	3428AB-19	✓		✓	✓	✓	✓
3802A-10	3802AB-10	✓		✓	✓		
3803A-10	3803AB-10		✓	✓	✓		
4887A-19	4887AB-19	✓		✓	✓	✓	✓

Metric		ISO/JIS type					
Order No.							
w/lug	Flat-back						
3046A	3046AB	✓					
3047A	3047AB		✓				
3050A	3050AB	✓			✓		
3052A-19	3052AB-19	✓		✓		✓	✓
3058A-19	3058AB-19	✓		✓	✓	✓	✓
3060A-19	3060AB-19	✓		✓	✓	✓	✓
3062A-19	3062AB-19	✓		✓	✓	✓	✓
3109A-10	3109AB-10		✓	✓		✓	
4046A	4046AB	✓					

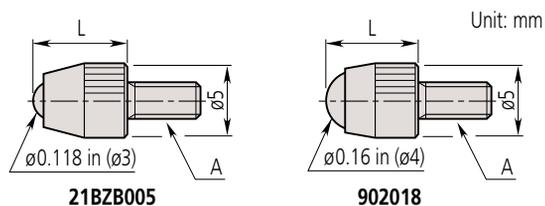
Dial Indicators

Optional Accessories for Digimatic and Dial Indicators and Linear Gages

Contact points, extension rod

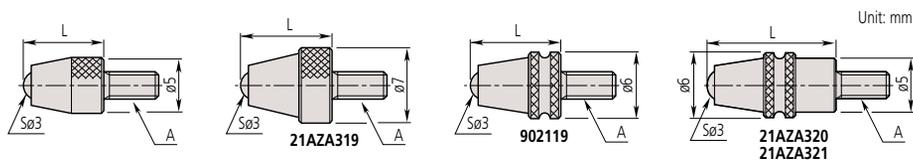
- After replacement, it must be tightened firmly to prevent looseness during use (recommended tightening torque: 50 N·cm).
- Carbide and ruby contact points are highly resistant to wear.

Standard contact point



A: 4-48UNF

L	Carbide	Sapphire	L	SR
.25"	21BZB005	—	—	—
.28"	—	—	—	902018
.3"	131262	131263	131264	—
.6"	131265	131266	131267	—
1"	131268	131269	131270	—



Note: Contact points for water-proof indicators are equipped with a groove to locate the rubber boot.

A: M2.5x0.45

L (mm)	Material	Carbide		Ruby	Plastic
		Without groove	With groove (water-proof type)	Without groove	Without groove
7.3		901312	—	120047	901994
8.3		21AZA319	902119	—	—
12.1		—	21AZA320	—	—
14		21JAA225	—	—	—
15		120049	—	120051	—
17		21JAA224	—	—	—
19.3		—	21AZA321	—	—
20		137391	—	137392	—
22		21JAA226	—	—	—
25		120053	—	120055	—
30		21AAA252	—	21AAA253	—

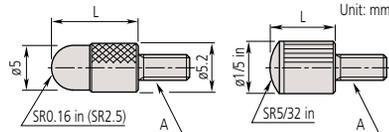


Find a Distributor

Dial Indicators

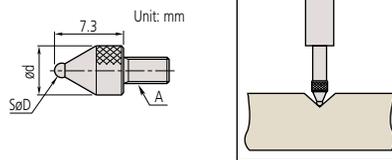
Shell Type Point (Hardened Steel)

Contact point with a large radius.
Optimal for use on flat surfaces.



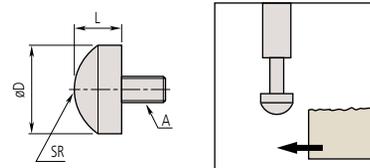
Ball point (Hardened Steel)

Optimal for workpieces with deep indentations.

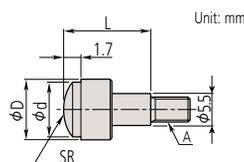


Spherical Point (Hardened Steel)

A large radius makes this contact point optimal for use where the workpiece needs to slide from the side.



Spherical Point (Carbide)

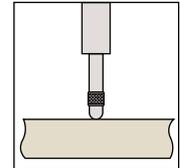


A: 4-48UNF

Order No.	L (in)
193697	3/32
101184	5/32
21AAA031	1/4
21AAA032	3/8
101185	1/2
21AAA033	5/8
101186	3/4
21AAA034	7/8
101187	1
21AAA035	1 1/4
21AAA036	1 1/2
21AAA037	1 3/4
21AAA038	2
21AAA039	2 1/4
21AAA040	2 1/2
21AAA041	2 3/4
21AAA042	3

A: M2.5x0.45

Order No.	L (mm)
101386	5
101118	10
137393	15
101387	20
101388	25
21AAA254	30



A: M2.5x0.45

Order No.	SøD (mm)	ød (mm)	Spherical tip material
21AAA349	1	5	Carbide
21AAA350	1.5	5	
101122	1.8	5	Hardened steel
21AAA351	2.5	5	Carbide
21AAA352	4	5	

A: 4-48UNF

Order No.	øD (in)	L (in)	SR (in)
101205	1/2	1/8	0.35
101204	3/8	3/32	0.28

A: M2.5x0.45

Order No.	øD (mm)	L (mm)	SR (mm)
111460	5.5	3	5
125258	7.9	5	5
101119	10	5	7

A: 4-48UNF

Order No.	øD (in)	ød (in)	L (in)	SR (in)
131273	ø.2	ø.17	.2	.2
131274	ø.27	ø.16	.4	.16
131275	ø.41	.4	.4	.4

A: M2.5x0.45

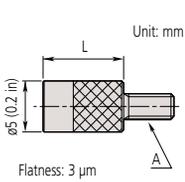
Order No.	øD	ød	L	SR
21AZB751	5.2	4.3	5	5
21AZB752	7.5	6.5	10	7
21AZB753	10.5	9.5	10	10

Dial Indicators

Flat Point

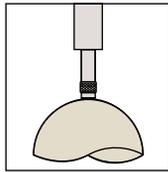


131365



A: 4-48UNF

Order No.	L (in)
133017	5/16
21AAA043	1/2
21AAA044	3/4
21AAA045	1



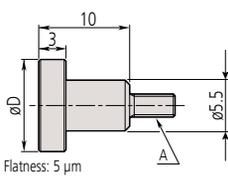
A: M2.5x0.45

Order No.	L
131365	8
21AAB715	10

Material:
Hardened steel

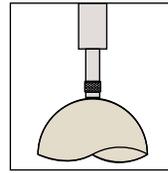


101117

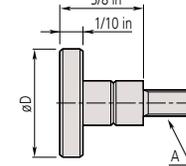


A: 4-48UNF

Order No.	øD (in)
101188	1/2
101189	3/8



Unit: mm



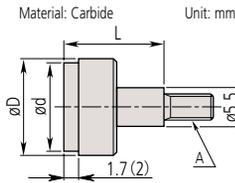
A: M2.5x0.45

Order No.	øD
101117	10
21AAB711	15
21AAB712	20
21AAB713	25
21AAB714	30

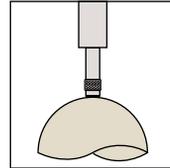
Flat Point (Carbide)



21AZB758



() For 21AZB757



A: 4-48UNF

Order No.	D (in)	d (in)	L (in)
131259	ø.2	ø.17	.2
131260	ø.27	ø.25	.4
131261	ø.41	ø.37	.4

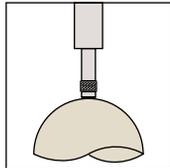
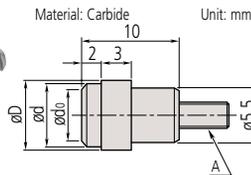
A: M2.5x0.45

Order No.	øD	ød	L
21AZB756	5.2	4.3 ^{*1}	5
21AZB757	7	6.5 ^{*1}	10
21AZB758	10.5	9.5 ^{*1}	10
21AZB760	17	15 ^{*2}	10
21AZB761	22	20 ^{*2}	10
21AZB762	27	25 ^{*2}	10
21AZB763	32	30 ^{*2}	10

Flatness: *1: 3 µm, *2: 5 µm



21AZB754



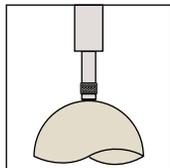
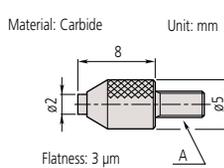
A: M2.5x0.45

Order No.	øD0	ød	øD
21AZB754	3	6.4	7
21AZB755	4.5	8	9

Flatness: 3 µm



21AZB759



A: M2.5x0.45

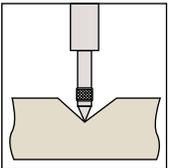
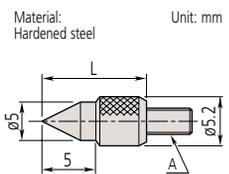
Order No.
21AZB759

Conical Point

Used for positioning the measurement point. Since it can damage a workpiece easily, it is not suitable for use on soft materials.



101120



A: 4-48UNF

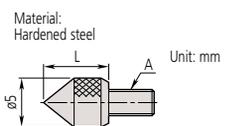
Order No.	Tip angle	L
101190	60°	1/2
101191	90°	1/4

A: M2.5x0.45

Order No.	Tip angle	L
101120	60°	10
101385	90°	5



101385



Got Questions?

Dial Indicators

A: 4-48UNF

Order No.	L
131272	.08"

A: 4-48UNF

Order No.	L
131283	.3"

A: 4-48UNF

Order No.	L (in)	SR (in)
21AAA030	0.6	0.016
21AAA046	1	0.016
21AAA047	1 1/2	0.016
21AAA048	2	0.016

A: 4-48UNF

Order No.	D	L
131281	ø.018"	.12"
131280	ø.04"	.12"
131279	ø.06"	.5"
131271	ø.078"	.04"

A: 4-48UNF

Order No.	D	L
131276	.08"	.016"
131277	.08"	.024"
131278	.16"	.04"

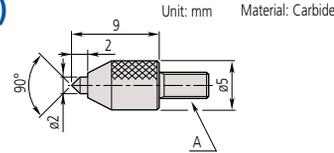
A: 4-48UNF

Order No.
131282

Conical Point (Carbide)



21AZB764

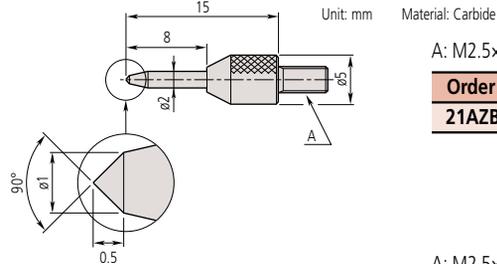


A: M2.5x0.45

Order No.
21AZB764



21AZB765



A: M2.5x0.45

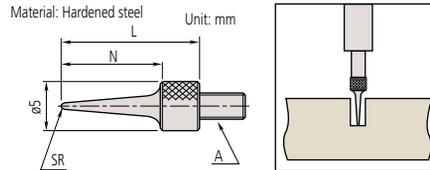
Order No.
21AZB765

Needle Point

Suitable for probing the bottom of a groove or hole.



101121



A: M2.5x0.45

Order No.	N	L	SR
101121	11	15	0.4
137413	13	17	0.2
21AAA255	21	25	0.4
21AAA256	31	35	0.4

A: M2.5x0.45

Order No.	øD	L
120066	0.45	3
21AAA329	0.45	5
120065	1	3
21AAA330	1	5
21AAA331	1	8
21AAA332	1	10
21AAA333	1	20
21AAA334	1	40
21AAA335	1.5	5
21AAA336	1.5	10
120064	1.5	13
21AAA337	1.5	20
21AAA338	1.5	40
137257	2	8
21AAA257	2	18
21AAA258	2	28
21AAA339	2	40

A: M2.5x0.45

Order No.	H	øD
21AZB767	0.4	2
21AZB768	0.6	2
21AZB769	1	4

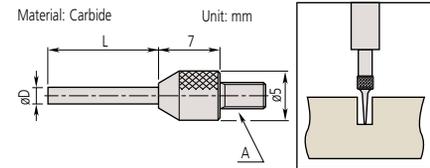
A: M2.5x0.45

Order No.
21AZB766

Needle Point (Carbide)



137257

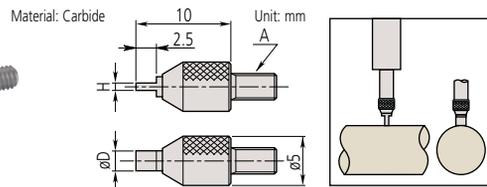


Blade Point (Carbide)

Suitable for measuring cylinders.

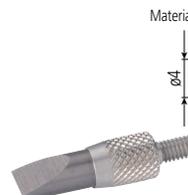


21AZB768

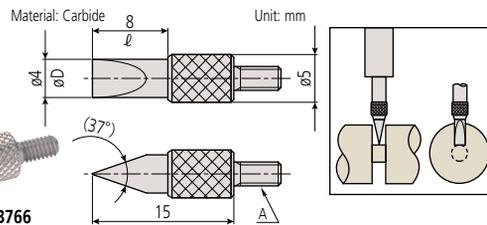


Knife Edge Point (Carbide)

Suitable for measuring narrow groove diameter, etc.



21AZB766



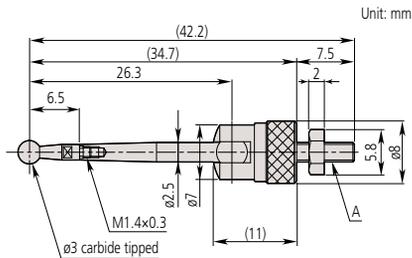
Dial Indicators

Optional Accessories for Digimatic and Dial Indicators and Linear Gages

Lever Point

Suitable for use* on perpendicular faces, such as those within mold cavities. Lever can be adjusted to the required angle.

* Perform measurement in the same posture and conditions as for the reference setting so that variation due to lever deflection is reduced. Gently bring the contact point into touch with the workpiece. Use a dial indicator with as small a measuring force as possible.

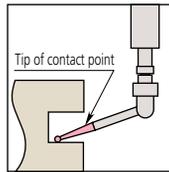


A: 4-48UNF

Order No.
900393

A: M2.5x0.45

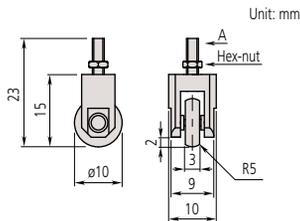
Order No.
900391



The tip of contact point is interchangeable.
Interchangeable contact points (optional)
ø1 mm contact point: **102824**
ø2 mm contact point: **102825**
ø3 mm contact point: **102826** (provided as standard)

Roller Point

Suitable for use on a moving workpiece surface, or where the workpiece needs to slide from the side.



A: 4-48UNF

Order No.
901991

A: M2.5x0.45

Order No.
901954

Roller material: Hardened steel

Roller runout: 10 μm or better

Note 1: For a different roller diameter, contact your nearest M³ Solution Center.

Note 2: High-accuracy roller with 5 μm runout is also available. (Special order item)



Talk to Sales

Dial Indicators

Interchangeable Contact Point Set

This set consists of six types of popular contact points for extending the use of an indicator to many applications.

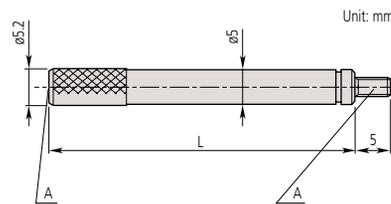


Set Order No. **7822**

M2.5x0.45

Order No.	Contact points included
7822	Set
131365	Flat Point (ø5 mm)
101117	Flat Point (ø10 mm)
101121	Needle Point
101119	Spherical Point
101118	Shell Type Point (R2.5x10)
101387	Shell Type Point (R2.5x20)

Extension Rod



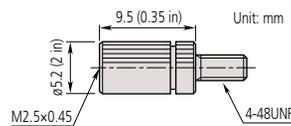
A: 4-48UNF

Order No.	L (in)
139167	1/2
301655	1
301657	2
301659	4

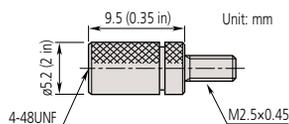
A: M2.5x0.45

Order No.	L
303611	10
21AAA259A	15
303612	20
21AAA259B	25
303613	30
21AAA259C	35
21AAA259D	40
21AAA259E	45
21AAA259F	50
21AAA259G	55
304146	60
21AAA259H	65
21AAA259J	70
21AAA259L	75
21AAA259M	80
304147	90
303614	100

Conversion Adapters



Order No.
21AAA011



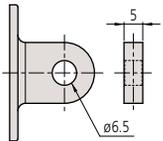
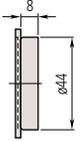
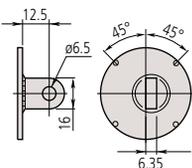
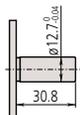
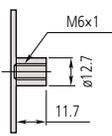
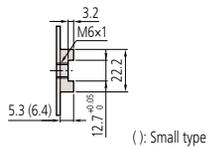
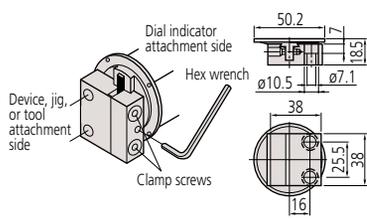
Order No.
21AAA012

Dial Indicators

Interchangeable Back Covers Optional Accessories for Digimatic and Dial Indicators

Various back covers

- A wide variety of indicator back cover types is available for Mitutoyo Digimatic and dial indicators.
- Most lugged back covers can be rotated by 90° because they have four retaining screws. However, **190561** and **137905** (for compact dial indicators) are only equipped with two retaining screws, therefore the lug orientation cannot be changed.

Description			
Lug-on-Center Back Clamped by securing the lug section.		Unit: mm	
Flat Back Cannot be clamped by means of the back cover.		Unit: mm	
Magnetic Back (Magnetic force: 10 N) Can be easily attached to the flat surfaces of iron plates or machine tools with a magnet.		Unit: mm	
Back with Offset Lug One side of the lug section is on the center line.		Unit: mm	
Back with Post Used by clamping the ø12.7 pillar section.		Unit: mm	
Back with Screw Mount Clamped with a screw with its thread as a guide.		Unit: mm	
Adjustable Back Can be slid with the groove as a guide. Clamped with a screw.		Unit: mm	
Back with Adjustable Bracket Can be attached to a device, jig, or tool and easily fine-tuned vertically with a hex wrench. (Travel range: Approx. 20 mm) Attachment procedure 1. Attach only the back cover with rack to the dial indicator. 2. Attach the main unit to a device, jig, or tool with M6 hexagon socket head cap screws. 3. Insert the back cover with rack into the main unit. 4. Use the supplied hex wrench (3/32") to fine-tune and fix with clamp screws.		Unit: mm	



Need Repair?

Dial Indicators

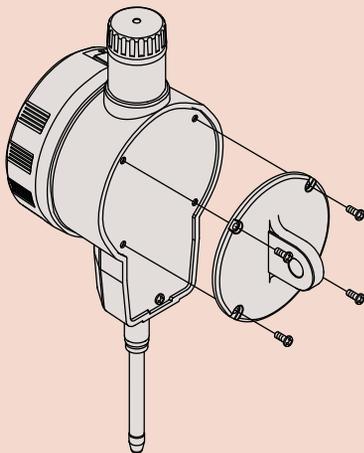
Selection table for various back covers

- If the back cover of water-proof model is replaced, the water resistance will not be guaranteed.
- When mounting a back cover to lightweight type Series (297*AB), separately prepare 4 fixing screws (546666 Self-tapping screw only for plastic). Do not apply a tightening torque of more than 20 N-cm in order to avoid stripping the screw threads.

Dial Indicators

		Inch			Series 1			Series 2			Series 3&4			
		1.22 in		1.57 in	1.57 in		2.19 in		2.24 in		2.24 in		3.07/3.62 in	
				(W/D proof models)			(W/D proof models)		(W/D proof models)					
Back Covers	Lug-on-Center Back	190139	101307	101307	101306			21BZB104			100797			
	Flat Back	191559	101211	136872	101039			192910			21AZB231		100836	
	Magnetic Back	—				900928			900929					
	Back with Offset Lug	—				101167			—					
	Back with Post	—	193172			101169			—					
	Back with Screw Mount	—				101170			(#1/4-28UNF)			—		
	Adjustable Back	—	129721			101168			(#1/4-20UNC)			—		
	Back with Adjustable Bracket	—				901963			—					

		Metric				Series 1			Series 2			Series 3&4				
		31 mm		36 mm	40 mm	40 mm		55.6/57 mm		55.6 mm		57 mm		78/92 mm		
						(W/D proof models)				(W/D proof models)		(W/D proof models)				
Back Covers	Lug-on-Center Back	190561	137905	101210	101210		101040			21AZB230		100691				
	Flat Back	191559	137906	101211	136872		101039			192910		21AZB231		100836		
	Magnetic Back	—				900928			900929							
	Back with Offset Lug	—				101167			—							
	Back with Post	—	193172			101169			—							
	Back with Screw Mount	—	193173			136023			(M6×1)		136026		(M6×1)		—	
	Adjustable Back	—	136025			136026			(M6×1)		136026		(M6×1)		—	
	Back with Adjustable Bracket	—				901963			—							



Digimatic Indicators

Current Series/ model	(0.5" models)		(1" & 2" models)		ID-C Series ID-S Series (Waterproof type)	
	ID-F Series	ID-C Series	ID-F Series	ID-C Series	ID-C Series	ID-S Series
Type	ISO/JIS	ANSI/AGD	ISO/JIS	ANSI/AGD	ISO/JIS	ANSI/AGD
Lug-on-Center Back	101040	101306	101040	101306	21AZB230	
Flat Back	101039		—		21AZB231	
Magnetic Back	900928				—	
Back with Offset Lug	101167				—	
Back with Post	101169				—	
Back with Screw Mount	136023 (M6×1)	101170 (#1/4-28UNF)	136023 (M6×1)	101170 (#1/4-28UNF)	136023 (M6×1)	101170 (#1/4-28UNF)
Adjustable Back	136026 (M6×1)	101168 (#1/4-20UNC)	136026 (M6×1)	101168 (#1/4-20UNC)	136026 (M6×1)	101168 (#1/4-20UNC)
Back with Adjustable Bracket	901963					

* For the ID-CNX, ID-FNX Series (25.4, 50.8 mm/1, 2 inch models), attach the back covers as shown to the left.

Dial Indicators

Spindle Lifting Lever and Cable Optional Accessories for Digimatic and Dial Indicators

Spindle Lifting Cable

- The spindle can be moved up and down using the lifting lever or the lifting cable.
- Attaching the dial indicator to a stand improves measurement accuracy and efficiency.

Lifting cable

Stroke: 10 mm



F

21JZA301: with auto-stop function (300 mm)

21JZA295: without auto-stop function (500 mm)

Note 1: Compatible with 0.5"/12.7mm range models. This accessory is not applicable to dial indicators with a range of 20 mm or more, special models (**2048A(B)-10, 2046A(B)-80**), certain models of 1 series (**1911A(B)-10, 1913A(B)-10, 1921A(B)-10, 1923A(B)-10, 1925A(B)-10, 2971AB, 2972AB, 2973AB, 2976AB, 2977AB, 2978AB**), back plunger type and water-proof type.

Note 2: The lifting cable is attached to the spindle. Therefore, its weight is added to the measuring force. (Approximately 0.3 N max.)

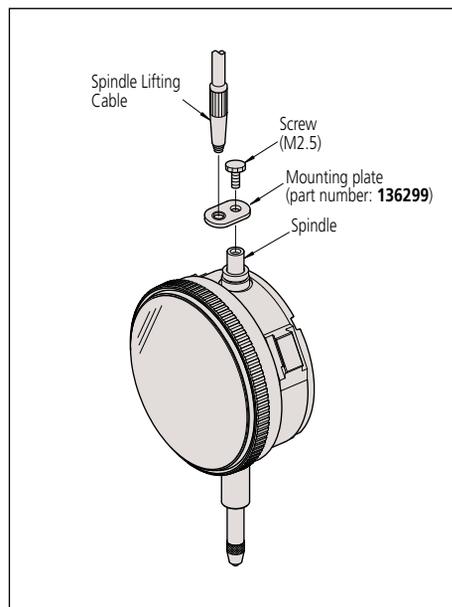
Spindle Lifting Lever

21EAA426

Suitable for 4.8 mm spindle diameter.



Typical application



Where to Buy

Dial Indicators

Spindle Lifting Lever

902100*1

Use for A type and S type SERIES 1 dial indicators.



21EZA198*3

Use for A type SERIES 2, 3, and 4 dial indicators (up to 0.4 in / 10 mm), ID-S and ID-C digital indicators (0.5 in / 12.7mm models)



21AZB149: Lever
101171: Stop screw

21AZB149*2 — Lever only

Use for S type SERIES 2, 3, and 4 dial indicators (up to 0.4 in / 10 mm).



21AZB150*2

Use for A type and S type SERIES 2 and 3 dial indicators (from 0.4 in / 10 mm up to 0.8 in / 20 mm).



*1 Before use, replace the stop screw with the standard accessory.

*2 Use the stop screw already fixed to the dial indicator body.

*3 Stop screw is M2.5x0.45 thread.

Dial Indicators

Limit Stickers

- Place limit stickers on a SERIES 2 indicator dial face or crystal to indicate tolerance limits. Stickers are available in: red, green, and yellow.



Red



136420
(10 sheets/set)

Green



136421
(10 sheets/set)

Yellow



136422
(10 sheets/set)

Color-coded Spindle Caps

- 9 color-coded spindle caps are available for compact/standard dial indicators with a range of 10 mm or less.



Color	Order No.	
	Standard	Water-proof
Black	21AAB675	21AAB676
White	21AAB675W	21AAB676W
Red	21AAB675R	21AAB676R
Green	21AAB675G	21AAB676G
Blue	21AAB675B	21AAB676B
Yellow	21AAB675Y	21AAB676Y
Orange	21AAB675D	21AAB676D
Pink	21AAB675P	21AAB676P
Navy	21AAB675S	21AAB676S

Note: This accessory is not applicable to 1003A(B), 1911A(B)-10, 1913A(B)-10, 1921A(B)-10, 1923A(B)-10, 1925A(B)-10, 2971AB, 2972AB, 2973AB, 2976AB, 2977AB, and 2978AB.

Note: When attaching to small dial indicators, the measuring range height will be 8 mm taller.



Need Support?

Dial Indicators

Dial Indicator Repair Tools Optional Accessories for Dial Indicators



Pointer removing tip (ø0.8) (126630)



Pointer removing tip (ø0.5) (126630B)



Pointer removing tip (ø1.6) (126630C)



Pointer removing tool (126628)



Adjustable nut (100699)



Pinion rest (129735)



Pin rest (129731)



Spindle rest (129730)



Reamer for pointer (ø0.5: 1/20 taper) (21JAA273)



Punch (129733)



Reamer (ø0.6: 1/50 taper) (193702)



Bearing adjuster (129734)



Reamer (ø1: 1/50 taper) (129736)



Pin remover (129732)

Special repairing technique is necessary for repair work. Note that we cannot guarantee accuracy if critical parts are disassembled. We recommend that you use our repair service to operate the instrument with peace of mind.

Typical applications

Remove the long hand

Select an appropriate pointer removing tip for the diameter of the hole of the long hand, and attach it to the pointer removing tool using the adjustable nut. Push the pivot with the pointer removing tool to remove the long hand.

Remove or replace a pin

Place the spindle on the V-groove of the spindle rest. Remove the pin using the pin remover and a commercially available hammer.

To press-fit the pin, tap it directly using a hammer, etc.

Replace the long or little hand

Screw the pinion rest into the pin rest.

Support the pinion with the pinion rest and press-fit the pointer using the punch and a commercially available hammer, etc.

When replacing with a new pointer on an old type of dial indicator or test indicator, reaming is necessary before press-fitting. Use a commercially available pin device (for ø0.8 to 1.2) with one of the following reamers*2.

- Pointers of dial indicators (A type) and TI-X Series*1 do not require a reamer.
- Use the reamer for pointer (ø0.5: 1/20 taper) for S type and T type dial indicators*2.
- Depending on the shaft diameter, use reamer (ø1: 1/50 taper) or reamer (ø0.6: 1/50 taper) for F type dial indicators and other than TI-X Series dial test indicators.

*1 Dial test indicator whose model No. ends in "X".

*2 Dial indicator whose Order No. includes an "S" and "T".

Dial Test Indicators

SERIES 513 — Dial Test Indicator Features

Provides easy access to narrow or recessed areas that cannot be reached with conventional dial indicators.

- Five types are available: standard, standard (20° Tilted face), vertical, horizontal, and universal, allowing users to select the model most suited to their needs.
- Newly designed contact point holder prevents backlash and permits smooth pointer operation.
- Ruby tip has wear-resistance several times greater than a carbide tip and, since it is nonconductive, it can be used safely on an electrical discharge machine.
- The pointer and carbide contact point are weakly magnetic.
 - Note 1: Magnetic material is used for some internal parts.
- Contact point length is printed on dial face to avoid accuracy issues.
 - Note 2: Attaching a contact point of incorrect length will lead to measurement failure.
- Glare-free flat crystal face allows easy reading of graduations. Multi-layer and composite coatings provide a more stain-resistant, anti-reflective crystal.
- Bonding the bezel and crystal together leaves no gap for cutting fluid or oil to penetrate through to the dial face. (Note that this type is NOT water-proof.)
- The main unit is equipped with three dovetails to which the stem with dovetail groove $\varnothing 6$ (standard accessory) can be attached. This greatly improves convenience as the attachment location can be adjusted as needed.
- Metric Dial Test Indicator is inspected according to JIS B 7533:2015. Standard, 20° tilted face, and vertical types are inspected with the dial face in the upward orientation, while the horizontal type is inspected with the dial face in the vertical orientation to guarantee their accuracy.

Standard



Standard (20° Tilted face)



Vertical



Universal



Horizontal



Naming of parts



Feature icons

Icon	Feature description
	High accuracy
	With revolution counter
	Long contact point
	Standard
	Double scale spacing
	Compact (Small face diameter)
	Carbide contact point
	Ruby contact point (Non-conductive and abrasion resistant)



Find a Distributor

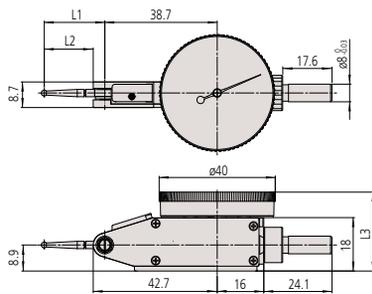


Dial Test Indicators

Dial Test Indicator SERIES 513 — Standard Type

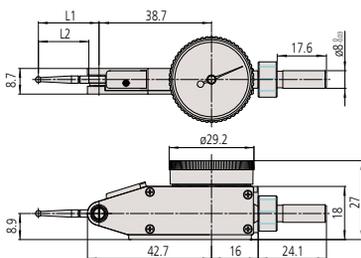
DIMENSIONS

Standard Unit: mm



Order No.	L1	L2	L3
513-401-10E	14.7	11.2	27
513-471-10E			
513-405-10E/A/T	18.7	15.2	28
513-475-10E			
513-425-10E/A	20.9	17.4	27
513-404-10E/A/T			
513-474-10E	22.2	18.7	28
513-424-10E/A/T			
513-426-10E/A	37.4	33.9	27
513-414-10E/A/T			
513-415-10E/A/T	44.5	41.0	
513-477-10E			

Compact



Type	Order No.	L1	L2
Compact	513-465-10E	18.7	15.2
	513-464-10E	20.9	17.4
	513-466-10E	22.2	18.7

Note: A slight difference may occur depending on the center of the contact point, graduation plate, and stem fixing position, etc.

Special Set: 513-907-10E (inch)

513-402-10E: Dial test indicator
7014E-10: Mini magnetic stand

513-908-10E (Metric)

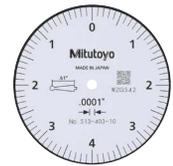
513-404-10E: Dial test indicator
7014-10: Mini magnetic stand



Graduation: 0.0005 in
Range: 0.03 in

513-402-10E/10T

- Standard
- Carbide contact point



Graduation: 0.0001 in
Range: 0.008 in

513-403-10E/10T

- Standard
- Carbide contact point



Graduation: 0.01 mm
Range: 0.8 mm

513-404-10E/10A/10T

- Standard
- Carbide contact point



Graduation: 0.01 mm
Range: 0.5 mm

513-424-10E/10A/10T

- Standard
- Double scale spacing
- Carbide contact point



Graduation: 0.01 mm
Range: 0.5 mm

513-414-10E/10A/10T

- Long contact point
- Carbide contact point
- Double scale spacing



Graduation: 0.01 mm
Range: 1.0 mm

513-415-10E/10A/10T

- Long contact point
- Carbide contact point



Graduation: 0.002 mm
Range: 0.2 mm

513-405-10E/10A/10T

- Standard
- Carbide contact point



Graduation: 0.002 mm
Range: 0.6 mm

513-425-10E/10A

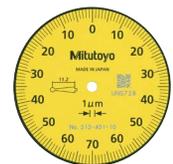
- With revolution counter
- Carbide contact point



Graduation: 0.002 mm
Range: 0.2 mm

513-465-10E

- Compact
- Carbide contact point



Graduation: 0.001 mm
Range: 0.14 mm

513-401-10E

- High accuracy
- Carbide contact point

Note: **513-4XX-10** is indicated on the dial face and the inspection certificate. The Order No. with suffix (E/T/A) is a set item which includes accessories. The main unit is not available as a standalone item.

Dial Test Indicators

Dial Test Indicator SERIES 513 — Standard Type

SPECIFICATIONS

Order No.			Graduation (in)	Range (in)	Dial reading	Accuracy (in)	Hysteresis	Repeatability	Mass (g)	Measuring force (N)	High accuracy	With revolution counter	Long contact point	Standard	Double scale spacing	Compact	Carbide contact point	Ruby contact point
Basic set	Plus set	Full set																
513-402-10E	-	513-402-10T	0.0005	0.03	0-15-0	±0.0005	0.0002	±0.0002	45	0.3 or less	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
513-472-10E	-	-									<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
513-412-10E	-	513-412-10T									<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
513-479-10E	-	-									<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
513-462-10E	-	-	0.00005	0.008	0-4-0	±0.0001	0.0001	±0.00004	45	0.3 or less	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
513-407-10E	-	513-407-10T									<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
513-403-10E	-	513-403-10T									<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
513-473-10E	-	-									<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
513-463-10E	-	-	0.0005	0.03	0-15-0	±0.0005	0.0002	±0.0002	45	0.3 or less	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
513-907-10E ^{*2}	-	-									<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		

*2 A set consisting of 513-402-10E and 7014E-10.

Order No.			Graduation (mm)	Range (mm)	Dial reading	Accuracy (µm)		Hysteresis	Repeatability	Mass (g)	Measuring force (N)	High accuracy	With revolution counter	Long contact point	Standard	Double scale spacing	Compact	Carbide contact point	Ruby contact point
Basic set	Plus set	Full set				Measuring range	One rev. divisions												
513-424-10E	513-424-10A	513-424-10T	0.01	0.5	0-25-0	6	-	4	3	45	0.3 or less	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
513-478-10E	-	-										<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>			
513-466-10E	-	-										<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>			
513-414-10E	513-414-10A	513-414-10T										<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>			
513-426-10E	513-426-10A	-	0.01	1.5	0-25-0	10	10	5	3	45	0.2 or less	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
513-404-10E	513-404-10A	513-404-10T										<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>			
513-474-10E	-	-										<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>			
513-464-10E	-	-										<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>			
513-415-10E	513-415-10A	513-415-10T	0.002	0.8	0-40-0	9	-	4	1	45	0.3 or less	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
513-474-10E	-	-										<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>			
513-464-10E	-	-										<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>			
513-415-10E	513-415-10A	513-415-10T										<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>			
513-477-10E	-	-	0.001	1.0	0-50-0	10	-	5	1	45	0.2 or less	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
513-405-10E	513-405-10A	513-405-10T										<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>			
513-475-10E	-	-										<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>			
513-465-10E	-	-										<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>			
513-425-10E	513-425-10A	-	0.001	0.6	0-100-0	4	5	2	1	45	0.4 or less	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
513-401-10E	-	-										<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>			
513-471-10E	-	-										<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>			
513-908-10E ^{*1}	-	-										<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>			
513-401-10E	-	-	0.01	0.8	0-40-0	9	-	5	4	3	45	0.3 or less	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
513-908-10E ^{*1}	-	-											<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		

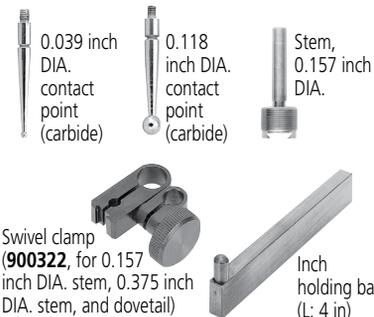
*1 A set consisting of 513-404-10E and 7014-10.

Order No.			Graduation	Range	Dial reading	Accuracy (in)	Hysteresis	Repeatability	Mass (g)	Measuring force (N)	High accuracy	With revolution counter	Long contact point	Standard	Double scale spacing	Compact	Carbide contact point	Ruby contact point
Basic set	Plus set	Full set																
513-406-10E	-	513-406-10T	0.0005 in / 0.01 mm	0.03 in / 0.7 mm	0-15-0 / 0-35-0	±0.0005	0.0002	±0.0002	45	0.3 or less	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>					

Order No.			Graduation	Range	Dial reading	Accuracy (µm)		Hysteresis	Repeatability	Mass (g)	Measuring force (N)	High accuracy	With revolution counter	Long contact point	Standard	Double scale spacing	Compact	Carbide contact point	Ruby contact point
Basic set	Plus set	Full set				Measuring range	10 scale divisions												
513-409-10E	-	513-409-10T	0.002 mm / 0.0001 in	0.2 mm / 0.0076 in	0-10-0 / 0-38-0	4	2	3	1	45	0.3 or less	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>					

Set Configuration: Inch and Inch / Metric

Full set 513-4XX-10T



Basic set 513-4XX-10E



513-4XX-10 is indicated on the dial face.

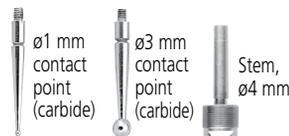


Set Configuration: Metric and Metric / Inch

Full set 513-4XX-10T



Plus set 513-4XX-10A



Basic set 513-4XX-10E



513-4XX-10 is indicated on the dial face.

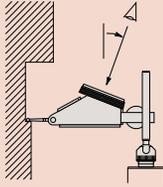




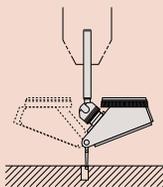
Dial Test Indicators

Example of use of a test indicator with a tilted dial face

- The dial face obliquely faces upward, allowing users to read the graduations from the user's side. It is convenient when probing on the side of a large workpiece and the workbench is high.



- Using the universal holder allows easy hole centering. The dial face always faces upward when the indicator is rotated, which makes reading easy.



Dial Test Indicator SERIES 513 — Standard (20° Tilted Face), Vertical, and Horizontal Types



513-454-10E/10A/10T
Contact point No. 103006



Graduation: 0.01 mm
Range: 0.8 mm

Carbide contact point



513-452-10E/10T
Contact point No. 133195



Graduation: 0.0005 in
Range: 0.03 in

Carbide contact point



513-444-10E/10A/10T
Contact point No. 103006



Graduation: 0.01 mm
Range: 1.6 mm

With revolution counter
 Carbide contact point



513-445-10E/10A/10T
Contact point No. 103011

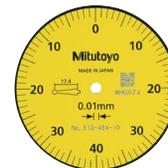


Graduation: 0.002 mm
Range: 0.4 mm

With revolution counter
 Carbide contact point



513-484-10E/10A/10T
Contact point No. 103006



Graduation: 0.01 mm
Range: 0.8 mm

Carbide contact point



513-485-10E
Contact point No. 103011



Graduation: 0.002 mm
Range: 0.2 mm

Carbide contact point

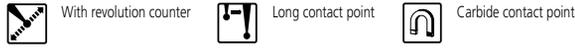


Got Questions?

Note: 513-4XX-10 is indicated on the dial face and the inspection certificate. The Order No. with suffix (E/A/T) is a set item which includes accessories. The main unit is not available as a standalone item.

F

Dial Test Indicators



SPECIFICATIONS

Inch			Standard (20° tilted face) type													
Basic set	Order No.		Graduation (in)	Range (in)	Dial reading	Accuracy (in)			Hysteresis	Repeatability	Mass (g)	Measuring force (N)	With revolution counter	Long contact point	Carbide contact point	Remarks
	Plus set	Full set				Measuring range	One rev.	10 scale divisions								
—	513-442-10A	513-442-10T	0.0005	0.06	0-15-0	±0.0005	±0.0005	0.0002	±0.0002	48	0.3 or less	✓	✓	✓	✓	
—	513-442-16A	513-442-16T				0.3 or less	✓	✓	✓		Black dial					
—	513-446-10A	513-446-10T				0.2 or less	✓	✓	✓		Black dial					
—	513-443-10A	513-443-10T	0.0001	0.016	0-4-0	±0.0002	±0.0002	0.0001	±0.00004	48	0.3 or less	✓	✓	✓	✓	Black dial
—	513-443-16A	513-443-16T				0.3 or less	✓	✓	✓		Black dial					

Metric			Standard (20° tilted face) type													
Basic set	Order No.		Graduation (mm)	Range (mm)	Dial reading	Accuracy (µm)			Hysteresis	Repeatability	Mass (g)	Measuring force (N)	With revolution counter	Long contact point	Carbide contact point	Remarks
	Plus set	Full set				Measuring range	One rev.	10 scale divisions								
513-444-10E	513-444-10A	513-444-10T	0.01	1.6	0-40-0	16	10	5	5	3	48	0.3 or less	✓	✓	✓	
513-445-10E	513-445-10A	513-445-10T	0.002	0.4	0-100-0	6	5	2	4	1	48	0.3 or less	✓	✓	✓	

Inch			Vertical type													
Basic set	Order No.		Graduation (in)	Range (in)	Dial reading	Accuracy (in)			Hysteresis	Repeatability	Mass (g)	Measuring force (N)	With revolution counter	Long contact point	Carbide contact point	Remarks
	Plus set	Full set				Measuring range	One rev.	10 scale divisions								
513-452-10E	—	513-452-10T	0.0005	0.03	0-15-0	±0.0005	—	0.0002	±0.0002	46	0.3 or less	✓	✓	✓		
513-453-10E	—	513-453-10T	0.0001	0.008	0-4-0	±0.0001	—	0.0001	±0.00004		0.3 or less	✓	✓	✓		

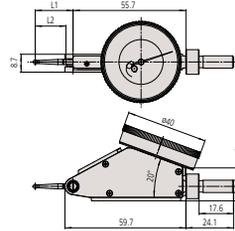
Metric			Vertical type														
Basic set	Order No.		Graduation (mm)	Range (mm)	Dial reading	Accuracy (µm)			Hysteresis	Repeatability	Mass (g)	Measuring force (N)	With revolution counter	Long contact point	Carbide contact point	Remarks	
	Plus set	Full set				Measuring range	One rev.	10 scale divisions									
513-456-10E	—	—	0.01	0.5	0-25-0	6	—	5	4	3	46	0.3 or less	✓	✓	✓		
513-454-10E	513-454-10A	513-454-10T				9	—	—	—	—							—
513-455-10E	513-455-10A	513-455-10T				4	—	2	3	1							—

Inch			Horizontal Type													
Basic set	Order No.		Graduation (in)	Range (in)	Dial reading	Accuracy (in)			Hysteresis	Repeatability	Mass (g)	Measuring force (N)	With revolution counter	Long contact point	Carbide contact point	Remarks
	Plus set	Full set				Measuring range	One rev.	First 2.5 rev.								
—	513-482-10A	513-482-10T	0.0005	0.03	0-15-0	±0.0005	—	0.0002	±0.0002	53	0.3 or less	✓	✓	✓		

Metric			Horizontal Type														
Basic set	Order No.		Graduation (mm)	Range (mm)	Dial reading	Accuracy (µm)			Hysteresis	Repeatability	Mass (g)	Measuring force (N)	With revolution counter	Long contact point	Carbide contact point	Remarks	
	Plus set	Full set				Measuring range	One rev.	10 scale divisions									
513-486-10E	—	—	0.01	0.5	0-25-0	6	—	5	4	3	53	0.3 or less	✓	✓	✓		
513-484-10E	513-484-10A	513-484-10T				9	—	—	—	—							—
513-485-10E	—	—				4	—	2	3	1							—

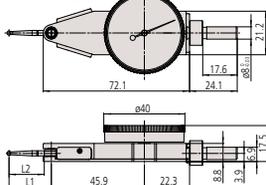
DIMENSIONS

Standard (20° Tilted Face) Type



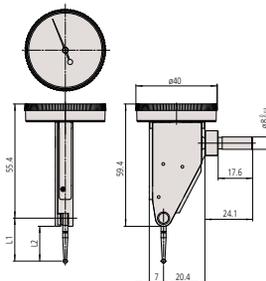
Order No.	L1	L2
513-445-10E	18.7	15.2
513-444-10E	20.9	17.4

Horizontal Type



Order No.	L1	L2
513-484-10E	20.9	17.4
513-485-10E	18.7	15.2
513-486-10E	22.2	18.7

Vertical Type

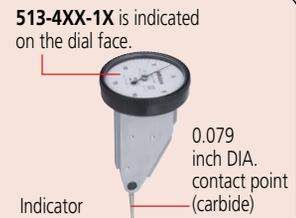


Order No.	L1	L2
513-454-10E	20.9	17.4
513-455-10E	18.7	15.2
513-456-10E	22.2	18.7

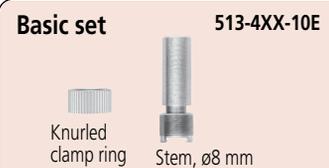
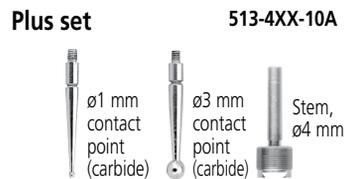
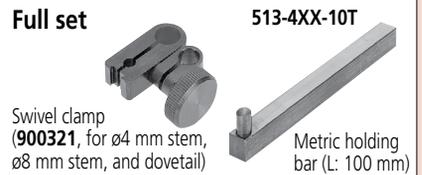
Unit: mm

Note: A slight difference may occur depending on the center of the contact point, graduation plate, and stem fixing position, etc.

Set Configuration: Inch



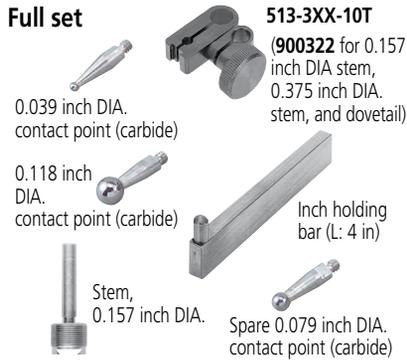
Set Configuration: Metric





Dial Test Indicators

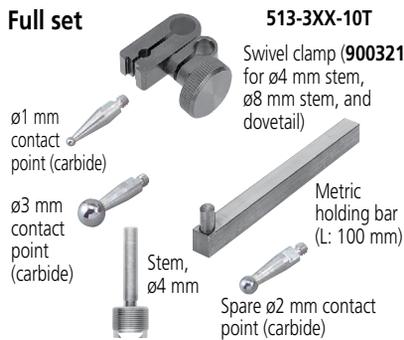
Set Configuration: Inch



513-3XX-10 is indicated on the dial face.



Set Configuration: Metric



513-3XX-10 is indicated on the dial face.



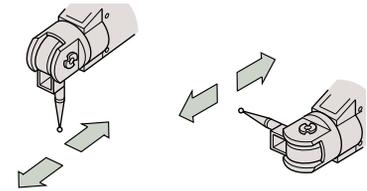
Optional Accessories

- Swivel clamps (See page F-84)
- Holding bars (See page F-85)
- Stems (See page F-85)
- 102824: $\varnothing 1$ mm contact point (carbide)
- 102825: $\varnothing 2$ mm contact point (carbide)
- 102826: $\varnothing 3$ mm contact point (carbide)

Dial Test Indicator SERIES 513 — Universal Type



Universal Type

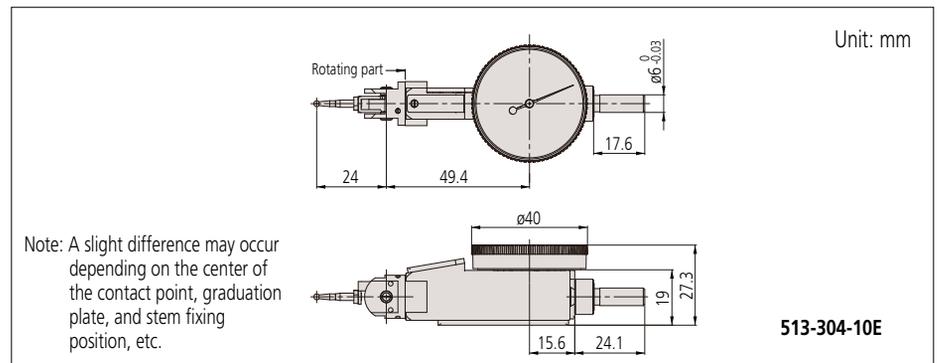


- The direction of the probe movement can be freely changed by rotating the contact point section of the indicator.

SPECIFICATIONS

Order No.		Graduation (in)	Range (in)	Dial reading	Accuracy (in)	Hysteresis	Repeatability	Mass (g)	Measuring force (N)	High accuracy	With revolution counter	Long contact point	Standard	Double scale spacing	Compact	Dustproof	Carbide contact point	Ruby contact point		
Basic set	Full set																			
513-302-10E	513-302-10T	0.0005	0.03	0-15-0	± 0.0005	0.0003	± 0.0003	71	0.3 or less	<input checked="" type="checkbox"/>										
Order No.		Graduation (mm)	Range (mm)	Dial reading	Accuracy (μm)			Hysteresis	Repeatability	Mass (g)	Measuring force (N)	High accuracy	With revolution counter	Long contact point	Standard	Double scale spacing	Compact	Dustproof	Carbide contact point	Ruby contact point
Basic set	Full set				Measuring range	One rev.	10 scale divisions													
513-304-10E	513-304-10T	0.01	0.8	0-40-0	9	—	5	4	3	71	0.3 or less	<input checked="" type="checkbox"/>								

DIMENSIONS



Dial Test Indicators

Pocket Type Dial Test Indicator SERIES 513

- This test indicator series is slimmer than standard test indicators without a clutch lever, making it more suitable for measuring deep points.
- Contact point length is printed on dial face to avoid accuracy issues.
Note 1: Attaching a contact point of incorrect length will lead to measurement failure.
- Glare-free flat crystal face allows easy reading of graduations. Multi-layer composite coatings make the crystal more anti-reflective and stain resistant.

- Bonding the bezel and crystal together leaves no gap for cutting fluid or oil to penetrate through to the dial face. (Note that this type is NOT water-proof.)
- Clutch type (with a clutch lever)
Note 2: See page F-83 for notes on differences with models that do not have a clutch lever.
- A $\varnothing 2$ mm carbide contact point is supplied as standard.



Graduation: 0.01 mm
Range: 0.8 mm

513-517-10E/
513-517-10T

- Standard
- Compact
- Carbide contact point



Graduation: 0.01 mm
Range: 1 mm

513-515-10E/
513-515-10T

- Long contact point
- Compact
- Carbide contact point



Graduation: 0.001 mm
Range: 0.14 mm

513-501-10E/
513-501-10T

- High accuracy
- Compact
- Carbide contact point



Graduation: 0.01 mm
Range: 0.5 mm

513-514-10E/
513-514-10T

- Long contact point
- Double scale spacing
- Compact
- Carbide contact point



Graduation: 0.002 mm
Range: 0.2 mm

513-503-10E/
513-503-10T

- Standard
- Compact
- Carbide contact point



Set Configuration: Inch

Full set



Basic set



513-5XX-10 is indicated on the dial face.



Set Configuration: Metric

Full set



Basic set



513-5XX-10 is indicated on the dial face.



Dial Test Indicators



Graduation: 0.001 in
Range: 0.04 in

**513-518-10E/
513-518-10T**

- Compact
- Carbide contact point



Graduation: 0.0005 in
Range: 0.02 in

**513-512-10E/
513-512-10T**

- Long contact point
- Double scale spacing
- Compact
- Carbide contact point



Graduation: 0.0001 in
Range: 0.01 in

**513-504-10E/
513-504-10T**

- Compact
- Carbide contact point

SPECIFICATIONS

Inch

Order No.		Graduation (in)	Range (in)	Dial reading	Accuracy (in)		Hysteresis	Repeatability	Mass (g)	Measuring force (N)	High accuracy	With revolution counter	Long contact point	Standard	Double scale spacing	Compact	Carbide contact point	Ruby contact point
Basic set	Full set				One rev.	First 2.5 rev.												
513-518-10E	513-518-10T	0.001	0.04	0-20-0	±0.001	—	0.0002	±0.0004	50	0.3 or less	<input checked="" type="checkbox"/>							
513-512-10E	513-512-10T	0.0005	0.02	0-10-0	±0.0005	—	0.0002	±0.0002	51	0.3 or less	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
513-504-10E	513-504-10T	0.0001	0.01	0-5-0	±0.0002	—	0.0001	±0.00004	50	0.3 or less	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>

Metric

Order No.		Graduation (mm)	Range (mm)	Dial reading	Accuracy (µm)			Hysteresis	Repeatability	Mass (g)	Measuring force (N)	High accuracy	With revolution counter	Long contact point	Standard	Double scale spacing	Compact	Carbide contact point	Ruby contact point
Basic set	Full set				Measuring range	One rev.	10 scale divisions												
513-517-10E	513-517-10T	0.01	0.8	0-40-0	9	—	5	4	3	50	0.3 or less	<input checked="" type="checkbox"/>							
513-514-10E	513-514-10T	0.01	0.5	0-25-0	10	—	5	5	3	51	0.3 or less	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
513-515-10E	513-515-10T	0.01	1	0-50-0	10	—	5	5	3	51	0.3 or less	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
513-503-10E	513-503-10T	0.002	0.2	0-100-0	4	—	2	3	1	50	0.4 or less	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
513-501-10E	513-501-10T	0.001	0.14	0-70-0	4	—	2	3	1	50	0.5 or less	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>

Note 1: Be sure to perform calibration with reference gage, etc. after exchanging the contact point. The inside parts may be damaged when the contact point is exchanged due to the breakage. In the case of the significant deterioration in the operation, repair is required.



Talk to Sales

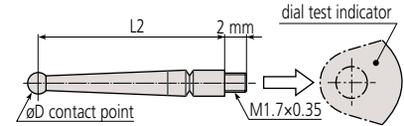
Dial Test Indicators

Contact points, Stems and Holders Optional Accessories for Dial Test Indicators

- Contact Point effective length, L2, must match what is currently mounted on the indicator. Effective length is printed on the dial face.

Contact point (for Metric Models Only*)

* Except for universal type dial test indicator 513-304-10E(T).



ø0.5 mm contact point (Steel)

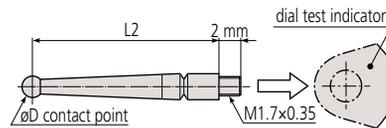
- 190547 (L2=11.2 mm)
- 21CAB109 (L2=15.2 mm)
- 190549 (L2=17.4 mm)
- 190654 (L2=18.7 mm)
- 21CAB111 (L2=33.9 mm)
- 190656 (L2=41.0 mm)

ø0.7 mm contact point (Steel)

- 190548 (L2=11.2 mm)
- 21CAB110 (L2=15.2 mm)
- 190550 (L2=17.4 mm)
- 190653 (L2=18.7 mm)
- 21CAB112 (L2=33.9 mm)
- 190655 (L2=41.0 mm)

Contact point (for Inch Models Only*)

* Except for universal type dial test indicator 513-302-10E(T).



ø1 mm contact point (Carbide)

- 21CZB065 (L2=.61")
- 133196 (L2=.65")
- 136291 (L2=1.2")

ø2 mm contact point (Carbide)

- 21CZB064 (L2=.61")
- 133195 (L2=.65")
- 136290 (L2=1.2")

ø1 mm contact point (Carbide)

- 103017 (L2=11.2 mm)
- 131314 (L2=15.2 mm)
- 103013 (L2=17.4 mm)
- 137558 (L2=18.7 mm)
- 131316 (L2=33.9 mm)
- 136235 (L2=41.0 mm)

ø2 mm contact point (Carbide)

- 103010 (L2=11.2 mm)
- 103011 (L2=15.2 mm)
- 103006 (L2=17.4 mm)
- 137557 (L2=18.7 mm)
- 131324 (L2=33.9 mm)
- 136013 (L2=41.0 mm)

ø3 mm contact point (Carbide)

- 21CZB066 (L2=.61")
- 133197 (L2=.65")
- 136292 (L2=1.2")

ø2 mm contact point (Ruby)

- 21CZB112 (L2=.61")
- 21CZA204 (L2=.65")
- 21CZA214 (L2=1.2")

ø2 mm contact point (Ruby)

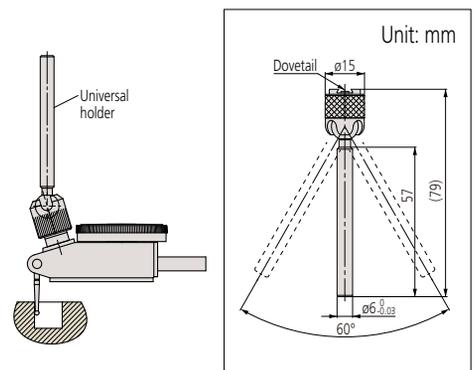
- 21CZA209 (L2=11.2 mm)
- 21CZB068 (L2=15.2 mm)
- 21CZA201 (L2=17.4 mm)
- 21CZA210 (L2=18.7 mm)
- 21CZA211 (L2=41.0 mm)

ø3 mm contact point (Carbide)

- 103018 (L2=11.2 mm)
- 131315 (L2=15.2 mm)
- 103014 (L2=17.4 mm)
- 137559 (L2=18.7 mm)
- 131317 (L2=33.9 mm)
- 136236 (L2=41.0 mm)

Universal Holder (dovetail clamp)

- A universal holder is an attachment used to mount a dial test indicator in a machine tool spindle so that it can be used to align the spindle axis with a workpiece feature such as a hole center, or a machine axis with an edge. (See diagram on the right.) It also gives some protection against accidental impacts on the indicator.



- 21CZA231 (0.25 inch DIA. stem)
- 21CZA233 (ø8 mm stem)
- 21CZA229 (ø6 mm stem)

Swivel Clamps

For 0.157 inch DIA. stem,
0.375 inch DIA. stem,
and dovetail



900322

For ø6 mm stem,
ø8 mm stem, and
dovetail

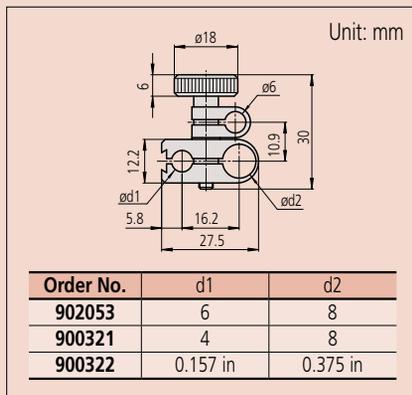


902053

For ø4 mm stem,
ø8 mm stem, and
dovetail



900321



Dial Test Indicators

Contact points, Stems and Holders Optional Accessories for Dial Test Indicators

Spanner

- Used for tightening or loosening the contact point.



102037

Holding Bars



0.25 in x 0.5 in

953639 (Length: 2 in)
900306 (Length: 4 in)



ø8 mm (0.315 inch DIA) 900211 (Length: 115 mm)



9 x 9 mm

953638 (Length: 50 mm)
900209 (Length: 100 mm)

Stems with Knurled Clamp Ring

5/32" DIA.
ø4 mm



21CZB131

5/16" DIA.
ø8 mm



21CZB129

3/8" DIA.



21CZB130

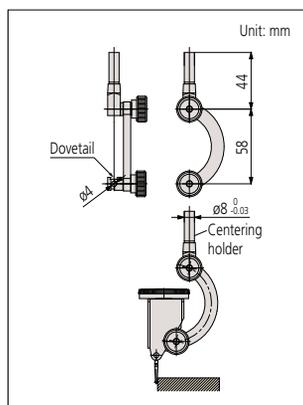
Stem DIA. ød	Stem with dovetail (Individual item)	Nut (Individual item)	Full set (Stem with dovetail+Nut)
Order No.			
ø4	21CAB106	190322	21CZB131
ø6	21CAB103	190322	21CZB128
ø8	21CAB104	190322	21CZB129
ø0.375 in	21CAB105	190322	21CZB130

Centering Holder

- Allows large diameter cylinders or holes to be centered on a machine tool.



901997 (0.25 inch DIA. stem)
901959 (ø8 mm stem)



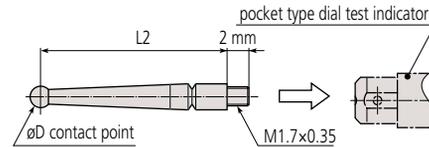
Get a Quote

Dial Test Indicators

Optional Accessories for Pocket Type Dial Test Indicators

- Contact Point effective length, L2, must match what is currently mounted on the indicator. Effective length is printed on the dial face.

Contact point (for Inch Models Only)



ø1 mm contact point (Carbide)



131314 (L2=.60")
103008 (L2=.91")
131316 (L2=1.34")

ø2 mm contact point (Carbide)



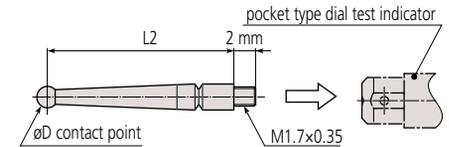
103011 (L2=.60")
103007 (L2=.91")
131324 (L2=1.34")

ø3 mm contact point (Carbide)



131315 (L2=.60")
103009 (L2=.91")
131317 (L2=1.34")

Contact point (for Metric Models Only)



ø0.5 mm contact point (Steel)



190547 (L2=11.2 mm)
190549 (L2=17.4 mm)
190656 (L2=41.0 mm)

ø0.7 mm contact point (Steel)



190548 (L2=11.2 mm)
190550 (L2=17.4 mm)
190655 (L2=41.0 mm)

ø1 mm contact point (Carbide)



136756 (L2=8.6 mm)
103017 (L2=11.2 mm)
103013 (L2=17.4 mm)
137746 (L2=33.3 mm)
136235 (L2=41.0 mm)

ø2 mm contact point (Carbide)



136104 (L2=8.6 mm)
103010 (L2=11.2 mm)
103006 (L2=17.4 mm)
129949 (L2=33.3 mm)
136013 (L2=41.0 mm)

ø2 mm contact point (Ruby)



21CZA209 (L2=11.2 mm)
21CZA201 (L2=17.4 mm)
21CZA211 (L2=41.0 mm)

ø3 mm contact point (Carbide)



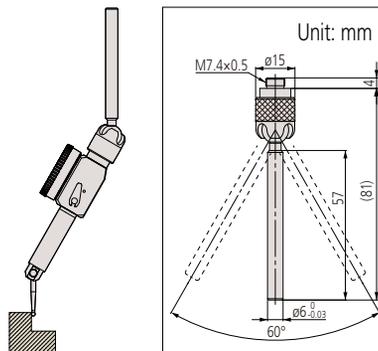
136758 (L2=8.6 mm)
103018 (L2=11.2 mm)
103014 (L2=17.4 mm)
137747 (L2=33.3 mm)
136236 (L2=41.0 mm)

Universal Holder (screw clamp)

- A universal holder is an attachment used to mount a dial test indicator in a machine tool spindle so that it can be used to align the spindle axis with a workpiece feature such as a hole center, or a machine axis with an edge. (See diagram below.) It also gives some protection against accidental impacts on the indicator.



21CZA232 (0.25 inch DIA. stem)
21CZA234 (ø8 mm stem)
21CZA230 (ø6 mm stem)



Swivel Clamps

For 0.157 inch DIA. stem and 0.375 inch DIA. stem, and dovetail



900322

For ø6 mm stem, ø8 mm stem, and dovetail

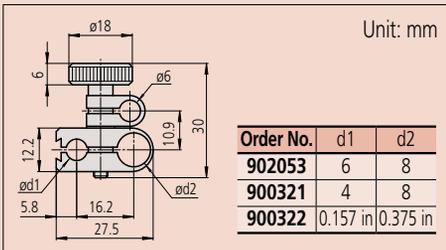


902053

For ø4 mm stem, and dovetail



900321



Stems

5/32" DIA. ø4 mm



102036

5/16" DIA. ø8 mm



102822

3/8" DIA.



102081

Spanner

- Used for tightening or removing the mounting stem for Pocket Type Test Indicators



301336

Holding Bars



*Suitable for height gages with a scriber section of 12.7x6.35 mm.

Indicator Calibration

i-Checker IC2000 SERIES 170

- The i-Checker makes it easier to continuously perform high-accuracy inspection of various indicators.
- A wide variety of optional accessories enable the inspection and calibration of many types of gages including dial indicators, lever-type dial indicators, dial test indicators, bore gages, Digimatic indicators, linear gages and lever gage heads that use various stem diameters and support systems.
- Can directly inspect indicators with a stroke of up to 4 in/100 mm.
- The pointer of the analog indicator is positioned just before the measuring point automatically in the semi-automatic mode.
- Digital indicators equipped with a data output function are checked very efficiently due to spindle positioning at the inspection points and recording of measurement results being under fully automatic control.



SPECIFICATIONS

Order No.	64PKA148A	
Measuring Range	4 in/100 mm	
Resolution	0.4 μm/0.01 mm	
Accuracy (20 °C)	vertical orientation	(0.1 + 0.4L/100) μm L=Arbitrary length (mm)
	lateral orientation	(0.15 + 0.6L/100) μm L=Arbitrary length (mm)
Feed speed	Maximum 10 mm/s	
Drive method	Motor drive (semi-automatic/fully-automatic)	
Measuring Unit	Separate type Linear Encoder	
	Semi-automatic measurement	
Measurement method	Fully automatic measurement	
	(only when using an indicator equipped with data output function)*1*2	
Mass	20 kg	
Operating temperature	20 °C±0.5 °C	
Remarks	with 8 mm bushing and 3/8 in bushing	

*1 Automatic measurement requires the indicator's connection cable. Additionally some form of indicator, along with the normally connected accessory (the optional accessory for the indicator such as a Digimatic power-supply unit in an EF counter) will be required.

*2 The indicator measured via RS-232C has the capability to receive data from the main unit and output the counter value. Recommended PC Part No. **PMICPU003** (PC) & **PMIMON003** (monitor)



Dial Indicators



Dial Test Indicators



Digimatic Indicators



Linear gages

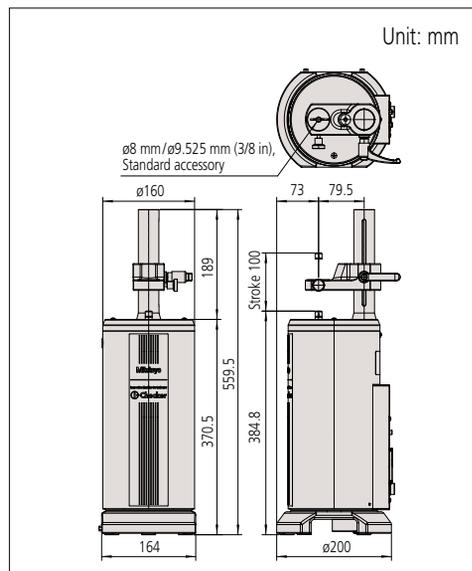


Bore Gages



Lever gage heads

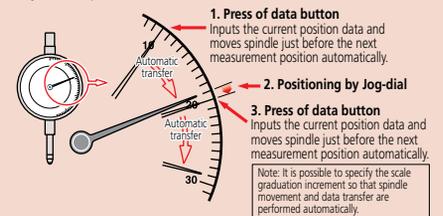
DIMENSIONS



Functions

Semi-automatic inspection of analog indicator

The pointer of the analog indicator is positioned just before the measuring point automatically via Mitutoyo's Semi-automatic Measurement function. After that, inspection begins simply by adjusting the pointer position with the jog-dial. Because of this function, measurement time is reduced and user fatigue is practically eliminated. Additionally all functions necessary for inspection are combined in the control box so that the operator need not rely on excessive eye movement to adjust the pointer.



Fully automatic inspection of digital indicator

The Automatic Measurement function, in tandem with a digital indicator, makes the spindle move so that measurement data is acquired automatically. Therefore, manual adjustment to the measurement position is unnecessary and the efficiency of every inspection is enhanced.



Create and printout a simplified inspection certificate

Create, edit and print your own inspection certificate. Data can be saved as a CSV file.

Optional Accessories

- 02ASK000:** Test indicator attachment set (ø6mm stem)
- 02ASK180:** Test indicator attachment set (ø8mm stem)
- 02ASK370:** Test indicator holder (ø6mm stem)
- 02ASK380:** Test indicator holder (ø8mm stem)
- 02ASU162:** CG accessory set (type C) for bore gages*
- 21CZB128:** ø6mm dovetail grooved stem
- 21CZB129:** ø8mm dovetail grooved stem
- 02ASK040:** Stem bushing ø6mm
- 02ASJ856:** Stem bushing ø8mm
- 02ASK150:** Stem bushing ø8mm, short
- 02ASL150:** Stem bushing ø10, short
- 02ASK050:** Bushing ø9.5 (Requires **02ASK070**)
- 02ASK060:** Stem bushing ø12mm
- 02ASK070:** Stem bushing ø15mm
- 02ASK080:** Stem bushing ø20mm
- 02ASK710:** Stem bushing ø28mm
- 02ASK090:** Stem bushing 3/8"
- 02ASK130:** Stem bushing case
- 02ASK730:** Reflector
- 937179T:** Foot switch

* Not compatible with IC1000 models



Product catalog
E12015



Video



Indicator Calibration

Typical application



Stand for bore gage inspection (12AAK824)

Optional accessory

Stand for bore gage inspection (12AAK824)

Note: Can be used for the inspection of bore gages SERIES 511 standard type and with micrometer head up to 400 mm. (Refer to pages 08-37 and 08-44 for details.)

Calibrating a dial test indicator



SERIES 170 — UDT-2 Calibration Tester

- UDT-2 is an accuracy tester for .001 in, .0005, 0.01 mm in graduation dial indicators, dial test indicators and bore gages.
- With the optional stand, inspection of dial bore gages becomes possible.
- Measuring range: 0 to 1 in / 0 to 25 mm. Accepts 1/4 in, 3/8 in, \varnothing 6 mm and \varnothing 8 mm indicator stems.



170-102-12

SPECIFICATIONS

Inch				
Order No.	Micrometer head		Accuracy	Hysteresis
	Graduation (in)	Range (in)		
170-101-10	0.0001	0 - 1	\pm 0.0001	0.00002

Metric				
Order No.	Micrometer head		Accuracy	Hysteresis
	Graduation (mm)	Range (mm)		
170-102-12	0.001	0 - 25	\pm 2	0.5

SERIES 521 — Calibration Tester

- Accuracy tester for .0005 in, .0001 in, 0.01 mm graduation dial indicators and dial test indicators. Can also be used to adjust the sensitivity of electronic micrometers.
- Universal bracket accepts any dial indicator, dial test indicator or electronic gage without any additional accessory. Clamping capacity: \varnothing 4mm - \varnothing 10mm / .157" - .394" dia.



521-103

SPECIFICATIONS

Inch				
Order No.	Micrometer head		Accuracy	Hysteresis
	Graduation (in)	Range (in)		
521-104	0.00001	0 - 0.05	\pm 0.00001	0.00001
521-106	0.00001	0 - 0.2	\pm 0.00003	0.00003

Metric				
Order No.	Micrometer head		Accuracy	Hysteresis
	Graduation (mm)	Range (mm)		
521-103	0.0002	0 - 1	\pm 0.2	0.2
521-105	0.0002	0 - 5	\pm 0.8	0.8



Find a Distributor

Digital Indicator Applications

Thickness Gages SERIES 547

Standard Type (Resolution: 0.0005 in)

- Thickness gages can quickly measure the thickness of thin products such as paper and felt.
- Using a ceramic contact and anvil, there is no need to worry about rust. (except for **547-400A**)



547-301A



547-321A

- Display: 6-digit display, sign (7-digit for models with 0.0005 mm resolution)
- Power source: CR2032 battery (1 pc.), included as standard (for operational checks)
- Zero-setting (INC system)
- Presetting (ABS system)
- Measuring direction switching
- Tolerance judgment
- Function Lock
- Calibration schedule warning function
- Data output
- Display value holding (when no external device is connected)
- 330° rotary display
- Low battery voltage alarm display
- Error alarm display

SPECIFICATIONS

Inch / Metric					
Order No.	Resolution	Range (in)	Measuring depth	Contact point, Anvil	Parallelism of Contact point, Anvil
547-526S*	0.0001 in/0.001 mm	0 - 0.47*	1.18 in (30 mm)	ø0.39 in (ø10 mm) Flat	0.0002 in/0.005 mm
547-300A	0.0005 in/0.01 mm	0 - 0.4	1.18 in (30 mm)	ø0.39 in (ø10 mm) Flat	0.005 in/0.01 mm
547-500S*	0.0005 in/0.01 mm	0 - 0.47*	1.18 in (30 mm)	ø0.39 in (ø10 mm) Flat	0.005 in/0.01 mm
547-320A	0.0005 in/0.01 mm	0 - 0.4	4.72 in (120 mm)	ø0.39 in (ø10 mm) Flat	0.005 in/0.01 mm
547-520S*	0.0005 in/0.01 mm	0 - 0.47*	4.72 in (120 mm)	ø0.39 in (ø10 mm) Flat	0.005 in/0.01 mm

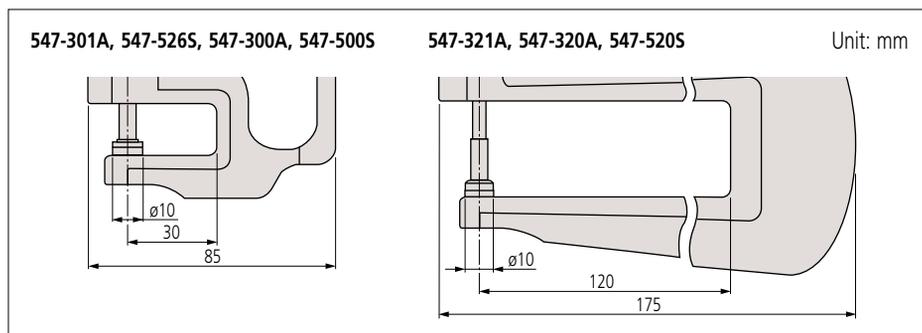
Order No.	Accuracy	Measuring force (N)	Mass (g)	Remarks
547-526S*	±0.0002 in/±5 µm	1.5 or less	225	Standard, ceramic point/anvil
547-300A	±0.001 in/±20 µm	1.5 or less	245	Standard, ceramic point/anvil
547-500S*	±0.001 in/±20 µm	1.5 or less	225	Standard, ceramic point/anvil
547-320A	±0.001 in/±20 µm	1.5 or less	385	Deep throat, ceramic point/anvil
547-520S*	±0.001 in/±20 µm	1.5 or less	380	Deep throat, ceramic point/anvil

* Using ID-SX Digimatic indicator.

Metric					
Order No.	Resolution (mm)	Range (mm)	Measuring depth (mm)	Contact point, Anvil (mm)	Parallelism of Contact point, Anvil (µm)
547-301A	0.01	0 - 10	30	ø10 Flat	10
547-321A	0.01	0 - 10	120	ø10 Flat	10

Order No.	Accuracy (µm)	Measuring force (N)	Mass (g)	Remarks
547-301A	±20	1.5 or less	245	Standard, ceramic point/anvil
547-321A	±20	1.5 or less	385	Deep throat, ceramic point/anvil

DIMENSIONS



Optional Accessories

Refer to page F-90.

- Measurement Data Management **USB-ITPAK V3.0: 06AGR543**



Got Questions?

Digital Indicator Applications

Optional Accessories

Order No.	Type	Description
264-020	—	USB Input Tool Series USB Keyboard Signal Conversion Type IT-020U
06AGL011	SF	Connection cable (1 m)
06AGL021	SF	Connection cable (2 m)
06AGQ001F	SF	USB Input Tool Direct (2 m)
264-622	IP67	U-WAVE-TM
264-623	Buzzer	U-WAVE-TM
02AZD810D	—	U-WAVE-R
264-626	IP67	U-WAVE-TMB
264-627	Buzzer	U-WAVE-TMB
02AZF700	—	Connecting unit for U-WAVE-TM/TMB (for ID-C/ID-F Series 12.7 mm/0.5 inch type only)
02AZF670	—	U-WAVE-TM/TMB mounting bracket: for Digimatic Indicators

High Accuracy Type (Resolution: 0.00002 in)



547-401A

SPECIFICATIONS

Inch / Metric

Order No.	Resolution	Range (in)	Measuring depth	Contact point, Anvil	Parallelism of Contact point, Anvil
547-400A	0.00002/0.00005/ 0.0001/0.0005 in 0.0005/0.001/ 0.01 mm (selectable)	0 - 0.47	0.83 in (21 mm)	ø0.25 in (ø6.3 mm) Flat	0.0001 in/0.003 mm

Order No.	Accuracy	Measuring force (N)	Mass (g)	Remarks
547-400A	±0.00012 in/±3 μm	3.5 or less	275	High accuracy, carbide point anvil

Metric

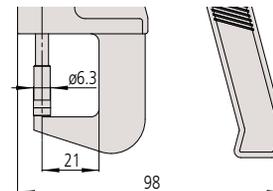
Order No.	Resolution (mm)	Range (mm)	Measuring depth (mm)	Contact point, Anvil (mm)	Parallelism of Contact point, Anvil (μm)
547-401A	0.0005 (0.001/0.01 selectable)	0 - 12	21	ø6.3 Flat (Carbide)	3

Order No.	Accuracy (μm)	Measuring force (N)	Mass (g)	Remarks
547-401A	±3	3.5 or less	275	High accuracy, carbide point anvil

DIMENSIONS

547-401A, 547-400A

Unit: mm



Dial Indicator Applications

Thickness Gages SERIES 7

Standard Type (Graduation: 0.0005 in)

- Integrated moulding of the bezel and crystal ensures protection against water and oil penetration via the front face.



SPECIFICATIONS

Inch					
Order No.	Graduation (in)	Range (in)	Measuring depth (in)	Contact point, Anvil (in)	Parallelism of Contact point, Anvil (in)
7326A	0.0001	0 - 0.05	1.18	ø0.39 Flat	0.0002
7300A	0.001	0 - 0.5	1.18	ø0.39 Flat	0.0005
7304A	0.001	0 - 1	1.18	ø0.39 Flat	0.0005
7322A	0.001	0 - 1	4.72	ø0.39 Flat	0.0005

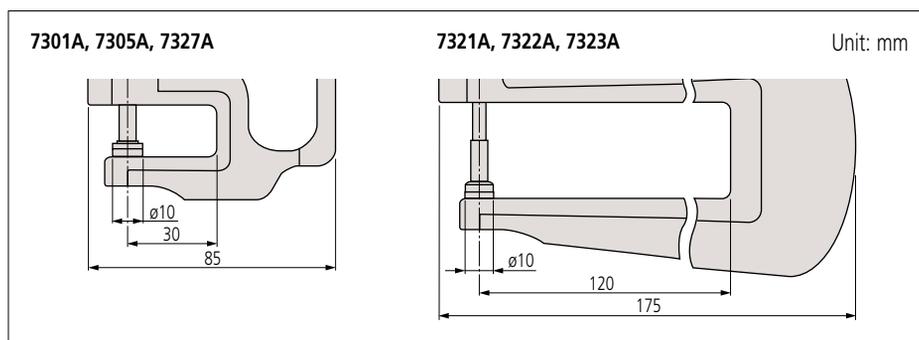
Order No.	Accuracy (in)	Measuring force (N)	Mass (g)	Remarks
7326A	±0.0002	2.0 or less	205	Fine dial reading, ceramic point/anvil
7300A	±0.001	1.8 or less	205	Standard, ceramic point/anvil
7304A	±0.002	1.8 or less	220	Standard, ceramic point/anvil
7322A	±0.002	1.8 or less	370	Deep throat, ceramic point/anvil

Metric					
Order No.	Graduation (mm)	Range (mm)	Measuring depth (mm)	Contact point, Anvil (mm)	Parallelism of Contact point, Anvil (µm)
7327A	0.001	0 - 1	30	ø10 Flat	5
7301A	0.01	0 - 10	30	ø10 Flat	5
7305A	0.01	0 - 20	30	ø10 Flat	5
7321A	0.01	0 - 10	120	ø10 Flat	5
7323A	0.01	0 - 20	120	ø10 Flat	5

Order No.	Accuracy (µm)	Measuring force (N)	Mass (g)	Remarks
7327A	±5	1.5 or less	225	Fine dial reading, ceramic point/anvil
7301A	±15	1.4 or less	205	Standard, ceramic point/anvil
7305A	±20	2.0 or less	220	Standard, ceramic point/anvil
7321A	±15	1.4 or less	370	Deep throat, ceramic point/anvil
7323A	±22	2.0 or less	370	Deep throat, ceramic point/anvil

Note: The dial indicator needs to be reset when a contact point is replaced.

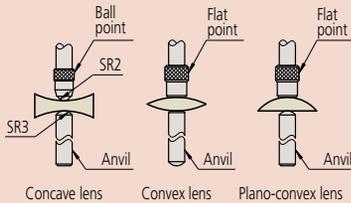
DIMENSIONS



Talk to Sales

Dial/Digital Indicator Applications

Typical applications



- Display: 6-digit display, sign
- Power source: CR2032 battery (1 pc.), included as standard (for operational checks)
- Zero-setting (INC system)
- Presetting (ABS system)
- Measuring direction switching
- Tolerance judgment
- Function Lock
- Calibration schedule warning function
- Data output
- Display value holding (when no external device is connected)
- 330° rotary display
- Low battery voltage alarm display
- Error alarm display

Optional Accessories

Refer to page F-90.

- Measurement Data Management **USB-ITPAK V3.0: 06AGR543**

Lens thickness measurement

- Thickness of concave-convex lenses and surfaces can be measured. (Contact point, Anvil: hardened steel)
- Anvils and contact points are interchangeable to enable concave surfaces to be measured.
- Provided with a ball point as standard.



SPECIFICATIONS

Inch/Metric					
Order No.	Resolution	Range (in)	Measuring depth	Contact point, Anvil	Parallelism of Contact point, Anvil
547-312A	0.0005 in/0.01 mm	0 - 0.4	1.18 in (30 mm)	ø6 mm (ø0.24 in) Flat (Contact point) ø4.8 mm (ø0.19 in) Flat (Anvil)	0.005 in/0.01 mm
547-512A*	0.0005 in/0.01 mm	0 - 0.47*	1.18 in (30 mm)	ø6 mm (ø0.24 in) Flat (Contact point) ø4.8 mm (ø0.19 in) Flat (Anvil)	0.005 in/0.01 mm
Order No.	Accuracy	Measuring force (N)	Mass (g)	Remarks	
547-312A	±0.001 in/±20 µm	1.5 or less	265	Lens thickness	
547-512A*	±0.001 in/±20 µm	1.5 or less	240	Lens thickness	

* Using ID-SX Digimatic indicator.

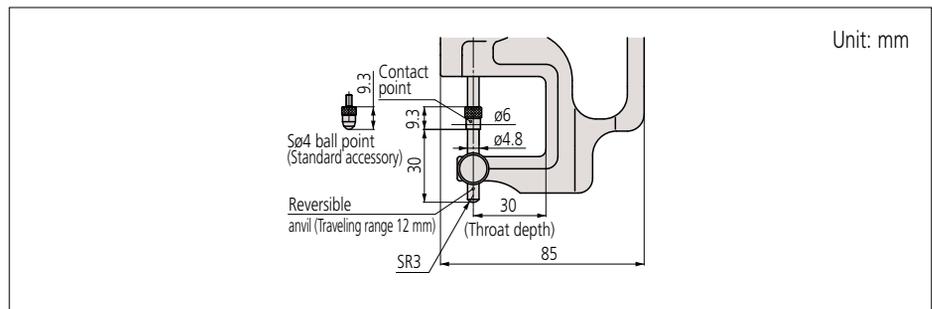
Metric					
Order No.	Resolution (mm)	Range (mm)	Measuring depth (mm)	Contact point, Anvil (mm)	Parallelism of Contact point, Anvil (µm)
547-313A	0.01	0 - 10	30	ø6 Flat (Contact point) ø4.8 Flat (Anvil)	12
Order No.	Accuracy (µm)	Measuring force (N)	Mass (g)	Remarks	
547-313A	±20	1.5 or less	265	Lens thickness	

Inch					
Order No.	Graduation (in)	Range (in)	Measuring depth (in)	Contact point, Anvil (in)	Parallelism of Contact point, Anvil (in)
7312A	0.001	0 - 0.5	1.18	ø0.24 Flat (Contact point) ø0.19 Flat (Anvil)	0.0005
Order No.	Accuracy (in)	Measuring force (N)	Mass (g)	Remarks	
7312A	±0.001	1.8 or less	215	Lens thickness	

Metric					
Order No.	Graduation (mm)	Range (mm)	Measuring depth (mm)	Contact point, Anvil (mm)	Parallelism of Contact point, Anvil (µm)
7313A	0.01	0 - 10	30	ø6 Flat (Contact point) ø4.8 Flat (Anvil)	5
Order No.	Accuracy (µm)	Measuring force (N)	Mass (g)	Remarks	
7313A	±15	1.4 or less	215	Lens thickness	

Note: The dial indicator needs to be reset when a contact point is replaced.

DIMENSIONS



Dial/Digital Indicator Applications

MeasurLink¹ ENABLED
Data Management Software by Mitutoyo

Thickness Gages SERIES 547, 7

Pipe gage measurement

- Pipe wall thickness, thickness of curved boards can be measured. (Contact point, Anvil: hardened steel)



547-360A

7360A

SPECIFICATIONS

Inch / Metric				
Order No.	Resolution	Range (in)	Measuring depth	Contact point, Anvil
547-361A	0.0005 in/0.01 mm	0 - 0.4	0.79 in (20 mm)	ø3 mm (ø0.12 in) Flat (Contact point) ø3.5 mm (ø0.14 in) Ball (Anvil)
547-561S	0.0005 in/0.01 mm	0 - 0.47*	0.79 in (20 mm)	ø3 mm (ø0.12 in) Flat (Contact point) ø3.5 mm (ø0.14 in) Ball (Anvil)
Order No.	Accuracy	Measuring force (N)	Mass (g)	Remarks
547-361A	±0.001 in/±20 µm	1.5 or less	230	Pipe gage
547-561S	±0.001 in/±20 µm	1.5 or less	215	Pipe gage

* Using ID-SX Digimatic indicator.

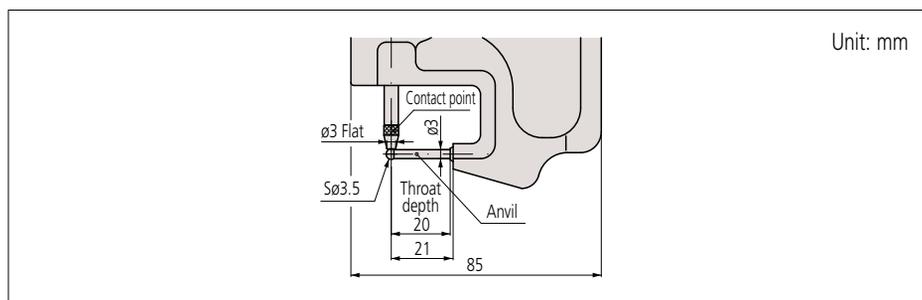
Metric				
Order No.	Resolution (mm)	Range (mm)	Measuring depth (mm)	Contact point, Anvil (mm)
547-360A	0.01	0 - 10	20	ø3 Flat (Contact point) ø3.5 Ball (Anvil)
Order No.	Accuracy (µm)	Measuring force (N)	Mass (g)	Remarks
547-360A	±20	1.5 or less	230	Pipe gage

Inch				
Order No.	Graduation (in)	Range (in)	Measuring depth (in)	Contact point, Anvil (in)
7361A	0.001	0 - 0.5	0.8	ø0.12 Flat (Contact point) ø0.14 Ball (Anvil)
Order No.	Accuracy (in)	Measuring force (N)	Mass (g)	Remarks
7361A	±0.001	1.8 or less	200	Pipe gage

Metric				
Order No.	Graduation (mm)	Range (mm)	Measuring depth (mm)	Contact point, Anvil (mm)
7360A	0.01	0 - 10	20	ø3 Flat (Contact point) ø3.5 Ball (Anvil)
Order No.	Accuracy (µm)	Measuring force (N)	Mass (g)	Remarks
7360A	±15	1.4 or less	200	Pipe gage

Note: The dial indicator needs to be reset when a contact point is replaced.

DIMENSIONS



- Display: 6-digit display, sign
- Power source: CR2032 battery (1 pc.), included as standard (for operational checks)
- Zero-setting (INC system)
- Presetting (ABS system)
- Measuring direction switching
- Tolerance judgment
- Function Lock
- Calibration schedule warning function
- Data output
- Display value holding (when no external device is connected)
- 330° rotary display
- Low battery voltage alarm display
- Error alarm display

Optional Accessories

Refer to page F-90.

- Measurement Data Management USB-ITPAK V3.0: 06AGR543



Need Repair?

Dial/Digital Indicator Applications

- Display: 6-digit display, sign
- Power source: CR2032 battery (1 pc.), included as standard (for operational checks)
- Zero-setting (INC system)
- Presetting (ABS system)
- Measuring direction switching
- Tolerance judgment
- Function Lock
- Calibration schedule warning function
- Data output
- Display value holding (when no external device is connected)
- 330° rotary display
- Low battery voltage alarm display
- Error alarm display

Optional Accessories

Refer to page F-90.

- Measurement Data Management **USB-ITPAK V3.0: 06AGR543**

Blade thickness measurement

- Measuring faces of the contact point and anvil are blade-shaped (thickness: 1 mm). Suitable for measuring narrow grooves.



547-315A

7315A

SPECIFICATIONS

Inch / Metric					
Order No.	Resolution	Range (in)	Measuring depth	Contact point, Anvil	Parallelism of Contact point, Anvil
547-316A	0.0005 in/0.01 mm	0 - 0.4	1.18 in (30 mm)	t=1 mm (0.04 in) Blade	0.005 in/0.01 mm
547-516A*	0.0005 in/0.01 mm	0 - 0.47*	1.18 in (30 mm)	t=1 mm (0.04 in) Blade	0.005 in/0.01 mm

Order No.	Accuracy	Measuring force (N)	Mass (g)	Remarks
547-316A	±0.001 in/±20 μm	1.5 or less	260	Blade thickness
547-516A*	±0.001 in/±20 μm	1.5 or less	240	Blade thickness

* Using ID-SX Digimatic indicator.

Metric					
Order No.	Resolution (mm)	Range (mm)	Measuring depth (mm)	Contact point, Anvil (mm)	Parallelism of Contact point, Anvil (μm)
547-315A	0.01	0 - 10	30	t=1 Blade	10

Order No.	Accuracy (μm)	Measuring force (N)	Mass (g)	Remarks
547-315A	±20	1.5 or less	260	Blade thickness

Inch					
Order No.	Graduation (in)	Range (in)	Measuring depth (in)	Contact point, Anvil (in)	Parallelism of Contact point, Anvil (in)
7316A	0.001	0 - 0.5	1.18	t=0.04 Blade	0.0005

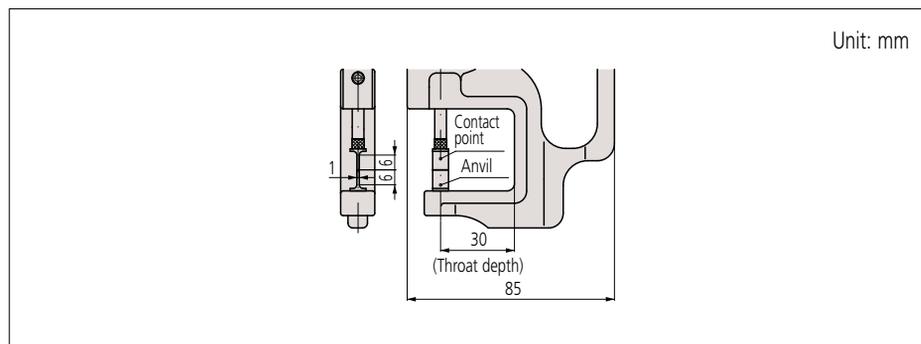
Order No.	Accuracy (in)	Measuring force (N)	Mass (g)	Remarks
7316A	±0.001	1.8 or less	220	Blade thickness

Metric					
Order No.	Graduation (mm)	Range (mm)	Measuring depth (mm)	Contact point, Anvil (mm)	Parallelism of Contact point, Anvil (μm)
7315A	0.01	0 - 10	30	t=1 Blade	5

Order No.	Accuracy (μm)	Measuring force (N)	Mass (g)	Remarks
7315A	±15	1.4 or less	220	Blade thickness

Note: The dial indicator needs to be reset when a contact point is replaced.

DIMENSIONS



Digimatic Caliper Gages



Internal Tube Thickness Measurement SERIES 209

Versatile ID measuring gages for hole diameters, groove thickness, tube diameter and hard-to-reach dimensions. The Digimatic Caliper Gages provide error-free LCD readings, as well as data output for SPC analysis.

Internal measurement type

209-936



Technical Data

Display: LCD Analog / Digital
Power Supply: AAA Battery (2 pcs.)
Dust/Water protection level: IP67

Function

Zeraset, Preset, Auto power off, Inch/Metric, Conversion data hold, Max/Min value holding, Data output

Optional Accessories

- KPL8007-10** Holder (back Lug)
- 06AFM380E** USB cable (2m)*1
- 937387** SPC Cable (1m)*1
- 965013** SPC Cable (2m)*1
- 02AZD790E** U-Wave-T Cable*1
- 02AZD880G** U-Wave-Transmitter (buzzer)
- KPL1961-09** Interface adapter (cable)
- KPL1961-13** Interface adapter (Bluetooth)
- KPL0682-60** Bluetooth dongle*2

*1 requires interface adapter (KPL1962-09)

*2 requires interface adapter (KPL1962-13)

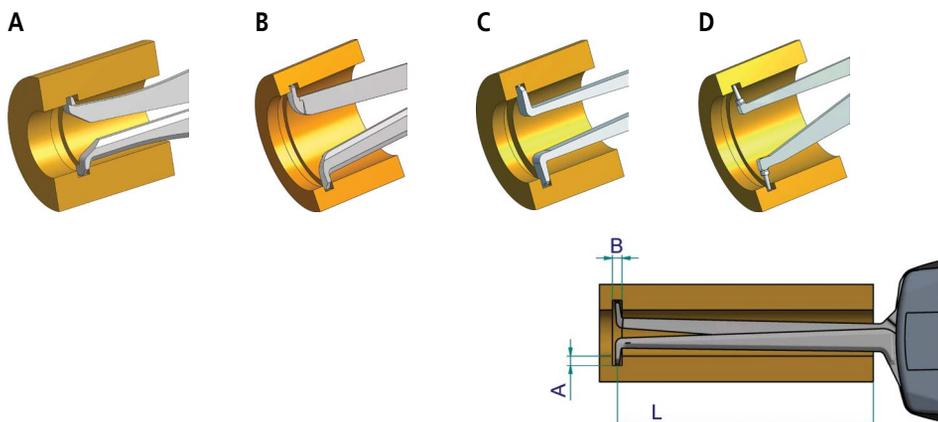
SPECIFICATIONS

Inch / Metric

Order No.	Range	Resolution	Accuracy	Measuring Depth (L)	Groove Depth (A)	Groove Width (B)	Measuring Contacts	Measuring Force (N)	Fig. Reference
209-934	0.09-0.49" / 2.5-12.5mm	10 Steps (switchable)*1	0.0005" / 0.015mm	0.47" / 12mm	.27" / 0.7mm	.02" / 0.4mm	Chisel R .0039" / 0.1mm	0.8-1.2	A
209-935	0.19-0.59" / 5-15mm		0.0005" / 0.015mm	1.37" / 35mm	.09" / 2.3mm	.03" / 0.8mm	Ball .024" / 0.6mm dia.	0.8-1.2	B
209-936	0.39-1.18" / 10-30mm		0.0010" / 0.03mm	3.34" / 85mm	.19" / 5.2mm	.05" / 1.2mm	Ball .04" / 1mm dia.	1.1-1.6	B
209-937	0.78-1.57" / 20-40mm		0.0010" / 0.03mm	3.34" / 85mm	.26" / 7.0mm	.05" / 1.2mm	Ball .04" / 1mm dia.	1.1-1.6	C
209-938	1.18-1.96" / 30-50mm		0.0010" / 0.03mm	3.34" / 85mm	.26" / 7.0mm	.05" / 1.2mm	Ball .04" / 1mm dia.	1.1-1.6	C
209-939	1.57-2.36" / 40-60mm		0.0010" / 0.03mm	3.34" / 85mm	.31" / 8.3mm	.05" / 1.2mm	Ball .04" / 1mm dia.	1.1-1.6	D
209-940	1.96-2.75" / 50-70mm		0.0010" / 0.03mm	3.34" / 85mm	.31" / 8.3mm	.05" / 1.2mm	Ball .04" / 1mm dia.	1.1-1.6	D
209-941	2.36-3.14" / 60-80mm		0.0010" / 0.03mm	3.34" / 85mm	.31" / 8.3mm	.05" / 1.2mm	Ball .04" / 1mm dia.	1.1-1.6	D
209-942	2.75-3.54" / 70-90mm		0.0010" / 0.03mm	3.34" / 85mm	.31" / 8.3mm	.05" / 1.2mm	Ball .04" / 1mm dia.	1.1-1.6	D
209-944	0.51-1.69" / 13-43mm		0.0015" / 0.04mm	5.00" / 127mm	.22" / 5.7mm	.06" / 1.5mm	Ball Ø.05" / 1.3mm	1.2-1.7	B
209-945	0.59-2.55" / 15-65mm		0.0020" / 0.05mm	7.40" / 188mm	.21" / 5.5mm	.07" / 1.9mm	Ball Ø.06" / 1.5mm	1.0-1.8	C
209-946	1.18-2.36" / 30-60mm		0.0015" / 0.04mm	5.19" / 132mm	.24" / 6.2mm	.07" / 1.8mm	Ball Ø.06" / 1.5mm	1.2-1.7	D
209-947	1.96-3.14" / 50-80mm		0.0015" / 0.04mm	5.19" / 132mm	.33" / 8.3mm	.09" / 2.4mm	Ball Ø.08" / 2mm	1.2-1.7	D
209-948	2.75-3.93" / 70-100mm		0.0015" / 0.04mm	5.19" / 132mm	.33" / 8.3mm	.09" / 2.4mm	Ball Ø.08" / 2mm	1.2-1.7	D
209-949	3.54-4.72" / 70-100mm		0.0015" / 0.04mm	5.19" / 132mm	.33" / 8.3mm	.09" / 2.4mm	Ball Ø.08" / 2mm	1.2-1.7	D
209-950	1.57-3.54" / 40-90mm		0.0020" / 0.05mm	7.55" / 192mm	.33" / 8.3mm	.09" / 2.4mm	Ball Ø.08" / 2mm	1.0-1.8	D

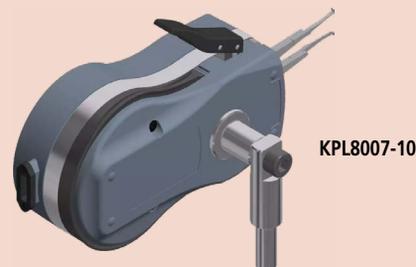
• Power Source: AAA Batteries (2 pcs)

*1 See Resolution Table



• Resolution Switching*

Resolution (in)		Resolution (mm)	
.0005	.0001	0.001	0.01
.0001	.001	0.002	0.02
		0.005	0.05



External Tube Thickness Measurement SERIES 209

Versatile OD measuring gages for groove thickness, tube thickness and hard-to-reach dimensions. Digimatic Caliper Gages provide error-free LCD readings, as well as data output for SPC analysis.

Technical Data

Display: LCD Analog / Digital
Power Supply: AAA Battery (2 pcs.)
Dust/Water protection level: IP67

Function

Zerose, Preset, Auto power off, Inch/Metric, Conversion data hold, Max/Min value holding, Data output

External measurement type

209-932



SPECIFICATIONS

Inch / Metric

Order No.	Range	Resolution	Accuracy	Measuring Depth (L)	Moveable (Hb)	Fixed (Hf)	Measuring Contacts	Measuring Force (N)	Fig. Reference
209-930	0-0.39" / 0-10mm	10 Steps (switchable)*1	0.0005" / 0.02mm	1.37" / 35mm	.75" / 19.1mm	.73" / 18.6mm	Ball .059"/1.5mm dia.	1.2-1.6	A
209-931	0-0.39" / 0-10mm		0.0005" / 0.02mm	1.37" / 35mm	.85" / 21.7mm	.58" / 14.8mm	Desc. .24" / 6mm dia.	0.8-1.2	C
209-932	0-0.78" / 0-20mm		0.0010" / 0.03mm	3.34" / 85mm	.97" / 24.7mm	.97" / 24.6mm	Ball .059"/1.5mm dia.	1.1-1.6	A
209-933	0-0.78" / 0-20mm		0.0010" / 0.03mm	3.34" / 85mm	.97" / 24.7mm	.10" / 2.5mm	Ball .059"/1.5mm dia.	1.1-1.6	B
209-951	0-1.18" / 0-30mm		0.0015" / 0.04mm	4.48" / 114mm	1.2" / 30mm	1.2" / 30mm	Ball Ø.12"/3mm	0.9-1.6	A
209-952	0-1.18" / 0-30mm		0.0015" / 0.04mm	4.48" / 114mm	1.2" / 30mm	.16" / 4mm	Ball Ø.12"/3mm	0.9-1.6	B
209-953	0-1.18" / 0-30mm		0.0020" / 0.05mm	4.48" / 114mm	1.4" / 36mm	.94" / 24mm	Disc Ø1.97"/50mm	0.9-1.6	D
209-954	0-1.96" / 0-50mm		0.0020" / 0.05mm	6.57" / 167mm	1.2" / 30mm	1.2" / 30mm	Ball Ø.12"/3mm	0.8-1.7	A
209-955	0-1.96" / 0-50mm		0.0020" / 0.05mm	6.65" / 169mm	1.2" / 30mm	.17" / 4.3mm	Ball Ø.12"/3mm	0.8-1.7	B
209-956	0-1.96" / 0-50mm		0.0020" / 0.05mm	6.57" / 167mm	1.4" / 36mm	.94" / 24mm	Disc Ø1.97"/50mm	0.8-1.7	D

• Power Source: AAA Batteries (2 pcs)

*1 See Resolution Table

Optional Accessories

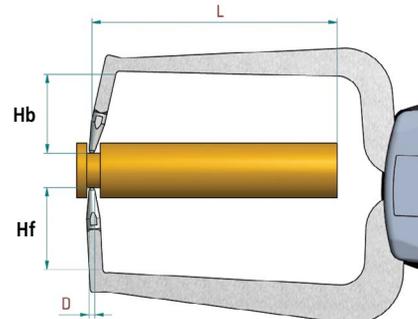
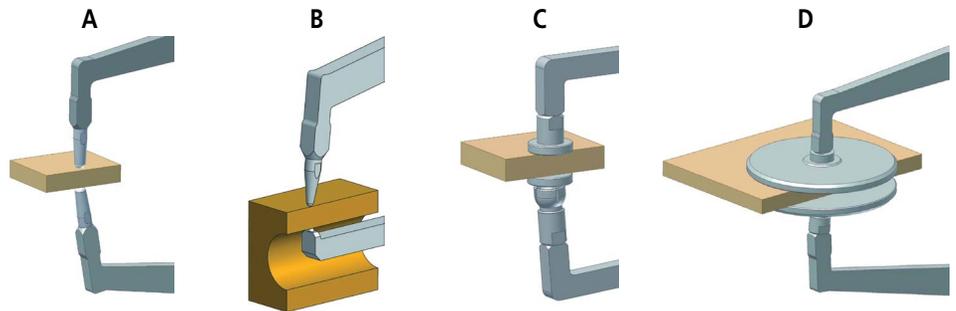
- KPL8007-10 Holder (back Lug)
- 06AFM380E USB cable (2m)*1
- 937387 SPC Cable (1m)*1
- 965013 SPC Cable (2m)*1
- 02AZD790E U-Wave-T Cable*1
- 02AZD880G U-Wave-Transmitter (buzzer)
- KPL1961-09 Interface adapter (cable)
- KPL1961-13 Interface adapter (Bluetooth)
- KPL0682-60 Bluetooth dongle*2

*1 requires interface adapter (KPL1962-09)

*2 requires interface adapter (KPL1962-13)

• Resolution Switching*

Resolution (in)		Resolution (mm)	
.0005	.0001	0.001	0.01
.00001	.001	0.002	0.02
		0.005	0.05

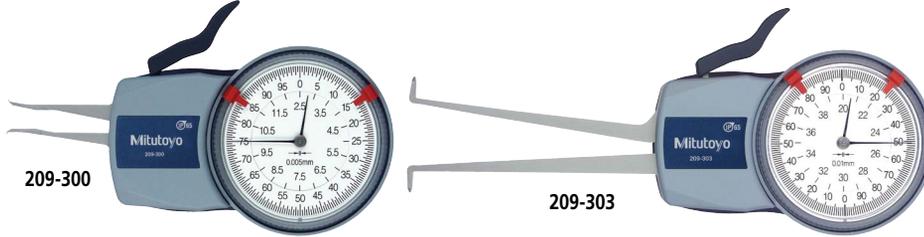


Where to Buy

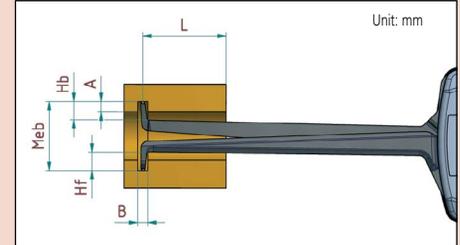
Dial Caliper Gages

Internal Measurement SERIES 209

The caliper is spring loaded and makes point contact at a constant measuring pressure.



DIMENSIONS



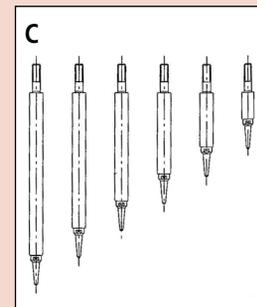
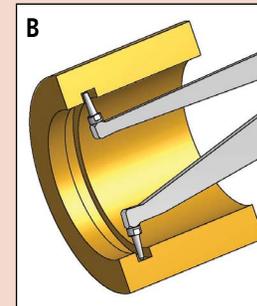
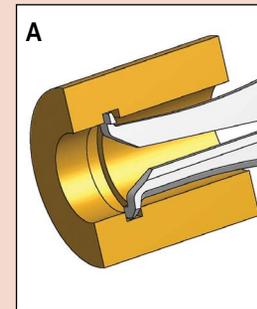
SPECIFICATIONS

Inch									
Order No.	Measuring Range	Graduation	Accuracy	Max. Measuring Depth L	Max. Groove Depth A	Min. Groove Width B	Measuring Contact Type	Size (mm)	Mass (g)
209-350	.10 - .50"	.0002"	± .0008"	.47"	.027"	.023"	A	R0.1	200
209-351	.20 - .60"	.0002"	± .0008"	1.37"	.09"	.032"	B	∅0.6	200
209-352	.40 - 1.2"	.0005"	± .0015"	3.3"	.19"	.06"	B	∅1	200
209-354	.80 - 1.6"	.0005"	± .0015"	3.3"	.26"	.06"	B	∅1	200
209-355	1.2 - 2"	.0005"	± .0015"	3.3"	.26"	.06"	B	∅1	200
209-356	1.6 - 2.4"	.0005"	± .0015"	3.3"	.31"	.06"	B	∅1	200
209-357	2 - 2.8"	.0005"	± .0015"	3.3"	.31"	.06"	B	∅1	200
209-358	2.4 - 3.2"	.0005"	± .0015"	3.3"	.31"	.06"	B	∅1	250
209-359	2.8 - 3.6"	.0005"	± .0015"	3.3"	.31"	.06"	B	∅1	250
209-360	3.2 - 4"	.0005"	± .0015"	3.3"	.31"	.06"	B	∅1	250
209-361*	2 - 4"	.0005"	± .0015"	3.3"	.31"	.06"	C	∅1	250
209-362*	3.6 - 5.6"	.0005"	± .0015"	3.3"	.31"	.06"	C	∅1	250
209-363*	5.2 - 7.2"	.0005"	± .0015"	3.3"	.31"	.06"	C	∅1	250

*Interchangeable contact points (additional anvil 4 pcs.) with ball point .04" dia. These Dial Caliper Gages are used only as comparison gages and should be used along with a setting ring or a micrometer.

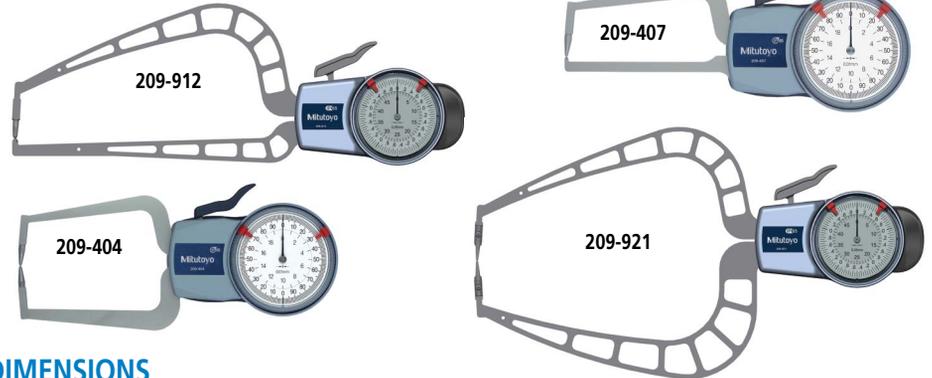
Metric									
Order No.	Measuring Range	Graduation	Accuracy	Max. Measuring Depth L	Max. Groove Depth A	Min. Groove Width B	Measuring Contact Type	Size (mm)	Mass(g)
209-300	2.5 - 12.5mm	0.005mm	±0.015mm	12mm	0.7mm	0.5mm	A	R0.1	155
209-301	5 - 15mm	0.005mm	±0.015mm	35mm	2.3mm	0.8mm	B	∅0.6	160
209-302	10 - 30mm	0.01mm	±0.03mm	85mm	5.2mm	1.2mm	B	∅1	180
209-303	20 - 40mm	0.01mm	±0.03mm	85mm	7mm	1.2mm	B	∅1	180
209-304	30 - 50mm	0.01mm	±0.03mm	85mm	7mm	1.2mm	B	∅1	185
209-305	40 - 60mm	0.01mm	±0.03mm	85mm	8.3mm	1.2mm	B	∅1	195
209-306	50 - 70mm	0.01mm	±0.03mm	85mm	8.3mm	1.2mm	B	∅1	195
209-307	60 - 80mm	0.01mm	±0.03mm	85mm	8.3mm	1.2mm	B	∅1	200
209-308	70 - 90mm	0.01mm	±0.03mm	85mm	8.3mm	1.2mm	B	∅1	200
209-309	80 - 100mm	0.01mm	±0.03mm	85mm	8.3mm	1.2mm	B	∅1	200
209-310*	50 - 100mm	0.01mm	±0.03mm	85mm	8.3mm	1.2mm	C	∅1	220
209-311*	90 - 140mm	0.01mm	±0.03mm	85mm	8.3mm	1.2mm	C	∅1	230
209-312*	130 - 180mm	0.01mm	±0.03mm	85mm	8.3mm	1.2mm	C	∅1	240
209-901	15-65mm	0.05mm	±0.05	188	5	1.9	B	∅1.5mm	355
209-902	40-90mm	0.05mm	±0.05	192	8.5	2.4	B	∅2mm	370
209-903	70-120mm	0.05mm	±0.05	192	8.5	2.4	B	∅2mm	380

*Interchangeable contact point (additional anvil 5pcs.) with ball point 1mm dia. These Dial Caliper Gages are used only as comparison gages and should be used along with a setting ring or a micrometer.

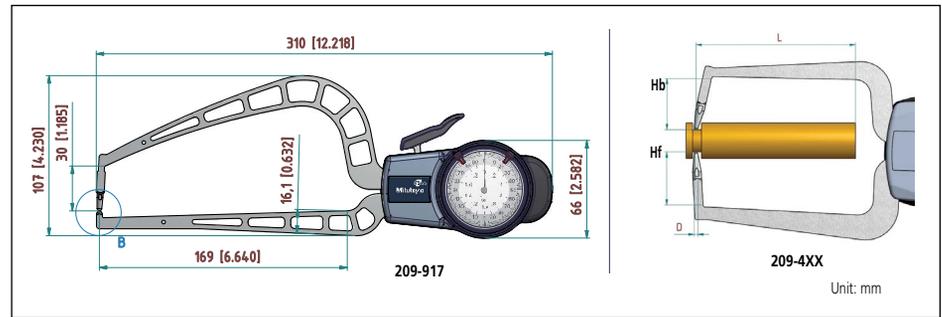


Dial Caliper Gages

External Measurement SERIES 209



DIMENSIONS



SPECIFICATIONS

Inch									
Order No.	Measuring Range	Graduation	Accuracy	Max. Measuring Depth L	Length Hb	Length Hf	Measuring Contact Type	Size (mm)	Mass (g)
209-450	0 - .40"	.0002"	± .0008"	1.37"	.75"	.75"	K/K	ø1.5	170
209-451	0 - .40"	.0002"	± .001"	1.37"	.85"	.58"	T	ø6	175
209-452	0 - .40"	.0002"	± .0008"	1.37"	.75"	.035"	RK/K	ø1.5	165
209-453	0 - .40"	.0002"	± .0008"	1.37"	.75"	.035"	R/S	Chisel R0.4, ø1.5	165
209-789	0 - .50"	.005"	± .005"	1.38"	-	-	PK	ø2, Chisel R0.5	40
209-790	0 - .50"	.005"	± .005"	1.38"	-	-	PR	ø2	40
209-454	0 - .80"	.0005"	± .0015"	3.2"	.97"	.97"	S	Chisel R0.4	210
209-455	0 - .80"	.0005"	± .0015"	3.2"	.97"	.97"	K/K	ø1.5	210
209-456	0 - .80"	.0005"	± .0015"	3.2"	.97"	.10"	RK/K	ø1.5	200
209-457	0 - .80"	.0005"	± .0015"	3.2"	.97"	.10"	R/S	Chisel R0.4, ø1.5	200
209-916	0 - 2.0"	.001"	± .002"	6.6"	1.2"	1.2"	K/K	ø3	430
209-917	0 - 2.0"	.001"	± .002"	6.6"	1.2"	.18"	RK/K	ø3	400

Metric									
Order No.	Measuring Range	Graduation	Accuracy	Max. Measuring Depth L	Length Hb	Length Hf	Measuring Contact Type	Size (mm)	Mass (g)
209-402	0 - 10mm	0.005mm	±0.015mm	35mm	19.1mm	18.6mm	K/K	ø1.5	240
209-403	0 - 10mm	0.005mm	±0.02mm	35mm	21.7mm	14.8mm	T	ø6	175
209-404	0 - 20mm	0.01mm	±0.03mm	85mm	7mm	24.6mm	K/K	ø1.5	210
209-405	0 - 20mm	0.01mm	±0.03mm	85mm	7mm	24.6mm	S	R 0.4	210
209-406	0 - 20mm	0.01mm	±0.03mm	80mm	7mm	2.5mm	R/S	Chisel R0.4, ø1.5	200
209-407	0 - 20mm	0.01mm	±0.03mm	80mm	7mm	2.5mm	RK/K	ø1.5	200
209-843	0 - 10mm	0.1mm	±0.1mm	36mm	-	-	PK	ø2, Chisel R0.5	40
209-603	0 - 10mm	0.1mm	±0.1mm	33mm	-	-	PR	ø2	40
209-911	0 - 50mm	0.05mm	±0.05mm	167mm	30mm	30mm	KK	Ball Ø3mm	430
209-912	0 - 50mm	0.05mm	±0.05mm	169mm	30mm	4.5mm	RK/K	Ball Ø3mm	400
209-921	0 - 50mm	0.05mm	±0.05mm	167mm	30mm	30mm	S	Chisel R0.75	490
209-922	0 - 50mm	0.05mm	±0.05mm	169mm	30mm	4.5mm	R/S	ø3, Chisel R0.75	400



Get a Quote

Dial Tension Gages

Contact Force Gage SERIES 546

- Contact Force Gages are widely used to determine the measuring force applied by an instrument to a workpiece, as well as contact forces of electrical relays, micro-switches, valves and precision springs.
- Thanks to the miniature anti-friction bearing in the fulcrum, stable measurement is guaranteed.
- 2 types are available: Standard and peak hold.



Measurement example of contact force on a relay



SPECIFICATIONS

mN-scale models

Standard			
Order No.	Graduation (mN)	Range (mN)	Accuracy (graduation)
546-112	2	6 - 50	±0.5
546-113	5	10 - 100	
546-114	10	30 - 300	

Peak hold			
Order No.	Graduation (mN)	Range (mN)	Accuracy (graduation)
—	—	—	—
546-133	5	10 - 100	±0.5
546-134	10	30 - 300	

Note: Please note that these products are only available in their standard forms; they cannot be customized for special sizes or specifications.

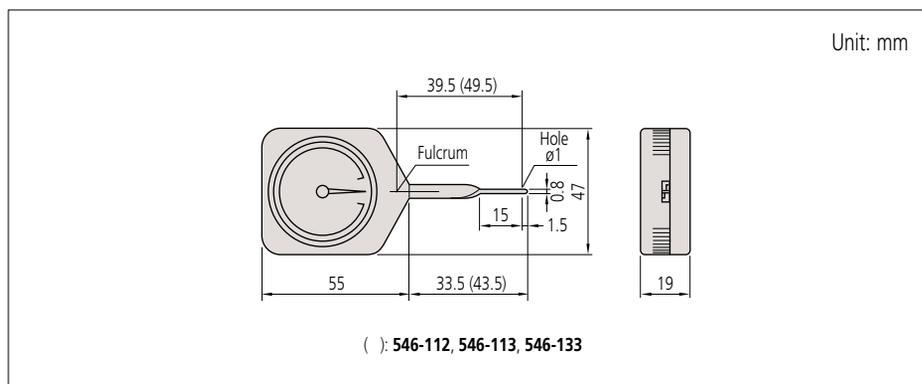
N-scale models

Standard			
Order No.	Graduation (N)	Range (N)	Accuracy (graduation)
546-115	0.02	0.06 - 0.5	±0.5
546-116	0.05	0.1 - 1	
546-117	0.05	0.15 - 1.5	
546-118	0.1	0.3 - 3	
546-119	0.2	0.6 - 5	

Peak hold			
Order No.	Graduation (N)	Range (N)	Accuracy (graduation)
546-135	0.02	0.06 - 0.5	±0.5
546-136	0.05	0.1 - 1	
546-137	0.05	0.15 - 1.5	
546-138	0.1	0.3 - 3	
546-139	0.2	0.6 - 5	

Note: Please note that these products are only available in their standard forms; they cannot be customized for special sizes or specifications.

DIMENSIONS



Need Support?

Dial Snap Gages

Optional accessories

Dial protection cover: **21DZA000**

Recommended dial indicators / Digimatic indicators (optional)

- Metric models:
2046AB: Dial indicator (Graduation: 0.01 mm)
2109AB-10: Dial indicator (Graduation: 0.001 mm)
543-700B: Digimatic Indicator (Resolution: 0.0005/0.001/0.01 mm)
- Inch models:
2414AB: Dial indicator (Graduation: 0.001 in)
2805AB-10: Dial indicator (Graduation: 0.0001 in)
543-702B: Digimatic Indicator (Resolution: 0.00002/0.00005/0.0001/0.0005 in (0.0005/0.001/0.01 mm))

Dial Snap Gage SERIES 201

- Designed for quick Go/±No-go judgment of diameters of cylinders and shafts in machining processes.
- Enables single-handed comparative measurements of a cylinder diameter, etc. while workpiece processing is taking place.
- The dial indicator and protection cover are optional.
- Some digimatic/dial indicators cannot be used with the dial snap gage. Consult Mitutoyo before using dial indicators which are not recommended.
- Measuring faces: Carbide.
- Anvil positioning range: 1 in / 25 mm.
Adjustment nut: adjusts the setting anvil to the nominal size required within the measuring range.
- Clamp: clamps the setting anvil at the required position.



201-101

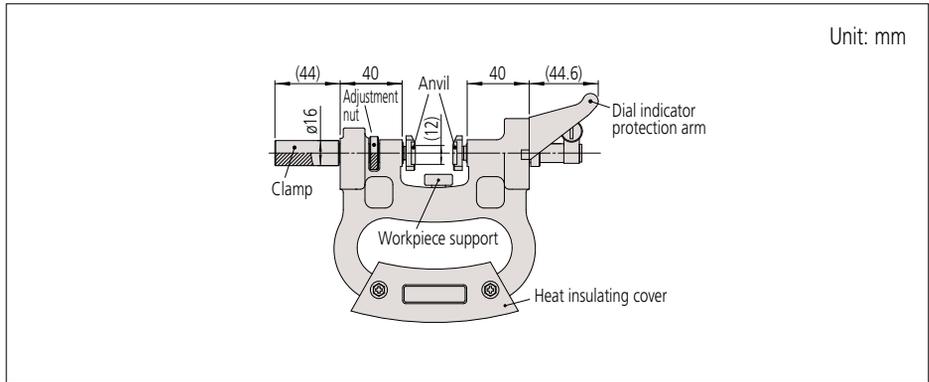
Note: The dial indicator and dial protection cover are optional.

SPECIFICATIONS

Inch				Metric			
Order No.	Range (in)	Parallelism (in)	Measuring force* (N)	Order No.	Range (mm)	Parallelism (μm)	Measuring force* (N)
201-151	0 - 1	0.00025	15±3	201-101	0 - 25	5	15±3
201-152	1 - 2			201-102	25 - 50		
201-153	2 - 3			201-103	50 - 75		
201-154	3 - 4			201-104	75 - 100		
201-155	4 - 5			201-105	100 - 125		
201-156	5 - 6			201-106	125 - 150		
201-157	6 - 7			201-107	150 - 175		
201-158	7 - 8			201-108	175 - 200		
201-159	8 - 9			201-109	200 - 225		
201-160	9 - 10			201-110	225 - 250		
201-161	10 - 11			201-111	250 - 275		
201-162	11 - 12			201-112	275 - 300		

* Measuring force is that force present before an indicator is installed and is determined at the point where the spindle is retracted 1 mm from the rest position.

DIMENSIONS



Stands

Magnetic Stands

- Mitutoyo magnetic stands clamp to iron or steel surfaces with a strong force and are indispensable for temporarily mounting a dial test indicator (or dial indicator) onto a machine tool or fixture for general alignment applications.
- Heavy Duty construction with high-force magnetic bases.
- All include a dovetail groove in the swivel holder for attaching dial test indicators that are equipped with a dovetail.
- With fine adjustment.

SPECIFICATIONS

Order No.	Description	Applicable holding stem sizes	Reach	Magnetic force
64PMT185	Universal magnetic stand	3/8" hole w/8mm sleeve	165mm	Approx. 300 N
64PMT186		3/8" hole w/8mm sleeve	230mm	Approx. 800 N
64PMT187		3/8" hole w/8mm sleeve	310mm	Approx. 800 N
64PMT188		3/8" hole w/8mm sleeve	430mm	Approx. 1000 N
64PMT189	Magnetic stand	3/8" hole w/8mm sleeve	300mm	Approx. 750 N



64PMT189



64PMT188



64PMT185

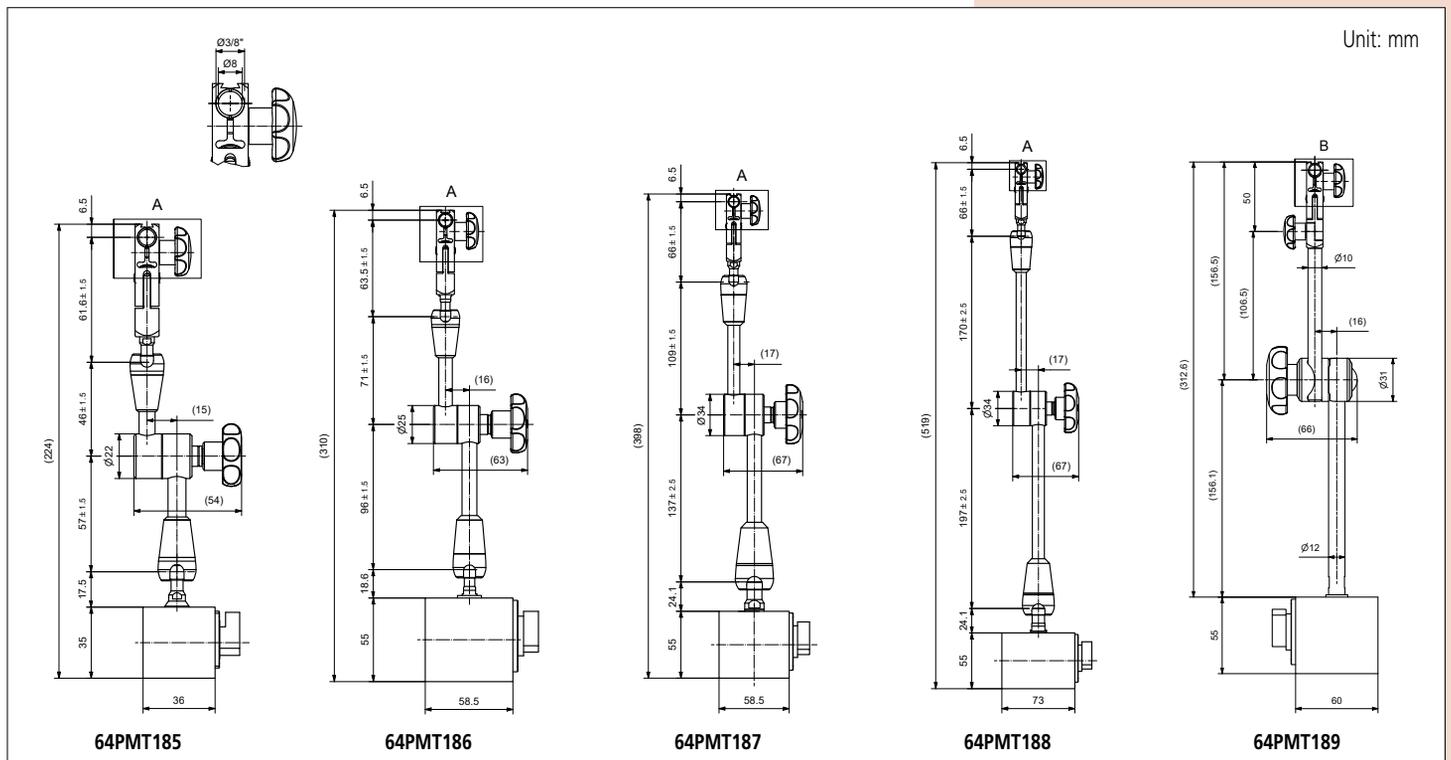


64PMT186



64PMT187

DIMENSIONS



SERIES 7 — Magnetic Stands

- Mitutoyo magnetic stands clamp to iron or steel surfaces with a strong force and are indispensable for temporarily mounting a dial test indicator (or dial indicator) onto a machine tool or fixture for general alignment applications.
- Vertical/horizontal mounting holes and bushes are available for attaching dial test indicators and dial indicators.
- Models **7014-10**, **7014E-10**, **7015-10**, **7031-10**, **7032-10** and **7033-10** have a dovetail groove in the swivel holder for attaching dial test indicators that are equipped with a dovetail.



7010-10



7011-10



7012-10



7014-10
(magnetic clamping is non-switchable)



7033-10



7031-10



7032-10



Need Service?

SPECIFICATIONS

Order No.	Description	Applicable holding stem sizes	Magnetic force*1	Remarks
7010-10*2*3	Magnetic stand	ø6 mm, ø8 mm	Approx. 600 N	—
7010S-10*2*3	Magnetic stand	ø4 mm, ø8 mm, ø0.375 in	Approx. 600 N	—
7011-10*2*3	Magnetic stand	ø6 mm, ø8 mm	Approx. 600 N	With fine adjustment
7011S-10*2*3	Magnetic stand	ø4 mm, ø8 mm, ø0.375 in	Approx. 600 N	With fine adjustment
7012-10*4	Magnetic stand	ø6 mm, ø8 mm, ø0.375 in	Approx. 600 N	—
7013-10	Magnetic stand base	—	Approx. 600 N	—
7014-10*4	Mini magnetic stand	ø6 mm, ø8 mm, with dovetail	Approx. 150 N	Without magnet ON/OFF
7014E-10*2*3	Mini magnetic stand	ø4 mm, ø0.375 in	Approx. 150 N	Without magnet ON/OFF
7015-10	Magnetic stand	ø6 mm, ø8 mm, ø0.375 in with dovetail	Approx. 600 N	With magnetic ON/OFF
7031-10	Universal magnetic stand	ø6 mm, ø8 mm, ø0.375 in with dovetail	Approx. 300 N	With magnetic ON/OFF
7032-10	Universal magnetic stand	ø6 mm, ø8 mm, ø0.375 in with dovetail	Approx. 600 N	With magnetic ON/OFF
7033-10	Universal magnetic stand	ø6 mm, ø8 mm, ø0.375 in with dovetail	Approx. 600 N	With magnetic ON/OFF

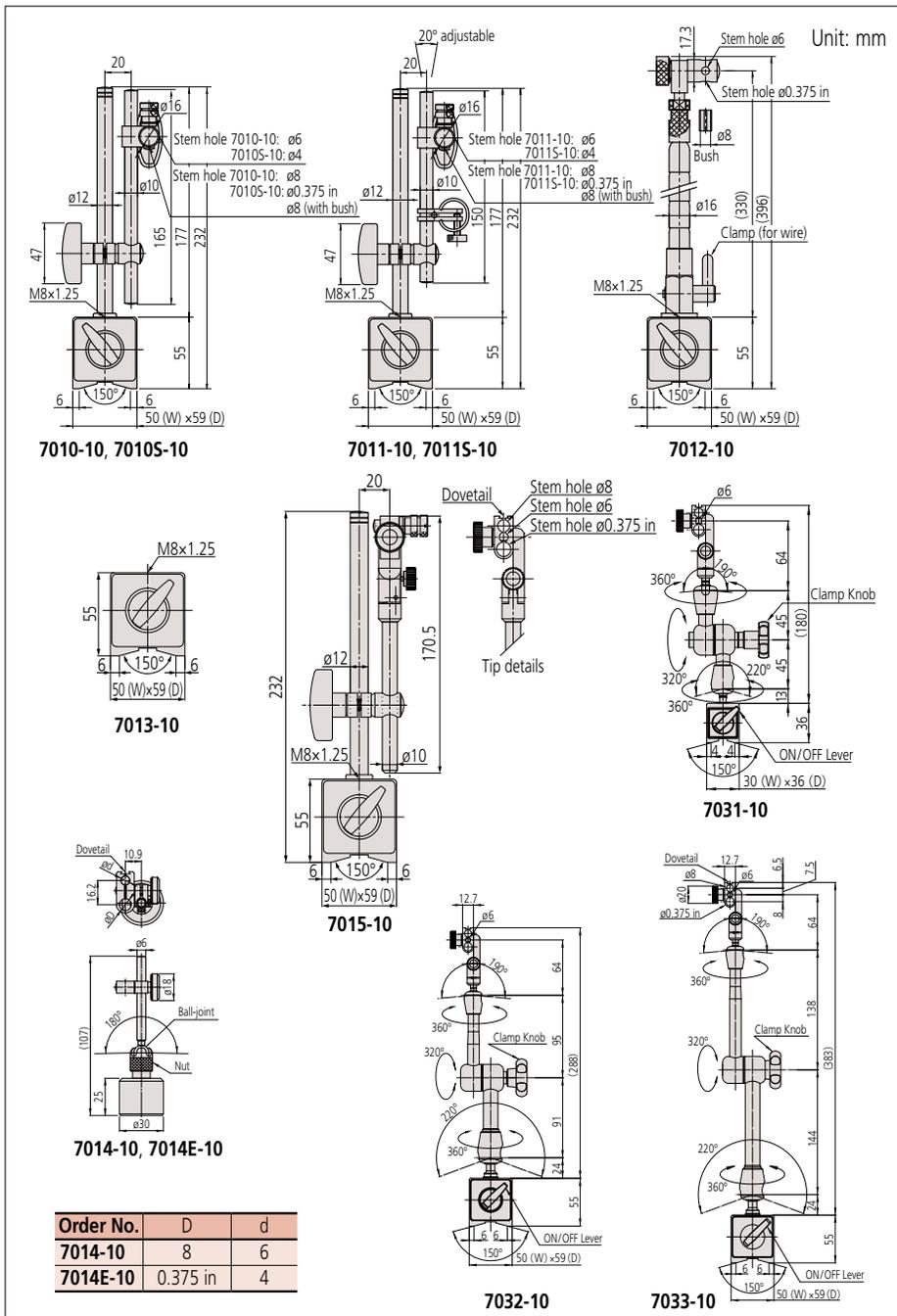
*1 The magnetic holding force applies to that needed for vertical separation from a thick and flat steel object.

*2 Back plunger type (1160A, etc.) cannot be attached.

*3 When attaching a compact dial indicator (outer frame diameter 31, 36 or 40 mm), select a back cover type with a lug.

*4 Use with a dial test indicator or SERIES 1 dial indicator (compact or lightweight type) is recommended.

DIMENSIONS



Find Training

Optional Accessories

101462: Hardened steel serrated anvil
(standard accessory for **7001-10**)



101461: Hardened steel non-serrated anvil
(standard accessory for **7002-10**)



101463: Hardened steel domed anvil* (optional)
* Not available for **7007-10**.



Dial Gage Stands SERIES 7

- Dial Gage Stands are designed for comparison measurements of size using a dial indicator or Digimatic Indicator. An anvil is provided as standard.
- Anvil: ø58 mm serrated anvil, ø58 mm flat anvil, 90 mm square anvil and domed anvil (optional)
- Vertical fine adjustment is available with one-touch control thanks to the parallel spring suspension.



7002-10
(with ø58 mm non-serrated anvil)

SPECIFICATIONS

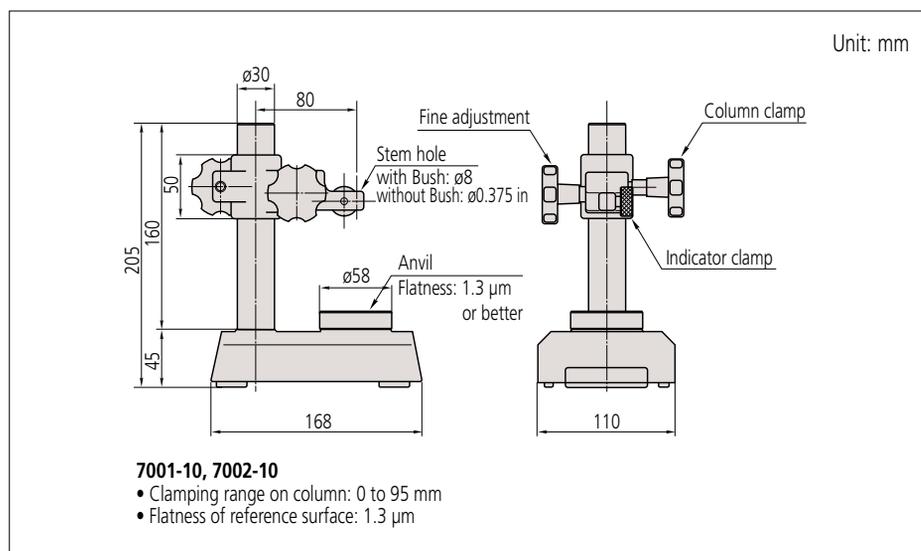
Inch / Metric			
Order No.	Clamping range on column (mm)	Stem hole	Remarks
7001-10	0 to 95	ø8 mm, ø0.375 in	With serrated anvil
7002-10			With flat anvil

Note 1: Perpendicularity of the stem hole to the anvil is better than 0.4 mm/100 mm

Note 2: Take note that when mounting high-accuracy Linear Gages (with resolution of 0.1 µm or better) to these stands, accuracy may be affected depending on the perpendicularity of the mounting hole to the top surface of the anvil (cosine effect).

Note 3: Compact dial indicators (bezel ø31, ø36) are not suitable for use with these stands.

DIMENSIONS



Stands

Dial Gage Stands SERIES 7

- Dial Gage Stands are designed for comparison measurements of size using a dial indicator or Digimatic Indicator. An anvil is provided as standard.
- Anvil: 90 mm serrated flat anvil.
- Vertical fine adjustment is available with one-touch control thanks to the parallel spring suspension.



7007-10
(with 90 mm square semi-serrated anvil)

SPECIFICATIONS

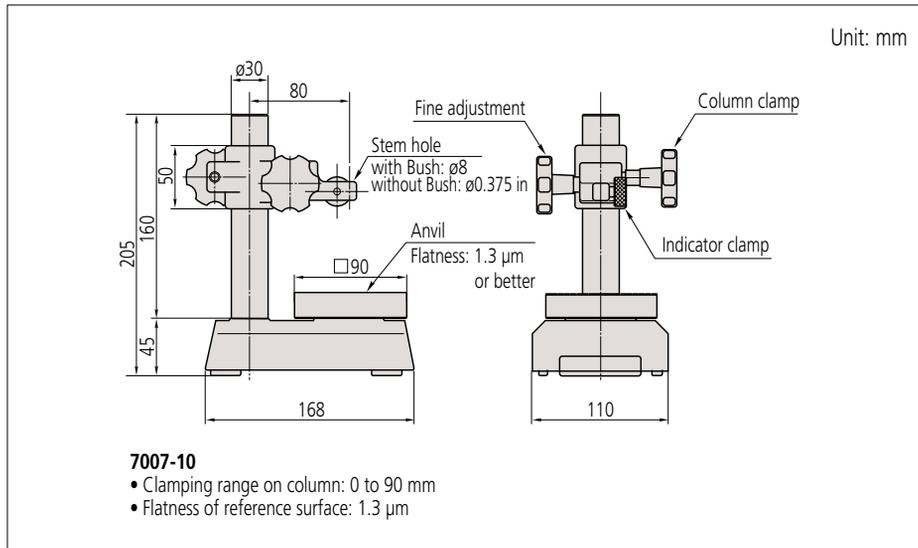
Inch / Metric			
Order No.	Clamping range on column (mm)	Stem hole	Remarks
7007-10	0 to 90	ø8 mm, ø0.375 in	With square anvil

Note 1: Perpendicularity of the stem hole to the anvil is better than 0.4 mm/100 mm

Note 2: Take note that when mounting high-accuracy Linear Gages (with resolution of 0.1 µm or better) to these stands, accuracy may be affected depending on the perpendicularity of the mounting hole to the top surface of the anvil (cosine effect).

Note 3: Compact dial indicators (bezel ø31, ø36) are not suitable for use with these stands.

DIMENSIONS



SERIES 913

- Simple standard version.
- Serrated flat anvil.
- For ø8 mm stems only.
- ø22 mm Column diameter.
- Optional holder for cylindrical parts.

SPECIFICATIONS

Metric			
Order No.	Effective table dimensions (mm)	Stem hole	Clamping range on column (mm)
913-102	60 X 70	ø8 mm	0 to 100



913-102

Optional Accessories

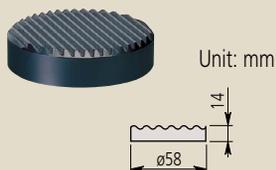
913-201 Horizontal holder



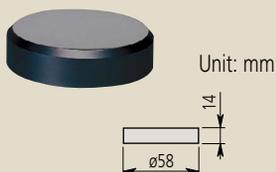
913-201

Optional Accessories

101462: Hardened steel serrated anvil (standard accessory)



101461: Hardened steel non-serrated anvil (optional)



101463: Hardened steel domed anvil (optional)



SERIES 519 — Transfer Stands

- Transfer Stands are designed for comparison measurements of size using a dial indicator or Digimatic Indicator.



519-109-10
(with a serrated anvil)

SPECIFICATIONS

Metric

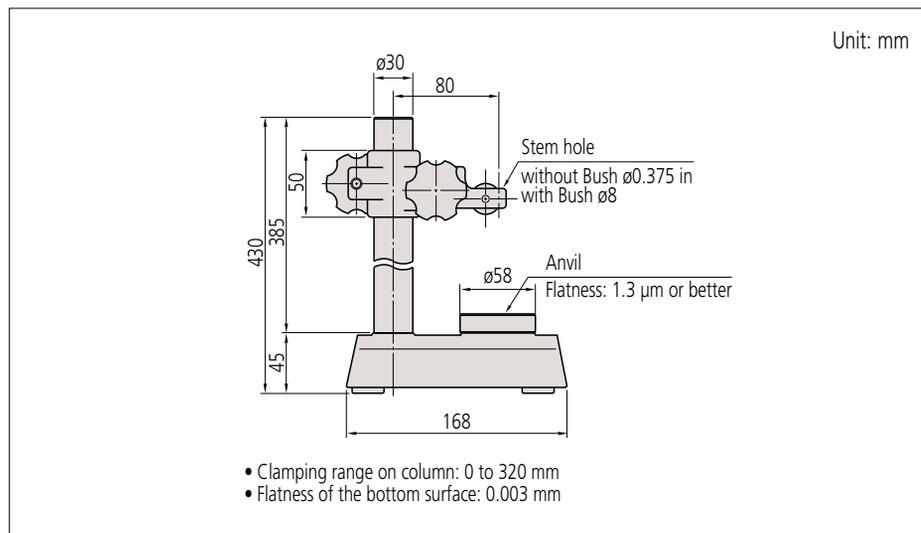
Order No.	Anvil	Clamping range on column (mm)	Micromotion adjustment range (mm)	Stem hole
519-109-10	With a serrated anvil (ø58 mm)	0 to 320	1	ø0.375 in, ø8mm with Bushing

Note 1: Perpendicularity of the stem hole to the anvil is better than 0.4 mm/100 mm.

Note 2: Take note that when mounting high-accuracy Linear Gages (with resolution of 0.1 µm or better) to these stands, accuracy may be affected depending on the perpendicularity of the mounting hole to the top surface of the anvil (cosine effect).

Note 3: Compact dial indicators (bezel ø31, ø36) are not suitable for use with these stands.

DIMENSIONS



Find a Distributor

Stands

SERIES 215 — Cast Iron Base Comparator Stands

- Comparator Stands are designed for comparison measurements of size using a dial indicator or Digimatic Indicator.
- The partially serrated anvil prevents very flat workpieces from wringing to it.



SPECIFICATIONS

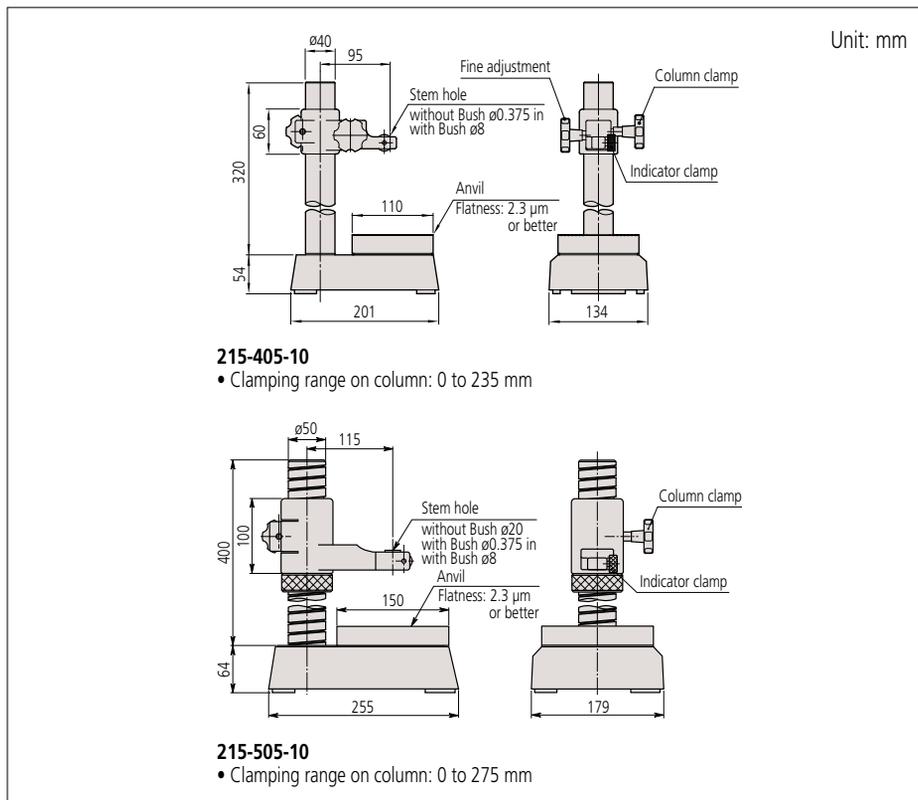
Order No.	Anvil	Clamping range on column (mm)	Micromotion mechanism (Adjustment range)	Stem hole
215-405-10	Square semi-serrated anvil (110x110 mm)	0 to 235	Vertical fine adjustment (1 mm)	ø0.375 in, ø8 mm with Bushing
215-505-10	Square semi-serrated anvil (150x150 mm)	0 to 275	Micromotion screw	ø20 mm, ø0.375 in with Bushing, ø8 mm with Bushing

Note 1: Perpendicularity of the stem hole to the anvil is better than 0.4 mm/100 mm.

Note 2: Take note that when mounting high-accuracy Linear Gages (with resolution of 0.1 µm or better) to these stands, accuracy may be affected depending on the perpendicularity of the mounting hole to the top surface of the anvil (cosine effect).

Note 3: Compact dial indicators (bezel ø31, ø36) are not suitable for use with these stands.

DIMENSIONS



Example of attaching the Digimatic Indicator



Digimatic Indicator ID-H.

Optional Accessories

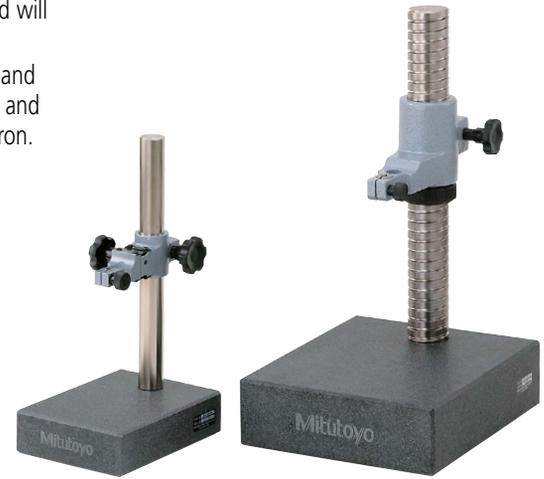
ø15 mm bushing (for 215-156-10, 215-505-10):
21JAA331



Got Questions?

SERIES 215 — Granite Base Comparator Stands

- The plates are made of natural stone and will hardly deteriorate over time.
- The rigid granite base is free from burrs and pileups due to its fine-grain composition and less viscousness compared with casting iron. The flatness is always accurate.



215-151-10

215-156-10

SPECIFICATIONS

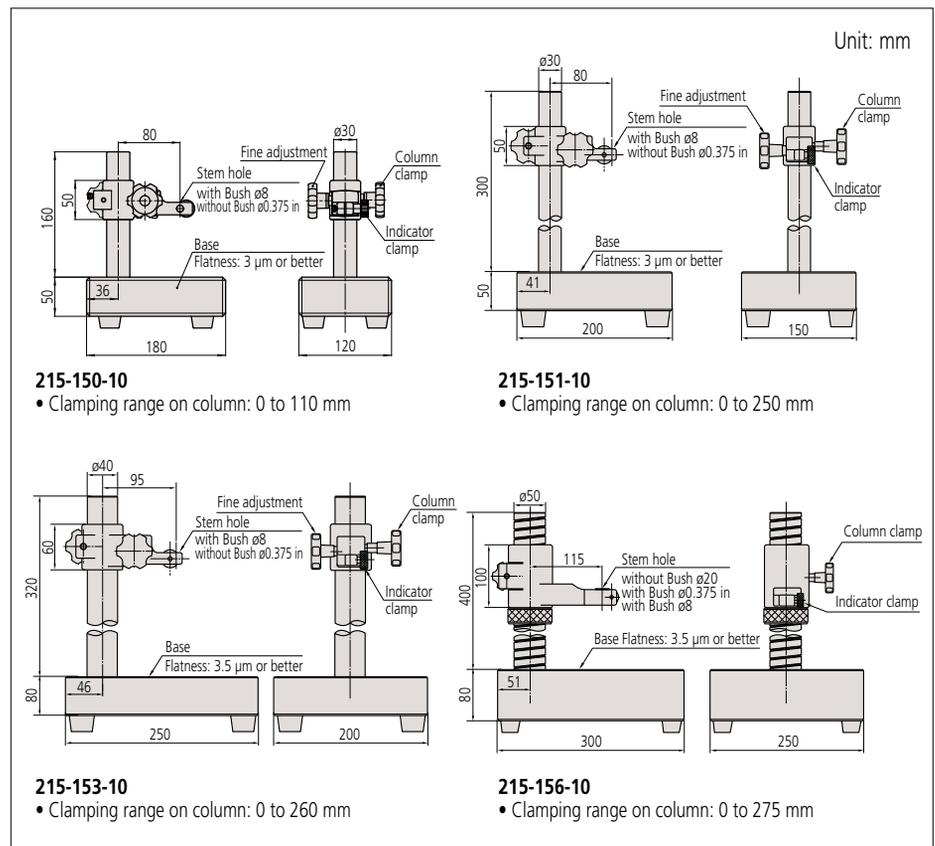
Order No.	Granite base size (WxDxH) (mm)	Clamping range on column (mm)	Stem hole	Remarks
215-150-10	120x180x50	0 to 110	ø8 mm, ø0.375 in	With fine adjustment of 1 mm range
215-151-10	150x200x50	0 to 250		
215-153-10	200x250x80	0 to 260		
215-156-10	300x250x80	0 to 275	ø8 mm, ø0.375 in, ø20 mm	With fine adjustment over entire travel

Note 1: Perpendicularity of the stem hole to the anvil is better than 0.2 mm/100 mm.

Note 2: Take note that when mounting high-accuracy Linear Gages (with resolution of 0.1 μm or better) to these stands, accuracy may be affected depending on the perpendicularity of the mounting hole to the top surface of the anvil (cosine effect).

Note 3: Compact dial indicators (bezel ø31, ø36) are not suitable for use with these stands.

DIMENSIONS



Stands

Precision Granite Stands (with black granite bases) SERIES 517

Mitutoyo's Granite Comparator Stands are basic building blocks for the assembly of special purpose, precision measuring equipment. By mounting precision measuring instruments such as Digimatic indicators, Mu-Checker Cartridge Heads and Linear Gages on the stands, it is possible to satisfy all manners of measuring assignment. The rigid granite base is free from burrs, pileups and rust, thereby preventing deterioration over time.

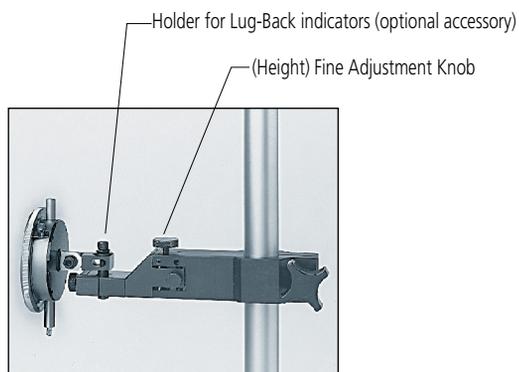


Optional Accessories

012580: Holder for Lug-Back indicator

SPECIFICATIONS

Order No.	Base	Column Diameter	Column Height	Throat Clearance	Table Flatness	Table Thickness	Weight
517-890	6 x 8"	1.181"	6"	4.375"	.0001"	2"	18 lbs
517-891	6 x 8"	1.181"	8"	4.375"	.0001"	2"	19 lbs
517-892	6 x 8"	1.181"	12"	4.375"	.0001"	2"	20 lbs
517-893	6 x 8"	1.181"	18"	4.375"	.0001"	2"	21 lbs
517-895	8 x 12"	1.181"	6"	5.8"	.0001"	2"	29 lbs
517-896	8 x 12"	1.181"	8"	5.8"	.0001"	2"	30 lbs
517-897	8 x 12"	1.181"	12"	5.8"	.0001"	2"	31 lbs
517-898	8 x 12"	1.181"	18"	5.8"	.0001"	2"	32 lbs
517-899	8 x 12"	1.181"	24"	5.8"	.0001"	2"	35 lbs



Talk to Sales

Brackets

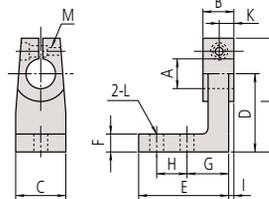
Mounting Fixtures

Mitutoyo offers various types of brackets to meet a range of applications

- Made from durable, nickel-plated cast iron

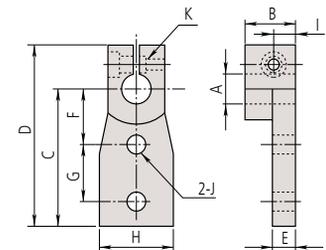


DIMENSIONS



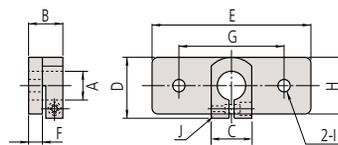
(Unit: mm)

Order No.	A	B	C	D	E	F	G	H	I	J	K	L	M
303560	ø9.5	9	15	20	23	5	11	8	1.5	3.25	4.5	ø3.4	M3x 0.5
303569	ø9.5	14.5	20	30	35	7	16	12	3.25	4.25	7.25	ø4.5	
303579	ø10	14.5	20	30	35	7	16	12	3.25	4.25	7.25	ø4.5	



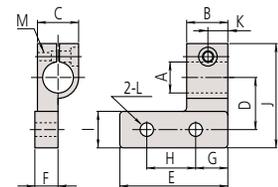
(Unit: mm)

Order No.	A	B	C	D	E	F	G	H	I	J	K
303564	ø9.5	9	30	42.5	4	15	10	15	4.5	ø3.4	M3x 0.5
303573	ø9.5	14.5	40	52.5	6	18	15	20	7.25	ø4.5	
303583	ø10	14.5	40	52.5	6	18	15	20	7.25	ø4.5	



(Unit: mm)

Order No.	A	B	C	D	E	F	G	H	I	J
303562	ø9.5	9		20	40	3	30	15	ø3.4	M3x 0.5
303571	ø9.5	14.5	15	22.5	60	5	40	20	ø4.5	
303581	ø10	14.5	15	22.5	60	5	40	20	ø4.5	



(Unit: mm)

Order No.	A	B	C	D	E	F	G	H	I	J	K	L	M
303566	ø9.5	9	15	25	7.5	10	10	32.5	4.5	ø3.4	M3x 0.5		
303575	ø9.5	14.5	15	20	8.5	10	20	15	40	7.25		ø4.5	
303585	ø10	14.5	15	20	8.5	10	20	15	40	7.25		ø4.5	

Featured Products



Linear Gages (Environment-Resistant)

LG100 Series

Refer to pages G-5 to G-6 for details.



Linear Gages (Environment-Resistant and Slim Type)

LG200 Series

Refer to page G-7 for details.



Industrial Interface-mounted Compact Counter

EJ-102N/NE Counter, Interface Unit

Refer to page G-13 for details.



High Accuracy Non-contact Measuring System/ Laser Scanning Micrometer

Refer to pages G-30 for details.



INDEX

Linear Gages

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In-line, Non-contact Measuring System / Laser Scanning Micrometer

Refer to pages G-31 for details.



Measuring Instruments Shipped with Inspection Certificate

Mitutoyo guarantees product quality as a leading precision measuring instrument manufacturer and ships measuring instruments with an inspection certificate that includes inspection data so that customers can use them with confidence.

ABSOLUTE™

ABSOLUTE Linear Encoder

Mitutoyo developed the unique absolute method to retain position information after the power is turned off. The origin is set once - thereafter the live position is displayed when the power is turned on.

MiCAT

Mitutoyo Intelligent Computer Aided Technology
the standard in world metrology software
SENSOR

Measurement Program

Free downloadable software available. **LSMPak** and **QuickTool**.

MeasurLink® ENABLED

Data Management Software by Mitutoyo

Measurement Data Network System

MeasurLink® is a measurement data management system based on databases (SQL Server). You can build a network to manage the measurement results and measuring machines by simply combining the functions necessary for your purpose.

MeasurLink® is a registered trademark of Mitutoyo Corporation in Japan and Mitutoyo America Corporation in the United States.



IP Codes

These are codes that indicate the degree of protection provided (by an enclosure) for the electrical function of a product against the ingress of foreign bodies, dust and water as defined in IEC standards (IEC 60529: 2001) and JIS C 0920: 2003. (Refer to page IX)

Gage Heads/Display Units

[Conversion plug]

[Gage Heads]

Environment-Resistant

LG100



Phase-AB2
IP67 G

Measuring range: 10 mm/25 mm/50 mm
Resolution: 1 μm/0.5 μm/0.1 μm

Refer to page G-5

Environment-Resistant and Slim Type

LG200*



Phase-A/B
IP67 G

Measuring range: 10 mm
Resolution: 1 μm/0.5 μm/0.1 μm

Refer to page G-7

* Function of reference point detection on counter is disabled.

Conversion Plug
21HZA196

Conversion Cable
21HZA261

Conversion Plug
21HZA195

Conversion Cable
21HZA260

Digimatic output Type

LGS



Digimatic
IP66

Measuring range: 12.7 mm
Resolution: 10 μm

Refer to page G-8

High-accuracy Type

LGH



Measuring range: 10 mm
Resolution: 0.01 μm/0.005 μm

Refer to page G-9

Gage Heads/Display Units

[Display Units]

[Interface Unit/Software]

DIN rail-mounted Type

EJ-102N/NE



2-axis input, subtraction calculations
8 units can be connected Refer to page G-13



Panel mount

EH-102Z



2-axis input, subtraction calculations
Multi-function Refer to page G-12



EH-101P (1 axis) EH-102P (2 axes)



Multi-function Refer to page G-12



EH-102D



2-axis input, subtraction calculations
Multi-function Refer to page G-12



Compact display Unit

EC-101D



1-axis input Refer to page G-11



Interface Unit

CC-Link 21HZA186

Refer to page G-13



PROFINET 21HZA187

Refer to page G-13



EtherNet/IP 21HZA188

Refer to page G-13



EtherCAT 21HZA264

Refer to page G-13



USB 21HZA149

Refer to page G-13



Setup tool for EJ counters

LG QuickSetupTool

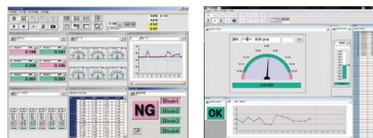
(can be downloaded for free from the Mitutoyo website)



Refer to page G-15

Measurement data acquisition software

SENSORPAK



Refer to page G-16



Find a Distributor

Linear Gages



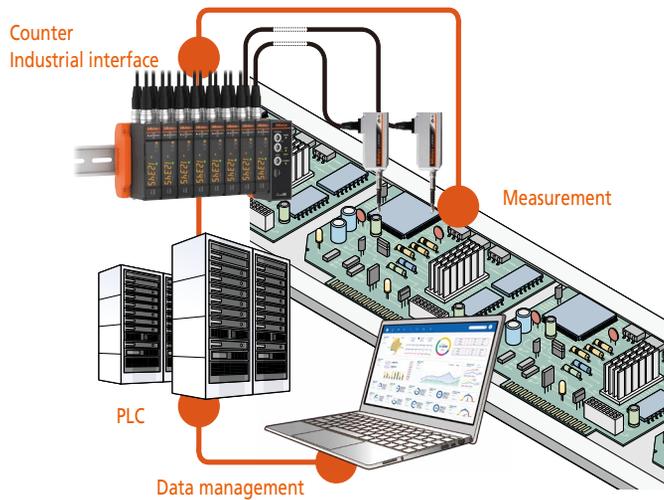
LG100 Standard Type Probe SERIES 542 — Environment-Resistant type

- High-accuracy gage head suitable for in-line and general use.
- Guaranteed Accuracy and Repeatability.
- Sliding durability of 50 million+ cycles*1.
- Can be connected to various counters such as:
 - EJ series - built-in display, modular, compact, with PLC interfaces, as well as USB
 - EH series - high-visibility display, serial and I/O communication (adapter required)
 - or direct to machines via TTL output from the Linear Gage
- **IP67G** protection rating with superior oil-resistance compared to standard gages.
- All models have the origin point signal output function to restore the origin point position after recovery from problems such as overspeed.
- When using any EJ+interface, a free setup and viewing software is available: LG Quicksetuptool (refer to page G-15)

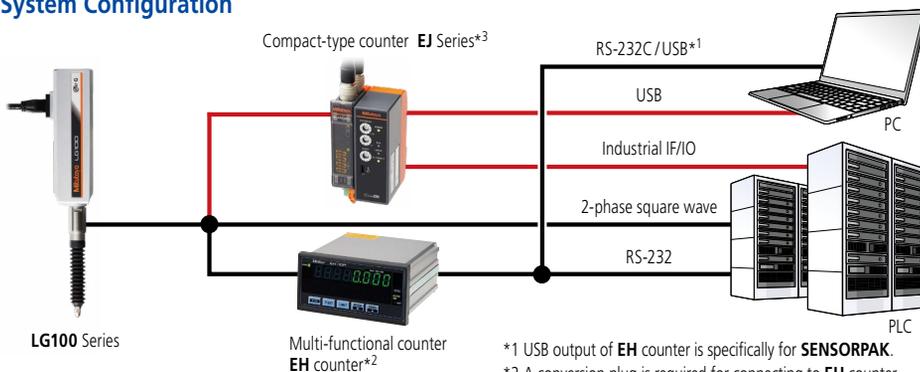
*1 10 mm range models (Actual value from in-house tests)



Enables real-time measurement and data management

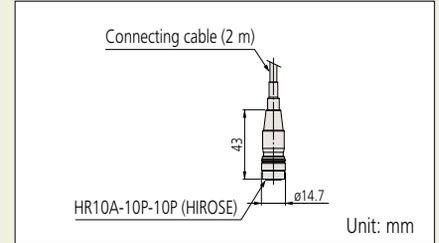


System Configuration



- *1 USB output of EH counter is specifically for **SENSORPAK**.
- *2 A conversion plug is required for connecting to EH counter.
- *3 Conventional gages can be connected using conversion connectors. (Please contact us for details of connectable gages.)

Connector



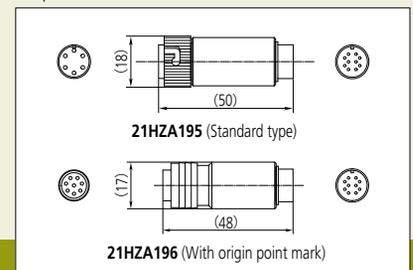
Optional Accessories

- Air lifter
 - For 10 mm range models: **02ADE230**
 - For 25 mm range models: **02ADE250**
 - For 50 mm range models: **02ADE270**
- Note 1: Required air pressure: 0.2 to 0.4 MPa (With a 0.1 μm resolution type: 0.2 MPa)
- Note 2: Spindle extends when air is supplied.



- Rubber boot (spare)
 - For 10 mm range models: **21HAA331**
 - For 25 mm range models: **21HZA176**
 - For 50 mm range models: **21HZA184**
- Note 3: Dimensions are shown in the external dimensions drawing of the product.
- Thrust stem set:
 - For 10 mm range models: **02ADB680** (Thrust stem: **02ADB681**, Clamp nut: **02ADB682**)
 - For 25/50 mm range models: **02ADN370** (Thrust stem: **02ADN371**, Clamp nut: **02ADB692**)
- This is a combination of thrust stem and a clamp nut.
- Spanner wrench:
 - For 10 mm range models: **02ADB683**
 - For 25/50 mm range models: **02ADB693**
- If required spanner wrench is required for tightening. If using multiple gages, a thrust stem set is required for each gage and one spanner wrench.
- Extension cable
 - 5 m: **21HZA197**
 - 10 m: **21HZA198**
 - 20 m: **21HZA199**
- Note 4: Connectable up to 3 pieces, 20 m at maximum.

- Conversion Plugs / Cables
 - Plug connection to EH-101P/102P: **21HZA195**
 - Plug connection to EH-102Z: **21HZA196**
 - Cable connection to EH-101P/102P: **21HZA260**
 - Cable connection to EH-102Z: **21HZA261**
- Note: Connectable to EH-102Z but the function of reference point detection is disabled.



Linear Gages

SPECIFICATIONS

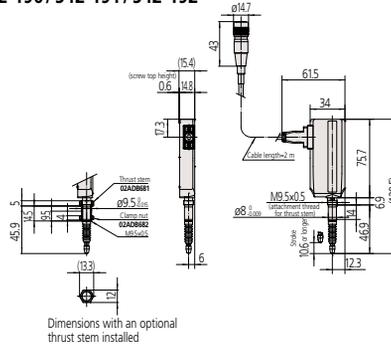
Order No.	542-190	542-191	542-192	542-193	542-194	542-195	542-196	542-197	
Measuring range	10 mm / .4"			25 mm / 1"			50 mm / 2"		
Resolution	1 μ m .00005"	0.5 μ m .000020"	0.1 μ m 5 uinch	1 μ m .00005"	0.5 μ m .000020"	0.1 μ m 5 uinch	1 μ m .00005"	0.5 μ m .000020"	
Measuring accuracy (20 °C) L=arbitrary measuring length (mm)	1.5 + L/50 μ m		0.8 + L/50 μ m	1.5 + L/50 μ m		0.8 + L/50 μ m	1.5 + L/50 μ m		
Small range accuracy (20 °C)	0.5 μ m (Arbitrary 20 μ m range)								
Repeatability: 2 σ (20 °C)	0.3 μ m								
Reference mark repeatability: σ (20 °C)	$\sigma \leq 0.5 \mu$ m (at a constant reference point passing speed less than 300 mm/s in the same direction)								
Measuring force	Contact point downwards			1.4 N or less			4.6 N or less		5.7 N or less
	Contact point horizontal			1.3 N or less			4.3 N or less		5.3 N or less
	Contact point upwards			1.2 N or less			4.0 N or less		4.9 N or less
Position detection method	Optical transmission-type Linear encoder								
Maximum response speed	1,500 mm/s		400 mm/s	1,500 mm/s		400 mm/s	1,500 mm/s		
Output signal	90° phase difference, differential square wave (RS-422A equivalent)								
Minimum edge intervals	500 ns (2 MHz)	250 ns (4 MHz)		500 ns (2 MHz)	250 ns (4 MHz)		500 ns (2 MHz)	250 ns (4 MHz)	
Output signal pitch	4 μ m	2 μ m	0.4 μ m	4 μ m	2 μ m	0.4 μ m	4 μ m	2 μ m	
Reference mark position (Phase-Z)	Approx. 3 mm from contact point tip (lowest rest point)				Approx. 5 mm from contact point tip (lowest rest point)				
Mass	Approx. 260 g				Approx. 300 g		Approx. 400 g		
Contact point	$\phi 3$ mm carbide tipped (fixing screw: (M2.5x0.45), standard contact point: 901312)								
Stem	$\phi 8$ mm			$\phi 15$ mm					
Bearing	Linear ball type								
Output cable length	2 m (directly from casing)								
Connector	Plug: HR10A-10P-10P (HIROSE), Compatible receptacle: HR10A-10R-10S (HIROSE), Compatible connector: HR10A-10J-10S (HIROSE)								
Operating temperature (humidity) ranges	0 to 50 °C (RH 20 to 80%, non-condensing)								
Storage temperature (humidity) ranges	-10 to 60 °C (RH 20 to 80%, non-condensing)								
Standard accessories	Wrench for contact point: 538610				Wrench for contact point: 210187				

G

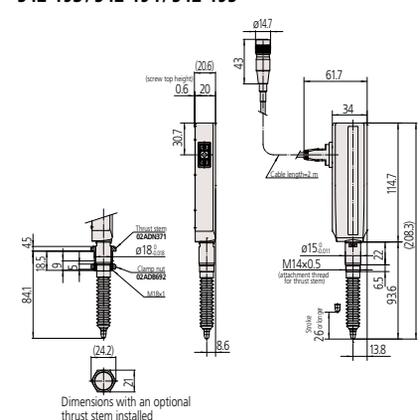
DIMENSIONS

Unit: mm

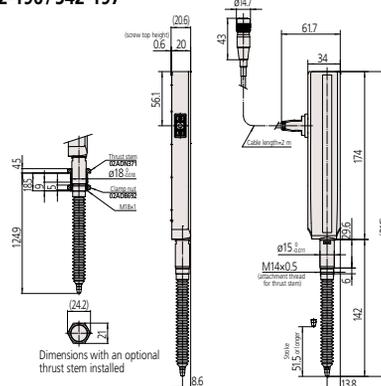
542-190 / 542-191 / 542-192



542-193 / 542-194 / 542-195



542-196 / 542-197



Got Questions?



Refer to the Linear Gage Brochure (2326) for more details.

Linear Gages

LG200 Pencil Probe Style SERIES 542 — Environment-Resistant and Slim Type

- High-accuracy gage head suitable for in-line and general use.
- Guaranteed Accuracy and Repeatability.
- Sliding durability of 100 million+ cycles*1.
- Can be connected to various counters such as:
 - EJ series - built-in display, modular, compact, with PLC interfaces, as well as USB
 - EH series - high-visibility display, serial and I/O communication (adapter required)
 - Direct to machines via TTL output from the Linear Gage
- **IP67G** protection rating with superior oil-resistance compared to standard gages.
- When using any EJ+interface, a free setup and viewing software is available: LG Quicksetuptool (refer to page G-15)
 - *1 10 mm range models (Actual value from in-house tests)



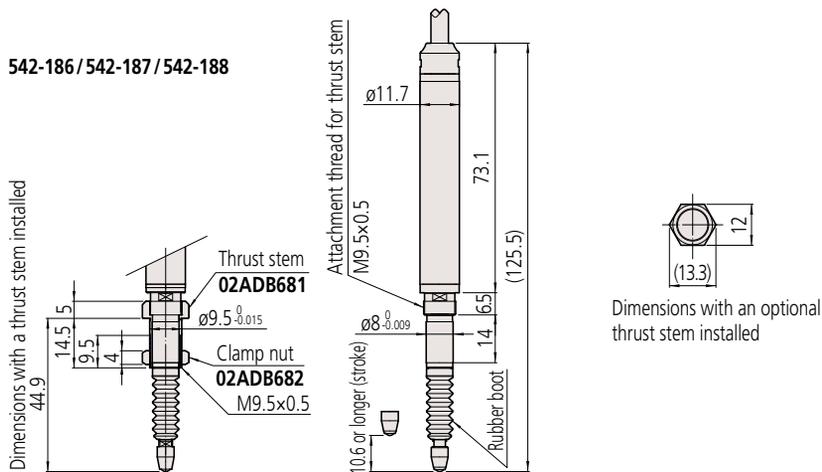
542-187

SPECIFICATIONS

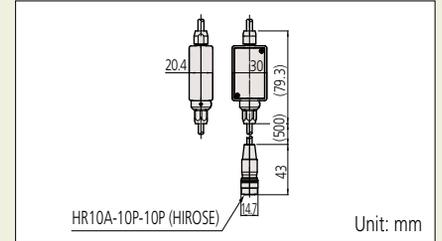
Order No.	542-186	542-187	542-188
Measuring range	10 mm / .4"		
Resolution	1 μm / 5 uinch	0.5 μm / .000020"	0.1 μm / .000050"
Measuring accuracy (20 °C)	(1.5 + L/50) μm L=arbitrary measuring length (mm)		(0.8 + L/50) μm L=arbitrary measuring length (mm)
Small range accuracy	0.5 μm (Arbitrary 20 μm range)		
Repeatability: 2 σ (20 °C)	0.3 μm		
Measuring force	Contact point downwards	0.8 N or less	
	Contact point horizontal	0.75 N or less	
	Contact point upwards	0.7 N or less	
Position detection method	Optical transmission-type Linear encoder		
Maximum response speed	1500 mm/s		400 mm/s
Output signal	90° phase difference, differential square wave (RS-422A equivalent)		
Minimum edge intervals	500 ns (2 MHz)	250 ns (4 MHz)	
Output signal pitch	4 μm	2 μm	0.4 μm
Mass	Approx. 210 g		
Contact point	ø3 mm carbide tipped (fixing screw: (M2.5x0.45), standard contact point: 901312)		
Stem	ø8 mm		
Bearing	Linear ball type		
Output cable length	Approx. 2.5 m (directly from casing)		
Connector	Plug: HR10A-10P-10P (HIROSE), Compatible receptacle: HR10A-10R-10S (HIROSE), Compatible connector: HR10A-10J-10S (HIROSE)		
Operating temperature (humidity) ranges	0 to 50 °C (RH 20 to 80%, non-condensing)		
Storage temperature (humidity) ranges	-10 to 60 °C (RH 20 to 80%, non-condensing)		
Standard Accessories	Wrench for contact point: 538610		

DIMENSIONS

Unit: mm



Connector



Optional Accessories

- Air lifter: **02ADE230**
- Note 1: Required air pressure: 0.2 to 0.4 MPa (With a 0.1 μm resolution type: 0.2 MPa)
- Note 2: Spindle extends when air is supplied.



- Rubber boot: **21HAA331** (spare)
- Thrust stem set: **02ADB680**
(Thrust stem: **02ADB681**, Clamp nut: **02ADB682**)
This is a combination of thrust stem and a clamp nut.
- Spanner wrench: **02ADB683**
If required spanner wrench is required for tightening.
If using multiple gages, one spanner wrench and a thrust stem set is required for each gage.

Thrust stem set / Spanner Wrench

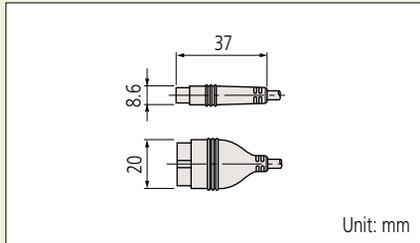


- Extension cable
 - 5 m: **21HZA197**
 - 10 m: **21HZA198**
 - 20 m: **21HZA199**
 - Note 1: Connectable up to 3 pieces, 20 m at maximum.
- Conversion Plugs / Cables
 - Plug connection to EH-101P/102P: **21HZA195**
 - Plug connection to EH-102Z: **21HZA196**
 - Cable connection to EH-101P/102P: **21HZA260**
 - Cable connection to EH-102Z: **21HZA261**
- Note: Connectable to EH-102Z but the function of reference point detection is disabled.

Custom order example

- Measuring force change
- Cable length change (less than 2 m)
- Connector change

Connector



Optional Accessories

- EC Counter: **542-007A**
- EH Counter: **542-072A**
- Air lifter (metric): **903594**
- Air lifter (inch): **903598**
- SPC cable extension adapter: **02ADF640**
- Extension cable for Digimatic gages (0.5 m): **02ADD950**
- Extension cable for Digimatic gages (1 m): **936937**
- Extension cable for Digimatic gages (2 m): **965014**
- Rubber boot: **238774** (spare)

Note: When connecting an extension cable, an SPC cable extension adapter is required.



LGS-1012P SERIES 575 — Digimatic output Type

- ABSOLUTE electrostatic capacitance type encoder makes it possible to maintain the reference point even when the power is switched off.
- Excellent protection against dust and splashing water (IP66) on the factory floor.

575-303



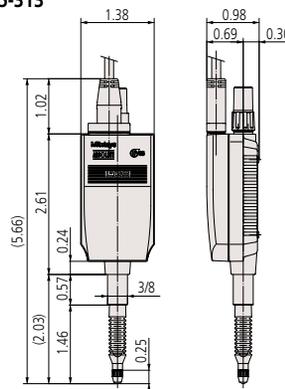
SPECIFICATIONS

Inch		
Order No.	575-313	
Measuring range	0.5 in	
Resolution	0.0005 in	
Measuring accuracy (20 °C)	0.0008 in	
Measuring force	Contact point downwards	2 N or less
	Contact point horizontal	1.8 N or less
	Contact point upwards	1.6 N or less
Position detection method	ABSOLUTE electrostatic capacitance type linear encoder	
Response speed	Unlimited (not applicable to scanning measurement)	
Output	Digimatic code	
Mass	Approx. 190 g	
Contact point	ø3 mm carbide tipped (fixing screw: 4-48 UNF), standard contact point: 21BZB005	
Stem	ø9.52=3/8 in DIA	
Bearing	Plain type	
Output cable length	2 m (directly extended from the main unit)	
Operating temperature (humidity) ranges	0 to 40 °C (RH 20 to 80%, non-condensing)	
Storage temperature (humidity) ranges	-10 to 60 °C (RH 20 to 80%, non-condensing)	

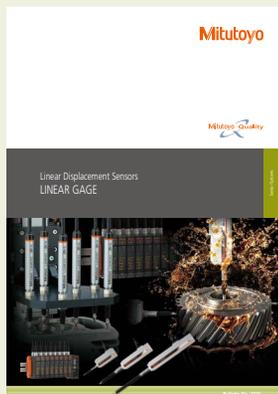
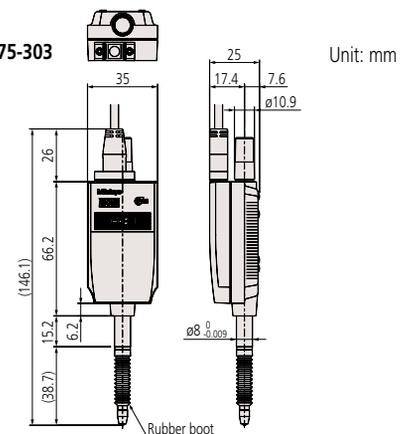
Metric		
Order No.	575-303	
Measuring range	12.7 mm	
Resolution	10 µm	
Measuring accuracy (20 °C)	15 µm	
Measuring force	Contact point downwards	2 N or less
	Contact point horizontal	1.8 N or less
	Contact point upwards	1.6 N or less
Position detection method	ABSOLUTE electrostatic capacitance type linear encoder	
Response speed	Unlimited (not applicable to scanning measurement)	
Output	Digimatic code	
Mass	Approx. 190 g	
Contact point	ø3 mm carbide tipped (fixing screw: (M2.5x0.45), standard contact point: 901312	
Stem	ø8 mm	
Bearing	Plain type	
Output cable length	2 m (directly extended from the main unit)	
Operating temperature (humidity) ranges	0 to 40 °C (RH 20 to 80%, non-condensing)	
Storage temperature (humidity) ranges	-10 to 60 °C (RH 20 to 80%, non-condensing)	

DIMENSIONS

575-313



575-303



Refer to the Linear Gage Brochure (2326) for more details.

Linear Gages

LGH (0.01/0.005 μm resolution) SERIES 542 — High-accuracy/resolution Type

- This series has achieved very high accuracy combined with a resolution of 0.01/0.005 μm (according to model), practically equivalent to that of a laser interferometer, and a wide measuring range of 10 mm.
- A compact body design makes a significant contribution to a downsizing of this gage itself, which is best suited for calibration/evaluation of master gages as well as measurement of high-precision parts and as a length measuring sensor incorporated into high-precision positioning/control units.



Gage head: 542-715A

- This model is equipped with a newly developed optical reflection-type linear encoder, achieving an excellent resolution of 0.01 μm, a measuring accuracy of 0.2 μm and a measuring range of 10 mm at a low price.
- Maximum operating speed has been improved by a factor of 2.8 times (250 mm/s → 700 mm/s) while maintaining very high accuracy.



Gage head: 542-720A

- A low measuring force model is available for those applications where measurement of easily deformed or damaged workpieces is required.
- Every LGH Series gage is bundled with a dedicated counter.
- This model is equipped with a newly developed ultra-high precision transmission type linear encoder, achieving the outstanding resolution of 0.005 μm (5 nm).
- Exceptional measuring accuracy of 0.1 μm has been attained over the wide measuring range of 10 mm. This series is most suited for calibration/evaluation of master gages where its wide measuring range is a great advantage.

TYPICAL APPLICATIONS

Master gage calibration/evaluation



Inspection of high-precision parts



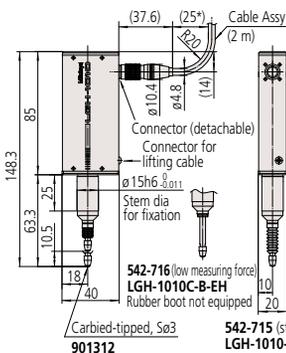
Needle contact-point mounting example



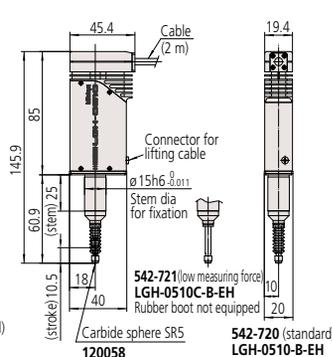
Dedicated counter

DIMENSIONS

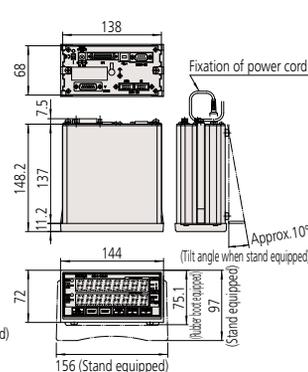
542-716A



542-721A



Dedicated counter (set)



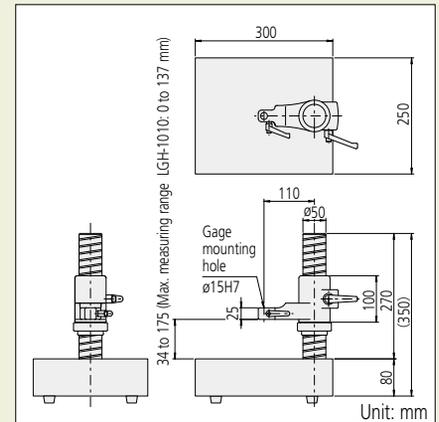
Unit: mm

* Minimum bending radius or minimum dressed dimension

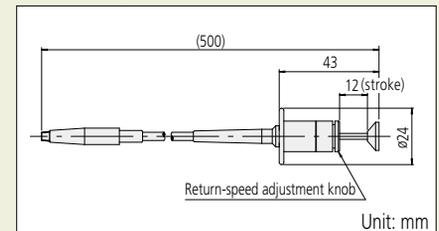


Optional Accessories

- Measuring stand: 971750



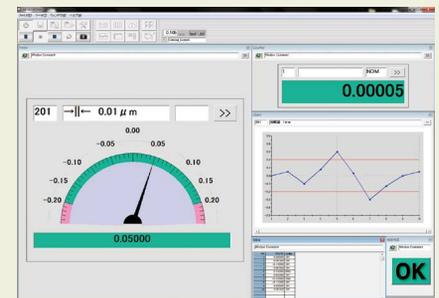
- Spindle lifting cable: 971753



- I/O connector: 02ADB440



SENSORPAK



Note: Refer to page G-16 for more details.

- Rubber boot: 238772 (Spare for 542-715A and 542-720A)



Refer to the Linear Gage Brochure (2326) for more details.

Linear Gages

SPECIFICATIONS

Order No.		Resolution 0.01 µm / Accuracy 0.2 µm model	
		542-715A (Standard)	542-716A (Low measuring force)
Measuring range		10 mm	
Resolution		0.01 µm (0.05 µm, 0.1 µm, 0.5 µm, 1 µm can be selected from the counter)	
Measuring accuracy (20 °C)*1		0.2 µm	
Repeatability (20 °C)*1		0.1 µm (2σ)	
Retrace error (20 °C)*1		0.1 µm	
Measuring force	Contact point downwards	0.65 N or less	Approx. 0.12 N
	Contact point horizontal	0.55 N or less	Not applicable
	Contact point upwards	0.45 N or less	Not applicable
Position detection method		Optical reflection type linear encoder	
Detectable operation speed		In normal measurement: 700 mm/sec; for peak detection: 120 mm/sec	
Mass of gage head		Approx. 370 g	
Contact point		Carbide tipped, 5ø3 mm (M2.5x0.45), standard contact point: 901312	
Stem		ø15 mm	
Bearing		Linear ball type	
Output cable length		Approx. 2 m	
Operating temperature (humidity) ranges		0 to 40 °C (Reference temperature 20 °C)/20 to 80% RH (non-condensing)	
Storage temperature (humidity) ranges		-10 to 60 °C/20 to 80% RH (non-condensing)	
Counter Specifications			
Display range		±999.99999 mm	
Functions		Zero-setting, presetting, direction changeover, tolerance judgment (3 steps/5 steps), RS-LINK	
Peak hold function		Yes	
Interface		RS-232C, USB (only for SENSORPAK), Digimatic (Printer: DP-1VA LOGGER)*3, I/O Connector	
External output		<ul style="list-style-type: none"> • RS-232C: counting data • Digimatic output: counting data*3 • I/O connector: counting data (simplified BCD), tolerance judgment result, simplified analog output 	
External control		Zero-setting, presetting, data hold, peak measurement mode selection, peak clear	
Power supply		Supplied AC Adapter, or 12 to 24 V DC, max. 700 mA	
Power consumption		8.4 W (max. 700 mA), ensure at least 1 A power supply per unit.	
Mass of counter		Approx. 900 g (AC Adapter excluded)	
Standard accessories		Wrench for contact point, rubber boot, stand, washer (for counter), AC Adapter, AC cord, DC plug, user's manual, inspection certificate	

Order No.		Resolution 0.005 µm / Accuracy 0.1 µm model	
		542-720A (Standard)	542-721A (Low measuring force)
Measuring range		10 mm	
Resolution		0.005 µm (0.01 µm, 0.05 µm, 0.1 µm can be selected from the counter)	
Measuring accuracy (20 °C)*1		0.1 µm	
Repeatability (20 °C)*1		0.02 µm (2σ)	
Retrace error (20 °C)*1		0.05 µm	
Measuring force	Contact point downwards	0.65 N or less	Approx. 0.1 N
	Contact point horizontal	0.55 N or less	Not applicable
	Contact point upwards	0.45 N or less	Not applicable
Position detection method		Ultra-high accuracy transmission type linear encoder	
Detectable operation speed		In normal measurement: 250 mm/sec	
Mass of gage head		Approx. 370 g	
Contact point		Carbide sphere SR5 (M2.5x0.45), standard contact point: 120058	
Stem		ø15 mm	
Bearing		Linear ball type	
Output cable length		Approx. 2 m	
Operating temperature (humidity) ranges		15 to 25 °C (Reference temperature 20 °C)/30 to 60% RH (non-condensing)	
Storage temperature (humidity) ranges		-10 to 60 °C/20 to 80% (non-condensing)*2	
Counter Specifications			
Display range		±99.999995 mm	
Functions		Zero-setting, presetting, direction changeover, tolerance judgment (3 steps/5 steps), RS-LINK	
Peak hold function		No	
Interface		RS-232C, USB (only for SENSORPAK), Digimatic (Printer: DP-1VA LOGGER)*3, I/O Connector	
External output		<ul style="list-style-type: none"> • RS-232C: counting data • Digimatic output: counting data*3 • I/O connector: counting data (simplified BCD), tolerance judgment result, simplified analog output 	
External control		Zero-setting, presetting, data hold	
Power supply		Supplied AC Adapter, or +12 to 24 V DC, max. 700 mA	
Power consumption		8.4 W (max. 700 mA), ensure at least 1 A power supply per unit.	
Mass of counter		Approx. 900 g (AC Adapter excluded)	
Standard accessories		Wrench for contact point, rubber boot, stand, washer (for counter), AC Adapter, AC cord, DC plug, user's manual, inspection certificate	

*1 Applies when used with counter.

*2 The storage temperature/humidity ranges after unpacking are the same as the operating temperature/humidity ranges.

*3 When using Digimatic output, the format is d1 and is limited to 5 decimal places



Talk to Sales



Refer to the Linear Gage Brochure (2326) for more details.

Linear Gages

EC Counter SERIES 542 — For Gages with Digimatic output

- This Digimatic display can be connected to Linear gages with Digimatic output (**LGS**).
- Employs DIN size (96×48 mm) and mount-on-panel configuration to facilitate system integration.
- It has a data output and tolerance evaluation function.

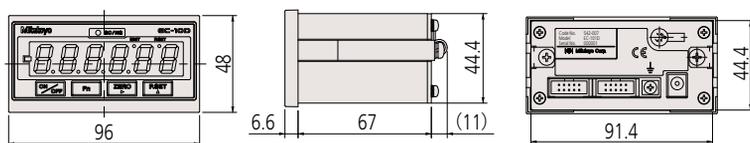


542-007A

SPECIFICATIONS

Model	EC-101D	
Order No.	542-007A	
Resolution () indicates maximum display range	0.0005 in (±99.9995 in) 0.001 in (±999.999 in) 0.00005 in (±9.99995 in) 0.0001 in (±99.999 in) 0.01 mm (±9999.99) 0.001 mm (±999.999) [Automatic setting by gage]	
Display	Sign plus 6 digits (Green LED)	
Tolerance judgment display	LED display (3 steps: Amber, Green, Red)	
External output (switching type)	Tolerance judgment output	-NG, OK, +NG (open-collector)
	Data output	Digimatic output
Control input	External PRESET, external HOLD	
Power supply	Voltage	Supplied AC adapter, or 9 to 12 V DC
	Consumption	4.8 W (max. 400 mA) Ensure at least 1 A is available per unit.
Operating temperature (humidity) ranges	0 to 40 °C (RH 20 to 80%, non-condensing)	
External dimensions	96 (W) × 48 (H) × 84.6 (D) mm	
Standard Accessories	AC adapter: 12BAR954 AC cable: 12BAK730	
Applicable gage head	LGS, Digimatic Indicators	
Mass	500 g	

DIMENSIONS



Unit: mm



Need Repair?



Refer to the Linear Gage Brochure (2326) for more details.

Linear Gages

Optional Accessories

- I/O output connector (with cover): **02ADB440**
- SPC cable (0.5 m): **02ADD950**
- SPC cable (1 m): **936937**
- SPC cable (2 m): **965014**
- Measurement data loading software: **SENSORPAK** (refer to page G-16)

Note: The Digimatic connecting cable doubles as a RS Link cable.

- Conversion Plugs / Cables
- Plug connection to EH-101P/102P: **21HZA195**
- Plug connection to EH-102Z: **21HZA196**
- Cable connection to EH-101P/102P: **21HZA260**
- Cable connection to EH-102Z: **21HZA261**

Note: Connectable to EH-102Z but the function of reference point detection is disabled.

EH Counter SERIES 542 — Panel Mount, Multi-function Type with RS-232C and I/O Communication Functions

- Two types are available for this model: a 1-axis display and a 2-axis display, both of which enable addition or subtraction calculations between two gages.
- Multifunctional counter equipped with zero-setting, presetting, tolerance judgment.
- RS-232C and USB are equipped as standard. Data transfer to a PC is possible. (USB is supported only by Mitutoyo **SENSORPAK**.)
- A multi-point measuring system (max. 20 points and max. 10 units) can easily be configured with the built-in RS Link networking function. Refer to "Quick Guide to Precision Measuring Instruments" on page G-18 for details of the RS link.
- Employs DIN size (144x72 mm) and mount-on-panel configuration to facilitate system integration.



542-075A

542-071A

542-073A

542-072A

SPECIFICATIONS

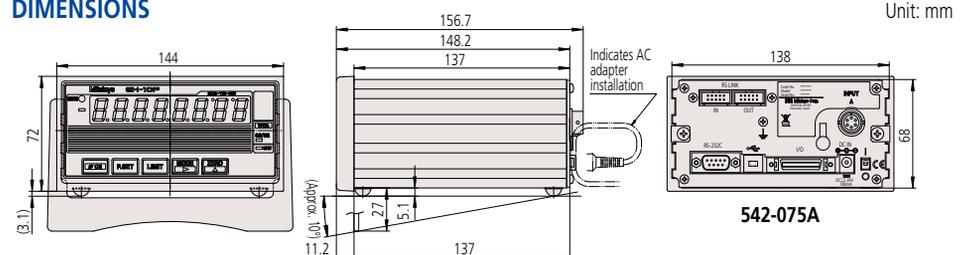
Model	EH-101P	EH-102P	EH-102Z	EH-102D
Order No.	542-075A	542-071A	542-073A	542-072A
Number of axes to be displayed	1 axis		2 axes	
Origin point detection function	—	—	✓	—
Maximum input frequency	2.5 MHz (2-phase square wave)			—
Resolution () indicates maximum display range	0.0005 in (±99.9995 in)/0.01 mm (±9999.99 mm) 0.00005 in (±9.99995 in)/0.001 mm (±999.999 mm) 0.000005 in (±0.999995 in)/0.0005 mm (±99.9995 mm) 0.000005 in (±0.999995 in)/0.0001 mm (±99.9999 mm) [Parameter set]			Automatic setting by gage
Tolerance judgment display	LED display (3 steps: Amber, Green, Red/5 steps: Amber, Amber flashing, Green, Red flashing, Red)			
Interface	RS-232C/USB/parameter selection via digimatic (only DP-1VA LOGGER , Digimatic Mini-Processor can be connected) (USB used only with SENSORPAK) Selection by parameter from 3-step, 5-step, or simple BCD Total tolerance judgment output (when tolerance function is enabled) Analog output (1 V to 4 V)			
Input/output	Control output	Open-collector		
	Control input	Display BANK switching, peak mode, presetting, display hold, hold per axis: open-collector or no-voltage contact signal (with/without contact point)		
Power supply	Voltage	Supplied AC adapter, or 12 to 24 V DC		
	Consumption	8.4 W (max. 700 mA) Ensure at least 1 A is available per unit.		
Operating temperature (humidity) ranges	0 to 40 °C (RH 20 to 80%, non-condensing)			
Storage temperature (humidity) ranges	-10 to 50 °C (RH 20 to 80%, non-condensing)			
Standard Accessories	AC adapter: 357651 / AC cable: 02ZAA010			
Applicable gage head	LG100/LG200 A conversion plug 21HZA195 is required (The origin point detection function is disabled)		LG100/LG200 A conversion plug 21HZA196 is required (The origin point detection function is disabled when connected to LG200)	
Mass	Approx. 760 g	Approx. 800 g	Approx. 800 g	Approx. 800 g

G



Refer to the Linear Gage Brochure (2326) for more details.

DIMENSIONS



Linear Gages

EJ-102N/NE Counter, Interface Unit: CC-Link, PROFINET, EtherNet/IP, EtherCAT, USB SERIES 542 — Linear Gage Counter

- A modular, high-speed, space-saving counter for linear gage suitable for in-line and general use.
- Up to 8 counters can be linked providing the capacity to connect up to 16 gages.
- DIN rail mountable.
- All linked units can be driven by a single power source.
- Data can be output through an industrial interface by linking a counter with an interface unit.
- Enables sum/difference operations between 2 gages connected to the same counter.

Counter unit
EJ-102N/NE



CC-Link



PROFINET



EtherNet/IP



EtherCAT



USB



Image of mounting



SPECIFICATIONS

Model		EJ-102N	
Order No.		542-081A Includes AC components	542-081
Unit		inch/mm	
Resolution		0.0002, 0.00005, 0.00002, 0.000005 (inch)/ 0.005, 0.001, 0.0005, 0.0001 (mm)	
Number of linear gage connection ports		2	
Supported gage signal		Differential square wave, differential square wave with reference point mark	
Maximum input frequency		5 MHz	
User Interface	Display	Negative sign + 8 digits and indicator (1 gage value displayed, manually switchable)	
External I/O	Number of I/O ports	Input: 4 ports (Ch switch, peak clear, data hold, preset) Output: 4 ports (Err/ALLGO, Tolerance judgment)	
	Compatible communication standards	CC-Link, USB (Supported with optional interface units)	
Max. number of linked units		EJ Counter 8 units + 1 (optional) interface unit (Max. number of linear gage connections: 16)	
Power supply	Input voltage	10 V to 27 V DC	
	Power consumption	1 unit only: 3 W or less (Includes 2 linear gages) Max. number of links: 30 W or less (Interface unit and 16 linear gages included)	
Operating temperature (humidity) ranges		0 to 50 °C (RH 20 to 80%, non-condensing)	
Storage temperature (humidity) ranges		-10 to 60 °C (RH 20 to 80%, non-condensing)	
Mass		Approx. 120 g	

Model		Interface unit USB
Order No.		21HZA149
Applicable interface		USB 2.0 Full Speed
User Interface		POWER (green)
Functions		Readout of current value, Current value hold (software hold), Parameter setting on EJ counter, Tolerance judgment value settings, Preset value settings, preset/zero-set clear, peak clear, error clear
Power supply		Power is supplied from EJ Counter (Cannot be charged via USB)
Operating temperature (humidity) ranges		0 to 50 °C (RH 20 to 80%, non-condensing)
Storage temperature (humidity) ranges		-10 to 60 °C (RH 20 to 80%, non-condensing)

Model		Interface unit EtherNet/IP
Order No.		21HZA188
Applicable interface		EtherNet/IP
User Interface		POWER (green), NETWORK (green/red), MODULE (green/ red), LINK PORT1 (green/amber), LINK PORT2 (green/amber), EJ-CONNECT (green)
Functions		Common protocols for USB and EtherNet/IP Readout of current value, Current value hold (software hold), Parameter setting on EJ counter, Tolerance judgment value settings, Preset valuesettings, preset/ zero-set clear, peak clear, error clear
Power supply		Power is supplied from EJ Counter (Cannot be charged via USB)
Operating temperature (humidity) ranges		0 to 50 °C (RH 20 to 80%, non-condensing)
Storage temperature (humidity) ranges		-10 to 60 °C (RH 20 to 80%, non-condensing)

Optional Accessories

- USB Cable - 2m w/ferrite: **64PMI269**
 - AC adapter: **357651**
 - AC cable*: **02ZAA010**
 - DC connector with bar terminal: **21HZA209***
- * Required when using AC adapter.

Connectable linear gage Series	Conversion cable (optional)
LGF-Z	Necessary (21HZA194)
LGF*/LGK*/LGB*/LG*	Necessary (21HZA193)

* The origin point detection function is disabled.

Linear Gages

SPECIFICATIONS

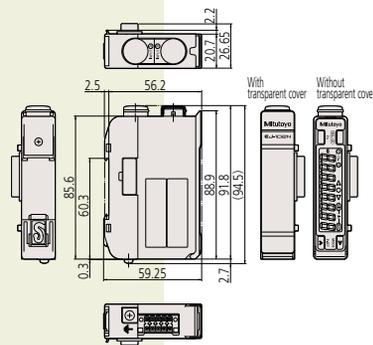
Model	Interface unit EtherCAT
Order No.	21HZA264
Applicable interface	EtherCAT
User Interface	POWER (green), RUN (green), ERROR (red), L/A IN (green), L/A OUT (red), EJ-CONNECT (green)
Functions	Common protocols for USB and EtherCAT Readout of current value, Current value hold (software hold), Parameter setting on EJ counter, Tolerance judgment value settings, Preset value settings, preset/zero-set clear, peak clear, error clear
Power supply	Power is supplied from EJ Counter (Cannot be charged via USB)
Operating temperature (humidity) ranges	0 to 50 °C (RH 20 to 80%, non-condensing)
Storage temperature (humidity) ranges	-10 to 60 °C (RH 20 to 80%, non-condensing)

Model	Interface unit PROFINET
Order No.	21HZA187
Applicable interface	PROFINET RT (RT Class1)/USB 2.0 Full Speed
User Interface	POWER (green), NETWORK (green/red), MODULE (green/red), LINK PORT1 (green), LINK PORT2 (green), EJ-CONNECT (green)
Functions	Common protocols for USB and PROFINET, Readout of current value, Current value hold (software hold), Parameter setting on EJ counter, Tolerance judgment value settings, Preset value settings, preset/zero-set clear, peak clear, error clear
Power supply	Power is supplied from EJ Counter (Cannot be charged via USB)
Operating temperature (humidity) ranges	0 to 50 °C (RH 20 to 80%, non-condensing)
Storage temperature (humidity) ranges	-10 to 60 °C (RH 20 to 80%, non-condensing)

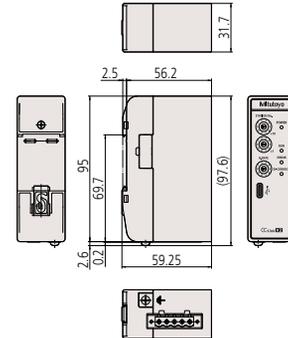
Model	Interface unit CC-Link
Order No.	21HZA186
Applicable interface	USB 2.0 Full Speed
	CC-Link Ver. 1.10
User Interface	Display
	Switch
Functions	POWER (green), RUN (green), ERROR (red), EJ-CONNECT (green) Rotary switch×3 (Exchange number settings×2, communication speed settings×1) Common protocols for USB and CC-Link, Readout of current value*, Current value hold (software hold), Parameter setting on EJ counter, Tolerance judgment value settings, Preset value settings, preset/zero-set clear, peak clear, error clear * For CC-Link, Ver. 1.10 allows for transition only while Ver. 2.00 allows for both cyclic communication and transition.
Power supply	Power is supplied from EJ Counter (Cannot be charged via USB)
Operating temperature (humidity) ranges	0 to 50 °C (RH 20 to 80%, non-condensing)
Storage temperature (humidity) ranges	-10 to 60 °C (RH 20 to 80%, non-condensing)

DIMENSIONS

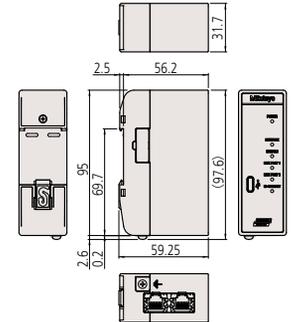
EJ-102N/NE



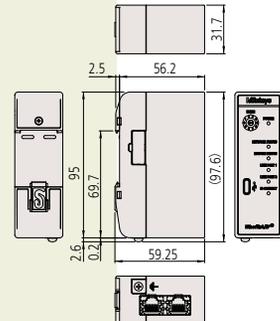
Interface unit CC-Link



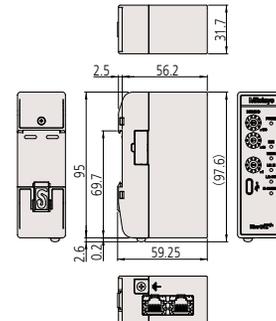
Interface unit PROFINET



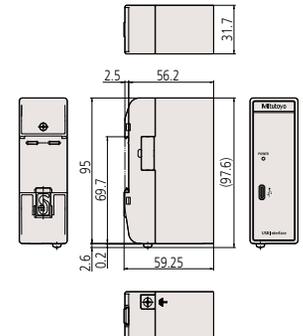
Interface unit EtherNet/IP



Interface unit EtherCAT



Interface unit USB



Where to Buy

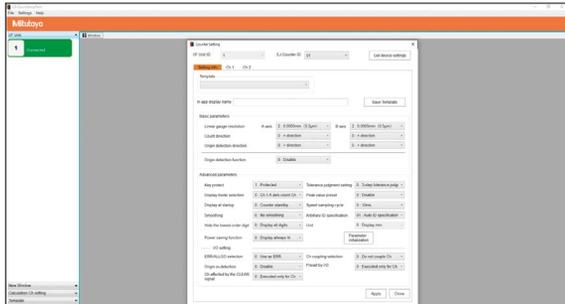
Note: Can be mounted on DIN rail. Case material: PC, POM

Linear Gages

LG QuickSetupTool Application Software

- For use with EJ Counters when connected to the USB port of any optional interface.
- Intuitive software for setting up the counters and viewing measurement data.
- Data can be saved in CSV format.

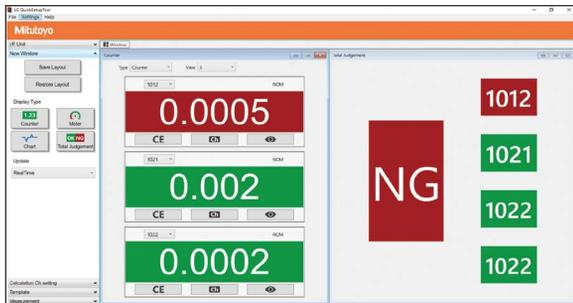
Note: This software can be used free of charge and downloaded from the Mitutoyo website.
<https://www.mitutoyo.co.jp/eng/contact/products/lg/>



Parameter setting



Chart



General settings



Recommended system environment

OS: Windows10 Pro 32 bit/64 bit

Display: 1600x1200 or more

Memory: 1024 MB or more

Communication method: USB2.0 (Full speed)

USB connector: Type C connector

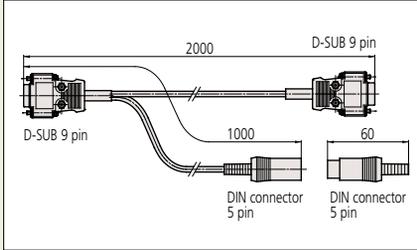
Note: USB device drivers are standard Windows drivers.



Refer to the Linear Gage Brochure (2326) for more details.

Standard Accessory

- I/O cable: **21HZA137**

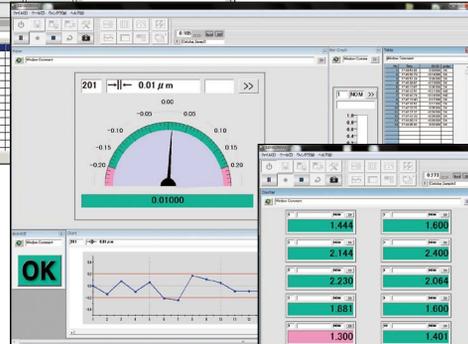


SENSORPAK Measurement Data Loading Software

- This software facilitates loading measurement data onto a personal computer with RS-232C output (**EH, EV, Litematic**), with USB output (**EH**).
- 60 channels (max.) of measurement data can be processed.
- Arithmetical calculations and maximum width calculations can be performed using the measurement data.
- Exporting measurement data into MS-Excel format is supported (CSV format).
- Real-time graphical display by means of bar-graph or meter is provided.



Measurement screen



Meter screen



Chart screen



License key



Get a Quote



Refer to the Linear Gage Brochure (2326) for more details.

SPECIFICATIONS

Order No.	02NGB073	
Product Configuration	Program disk (CD), license key, operation manual	
Compatible devices (Connection method)	Mitutoyo RS_LINK compatible devices <ul style="list-style-type: none"> • LGH Series (USB, RS-232C) • EH counter (USB, RS-232C) • EV counter (RS-232C) • VL Litematic (RS-232C) 	
Connecting cable	<ul style="list-style-type: none"> • RS-232C connection: I/O cable (21HZA137)*¹ standard accessory • USB connection: USB cable (type A to type B) • RS-232C connection: RS-232C cross cable*¹ 	
Number of connectable gages	Max. 60 units (when 10 units of EV counter for linear gage are connected via RS-Link)	
Functions	Display* ²	Display format: counting, bar graph, indicator, chart, and table Display cycle: 1s (when 60 gage units are connected, 1-window display, and no Excel output)
	Calculation	Calculation (up to 30 items) between designated gages is available.
	Tolerance judgment	Per item: Displays the result in colors (3-step tolerance: red/green/red; 5-step tolerance: red/yellow/green/yellow/red) Total judgment: Displays in colors (red/green) by monitoring the multiple gages and calculation result
	Recording* ²	Items: channel values, calculation result, tolerance judgment, total tolerance judgment, timestamp Max. number of records: 60000 for software recording (with 6 gages connected); up to 9000 (with 60 gages connected) Output function: Direct output to Excel, CSV file output (compatible with MeasurLink [®]) Recording trigger: key, timer, external TRG
	Input/output* ³	Input: TRG for recording (HOLD) Output: Total tolerance judgment result
System Environment	DOS/V compatible PC environment CPU: Pentium4 2 GHz or more, Memory: 2 GB or more, Hard disk: 2 GB or more free space OS: Windows 7 (32 bit/64 bit), Windows 8.1 (32 bit/64 bit), Windows 10 (64 bit)	

*1 If the PC is not equipped with an RS-232C port, please contact your nearest M³ Solution Center.

*2 Display cycle and the maximum number of records differ depending on the environment (specification of PC, number of connected gages, display format and communication setting).

*3 With use of the I/O cable (accessory). When an I/O cable is not used, the I/O connector of the counter alternatively functions. (Refer to the user's manual of the counter in use.)

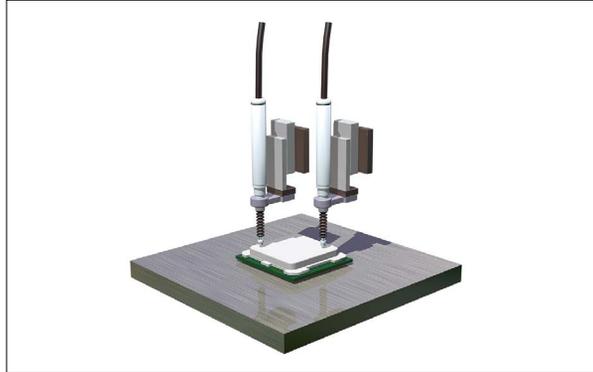
Linear Gages

Measurement Examples

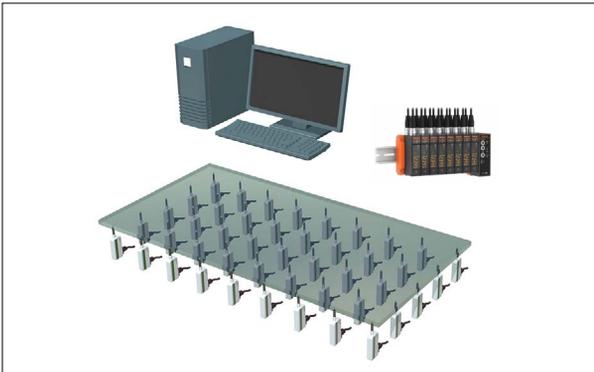
Roll gap measurement



Chip parallelism measurement



FPD board multipoint measurement



Cam-lift measurement



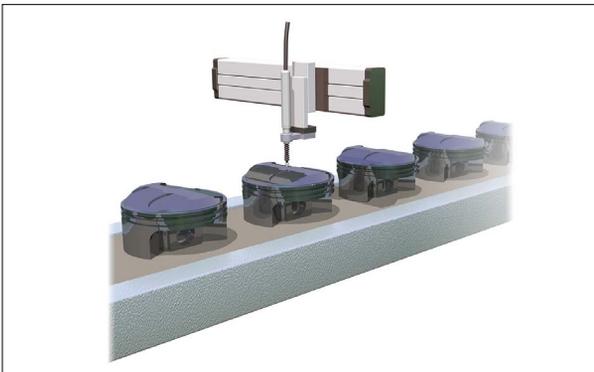
Brake disk multipoint measurement



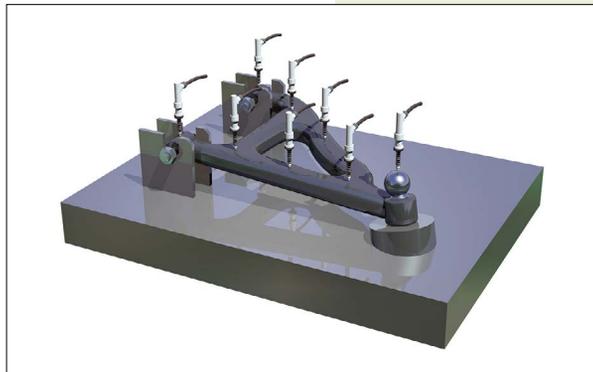
Machine device tool length measurement



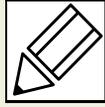
Workpiece discrimination



Inspection fixture



Quick Guide to Precision Measuring Instruments

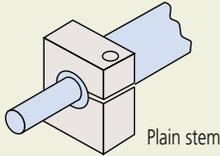


Linear Gages

Gage Head

Plain Stem

The plain stem has the advantage of wider application and slight positional adjustment in the axial direction on final installation, although it does require a split-fixture clamping arrangement or adhesive fixing. However, take care so as not to exert excessive force on the stem.



Measuring Force

This is the force exerted on a workpiece during measurement by the contact point of a linear gage head, at its stroke end, expressed in newtons.

Comparative Measurement

A measurement method where a workpiece dimension is found by measuring the difference in size between the workpiece and a master gage representing the nominal workpiece dimension.

Ingress Protection Code

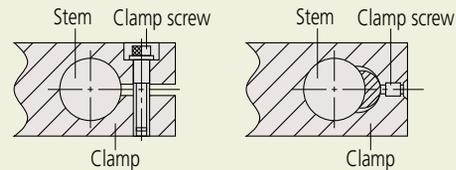
Protection code	Type	Level	Description
IP66	Protection against contact with the human body and foreign objects	6: Dust tight	Protection from dust ingress Complete protection against contact
	Protection against exposure to water	6: Water-resistant type	Water jets directed against the enclosure from any direction shall have no harmful effects.
IP67	Protection against contact with the human body and foreign objects	6: Dust tight	Protection from dust ingress Complete protection against contact
	Protection against exposure to water	7: Immersion-protection	Protection against the effects of immersion in water between 1 cm and 1 m for 30 minutes
IP□□G	Protection against entry of oil	—	Protection against entry of oil droplets or splashes from all directions

Precautions in Mounting a Gage Head

- Insert the stem of the gage into the mounting clamp of a measuring unit or a stand and tighten the clamp screw.
- Notice that excessively tightening the stem can cause problems with spindle operation.
- Never use a mounting method in which the stem is clamped by direct contact with a screw.
- Never mount a linear gage by any part other than the stem.
- Mount the gage head so that it is in line with the intended direction of measurement. Mounting the head at an angle to this direction will cause an error in measurement.
- Exercise care so as not to exert a force on the gage through the cable.

Precautions in Mounting LGH Series

To fix the **LGH** Series, insert the stem into the dedicated stand or fixture.



Recommended hole diameter on the fixing side: 15 mm +0.034/+0.014

- Machine the clamping hole so that its axis is parallel with the measuring direction. Mounting the gage at an angle will cause a measuring error.
- When fixing the **LGH** Series, do not clamp the stem too tightly. Over-tightening the stem may impair the sliding ability of the spindle.
- If measurement is performed while moving the **LGH** Series, mount it so that the cable will not be strained and no undue force will be exerted on the gage head.

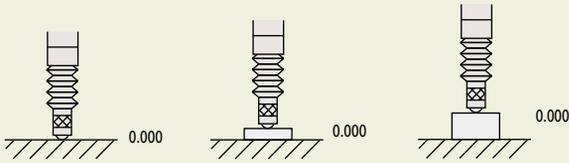


Need Support?

Display Unit

Zero-setting

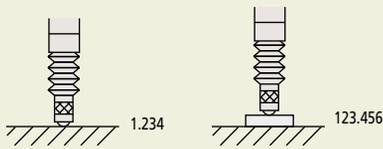
The display value can be set to 0 (zero) at any position of the spindle.



Note: Perform the zero-setting beyond 0.2 mm stroke from the rest position. This puts the spindle in the guaranteed accuracy region.

Presetting

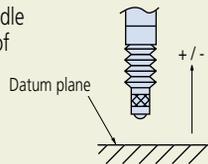
Any numeric value can be set on the display unit for starting the count from this value.



Note: Perform the zero-setting beyond 0.2 mm stroke from the rest position. This puts the spindle in the guaranteed accuracy region.

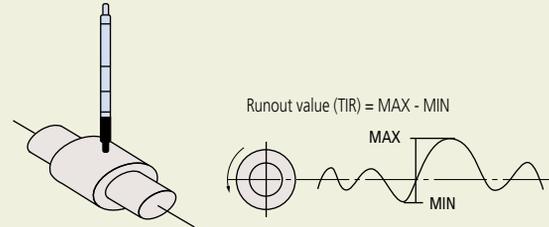
Direction Changeover

The measuring direction of the gage spindle can be set to either plus (+) or minus (-) of count.



MAX, MIN, TIR Settings

The display unit can hold the maximum (MAX) and minimum (MIN) values, and the run out value (TIR) during measurement.



Tolerance Setting

Tolerance limits can be set in various display units for automatically indicating if a measurement falls within those limits.

Open-collector Output

An external load, such as a relay or a logic circuit, can be driven from the collector output of an internal transistor which is itself controlled by a Tolerance Judgment result, etc.

Digimatic Code

A communication protocol for connecting the output of measuring tools with various Mitutoyo data processing units. This allows output connection to a Digimatic Mini Processor **DP-1VA LOGGER** for performing various statistical calculations and creating histograms, etc.

BCD Output

A system for outputting data in binary-coded decimal notation.

RS-232C Output

A serial communication interface in which data can be transmitted bi-directionally under the EIA Standards. For the transmission procedure, refer to the specifications of each measuring instrument.

CC-Link

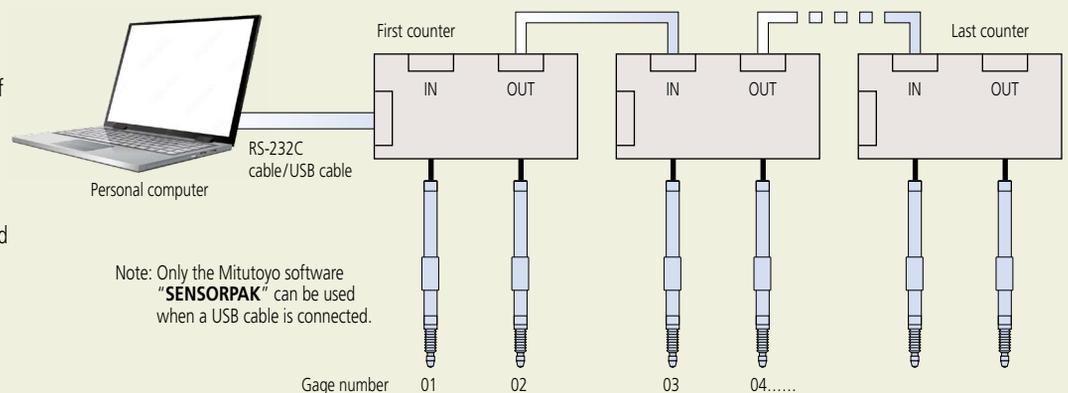
An abbreviation of Control & Communication Link, the new open field network developed by Mitsubishi Electric Corporation. It is a high-speed field network that allows for control and communication at the same time.

RS Link Function Multi-point measurement can be performed by connecting multiple **EH** counters with RS Link cables.

RS Link for EH Counter

It is possible to connect a maximum of 10 counter units and handle up to 20 channels of multi-point measurement at a time. For this connection use a dedicated RS Link cable **02ADD950** (0.5 m), **936937** (1 m) or **965014** (2 m).

(The overall length of RS Link cables permitted for the entire system is up to 10 m.)

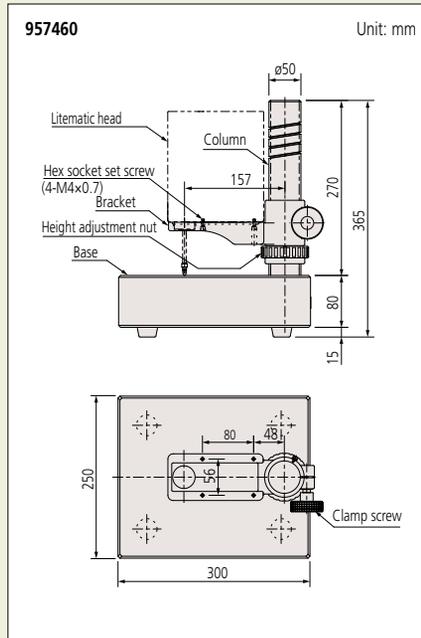


Note: Only the Mitutoyo software "SENSORPAK" can be used when a USB cable is connected.

Gage number 01 02 03 04.....

VL-50-B/50S-B Litematic SERIES 318 — High-accuracy/resolution Measuring Machine

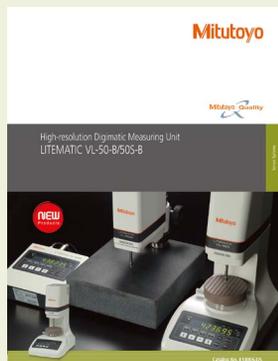
Optional Stand for VL-50S-B



Optional Accessories

- Foot switch: **937179T**
- Dedicated stand: **957460***1
- SPC cable (1 m): **936937***2
- SPC cable (2 m): **965014***2
- VL weight part: **02AZE375***3
- Recommended contact points:
 - Shell type: **101118** (Approx. 0.02 N)*4
 - Carbide tipped spherical contact point, $\phi 7.5$: **120059** (Approx. 0.03 N)*4
 - Carbide tipped spherical contact point, $\phi 10.5$: **120060** (Approx. 0.06 N)*4
 - Carbide tipped needle contact point, $\phi 0.45$: **120066** (Approx. 0.01 N)*4

- *1 Only **VL-50S** is available.
- *2 Refer to page G-18 for details of the RS link.
- *3 Not applicable to **VL-50-100-B** and **VL-50S-100-B**
- *4 Values in parentheses indicate the measuring force of a 0.01 N model fitted with the respective optional points



Refer to the Litematic Brochure (E13006-US) for more details.

- With a measuring force of only 0.01 N, the Litematic is ideal for measuring easily deformed workpieces or high-accuracy components.
- For workpieces for which 0.01 N is insufficient, either the 0.15 N or 1 N model is recommended.
- The motor-driven spindle moves up/down and stops when the contact point touches the workpiece. Then the maximum, minimum and runout values are measured under a constant force.

- High resolution of 0.01 μm , and wide measuring range of 50 mm.
- Measuring system **VL-50-B**, integrated display type, and **VL-50S-B**, a separate display type, are available.
- The measuring table supplied with **VL-50-B** is ceramic, which is corrosion free, for easier maintenance and storage.
- The spindle is made of low thermal expansion material.



Shown with optional granite base, **957460**

SPECIFICATIONS

Model	VL-50-B	VL-50-15-B	VL-50-100-B	VL-50S-B	VL-50S-15-B	VL-50S-100-B
Order No.	318-221-10A	318-222-10A	318-223-10A	318-226-10A	318-227-10A	318-228-10A
Measuring range	0 to 50 mm (0 to 2 in)					
Resolution	0.01/0.1/1.0 μm (0.000005 in/0.000005 in/0.00005 in)					
Display unit	8 digits/14 mm (0.6 in) character height (without signs)					
Scale type	Reflection type linear encoder					
Stroke	51.5 mm (2 in) (when using a standard contact point)					
Measuring accuracy (20 °C)*1	(0.5 + L/100) μm L=arbitrary measuring length (mm)					
Accuracy guaranteed temperature*2	20 \pm 1 °C					
Repeatability*1	$\sigma=0.05 \mu\text{m}$					
Measuring force*1	0.01 N	0.15 N*3	1 N*3	0.01 N	0.15 N*3	1 N*3
Feed speed	Approx. 2 mm/s (0.08 in/s) or 4 mm/s (0.16 in/s) (changeable by parameter)					
Fast feed	Approx. 8 mm/s (0.3 in/s)					
Contact point	$\phi 3$ mm carbide tipped (fixing screw: (M2.5x0.45), standard contact point: 901312)					
Measuring table	$\phi 100$ (ceramic, grooved, removable)					
Input	Foot switch input (when optional foot switch is used) External Control					
Output	Digimatic output/RS-232C output (changeable by parameter)					
Rating Power consumption	Max. 18W (12V, 1.5A)					
Standard Accessories	AC adapter: 357651 , Grounding wire: 09CAA985 , AC cable: 02ZAA010 Hex wrench (2 pcs. for fixing contact point and for removing fixing bracket)					

*1 Normal measurement using standard contact point.

*2 Under less temperature change, and hot or cold direct air flow should be avoided.

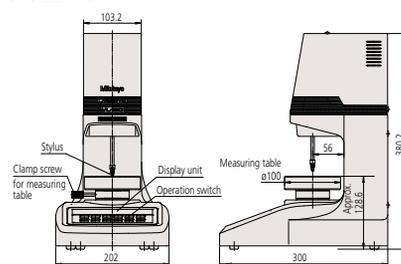
*3 0.15 N, 1 N types are factory-installed option.

Note: Motor life is approximately 100,000 operations, after which replacement is advisable.

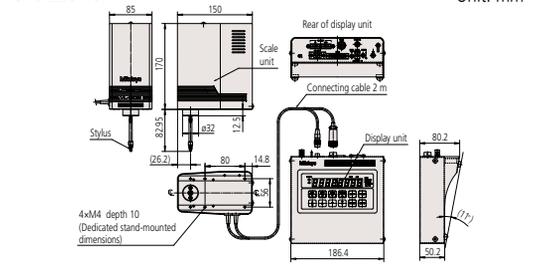
This maintenance factor is particularly important to bear in mind when the machine is used frequently, such as on a production line.

DIMENSIONS

318-221-10A



318-226-10A



Mu-checker

Display Unit (analog/digital) SERIES 519

- Switchable measurement ranges make the Mu-checker suitable for a range of applications, especially those that involve moderately fast-changing measurement values which suit the use of analog readout.
- Single touch zero-set function is standard.
- Two types of analog display are available and one digital type.

Digital Mu-checker

SPECIFICATIONS

Dual Input	
Model	M-562
Order No.	519-562A
Type	Differential type digital Mu-Checker (2 connecting heads)
Display range	± 2.000 mm/ ± 0.2000 mm/ ± 0.08 in/ ± 0.008 in
Resolution	0.001 mm/0.0001 mm/0.00005 in/0.000005 in
Differential mode	$\pm A$, $\pm B$, $\pm A \pm B$
Measurement mode	ABS/CMP
Analog output	± 1 V at full-scale reading
Digital output	Digimatic code out
External dimensions	134 (W) \times 183 (D) \times 208 (H) mm
Mass	Approx. 2.6 kg
Power input	AC adapter 100, 120, 220, 240 V AC 50/60 Hz
Probe	Various probes (refer to pages G-21 and G-22)



Digital Mu-checker

Analog Mu-checker

SPECIFICATIONS

	Dual Input	Single Input
Model	M-554	M-553
Order No.	519-554A	519-552A
Type	Differential type (one/two probes required)	Standard type (one probe required)
Display range	± 5 μ m/ ± 15 μ m/ ± 50 μ m/ ± 150 μ m/ ± 500 μ m/ ± 1500 μ m ± 0.00015 in/ ± 0.0005 in/ ± 0.0015 in/ ± 0.005 in/ ± 0.015 in/ ± 0.05 in	± 5 μ m/ ± 15 μ m/ ± 50 μ m/ ± 150 μ m/ ± 500 μ m/ ± 1500 μ m ± 0.00015 in/ ± 0.0005 in/ ± 0.0015 in/ ± 0.005 in/ ± 0.015 in/ ± 0.05 in
Graduation	0.1 μ m/0.5 μ m/1 μ m/5 μ m/10 μ m/50 μ m 0.000005 in/0.00001 in/0.00005 in/0.0001 in/0.0005 in/0.001 in	0.1 μ m/0.5 μ m/1 μ m/5 μ m/10 μ m/50 μ m 0.00005 in/0.0001 in/0.0005 in/0.001 in/0.005 in/0.01 in
Differential mode	$\pm A$, $\pm B$, $\pm A \pm B$	$\pm A$
Display accuracy (linearity)	$\pm 1\%$ of full-scale reading	
Analog output	± 1.0 V at full-scale reading	
Analog output accuracy	Within $\pm 0.1\%$ of full-scale reading (excluding probe)	
Zero-setting adjustment range	$\pm 15\%$ /FS (error: $\pm 0.2\%$ /FS)	
External dimensions	134 (W) \times 183 (D) \times 208 (H) mm	
Mass	2.4 kg	
Power input	AC adapter 100, 120, 220, 240 V AC 50/60 Hz	
Probe	Various probes (refer to pages G-21 and G-22)	



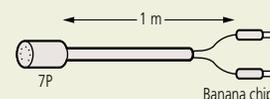
Standard type



Differential type

Optional Accessories

- SPC Cable for connecting digital Mu-checker (**936937**)
Used for connecting to the Digimatic mini-processor.
(Not suitable for analog Mu-checkers)
- Output cable A (**934795**)
Used for connecting to external devices, such as data recorders, etc.



- Analog, limit out (7P) connector (**529035**)
Used for output to external data recorders, sequencers, etc.

Lever/Cartridge Probe Heads SERIES 519 — Electronic Micrometer

Common specifications

- Connection: Half-bridge
- Cable length: 2 m
- Connector type: MAS-5100 (DIN5P) or equivalent

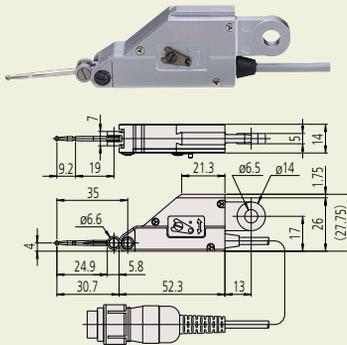
SPECIFICATIONS

Lever heads

Model	MLH-521	MLH-522	MLH-326	MLH-327
Order No.	519-521	519-522	519-326	519-327
Measuring range (mm)	±0.5			
Stroke (mm)	±0.6			±0.65
Measuring force (N)	Approx. 0.2	Approx. 0.02	Approx. 0.15	
Linearity (%)	±0.3			±0.5
Stylus support	Pivot bearing	Pivot bearing	Parallel-leaf spring	Pivot bearing

Note: A $\varnothing 2$ mm ball-ended stylus is supplied as standard with all probes.

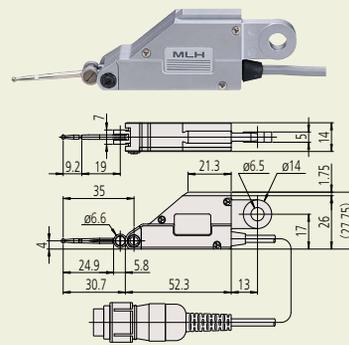
519-521 MLH-521



- Interchangeable styli:
 - ø1: **520940** (Standard accessory)
 - ø2: **520939** (Standard equipment)
 - ø3: **520938** (Standard accessory)

Unit: mm

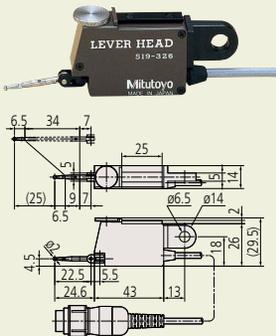
519-522 MLH-522



- Interchangeable styli:
 - ø1: **520940** (Standard accessory)
 - ø2: **520939** (Standard equipment)
 - ø3: **520938** (Standard accessory)

Unit: mm

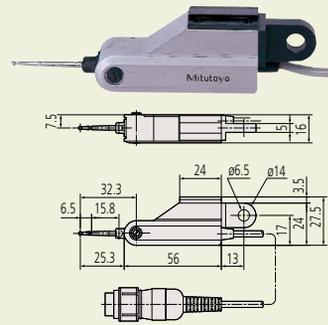
519-326 MLH-326



- Interchangeable styli:
 - ø1: **102824** (Optional)
 - ø2: **102825** (Standard equipment)
 - ø3: **102826** (Optional)
- Extension bar
 - L=9 mm (Standard equipment)
 - L=34 mm (When a bar for extending the distance to the stylus tip is supplied)

Unit: mm

519-327 MLH-327



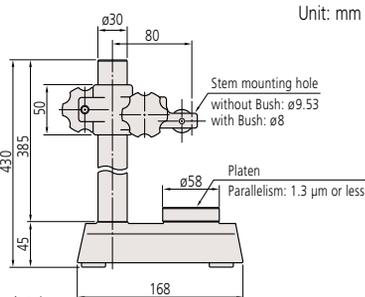
- Interchangeable styli:
 - ø1: **102824** (Optional)
 - ø2: **102825** (Standard equipment)
 - ø3: **102826** (Optional)

Unit: mm

Transfer Stand



519-109-10
(with a serrated plate)



Unit: mm

Main Specifications

Order No.	Effective transfer range (mm)	Fine adjustment range (mm)	Mounting hole (mm)
519-109-10	0 - 320	1	Without Bush: $\varnothing 9.53$ With Bush: $\varnothing 8$

Note on stylus angle

If the stylus of a pivot bearing type probe makes an angle with a workpiece surface, as in the figure, calibration should be performed for accurate measurement. Alternatively, the displayed value may be corrected by multiplying it by the appropriate correction factor as given in the table.

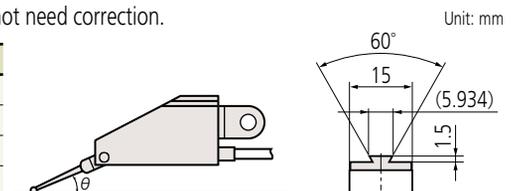
Model **519-326** does not need correction.

Angle (θ)	Correction factor
0°	1.00
10°	0.98
20°	0.94
30°	0.87
40°	0.77
50°	0.64
60°	0.50

Display value \times Correction factor = Corrected value

Dimensions of dovetail plate on probe body

Enables mounting on a lever head mounting bracket or stem.



Unit: mm

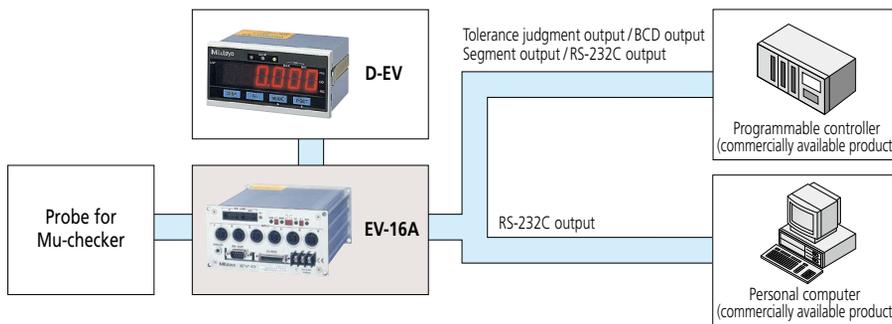
Mu-Checker

EV-16A Counter SERIES 519 — 6-channel, No-display Type

- Up to six probes can be connected to one unit. Up to ten counters can be connected to one personal computer using the RS Link function
- I/O outputs for RS-232C, BCD, tolerance judgment and segment output are available.
- Maximum, minimum and runout measurement between channels (in the same unit) is possible in addition to normal measurement on individual channels.

SYSTEM CONFIGURATION

Mitutoyo probes, **EV-16A** counters and **D-EV** display units combined with commercial controllers and personal computers enable construction of a powerful, multi-channel system that can be built to meet the needs of almost any measurement application.



Unit: mm

SPECIFICATIONS

Model	EV-16A	
Order No.	519-355	
Number of gage inputs	6	
Display range (mm)	$\pm 2.000, \pm 0.200$	
Resolution (mm)	0.001, 0.0001	
Display processing	8 digits for parameters (display setting), 1 for error display	
Error messaging	Power supply voltage error, Gage error, etc.	
External display	Dedicated external display unit D-EV (optional) can be connected	
Number of input switches	4	
Input switch function	Measurement mode switching, Parameter settings	
I/O	Tolerance judgment output	1 to 6 gages (L1, L2, L3), open-collector
	BCD output	Parallel BCD output (positive/negative-true logic), open-collector
	Segment output	A function to enable only output from the terminal corresponding to the counting values, open-collector
	Control output	Normal operation signal (NOM), open-collector
	Control input	Output channel designation (segment, in BCD mode), presetting, peak value clear, range changeover (at segment output), holding counting value, open-collector or no-voltage contact signal (with/without contact point)
Interface	RS-232C	Measurement data output and control input, EIA RS-232C-compatible Use cross cables for home position DTE (terminal definition)
	RS link	Max. connected units: 10 Connecting cable length: Max. 10 m (sum of link cable length) Data transfer time: 1.1 sec./60 ch (when transmission rate is 19200 bps)
Power supply	Voltage	12 to 24 V DC (Terminal block: M3)
	Consumption	1 A
Operating temperature (humidity) ranges	0 to 40 °C (RH 20 to 80%, non-condensing)	
Storage temperature (humidity) ranges	-10 to 50 °C (RH 20 to 80%, non-condensing)	
External dimensions	144 (W) × 72 (H) × 139 (D) mm	
Mass	Approx. 1000 g	
Standard accessories	Fixing foot (4), connecting bracket (4), fixing screw M4×8 (8)	
Applicable probes	For probes, refer to pages G-21 and G-22.	



Main features

- External control (Zero-set, Preset etc.)
- Direction switching
- Error messaging
- Tolerance judgment output
- Each data output (RS-232C, BCD, segment)
- Peak measurement (maximum value, minimum value, runout) and arithmetic operation (addition, average, maximum value, minimum value, maximum width) between axes

Optional Accessories

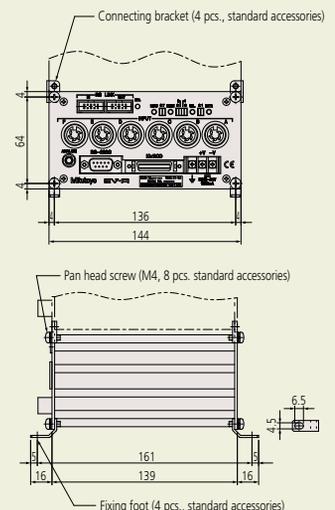
- Output connector: **02ADB440**
 - D-EV External display unit*1: **02ADD400**
 - SPC cable (0.5 m): **02ADD950**
 - SPC cable (1 m): **936937**
 - SPC cable (2 m): **965014**
 - AC adapter: **357651**
 - AC cable: **02ZAA010**
 - Terminal connecting cable: **02ADD930**
- *1 Refer to page G-25 for details of D-EV.

• SENSORPAK



Note: Refer to page G-16 for more details.

DIMENSIONS



Optional Accessories

- AC adapter: **357651**
- AC cable: **02ZAA010**
- Terminal connecting cable: **02ADD930**

D-EV Display Unit for the EV Counter

- Display unit for the **EV** counter.
- Connecting this display unit helps configuration of the **EV** counter.
- Able to display each gage measurement value and Go/No-go judgment result, total Go/No-go judgment result for all gages, setting details and errors.



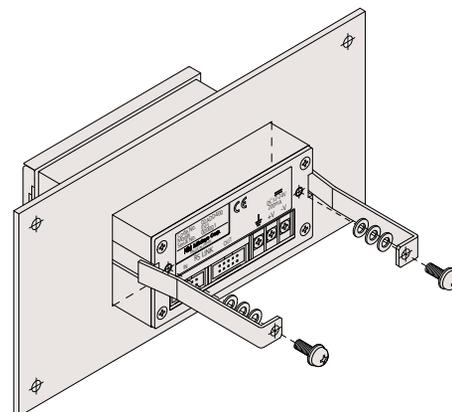
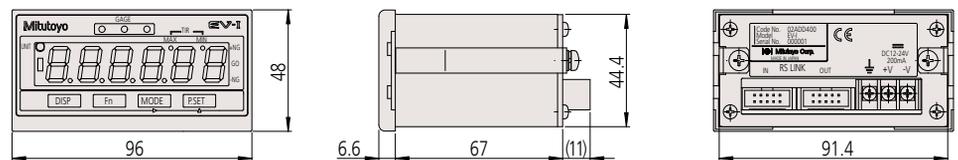
02ADD400

SPECIFICATIONS

Model	D-EV
Order No.	02ADD400
Number of connections	1 EV counter per unit
Number of digits	Sign plus 6 digits (8 digits internal to EV counter)
LED display	Channel display (also for judgment result display): 3 (3-color LED) Measurement mode display (current data, maximum value, minimum value, runout): 2 Status display: 1 (2 colors)
Operation switches	4
Function of operation switch	Channel switching, measurement mode switching (current data, maximum value, minimum value, runout), parameter setting, presetting, tolerance setting
Input/output	RS Link connectors: 1 each for IN, OUT
Error message	Overspeed, gage error etc.
Power supply	12 to 24 V DC, 200 mA (Terminal block: M3)
Operating temperature (humidity) ranges	0 to 40 °C (RH 20 to 80%, non-condensing)
Storage temperature (humidity) ranges	-10 to 50 °C (RH 20 to 80%, non-condensing)
External dimensions	96 (W) x48 (H) x84.6 (D) mm
Mass	150 g

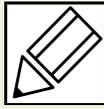
DIMENSIONS

Unit: mm



Need Service?

Quick Guide to Precision Measuring Instruments



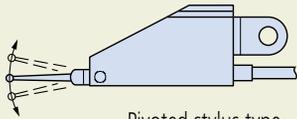
Mu-checker

Probe

A sensor that converts movement of a contact point, on a stylus or plunger, into an electrical signal.

Lever probes

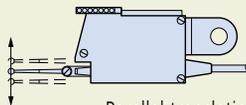
Lever probes are available in two types. The most common type uses a pivoted stylus so the contact point moves in a circular arc; this type is subject to cosine effect and, therefore, measurements may require linearity correction if the direction of measurement is much different to the direction of movement of the contact point. The less common type uses a parallel translation leaf-spring mechanism so contact point movement is linear; this type requires no correction.



Pivoted stylus type

519-521 (measuring direction can be switched with the up/down lever)

519-522 (measuring direction is not switchable)

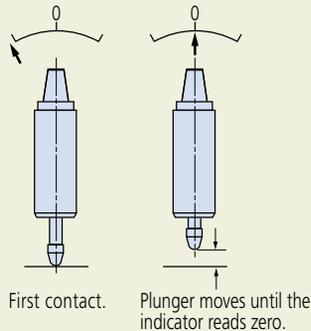


Parallel translation type

519-326 (measuring direction can be switched with the upper dial)

Pre-travel

The distance from first contact with a workpiece until the measurement indicator reads zero.



Measuring force

The force applied to the workpiece by the probe when the indicator registers zero. It is indicated in newtons (N).

Digimatic code

A communication protocol for connecting the output of measuring tools with various Mitutoyo data processing units. This allows output connection to a Digimatic Mini Processor **DP-1VA LOGGER** for performing various statistical calculations and creating histograms, etc.

Open-collector output

A direct connection to the collector of a driving transistor.

Comparative measurement

A measurement method where a workpiece dimension is found by measuring the difference in size between the workpiece and a master gage that represents the nominal dimension.

This method is usually applied when the measurement to be made is greater than the measuring range of the instrument.

Linearity

The ratio of proportionality between measuring system output and measured distance.

If this is not constant within acceptable limits then correction is required.

0 (zero) point

A reference point on the master gage in a comparative measurement.

Sensitivity

The ratio of the electric micrometer output signal to the input signal to the amplifier. The sensitivity is normal if a value as expected from the given displacement is displayed.

Tolerance setting

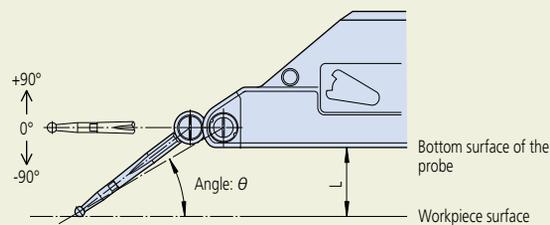
Tolerance limits can be set on the electronic micrometer to provide an automatic judgment as to whether a measured value falls within the tolerance.

Lever-head angle

Before measurement, be sure to confirm that probe sensitivity adjustment has been completed.

Changing the probe angle will cause variation in the measured values. Adjust the probe angle to obtain an optimum sensitivity before starting measurement. If it is difficult, adjust the sensitivity with the probe angle set to 0°, and after measurement, correct the measured values according to the actual probe angle (by multiplying the measured value by a correction factor).

Tips Correction using a correction factor may result in lower accuracy than when adjusting sensitivity with the actual probe angle.



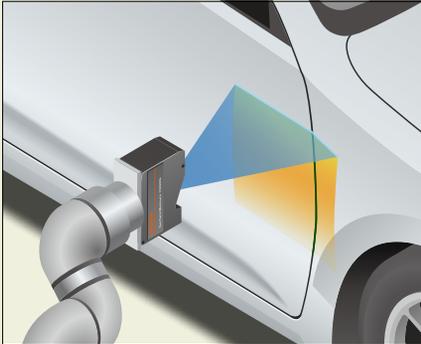
Angle: θ	Distance from the workpiece surface: L*	Correction factor
0°	—	1.00
10°	Approx. 3.1 mm	Approx. 0.98
20°	Approx. 8.8 mm	Approx. 0.94
30°	Approx. 13.9 mm	Approx. 0.87
40°	Approx. 18.3 mm	Approx. 0.77
50°	Approx. 21.6 mm	Approx. 0.64
60°	Approx. 23.8 mm	Approx. 0.50

* Value when using a carbide probe with spherical diameter of $\phi 2$ that is installed before shipment. When using a $\phi 1$ (or $\phi 3$) carbide probe, subtract (or add) 1/2 of the difference in spherical diameter.

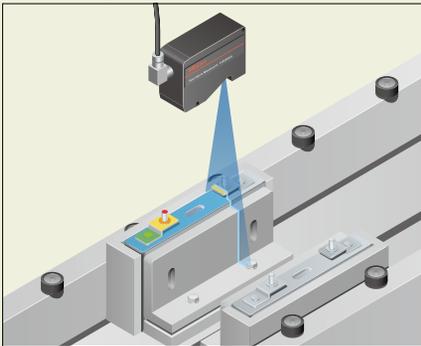
Non-contact Sensors

APPLICATIONS

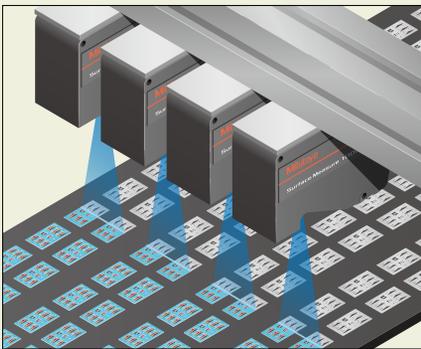
Automobile industry
Panel gap inspection



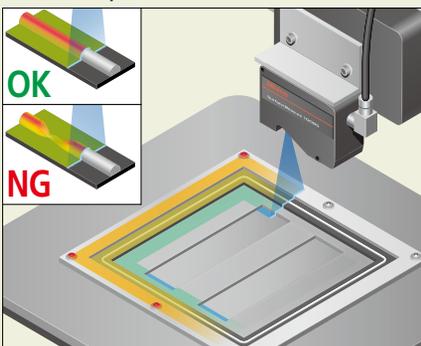
Electric vehicle battery industry:
Cell assembly inspection



Electrical and electronic industries
Connector pin inspection



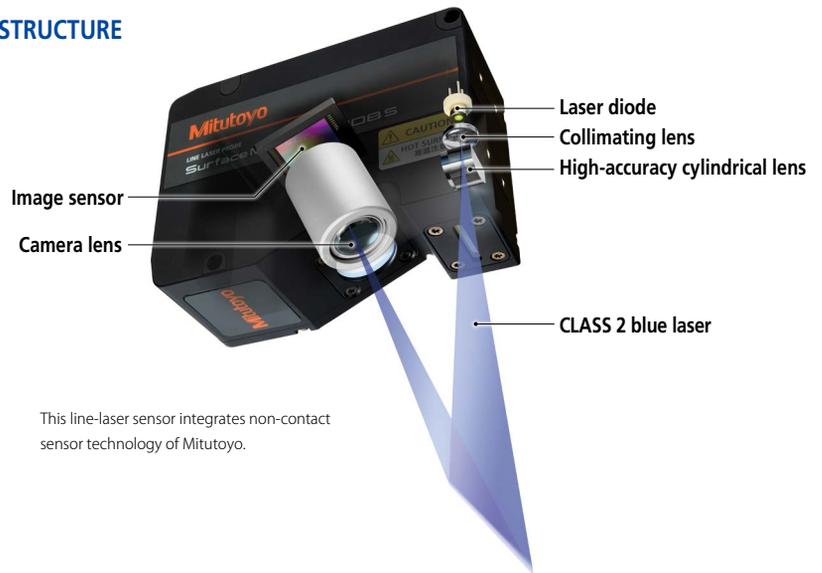
Electrical and electronic industries
Adhesive inspection



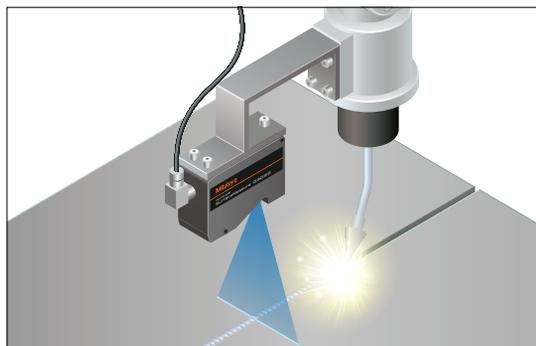
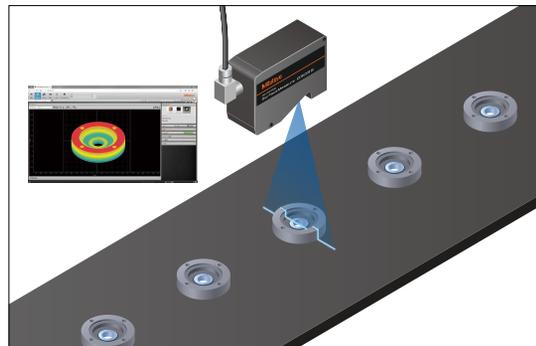
SurfaceMeasure-S Series

- The sensor itself is guaranteed for accuracy and has a Z-axis repeatability of 0.5 μm or less. It has also achieved the IP67 protection level, providing stable measurements.
- The SurfaceMeasure-S Series can obtain the profiles and three-dimensional shapes of measurement workpieces at high speed (a maximum frame rate of 10 kHz) and make an automatic judgement inside the sensor.
- It is also equipped with a parts matching function that allows the measurement tool to be applied throughout, regardless of the orientations of the parts being measured. Measurements can be taken without performing alignment.
- The software supports intuitive operation and is built into the sensor (software installation is not required), so you can use it immediately after mounting.

PRODUCT STRUCTURE



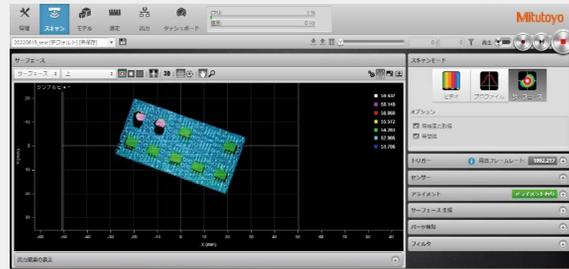
This line-laser sensor integrates non-contact sensor technology of Mitutoyo.



Non-contact Sensors

SOFTWARE

Powerful interface with excellent operability and functionality



- Excellent operability simply by using a mouse
- Simple and intuitive interface
- Web browser-based, no need to install software
- Various built-in measurement tools
- 2D and 3D data can be obtained



Easy-to-configure measuring system

Measurement tool

A variety of measurement tools are available.



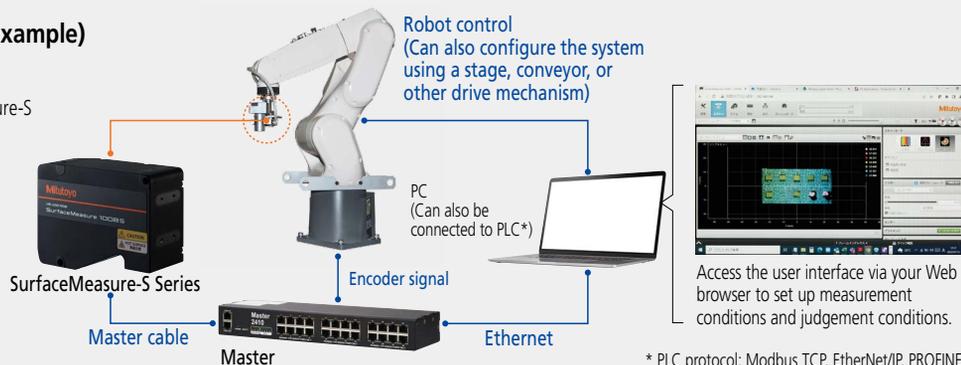
Emulator

Using the emulator makes it possible to consider measurement conditions or make an analysis with obtained data even when offline.

SYSTEM

System configuration (example)

This is an example of the system configuration of the SurfaceMeasure-S Series. Various other system configurations are also available.



Need Calibration?



SPECIFICATIONS

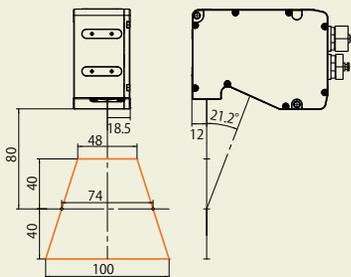
Model	1008S	0303S	2929S
Order No.	553-100	553-110	553-120
Maximum measuring width	100 mm	32.5 mm	292 mm
Measuring range	80 mm	25 mm	290 mm
Working distance	80 mm	60 mm	299.5 mm
Scanning error (1 σ) *1	20 μ m	9 μ m	65 μ m
Z axis repeatability	0.5 μ m	0.4 μ m	1.2 μ m
Frame rate	Max. 10 kHz		
Laser class	EN / IEC	CLASS 2 (IEC 60825-1:2014, EN 60825-1:2014+A11:2021)	
	JIS	CLASS 2 (JIS C 6802: 2014)	
Line laser	Laser medium	Semiconductor laser	
	Wavelength	405 nm (visible)	
	Max. output	2.2 mW	
Mass	650 g		1480 g
Operating environment	Temperature	0 °C to 40 °C	
	Humidity	RH 20 to 80%, non-condensing	
Storage environment	Temperature	-30 °C to 70 °C	
	Humidity	RH 20 to 95%, non-condensing	
IP code	IP 67 *2		
Power supply (power consumption)	24 to 48 VDC (15 W)		

*1 Accuracy inspection environment:
 Temperature 20 °C \pm 1 °C, Humidity
 50%RH \pm 10%RH
 Measurement workpieces: Specified refer-
 ence ball for inspection (ϕ 25 mm)
 Inspection method: Determined by
 Mitutoyo-specified inspection method.
 The operating environment and the
 storage environment are different from
 the guaranteed accuracy environment.
 *2 Measuring accuracy may deteriorate if any
 water droplet or dust particle adheres to
 the optical path.

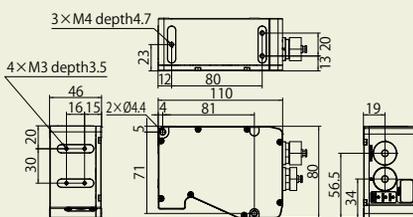
DIMENSIONS

SurfaceMeasure1008S

Measuring range

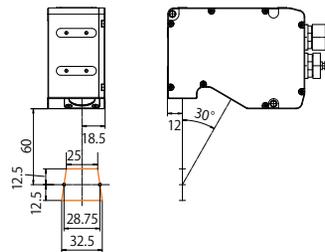


Mounting size

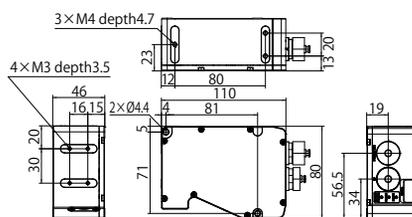


SurfaceMeasure0303S

Measuring range

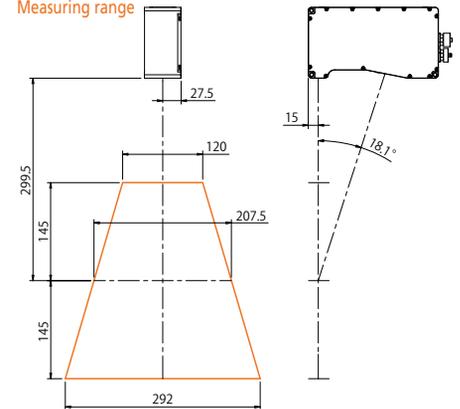


Mounting size

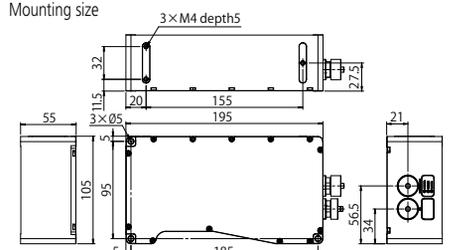


SurfaceMeasure2929S

Measuring range



Mounting size



Unit: mm

Non-contact Sensors



Master810



Master2410

Order No.	Product Name	Remarks
02AQL401	Master810	Accepting a maximum of 8 sensors
02AQL402	Master2410	Accepting a maximum of 24 sensors

Specifications	
Sensor side	M16 connector (Straight or 90° upward-pointing can be selected)
Power supply side	RJ45 (Connect to Master)
Communication side	RJ45 (Ethernet connection)

Order No.	Product Name	Remarks
02AQL373	2 m Power and Ethernet Master	2×RJ45 ends
02AQL374	5 m Power and Ethernet Master	2×RJ45 ends
02AQL375	10 m Power and Ethernet Master	2×RJ45 ends
02AQL376	15 m Power and Ethernet Master	2×RJ45 ends
02AQL377	20 m Power and Ethernet Master	2×RJ45 ends
02AQL378	25 m Power and Ethernet Master	2×RJ45 ends
02AQL391	2 m Power and Ethernet Master 90deg	2×RJ45 ends, 90° connector
02AQL392	5 m Power and Ethernet Master 90deg	2×RJ45 ends, 90° connector
02AQL393	10 m Power and Ethernet Master 90deg	2×RJ45 ends, 90° connector
02AQL394	15 m Power and Ethernet Master 90deg	2×RJ45 ends, 90° connector
02AQL395	20 m Power and Ethernet Master 90deg	2×RJ45 ends, 90° connector
02AQL396	25 m Power and Ethernet Master 90deg	2×RJ45 ends, 90° connector

Specifications	
Sensor side	M16 connector (Straight or 90° upward-pointing can be selected)
Power supply side	Flying lead
Communication side	RJ45 (Ethernet connection)

Order No.	Product Name	Remarks
02AQL367	2 m Power and Ethernet	1×Open wire end, 1×RJ45 end
02AQL368	5 m Power and Ethernet	1×Open wire end, 1×RJ45 end
02AQL369	10 m Power and Ethernet	1×Open wire end, 1×RJ45 end
02AQL370	15 m Power and Ethernet	1×Open wire end, 1×RJ45 end
02AQL371	20 m Power and Ethernet	1×Open wire end, 1×RJ45 end
02AQL372	25 m Power and Ethernet	1×Open wire end, 1×RJ45 end
02AQL385	2 m Power and Ethernet 90deg	1×Open wire end, 1×RJ45 end, 90° connector
02AQL386	5 m Power and Ethernet 90deg	1×Open wire end, 1×RJ45 end, 90° connector
02AQL387	10 m Power and Ethernet 90deg	1×Open wire end, 1×RJ45 end, 90° connector
02AQL388	15 m Power and Ethernet 90deg	1×Open wire end, 1×RJ45 end, 90° connector
02AQL389	20 m Power and Ethernet 90deg	1×Open wire end, 1×RJ45 end, 90° connector
02AQL390	25 m Power and Ethernet 90deg	1×Open wire end, 1×RJ45 end, 90° connector

Specifications	
NVIDIA module	Jetson Xavier NX
CPU	6-core NVIDIA Carmel ARM v8.2
GPU	Volta GPU, 384 CUDA core, 48 Tensor core
Memory	Onboard 8 GB LPDDR4
Storage	Onboard 16 GB eMMC
I/O	2-port Ethernet
Power supply	12 to 24 V, Max. 15 W
Weight	2.1 kg
Operating temperature	-15 to 55°C
Mounting	DIN rail, wall mounting

Order No.	Product Name	Remarks
02AQL420	GoMax NX	Power plug type: B UL•CSA•PSE 

Sensor networking hub Master

Device used for distributing power to sensors and synchronizing the sensors in the multi-sensor system
Input: Power supply 24 to 48 V, Laser Enable input, Encoder input, External input

Master cable

Cable for the connection between sensor and Master



Power and Ethernet cable

Cable to supply and control power without using the Master for the sensor



GoMax NX

Arithmetic unit to accelerate measurement processing without a PC



Specifications	
Sensor side	M16 connector (Straight or 90° upward-pointing can be selected)
I/O device side	Flying lead
Encoder input	(2-phase square-wave signals Phase A, Phase B, Phase Z), Trigger input, Digital output, RS-485 output

Note: Sensors cannot be synchronized by the signals input to and output from each sensor through this cable.

Order No.	Product Name	Remarks
02AQL361	2 m I/O	Open wire end
02AQL362	5 m I/O	Open wire end
02AQL363	10 m I/O	Open wire end
02AQL364	15 m I/O	Open wire end
02AQL365	20 m I/O	Open wire end
02AQL366	25 m I/O	Open wire end
02AQL379	2 m I/O 90deg	Open wire end, 90° connector
02AQL380	5 m I/O 90deg	Open wire end, 90° connector
02AQL381	10 m I/O 90deg	Open wire end, 90° connector
02AQL382	15 m I/O 90deg	Open wire end, 90° connector
02AQL383	20 m I/O 90deg	Open wire end, 90° connector
02AQL384	25 m I/O 90deg	Open wire end, 90° connector

I/O cable

Cable to connect the external I/O device to the sensor



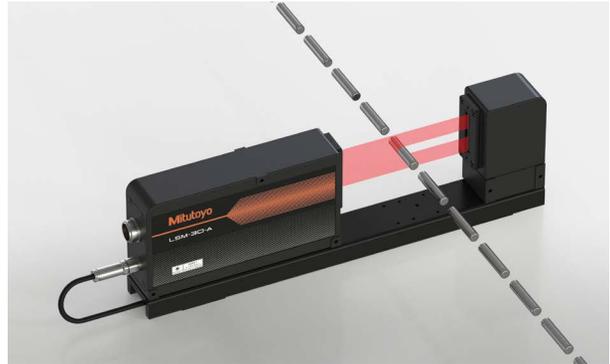
In-line, Non-contact Measuring System / Laser Scanning Micrometer

APPLICATION

Catheter and magnetic wire measurements



Roller bearing measurements



Simultaneous measurements of roller outer diameter and deflection

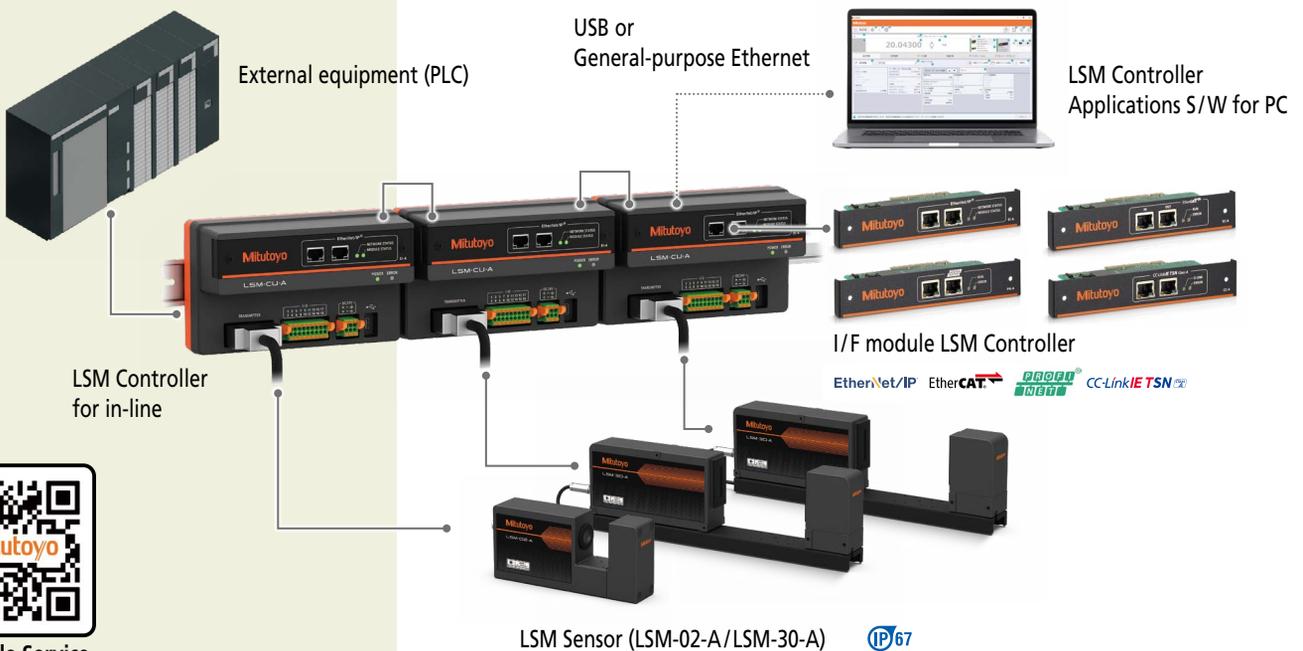


Film sheet thickness measurements



Note: The laser in the image is for illustrative purposes only.

SYSTEM CONFIGURATION



Schedule Service

LSM Sensor (LSM-02-A/LSM-30-A) IP67

Laser Micrometers

Laser Scanning Micrometer



LSM-30-A

LSM-02-A

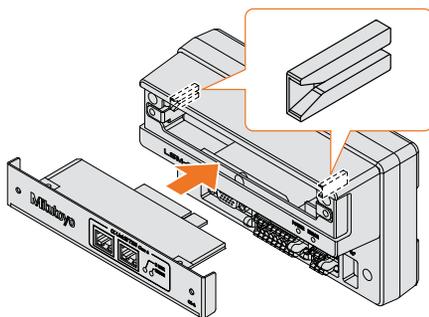
- Proven accuracy developed by one of the most reputable precision measurement instrument manufacturers.
- Guaranteed repeatability of 2σ
 - LSM-02-A** ($\varnothing 1$ mm): $\pm 0.015 \mu\text{m}$
 - LSM-30-A** ($\varnothing 10$ mm): $\pm 0.06 \mu\text{m}$
- Guaranteed linearity:
 - LSM-02-A**: $\pm 0.3 \mu\text{m}$
 - LSM-30-A**: $\pm 1.0 \mu\text{m}$
- Compact body for **LSM-02-A**, ensuring versatile installation.
- **LSM-30-A** is a separable sensor with an emission/reception unit that can be used independently.
- Equipped with an ultra-fine wire measurement mode, capable of measuring outer diameters as small as $5 \mu\text{m}$.
- **IP67** rated for durability.
- High-accuracy scanning facilitated by a precision motor.
- Scanning rate: **3,200** scans/s



LSM-CU-A

I/F module

- Choose from four interface types to match your production line requirements.
- Controller design allows for module insertion without altering the layout.



EtherNet/IP



PROFINET



EtherCAT



CC-Link I/ETSN



- Compact, thin design to fit seamlessly into distribution boards or equipment.
- Entire unit, including the cable, can be stored within a 100 mm deep distribution board.
- Tool-free mounting on a DIN rail.
- Equipped with USB Type-C, I/O ports, and optional industrial interfaces.
- Standard configuration software included for user-friendly setup.
- Unit can be rotated 90 degrees for flexible layout options.



Laser Micrometers

SENSOR UNIT — COMPATIBLE WITH 544-121 CONTROLLER (NOT COMPAT. W/LSM-6200) SPECIFICATIONS

Optional Packages

64PKA299	2 mm LSM basic package
64PKA300	2 mm LSM package with tablet
64PKA301	30 mm LSM basic package
64PKA302	30 mm LSM package with tablet
64PKA303	40-90 mm dual LSM kit with tablet
64PKA304	90-140 mm dual LSM kit with tablet
64PKA305	140-180 mm dual LSM kit with tablet
64PKA306	40-90 mm dual LSM kit with tablet
64PKA307	90-140 mm dual LSM kit with tablet
64PKA308	140-180 mm dual LSM kit with tablet

Optional Accessories

02AGD490	Adjustable workstage - 544-124
02AGD270	Workstage - 544-124
02AGD110	Calibration gage set - 544-123
02AGD130	Calibration gage set - 544-124
02AGD200	Wire guiding pulley - 544-123
02AGQ450	Air shield
02AGQ452	Laser beam stabilization shield
02AGN780A	5m Extension signal cable
02AGD420	Additional V-block for 02AGD490
02AGD430	Additional Stop for 02AGD490

Model	LSM-02-A	LSM-30-A
Order No.	544-123	544-124
Measuring range	0.005 to 2 mm 0.05 to 2 mm	0.3 to 30 mm
Resolution	0.01 μ m	0.01 μ m
Repeatability (2)	Full range Middle range	\varnothing 30 mm: \pm 0.09 μ m \varnothing 10 mm: \pm 0.06 μ m
Linearity	\pm 0.3 μ m	Whole range: \pm 1.0 μ m Narrow range: \pm (0.6+0.1 \angle D) μ m
Positional error	\pm 0.4 μ m	Full range (10 \times 30): \pm 1.8 μ m Middle range (5 \times 20): \pm 1.0 μ m
Measuring region	1 \times 2 [optical axis depth] \times [scanning width] mm	10 \times 30 [optical axis depth] \times [scanning width] mm
Number of scans for averaging	16 to 2048 scans	1 to 2048 scans
Laser Class	Semiconductor laser: CLASS 1 (Max. output: 1.0 mW, Laser wavelength: 650 nm)	
Scanning rate	3200 scans/s	
Laser scanning speed	76 m/s	226 m/s
Protection level	IP67	
Distance between the emission unit and reception unit	-	Standard: 130 mm, Max.: 350 mm
Operating environment	Temperature: 0 $^{\circ}$ C to 40 $^{\circ}$ C, Humidity: 35%RH to 85%RH (non-condensing) Altitude: 2000 m or less	
Storage temperature	Temperature: -10 $^{\circ}$ C to 50 $^{\circ}$ C, Humidity: 35%RH to 85%RH (non-condensing)	
CE Marking/UKCA Marking	EMC Directive: EN IEC 61326-1, Immunity test requirements: Clause 6.2 Table 2 Emission limit: Class A RoHS Directive: EN IEC 63000	
Standard accessory	Signal cable: 02AGQ190 CD (User's Manual): 02AGQ039	

CONTROLLER — COMPATIBLE WITH 544-123, 544-124 (NOT COMPAT. W/544-5XX) SPECIFICATIONS

Model	LSM-CU-A	
Order No.	544-121 (mm/inch switchable type)	
Measuring functions	Segment mode	1 to 7 (1 to 3, transparent)
	Edge mode	1 to 255
	Averaging method	Arithmetic average: from 1 to 2048, Moving average: from 32 to 2048
Standard I/F	Indicator	[POWER] LED (green), [ERROR] LED (red)
	Signal cable connector	Mini D-Sub (15 pins)
	USB connector	Type-C
	I/O connector	Separate terminal block (18 pins)
Power supply	I/O connector	Separate terminal block (6 pins)
	Power supply connector	DC+24 V \pm 10%, 3.0 A or more
Operating temperature	Temperature: 0 $^{\circ}$ C to 50 $^{\circ}$ C, Humidity: 20%RH to 80%RH (non-condensing) Altitude: 2000 m or less	
Storage temperature	Temperature: -10 $^{\circ}$ C to 60 $^{\circ}$ C, Humidity: 20%RH to 80%RH (non-condensing)	
Mass	Approx. 550 g	
CE Marking/UKCA Marking	EMC Directive: EN IEC 61326-1, Immunity test requirements: Clause 6.2 Table 2 Emission limit: Class A RoHS Directive: EN IEC 63000	
Standard accessory	Socket for I/O terminal block: D800-396 , Socket for power supply terminal block: D827-827 Grounding wire (4 m): 02AGQ068 CD (LSMPAK installer, User's Manual): 02NGA070	



Need Integration Help?

Laser Micrometers

INTERFACE UNIT SPECIFICATIONS

Model		LSM-EI-A	LSM-EC-A
Order No.		02AGQ300	02AGQ370
Communication standards		EtherNet/IP	EtherCAT
Interface	LED	NETWORK STATUS Indicator: Dual Color LED1 (red/green)	RUN Indicator: Single Color LED1 (green)
		MODULE STATUS Indicator: Dual Color LED1 (red/green)	ERROR Indicator: Single Color LED1 (red)
	RJ45 connector	2 channels	
Ethernet communication	Communication port	RJ45 x 2	
	Communication speed	100 Mbps Full duplex	
	Cable used	Cat.5e or more STP cable	

Model		LSM-PN-A	
Order No.		02AGQ350	
Communication standards		PROFINET	
Interface	LED	RUN Indicator: Dual Color LED1 (red/green)	
		ERROR Indicator: Dual Color LED1 (red/green)	
	RJ45 connector	2 channels	
Ethernet communication	Communication port	RJ45 x 2	
	Communication speed	100 Mbps Full duplex	
	Cable used	Cat.5e or more STP cable	
PROFINET function	PROFINET RT	Conformance class B PROFINET device Media redundancy protocol (MRP) client Multicast provider and subscriber	
	Min. cycle time	2 msec	
	Maximum number of connections (ARs*1)	2	
	Number of CRs*2 per connected controller	For cyclic data: 2, For parameter setting: 1	

Model		LSM-CC-A	
Order No.		02AGQ390	
Communication standards		CC-Link IE TSN	
Interface	LED	D Link: Dual Color LED1 (red/green)	
		ERROR: Single Color LED1 (red)	
	RJ45 connector	2 channels	
Ethernet communication	Communication port	RJ45x2	
	Communication speed	100 Mbps Full duplex	
	Cable used	Cat 5e or more STP cable	
CC-Link IE TSN function	CC-Link IE TSN	Class A remote station	
	Min. cycle time	1 msec	

*1 AR: Application Relation, Type of AR: Device Access

*2 CR: Communication Relation

EtherNet/IP



EtherCAT



PROFINET



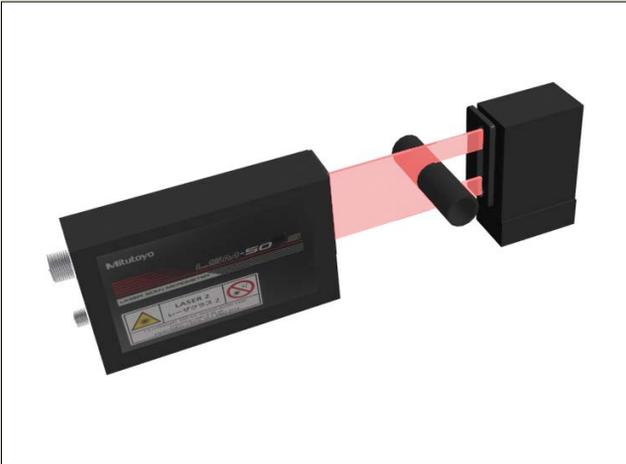
CC-Link IE TSN



Find Training

Measurement Examples

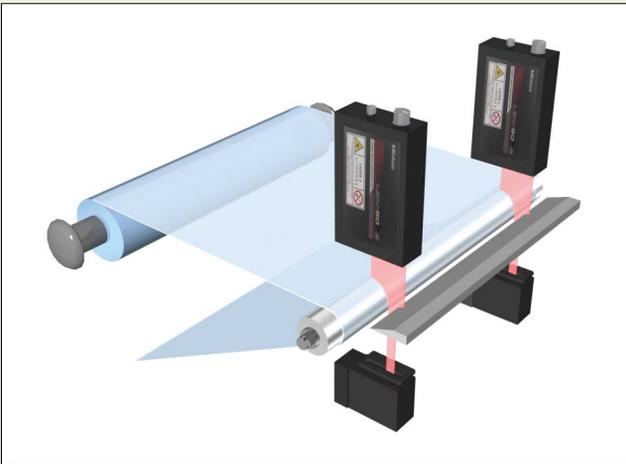
Measurement of outside diameter of rubber roll



Simultaneous measurement of roller outside diameter and deflection



Measurement of uneven thickness of film or sheet (simultaneous measurement)



Measurement of gap between rollers



Measurement of film sheet thickness



Dual system for measuring a large outside diameter



Laser Scan Micrometer

LSM-500S Measuring Unit SERIES 544 — 5 μm to 2 mm Measuring Unit

- Capable of measuring down to 5 μm outside diameter.
- Provides ultra-high accuracy of ±0.3 μm over the entire measuring range (5 μm to 2 mm).



SPECIFICATIONS

Order No. (Laser only)	544-532	
Package No. (with LSM 6200 Display)	64PKA117	
Applicable laser standards	IEC, FDA	
User's manual	English version	
Measuring range	.0002" to .080" (0.005 to 2mm)*1	
Resolution	.00001" to .0005" (0.01 to 10μm) (selectable)	
Repeatability*2	±0.03μm	
Accuracy (20°C)*3	±0.3μm	
Positional error*4	±0.4μm	
Measuring area*5	1×2mm (0.005 to 2mm)	
Scanning rate	3200 scans/s	
Laser wavelength	650nm (Visible)	
Laser scanning speed	76m/s	
Operating environment	Temperature	0 to 40°C
	Humidity	RH 35 to 85% (no condensation)
Protection Level	IP64*6	

*1: The measuring range for the transparent object will be 0.05mm to 2mm. Please consult your local Mitutoyo office for objects smaller than 0.05mm. The measuring range will be 0.1mm to 2mm in the 1 to 255 edge measurement mode or when activating the automatic workpiece detection. If using the optional dual-connection unit for LSM-6200, the measuring range will be 0.05mm to 2mm.

*2: Determined by the value of ±2σ (σ: standard deviation) when measuring ø2mm at the interval of 0.32 sec. (average 1024 times).

*3: Center of the measuring range for cylindrical workpieces outside diameter.

*4: An error of the outside diameter due to variation in workpiece position either in the optical axis direction or in the scanning direction.

*5: The area given by [optical axis direction]×[scanning direction].

*6: If the workpiece or glass of the measuring unit window is soiled by water or dust, the unit may malfunction.

Note: When using extra-fine line measurement function (FINE), guide messages for setting the following will not be displayed: dual-measurement, segment designation, automatic workpiece detection and group judgment.

LSM-501S Measuring Unit SERIES 544 — 50 μm to 10 mm Measuring Unit

- Provides ultra-high accuracy of ±0.5 μm over the entire measuring range (0.05 to 10 mm).
- The industry's first narrow-range accuracy performance in this measuring range of ±(0.3+0.1ΔD) μm is available for high-accuracy measurement.



SPECIFICATIONS

Order No. (Laser only)	544-534	
Package No. (Laser w/LSM 6200 display)	64PKA118	
Applicable laser standards	IEC, FDA	
User's manual	English version	
Measuring range	.002" to .4" (0.05 to 10mm)	
Resolution	.000001" to .0005" (0.01 to 10μm) (selectable)	
Repeatability*1	±0.04μm	
Accuracy*2 (20°C)	Whole range	±0.5μm
	Small range	±(0.3+0.1ΔD)μm*3
Positional error*4	±0.5μm	
Measuring area*5	2×10mm (ø0.05 to ø0.1mm) 4×10mm (ø0.1 to ø10mm)	
Scanning rate	3200 scans/s	
Laser wavelength	650nm (Visible)	
Laser scanning speed	113m/s	
Operating environment	Temperature	0 to 40°C
	Humidity	RH 35 to 85% (no condensation)
Protection Level	IP64*6	

*1: Determined by the value of ±2σ (σ: standard deviation) when measuring ø10mm at the interval of 0.32 sec. (average 1024 times).

*2: Center of the measuring range for cylindrical workpieces outside diameter.

*3: ΔD=Difference in diameter between the master gage and workpiece (Unit: mm)

*4: An error of the outside diameter due to variation in workpiece position either in the optical axis direction or in the scanning direction.

*5: The area given by [optical axis direction]×[scanning direction].

*6: The protection level provided for the interior. If the workpiece or glass of the measuring unit window is soiled by water or dust, the unit may malfunction.

Optional Accessories

- Multifunctional display unit, **LSM-6200**:

Order No.	Display type	Remarks
542-072A	English mm/in	English user's manual

- Panel-mount type display unit, **LSM-5200**:

Order No.	Remarks
544-047	English user's manual

- Standard calibration gage set (ø0.1, ø2.0): **02AGD110**
- Guide pulley: **02AGD200**
- Air blower: **02AGD220**
- Extension signal cable (max. 15 m)

Order No.	Cable length
02AGN780A	5 m
02AGN780B	10 m
02AGN780C	15 m



Schedule Service

Optional Accessories

- Multifunctional display unit, **LSM-6200**:

Order No.	Display type	Remarks
542-072A	English mm/in	English user's manual

- Panel-mount type display unit, **LSM-5200**:

Order No.	Remarks
544-047	English user's manual

- Standard calibration gage set (ø0.1, ø10.0): **02AGD120**
- Wire guiding pulley: **02AGD210**
- Adjustable workstage: **02AGD400**
- Air blower: **02AGD230**
- Workstage: **02AGD270**
- Extension signal cable (max. 15 m)

Order No.	Cable length
02AGN780A	5 m
02AGN780B	10 m
02AGN780C	15 m

- Extension relay cable

Order No.	Cable length
02AGC150A	1 m

Laser Scan Micrometer

Optional Accessories

- Multifunctional display unit, **LSM-6200**:

Order No.	Display type	Remarks
542-072A	English mm/in	English user's manual

- Panel-mount type display unit, **LSM-5200**:

Order No.	Remarks
544-047	English user's manual

- Standard calibration gage set ($\phi 1.0, \phi 30.0$): **02AGD130**
- Adjustable workstage: **02AGD490**
- Air blower: **02AGD240**
- Workstage: **02AGD270**
- Extension signal cable (max. 25 m)

Order No.	Cable length
02AGN780A	5 m
02AGN780B	10 m
02AGN780C	15 m
02AGN780D	20 m

- Extension relay cable (max. 5 m)

02AGC150A	1 m
02AGC150B	3 m
02AGC150C	5 m

Optional Accessories

- Multifunctional display unit, **LSM-6200**:

Order No.	Display type	Remarks
542-072A	English mm/in	English user's manual

- Panel-mount type display unit, **LSM-5200**:

Order No.	Remarks
544-047	English user's manual

- Standard calibration gage set ($\phi 0.1, \phi 60.0$): **02AGD140**
- Adjustable workstage: **02AGD520**
- Air blower: **02AGD250**
- Extension signal cable (max. 25 m)

Order No.	Cable length
02AGN780A	5 m
02AGN780B	10 m
02AGN780C	15 m
02AGN780D	20 m

- Extension relay cable (max. 5 m)

02AGC150A	1 m
02AGC150B	3 m
02AGC150C	5 m

LSM-503S Measuring Unit SERIES 544 — 0.3 mm to 30 mm Measuring Unit

- Ensures $\pm 1.0 \mu\text{m}$ accuracy over the entire measuring range (0.3 to 30 mm).
- The industry's first narrow-range accuracy performance in this measuring range of $\pm(0.6+0.1\Delta D) \mu\text{m}$ is available for high-accuracy measurement.



SPECIFICATIONS

Order No. (Laser only)	544-536	
Package No. (Laser w/LSM 6200 display)	64PKA119	
Applicable laser standards	IEC, FDA	
User's manual	English version	
Measuring range	.012" to 1.18" (0.3 to 30mm)	
Resolution	.000001" to .005" (0.02 to 100 μm) (selectable)	
Repeatability*1	$\pm 0.11 \mu\text{m}$	
Accuracy*2 (20°C)	Whole range	$\pm 1.0 \mu\text{m}$
	Small range	$\pm(0.6+0.1\Delta D) \mu\text{m}^*3$
Positional error*4	$\pm 1.5 \mu\text{m}$	
Measuring area*5	10x30mm (0.3 to 30mm)	
Scanning rate	3200 scans/s	
Laser wavelength	650nm (Visible)	
Laser scanning speed	226m/s	
Operating environment	Temperature	0 to 40°C
	Humidity	RH 35 to 85% (no condensation)
Protection Level	IP64*6	

*1: Determined by the value of $\pm 2\sigma$ (σ : standard deviation) when measuring $\phi 30\text{mm}$ at the interval of 0.32 sec. (average 1024 times).

*2: Center of the measuring range for cylindrical workpieces outside diameter.

*3: ΔD =Difference in diameter between the master gage and workpiece (Unit: mm).

*4: An error of the outside diameter due to variation in workpiece position either in the optical axis direction or in the scanning direction.

*5: The area given by [optical axis direction]x[scanning direction].

*6: The protection level provided for the interior. If the workpiece or glass of the measuring unit window is soiled by water or dust, the unit may malfunction.

LSM-506S Measuring Unit SERIES 544 — 1 mm to 60 mm Measuring Unit

- Ensures $\pm 3 \mu\text{m}$ accuracy over the entire measuring range (1 to 60 mm).
- The industry's first narrow-range accuracy performance in this measuring range of $\pm(1.5+0.5\Delta D) \mu\text{m}$ is available for high-accuracy measurement.



SPECIFICATIONS

Order No. (Laser only)	544-538	
Package No. (Laser w/ LSM 6200 display)	64PKA120	
Applicable laser standards	IEC, FDA	
User's manual	English version	
Measuring range	.040" to 2.36" (1 to 60mm)	
Resolution	.000002" to .005" (0.05 to 100 μm) (selectable)	
Repeatability*1	$\pm 0.36 \mu\text{m}$	
Accuracy*2 (20°C)	Whole range	$\pm 3 \mu\text{m}$
	Small range	$\pm(1.5+0.5\Delta D) \mu\text{m}^*3$
Positional error*4	$\pm 4 \mu\text{m}$	
Measuring area*5	20x60mm (1 to 60mm)	
Scanning rate	3200 scans/s	
Laser wavelength	650nm (Visible)	
Laser scanning speed	452m/s	
Operating environment	Temperature	0 to 40°C
	Humidity	RH 35 to 85% (no condensation)
Protection Level	IP64*6	

*1: Determined by the value of $\pm 2\sigma$ (σ : standard deviation) when measuring $\phi 60\text{mm}$ at the interval of 0.32 sec. (average 1024 times).

*2: Center of the measuring range for cylindrical workpieces outside diameter.

*3: ΔD =Difference in diameter between the master gage and workpiece (Unit: mm)

*4: An error of the outside diameter due to variation in workpiece position either in the optical axis direction or in the scanning direction.

*5: The area given by [optical axis direction]x[scanning direction].

*6: The protection level provided for the interior. If the workpiece or glass of the measuring unit window is soiled by water or dust, the unit may malfunction.

Laser Scan Micrometer

LSM-512S Measuring Unit SERIES 544 — 1 mm to 120 mm Measuring Unit

- Ensures $\pm 6 \mu\text{m}$ accuracy over the entire measuring range (1 to 120 mm).
- The industry's first narrow-range accuracy performance in this measuring range of $\pm(4.0+0.5\Delta D) \mu\text{m}$ is available for high-accuracy measurement.



With signal cable (5 m)
02AGN770A

SPECIFICATIONS

Order No. (Laser only)	544-540	
Package No. (Laser w/ LSM 6200 display)	64PKA121	
Applicable laser standards	IEC, FDA	
User's manual	English version	
Measuring range	.040" to 4.72" (1 to 120mm)	
Resolution	.000005" to .005" (0.1 to 100 μm) (selectable)	
Repeatability*1	$\pm 0.85 \mu\text{m}$	
Accuracy*2 (20°C)	Whole range	$\pm 6 \mu\text{m}$
	Small range	$\pm(4.0+0.5\Delta D) \mu\text{m}^*3$
Positional error*4	$\pm 8 \mu\text{m}$	
Measuring area*5	30x120mm (1 to 120mm)	
Scanning rate	3200 scans/s	
Laser wavelength	650nm (Visible)	
Laser scanning speed	904m/s	
Operating environment	Temperature	0 to 40°C
	Humidity	RH 35 to 85% (no condensation)
Protection level	IP64*6	

*1: Determined by the value of $\pm\sigma$ (σ : standard deviation) when measuring $\phi 120\text{mm}$ at the interval of 0.32 sec. (average 1024 times).

*2: Center of the measuring range for cylindrical workpieces outside diameter.

*3: ΔD =Difference in diameter between the master gage and workpiece (Unit: mm)

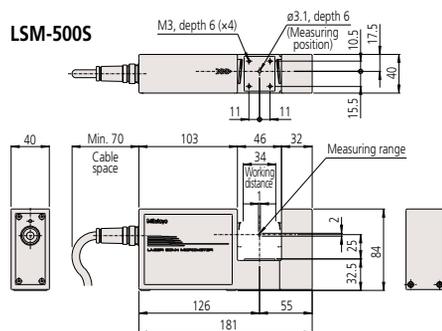
*4: An error of the outside diameter due to variation in workpiece position either in the optical axis direction or in the scanning direction.

*5: The area given by [optical axis direction]x[scanning direction].

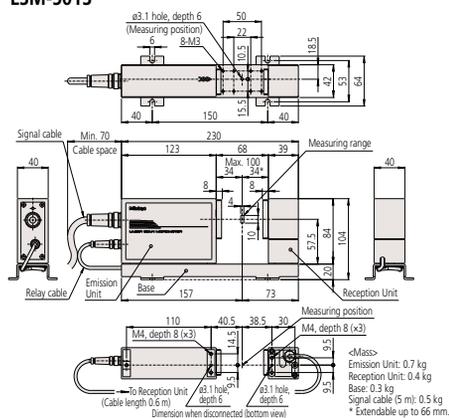
*6: The protection level provided for the interior. If the workpiece or glass of the measuring unit window is soiled by water or dust, the unit may malfunction.

DIMENSIONS

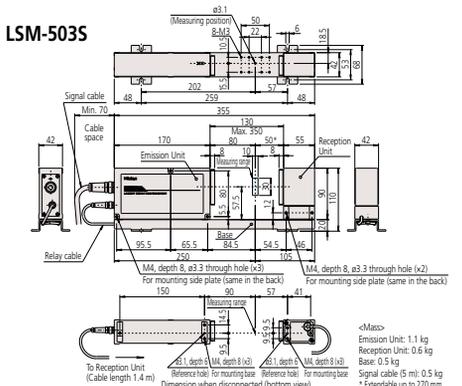
LSM-500S



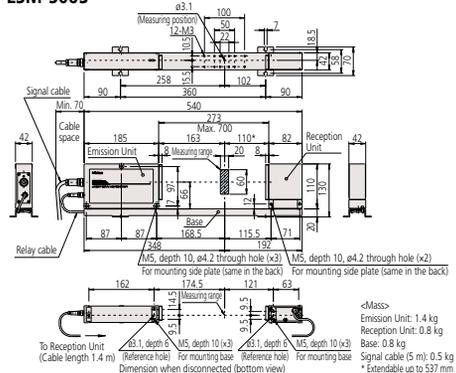
LSM-501S



LSM-503S



LSM-506S



Optional Accessories

- Multifunctional display unit, **LSM-6200**:

Order No.	Display type	Remarks
542-072A	English mm/in	English user's manual

- Panel-mount type display unit, **LSM-5200**:

Order No.	Remarks
544-047	English user's manual

- Heavy Duty Adjustable Workstage: **K542965**
- Standard calibration gage set ($\phi 20.0, \phi 120.0$): **02AGD150**
- Air blower: **02AGD260**
- Extension signal cable (max. 25 m)

Order No.	Cable length
02AGN780A	5 m
02AGN780B	10 m
02AGN780C	15 m
02AGN780D	20 m

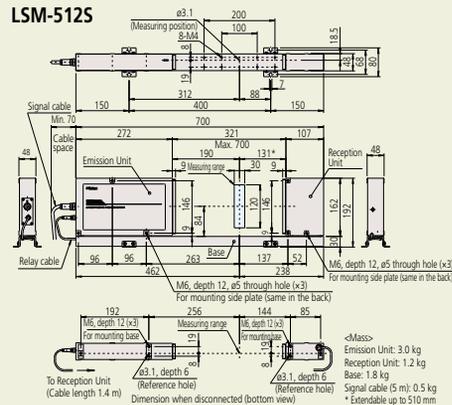
- Extension relay cable (max. 5 m)

02AGC150A	1 m
02AGC150B	3 m
02AGC150C	5 m

DIMENSIONS

Unit: mm

LSM-512S



Find a Distributor

Laser Scan Micrometer

LSM-6200 Display Unit SERIES 544 — Multi-function Type

- Multi-function display for LSM500S series.
- Capable of statistical analysis such as: average, maximum value, minimum value, range (max. to min.).
- Segment measurement (7 points) or edge measurement (1 to 255 edges) can be selected.
- A function to eliminate abnormal values is standard.
- 100 tolerance values, preset values, or settings can be stored.
- Multiple communication formats are available

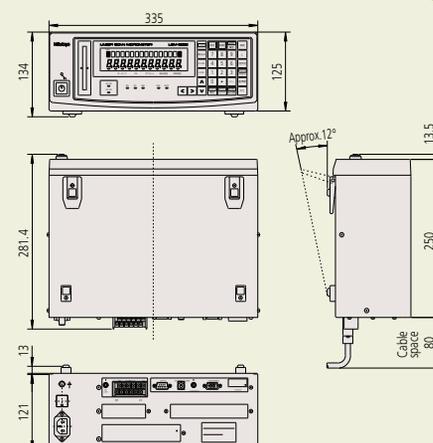


SPECIFICATIONS

Model	LSM-6200
Order No.	544-072A
Type	inch/mm
Display	16-digit dot matrix (upper) and 11-digit 7-segment (lower)
Segment	1 to 7 (1 to 3, transparent) or 1 to 255 edges*1
Averaging times	Arithmetic average: per 2 to 2048/Moving average: per 32 to 2048 (Arithmetic average is per 16 to 2048 when using 544-532)
Judgment	Selection from "target value+tolerance", "lower tolerance + upper tolerance", or "7 classes multi-limit tolerance zone".
Measurement mode	Standby, Single measurement, Continuous measurement
Statistical analysis	Maximum, Minimum, Average, Dispersion, σ (S.D)
Size	335 (W) x 134 (H) x 250 (D) mm
Power supply	100 to 240 V AC $\pm 10\%$, 45 W, 50/60 Hz
Standard I/F	RS-232C, Analog I/O
Optional I/F	Digimatic code output unit (2-ch), 2nd I/O analog I/F, BCD I/F
Operating environment	0 to +40 °C, RH 35 to 85% (non-condensing)
Other functions	Nominal setting, sample setting, selection of unnecessary digits, transparent object measurement*2, measurement of odd fluted parts, automatic measurement in edge mode, output timer, abnormal data elimination, SHL change, group judgment, simultaneous measurement, statistical processing, mastering, buzzer function, automatic workpiece detection (dimension/position)*1, zero-set/offset, dual measurement (optional)

DIMENSIONS

Unit: mm



Optional Accessories

- Serial cable (RS-232C null): **12AAA807**
- Footswitch: **937179T**
- Extension Signal Cables: **02AGN780A, B, C, D**
- Digimatic output card: **02AGC840**
- Dual Input Card: **02AGP150**
- BCD output: **02AGC910**
- 2nd analog output card: **02AGC880**
- Printer: **02AGD600B**

LSM-5200 Display Unit SERIES 544 — Panel-mount Type

- A compact controller which could be used for multi-unit system configurations.
- A panel-mount type display unit designed for the LSM500S Series.
- Analog I/O and RS-232C is standard.

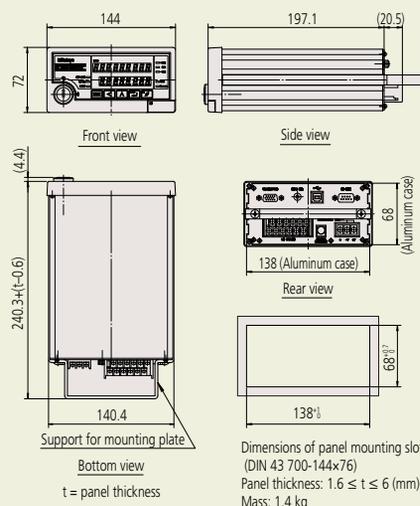


SPECIFICATIONS

Model	LSM-5200
Order No.	544-047 (power supply not included)
Display	9-digit (upper) and 8-digit (lower) 7-segment
Segment	1 to 7 (1 to 3, transparent) or 1 to 255 edges
Averaging method	Arithmetic average: from 4 to 2048; Moving average: from 32 to 2048 (Arithmetic average is from 16 to 2048 when using LSM-500S.)
Judgment	Selecting from "target value \pm tolerance value" or "lower limit/upper limit".
Measurement mode	Standby, Single measurement, Continuous measurement
Statistical analysis	Calculation result is output via USB or RS-232C.
External dimensions	144 (W) x 72 (H) x 197.1 (D) mm
Power supply	24 V DC $\pm 10\%$, 1.3 A or more
Standard I/F	USB2.0, RS-232C, I/O analog
Operating temperature (humidity) ranges	0 to 40 °C, RH 35 to 85% (non-condensing)
Storage temperature (humidity) ranges	-20 to 70 °C, RH 35 to 85% (non-condensing)
Other functions	Measurement of odd fluted parts, simultaneous measurement, nominal setting, sample setting, selection of unnecessary digits, transparent object measurement Automatic workpiece detection (dimension/position detected)*1, abnormal data elimination, mastering, statistical processing (when using USB, RS-232C), output timer, automatic measurement in edge mode, presetting Note that every function is limited in its combination possibilities. See the user manual for details.
Mass	1.4 kg

DIMENSIONS

Unit: mm



Note 1: For USB communication with a PC, a dedicated device driver is required. For details, contact your nearest M³ Solution Center.

Laser Scan Micrometer

Optional Accessories SERIES 544 — Laser Scan Micrometer (Measuring Unit)

Standard calibration gage set

- Standard gage set suitable for calibration of Laser Scan Micrometers.
- Nominal gage diameters (1 to 160 mm) are as given in Specifications.



SPECIFICATIONS

For calibrating models	LSM-6902H	LSM-500S	LSM-501S	LSM-503S	LSM-506S	LSM-512S	LSM-9506
Set No.	02AGD180	02AGD110	02AGD120	02AGD130	02AGD140	02AGD150	02AGD170
Configuration (Order No.)	Stand	02AGD181	02AGD111	02AGD121	02AGD131	02AGD141	02AGD151
	Gages	ø1: 02AGD920 ø25: 02AGD963	ø0.1: 958200 ø2: 958202	ø0.1: 958200 ø10: 229317	ø1: 02AGD920 ø30: 02AGD961	ø1: 02AGD920 ø60: 02AGD962	ø20: 229730 ø120: 234072
Carrying case	02AGD190	958203	958203	02AGD980	02AGD980	02AGD990	02AGD970

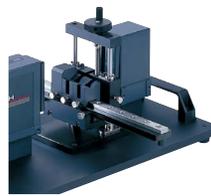
Workstage

- Easy set-up and height adjustment enables high-precision measurement.

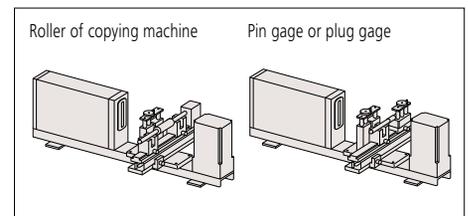


Adjustable workstage

- Vertical/horizontal slide mechanism enables easy measurement of various workpiece diameters.
- Suitable for quality control of high-precision shafts, rollers, pin gages and similar.



Measurement Examples



SPECIFICATIONS

Model	LSM-501S LSM-503S LSM-6902H
Order No.	02AGD270

Basic configuration

Basic set	Order No.	Model	Standard Accessories	Measuring range (mm)	Horizontal stroke (mm)	Vertical stroke (mm)
1) Main unit 2) V-block 3) Stop	02AGD280	LSM-6902H	V-block (02AGD420), 2 pcs. Stopper (02AGD430), 1 pc.	0.1 - 25	130	47
	02AGD400	LSM-501S		0.05 - 10	130	32
	02AGD490	LSM-503S		0.3 - 30	200	35
	02AGD520	LSM-506S*	V-block A (02AGD550), 2 pcs. V-block B (02AGD560), 1 pc. V-block C (02AGD570), 1 pc.	1 - 60	300	45
	02AGD370	LSM-9506*		0.5 - 60	200	45
	02AGD680			0.5 - 60	300	45

* The stop is not included in the basic set for these models.

Note: Optional part for the adjustable workstage, such as center support, adjustable V-block (up/down) etc., are available.

Guide pulley

- Used for supporting measurement of outside diameter of fine wire-like materials such as magnetic wire or fiber.

SPECIFICATIONS

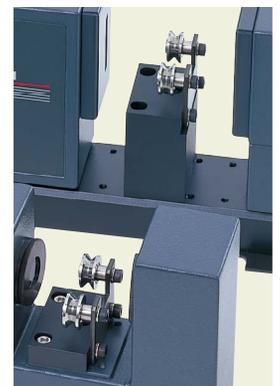
Model	LSM-500S	LSM-501S
Order No.	02AGD200	02AGD210

Note 1: Each measurement range is as follows:

LSM-500S: ø5 µm to ø1.6 mm

LSM-501S: ø50 µm to ø2 mm

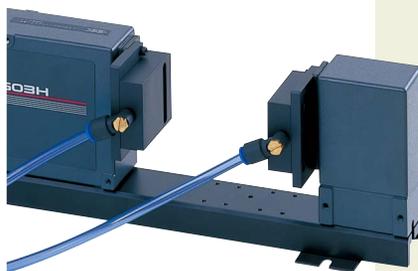
Note 2: For calibration, the calibration gage set for LSM-500S (02AGD110) is required.



Got Questions?

Laser Scan Micrometer

Optional Accessories SERIES 544 — Laser Scan Micrometer (Measuring Unit)



Air Shield

- Air blows from the air outlet installed on the laser section to clear dust adhering to the laser window.

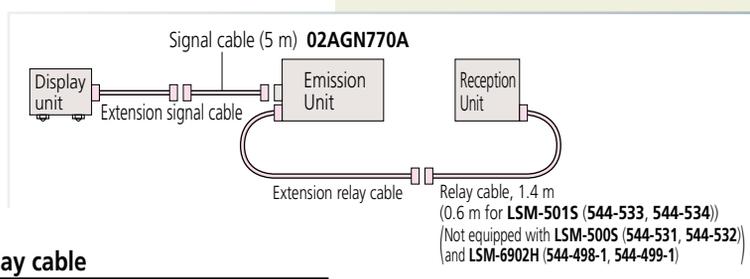
SPECIFICATIONS

Air supply unit	Air shield	Applicable models
957608	02AGD220	LSM-500S (544-532)
	02AGD230	LSM-501S (544-534)
	02AGD240	LSM-503S (544-536)
	02AGD250	LSM-506S (544-538)
	02AGD260	LSM-512S (544-540)

Note: Air shield is supplied with 5 m air tube (Outside Diameter: 6 mm).

Extension signal cable/Extension relay cable

- Extension signal cables are necessary when the measuring unit and display unit are separated in operation; Extension relay cables are necessary when the optical section is separated in operation.



SPECIFICATIONS

Extension signal cable

Order No.	Cable length
02AGN780A	5 m
02AGN780B	10 m
02AGN780C	15 m
02AGN780D	20 m

Extension relay cable

Order No.	Cable length
02AGC150A	1 m
02AGC150B	3 m
02AGC150C	5 m

Note 1: For 544-532, 544-534, the overall length of the signal cable and the extension signal cable is 20 m at a maximum.

Note 2: For 544-536, 544-538, 544-540, 544-542 the overall length of the signal cable and the extension signal cable is 30 m at a maximum.

Note 3: The length of the relay extension cable is 5 m at a maximum.

Note 4: The maximum extension length of the signal cable and relay cable is 32 m in total.

Note 5: Cannot be used with 544-499-1A.

Optional Accessories SERIES 544 — Laser Scan Micrometer (Display Unit)

Foot switch

- For LSM-6200 (544-071, 544-072), LSM-6902H (544-498-1, 544-499-1) and LSM-9506 (544-116).



Optional Accessories Interface for LSM6200, 6902H

BCD Interface

- Outputs measurement data in BCD output (7-digit) or HEX output.
- Data logic can be switched.
- Isolated I/O circuitry
- Available for LSM-6200 (544-072) and LSM-6902H (544-499-1).



SPECIFICATIONS

Order No.	02AGC910
Standard Accessories	Connector (DDK) 57-30360 (214188)



Talk to Sales

Laser Scan Micrometer

Optional Accessories SERIES 544 — Laser Scan Micrometer (Display Unit)

Digimatic code output unit

- 2-channel Digimatic code output
 - In simultaneous measurement, measurement data are output as follows:
Program No. 0 to No. 4 in OUTPUT-1
Program No. 5 to No. 9 in OUTPUT-2 (10 programs operated)
 - 10 pin MIL type connector.
 - Output cable is not supplied.
- Connecting cable (optional) 1 m (936937)
- Available for **LSM-6200 (544-071, 544-072)** and **LSM-6902H (544-498-1, 544-499-1)**.

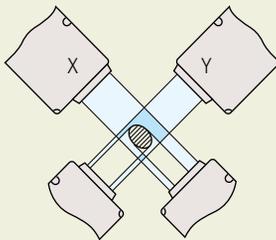
Note 1: Output is 6 digits of measurement data.
Note 2: Displaying 6th and 7th digit after the decimal point is not supported.



SPECIFICATIONS

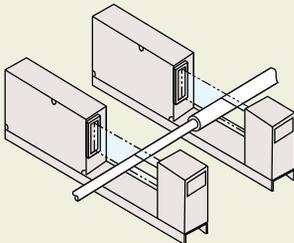
Order No.	02AGC840
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XY Measurement



(X-Y): runout
(X+Y)/2: average
Note: XY requires 10 mm-interval.

Parallel Measurement



Dual connection unit

- Enables second unit connection to **LSM-6200 (544-071, 544-072)**. (both units must be the same model)
- Note: Cannot be used for **LSM-6902H (544-498-1, 544-499-1)**.
- Depending on the layout of the two measuring units, large-diameter measurement, XY measurement, and parallel measurement are possible.
 - Both of the measuring units and display units can be simultaneously operated.



SPECIFICATIONS

Order No.	02AGP150
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2nd I/O analog I/F

- I/O, analog output.
- Simultaneous measurement is supported by two pairs of GO/NG judgment outputs.
- Available for **LSM-6200 (544-071, 544-072)** and **LSM-6902H (544-498-1, 544-499-1)**.

SPECIFICATIONS

Order No.	02AGC880
Standard Accessories	Connector (DDK) 57-30360 (214188)



Cable for BCD and 2nd I/O simultaneous mount

- Both BCD (**02AGC910**) and 2nd I/O analog I/F (**02AGC880**) can be mounted on **LSM-6200 (544-071, 544-072)** and **LSM-6902H (544-498-1, 544-499-1)** using this cable.

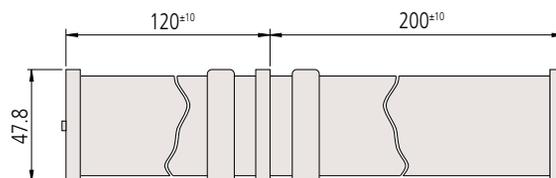
Note: If using this cable, the dual connection unit (**02AGP150**) cannot be used.

SPECIFICATIONS

Order No.	02AGE060
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DIMENSIONS

Unit: mm



Quick Guide to Precision Measuring Instruments



Laser Scan Micrometers

Compatibility

Your Laser Scan Micrometer has been adjusted together with the ID Unit, which is supplied with the measuring unit. The ID Unit, which has the same code number and the same serial number as the measuring unit, must be installed in the display unit. This means that if the ID Unit is replaced the measuring unit can be connected to another corresponding display unit.

The workpiece and measuring conditions

Depending on whether the laser is visible or invisible, the workpiece shape, and the surface roughness, measurement errors may result. If this is the case, perform calibration with a master workpiece which has dimensions, shape, and surface roughness similar to the actual workpiece to be measured. If measurement values show a large degree of dispersion due to the measuring conditions, increase the number of scans for averaging to improve the measurement accuracy.

Electrical interference

To avoid operational errors, do not route the signal cable and relay cable of the Laser Scan Micrometer alongside a high voltage line or other cables capable of inducing noise current in nearby conductors. Ground all appropriate units and cable shields.

Connection to a computer

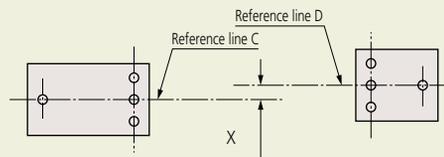
If the Laser Scan Micrometer is to be connected to an external personal computer via the RS-232C interface, ensure that the cable connections conform to the specification.

Re-assembly after removal from the base

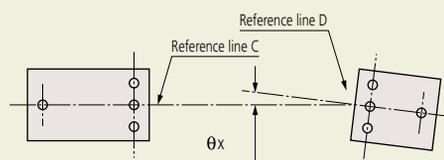
Observe the following limits when re-assembling the emission unit and reception unit to minimize measurement errors due to misalignment of the laser's optical axis with the reception unit.

• Alignment within the horizontal plane

- a. Parallel deviation between reference lines C and D: X (in the transverse direction)

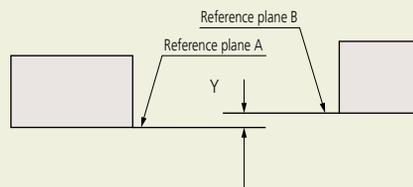


- b. Angle between reference lines C and D: θ_x (angle)

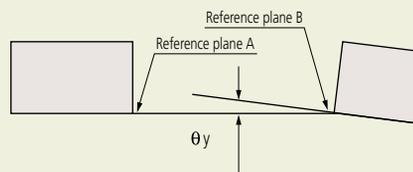


• Alignment within the vertical plane

- c. Parallel deviation between reference planes A and B: Y (in height)



- d. Angle between reference planes A and B: θ_y (angle)



• Allowable limits of optical axis misalignment

Model	Distance between Emission Unit and Reception Unit	X and Y	θ_x and θ_y
LSM-501S	68 mm (2.68 in) or less	within 0.5 mm (0.02 in)	within 0.4° (7 mrad)
	100 mm (3.94 in) or less	within 0.5 mm (0.02 in)	within 0.3° (5.2 mrad)
LSM-503S	130 mm (5.12 in) or less	within 1 mm (0.04 in)	within 0.4° (7 mrad)
	350 mm (13.78 in) or less	within 1 mm (0.04 in)	within 0.16° (2.8 mrad)
LSM-506S	273 mm (10.75 in) or less	within 1 mm (0.04 in)	within 0.2° (3.5 mrad)
	700 mm (27.56 in) or less	within 1 mm (0.04 in)	within 0.08° (1.4 mrad)
LSM-512S	321 mm (12.64 in) or less	within 1 mm (0.04 in)	within 0.18° (3.1 mrad)
	700 mm (27.56 in) or less	within 1 mm (0.04 in)	within 0.08° (1.4 mrad)
LSM-516S	800 mm (31.50 in) or less	within 1 mm (0.04 in)	within 0.09° (1.6 mrad)

G

Laser safety

Mitutoyo Laser Scan Micrometers use a low-power visible laser for measurement. The laser is a CLASS 2 EN/IEC60825-1 device. Warning and explanation labels, as shown below, are attached to the Laser Scan Micrometers as is appropriate.



Featured Products



Attached Type Scale Unit for ABSOLUTE Systems

ABS AT1300 Series

Refer to page H-11 for details.

Attached Type Scale Unit for ABSOLUTE Systems

ABS AT1100 Series

Refer to page H-12 for details.



DRO Retrofit Packages

Refer to page H-18 for details.

H

Digimatic Scale Units Linear Scales

INDEX

ABSOLUTE Digimatic Scale Units

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Linear Scales

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Exposed, Compact Linear Scales & Multiple Mounting Options

ST46-EZA Series

Refer to page H-20 for details.



IP Codes

These are codes that indicate the degree of protection provided (by an enclosure) for the electrical function of a product against the ingress of foreign bodies, dust and water as defined in IEC standards (IEC 60529: 2001) and JIS C 0920: 2003.



Measuring Instruments Shipped with Inspection Certificate

Mitutoyo guarantees product quality as a leading precision measuring instrument manufacturer and ships measuring instruments with an inspection certificate that includes inspection data so that customers can use them with confidence.

ABSOLUTE™

ABSOLUTE Linear Encoder

Mitutoyo developed the unique ABSOLUTE method to retain position information after the power is turned off. The origin is set once - thereafter the live position is displayed when the power is turned on.

ABSOLUTE Digimatic Scale Units



ABSOLUTE™



Applicable models: SD-G

SD ABSOLUTE Digimatic Scale Units SERIES 572



Horizontal single-function type (Water-proof type)
572-602 SD-20G



Horizontal single-function type
572-202-30 SD-20AX
572-203-10 SD-30D



Horizontal multi-function type
572-461 SD-15E



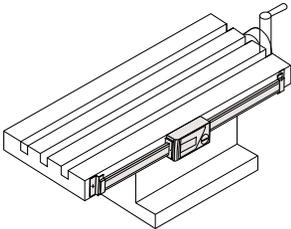
Vertical single-function type
572-303-10 SDV-30D



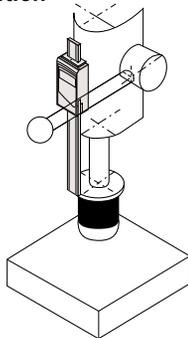
Vertical multi-function type
572-561 SDV-15E

Typical Applications

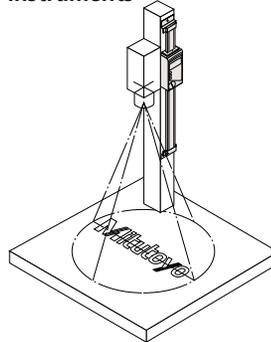
Machine table position



Drilling machine stroke position

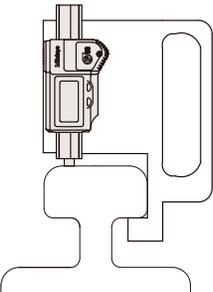


Focus setting on optical instruments



Special Applications

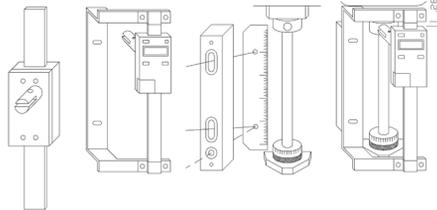
Please contact Mitutoyo for special applications.



As a measurement jig for outdoor use (SD-G)



Detector head mechanism



The Mitutoyo Quill Kit mounted on a vertical mill

- SD series facilitates mounting on jigs, tools, and small machine tools to enable accurate positioning.
- Built-in ABSOLUTE scale including the ABS point does not require a zero-set every time the power is turned on. In addition, reliability has improved thanks to elimination of overspeed errors.
- Horizontal or vertical display according to the scale mounting direction.
- The dust resistance and the environmental resistance of the display has improved. The SD-G series offers dust/water protection level IP66.
- Long battery life.
- EC counters are available as external display units.
- Equipped with an output port to transfer measurement data, allowing implementation in control systems and gaging systems.

Functions

- ABS (ABSOLUTE) measurement function
 - INC (Incremental) measurement function
 - Zero-setting function
 - Presetting function (2 preset values can be set. Not available for SD-G, SD-AX, SD-D, SDV-D)
 - Double reading function (Available only for SD-F or SDV-F)
 - Direction switch function (Available only for SD-E, SDV-E)
 - Hold function*
 - Measurement value composition error alarm
 - Low battery alarm
 - Output function
- * To activate the hold function when using SD-AX, SD-D or SDV-D models, an optional hold unit is required. Simultaneous activation with the output function is not available.

Note: These units use 1.5 V silver oxide cells for the power supply. Therefore, when the units are directly fixed to the frame of a machine tool that requires a high voltage, malfunctions such as display digit fluctuations and errors may occur. Countermeasure examples are described in the user manuals provided.



Refer to the ABSOLUTE Digimatic Scale Units Brochure (E316-572R) for more details.

ABSOLUTE Digimatic Scale Units

System Diagram

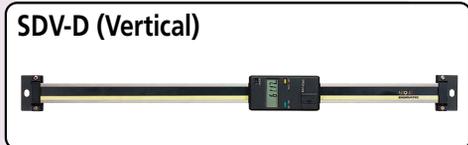
[Scale units]

[Display units]

Single-function Type with High Dust / Water Resistance



Single-function type



Multi-function type



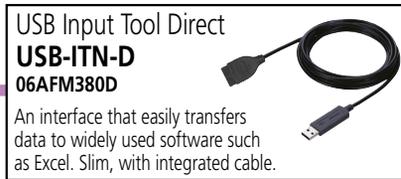
Multi-function type



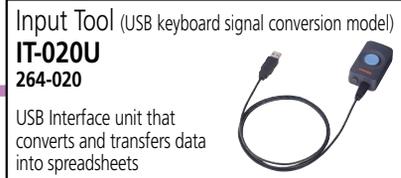
Tolerance judgment output*1



USB keyboard
RS-232C output



USB keyboard
signal conversion

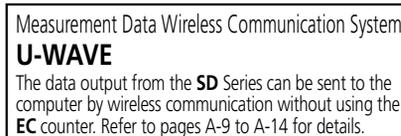


USB keyboard
signal conversion

Note 2: May also be connected to an RS-232C conversion type (IT-007R) input tool.

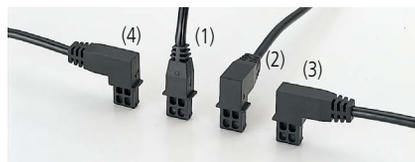


USB keyboard
signal conversion



USB keyboard
signal conversion

- Connecting cable with the water-proof type output switch*2 1 m: **05CZA624**
2 m: **05CZA625**
- Connecting cable with the output switch 1 m: **959149**
2 m: **959150**
- Connecting cable with the output switch



- (1) 1 m: **905338** (3) 1 m: **905691**
2 m: **905409** 2 m: **905692**
- (2) 1 m: **905689** (4) 1 m: **905693**
2 m: **905690** 2 m: **905694**

- Connecting cable 1 m: **936937**
2 m: **965014**

*1 Select the tolerance judgment output or Digimatic output when setting the parameters.

*2 Connecting cable with the water-proof type output switch can be used only for SD-G or Water-proof Digital Caliper equipped with the external output function.

*3 Connecting of SD series and DP-1VA LOGGER/MIG-8USB, MIG-4USB/IT-020U is also available without passing through the EC counter. In this case, connect these units and SD series with the cables used for connection with the EC counter.

ABSOLUTE Digimatic Scale Units

ABSOLUTE Digimatic Scale Units SERIES 572 SPECIFICATIONS

Type	Unit spec.	Order No.	Model	Range	Resolution	Accuracy	Repeatability	Response speed*2	Battery life							
Horizontal single-function type (Water-proof type)	Inch/Metric	572-613	SD-4" /10G	4 in/100 mm	0.0005 in/0.01 mm	0.001 in/0.03 mm	0.0005 in/0.01 mm	Unlimited	Approx. 13,000 hours							
		572-614	SD-6" /15G	6 in/150 mm												
		572-615	SD-8" /20G	8 in/200 mm												
	Metric	572-600	SD-10G	100 mm	0.01 mm	0.03 mm	0.01 mm									
		572-601	SD-15G	150 mm												
572-602	SD-20G	200 mm														
Horizontal single-function type	Inch/Metric	572-210-30	SD-4" AX	4 in/100 mm	0.0005 in/0.01 mm	0.001 in/0.03 mm	0.0005 in/0.01 mm	Approx. 18,000 hours								
		572-211-30	SD-6" AX	6 in/150 mm				Approx. 20,000 hours								
		572-212-30	SD-8" AX	8 in/200 mm				0.01 mm	0.03 mm	0.01 mm	Approx. 18,000 hours					
		572-213-10	SD-12" D	12 in/300 mm								0.002 in/0.04 mm				
		Metric	572-200-30	SD-10AX				100 mm	0.01 mm	0.03 mm	0.01 mm	Approx. 20,000 hours				
	572-201-30		SD-15AX	150 mm												
	572-202-30		SD-20AX	200 mm												
	572-203-10		SD-30D	300 mm												
					0.04 mm											
	Horizontal multi-function type	Inch/Metric	572-470	SD-4" E	4 in/100 mm	0.0005 in/0.01 mm	0.001 in/0.03 mm	0.0005 in/0.01 mm	Unlimited	Approx. 5,000 hours						
572-471			SD-6" E	6 in/150 mm												
572-472			SD-8" E	8 in/200 mm												
572-473			SD-12" E	12 in/300 mm												
572-474			SD-18" E	18 in/450 mm												
572-475			SD-24" E	24 in/600 mm												
572-476			SD-32" E	32 in/800 mm												
572-477			SD-40" E	40 in/1000 mm												
Metric			572-460	SD-10E	100 mm						0.01 mm	0.03 mm	0.01 mm			
			572-461	SD-15E	150 mm											
		572-462	SD-20E	200 mm												
		572-463	SD-30E	300 mm												
		572-464	SD-45E	450 mm												
		572-465	SD-60E	600 mm												
		572-466	SD-80E	800 mm												
		572-467	SD-100E	1000 mm												
		Horizontal multi-function type (equipped with double reading function)	Inch/Metric	572-490-10*1	SD-4" F	4 in/100 mm	0.0005 in/0.01 mm	0.001 in/0.03 mm						0.0005 in/0.01 mm (Radius indication, not diameter)	Unlimited	Approx. 5,000 hours
				572-491-10*1	SD-6" F	6 in/150 mm										
572-492-10*1				SD-8" F	8 in/200 mm											
572-493-10*1				SD-12" F	12 in/300 mm											
572-494-10*1	SD-18" F			18 in/450 mm												
572-495-10*1	SD-24" F			24 in/600 mm												
572-496-10*1	SD-32" F			32 in/800 mm												
572-497-10*1	SD-40" F		40 in/1000 mm													
Metric	572-480-10*1		SD-10F	100 mm	0.01 mm	0.03 mm	0.01 mm (Radius indication, not diameter)									
	572-481-10*1		SD-15F	150 mm												
	572-482-10*1	SD-20F	200 mm													
572-483-10*1	SD-30F	300 mm														
572-484-10*1	SD-45F	450 mm														
572-485-10*1	SD-60F	600 mm														
572-486-10*1	SD-80F	800 mm														
572-487-10*1	SD-100F	1000 mm														
Vertical single-function type	Inch/Metric	572-310-10	SD-4" D	4 in/100 mm	0.0005 in/0.01 mm	0.03 mm/0.001 in	0.0005 in/0.01 mm	Unlimited	Approx. 20,000 hours							
		572-311-10	SD-6" D	6 in/150 mm												
		572-312-10	SD-8" D	8 in/200 mm												
		572-313-10	SD-12" D	12 in/300 mm												
		572-300-10	SDV-10D	100 mm						0.01 mm	0.03 mm	0.01 mm				
	572-301-10	SDV-15D	150 mm													
	572-302-10	SDV-20D	200 mm													
	572-303-10	SDV-30D	300 mm													
				0.04 mm												
	Vertical multi-function type	Inch/Metric	572-570	SDV-4" E	4 in/100 mm	0.0005 in/0.01 mm	0.001 in/0.03 mm			0.0005 in/0.01 mm	Unlimited	Approx. 5,000 hours				
572-571			SDV-6" E	6 in/150 mm												
572-572			SDV-8" E	8 in/200 mm												
572-573			SDV-12" E	12 in/300 mm												
572-574			SDV-18" E	18 in/450 mm												
572-575			SDV-24" E	24 in/600 mm												
572-576			SDV-32" E	32 in/800 mm												
572-577		SDV-40" E	40 in/1000 mm													
Metric		572-560	SDV-10E	100 mm	0.01 mm	0.03 mm	0.01 mm									
		572-561	SDV-15E	150 mm												
		572-562	SDV-20E	200 mm												
		572-563	SDV-30E	300 mm												
		572-564	SDV-45E	450 mm												
		572-565	SDV-60E	600 mm												
		572-566	SDV-80E	800 mm												
	572-567	SDV-100E	1000 mm													
Vertical multi-function type (equipped with double reading function)	Inch/Metric	572-590-10*1	SDV-4" F	4 in/100 mm	0.0005 in/0.01 mm	0.001 in/0.03 mm	0.0005 in/0.01 mm (Radius indication, not diameter)	Unlimited	Approx. 5,000 hours							
		572-591-10*1	SDV-6" F	6 in/150 mm												
		572-592-10*1	SDV-8" F	8 in/200 mm												
		572-593-10*1	SDV-12" F	12 in/300 mm												
		572-594-10*1	SDV-18" F	18 in/450 mm												
		572-595-10*1	SDV-24" F	24 in/600 mm												
		572-596-10*1	SDV-32" F	32 in/800 mm												
		572-597-10*1	SDV-40" F	40 in/1000 mm												
	Metric	572-580-10*1	SDV-10F	100 mm	0.01 mm	0.03 mm	0.01 mm (Radius indication, not diameter)									
		572-581-10*1	SDV-15F	150 mm												
		572-582-10*1	SDV-20F	200 mm												
		572-583-10*1	SDV-30F	300 mm												
		572-584-10*1	SDV-45F	450 mm												
		572-585-10*1	SDV-60F	600 mm												
		572-586-10*1	SDV-80F	800 mm												
572-587-10*1	SDV-100F	1000 mm														

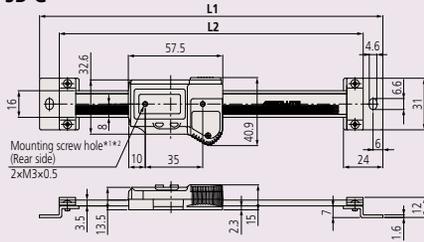
*1 Available to special order *2 High slider speed does not cause data errors. Position feedback and output data may not be used while the slider is moving.

ABSOLUTE Digimatic Scale Units

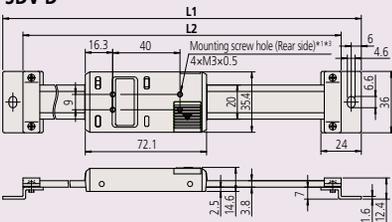
DIMENSIONS

Note: the hole dimensions are on the back.

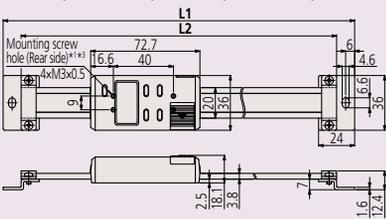
SD-G



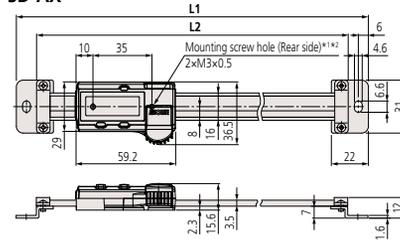
SDV-D



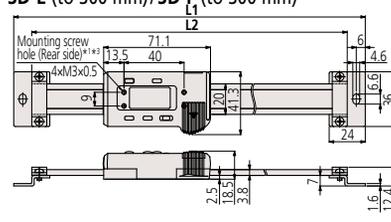
SDV-E (to 300 mm)/SDV-F (to 300 mm)



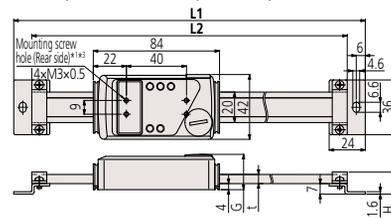
SD-AX



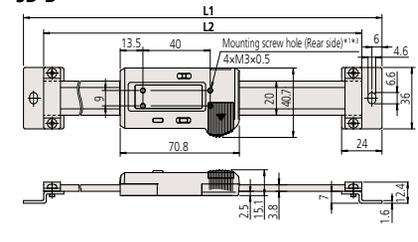
SD-E (to 300 mm)/SD-F (to 300 mm)



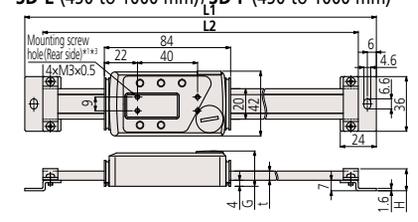
SDV-E (450 to 1000 mm)/SDV-F (450 to 1000 mm)



SD-D



SD-E (450 to 1000 mm)/SD-F (450 to 1000 mm)



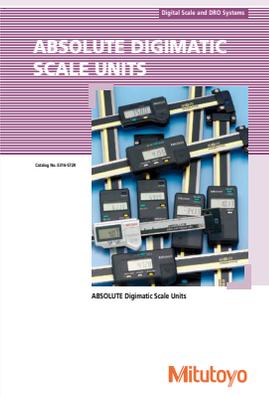
*1 Refer to the dimension table for details of the depth including the screw on the rear of the display.

*2 Mounting screw hole: 2xNo.5-40 UNC (Inch type, Inch/Metric switching type)/2xM3x0.5 (Metric type) Screwed depth on the rear side of display unit: under 2 mm

*3 Mounting screw hole: 4xNo.5-40 UNC (Inch type, Inch/Metric switching type)/4xM3x0.5 (Metric type) Screwed depth on the rear side of display unit: under 2 mm



Talk to Sales



Refer to the ABSOLUTE Digimatic Scale Units Brochure (E316-572R) for more details.

SPECIFICATIONS

1 inch = 25.4 mm

Model	Range (mm)	Dimensions (mm)					Depth including the screw on the rear of the display	Mass (g)
		L1	L2	t	G	H		
SD-G	100	209	185	—	—	—	Less than 2 mm	390
	150	259	235	—	—	—		410
	200	311	287	—	—	—		430
SD-AX	100	209	185	—	—	—	Less than 2 mm	235
	150	259	235	—	—	—		255
	200	311	287	—	—	—		275
SD-30D	300	444	420	—	—	—	Less than 2 mm	370
	100	244	220	—	—	—		250
	150	294	270	—	—	—		280
SD-E SD-F	200	344	320	—	—	—	Less than 3 mm	310
	300	444	420	—	—	—		370
	450	594	570	6	23.2	14.6		760
	600	774	750	—	—	—		900
	800	974	950	10	27.2	18.6		1710
	1000	1174	1150	—	—	—		2040
SDV-D	100	244	220	—	—	—	Less than 2 mm	250
	150	294	270	—	—	—		280
	200	344	320	—	—	—		310
	300	444	420	—	—	—		370
SDV-E SDV-F	100	244	220	—	—	—	Less than 2 mm	250
	150	294	270	—	—	—		280
	200	344	320	—	—	—		310
	300	444	420	—	—	—		370
	450	594	570	6	23.2	14.6		760
	600	774	750	—	—	—		900
	800	974	950	10	27.2	18.6		1710
1000	1174	1150	—	—	—	2040		

Quill Kit with ABSOLUTE Encoder

Easy Installation Fits Most Vertical Knee Mills

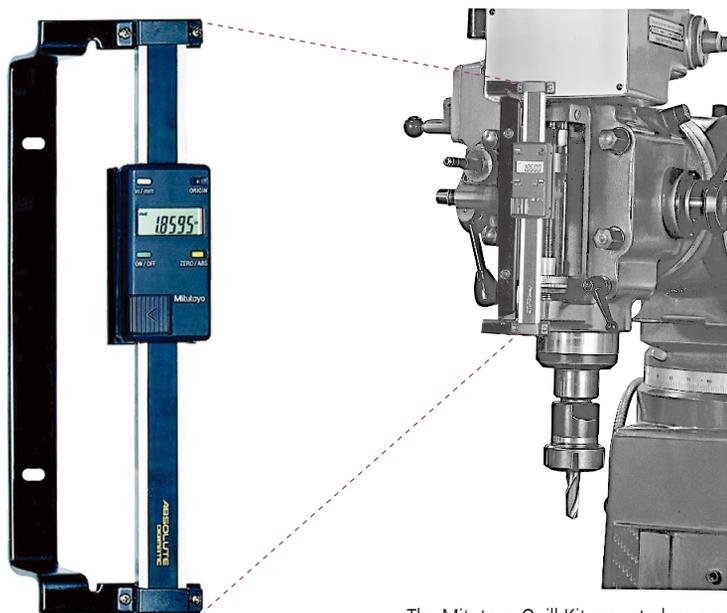
- Easy-to-read LCD with resolution of .0005"/0.01mm. 0 -5" travel inch/mm
- Push button controls for inch/mm, zero-set and on/off.
- Powered by a single SR-44 battery which lasts about 1 year with normal use.
- SPC Output for data transmission to data processors or a remote display.

SPECIFICATIONS

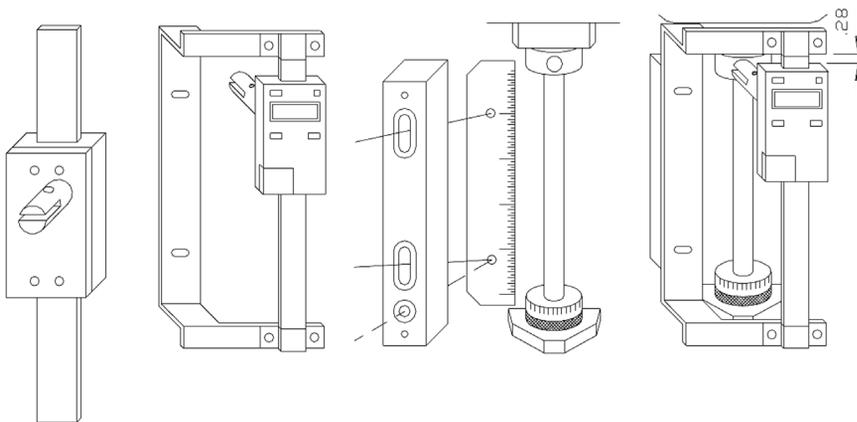
Order No.	Description
053906B	Digimatic Quill Kit complete with brackets & scale for Bridgeport-type machines.

Optional Accessories

- 905338: SPC cable (40" / 1m standard)
- 905409: SPC cable (80" / 2m standard)
- 264-505A: DP-1VA data processor, 120V AC
- 02AZD810D: U-Wave-R (wireless receiver)
- 02AZD730D: U-Wave-T/IP67 type (wireless transmitter)
- 02AZD790F: U-Wave connecting cable F
- 02AZE200: U-Wave-T installation brackets kit



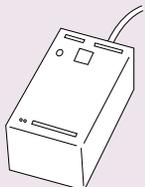
The Mitutoyo Quill Kit mounted on a vertical mill.



Find a Distributor

Optional Accessories

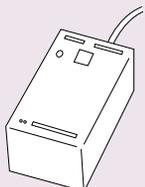
- 06AET993** Code out unit - USB output, RS232C output, Digimatic Input
- 06ACB393** Adapter for Linear gages with origin
- 06ACB913** Adapter for Linear gages without origin
- 06ACB391** Adapter for AT211 Linear Scales
- 06ACB392** Adapter for ST Series
- 09CAB231** Adapter for micrometer head
- 09AAA207** Adapter for previous model 6 pin linear scales
- 937179T** Foot switch to trigger USB output (06AET993 needed)
- 64AAB336** Foot switch to trigger RS-232C output (06AET993 needed)
- 06ACF941** Extension cable for remote load & zero (06AET993 needed)
- 965004** Foot switch to trigger RS-232C output (for 06ACF941 only)
- 937328** External load box (06AET993 & 06ACF941 needed)
- 936553** External zero box (06AET993 & 06ACF941 needed)
- 09EAA094** Counter cable RS232C for DP-1VA
- 64AAB519** RS232C output cable 6-ft. (25-9 pin)



936553

External Zero Box

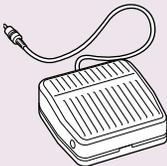
Zeros the counter just by pressing the button when using the counter's data output function. For KA-200 Counter (equipped with RS-232C output).



937328

External Load Box

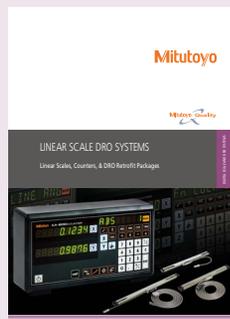
Outputs counter value just by pressing the button when using the counter's data output function. For KA-200 Counter (equipped with RS-232C output).



965004

External Load Foot Switch

Connects to the external load/ zero cable (06ACF941) when also using the optional RS-232C card of KA, KS and KC counters. The foot switch can be used to output the displayed data



Refer to the Linear Scale DRO Systems Brochure (No. 2217 (4)) for more details.

KA-200 Counter SERIES 174 — Standard Type

- High performance, low cost 2 & 3 axis counter.
- ABSOLUTE and incremental modes (10 presets each).
- Non-linear and linear error compensation
- Adjustable high-brightness, high-refresh rate LED displays .
- Calculator function.
- Outputs data into spreadsheets (optional USB card).
- Standard and lathe modes.
- Connects to AT715 and AT100 series Linear Scales.



174-183A
KA-212



174-185A
KA-213

SPECIFICATIONS

Model	KA-212	KA-213
Order No.	174-183A	174-185A
Number of axes to be displayed	2	3
Resolution	(Changeable according to the parameter) When AT100 is connected: 0.05 to 0.0001 mm When AT715 is connected: 0.01 to 0.001 mm	
Display/digit	Main display: 9 digits including sign Sub display: 8 digits	
Power supply voltage	AC100 to 240 V, 50/60 Hz	
Dimensions	300 (W) x 70 (D) x 167 (H) mm	
Output (optional)	RS-232C	
Mass	1.25 kg	1.3 kg

Linear Scales



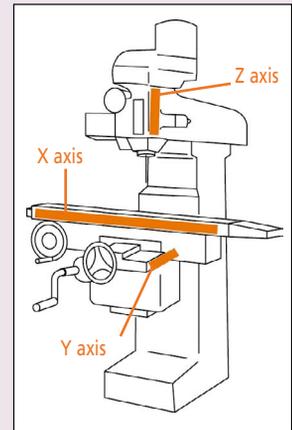
Digital Readout / DRO Packages 2-Axis / 3-Axis Travels

- KA-200 counter
- AT715 electromagnetic ABSOLUTE linear scales
- Brackets for linear scales
- Display arm kit



2 Axis Milling Machine System Packages

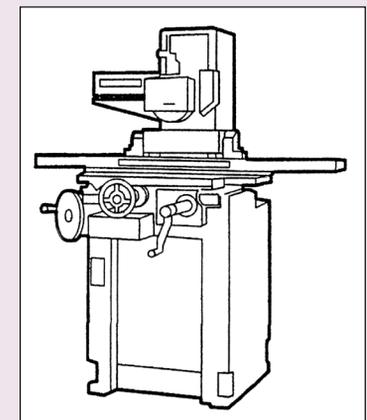
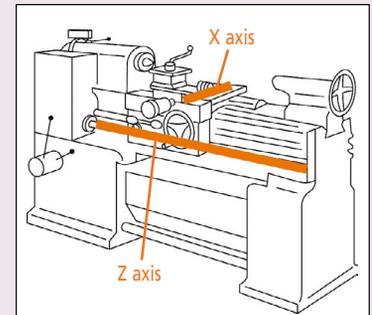
X Axis Travel (AT715 Slim Electromagnetic)	Y Axis Travel (AT715 Slim Electromagnetic)			
	12" (539-805N)	14" (539-806N)	16" (539-806N)	18" (539-808N)
24" (539-811N)	64PKA170A	64PKA172B		
30" (539-814N)	64PKA058D	64PKA060C	64PKA175B	
32" (539-815N)		64PKA169A	64PKA176A	
36" (539-816N)	64PKA059D	64PKA168B	64PKA062D	64PKA178B
40" (539-817N)	64PKA171B	64PKA061B	64PKA063C	64PKA064C
44" (42") (539-815N)	64PKA173B		64PKA177A	



2-Axis Lathe Package

- KA-200 counter
- AT113 and AT715 linear scale combinations (with cables)
- Mounting bracket kit
- Counter tray
- Additional extension cable (2m) included in 60" and 72" packages

Z axis travel (AT715 Slim Electromagnetic)	X Axis Travel (AT113 Slim Glass Scale)					
	6" (539-202-30)	8" (539-203-30)	10" (539-204-30)	12" (539-205-30)	14" (539-206-30)	16" (539-207-30)
28" (539-813N)	64PKA035B					
30" (539-814N)	64PKA036D					
36" (539-816N)	64PKA037C	64PKA194B				
40" (539-817N)	64PKA038B	64PKA039B	64PKA042C	64PKA046C	64PKA052C	
44" (539-818N)		64PKA040B	64PKA043B	64PKA047C	64PKA053C	
48" (539-819N)		64PKA041B	64PKA044B	64PKA048B	64PKA054B	
52" (539-820N)		64PKA195A	64PKA198A	64PKA049C	64PKA055C	
60" (539-822N)		64PKA196B	64PKA045C	64PKA050B	64PKA056C	64PKA057C
68" (539-824N)		64PKA220A		64PKA200A		
72" (539-825N)				64PKA051C		
80" (539-860N)		64PKA197B	64PKA199B	64PKA210B	64PKA203B	
88" (539-861N)			64PKA223A*	64PKA201B		
96" (539-862N)					64PKA222B	
120" (539-866N)			64PKA211A*	64PKA202A*	64PKA224B/64PKA204A	64PKA205A*



2-Axis, KA Counter Grinder System

- KA-200 counter
- AT113 glass linear scales
- Mounting bracket kit
- Display arm kit

Vertical (AT113 Slim Glass Scale)	Cross Side (AT113 Slim Glass Scale)				
	6" (539-202-30)	8" (539-203-30)	10" (539-204-30)	12" (539-205-30)	14" (539-206-30)
12" (539-205-30)	64PKA026B	64PKA028C			
14" (539-206-30)	64PKA027C	64PKA029B			
16" (539-207-30)		64PKA030D			
18" (539-208-30)	64PKA206A	64PKA212A	64PKA031B	64PKA033B	
20" (539-209-30)				64PKA034B	
24" (539-211-30)			64PKA032C	64PKA207	64PKA208A

Milling Packages Electro-Magnetic ABSOLUTE DRO Packages for Milling Machines

3 Axis (Quill) - AT715 Slim Electromagnetic for all axes

Order No.	Description
64PKA065C	ABS Scales, 12" x 30" x 6" w/3 axis KA-200 Counter (174-175A)
64PKA066C	ABS Scales, 12" x 36" x 6",w/3 axis KA-200 Counter (174-175A)
64PKA067C	ABS Scales, 16" x 36" x 6" w/3 axis KA-200 Counter (174-175A)
64PKA179B	ABS SCALES 32" X 14" X 4" w/3 axis KA-200 Counter (174-185A)
64PKA180B	ABS SCALES 36" X 14" X 4" w/3 axis KA-200 Counter (174-185A)
64PKA181B	ABS SCALES 36" X 16" X 4" w/3 axis KA-200 Counter (174-185A)
64PKA182B	ABS SCALES 30" X 14" X 6" w/3 axis KA-200 Counter (174-185A)
64PKA183B	ABS SCALES 32" X 14" X 6" w/3 axis KA-200 Counter (174-185A)
64PKA184B	ABS SCALES 36" X 14" X 6" w/3 axis KA-200 Counter (174-185A)
64PKA185A	ABS SCALES 32" X 16" X 6" w/3 axis KA-200 Counter (174-185A)
64PKA186B	ABS SCALES 40" X 18" X 6" w/3 axis KA-200 Counter (174-185A)
64PKA213B	ABS SCALES 40" X 16" X 5" w/3 axis KA-200 Counter (174-185A)
64PKA216B	ABS SCALES 40" X 12" X 5" w/3 axis KA-200 Counter (174-185A)
64PKA217A	ABS SCALES 48" X 18" X 18" w/3 axis KA-200 Counter (174-185A)
64PKA218C	ABS SCALES 60" X 24" X 28" w/3 axis KA-200 Counter (174-185A)
64PKA219B	ABS SCALES 80" X 32" X 28" w/3 axis KA-200 Counter (174-185A)
64PKA225A	ABS SCALES 48" X 18" X 22" w/3 axis KA-200 Counter (174-185A)

Scale lengths provided above specify travel.

3 Axis (Knee) - AT715 Slim Electromagnetic for all axes

Order No.	Description
64PKA187B	ABS SCALES 32" X 13"/14" X 16" w/3 axis KA-200 Counter (174-185A)
64PKA188C	ABS SCALES 36" X 13"/14" X 16" w/3 axis KA-200 Counter (174-185A)
64PKA189C	ABS SCALES 30" X 14" X 16" w/3 axis KA-200 Counter (174-185A)
64PKA190B	ABS SCALES 36" X 16" X 16" w/3 axis KA-200 Counter (174-185A)
64PKA191B	ABS SCALES 36" X 16" X 18" w/3 axis KA-200 Counter (174-185A)
64PKA192C	ABS SCALES 40" X 18" X 16" w/3 axis KA-200 Counter (174-185A)
64PKA193B	ABS SCALES 40" X 18" X 18" w/3 axis KA-200 Counter (174-185A)
64PKA209A	ABS SCALES 32" X 16" X 16" w/3 axis KA-200 Counter (174-185A)
64PKA214C	ABS SCALES 30" X 12" X 16" w/3 axis KA-200 Counter (174-185A)
64PKA215B	ABS SCALES 40" X 12" X 16" w/3 axis KA-200 Counter (174-185A)

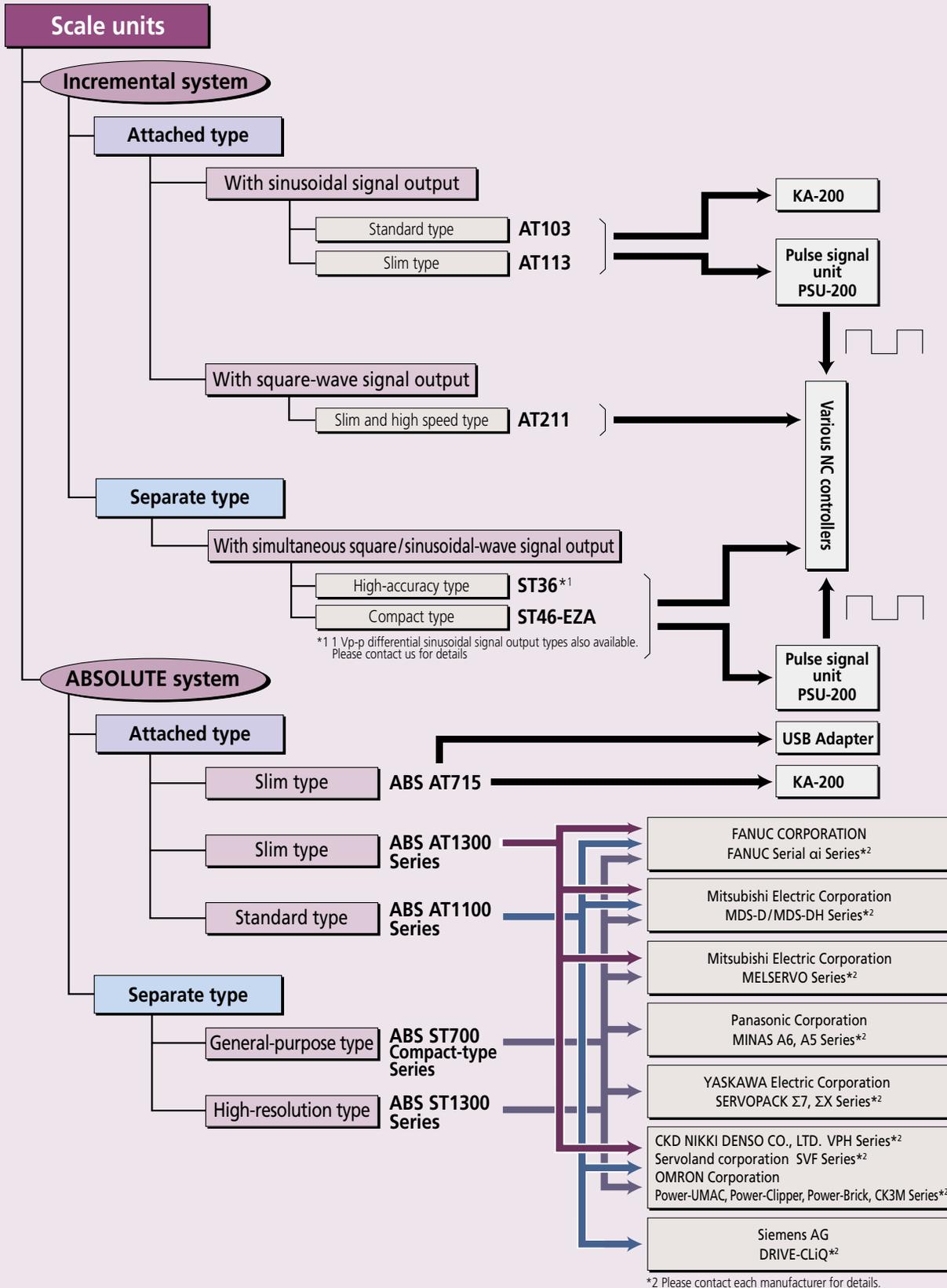
Scale lengths provided above specify travel.



Got Questions?

Linear Scales

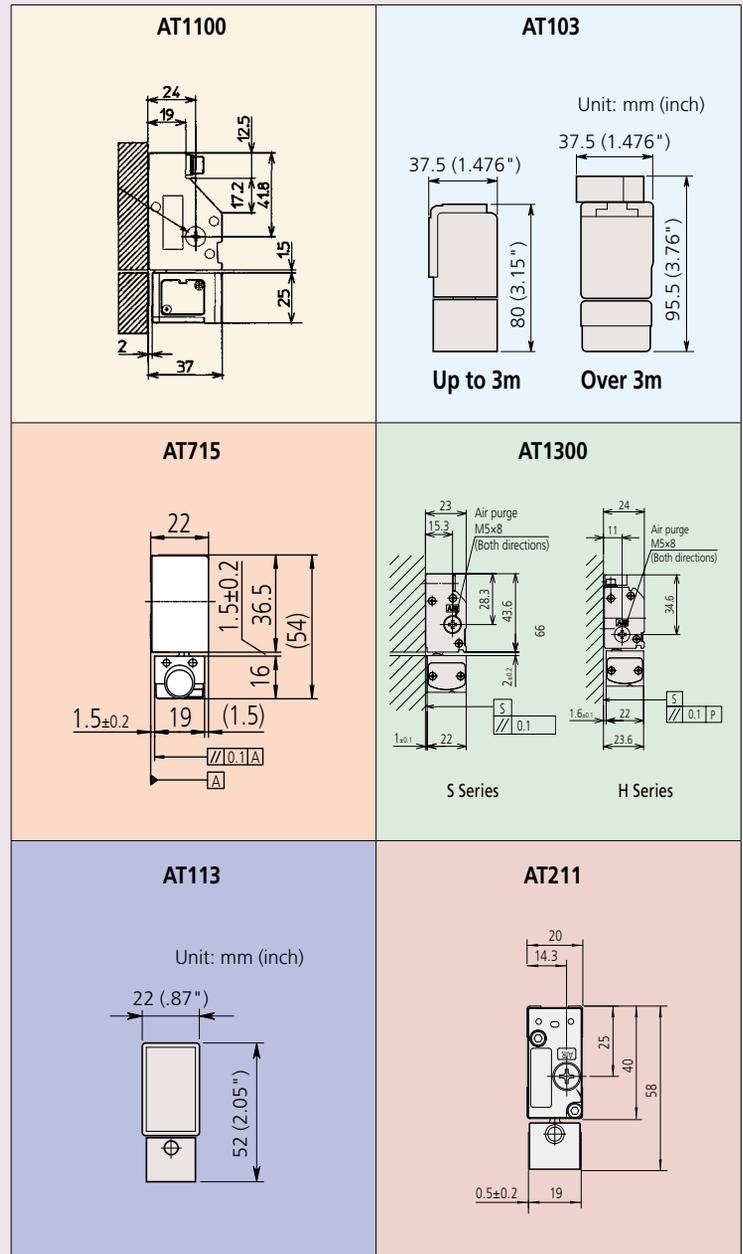
Linear Scale System Diagram



H

Linear Scales

Name	Type	Page
AT103	Standard	H-13
AT113	Slim type	H-14
AT211	Slim type high speed	H-15
AT-715	Slim (IP67)	H-16
AT1300	Slim	H-17
AT1100	General-purpose	H-18
ST36	High Accuracy type (Exposed)	H-19
ST46-EZA	Compact type (Exposed)	H-20
ABS ST700	General Purpose Compact type (Exposed)	H-21
ST1300	High Speed High Accuracy (Exposed)	H-22



Linear Scales

Linear Scales AT103 SERIES 539 — Standard Type



SPECIFICATIONS

Model	AT103
Effective range	1600 to 6000 mm
Resolution	5 μinch / 0.1 μm
Accuracy (20 °C)	Effective range 1600 to 3000 mm: (5 + 5L _o /1000) μm *1 Effective range 3250 to 6000 mm: (5 + 8L _o /1000) μm *1
Output signal	Two 90° phase-shifted sinusoidal signals
Maximum response speed	120 m/min (50 m/min when the effective measuring length is 3250 to 6000 mm)
Signal output pitch	20 μm
Scale reference point	Output in 50 mm pitch
Operating temperature	0 to 45° C

Note 1: High precision model **AT103F** (JIS Class 0, (3 + 3L_o/1000) μm) is also available to special order for the effective range of 100 to 2000 mm.
Note 2: Ultra-high precision model **AT103S** (2 + 2L_o/1000) μm is also available to special order for the effective range of 100 to 500 mm.

*1 L_o=Effective range (mm), see table below

AT103		Effective range L _o inch / mm	Signal cable length (m)
Order No.	Model		
539-133-30	AT103-1600	64 in / 1600 mm	5
539-134-30	AT103-1700	68 in / 1700 mm	
539-135-30	AT103-1800	72 in / 1800 mm	
539-136-30	AT103-2000	80 in / 2000 mm	
539-137-30	AT103-2200	88 in / 2200 mm	
539-138-30	AT103-2400	96 in / 2400 mm	7
539-139-30	AT103-2500	100 in / 2500 mm	
539-140-30	AT103-2600	104 in / 2600 mm	
539-141-30	AT103-2800	112 in / 2800 mm	
539-142-30	AT103-3000	120 in / 3000 mm	
539-143-30	AT103-3250	130 in / 3250 mm	10
539-144-30	AT103-3500	140 in / 3500 mm	
539-145-30	AT103-3750	150 in / 3750 mm	
539-146-30	AT103-4000	160 in / 4000 mm	
539-147-30	AT103-4250	170 in / 4250 mm	
539-148-30	AT103-4500	180 in / 4500 mm	15
539-149-30	AT103-4750	190 in / 4750 mm	
539-150-30	AT103-5000	200 in / 5000 mm	
539-151-30	AT103-5250	210 in / 5250 mm	
539-152-30	AT103-5500	220 in / 5500 mm	
539-153-30	AT103-5750	230 in / 5750 mm	15
539-154-30	AT103-6000	240 in / 6000 mm	

* Models for the effective range 3250 mm or more are made-to-order.

- The **PSU-200** splits the sinusoidal signal output by Mitutoyo linear scales into a minimum of four and a maximum of 200 divisions, and converts the signal to a square-wave signal so that NC feedback systems, measurement control devices, etc., can be used with linear scales in order to achieve highly accurate positioning.
- Connectable to **AT103** and **AT113** Linear Scales.



539-005

Pulse Signal/Square-Wave adapter (PSU-200)



- Standard type scale for longer ranges of travel.
- Connectable to the KA-200 counter or PSU-200 square wave adapter.

Optional Accessories

- 539-005:** Pulse Signal/Square-Wave adapter (PSU-200)
- 09AAA033A:** Extension cable (80" / 2m)
- 09AAA033B:** Extension cable (200" / 5m)
- 09AAA033C:** Extension cable (280" / 7m)



- 174-183A** 2-Axis KA Counter
- 174-185A** 3-Axis KA Counter

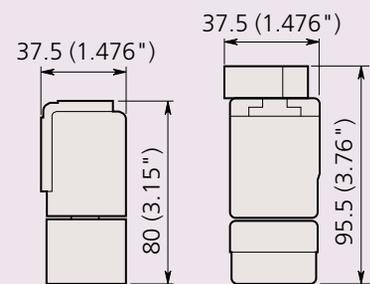


174-183A

See page H-8 for details

Cross Section

Unit: mm (inch)



Up to 3m

Over 3m



Refer to the Linear Scale DRO Systems Brochure (No. 2217 (4)) for more details.



Linear Scales

- Slim type scale.
- Connectable to the KA-200 counter or PSU-200 square wave adapter.

Optional Accessories

- 539-005:** Pulse Signal/Square-Wave adapter (PSU-200)
- 09AAA033A:** Extension cable (80" / 2m)
- 09AAA033B:** Extension cable (200" / 5m)
- 09AAA033C:** Extension cable (280" / 7m)



- 174-183A** 2-Axis KA Counter
- 174-185A** 3-Axis KA Counter

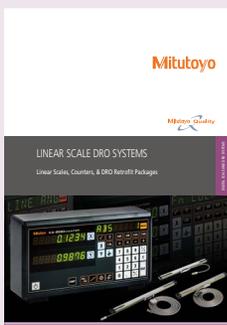
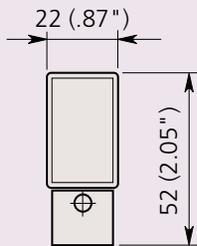


174-183A

See page H-8 for details

Cross Section

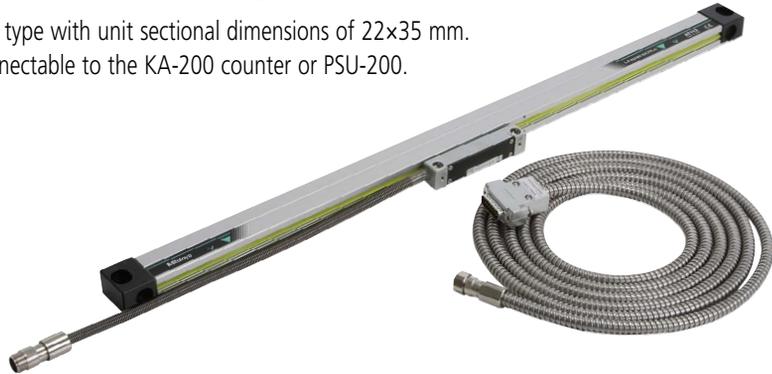
Unit: mm (inch)



Refer to the Linear Scale DRO Systems Brochure (No. 2217 (4)) for more details.

Linear Scales AT113 SERIES 539 — Slim Type

- Slim type with unit sectional dimensions of 22×35 mm.
- Connectable to the KA-200 counter or PSU-200.



SPECIFICATIONS

Model	AT113
Effective range	100 to 1500 mm
Resolution	5 μinch / 0.1 μm
Accuracy (20 °C)	(5 + 5L ₀ /1000) μm *1
Output signal	Two 90° phase-shifted sinusoidal signals
Maximum response speed	120 m/min
Signal output pitch	20 μm
Scale reference point	Output in 50 mm pitch
Operating temperature	0 to 45° C

*1 L₀=Effective range (mm), see table below

Note : High precision model **AT113F** (JIS Class 0, 3 + 3L₀/1000) μm is also available to special order.

AT113		Effective range L ₀ inch / mm	Signal cable length (m)
Order No.	Model		
539-201-30	AT113-100	4 in / 100 mm	3
539-202-30	AT113-150	6 in / 150 mm	
539-203-30	AT113-200	8 in / 200 mm	
539-204-30	AT113-250	10 in / 250 mm	
539-205-30	AT113-300	12 in / 300 mm	
539-206-30	AT113-350	14 in / 350 mm	
539-207-30	AT113-400	16 in / 400 mm	
539-208-30	AT113-450	18 in / 450 mm	
539-209-30	AT113-500	20 in / 500 mm	
539-211-30	AT113-600	24 in / 600 mm	
539-213-30	AT113-700	28 in / 700 mm	
539-214-30	AT113-750	30 in / 750 mm	
539-215-30	AT113-800	32 in / 800 mm	
539-216-30	AT113-900	36 in / 900 mm	
539-217-30	AT113-1000	40 in / 1000 mm	5
539-218-30	AT113-1100	44 in / 1100 mm	
539-219-30	AT113-1200	48 in / 1200 mm	
539-220-30	AT113-1300	52 in / 1300 mm	
539-221-30	AT113-1400	56 in / 1400 mm	
539-222-30	AT113-1500	60 in / 1500 mm	

Linear Scales

Linear Scales AT211-A (Multipoint Mounting) AT211-B (Double-end Mounting) SERIES 539 — Slim and High Speed Type



- This is a slim, sealed, 2-phase square-wave scale that can be directly connected to a control unit.
- Scale alarm LED enables easy maintenance.
- A wide range of specifications to best suit your application.
- Suitable for the control (positioning and speed) of semiconductor manufacturing systems and NC machine tools.
- Contact Mitutoyo America for an estimate.

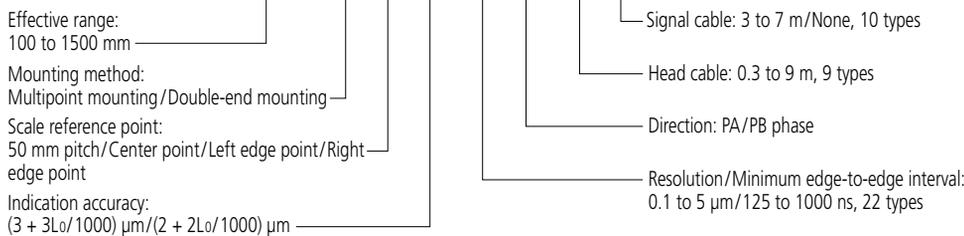
SPECIFICATIONS

Model	AT211 Only available via special quote due to large possibility of specification combinations.
Effective range*	100 to 1500 mm
Resolution	Selectable down to 5 μ inch / 0.1 μ m
Accuracy (20 °C)*	(3 + 3Lo/1000) μ m Lo=effective range (mm) (2 + 2Lo/1000) μ m (Lo \leq 500 mm)
Output signal	2-phase square-wave signals (RS-422A compatible)
Maximum response speed*	5.4 to 120 m/min (varies depending on the resolution or minimum edge interval)
Resolution*	0.1/0.2/0.5/1.0/2.5/5.0 μ m
Scale reference point*	50 mm pitch/Center point/Left-edge point/Right-edge point
Operating temperature	0 to 45° C

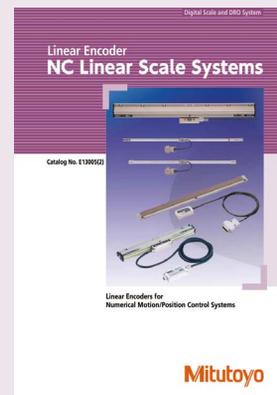
* Desired specification is selectable.

Meaning of Model No.

AT211 - 0100 A 1 S - P 1 - A B



Where to Buy



Refer to the NC Linear Scale Systems Brochure (E13005) for more details.



- The electromagnetic induction principle adopted means ABSOLUTE system-type linear scales are highly resistant to environmental contamination.
- ABSOLUTE scales have eliminated the need for origin restoration, also drastically reducing power consumption.
- Comes with 5 year warranty.

Linear Scales ABS AT715 SERIES 539 — Slim Type



Optional Accessories

- 09AAB674A:** Extension cable (80" / 2m)
- 09AAB674B:** Extension cable (200" / 5m)
- 09AAB674C:** Extension cable (280" / 7m)

64AAB545: USB Adapter (virtual COM port)

- 174-183A** 2-Axis KA Counter
- 174-185A** 3-Axis KA Counter



174-183A

See page H-8 for details

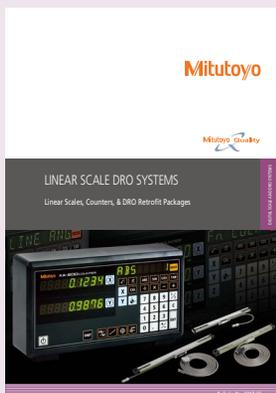
SPECIFICATIONS

Model	ABS AT715
Detection method	Electromagnetic induction
Minimum resolution	20 μinch to .001 - 0.001 mm to 0.01 mm (Changeable by parameter on the KA-200 counter)
Effective range	100 to 3000 mm
Accuracy (20° C)	±5 μm (Lo: 100 to 500 mm) ±7 μm (Lo: 600 to 1800 mm) ±10 μm (Lo: 2000 to 3000 mm)*1
Maximum response speed	50 m/min
Protection level	IP67
Sliding force	5 N or less
Signal cable	Standard Accessories Refer to the dimension table shown below for the length.
Connectable counter	KA-200 Counter

*1 L₀=Effective range (mm)

AT715		Effective range L ₀ inch / mm	Signal cable length (m)
Order No.	Model		
539-801N	ABS AT715-100	4 in / 100 mm	3.5
539-802N	ABS AT715-150	6 in / 150 mm	
539-803N	ABS AT715-200	8 in / 200 mm	
539-804N	ABS AT715-250	10 in / 250 mm	
539-805N	ABS AT715-300	12 in / 300 mm	
539-806N	ABS AT715-350	14 in / 350 mm	
539-807N	ABS AT715-400	16 in / 400 mm	
539-808N	ABS AT715-450	18 in / 450 mm	
539-809N	ABS AT715-500	20 in / 500 mm	
539-811N	ABS AT715-600	24 in / 600 mm	
539-813N	ABS AT715-700	28 in / 700 mm	5
539-814N	ABS AT715-750	30 in / 750 mm	
539-815N	ABS AT715-800	32 in / 800 mm	
539-816N	ABS AT715-900	36 in / 900 mm	
539-817N	ABS AT715-1000	40 in / 1000 mm	
539-818N	ABS AT715-1100	44 in / 1100 mm	
539-819N	ABS AT715-1200	48 in / 1200 mm	
539-820N	ABS AT715-1300	52 in / 1300 mm	
539-821N	ABS AT715-1400	56 in / 1400 mm	
539-822N	ABS AT715-1500	60 in / 1500 mm	
539-823N	ABS AT715-1600	64 in / 1600 mm	7*
539-824N	ABS AT715-1700	68 in / 1700 mm	
539-825N	ABS AT715-1800	72 in / 1800 mm	
539-860N	ABS AT715-2000	80 in / 2000 mm	
539-861N	ABS AT715-2200	88 in / 2200 mm	
539-862N	ABS AT715-2400	96 in / 2400 mm	
539-863N	ABS AT715-2500	100 in / 2500 mm	
539-864N	ABS AT715-2600	104 in / 2600 mm	
539-865N	ABS AT715-2800	112 in / 2800 mm	
539-866N	ABS AT715-3000	120 in / 3000 mm	

* Combination of a 5 m signal cable and a 2 m extension cable



Refer to the Linear Scale DRO Systems Brochure (No. 2217 (4)) for more details.

Linear Scales



Linear Scales ABS AT1300 — Slim Type Attached Type Scale Unit for ABSOLUTE Systems



ABS AT1300-S



ABS AT1300-H

SPECIFICATIONS

	High rigidity type ABS AT13□□(A)-S	High accuracy type ABS AT13□□(A)-H
Detection method	Optical	
Resolution	0.001/0.01/0.05 μm (1 / 10 / 50 nanometer)	
Maximum response speed	3 m/s	
Maximum effective measuring length	2.2 m	1 m
Accuracy (20° C)	$(3 + 3L_0/1000)\mu\text{m}^{*1}$	$(2 + 2L_0/1000)\mu\text{m}^{*1}$
Reference point*2	Center of the effective measuring length	
Operating temperature (humidity) range	0 to 50° C (RH 20 to 80%, non-condensing)	
Storage temperature (humidity) range	-20 to 70° C (RH 20 to 80%, non-condensing)	

*1 L_0 =Effective range (mm)

*2 Scale is mechanically fixed at this point, therefore expansion caused by temperature fluctuations are relative to this point.

Meaning of Model No.

ABS AT13□□□ - □□□□ - □

Interface specifications

Effective range

Type of the scale unit

S: High rigidity type

H: High accuracy type

Model	Applicable system
ABS AT135□	FANUC CORPORATION Serial ai Interface
ABS AT134□	Mitsubishi Electric Corporation MDS-D/MDS-DH Series
ABS AT134□A	Mitsubishi Electric Corporation MELSERVO servo amplifier MR-J5 Series, MR-J4 Series
ABS AT138□A	YASKAWA Electric Corporation SERVOPACK Σ7, ΣX Series
ABS AT130□A	Mitutoyo ENSIS

Note 1: Be sure to contact each manufacturer for details of the applicable systems.

Note 2: ABS AT13□□□

Resolution

7: 0.001 μm

4: 0.01 μm

3: 0.05 μm

Transmission method

Nothing: Full duplex communication

A: Half-duplex communication

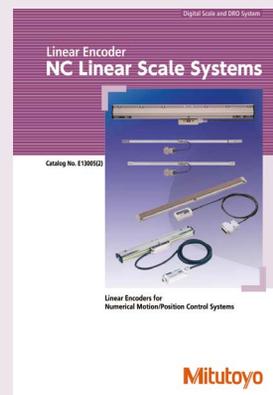
Signal cable specifications (optional)

Items	Specifications
Cable length	1 m, 2 m, 3 m, 4 m, 5 m, 6 m, 7 m, 8 m, 9 m, 12 m
Cable material	PVC sheath (ø6.5 mm), High-flex connecting cable (No metal conduit)
I/O output connector	Flying lead specifications FANUC specifications Mitsubishi specifications D-sub specifications (Alarm display LED mounted)

- Outstanding resistance to contamination compared to conventional optical types by using a new detection principle (in-house testing result).
- Features a new coolant-proof design incorporating a high-performance rubber seal to provide higher reliability in the harsh factory environment.
- Delivers high accuracy and the outstanding resolution of 0.001 μm, the best-in-class in ABSOLUTE scales.
- Allows space-saving design thanks to a slim form.
- Supports the interfaces of various manufacturers allowing a variety of system configurations.



Get a Quote



Refer to the NC Linear Scale Systems Brochure (E13005) for more details.

Linear Scales ABS AT1100 Attached Type Scale Unit for ABSOLUTE Systems

- Features a new coolant-proof design incorporating a high-performance rubber seal to provide higher reliability in the harsh factory environment.
- The 0.4 mm air gap between the sensors is approximately four times wider than the conventional optical or magnetic sensors. Therefore, the chance of foreign objects lodging in this gap is lower. This air gap is the world's largest in this class of scale used on machine tools.
- The de facto standard multi-point fixing method for the frame is adopted, resulting in high vibration/shock-resistance.
- Due to an improvement in the signal processing technique for the electromagnetic induction ABSOLUTE linear encoder, the repeatability is six times better than our conventional model.
- Being compatible with the high-speed serial interface of each company, a direct connection to the NC controller is possible.



ABS AT1100

SPECIFICATIONS

Model	ABS AT11□3(A)
Detection method	Electromagnetic induction
Mounting method	Frame multipoint
Effective range	140 to 3040 mm
Resolution	0.05 μm (50 nanometer)
Maximum response speed	3 m/s
Accuracy (20° C)	Effective range L ₀ =140 to 2040 mm: 3 + 5L ₀ /1000 (μm) Effective range L ₀ =2240 to 3040 mm: 5 + 5L ₀ /1000 (μm)
Expansion coefficient	≈8×10 ⁻⁶ /K
Vibration resistance	≤196 m/s ² (20 G) (55 to 2000 Hz)
Shock resistance	Effective range L ₀ =140 to 2040 mm: ≤ 343 m/s ² (35 G) Effective range L ₀ =2240 to 3040 mm: ≤ 294 m/s ² (30 G) (1/2 sin 11 ms)
Power supply voltage	ABS AT1153/1143/1103A: 5 VDC ± 10% ABS AT1123: DC24 V (Conforming to DRIVE-CLiQ)
Maximum current consumption	AT1153: 300 mA (Max.) AT1143: 290 mA (Max.) AT1123: 140 mA (Max.) AT1103A: 300 mA (Max.)
Operational temperature (humidity) ranges	0 to 50° C (RH 20 to 80%, non-condensing)
Storage temperature (humidity) ranges	-20 to 70° C (RH 20 to 80%, non-condensing)

*1 L₀=Effective range (mm), see table below

Meaning of Model No.

ABS AT11□3 - □□□□
Effective range

Interface specifications

Model	Applicable system
ABS AT1153	FANUC CORPORATION Serial ai Interface
ABS AT1143	Mitsubishi Electric Corporation MDS-D/MDS-DH Series
ABS AT1123	Siemens AG DRIVE-CLiQ
ABS AT1103A	Mitutoyo ENSIS

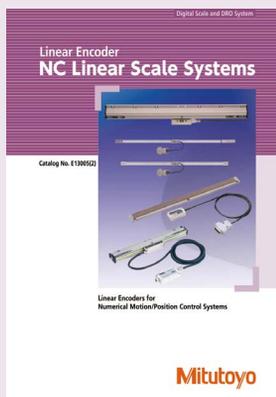
Note 1: Please contact each manufacturer for details of the applicable systems.

Note 2: ABS AT11□3□

- Transmission method
- Nothing: Full duplex communication
- A: Half-duplex communication

Signal cable specifications (optional)

Items	Specifications
Cable length	1 m, 3 m, 6 m, 9 m, 12 m
Cable material	PVC sheath ø6.5 Without conduit, High-flex specification with conduit PUR sheath ø6.5 Without conduit
I/O output connector	Flying lead specifications FANUC specifications Mitsubishi specifications Mitutoyo standard specifications Siemens specifications M12 connector specifications



Refer to the NC Linear Scale Systems Brochure (E13005) for more details.

Linear Scales

Linear Scales ST36 SERIES 579 — High Accuracy Type



- Outputs 2-phase sinusoidal wave signals at 4 μm pitch.
- The maximum effective measuring length is 3000 mm when the resolution is 0.01/0.02/0.05/0.1 μm (2-phase square-wave is output).
- Compact detector head enables space saving design.
- Along with the output specifications of 2-phase sinusoidal wave and 2-phase square-wave, the output specification of 1 Vp-p wave is also available.
- Equipped with the function to display signal errors on the LED.

SPECIFICATIONS

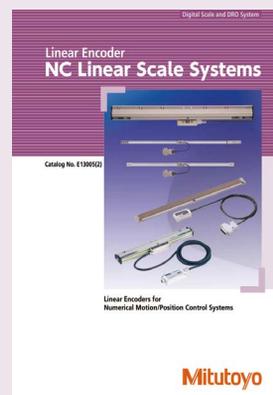
Model	ST36
Detection method	Optical
Output signal	ST36A: 2 Vp-p sinusoidal signals ST36B: 2-phase square-wave signals (RS-422A compatible), Alarm reset input ST36C: 2-phase square-wave signals (RS-422A compatible), 2-phase sinusoidal signals ST36D: 1 Vp-p differential sinusoidal signals
Main scale grating pitch	8 μm
Signal output pitch	4 μm
Effective range	10 to 3000 mm
Accuracy (20° C)*1	$\pm 0.5 \mu\text{m}$, $\pm 1 \mu\text{m}$, $\pm 2 \mu\text{m}/\text{m}$
Maximum response speed*2	1200 mm/s
Scale reference point	10 to 80 mm: 1 center point; 100 to 300 mm: 50 mm pitch
Power supply voltage	5 VDC $\pm 5\%$
Operating temperature (humidity) range	0 to 40° C (20 to 80% RH, non-condensing)
Storage temperature (humidity) range	-20 to 60° C (20 to 80% RH, non-condensing)
Head cable length	1 m (high-flex connecting cable)

*1	Effective range	Accuracy
	300 mm or less	$\pm 0.5 \mu\text{m}$
	500 mm or less	$\pm 1 \mu\text{m}$
	1000 mm or less	$\pm 2 \mu\text{m}$
	3000 mm or less	$\pm 2 \mu\text{m}/\text{m}$

*2 Maximum response speed when sinusoidal signals are output



Need Support?



Refer to the NC Linear Scale Systems Brochure (E13005) for more details.



Linear Scales

Linear Scales ST46-EZA SERIES 579 — Compact Type

- Includes an automatic adjusting function for the signal (EZA function) at the push of a button.
- Detector head mounting and signal adjustment possible without oscilloscope or PC.
- A setup indicator for checking signal strength is included.
- When connected with a PC it is possible to check signal strength and set parameter (Optional application program required).
- I/F circuit integrated in connector shell reduces volume to compared to conventional interface.
- The thickness of the detector head is only 7.5 mm. The metal tape scale type has a mounting surface area of 12.5 by 9.325 mm, allowing use in applications where a space-saving design is important.
- Glass and metal tape versions are available.

Glass Scale Type

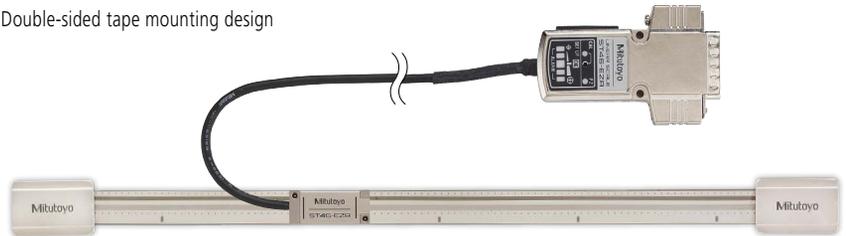


Metal Tape Scale Type

- Double-end mounting design



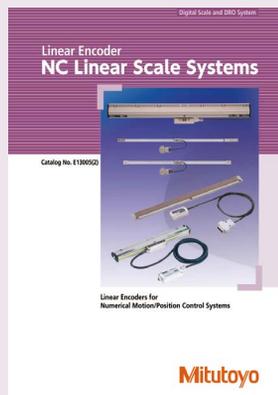
- Double-sided tape mounting design



SPECIFICATIONS

Model	ST46-EZA	
Detection method	Optical	
Scale type	Glass	Metal tape
Main scale grating pitch	20 μm	
Output signal	Type B: 2-phase square-wave signals (RS-422A compatible), reference point pulse, external reset input. Type C: 2-phase square-wave signals (RS-422A compatible), reference point pulse, 2-phase sinusoidal signals.	
Effective range	10 to 3000 mm	
Accuracy (20° C)	Effective range 10 to 300 mm: $\pm 1 \mu\text{m}$ Effective range 350 to 500 mm: $\pm 2 \mu\text{m}$ Effective range 600 to 1000 mm: $\pm 3 \mu\text{m}$ Effective range 1100 to 3000 mm: $\pm 3 \mu\text{m/m}$	Effective range 10 to 1000 mm: $\pm 5 \mu\text{m}^*1$ Effective range 1100 to 3000 mm: $\pm 5 \mu\text{m/m}^*1$
Maximum response speed	2.6 m/s (at the point where the sinusoidal signal amplitude has decreased by 3 dB)	
Scale reference point	10 to 80 mm: 1 center point; 100 to 300 mm: 50 mm pitch	
Power supply voltage	5 VDC $\pm 5\%$	
Operating temperature (humidity) range	0 to 40° C (RH 20 to 80%, non-condensing)	
Storage temperature (humidity) range	-20 to 60° C (RH 20 to 80%, non-condensing)	
Head cable length	1 m (high-flex connecting cable)	

*1 The above accuracy applies to individual scales. For double-end mounting designs, perform point-to-point correction after ensuring the metal tape is tensioned correctly.



Refer to the NC Linear Scale Systems Brochure (E13005) for more details.

Linear Scales

Linear Scales ABS ST700 SERIES 579 — General-purpose Type



SPECIFICATIONS

Model	ABS ST700	
Scale type	Scale base	
Resolution	0.1 μm	
Detection method	Electromagnetic induction	
Max. effective range	100 to 3000 mm	3200 to 6000 mm
Accuracy (20° C)	5 + (5L/1000) μm^{*1}	5 + (5L/1000) μm^{*1}
Maximum response speed	5 m/s	
Power supply voltage	5 VDC \pm 10% (at the detection head) (Ripple+spike noise component should be less than 100 mV)	
Maximum current consumption	270 mA	
Head cable length	1 m (high-flex connecting cable)	
Maximum cable length	29 m (including the head cable length)	
Operating temperature (humidity) range	0 to 50° C (RH 20 to 80%, non-condensing)	0 to 50° C (RH 20 to 70%, non-condensing)
Storage temperature (humidity) range	-20 to 70° C (RH 20 to 80%, non-condensing)	-20 to 60° C (RH 20 to 70%, non-condensing)

*1 Lo=Effective range (mm)

Meaning of Model No.

ABS ST7 0 8 A L - 100 A - R

ABSOLUTE type

Series name

Separate Type ABSOLUTE Linear Scale
ABS ST700 Compact-type Series (Effective range \leq 3 m)
ABS ST700 Compact-type Series (3.2 m \leq Effective range \leq 6 m)

Interface specification*1

0: Supports Mitutoyo ENSIS high-speed serial interface
ABS ST708A
4: Supports Mitsubishi Electric Corporation, high-speed serial interface
ABS ST748A, ABS ST748
5: Supports FANUC CORPORATION, high-speed serial interface
ABS ST758, ST758L
7: Supports Panasonic Corporation, high-speed serial interface
ABS ST778A
8: Supports YASKAWA Electric Corporation, high-speed serial interface
ABS ST788A

A: Scale base type

Effective range: 100 to 6000 mm

Nothing: 100 to 3000 mm
L: 3200 to 6000 mm

Transmission method

A: 2-wire system
Nothing: 4-wire system

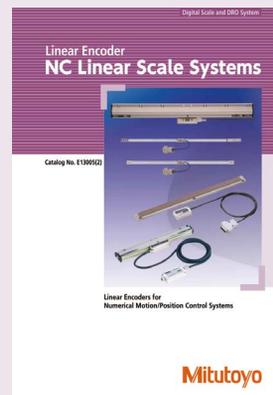
Detection head form and resolution

8: Form: 50 (W) \times 28 (D) \times 11 (H) mm
Resolution: 0.1 μm
9: 0.05 μm resolution (to special order)

Head cable outlet direction
R: Right side
L: Left side
U: Upper side
D: Lower side



Need Service?



Refer to the NC Linear Scale Systems Brochure (E13005) for more details.

ABSOLUTE™



- ABSOLUTE measurement with separate type scales
- Non-contact detection is optimal for high speed and high acceleration devices such as linear motors
- Electromagnetic induction principle means scales are unaffected by water and oil contamination
- The detector head is approximately 1/3 the previous model size: 50 mm (W) \times 28 mm (D) \times 11 mm (H)
- Cable outlets can be in four directions, with mounting holes on the top and sides
- Compatible with servo amplifiers from a range of companies (high-speed serial interfaces)

Linear Scales ABS ST1300 SERIES 579

- Effective range: 12 m, Maximum response speed: 8 m/s, Resolution: 1 nm
- Various interfaces are supported.
- A new detection method has improved robustness in regards to contamination resistance and gap tolerance (in-house testing result).
- Can be mounted using double-sided tape or screws (on both sides or at the center of the unit).
- Signal check program enables integrity check and maintenance.

Double-end mounting type



Center mounting



Double-sided tape mounting type



SPECIFICATIONS

Model	ABS ST1300		
Detection method	Optical		
Scale type	Double-end mounting	Center mounting	Double-sided tape mounting
Maximum effective range	12000 mm	6000 mm	3000 mm
Accuracy (20° C)	±5 μm (1 m or less), ±5 μm/m (1.1 m or more)*4	With system parameters: ±5 μm (1 m or less), ±5 μm/m (1.1 m or more) Without system parameters: ±10 μm (1 m or less), ±10 μm/m (1.1 m or more)	±5 μm (1 m or less), ±5 μm/m (1.1 m or more)
Maximum response speed	8 m/s or less		
Expansion coefficient	≈10×10 ⁻⁶ /K*5	≈10×10 ⁻⁶ /K	≈10×10 ⁻⁶ /K*2
Power supply	5 VDC ± 10%		
Maximum current consumption	270 mA or 250 mA (depends on interface)		
Cable length	1 m (high-flex connecting cable)		
Maximum cable length	29 m (including head cable)		
Usable temperature (humidity) range	0 to 50° C (RH 20 to 70%, non-condensing)		
Storage temperature (humidity) range	-20 to 70° C (RH 20 to 70%, non-condensing)		

*2 Thermal expansion coefficient occasionally change, as the difference between scale material's and sealing surface material's is excessive.

*4 Tension fix is adopted to be stable the temperature property. Because scale tension is longer 250 μm/m, the accuracy compensation is needed over the system.

*5 Thermal expansion coefficient after mounted conform to expansion/contraction of mounted surface by changing outer temperature (Double-end fixing type).

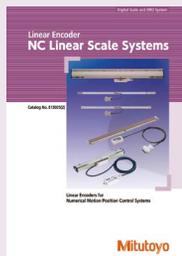
Note: For details on specification, mounting procedure, and adjustments, refer to the corresponding brochure and operation manual.

Available Interfaces*1

- FANUC CORPORATION, FANUC Serial αi Series
- Mitsubishi Electric Corporation, MELSERVO Series Servo Amplifier MR-J5 Series, MR-J4 Series
- YASKAWA Electric Corporation, SERVOPACK Σ7, ΣX Series
- Panasonic Corporation, MINAS A6, A5 Series
- Mitutoyo ENSIS*2

*1 Be sure to contact each manufacturer for details of the applicable systems (availability of connection).

*2 ENSIS is a registered trademark of Mitutoyo Corporation.



Refer to the NC Linear Scale Systems Brochure (E13005) for more details.

Meaning of Model No.

ABS ST13 4 1 A - 1200 D

ABSOLUTE type

Series name
Separate Type ABSOLUTE Linear Scale

- Interface specification*1
- 0: Supports Mitutoyo ENSIS high-speed serial interface
ABS ST130□A
 - 4: Supports Mitsubishi Electric Corporation, high-speed serial interface
ABS ST134□A
 - 5: Supports FANUC CORPORATION, high-speed serial interface
ABS ST135□
 - 7: Supports Panasonic Corporation, high-speed serial interface
ABS ST137□A
 - 8: Supports YASKAWA Electric Corporation, high-speed serial interface
ABS ST138□A

Scale mount

- D: Double-end mounting
- E: Double-sided tape mounting
- F: Center mounting (With system parameters)
- G: Center mounting (Without system parameters)

Effective range: 10 to 12000 mm

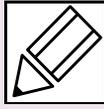
Transmission method

- A: Half-duplex method
- Nothing: Full duplex method or Half-duplex method/Half-duplex method

Resolution

- 1: Resolution 0.01 μm
- 2: Resolution 0.001 μm

Quick Guide to Precision Measuring Instruments



Linear Scales

Glossary

ABSOLUTE (ABS) system

A measurement mode in which every point measurement is made relative to a fixed origin point.

Incremental system

A measurement mode in which every point measurement is made relative to a certain stored reference point.

Origin offset

A function that enables the origin point of a coordinate system to be translated to another point offset from the fixed origin point. For this function to work, a system needs a permanently stored origin point.

Restoring the origin point

A function that stops each axis of a machine accurately in position specific to the machine while slowing it with the aid of integrated limit switches.

Sequence control

A type of control that sequentially performs control steps according to a prescribed order.

Numerical control

A way of controlling the movements of a machine by encoded commands created and implemented with the aid of a computer (CNC). A sequence of commands typically forms a 'part program' that instructs a machine to perform a complete operation on a workpiece.

Binary output

Refers to output of data in binary form (ones and zeros) that represent numbers as integer powers of 2.

RS-232C

An interface standard that uses an asynchronous method of serial transmission of data over an unbalanced transmission line for data exchange between transmitters located relatively close to each other. It is a means of communication mainly used for connecting a personal computer with peripherals.

Line driver output

This output features fast operating speeds of several tens to several hundreds of nanoseconds and a relatively long transmission distance of several hundreds of meters. A differential-voltmeter line driver (RS-422A compatible) is used as an I/F to the NC controller in the linear scale system.

RS-422

An interface standard that uses serial transmission of bits in differential form over a balanced transmission line. RS-422 is superior in its data transmission characteristics and in its capability of operating with only a single power supply of 5 VDC.

Accuracy

The accuracy specification of a scale is given in terms of the maximum error to be expected between the indicated and true positions at any point, within the range of that scale, at a temperature of 20 °C. Since there is no international standard defined for scale units, each manufacturer has a specific way of specifying accuracy. The accuracy specifications given in our catalog have been determined using laser interferometry.

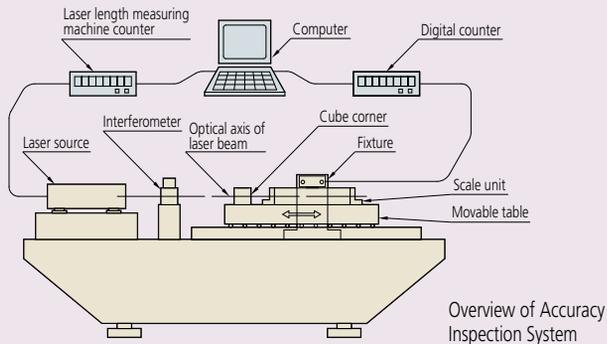
Narrow range accuracy

Scale gratings on a scale unit normally adopt 20 µm pitch though it varies according to the kind of scale. The narrow range accuracy refers to the accuracy determined by measuring one pitch of each grating at the limit of resolution (1 µm for example).

Specifying Linear Scale Accuracy

Positional Indication accuracy

The accuracy of a linear scale is determined by comparing the positional value indicated by the linear scale with the corresponding value from a laser length measuring machine at regular intervals using the accuracy inspection system as shown in the figure below. As the temperature of the inspection environment is 20° C, the accuracy of the scale applies only in an environment at this temperature. Other inspection temperatures may be used to comply with internal standards.



The accuracy of the scale at each point is defined in terms of an error value that is calculated using the following formula:

$$\text{Error} = \text{Value indicated by Laser length measuring machine} - \text{Corresponding value indicated by the linear scale}$$

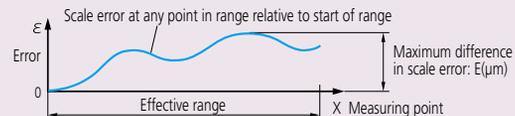
A graph in which the error at each point in the effective positioning range is plotted is called an accuracy diagram.

There are two methods used to specify the accuracy of a scale, unbalanced or balanced, described the right.

(1) Unbalanced accuracy specification - maximum minus minimum error

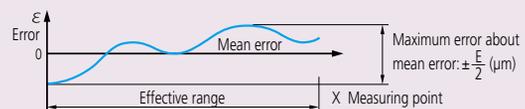
This method simply specifies the maximum error minus the minimum error from the accuracy graph, as shown below. It is of the form: $E = (\alpha + \beta L) \mu\text{m}$. L is the effective range (mm), and α and β are factors specified for each model.

For example, if a particular type of scale has an accuracy specification of $(3 + \frac{3L}{1000}) \mu\text{m}$ and an effective range of 1000 mm, E is 6 μm .



(2) Balanced accuracy specification - plus and minus about the mean error

This method specifies the maximum error relative to the mean error from the accuracy graph. It is of the form: $e = \pm \frac{E}{2} (\mu\text{m})$. This is mainly used in separate-type (retrofit) scale unit specifications.



A linear scale detects displacement based on graduations of constant pitch. Two-phase sinusoidal signals with the same pitch as the graduations are obtained by detecting the graduations. Interpolating these signals in the electrical circuit makes it possible to read a value smaller than the graduations by generating pulse signals that correspond to the desired resolution. For example, if the graduation pitch is 20 μm , interpolated values can generate a resolution of 1 μm .

The accuracy of this processing is not error-free and is called interpolation accuracy. The linear scale's overall positional accuracy specification depends both on the pitch error of the graduations and interpolation accuracy.

Featured Products



Profile Projectors

PJ-H30

Refer to page I-7 for details.



Microscopes

MF

Refer to page I-18 for details.



Microscopes

MF-UD

Refer to page I-21 for details.



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Profile Projectors

PH-3515F SERIES 172 — Profile Projector

- Benchtop model uses a horizontal optical system.
- Suitable for thread pitch measurements—blurred or distorted images will not be produced when workpiece is angled.
- Erect image on the day-bright screen.
- Standard twin fiber-optic illumination.
- 14" (353mm) diameter protractor screen with cross-hairs and staggered lines for easy alignment.
- Digital angle measurement to 1' or 0.01°.
- Heavy-duty workpiece table incorporates linear scales for fast, accurate measurement.
- Built-in linear scales for use with optional display counters.



Built-in Surface Illumination



Includes Built-in Twin Fiber Optics to assist with measuring surface features/defects.

Flexible housing allows the lighting condition to be easily manipulated for a user dealing with a lighting situation.

PH-3515 offers a variety of illumination options from crisp couture illumination users have come to expect, as well as coaxial and surfaces illumination.

- Inspect edges with ease
- Amplify surface features
- Examine small changes in typography (markings, scratching, dents)

Accessories for Common Industry Applications



Durable working stage with built-in T slots allows for fixtures to be seamlessly mounted to a stage. Mitutoyo offers a variety of fixturing options on the PH-3515F which were made to accommodate common industry applications

- In the picture to the left is the Mitutoyo Tipped Saw Support Stand (172-001) used for streamlined inspection of each tooth grind, ensuring its consistency and accuracy across teeth on a saw blade



172-001



172-002

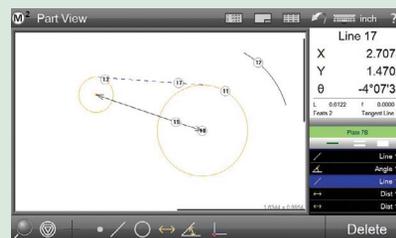


2D Coordinate Interfacing RETROFITS

Model No.	Description
64PKA-M2-P	M2 Non-edge Detection Unit with ASUS Touchscreen PC
64PKA-M2-PE	M2 with Edge Detection Unit & ASUS Touchscreen PC
264-161-13A	QM-DATA200 Arm Type (PJ-Plus)

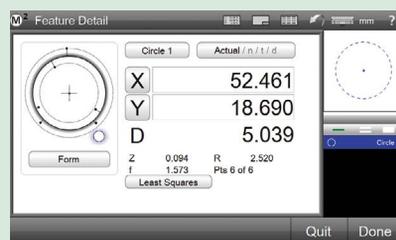


KA Counter (174-183A)
(Refer to page H-8 for more details.)
64AAB149: Counter stand



M2 Graphics-based "Part View" constructions

Generate popular construction types, like distances and tangent lines, from within the graphical part view.

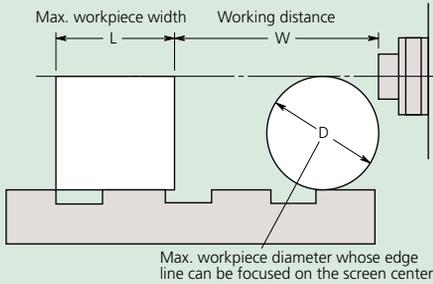


M2 Geometric tolerance view

Measure features, set nominals, apply tolerances and view deviation results with only a few quick clicks.

Profile Projectors

Projection Capacity



PH-3515F Unit: mm

	Magnification			
	10X (standard)	20X	50X	100X
View field	35.3	17.65	7.06	3.5
L	235	235	80	109
W	93 (41)	40	14.6	9.5
D	152.4	116	30.4	19

(): When using surface illumination

Optional Accessories

- 172-482: 10X projection lens set (standard accessory)
- 172-483: 10X projection lens
- 172-484: 20X projection lens set
- 172-485: 20X projection lens
- 172-486: 50X projection lens set
- 172-487: 50X projection lens
- 172-166: 100X projection lens set
- 64PMI308: Machine stand
- 172-116: Standard scale (50mm)
- 172-117: Standard scale (2")
- 172-118: Reading scale (200mm)
- 172-161: Reading scale (300mm)
- 172-119: Reading scale (8")
- 172-162: Reading scale (12")
- 172-286: Green filter
- 512305: Halogen bulb (24V, 150W) (standard accessory)
- 172-425: Twin surface illumination

Fixture and Stage Accessories*

- 172-600: Center support
- 172-601: Center support riser
- 172-602: Rotary vise (Max. workpiece dia.: 2.3" / 60mm)
- 172-603: V-block with clamp (Max. workpiece dia.: 2" / 50mm)
- 172-132: Vertical holder
- 172-001: Tipped-saw support stand
- 172-002: Cutter support stand

* See page I-13 for details



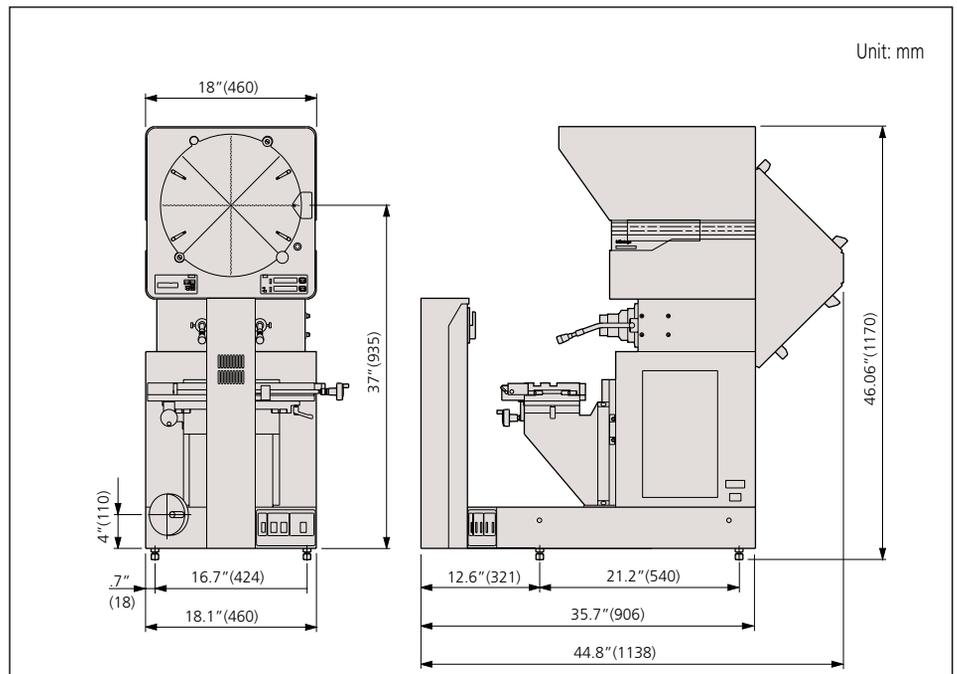
Find a Distributor

SPECIFICATIONS

Model No.	PH-3515F		
Order No.	172-868-11A*		
Projected image	Erect image		
Protractor screen	Effective diameter	14" / 353mm	
	Screen material	Fine ground glass	
	Reference line	Cross hair line	
	Screen rotation	±360°, fine feed and clamp	
	Angle display (LED)	Resolution: 1' or 0.01° (switchable), Range: ±370°, Functions: ABSOLUTE/incremental mode switching, Zero set	
Projection lens	Standard accessory: 10X (172-184), Optional accessories: 5X, 20X, 50X, 100X		
Magnification accuracy	Contour illumination	±0.1% or less	
	Surface illumination	±0.15% or less	
Contour illumination	Light source	Halogen bulb (24V 150W)	
	Optical system	Telecentric system	
	Functions	2-step brightness switch, Heat-absorbing filter, Cooling fan	
XY Stage	Light source	Halogen bulb (24V 150W)	
	Functions	Adjustable condenser lens, Heat-absorbing filter, Cooling fan	
Surface illumination (Optional accessories)	Table travel (X-axis)	10" / 254mm	
	Table size (X, Z)	17.7" x 5.7" / 450 x 146mm	
	Vertical travel (Y-axis)	6" / 152mm	
	Resolution	0.001mm/0.0005"*	
	Measuring Unit	Built-in Linear scale	
	Max. workpiece width	See (L) in chart to left	
Max. workpiece load	100lbs / 45kg		
Power supply	120V AC, 50/60Hz		
Mass	333lbs / 150kg		
Standard accessories	10X projection lens set, work stage, power cord, halogen bulb, tube fuse, grounding wire, allen wrench		

* Counter not included

DIMENSIONS



Profile Projectors

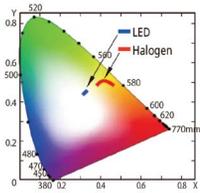
PJ-PLUS SERIES 302 — Premium Benchtop Series

- Excellent durability and energy-saving performance thanks to the adoption of an “LED illumination source” and “fan-less cooling system”.
- The measuring projector that “can be operated intuitively” even by inexperienced people and also has excellent durability and energy-saving performance thanks to the adoption of fan-less cooling system.
- Provides stable dimension and angle measurements in harsher environments, such as manufacturing and processing lines, than can be handled by conventional models.



LED (White)

No color change in projected image with changes in illumination intensity.



Color temperature varies significantly with the level of halogen illumination but not so much with LED illumination, so the appearance of the image varies a lot less as the LED level is adjusted. Also, the projected image under LED illumination is sharper and easier on the operator's eyes which contributes to a reduction in fatigue and more efficient inspection and measurement.

High visibility digital display



In addition to zero-setting and direction change, the data output of each counter value adopts the highly versatile RS-232C. Resolution: 0.001 mm or 0.0001 in / 0.001 mm.

Stepless illumination adjustment



The conventional 2-step illumination adjustment has been changed to stepless control so the level of illumination can be precisely set to suit the surface texture and color of the workpiece.

LED Circular Illuminator for PJ-PLUS (Optional)

LED illumination light can emphasize the contrast of projected workpiece images, stereoscopic and sharp observation. Projected image can be observed at high color reproducibility; Low power consumption: 17.4W; and long operating life: 30,000 hours.



SPECIFICATIONS

Model No.	172-502A*
Compatible model	PJ-PLUS (Projection lens 10X and 20X)
Illumination source	White LED
Power consumption	12 V / 17.4 W
LED life (reference)	30,000 H

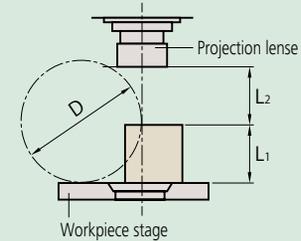
* This optional accessory requires (12AAX044) and is compatible with the PJ-PLUS 20x Objective



Example of attaching the LED circular illuminator on PJ-PLUS

PJ-Plus Objectives

Model No.	Description
172-296	Projection lens set, 10X magnification
172-297	Projection lens set, 20X magnification
172-298	Projection lens, 50X magnification
172-299	Projection lens, 100X magnification



L1: Max. height where focusing is available
L2: Max. step where focusing is available (working distance)
D: Max. diameter when a cylinder image is projected on the center line of the screen

	Contour Illumination				Surface Illumination			
	10X	20X	50X	100X	10X	20X	50X	100X
Magnification	10X	20X	50X	100X	10X	20X	50X	100X
View Field	31.5	15.7	6.3	3.1	31.5	15.7	6.3	3.1
Working distance	L ₂	66	32.5	12.6	5	20	2	12.6
PJ-P1010A	L ₁	91						
	D	182	87	27	10	182	61	27
PJ-P2010A	L ₁	90.5						
	D	181	87	27	10	181	61	27

Oblique Reflection Mirror

This is used for observing low-reflectivity workpieces, such as plastic parts, and the surfaces of parts with high surface roughness.



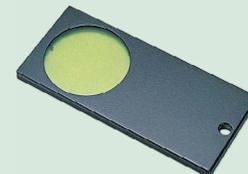
172-229 (for 10X)



172-230 (for 20X)

Green Filter

(Improved contrast - less susceptible to ambient light)



172-160-3

Profile Projectors

SPECIFICATIONS

Model No.	PJ-P101A	PJ-P2010A
Order No.	302-801-10A	302-802-10A
Unit system for Main Unit	mm/in	
Projected image	Inverted-reversed	
Protractor screen	Effective diameter	ø315 mm / 12.4 in
	Screen rotation	±360° (±370° for display)
	Angle display	Digital Counter (ABS/INC mode switching, Zero Set)
	Resolution	1' or 0.01'
	Cross-hairs	90° (solid lines)
Projection lens	Magnification	Standard accessory: 10X, Optional accessories: 20X, 50X, 100X 10 x 8 20x (Equipped with external half-mirror for coaxial surface illumination)
	Lens Mounts	Bayonet Mount
Magnification accuracy	Contour illumination	±0.1%
	Surface illumination	±0.15%
Contour illumination	Light source	White LED light source
	Optical system	Telecentric system
	Functions	Variable brightness adjustment
Surface illumination (Optional accessories)	Light source	White LED light source
	Optical system	Adjustable condenser lens (ensuring even lighting across entire FOV at specific magnification)
Counter unit	Angle	Built-in Digital counter, range ±370°, resolution: 1' or 0.01' (switchable), zero set, ABS/INC switchable
	XY Axis Resolution	.001mm/.0001"
	Functions	Zero set (with buzzer function), Unit switching, Direction switching OPTOEYE input, External load signal input, RS-232C output
	Edge Detection	OPTOEYE Retrofit Available (264-161-13A-PJP-OPT)
	Measuring Unit	Digital Linear Scale
	Measuring Range	100 x 100 mm / 4x4 in 200 x 100 mm / 8 x 4 in
System	Table Size	250 x 250 mm / 9.8 x 9.8 in 350 x 280 mm / 14 x 11 in
	Effective Table Area	142 x 142 mm / 5.6 x 5.6 in 250 x 150 mm / 9.8 x 5.6 in
	Max Workpiece Height	91 mm / 3.58 in 90.5 mm / 3.56 in
	Max Workload	10 kg / 22 lbs 8 kg / 17 lbs



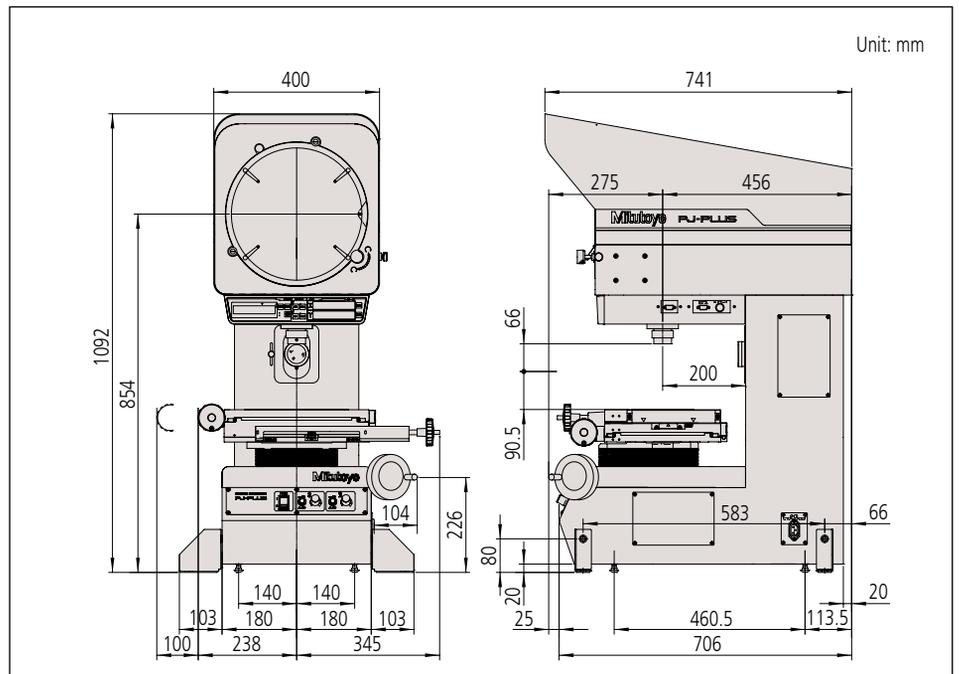
2D Coordinate Interfacing RETROFITS

Model No.	Description
64PKA-M2-P	M2 Non-Edge Detection Unit with ASUS Touchscreen PC
64PKA-M2-PE	M2 with Edge Detection Unit & ASUS Touchscreen PC
264-161-13A-PJP	QM-DATA200 Arm Type (PJ-Plus)
264-161-13A-PJP-OPT	QM-DATA200 Arm Type & Optoeye Edge Detection (PJ-Plus)

Optional Accessories

- 172-116:** Inspection tool, Standard scale 50 mm/0,1 mm
- 172-118:** Inspection tool, Reading scale 200 mm/0,5 mm
- 172-119:** Inspection tool, Reading scale 8"/0.02"
- 172-161:** Inspection tool, Reading Scale 300 mm/0,5 mm
- 172-162 :** Inspection tool, Reading Scale 12"/0.02"
- 172-160-3:** Green Filter, Colour filter
- 172-604:** Swivel center support, Fixture/clamping material
- 172-229:** Lens accessory, Oblique reflecting mirror for 10X lens
- 172-230:** Lens accessory, Oblique reflecting mirror for 20X lens
- 172-378:** V-BLOCK, with clamp
- 176-107:** Fixture/clamping material, Holder with clamp
- 172-604:** Fixture/clamping material, Swivel center support
- 12AAE671:** Attachment, OPTOEYE-200 Attachment A, 250-350 mm
- 332-161:** Sensor, Optoeye-200 edge detection sensor
- 176-106:** Rotary table
- 172-196:** Rotary table, 100 mm for TM-1005B
- 172-198:** Rotary table, 100 mm with fine feed knob for TM-1005B
- 172-502:** LED Circular Illuminator (PJ-PLUS), for 10x and 20x + adapter 12AAX044
- 12AAX044:** Damping Ring A (for PJ 20X), to connect LED illumination 172-502 to 20x lens

DIMENSIONS



"Got Questions?"

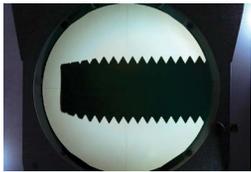
Profile Projectors

PJ-H30 SERIES 303 — High-Accuracy Profile Projectors

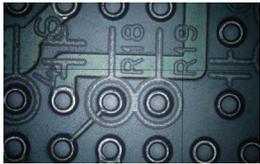
By separating axial motion and stabilizing the XY measuring table in the vertical direction, high measuring accuracy of $(3+0.02L) \mu\text{m}$ has been achieved on the PJ-H30 Series Profile Projectors. Focusing is accomplished by moving the screen head itself up and down with the hand wheel or motorized unit. The power focusing (PJ-H30D type) provides higher performance.



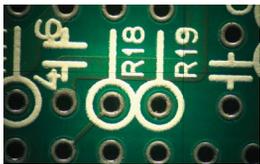
Switchable surface illumination: vertical or oblique



Contour illumination (Standard)



1. Vertical transmitted light illumination



2. Oblique illumination
High color reproducibility

All models equipped with Lens Turret



The turret of the PJ-H30 Series uses low-friction bearings that enable smooth and rapid rotary motion for changing magnification by bringing different projection lenses into the light path. The turret body uses bayonet mounts to aid quick attachment and detachment of lenses.

- Newly designed optical system with high NA lenses provides drastically brighter and clearer screen images during surface illumination.
- The three-lens mounting turret includes a 10X lens as standard. Four types of projection lenses (5X, 20X, 50X, 100X) are available.



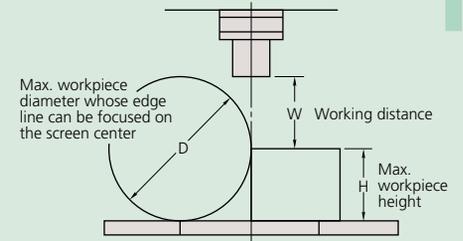
PJ-H30A3017B
XY stage travel range: 12x7" / 300x170mm

Quick-release mechanism



A quick-release handle inside the XY handle allows you to switch stage feed between extremely coarse and fine traverse movement.

Projection Capacity



Unit: mm

Model No.	View Field (mm)	L ₁ (mm)	L ₂ (mm)	D (mm)
5X Lens 172-271	61.2	105	66	148
10X Lens 172-472	30.6	105	70.5	197
10X Lens with C-mount 172-500	30.6	105	70.5	197
20X Lens 172-473	15.3	105	56.5	137
50X Lens 172-474	6.12	105	50	114
100X Lens 172-475	3.06	105	50	114

10x C-Mount Camera Objective



Model No.	172-500
Camera Projected Image	Inverted
Camera Magnification	0.71X
Compatible Sensor Size	Four Thirds 4/3 type
Camera Mount	C Mount
Mountable Mass	0.9 kg or less

The projection lens is equipped with a C mount, therefore a compatible digital camera can be attached. Retrofitting is possible on a Profile Projector (PJ-H). A workpiece can be observed on the large-size projection screen, and the color image can be simultaneously saved on the camera and observed on the monitor.



2D Coordinate Interfacing RETROFITs

Model No.	Description
264-161-13A-PJH	QM-DATA200 Arm Type (PJ-H30)
264-161-13A-PJH-OPT	QM-DATA200 Arm Type & Optoeye Edge Detection (PJ-H30)

Optional Accessories

- 172-271:** 5X projection lens
- 172-472:** 10X projection lens (standard accessory)
- 172-473:** 20X projection lens
- 172-474:** 50X projection lens
- 172-475:** 100X projection lens
- 172-116:** Standard scale (50mm)
- 172-117:** Standard scale (2")
- 172-118:** Reading scale (200mm)
- 172-161:** Reading scale (300mm)
- 172-119:** Reading scale (8")
- 172-162:** Reading scale (12")
- 12AAG981:** Green filter
- 172-370:** Machine stand
- 512305:** Halogen bulb (24V, 150W) (standard accessory)

Fixture and Stage Accessories

- 172-198:** Rotary table (Effective diameter: 4" / 100mm)
- 176-305:** Rotary table (Effective diameter: 7.2" / 183mm)
- 176-306:** Rotary table (Effective diameter: 9.4" / 240mm)
- 172-604:** Swivel center support
(Max. workpiece dia.: 3.1" / 80mm)
- 176-107:** Holder with clamp
- 172-378:** V-block with clamp
(Max. workpiece dia.: 1" / 25mm)
- 176-317:** Fixture mount adapter C
- 176-304:** Fixture mount adapter A

Availability	Models	
	PJ-H30A1010B	PJ-H30A2017B
	PJ-H30D1010B	PJ-H30D2017B
	PJ-H30A2010B	PJ-H30A3017B
	PJ-H30D2010B	PJ-H30D3017B
172-198	✓**	✓****
176-305	✓**	
176-306		✓****
176-107 *	✓**	✓****
172-378 *	✓**	✓****
172-604	✓***	✓***

* Able to attach to a Rotary table 172-198 or 176-305 (172-197 can only attach to 176-305).

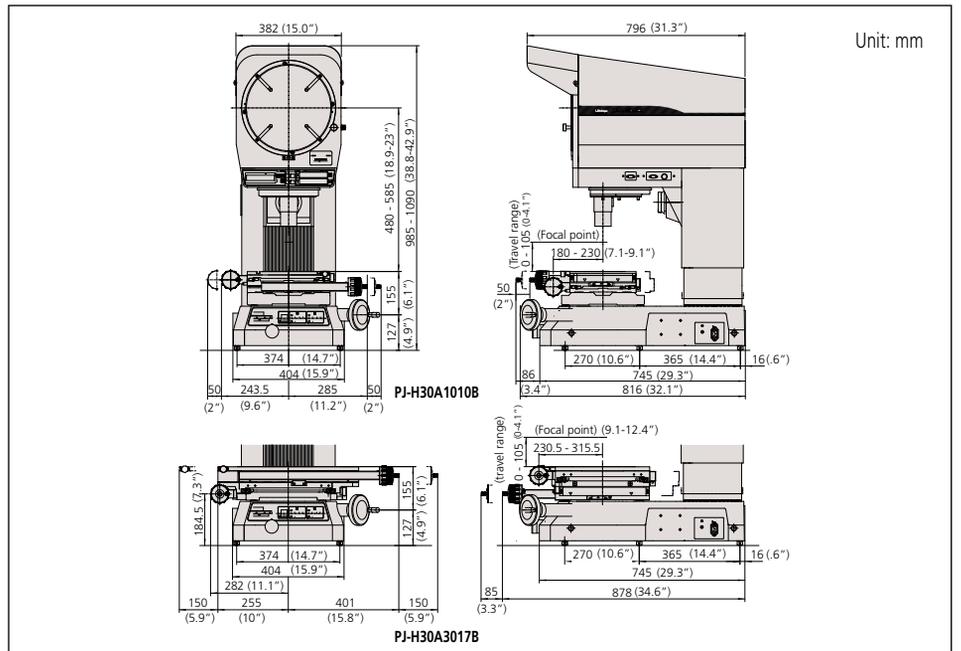
** Fixture mount adapter C (176-317) is required.

*** Rotary table (172-198) is required.

**** Fixture mount adapter A (176-304) is required.

Manual Focus type	Model No.	PJ-H30A1010B	PJ-H30A2010B	PJ-H30A2017B	PJ-H30A3017B
	Order No.	303-716-13A	303-717-13A	303-718-13A	303-719-13A
Projected Image		Erect image			
Protractor screen	Effective diameter	12" / 306mm			
	Screen material	Fine ground glass			
	Reference line	Cross hair line			
	Screen rotation	±360°, fine feed and clamp			
	Angle display (LED)	Resolution: 1° or 0.01° (switchable), Range: ±370°, Functions: ABSOLUTE/incremental mode switching, Zero set			
Projection lens		Standard accessory: 10x (172-472), Optional accessories: 2X, 5X, 20X, 50X, 100X			
Lens mount		3-lenses mounting turret			
Magnification accuracy	Contour illumination	±0.1% or less			
	Surface illumination	±0.15% or less			
Contour illumination	Light source	Halogen bulb (24V 150W)			
	Optical system	Zoom telecentric system			
	Functions	Brightness adjustment, Heat-absorbing filter, Cooling fan			
Surface illumination	Light source	Halogen bulb (24V 150W)			
	Optical system	Vertical / Oblique illumination with an adjustable condenser lens			
	Functions	Non-stepped brightness adjustment, Heat-absorbing filter, Cooling fan			
	XY Range	4 x 4"	8 x 4"	8 x 6.7"	12 x 6.7"
		100 x 100mm	200 x 100mm	200 x 170mm	300 x 170mm
	Resolution	.0001" / 0.001mm			
	Measuring unit	Built-in Linear scale			
	Table size	11.8 x 9.4" 300 x 240mm	13.8 x 11" 350 x 280mm	16.1 x 13.5" 410 x 342mm	20 x 13.5" 510 x 342mm
	Effective table area	7.1 x 5.9" 180 x 150mm	9.8 x 5.9" 250 x 150mm	10.6 x 9.4" 270 x 240mm	14.6 x 9.4" 370 x 240mm
	Max. workpiece ht.	4.1" / 105mm			
	Max. workpiece load	22lbs / 10kg	22lbs / 10kg	44 lbs / 20kg	44 lbs / 20kg
Power supply		120V AC, 50/60Hz			
Mass		391lbs / 176kg	396lbs / 178kg	556lbs / 205kg	471lbs / 212kg
Standard accessories		10X projection lens set, masking shield, power cord, halogen bulb, tube fuse, grounding wire, allen wrench, vinyl cover			

DIMENSIONS



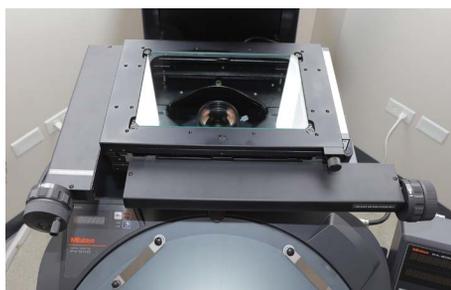
Profile Projectors

PV-5110 SERIES 304 — Profile Projectors

- Large 500mm screen
- Floor model uses a downward illumination system.
- Digital readout protractor screen (including zero-setting, ABS/INC coordinate switching functions) for easy and error-free angle measurement.
- Angled screen allows projected images to be easily traced or compared with a template.
- The oblique surface illumination system provides clear and bright images allowing easy inspection of non-reflective workpieces such as plastic parts or printed materials.

Upward Vertical Projector

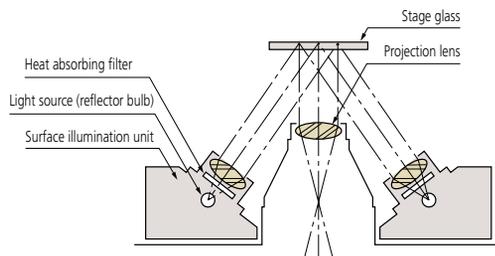
The PV-5110 one of the only Upward Vertical Profile Projectors on the market. With its finely tuned optic to view through the bottom of the stage glass, this system is ideal for measuring parts which need to be supported such as rubbers or films. With only the illumination unit mounted overhead, this leaves operators with ample room to position their workpiece.



Surface Illumination Units (172-424)

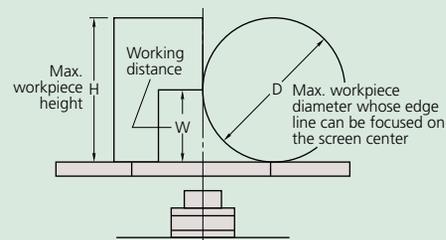
Built-In Oblique Surface Illumination

In addition to traditional couter illumination, this system also offers built-in oblique surface illumination as a standard. Two illumination units (172-424) are placed to the side of the objective which provides bright, even lighting across the surface of the workpiece and stage. It is important to note that the objectives of this system have been finely tuned to measure surface features through the stage glass.



PV-5110

Projection Capacity



Unit: mm

	Magnification				
	5X	10X	20X	50X	100X
View field	ø101.6	ø50.8	ø25.4	ø10.16	ø5.08
H	125	181	206	87	87
W	60 (27)	60	60	32.4	22.5
D	120	120	120	64.8	45

(): When using surface illumination



Talk to Sales

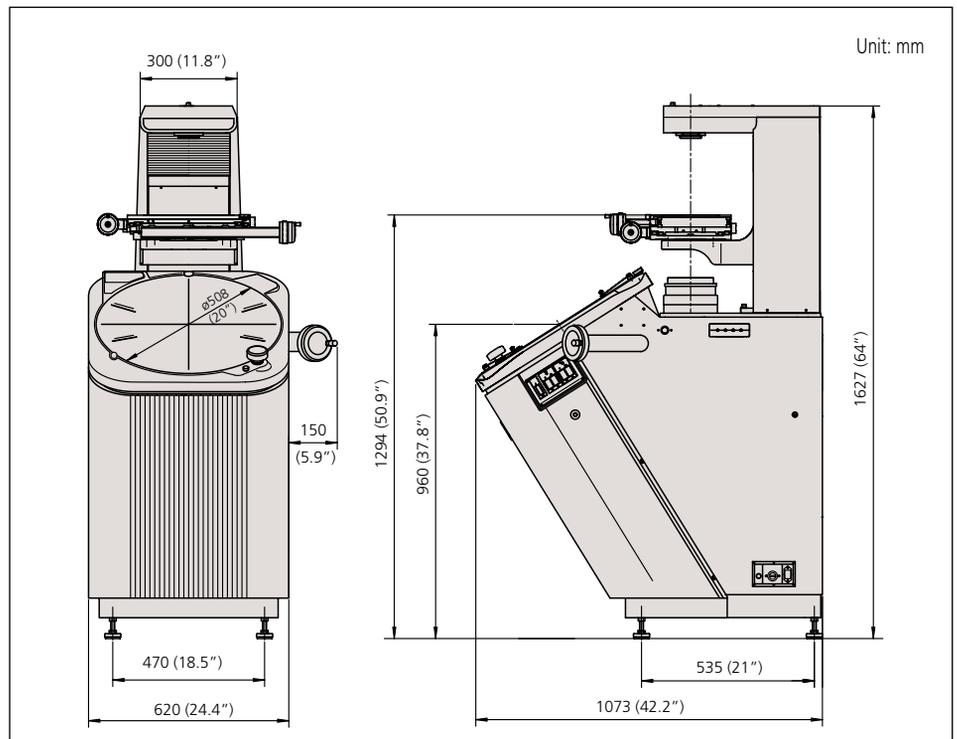
Profile Projectors

SPECIFICATIONS

Model No.		PV-5110
Order No.		304-919-11A*
Projected image		Invert image
Protractor screen	Effective diameter	20" / 508mm
	Screen material	Fine ground glass
	Reference line	Cross hair line
	Screen rotation	±360°, fine feed and clamp
	Angle display (LED)	Resolution: 1° or 0.01°(switchable), Range: ±370°, Functions: ABSOLUTE/incremental mode switching, Zero set
Projection lens		Standard accessory: 10x(172-472), Optional accessories: 5X, 20X, 50X, 100X
Magnification accuracy	Contour illumination	±0.1% or less
	Surface illumination	±0.15% or less
Contour illumination	Light source	Halogen bulb (24V 150W)
	Optical system	Telecentric system
	Functions	2-step brightness switch, Heat-absorbing filter, Cooling fan
Surface illumination	Light source	Halogen bulb (24V 150W)
	Optical system	Vertical illumination
	Functions	Adjustable condenser lens, Oblique illumination (for 5X, 10X, and 20X), 2-step brightness switch, Heat-absorbing filter, Cooling fan
	XY Range	8 x 4" / 200 x 100mm
	Resolution	.0001" / 0.001mm*
	Measuring unit	Built-in Linear scale
	Table size	15 x 9.8" / 380 x 250mm
	Effective table area	10.5 x 6.7" / 266 x 170mm
	Max. workpiece height	See (H) on page I-9
	Max. workpiece load	17.6lbs / 8kg
Power supply		120V AC, 50/60Hz
Mass		467lbs / 210kg
Standard accessories		200x100mm (8" x 4") stage, 10X projection lens set, Surface illumination unit, Counter stand for KA counter, power cord, halogen bulb, fuse, grounding wire, allen wrench

* Counter not included

DIMENSIONS



2D Coordinate Interfacing RETROFITS

Model No.	Description
264-161-13A	QM-DATA200 Arm Type (PJ-H30)
264-161-13A-PV-OPT	QM-DATA200 Arm Type & Optoeye Edge Detection (PV-5110)



KA Counter (174-183A)

(Refer to page H-7 for more details.)

Optional Accessories

- 172-401:** 5X projection lens set
- 172-406:** 5X projection lens
- 172-402:** 10X projection lens set (standard accessory)
- 172-409:** 10X projection lens
- 172-403:** 20X projection lens set
- 172-411:** 20X projection lens
- 172-404:** 50X projection lens set
- 172-413:** 50X projection lens
- 172-405:** 100X projection lens set
- 172-415:** 100X projection lens
- 172-424:** Surface illumination unit (standard accessory)
- 172-116:** Standard scale (50mm)
- 172-117:** Standard scale (2")
- 172-118:** Standard scale (200mm)
- 172-119:** Standard scale (8")
- 172-161:** Reading scale (300mm)
- 172-329:** Reading scale (600mm)
- 172-162:** Reading scale (12")
- 172-160-2:** Green filter (standard accessory)
- 172-319:** Canopy
- 512305:** Halogen bulb (24V, 150W) (standard accessory)

Fixture and Stage Accessories

- 172-196:** Rotary table*
(Effective diameter: 4" / 100mm)
- 172-198:** Rotary table with fine feed wheel*
(Effective diameter: 4" / 100mm)
- 172-604:** Swivel center support*
(Max. workpiece dia.: 3.1" / 80mm)
- 176-107:** Holder with clamp*
- 172-378:** V-block with clamp*
(Max. workpiece dia.: 1" / 25mm)

*Stage adapter C (176-317) is required.

Accessories for Profile Projectors

SERIES 172 — Profile Projector

Standard Scales



172-116

- Used for checking magnification accuracy.

SPECIFICATIONS

Inch			
Graduation	Range	Order No.	Accuracy (20°C)*
0.1"	2"	172-117	.00013"

Metric			
Graduation	Range	Order No.	Accuracy (20°C)*
0.1mm	50mm	172-116	(3+5L/1000)μm
0.1mm	80mm	172-330	(3+5L/1000)μm

Rotary Tables



176-106

172-198

SPECIFICATIONS

Order No.	176-106	172-198
Effective glass dia.	66mm	100mm
Angle reading	6'	2' (w/ fine adjustment)
Mass	1.7kg	2.5kg

Note: Holder with clamp (176-107) can be mounted.

Swivel Center Supports



172-604

SPECIFICATIONS

Order No.	172-604
Max. workpiece dia.	80mm (65mm)*
Max. workpiece length	140mm
Swivel range	±10°
Mass	2.5kg

*When swiveled 10°



172-603

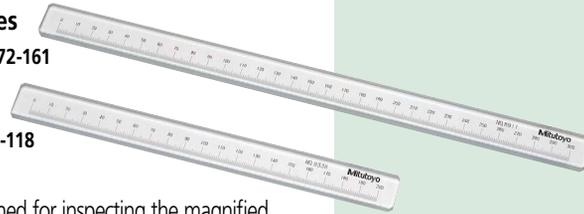
V-Block with Clamp

Order No.	172-603
Max. workpiece dia.	50mm
Width of block	60mm
Mass	1.24kg

Reading Scales

172-161

172-118



- Specially designed for inspecting the magnified image of a standard scale on the projection screen.

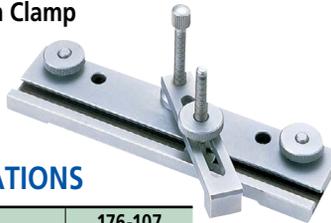
SPECIFICATIONS

Inch			
Graduation	Range	Order No.	Accuracy (20°C)*
0.01"	8"	172-119	.00071"
0.02"	12"	172-162	.00077"

Metric			
Graduation	Range	Order No.	Accuracy (20°C)*
0.5mm	200mm	172-118	18μm (15+15L/1000)μm
0.5mm	300mm	172-161	19.5μm (15+15L/1000)μm
0.5mm	600mm	172-329	24μm (15+15L/1000)μm

Holder with Clamp

176-107



SPECIFICATIONS

Order No.	176-107
Max. workpiece height	35mm
Mass	0.42kg

Center Support



172-600

172-601

SPECIFICATIONS

Order No.	172-600
Max. workpiece height	120mm (240mm)*
Mass	3.3kg

*When using a center support riser (172-601)



172-602

Rotary Vise

SPECIFICATIONS

Order No.	172-602
Max. workpiece height	60mm
Width of jaw	40mm
Angle reading	5°
Mass	2.5kg



Need Repair?

Vertical Holder



172-132

SPECIFICATIONS

Order No.	172-132
Mass	1.3kg

QM-Data Interface Unit

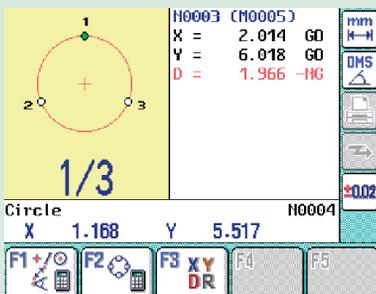
for Profile Projectors

The QM-Data200 is a geometric readout/analysis unit for optical instruments such as profile projectors. This unit features powerful 2-D coordinate measurement capabilities with easy-to-use key operation. Measurement results can be visualized on the LCD display and printed out if required.

2-D Data Processing Unit QM-Data200



Operation screen (Counter)



OPTOEYE 200 (Automatic Edge Detection)



PJ-H30 with OPTOEYE 200



OPTOEYE 200 and detector mounting plate A

	332-161
Model No.	OPT-200
Illumination	Contour/surface*1
Detecting directivity	Non-directional
Minimum detectable circle	ø2 mm
Minimum detectable line width	1 mm
Maximum response speed	4.5 mm/s (10 X lens)
Illumination range (Bright)	30 to 2000l
Bright-Dark field difference	20 IX or higher
Repeatability (contour illumination)	$\sigma=1 \mu\text{m}^*$

*1, *2 Mitutoyo's test conditions.

Basic Element Measurement

- A Point**
Coordinates (multi-point processing for a maximum of 100 points)
Note: In multi-point processing, the mean value is used as the measured value.
- B Line**
Angle and perpendicularity with the X-axis. (multi-point processing for a maximum of 100 points)
- C Circle**
Center coordinates, diameter, roundness (multi-point processing for a maximum of 100 points)
- D Point-point distance**
Distance, coordinates difference, radial difference
- F Ellipse**
Center coordinates, major-axis diameter, minor-axis diameter, angle with the X-axis, departure from the X-axis (multi-point processing for a maximum of 100 points)
- G Rectangular Hole**
Center coordinates, length, width
- H Slotted Hole**
Center coordinates, length, width, radius of slotted hole
- I Intersection Point & Intersecting Angle**
Intersection coordinates, intersecting angle, supplementary angle

Pattern Measurement

- K Pitch**
Point-point distance, difference between coordinates, angle, cumulative distance, cumulative angle
- L Linear-point Distance**
Perpendicular (shortest) distance
- M Line-circle distance**
Center-center distance, longest distance, shortest distance
- N Circle-circle distance**
Center-center distance, longest distance, shortest distance, difference between coordinates, radial difference

SPECIFICATIONS

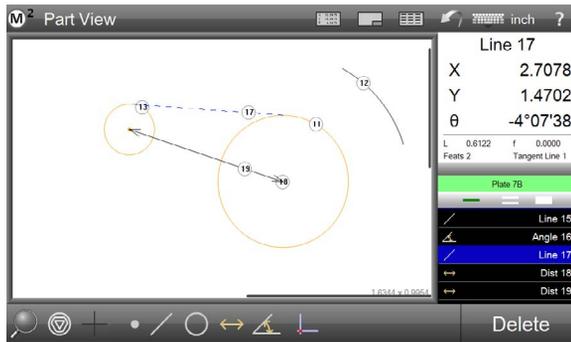
Model No.	QM-Data200	
Order No.	Stand-mount type	Arm-mount type
	264-160-13A	264-161-13A
Display languages (selectable)	Japanese/English/German/French/Italian/Spanish/Portuguese/Czech/ Chinese(simplified/traditional)/Korean/Turkish/Swedish/Polish/Dutch/Hungarian	
Measured value unit	Length: mm Angle: degree/degree minute second (selectable)	
Resolution	0.1 μm	
Program functions	Part program creation, execution, editing	
Statistical processing	Number of data, maximum value, minimum value, mean value, standard deviation, range, histogram, statistics on a measuring function basis (by command)	
Display system	COLOR TFT LCD (with LED backlight)	
Edge Sensor Position Compensation	Supported (Projector)	
Input /Output	XYZ: Maximum of three Linear Scales RS-232C 1: For connecting to external PC RS-232C 2: For connecting to counter of measuring instrument OPTOEYE: For inputting edge signal from OPTOEYE (OPTOEYE 200) FS: For connecting to optional foot switch PRINTER: For connecting to optional printer USB-MEMORY : For connecting to USB memory	
Measurement result file output	RS-232C output (CSV format, MUX-10 format)	
Power	100 to 240 V AC	
Maximum power consumption	17 W (does not include optional accessories)	
External dimensions (WxDxH)	Approximately 260x242x310 mm (including the stand)	Approximately 318x153x275 mm (when the arm is in the horizontal posture)
Surface illumination	Halogen bulb (24V 150W)	
Mass	Approximately 2.9 kg	Approximately 2.8 kg
Applicable models	PJ-PLUS Series PJ-H30 Series PV-5110 PH-3515F	PJ-PLUS Series PJ-H30 Series PV-5110*1 PH-3515F*1
Optional accessories	AC adapter, power cable, Easy operation guide	

*1 The arm-mount type cannot be used concurrently with a counter stand.
Note: For details, refer to the QM-Data200 and Vision Unit brochure.

M2 User Interface

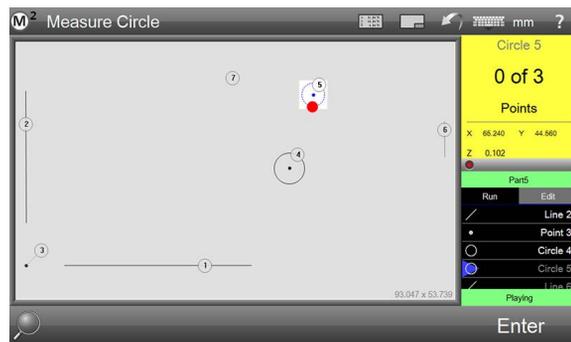
For PH-3515F & PJ-Plus Systems

2-D Coordinate Measurement M2 Hardware & Software Add-on



Graphics-based "Part View" constructions

Generate popular construction types, like distances and tangent lines, from within the graphical part view.

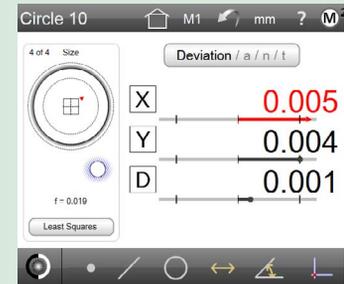


Intuitive "Part Playback" / Programmability

Save your most common part files to be used in playback mode where M2 software will guide you through your predefined procedures to accurately and efficiently inspect your parts.



PH-3515F w/ M2 Software & All-in-One Touchscreen PC 172-868-11A-M2



Geometric tolerancing

Measure features, set nominals, apply tolerances and view deviation results with only a few quick clicks.

Feature	Tol	Actual	Nominal	Tol	Tol
Line 1	X	17.562			
	Y	0.000			
	A	0°00'00"			
Line 2	X	1.326			
	Y	12.030			
	A	64°00'32"			
Point 3	X	0.000			
	Y	0.000			
Circle 4	X	8.416			

Reports

Flexibility for report contents and formatting allows for full customization of the data format, header information, and header and footer graphics.

Machine & M2 Retrofit Kits Packages

PH-3515F	
172-868-11A-M2	PH-3515F Profile Projector with M2 Hardware/Software and All-in-One Touchscreen Tablet
172-868-11A-M2-EDGE	PH-3515F Profile Projector with M2 Hardware/Software and Touchscreen PC - Automatic EDGE Detection (included)
PJ-PLUS	
302-801-10A-M2	PJ-PLUS 4X4 STAGE - with M2 Hardware/Software and All-in-One Touchscreen Tablet
302-801-10A-M2-EDGE	PJ-PLUS 4X4 STAGE - with M2 Hardware/Software and Touchscreen PC - Automatic EDGE Detection (included)
302-802-10A-M2	PJ-PLUS 8X4 STAGE - with M2 Hardware/Software and All-in-One Touchscreen Tablet
302-802-10A-M2-EDGE	PJ-PLUS 8X4 STAGE - with M2 Hardware/Software and Touchscreen PC - Automatic EDGE Detection (included)

Retrofits

Retrofit Kits	
64PKA-M2-P	RETROFIT KIT - WITH M2 Hardware/Software and All-in-One Touchscreen Tablet
64PKA-M2-PE	RETROFIT KIT - M2 Hardware/Software and Touchscreen PC - Automatic EDGE Detection (included)



Where to Buy

Kitted Machine & Interface Packages

All-In-One Packages were created for the convenience of our valued customers. These packages help expedite the ordering process as well as ensure all necessary accessories for each of our modular interfacing options.



Model	Interface/DRO	XY Range	Standard Objective	Package Order No.	Package Description
PH-3515F	KA Counter	254x152mm	10x	172-868-11A-KA	PH-3515F Profile Projector - KA Counter & Tray (Included)
	QM-Data 200	254x152mm	10x	172-868-11A-QM	PH-3515F Profile Projector - QM-DATA-200 Arm Type (Included)
	QM-Data 200 & OPTOEYE	254x152mm	10x	172-868-11A-QM-OPT	PH-3515F Profile Projector - QM-DATA-200 Arm Type & OPTOEYE (Included)
	M2	254x152mm	10x	172-868-11A-M2	PH-3515F Profile Projector - M2 Add-on & Touchscreen PC (Included)
	M2 & AUTO EDGE	254x152mm	10x	172-868-11A-M2-EDGE	PH-3515F Profile Projector - M2 Add-on, Touchscreen PC & Automatic EDGE Detection (Included)



Model	Interface/DRO	XY Range	Standard Objective	Package Order No.	Package Description
PJ-PLUS	M2	100x100mm	10x	302-801-10A-M2	PJ-P1010A Profile Projector - M2 Add-on & Touchscreen PC (Included)
	M2 & AUTO EDGE	100x100mm	10x	302-801-10A-M2-EDGE	PJ-P1010A Profile Projector - M2 Add-on, Touchscreen PC & Automatic EDGE Detection (Included)
	M2	200x100mm	10x	302-802-10A-M2	PJ-P2010A Profile Projector - M2 Add-on & Touchscreen PC (Included)
	M2 & AUTO EDGE	200x100mm	10x	302-802-10A-M2-EDGE	PJ-P2010A Profile Projector - M2 Add-on, Touchscreen PC & Automatic EDGE Detection (Included)

Model	Interface/DRO	XY Range	Standard Objective	Package Order No.	Package Description
PV-5110	KA Counter	200x100mm	10x	304-919-11A-KA	PV-5110 Profile Projector - KA Counter & Tray (Included)
	QM-Data 200	200x100mm	10x	304-919-11A-QM	PV-5110 Profile Projector - QM-DATA-200 Arm Type (Included)
	QM-Data 200 & OPTOEYE	200x100mm	10x	304-919-11A-QM-OPT	PV-5110 Profile Projector - QM-DATA-200 Arm Type & OPTOEYE (Included)



QM Data Retrofit Packages

Model	Package Type	Package Order No.	Package Description
PH-3515F & PV-5110	KA Counter	264-161-13A	QM-DATA200 Arm Type
	QM-DATA 200 Retrofit	264-161-13A-PJH	QM-DATA200 Arm Type (PJ-H30)
PJ-H30 Series	QM-DATA 200 & OPTOEYE Retrofit	264-161-13A-PJH-OPT	QM-DATA200 Arm Type & OPTOEYE (PJ-H30)
	QM-DATA 200 Retrofit	264-161-13A-PJP	QM-DATA200 Arm Type (PJ-PLUS)
PJ-PLUS Series	QM-DATA 200 & OPTOEYE Retrofit	264-161-13A-PJP-OPT	QM-DATA200 Arm Type & OPTOEYE (PJ-PLUS)

*Retrofits do not include main unit please reference page 16 for main unit model numbers.

Overlay Chart Set

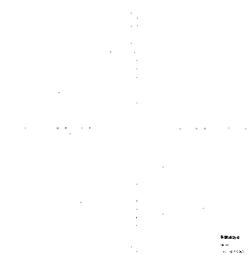
- Makes inspection of projected images an easy process.
- Twelve different patterns are available in the set.
- Designed for use with profile projectors whose screen diameter is 300mm or larger.

Overlay chart set (12 sheets)

Order No.: 12AAM027



12AAM587
Protractor (1°-grad. radial index)
and radius (1mm-radius increment
concentric semicircles)



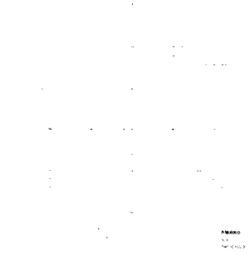
12AAM588
Radius (0.1cm-reading scales and
5mm-radius increment concentric
circles)



12AAM589
Radius (1X, 10X, 20X, 50X)



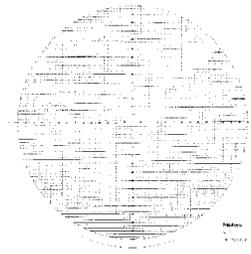
12AAM590
1mm-reading scales (20X, 50X)



12AAM591
10x10mm sections



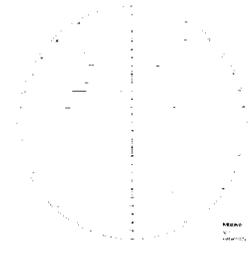
12AAM592
0.5mm-reading scales



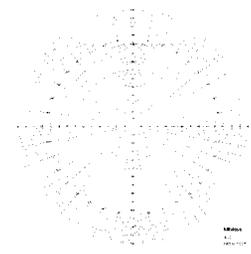
12AAM593
1x1mm sections



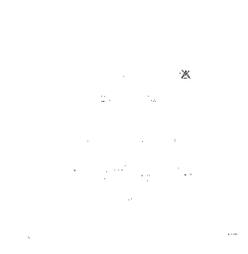
12AAM594
Protractor (1°-grad. diametral index)



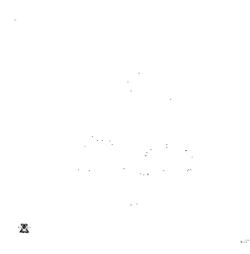
12AAM595
1mm-reading vertical scale



12AAM596
Protractor (1°-grad. diametral index)
and radius (1mm-radius increment
concentric circles)



12AAM597
Metric, Unified, and Whitworth
screw threads (20X)

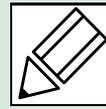


12AAM598
Metric screw thread (100X) and
20° and 14.5° gear teeth (20X)



Get a Quote

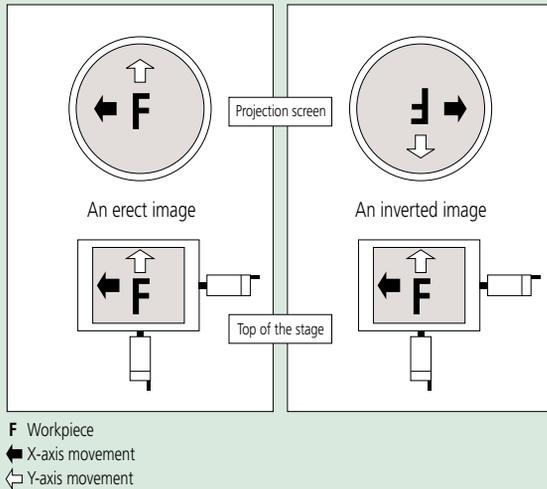
Quick Guide to Precision Measuring Instruments



Profile Projectors

Erect Image and Inverted Image

An image of an object projected onto a screen is erect if it is orientated the same way as the object on the stage. If the image is reversed top to bottom, left to right and by movement with respect to the object on the stage (as shown in the figure below) it is referred to as an inverted image (also known as a reversed).



Magnification Accuracy

The magnification accuracy of a projector when using a certain lens is established by projecting an image of a reference object and comparing the size of the image of this object, as measured on the screen, with the expected size (calculated from the lens magnification, as marked) to produce a percentage magnification accuracy figure, as illustrated below. The reference object is often in the form of a small, graduated glass scale called a 'stage micrometer' or 'standard scale', and the projected image of this is measured with a larger glass scale known as a 'reading scale'.

(Note that magnification accuracy is not the same as measuring accuracy.)

$$\Delta M(\%) = \frac{L - \ell M}{\ell M} \times 100$$

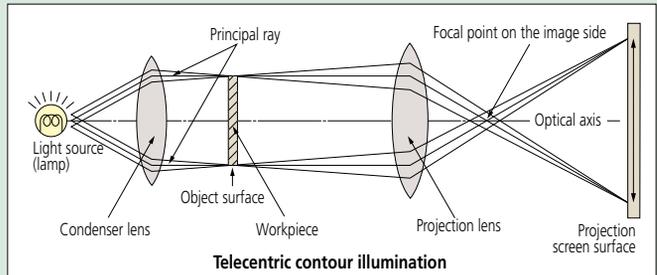
- ΔM(%): Magnification accuracy expressed as a percentage of the nominal lens magnification
- L: Length of the projected image of the reference object measured on the screen
- ℓ: Length of the reference object
- M: Magnification of the projection lens

Type of Illumination

- Contour illumination: An illumination method to observe a workpiece by transmitted light and is used mainly for measuring the magnified contour image of a workpiece.
- Coaxial surface illumination: An illumination method whereby a workpiece is illuminated by light transmitted coaxially to the lens for the observation/measurement of the surface. (A half-mirror or a projection lens with a built-in half-mirror is needed.)
- Oblique surface illumination: A method of illumination by obliquely illuminating the workpiece surface. This method provides an image of enhanced contrast, allowing it to be observed three-dimensionally and clearly. However, note that an error is apt to occur in dimensional measurement with this method of illumination. (An oblique mirror is needed. Models in the PJ-H30 series are supplied with an oblique mirror.)

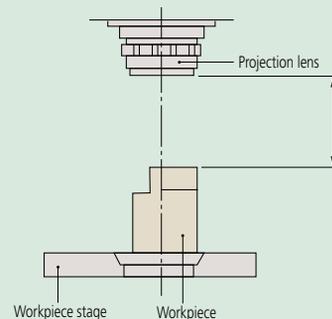
Telecentric Optical System

An optical system based on the principle that the primary ray is aligned parallel to the optical axis by placing a lens stop on the focal point on the image side. Its functional feature is that the image will not vary in size even though the image blurs as the object is shifted along the optical axis. For measuring projectors and measuring microscopes, an identical effect is obtained by placing a lamp filament at the focal point of a condenser lens instead of a lens stop so that the object is illuminated with parallel beams. (See the figure below.)



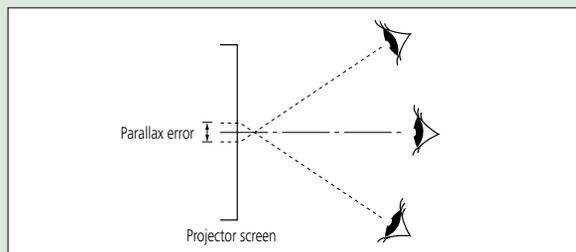
Working distance

Refers to the distance from the face of the projection lens to the surface of a workpiece in focus. It is represented by L in the diagram below.



Parallax error

This is the displacement of an object against a fixed background caused by a change in the observer's position and a finite separation of the object and background planes.



Field of view diameter

The maximum diameter of the workpiece that can be projected using a particular lens.

$$\text{Field of view diameter (mm)} = \frac{\text{Screen diameter of profile projector}}{\text{Magnification of projection lens used}}$$

Example: If a 5X magnification lens is used for a projector with a screen of ø500mm:

$$\text{Field of view diameter is given by } \frac{500\text{mm}}{5} = 100\text{mm}$$

Microscopes

TM-505B/1005B SERIES 176 — Toolmakers' Microscopes

The Mitutoyo TM Series is a toolmakers' microscope well suited for measuring dimensions and angles of machined metals. It also can be used to check the shape of screws and gears by attaching an optional reticle. The compact body makes it ideal for use on shop floors with limited space.

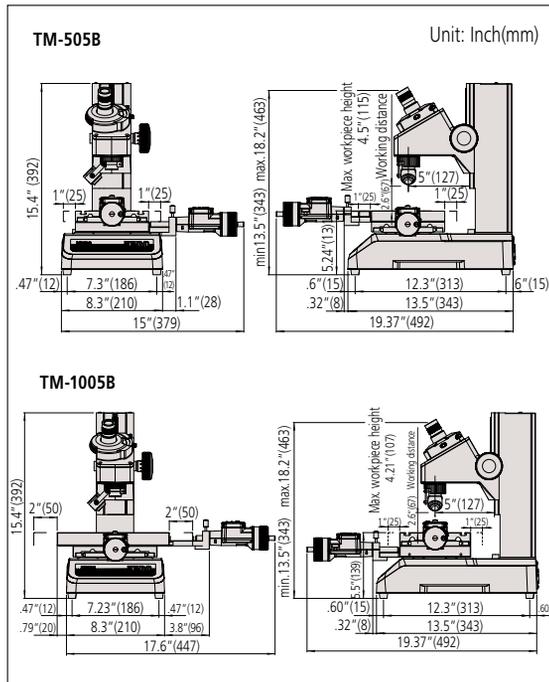
- Angle measurement is performed easily by turning the angle scale disc to align the cross-hair reticle with the workpiece image.
- Illumination intensity can be adjusted.
- Included standard accessories create an overall magnification of 30X. Magnifications can be changed from 20 - 200X by using optional objectives and/or eyepieces.



SPECIFICATIONS

Model No.	TM-505B	TM-A505B	TM-1005B	TM-A1005B
Order No.	176-818-11A	176-820-11A	176-819-11A	176-821-11A
Objective lens	Standard accessory: 2X, Options: 5X, 10X			
Microscope head	Maximum height of workpiece 4.53" / 115mm		4.21" / 107mm	
Illumination unit	Transmitted illumination Stepless brightness adjustment, White LED light source, With green filter			
	Surface illumination Oblique single-source type, Stepless brightness adjustment, White LED light source			
Cross-travel stage	Measuring range 2" x 2" / 50x50mm		4" x 2" / 100x50mm (An optional 2"/50mm gage block is required to cover full range. A CERA block is recommended.)	
	Table size 6" x 6" / 152x152mm		9.44" x 6" / 240x152mm	
	Usable area of the stage glass 3.8" x 3.8" / 96x96mm		6" x 3.8" / 154x96mm	
Linear measurement method	Micrometer heads optional	Micrometer heads included (164-164)	Micrometer heads optional	Micrometer heads included (164-164)
Resolution	N/A	.00005"/1µm	N/A	.00005"/1µm
Micrometer head travel range	N/A	2"/50mm	N/A	2"/50mm

DIMENSIONS



Technical Data

Optical tube	<ul style="list-style-type: none"> • Monocular with 30° depression angle • 90° broken cross-hair reticle (176-126) • Erect image • Diopter adjustable
Eyepiece protractor	<ul style="list-style-type: none"> • Graduation: 1° • Protractor range: 360° • Minimum reading by vernier: 6'
Eyepiece (176-116)	<ul style="list-style-type: none"> • Magnification: 15X • Field number: 13
Objective (176-138)	<ul style="list-style-type: none"> • Magnification: 2X • Working distance: 2.638" (67mm) • Numerical aperture: 0.07
Total magnification	• 30X
Transmitted illumination	<ul style="list-style-type: none"> • 3W LED • GIF (green) filter • Stepless intensity adjustment
Reflected illumination	<ul style="list-style-type: none"> • 3W LED • Stepless intensity adjustment • Adjustable position
Power supply	120 V AC, 50/60Hz
Power consumption	4.2W
Mass	TM-505B: Approx. 30.8 lbs. (14kg) TM-1005B: Approx. 33 lbs. (15kg)

Optional Accessories

- 176-115:** 10X eyepiece (field number: 13mm)
- 176-116:** 15X projection lens set (standard accessory)
- 176-117:** 20X eyepiece (field number: 10mm)
- 176-138:** Objective, 2X (W.D. 67mm, N.A. 0.07) (standard accessory)
- 176-139:** Objective, 5X (W.D.: 33mm, N.A.: 0.10)
- 176-137:** Objective, 10X (W.D.: 14mm, N.A.: 0.14)
- 164-164:** Digimatic micrometer head (range: 2"/50mm, reading: .00005"/0.001mm)
- 152-390:** Micrometer head for X-axis (range: 25mm, reading: 0.005mm)
- 152-389:** Micrometer head for Y-axis (range: 25mm, reading: 0.005mm)
- 611201-531:** Rectangular gage block (1")
- 611202-531:** Rectangular gage block (2")
- 176-204:** Dial indicator attachment for Z-axis measurement
- 959149:** SPC cable (2m) for Digimatic micrometer head

Fixture and Stage Accessories

- 176-106:** Rotary table for TM-505B (effective dia.: 66mm)
- 172-196:** Rotary table for TM-1005B (effective dia.: 100mm)
- 172-604:** Swivel center support for TM-1005B (max. workpiece dia.: 3.1" / 80mm)
- 172-378:** V-block with clamp (max. workpiece dia.: 1" / 25mm)
- 176-107:** Holder with clamp

Illumination Units

- 64AAB214:** LED variable ring light
- 176-208A:** LED circular illumination

Reticles

- 176-126:** Broken cross-hair (90°) (standard accessory)
- 176-111:** Concentric circles (up to ø4mm, 0.05mm increment)
- 176-135:** Concentric circle (up to ø.2", .01" increment)
- 176-114:** 60° angle

Protractor eyepiece



LED ring light 64AAB214



Part Number	Description	Sensor Size
64PMI247	MOTICAM S1, 1.2 MEGAPIXEL, 1280x960, USB	1/3"
64PMI249	MOTICAM S3, 3 MEGAPIXEL, 2048 X 1536 PIXELS, USB	1/2.8"
64PMI248	MOTICAM S6, 6 MP, 3072x2048 PIXELS, USB	1/1.8"
64PMI309	MOTICAM BMH4000X, 8 MP HDMI/USB	1/2.8"
64PMI310	MOTICAM BMH4000X, 8 MEGAPIXEL, HDMI / USB, LCD SCREEN	
63AAA060	0.37x C Mount Adapter (TM - Camera Adapter)*1	

*1 Required Item if utilizing C-Mount Camera

Microscopes

Technical Data

Optical tube	<ul style="list-style-type: none"> Monocular or Binocular (Must Choose) 25° depression angle 90° broken cross-hair reticle (12AAG836) Erect image TV Mount 50/50
Observation image	<ul style="list-style-type: none"> Erect Image
Observation type	<ul style="list-style-type: none"> Bright Field
Eye-piece lens	<ul style="list-style-type: none"> 10x (Included w/Tube) 15x (Optional) 20x (Optional)
Objective	<ul style="list-style-type: none"> Magnification: 3X (Included) W.D.: 3.03" (77mm); N.A.: .09 Optional: 1x, 5x, 10x, 20x, 50x, 100x
Light source	<ul style="list-style-type: none"> Halogen or LED (Must Choose) Adjustable aperture diaphragms Light intensity infinitely adjustable
Transmitted illumination	<ul style="list-style-type: none"> Telecentric illumination
Reflected illumination	<ul style="list-style-type: none"> Koehler illumination
Display Unit	
Number of axis	<ul style="list-style-type: none"> 2 axes (MF-A Type) or 3 axes (MF-B Type)
Resolution	<ul style="list-style-type: none"> 0.0001" / 0.00005" / 0.00001" (0.001 mm / 0.0005 mm / 0.0001 mm)
Functions	<ul style="list-style-type: none"> Data output, Axis linear compensation, Metric or English Units, and more
Stage	<ul style="list-style-type: none"> Precision travel (2.2+0.02L)µm accuracy High-accuracy linear glass scales Quick-release floating mode Zero-set button
Power consumption	45W LED, 160W Halogen, 120V AC, 50/60 Hz
Mass	<ul style="list-style-type: none"> 1010D - 148 lbs. / 67 kg 2010D - 157 lbs. / 71 kg 2017D - 326 lbs. / 148 kg 3017D - 344 lbs. / 156 kg 4020D - 357 lbs. / 162 kg

LED and Halogen Light Options for Transmitted and Reflected Illumination

(Common to MF D and MF-U D)



LED illumination



Halogen illumination

Available Optical Tubes

(Common to MF D and MF-U D)



Monocular Tube - 176-392



Binocular Tube - 176-394

MF SERIES 176 — Measuring Microscopes

The MF measuring microscopes can be combined with a Mitutoyo vision unit to boost its performance and data management on a PC, further improving measuring efficiency and productivity.

- Observation with a crisp and high-resolution erect image and a wide field of view
- Measuring accuracy that is highest in its class (and conforms to JIS B 7153)
- ML series, high-NA objectives are specially designed for the MF series (long working distance type)
- Illumination unit (reflected/transmitted) selectable from a high-intensity LED or halogen bulb (selection required)
- Variable aperture diaphragm (reflected/transmitted) allows observation measurement while suppressing light diffraction
- Variety of standardized stages in sizes up to 400x200mm
- Quick-release mechanism useful for moving the stage quickly when measuring workpieces that are large in size or quantity
- Coarse/fine feed handles equipped as standard on both sides allow precise focus and observation measurement regardless of handedness
- High-magnification eyepiece observation up to 2000X
- Standard measuring microscope has a wide variety of optional accessories including a vision unit and various digital CCD cameras



MF-B2017D

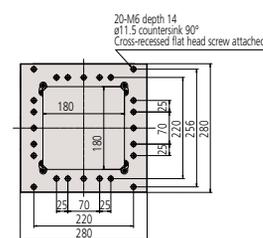
XY stage travel range: 8 x 6.6" / 200 x 170mm (with optional binocular tube)



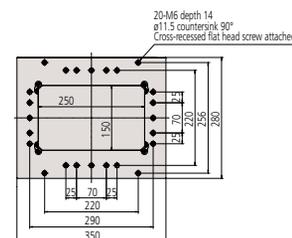
Using optional slide-type nosepiece with 2-lens mount (factory set option)

Selection of XY stage by travel range

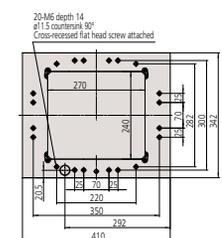
1010D: 4 x 4" / 100 x 100mm



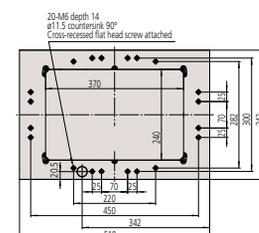
2010D: 8 x 4" / 200 x 100mm



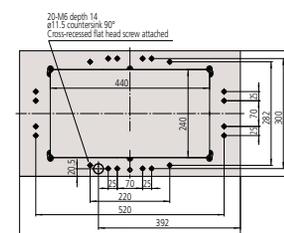
1017D: 8 x 6.7" / 200 x 170mm



3017D: 12 x 6.6" / 300 x 170mm



4020D: 16 x 8" / 400 x 200mm



Microscopes

MF SERIES 176 — Measuring Microscopes SPECIFICATIONS

Model No. (XY stage size)		1010D	2010D	2017D	3017D	4020D
Order No.	MF-A	176-961-13	176-962-13	176-963-13	176-864-10	176-965-13
	MF-B	176-966-13	176-967-13	176-968-13	176-969-13	176-970-13
XY stage travel range		4 x 4" 100 x 100mm	8 x 4" 200 x 100mm	8 x 7" 200 x 170mm	12 x 7" 300 x 170mm	16 x 8" 400 x 200mm
Z-axis travel range		6" / 150mm		8.7" / 220mm		
Focusing method		Manual focusing (Coarse focusing: 30mm/rev., Fine focusing: 0.2mm/rev.)				
Measurement method		Linear encoder (2-axis model: X / Y-axis, 3-axis model: X / Y / Z-axis)				
Resolution (switchable)		.0001" / .00005" / .00001" (0.001mm / 0.0005mm / 0.0001mm)				
Measuring accuracy (at 20°C)		XY-axis: (2.2+0.02L) μm, L = Measuring length (mm) when not loaded, JIS B 7153				
Indication accuracy (at 20°C)		Z-axis: (5+0.04L) μm, L = Measuring length (mm), (MF-B type)				
Floating function		X and Y axes with Quick-release mechanism				
XY stage top size		11 x 11" 280 x 280mm	14 x 11" 350 x 280mm	16.1 x 13.4" 410 x 342mm	20.07 x 13.4" 510 x 342mm	24" x 13.4" 610 x 342mm
Effective glass size		7 x 7" 180 x 180mm	10 x 6" 250 x 150mm	10.6 x 9.4" 270 x 240mm	14.5 x 9.4" 370 x 240mm	17.3 x 9.4" 440 x 240mm
Swivel function		—			±5° (left)	±3° (left)
Max. stage loading		22lbs / 10kg		44lbs / 20kg		33lbs / 15kg
Max. workpiece height		6" / 150mm			8.7" / 220mm	

MF Selection of Machine Type (must select)

↓	1010	2010	2017	3017	4020	Counter	Motorized stage	Optics
A	176-961-13	176-962-13	176-963-13	176-864-10	176-965-13	X,Y	Manual	BF
B	176-966-13	176-967-13	176-968-13	176-969-13	176-870-13	X,Y,Z	Manual	BF
J	-	-	176-891-13	176-892-13	176-893-13	X,Y,Z	Z only	BF

Example: MF-A1010D results in part number 176-861-10

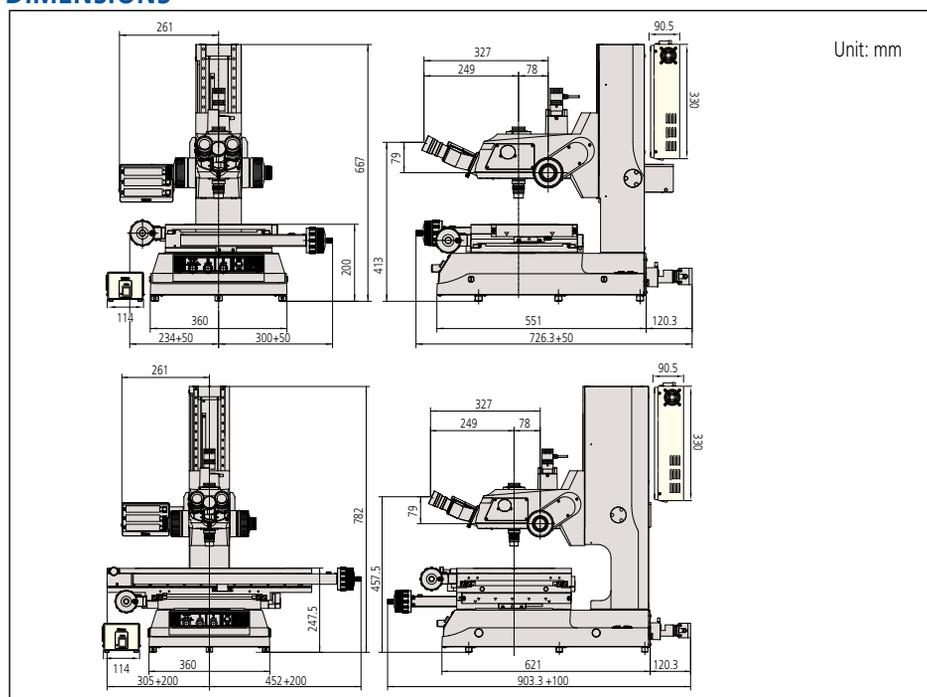
Illumination Unit (must select)

Applicable Illumination Unit	LED	Halogen
Order No.	176-449A	176-451A

Eye Tube Selection (must select)

Monocular with 10X eyepiece	176-392
Binocular with 10X eyepiece	176-394

DIMENSIONS



Optional Accessories

- 176-392: Monocular tube with 10X eyepiece
- 176-394: Binocular tube with 10X eyepiece set
- 378-866: 10X eyepiece set (view field dia.: 24mm)
- 378-858: 20X eyepiece set (view field dia.: 12mm)
- 375-043: Protractor eyepiece (10X)
- 176-313-11: Digital protractor eyepiece (10X)
- 375-036-2: 1X objective (W.D.: 61mm, N.A.: 0.03)
- 375-037-1: 3X objective (W.D.: 77mm, N.A.: 0.09) (std. accessory)
- 375-034-1: 5X objective (W.D.: 61mm, N.A.: 0.13)
- 375-039: 10X objective (W.D.: 51mm, N.A.: 0.21)
- 375-051: 20X objective (W.D.: 20mm, N.A.: 0.42)
- 375-052: 50X objective (W.D.: 13mm, N.A.: 0.55)
- 375-053: 100X objective (W.D.: 6mm, N.A.: 0.7)
- 12AAA645: GIF filter (transmitted / surface) (std. accessory)
- 12AAA646: LB80 color filter (transmitted / surface)
- 375-054: 0.5X camera adapter (with C-mount adapter)
- 970441: C-mount adapter
- 513667: Halogen bulb (12V, 50W)
- 12BAB345: Halogen bulb (long life type, 12V, 50W)
- 176-308: Vibration damping stand
- 176-309: Mounting stand
- 375-056: Stage micrometer
- 12AAA846: Foot switch

Illumination Units

- 176-367-2A: LED ring illuminator
- 176-387A: Twin fiber-optics illuminator

Fixture and Stage Accessories

- 176-107: Holder with clamp
- 172-378: V-block with clamp (max. workpiece dia.: 1" / 25mm)
- 172-604: Swivel center support¹ (max. workpiece dia.: 3.1" / 80mm)
- 176-305: Rotary stage with fine feed knob for 1010D/2010D models
- 176-306: Rotary stage with fine feed knob for 2017D/3017D/4020D models

¹ Fixture mount adapter (176-310) is required for 2010D models.
Fixture mount adapter (176-304) is required for 2017D/3017D/4020D models.



QM-Data200
2-D data processing unit
264-160-13: Stand-Mount Type
12AAA807: Connecting cable set

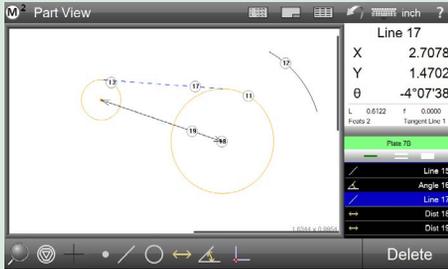
Focus pilot FP-05
Focus assisting system



Vision Unit
PC-based vision measuring system
359-763

MF Motorized SERIES 176 — Motorized Type Measuring Microscopes

- Motorized model of the MF Series. The Z-axis is motorized, and the stage can be operated using a remote box.
- Using the optional vision unit enables the image AF function.
- Illumination unit (reflected/transmitted) can be selected from a high-intensity LED or halogen bulb (selection required).
- Variable aperture diaphragm (reflected/transmitted) allows observation measurement while suppressing light diffraction.
- A wide variety of optional accessories are offered.
- ML series, high-NA objectives that are specially designed for the MF series (long-working distance type).
- High-magnification observation up to 2000X.



M2 Software & Hardware
2D Coordinate Measurement Interface
64PKA-M2-MF - MF/MFU M2 Retrofit Kit



MF-J2017D

* The binocular tube, eyepieces, and LED illumination unit are optional accessories.

SPECIFICATIONS

Model No.		MF-J2017D	MF-J3017D	MF-J4017D
Order No.		176-891-13	176-892-13	176-893-13
Observation image		BF (Bright field)/Erect image		
Eyepiece	Diopter adjustment	10X (field number: 24), 15X, 20X Note: Monocular unit: a 10X eyepiece (standard accessory), Binocular tube: two 10X eyepieces (standard accessory)		
Objective lens		ML series 3X objective lens (standard accessory), 1X, 5X, 10X, 20X, 50X, 100X		
Illumination unit (One of the two options must be selected.)	LED illumination unit	Transmitted illumination: Telecentric system, Built-in aperture diaphragm, White LED light source, stepless light intensity control, with cooling fan Reflected illumination: Koehler illumination, Variable aperture diaphragm mechanism, White LED light source, stepless light intensity control Control unit: Power ON/OFF switch (main switch), 100 - 240V AC power input connector		
	Halogen illumination unit	Transmitted illumination: Telecentric system, Built-in aperture diaphragm, Halogen bulb (12V, 50W), stepless light intensity control, with cooling fan Reflected illumination: Koehler illumination, Variable aperture diaphragm mechanism, Halogen bulb (12V, 50W), stepless light intensity control, with cooling fan Control unit: Power ON/OFF switch (main switch), 100 - 240V AC power input connector		
Vision AF*1		Available Option		
XY-axis Vision	Measuring range	200×170mm	300×170mm	400×200mm
Z-axis	Measuring range	220mm		
Measuring accuracy *2 (When no load is put on the X- or Y-axis)		(2.2+0.02L) μm L: Measuring length (mm)		
Digital counter	Resolution	1/0.5/0.1μm .0001"/.00005"/.00001" switchable		

*1: Vision Unit **359-763** and an image AF cable **12AAN358** are sold separately.

*2: Measuring method complies with JIS B7153.



Need Support?

Bulb replacement for transmitted/reflected illumination Standard: Halogen bulb (12V, 50W) (No.513667)
Bulb life: 1,100 hours

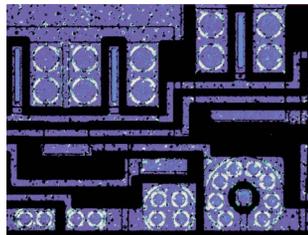
Microscopes

MF-U SERIES 176 — High-power Multi-function Measuring Microscopes

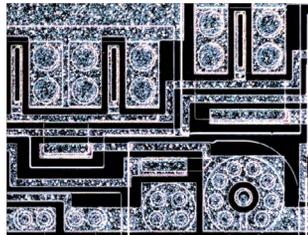


MF-UB3017D
XY stage travel range: 12 x 6.7" / 300 x 170mm
(with optional turret, objective and fiber illumination)

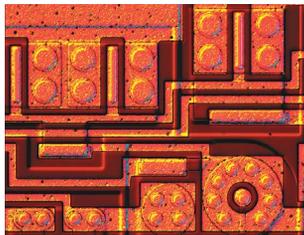
- Observation with a clear and flareless erect image and a wide field of view
- Measuring accuracy that is highest in its class (and conforms to JIS B 7153)
- Proven high-NA objectives from the FS optical system (long-working distance type)
- Integration of metallurgical and measurement microscope functions provides high-resolution observation and high-accuracy measurement solution
- Illumination unit (reflected/transmitted) selectable from a high-intensity LED or halogen bulb (required)
- Variable aperture diaphragm (reflected/transmitted) allows for contrast adjustment
- Variety of standardized stages in sizes up to 400 x 200 mm
- Quick-release mechanism useful for moving the stage quickly when measuring workpieces that are large in size or quantity
- High-magnification eyepiece observation up to 4000X



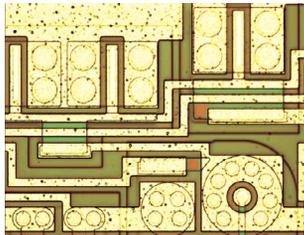
Polarized light observation:
Observing only the filtered light that vibrates in one direction. Used for observing materials with special optical characteristics, such as mineral and liquid crystal.



Dark field (DF) observation:
Observing only the scattered light by shutting down the direct light to the objectives. The scratches and dust that cannot be viewed in the bright view field can be observed by this method in high-contrast.



Differential interference contrast (DIC) observation:
Effective in detecting fine scratches and steps on the surface of metal, liquid crystal, and semiconductors.

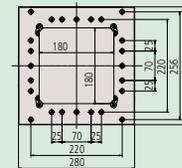


Bright field (BF) observation:
Most common method of observation. Observing directly the light reflected from the surface of the workpiece.

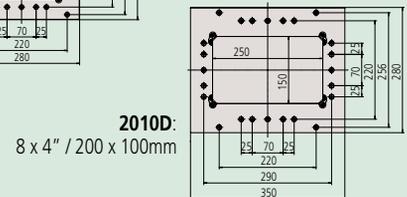
Technical Data

Observation image:	Erect image
Optical tube:	Siedentopf type (pupil distance adjustment: 51 - 76mm), 1X tube lens, Binocular tube (depression: 30°), Reticle projection method, with TV mount, Optical path ratio (eyepiece/TV mount: 50/50)
Eyepiece lens:	10X (field No.: 24mm), Optional: 15X, 20X
Turret (optional):	Manual or power
Objective (optional):	M / BD Plan Apo objective from 1X to 200X
Transmitted illumination	
• Light source:	Halogen bulb (12V, 50W) or LED
• Optical system:	Telecentric illumination with adjustable aperture diaphragms
• Functions:	Light intensity adjustable, Non-stepped brightness adjustment
Surface illumination	
• Light source:	Optional halogen illumination unit (fiber-optic cold light illumination) or LED
• Optical system:	Koehler illumination with adjustable aperture diaphragms
• Functions:	Light intensity adjustable, Non-stepped brightness adjustment
Display unit:	
• No. of axis:	2 axes or 3 axes
• Resolution:	.0001" / .00005" / .00001" / 0.001mm / 0.0005mm / 0.0001mm
• Functions:	Zero-setting, Direction switching, Data output (via RS-232C interface)
Power supply:	120V AC, 50/60Hz
Mass:	148lbs/67kg (1010D) / 157lbs/71kg (2010D) / 326lbs/148kg (2017D) / 344lbs/156kg (3017D) / 357lbs/162kg (4020D)

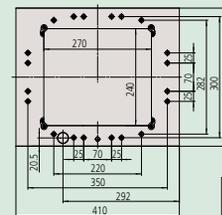
Selection of XY stage by travel range



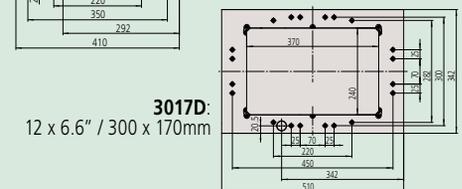
1010D:
4 x 4" / 100 x 100mm



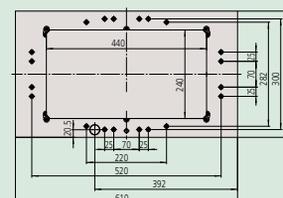
2010D:
8 x 4" / 200 x 100mm



2017D:
8 x 6.7" / 200 x 170mm



3017D:
12 x 6.6" / 300 x 170mm



4020D:
16" x 8" / 400 x 200mm

MF-U SERIES 176 — High-power Multi-function Measuring Microscopes

SPECIFICATIONS

Model No. (XY stage size)	1010D	2010D	2017D	3017D	4020D	
Order No.	MF-UB	176-976-13	176-977-13	176-878-10	176-879-10	176-980-13
	MF-UD	176-886-10	176-887-10	176-888-10	176-889-10	176-990-13
XY stage travel range	4 x 4" 100 x 100mm	8 x 4" 200 x 100mm	8 x 6.7" 200 x 170mm	12 x 6.7" 300 x 170mm	16 x 8" 400 x 200mm	
Z-axis travel range	6" / 150mm		8.7" / 220mm			
Focusing method	Manual focusing (coarse focusing: 10mm/rev., fine focusing: 0.1mm/rev.)					
Measurement method	Linear encoder (2-axis model: X / Y-axis, 3-axis model: X / Y / Z-axis)					
Resolution (switchable)	.0001" / .00005" / .00001" (0.001mm / 0.0005mm / 0.0001mm)					
Measuring accuracy (at 20°C)	XY-axis: (2.2+0.02L) μm, L = Measuring length (mm) when not loaded, JIS B 7153					
Indication accuracy (at 20°C)	Z-axis: (5+0.04L) μm, L = Measuring length (mm)					
Floating function	X and Y axes with Quick-release mechanism					
XY stage top size	11 x 11" 280 x 280mm	14 x 11" 350 x 280mm	16 x 13.6" 410 x 342mm	20 x 13.6" 510 x 342mm	24 x 13.6" 610 x 342mm	
Effective glass size	7.1 x 7.1" 180 x 180mm	10 x 6" 250 x 150mm	10.6 x 9.6" 270 x 240mm	14.6 x 9.6" 370 x 240mm	17.3 x 9.6" 440 x 240mm	
Swivel function	—		±5° (left)		±3° (left)	
Max. stage loading	22lbs / 10kg		44lbs / 20kg		33lbs / 15kg	

Optional Accessories

- 378-866:** 10X eyepiece set (view field dia.: 24mm) (standard accessory)
378-858: 20X eyepiece set (view field dia.: 12mm)

Turret (Nosepiece) **must select**

- 378-018:** Adjustable manual BF turret (4 port)
378-216A: Adjustable power BF turret (5 port)
176-211: Adjustable manual BF/DF turret (4 port)
176-212-11: Adjustable power BF/DF turret (4 port)

Objectives

See page I-28 for objective selection

Manual and Power Turrets



Filters

- 378-092:** Polarization unit
12AAA645: GIF filter (standard accessory)
12AAA646: LB80 color filter (for halogen illuminator, (176-448A))

Camera Mounts

- 375-054:** 0.5X camera adapter (with C-mount adapter)
970441: C-mount adapter

Bulbs

- 513667:** Halogen bulb (12V, 50W)
12BAB345: Halogen bulb (long life type, 12V, 50W)
517181: Halogen bulb (12V, 100W)

Illumination Units

- 176-316A:** Halogen illumination unit (12V, 150W)
176-387: Twin fiber-optics illuminator

Fixture and Stage Accessories

- 176-107:** Holder with clamp
172-378: V-block with clamp (max. workpiece dia.: 1" / 25mm)
172-604: Swivel center support* (max. workpiece dia.: 3.1" / 80mm)
176-305: Rotary stage with fine feed knob for 1010D/2010D models
176-306: Rotary stage with fine feed knob for 2017D/3017D/4020D models

*Fixture mount adapter (176-310) is required for 2010D models.
 Fixture mount adapter (176-304) is required for 2017D/3017D/4020D models.

Misc.

- 176-308:** Vibration damping stand
176-309: Mounting stand
375-056: Stage micrometer
937179T: Foot switch

Reticle See page I-21

Selection of machine type

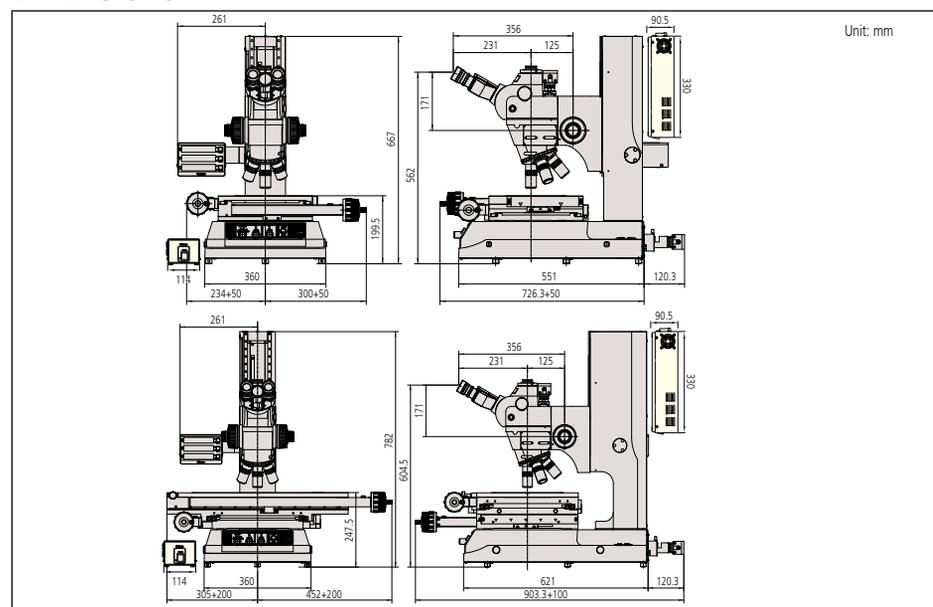
Machine type	MF-UB	MF-UD
Observation type	Bright field (BF)	Bright field / Dark field (BF/DF)
Measurement system	X, Y and Z-axis (3 axes)	X, Y and Z-axis (3 axes)

Illumination Unit (must select LED or Halogen illumination unit)

Applicable Illumination Unit	LED	Halogen
Order No.	176-446A (transmitted & reflected)	176-452A (transmitted) 176-316A (reflected)

Note: illumination unit not included. If halogen transmitted illumination is selected, then 176-316A must be chosen.

DIMENSIONS



Microscopes

MF-U Motorized SERIES 176 — Motorized-type Universal Measuring Microscopes

- Motorized model of the MF-U Series. The Z-axis is motorized and can be operated using a remote box.
- Using the optional vision unit enables the image AF function.
- Illumination unit (reflected/transmitted) can be selected from a high-intensity LED or halogen bulb (required).
- Variable aperture diaphragm (reflected/ transmitted) allows observation measurement while suppressing light diffraction.
- A wide variety of optional accessories are offered.
- Proven high-NA objectives from the FS optical system (long working distance type).
- Integration of metallurgical and measurement microscope functions provide high-resolution observation and a high-accuracy measurement solution.
- High-magnification observation up to 4000X.



MF-UJ2017D
The turret, objectives, and LED illumination unit are sold separately.

MF-U Selection of Machine Type

↓	2017	3017	4020	Counter	Motorized stage	Optics
J	176-894-13	176-895-13	176-896-13	X,Y,Z	Z only	BF
K	176-897-13	176-898-13	176-899-13	X,Y,Z	Z only	BF/DF

SPECIFICATIONS

		Model No.	MF-UJ2017D	MF-UJ3017D	MF-UJ4020D
BF (Bright field)	Model No.		MF-UJ2017D	MF-UJ3017D	MF-UJ4020D
	Order No.		176-894-13	176-895-13	176-896-13
BD (Bright / Dark field)	Model No.		MF-UK2017D	MF-UK3017D	MF-UK4020D
	Order No.		176-897-13	176-898-13	176-899-13
Observation image		BF (Bright field), DF (Dark field), Polarization, Differential Interference Contrast (DIC) / Erect image			
Eyepiece	Diopter adjustment	10X (standard accessory) (Field number: 24), 15X, 20X			
	BF (Bright field)	M Plan Apo, M Plan Apo HR, M Plan Apo SL, G Plan Apo			
Objective lens (optional)	BD (Bright / Dark field)	BD Plan Apo, D Plan Apo HR, BD plan Apo SL			
	LED illumination unit	Transmitted illumination: Telecentric system, Built-in aperture diaphragm, White LED light source, stepless light intensity control, with cooling fan Reflected illumination: Koehler illumination, Variable aperture diaphragm mechanism, White LED light source, Non-step light intensity control Control unit: Power ON/OFF switch (main switch), 100 - 240V AC power input connector			
Illumination unit (One of the two options must be selected.)	Halogen illumination unit	Transmitted illumination: Telecentric system, Built-in aperture diaphragm, Halogen bulb (12V, 50W), stepless light intensity control, with cooling fan Reflected: BF/BD Kohler illumination with adjustable aperture diaphragm, 12V100W or 12V15W halogen lamp (selectable), external fiber illumination, stepless brightness adjustment Control unit: Power ON/OFF switch (main switch), 100 - 240V AC power input connector			
	Vision AF*1	3			
XY-axis	Measuring range	8x6.7" / 200x170mm	12x6.7" / 300x170mm	16x8" / 400x200mm	
Z-axis	Measuring range	8.7" / 220mm			
Measuring accuracy	(When no load is put on the X- or Y-axis)	(2.2+0.02L) μm L: Measuring length (mm)			
Digital counter	Resolution	1/0.5/0.1μm .0001"/.00005"/.00001" switchable			

*1: Vision unit and an image AF cable are separately required.

*2: Measuring method complies with JIS B7153.

Bulb replacement for transmitted illumination Standard: Halogen bulb (12V, 50W) (No.513667), Bulb life: 1,100 hours
For replacement for reflected illumination (from separate light source) Standard: Halogen bulb (12V, 100W) (No.517181),
High-intensity bulb (12V, 100W) (No.12BAD602)

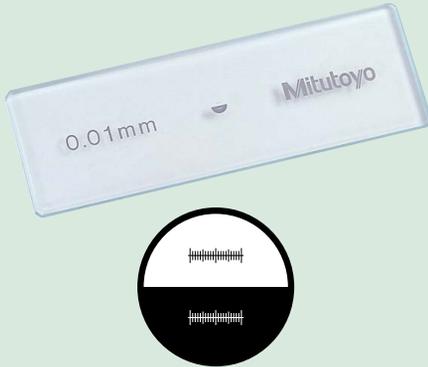
*At the time of purchase, a standard bulb and a high-intensity bulb are provided. (Only for the reflected illumination models.)



Need Service?

Accessories for Measuring Microscope

Stage Micrometer



SPECIFICATIONS

Order No.	375-056
Range	1mm
Graduations	0.01mm
Accuracy (at 20°C)	(1+L) μ m, L = Measuring length (mm)
Dimensions (WxD)	3" x 1" / 76 x 26mm
Mass	16g

Optional Reticles

- 12AAG838 (12AAG878)**: Cross-hair (7 μ m width)
 - 12AAG836 (12AAG877)***: Cross-hair (5 μ m width)
 - 12AAG873 (12AAG876)**: Cross-hair (3 μ m width)
 - 12AAG839 (12AAG879)**: Cross-hair and 45° angle
 - 12AAG840 (12AAG880)**: Broken cross-hair and 60° angle
 - 12AAG842**: 20mm scale (0.1mm reading)
 - 12AAG843**: Concentric circle (ϕ 1.2 - ϕ 18mm)
 - 12AAG844**: 10mm scale (0.1mm reading)
 - 12AAG854**: Concentric circle (ϕ .01" - ϕ .2")
- () : for MF-U models,
* Standard accessory

- Reticle mount (standard accessory)
-
- for MF models
- for MF-U models
- Cross-hair and 90° angle (standard accessory)

Focus Pilot FP-05

- By installing this system on the camera mount of an MF series measuring microscope and projecting the focusing chart onto the workpiece surface, the focal point can be detected with high accuracy and high repeatability.
- The brightness of the chart can be adjusted.
- A wide view field observation on the monitor is made possible with the use of a CCD camera (C-mount adapter is included.)
- Four types of chart patterns are available.* The pattern should be selected in accordance with the type of workpiece surface texture.

* Factory installed option



Concentric circle

Slit

SPECIFICATIONS

Order No.	375-057-11	375-058-11	375-067-11	375-068-11
Applicable microscopes	MF D models		MF-U D models	
Light source	Green LED	Red LED	Green LED	Red LED
Magnification	0.5X, Accuracy: 0.1%**			
Camera adapter	C-mount (provided)			
Applicable CCD camera	Up to 2/3-inch			
Mass	4lbs / 1.8kg			

**Within 2/3 area from the center of view field



Manual and Power Turrets



SPECIFICATIONS

Order No.	176-211	378-018	176-212-11	378-016A	378-216A
Observation type	BD	BF	BD	BF	BF
No. of objective mounts	4-mount	4-mount	4-mount	4-mount	5-mount
Driving method	Manual		Motor		
Dimensions (W x D x H)	—	—	Turret: 6.5 x 2.6 x 5.4"		
			Control Box: 4.1 x 3 x 7.6"		
			108 x 72 x 193		

Accessories for Measuring Microscope

Twin fiber-optics illuminator



SPECIFICATIONS

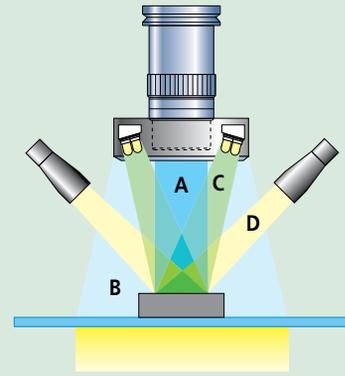
Order No.	176-387
Applicable microscopes	MF, MF-U models
Length of fiber cable	28" / 700mm
Light source	Halogen bulb (12V, 100W) (517181: halogen bulb)
Dimensions (W x D x H)	Light unit: 9.3 x 3 x 4.7" 235 x 76 x 120mm

LED Ring Illuminator

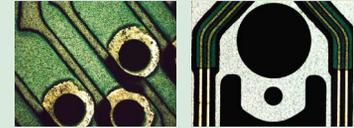


SPECIFICATIONS

Order No.	176-367-2A
Applicable microscopes	MF models with 1X/3X/5X/10X objective
Light source	White LED
Length of LED cable	59" / 1500mm

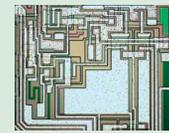


A: Vertical surface illumination (Halogen)



PCB

HDD suspension



IC circuit

B: Ring fiber optics illumination



Flexible PCB

PCB



Electric parts

C: LED ring illumination



HDD suspension

PCB



Black resin molded parts

D: Twin fiber-optics illumination



IC package

Garnet



PCB

Accessories for Measuring Microscope

QM-Data200 SERIES 264 — 2-D Data Processing Unit

Technical Data

Resolution:	0.0001mm
Program functions:	Part program creation, execution, editing
Statistical processing:	Number of data, maximum value, minimum value, mean value, standard deviation, range, histogram
Element memory:	Maximum of 1000 elements
Element recall:	Point, line, circle, distance, ellipse, rectangular hole, slotted hole, intersection and intersecting angle
Element key-in:	Point, line, circle
Display system:	Monographic LCD (320 x 240 dots, with back light)
Measurement result file output:	RS-232C/USB output (CSV format, MUX-10F format)
Display language:	Japanese/English/German/French/Italian/Spanish/Portuguese/Swedish/Polish/Dutch/Hungarian
Data input:	RS-232C/USB, X/Y/Z-axis signal, Footswitch
Data output:	RS-232C/USB
Power supply	120V AC, 50/60Hz
Mass	2.2kg (stand-mount type)
	2.1kg (arm-mount type)

QM-Data200
Order No.: 264-160-13A (stand-mount type)
Order No.: 264-161-13A (arm-mount type)

The QM-Data200 is a geometric readout/analysis unit for optical instruments like profile projectors. This features powerful 2-D coordinate measurement capabilities with unmatched simple key operation. The QM-Data200 improves operator productivity, minimizes errors, and saves measurement time and production cost.

- Various graphic displays on the large colored LCD screen for easy measurement operations.
- One-key operation for combined measurements that are often used (circle-circle distance, etc.)
- The AI measurement function (automatic identification of measuring item) eliminates switching between the measurement command keys.

- Equipped with the measurement procedure teaching function and the measuring position navigation in Repeat mode.
- The user menu function allows users to register measurement commands or part programs to create custom menus.
- Tolerance zone measurement of data processing results and various statistical processing for each item is available.
- Measurement results output to "MS-Excel" in spreadsheet (CSV) format.
- Measurement procedures and results can be saved using a USB Drive.
- Two models available: a stand-alone type with tilt system and a flexible-arm type that can be mounted on a profile projector.



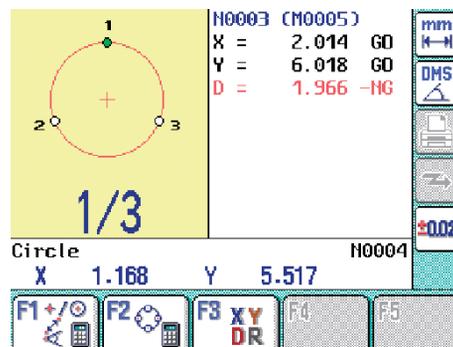
QM-Data 200
Stand-mount type

Intuitive panel design

The QM-Data200 employs Geometry Keys to accelerate the measurement process. The probing routine of standard geometric features and combinations are designed with Geometry Keys on the front panel. Click the key you need and capture features to complete the measurement quickly and accurately. This improves operator productivity, reduces errors, and saves operation time and cost.

Graphic display

Measurement information and data are visualized on the back-lit colored LCD with graphical interfaces. The geometric feature selected is displayed with the probing navigator. The measurements map and blink indication show the probing points and sequences. This improves operation accuracy and reduces errors and time.



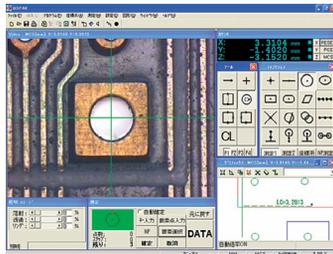
Need Integration Help?

Accessories for Measuring Microscope

Vision Unit SERIES 359 — Vision System Retrofit for MF and MF-U Microscopes

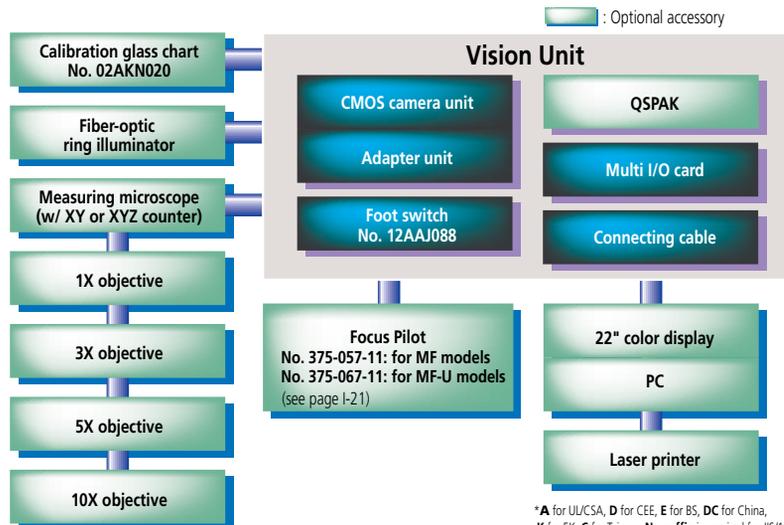
- The automatic edge-detection tools and various macro icons allow measurement in one easy step.
- The graphics and measurement navigation functions facilitate operation.
- Image data input/storage function.
- Measurement results are output in CVS format. This lets the user generate an inspection table in MS-Excel®.
- Allows the tolerance zone measurement of measurement results and various types of statistical processing for each item.
- Combined use with the focus pilot provides high-accuracy height measurements. (Patent pending)
- A series of measuring operations can be performed using just one screen display.
- The auto-brightness control function reproduces the type and degree of illumination required. (This function is limited to the MF/MF-U series.)

QSPAK Measurement Window



The PC system, QSPAK software and microscope are optional.

Vision Unit
No.: 359-763 (for MF D)



*A for U/L/C/S/A, D for C/E, E for B/S, DC for China, K for E/K, C for Taiwan, No suffix is required for JIS/100V

SPECIFICATIONS

Projected Image	Inverted Image
Onscreen Magnification	19x-1900x (22" Monitor)
Camera Unit	
Image Sensor Size	1/2" Color CMMOS
Image Sensor Resolution	3 MP
Interface	USB 2.0
Dimensions (WxDxH)	2.28 x 2.32 x 3.27" 58 x 59 x 83mm
Adapter Unit	
Measurement Software	QSPak VUE (optional)
Dimensions (DXH)	1.77 x 4.84" / 45 x 123mm
Magnification	0.5x
Optional Accessory:	Foot Switch (12AAJ088)

QSPAK, optional software

For observation/comparison of form

- Template matching function
- Manual pattern matching function

For simple measurement

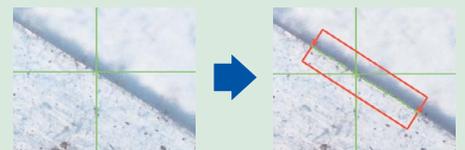
- One-click edge detection tool function
- Smart tool function
- User macro function

For repeated measurement/ auto-measurement

- Quick navigation function
- Playback function
- Graphic function
- External data output function
- Statistical calculation function

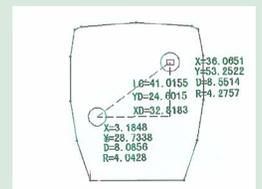
One-click Edge Detection

By clicking the mouse near the edge of a workpiece, QSPAK automatically scans the edge and detects it, showing its coordinates. This function also works with the point tool, box tool, circle tool and auto-focus tool.



Graphic Window

The measurement results and measured elements are plotted in the graphic window in real-time. By using this function, the user can check the current measuring position at a glance. The graphic window can be used for geometrical calculation.



Accessories for Measuring Microscope

FS-70

SERIES 378 — Microscope Unit for Semiconductor Inspection

Technical Data

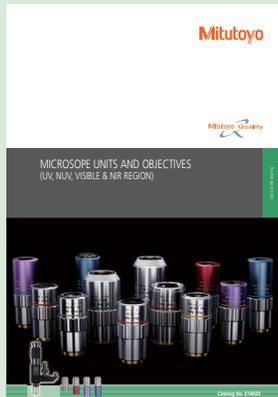
Focus Adjustment Method:	With concentric coarse and fine focusing wheels (right and left)
Range:	50mm travel range 0.1mm/rev. for fine adjustment, 3.8mm/rev. for coarse adjustment
Trinocular tube Image:	Erect image
Pupil distance:	Siedentopf type, adjustment range: 2-3" / 51-76mm
Field number:	24
Tilt angle:	0° - 20° (only -TH, -THS models)
Illumination system:	Reflective illumination for bright field (Koehler illumination, with aperture diaphragm)
Light source (optional):	12V100W fiber optic, non-stepped adjustment, light guide length 1.5m, power consumption 150W
Objectives (optional):	M Plan Apo, M Plan Apo SL, G Plan Apo

- The optical system that was developed for the best-selling FS60 models was further enhanced for the FS70 models. It is ideal as a microscope unit of a prober station for semiconductors. (All models CE marked.)
- The FS70L supports three types of YAG laser wavelength ranges (1064nm, 532nm and 355nm), while the FS70L4 supports two types of wavelength ranges (532nm and 266nm), thus expanding a scope of laser applications, allowing laser-cutting of thin films used in semiconductors and liquid crystal substrates. However, Mitutoyo assumes no responsibility for the performance and/or safety of the laser system used with Mitutoyo microscopes. Careful examination is recommended in selecting a laser-emission unit.

- Bright field, differential interference contrast (DIC) and polarized observations are optional with FS70Z and FS70. The FS70L and FS70L4 do not support the DIC method.
- By employing an inward revolver, the long working distance objectives provide excellent operability.
- An ergonomic design with superb operability: the FS70 employs the erect-image optical system (the image in the field of view has the same orientation as the specimen) and enlarged fine focus adjustment wheel with rubber-grip coarse adjustment knob.

Optional Accessories

For a complete listing of accessories see Microscope Units and Objectives brochure, E4191-378



Refer to No. (E14020) for more details.

Model No.	FS70	FS70-TH	FS70Z	FS70Z-TH	FS70L	FS70L-TH	FS70L4	FS70L4-TH
Order No.	378-184-1	378-184-3	378-185-1	378-185-3	378-186-1	378-186-3	378-187-1	378-187-3
Short base model No.	FS70-S	FS70-THS	FS70Z-S	FS70Z-THS	FS70L-S	FS70L-THS	FS70L4-S	FS70L4-THS
Order No.	378-184-2	378-184-4	378-185-2	378-185-4	378-186-2	378-186-4	378-187-2	378-187-4
Focus adjustment	50mm travel range with concentric coarse (3.8mm/rev) and fine (0.1mm/rev) focusing wheels (right / left)							
Image	Erect image							
Pupil distance	Siedentopf type, adjustment range: 2 - 3" / 51 - 76mm							
Field number	24							
Tilt angle	—	0° - 20°	—	0° - 20°	—	0° - 20°	—	0° - 20°
Optical pass ratio	50/50	100/0 or 0/100	50/50	100/0 or 0/100	100/0 or 0/100		100/0 or 0/100	
Protective filter	—		—		Built-in laser beam filter		Built-in laser beam filter	
Tube lens	1X		1X - 2X zoom		1X		1X	
Applicable laser	—		—		1064/532/355nm		532/266nm	
Camera mount	C-mount (using optional adapter B)				Use a laser with TV port.		C-mount receptacle (with green filter switch)	
Illumination system, optional	Reflective illumination for bright field (Koehler illumination, with aperture diaphragm) 12V 100W fiber optics, non-stepped adjustment, light guide length: 1.5m, power consumption 150W							
Objective, optional (for observation)	M Plan Apo, M Plan Apo SL, G Plan Apo							
Objective, optional (for laser-cutting)	—				M/LCD Plan NIR, M/LCD Plan NUV		M Plan UV	
Loading weight*	32lbs/14.5kg	30lbs/13.6kg	31lbs/14.1kg	29lbs/13.2kg	31lbs/14.2kg	30lbs/13.5kg	31lbs/13.9kg	29lbs/13.1kg
Mass (main unit)	13lbs/6.1kg	15.5lbs/7.1kg	14.5lbs/6.6kg	16.5lbs/7.5kg	14lbs/6.4kg	15.5lbs/7.2kg	14.5lbs/6.7kg	16.5lbs/7.5kg

*Loading weight on optical tube excluding weight of objective lenses and eyepieces.



Need Calibration?

Accessories for Measuring Microscope

VMU SERIES 378 — Unit for Incorporating into Equipment

- Telecentric system equipped with an aperture diaphragm is standard on the epi-illumination optical system.
- Best suited to process images for which uniform illumination is required.
- Design and manufacture are flexible to meet your demands such as double camera mounting or double (low/high) magnification.



- Compact and lightweight microscope designed to be built in for camera observation
- Can be used with YAG (near-infrared, visible, near-ultraviolet, or ultraviolet) lasers.*1
*1 The performance and safety of laser-equipped system products is not guaranteed.
- For VMU-LB and VMU-L4B, the rigidity and general performance of the microscope main unit have been enhanced compared with previous models.
- Compatible with infrared optical systems*2
*2 An infrared source and infrared camera are necessary.

SPECIFICATIONS

Model No.	VMU-V	VMU-H	VMU-LB	VMU-L4B
Order No.	378-505	378-506	378-513	378-514
Camera mounting direction	Vertical	Horizontal	Vertical (Rotatable)	
Observation	Bright-field/Erect image	Bright-field/Inverted image	Bright-field/Erect image	
Optical tube	TV adapter	Equipped with a C-mount		Equipped with a C-mount (Equipped with a green filter switching mechanism)
	Image forming (tube) lens	Built-in 1X (visible/near-infrared calibration)		Built-in 1X (near-infrared/visible/near-ultraviolet calibration)
	Available for lasers	—		YAG laser source (Fundamental, Second/Third harmonic) mountable
Objective (optional)	For observation	M Plan Apo, M Plan Apo HR, M Plan Apo SL, G Plan Apo		M Plan Apo
	For laser processing	—		NIR Series NUV Series Note 1: Selected depending on the wavelength of the laser source
Applicable camera (s)	2/3 type or less cameras (C-mount type)			
Optical system epi-illumination	Telecentric system equipped with an aperture diaphragm			
Illuminated lens tube	Bright-field illuminated lens tube			
Illumination unit (optional)	Fiber-optic cable illumination unit (100 W) (378-700)			
Main unit mass	650 g	750 g	1270 g	1300 g

Note 3: The M Plan Apo 1X objective is used with the polarization unit (378-710 or 378-715).

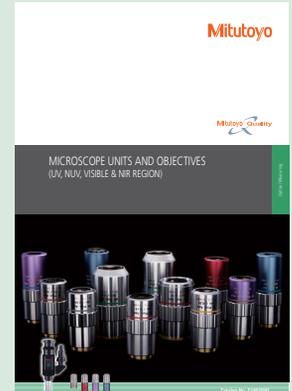
WIDE VMU

SPECIFICATIONS



	For Bright-field Observation	For Bright/Dark-field Observation	
Model No.	WIDE VMU-HR	WIDE VMU-BDV	WIDE VMU-BDH
Order No.	378-519	378-517	378-518
Camera mounting orientation	Vertical	Vertical	Horizontal
Observation	Bright-field/Erect image	Bright/Dark-field/Erect image	Bright/Dark-field/Inverted image
Optical tube	Optical system	Magnification: 1X Visible light	
	Camera Mount	F-Mount, C-Mount (with aligning and parfocal adjustment mechanism)	
	Imaging forming (tube) lens	Built in 1X (visible - NIR)	Built in 1X (visible)
Objective (required option)	M Plan Apo, M Plan Apo HR, M Plan Apo SL, G Plan Apo, NIR Series		BD Plan Apo
	Diagonal line length: 30 mm or less (equivalent to APS-C format)		
Optical system epi-illumination	Telecentric (Pupil diameter of $\phi 16.8$) Note: Coaxial epi-illumination, with aperture diaphragm	Telecentric illumination, Bright/Dark-field illumination optical tube (Dual-port fiber-optic illumination) Bright/Dark-field switching with light source on-off	
Illuminated lens tube	Bright-field illuminated lens tube (rotatable) *3, selectable between LED adapter and fiber adapter (both supplied as standard)	Bright-field illuminated lens tube (rotatable) *3	
Illumination unit (optional)*2	Fiber-optic illumination unit (100 W) (378-700)		
Main unit mass	1400 g	2000 g	2150 g

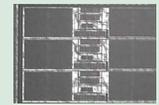
*1 Polarized observation by Bright-field illumination *2 Support for third-party LED illuminators (WIDE VMU-HR only)
*3 The fiber (light source) mount orientation can be changed.



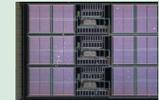
Refer to the **Microscope Units and Objectives Brochure (E14020)** for more details.



Bright-field



Infrared



Dark-field

- Observation over a wide field of view (Image field of $\phi 30$ mm)
- Greatly enhanced brightness on the periphery of the field of view (Reduces the dependence on the light distribution characteristics.)
- Compatible with infrared optical systems*
* An infrared source and infrared camera are necessary. For more details on infrared observation, visit your local Mitutoyo M² Solution Center or contact your Mitutoyo Sales Representative.
- Small optical observation system
- Compatible with HR series of high resolving power lens (designed with pupil diameter of $\phi 16.8$ mm)
- Available for various observation methods (Including bright-field, dark-field for visual or scratch inspection, and polarized observation of objects with polarization characteristics)

Accessories for Measuring Microscope

Varifocal Lens TAGLENS

- Without changing the required magnification, ultra-high speed variable focal length enables obtaining perfectly focused images in real-time with stress-free operation.
- The time required for auto-focusing is drastically reduced, and the optical system focus range is extended without the expense of a mechanical drive.



TAGLENS-T1

Ultra-high speed, varifocal lens. A dedicated controller and software are equipped as standard.

SPECIFICATIONS

Operating principle	Variable refraction index
Resonance frequency	70 kHz
Effective aperture	ø11 mm*
Transmittance	90% or more (λ 400 to 700 nm)*

* The above values are based on optical design theoretically.



Refer to the **Varifocal Lens TAGLENS Brochure (E14025)** for more details.



Video Microscope Unit VMU-T1

Microscope unit for configuring a varifocal optical system by incorporating TAGLENS-T1, the objective and the camera.

SPECIFICATIONS

Compatible TAGLENS	TAGLENS-T1
Imaging lens magnification	1X
Imaging area	ø11 mm
Applicable objective	M Plan Apo Series
Options	Manual turret, Power turret, Polarizer, Focusing unit A or B, XY stage, Simplified stand.

M Plan Apo Series

Objective	1X	2X	5X	7.5X	10X	20X	50X	
Depth of focus×2 (mm)	0.88	0.18	0.028	0.012	0.007	0.003	0.0018	
Total scanning width (mm)	16	4.0	0.64	0.28	0.16	0.04	0.007	
Real FOV (mm)	1/2 inch camera	4.8×6.4	2.4×3.2	0.96×1.28	0.64×0.85	0.48×0.64	0.24×0.32	0.096×0.128
	2/3 inch camera	6.6×8.8	3.3×4.4	1.32×1.76	0.88×1.17	0.66×0.88	0.33×0.44	0.132×0.176



Schedule Service

Accessories for Measuring Microscope

Eyepieces SERIES 378

- The field of view is extra wide.
- Optional reticles are available.

SPECIFICATIONS

Order No. (2pcs. set)	Magnification	Field number	Mass	Individual order No.
378-866	10X	24	85g	378-856-5
378-858	20X	12	55g	378-858-5



378-866



378-858

Objectives SERIES 378

The Mitutoyo 378 Series objectives have the world's longest working distance and an infinity correction optical system. These objectives provide flexible observation at high magnifications and independent correction of chromatic aberration.

- The long working distance objectives provide excellent clearance between the lens surface and the workpiece surface in focus, making it possible to observe workpieces which are usually hard to focus because of awkward projections.
- The metallurgical plan apochromatic (M Plan Apo) objective provides a flat, chromatic aberration-free image throughout the field of view, making it suitable for any type of microscope.
- Specially designed objectives also are available with correction for near-infrared radiation, near-ultraviolet radiation, and ultraviolet radiation, or various thicknesses of LCD screen glasses.
- The mounting screw threads of objectives are designed to conform to JIS B-7141-1988.



M Plan Apo and M Plan Apo SL
Objectives for bright field observation



BD Plan Apo and BD Plan Apo SL
Objectives for bright/dark field observation



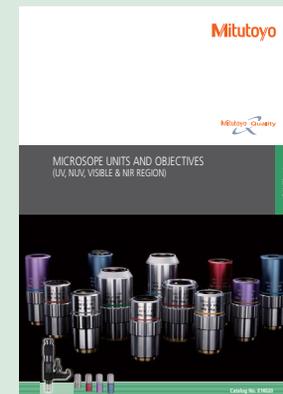
Near-infrared radiation corrected M Plan Apo NIR objectives



Near-ultraviolet radiation corrected M Plan Apo NUV objectives

Reticles (optional)

- 516848:** Cross-hair
- 516576:** Broken cross hair (90° and 60°)
- 516578:** Concentric circle (Diametric increment: 1.2mm)
- 516577:** 20mm scale (Minimum reading: 0.1mm) with cross hair
- 516849:** 10mm scale (Minimum reading: 0.1mm)
- 516850:** 5mm scale (Minimum reading: 0.05mm)



Refer to **No. (E14020)** for more details.



Find Training



Ultraviolet radiation corrected M Plan UV objectives

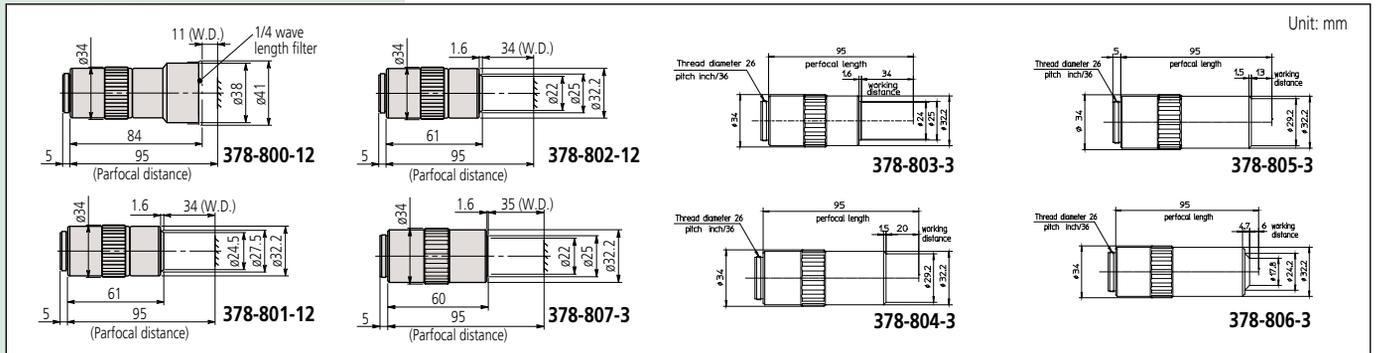
Accessories for Measuring Microscope



M Plan Apo for Bright Field Observation

Order No.	Mag.	N.A.	W.D.	f	R	D.F.	View field 1	View field 2	Mass
378-800-3	1X	0.025	11.0mm	200mm	11.0μm	440μm	ø24mm	4.8x6.4mm	300g
378-801-12	2X	0.055	34.0mm	100mm	5.0μm	91μm	ø12mm	2.4x3.2mm	220g
378-802-12	5X	0.14	34.0mm	40mm	2.0μm	14.0μm	ø4.8mm	0.96x1.28mm	230g
378-807-3	7.5X	0.21	35.0mm	26.67mm	1.3μm	6.2μm	ø3.6mm	0.64x0.85mm	240g
378-803-3	10X	0.28	34.0mm	20mm	1.0μm	3.5μm	ø2.4mm	0.48x0.64mm	240g
378-804-3	20X	0.42	20.0mm	10mm	0.7μm	1.6μm	ø1.2mm	0.24x0.32mm	270g
378-805-3	50X	0.55	13.0mm	4mm	0.5μm	0.9μm	ø0.48mm	0.10x0.13mm	290g
378-806-3	100X	0.70	6.0mm	2mm	0.4μm	0.6μm	ø0.24mm	0.05x0.06mm	320g

DIMENSIONS



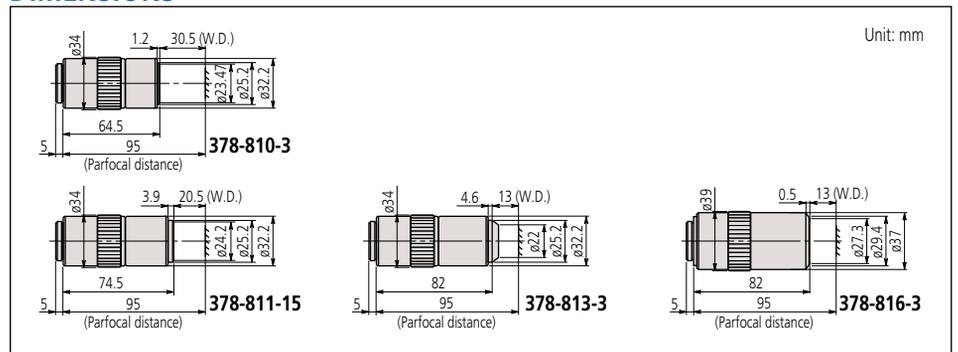
Note:
These objectives offer extra-long working distance.



M Plan Apo SL for Bright Field Observation

Order No.	Mag.	N.A.	W.D.	f	R	D.F.	View field 1	View field 2	Mass
378-810-3	20X	0.28	30.5mm	10mm	1.0μm	3.5μm	ø1.2mm	0.24x0.32mm	240g
378-811-15	50X	0.42	20.5mm	4mm	0.7μm	1.6μm	ø0.48mm	0.10x0.13mm	280g
378-813-3	100X	0.55	13.0mm	2mm	0.5μm	0.9μm	ø0.24mm	0.05x0.06mm	290g
378-816-3	200X	0.62	13.0mm	1mm	0.4μm	0.7μm	ø0.12mm	0.025x0.03mm	490g

DIMENSIONS

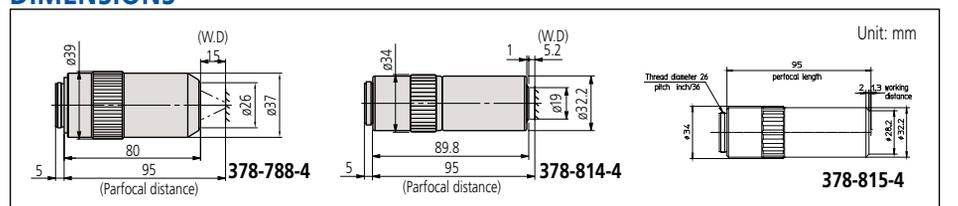


Note:
These objectives offer extra-high resolving power.

M Plan Apo HR for Bright Field Observation

Order No.	Mag.	N.A.	W.D.	f	R	D.F.	View field 1	View field 2	Mass
378-787-16	5X	0.21	27mm	40mm	1.3μm	6.2μm	ø4.8mm	0.96x1.28mm	285g
378-788-15	10X	0.42	15mm	20mm	0.7μm	1.6μm	ø2.4mm	0.48x0.64mm	460g
378-814-4	50X	0.75	5.2mm	4mm	0.4μm	0.49μm	ø0.48mm	0.10x0.13mm	400g
378-815-4	100X	0.90	1.3mm	2mm	0.3μm	0.34μm	ø0.24mm	0.05x0.06mm	410g

DIMENSIONS



Mag.: Magnification
N.A.: Numerical aperture
W.D.: Working distance
f: Focal distance
R: Resolving power
D.F.: Focal depth
View field 1: Field of view when using ø24mm eyepiece
View field 2: Field of view when using 1/2" CCD camera

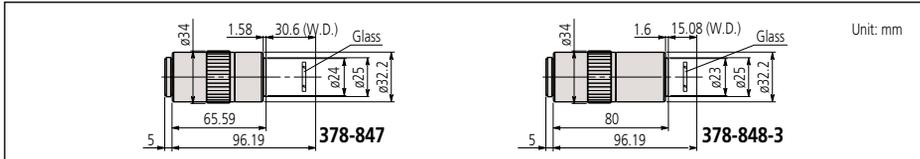
Accessories for Measuring Microscope

Glass Thickness (t = 3.5mm) Corrected G Plan Apo for Bright Field Observation

Order No.	Mag.	N.A.	W.D.	f	R	D.F.	View field 1	View field 2	Mass
378-847	20X	0.28	29.42mm*	10mm	1.0μm	3.5μm	ø1.2mm	0.24x0.32mm	270g
378-848-3	50X	0.50	13.89mm*	4mm	0.6μm	1.1μm	ø0.48mm	0.10x0.13mm	320g

*In air

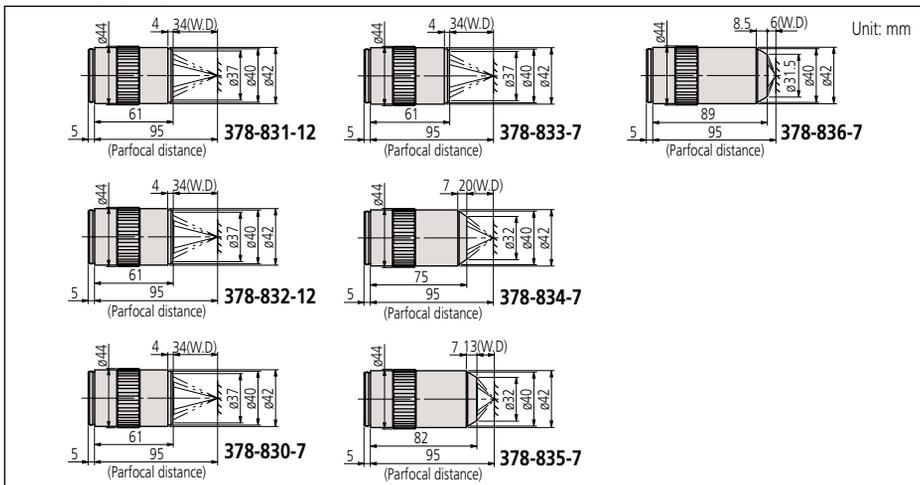
DIMENSIONS



BD Plan Apo for Bright/Dark Field Observation

Order No.	Mag.	N.A.	W.D.	f	R	D.F.	View field 1	View field 2	Mass
378-831-13	2X	0.055	34.0mm	100mm	5.0μm	91μm	ø12mm	2.4x3.2mm	340g
378-831-13	5X	0.14	34.0mm	40mm	2.0μm	14.0μm	ø4.8mm	0.96x1.28mm	350g
378-830-7	7.5X	0.21	34.0mm	26.67mm	1.3μm	6.2μm	ø3.6mm	0.64x0.85mm	350g
378-833-7	10X	0.28	34.0mm	20mm	1.0μm	3.5μm	ø2.4mm	0.48x0.64mm	350g
378-834-7	20X	0.42	20.0mm	10mm	0.7μm	1.6μm	ø1.2mm	0.24x0.32mm	400g
378-835-7	50X	0.55	13.0mm	4mm	0.5μm	0.9μm	ø0.48mm	0.10x0.13mm	440g
378-836-7	100X	0.70	6.0mm	2mm	0.4μm	0.6μm	ø0.24mm	0.05x0.06mm	460g

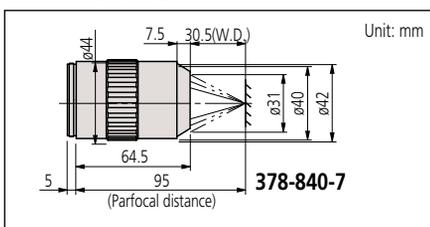
DIMENSIONS



BD Plan Apo SL for Bright/Dark Field Observation

Order No.	Mag.	N.A.	W.D.	f	R	D.F.	View field 1	View field 2	Mass
378-840-7	20X	0.28	30.5mm	10mm	1.0μm	3.5μm	ø1.2mm	0.24x0.32mm	350g

DIMENSIONS



Note:

The G Plan Apo Series are designed for observing a workpiece through BK-7 glass (thickness = 3.5mm).



Find a Distributor



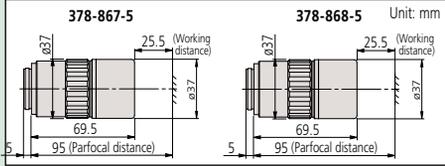
Note:

These objectives offer extra-long working distance.

Mag.: Magnification
 N.A.: Numerical aperture
 W.D.: Working distance
 f: Focal distance
 R: Resolving power
 D.F.: Focal depth
 View field 1: Field of view when using ø24mm eyepiece
 View field 2: Field of view when using 1/2" CCD camera

Accessories for Measuring Microscope

DIMENSIONS



Note:
These objectives are designed so that a workpiece's image can be focused within the focal depth even when the wavelength is changed anywhere from the visible range ($\lambda = 480\text{nm}$) up to near-infrared range ($\lambda = 1800\text{nm}$). Therefore, the M Plan NIR Series are suitable for laser repair. However, when the wavelength used exceeds 1100nm, the focusing position may slightly deviate from that in the visible range due to changes in glass dispersion and refractive index.



Note:
These objectives are designed so that a workpiece's image can be focused within the focal depth even when the wavelength is changed anywhere from the visible range ($\lambda = 620\text{nm}$) to the near-ultraviolet range ($\lambda = 355\text{nm}$). Therefore The M Plan NUV Series are suitable for laser repair using a high frequency laser beam.

Mag.: Magnification
N.A.: Numerical aperture
W.D.: Working distance
f: Focal distance
R: Resolving power
D.F.: Focal depth

View field 1: Field of view when using $\phi 24\text{mm}$ eyepiece
View field 2: Field of view when using 1/2" CCD camera

M Plan Apo NIR B

Order No.	Mag.	N.A.	W.D. (mm)	f (mm) ($\lambda = 550\text{nm}$)	R (μm) ($\lambda = 550\text{nm}$)	$\pm\text{DOF}$ (μm)	View field 1	View field 2	Mass (g)
378-867-5	20X	0.40	25.5	10	0.7	1.7	1.2	0.24x0.32	350
378-868-5	50X	0.42	25.5	4	0.7	1.6	0.48	0.10x0.13	375

> A high-transmission laser type objective suited to the fundamental and second harmonic of the YAG laser. Corrected over the visible (420nm) to near-infrared (1064nm) spectrum.

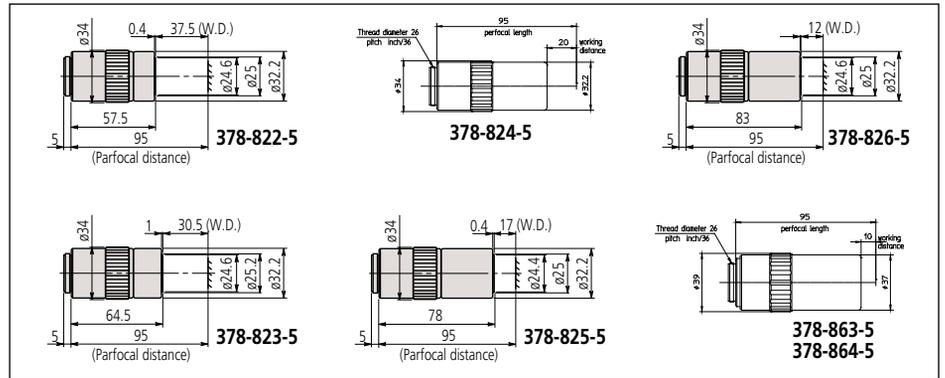
> This series of objective has greatly improved in operability thanks to the achievement of an ultra-long working distance of 25.5mm while maintaining the NA of the NIR series 20X/50X.

Near-infrared Radiation Corrected M Plan Apo NIR for Bright Field Observation

Order No.	Mag.	N.A.	W.D.	f	R	D.F.	View field 1	View field 2	Mass
378-822-5	5X	0.14	37.5mm	40mm	2.0 μm	14.0 μm	$\phi 4.8\text{mm}$	0.96x1.28mm	220g
378-823-15	10X	0.26	30.5mm	20mm	1.1 μm	4.1 μm	$\phi 2.4\text{mm}$	0.48x0.64mm	250g
378-824-16	20X	0.40	20.0mm	10mm	0.7 μm	1.7 μm	$\phi 1.2\text{mm}$	0.24x0.32mm	300g
378-825-17	50X	0.42	17.0mm	4mm	0.7 μm	1.6 μm	$\phi 0.48\text{mm}$	0.10x0.13mm	315g
378-826-15	100X	0.50	12.0mm	2mm	0.6 μm	1.1 μm	$\phi 0.24\text{mm}$	0.05x0.06mm	335g
378-863-5*	50X	0.65	10mm	4mm	0.4 μm	0.7 μm	$\phi 0.48\text{mm}$	0.10x0.13mm	450g
378-864-15	100X	0.70	10mm	2mm	0.4 μm	0.6 μm	$\phi 0.24\text{mm}$	0.05x0.06mm	450g

* High Resolution (HR objectives)

DIMENSIONS

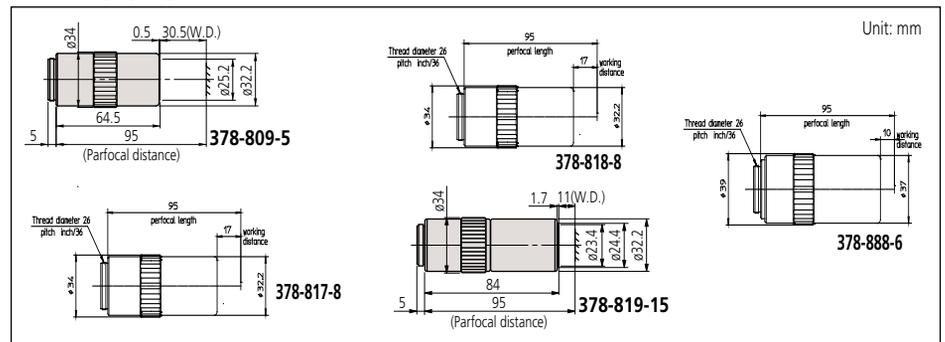


Near-ultraviolet Radiation Corrected M Plan Apo NUV for Bright Field Observation

Order No.	Mag.	N.A.	W.D.	f	R	D.F.	View field 1	View field 2	Mass
378-809-5	10X	0.28	30.5mm	20mm	1 μm	3.5 μm	$\phi 2.4\text{mm}$	0.48x0.64mm	255g
378-817-8	20X	0.42	17.0mm	10mm	0.7 μm	1.7 μm	$\phi 1.2\text{mm}$	0.24x0.32mm	340g
378-818-8	50X	0.44	15.0mm	4mm	0.7 μm	1.6 μm	$\phi 0.48\text{mm}$	0.10x0.13mm	350g
378-819-15	100X	0.50	11.0mm	2mm	0.6 μm	1.1 μm	$\phi 0.24\text{mm}$	0.05x0.06mm	380g
378-888-6*	50X	0.65	10.00mm	4mm	0.42 μm	0.65 μm	$\phi 0.48\text{mm}$	0.10x0.13mm	500g

*High resolution (HR objective)

DIMENSIONS



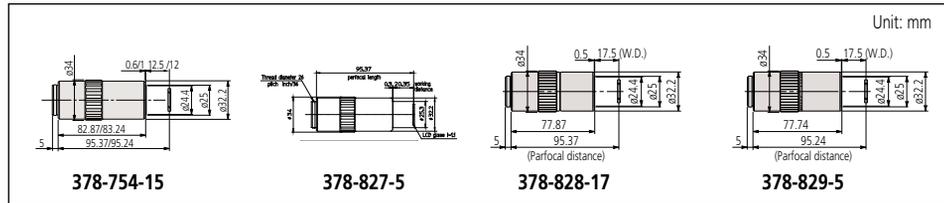
Accessories for Measuring Microscope

Near-infrared Radiation and LCD Glass Thickness (t = 1.1mm or 0.7mm) Corrected LCD Plan Apo NIR for Bright Field Observation

Order No.	Mag.	N.A.	W.D.	f	R	D.F.	View field 1	View field 2	Mass
378-821-16	20X (t0.7)	0.40	20mm*	10mm	0.7 μ m	1.7 μ m	ϕ 1.2mm	0.24x0.32mm	305g
378-827-16	20X (t1.1)	0.40	19.98mm*	10mm	0.7 μ m	1.7 μ m	ϕ 1.2mm	0.24x0.32mm	305g
378-828-16	50X (t1.1)	0.42	17.13mm*	3.9mm	0.7 μ m	1.6 μ m	ϕ 0.48mm	0.10x0.13mm	320g
378-829-5	50X (t0.7)	0.42	17.26mm*	3.9mm	0.7 μ m	1.6 μ m	ϕ 0.48mm	0.10x0.13mm	320g
378-754-15	100X (t0.7)	0.50	12.06mm*	2mm	0.6 μ m	1.1 μ m	ϕ 0.24mm	0.05x0.06mm	335g

*In air

DIMENSIONS



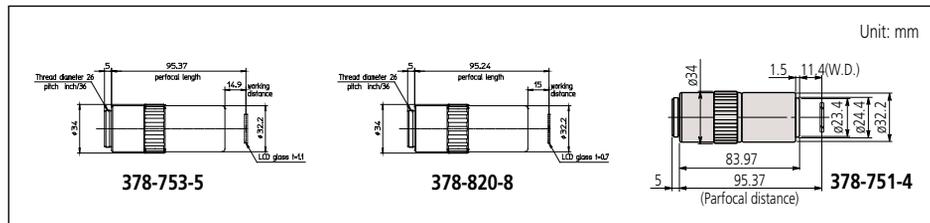
Near-ultraviolet Radiation and LCD Glass Thickness (t = 0.7mm) Corrected LCD Plan Apo NUV for Bright Field Observation

Order No.	Mag.	N.A.	W.D.	f	R	D.F.	View field 1	View field 2	Mass
378-890-8	20X (t0.7)	0.42	16.96mm*	10mm	0.7 μ m	1.7 μ m	ϕ 1.2mm	0.24x0.32mm	340g
378-891-6**	50X (t0.7)	0.65	9.76mm*	4mm	0.42 μ m	0.65 μ m	ϕ 0.48mm	0.10x0.13mm	500g
378-820-8	50X (t0.7)	0.44	14.76mm*	4mm	0.7 μ m	1.6 μ m	ϕ 0.48mm	0.10x0.13mm	310g
378-751-4	100X(t1.1)	0.50	11.03mm	2mm	0.6 μ m	1.1 μ m	ϕ 0.24mm	0.05x0.06mm	380g

* In air

** High-Resolution (HR Objectives)

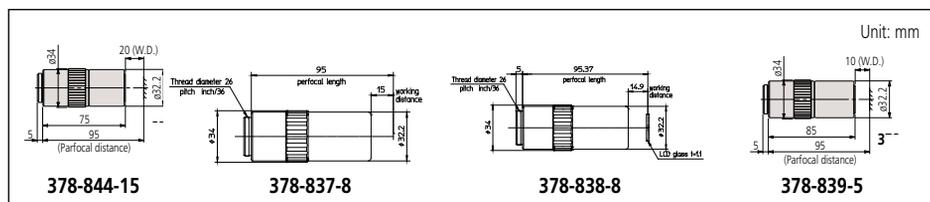
DIMENSIONS



Ultraviolet Radiation Corrected M Plan UV for Bright Field Observation

Order No.	Mag.	N.A.	W.D.	f	R	D.F.	View field 1	View field 2	Mass
378-844-15	10X	0.25	20mm	20mm	1.1 μ m	4.4 μ m	ϕ 2.4mm	0.48x0.64mm	310g
378-837-8	20X	0.37	15.0mm	10mm	0.8 μ m	2.1 μ m	ϕ 1.2mm	0.24x0.32mm	330g
378-838-8	50X	0.41	12.0mm	4mm	0.7 μ m	1.7 μ m	ϕ 0.48mm	0.10x0.13mm	400g
378-839-5	80X	0.55	10.0mm	2.5mm	0.5 μ m	0.9 μ m	ϕ 0.3mm	0.06x0.08mm	380g

DIMENSIONS



Note:

These near-infrared ($\lambda = 1800\text{nm}$) corrected objectives are designed for observing a workpiece through LCD glass (thickness = 1.1mm (378-827-5, 378-828-5, 378-752-5) or 0.7mm (378-829-5, 378-754-5) and for laser repair.



Note:

These near ultraviolet corrected objectives are designed for observing a workpiece through LCD glass (thickness = 1.1mm (378-753-6, 378-751-4) or 0.7mm (378-820-6) and for laser repair.



Note:

These ultraviolet corrected objectives are designed so that a workpiece's image can be focused within the focal depth even when the wavelength is changed anywhere from the visible range ($\lambda = 550\text{nm}$) to the ultraviolet range ($\lambda = 266\text{nm}$). Therefore the M Plan UV Series are suitable for laser repair using a high-frequency laser beam.

- Mag.: Magnification
- N.A.: Numerical aperture
- W.D.: Working distance
- f: Focal distance
- R: Resolving power
- D.F.: Focal depth

View field 1: Field of view when using ϕ 24mm eyepiece
View field 2: Field of view when using 1/2" CCD camera

MSM-400 SERIES 377 — Stereo Microscopes

Digital Imaging with Software

Order No.	Description
64PMI247	Moticam S1, 1.2 Megapixel, 1/3" Sensor, USB
64PMI249	Moticam S3, 3 Megapixel, 1/2.8", USB
64PMI248	Moticam S6, 6MP, 1/1.8" Sensor, USB
64PMI309	Moticam 4000x, 8MP, 1/1.8" Sensor, USB/HDMI Output
64PMI310	Moticam BMH4000X, 1/2.8" Sensor, USB/HDMI output, built-in 11" screen



64PMI247



64PMI248



64PMI249



64PMI310

- Continuous 1X - 4X magnification
- Image always in focus throughout zoom range
- Crisp, erect images with high resolution and excellent stereoscopic effect
- Stereo-tube can be rotated a full 360° for viewing at any angle
- Bilateral zoom control knob adds convenience and increases operator efficiency
- Diopter adjustment for both eyepieces
- Binocular tube inclination: 45°
- Focusing range: 1.46" (37mm)
- LED Illumination
- Interpupillary adjustable range: 2.12" - 2.99" (54mm - 76mm)
- The MSM-414L is a traditional binocular stereo microscope for industrial, medical and classroom applications. It is ideal for electrical small part inspection, assembly, and medical/biological dissection.



377-993A

SPECIFICATIONS

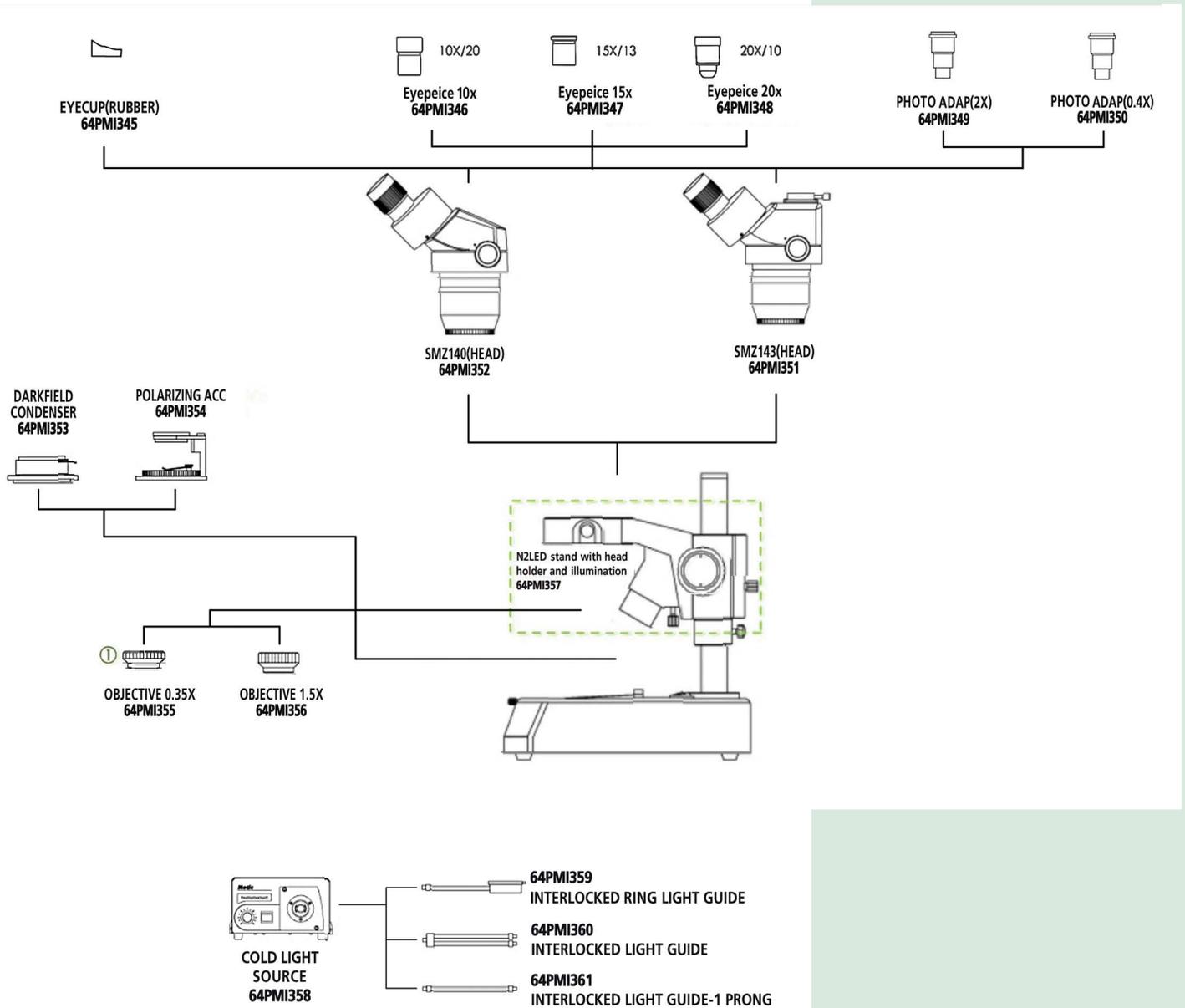
Model.	MSM-414L	MSM-414TL
Order No.	377-992A	377-993A
Optical tube	Binocular	Trinocular
Total magnification	10X - 40X	
Eyepiece	10X (377-016)	
Objective	1X - 4X	
Working distance	80mm	
Field of view	20mm - 5mm	
Dimensions	H=13.2"x W=6.7"x D=9.3"	
Mass	13.2 lbs (6kg)	



Got Questions?

Microscopes

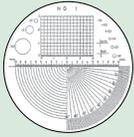
Stereo Microscope — Parts Breakdown



Talk to Sales

Microscopes

Optional Reticles for Pocket Comparators



183-102



183-104



183-106



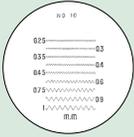
183-107



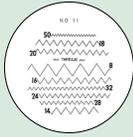
183-109



183-110



183-111



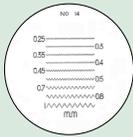
183-112



183-113



183-114



183-115

8x Pocket Comparator Sets SERIES 183

- 8x Eyepiece which includes a set of reticles for dimensional, angle and other types of measurements.
- Illuminator (950757) is available.

Pocket Comparator 8X with Reticles Set

Set No.	
183-901	183-101, 183-106
183-902	183-101, 183-102, 183-106, 183-107, 183-112, 183-113, 183-114
183-903	183-101, 183-102, 183-106, 183-107, 183-109, 183-113, 183-115
183-904	183-101, 183-102

Zoom Loupe SERIES 183

- Allows the user 8X - 16X zoom observation.
- Magnification indicator is provided for 8X, 10X, 12X, 14X and 16X observation.
- Metric and inch scales are provided for measuring.
- Comes with a carrying case.

SPECIFICATIONS

Magnification	Order No.	Remarks
8X - 16X	183-304	With reticle (Scale graduation: 0.1mm, .005")

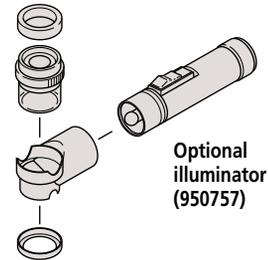
Clear Loupe SERIES 183

SPECIFICATIONS

Magnification	Order No.	Remarks
5X	183-310	Drawtube removable
15X	183-312	Drawtube removable



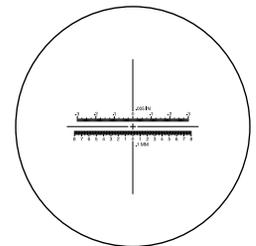
183-101



Optional illuminator (950757)



183-304



Reticle provided

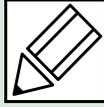


183-310



183-312

Quick Guide to Precision Measuring Instruments



Microscopes

Numerical Aperture (NA)

The NA figure is important because it indicates the resolving power of an objective lens. The larger the NA value the finer the detail that can be seen. A lens with a larger NA also collects more light and will normally provide a brighter image with a narrower depth of focus than one with a smaller NA value.

$$NA = n \cdot \sin\theta$$

The formula above shows that NA depends on N, the refractive index of the medium that exists between the front of an objective and the specimen (for air, $n=1.0$), and angle θ , which is the half-angle of the maximum cone of light that can enter the lens.

Resolving Power (R)

The minimum detectable distance between two image points, representing the limit of resolution. Resolving power (R) is determined by numerical aperture (NA) and wavelength (λ) of the illumination.

$$R = \frac{\lambda}{2 \cdot NA} \text{ (}\mu\text{m)}$$

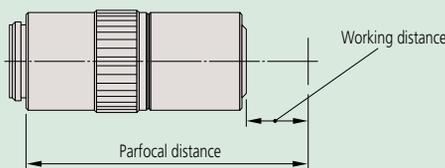
$\lambda = 0.55\mu\text{m}$ is often used as the reference wavelength

Working Distance (W.D.)

The distance between the front end of a microscope objective and the surface of the workpiece at which the sharpest focusing is obtained.

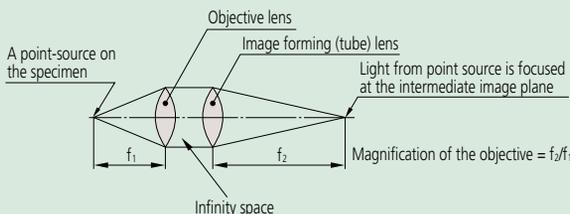
Parfocal Distance

The distance between the mounting position of a microscope objective and the surface of the workpiece at which the sharpest focusing is obtained. Objective lenses mounted together in the same turret should have the same parfocal distance so that when another objective is brought into use the amount of refocusing needed is minimal.



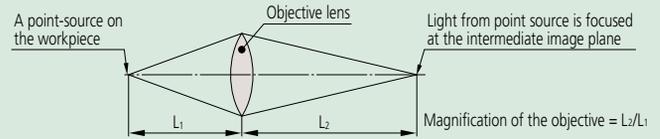
Infinity Optical System

An optical system where the objective forms its image at infinity and a tube lens is placed within the body tube between the objective and the eyepiece to produce the intermediate image. After passing through the objective, the light effectively travels parallel to the optical axis to the tube lens through what is termed the infinity space within which auxiliary components can be placed, such as differential interference contrast (DIC) prisms, polarizers, etc., with minimal effect on focus and aberration corrections.



Finite Optical System

An optical system that uses an objective to form the intermediate image at a finite position. Light from the workpiece passing through the objective is directed toward the intermediate image plane (located at the front focal plane of the eyepiece) and converges in that plane.



Focal Length (f)

unit: mm

The distance from the principal point to the focal point of a lens: if f_1 represents the focal length of an objective and f_2 represents the focal length of an image forming (tube) lens then magnification is determined by the ratio between the two. (In the case of the infinity-correction optical system.)

$$\text{Objective magnification} = \frac{\text{Focal length of the image-forming (tube) lens}}{\text{Focal length of the objective}}$$

Example: $1X = \frac{200}{200}$ Example: $10X = \frac{200}{20}$

Focal Point

Light rays traveling parallel to the optical axis of a converging lens system and passing through that system will converge (or focus) to a point on the axis known as the rear focal point or image focal point.

Depth of Focus (DOF)

unit: mm

Also known as depth of field, this is the distance (measured in the direction of the optical axis) between the two planes which define the limits of acceptable image sharpness when the microscope is focused on an object. As the numerical aperture (NA) increases, the depth of focus becomes shallower, as shown by the expression below:

$$DOF = \frac{\lambda}{2 \cdot (NA)^2} \quad \lambda = 0.55\mu\text{m} \text{ is often used as the reference wavelength}$$

Example: For an **M Plan Apo 100X** lens ($NA = 0.7$)

The depth of focus of this objective is

$$\frac{0.55\mu\text{m}}{2 \times 0.7^2} = 0.6\mu\text{m}$$

Bright-field Illumination and Dark-field Illumination

In brightfield illumination a full cone of light is focused by the objective on the specimen surface. This is the normal mode of viewing with an optical microscope. With darkfield illumination, the inner area of the light cone is blocked so that the surface is only illuminated by light from an oblique angle. Darkfield illumination is good for detecting surface scratches and contamination.

Apochromat and Achromat Objectives

An apochromat objective is a lens corrected for chromatic aberration (color blur) in three colors (red, blue, yellow).

An achromat objective is a lens corrected for chromatic aberration in two colors (red, blue).

■ Magnification

The ratio of the size of a magnified object image created by an optical system to that of the object. Magnification commonly refers to lateral magnification although it can mean lateral, vertical, or angular magnification.

■ Principal Ray

A ray considered to be emitted from an object point off the optical axis and passing through the center of an aperture diaphragm in a lens system.

■ Aperture Diaphragm

An adjustable circular aperture which controls the amount of light passing through a lens system. It is also referred to as an aperture stop and its size affects image brightness and depth of focus.

■ Field Stop

A stop which controls the field of view in an optical instrument.

■ Telecentric System

An optical system where the light rays are parallel to the optical axis in object and/or image space. This means that magnification is nearly constant over a range of working distances, therefore, almost eliminating perspective error.

■ Erect Image

An image in which the orientations of left, right, top, bottom and moving directions are the same as those of a workpiece on the workstage.

■ Field number (FN), real field of view, and monitor display magnification

unit: mm

The observation range of the sample surface is determined by the diameter of the eyepiece's field stop. The value of this diameter in millimeters is called the field number (FN). In contrast, the real field of view is the range on the workpiece surface when actually magnified and observed with the objective lens.

The real field of view can be calculated with the following formula:

(1) The range of the workpiece that can be observed with the microscope (diameter)

$$\text{Real field of view} = \frac{\text{FN of eyepiece}}{\text{Objective lens magnification}}$$

Example: The real field of view of a 1X lens is $24 = \frac{24}{1}$
The real field of view of a 10X lens is $2.4 = \frac{24}{10}$

(2) Monitor observation range

$$\text{Monitor observation range} = \frac{\text{The size of the camera image sensor (diagonal length)}}{\text{Objective lens magnification}}$$

• Size of image sensor

Format	Diagonal length	Length	Height
1/3"	6.0	4.8	3.6
1/2"	8.0	6.4	4.8
2/3"	11.0	8.8	6.6

(3) Monitor display magnification

Monitor display magnification =

$$\text{Objective lens magnification} \times \frac{\text{Display diagonal length on the monitor}}{\text{Diagonal length of camera image sensor}}$$

Featured Products



Surface Roughness Measurement (Surface Texture Measuring Instruments)

SJ-220/310/410/500/2100 Series

Refer to page J-3 for details



FORMTRACER Avant (Contour Measuring Instruments)

C3000/4000 Series

Refer to page J-10 for details.



FORMTRACER Avant (Contour & Surface Texture Measuring Instruments)

FTA-H3000 Series

Refer to page J-12 for details.



ROUNDTRACER EXTREME (CNC Roundness/Cylindricity Measuring System)

RTX-0605-A

Refer to page J-25 for details.



ROUNDTRACER FLASH (Optical Shaft Measuring System)

S-100 / 300 Series

Refer to page J-25 for details





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Contracer (Contour Measuring Instruments)

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RA-H5200	J-23
RA-2200 PLUS	J-23
RA-H5200 PLUS	J-24

ROUNDTRACER EXTREME (CNC Roundness/Cylindricity Measuring Systems)

RTX-0605-A	J-25
ROUNDPAK	J-26

ROUNDTRACER FLASH (Optical Shaft Measuring Systems)

S100 / 300 Series	J-25
Quick Guide to Precision Measuring Instruments	J-27

Surftest

Surftest SJ-220 SERIES 178 – On-site Surface Roughness Tester



**Wireless Unit for Measuring Instrument U-WAVE-TIB
264-628**

It can only be used in countries where wireless certification has been obtained, including the country of purchase. For use in countries other than the country of purchase, please contact the nearest Mitutoyo M³ Solution Center.

SPECIFICATIONS

Model No.	Standard drive unit		Retractable drive unit		Transverse tracing drive unit			
	SJ-220 (0.75 mN type)	SJ-220 (4 mN type)	SJ-220 (0.75 mN type)	SJ-220 (4 mN type)	SJ-220 (0.75 mN type)	SJ-220 (4 mN type)		
	inch/mm	178-741-13	178-742-13	178-743-13	178-744-13	178-745-13	178-746-13	
Drive Unit Order No.		178-747		178-748		178-749		
Measuring range	X-axis	16.0 mm				5.6 mm		
	Detector	Range					360 μm (-200 μm to +160 μm)	
		Range/Resolution					360 μm/0.0256 μm, 100 μm/0.0064 μm, 25 μm/0.0016 μm	
Measuring force/Stylus tip shape		Depends on the Order No.: 0.75 mN/2 μmR 60°					4 mN/5 μmR 90°	
Applicable standards		JIS B 0601:1982 / 1994 / 2013		JIS B 0671:2002		JIS B 0631:2000 ISO 4287:1997 ISO 13565:1996 ISO 12085:1996 ISO 21920:2021 ASME B46.1 VDA2006		
Assessed profile		Primary profile, Roughness profile, DF profile, Roughness motif profile						

Surftest SJ-310 SERIES 178 — On-site Surface Roughness Tester



SPECIFICATIONS

Model No.	Standard drive unit		Retractable drive unit		Transverse tracing drive unit			
	SJ-310 (0.75 mN type)	SJ-310 (4 mN type)	SJ-310 (0.75 mN type)	SJ-310 (4 mN type)	SJ-310 (0.75 mN type)	SJ-310 (4 mN type)		
	inch/mm	178-571-21A	178-571-22A	178-573-21A	178-573-22A	178-575-21A	178-575-22A	
Drive unit Order No.		178-747		178-748		178-749		
Measuring range	X-axis	16.0 mm				5.6 mm		
	Detector	Range					360 μm (-200 μm to +160 μm)	
		Range/Resolution					360 μm/0.0256 μm, 100 μm/0.0064 μm, 25 μm/0.0016 μm	
Measuring force/Stylus tip shape		Depends on the Order No.: 0.75 mN/2 μmR 60° (when the Order No. ends with "-21")						
		4 mN/5 μmR 90° (when the Order No. ends with "-22")						
Applicable standards		JIS B 0601:2001, JIS B 0601:1994, JIS B 0601:1982, VDA, ISO:1997, ANSI						
Assessed profile		Primary profile, Roughness profile, DF profile, Roughness motif profile, Waviness motif profile						

MeasurLink ENABLED
Data Management Software by Mitutoyo

Free Communication Software

Output software based on Microsoft-Excel for controlling the devices and reproducing and storing the measurement data.

Software

PC-linked software
"SJ-Communication-Tool"

Freely available

Can be downloaded from the Mitutoyo website.
 ■ Download site URL
<https://www2.mitutoyo.co.jp/eng/contact/products/SJ-Communication-Tool/>
 Windows 10/11, Bluetooth® 5.0 compatible (Windows only)

Dedicated "SJ-APP" for increased efficiency of measurement work
 The dedicated app that enables communication with the SJ-220 is equipped with various functions to increase work efficiency.
 It is also possible to manage data, create inspection reports, and export to CSV and PDF files on the terminal.

Standard accessories for SJ-220

- 12AA5583** Handy case
- 12BAA303** Connecting cable
- 12BAS450** AC adaptor
- 12BAS451** USB 2.0 cable
- 178-601-1** Roughness specimen (mm)
- 178-602-1** Roughness specimen (inch/mm)
- 178-605** Roughness specimen (mm) for Transverse drive
- 178-606** Roughness specimen (inch/mm) for Transverse drive
- 12BAK700** Calibration stage
- 12BAS476** Tool for battery switch
- 12AAE643** Point-contact adapter for transverse drive
- 12AAE644** V-type adapter for transverse drive

SJ Stand 178-069
(must order optional part **12AAA221** to mount **SJ-220/310** drive unit)



MeasurLink ENABLED
Data Management Software by Mitutoyo

Standard accessories for SJ-310

- 12AAW066** Connecting cable for Drive unit to Display unit
- 178-602** Roughness reference specimen (Ra3 μm)
- 178-606** Roughness reference specimen (Ra1 μm) (For Transverse Drive Type only)
- 357651** AC adaptor
- 12AAA217** Nosepiece for plane surface
- 12AAA218** Nosepiece for cylinder
- 12AAA216** Supporting leg
- 12AAE643** Point-contact adapter (For Transverse Drive Type only)
- 12AAE644** V-type adapter (For Transverse Drive Type only)
- 12BAK700** Calibration stage
- 12BAG834** Stylus pen
- 12BAL402** Protection sheet
- 270732** Printer paper (5 pieces)
- 12BAL400** Carrying case

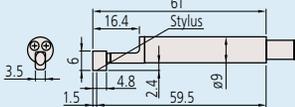
Philips screwdriver, strap for stylus pen, operation manual, quick reference manual, warranty.

Optional Accessories for Surftest SJ-220/310

• Standard detectors

Order No.	Measuring force	Stylus profiles*	Remarks
178-296	0.75 mN	2 $\mu\text{mR}/60^\circ$	Dedicated to the standard/retractable drive unit
178-390	4 mN	5 $\mu\text{mR}/90^\circ$	
178-387	0.75 mN	2 $\mu\text{mR}/60^\circ$	Dedicated to the transverse tracing drive unit
178-386	4 mN	5 $\mu\text{mR}/90^\circ$	
178-391	4 mN	10 $\mu\text{mR}/90^\circ$	Dedicated to the standard/retractable drive unit

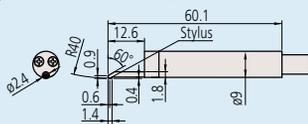
* Tip radius / Tip angles



• Gear-tooth surface detectors

Order No.	Measuring force	Stylus profiles*
178-388	0.75 mN	2 $\mu\text{mR}/60^\circ$
178-398	4 mN	5 $\mu\text{mR}/60^\circ$

* Tip radius / Tip angles

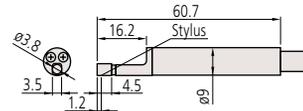


Detector

• Small hole detectors

Order No.	Measuring force	Stylus profiles*	Remarks
178-383	0.75 mN	2 $\mu\text{mR}/60^\circ$	Minimum measurable hole diameter: $\phi 4.5$ mm
178-392	4 mN	5 $\mu\text{mR}/90^\circ$	

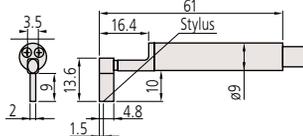
* Tip radius / Tip angles



• Deep groove detectors

Order No.	Measuring force	Stylus profiles*	Remarks
178-385	0.75 mN	2 $\mu\text{mR}/60^\circ$	Not available for the transverse tracing drive unit
178-394	4 mN	5 $\mu\text{mR}/90^\circ$	

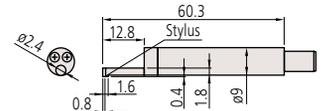
* Tip radius / Tip angles



• Extra small hole detectors

Order No.	Measuring force	Stylus profiles*	Remarks
178-384	0.75 mN	2 $\mu\text{mR}/60^\circ$	Minimum measurable hole diameter: $\phi 2.8$ mm
178-393	4 mN	5 $\mu\text{mR}/90^\circ$	

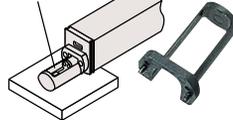
* Tip radius / Tip angles



Optional Accessories for Drive Units

• Nosepiece for flat surfaces

Nosepiece for flat surfaces
12AAA217

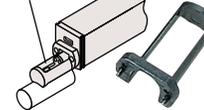


12AAA217

- Standard accessory for the standard/retractable drive unit of the SJ-310 Series
- Not available for the transverse tracing drive unit

• Nosepiece for cylindrical surfaces

Nosepiece for cylindrical surfaces
12AAA218



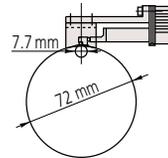
12AAA218

- Standard accessory for the standard/retractable drive unit of the SJ-310 Series
- Not available for the transverse tracing drive unit

• V-type adapter

12AAE644

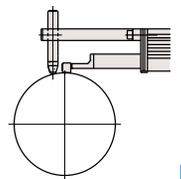
- Transverse tracing type standard accessory.
- Dedicated to the transverse tracing drive unit.



• Point-contact adapter

12AAE643

- Transverse tracing type standard accessory.
- Dedicated to the transverse tracing drive unit.



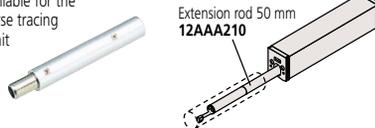
• Extension rod (50 mm)

12AAA210

- Not available for the transverse tracing drive unit

(Note: Only one rod can be used.)

- Not applicable to upward measurement.

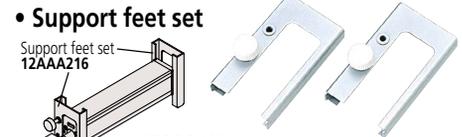


• Extension cable (1 m)

12BAA303

(Note: Only one rod can be used.)

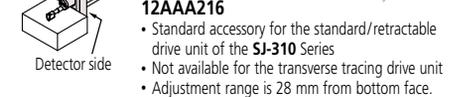
- For the connection between the calculation display unit and drive unit



• Support feet set

Support feet set
12AAA216

- Standard accessory for the standard/retractable drive unit of the SJ-310 Series
- Not available for the transverse tracing drive unit
- Adjustment range is 28 mm from bottom face.



• Adapter for flat surface

12AAA219

- Not available for the transverse tracing drive unit



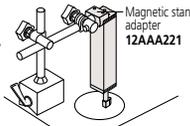
• Magnetic stand adapter

12AAA221

Mounting spigot diameter is 8 mm.

12AAA220

Mounting spigot diameter is 9.5 mm.

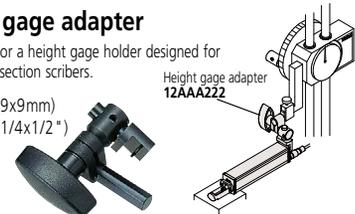


• Height gage adapter

Note: Suitable for a height gage holder designed for 9x9 mm section scribers.

12AAA222 (9x9mm)

12AAA233 (1/4x1/2")



Surftest SJ-410 SERIES 178 Compact Surface Roughness Tester



SPECIFICATIONS

Model No.	inch/mm	SJ-411		SJ-412	
		178-581-31A	178-581-32A	178-583-31A	178-583-32A
Measuring range	X-axis	25 mm		50 mm	
	Z-axis (detector)	800 μm, 80 μm, 8 μm Up to 2,400 μm when using an optional stylus.			
Detector	Detection method	Differential inductance			
	Resolution	0.0125 μm (800 μm range), 0.00125 μm (80 μm range), 0.000125 μm (8 μm range)			
	Stylus tip shape (Angle/Radius)	60°/2 μm	90°/5 μm	60°/2 μm	90°/5 μm
	Measuring force	0.75 mN	4 mN	0.75 mN	4 mN
	Radius of skid curvature	40 mm			
	Measuring methods	Skidless/Skidded (switchable)			
Drive unit (X-axis)	Measuring speed	0.05, 0.1, 0.2, 0.5, 1.0 mm/s			
	Drive speed	0.5, 1, 2, 5 mm/s			
	Straightness	0.3 μm/25 mm		0.5 μm/50 mm	
Up/down inclination unit	Vertical travel	10 mm			
	Inclination adjustment angle	±1.5°			
Applicable standards		JIS 1982/JIS 1994/JIS 2001/ISO 1997/ANSI/VDA			
Parameter		Ra, Rq, Rz, Ry, Rp, Rt, R3z, Rsk, Rku, Rc, Rpc, RSm, Rmax*1, Rz1max*2, S, HSC, RzJIS*3, Rppi, RΔa, RΔq, Rlr, Rmr, Rmr(c), Rσc, Rk, Rpk, Rvk, Mr1, Mr2, A1, A2, Vo, λa, λq, Lo, Rpm, tp*4, Htp*4, R, Rx, AR, W, AW, Wx, Wte Customizable			
Filtered profile		Primary profile, Roughness profile, DF profile, Waviness profile, Roughness motif profile, Waviness motif profile			
Analysis graph		Material ratio curve, Profile height amplitude distribution curve			
Data compensation functions		Parabola, Hyperbola, Ellipse, Circle, Tilt, No compensation			
Filter		2CR, PC75, Gaussian			
Cutoff value	λc	0.08, 0.25, 0.8, 2.5, 8 mm			
	λs *5	2.5, 8, 25 μm			
Sampling length		0.08, 0.25, 0.8, 2.5, 8, 25 mm			
Number of intervals		x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, x12, x13, x14, x15, x16, x17, x18, x19, x20			
Arbitrary length		0.1 to 25 mm		0.1 to 50 mm	
Calculation display unit	Customization	Selection of display/evaluation roughness parameter			
	Simplified contour analysis function	Step, Step quantity, Area, Coordinate difference			
	D.A.T. (Digimatic Adjustment Table) function	Helps to level workpiece prior to skidless measurement			
	Real sampling function	Inputs the displacement of the detector while stopping the drive unit			
	Statistical processing	Calculates the maximum value, minimum value, average value, standard deviation, pass rate and histogram for each parameter.			
	Judgment*6	Maximum value rule, 16% rule, mean value rule, standard deviation (1σ, 2σ, 3σ)			
	Storing measurement condition	Max. 10 (calculation display unit)			
	Print function (Built-in thermal printer)	Measurement condition/Calculation result/Judgment result/Calculation result per segment/Tolerance value/Evaluation curve/Graphic curve/Material ratio curve/Profile height amplitude distribution curve/Environmental setting items/Statistical result (Histogram)			
	Display language	16 languages (Japanese, English, German, French, Italian, Spanish, Portuguese, Korean, Chinese (simplified/traditional), Czech, Polish, Hungarian, Turkish, Swedish, Dutch)			
	Storage function	Built-in memory: Measurement condition (Up to 10) Memory card (optional): 500 measurement conditions, 10000 measured profiles, 500 display images, 10000 text files, 500 statistical data, 1 backup file of device setting data, 10 data of Trace 10			
Power supply	External I/O functions	USB I/F, Digimatic output, RS-232C I/F, Foot switch I/F			
	Battery	Built-in battery (rechargeable Ni-MH battery)/AC adapter			
	Charging time/Endurance	Charging time of the built-in battery: about 4 hours (may vary due to ambient temperature) Endurance: about 1000 measurements (differs slightly due to use conditions/environment)			
External dimensions (WxDxH)	Max. power consumption	50 W			
	Calculation display unit	275x198x109 mm			
	Up/down inclination unit	130.9x63x99 mm			
	Drive unit	128x35.8x46.6 mm		154.5x35.8x46.6 mm	
Mass	Calculation display unit	1.7 kg			
	Up/down inclination unit	0.4 kg			
	Drive unit	0.6 kg		0.64 kg	
Standard Accessories		Detector*7/Standard stylus*8 178-602 Roughness specimen (Ra3 μm) 270732 Receipt paper (Standard type: 5-roll set) 12BAL402 Protective sheet for the LCD (x1 sheet) 12BAR507 Touch pen 12AAN041 Carrying case		AC adapter, Power cable, Flat-blade screwdriver, Phillips screwdriver, Hex wrench, Strap for the touch pen, Operation manual, One-sheet manual, Warranty card	

*1 Calculation is available only when selecting the VDA, ANSI, or JIS 1982 standards.
*2 Calculation is available only when selecting the ISO 1997 standard. *3 Calculation is available only when selecting the JIS 2001 standard.
*4 Calculation is available only when selecting the ANSI standard. *5 Not available when selecting the JIS 1982 standard.
*6 Only the mean value rule is available for the ANSI standard. 16% rule is not available when selecting the VDA standard.
*7 Depending on the Order No. of the SJ-410 Series main unit, 178-396 (0.75 mN) or 178-397 (4 mN) is provided as standard.
*8 Standard stylus (12AAC731 or 12AAB403) supporting the provided detector is provided as standard.

Surfstand (optional accessory)

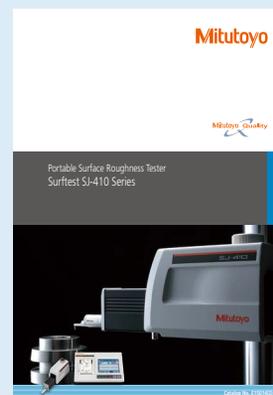
Mounted on the same large surface plate as the workpiece to be inspected, this substantially built stand can be maneuvered and adjusted to position the detector on practically any surface of the workpiece desired. The SJ-400 Series detector is carried on an adjustable-length tube mounted on an extendable arm carried by a vertically traveling carriage on the column, thus enabling positioning of the detector anywhere in the vertical plane within reach.



Order No.	64PMI307	
Measuring range	Z-axis at 0 degrees	663mm max
	X-axis at 0 degrees	550mm max from base
	Theta-1 axis	180°(+90°to -90°)
	Theta-2 axis	360°(+180°to -180°)
	Depth into bore	453mm max
Dimensions	Height	986mm (not including the lifting eye)
	Width	850mm max
	Depth	280mm
	Weight	55kg
Compatible Surftests	SJ-411 & SJ-412	

Optional Accessories for SJ-410 Consumables

- Receipt paper Standard type (5-roll set) **270732**
- Receipt paper High-durability paper (5-roll set) **12AAA876**
- Protective sheet for the touch panel (x10 sheets) **12AAN040**
- Memory card (2 GB) **12AAW452**



Refer to the Surftest SJ-410 Series Brochure (E15014(6)-US) for more details.

High precision and high performance type surface roughness tester with a dedicated control unit, offering a user-friendly display and simple operation.

- Equipped with a 7.5-inch, color TFT LCD, color icons and touch panel controls, the display unit is easy to read and simple to operate.
- A built-in joystick on the control unit allows quick and easy positioning. The manual adjustment knob allows fine positioning of a small stylus for measuring small holes.
- In addition to the roughness parameters compliant with ISO/JIS/ANSI/VDA surface roughness standards, contour analysis is also available.

Surftest SJ-500/SV-2100 SERIES 178 — Dedicated Control Unit Type Surface Roughness Tester



SPECIFICATIONS

Model No.	SJ-500	SV-2100M4*1	SV-2100S4*1	SV-2100H4*1	SV-2100W4*1
inch/mm	178-533-11	178-637-11	178-681-01A	178-683-01A	178-685-01A
Detector Measuring Force	0.75mN	0.75mN	0.75mN	0.75mN	0.75mN
Stand type	—*2	Manual stand		Motorized stand	
Measuring range	Z1-axis (detector)	800 μm, 80 μm, 8 μm			
	X-axis	50 mm	100 mm		
Resolution	X-axis	0.05 μm			
	Z1-axis (detector)	0.01 μm (800 μm), 0.001 μm (80 μm), 0.0001 μm (8 μm)			
	Z2-axis (column)	—	1 μm		
Assessed profile	Primary profile, Roughness profile, Waviness profile, DF profile, Roughness motif profile, Waviness motif profile				

*1 While the appearance of the natural stone measuring table varies according to the source, the high stability for which this material is known can always be relied upon.

*2 Stand for SJ-500 is optional.

Surftest SJ-500P SERIES 178 — Data Processing Unit (PC) Surface Roughness Testers

FORMTRACERPAK: Best-selling Surface Roughness Analysis Program

Best-selling dedicated software for surface roughness measurement and analysis. Features a flexible printer format and creation of an original inspection certificate.



SJ-500P

A superior data processing tester with PC data analysis for higher efficiency.

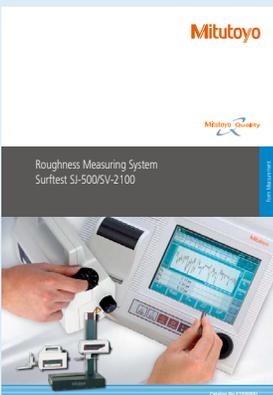
Note: If a power column type (SV-2100S4/H4/W4) with PC data-processing is required, consider the FORMTRACER Avant S3000 Series (Refer to page L-9 for specifications).

SPECIFICATIONS

Type of data processing unit	PC type	
Model No.	SJ-500P	
inch/mm	178-534-23	
Detector Measuring Force	0.75mN	
Elevating shaft mechanism of stand	—*2	
Measuring range	X-axis	50 mm
	Z1-axis (detector)	800 μm, 80 μm, 8 μm
Z2-axis (column) travel range	X-axis	—
	X-axis	0.05 μm
Resolution	Z1-axis (detector)	0.01 μm (800 μm), 0.001 μm (80 μm), 0.0001 μm (8 μm)
	Z2-axis (column)	—
Applicable standards	JIS 1982/JIS 1994/JIS 2001/ISO 1997/ANSI/VDA	
Assessed profile	Primary profile, Roughness profile, Waviness profile, Filtered waviness profile, Rolling circle waviness profile, Rolling circle center line waviness profile, Envelope residual profile, DIN4776 profile, Roughness motif profile, Waviness motif profile	

*1 While the appearance of the natural stone measuring table varies according to the source, the high stability for which this material is known can always be relied upon.

*2 The simplified stand or manual column stand is available as an optional accessory.



Refer to the Surftest SJ-500/SV-2100 Brochure (E15006(6)-US) for more details.

Surftest Extreme SV-3000CNC/SV-M3000CNC SERIES 178 — CNC Surface Roughness Testers



SV-3000CNC
(Inclinable drive unit +
Y-axis table)



SV-M3000CNC
(Surface Roughness Tester with built-in Y-axis.)
(The photo represents a special specification
model.)

SV-3000CNC SPECIFICATIONS

Model No.		SV-3000CNC				
		inch/mm				
		178-508-13	178-528-13	178-509-13	178-529-13	
X1-axis (drive unit)	Measuring range	200 mm				
	Resolution	0.05 μm				
	Scale type	Reflective-type linear encoder				
	Drive speed	CNC mode	Max. 200 mm/s			
		Joystick mode	0 to 50 mm/s			
	Measuring speed	0.02, 0.05, 0.1, 0.2, 0.5, 1.0, 2.0 mm/s				
	Measuring direction	Pulling				
Y-axis (table)	Y-axis table unit	Installed				
Y-axis (table)	Measuring range	200 mm				
	Resolution	0.05 μm				
	Drive speed	CNC mode	Max. 200 mm/s			
		Joystick mode	0 to 50 mm/s			
	Maximum table loading weight	20 kg				
Z2-axis (column)	Z2-axis vertical travel	300mm	500mm	300mm	500mm	
	Resolution	0.05 μm				
	Scale type	Reflective-type linear encoder				
	Drive speed	CNC mode	Max. 200 mm/s			
		Joystick mode	0 to 50 mm/s			
Base unit	Base size (width×depth)	750×600 mm				
	Base material	-	Granite	-	-	
	Alpha-axis unit	-	-	Installed	Installed	

Note: While the appearance of the natural stone measuring table varies according to the source, the high stability for which this material is known can always be relied upon.

SV-M3000CNC SPECIFICATIONS

Model No.		SV-M3000CNC		
		inch/mm		
		178-549-1		
X1-axis (drive unit)	Measuring range	200 mm		
	Resolution	0.05 μm		
	Scale type	Reflective-type linear encoder		
	Drive speed	CNC mode	Max. 200 mm/s	
		Joystick mode	0 to 50 mm/s	
	Measuring speed	0.02, 0.05, 0.1, 0.2, 0.5, 1.0, 2.0 mm/s		
Z2-axis (column)	Measuring range	500 mm		
	Resolution	0.05 μm		
Z2-axis (column)	Scale type	Reflective-type linear encoder		
	Drive speed	CNC mode	Max. 200 mm/s	
		Joystick mode	0 to 50 mm/s	
	Y-axis	Measuring range	800 mm	
Resolution		0.05 μm		
Scale type		Reflective-type linear encoder		
Drive speed		CNC mode	Max. 200 mm/s	
		Joystick mode	0 to 50 mm/s	
Measuring speed		0.02 to 2 mm/s		
Y-axis	Straightness	When using a standard detector	Narrow range 0.5 μm/50 mm	
		Wide range 2 μm/800 mm		
Base unit	Base size (width×depth)	600×1500 mm		
	Base material	Steel		
	Maximum table loading	300 kg		

- The X1, Y and Z2 axes have a maximum drive speed of 200 mm/s. This permits high-speed positioning that can potentially result in a large increase in the throughput of multiple-profile/multiple-workpiece measurement tasks.
- Capable of inclined plane measurement through 2 axis simultaneous control in X and Y.
- Models equipped with the Alpha-axis allow continuous measurement on horizontal and inclined surfaces by power-tilting the X1-axis.
- It is possible to expand the measuring range for multiple workpieces through positioning in the Y-axis.
- All connecting cables are contained within the measuring instrument to eliminate any inconvenience during measurement.
- Since the Z1-axis detector incorporates an anti-collision safety device, the detector unit will automatically stop if it touches a workpiece or fixture.
- Surftest Extreme **SV-M3000CNC** (CNC Surface Roughness Tester with a movable Y-axis table) that handles measurement of large/heavy workpieces, such as engine blocks or crankshafts, is also available.
- Optional external control function (Ext I/O) through bidirectional communication (RS-232C) with the PLC (programmable logic controller) is available.



Find a Distributor



Refer to the CNC Form Measuring Instrument Series Brochure (E15021-US) for more details.

Contour Measuring System enabling measurement that is fast, accurate, and easy.

- The operation flow is significantly shortened by arranging the controls for stylus position change, measurement start/stop and return on the front of the drive unit.



Centralized front control panel

- Fine and coarse X-axis positioning can be performed easily by using the jog shuttle that covers the whole measuring range.



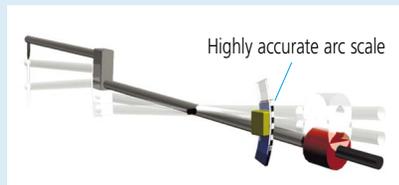
Motor-driven jog shuttle

- The quick-vertical-motion stand allows operators to swiftly and easily move the drive unit to and from the measurement height without having to push or pull (only for CV-2100M4).



Quick-vertical-motion stand

- The detector unit (Z1-axis) is equipped with a highly accurate arc scale. This scale directly tracks the arc locus of the stylus tip so that the most accurate compensation can be applied to the scale output, which leads to higher accuracy and resolution. Operators are free from bothersome operations such as measurement magnification switching and calibrating each magnification as required for analog instruments.

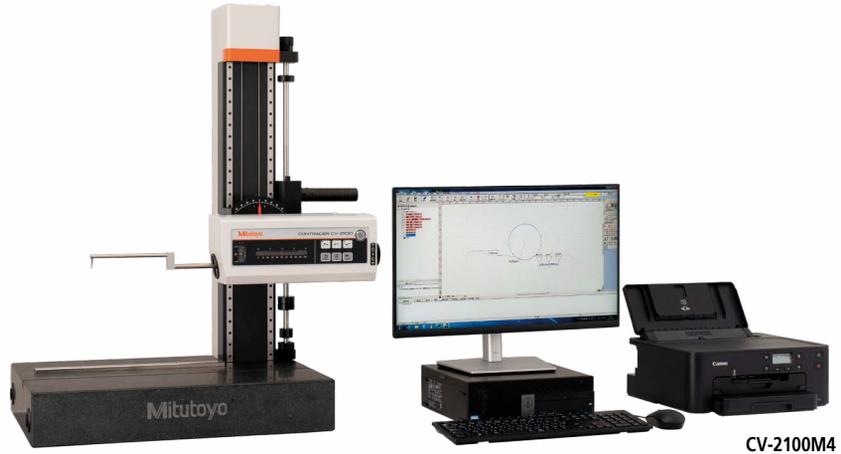


Highly accurate arc scale

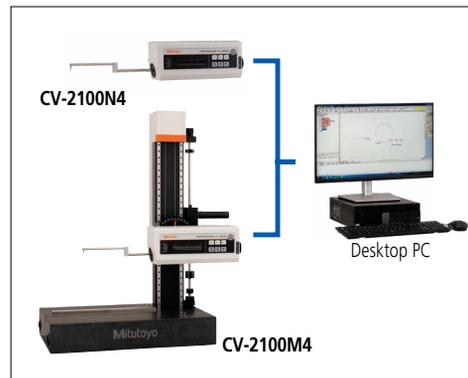


Refer to the Contracer CV-2100 Series Brochure (E15020(5)-US) for more details.

Contracer CV-2100 SERIES 218 — Contour Measuring Instruments



CV-2100M4



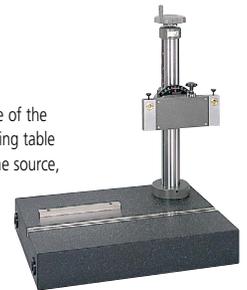
Optional Column Stand for CV-2100N4

- Allows the use of the CV-2100N4 in a fixed configuration.

218-042

Base material: Granite
Inclination range: $\pm 45^\circ$
Vertical travel: 320 mm
Mass: 110 kg

Note: While the appearance of the natural stone measuring table varies according to the source, the high stability for which this material is known can always be relied upon.



SPECIFICATIONS

Model No.	CV-2100M4		CV-2100N4	
	inch/mm		218-643-13	
Measuring range	X-axis	100 mm		
	Z1-axis (detector unit)	50 mm		
Z2-axis (column) travel range	350 mm		—	
X-axis inclination angle	$\pm 45^\circ$		—	
Resolution	X-axis	0.1 μm		
	Z1-axis	0.1 μm		
Drive method	X-axis	Motor (0 to 20 mm/s)		
	Vertical travel (Z-axis column)	Manual (Quick-vertical-motion, fine)		—
Measuring speed	0.02, 0.05, 0.1, 0.2, 0.5, 1.0, 2.0, 5.0 mm/s			
Straightness (when the X-axis is horizontal)	2.5 $\mu\text{m}/100\text{ mm}$			
Accuracy (20 °C)	X-axis	$\pm(2.5+0.02L)\ \mu\text{m}$ L = Measurement Length (mm)		
	Z1-axis	$\pm(2.5+0.1H)\ \mu\text{m}$ H = Measurement height from horizontal position within $\pm 25\text{ mm}$		
Measuring direction	Both pulling and pushing directions			
Measuring face direction	Downward direction			
Measuring force	30 \pm 10 mN (3 gf)			
Traceable angle (using the standard stylus)	Ascent 77°, Descent 87° (according to surface property)			
External dimensions (WxDxH)	745x450x885 mm		651x143x138.5 mm	
Mass	145.8 kg		5.8 kg	

Note 1: While the appearance of the natural stone measuring table varies according to the source, the high stability for which this material is known can always be relied upon.

Note 2: For the CV-2100N4, a manual column stand (optionally available) or custom fixture is required.

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FORMTRACER Avant S3000 Series SERIES 178 — Surface Roughness Measuring Instruments



FTA-S4S3000



Large sized base models and high-column models are added to the line-up.



Remote box with user-friendly operability



Detector holder (optional)

- **FORMTRACER Avant S3000** Series are highly functional and user-friendly surface roughness measuring systems with innovative design features.
- The **FORMTRACER Avant S3000** Series includes models with inclined drive unit. Inclining the drive unit makes it easier to approach target surfaces and measure large workpieces.
- Equipped with an operability focused, new style remote box. The new part program key strongly supports manual part-programming.
- High throughput is achieved thanks to high drive speed (X-axis: Max. 80 mm/s, Z2-axis: Max. 30 mm/s) and acceleration (X-axis: 30 mm/s²).
- All connecting cables are contained within the measuring instrument to eliminate any inconvenience during measurement.
- The Z1-axis detector is equipped with a built-in anti-collision safety device.
- A variety of detector holders (optional) are available.
- A detector for measuring contours can be retrofitted.



Inclined drive unit



Got Questions?



Refer to the **FORMTRACER Avant Series Brochure (E15030(2)-US)** for more details.

SPECIFICATIONS

Model No.	FTA-S4S3000	FTA-H4S3000	FTA-W4S3000	FTA-L4S3000	FTA-S8S3000	FTA-H8S3000	FTA-W8S3000	FTA-L8S3000
inch/mm	178-151-13	178-152-13	178-153-13	178-154-13	178-156-13	178-157-13	178-158-13	178-159-13
Measuring range	X-axis	100 mm			200 mm			
	Z1-axis	800 μm, 80 μm, 8 μm						
Straightness (when the X-axis is horizontal)	(0.05+0.001L) μm L = Measurement Length (mm)				(0.1+0.002L) μm L = Measurement Length (mm)			
X-axis inclination angle	±45° (Only for models with X-axis inclining drive unit)							
Z2-axis (column) travel range	300 mm	500 mm	700 mm	300 mm	500 mm	700 mm		
Base size (WxD)	60x450 mm		1000x450 mm		600x450 mm		1000x450 mm	
Base material	Granite							

Note: While the appearance of the natural stone measuring table varies according to the source, the high stability for which this material is known can always be relied upon.

FORMTRACER Avant C3000/4000 Series SERIES 218 — Contour Measuring Instruments

- **FORMTRACER Avant C3000/4000 Series** are highly functional and user-friendly contour measuring systems with innovative design features.
- **FORMTRACER Avant C3000/4000 Series** comes with the inclined drive unit as standard, making approach to the target surface and measurement of large workpieces much easier.
- Equipped with an operability focused, new style remote box. The new part program key strongly supports manual part-programming.
- High throughput is achieved thanks to high drive speed (X-axis: Max. 80 mm/s, Z2-axis: Max. 30 mm/s) and acceleration (X-axis: 30 mm/s²).
- All connecting cables are contained within the measuring instrument to eliminate any inconvenience during measurement.
- The Z1-axis detector is equipped with a built-in anti-collision safety device.
- A detector for measuring roughness can be retrofitted.
- The arm of the detector is a user-friendly, magnetic, one-touch, detachable mechanism.
- **C4000** type is a highly functional contour measuring system that has a wide-range digital detector (measuring range: 60 mm), top/bottom plane continuous measurement function, automatic variable measuring force function, and stylus drop detection function.



Inclined drive unit



Refer to the **FORMTRACER Avant Series Brochure (E15030(2)-US)** for more details.



FTA-S4C3000



FTA-S4C4000



Large-sized base models and high-column models are added to the line-up.



Remote box with user-friendly operability



For C4000

For C3000

Detector

SPECIFICATIONS

Model No.	FTA-S4C3000	FTA-H4C3000	FTA-W4C3000	FTA-L4C3000	FTA-S8C3000	FTA-H8C3000	FTA-W8C3000	FTA-L8C3000
	FTA-S4C4000	FTA-H4C4000	FTA-W4C4000	FTA-L4C4000	FTA-S8C4000	FTA-H8C4000	FTA-W8C4000	FTA-L8C4000
	inch/mm							
	218-361-13	218-362-13	218-363-13	218-364-13	218-366-13	218-367-13	218-368-13	218-369-13
	218-371-13	218-372-13	218-373-13	218-374-13	218-376-13	218-377-13	218-378-13	218-379-13
Measuring range	X-axis	100 mm			200 mm			
	Z1-axis	60 mm (±30 mm in horizontal situation)						
Straightness (when the X-axis is horizontal)	0.8 μm/100 mm				2 μm/200 mm			
Accuracy (20 °C)	C3000	X-axis	(0.8+0.01L) μm L = Measurement Length (mm)			(0.8+0.015L) μm L = Measurement Length (mm)		
		Z1-axis (detector unit)	±(1.2+ 2H /100) μm H = Measurement height from the horizontal position (mm)					
	C4000	X-axis	(0.8+0.01L) μm L = Measurement Length (mm)			(0.8+0.015L) μm L = Measurement Length (mm)		
		Z1-axis (detector unit)	±(0.8+ 2H /100) μm H = Measurement height from the horizontal position (mm)					
X-axis inclination angle	±45°							
Z2-axis (column) travel range	300 mm	500 mm	700 mm	300 mm	500 mm	700 mm		
Base size (WxD)	600x450 mm		1000x450 mm		600x450 mm		1000x450 mm	
Base material	Granite							

Note: While the appearance of the natural stone measuring table varies according to the source, the high stability for which this material is known can always be relied upon.

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FORMTRACER Avant D3000/4000 Series SERIES 525 — Surface Roughness / Contour Measuring Instruments



FTA-S4D3000
(Detector for surface roughness measurement attaching example, Inclined drive unit, with monitor arm)



FTA-S4D4000
(Detector for form/contour measurement attaching example, Inclined drive unit, with monitor arm)



Large-sized base models and high-column models are added to the line-up.



Inclined drive unit



Remote box with user-friendly operability



Detector holder (optional)



Connecting cables are contained within the measuring instrument.



Detector

- **FORMTRACER Avant D3000/4000 Series** are highly functional and user-friendly surface texture measuring systems with innovative design features. Both surface roughness measurement and contour measurement are available on a single system just by replacing the detector.
- The contour/roughness detector can be replaced without turning off the controller power and without using any tool. Furthermore, the detector is recognized automatically.
- **FORMTRACER Avant D Series** comes with the inclined drive unit as standard, making approach to the target surface and measurement of large workpieces much easier.
- Equipped with an operability focused, new style remote box. The new part program key strongly supports manual part-programming.
- High throughput is achieved thanks to high drive speed (X-axis: Max. 80 mm/s, Z2-axis: Max. 30 mm/s) and acceleration (X-axis: 30 mm/s²).
- All connecting cables are contained within the measuring instrument to eliminate any inconvenience during measurement.
- The Z1-axis detector is equipped with a built-in anti-collision safety device.
- The arm of the detector for contour measurement is a magnetic, one-touch, detachable mechanism.
- **D4000** type is a highly functional contour measuring system with a digital detector (measuring range: 60 mm) that enables a wide measurement range, top/bottom plane continuous measurement function, automatic variable measuring force function, and stylus drop detection function.



Talk to Sales

SPECIFICATIONS

Model No.	FTA-S4D3000	FTA-H4D3000	FTA-W4D3000	FTA-L4D3000	FTA-S8D3000	FTA-H8D3000	FTA-W8D3000	FTA-L8D3000
	FTA-S4D4000	FTA-H4D4000	FTA-W4D4000	FTA-L4D4000	FTA-S8D4000	FTA-H8D4000	FTA-W8D4000	FTA-L8D4000
	inch/mm	525-311-13	525-312-13	525-313-13	525-314-13	525-316-13	525-317-13	525-318-13
		525-322-13	525-323-13	525-324-13	525-326-13	525-327-13	525-328-13	525-329-13

Surface roughness measurement		100 mm			200 mm			
Measuring range	X-axis							
	Z1-axis	800 μm, 80 μm, 8 μm						
Straightness (when the X-axis is horizontal)		(0.05+0.001L) μm L = Measurement Length (mm)			(0.1+0.002L) μm L = Measurement Length (mm)			
Contour measurement		100 mm			200 mm			
Measuring range	X-axis							
	Z1-axis	60 mm (±30 mm in horizontal situation)						
Straightness (when the X-axis is horizontal)		0.8 μm/100 mm			2 μm/200 mm			
Accuracy (20 °C)	D3000	X-axis	(0.8+0.01L) μm L = Measurement Length (mm)			(0.8+0.015L) μm L = Measurement Length (mm)		
		Z1-axis (detector unit)	±(1.2+ 2H /100) μm H = Measurement height from the horizontal position (mm)					
	D4000	X-axis	(0.8+0.01L) μm L = Measurement Length (mm)			(0.8+0.015L) μm L = Measurement Length (mm)		
		Z1-axis (detector unit)	±(0.8+ 2H /100) μm H = Measurement height from the horizontal position (mm)					
Common specifications								
X-axis inclination angle		±45°						
Z2-axis (column) travel range		300 mm	500 mm	700 mm	300 mm	500 mm	700 mm	
Base size (WxD)		600x450 mm		1000x450 mm		600x450 mm		1000x450 mm
Base material		Granite						

Note: While the appearance of the natural stone measuring table varies according to the source, the high stability for which this material is known can always be relied upon.

FTA-H3000 Series SERIES 525 — Contour and Surface Roughness Measuring System

- **FTA-H3000** Series are highly functional and user-friendly surface texture measuring systems with innovative design features. They enable simultaneous measurement of both surface roughness and contour without changing the detector.
- Large-sized base models and high-column models are newly added to the line-up.
- Equipped with a wide range and high resolution Z1-axis detector.
- **FTA-H3000** Series comes with the inclined drive unit as standard, making approach to the target surface and measurement of large workpieces much easier.
- Equipped with an operability focused, new style remote box. The new part program key strongly supports manual part-programming.
- High throughput is achieved thanks to high drive speed (X-axis: Max. 80 mm/s, Z2-axis: Max. 30 mm/s).
- All connecting cables are contained within the measuring instrument to eliminate any inconvenience during measurement.
- The Z1-axis detector is equipped with a built-in anti-collision safety device.



FTA-H3000



FTA-H3000
(with monitor arm)



Refer to the FORMTRACER Avant Series Brochure (E15030(2)-US) for more details.



Inclinable drive unit



Detector sliding mechanism



Connecting cables are contained within the measuring instrument.



Contour & Roughness Detector H3000

SPECIFICATIONS

Model No.	FTA-54H3000	FTA-H4H3000	FTA-W4H3000	FTA-L4H3000	FTA-S8H3000	FTA-H8H3000	FTA-W8H3000	FTA-L8H3000	
	inch/mm								
Measuring range	X-axis	100 mm			200 mm				
	Z1-axis	16mm (±8mm from the horizontal position)							
Straightness (when the X-axis is horizontal)		0.2 μm/100 mm			0.6 μm/200 mm				
Accuracy (20 °C)	X-axis	±(0.8+0.01L) μm L = Measurement Length (mm)			(0.8+0.015L) μm L = Measurement Length (mm)				
	Z1-axis (detector unit)	±(0.5+ 2H /100) μm H = Measurement height from the horizontal position (mm)							
Detector (Z1-axis)	Detection method	Arc scale (RT-10μm)							
	Measuring force	0.75 mN							
	Stylus tip	Standard	Tip radius 2 μm, Tip angle 60°, Diamond (surface roughness/contour)			Tip radius 25 μm, Tip angle 30°, Sapphire (contour)			
		Cone							
	Stroke limit function	Specified range: -7mm to +7mm Positioning accuracy range: ± 1 mm							
X-axis inclination angle		±45°							
Z2-axis (column) travel range		300 mm	500 mm	700 mm	300 mm	500 mm	700 mm		
Base size (WxD)		600x450 mm		1000x450 mm		600x450 mm		1000x450 mm	
Base material		Granite							

Note: While the appearance of the natural stone measuring table varies according to the source, the high stability for which this material is known can always be relied upon.

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Formtracer Extreme SV-C4500CNC SERIES 525 — CNC Surface Roughness and Contour Measuring Systems



SV-C4500CNC
(Contour detector shown mounted together with the inclinable drive unit and Y-axis table)

SV-C4500CNC

- High-accuracy stylus type CNC Surface Roughness/Contour Measuring System allows measurement of surface roughness and form/contour with one unit through detector replacement.
- For models with the α -axis, it is possible to perform continuous measurement over horizontal and inclined surfaces by power-tilting the X1-axis. In addition, automatic measuring force adjustment function of Z1-axis detector for contour measurement enables automatic measurement with constant measuring force even with the X1-axis tilted.
- For models with the Y-axis table, it is possible to expand the measuring range for multiple workpieces through positioning in the Y-axis direction.
- Since the Z1-axis detector incorporates an anti-collision safety device, the machine will automatically stop if the detector touches a workpiece or jig.
- Optional external control function (Ext I/O) through bidirectional communication (RS-232C) with the PLC (programmable logic controller) is available.

SPECIFICATIONS

Model No.		SV-C4500CNC					
		inch/mm	525-701-13	525-702-13	525-703-13	525-704-13	
X1-axis (Drive unit)	Measuring range		200 mm				
	Resolution		0.05 μ m				
	Scale type		Reflective-type linear encoder				
	Drive Speed	CNC Mode		Max. 200 mm/s			
		Joystick mode		0 to 50 mm/s			
Measuring Speed		0.02 to 2.0 mm/s					
Contour	Measuring direction		Pulling and Pushing				
	Straightness		2 μ m / 200 mm				
	Accuracy (20 °C)		$\pm(0.8+4L/200)$ μ m L: Measuring length (mm)				
	Surface roughness	Measuring direction		Pulling			
Straightness			0.5 μ m / 200 mm				
Z1-axis (Detector)	Contour	Measuring range	60 mm (\pm 30 mm from the horizontal)				
		Resolution	0.02 μ m				
		Scale type	Arc				
	Surface roughness	Accuracy (20 °C)	$\pm(0.8+ 2H /100)$ μ m H: Measuring height position				
		Measuring range	800 μ m, 80 μ m, 8 μ m				
Resolution	0.01 μ m, 0.001 μ m, 0.0001 μ m						
Y-axis table unit		Installed					
Measuring range		200 mm					
Resolution		0.05 μ m					
Drive Speed	CNC mode	Max. 200 mm/s					
	Joystick mode	0 to 50 mm/s					
Max. table loading weight		20 kg					
Z2-axis (Column)	22-axis vertical travel	300 mm	500 mm				
	Resolution	0.05 μ m					
	Scale type	Reflective-type linear encoder					
	Drive speed	CNC mode	Max. 200 mm/s				
		Joystick mode	0 to 50 mm/s				
Base size (width x depth)		750 x 600 mm					
Base material		Granite					
Alpha-axis unit		-	Installed	-	Installed		

Note: While the appearance of the natural stone measuring table varies according to the source, the high stability for which this material is known can always be relied upon.



Need Repair?

Formtracer Extreme CS-5000CNC/CS-H5000CNC SERIES 525 — CNC Surface Roughness and Contour Measuring Systems



CS-H5000CNC
(with Y-axis table)



Wide-range detector employing active control technology

- Since the Z1-axis detector incorporates an anti-collision safety device, the detector unit will automatically stop if it touches a workpiece or fixture.
- For models with the α -axis, it is possible to perform continuous measurement over horizontal and inclined surfaces by power-tilting the X1-axis. (CS-5000CNC only)
- For models with the Y-axis table, it is possible to expand the measuring range for multiple workpieces through positioning in the Y-axis direction.
- Optional external control function (Ext I/O) through bidirectional communication (RS-232C) with the PLC (programmable logic controller) is available.

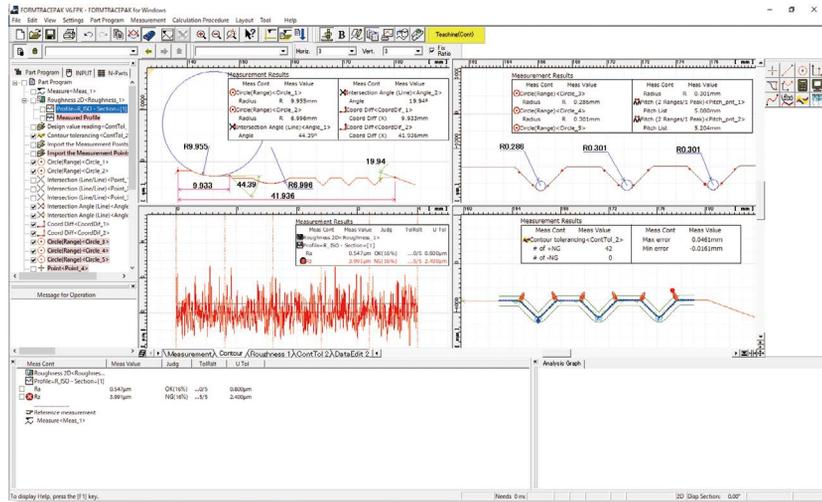
SPECIFICATIONS

Model No.		CS-5000CNC				CS-H5000CNC			
inch/mm		525-727-13	525-729-13	525-747-13	525-749-13	525-777-13	525-706-13	525-707-13	
X1-axis (drive unit)	Measuring range	200 mm							
	Resolution	0.005 μ m							
	Scale type	Transmission-type linear scale							
	Drive speed	CNC mode	Max. 40 mm/s						
		Joystick mode	0 to 40 mm/s						
	Measuring speed	Roughness measurement: 0.02 to 0.2 mm/s Contour measurement: 0.02 to 2.0 mm/s							
	Measuring direction	Pulling and Pushing							
	Straightness	with standard stylus	(0.1+0.0015L) μ m				(0.05+0.0003L) μ m		
with 2X-long stylus		(0.2+0.0015L) μ m				(0.1+0.0015L) μ m			
Accuracy (at 20 °C)	$\pm(0.3+0.002L)$ μ m L: Measuring length (mm)				$\pm(0.16+0.001L)$ μ m L: Measuring length (mm)				
Alpha-axis	Inclination range	- 45° (CCW), +10° (CW)				—			
Y-axis table	Measuring range	—	200 mm	—	200 mm	200 mm	—	200 mm	
	Resolution	—	0.05 μ m	—	0.05 μ m	0.05 μ m	—	0.05 μ m	
	Scale type	—	Reflection-type linear scale	—	Reflection-type linear scale	Reflection-type linear scale	—	Reflection-type linear scale	
	Drive speed	CNC mode	—	Max. 200 mm/s	—	Max. 200 mm/s	Max. 200 mm/s	—	Max. 200 mm/s
		Manual mode	—	0 to 50 mm/s	—	0 to 50 mm/s	0 to 50 mm/s	—	0 to 50 mm/s
	Maximum loading mass	—	20 kg (at table center)	—	20 kg (at table center)	20 kg (at table center)	—	20 kg (at table center)	
	Straightness	—	0.5 μ m / 200 mm	—	0.5 μ m / 200 mm	0.5 μ m / 200 mm	—	0.5 μ m / 200 mm	
	Accuracy (at 20 °C)	—	$\pm(2+2L/100)$ μ m	—	$\pm(2+2L/100)$ μ m	$\pm(2+2L/100)$ μ m	—	$\pm(2+2L/100)$ μ m	
	Table size	—	200 x 200 mm	—	200 x 200 mm	200 x 200 mm	—	200 x 200 mm	
	External dimensions (W x D x H)	—	320 x 646 x 105 mm	—	320 x 646 x 105 mm	320 x 646 x 105 mm	—	320 x 646 x 105 mm	
Mass	—	35 kg	—	35 kg	35 kg	—	35 kg		
Z1-axis (Detector)	Measuring range	with standard stylus	12 mm						
		with 2X-long stylus	24 mm						
	Resolution	with standard stylus	0.0008 μ m						
		with 2X-long stylus	0.0016 μ m						
	Vertical movement of the stylus	Arc motion							
	Scale type	Transmission-type linear scale							
	Accuracy (at 20 °C)	$\pm(0.3+ 0.02H)$ μ m H: Probing height (mm)				$\pm(0.07+ 0.02H)$ μ m H: Probing height (mm)			
	Measuring force	with standard stylus	4 mN (Fixed)						
		with 2X-long stylus	0.75 mN (Fixed)						
	Traceable angle	Ascent: 60°, Descent: 60° (Depends on the surface texture)							
Stylus tip shape	Standard stylus	Tip radius: 5 μ m, Tip angle: 40°, Diamond							
	Standard ball stylus	Tip ball radius: 0.25 mm, Sapphire							
	2X-long stylus	Tip radius: 5 μ m, Tip angle: 40°, Diamond				Tip radius: 2 μ m, Tip angle: 60°, Diamond			
	2X-long ball stylus	Tip ball radius: 0.25 mm, Sapphire							
Face of stylus	Downward								
Z2-axis (Column)	Travel range	Z2-axis (column)	300 mm		500 mm	300 mm		500 mm	
	Resolution	0.05 μ m							
	Scale type	Reflective-type linear scale							
	Drive speed	CNC mode	Max. 200 mm/s						
Joystick mode		0 to 50 mm/s							
Base	Base size (WxD)	800 x 600 x 1000 mm		800 x 600 x 1200 mm		800 x 600 x 1000 mm		800 x 600 x 1200 mm	
	Base material	Granite							
	Alpha-axis unit	Installed	Installed	Installed	Installed	—			

Note: While the appearance of the natural stone base varies according to the source, the high stability for which this material is known can always be relied upon.

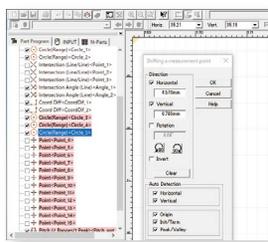
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Surface Roughness/Contour Analysis Program FORMTRACEPAK

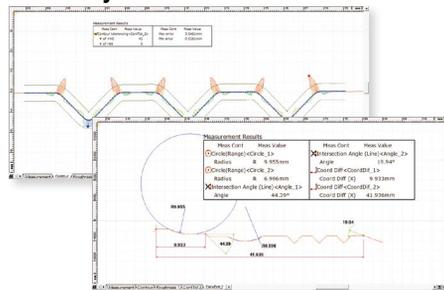


• Editing measurement procedures

The items displayed in the measurement procedure window can be directly modified. You can, for example, perform new analyses by modifying the evaluation setup or roughness standard.

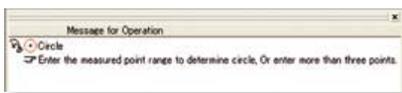


• Versatile graphics windowing for data and analysis



• Operation messaging

The operation message window for explaining the next step is incorporated.



• Measurement control

To make only a single measurement, you can create a part program in the single mode. To measure multiple workpieces of an identical shape, you can use the teaching mode. Since you can embed the entire flow, from making measurement to printing a report, into a part program, you can efficiently make measurements, analyze data, and output a report. A function is also provided that enables you to insert comments accompanied with photographs at desired timings, enabling you to embed the roles described in a measurement procedure document that specifies important points such as work settings.

To make immediate measurements, you can use the pull-down menu to easily select and call up the desired operating procedure.

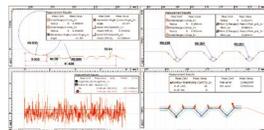


• Tab-selection graphics window

Just select a tab to display the measurement data required, such as contour, roughness, or tolerancing results.

• Dividing the screen into two or four windows

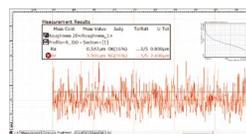
The screen can be divided into two, or four, windows for the convenient display of measurement data (for contour and roughness), analysis results, and contour tolerancing data, as required.



• Displaying the results in the graphics window

You can paste the graphics obtained from measurements, as well as measurement values (including pass/fail results) and an analysis graph, into the graphics window.

This enables you to check the graphics and measurement results at a glance using the graphics window alone.



- FORMTRACEPAK functions offer total support for controlling the measurement system, surface roughness analysis, contour analysis, contour tolerancing, and inspection report creation.



Where to Buy

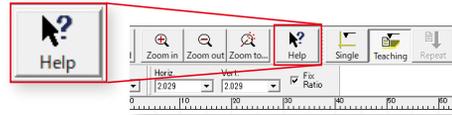


Refer to the FORMTRACEPAK Brochure (E15018(4)-US) for more details.

Formtracer

- **Online help functions**

Online help that can be viewed any time is incorporated into the software. In addition to index and keyword searches, a status-saving help button, which displays menus and Windows help with a click of the mouse, is provided.



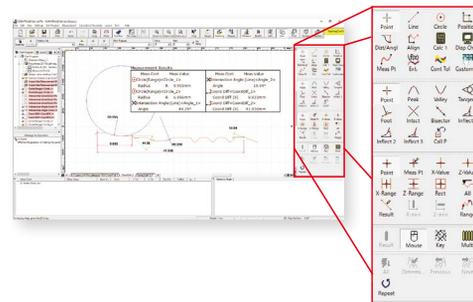
- **Multiple language support (18 languages)**

You can switch the language to be used in the measurement, analysis, and layout windows. After measurements have been made, you can switch to another language and create a report in that language. This function can be used worldwide.

CONTOUR MEASUREMENT

- **Contour analysis**

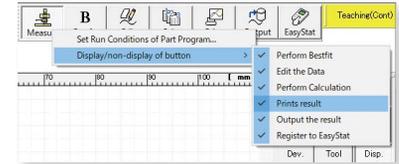
A wide variety of commands, which form the basic elements for analysis, are provided, including those for points (10 types), lines (6 types) and circles (6 types). A rich set of commands that combine these elements to calculate angles, pitches and distances as well as performing contour tolerancing and design value generation are also provided as standard features. These functions, combined with the function that enables you to customize the calculation command buttons by hiding less frequently used commands, help you to tailor the window according to the user's environment.



- Contour-tolerancing as a standard feature
- Design value generation
- Data combination
- Simple pitch calculation

- **Button-editing function**

You can hide buttons that are not used frequently. For example, you can choose to display only those buttons that are used frequently and increase the size of the displayed graphics window, thereby customizing the window to suit your needs.



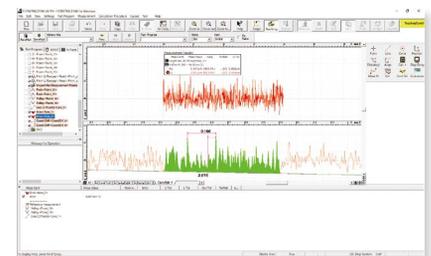
- **Simple statistical commands**

You can perform statistical calculations of roughness parameters and contour analysis results without using a separate program such as Excel.

SURFACE ROUGHNESS MEASUREMENT

- **Surface roughness analysis**

FORMTRACEPAK can perform surface roughness analyses that conform to various standards such as ISO, JIS, ANSI and VDA. For comparing measurement values with the tolerance limits, you can use the 16% rule or the maximum value rule. Furthermore, since **FORMTRACEPAK** comes with parameter calculation functions as well as a rich set of graphic analysis functions, it can be widely utilized for everything from routine quality control to R&D applications. It also includes many other functions such as the function for eliminating (compensating) shapes, such as slopes and radiused surfaces (R-surfaces), and data deletion.

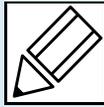


- Micro contour analysis
- Simple input using drawing symbols
- Multiple-point measurement
- Analysis using multiple-point measurements
- Reference length dialog box
- Analysis condition modification with preview
- R-surface automatic measurement



Refer to the **FORMTRACEPAK Brochure (E15018(4)-US)** for more details.

Quick Guide to Precision Measuring Instruments



Surftest (Surface Roughness Testers)

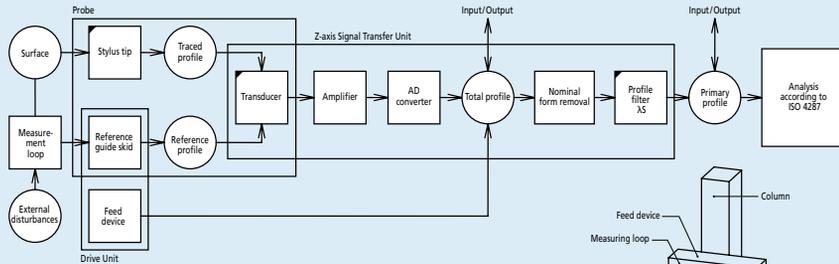
ISO 4287: 1997 Geometrical Product Specifications (GPS) – Surface Texture: Profile method– Terms, definitions, and surface texture parameters

ISO 4288: 1996 Geometrical Product Specifications (GPS) – Surface Texture: Profile method– Rules and procedures for the assessment of surface texture

ISO 3274: 1996 Geometrical Product Specifications (GPS) – Surface Texture: Profile method– Nominal characteristics of contact (stylus) instruments

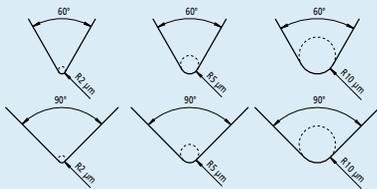
ISO 11562: 1996 Geometrical Product Specifications (GPS) – Surface texture: Profile method– Metrological characteristics of phase correct filters

Elements of Contact Type Surface Roughness Measuring Instruments



Stylus Shape

A typical shape for a stylus end is conical with a spherical tip. Tip radius: $r_{tip} = 2 \mu\text{m}, 5 \mu\text{m}$ or $10 \mu\text{m}$. Cone angle: $60^\circ, 90^\circ$. In typical surface roughness testers, the conical angle of the stylus end is 60° unless otherwise specified.



Static Measuring Force

Nominal radius of curvature of stylus tip: μm	Static measuring force at the mean position of stylus: mN	Tolerance on static measuring force variations: mN/ μm
2	0.75	0.035
5	0.75 (4.0)*	0.2
10		

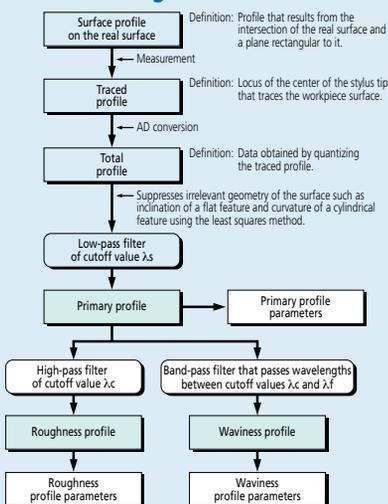
* The maximum value of static measuring force at the average position of a stylus is to be 4.0 mN for a probe with a special structure including a replaceable stylus.

Metrological Characterization of Phase Correct Filters

A profile filter is a phase-correct filter without phase delay (cause of profile distortion dependent on wavelength). The weight function of a phase-correct filter shows a normal (Gaussian) distribution in which the amplitude transmission is 50% at the cutoff wavelength.

ISO 11562: 1996 (JIS B 0632: 2001)

Data Processing Flow



Relationship between Cutoff Value and Stylus Tip Radius

The following table lists the relationship between the roughness profile cutoff value λ_c , stylus tip radius r_{tip} , and cutoff ratio λ_c/λ_s .

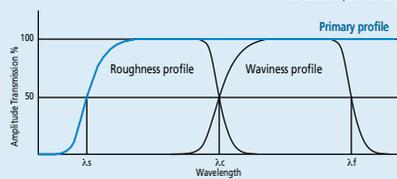
λ_c mm	λ_s μm	λ_c/λ_s	Maximum r_{tip} μm	Maximum sampling length μm
0.08	2.5	30	2	0.5
0.25	2.5	100	2	0.5
0.8	2.5	300	2 ¹⁾	0.5
2.5	8	300	5 ^{1,2)}	1.5
8	25	300	10 ^{1,2)}	5

¹⁾ For a surface with $R_a \geq 0.5 \mu\text{m}$ or $R_z \geq 3 \mu\text{m}$, a significant error will not usually occur in a measurement even if $r_{tip} = 5 \mu\text{m}$.

²⁾ If a cutoff value λ_s is 2.5 μm or 8 μm , attenuation of the signal due to the mechanical filtering effect of a stylus with the recommended tip radius appears outside the roughness profile pass band. Therefore, a small error in stylus tip radius or shape does not affect parameter values calculated from measurements. If a specific cutoff ratio is required, the ratio must be defined.

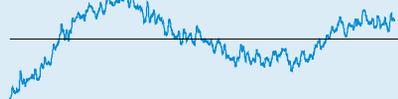
Surface Profiles

ISO 4287:1997 (JIS B 0601: 2013)



Primary Profile

Profile obtained from the measured profile by applying a low-pass filter with cutoff value λ_s .



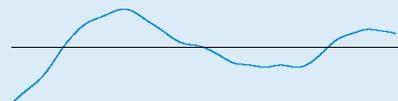
Roughness Profile

Profile obtained from the primary profile by suppressing the longer wavelength components using a high-pass filter of cutoff value λ_c .



Waviness Profile

Profile obtained by applying a band-pass filter to the primary profile to remove the longer wavelengths above λ_f and the shorter wavelengths below λ_c .



Roughness sampling length for non-periodic profiles

ISO 4288: 1996 (JIS B 0633: 2001)

Table 1: Sampling lengths for aperiodic profile roughness parameters ($R_a, R_q, R_{sk}, R_{ku}, R_{dq}$), material ratio curve, probability density function, and related parameters

R_a μm	Sampling length l_r mm	Evaluation length l_n mm
(0.006) < R_a ≤ 0.02	0.08	0.4
0.02 < R_a ≤ 0.1	0.25	1.25
0.1 < R_a ≤ 0.2	0.8	4
2 < R_a ≤ 10	2.5	12.5
10 < R_a ≤ 80	8	40

Table 2: Sampling lengths for aperiodic profile roughness parameters (R_z, R_v, R_p, R_c, R_t)

R_z R_z max. μm	Sampling length l_r mm	Evaluation length l_n mm
(0.025) < R_z, R_z max. ≤ 0.1	0.08	0.4
0.1 < R_z, R_z max. ≤ 0.5	0.25	1.25
0.5 < R_z, R_z max. ≤ 10	0.8	4
10 < R_z, R_z max. ≤ 50	2.5	12.5
50 < R_z, R_z max. ≤ 200	8	40

¹⁾ R_z is used for measurement of R_z, R_v, R_p, R_c , and R_t .
²⁾ R_z max. only used for measurement of R_z max., R_v max., R_p max., and R_c max.

Table 3: Sampling lengths for measurement of periodic roughness profile roughness parameters and periodic or aperiodic profile parameter R_{sm}

R_{sm} mm	Sampling length l_r mm	Evaluation length l_n mm
0.013 < R_{sm} ≤ 0.04	0.08	0.4
0.04 < R_{sm} ≤ 0.13	0.25	1.25
0.13 < R_{sm} ≤ 0.4	0.8	4
0.4 < R_{sm} ≤ 1.3	2.5	12.5
1.3 < R_{sm} ≤ 4	8	40

Procedure for determining a sampling length if it is not specified

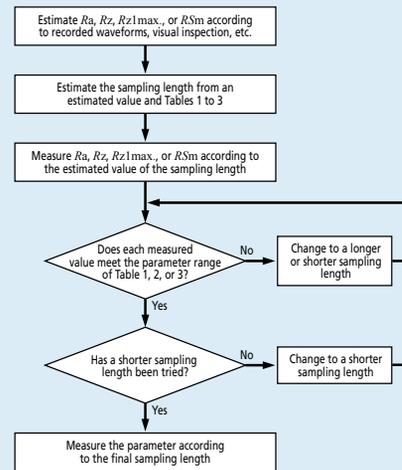


Fig.1 Procedure for determining the sampling length of an aperiodic profile if it is not specified.

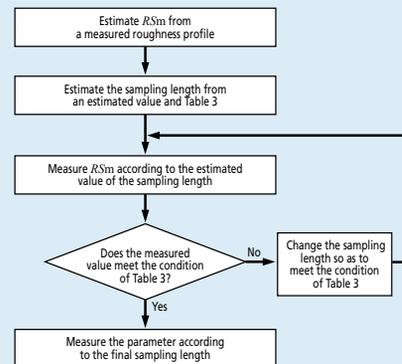


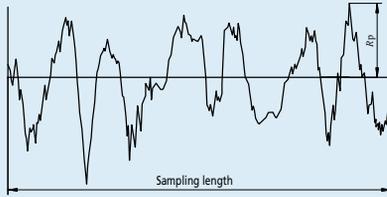
Fig.2 Procedure for determining the sampling length of a periodic profile if it is not specified.

Definition of Parameters

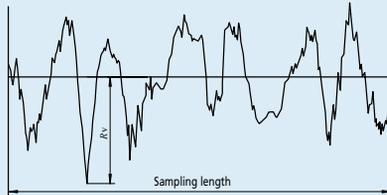
ISO 4287:1997, Amd. 1: 2009 (JIS B 0261:2013)

Amplitude Parameters (peak and valley)

Maximum peak height of the primary profile P_p
 Maximum peak height of the roughness profile R_p
 Maximum peak height of the waviness profile W_p
 Largest profile peak height Z_p within a sampling length

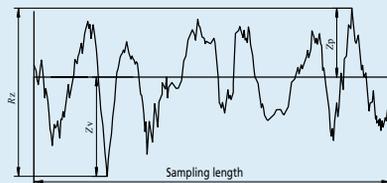


Maximum valley depth of the primary profile P_v
 Maximum valley depth of the roughness profile R_v
 Maximum valley depth of the waviness profile W_v
 Largest profile valley depth Z_v within a sampling length



Maximum height of the primary profile P_z
 Maximum height of the roughness profile R_z
 Maximum height of the waviness profile W_z

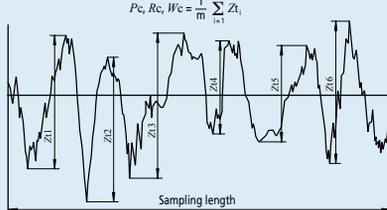
Sum of height of the largest profile peak height Z_p and the largest profile valley depth Z_v within a sampling length



In the old JIS and ISO 4287-1: 1984, R_z was used to indicate the "ten point height of irregularities". Care must be taken because differences between results obtained according to the existing and old standards are not always negligibly small. (Be sure to check whether the drawing instructions conform to existing or old standards.)

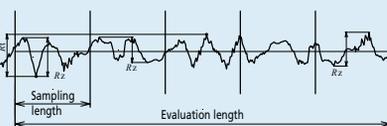
Mean height of the primary profile elements P_c
 Mean height of the roughness profile elements R_c
 Mean height of the waviness profile elements W_c

Mean value of the profile element heights Z_i within a sampling length



Total height of the primary profile P_t
 Total height of the roughness profile R_t
 Total height of the waviness profile W_t

Sum of the height of the largest profile peak height Z_p and the largest profile valley depth Z_v within the evaluation length



Amplitude Parameters (average of ordinates)

Arithmetical mean deviation of the primary profile P_a
 Arithmetical mean deviation of the roughness profile R_a
 Arithmetical mean deviation of the waviness profile W_a
 Arithmetic mean of the absolute ordinate values $Z(x)$ within a sampling length

$$P_a, R_a, W_a = \frac{1}{l} \int_0^l |Z(x)| dx$$

with l as $l_p, l_r,$ or l_w according to the case.

Root mean square deviation of the primary profile P_q
 Root mean square deviation of the roughness profile R_q
 Root mean square deviation of the waviness profile W_q
 Root mean square value of the ordinate values $Z(x)$ within a sampling length

$$P_q, R_q, W_q = \sqrt{\frac{1}{l} \int_0^l Z^2(x) dx}$$

with l as $l_p, l_r,$ or l_w according to the case.

Skewness of the primary profile P_{sk}
 Skewness of the roughness profile R_{sk}
 Skewness of the waviness profile W_{sk}

Quotient of the mean cube value of the ordinate values $Z(x)$ and the cube of $P_q, R_q,$ or W_q respectively, within a sampling length

$$R_{sk} = \frac{1}{R_q^3} \left[\frac{1}{l} \int_0^l Z^3(x) dx \right]$$

The above equation defines R_{sk} . P_{sk} and W_{sk} are defined in a similar manner. $P_{sk}, R_{sk},$ and W_{sk} are measures of the asymmetry of the probability density function of the ordinate values.

Kurtosis of the primary profile P_{ku}
 Kurtosis of the roughness profile R_{ku}
 Kurtosis of the waviness profile W_{ku}

Quotient of the mean quartic value of the ordinate values $Z(x)$ and the fourth power of $P_q, R_q,$ or W_q respectively, within a sampling length

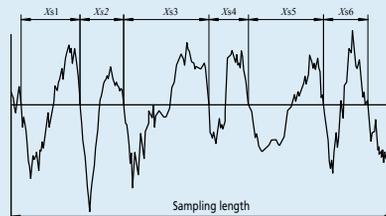
$$R_{ku} = \frac{1}{R_q^4} \left[\frac{1}{l} \int_0^l Z^4(x) dx \right]$$

The above equation defines R_{ku} . P_{ku} and W_{ku} are defined in a similar manner. $P_{ku}, R_{ku},$ and W_{ku} are measures of the sharpness of the probability density function of the ordinate values.

Spacing Parameters

Mean width of the primary profile elements P_{Sm}
 Mean width of the roughness profile elements R_{Sm}
 Mean width of the waviness profile elements W_{Sm}
 Mean value of the profile element widths X_i within a sampling length

$$P_{Sm}, R_{Sm}, W_{Sm} = \frac{1}{m} \sum_{i=1}^m X_i$$



Peak count number based on the primary profile elements P_{Pc}
 Peak count number based on the roughness profile elements R_{Pc}
 Peak count number based on the waviness profile elements W_{Pc}

$$R_{Pc} = \frac{1}{R_{Sm}}$$

Hybrid Parameters

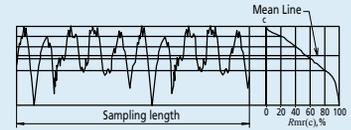
Root mean square slope of the primary profile P_{Aq}
 Root mean square slope of the roughness profile R_{Aq}
 Root mean square slope of the waviness profile W_{Aq}
 Root mean square value of the ordinate slope dZ/dX within a sampling length



Curves, Probability Density Function, and Related Parameters

Material ratio curve of the profile (Abbott-Firestone curve)

Curve representing the material ratio of the profile as a function of section level c



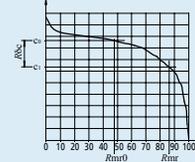
Material ratio of the primary profile $P_{mr}(c)$
 Material ratio of the roughness profile $R_{mr}(c)$
 Material ratio of the waviness profile $W_{mr}(c)$

Ratio of the material length of the profile elements $MI(c)$ at a given level c to the evaluation length

$$P_{mr}(c), R_{mr}(c), W_{mr}(c) = \frac{MI(c)}{l_n}$$

Section height difference of the primary profile $P_{\delta c}$
 Section height difference of the roughness profile $R_{\delta c}$
 Section height difference of the waviness profile $W_{\delta c}$
 Vertical distance between two section levels of a given material ratio

$$R_{\delta c} = c(R_{mr1}) - c(R_{mr2}), R_{mr1} < R_{mr2}$$



Relative material ratio of the primary profile P_{mr}
 Relative material ratio of the roughness profile R_{mr}
 Relative material ratio of the waviness profile W_{mr}

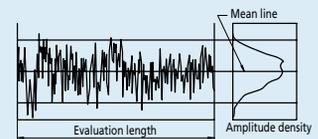
Material ratio determined at a profile section level $R_{\delta c}$ related to the reference section level c_0

$$P_{mr}, R_{mr}, W_{mr} = P_{mr}(c), R_{mr}(c), W_{mr}(c)$$

where $c = c_0 - R_{\delta c}(P_{\delta c}, W_{\delta c})$
 $c_0 = c(P_{m0}, R_{m0}, W_{m0})$

Probability density function (profile height amplitude distribution curve)

Sample probability density function of the ordinate $Z(x)$ within the evaluation length

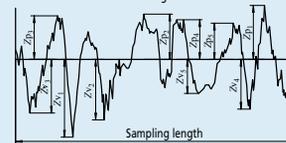


JIS Specific Parameters

Ten-point height of irregularities $R_{Z_{10S}}$

Sum of the absolute mean height of the five highest profile peaks and the absolute mean depth of the five deepest profile valleys, measured from the mean line within the sampling length of a roughness profile. This profile is obtained from the primary profile using a phase-correct band-pass filter with cutoff values of l_c and l_s .

$$R_{Z_{10S}} = |Z_{p1} + Z_{p2} + Z_{p3} + Z_{p4} + Z_{p5}| + |Z_{v1} + Z_{v2} + Z_{v3} + Z_{v4} + Z_{v5}|$$



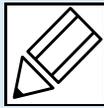
Symbol	Used profile
$R_{Z_{10S2}}$	Surface profile as measured
$R_{Z_{10S4}}$	Roughness profile derived from the primary profile using a phase-correct high-pass filter

Arithmetic mean deviation of the profile $R_{a_{75}}$

Arithmetic mean of the absolute values of the profile deviations from the mean line within the sampling length of the roughness profile (75%). This profile is obtained from a measurement profile using an analog high-pass filter with an attenuation factor of 12db/octave and a cutoff value of λ_c .

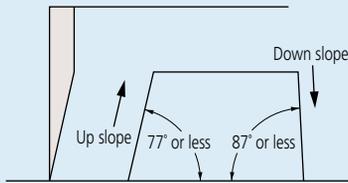
$$R_{a_{75}} = \frac{1}{l} \int_0^l |Z(x)| dx$$

Quick Guide to Precision Measuring Instruments



Contracer (Contour Measuring Instruments)

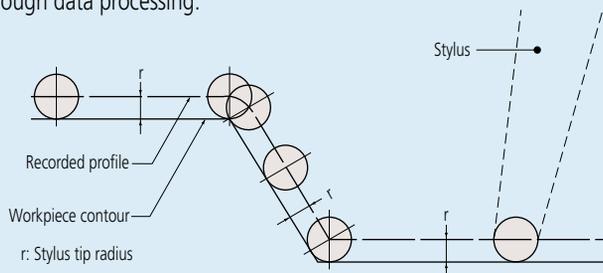
Traceable Angle



The maximum angle at which a stylus can trace upwards or downwards along the contour of a workpiece, in the stylus travel direction, is referred to as the traceable angle. A one-sided sharp stylus with a tip angle of 12° (as in the above figure) can trace a maximum 77° of up slope and a maximum 87° of down slope. For a conical stylus (30° cone), the traceable angle is smaller. An up slope with an angle of 77° or less overall may actually include an angle of more than 77° due to the effect of surface roughness. Surface roughness also affects the measuring force.

Compensating for Stylus Tip Radius

A recorded profile represents the locus of the center of the ball tip rolling on a workpiece surface. (A typical radius is 0.025 mm.) Obviously this is not the same as the true surface profile so, in order to obtain an accurate profile record, it is necessary to compensate for the effect of the tip radius through data processing.

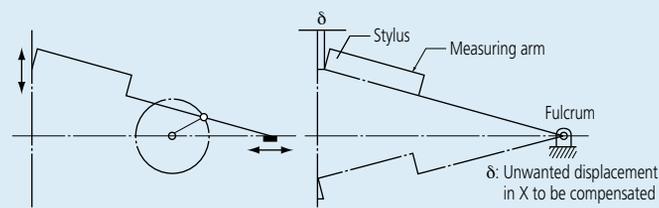


If a profile is read from the recorder through a template or scale, it is necessary to compensate for the stylus tip radius beforehand according to the applied measurement magnification.

Compensating for Arm Rotation

When the stylus traces through a circular-arc, error arises in the X-axis direction of the recorded profile. Possible methods for compensating for this effect are as follows:

- 1) Mechanical compensation
- 2) Electrical compensation



3) Software processing. To measure a workpiece contour that involves a large displacement in the vertical direction with high accuracy, one of these compensation methods needs to be implemented.

Accuracy

As the detector units of the X and Z-axes incorporate scales, the magnification accuracy is displayed not as a percentage but as the linear displacement accuracy for each axis.

Overload Safety Cutout

If an excessive force (overload) is exerted on the stylus tip due, perhaps, to the tip encountering a too-steep slope on a workpiece feature, or a burr, for example, a safety device automatically stops operation and sounds an alarm buzzer. This type of instrument is commonly equipped with separate safety devices for the tracing direction (X-axis) load and vertical direction (Z-axis) load.

Circular-Arc/Linear Tracing

The locus traced by the stylus tip during vertical stylus movement can be a circular arc or a straight line. Ensuring a straight-line locus entails complex mechanics, while in the case of a circular-arc locus, if the amplitude of stylus displacement is large in the vertical direction, an error (δ) in the recorded profile in the horizontal direction arises. (See figure at lower left)

Z-axis Measurement Methods

Though the X-axis measurement method commonly adopted is by means of a digital scale, the Z-axis measurement divides into analog methods (using a differential transformer, for example) and digital scale methods. Analog methods vary in Z-axis resolution depending on the measurement magnification and measuring range. Digital scale methods have fixed resolution. Generally, a digital scale method provides higher accuracy than an analog method.

Contour analysis methods

You can analyze the contour with one of the following two methods after completing the measurement operation.

Data processing section and analysis program

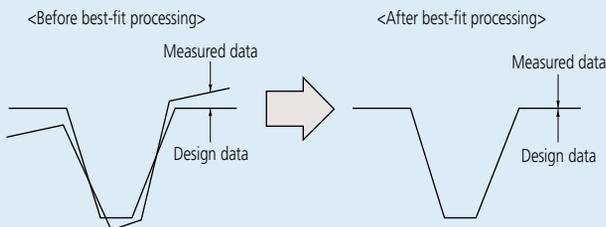
The measured contour is input into the data processing section in real time and a dedicated program performs the analysis using the mouse and/or keyboard. The angle, radius, step, pitch and other data are directly displayed as numerical values. Analysis combining coordinate systems can be easily performed. The graph that goes through stylus radius correction is output to the printer as the recorded profile.

Tolerancing with Design Data

Measured workpiece contour data can be compared with design data in terms of actual and designed shapes rather than just analysis of individual dimensions. In this technique, each deviation of the measured contour from the intended contour is displayed and recorded. Also, data from one workpiece example can be processed to become the master design data to which other workpieces are compared. This function is particularly useful when the shape of a section greatly affects product performance, or when its shape has an influence on the relationship between mating or assembled parts.

Best-fitting

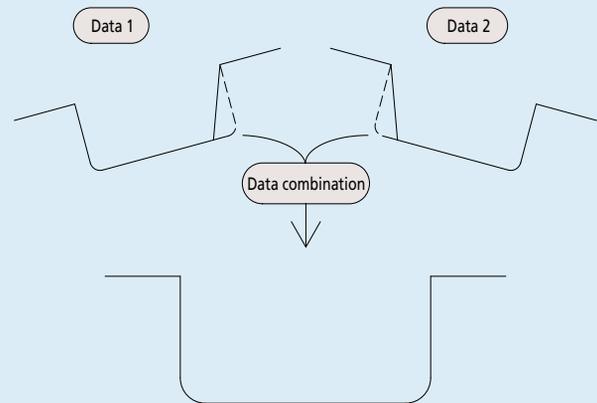
If there is a standard for surface profile data, tolerancing with design data is performed according to the standard. If there is no standard, or if tolerancing only with shape is desired, best-fitting between design data and measurement data can be performed.



The best-fit processing algorithm searches for deviations between both sets of data and derives a coordinate system in which the sum of squares of the deviations is a minimum when the measured data is overlaid on the design data.

Data Combination

Conventionally, if tracing a complete contour is prevented by stylus traceable-angle restrictions, then it has to be divided into several sections that are then measured and evaluated separately. This function avoids this undesirable situation by combining the separate sections into one contour by overlaying common elements (lines, points) onto each other. With this function, the complete contour can be displayed and various analyses performed in the usual way.



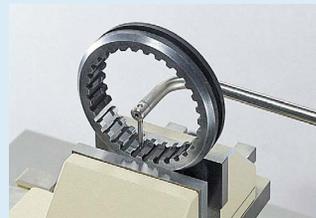
Measurement Examples



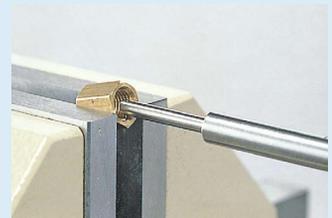
Aspheric lens contour



Inner/outer ring contour of a bearing



Internal gear teeth



Female thread form



Male thread form



Gage contour

Roundtest

MeasurLink¹ ENABLED
Data Management Software by Mitutoyo

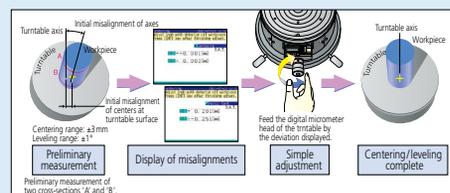


Roundtest RA-120/120P SERIES 211 — Roundness Measuring Instruments

Easy operation, compact and outstanding cost/performance ratio, designed for use on the shop-floor right beside the production line.

- D.A.T. (Digimatic Adjustment Table) function aids adjustments such as centering and leveling, and substantially reduces the time required for preliminary setup operations.

What is the D.A.T. function? <Patented>



Dedicated analysis unit type (RA-120)

Data analysis by PC (RA-120P)

- Compact, lightweight design due to incorporating electronic components inside the main unit.
- **ROUNDPAK**, a data analysis program employs Windows OS and archives higher level of analysis.



RA-120

RA-120P

The analysis capabilities for the various models (RA-120/120P/10) vary. For details, refer to page L-26.

SPECIFICATIONS

Model No.		RA-120		RA-120P	
		inch/mm	211-544-13	211-543-13	211-547-11
DAT Function		-	Installed	-	Installed
Turntable	Rotational accuracy (JIS B 7451-1997)	Radial direction	(0.04 + 6H/10000) μm H: Probing height (mm)		
		Axial direction	(0.04 + 6X/10000) μm X: distance from the center of rotation (mm)		
	Maximum probing diameter*1	ø280 mm (ø380 mm: for the vertical position when detector holder is installed reversely, the maximum probing height is up to 50 mm from the table top.)			
	Maximum loading mass	25 kg			
Vertical movement	Vertical travel	280 mm			
X-axis	Travel range	165 mm (-25 mm to 140 mm from the rotation center)			
Detector*2	Measuring range	±1000 μm			

*1 Auxiliary stage for a low-height workpiece (optional) is required for the measurement 20 mm or less in the radial direction from the center point of the table and 20 mm or less from the table top.

*2 Only the standard length stylus is applicable to this detector. The long type cannot be used.



Refer to the Roundtest RA-120/120P Brochure (E15008) for more details.



Get a Quote

Roundtest RA-1600M SERIES 211 — Roundness/Cylindricity Measuring System

- Compact body and a wide measuring range assures precision that compares well with that of higher-grade models.
- D.A.T. (Digital Adjustment Table) function aids manual workpiece centering and leveling.
- Safety mechanism provided in the detection section as a standard feature.
- A sliding mechanism (optional sliding detector holder) can be installed in the detector holder. It enables one-touch measurement of a workpiece with a deep hole having a thick wall, which has been difficult with the standard detector.



Detector safety mechanism



RA-1600M

SPECIFICATIONS

Model No.		inch/mm		RA-1600M 211-724-11
Turntable	Rotational accuracy (JIS B 7451-1997)	Radial direction	(0.03 + 6H / 10000) μm H: Probing height (mm)	
		Axial direction	(0.03 + 6X / 10000) μm X: Distance from the center of rotation (mm)	
	Maximum loading mass	25 kg		
	Maximum probing diameter	ø280 mm		
Vertical movement (Z-axis column unit)	Vertical travel	300 mm		
X-axis	Travel range	165 mm (-25 mm to +140 mm from the rotation center)		
Detector	Measuring range	Standard	±400 μm/±40 μm/±4 μm	
		Tracking	±5 mm	

Refer to the Roundtest RA-1600M Brochure (E15000) for more details.

Achieved the world's highest level of accuracy for this class of machine. A high-performance automatic system equipped with a high-speed automatic centering/leveling function.

- High-speed automatic centering/leveling function contributes to a significant reduction in the man-hours required for setups.
- A fully automatic system which performs processing automatically from part program calling, centering/leveling, measurement, calculation, all the way through to printing.
- Capable of continuous inside/outside diameter measurement without changing the detector orientation (up to 50 mm ID).
- The automatic positioning function of the turntable enables automatic measurement in combination with table rotation and slider/column movement.
- Advanced graphical analysis such as power spectrum chart is available.
- A sliding mechanism is incorporated in the detector holder part.

Roundtest RA-2200 SERIES 211 — Roundness/Cylindricity Measuring System



RA-2200AH
System vibration isolator (with side table)



RA-2200AH
System vibration isolator (monitor arm type)*
* Printer table (provided by the customer) not shown.

SPECIFICATIONS

Model No.		inch/mm		RA-2200AS 211-511-11	RA-2200DS 211-514-13	RA-2200AH 211-512-11	RA-2200DH 211-516-13
Turntable	Rotational accuracy (JIS B 7451-1997)	Radial direction	(0.02 + 3.5H/10000) μm H: Probing height (mm)				
		Axial direction	(0.02 + 3.5X/10000) μm X: Distance from the center of rotation (mm)				
	Maximum loading mass	30 kg					
	Maximum probing diameter	ø300 mm					
Vertical movement (Z-axis column unit)	Vertical travel	300 mm			500 mm		
X-axis	Travel range	175 mm (-25 mm to +150 mm from the rotation center)					
Detector	Measuring range	Standard	±400 μm/±40 μm/±4 μm				
		Tracking	±5 mm				

Refer to the Roundtest RA-2200 Series Brochure (E15001(3)-US) for more details.

Roundtest RA-H5200 SERIES 211 — Roundness/Cylindricity Measuring System



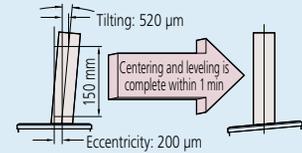
RA-H5200AS
with side table
(option 178-181)

SPECIFICATIONS

Model No.		inch/mm		RA-H5200AS 211-531-11	RA-H5200AH 211-532-11
Turntable	Rotational accuracy (JIS B 7451-1997)	Radial direction	(0.02 + 3.5H/10000) μm H: Probing height (mm)		
		Axial direction	(0.02 + 3.5X/10000) μm X: Distance from the center of rotation (mm)		
	Maximum loading mass	80 kg (On auto-centering: 65 kg)			
	Maximum probing diameter	ø400 mm			
Vertical movement (Z-axis column unit)	Vertical travel	350 mm		550 mm	
	X-axis	Travel range	225 mm (-25 mm to +200 mm from the rotation center)		
Detector	Measuring range	Standard	±400 μm/±40 μm/±4 μm		
		Tracking	±5 mm		

A high-performance automatic system equipped with a high-speed automatic centering/leveling function achieves the world's highest level of accuracy.

- High-speed automatic centering/leveling function contributes to a significant reduction in the man-hours required for setups.



- A fully automatic system which performs processing automatically from part program calling, centering/leveling, measurement, calculation, all the way through to printing.
- Capable of continuous inside/outside diameter measurement without changing the detector orientation (up to 50 mm ID).
- The automatic positioning function of the turntable enables automatic measurement in combination with table rotation and slider/column movement.
- Advanced graphical analysis such as a power spectrum chart is available.
- A sliding mechanism is incorporated in the detector holder.

Roundtest RA-2200 PLUS SERIES 211 — Roundness/Cylindricity Measuring System



RA-2200AH PLUS
System vibration isolator (with side table)



SPECIFICATIONS

Model No.		inch/mm		RA-2200AS PLUS 211-517-11	RA-2200AH PLUS 211-518-11
Turntable	Rotational accuracy (JIS B 7451-1997)	Radial direction	(0.02 + 3.5H/10000) μm H: Probing height (mm)		
		Axial direction	(0.02 + 3.5X/10000) μm X: Distance from the center of rotation (mm)		
	Maximum loading mass	30 kg			
	Maximum probing diameter	ø256 mm			
Vertical movement (Z-axis column unit)	Vertical travel	300 mm		500 mm	
	X-axis	Travel range	175 mm (-25 mm to +150 mm from the rotation center)		
Detector	Measuring range	Standard	±400 μm/±40 μm/±4 μm		
		Tracking	±5 mm		

- The turntable with automatic centering and leveling function is equipped as standard, which frees operators from manual centering and leveling operations.
- Automatic control of holder arm posture (vertical/horizontal) and the rotation feature of the detector (rotates in 1° increments in the range of 0 to 270°) enables continuous measurement of various feature combinations, such as OD/ID and/or top/bottom plane measurements.
- A Mitutoyo linear scale is used in the X-axis drive unit to directly detect the position of the drive unit. It guarantees the highly precise positioning vital for automatic measurement.
- A roughness detector (optional) is supported.



Refer to the Roundtest RA-2200 Series Brochure (E15001(3)-US) for more details.

Roundtest RA-H5200 PLUS SERIES 211 — Roundness/Cylindricity Measuring System

A fully automated machine with highest-level accuracy that can greatly improve productivity and efficiency.

- The turntable with automatic centering and leveling function is equipped as standard, which frees operators from manual centering and leveling operations.
- Automatic control of holder arm posture (vertical/horizontal) and the rotation feature of the detector (rotates in 1° increments in the range of 0 to 270°) enables continuous measurement of various feature combinations, such as OD/ID and/or top/ bottom plane measurements.
- A Mitutoyo linear scale is used in the X-axis drive unit to directly detect the position of the drive unit. It guarantees the highly precise positioning vital for automatic measurement.
- A roughness detector (optional) is supported.



RA-H5200AS PLUS
with side table
(option 178-181)



SPECIFICATIONS

Model No.		RA-H5200AS PLUS		RA-H5200AH PLUS			
		inch/mm		211-533-11		211-534-11	
Turntable	Rotational accuracy (JIS B 7451-1997)	Radial direction	(0.02 + 3.5H/10000) μm H: Probing height (mm)				
		Axial direction	(0.02 + 3.5X/10000) μm X: Distance from the center of rotation (mm)				
	Maximum loading mass	80 kg (On auto-centering: 65 kg)					
	Maximum probing diameter	ø356 mm					
Vertical movement (Z-axis column unit)	Vertical travel	350 mm		550 mm			
X-axis	Travel range	225 mm (-25 mm to +200 mm from the rotation center)					
Detector	Measuring range	Standard	±400 μm/±40 μm/±4 μm				
		Tracking	±5 mm				



Need Support?



Refer to the Roundtest
RA-H5200 Series Brochure
(E15011(2)-US) for more details.

Roundtracer

ROUNDTRACER EXTREME SERIES 211 — CNC Roundness/ Cylindricity Measuring System



RTX-0605-A
(Optional side table 12AAV541)

SPECIFICATIONS

Model No.		RTX-0605-A	
		inch/mm	
		211-552-11	
Turntable	Rotational accuracy (JIS B 7451:1997)	Radial direction	(0.02 + 3.5H/10000) μm H: Probing height (mm)
		Axial direction	(0.02 + 3.5R/10000) μm R: Measuring radius (mm)
	Maximum loading mass		60 kg
	Maximum probing diameter		ø680 mm
Vertical movement (Z-axis column unit)	Travel range		550 mm
X-axis	Travel range		197 mm (-33 mm to 164 mm from the rotation center)*
Detectors	Measuring range		±400 μm/±40 μm/±3.6 μm

* Value when the measuring system is mounted with a roundness detector and a standard stylus, and is in the outside diameter measuring position with the stylus at 0°.

Roundtracer Flash Series 211 - Roundness / Cylindricity Measuring System



211-581-02MEU

The Roundtracer Flash is a fast, flexible and precise optical shaft measuring system. The instrument is a good solution for accurate quality control in a laboratory as well as in the production environment.

- Dimensional, position, form analysis in static and dynamic mode.
- Image sensors integrated in a fixed position across the product structure to cover the entire measurement range.
- Less mechanical stress.
- Side-by-side 2D image architecture.
- Short cycle time.
- One-click measuring cycle activation.
- Graphical user interface via touchscreen monitor.
- Thread and camshaft measurement functionality.

SPECIFICATIONS

Model No.		S100	S300
		211-581-01MEU	211-583-01MEU
Z-axis (column) vertical travel		100mm	300mm
Measuring Range		ø60 mm	
Max. turntable loading		6 kg	
Measuring uncertainty	Length	U95 (2+L[mm])/200) μm	
	Diameter	U95 (1+LDmm)/200) μm	
Workpiece loading mode		Manual and automatic (by robot)	
Workpiece rotation		Standard	
Measuring mode		Static and dynamic	
Dimensions (WxDxH)		925x615x640mm	925x615x840mm

MeasurLink ENABLED
Data Management Software by Mitutoyo



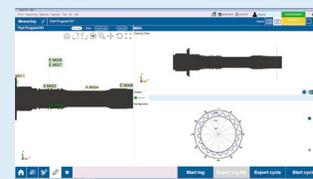
- ROUNDTRACER EXTREME models are triple-role CNC profile measuring systems that integrate the roundness and cylindricity measuring capabilities of our ROUNDTTEST models and the contour and surface roughness measuring capabilities of our hybrid, dual-role FORMTRACER models to measure surface roughness, contour, roundness, and cylindricity.



- A detector holder with motorized sliding function enables continuous inside and upper surface measurement of thick workpieces.



Refer to the ROUNDTRACER EXTREME Brochure (E15032) for more details.



Smart search function provides part detail review by images and trend visualization.



Superior setup flexibility



Intuitive user interface

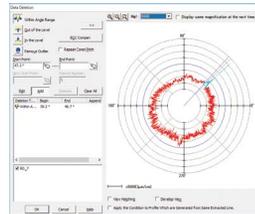
ROUNDPAK Roundness/Cylindricity measurement/Analysis software

- A wide variety of parameters including those for roundness/cylindricity, as well as flatness and parallelism, are provided as standard features. You can visually select these parameters using icons.

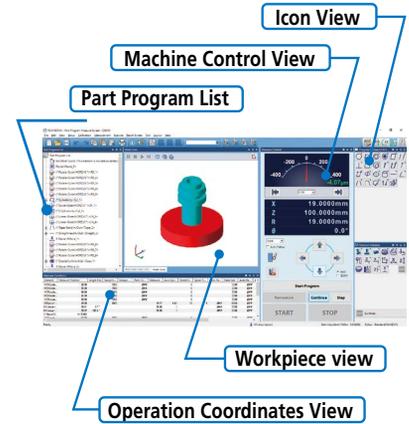


ROUNDPAK also comes with specialized functions, such as the design value best-fit analysis function, the harmonic analysis function, and a function for recording the peak or trough points on a circumference. Data that has already been collected can be easily used for re-calculation or deleted.

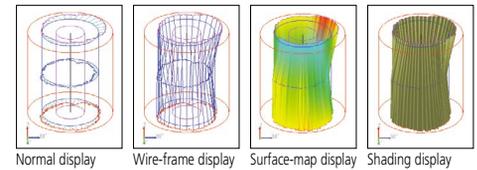
Data deletion



- The customer can create reports in custom formats by specifying how the analysis results will be displayed as well as the sizes and positions of graphics. The analysis result window can be directly utilized as a layout window. Since the measurement procedure, including the layout information, is saved, the entire process, from measurement start, calculation, result saving, and finally to printing, can be automatically executed.



- Analysis results such as cylindricity and coaxiality can be visually expressed in 3D graphics.



- An offline teaching function is provided to create a part program (measurement procedure) without an actual measurement target, enabling the user to virtually execute the measurement operation in a 3D simulation window.

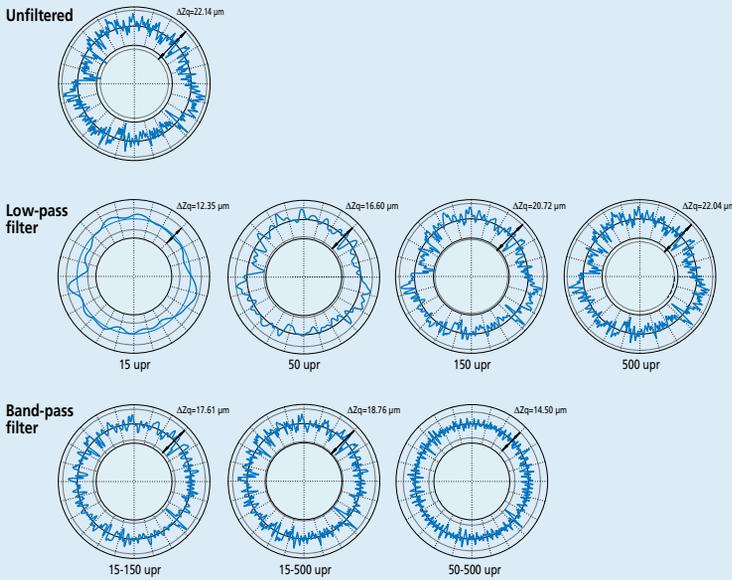
Analysis type		Model	RTX-0605-A	RA-2200/H5200 PLUS/H5200 PLUS	RA-1600	RA-120P	RA-120	RA-10
Roundness	○		✓	✓	✓	✓	✓	✓
Cylindricity	∅		✓	✓	✓			
Concentricity	◎		✓	✓	✓	✓	✓	✓
Coaxiality	Axis element	◎	✓	✓	✓	✓	✓	✓
	Axis	◎	✓	✓	✓	✓	✓	✓
Flatness	□		✓	✓	✓	✓	✓	✓
Parallelism	//		✓	✓	✓	✓	✓	
Perpendicularity	⊥		✓	✓	✓	✓	✓	
Radial deviation	△		✓	✓	✓			
Thickness deviation	⊙		✓	✓	✓	✓	✓	
Radial runout	↗		✓	✓	✓	✓	✓	✓
Total runout	↗		✓	✓	✓			
Diameter measurement	∅		✓	✓	✓			
Straightness	—		✓	✓	✓			
Inclination	∟		✓	✓	✓			
Taper	∧		✓	✓	✓			
Diameter contour tolerancing	⊕		✓	✓	✓			
Rectilinear contour tolerancing	∩		✓	✓	✓			
Width measurement (only CNC)	■		✓	✓ (only PLUS and CNC)				
Power spectrum	▒		✓	✓	✓			
Harmonic analysis	⊕		✓	✓	✓	✓		
Profile operation	±		✓	✓	✓	✓		
Tapered surface analysis	∩		✓	✓	✓			
Lead (twist) analysis	∕		✓ (optional)					
3D surface property analysis	⊗		✓ (optional)					



Find Training

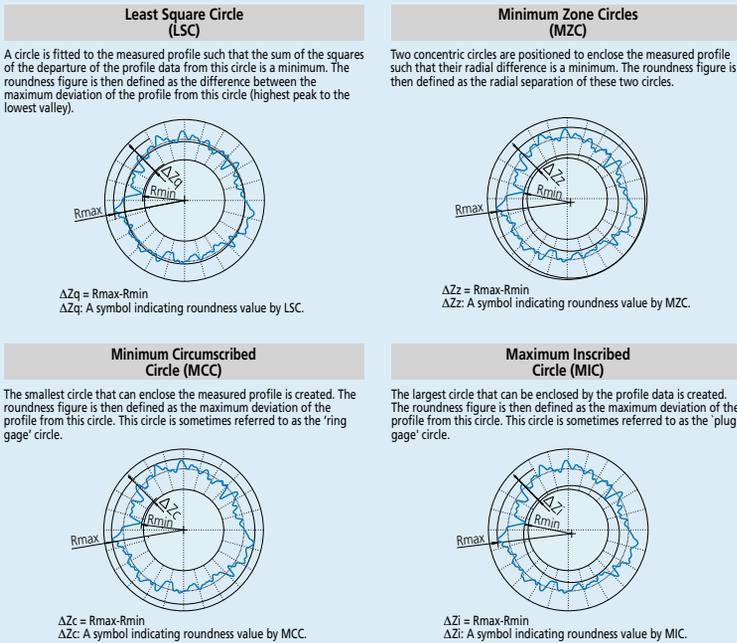
Effect of Filter Settings on the Measured Profile ISO 12181-2: 2011**4

Profiles can be filtered in various ways to reduce or eliminate unwanted detail, with a cut-off value set in terms of undulations per revolution (upr). The effect of different upr settings is shown in the diagrams below, which illustrate how the measured roundness value decreases as lower upr settings progressively smooth out the line.



Evaluating the Measured Profile Roundness ISO 12181-1: 2011**5, ISO 4291: 1985**3

Roundness testers use the measurement data to generate reference circles whose dimensions define the roundness value. There are four methods of generating these circles, as shown below, and each method has individual characteristics so the method that best matches the function of the workpiece should be chosen. Each method results in a different center position for the reference circles and therefore affects the axial location of the circular feature measured.



Filtering

	2CR filter	Gaussian filter
Standard	ISO 4291: 1985**3	ISO 12181-1: 2011**5
Attenuation rate	75%	50%

Terms and abbreviated terms ISO 12181-1: 2011**5

Abbreviated terms	Terms
LSCI	Least squares reference circle
LSCY	Least squares reference cylinder
LSLI	Least squares reference line
LSPL	Least squares reference plane
LCD	Local cylindricity deviation
LFD	Local flatness deviation
LRD	Local roundness deviation
LSD	Local straightness deviation
MICI	Maximum inscribed reference circle
MICY	Maximum inscribed reference cylinder
MCCI	Minimum circumscribed reference circle
MCCY	Minimum circumscribed reference cylinder
MZCI	Minimum zone reference circles
MZCY	Minimum zone reference cylinder
MZLI	Minimum zone reference lines
MZPL	Minimum zone reference planes
UPR	Undulations per revolution

Parameters and abbreviated terms ISO 12181-1: 2011**5

Abbreviated terms	Parameter	Reference element*			
		Minimum zone	Least square	Minimum circumscribed	Minimum inscribed
CYLtt	Cylinder taper		✓		
STRsg	Generatrix straightness deviation		✓		
STRlc	Local generatrix straightness deviation		✓		
CYLp	Peak-to-reference cylindricity deviation		✓		
FLTp	Peak-to-reference flatness deviation		✓		
RONp	Peak-to-reference roundness deviation		✓		
STRp	Peak-to-reference straightness deviation		✓		
CYLt	Peak-to-valley cylindricity deviation	✓	✓	✓	✓
FLTt	Peak-to-valley flatness deviation	✓	✓		
RONt	Peak-to-valley roundness deviation	✓	✓	✓	✓
STRt	Peak-to-valley straightness deviation	✓	✓		
CYLv	Reference-to-valley cylindricity deviation		✓		
FLTv	Reference-to-valley flatness deviation		✓		
RONv	Reference-to-valley roundness deviation		✓		
STRv	Reference-to-valley straightness deviation		✓		
CYLq	Root-mean-square cylindricity deviation		✓		
FLTq	Root-mean-square flatness deviation		✓		
RONq	Root-mean-square roundness deviation		✓		
STRq	Root-mean-square straightness deviation		✓		
STRsa	Straightness deviation of the extracted median line	✓	✓	✓	✓

* The reference elements to which the parameter can be applied.

*1 ISO/DIS 1101: 1996 Geometrical Product Specifications (GPS) - Geometrical tolerancing - Tolerancing of form, orientation, location and run-out
 *2 ISO 5459 Technical drawings - Geometrical tolerancing - Datums and datum-systems for geometrical tolerances
 *3 ISO 4291: 1985 Methods for the assessment of departure from roundness - Measurement of variations in radius
 *4 ISO 12181-2: 2011 Geometrical Product Specifications (GPS) - Roundness - Part2: Specification operators
 *5 ISO 12181-1: 2011 Geometrical Product Specifications (GPS) - Roundness - Part 1: Vocabulary and parameters of roundness

Featured Products



Micro Vickers Hardness Testing Machines

HM 200 series Type A

Refer to page K-4 for details.



Micro Vickers Hardness Testing Machines

HM-200 Series Type B and Type D

Refer to page K-5 for details.



Vickers Hardness Testing Machines

HV-100 Series

Refer to page K-6 for details.



Rockwell Hardness Testing Machines

HR-300/HR-400

Refer to page K-9 for details.



Rockwell Hardness Testing Machines

HR-530/530L

Refer to page K-10 for details.



Rockwell Hardness Testing Machines

HR-600

Refer to page K-11 for details.



Portable Hardness Testing Instruments

Hardmatic HH-411

Refer to page K-14 for details.



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Micro Hardness Testing Machines

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Rockwell Hardness Testing Machines

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HR-530/530L Rockwell Tester	K-10
HR-600 Rockwell Tester	K-11
Optional Accessories for Rockwell Testers	K-12

Portable Hardness Testing Machines

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Quick Guide to Precision Measuring Instruments - Hardness Testing Machines	K-17

Lineup of Hardness Testing Machines

Hardness testing machines provide the simplest and most economical testing methods among many material testing machines, playing an important role in research activities, production activities, and commercial transactions.

Mitutoyo offers a choice of standard hardness testing machines that are optimal for hard materials such as metals to soft materials such as plastic and rubber, as well as custom-designed testers such as in line-type automatic machines and labor-saving machines required on the shop floor.

Microhardness (Micro-Vickers)



Automatic Vickers Hardness Testing



Rebound Type Portable



Rockwell



Rockwell Superficial



Vickers



For Rubber and Plastic



Find a Distributor

Technical Data

Test force range:

HM-210A: 9 steps + arbitrary test force

HM-220A: 19 steps + arbitrary test force

Load dwell time: 0 - 999s

Manual XY stage unit

Stage size: 100x100mm

Travel range: 25x25mm

with Digimatic in/mm micrometer heads

Resolution: 0.001mm

Max. specimen height: 133mm (Stage size: 25 x 25mm)

Max. specimen height: 121mm (Stage size: 50 x 50mm)

Max. specimen depth: 160mm (from the center of indenter)

Optical path: 4-port objectives switching system of Infinity-correction optical system

Resolution: 0.01µm (When using objectives of X40 or more)

Data output: Serial interface (RS-232),

Digimatic interface, USB 2.0

Power supply: 39VA 100-125/220-240V AC, 50/60Hz

Dimensions: (W x D x H): 315x671x595mm

Mass: 43kg

Optional Accessories (Factory-installed option)

11AAE665: Objective lens unit 2X

11AAE666: Objective lens unit 5X

11AAE667: Objective lens unit 10X

11AAE668: Objective lens unit 20X

11AAE669: Objective lens unit 100X

11AAE677: Measuring microscope (Digital ocular)

11AAE670: Knoop Indenter Assembly (HM-210 Series)

11AAE671: Knoop Indenter Assembly (HM-220 Series)

Optional Accessories

810-454-20A: TV camera unit (8.4 inch LCD)

19BAA058: Diamond indenter for Vickers (HM210 Series standard test force)

19BAA059: Diamond indenter for Vickers (HM220 Series low test force)

19BAA061: Diamond indenter for Knoop (HM210 Series)

19BAA062: Diamond indenter for Knoop (HM220 Series)

810-013: Specimen (thin plate) holder

810-014-1: Specimen (wire) holder

810-015-1: Specimen (wire or ball) holder

810-016: 50 mm Vise

810-017: 100 mm Vise

810-019: Specimen tilting holder

810-020: Universal specimen holder

810-018: Rotary table

810-084: Rotatable universal specimen holder

810-085: Adjustable specimen (thin plate) holder

810-095: Rotatable specimen stage

375-056: Stage Micrometer (glass) Micro-scale

810-650-1: Resin mold specimen stage ø25.4

810-650-2: Resin mold specimen stage ø30

810-650-3: Resin mold specimen stage ø31.75

810-650-4: Resin mold specimen stage ø38.1

810-650-5: Resin mold specimen stage ø40

810-641: Vibration Isolator

810-420: 25x25mm stage (metric only)

810-423: 50x50mm stage (metric only)

810-424: 1" x 1" in/mm stage (standard)

810-427: 2" x 2" in/mm stage



Power turret with up to 2 indenter mounts and 4 objective mounts (manual operation possible)



Touch-screen type control panel

HM-210 / 220 Type A

SERIES 810 — Micro Vickers Hardness Testing Machines

- The electromagnetic force motor used in the loading mechanism enables the test force to be freely selected (see test force specifications) over the wide range of 0.4903mN to 19610mN (0.05gf to 2 kgf). It is also possible to freely set load dwell times. Now your desire for absolute control over the indentation size in Vickers hardness testing can be satisfied. The HM-200 series always offers the test force most appropriate for the specimen material and shape.
- Newly-designed 'MH Plan' objectives are optimized for measuring indentation images. The lineup includes 6 types of long working distance objectives: 10X, 20X, 50X and 100X for measuring indentation images, and 2X and 5X for enabling wide-range measurement around indentations.
- The long working distance objectives enable a comfortable working distance between the objective and the specimen surface. This greatly reduces the possibility of collision between the specimen and the objective during focusing operations. (e.g. for 50X objectives: 1.1mm for conventional models, 2.5mm for HM-200 series).
- LEDs, which have a longer life, produce less heat, consume less power and are more energy efficient than incandescent bulbs, are employed for the illumination system.
- The motorized turret allows for up to 4 objective lenses and 2 indenter assemblies to be mounted at the same time.



Observation image of the indentation (50X)



Stray light reduction around the indentation



HM-210A

SPECIFICATIONS TYPE A Digital Hardness Tester

Model No.	HM-210 Type A	HM-210 Type A V/K	HM-220 Type A	HM-220 Type A V/K
Order No.	64AAB305PA	64AAB306PA	64AAB307PA	64AAB308PA
Fixed test force (mN)	98.07, 196.1, 294.2, 490.3, 980.7, 1961, 2942, 4903, 9807 (10gf-1000gf)		0.4903, 0.9807, 1.961, 2.942, 4.903, 9.807, 19.61, 29.42, 49.03, 98.07, 196.1, 294.2, 490.3, 980.7, 1961, 2942, 4903, 9807, 19610 (0.05 gf-2kgf)	
Arbitrary test force	≤100 gf in 1 gram increments, > 100gf in 10 gram increments		< 1 gf in .1 gf increments, ≤100 gf in 1 gram increments, > 100gf in 10 gram increments	
Test force control	Force generation by electromagnetic and automatic control (load, dwell, unload)			
Control unit	Color LCD Touch Screen			
Loading rate	60 µ/ sec		60µm/s, Variable between 2 and 60µm/s. ≤ 30 gf.	
Load dwell time	0-999 sec			
Indenter	Vickers	Vickers and Knoop	Vickers	Vickers and Knoop
Objective lenses	10x, 50x	10x, 20x, 50x	10x, 50x, 100x	10x, 50x, 100x
Objective turret	Motor driven and manual operation			
Filar eye piece	Dual Line, 10X, .01µ min			

With TV camera unit 810-454-20A (selectable with HM-210A/220A)

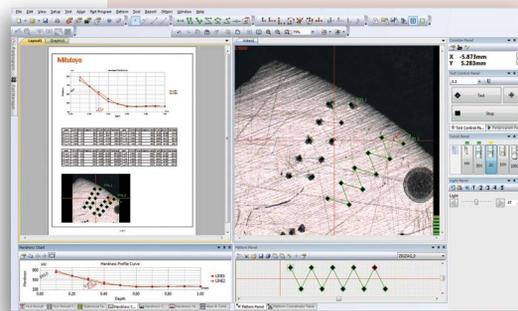
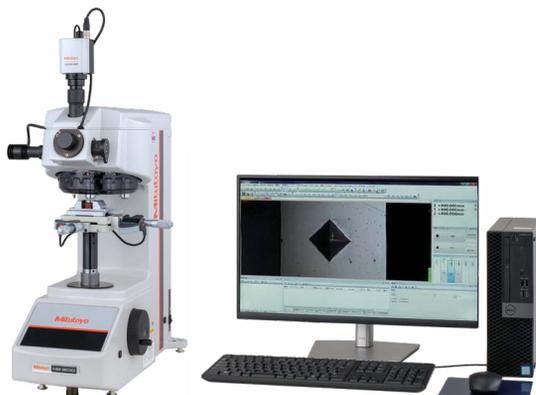
Measurement of indentation dimensions on a TV monitor reduces eye fatigue, which leads to improvement in operation efficiency in multi-point testing.



HM-200 Series with AVPAK software

For semi and fully automatic Type B and D Systems

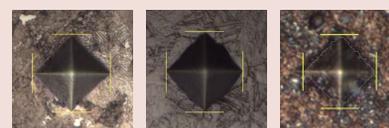
System B (HM-210B/220B)



AVPAK Software

System B is equipped with **AVPAK-10**, a software package that automatically measures the diagonal length of an indentation and calculates the corresponding hardness value. This means that measurement error caused by variation in operator interpretation is eliminated, thereby reducing costs.

Automatic measurement of indentation/ manual stage



Indentation-reading example



System D (HM-210D/220D)

In addition to the functions of System B, System D is equipped with the autofocus function and motorized x-y stage. This function allows for automatic hardness testing, thereby increasing efficiency and reducing labor costs.

Automatic measurement of indentation / motorized XY stage / Autofocusing

System D Technical Data

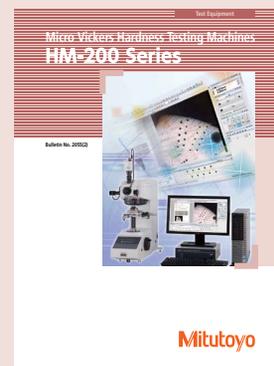
Motorized X-Y Stage	Travel Max	50 x 50 mm*
	Travel Min	1µ
	Table Size	130 x 130mm
Motorized Focusing Stage	Speed Max	25mm/ sec
	Max Range	1.4mm
	Min Unit	.1µ
Joystick Controller Functions	Max Speed	1mm/ sec
	Functions	X and Y Lock out
	Axis	X, Y and Z (Focus)
	Speed Control	Adjustable H,M,L
	Tester Control	Indent, Turret Position
Other	Emergency Stop	

*Optional 100 x 100 mm

SPECIFICATIONS

	TYPE B PC-Driven Test System		TYPE D PC-Driven Test System with motorized stage and auto focus	
Model No.	HM-210 Type B	HM-210 Type B V/K	HM-220 Type B	HM-220 Type B V/K
Order No.	64AAB323PA	64AAB324PA	64AAB325PA	64AAB326PA
Model No.	HM-210 Type D	HM-210 Type D V/K	HM-220 Type D	HM-220 Type D V/K
Order No.	64AAB380PA	64AAB381PA	64AAB382PA	64AAB383PA
Fixed test force (mN)	98.07, 196.1, 294.2, 490.3, 980.7, 1961, 2942, 4903, 9807 (10gf-1000gf)		0.4903, 0.9807, 1.961, 2.942, 4.903, 9.807, 19.61, 29.42, 49.03, 98.07, 196.1, 294.2, 490.3, 980.7, 1961, 2942, 4903, 9807, 19610 (0.05 gf-2kgf)	
Arbitrary test force	≤100 gf in 1 gram increments, > 100gf in 10 gram increments		< 1 gf in .1 gf increments, ≤100 gf in 1 gram increments, > 100gf in 10 gram increments	
Test force control	Force generation by electromagnetic and automatic control (load, dwell, unload)			
Control unit	None, By PC*			
Loading rate	60 µ/ sec		60µm/s, Variable between 2 and 60µm/s. ≤ 30 gf.	
Load dwell time	0-999 sec			
Indenter	Vickers	Vickers and Knoop	Vickers	Vickers and Knoop
Objective lenses	10x, 50x	10x, 20x, 50x	10x, 50x, 100x	10x, 50x, 100x
Objective turret	Motor-driven and manual operation			
Filar eye piece	None			
CCTV camera	3 megapixel, 1/2"		3 megapixel, 1/2"	
Software	AV Pak		AV Pak	

*Must use specified PC



Mitutoyo

Refer to **HM-200 Series Brochure 2055(2)** for more details.

HV110 / HV120

Series 810—Vickers Hardness Testing Machines – Type A

Optional Accessories

Lens:

11AAC712	OBJECTIVE LENS 2X
11AAC713	OBJECTIVE LENS 5X
11AAC714	OBJECTIVE LENS 20X
11AAE675	OBJECTIVE LENS 50X
11AAE676	OBJECTIVE LENS 100X

Stage

810-423	MANUAL STAGE 50X50
810-427	MANUAL STAGE 2"X 2" (In/mm)

936937	SPC cable (1m / 40")
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Optical

11AAC711	"C" mount CAMERA ADAPTER
810-454-20A	CCTV System

Indenters

19BAA060	DIAMOND INDENTER (VICKERS TYPE)
19BAA063	KNOOP DIAMOND INDENTER
06AFM380D	USB Input Tool Direct for data entry into Excel

- Heavy load Vickers testing machines feature motorized force selection from 1-50kgf or .3 to 30kgf. Fully adjustable long-life LED illumination runs cool.
- A dual-line filar eyepiece combines with a color touch-screen LCD to create accurate measurements with the touch of a button.
- The motorized turret can accommodate up to 3 long working distance objective lenses for an even wider range of materials and a wide variety of anvils and x-y stages are also available.



HV120 show with optional **810-545-20A** CCTV Camera

SPECIFICATIONS

Model	HV110	HV120
Order No.	810-441A	810-446A
Test force	9.807N (1kgf), 19.61N (2kgf), 29.42N (3kgf), 49.03N (5kgf), 98.07N (10kgf), 196.1N (20kgf), 294.2N (30kgf), 490.3N (50kgf)	2.942N (0.3kgf), 4.903N (0.5kgf), 9.807N (1kgf), 24.51N (2.5kgf), 49.03N (5kgf), 98.07N (10kgf), 196.1N (20kgf), 294.2N (30kgf)
Supported test method	HV, HK, HB (Light Force*), Kc	
Test force selection	Motorized	
Loading accuracy	±1%	
Load control	60μ/s, 150μ/s Automatic (loading, duration, unloading)	
Load rate	5~999 sec.	
Objective lens	2X, 5X, 10X (standard), 20X, 50X, 100X	
Measuring microscope	10X Dual-line filar	
Total magnification	20-1000X (100X Standard) ¹	
Field of view	1,400μ (10X Lens) Type A	
Minimum reading	< 50x = 0.1μm, ≥50x = 0.01μm	
Display	Color LCD touch-screen	
Scaled conversion:	8 Types (ASTM, ISO, JIS, SAE and BS)	
Statistics:	N, Max., Min., Average, Range, High, Low, Good, Over, Under, SD(n-1), SD(n), SD(n) Go/No-go judgment,	
Curvature correction:	0.01 to 200.00mm	
Maximum sample height	210mm Type A	
Maximum sample depth	160mm	
Maximum sample weight	20 Kg Anvil, 10 Kg with x-y Stage	
Optical path	100% Eyetube or Camera	
Output	Rs232, SPC, USB2.0	
Power supply	120 Volt AC/ 60 Hz	
Dimensions main unit (WxDxH)	9.9" x 24.7" x 30.7" (252x627x781mm)	
Mass	110lbs. (50kg)	

* Optional test forces may be required.
1: 10x eyepiece included.
Contact Mitutoyo for more information.

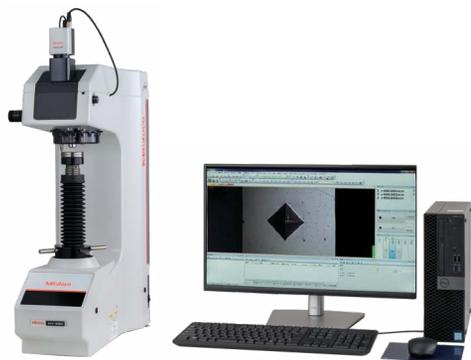


Got Questions?

HV110 / HV120

Series 810—Vickers Hardness Testing Machines – Type B / D

- The Type B HV110/ HV120 Vickers hardness testers add computer control to make measurements even more repeatable.
- A high-resolution 3 mega-pixel camera produces crisp images that are automatically measured in less than .3 seconds.
- Various software functions such as automatic light intensity, simple-to-use report generator and programming wizards make tedious and repetitive testing requirements more accurate than manual testing and eliminates common operator errors.
- The Type D HV110 / 120 adds a motorized X-Y stage with up to 100mm x 100mm of travel for large samples. A motorized focusing platform is also utilized for a complete walk away system.



Type B System
show with optional PC



Type D System
show with optional PC

SPECIFICATIONS

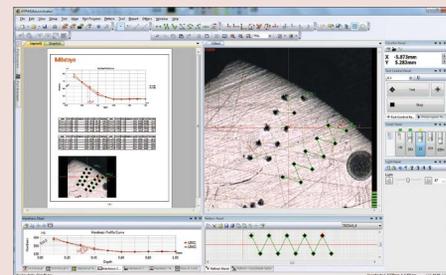
Model	HV110 Main Unit Only	HV120 Main Unit Only
Order No.	810-443A	810-448A
Test force	9.807N (1kgf), 19.61N (2kgf), 29.42N (3kgf), 49.03N (5kgf), 98.07N (10kgf), 196.1N (20kgf), 294.2N (30kgf), 490.3N (50kgf)	2.942N (0.3kgf), 4.903N (0.5kgf), 9.807N (1kgf), 24.51N (2.5kgf), 49.03N (5kgf), 98.07N (10kgf), 196.1N (20kgf), 294.2N (30kgf)
Supported test method	HV, HK, HB (Light Force**), Kc	
Measuring microscope	Optional	
Field of View w/ 10X Lens	590 x 443 μm	
Display	Via PC	
Curvature correction:	0.01 to 200.00mm	
Maximum sample height	172mm Type B, 132mm Type D	
Maximum sample depth	160mm	
Maximum sample weight	10 Kg Type B, 3 kg Type D	
Optical path	100% Eyetube or Camera	
Output	USB2.0	
Mass	110lbs. (50kg)	

*Other specifications as Type A testers

** Optional test forces may be required

Basic Configuration	Type B	Type D
Main Unit	810-443A or 810-448A	810-443A or 810-448A
AVPak-10 Software	11AAE268-USE	11AAE268-USE
PC***	***	***
Automatic Focus Stage		810-465
Motorized X-Y Stage 50x50		810-461-10
Motorized X-Y Stage 100x100		810-462-10

*** PC not included



Talk to Sales

Optional Accessories

Micro-Vickers/Vickers Hardness Testing Machine

50x50mm travel stage

Manual XY Stage Unit 50 x 50
Manual XY Stage Unit 2"x 2"
810-423 Metric
810-427 Inch/Metric



Clamping devices (Vises)



Vise
Max. opening: 3.94"(100mm)
810-017



Vise
Max. opening: 2"(51mm)
810-016

Rotary Table

Rotary Table
810-018



Round Tables

Dimensions: 7.08"(180mm)
810-037

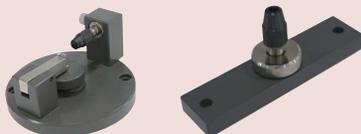


Specimen (thin plate) Holder

Secures a plate with a thickness of .197"(5mm) or less, or foil-like specimens.
810-013



Specimen (wire) Holder



Used to horizontally or vertically secure a wire or needle specimen that has a diameter of .126"(3.2mm) or less.

810-014-1 horizontal
810-015-1 vertical

Test Blocks

Order No.	Description	Load
64HAA375	Vickers 100HV Test Block	100gf
64HAA376	Vickers 200HV Test Block	100gf
64HAA377	Vickers 300HV Test Block	100gf
64HAA378	Vickers 400HV Test Block	100gf
64HAA379	Vickers 500HV Test Block	100gf
64HAA380	Vickers 600HV Test Block	100gf
64HAA381	Vickers 700HV Test Block	100gf
64HAA382	Vickers 800HV Test Block	100gf
64HAA383	Vickers 900HV Test Block	100gf
64HAA384	Vickers 100HV Test Block	300gf
64HAA388	Vickers 500HV Test Block	300gf
64HAA385	Vickers 200HV Test Block	300gf
64HAA386	Vickers 300HV Test Block	300gf
64HAA387	Vickers 400HV Test Block	300gf
64HAA389	Vickers 600HV Test Block	300gf
64HAA390	Vickers 700HV Test Block	300gf
64HAA391	Vickers 800HV Test Block	300gf
64HAA392	Vickers 900HV Test Block	300gf
64HAA393	Vickers 100HV Test Block	500gf
64HAA394	Vickers 200HV Test Block	500gf
64HAA395	Vickers 300HV Test Block	500gf
64HAA396	Vickers 400HV Test Block	500gf
64HAA397	Vickers 500HV Test Block	500gf
64HAA398	Vickers 600HV Test Block	500gf
64HAA399	Vickers 700HV Test Block	500gf
64HAA400	Vickers 800HV Test Block	500gf
64HAA401	Vickers 900HV Test Block	500gf
64HAA402	Vickers 100HV Test Block	1,000gf
64HAA403	Vickers 200HV Test Block	1,000gf
64HAA404	Vickers 300HV Test Block	1,000gf
64HAA405	Vickers 400HV Test Block	1,000gf
64HAA406	Vickers 500HV Test Block	1,000gf
64HAA407	Vickers 600HV Test Block	1,000gf
64HAA409	Vickers 800HV Test Block	1,000gf
64HAA408	Vickers 700HV Test Block	1,000gf
64HAA410	Vickers 900HV Test Block	1,000gf
64HAA411	Knoop 100HK Test Block	100gf
64HAA412	Knoop 200HK Test Block	100gf
64HAA413	Knoop 300HK Test Block	100gf
64HAA414	Knoop 400HK Test Block	100gf
64HAA415	Knoop 500HK Test Block	100gf
64HAA416	Knoop 600HK Test Block	100gf
64HAA417	Knoop 700HK Test Block	100gf
64HAA418	Knoop 800HK Test Block	100gf
64HAA419	Knoop 100HK Test Block	500gf
64HAA420	Knoop 200HK Test Block	500gf
64HAA421	Knoop 300HK Test Block	500gf
64HAA422	Knoop 400HK Test Block	500gf
64HAA423	Knoop 500HK Test Block	500gf
64HAA424	Knoop 600HK Test Block	500gf
64HAA425	Knoop 700HK Test Block	500gf
64HAA426	Knoop 800HK Test Block	500gf
64HAA427	Knoop 100HK Test Block	1,000gf
64HAA428	Knoop 200HK Test Block	1,000gf
64HAA429	Knoop 300HK Test Block	1,000gf

64HAA430	Knoop 400HK Test Block	1,000gf
64HAA431	Knoop 500HK Test Block	1,000gf
64HAA434	Knoop 800HK Test Block	1,000gf
64HAA432	Knoop 600HK Test Block	1,000gf
64HAA433	Knoop 700HK Test Block	1,000gf
64HAA435	Vickers 100HV Test Block	10kgf
64HAA436	Vickers 200HV Test Block	10kgf
64HAA437	Vickers 300HV Test Block	10kgf
64HAA438	Vickers 400HV Test Block	10kgf
64HAA439	Vickers 500HV Test Block	10kgf
64HAA440	Vickers 600HV Test Block	10kgf
64HAA441	Vickers 700HV Test Block	10kgf
64HAA442	Vickers 800HV Test Block	10kgf
64HAA443	Vickers 100HV Test Block	30kgf
64HAA444	Vickers 200HV Test Block	30kgf
64HAA445	Vickers 300HV Test Block	30kgf
64HAA446	Vickers 400HV Test Block	30kgf
64HAA447	Vickers 500HV Test Block	30kgf
64HAA448	Vickers 600HV Test Block	30kgf
64HAA449	Vickers 700HV Test Block	30kgf
64HAA450	Vickers 800HV Test Block	30kgf

*Other hardness ranges and test forces available

Indenters

Order No.	Type	Model
19BAA058	Vickers Indenter	HM-210 Series
19BAA059	Vickers Indenter	HM220
19BAA061	Knoop Indenter	HM-210 Series
19BAA062	Knoop Indenter	HM220
19BAA060	Vickers Indenter	HV Series
19BAA063	Knoop Indenter	HV Series

Universal Specimen Holder

Used to secure a specimen that has a measuring surface that is hard to stabilize perpendicular to the indenter axis.



810-020

Mounted Specimen Vise



1.5" (39mm) Max Height

810-650-1

810-650-2

810-650-3

810-650-4

810-650-5

Diameter

1" 25.4mm

30mm

1.25" 31.75mm

1.5" 38.1mm

40mm

Rockwell Hardness Testing Machines

HR-300/400 Series



HR-320MS Dual type (Rockwell/ Rockwell superficial) hardness testing machine

Changing of weights is required. Motor drive controls loading sequence. Loading navigator provides feedback for applying preliminary force.



HR-430MR Rockwell hardness testing machine

Equipped with automatic brake handle for auto start feature. Motor drive controls loading sequence.



HR-430MS Dual type (Rockwell/ Rockwell superficial combined use) hardness testing machine

Equipped with automatic brake handle for auto start feature. Motor drive controls loading sequence.



The digital type (HR-430MR and HR-430MS) with the adoption of the automatic brake handle and load sequence.



Features

- The newly designed frame provides maximum clearance for positioning the workpiece. A flat table is all that is needed for mounting these testing machines.
- The digital type (HR-320MS, HR-430MR and HR-430MS) has digimatic output and our Digimatic Mini-Processor (DP-1VA LOGGER) to print and input tools (USB-ITN-E) to connect to a PC and use for data transfer.

SPECIFICATIONS

Model	HR-320MS	HR-430MR	HR-430MS
Order No	810-192-31A	810-193-31A	810-193-31A
Type of hardness test	Rockwell		
	Rockwell superficial	-	Rockwell superficial
Preliminary test force (N)	29.42, 98.07 (3Kgf, 10Kgf)	98.07 (10Kgf)	29.42, 98.07)3Kgf, 10Kgf)
Test force (N)	Superficial	147.1, 294.2, 441.3 (15Kgf, 30Kgf, 45Kgf)	147.1, 294.2, 441.3 (15Kgf, 30Kgf, 45Kgf)
	Rockwell	588.4, 980.7, 1471 (60Kgf, 100Kgf, 150Kgf)	
Standard	IS B 7726 ISO6508-2 ASTM E18		
Display	Digital		
Minimum reading	0.1 HR graduation		
Preliminary test force (handling support)	Loading navigator indication	Automatic brake handle	
Preliminary test force setting	Dial Switching	-	Dial switching
Total test force setting	Weight change	Dial switching	
Total test force control	Motor drive, Button start	Motor drive, Automatic start	
Test force duration	3-5.5 s setting, Manual	1-99 s setting, Manual	
Maximum specimen dimensions	Height 180 mm (100 mm if the cover is attached), depth 165 mm (from indenter axis to the frame)		
Function	Success or failure decision function		
	Offset revision function		
	Hardness conversion function		
Data output	Digimatic RS-232C		
Power supply	AC Input : 100-240 V, 50-60 Hz, 1.8 A, DC Output: 12 V - 4.17 A		
Dimensions	214 (W) x 512 (D) x 780 (H) mm		
Mass	Approximately 47kg	Approximately 50kg	

Hardness Testers are compliant with ASTM requirements

810-192-21A and **810-194-21A** come with diamond indenter, 1/16" carbide ball indenter, HRC30 Block, HRC63 Block, HRBW95 Block, HR30N 60 Block and HR30TW 70 Block
810-193-31A comes with diamond indenter, 1/16" carbide ball indenter, HRC30 Block, HRC63 Block, and HRBW95 Block

HR-530/530L



HR-530
(810-233-33A)



Standard operating display



Fine-adjustment table for
Jominy testing
810-700

Optional Accessories: See page K-11, 12

Function: Touch-screen type

- Touch-screen operation with a back-lit LCD graphic display.
- Remote selection of the test force linked to the hardness scale selection.
- Choice of message language in English, German, French, Spanish, Italian and Japanese.
- Cylindrical and spherical surface compensation.
- Data offset.
- Conversion to other hardness scales.
- Powerful statistical processing with flexible data point editing and 1024 data memory.
- Measured data editing
- Go/no-go tolerance judgment.
- Statistical processing, histogram and x-R chart

SERIES 810 — Rockwell Type Hardness Testing Machines

- Closed Loop Test Force Control allows for a wide variety of hardness testing including Rockwell, Superficial and Light Force Brinell (6.25 to 187.5 kgf).
- Hardness testing of plastics according to ASTM D785 (Procedure A and B) and ISO 2039-2 are also possible.
- Projected nose type tester allows testing of interior parts
- 5 display formats are possible to show you the information you need. Statistics and graphs can also be displayed on the color touch screen control panel.
- Machine, blocks, and indenters are ASTM E18 compliant.
- Simple-to-use automatic brake-start system begins the test automatically when initial force is reached
- The HR-530 is available in 9.8" (250mm) or 15.5" (395mm) height capacity models.
- Complete with a combination diamond indenter, one flat and one V anvil, 2 HRC, 1 HRBW, 1 HR30TW and 1 HR30N test block.



5.7-inch color LCD

SPECIFICATIONS

Model	HR-530	HR-530L
Order No.	810-233-33A	810-333-33A
Hardness testing methods	Rockwell/Rockwell Superficial/Brinell/Plastics hardness	
Initial test force (N)	29.42N (3kgf), 98.07N (10kgf)	
Test force (N)	Rockwell Superficial: 147.1N (15kgf), 294.2N (30kgf), 441.3N (45kgf) Rockwell: 588.4N (60kgf), 980.7N (100kgf), 1471N (150kgf) Light Force Brinell: 61.29 (6.25kgf), 98.07 (10kgf), 153.2 (15.625kgf), 245.2 (25kgf), 294.2 (30kgf), 306.5 (31.25kgf), 612.9 (62.5kgf), 980.7 (100kgf), 1226 (125kgf), 1839 (187.5kgf)	
Test force control	Automatic (load/hold/unload)	
Table up/down mechanism	Manual (automatic braking and load sequencing)	
Control unit	Color touch-panel	
Test force switching	Operated with the display unit	
Test force hold time	1 to 120s (Selectable in units of 1s)	
Maximum specimen size	Height: 9.8" (250 mm) Depth: 5.9" (150 mm)	Height: 15.5" (395 mm) Depth: 5.9" (150 mm)
Permissible inside diameter of a tube specimen	Minimum hole diameter: 1.38" (35 mm) (when using the special indenter: .87" (22 mm))	
Maximum table loading	45 lb (20 kg)	
Ball indenter	Tungsten carbide ball indenter	
Unit (display unit)	inch	
Display	Hardness value, test condition, go/no-go judgment result, statistical calculation result, X-R control chart, hardness conversion value Conversion function [HV, HK, HR (Rockwell hardness A, B, C, D, F, G / Rockwell Superficial 15T, 30T, 45T, 15N, 30N, 45N), HS, HB, tensile strength] Go/no-go judgment function Continuous test function (for specimens with the same thickness) Cylindrical correction, spherical correction, offset correction, multi-point correction functions Statistical calculation function (maximum value, minimum value, mean value, standard deviation, upper limit value, lower limit value, go count, range, no-go count) Graph generation function (X-R control chart)	
Language support	Japanese, English, German, French, Italian, Spanish, Korean, Chinese (simplified characters/traditional characters), Turkish, Portuguese, Hungarian, Polish, Dutch and Czech	
External data output	RS-232C, SPC, USB2.0	
Power supply	AC120V	
External dimensions	Main unit: 9.84" x 26.38" x 23.82" (250(W) x 667(D) x 621(H) mm)	11.8" x 26.2" x 30.1" (300(W) x 667(D) x 766(H) mm)
	Touch-panel display	191(W) x 147(D) x 71(H) mm
Mass	Approx. 60 kg	Approx. 69 kg

Note: Plastic testing may not be enabled, depending on the material.

Hardness Testing Machines



MeasurLink ENABLED
Data Management Software by Mitutoyo



HR-600 SERIES 810 — CNC Rockwell Hardness Testing Machines

- A workpiece that cannot be placed on a tester due to its large size can be placed on the stage of this product and tested as-is. (Maximum loading mass 100 kg)
- The motorized stage makes automatic multi-point testing at multiple places and of multiple workpieces possible.
- Plastic hardness testing is also available in addition to Rockwell/Brinell tests on metal. Brinell and Vickers indentation hardness tests which do not require vision measurement can also be performed.
- ASTM E18 compliant
- The **HR-610A/620A** is operable with a touch panel display (some functions are operable with **AVPAK** software) and the **HR-620B** is operable with a touch panel display and **AVPAK** software.
- Automatic testing by moving in the X-, Y- and Z-axis directions for workpieces with uneven surfaces or steps is made possible by adding X-axis stage and **AVPAK** software to **HR-620B**, which is equipped with a motorized Y-axis stage as standard. Also, using **FORMEio** software makes easy communication with PLCs for automation purposes, such as control of handling devices and work cells, possible.



HR-610A
(Motorized X-axis stage is available)



HR-620B
(With a motorized Y-axis stage as standard and an optional motorized X-axis stage)



SPECIFICATIONS

Model	HR-610A	HR-620A	HR-620B
Order No.	810-512-23A	810-522-23A	810-527-21A
Unit (display unit)	Rockwell/Rockwell Superficial/Brinell/Plastics hardness		
Indenter type *1	Diamond indenter and 1/16th inch carbide ball indenter		
Test force range	29.42 - 1839 N (3 - 187.5 kgf)	9.807 - 2452 N (1 - 250 kgf)	
Specimen height (Z-axis stroke)	40 - 250 mm		
Testable workpieces	Minimum surface dimensions	18 x 4 mm	
	Minimum inner diameter of pipe-type workpiece	ø400 mm	
	Concave workpiece	R25 mm or more, Height 20 mm or less	
	Minimum outside diameter	ø20 mm (See Figure 4)	
Z-axis speed	Approx. 10 mm/s		
Maximum depth (from indenter center)	220 mm		
X-axis stroke	None (Option: 160 mm or 300 mm)		
Y-axis stroke	None	160 mm (±80 mm)	
Y-axis speed	–	Approx. 50 mm/s	
Y-axis feed error	–	±0.1 mm or less	
Maximum table loading	100 kg		
Power supply	AC100 - 200 V 50/60 Hz		
Mass	176 kg	181 kg	205 kg

Hardness Testers are compliant with ASTM requirements

All **HR-600** machines come with diamond indenter, 1/16" carbide ball indenter, HRC30 block, HRC 63 block, HRBW 95 block, HR30N 60 block, and HR30TW 70 block

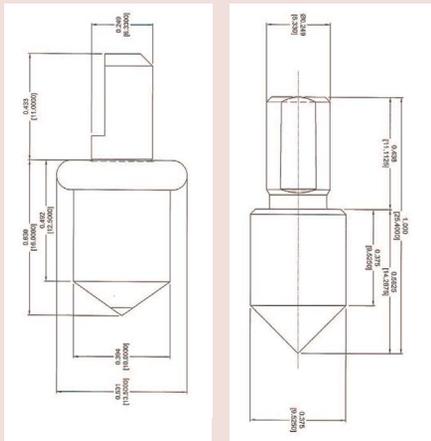


Refer to the **HR-600 Series Brochure (2295)** for more details.

Optional Accessories

Rockwell Type Diamond Indenters

Scale	Mitutoyo Round Style Order No.	Universal w/ Flat Style Order No.
C	64HAA105	64HAA100
N	64HAA106	64HAA101
C&N	64HAA107	64HAA104
A		64HAA102
"A" for Carbides		64HAA103



Round Style

Universal with Flat



Where to Buy

Test Blocks and Diamond Indenters

Test Blocks

Rockwell Test Blocks

Order No.	Hardness
64HAA145	HRA22 Rockwell Test Block
64HAA147	HRA30 Rockwell Test Block
64HAA149	HRA39 Rockwell Test Block
64HAA151	HRA49 Rockwell Test Block
64HAA153	HRA63 Rockwell Test Block
64HAA155	HRA68 Rockwell Test Block
64HAA157	HRA73 Rockwell Test Block
64HAA159	HRA78 Rockwell Test Block
64HAA161	HRA83 Rockwell Test Block
64HAA163	HRB0 Rockwell Test Block
64HAA164	HRBW10 Rockwell Test Block
64HAA165	HRBW20 Rockwell Test Block
64HAA166	HRBW30 Rockwell Test Block
64HAA167	HRBW40 Rockwell Test Block
64HAA168	HRBW50 Rockwell Test Block
64HAA169	HRBW60 Rockwell Test Block
64HAA170	HRBW70 Rockwell Test Block
64HAA171	HRBW80 Rockwell Test Block
64HAA172	HRBW95 Rockwell Test Block
64BAA124	HRC40/45 Rockwell Test Block
64BAA123	HRC30/35 Rockwell Test Block
64BAA158	HRC20/25 Rockwell Test Block
64HAA173	HRC25 Rockwell Test Block
64HAA174	HRC30 Rockwell Test Block
64HAA175	HRC35 Rockwell Test Block
64HAA176	HRC40 Rockwell Test Block
64HAA177	HRC45 Rockwell Test Block
64HAA178	HRC50 Rockwell Test Block
64HAA179	HRC55 Rockwell Test Block
64HAA180	HRC60 Rockwell Test Block
64HAA181	HRC63 Rockwell Test Block
64HAA182	HRC65 Rockwell Test Block
64HAA183	HRC67 Rockwell Test Block
64HAA193	HREW57 Rockwell Test Block
64HAA194	HRE62 Rockwell Test Block
64HAA195	HRE68 Rockwell Test Block
64HAA196	HRE75 Rockwell Test Block
64HAA197	HRE81 Rockwell Test Block
64HAA198	HRE87 Rockwell Test Block
64HAA199	HRE93 Rockwell Test Block
64HAA200	HRE99 Rockwell Test Block
64BAA156	HR15T61/63 Rockwell Test Block

* Please inquire for other hardness ranges

Test Blocks

Superficial Test Blocks

Order No.	Hardness
64HAA251	HR15N 72 Rockwell Test Block
64HAA253	HR15N 78 Rockwell Test Block
64HAA255	HR15N 83 Rockwell Test Block
64HAA257	HR15N 88 Rockwell Test Block
64HAA259	HR15N 91 Rockwell Test Block
64HAA261	HR15N 94 Rockwell Test Block
64HAA262	HR30N 46 Rockwell Test Block
64HAA264	HR30N 55 Rockwell Test Block
64HAA266	HR30N 64 Rockwell Test Block
64HAA268	HR30N 73 Rockwell Test Block
64HAA270	HR30N 80 Rockwell Test Block
64HAA272	HR30N 86 Rockwell Test Block
64HAA273	HR45N 25 Rockwell Test Block
64HAA276	HR45N 43 Rockwell Test Block
64HAA278	HR45N 55 Rockwell Test Block
64HAA280	HR45N 67 Rockwell Test Block
64HAA282	HR45N 72 Rockwell Test Block
64HAA284	HR15TW 61 Rockwell Test Block
64HAA286	HR15TW 67 Rockwell Test Block
64HAA288	HR15TW 73 Rockwell Test Block
64HAA290	HR15TW 80 Rockwell Test Block
64HAA292	HR15TW 86 Rockwell Test Block
64HAA294	HR30TW 15 Rockwell Test Block
64HAA296	HR30TW 28 Rockwell Test Block
64HAA298	HR30TW 43 Rockwell Test Block
64HAA300	HR30TW 56 Rockwell Test Block
64HAA302	HR30TW 70 Rockwell Test Block
64HAA304	HR45TW 2 Rockwell Test Block
64HAA306	HR45TW 23 Rockwell Test Block
64HAA308	HR45TW 42.5 Rockwell Test Block
64HAA310	HR45TW 67 Rockwell Test Block
64HAA278	HR45N 55 Rockwell Test Block
64HAA280	HR45N 67 Rockwell Test Block
64HAA282	HR45N 72 Rockwell Test Block

Calibration Set

Order No. 64HAA462	Order No. 64HAA463	Order No. 64HAA464	Order No. 64HAA465
HRC Scale Test Blocks	HRBW Scale Test Blocks	HR30N Scale Test Blocks	HR30TW Scale Test Blocks
64HAA181	64HAA172	64HAA270	64HAA303
64HAA177	64HAA170	64HAA266	64HAA301
64HAA173	64HAA168	64HAA262	64HAA299
Universal Style Indenter with Flat			
64HAA100	64HAA119	64HAA101	64HAA119

Carbide Ball Indenters

Description	Mitutoyo Round Style Order No.	Universal w/ Flat Style Order No.	Tapered w/Flat Style Order No.
1/16" Carbide ball indenter	64HAA120	64HAA119	64HAA129
1/8" Carbide ball indenter		64HAA122	
1/4" Carbide ball indenter		64HAA124	
1/2" Carbide ball indenter		64HAA126	
1/16" Carbide ball (10pc.)		64HAA131	
1/8" Carbide ball (1pc.)		64HAA133	
1/4" Carbide ball (1pc.)		64HAA135	
1/2" Carbide ball (1pc.)		64HAA137	

Steel Indenters/Balls Available Upon Request

Optional Accessories

For Rockwell/Rockwell Superficial Type Hardness Testing machine

Round table

810-038 Outside ϕ 250 mm



For large specimens such as molded items

Round table

810-037 Outside ϕ 180 mm



For large specimens such as molded items

V-anvil (large)

810-040

(Outside ϕ 40 mm,
Groove width 30 mm)



For round specimens (max. ϕ 60 mm)

V-anvil (small)

810-041

(Outside ϕ 40 mm,
Groove width 6 mm)



For shaft materials (max. ϕ 8.4 mm)

Spot anvil

810-043

(Outside ϕ 12 mm)



Spot anvil

810-044

(Outside ϕ 5.5 mm)

For sheet specimens



Jack rest

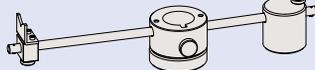
810-028

For supporting long specimens
(Used with anvil or round table)



VARI-REST

810-027

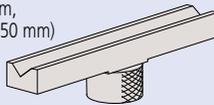


For testing long specimens (commonly used
for the anvil)

Special V-anvil

810-029

(Length 400 mm,
Groove width 50 mm)



For round specimens ϕ 14-98 mm

Diamond-spot anvil

810-030

(Outside ϕ 10 mm)

For sheet specimens



*Dedicated to the Rockwell Superficial hardness test

Small V-anvil

810-042

(Outside ϕ 10 mm)

For round specimens (max. ϕ 16 mm)



Testing machine table

11AAD186

Supplied with
stability bracket

Testing machine table



Vibration isolator

810-643

Only for mounting hardness testing machines

Foot switch

11AAD537



Digimatic mini-processor

DP-1VA

264-505A

Connection cable not supplied. (To be ordered separately.)



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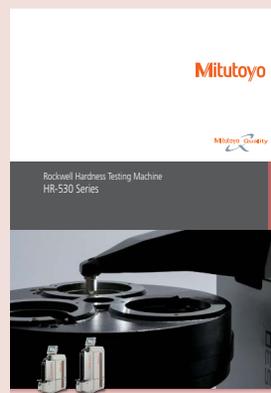
936937

Optional Accessories

HM200 and HR-530 Series:

06AFM380D: USB input tool – Tester to PC

936937: Tester to DP1-VA Printer



Refer to **HR-530 Series Brochure (2255)** for more details.

Hardmatic HH-V400

SERIES 810 — Impact Type Hardness Testing Unit

Standard Accessories

11AAE901:	Display unit
12BAS450:	AC adapter
12BAS451:	USB 2.0 cable (Type A-C)
11BAB687:	Handle
11AAA857:	Small support ring (ø14 mm)
05CAA952:	Phillips screwdriver
11PAA429:	Storage box
99MBG538B:	Quick start guide
99MBG537A:	Instruction manual

Optional Accessories

11AAE902:	Detector D
11AAE903:	Detector DC
11AAE904:	Detector D +15
11AAE905:	Detector DL
11AAD240:	Hardness test block
19BAA248:	Support ring for convex cylindrical surfaces (R10 to 20 mm)
19BAA249:	Support ring For concave cylindrical surfaces (R14 to 20 mm)
19BAA250:	Support ring for convex spherical surfaces (R10 to 27.5 mm)
19BAA251:	Support ring for concave spherical surfaces (R13.5 to 20 mm):)
19BAA457:	Carbide ball for Detectors D, DC, and D +15
19BAA458:	Replacement ball shaft for Detector DL

Calibration Blocks

64HAA467:	520 HLD range leeb hardness standard
64HAA468:	630 HLD range leeb hardness standard
64HAA469:	730 HLD range leeb hardness standard
64HAA470:	800 HLD range leeb hardness standard



Get a Quote

HH-V400 is Mitutoyo's newly designed rebound-type portable tester for metals with a compact body & high operability.

- LCD Interface
- Ability to store 1800 measurements
- Maintain up to 100 control groups
- Perform statistical analysis on measured data
- Rechargeable - No Batteries Required



810-306: HH-V400 ASTM compliant rebound tester
Includes Display unit - **11AAE901** & D Type Detector **11AAE902**

SPECIFICATIONS

Model	HH-V400	
Order No.	810-306	
Testing hardness and range	Leeb hardness: 100.0 to 999.9 HLD	
Testing direction	Omnidirectional (with automatic angle-correcting function)	
Hardness scale conversion function* (Conversion range varies depending on material)	Vickers hardness: 43 to 950 HV	
	Brinell hardness: 20 to 655 HB	
	Rockwell hardness (C-scale): 19.3 to 68.2 HRC	
	Rockwell hardness (B-scale): 13.5 to 101.7 HRB	
	Shore hardness: 30.1 to 99.5 HS (ASTM) 13.2 to 98.6 HS (JIS)	
Sample conditions	Tensile strength: 390 to 1999 MPa	
	Minimum thickness: 5 mm	
	Minimum mass: 5 kg	
	Testing position: At least 5 mm from the edge of the sample and at least 3 mm between test points	
Functions	Surface roughness: Ra 2.0 or less	
	Automatic angle correction, offset setting, acceptance judgment, hardness scale conversion, data memory storage (1800 points), statistical calculation function, eco mode, auto power-off, backlight	
Detector	Type	
	Dimensions	ø28 x 175 mm (excluding cable)
	Mass	Approx. 150 g
Display unit	Screen	2.83" (240 x 320 pixels), RGB color LCD
	Dimensions	174 x 68 x 32 mm
	Mass	Approx. 250 g
Power supply	C adapter, built-in battery (Ni-MH) (Up to 8 hours of operation after 100 minutes of charging)	

* HH-V400 guarantees the indicated values based on Leeb hardness. Converted values are for reference only.

Detector Conversion Ranges

Detector D, DC

Material	HV/Vickers	HB/Brinell	HRC/Rockwell C	HRB/Rockwell B	HS (ASTM)/Shore	VHS (JIS)/Shore	MPa/Tensile strength
Iron and steel	80 to 940	80 to 647	20.0 to 68.0	38.4 to 99.5	30.1 to 99.5	13.2 to 98.0	390 to 1999
Alloyed tool-steel	80 to 898	—	20.4 to 67.1	—	—	—	—
Gray iron	—	93 to 334	—	—	—	—	—
Spherical graphite cast iron	—	131 to 387	—	—	—	—	—
Stainless steel	85 to 802	85 to 655	19.6 to 62.4	46.5 to 101.7	—	—	—
Brass	43 to 196	40 to 173	—	13.5 to 95.3	—	—	499 to 701
Casting copper-based alloys	—	45 to 315	—	—	—	—	—
Casting aluminum-based alloys	—	20 to 159	—	—	—	—	—
Copper-tin-based alloys	—	60 to 290	—	—	—	—	—

Detector D +15

Material	HV/Vickers	HB/Brinell	HRC/Rockwell C	HRB/Rockwell B	HS (ASTM)/Shore	VHS (JIS)/Shore	MPa/Tensile strength
Iron and steel	80 to 937	80 to 638	19.3 to 67.9	—	33.3 to 99.3	35.3 to 97.8	394 to 1991
Tool steels for cold-work	80 to 935	—	19.8 to 68.2	—	—	—	—

Detector DL

Material	HV/Vickers	HB/Brinell	HRC/Rockwell C	HRB/Rockwell B	HS (ASTM)/Shore	VHS (JIS)/Shore	MPa/Tensile strength
Iron and steel	80 to 950	81 to 638	20.6 to 68.2	37.0 to 99.9	30.6 to 96.8	32.3 to 98.6	390 to 1976

Hardmatic HH-300

SERIES 811 — Durometers for Rubber and Plastics Hardness Testing

Digital / Dial Durometers are suitable for testing the nature of the following materials like natural rubber, neoprene, polyesters, P.V.C., leather, nitrite rubber, wax, vinyl, cellulose acetates, glass polystyrene, etc.



Compact Digital
Compact Dial

811-336-10
811-335-10

Long Leg Digital
Long Leg Dial

811-332-10
811-331-10

Technical Data

- Designed in accordance with the ASTM D 2240, ISO868, ISO 7619, DIN 53 505, JIS K 6253, and JIS K 7215 specifications.
- Units are available in both Shore A and Shore D scales, and will test a wide variety of applications.
- The Digital Durometer is provided with data hold function, permitting the operator to make an error-free reading on the LCD screen.
- The Dial Durometer is provided with a peak retaining hand for error-free reading.



SPECIFICATIONS

Model No.	Digital	HH-330	HH-336	HH-336	HH-332	HH-338	HH-338	HH-334
	Dial	HH-329	HH-335	HH-335	HH-331	HH-337	HH-337	HH-333
Order No.	Digital	811-330-10	811-336-10	811-336-11	811-332-10	811-338-10	811-338-11	811-334-10
	Dial	811-329-10	811-335-10	811-335-11	811-331-10	811-337-10	811-337-11	811-333-10
Scale		Shore E	Shore A			Shore D		
Applications		Soft Rubber, Sponge, Felt, Hard Foam	Natural rubber, soft elastomers, etc.			Hard elastomers, plastics, hard rubber, ebonite, etc.		
Resolution		0.1 (digital) or 1 (dial)				0.1 (digital) or 1 (dial)		
Range		HA: 10 - 90				HD: 20 - 90		
Standards	ASTM D 2240	—	3	3	3	3	3	3
	ISO 868	—	3	3	3	3	3	3
	ISO 7619	—	3	3	3	3	3	3
	DIN 53 505	—	—	3	—	—	3	3
	JIS K 6253	3	3	3	3	3	3	3
	JIS K 7215	—	3	3	3	3	3	3
Pressure foot		44 x 18mm	44 x 18mm	ø18mm		44 x 18mm	ø18mm	
Spring force (mN)		WE=550+HE	WA=550+75HD (HA:Reading 10-90)			WD=444.5HD (HD:Reading 20-90)		
Indenter		Sphere (Tip diameter: 0.79mm)	Blunt taper (Tip diameter: 0.79mm)			Sharp point (Tip curvature: 0.1±0.01mm)		
Tip angle		—	35°±0.25°			30°±0.5°		
Indenter diameter		5mm	1.25mm			1.25mm		
Indenter protrusion		2.5mm						
Functions		Digital: Data hold, Zero -setting, SPC output, Power ON/OFF (Power supply: SR44 x 1pc.) Analog Durometer: Peak retaining hand						
Type		Compact	Compact		Long-leg	Compact		Long-leg
Dimensions (WxDxH)	Digital	60 x 28.5 x 151	60 x 28.5 x 151mm		60 x 28.5 x 193mm	60 x 28.5 x 151mm		60 x 28.5 x 193mm
	Dial	56 x 33.5 x 144mm	56 x 33.5 x 144mm		56 x 33.5 x 186mm	56 x 33.5 x 144mm		56 x 33.5 x 186mm
Mass	Digital	290g	290g		310g	290g		310g
	Dial	300g	300g		320g	300g		320g

Hardmatic HH-300

Test Block Set

Testing stand applications

These stands are used to mount Durometers. They allow constant-pressure hardness measurement by pressing the Durometer vertically on a workpiece.

- Anyone can perform repeatable hardness measurement due to fewer possibilities of human error and measurement variations.
- The supplied weights can be attached directly to a Durometer and allow constant-pressure hardness measurement of large samples for which a stand cannot be used.
- The supplied weights are used for calibrating the spring tension of Durometers.



64AAA964



64AAA963



905693

811-332-10

264-505A

Order No.	Description
64AAA964	Calibration Set (Shore A Scale) Test Block 30* DURO (Blue) Test Block 60* DURO (Yellow) Test Block 90* DURO (Gray) Mahogany Box
64AAA590	Calibration Set (Shore D Scale) Test Block 20* DURO (Blue) Test Block 40* DURO (Gray) Test Block 80* DURO (Black)
64AAA962	"A" Scale Durometer Stand
64AAA794	"A" Scale Durometer Stand with Air Damper
64AAA796	Combination "D" & "A" Scale Durometer Stand
64AAA963	O-Ring Fixture Set 1/16", 3/32", 1/8", 3/16" and 1/4" O-Ring cross sections
264-505A	Digimatic Miniprocessor with printer
905693	Connecting Cable 40" (1m) for Durometer and Digimatic Miniprocessor

* Values shown are nominal only. Test Block Size 2" x 2" x 1/4"



Need Support?



■ Hardness Test Methods and Guidelines for Selection of a Hardness Testing Machine

Test Method	Micro Vickers	Micro surface material characteristics	Vickers	Rockwell	Rockwell Superficial	Durometer	Rebound type portable	Brinell	Shore
Material									
IC wafer	●	●							
Carbide, ceramics (cutting tool)		▲	●	●					
Steel (heat-treated material, raw material)	●	▲	●	●	●		●		●
Non-ferrous metal	●	▲	●	●	●		●		
Plastic		▲		●		●			
Grinding wheel				●					
Casting								●	
Sponge, rubber						●			
Shape									
Thin metal sheet (safety razor, metal foil)	●	●	●		●				
Thin film, plating, painting, surface layer (nitrided layer)	●	●							
Small parts, acicular parts (clock hand, sewing-machine needle)	●	▲							
Large specimen (structure)							●	●	●
Metallic material configuration (hardness for each phase of multilayer alloy)	●	●							
Plastic plate	▲	▲		●		●			
Sponge, rubber plate						●			
Inspection, judgment									
Strength or physical property of materials	●	●	●	●	●	●	▲	●	●
Heat treatment process	●		●	●	●		▲		▲
Carburized case depth	●		●						
Decarburized layer depth	●		●		●				
Flame or high-frequency hardening layer depth	●		●	●					
Hardenability test			●	●					
Maximum hardness of a welded spot			●						
Weld hardness			●	●					
High-temperature hardness (high-temperature characteristics, hot-workability)			●						
Fracture toughness (ceramics)	●		●						

Key: ● Well-suited ▲ Reasonably suited

■ Methods of Hardness Measurement

(1) Vickers

Vickers hardness is a test method that has the widest application range, allowing hardness inspection with an arbitrary test force. This test has an extremely large number of application fields particularly for hardness tests conducted with a test force less than 9.807N (1kgf). As shown in the following formula, Vickers hardness is a value determined by dividing test force F (N) by contact area S (mm²) between a specimen and an indenter, which is calculated from diagonal length d (mm, mean of two directional lengths) of an indentation formed by the indenter (a square pyramidal diamond, opposing face angle $\theta=136^\circ$) in the specimen using a test force F (N). k is a constant ($1/g=1/9.80665$).

$$HV=k \frac{F}{S}=0.102 \frac{F}{S}=0.102 \frac{2F \sin \frac{\theta}{2}}{d^2}=0.1891 \frac{F}{d^2} \quad \begin{matrix} F:N \\ d:mm \end{matrix}$$

The error in the calculated Vickers hardness is given by the following formula. Here, Δd_1 , Δd_2 , and 'a' represent the measurement error that is due to the microscope, an error in reading an indentation, and the length of an edge line generated by opposing faces of an indenter tip, respectively. The unit of $\Delta \theta$ is degrees.

$$\frac{\Delta HV}{HV} \approx \frac{\Delta F}{F} - 2 \frac{\Delta d_1}{d} - 2 \frac{\Delta d_2}{d} - \frac{a^2}{d^2} \cdot 3.5 \times 10^{-3} \Delta \theta$$

(2) Knoop

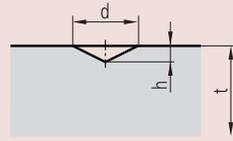
As shown in the following formula, Knoop hardness is a value obtained by dividing test force by the projected area A (mm²) of an indentation, which is calculated from the longer diagonal length d (mm) of the indentation formed by pressing a rhomboidal diamond indenter (opposing edge angles of $172^\circ 30'$ and 130°) into a specimen with test force F applied. Knoop hardness can also be measured by replacing the Vickers indenter of a microhardness testing machine with a Knoop indenter.

$$HK=k \frac{F}{A}=0.102 \frac{F}{A}=0.102 \frac{F}{cd^2}=1.451 \frac{F}{d^2} \quad \begin{matrix} F:N \\ d:mm \\ c:Constant \end{matrix}$$

(3) Rockwell and Rockwell Superficial

To measure Rockwell or Rockwell Superficial hardness, first apply a preload force and then the test force to a specimen and return to the preload force using a diamond indenter (tip cone angle: 120° , tip radius: 0.2mm) or a sphere indenter (steel ball or carbide ball). This hardness value is obtained from the hardness formula expressed by the difference in indentation depth h (μ m) between the preload and test forces. Rockwell uses a preload force of 98.07N, and Rockwell Superficial 29.42N. A specific symbol provided in combination with a type of indenter, test force, and hardness formula is known as a scale. Japanese Industrial Standards (JIS) define various scales of related hardness.

Relationship Between Vickers Hardness and the Minimum Allowable Thickness of a Specimen

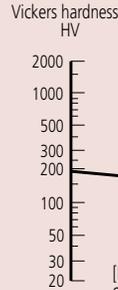


$$HV = 0.1891 \frac{F}{d^2}$$

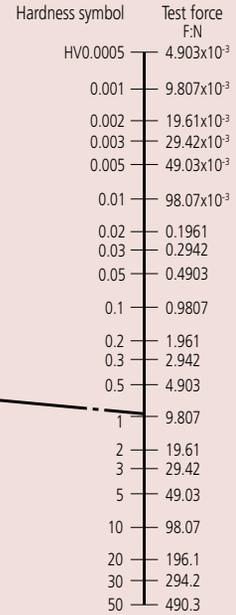
$$t > 1.5d$$

$$h = d/7$$

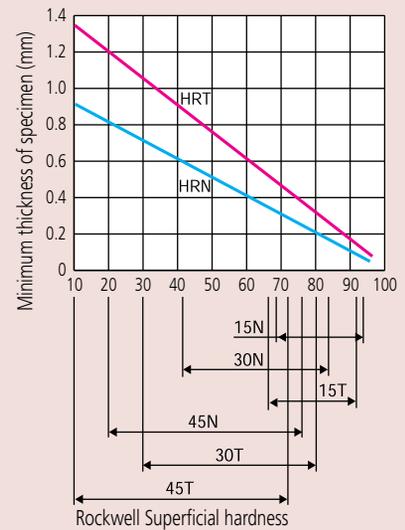
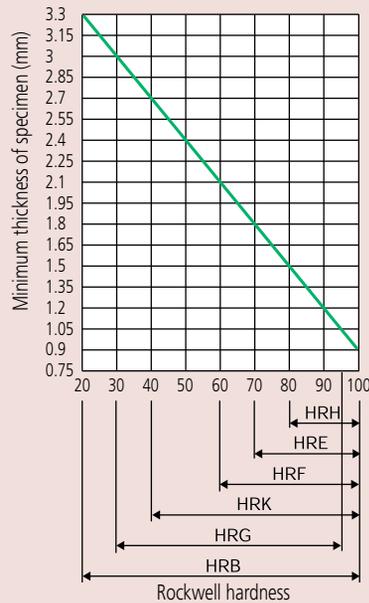
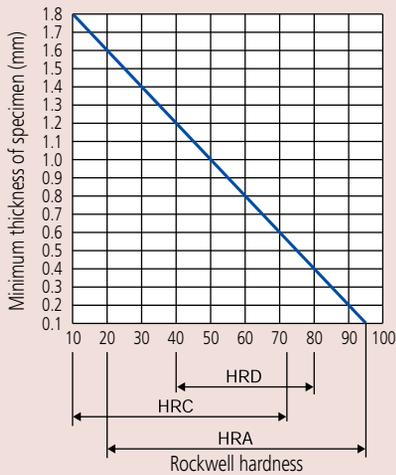
t: Thickness of specimen (mm)
d: Diagonal length (mm)
h: Depth of indentation (mm)



[Example]
Specimen thickness t: 0.15mm
Specimen hardness: 185HV1
Test force F: 9.807N (1kgf)
Diagonal length d: 0.1mm



Relationship Between Rockwell/Rockwell Superficial Hardness and the Minimum Thickness of a Specimen



Rockwell Hardness Scales

Scale	Indenter	Test force	Application
A	Diamond	588.4N	Carbide, sheet steel
D		980.7N	Case-hardened steel
C		1471N	Steel (100HRB or more to 70HRC or less)
F	Sphere of 1.5875mm diameter	588.4N	Bearing metal, annealed copper
B		980.7N	Brass
G		1471N	Hard aluminum alloy, beryllium copper, phosphor bronze
H	Sphere of 3.175mm diameter	588.4N	Bearing metal, grinding wheel
E		980.7N	Bearing metal
K		1471N	Bearing metal
L	Sphere of 6.35mm diameter	588.4N	Plastic, lead
M		980.7N	
P		1471N	
R	Sphere of 12.7mm diameter	588.4N	Plastic, lead
S		980.7N	
V		1471N	

Rockwell Superficial Hardness Scales

Scale	Indenter	Test force	Application
15-N	Diamond	147.1N	Thin surface-hardened layer on steel such as carburized or nitrided
30-N		294.2N	
45-N		441.3N	
15-T	Sphere of 1.5875mm diameter	147.1N	Sheet of mild steel, brass, bronze, etc.
30-T		294.2N	
45-T		441.3N	
15-W	Sphere of 3.175mm diameter	147.1N	Plastic, zinc, bearing alloy
30-W		294.2N	
45-W		441.3N	
15-X	Sphere of 6.35mm diameter	147.1N	Plastic, zinc, bearing alloy
30-X		294.2N	
45-X		441.3N	
15-Y	Sphere of 12.7mm diameter	147.1N	Plastic, zinc, bearing alloy
30-Y		294.2N	
45-Y		441.3N	

Featured Products



Shop-floor Type CNC Coordinate Measuring Machine

MiSTAR Series

Refer to page L-3 for details.



CNC Coordinate Measuring Machine MICROCORD CRYSTA-Apex V Series

Refer to page L-4 for details.



Non-contact Line-Laser Probe SurfaceMeasure

Refer to page L-16 for details.





An online system to monitor the operational and mechanical statuses of measuring machines. This allows you to grasp the state of a process flow from the operational status of measuring machines within a production process.



Products equipped with the measurement data output function can be connected to the measurement data network system MeasurLink® (refer to page A-3 for details).



Coordinate Measuring Machines

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CMM

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Coordinate Measuring Systems

Precision measuring technology in three dimensions

Shop-floor Type CNC Coordinate Measuring Machine MiSTAR 555 & 575



MeasurLink ENABLED
Data Management Software by Mitutoyo

- An accuracy-guaranteed temperature range of 10 to 40° C is possible thanks to a combination of technologies, such as the symmetric guide structure, uniform material and temperature compensation.
- A contamination resistance more than 2 times better than conventional Mitutoyo CMMs is achieved by adopting a newly developed environment-resistant ABSOLUTE scale*.
* ABSOLUTE scale that provides an absolute XYZ-values relative to an internal reference point for each coordinate captured. This eliminates the need for an initialization operation.
- The footprint is reduced to about 80% compared to conventional moving bridge models by adopting the horizontal-arm structure and installing the CMM controller and PC under the measuring table.
- Design allows open access from 3 sides.



MiSTAR 555

25.4 mm = 1.0 inch

SPECIFICATIONS

Items		Model	MiSTAR 555	MiSTAR 575
Measuring range	X-axis		570 mm	570 mm
	Y-axis		500 mm	700 mm
	Z-axis		500 mm	500 mm
Maximum permissible length measurement error*1*2 ISO 10360-2: 2009 (18 to 22° C)			2.2 + 3L/1000 μm	
Drive speed			5 to 350 mm/s (max. combined speed 606 mm/s) in CNC MODE	
Drive acceleration			1556 mm/s ² (max. combined acceleration 2695 mm/s ²)	
Workpiece	Max. height		660 mm	
	Max. loading		120 kg	180 kg
Accuracy guaranteed temperature range			10 to 40° C	
Mass (including the controller and installation platform)			655 kg	805 kg

*1 Specifications vary by configuration, size, and thermal environment.

*2 L = Measuring length (unit: mm)

Note1: While the appearance of the natural stone measuring table varies according to the source, the high stability for which this material is known can always be relied upon.

Note2: For information about guaranteed accuracy outside of the 18 to 22° C temperature range, contact your nearest M³ Solution Center.



Status monitoring boosts uptime with timely adjustments and alerts for events like busy, idle, or maintenance. Operators can optimize machine use and repurpose idle instruments for measuring other parts.

MeasurLink ENABLED
Data Management Software by Mitutoyo

Products equipped with the measurement data output function can be connected to the measurement data network system MeasurLink® (refer to page A-3 for details).



Equipped with the PH10MQ probe head



MRT240

Rotary table diameter 240 mm



Refer to the **MiSTAR Series** Brochure (B2321(3)) for more details.



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Coordinate Measuring Systems

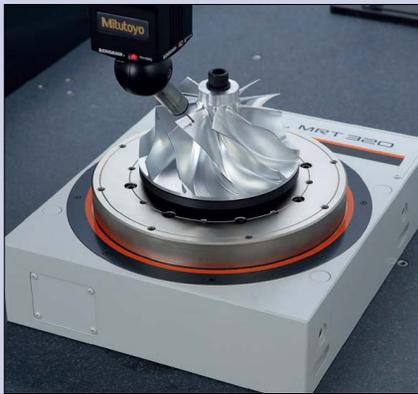
Precision measuring technology in three dimensions



Data Management Software by Mitutoyo

Standard CNC CMM CRYSTA-Apex V500/700/900 Series

- The CRYSTA-Apex V500/700/900 series, CNC CMMs deliver high accuracy (1.7 μm), high speed, and high acceleration. This series offers flexibility with a wide range of models to suit practically any size workpiece.
 - Has achieved a contamination resistance more than 2 times better than conventional Mitutoyo CMMs by adopting a newly developed ABSOLUTE scale* that is highly resistant to the challenging production-line environment.
- * ABSOLUTE scale that provides an ABSOLUTE value for each measurement point. This eliminates the need for an initialization operation.
- Equipped with a temperature compensation system that guarantees the specified accuracy within the wide range of 16 to 26 °C under certain environmental conditions, although high-accuracy CMMs should ideally be installed in a temperature-controlled room.



MRT320
Rotary table diameter 320 mm



Find a Distributor



SPECIFICATIONS

CRYSTA-Apex V776

25.4 mm = 1.0 inch

Model		CRYSTA-Apex V544	CRYSTA-Apex V574	CRYSTA-Apex V776	CRYSTA-Apex V7106
Measuring range	X-axis	500 mm		700 mm	
	Y-axis	400 mm	700 mm	700 mm	1000 mm
	Z-axis	400 mm		600 mm	

Model		CRYSTA-Apex V9106 (Z600) / 9108 (Z800)	CRYSTA-Apex V9166 (Z600) / 9168 (Z800)	CRYSTA-Apex V9206 (Z600) / 9208 (Z800)
Measuring range	X-axis	900 mm		
	Y-axis	1000 mm	1600 mm	2000 mm
	Z-axis	600 mm / 800 mm		

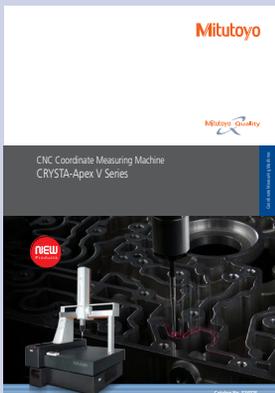
Note: While the appearance of the natural stone measuring table varies according to the source, the high stability for which this material is known, can always be relied upon.

CRYSTA-Apex V Series Accuracy

Series	Probe used	Length measurement error* ¹ ISO 10360-2: 2009
500/700/900 Series	SP25M	$E_{0, MPE} = 1.7 + 3L/1000^{*2}$

*1 Specifications vary by configuration, size, and thermal environment.

*2 L = Measuring length (unit: mm)



Refer to the **CRYSTA-Apex V Series** Brochure (E16026) for more details.

Coordinate Measuring Systems

Precision measuring technology in three dimensions

Standard CNC CMM CRYSTA-Apex V1200/1600/2000 Series



MeasurLink ENABLED
Data Management Software by Mitutoyo

- The **CRYSTA-Apex V1200/1600/2000** Series are large-sized CNC CMMs developed for supporting quality evaluation of large parts.

- Equipped with a temperature compensation system that guarantees the specified accuracy within the wide range of 16 to 26° C for **CRYSTA-Apex V1200** and 16 to 24° C for **V1600/2000** under certain environmental conditions, although high-accuracy CMMs should ideally be installed in a temperature-controlled room.



CRYSTA-Apex V122010



CRYSTA-Apex V162012

25.4 mm = 1.0 inch

SPECIFICATIONS

Items	Model	CRYSTA-Apex V121210	CRYSTA-Apex V122010	CRYSTA-Apex V123010
Measuring range	X-axis		1200 mm	
	Y-axis	1200 mm	2000 mm	3000 mm
	Z-axis		1000 mm	

Items	Model	CRYSTA-Apex V162012 (Z1200)/V162016 (Z1600)	CRYSTA-Apex V163012 (Z1200)/V163016 (Z1600)	CRYSTA-Apex V164012 (Z1200)/V164016 (Z1600)
Measuring range	X-axis		1600 mm	
	Y-axis	2000 mm	3000 mm	4000 mm
	Z-axis		1200 mm/1600 mm	

Items	Model	CRYSTA-Apex V203016	CRYSTA-Apex V204016
Measuring range	X-axis		2000 mm
	Y-axis	3000 mm	4000 mm
	Z-axis		1600 mm

Note: While the appearance of the natural stone measuring table varies according to the source, the high stability for which this material is known, can always be relied upon.

CRYSTA-Apex V Series Accuracy

Unit: μm

Series	Probe used	Length measurement error*1 ISO 10360-2: 2009
1200 Series	SP25M	$E_{0, MPE} = 2.3 + 3L/1000^{*2}$
1600 Series		$E_{0, MPE} = 3.3 + 4.5L/1000 (4.5 + 5.5L/1000)^{*2 *3}$
2000 Series		$E_{0, MPE} = 4.5 + 8L/1000^{*2}$

- *1 Specifications vary by configuration, size, and thermal environment.
- *2 L = Measuring length (unit: mm)
- *3 () indicates Z: 1600 mm specification



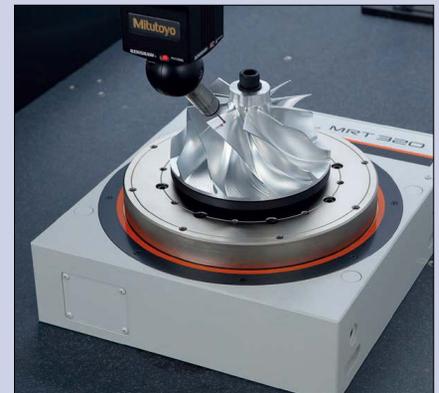
Status monitoring boosts uptime with timely adjustments and alerts for events like busy, idle, or maintenance. Operators can optimize machine use and repurpose idle instruments for measuring other parts.

MeasurLink ENABLED
Data Management Software by Mitutoyo

Products equipped with the measurement data output function can be connected to the measurement data network system MeasurLink® (refer to page A-3 for details).



MRT240
Rotary table diameter 240 mm



MRT320
Rotary table diameter 320 mm



Got Questions?



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Coordinate Measuring Systems

Precision measuring technology in three dimensions

Standard CNC CMM CRYSTA-Apex EX 1200R Series



- **CRYSTA-Apex EX 1200R** Series products are advanced CNC CMMs equipped with the REVO-2 probe head and a choice of probes to create a range of standard 5-axis measuring machines.
- 5-axis operation reduces the time required for probe repositioning movements and allows more flexible positioning. This also facilitates access to complex workpieces and saves time both during programming and measurement.
- Allows ultra high-speed 5-axis scanning (max. 500 mm/s), far surpassing conventional 3-axis control. Support for high-speed sampling of up to 4,000 points per second allows acquisition of densely spaced measurement points, even during fast scanning.
- Internal implementation of laser sensing technology ensures high-accuracy measurement, even with long styli (up to 500 mm*).
- * Distance from probe rotation center to stylus tip



CRYSTA-Apex EX 123010R

SPECIFICATIONS

25.4 mm = 1.0 inch

Items		Model	CRYSTA-Apex EX 121210R	CRYSTA-Apex EX 122010R	CRYSTA-Apex EX 123010R
Measuring range	X-axis		1200 mm		
	Y-axis		1200 mm	2000 mm	3000 mm
	Z-axis		960 mm		

Note: While the appearance of the natural stone measuring table varies according to the source, the high stability for which this material is known can always be relied upon.

CRYSTA-Apex EX 1200R Series Accuracy

Unit: μm

Probe used	Length measurement error*1 ISO 10360-2: 2009
REVO + RSP2 + RSH250	$E_{0, MPE} = 2.9 + 4L/1000^{*2}$
REVO + RSP3-3 + RSH3-3	$E_{0, MPE} = 2.5 + 3L/1000^{*2}$

*1 Specifications vary by configuration, size, and thermal environment.

*2 L = Measuring length (unit: mm)



MRS2 Tiered Racks

Coordinate Measuring Systems

Precision measuring technology in three dimensions

High Accuracy CNC CMM STRATO-Apex Series



MeasurLink® ENABLED
Data Management Software by Mitutoyo

- The **STRATO-Apex** Series of CNC CMMs offer improved structural rigidity and guide systems to guarantee very high accuracy measurement. High drive speed and high acceleration provide lower cycle times in critical measurement applications.

- The **STRATO-Apex** Series uses the same ultra-high accuracy length measuring unit (manufactured in-house) as used in the **LEGEX** Series for position detection, allowing for extremely advanced position detection and enabling control of these ultra-high-accuracy machines. It also applies various other technologies, such as a high-speed control program, that enable high speed and accuracy.



STRATO-Apex 574



STRATO-Apex 7106



STRATO-Apex 9166



STRATO-Apex 162016

SPECIFICATIONS

25.4 mm = 1.0 inch

Model		STRATO-Apex 574	STRATO-Apex 776	STRATO-Apex 7106
Measuring range	X-axis	500 mm	700 mm	
	Y-axis	700 mm	700 mm	1000 mm
	Z-axis	400 mm	600 mm	

Model		STRATO-Apex 9106	STRATO-Apex 9166	STRATO-Apex 162012	STRATO-Apex 162016	STRATO-Apex 163012	STRATO-Apex 163016
Measuring range	X-axis	900 mm		1600 mm			
	Y-axis	1000 mm	1600 mm	2000 mm		3000 mm	
	Z-axis	600 mm		1200 mm	1600 mm	1200 mm	1600 mm

Note: While the appearance of the natural stone measuring table varies according to the source, the high stability for which this material is known, can always be relied upon.

STRATO-Apex Series Accuracy Unit: μm

Series	Probe used	Length measurement error*1 ISO 10360-2: 2009
574 Series	SP25M	$E_{0,MPE} = 0.7 + 2.5L/1000^{*2}$
700/900 Series		$E_{0,MPE} = 0.9 + 2.5L/1000^{*2}$
1600 Series		$E_{0,MPE} = 2.5 + 4.0L/1000 (3.0 + 4.0L/1000)^{*2} *3$

*1 Specifications vary by configuration, size, and thermal environment.
*2 L = Measuring length (unit: mm)
*3 () indicates Z: 1600 mm specification



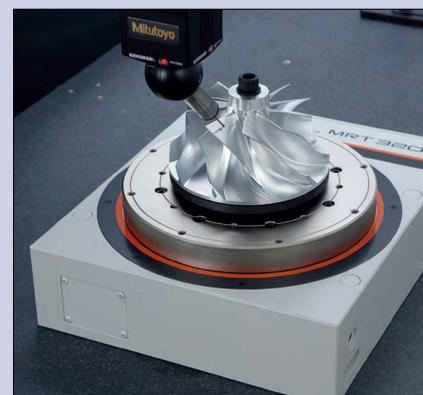
Status monitoring boosts uptime with timely adjustments and alerts for events like busy, idle, or maintenance. Operators can optimize machine use and repurpose idle instruments for measuring other parts.

MeasurLink® ENABLED
Data Management Software by Mitutoyo

Products equipped with the measurement data output function can be connected to the measurement data network system MeasurLink® (refer to page A-3 for details).



MRT240
Rotary table diameter 240 mm



MRT320
Rotary table diameter 320 mm



Talk to Sales



Status monitoring boosts uptime with timely adjustments and alerts for events like busy, idle, or maintenance. Operators can optimize machine use and repurpose idle instruments for measuring other parts.



Products equipped with the measurement data output function can be connected to the measurement data network system MeasurLink® (refer to page A-3 for details).



High Accuracy CNC CMM STRATO-Active Series

- The **STRATO-Active** Series is a lineup of intermediately priced coordinate measuring machines between the CRYSTA-Apex V and STRATO-Apex with 4 models being offered: 776; 7106; 9106; 9166.
- The **STRATO-Active** includes thermal compensation as standard and has a larger guaranteed temperature range of 18~22° C (64.4~71.6° F) compared to 19~21° C (66.2~69.8° F) for the STRATO-Apex.



STRATO-Active 7106 25.4 mm = 1.0 inch

SPECIFICATIONS

Model		STRATO-Active 776	STRATO-Active 7106	STRATO-Active 9106	STRATO-Active 9166
Measuring range	X-axis	700mm		900 mm	
	Y-axis	700mm	1000mm	1000mm	1600mm
	Z-axis	600mm			

STRATO-Active Series Accuracy

Unit: μm

Series	Probe used	Length measurement error*1 ISO 10360-2: 2009
700/900 Series	SP25M	$E_{0,MPE} = 1.2 + 3L/1000^{*2}$

*1 Specifications vary by configuration, size, and thermal environment.

*2 L = Measuring length (unit: mm)

High-accuracy Separate Guide Type STRATO-Apex G



- The **STRATO-Apex G** Series are CNC CMMs that use the standard Mitutoyo CMM structure for large machines which are designed to be used for measuring large and heavy workpieces with high accuracy. The picture below gives a good idea of how large the machine is. The measuring accuracy and drive speed are the world's highest in the X-axis measuring range of 2000 mm (78.7 in) and 3000 mm (118.1 in).



STRATO-Apex 3000G Series

- High-accuracy linear encoders (manufactured in-house) are built into the length measuring units used for position detection. Their excellent position detection capability is what makes the control of these high-accuracy devices possible. The series also applies a multitude of technologies regarding structure, control, component processing, assembly, and other aspects that enable large CMMs to deliver high-accuracy measurements.
- This series of CMMs is equipped with a system to automatically restore accuracy deterioration (MOVAC - Mitutoyo On-site Volumetric Accuracy Compensation system) caused by foundation deformation as a standard feature.
- Equipped with a temperature compensation system that guarantees the specified accuracy within the wide range of 18 to 22° C under certain environmental conditions, although high-accuracy CMMs should ideally be installed in a temperature-controlled room.
- Safety devices such as a Z-axis beam sensor, tape switch, and area sensor are available as options.

SPECIFICATIONS

25.4 mm = 1.0 inch

Model		STRATO-Apex 2000G Series	STRATO-Apex 3000G Series	STRATO-Apex 4000G Series
Measuring range	X-axis	2000 mm	3000 mm	4000 mm
	Y-axis	3000 mm/4000 mm/5000 mm/6000 mm		
	Z-axis	1200 mm/1600 mm/2000 mm		

Note: For information on accuracy specifications, contact your nearest M³ Solution Center.

Coordinate Measuring Systems

Precision measuring technology in three dimensions

Ultra-high Accuracy CNC CMM LEGEX TAKUMI



- The **LEGEX TAKUMI** Series is an ultra-high precision CNC CMM with the world's highest level of accuracy, made possible by rigorous analysis of all possible error-producing factors and the elimination or minimization of their effects.
- The fixed bridge structure and precision air bearings running on highly rigid guideways ensure superior motion stability and ultra-high geometrical accuracy. Thorough testing, using FEM structure analysis simulation, guarantees geometric motion accuracy with minimal errors due to fluctuations in inertial loading and other variables. In addition, other technologies have been utilized in the structure of the drive unit, minimizing vibration, etc., to provide ultra-high accuracy.

- The combination of a Mitutoyo ultra-high accuracy crystallized glass scale with a coefficient of thermal expansion of almost zero and a high resolution, high-performance reflection type linear encoder provides excellent position detection for premium performance.
- Many optional systems are available, including probes (contact and non-contact types), data processing units, and many other items to support the ultra-high accuracy measurement of a wide variety of workpieces.



LEGEX TAKUMI 9106

SPECIFICATIONS

25.4 mm = 1.0 inch

Items	Model	LEGEX TAKUMI 574	LEGEX TAKUMI 774	LEGEX TAKUMI 776	LEGEX TAKUMI 9106
Measuring range	X-axis	500 mm	700 mm	700 mm	900 mm
	Y-axis	700 mm	700 mm	700 mm	1000 mm
	Z-axis	450 mm	450 mm	600 mm	600 mm

Note: For measuring table, the standard specification is ceramic coating. A scraping specification is also available as an option.

LEGEX Series accuracy

Unit: μm

Probe used	Length measurement error*1 ISO 10360-2: 2009
MPP-310Q	$E_{0, MPE} = 0.23 + L/1000^{*2}$

*1 Specifications vary by configuration, size, and thermal environment.

*2 L = Measuring length (unit: mm)

Note: For **LEGEX 12128**, contact your nearest M³ Solution Center.



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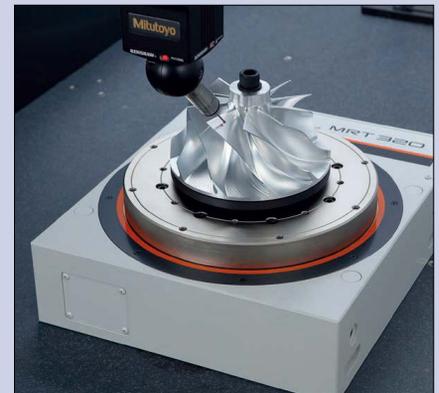


Products equipped with the measurement data output function can be connected to the measurement data network system MeasurLink® (refer to page A-3 for details).



MRT240

Rotary table diameter 240 mm



MRT320

Rotary table diameter 320 mm



Refer to the **LEGEX TAKUMI** brochure (16034) for more details.



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Coordinate Measuring Systems

Precision measuring technology in three dimensions

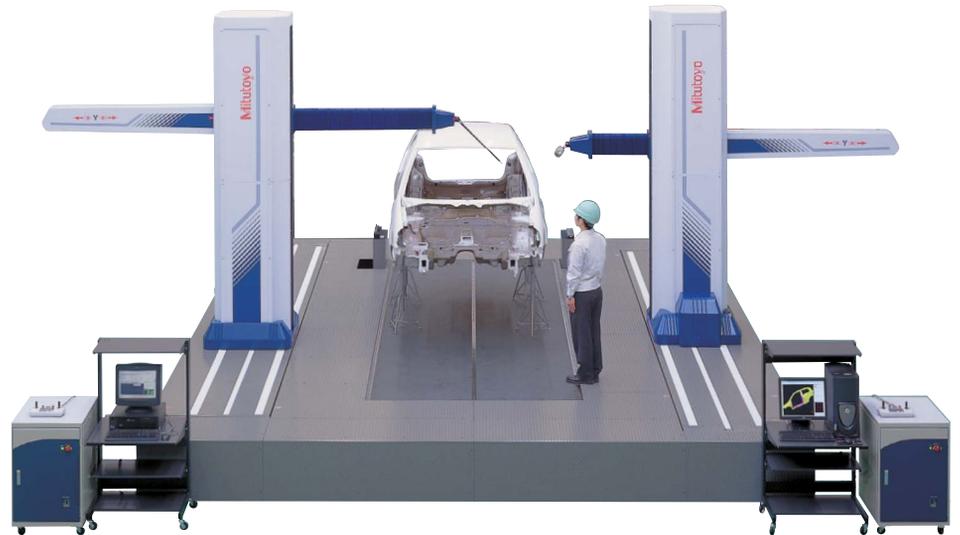
Car Body Measuring System CARBstrato Series



Measurement example for dual-ram type
(Simultaneous use of touch-trigger probe and line laser probe)

- The world's largest class of CMM.
The CARBstrato series is a lineup of horizontal-arm type CNC CMMs, offering the world's largest measurement range that even makes it possible to measure car bodies.

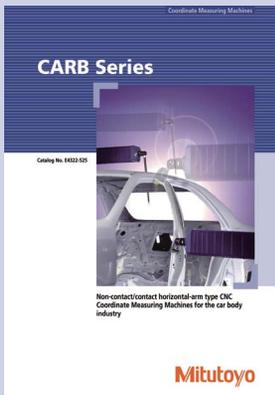
- Single-arm/Dual-arm systems.
Single-arm/Dual-arm system types are available to suit the intended use.
Single-arm type: Measures a workpiece using a single arm
Dual-arm type: Measures a workpiece placed between two simultaneously controlled arms



CARBstrato 601624D (Dual-ram type)



Where to Buy



Refer to the CARB Series Brochure (E16014) for more details.

Coordinate Measuring Systems

Precision measuring technology in three dimensions

In-line Type CNC CMM MACH-3A Series

- In-line type CNC CMM (Horizontal-arm type) incorporates the CMM controller and the host computer in the main unit resulting in a compact space-saving footprint for the shop floor. This series is designed for 24-hour operation with high stability and remarkable durability. In addition, its accuracy is guaranteed within the temperature range 5 to 40° C.

SPECIFICATIONS

25.4 mm = 1.0 inch

Items	Model	MACH-3A 653
Measuring range	X-axis	600 mm
	Y-axis	500 mm
	Z-axis	280 mm
Accuracy*1	19 to 21 °C	$E_{0,MPE} = 2.5 + 3.5L/1000 \mu\text{m}^{*2}$

*1 Specifications vary by configuration, size, and thermal environment.

*2 L = Measuring length (unit: mm)

Note: For information about guaranteed accuracy within a temperature range other than 19 to 21 °C, contact your local Mitutoyo sales office.



MeasurLink® ENABLED
Data Management Software by Mitutoyo



MACH-3A 653

The indexing table shown is optional

In-line Type CNC CMM MACH-V9106

- Makes building a flexible measuring system to replace gage measurements on power train production lines possible. It also allows for high throughput thanks to high acceleration and high drive speed. In addition, its accuracy is guaranteed within the temperature range 5 to 35° C.

SPECIFICATIONS

25.4 mm = 1.0 inch

Items	Model	MACH-V9106
Measuring range	X-axis	900 mm
	Y-axis	1000 mm
	Z-axis	600 mm
Accuracy*1	19 to 21 °C	$E_{0,MPE} = 2.2 + 3.5L/1000 \mu\text{m}^{*2}$

*1 Specifications vary by configuration, size, and thermal environment.

*2 L = Measuring length (unit: mm)

Note: For information about guaranteed accuracy within a temperature range other than 19 to 21 °C, contact your nearest M³ Solution Center.



MeasurLink® ENABLED
Data Management Software by Mitutoyo



MACH-V9106



Status monitoring boosts uptime with timely adjustments and alerts for events like busy, idle, or maintenance. Operators can optimize machine use and repurpose idle instruments for measuring other parts.

MeasurLink® ENABLED
Data Management Software by Mitutoyo

Products equipped with the measurement data output function can be connected to the measurement data network system MeasurLink® (refer to page A-3 for details).



Refer to the **MACH Series Brochure (E16010)** for more details.



An online system to monitor the operational and mechanical statuses of measuring machines. This allows you to grasp the state of a process flow from the operational status of measuring machines within a production process.

MeasurLink® ENABLED
Data Management Software by Mitutoyo

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MRT240

Rotary table diameter 240 mm



Refer to the **MACH Series Brochure (E16010)** for more details.



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Refer to the **MACH Series Brochure (E16010)** for more details.

Coordinate Measuring Systems

Precision measuring technology in three dimensions

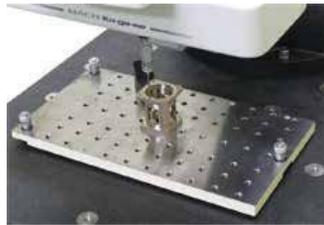
CMM Equipped with High-accuracy/High-speed/Flexible CNC Measuring Head Mach Ko-ga-me



- Can be used in standalone applications or integrated into work cells.
- If required, the system can measure workpiece features that exceed the **Ko-ga-me**'s X-stroke by mounting the workpiece, or the **Ko-ga-me**, on an auxiliary X-axis.
- Ideal for inspection of large or small workpieces and offers a wide choice of measuring probes including touch-trigger and scanning types. (Note: Probe choice may be restricted, depending on the application.)



Standalone system



Stand, measuring table, etc. are options.

SPECIFICATIONS

25.4 mm = 1.0 inch

Items	Model	KGM12128-C
Measuring range	X-axis	120 mm
	Y-axis	120 mm
	Z-axis	80 mm
Accuracy*1	19 to 21 °C	$E_{0,MPE} = 2.4 + 5.7L/1000 \mu\text{m}^{*2}$

*1 Specifications vary by configuration, size, and thermal environment.

*2 L = Measuring length (unit: mm)

Note: For information about guaranteed accuracy within a temperature range other than 19 to 21 °C, contact your nearest M³ Solution Center.



Get a Quote

Probes for MACH Ko-ga-me

Touch trigger PH6/TP200



Scanning PH6M/SP25M



Refer to the **MCOSMOS Software Brochure (Bulletin No. 2322)** for more details.

Coordinate Measuring Systems

Precision measuring technology in three dimensions

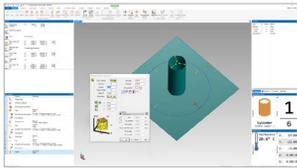
Software for Manual/CNC Coordinate Measuring Machines MCOSMOS

MCOSMOS software modules

	GEOPAK	CAT1000P	CAT1000S	SCANPAK
MCOSMOS-1	✓			
MCOSMOS-2	✓	✓	✓	
MCOSMOS-3	✓	✓	✓	✓

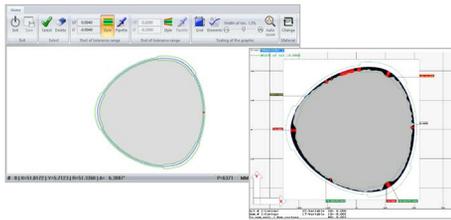
GEOPAK [General purpose measurement program]

This universal geometrical measuring software delivers high-performance multidimensional measurements. With the ability to control your workpiece from design to completion, its various functions make GEOPAK one of the most powerful programs available.



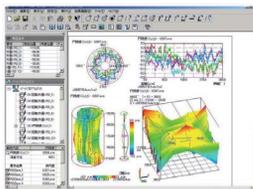
SCANPAK [Profile measurement program]

Quantitatively determine workpiece profiles and reflect this in the production process directly for optimizing workpieces immediately by using SCANPAK.



ROUNDPAK-CMM

The functionality of analysis software as used for roundness measuring machines is now available on MCOSMOS. As well as roundness and cylindricity evaluation, various filters are also available.



GEARPAK-Worm [Gear evaluation program]

GEARPAK-Worm for MCOSMOS measures cylindrical worms with flank types ZI, ZA, ZN, and ZK. After input of the Worm gear parameters, the measurement program is generated automatically.

GEARPAK-Bevel/Hypoid [Gear production support/evaluation program]

GEARPAK Bevel is currently supporting the measurement and evaluation of:

- Straight-Bevel Gear manufactured by Gleason Works Co.(Ring Gear/Pinion)
- Spiral-Bevel Gear manufactured by Gleason Works Co.(Ring Gear/Pinion)

GEARPAK Hypoid is currently supporting the measurement and evaluation of:

- Hypoid Gear generated by Gleason Works Co.(Ring Gear [Formate, Helix-form]/Pinion)

By inputting the gear parameters, the measurement program is generated automatically.



[Result drawing]

- MCOSMOS is the powerful and flexible metrology information system for the vast range of state-of-the-art Mitutoyo CMMs. Supported by an extensive lineup of optional software applications giving users complete control over a comprehensive range of sensors ready for every application.

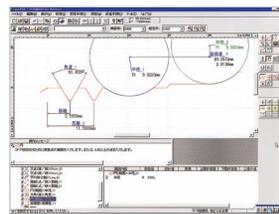
CAT1000P [Online/Offline programming module]

CAT1000P (Prismatic), users create measurement programs from the CAD model using the seven basic geometric elements: point, line, plane, circle, sphere, cylinder, and cone. With automatic probe changes, probe path generation, and collision avoidance to generate a concise, efficient, and optimized measurement program. CAT1000P's 3D graphical display of the CMM, probe, and part provides a clear representation of the measured geometrical elements in 3D for part program simulation.



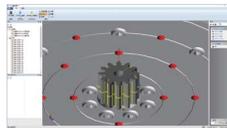
FORMTRACEPAK-AP [Analysis program]

This program is used for minutely analyzing two-dimensional curved lines captured by SCANPAK.



GEARPAK-Express Cylindrical [Gear evaluation program]

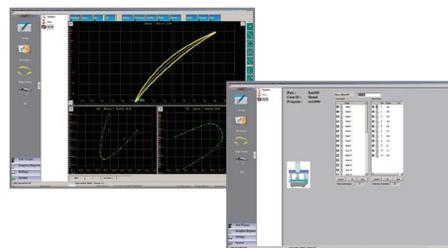
Gears with involute tooth shape can be measured with GEARPAK-Express. By inputting the gear parameters, the measurement program is generated automatically. GEARPAK-Express then evaluates the parameters and deviations for profile and flank line, pitch, tooth thickness, space width, dimension over one or two balls, base tangent length, radial runout, single and dual flank working test.



[Result drawing]

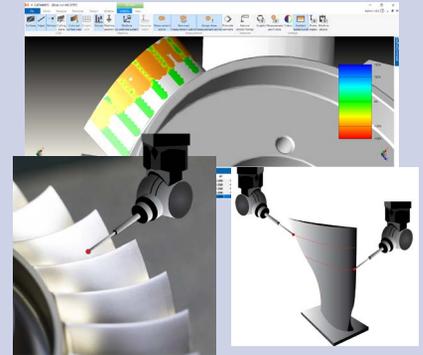
MAFIS Express [Blade measurement/Evaluation program]

This software program enables creation of measurement programs and measurement and analysis of blades and blisks. A part program for measurement can be automatically created just by selecting required contents and evaluation conditions. The measurement results will be displayed in a report including 2D graphics.



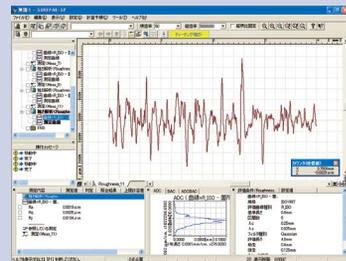
CAT1000S [Curved surface evaluation program]

This software is used for free-form surface evaluation and online/offline teaching. The measurement results are then displayed in easily interpreted graphics with sections color-coded based on non-conformances.



SURFPAK-SP [Analysis program]

This is a software program used for the SURFTEST roughness probe for a CMM. With this program, surface roughness analysis conforming to standards such as ISO, JIS, ANSI, and VDA are available. Cooperation with MCOSMOS enables fully automatic dimensional measurement and surface roughness measurement.



Refer to the MCOSMOS Software Brochure (Bulletin No. 2322) for more details.

Coordinate Measuring Systems

Precision measuring technology in three dimensions

Automatic Measurement Program Generation Software MiCAT Planner

One-click programming that changes the relationship between people and precision measurement

- Identifies tolerance information included in 3D models with Product and Manufacturing Information (PMI), defines the measurement plan and automatically creates a measurement program. For 3D CAD models without PMI, tolerance information may be added with MiCAT Planners fast tolerance assistant.
- With its optimization function, MiCAT Planner identifies the most efficient measurement path, minimizing probe repositioning and tool changes to deliver measurement programs in the shortest possible time.
- Utilizing the rule editor function to set the measurement rules prevents variation in measurement quality between program writers.

Tolerance information add function

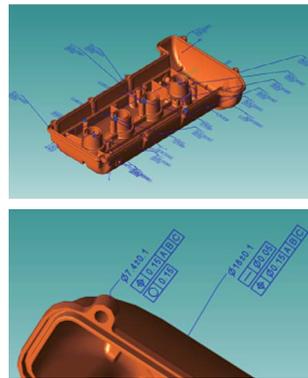
Lets you add tolerances in the software for 3D CAD models without tolerance information. Automatically create optimal measuring programs based on the user added tolerance specifications.

Supported languages

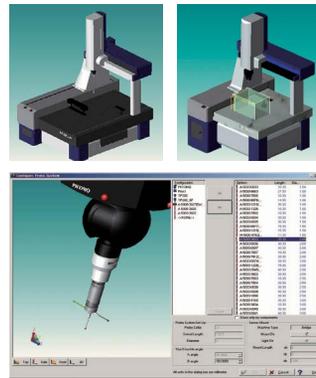
Available in 16 languages



CAD data with tolerances

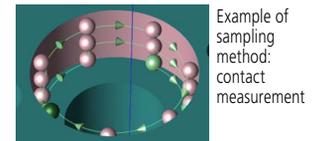


CMM System configuration

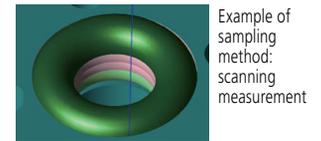


User-defined measurement rules

(number of locations to measure with tolerance information and sampling method, etc.)

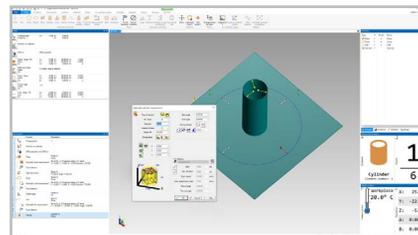


Example of sampling method: contact measurement



Example of sampling method: scanning measurement

Instantly and automatically creates a measurement program



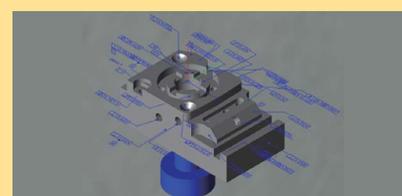
An optimized measurement program for MCOSMOS

Case study

Compare the measurement part-programming time for a test piece.

- 1: Programming in 2D drawing: **approx. 45 to 60 minutes**
- 2: Programming using 2D drawing + 3D CAD: **approx. 15 to 20 minutes**
- 3: Create with **MiCAT Planner** (using 3D CAD model + PMI): **approx. 3 minutes!**

Note: The measurement rules are defined in advance.

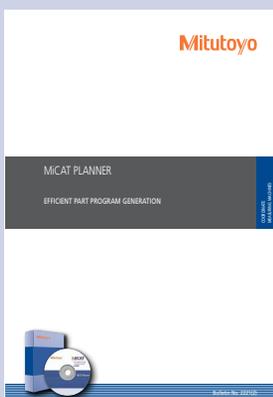


Part-programming time
Reduced by up to 95%!!

Guarantee a **dramatically reduced development phase** and improve product quality at the same time.



Need Support?



Refer to the **MiCAT Planner Brochure (Bulletin 2221(2))** for more details.

Coordinate Measuring Systems

Precision measuring technology in three dimensions

Scanning Probes

SP25M

Compact high accuracy type scanning probe

This compact, multi-functional and highly accurate scanning probe is only 25 mm in diameter, which enables it to access shrouded workpiece features. Data is collected by scanning measurement, ultra-high precision point measurement and center alignment point measurement. The probe can be attached to a probe head (PH10M/10MQ) to automatically change the orientation allowing for maximum flexibility in measurement. Reference SP25M scanning probe on L-18.



MPP-310Q

Ultra-high accuracy and low measuring force scanning probe

This ultra-high precision scanning probe incorporates built-in XYZ scales for highest-accuracy performance. The compact size of this probe is ideal for low measuring force and high speed scanning. Data collection can be performed by scanning measurement, ultra-high precision point measurement and center alignment measurement.



REVO-2

High speed 5-axis scanning head

This high-speed scanning head delivers high accuracy measurement while delivering high-throughput. Measurement with stylus up to 500 mm in length increases flexibility and makes simultaneous 5-axis measuring without probe head indexing.



SP80

High accuracy scanning probe (supporting long styli)

A highly accurate stylus up to 500 mm in length (both horizontally and vertically) can be installed on this probe. This ultra-high precision scanning probe allows data collection by scanning measurement, ultra-high precision point measurement and center alignment point measurement.



Non-contact probes

SurfaceMeasure

Non-contact type laser probe

This compact, high accuracy, non-contact type laser probe is designed for use with CNC CMMs. The scanning probe automatically adjusts to workpiece surface characteristics to deliver highly efficient measurements. Automatic laser intensity and camera sensitivity adjust according to the environment and the workpiece material for simpler and more comfortable laser scanning. (Refer to page L-17 for more information on SurfaceMeasure probes)



SurfaceMeasure 1110 SurfaceMeasure 201FS

Roughness measurement probe

SURFTTEST

Probe for surface roughness measurement

Mounting this probe on a CMM enables surface roughness measurement and analysis to be included in fully automatic CNC measurement cycles. This probe is compatible with an automatic probe changer and therefore can be automatically replaced with another type of probe for 3D coordinate measurement. A wide variety of roughness analyses can be performed using the dedicated evaluation program.



Touch-trigger probes

TP20



Compact touch-trigger probe

This compact touch-trigger probe is only 13.2 mm in diameter, making it an ideal choice for probing deep inside narrow or shrouded workpiece features. Styli auto-changing (optional) is supported when mounted on a CNC CMM.

TP200



Compact high-accuracy touch-trigger probe

This compact, high accuracy touch-trigger probe is only 13.5 mm in diameter, making it an ideal choice where high-accuracy measurement inside narrow or shrouded workpiece features is needed. Styli auto-changing (optional) is supported.



Status monitoring boosts uptime with timely adjustments and alerts for events like busy, idle, or maintenance. Operators can optimize machine use and repurpose idle instruments for measuring other parts.



Data Management Software by Mitutoyo

Products equipped with the measurement data output function can be connected to the measurement data network system MeasurLink® (refer to page A-3 for details).



Refer to the Probes for **CNC Coordinate Measuring Machines Brochure (Bulletin 2133)** for more details.

QVP

QUICK VISION probe

This CNC CMM Quick Vision Probe utilizes Mitutoyo vision measuring machine technology for totally automated video measurement.





Status monitoring boosts uptime with timely adjustments and alerts for events like busy, idle, or maintenance. Operators can optimize machine use and repurpose idle instruments for measuring other parts.



Products equipped with the measurement data output function can be connected to the measurement data network system MeasurLink® (refer to page A-3 for details).

Coordinate Measuring Systems

Precision measuring technology in three dimensions

PH20

5-axis control touch-trigger system

Thanks to unique "head touches", it is possible to measure by movement of the probe head itself instead of moving the CMM elements. Also, measuring time can be significantly shortened by means of 5-axis concurrent movement and stepless positioning angle.



Probe heads

PH10M/10MQ

Motorized probe heads

These heads allow automatic control of positioning (up to 720 directions) of the mounted probe. It is possible to mount not only a touch-trigger probe but also any scanning probe, vision probe, laser probe, screw-thread depth probe, etc. Auto-changing is available (optional).



▲ Mounting example of touch-trigger probe

PH6M

Fixed probe head

A fixed probe head with autojoint connector for use with TP7, SP25M, and QVP.



SP25M Scanning Probe

The SP25M combines two sensors in a single housing. Users can switch between a choice of five scanning modules (which can carry M3 styli with lengths from 20 mm to 400 mm) and the TM25-20 adapter module that is compatible with Renishaw's TP20 range of probe modules. This capability enables scanning and touch-trigger probing in a single probe system.

SP25M modules and stylus holders

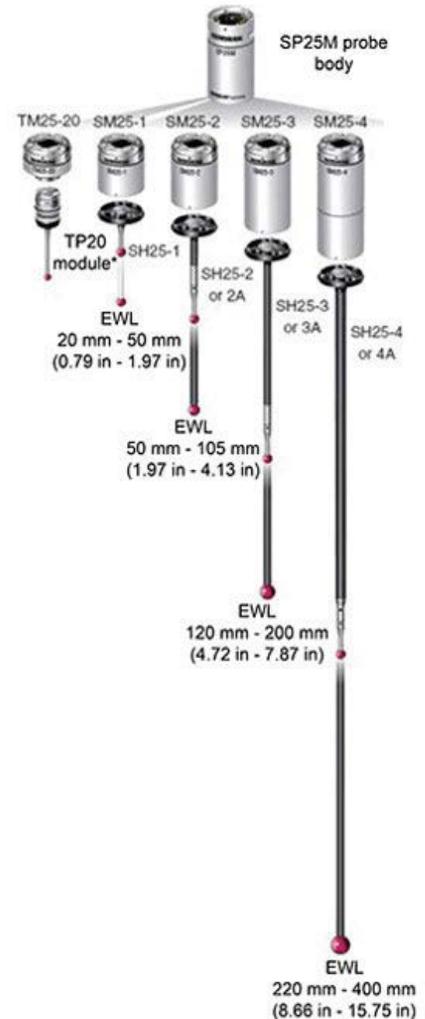
The SP25M's compact size and auto-joint mounting makes it compatible with the PH10M PLUS / PH10MQ PLUS and PH6M probe heads. It can also be mounted on a multi-wired probe extension bar. Together, these combinations permit excellent reach and access to part features.

A range of module kits allows SP25M users to build up their probing capability over time.

Each SM25-# scanning module is optimized in terms of gain and spring rate to suit the range of stylus lengths specified. For every module, there is a matching SH25-# stylus holder.

The SH25-3 and SH25-4 stylus holders are constructed with a fixed carbon fiber stem to which an M3 stylus is mounted, selected to provide the correct working length.

While the SP25M can carry cranked (non straight) styli configurations when using SM25-1 / 2 / 3 / 4 / 5 scanning modules and the original standard stylus holders (SH25-1 / 2 / 3 / 4 / 5), for optimum metrology where larger offsets are required Renishaw recommends the SH25-2A / 3A / 4A range of stylus holder, specifically designed to meet the challenges posed by such stylus arrangements.



Need Service?

Coordinate Measuring Systems

Precision measuring technology in three dimensions

Non-contact Type Laser Probe SurfaceMeasure

- **Ultra-high speed data collection:**

The **SurfaceMeasure** probe works by emitting a laser line onto the workpiece with ultra-high speed measuring to acquire 300,000 surface points/second.*

* When using **SurfaceMeasure 1110**

- **Advantages of non-contact type:**

Non-contact measurement enables measurement of materials that may be easily deformed by contact measurement, including plastics or thin, elastic parts.

- **Powder-less measurement:**

Automatic configuration of the camera sensitivity and the laser intensity settings according to the environment and materials enable establishing an easy and trouble-free laser-scanning environment without the need for 3D scanning sprays.

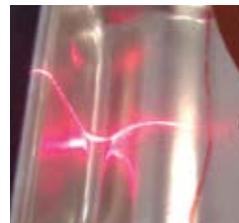
- **Evaluation cases:**

The measure point cloud data can be used by various optional software in a wide range of applications, such as editing, plane creation, comparison using CAD data and more.

- The flying spot type is capable of scanning difficult parts, such as this impeller, precisely and achieves highest scanning accuracy in the class (in the case of **SurfaceMeasure 201FS**).



Measurement of color sample plate



Measurement of glossy parts



1110



201FS

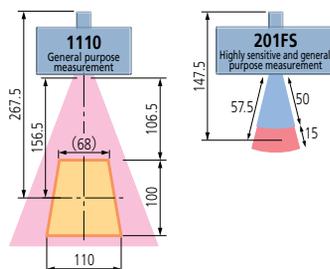
SPECIFICATIONS

25.4 mm = 1.0 inch

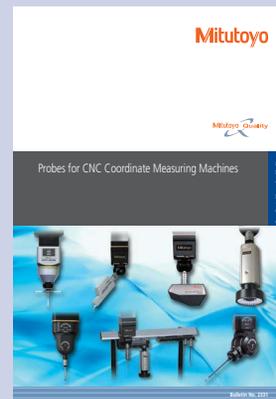
	SurfaceMeasure 1110	SurfaceMeasure 201FS
Laser irradiation method	Line Laser	Flying spot
Max. scan width	110 mm	23 mm
Max. scan depth	100 mm	15 mm
Working distance	156.5 mm	57.5 mm
Scanning error*	9 μm	1.8 μm
Max. acquisition rate	300,000 points/sec	25,000 points/sec
Mass	440 g	500 g
Laser Class	EN/IEC Class2 [EN/IEC 60825-1 (2014)]	
Laser Type	Red-light semiconductor	Semiconductor
Line Laser	Wave length 660 nm	670 nm
	Power output 2.5 mW	1 mW

* According to Mitutoyo's acceptance procedure. (1σ / sphere measurement, probe alone.)

Measuring range



Unit: mm



Refer to the Probes for **CNC Coordinate Measuring Machines Brochure (Bulletin 2133)** for more details.



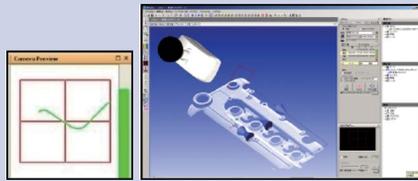
Refer to the **SurfaceMeasure Brochure (Bulletin 2134(2))** for more details.

Coordinate Measuring Systems

Precision measuring technology in three dimensions

Point Cloud Processing Software for Coordinate Measuring Machines **MSURF**

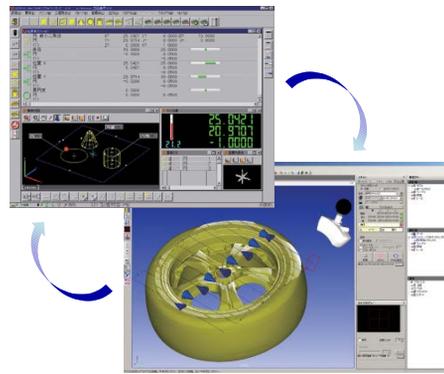
- **MSURF** is a software program that enables users to perform operations from measurement to evaluation on the same platform when the non-contact line laser probe, **SurfaceMeasure**, is used. Eight software modules are provided according to the task.



Note: **IACR3** change rack enables automatic change of probes during CNC program execution thereby reducing measurement cycle time.

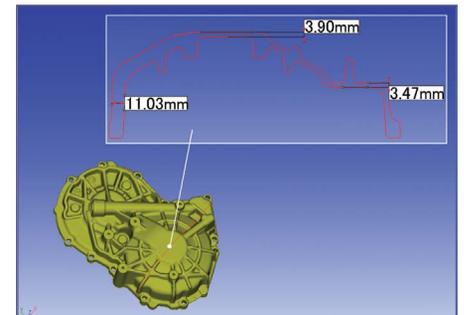
MSURF-S

Calculates point cloud data measured by CNC CMM with **SurfaceMeasure**. It generates scanning paths by defining the scanning start position, length, and width.

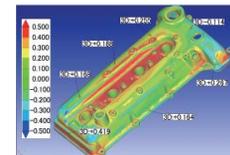


MSURF-I

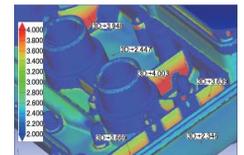
Conducts analysis or comparison verification of measured point cloud data in reference to nominal data (supporting CAD data import).



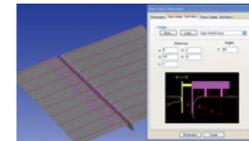
Section evaluation (dimensional calculation)



Error color-coded map



Thickness color-coded map



Evaluation of step/clearance



Surface curvature evaluation



Find Training

MSURF-G

MSURF-G is the off-line version of **MSURF-S**. It allows users to create measurement programs in advance of actual measurements on a CMM by using CAD data. Therefore, users can start measurement immediately at the time a real workpiece is ready. Since **MSURF-S** is a standalone PC application, only requiring installation by the user, it helps preserve valuable CMM time exclusively for productive measurement.

Note: **MSURF-G** cannot be combined with **MSURF-S**.

MSURF-MESH PRO

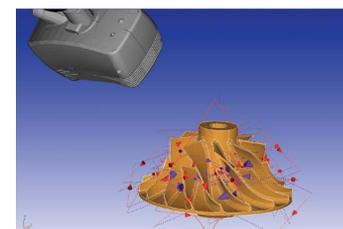
This software is provided with various functions such as filtering point cloud data and mesh data. The software is enhanced by adding functions to standard ones. It also enables functions such as mesh data thinning-out, highlighting, interpolation and outlier removal that are unavailable as standard.

Note: **MSURF-MESH PRO** has the optional functions of **MSURF-I**.

MSURF-PLANNER

MSURF-PLANNER is software to automatically create measurement macros (surface form, feature form) for the line laser probe from 3D CAD data.

Optimized data (travel path, number of probe head revolutions, etc.) of a measurement path will contribute to improvements in productivity.



Automatic generation of measurement macros by **MSURF-PLANNER**

Coordinate Measuring Systems

Precision measuring technology in three dimensions

Mitutoyo ECO-FIX Fixture Systems

The Mitutoyo Eco-Fix modular fixture systems for CMM, Form, and Vision products, the work-holding setups work well for different part sizes/types and environments. The design combines operational modularity advances with lower-cost solutions. This can be found both in the reduction or elimination of hard fixturing costs and setup time. This system is comprised of well-marked, color-coded components designed to simplify part measurement requirements. Magnetic or threaded fastening points deliver fast, plug-and-play connectivity. First-time fixturing jobs can be established and reconfigured in a matter of minutes for quick turnaround for future part measurement. Or, as needed, fixtures can be built and stored to meet all common part measurement requirements. Base plates are hard-coated and other components are machined for durability.

- A workpiece can be mounted on a CMM's measuring table using combinations of Eco-Fix clamping components. Dedicated fixturing is no longer required.
- Individual starter kits are available, "Eco-fix Kit S" and "Eco-fix Kit L" as shown on the next page.
- The Eco-Fix Pallet Receiver System (PRS) is available with either "Eco-Fix Pallet Receiver Kit S" or "Eco-Fix Pallet Receiver Kit L" (shown below), eliminating the time consuming positioning of the workpiece.

ECO-FIX Pallet Receiver Kits

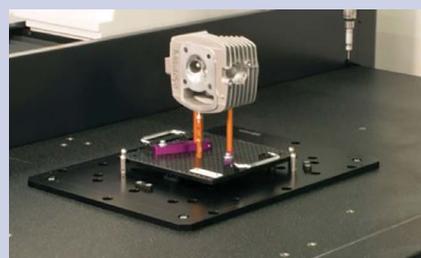
The sophisticated Mitutoyo manual Pallet Receiver System (PRS) significantly speeds up measuring on coordinate measuring machines as well as on form and vision measuring systems. Workpieces can be exchanged rapidly with the new system. The pallet system comprises the tried and tested Mitutoyo Eco-Fix system, a base plate with two handles and three semi-spheres on the bottom. The latter help users to quickly and precisely position the pallet on the receiver plate prisms fixed to the measuring machine in just one step. This way, fine adjusting of the position is a thing of the past.

Eco-Fix Pallet Receiver Kit L - K5512219

(Includes K551049, K551217, & K551216)



Receiver plate set (optional)



Schedule Service

Coordinate Measuring Systems

Precision measuring technology in three dimensions

ECO-FIX Fixture Kits

The entry-level Mitutoyo Eco-Fix Kit S version is comprised of a 250mm x 250mm base plate footprint and 59 total components in the system. The Eco-Fix Kit L is a larger version and built for more complex part fixturing applications (measuring 500mm x 400mm in base plate footprint and a total of 98 total components in the system).

Locating Pins 1 - K551123



Locating Pins 2 - K551124



Clamping Elements 1 - K551125



Supporting Elements 1 - K551126



Supporting Elements 2 - K551127



Straight Pins - K551128



Receiver Brackets 1 - K551129



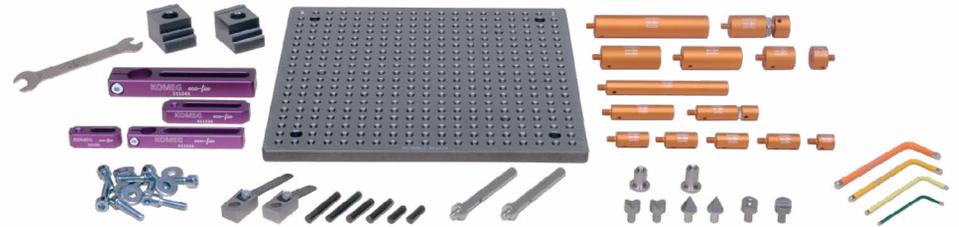
Receiver Brackets 2 - K551130



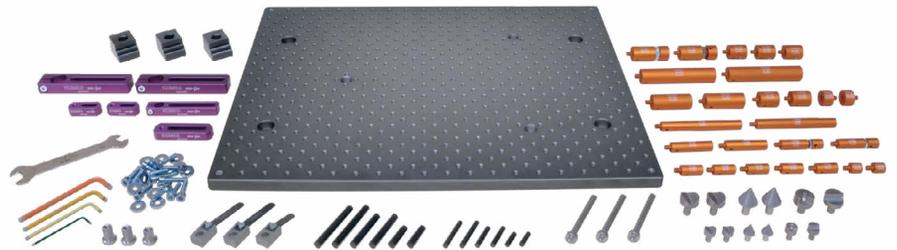
Magnet 1 - K551131



Joints 1 - K551132



Eco-Fix Kit - S K551048



Eco-Fix Kit L - K551049



Eco-Fix MAG S - K551089



Eco-Fix MAG L - K551090

Coordinate Measuring Machines

Probing Accessories

Mitutoyo Styli Kits

M2



STARTER - K651376



BASIC 1 - K651377



BASIC 2 - K651354



PROFESSIONAL - K651379



Styli Kit M2/M3 - K651445

M3



STARTER - K651380



Carbon Fiber 1 - K651318



BASIC 1 - K651381



Carbon Fiber 2 - K651319



Carbon Fiber 3 - K651320

Materials used for spherical probes

Ruby

As the hardest of all probe element materials, ruby is the perfect all-round material. Spherical probes made of ruby have been used for most standard applications. The low specific density of ruby enables the mass of the stylus tip to be kept as small as possible. This effectively allows the elimination of false triggers caused by mass inertia when the CMM moves.



Zirconium oxide

Because of the specific surface properties of balls made of zirconium oxide - a ceramic compound - it is ideally suited for aggressive scanning of abrasive surfaces, such as workpieces made of cast iron. Zirconium oxide has virtually the same hardness and wear-resistant properties as ruby.



Silicon nitride

Silicon nitride is extremely hard and wear-resistant with the lowest surface roughness of all ball materials. Specific advantage: Silicon nitride is resistant to absorbing aluminum from workpiece surfaces.



Find a Distributor

Coordinate Measuring Machines

Probing Accessories

Diamond Styli

Solid diamond and diamond-coated balls offer significant advantage over other styli tip materials. Whether it is because the application demands extreme wear resistance or extreme long lasting is the requirement, diamond is a perfect choice.

General specification:

- The ball and stem connection is done by using hard soldering in a protective atmosphere.
- Stem material: carbide
- Styli lengths up to 50mm are currently supported.
- All styli specified with ruby balls and tungsten carbide stems can be replicated with diamond coated balls. (M2, M3, M4 and M5)

Specification: Solid diamonds

- Available ball diameters are: $\varnothing 0.3\text{mm}$, $\varnothing 0.6\text{mm}$, $\varnothing 0.8\text{mm}$, $\varnothing 1.0\text{mm}$, $\varnothing 2.0\text{mm}$, $\varnothing 3.0\text{mm}$
- Sphericity deviation Grade 10 <250 nm

Specification: Diamond coated balls

- The diamond coating is applied on a silicon nitride ball.
- The black color is still visible through the translucent diamond coat.
- 0.05mm are added to the diameter of the nitride ball.
- Available ball diameters are: $\varnothing 1.05\text{mm}$, $\varnothing 2.05\text{mm}$, $\varnothing 3.05\text{mm}$, $\varnothing 5.05\text{mm}$, $\varnothing 8.02\text{mm}$
- Sphericity deviation Grade 10 <250 nm
- Sphericity deviation Grade 5 <130 nm for $\varnothing 1.05\text{mm}$, $\varnothing 2.05\text{mm}$, $\varnothing 3.05\text{mm}$, $\varnothing 5.05\text{mm}$ on request

StyliCleaner

The integrated solution for automatic styli tip cleaning improves reliability of measurement results and reduce machine downtime caused by manual cleaning and human error.

Risk at manual styli cleaning

- Contaminations on the styli elements lead to significant deviations in the measurement results.
- Cleaning the stylus elements is time consuming and requires a high level of expertise.
- Human error can lead to damage and misplacement of the stylus.
- This leads to downtimes in which measurements cannot be made.

Solution

- Human error is avoided.
- Planning of automatic cleaning cycles to remove dust, oil or chips from spherical stylus elements.
- The cleaning cycle can be coupled to the calibration cycle, for example.
- The cleaning program can also be initiated by less qualified personnel using a bar or QR code.

Cleaning process

The stylus tip element is cleaned with cleaning agent for 10 seconds and then dried for 10 seconds residue-free with compressed air.



Straight Shaft Stylus



Stepped Shaft Stylus

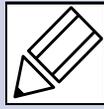


Contaminated stylus tip



Cleaned stylus tip

Quick Guide to Precision Measuring Instruments



Coordinate Measuring Machines

Performance Assessment Method of Coordinate Measuring Machines

Regarding the performance assessment method of CMM, a revision of ISO 10360 Series was issued in 2003 and was partially revised in 2009.

The following describes the standard inspection method including the revised content.

Table 1 ISO 10360 Series

	Item	ISO Standard No.	Year of issue
1	Terms	ISO 10360-1	2000
2	Length measurement	ISO 10360-2	2009
3	Rotary table equipped CMM	ISO 10360-3	2000
4	Scanning measurement	ISO 10360-4	2000
5	Single/Multi-styli measurement	ISO 10360-5	2010
6	Software inspection	ISO 10360-6	2001

Maximum Permissible Length Measurement Error $E_{0,MPE}$ [ISO 10360-2: 2009]

Using the standard CMM with specified probe, measure 5 different calibrated lengths 3 times each in 7 directions within the measuring volume (as indicated in Figure 1), making a total of 105 measurements. If these measurement results, including the allowance for the uncertainty of measurement, are equal to or less than the values specified by the manufacturer, then it proves that the performance of the CMM meets its specification. The result of OK/NG is required to be judged considering the uncertainties. The maximum permissible error (standard value) of the test may be expressed in any of the following three forms (unit: μm).

$$E_{0,MPE} (MPE_e) = A + L/K \leq B$$

$$E_{0,MPE} (MPE_e) = A + L/K$$

$$E_{0,MPE} (MPE_e) = B$$

}

A: Constant (μm) specified by the manufacturer

K: Dimensionless constant specified by the manufacturer

L: Measured length (mm)

B: Upper limit value (μm) specified by the manufacturer

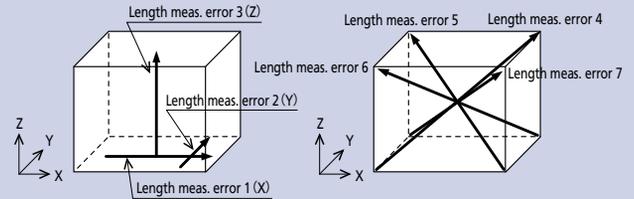


Figure 1 Measuring directions to obtain length measurement error

Note: ISO 10360-2: 2009 requires measurement in 4 different directions and recommends measurement parallel to each axis, while ISO 10360-2: 2001 specified the measurement "in 7 arbitrary directions."

The following error definitions were added in ISO 10360-2: 2009.

Maximum Permissible Length Measurement Error/ Length Measurement Error when stylus offset is 150 mm $E_{150,MPE}$ [ISO 10360-2: 2009]

In addition to length measurement in 7 directions, ISO 10360-2: 2009 specifies measuring in 2 lines over the diagonal YZ or XZ plane with probe offset as shown in Figure 2. Note: The stylus offset is set at 150 mm as default.

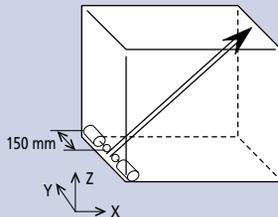


Figure 2 Length measurement error when Z-axis stylus offset is 150 mm

Maximum Permissible Limit of the Repeatability Range of Length Measurement $R_{0,MPL}$ [ISO 10360-2: 2009]

Calculate the maximum value from the results of three repeated measurements.

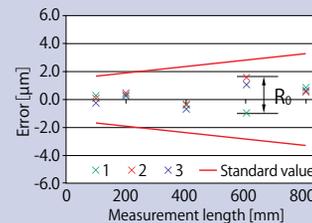


Figure 3 Repeating range of length measurement

Maximum Permissible Radial Four-Axis Error MPE_{FR} , Maximum Permissible Tangential Four-Axis Error MPE_{FT} , and Maximum Permissible Axial Four-Axis Error MPE_{FA} [ISO 10360-3: 2000]

The test procedure under this standard is to place two standard spheres on the rotary table as shown in Figure 4. Rotate the rotary table to a total of 15 positions including 0° , 7 positions in the plus (+) direction, and 7 positions in the minus (-) direction and measure the center coordinates of the two spheres in each position. Then, add the uncertainty of the standard sphere shape to each variation (range) of radial direction elements, connecting direction elements, and rotational axis direction elements of the two standard sphere center coordinates. If these calculated values are less than the specified values, the evaluation test is passed.

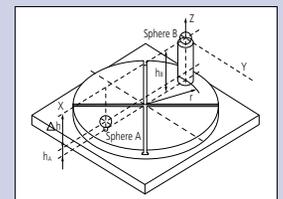


Figure 4 Evaluation of a CMM with a rotary table

Maximum Permissible Scanning Probing Error MPE_{THP} [ISO 10360-4: 2000]

This is the accuracy standard for a CMM if equipped with a scanning probe. The test procedure under this standard is to perform a scanning measurement in 4 planes on the standard sphere and then, for the least squares sphere center calculated using all the measurement points, calculate the radial range (dimension 'A' in Figure 5) within which all measurement points exist. Based on the least squares sphere center calculated above, calculate the radial distance between the calibrated standard sphere radius and the maximum measurement point and the minimum measurement point, and take the larger distance (dimension 'B' in Figure 5). Add an extended uncertainty that combines the uncertainty of the stylus tip shape and the uncertainty of the standard test sphere shape to each A and B dimension. If both calculated values are less than the specified values, this scanning probe test is passed.

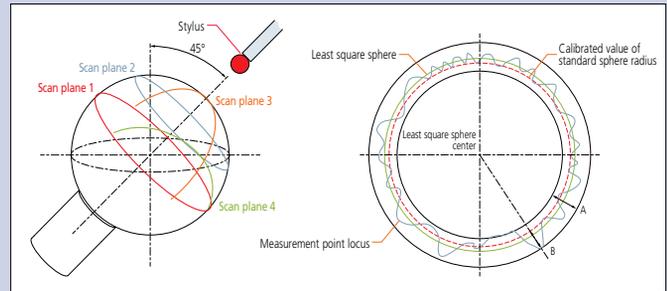


Figure 5 Target measurement planes for the maximum permissible scanning probing error and its evaluation concept

Maximum Permissible Single Stylus Form Error $P_{FTU, MPE}$ [ISO 10360-5: 2010]

This measurement was included in the dimensional measurement in ISO 10360-2: 2001. However, it is specified as "CMMs using single and multiple stylus contacting probing systems" in ISO 10360-5: 2010. The measurement procedure has not been changed, and the following procedure should be performed. Measure the defined target points on a standard sphere (25 points, as in Figure 6) and use all the results to calculate the center position of the sphere by the least squares method. Then, calculate the radial distance from the center position of the sphere by the least squares method for each of the 25 measurement points and obtain the radial difference $R_{max} - R_{min}$. If this difference, to which a compound uncertainty of forms of the stylus tip and the standard test sphere are added, is equal to or less than the specified value, it can be judged that the probe has passed the test.

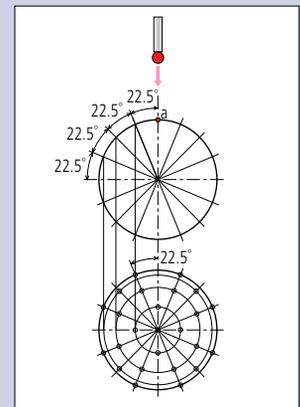
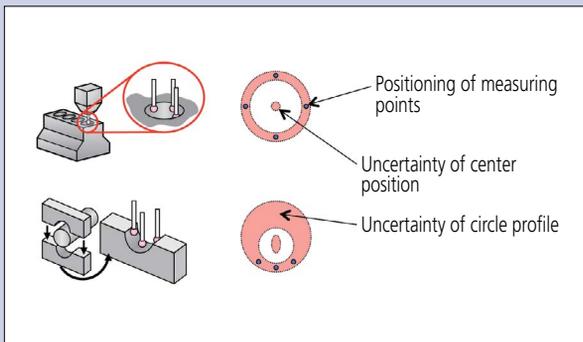


Figure 6 Target points of measurement for Single Stylus Form Error

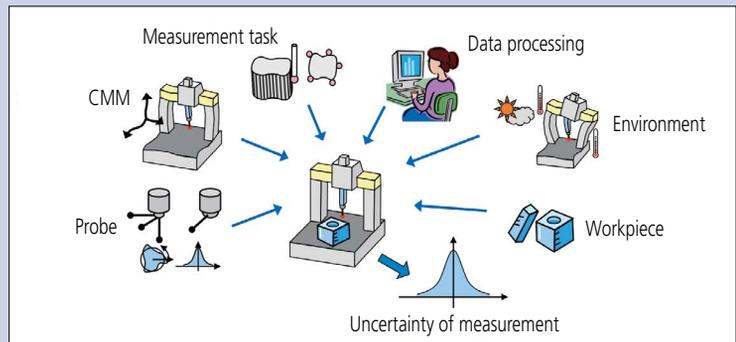
Measurement Uncertainty of the CMM

Measurement uncertainty is an indication used for evaluating reliability of measurement results. In ISO 14253-1: 1998, it is proposed to consider the uncertainty when evaluating the measurement result in reference to the specification. However, it is not easy to estimate the uncertainty of the measurement performed by a CMM. To estimate the uncertainty of the measurement, it is necessary to quantify each source of uncertainty and determine how it propagates to the measurement result. The CMM is subject to all types of settings that determine how the measurement should be performed, such as measurement point distribution, or datum definition, according to the drawing instruction or operator's intention. This fact makes it harder to detect the sources of uncertainty influencing the result. Taking circle measurement as an example, just a difference of one measurement point and its distribution causes the necessity of recalculation of the uncertainty.

Also, there are many sources of uncertainty to be considered with the CMM and their interactions are complex. Because of the above, it is almost impossible to generalize on how to estimate measurement uncertainty of the CMM.



Example of circle measurement by CMM



Major contributions that cause uncertainty in CMM measurement results

Featured Products



CNC Vision Measuring Machine

Quick Vision Active

Refer to page M-3 for details.



Smart Vision System

QM-Fit

Refer to page M-12 for details.



Manual Vision Measuring System

QUICK SCOPE

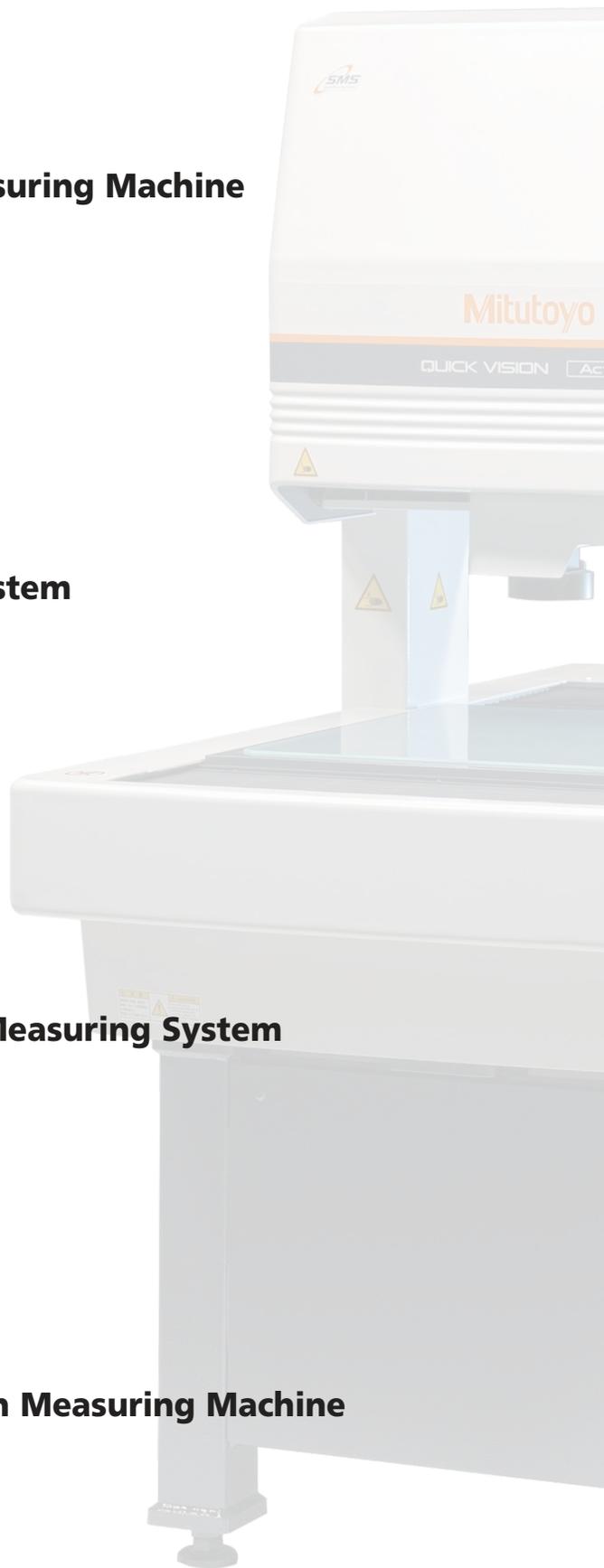
Refer to page M-13 for details.



Large FOV Vision Measuring Machine

Quick Image with M3

Refer to page M-14 for details.





M

Vision Measuring Systems

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Smart Measuring System

An online system to monitor the operational and mechanical statuses of measuring machines. This allows you to grasp the state of a process flow from the operational statuses of measuring machines within a production process.



Data Management Software by Mitutoyo

Measurement Data Network System

MeasurLink® is a measurement data management system based on databases (SQL Server). You can build a network to manage the measurement results and measuring machines by simply combining the functions necessary for your purpose.

MeasurLink® is a registered trademark of Mitutoyo Corporation in Japan and Mitutoyo America Corporation in the United States.



Measuring Instruments Shipped with Inspection Certificate

Mitutoyo guarantees product quality as a leading precision measuring instrument manufacturer and ships measuring instruments with an inspection certificate that includes inspection data so that customers can use them with confidence.



Vision Measuring Systems

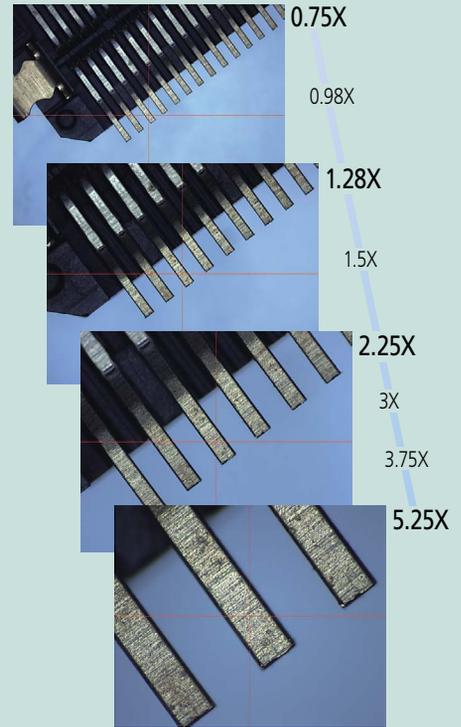


MeasurLink ENABLED
Data Management Software by Mitutoyo



QV Active CNC Vision Measuring System

- Cost effective, multifunction, CNC Vision Measuring System.
- Usability has been improved through a color camera and 8-step zoom optics.
- The zoom ratio of 7X (14X at maximum by changing the fixed-magnification objective lens) enables a wide range of inspection from wide view measurement at low magnification to micro-measurement at high magnification.
- The 74 mm maximum working distance (1X optional objective) promotes safe working by reducing the risk of collision, and allows greater freedom in fixture design.



From wide view measurement to micro-measurement

Optical magnification	0.5X	0.65X	0.75X	0.85X	0.98X	1X	1.28X	1.3X	1.5X	1.7X	2X	2.25X	2.5X	3X	3.5X	3.75X	4X	5X	5.25X	7X	
View field Horizontal (H) (mm)	13.60	10.46	9.07	8.00	6.94	6.80	5.31	5.23	4.53	4.00	3.40	3.02	2.72	2.27	1.94	1.81	1.70	1.36	1.30	0.97	
View field Vertical (V) (mm)	10.80	8.31	7.20	6.35	5.51	5.40	4.22	4.15	3.60	3.18	2.70	2.40	2.16	1.80	1.54	1.44	1.35	1.08	1.03	0.77	
Total magnification (on the monitor)	13.20	17.10	19.80	22.40	25.80	26.40	33.70	34.30	39.50	44.80	52.70	59.30	65.90	79.10	92.30	98.90	105.50	131.80	138.40	184.50	
Objective lens	1X objective (optional) Working distance																				
	74 mm																				
	1.5X objective (standard accessory) Working distance																				
	42 mm																				
	2X objective (optional) Working distance																				
	42 mm																				

Note: The total magnification indicates the magnification on the monitor when the size of the QVPAK video window is 178.8x143.0 mm (default).

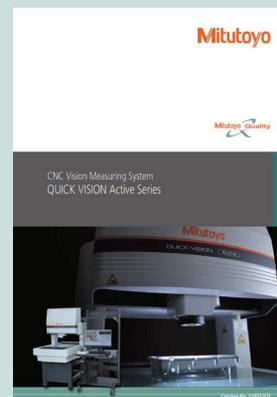
SPECIFICATIONS

Model No.	QV Active 202	QV Active 404
Type	Standard model	Standard model
Measuring range (X×Y×Z)	250×200×150 mm 10"×8"×6"	400×400×200 mm 16"×16"×8"
Observation unit	Zoom unit (8 positions)	
Imaging device	Color CMOS camera	
Vision measuring accuracy*	E_{1X}, E_{1Y}	
	(2 + 3L/1000) μm	
	E_{1Z}	
(3 + 5L/1000) μm		
E_2		
(2.5 + 4L/1000) μm		
Accuracy guaranteed with optics specified	Objective: 1.5X, Optical magnification: 5.25X	
Accuracy guaranteed temperature	20±1 °C	20±1 °C

* Inspected to a Mitutoyo standard. L=length between two arbitrary points (mm)



Find a Distributor



Refer to the **QUICK VISION Active Series Brochure (2206)** for more details.

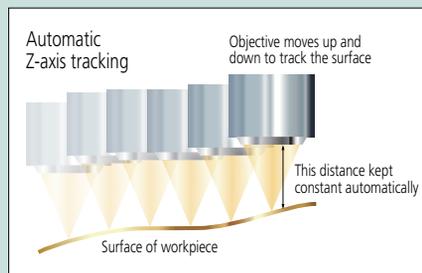
Vision Measuring Systems

QV APEX Pro/QV HYPER Pro CNC Vision Measuring System

- Equipped with a strobe light and StrobeSnap, **QUICK VISION Pro** models deliver high-speed, high-accuracy measurements.
- The STREAM function is an optional upgrade to improve productivity by up to five times.

Tracking Auto Focus (TAF)

Laser transmitted through the objective lens allows automatic focusing. The system automatically keeps the object in focus based on its shape, eliminating the task of focus adjustment and increasing measurement throughput.



Laser source	Semiconductor laser (peak wavelength: 690 nm)
Laser safety	Class 2 (JIS C6802: 2014, EN/IEC 60825-1: 2014)
Auto focus system	Objective co-axial autofocusing (knife-edge method)



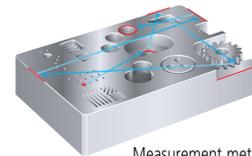
QV APEX 404 Pro



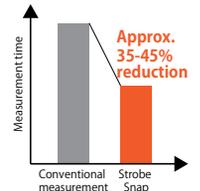
QV HYPER 302 Pro

StrobeSnap

All the **QUICK VISION Pro** models are equipped with a strobe light and "StrobeSnap" which delivers measurements with both high throughput and high accuracy. Regardless of the spacing of measuring positions, measuring time can be shortened by about 35 to 45% for most measurement samples.



Measurement method



Note: Comparison with old specifications using our demo sample

STREAM function (optional)

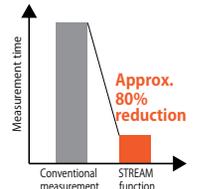
The STREAM function provides an amazingly high throughput due to the non-stop measurement where the camera motion and the strobe light are synchronized. It can shorten measuring time more than StrobeSnap on account of continuous element measurement as shown in the following conceptual image of measurement.



XY=0.2 mm pitch, 626
Measured with a field of view of 0.62x0.47 mm
STREAM measurement 36 sec.



Measurement method



Note: Comparison with old specifications using our demo sample

SPECIFICATIONS

QV APEX Pro

Items	Model No.	QV APEX 302 Pro	QV APEX 404 Pro	QV APEX 606 Pro
Measuring range (XxYxZ)		300x200x200 mm 12"x8"x8"	400x400x250 mm 16"x16"x10"	600x650x250 mm 24"x26"x10"
Observation unit		Programmable power turret 1X-2X-6X		
Imaging device		B&W CMOS		
Vision measuring accuracy*	$E_{LUX}/E_{LJY}/MPE$	(1.5 + 3L/1000) μ m		
	E_{LUXY}/MPE	(2.0 + 4L/1000) μ m		
	E_{LZZ}/MPE	(1.5 + 4L/1000) μ m		

QV HYPER Pro (Specifications other than as quoted in the table are the same as the QV APEX Pro specifications.)

Items	Model No.	QV HYPER 302 Pro	QV HYPER 404 Pro	QV HYPER 606 Pro
Imaging device		B&W CMOS		
Vision measuring accuracy*	$E_{LUX}/E_{LJY}/MPE$	(0.8 + 2L/1000) μ m		
	E_{LUXY}/MPE	(1.4 + 3L/1000) μ m		
	E_{LZZ}/MPE	(1.5 + 2L/1000) μ m		

* L=length between two arbitrary points (mm)



Refer to the **QUICK VISION Series Brochure (2316)** for more details.

Vision Measuring Systems



MeasurLink ENABLED
Data Management Software by Mitutoyo



QV ACCEL Large CNC Vision Measuring System

- This is a vision measuring machine with moving-bridge type main unit structure suitable for measuring large, thin workpieces.
- **QV ACCEL 1212** (range: 1250×1250×100 mm) and **QV ACCEL 1517** (range: 1500×1750×100 mm) are available to special order.
- As the stage is fixed, you can use simple fixturing or even no fixturing to fix a workpiece.



QV ACCEL 808

SPECIFICATIONS

Items	Model No.	QV ACCEL 808	QV ACCEL 1010
Measuring range (X×Y×Z)		800×800×150 mm 32"×32"×6"	1000×1000×150 mm 39"×39"×6"
Observation unit		Programmable power turret 1X-2X-6X	
Imaging device		B&W CCD (1/2 in)	
Vision measuring accuracy*	E_{1X}, E_{1Y}	$(1.5 + 3L/1000) \mu\text{m}$	
	E_{1Z}	$(1.5 + 4L/1000) \mu\text{m}$	
	E_{2XY}	$(2.5 + 4L/1000) \mu\text{m}$	
Repeatability*	Short dimension	X, Y-axis	$3 \sigma \leq 0.2 \mu\text{m}$
	Long dimension		$3 \sigma \leq 0.7 \mu\text{m}$
Tracking auto focus device		Optional	

* Inspected to a Mitutoyo standard. L=length between two arbitrary points (mm)



Got Questions?



Refer to the **QUICK VISION Series Brochure (2316)** for more details.

Vision Measuring Systems

ULTRA QV Ultra-High Accuracy CNC Vision Measuring System



ULTRA QV 404

- Ultra-high accuracy CNC vision measuring machine with a measuring accuracy of 0.35µm.
- Our proprietary high-resolution (Resolution: 0.01 µm) and high-accuracy low-expansion glass scales are used on the X, Y and Z axes.
- The main unit utilizes a highly rigid moving Y-axis table with a fixed bridge. The base is made of high-stability granite.
- This model is standard-equipped with an automatic temperature compensation function that uses a temperature sensor on the main unit of the measuring machine and a temperature sensor for the workpiece.

SPECIFICATIONS

Items	Model No.	ULTRA QV 404
Measuring range (X×Y×Z)		400×400×200 mm 16"×16"×8"
Observation unit		Programmable power turret 1X-2X-6X
Imaging device		B&W CMOS camera
Vision measuring accuracy*1	$E_{LUX} / E_{LUV, MPE}$	(0.35 + 1.3L/1000) µm
	$E_{LXLUV, MPE}$	(0.5 + 2L/1000) µm
	E_{LIZ}	(1.5 + 2L/1000) µm
Tracking auto focus device		Optional

*1 Inspected to a Mitutoyo standard. L=length between two arbitrary points (mm)

*2 Verified at shipment from factory.

Hyper QVWLI Non-contact 3D Measuring System



Hyper QVWLI 606

- **Hyper QVWLI** is a high-accuracy dual 3D measurement system consisting of **QV** and a white light interferometer.
- You can perform 3D surface texture analysis from 3D data captured by the WLI optical system. You can also perform dimension measurement and cross-section measurement at a specific height using the 3D data.

SPECIFICATIONS

Items	Model No.	Hyper QVWLI 302	Hyper QVWLI 404	Hyper QVWLI 606
Measuring range (X×Y×Z)	Vision measuring area	300×200×190 mm 12"×8"×7.5"	400×400×240 mm 16"×16"×9.5"	600×650×220 mm 24"×26"×8.5"
WLI optical head unit				
View field (H×V)		5X lens: approx. 0.64×0.48 mm / 10X lens: approx. 0.32×0.24 mm / 25X lens: approx. 0.13×0.10 mm / 50X lens: approx. 0.064×0.048 mm		
Z repeatability		2σ ≤ 0.08 µm		
Vision optical head unit				
Observation unit		Programmable power turret 1X-2X-6X		
Imaging device		B&W CCD (1/2 in)		
Vision measuring accuracy*2	Vision	$E_{LUX} / E_{LUV, MPE}$	(0.8 + 2L/1000) µm	
		$E_{LXLUV, MPE}$	(1.4 + 3L/1000) µm	
	Stream (optional)	$E_{LIZ, MPE}$	(1.5 + 2L/1000) µm	
		E_{LIX} / E_{LY}	(1.5 + 3L/1000) µm	
		E_{YX}	(2.0 + 4L/1000) µm	

*1 Movable range of **WLI** optical head.

*2 Inspected to a Mitutoyo standard. L=length between two arbitrary points (mm)



Refer to the **QUICK VISION Series Brochure (2316)** for more details.

Vision Measuring Systems



MeasurLink ENABLED
Data Management Software by Mitutoyo



QV TP Active/QV TP Pro CNC Vision Measuring System Equipped with a Touch Trigger Probe

Non-contact and contact measurement on one machine

- QV touch-trigger probe unit enables both vision measurement and touch-trigger probe measurement.

3D workpiece measurement

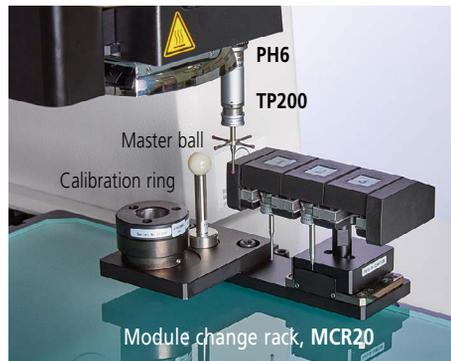
- Enables 3D measurement of workpieces, such as press-molded products, plastic-molded products, and machined products, that, until now, could not be measured with image processing alone.

Module change rack available

- Using the module change rack enables switching between vision measurement and touch probe measurement during an automatic measuring sequence.



QV TP HYPER 404 Pro



Refer to the **QUICK VISION** Series Brochure (2316) for more details.

SPECIFICATIONS WITH TOUCH-TRIGGER PROBE OPTIONS MOUNTED

Items	Model No.	QV TP Active 202	QV TP Active 404
Measuring range*1 (X×Y×Z)	Vision	250×200×150 mm 10"×8"×6"	400×400×200 mm 16"×16"×8"
	Common to Touch-trigger Probe	184×200×150 mm 7.25"×8"×6"	334×400×200 mm 13"×16"×8"
Measuring accuracy*2 (Touch-trigger probe)	E_{1X} , E_{1Y} , E_{1Z}	(2.4 + 3L/1000) μm	(2.4 + 3L/1000) μm

Items	Model No.	QV TP APEX 302 Pro	QV TP APEX 404 Pro	QV TP APEX 606 Pro	QV TP HYPER 302 Pro	QV TP HYPER 404 Pro	QV TP HYPER 606 Pro
Measuring range*1 (X×Y×Z)	Vision	300×200×200 mm 12"×8"×8"	400×400×250 mm 16"×16"×10"	600×650×250 mm 24"×26"×10"	300×200×200 mm 12"×8"×8"	400×400×250 mm 16"×16"×10"	600×650×250 mm 24"×26"×10"
	Common to Touch-trigger Probe	234×200×200 mm 9"×8"×8"	334×400×250 mm 13"×16"×10"	534×650×250 mm 21"×26"×10"	234×200×200 mm 9"×8"×8"	334×400×250 mm 13"×16"×10"	534×650×250 mm 31"×26"×10"
Measuring accuracy*2 (Touch-trigger probe)	$E_{X'}$, MPE / $E_{Y'}$, MPE / $E_{Z'}$, MPE	(1.8 + 3L/1000) μm			(1.7 + 3L/1000) μm		

*1 When a module change rack, a master ball, and a calibration ring are mounted, the measurement ranges are smaller than those in the table. Other specifications are the same as those for **QV Active**, **QV APEX Pro**, and **QV HYPER Pro**.

Please contact your nearest M³ Solution Center for more details.

*2 L=length between two arbitrary points (mm)



Talk to Sales

QV Hybrid Type 4 CNC Vision Measuring System Equipped with CPS Non-contact Displacement Sensor

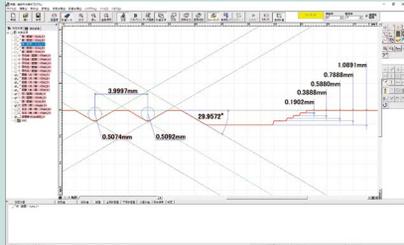
- This dual system with a non-contact displacement sensor for scanning that enables measurement of minute height differences and 3D shapes.
- The non-contact displacement sensor (CPS probe) uses the wavelength confocal method.
- The LED used as the light source of the displacement sensor has an auto-brightness control function that enables seamless measurement of materials with different reflectivity.


QVH4 HYPER 606 Pro

Features: QVH4 Pro

- Enables detection of high inclination angles for both mirror and diffused surfaces.
- The automatic lighting adjustment function allows for high accuracy measurements.
- Surface roughness or thickness measurement of thin and transparent objects such as film.

Example of 3D form comparison



COMMON SPECIFICATIONS

Items	Model No.	QVH4 APEX 302 Pro	QVH4 APEX 404 Pro	QVH4 APEX 606 Pro	QVH4 HYPER 302 Pro	QVH4 HYPER 404 Pro	QVH4 HYPER 606 Pro
Measuring range (XxYxZ)	Vision	300x200x200 mm 12"x8"x8"	400x400x250 mm 16"x16"x10"	600x650x250 mm 24"x26"x10"	300x200x200 mm 12"x8"x8"	400x400x250 mm 16"x16"x10"	600x650x250 mm 24"x26"x10"
Vision measuring accuracy*1	$E_{UX}/E_{UY}/MPE$		(1.5 + 3L/1000) μ m			(0.8 + 2L/1000) μ m	
	E_{LUX}/MPE		(2.0 + 4L/1000) μ m			(1.4 + 3L/1000) μ m	
	E_{LIZ}/MPE		(1.5 + 4L/1000) μ m			(1.5 + 2L/1000) μ m	
Displacement sensor measuring accuracy*1*2	E_{IZ}		(1.5 + 4L/1000) μ m			(1.5 + 2L/1000) μ m	

*1 L=length between two arbitrary points (mm) *2 Inspected to a Mitutoyo standard.

CLASS 1 LASER PRODUCT

Safety precautions regarding QV HYBRID TYPE1

This product uses a low-power invisible laser (780 nm) for measurement. The laser is a CLASS 1 EN/IEC 60825-1 device. A warning and explanation label, as shown above, is attached to the product as appropriate.

QV HYBRID TYPE1

CNC Vision Measuring System equipped with Laser Non-contact displacement sensor

- This dual system with a non-contact displacement sensor for scanning enables measurement of minute height differences and 3D shapes.

- The double-pinhole technique is used as the detection method of the displacement sensor. It is less directional compared with the knife-edge and triangulation techniques.
- The small laser spot with diameter of about 2 μ m makes it possible to measure minute shapes.

Features: QV HYBRID TYPE1

- The focusing point method minimizes the difference in the measuring face reflectance and achieves high measurement reproducibility.
- Capable of measuring detailed shapes in high resolution.

COMMON SPECIFICATIONS

Items	Model No.	QVH1 Apex 302	QVH1 Apex 404	QVH1 Apex 606	Hyper QVH1 302	Hyper QVH1 404	Hyper QVH1 606
Measuring range (XxYxZ)	Vision	300x200x200 mm 12"x8"x8"	400x400x250 mm 16"x16"x10"	600x650x250 mm 24"x26"x10"	300x200x200 mm 12"x8"x8"	400x400x250 mm 16"x16"x10"	600x650x250 mm 24"x26"x10"
Vision measuring accuracy*	E_{IX}/E_{IY}		(1.5 + 3L/1000) μ m			(0.8 + 2L/1000) μ m	
	E_{IZ}		(1.5 + 4L/1000) μ m			(1.5 + 2L/1000) μ m	
	E_{2XY}		(2.0 + 4L/1000) μ m			(1.4 + 3L/1000) μ m	
Displacement sensor measuring accuracy*	E_{IZ}		(1.5 + 4L/1000) μ m			(1.5 + 2L/1000) μ m	

* Inspected to a Mitutoyo standard. L=length between two arbitrary points (mm)

Vision Measuring Systems

MeasurLink¹ ENABLED
Data Management Software by Mitutoyo



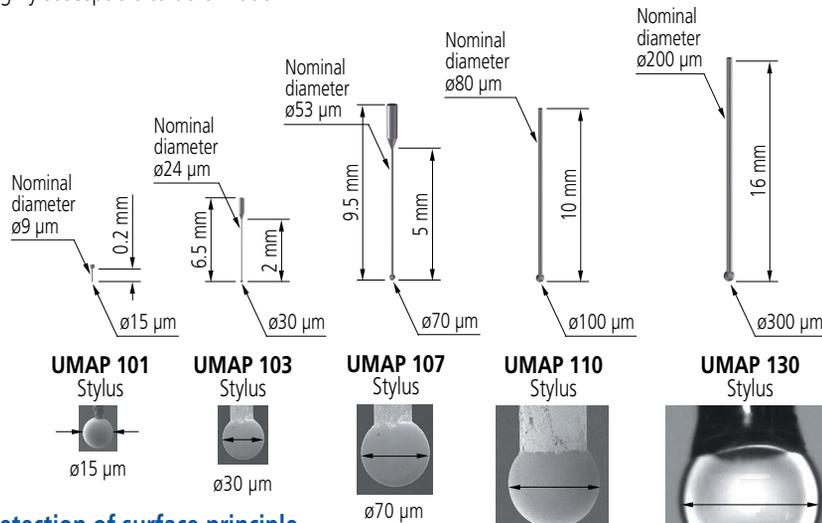
UMAP Vision System TYPE2 Micro Form Measuring System

Ultrasonic Micro Probe UMAP

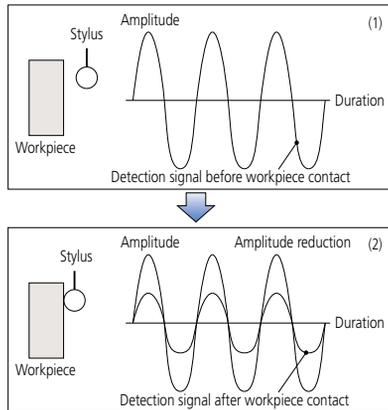
Contact measurement of a small diameter and its section or contour is possible, which is difficult with a conventional Vision Measuring System or CMM. Capable of high accuracy, sophisticated, non-contact and contact measurement on one machine. With a minimum measuring force of 1 μN, it is not only less likely to mark workpiece surfaces, but also enables measurement of workpieces that are highly susceptible to deformation.



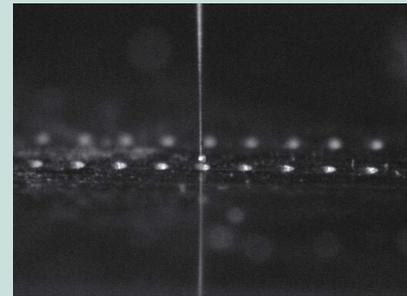
Micro probe, UMAP



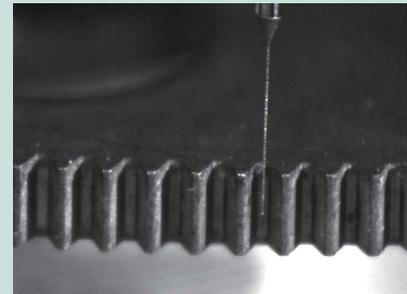
Detection of surface principle



Typical applications



Contour measurement of a ø0.125 mm hole



Measuring form of micro gear teeth

SPECIFICATIONS

Items	Model No.	Hyper UMAP 302	ULTRA UMAP 404
Measuring range (common to vision and UMAP)	X-axis×Y-axis	185×200 mm 7"×8"	285×400 mm 11"×16"
Vision measuring accuracy*	Z-axis	UMAP 101/103	175 mm / 6.9"
		UMAP 107/110	180 mm / 7"
	Vision	UMAP 130	185 mm / 7.3"
		Stream (optional)	-
Repeatability	UMAP	UMAP 101/103/107	σ ≤ 0.1 μm
		UMAP 110/130	σ ≤ 0.15 μm
	UMAP	UMAP 101/103/107	σ ≤ 0.08 μm
		UMAP 110/130	σ ≤ 0.12 μm

* Inspected to a Mitutoyo standard. L=length between two arbitrary points (mm)

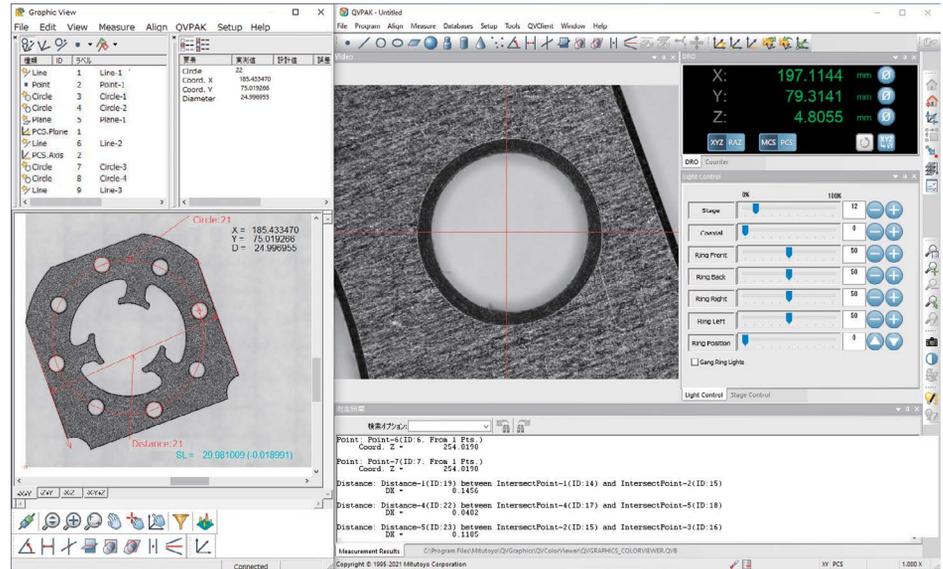


Refer to UMAP Vision System Brochure (E14000) for more details.

Vision Measuring Systems

QVPAK Operating Software for Quick Vision Systems

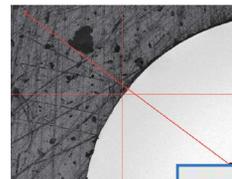
- QVPak is the control software used on all Quick Vision machines. It is used to write programs, run programs, and perform manual measurements.



Edge Detection Tools



Where to Buy



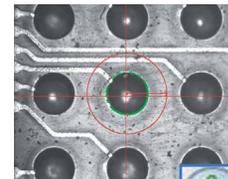
Simple Tool

This is a basic tool for detecting one point.



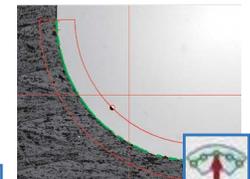
Box Tool

This tool detects straight edges with a minimum of one pixel interval. Compared to the simple tool, the Box tool can perform averaging and remove abnormal points, which enables stable measurements.



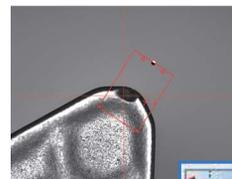
Circle Tool

This tool detects rounded edges with a minimum of one pixel space. Edges can be specified easily with a single click.



Arc Tool

This tool is suited for detection of arcs and corner radii.



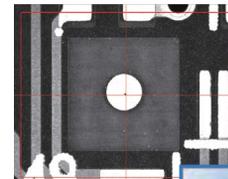
Maximum / Minimum Tool

This tool detects the maximum or minimum on the specified edge.



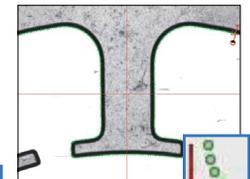
Area Centroid Tool

This tool detects the position of a form's centroid, and is suited for locating the position of different forms.



Pattern Search Tool

This tool performs pattern matching to detect a position, and is optimal for positioning alignment marks and similar tasks.



Auto Trace Tool

This is a shape-measuring tool that automatically tracks a contour with input consisting only of a start point and end point.



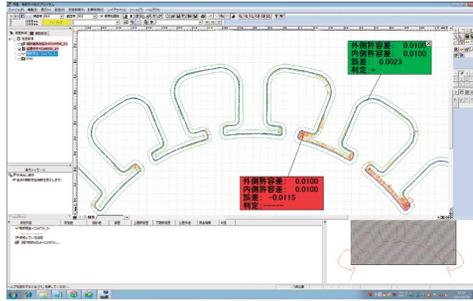
Refer to the **QUICK VISION Series Brochure (2316)** for more details.

Vision Measuring Systems

Application Software (Optional)

Form assessment/analysis software FORMTRACEPAK-AP

Verification of designed value and form analysis are performed on the basis of the contour data obtained via the QV auto trace tool, non-contact displacement sensor, PFF, and WLI.

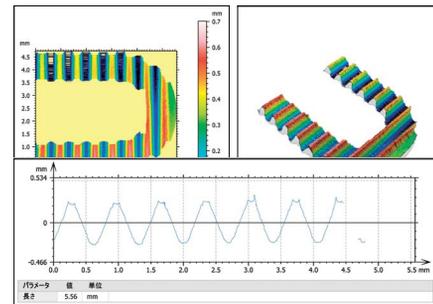


FORMTRACEPAK-PRO

This software performs 3D form analysis from the data obtained via the non-contact displacement sensor of the QV HYBRID Series.

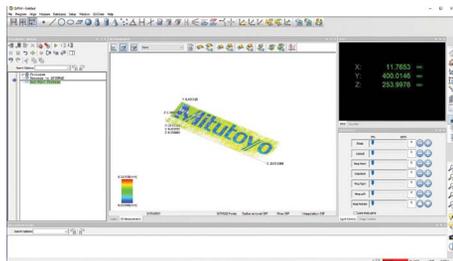
MCubeMap

Allows you to analyze parameters compliant with JIS B681-2: 2018 (ISO25178-6: 2010), such as Sa, Sq and other height parameters from the 3D data captured by QVWLI.



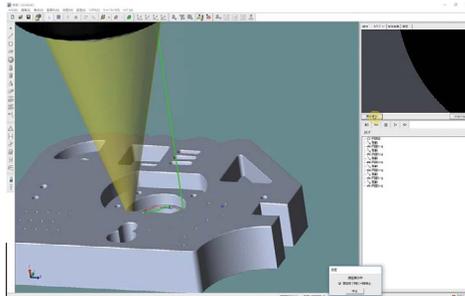
QV3D Function

This option generates 3D forms from the PFF (Points From Focus) or WLI (White Light Interferometer) data.



Measurement support software QV3DCAD

QV3DCAD uses 3D CAD models to easily create QVPAK part programs both online and offline.



Offline teaching software EASYPAG-PRO

This software creates QVPAK measurement procedure programs using 2D CAD data.

Statistical processing software MeasurLink®

This software enables statistical arithmetic processing of measurement results.

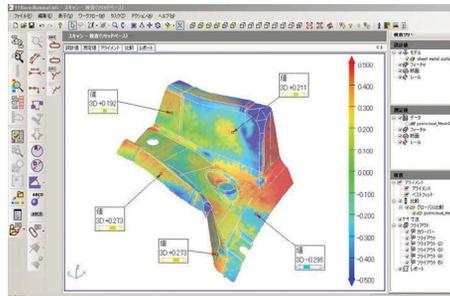
MeasurLink®

External control software QVEio

Allows you to externally control or output the operating status of a QV connected to a PLC or PC.

MSurf-I

This software compares scanned points collected by the QV system to a solid model allowing profile of a surface measurement.



Get a Quote

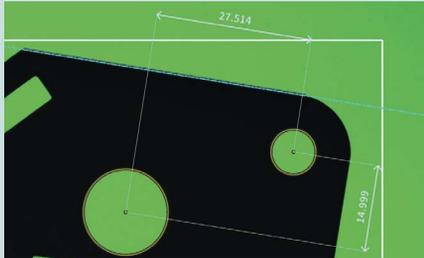
Vision Measuring Systems

QM-Fit Smart Vision System

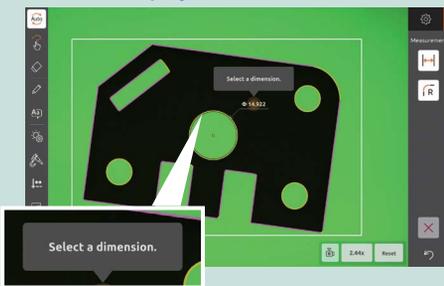
- Measurements are automatically detected based on the workpiece. To start measuring a workpiece, simply place it on the measuring stage.
- Intuitive, touch interface.
- Standalone machine with integrated PC and display.
- More compact than conventional measuring machines and can be installed almost anywhere.



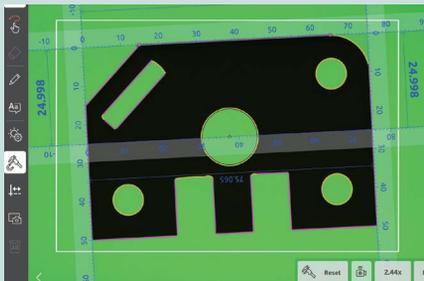
Automatic Element Detection



Guidance Display



Caliper Snap



SPECIFICATIONS

QM-Fit	Description	
Image sensor	20-megapixel color CMOS	
Touch panel monitor	Size	15.6 in
	Resolution	1980 x 1080
	Zoom magnification (digital)	Max. 100X
Illumination	Stage light	Green LED
	Ring light	White LED: 8 segments
Measurement specifications (Accuracy assurance temperature: 20±1°C)	Max. loading capacity	22 lbs / 10 kg (uniformly disubed load)
	Measurement accuracy*	±10 μm
	Repeatability*	2σ 4 μm
	Measurement range	4.5 x 2.95 in / 115 x 75 mm
	Max. workpiece height	1.4 in / 36 mm

* Based on in-house inspection criteria



Refer to the **QM-Fit Series Brochure (E14032-US)** for more details.

Vision Measuring Systems

Quick Image Non-contact 2D Vision Measuring System

- This series of 2D vision measuring machines offers high-efficiency measurement by employing a telecentric optical system that has a deep focal depth and a wide field of view.
- Includes Metlogix M3 software for easy, intuitive operation.
- The stitching function enables the entire view of a large workpiece so that highly accurate and speedy measurement can be performed.
- An optional model with a motorized stage offers easy and comfortable stage operation.
- A single click enables multiple measurements in one display. A batch measurement can be applied to multiple workpieces in the display after executing a pattern search based on the workpiece position.
- This series is equipped with a 3-megapixel color camera. Even with low magnification, high repeatability can be obtained.
- The choice of five stage sizes makes it easy to choose a machine to suit the user's application.



QI-C2017D



Motorized stage on QI-C



M3 software



Refer to the **QUICK IMAGE** Series Brochure (E14009-US) for more details.

SPECIFICATIONS

	Manual stage model					Motorized stage model		
Model No.	QI-A1010D	QI-A2010D	QI-A2017D	QI-A3017D	QI-A4020D	QI-C2010D	QI-C2017D	QI-C3017D
Order No.	361-850A	361-851A	361-852A	361-853A	361-854A	361-860A	361-861A	361-862A
Package No.	361-850M3Pk	361-851M3PK	361-852M3PK	361-853M3PK	361-854M3PK	361-860APK	361-861APK	361-862APK
Measuring range (XxY)	3.94" x 3.94" 100x100mm	7.87" x 3.94" 200x100mm	7.87" x 6.69" 200x170mm	11.8" x 6.69" 300x170mm	15.7" x 7.87" 400x200mm	7.87" x 3.94" 200x100mm	7.87" x 6.69" 200x170mm	11.8" x 6.69" 300x170mm
Effective stage glass size	6.69" x 6.69" 170x170mm	9.53" x 5.51" 242x140mm	10.2" x 9.06" 260x230mm	14.2" x 9.06" 360x230mm	17.3" x 9.13" 440x232mm	9.53" x 5.51" 242x140mm	10.2" x 9.06" 260x230mm	14.2" x 9.06" 360x230mm
Maximum stage loading *1	Approx. 22 lbs.(10kg)		Approx. 44 lbs.(20kg)		Approx. 33 lbs. 15kg	Approx. 22 lbs. 10kg	Approx. 44 lbs.(20kg)	
Main unit mass	Approx. 143 lbs. 65kg	Approx. 152 lbs. 69kg	Approx. 330 lbs. 150kg	Approx. 348 lbs. 158kg	Approx. 361 lbs. 164kg	Approx. 158 lbs. 72kg	Approx. 337 lbs. 153kg	Approx. 354 lbs. Approx. 161kg

*1 Does not include extremely offset or concentrated loads

		QI-A / QI-C	
View field		1.26" x 0.94" (32x24mm)	
Measurement mode		High resolution mode / Normal mode *4	
Travel range (Z-axis)		3.94"(100mm)	
Accuracy	Measurement accuracy within the screen *1	±4µm	
	Repeatability within the screen (±2σ) *2	High resolution mode	±1µm
		Normal mode	±2µm
Measurement accuracy (E1xy) *1		±(3.5+0.02L)µm L: arbitrary measuring length (mm)	
Monitor magnification *3		7.6X	
Optical system	Magnification (Telecentric Optical System)	0.2X	
	Depth of focus	High resolution mode	±0.6mm
		Normal mode	±11mm
Working distance		3.54"(90mm)	
Camera		3 million pixels, 1/2", full color	
Illumination		Transmitted light: Green LED telecentric illumination Co-axial light: White LED Ring light: 4-quadrant white LED	
Power supply		100-240VAC 50/60Hz	
Accuracy guaranteed temperature range		19-21°C	

*1 Inspected to Mitutoyo standards by focus point position.

*2 The measuring accuracy is guaranteed to be accurate within the depth of focus.

*3 For 1X digital zoom (when using the 22-inch-wide monitor)

*4 Patent registered (Japan)

Quick Guide to Precision Measuring Instruments



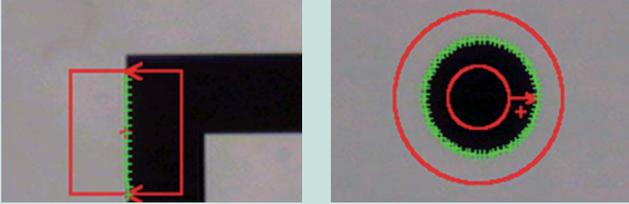
Vision Measuring Machines

Vision Measurement

Vision measuring machines mainly provide the following processing capabilities.

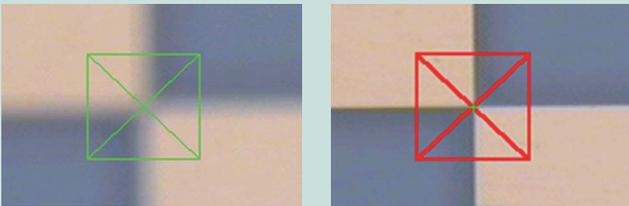
- **Edge detection**

Detecting/measuring edges in the XY plane



- **Auto focusing**

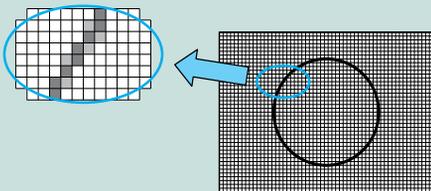
Focusing and Z-axis measurement



- **Pattern recognition**

Alignment, positioning, and inspecting a feature

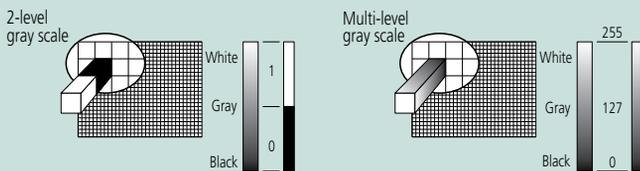
Image Storage



An image is comprised of a regular array of pixels. This is just like a picture on fine plotting paper with each square solid-filled differently.

Gray Scale

A PC stores an image after internally converting it to numeric values. A numeric value is assigned to each pixel of an image. Image quality varies depending on how many levels of gray scale are defined by the numeric values. The PC provides two types of gray scale: two-level and multi-level. The pixels in an image are usually displayed as 256-level gray scale.

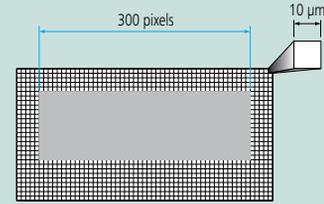


Pixels in an image brighter than a given level are displayed as white and all other pixels are displayed as black.

Each pixel is displayed as one of 256 levels between black and white. This allows high-fidelity images to be displayed.

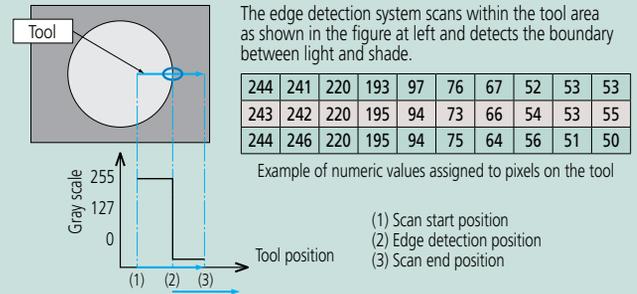
Dimensional Measurement

An image consists of pixels. If the number of pixels in a section to be measured is counted and is multiplied by the size of a pixel, then the section can be converted to a numeric value in length. For example, assume that the total number of pixels in the horizontal size of a square workpiece is 300 pixels as shown in the figure below. If a pixel size is 10 μm under imaging magnification, the total length of the workpiece is given by 10 μm×300 pixels=3000 μm=3 mm.

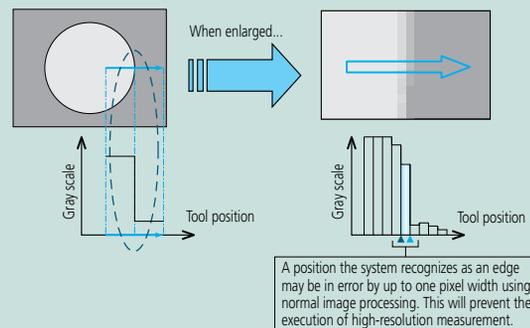


Edge Detection

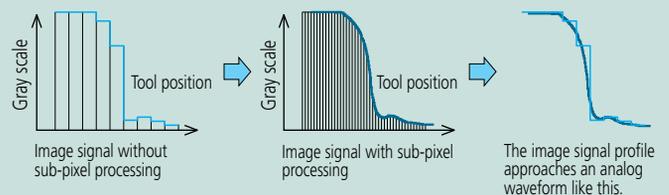
How to actually detect a workpiece edge in an image is described using the following monochrome picture as an example. Edge detection is performed within a given domain. A symbol which visually defines this domain is referred to as a tool. Multiple tools are provided to suit various workpiece geometries or measurement data.



High-resolution Measurement

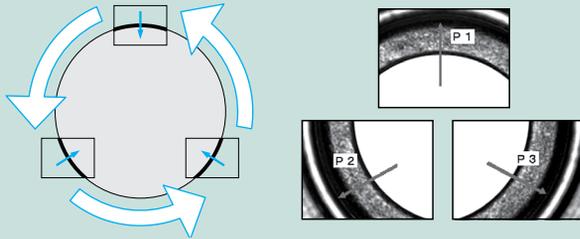


To increase the accuracy in edge detection, sub-pixel image processing is used. An edge is detected by determining an interpolation curve from adjacent pixel data as shown below. As a result, it allows measurement with a resolution better than 1 pixel.

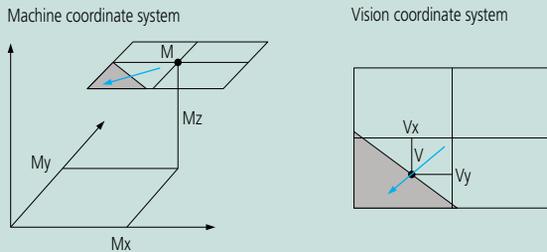


Measurement along Multiple Portions of an Image

Large features that do not fit on one screen have to be measured by precisely controlling the position of the sensor and stage so as to locate each reference point within individual images. By this means, the system can measure even a large circle, as shown below, by detecting the edge while moving the stage across various parts of the periphery.



Composite Coordinates of a Point



Measuring machine stage position
 $M = (Mx, My, Mz)$

Detected edge position (from the center of vision)
 $V = (Vx, Vy)$

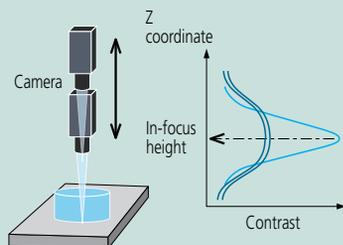
Actual coordinates are given by $X=(Mx+Vx)$, $Y=(My+Vy)$, and $Z=Mz$, respectively.

Since measurement is performed while individual measured positions are stored, the system can measure dimensions that cannot be included in one screen, without problems.

Principle of Auto Focusing

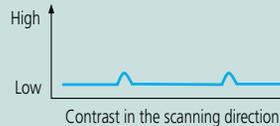
The system can perform XY-plane measurement, but cannot perform height measurement using only the camera image. The system is commonly provided with the Auto Focus (AF) mechanism for height measurement. The following explains the AF mechanism that uses a common image, although some systems may use a laser AF.

The AF system analyzes an image while moving the camera up and down in the Z-axis. In the analysis of image contrast, an image in sharp focus will show a peak contrast and one out of focus will show a low contrast. Therefore, the height at which the image contrast peaks is the just-in-focus height.

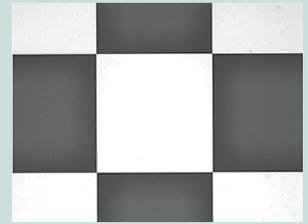


Variation in Contrast Depending on the Focus Condition

Edge contrast is low due to out-of-focus edges.



Edge contrast is high due to sharp, in-focus edges.



Overview of ISO 10360-7:2011

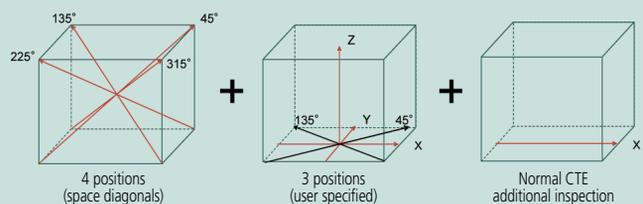
ISO 10360-7:2011 (Geometrical product specifications (GPS) -- Acceptance and reverification tests for coordinate measuring machines (CMM) -- Part 7: CMMs equipped with imaging probing systems) was published on June 1, 2011.

Some inspection items are listed in ISO 10360-7:2011. The following summarizes the test method for determining length measurement error (E) and probing error (P_{F2D}).

Length measurement error, E

Five test lengths in seven different directions within the measuring volume, each length measured three times, for a total of 105 measurements. Four directions are the space diagonal. Remaining three directions are user specified; default locations are parallel to the VMM axes.

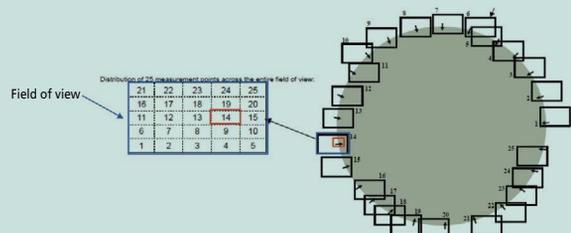
When CTE (coefficient of thermal expansion) of the test-length artifact is $< 2 \times 10^{-6}/K$, additional measurement using an artifact with a normal CTE (8 to $13 \times 10^{-6}/K$) is performed.



Probing error, P_{F2D}

Measure 25 points distributed evenly around the test circle (14.4° pitch). Each of the 25 points shall be measured using the specified 25 areas of the field of view.

Calculate probing error as the range of the 25 radial distances ($R_{max} - R_{min}$) from the center of the least-square circle.





In the Spirit of Mitutoyo

To become a complete man, one must acquire Wisdom, Benevolence and Valor. With Wisdom only, one tends to be cold. Benevolence alone makes one weaker. With valor only, one may reach beyond his capabilities. When the three qualities are combined, however, one will become a complete man. Similarly, success in enterprise lies in the knowledge of Heaven, Earth and Man. Business will succeed only when these factors, "heavensent" chances, natural opportunities, and harmony of man are present. Without even one factor, success is remote. In Buddhism, Butsu (Buddha), Po (Doctrine) and So (Priest) are three principle treasures for its promotion of the teaching. In Christianity, God, Bible and Minister.

The word MITUTOYO signifies three abundances. "Mitsu" means three, while "Toyo" stands for a state of abundance. The name MITUTOYO was selected, with a sincere wish to see more complete men, to create a prosperous enterprise and to introduce righteous religion to all, along with the lasting wish for a peaceful world and fulfillment of meaningful life.

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