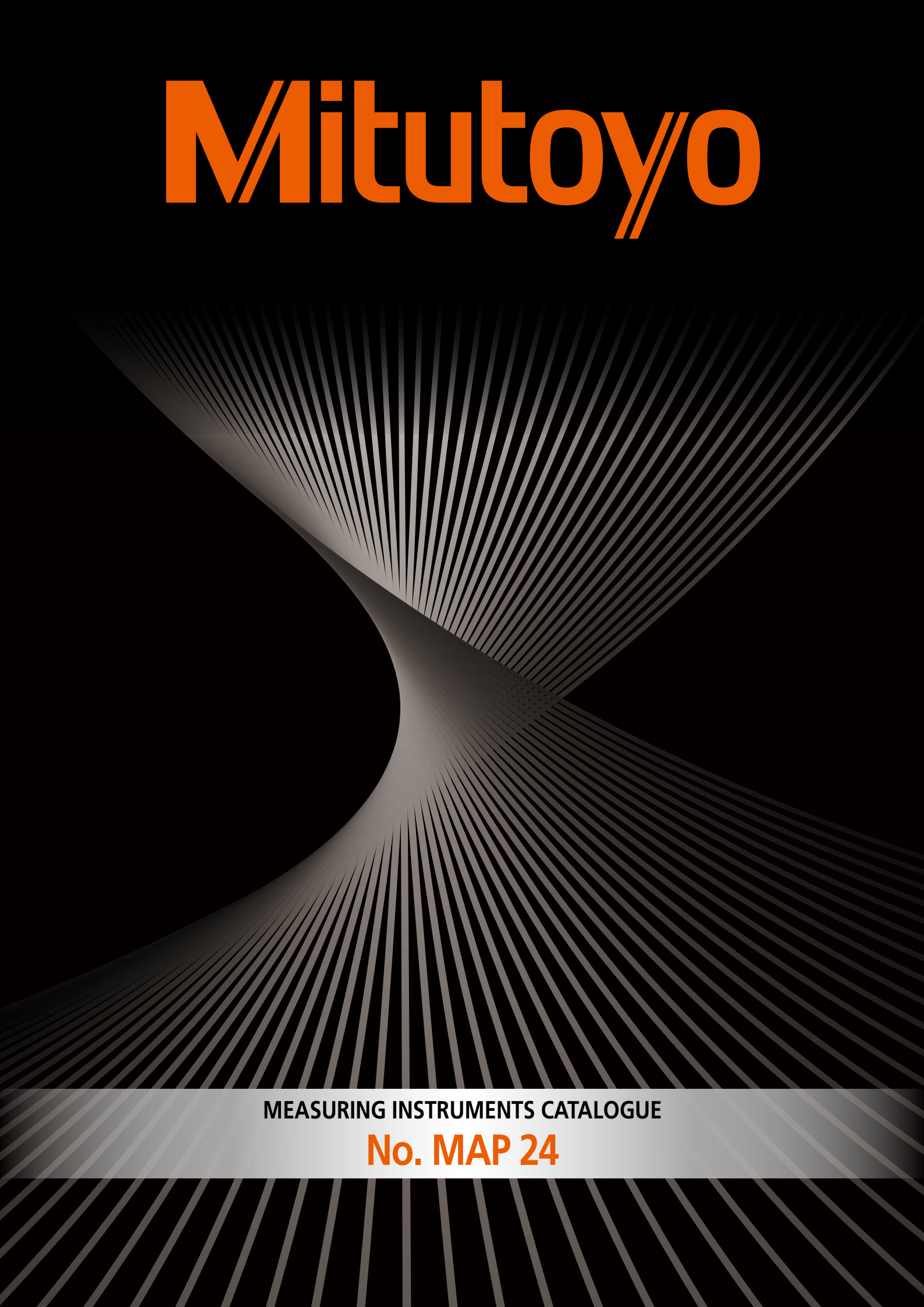


Mitutoyo



MEASURING INSTRUMENTS CATALOGUE

No. MAP 24

Notes on Use

Export Control

Do not commit an act, which could directly or indirectly, violate any law or regulation of Japan, your country or any other international treaty, relating to the export or re-export of any commodities. Please consult our sales office near you before you export our products or you offer technical information to a nonresident.

Sale of inch-model products

Sale of inch-model products in Japan is regulated by the Japanese laws and ordinances.

If you request to purchase inch-model products, contact your nearest Mitutoyo sales office.

Safety Caution

Mitutoyo products are designed, manufactured and sold as industrial products that are intended for use at manufacturing sites. 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

Mitutoyo reserves the right to change any or all aspects of any product specification, including prices, designs and service content, without notice.

The product names in this catalog are registered trademarks or trademarks of Mitutoyo or their respective companies.



Measuring Instruments Catalog

E2024

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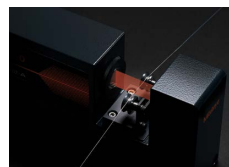
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07**Indicators****07-1 to 07-104**

08**Inside Measuring Instruments****08-1 to 08-58**

09**Measurement Data
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11**Sensors and Embedded
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12**Measuring Equipment****12-1 to 12-28**

13**Quick Guide to Precision
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14**Network Service****14-1 to 14-13**

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		Second characteristic numeral	Degrees of protection against water		Supplementary letter	Degrees of protection against oil	
	Brief description	Definition		Brief description	Definition		Abstract	
0	Unprotected	—	0	Unprotected	—			
1	Protected against solid foreign objects of ≥ 50 mm and greater	A ≥ 50 mm object probe shall not fully penetrate enclosure*	1	Protected against vertical water drops	Vertically falling water drops shall have no harmful effects.	F	Oil-resistant	Drops or splashes of oil from any direction cause no harmful effects.
2	Protected against solid foreign objects of ≥ 12.5 mm and greater	A ≥ 12.5 mm object probe shall not fully penetrate enclosure*	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 solid foreign objects of ≥ 2.5 mm and greater	A ≥ 2.5 mm object probe shall not fully penetrate enclosure*	3	Protected against spraying water	Water sprayed at an angle up to 60° either side of the vertical shall have no harmful effects.	G	Oil-proof	Protection against entry of oil droplets or splashes from all directions.
4	Protected against solid foreign objects of ≥ 1.0 mm and greater	A ≥ 1.0 mm object probe shall not fully penetrate enclosure*	4	Protected against splashing water	Water splashed against the enclosure from any direction shall have no harmful effects.			
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.	5	Protected against water jets	Water projected in jets against the enclosure from any direction shall have no harmful effects.			
6	Dust-proof	No ingress of dust allowed.	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.			

* 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).

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

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.

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

**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.

Features of Mitutoyo Small Tool Instruments



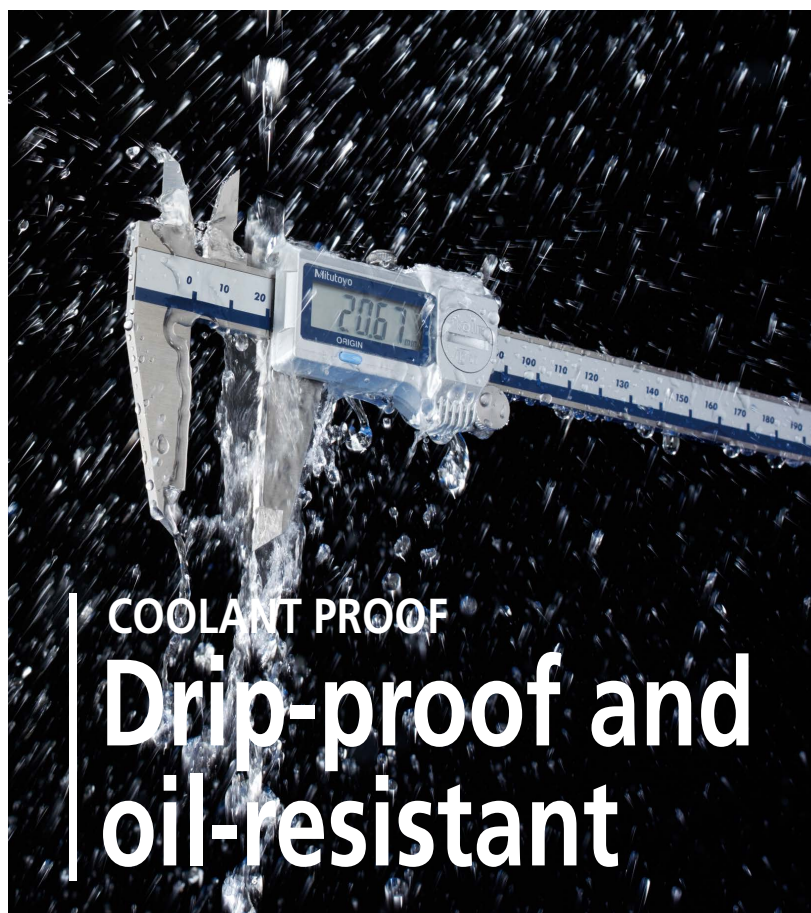
Resolution:
0.0001 mm



Resolution: 0.0001 mm

High Accuracy Digimatic Micrometer SERIES 293 with resolution of 0.0001 mm

The High-Accuracy Digimatic Micrometer utilizes Mitutoyo's innovative 0.1 μm resolution ABS (ABSOLUTE) rotary sensor and high-accuracy screw machining technology to achieve the MPE of $\pm 0.5 \mu\text{m}$, delivering 0.1 μm resolution measurements without sacrificing operability.



COOLANT PROOF

COOLANT PROOF is the universal term for Mitutoyo Digimatic Small Tool Instruments that are not only resistant to dust and water ingress (rated to IP65 or better) but also to deterioration of materials due to contact with the cutting oil or coolant fluids in normal use.

Note: Some types of aggressive cutting oil or coolant may degrade the sealing materials over time.

COOLANT PROOF™



QuantuMike with 2 mm/rev Spindle Feed

Faster measurement is achieved by using a finer thread which feeds the spindle by 2 mm per revolution of the thimble instead of the standard 0.5 mm. This increase of spindle feed has been made possible thanks to new high precision thread-cutting and testing techniques. In addition, the ratchet thimble mechanism helps ensure repeatable results and enables easy operation- even when making measurement one-handed.

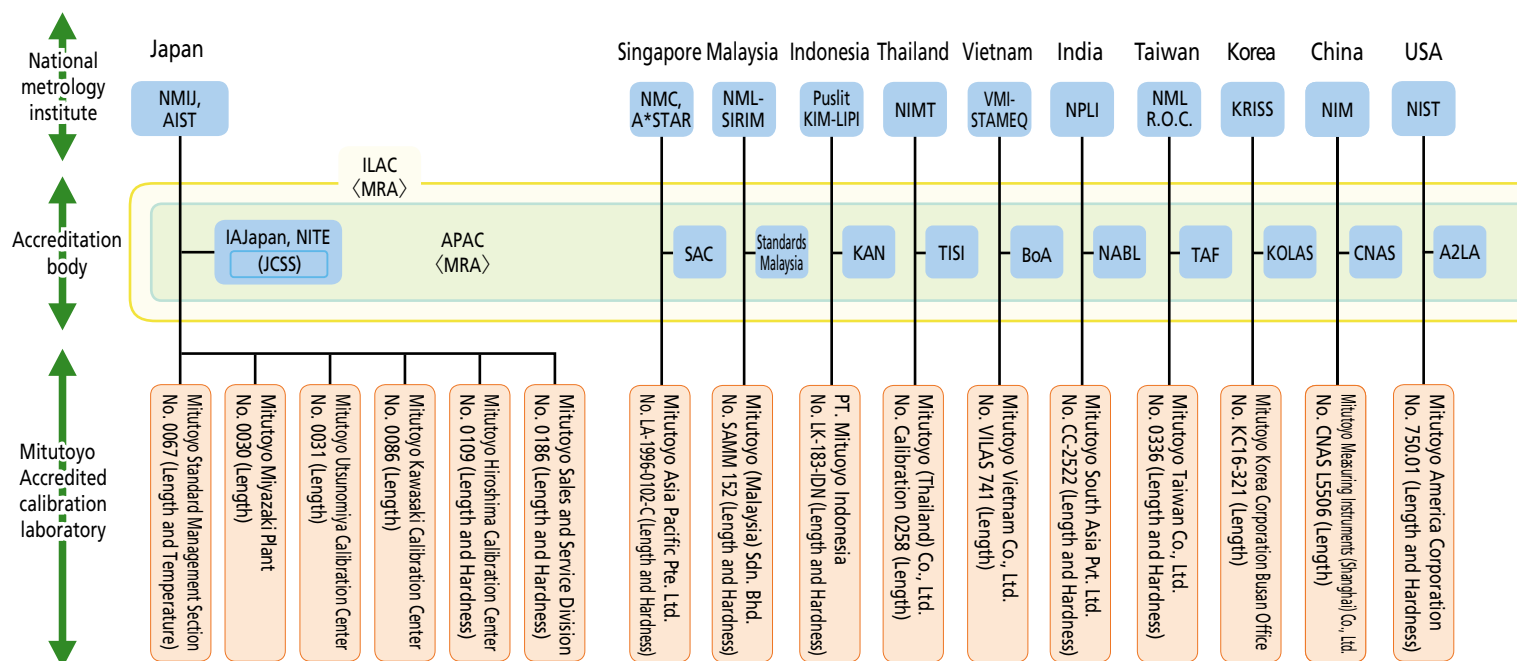


2 mm feed per revolution



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

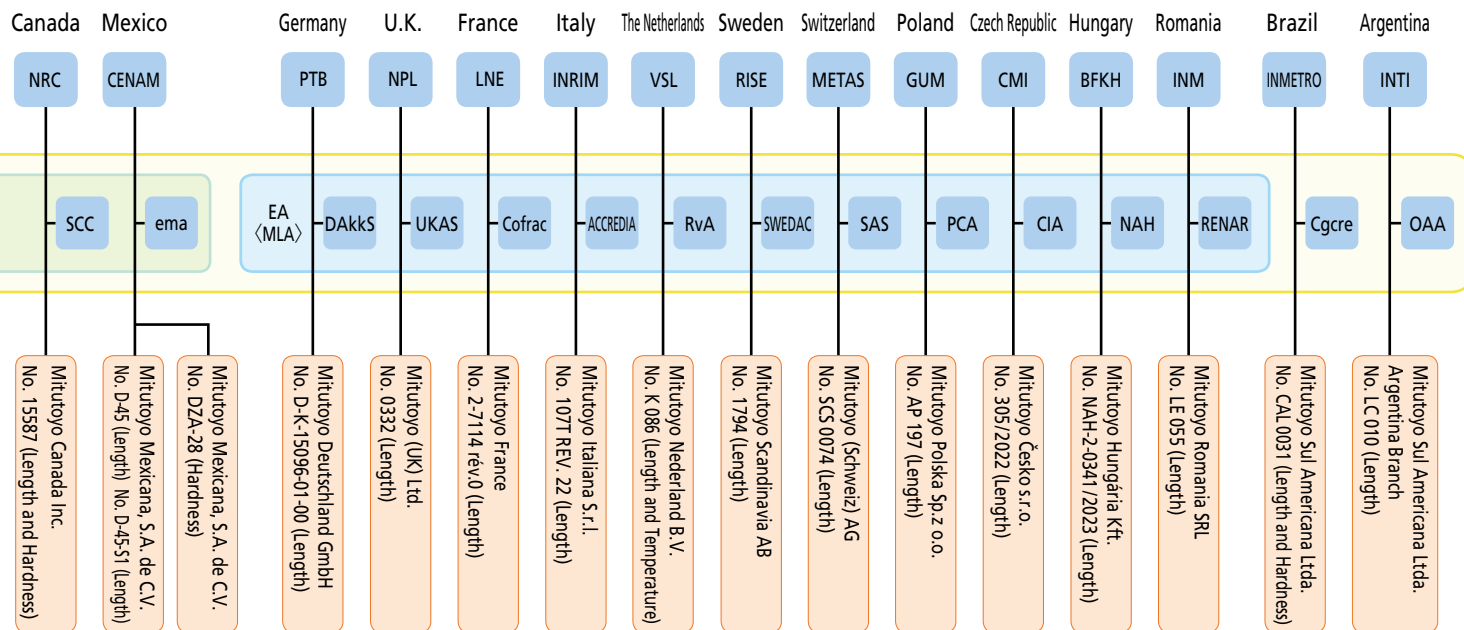
- Mexico
 - CENAM : Centro Nacional de Metrología
 - ema : Entidad Mexicana de Acreditación, a.c.

- 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 Accreditare 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

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>



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)

Traceability of Mitutoyo Standards

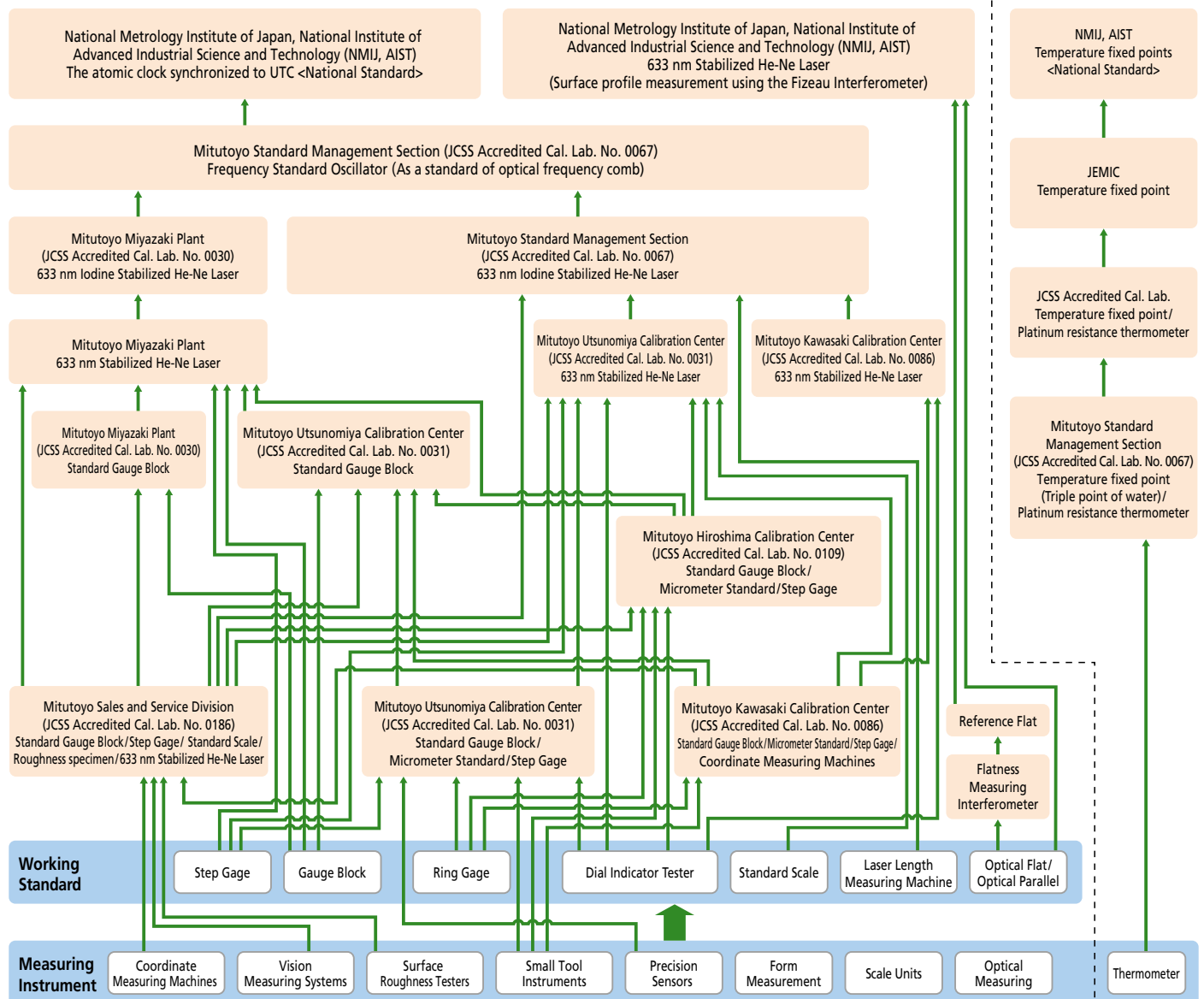
Mitutoyo ensures and maintains traceability of various types of precision measuring instruments by holding standards of length and other physical quantities that are directly traceable to the national standards for use in calibrating the working standards used for the calibration of measuring instrument 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)

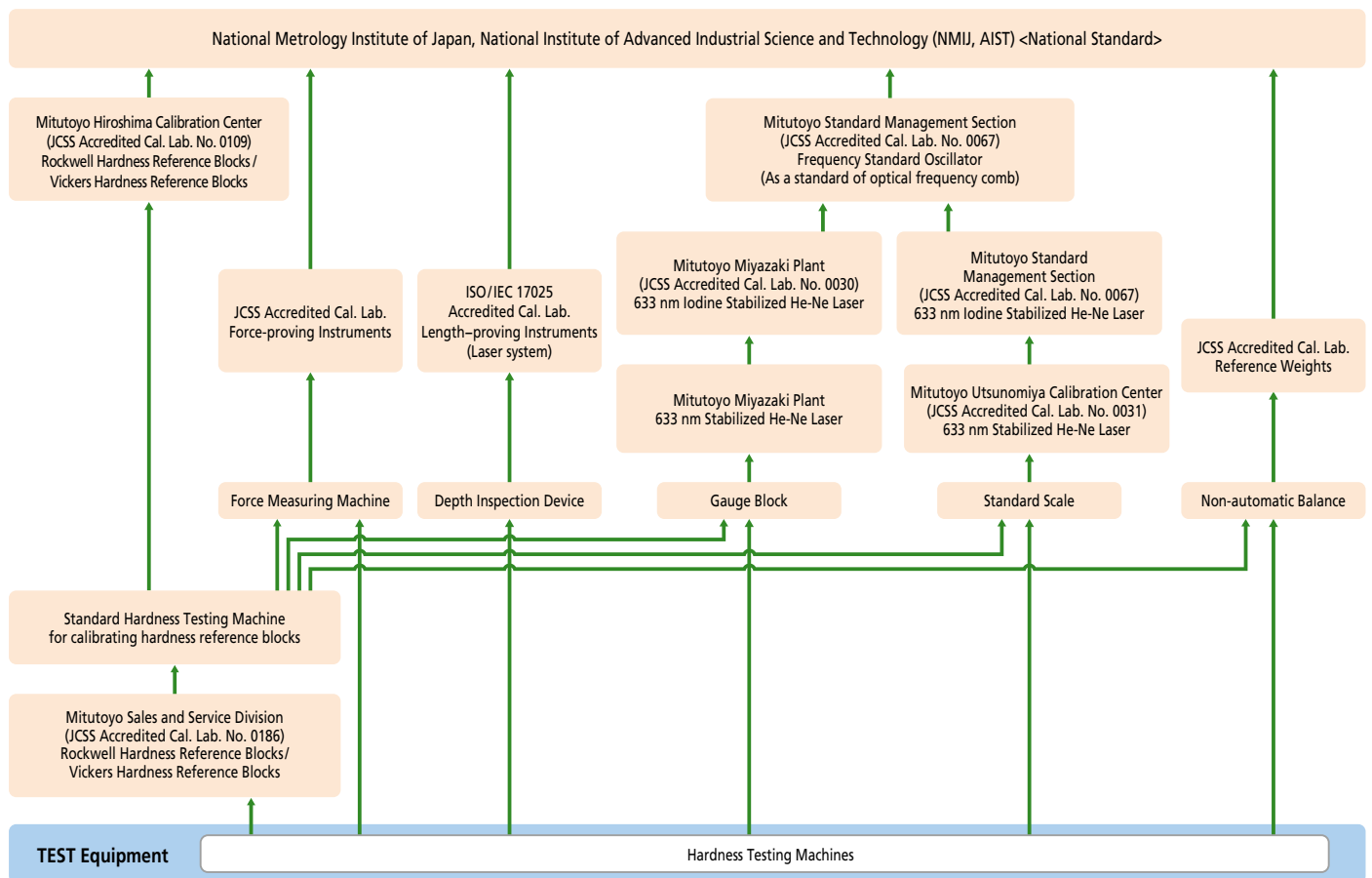
Traceability of Length Field



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>

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>

Video

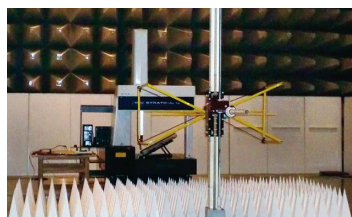


Response to Safety and Environmental Protection Regulations

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: - 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 (CLSV)) 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.

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01

Calibration Instruments

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.



Metric/Inch Rectangular Gauge Block Sets



Gauge Block Comparator GBCD-100A



Black Granite Surface Plates

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Gauge Blocks

Features and Accuracies

Features of Mitutoyo gauge blocks

Mitutoyo offers gauge blocks for use as length standards that are fully domestically manufactured at our plant in Japan and highly trusted worldwide for their accuracy, quality, and durability. They are available in three types: steel rectangular gauge blocks, ceramic rectangular gauge blocks (CERA Blocks), and steel square gauge blocks. In addition, tungsten carbide rectangular gauge blocks and tungsten carbide square gauge blocks are available as protectors. Select the right gauge blocks depending on the conditions, environment, and application of use.

Accuracy

Our calibration technique combined with established traceability to the Japanese national standard ensures that highly reliable products are delivered. We ensure the traceability of all our gauge blocks and guarantee their accuracy based on the national standard, so you can feel confident when using them.

Wringing

Lapping measuring surfaces is one of Mitutoyo's specialties. Our advanced technique, developed over more than half a century, enables us to achieve the optimum flatness and surface finish needed for gauge blocks and thus maximize the wringing force.

Abrasion resistance and dimensional stability

By adopting high-carbon, high-chrome steel that can satisfy various material characteristics necessary for gauge blocks, and thermally processing it carefully and repeatedly with our advanced technology, we produce high levels of hardness for reliable use and minimize aging deterioration as much as possible.

CERA Blocks

Produced by using our ultra-precision processing technology and ceramic materials with excellent surface smoothness, CERA Blocks feature the following advantages not delivered by steel blocks.

(1) Corrosion Resistant

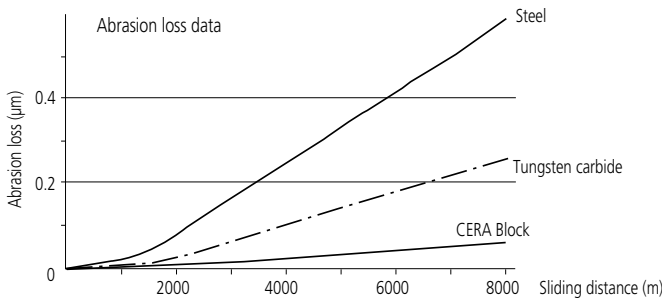
Anti-corrosion treatment is not required when handled normally (i.e. with fingers), resulting in simple maintenance and storage.

(2) No Burrs Caused by Accidental Mishandling

Since the CERA Block is very hard, it will not scratch easily and is highly resistant to burrs. If a burr is formed, it can easily be removed with a ceramic deburring stone (Ceraston).

(3) Excellent abrasion resistance

CERA Blocks are 10 times more resistant to abrasion than steel blocks and therefore have a longer life (based on in-house test results).



(4) Dimensional Stability

CERA Blocks are highly resistant to dimensional changes over time.

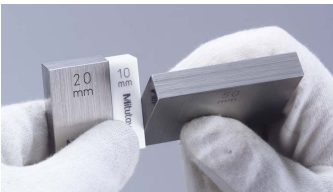
(5) Clearly Marked Sizes

Black characters, indicating the nominal length, are inscribed by laser and are clearly visible against the white surface of the block.

(6) Non-magnetic Nature Prevents Steel Swarf Contamination

(7) High Wringing Force

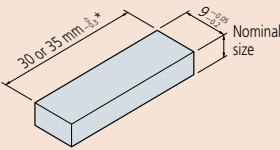
Superior flatness and surface finish provides maximum wringing force.



Classification of Gauge Blocks by Shape

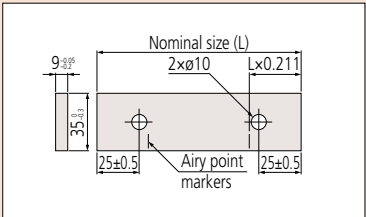
Mitutoyo broadly divides gauge blocks into two categories according to the block shape.

Rectangular gauge blocks



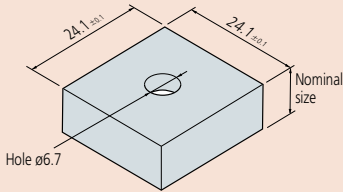
* Depends on the nominal size.
More than 10 mm: 35 mm
10 mm or less: 30 mm

All standard long blocks 125 mm or more have two coupling holes on the body.



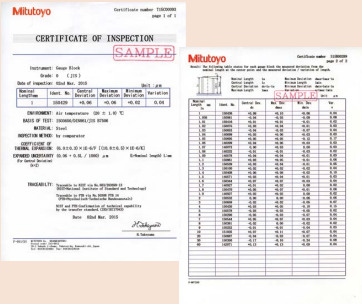
Long rectangular gauge blocks

Square gauge blocks



Mitutoyo Gauge Blocks and Inspection Certificates

A Certificate of Inspection is furnished with all Mitutoyo gauge blocks with a serial number on the box (in the case of sets) and an identification number on each block. The deviation of each block from nominal length, at the time of inspection, is stated. For this inspection, each gauge block is measured relative to the upper level master using a gauge block comparator. Grade K gauge blocks are measured by a primary measurement method using an interferometer.



Selecting Gauge Blocks

- Select gauge blocks in accordance with the combination range required.
If a large length is required, use one or more blocks from a long-block set.
- Select gauge blocks in accordance with the minimum length step required. Add a wear block at each end of the stack if the workpiece material is abrasive, or if the stack will be used frequently.
- If a set containing a large number of gauge blocks is selected, the number of gauge blocks required for any particular length is reduced and the number of combinations is increased. Accuracy of the blocks in the set will be retained longer because normal wear will be spread over a larger number of blocks.
- Gauge block sets dedicated to micrometer and caliper inspection are available (refer to page 01-13 for details).
- If using only one length repeatedly, it is a good idea to purchase discrete gauge blocks (refer to pages 01-15, 01-16, 01-17, 01-18, 01-25, and 01-26 for details).
- Products can be provided in combinations other than those in our standard sets. When placing such orders, please specify whether a storage box is required. Feel free to consult us if you need gauge blocks compliant with British (BS), American, or other standards. The U.S. Federal Specification for gauge blocks was replaced by ASME B89.1.9 in 2002. Please contact your local Mitutoyo sales office for further information.
- 2 mm-based gauge blocks, which take the base of the minimum length step as 2 mm, are available and many people find them easier to handle than 1 mm-based gauge blocks.
- All Mitutoyo gauge blocks, whether sold in sets or individually, come with a measurement inspection certificate.

Constructing a Gauge Block Stack

The following points should be noted when constructing a gauge block stack:

- (1) Use as few gauge blocks as possible to obtain the required length by selecting thick blocks wherever possible.
- (2) Select the block for the least significant digit first, then work back through the more significant digits until the required length is attained.
- (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 gauge blocks.

Example: Required length=45.6785 mm

• For a 1 mm-based gauge block set

$$\begin{array}{r}
 1.0005 \\
 1.008 \\
 1.17 \\
 17.5 \\
 +) \quad 25 \\
 \hline
 45.6785 \text{ mm}
 \end{array}$$

• For a 2 mm-based gauge block set

$$\begin{array}{r}
 2.0005 \\
 2.008 \\
 2.17 \\
 14.5 \\
 +) \quad 25 \\
 \hline
 45.6785 \text{ mm}
 \end{array}$$

Note: Regarding the method for wringing, refer to "Quick Guide to Precision Measuring Instruments" on page 13-28.



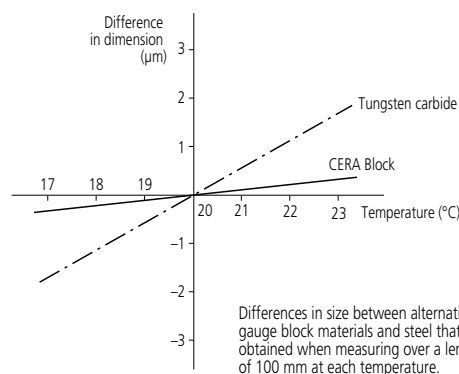
(8) Superior Material Characteristics of CERA Block

Property	Material	CERA Block (ZrO ₂)	Steel (Fe)	Tungsten Carbide (WC-Co)	ZERO CERA Blocks (Low thermal expansion)
Hardness (HV)		1350	800	1650	826
Coefficient of thermal expansion (10 ⁻⁶ /K)		9.3±0.5	10.8±0.5	5.5±1.0	0±0.02
Flexural strength by 3-point bending (MPa)		1270	1960	1960	210
Fracture toughness K _{1c} (MPa·m ^{1/2})		7	120	12	1.2
Young's modulus ×10 ⁴ (MPa)		20.6	20.6	61.8	130
Poisson's ratio		0.3	0.3	0.2	0.3
Specific gravity		6.0	7.8	14.8	2.5
Thermal conductivity (W/m·K)		2.9	54.4	79.5	3.7

Note: Ceramics have the advantage of a slow response to temperature changes due to the low thermal conductivity. However, caution is required when using CERA blocks under conditions of rapid temperature change.

(9) Difference in expansion coefficient between steel and CERA blocks is just 1.5×10⁻⁶/K

The thermal expansion coefficient of a CERA Block is quite similar to that of a steel gauge block.



(10) Highly Resistant to Dropping and Impact Damage

The CERA Block material is one of the toughest ceramics. It is extremely difficult to crack a CERA Block in normal use.

Features of Square Gauge Blocks



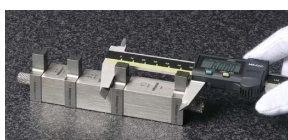
(1) Gauge blocks in a stack can be clamped together

After wringing square gauge blocks, a tie rod can be inserted through the center hole to clamp the blocks together for extra security.



(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 easily be made

A dedicated inspection jig for periodic inspection of instruments can be made easily and inexpensively.



(4) A wide measuring surface with cross-sectional dimensions of 24.1×24.1 mm is available.

A square gauge block retains stable orientation both longitudinally and laterally. A wide range of applications is covered, including cutting tool positioning, angle measurement with a sine bar, taper measurement with a roller, and inspection of depth micrometers.

Long and Ultra-Thin Gauge Blocks

Mitutoyo offers extra-thin gauge blocks from 0.10 mm to 0.99 mm (increments of 0.01 mm) as well as long gauge blocks up to 1,000 mm as standard products.

Gauge Blocks

Features and Accuracies

Grade and Application

The following table can be used to select the gauge block grade according to usage (specified by ISO3650, BS4311, and JIS B 7506).

	Applications	Grade
Workshop use	• Mounting tools and cutters	2
	• Manufacturing gages	1 or 2
	• Calibrating instruments	
Inspection use	• Inspecting mechanical parts, tools, etc.	1 or 2
	• Checking the accuracy of gages	0 or 1
	• Calibrating instruments	
Calibration use	• Checking the accuracy of gauge blocks for workshop • Checking the accuracy of gauge blocks for inspection • Checking the accuracy of instruments	K or 0
Reference use	• Checking the accuracy of gauge blocks for calibration • For academic research	K

ACCURACY SPECIFICATIONS: JIS B 7506-2004 (JAPAN) ISO 3650:1998 (at 20 °C)

Nominal length (mm)		Grade K		Grade 0		Grade 1		Grade 2	
		Limit deviation of length at any point (μm)	Tolerance for the variation in length (μm)	Limit deviation of length at any point (μm)	Tolerance for the variation in length (μm)	Limit deviation of length at any point (μm)	Tolerance for the variation in length (μm)	Limit deviation of length at any point (μm)	Tolerance for the variation in length (μm)
from 0.5	up to 10	±0.20	0.05	±0.12	0.10	±0.20	0.16	±0.45	0.30
over 10	up to 25	±0.30	0.05	±0.14	0.10	±0.30	0.16	±0.60	0.30
over 25	up to 50	±0.40	0.06	±0.20	0.10	±0.40	0.18	±0.80	0.30
over 50	up to 75	±0.50	0.06	±0.25	0.12	±0.50	0.18	±1.00	0.35
over 75	up to 100	±0.60	0.07	±0.30	0.12	±0.60	0.20	±1.20	0.35
over 100	up to 150	±0.80	0.08	±0.40	0.14	±0.80	0.20	±1.60	0.40
over 150	up to 200	±1.00	0.09	±0.50	0.16	±1.00	0.25	±2.00	0.40
over 200	up to 250	±1.20	0.10	±0.60	0.16	±1.20	0.25	±2.40	0.45
over 250	up to 300	±1.40	0.10	±0.70	0.18	±1.40	0.25	±2.80	0.50
over 300	up to 400	±1.80	0.12	±0.90	0.20	±1.80	0.30	±3.60	0.50
over 400	up to 500	±2.20	0.14	±1.10	0.25	±2.20	0.35	±4.40	0.60
over 500	up to 600	±2.60	0.16	±1.30	0.25	±2.60	0.40	±5.00	0.70
over 600	up to 700	±3.00	0.18	±1.50	0.30	±3.00	0.45	±6.00	0.70
over 700	up to 800	±3.40	0.20	±1.70	0.30	±3.40	0.50	±6.50	0.80
over 800	up to 900	±3.80	0.20	±1.90	0.35	±3.80	0.50	±7.50	0.90
over 900	up to 1000	±4.20	0.25	±2.00	0.40	±4.20	0.60	±8.00	1.00

ACCURACY SPECIFICATIONS: BS 4311:2007 (UK) (at 20 °C)

Nominal length (in)		Grade K		Grade 0		Grade 1		Grade 2	
		Limit deviation of length at any point (μin)	Tolerance for the variation in length (μin)	Limit deviation of length at any point (μin)	Tolerance for the variation in length (μin)	Limit deviation of length at any point (μin)	Tolerance for the variation in length (μin)	Limit deviation of length at any point (μin)	Tolerance for the variation in length (μin)
over 0	up to 0.4	±8	2	±5	4	±8	6	±18	12
over 0.4	up to 1	±12	2	±6	4	±12	6	±24	12
over 1	up to 2	±16	3	±8	4	±16	7	±32	12
over 2	up to 3	±20	3	±10	5	±20	7	±40	14
over 3	up to 4	±24	3	±12	5	±24	8	±48	14

Note 1: The accuracy of nominal lengths from 0.1 mm up to less than 0.5 mm follows that of nominal lengths from 0.5 mm up to 10 mm.

Note 2: Grade K gauge blocks are only available as made-to-order rectangular gauge blocks.

Note 3: Grade K gauge blocks are supplied with a JCSS calibration certificate. When ordering, kindly provide your formal name and contact information.

ACCURACY SPECIFICATIONS: ASME B89.1.9-2002 (USA)

(at 20 °C)

Nominal length (in)		Grade K		Grade 00		Grade 0		Grade 1		Grade 2	
		Limit deviation of length at any point (μin)	Tolerance for the variation in length (μin)	Limit deviation of length at any point (μin)	Tolerance for the variation in length (μin)	Limit deviation of length at any point (μin)	Tolerance for the variation in length (μin)	Limit deviation of length at any point (μin)	Tolerance for the variation in length (μin)	Limit deviation of length at any point (μin)	Tolerance for the variation in length (μin)
	up to 0.05	±12	2	±4	2	±6	4	±12	6	±24	12
over 0.05	up to 0.4	±10	2	±3	2	±5	4	±8	6	±18	12
over 0.45	up to 1	±12	2	±3	2	±6	4	±12	6	±24	12
over 1	up to 2	±16	2	±4	2	±8	4	±16	6	±32	12
over 2	up to 3	±20	2	±5	3	±10	4	±20	6	±40	14
over 3	up to 4	±24	3	±6	3	±12	5	±24	8	±48	14
over 4	up to 5	±32	3	±8	3	±16	5	±32	8	±64	16
over 5	up to 6	±32	3	±8	3	±16	5	±32	8	±64	16
over 6	up to 7	±40	4	±10	4	±20	6	±40	10	±80	16
over 7	up to 8	±40	4	±10	4	±20	6	±40	10	±80	16
over 8	up to 10	±48	4	±12	4	±24	6	±48	10	±104	18
over 10	up to 12	±56	4	±14	4	±28	7	±56	10	±112	20
over 12	up to 16	±72	5	±18	5	±36	8	±72	12	±144	20
over 16	up to 20	±88	6	±20	6	±44	10	±88	14	±176	24
over 20	up to 24	±104	6	±25	6	±52	10	±104	16	±200	28
over 24	up to 28	±120	7	±30	7	±60	12	±120	18	±240	28
over 28	up to 32	±136	8	±34	8	±68	12	±136	20	±260	32
over 32	up to 36	±152	8	±38	8	±76	14	±152	20	±300	36
over 36	up to 40	±160	10	±40	10	±80	16	±168	24	±320	40

Nominal length (mm)		Grade K		Grade 00		Grade 0		Grade 1		Grade 2	
		Limit deviation of length at any point (μm)	Tolerance for the variation in length (μm)	Limit deviation of length at any point (μm)	Tolerance for the variation in length (μm)	Limit deviation of length at any point (μm)	Tolerance for the variation in length (μm)	Limit deviation of length at any point (μm)	Tolerance for the variation in length (μm)	Limit deviation of length at any point (μm)	Tolerance for the variation in length (μm)
	up to 0.5	±0.30	0.05	±0.10	0.05	±0.14	0.10	±0.30	0.16	±0.60	0.30
over 0.5	up to 10	±0.20	0.05	±0.07	0.05	±0.12	0.10	±0.20	0.16	±0.45	0.30
over 10	up to 25	±0.30	0.05	±0.07	0.05	±0.14	0.10	±0.30	0.16	±0.60	0.30
over 25	up to 50	±0.40	0.06	±0.10	0.06	±0.20	0.10	±0.40	0.18	±0.80	0.30
over 50	up to 75	±0.50	0.06	±0.12	0.06	±0.25	0.12	±0.50	0.18	±1.00	0.35
over 75	up to 100	±0.60	0.07	±0.15	0.07	±0.30	0.12	±0.60	0.20	±1.20	0.35
over 100	up to 150	±0.80	0.08	±0.20	0.08	±0.40	0.14	±0.80	0.20	±1.60	0.40
over 150	up to 200	±1.00	0.09	±0.25	0.09	±0.50	0.16	±1.00	0.25	±2.00	0.40
over 200	up to 250	±1.20	0.10	±0.30	0.10	±0.60	0.16	±1.20	0.25	±2.40	0.45
over 250	up to 300	±1.40	0.10	±0.35	0.10	±0.70	0.18	±1.40	0.25	±2.80	0.50
over 300	up to 400	±1.80	0.12	±0.45	0.12	±0.90	0.20	±1.80	0.30	±3.60	0.50
over 400	up to 500	±2.20	0.14	±0.50	0.14	±1.10	0.25	±2.20	0.35	±4.40	0.60
over 500	up to 600	±2.60	0.16	±0.65	0.16	±1.30	0.25	±2.60	0.40	±5.00	0.70
over 600	up to 700	±3.00	0.18	±0.75	0.18	±1.50	0.30	±3.00	0.45	±6.00	0.70
over 700	up to 800	±3.40	0.20	±0.85	0.20	±1.70	0.30	±3.40	0.50	±6.50	0.80
over 800	up to 900	±3.80	0.20	±0.95	0.20	±1.90	0.35	±3.80	0.50	±7.50	0.90
over 900	up to 1000	±4.20	0.25	±1.00	0.25	±2.00	0.40	±4.20	0.60	±8.00	1.00

Note 1: The accuracy of nominal lengths from 0.1 mm up to less than 0.5 mm follows that of nominal lengths from 0.5 mm up to 10 mm.

Note 2: Grade K gauge blocks are only available as made-to-order rectangular gauge blocks.

Note 3: Grade K gauge blocks are supplied with a JCSS calibration certificate. When ordering, kindly provide your formal name and contact information.

Limit deviation of length at any point

This is the permitted deviation from nominal length.

The deviation of length, expressed as "actual length - nominal length", is measured at a total of five points: the "middle point" of the gauge block measuring face and the "four corners, at 1.5 mm on the inside from the side faces".

Tolerance for the variation in length

This is the permitted variation in length.

The variation in length is expressed as "deviation of length for the maximum (greatest length) - deviation of length for the minimum (smallest length)" among those measured at the five points mentioned above.

Gauge Blocks

Gauge Blocks with a Calibrated Coefficient of Thermal Expansion

- The products are the highest-quality gauge blocks exceeding Grade K and are provided with highly accurate thermal expansion coefficient data. They help minimize thermal correction and therefore are suitable for highly accurate calibration. (Uncertainty of thermal expansion coefficient: $0.035 \times 10^{-6}/K$ ($k=2$))
- The thermal expansion coefficient is measured with a highly accurate double-faced interferometer (DFI), and the dimensional accuracy is guaranteed with gauge block interferometer (GBI).
- Useful in highly accurate calibration of CMMs.
- A mark "Coefficient of Thermal Expansion" is engraved on the surface. They are available in the nominal sizes (100 to 500 mm) of steel and ceramic rectangular gauge blocks.



SPECIFICATIONS

Metric Blocks with CTE			Inch Blocks with CTE		
Code No. (steel)*1	Code No. (CERA)*1	Length (mm)	Code No. (steel)*1	Code No. (CERA)*1	Length (in)
611681	613681	100	611204	613204	4
611802	613802	125	611205	613205	5
611803	613803	150	611206	613206	6
611804	613804	175	611207	613207	7
611682	613682	200	611208	613208	8
611805	613805	250	611222	613222	10
611683	613683	300	611223	613223	12
611684	613684	400	611224	613224	16
611685	613685	500	611225	613225	20

Grade	K class in JIS/ISO, ASME
Uncertainty of thermal expansion coefficient	$0.035 \times 10^{-6}/K$ ($k=2$)
Uncertainty of length measurement	30 nm ($k=2$), for 100 mm block

Note: An inspection certificate and a JCSS calibration certificate are supplied as standard.
A calibration report and a calibration certificate for the thermal expansion coefficient are also supplied as standard.



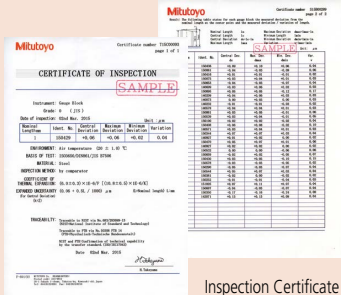
*1: Suffix No. (- ■■■■) for Selecting Standard Required

ISO / JIS			
Suffix No.	Grade	Inspection Certificate	Calibration Certificate
-01B	K	✓	✓

ASME			
Suffix No.	Grade	Inspection Certificate	Calibration Certificate
-51B	K	✓	✓

BS			
Suffix No.	Grade	Inspection Certificate	Calibration Certificate
-11B	K	✓	✓

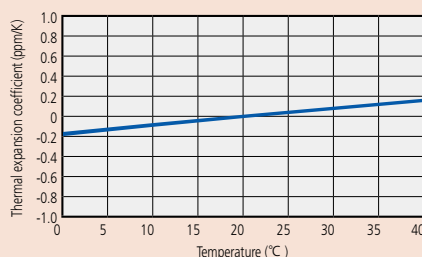
Note: Only for 100 mm type



Inspection Certificate

ZERO CERA Blocks (Ultra-low Thermal Expansion)

Thermal expansion coefficient–Temperature characteristic



Comparison of maximum errors at 23 °C (500 mm size)

Temperature compensation error of typical ISO/JIS-certified product: $\pm 1.5 \mu\text{m}$

Temperature compensation error of Mitutoyo standard gauge blocks: $\pm 0.75 \mu\text{m}$

Temperature compensation error of gauge blocks with thermal expansion coefficient: $\pm 0.075 \mu\text{m}$

Maximum thermal expansion of ZERO CERA Blocks: $+0.03 \mu\text{m}$

Thermal expansion of steel gauge blocks: $+16.2 \mu\text{m}$

Thermal expansion of CERA Blocks: $+13.95 \mu\text{m}$

- ZERO CERA Blocks are next-generation gauge blocks made of special ceramic materials that have extremely low thermal expansion. They are lightweight, easy to handle, and slow in aging (thermal expansion coefficient: $0 \pm 0.02 \times 10^{-6}/\text{K}$ (20 °C), specific gravity 2.4 kg/cm^3). Many research institutions and academic institutions rely on ZERO CERA Blocks in various applications, including the study of methods of calibrating CMM.

- Each block is marked with “ZERO CERA BLOCK” logo.
- Available in the nominal sizes (30 to 1,000 mm) of rectangular gauge blocks.



SPECIFICATIONS

Metric Blocks			
Code No.			Length (mm)
JIS/ISO	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

Gauge Blocks



Metric/Inch Rectangular Gauge Block Sets
SERIES 516

- Mitutoyo provides a wide selection of boxed sets of gauge blocks to meet the various needs of industry. Please select the set most suited to your working conditions and applications.

Steel 1 mm Base Block Sets



Steel 112-block set



Steel 103-block set



Steel 76-block set



Steel 56-block set



Steel 47-block set



Steel 46-block set



Steel 34-block set



Steel 32-block set

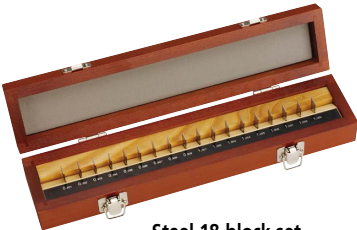
Steel 0.001 mm Step Block Sets



Steel 9-block set
(1.001 to 1.009 mm)



Steel 9-block set
(0.991 to 0.999 mm)



Steel 18-block set

Steel Long Block Sets



Steel 8-block set

Steel Wear Block Sets



Steel (1 mm)

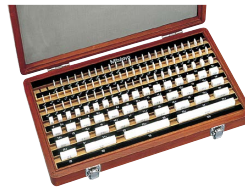
Steel Thin Block Sets



Steel 9-block set

Note: Details of the contents of any particular set are given on pages 01-11 to 01-12.

CERA 1 mm Base Block Sets



CERA 112-block set



CERA 103-block set



CERA 76-block set



CERA 56-block set



CERA 47-block set



CERA 46-block set



CERA 34-block set



CERA 32-block set

CERA 0.001 mm Step Block Sets



CERA 9-block set
(1.001 to 1.009 mm)



CERA 9-block set
(0.991 to 0.999 mm)

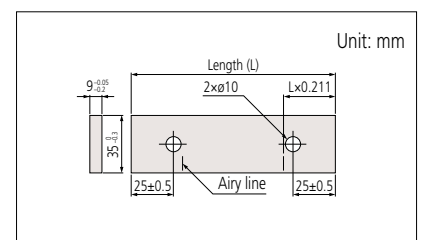


CERA 18-block set

CERA Long Block Sets



CERA 8-block set



CERA Wear Block Sets



CERA (1 mm)

Note: Details of the contents of any particular set are given on pages 01-11 to 01-12.

Gauge Blocks

SPECIFICATIONS

1 mm Base Block Sets

Blocks per set	Code No.		Standard/grade available and Suffix No.*1			Blocks included in set		
	Steel	CERA	ISO/JIS	ASME	BS	Size (mm)	Step (mm)	Qty.
122	—	—	—	—	—	1.0005	—	1
	516-596	—	K: -■0	—	—	1.001 - 1.009	0.001	9
	516-597	—	O: -■0	—	—	1.01 - 1.49	0.01	49
	516-598	—	1: -■0	—	—	1.6 - 1.9	0.1	4
	516-599	—	2: -■0	—	—	0.5 - 24.5	0.5	49
112	516-531	516-541	—	K: -■6	—	1.0005	—	1
	516-937	516-337	K: -■0	00: -■6	K: -■1	1.001 - 1.009	0.001	9
	516-938	516-338	O: -■0	0: -■6	O: -■1	1.01 - 1.49	0.01	49
	516-939	516-339	1: -■0	1: -■6	1: -■1	0.5 - 24.5	0.5	49
	516-940	516-340	2: -■0	2: -■6	2: -■1	25 - 100	25	4
103	516-533	516-542	—	K: -■6	—	1.005	—	1
	516-941	516-341	K: -■0	00: -■6	K: -■1	1.01 - 1.49	0.01	49
	516-942	516-342	O: -■0	0: -■6	O: -■1	0.5 - 24.5	0.5	49
	516-943	516-343	1: -■0	1: -■6	1: -■1	25 - 100	25	4
	516-944	516-344	2: -■0	2: -■6	2: -■1	—	—	—
88	—	—	—	—	—	1.0005	—	1
	516-969	516-369	—	—	K: -■1	1.001 - 1.009	0.001	9
	516-970	516-370	O: -■0	—	O: -■1	1.01 - 1.49	0.01	49
	516-971	516-371	1: -■0	—	1: -■1	0.5 - 9.5	0.5	19
	516-972	516-372	2: -■0	—	2: -■1	10 - 100	10	10
87	516-535	515-543	—	K: -■6	—	1.001 - 1.009	0.001	9
	516-945	516-345	K: -■0	00: -■6	K: -■1	1.01 - 1.49	0.01	49
	516-946	516-346	O: -■0	0: -■6	O: -■1	0.5 - 9.5	0.5	19
	516-947	516-347	1: -■0	1: -■6	1: -■1	10 - 100	10	10
	516-948	516-348	2: -■0	2: -■6	2: -■1	—	—	—
76	—	—	—	—	—	1.005	—	1
	516-949	516-349	K: -■0	—	—	1.01 - 1.49	0.01	49
	516-950	516-350	O: -■0	—	—	0.5 - 9.5	0.5	19
	516-951	516-351	1: -■0	—	—	10 - 40	10	4
	516-952	516-352	2: -■0	—	—	50 - 100	25	3
56	516-536	516-544	—	K: -■6	—	0.5	—	1
	516-953	516-353	K: -■0	00: -■6	—	1.001 - 1.009	0.001	9
	516-954	516-354	O: -■0	0: -■6	—	1.01 - 1.09	0.01	9
	516-955	516-355	1: -■0	1: -■6	—	1.1 - 1.9	0.1	9
	516-956	516-356	2: -■0	2: -■6	—	1 - 24	1	24
47	516-537	516-545	—	K: -■6	—	1.005	—	1
	516-957	516-357	K: -■0	00: -■6	—	1.01 - 1.09	0.01	9
	516-958	516-358	O: -■0	0: -■6	—	1.1 - 1.9	0.1	9
	516-959	516-359	1: -■0	1: -■6	—	1 - 24	1	24
	516-960	516-360	2: -■0	2: -■6	—	25 - 100	25	4
47	—	—	—	—	—	1.005	—	1
	516-961	516-361	K: -■0	—	K: -■1	1.01 - 1.19	0.01	19
	516-962	516-362	O: -■0	—	O: -■1	1.2 - 1.9	0.1	8
	516-963	516-363	1: -■0	—	1: -■1	1 - 9	1	9
	516-964	516-364	2: -■0	—	2: -■1	10 - 100	10	10
46	—	—	—	—	—	1.001 - 1.009	0.001	9
	516-994	516-394	K: -■0	—	—	1.01 - 1.09	0.01	9
	516-995	516-395	O: -■0	—	—	1.1 - 1.9	0.1	9
	516-996	516-396	1: -■0	—	—	1 - 9	1	9
	516-997	516-397	2: -■0	—	—	10 - 100	10	10
34	—	—	—	—	—	1.0005	—	1
	516-128	516-178	K: -■0	—	K: -■1	1.001 - 1.009	0.001	9
	516-129	516-179	O: -■0	—	O: -■1	1.01 - 1.09	0.01	9
	516-130	516-180	1: -■0	—	1: -■1	1.1 - 1.9	0.1	9
	516-131	516-181	2: -■0	—	2: -■1	1 - 5	1	5
32	—	—	—	—	—	1.005	—	1
	516-965	516-365	K: -■0	—	K: -■1	1.01 - 1.09	0.01	9
	516-966	516-366	O: -■0	—	O: -■1	1.1 - 1.9	0.1	9
	516-967	516-367	1: -■0	—	1: -■1	1 - 9	1	9
	516-968	516-368	2: -■0	—	2: -■1	10 - 30	10	3
32	—	—	—	—	—	60	—	1

Thin Block Sets

Blocks per set	Code No.		Standard/grade available and Suffix No.*1			Blocks included in set		
	Steel	CERA	ISO/JIS	ASME	BS	Size (mm)	Step (mm)	Qty.
9	516-990	—	O: -■0	—	—	0.10 - 0.50	0.05	9
	516-991	—	1: -■0	—	—			
	516-992	—	2: -■0	—	—			
	—	—	—	—	—			

Note: Details of the overall sizes for forms of block are given on page 01-3 and the accuracy standards to which they are manufactured are given on page 01-5.



*1: Suffix No. (■) for Selecting Standard and Certificate Provided

ISO / JIS		
Suffix No.	Inspection Certificate	Calibration Certificate JCSS
1	✓	—
6	✓	✓

Suffix No. 1: Not available for Grade K sets.

ASME		
Suffix No.	Inspection Certificate	Calibration Certificate JCSS
1	✓	—
6	✓	✓

Suffix No. 1: Not available for Grade K sets.

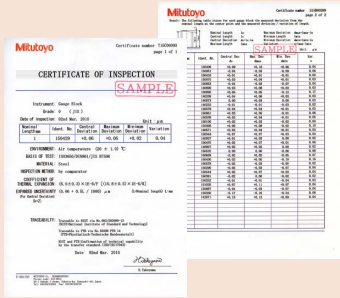
Suffix No. 6: Only for Grade K sets.

BS		
Suffix No.	Inspection Certificate	Calibration Certificate JCSS
1	✓	—
6	✓	✓

Suffix No. 1: Not available for Grade K sets.

Suffix No. 6: Only for Grade K sets.

Inspection Certificate





SPECIFICATIONS

0.001 mm Step Block Sets

Blocks per set	Code No.		Standard/grade available and Suffix No.*1			Blocks included in set		
	Steel	CERA	ISO/JIS	ASME	BS	Size (mm)	Step (mm)	Qty.
18	516-973	516-373	K: -#0	—	—	0.991 - 0.999	0.001	9
	516-974	516-374	O: -#0	—	—	1.001 - 1.009	0.001	9
	516-975	516-375	1: -#0	—	—	—	—	—
	516-976	516-376	2: -#0	—	—	—	—	—
9	516-981	516-381	K: -#0	—	K: -#1	1.001 - 1.009	0.001	9
	516-982	516-382	O: -#0	—	O: -#1	—	—	—
	516-983	516-383	1: -#0	—	1: -#1	—	—	—
	516-984	516-384	2: -#0	—	2: -#1	—	—	—
9	516-985	516-385	K: -#0	—	—	0.991 - 0.999	0.001	9
	516-986	516-386	O: -#0	—	—	—	—	—
	516-987	516-387	1: -#0	—	—	—	—	—
	516-988	516-388	2: -#0	—	—	—	—	—

Long Block Sets

Blocks per set	Code No.		Standard/grade available and Suffix No.*1			Blocks included in set		
	Steel	CERA	ISO/JIS	ASME	BS	Size (mm)	Step (mm)	Qty.
8	516-540	516-546	—	K: -#6	—	125 - 175	25	3
	516-701	516-731	K: -#0	O: -#6	—	200 - 250	50	2
	516-702	516-732	O: -#0	O: -#6	—	300 - 500	100	3
	516-703	516-733	1: -#0	1: -#6	—	—	—	—
	516-704	516-734	2: -#0	2: -#6	—	—	—	—
	—	—	—	—	—	—	—	—

Wear Block Sets

Blocks per set	Code No.		Standard/grade available and Suffix No.*1			Blocks included in set		
	Carbide	CERA	ISO/JIS	ASME	BS	Size (mm)	Step (mm)	Qty.
2	516-807	516-832	O: -#0	O: -#6	—	1	—	2
	516-806	516-833	1: -#0	1: -#6	—	—	—	—
2	516-803	516-830	O: -#0	O: -#6	—	2	—	2
	516-802	516-831	1: -#0	1: -#6	—	—	—	—

Inch Block Sets

Blocks per set	Code No.		Standard/grade available and Suffix No.*1			Blocks included in set		
	Steel	CERA	ISO/JIS	ASME	BS	Size (in)	Step (in)	Qty.
82	516-548	516-556	—	K: -#6	—	0.10005	—	1
	516-905	516-305	—	O: -#6	—	0.1001 - 0.1009	0.0001	9
	516-906	516-306	—	O: -#6	O: -#1	0.101 - 0.149	0.001	49
	516-907	516-307	—	1: -#6	1: -#1	0.05 - 0.95	0.05	19
	516-908	516-308	—	2: -#6	2: -#1	1 - 4	1	4
	—	—	—	—	—	—	—	—
81	516-549	516-557	—	K: -#6	—	0.1001 - 0.1009	0.0001	9
	516-901	516-301	—	O: -#6	—	0.101 - 0.149	0.001	49
	516-902	516-302	—	O: -#6	O: -#1	0.05 - 0.95	0.05	19
	516-903	516-303	—	1: -#6	1: -#1	1 - 4	1	4
	516-904	516-304	—	2: -#6	2: -#1	—	—	—
	—	—	—	—	—	—	—	—
49	—	—	—	—	—	0.1001 - 0.1009	0.0001	9
	516-910	—	—	—	—	0.101 - 0.109	0.001	9
	516-911	—	—	—	O: -#1	0.01 - 0.19	0.01	19
	516-912	—	—	—	1: -#1	0.2 - 0.9	0.1	8
35	—	—	—	—	2: -#1	1 - 4	1	4
	516-550	516-558	—	K: -#6	—	0.10005	—	1
	516-913	516-313	—	O: -#6	—	0.1001 - 0.1009	0.0001	9
	516-914	516-314	—	O: -#6	O: -#1	0.101 - 0.109	0.001	9
	516-915	516-315	—	1: -#6	1: -#1	0.11 - 0.19	0.01	9
	516-916	516-316	—	2: -#6	2: -#1	0.1 - 0.3	0.1	3

Thin Block Sets

Blocks per set	Code No.		Standard/grade available and Suffix No.*1			Blocks included in set		
	Steel	CERA	ISO/JIS	ASME	BS	Size (in)	Step (in)	Qty.
28	516-551	—	—	K: -#6	—	0.02005	—	1
	516-917	—	—	O: -#6	—	0.0201 - 0.0209	0.0001	9
	516-918	—	—	O: -#6	—	0.021 - 0.029	0.001	9
	516-919	—	—	1: -#6	—	0.01 - 0.09	0.01	9
	516-920	—	—	2: -#6	—	—	—	—
	—	—	—	—	—	—	—	—
10	516-926	—	—	O: -#6	O: -#1	0.005 - 0.050	0.005	10
	516-927	—	—	1: -#6	1: -#1	—	—	—
	516-928	—	—	—	2: -#1	—	—	—

Long Block Sets

Blocks per set	Code No.		Standard/grade available and Suffix No.*1			Blocks included in set		
	Steel	CERA	ISO/JIS	ASME	BS	Size (in)	Step (in)	Qty.
8	—	516-564	—	K: -#6	—	5 - 7	1	3
	—	516-741	—	O: -#6	—	8, 10, 12	2	3
	516-712	516-742	—	O: -#6	—	16, 20	4	2
	516-713	516-743	—	1: -#6	—	—	—	—

Wear Block Sets

Blocks per set	Code No.		Standard/grade available and Suffix No.*1			Blocks included in set		
	Carbide	CERA	ISO/JIS	ASME	BS	Size (in)	Step (in)	Qty.
2	516-809	516-836	—	O: -#6	—	0.05	—	2
	516-808	516-837	—	1: -#6	—	—	—	—
2	516-805	516-834	—	O: -#6	—	0.1	—	2
	516-804	516-835	—	1: -#6	—	—	—	—

Note: Details of the overall sizes for forms of block are given on page 01-3 and the accuracy standards to which they are manufactured are given on page 01-5.

Gauge Blocks

Micrometer Inspection Gauge Block Sets
SERIES 516

- Special sets for micrometer inspection. **516-106/107/108** and **516-156/157/158** are useful for checking maximum permissible error. For inspection of large micrometers, we recommend using **516-115/116/117** and **516-165/166/167** together. **516-580/581/582** and **516-390/391/392** are special sets for inspection of QuantuMike, whose spindle moves 2.0 mm per one thimble rotation.

Steel



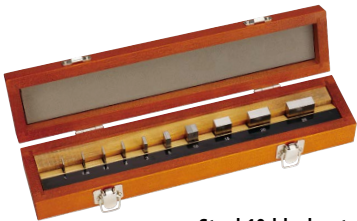
Steel 10-block set



Steel 10-block set



Steel 8-block set



Steel 10-block set

CERA



CERA 10-block set



CERA 10-block set



CERA 8-block set



CERA 10-block set



Gauge Block Sets for Micrometer Inspection

A set consisting of a Micro Checker and gauge blocks for micrometer inspection.
(516-132/133/134/135/136/137)



516-607

Micro Checker

Can clamp a stack of gauge blocks to be used for micrometer inspection.

SPECIFICATIONS

Metric	Micro Checker (holder only)
Code No.	516-607
Applicable gauge block sets	516-106/107/108, 516-156/157/158
Applicable gauge block sizes (mm)	2.5, 5.1, 7.7, 10.3, 12.9, 15, 17.6, 20.2, 22.8, 25

Inch	Micro Checker (holder only)
Code No.	516-608
Applicable gauge block sets	516-921/922/923, 516-321/322/323
Applicable gauge block sizes (in)	0.105, 0.210, 0.315, 0.420, 0.5, 0.605, 0.710, 0.815, 0.920, 1

Typical application



(The gauge block and optical parallel shown are optional accessories.)



*1: Suffix No. (■) for Selecting Standard and Certificate Provided

ISO/JIS		
Suffix No.	Inspection Certificate	Calibration Certificate
1	✓	JCSS
6	✓	✓

Suffix No. 1: Not available for Grade K sets.

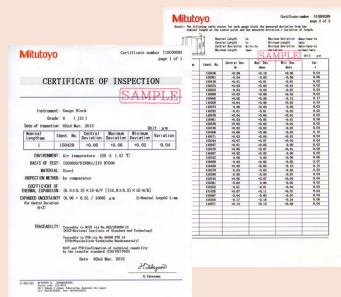
ASME		
Suffix No.	Inspection Certificate	Calibration Certificate
1	✓	JCSS
6	✓	✓

Suffix No. 1: Not available for Grade K sets.

Suffix No. 6: Only for Grade K sets.

BS		
Suffix No.	Inspection Certificate	Calibration Certificate
1	✓	JCSS

Inspection Certificate



SPECIFICATIONS

Metric Block Sets						
Blocks per set	Code No.		Standard/grade available and Suffix No.*1			Blocks included in set
	Steel	CERA	ISO/JIS	ASME	BS	
16	516-111	516-161	0: -#0	—	—	1.00, 1.25, 1.5, 2, 3, 5, 10, 15, 20, 25, 25.25, 30, 35, 40, 45, 50 mm, Cerastone, Optical parallels (t=12 mm, 25 mm)
	516-112	516-162	1: -#0	—	—	
	516-113	516-163	2: -#0	—	—	
10	516-977	—	K: -#0	—	—	1.00, 1.25, 1.50, 2, 3, 5, 10, 15, 20, 25 mm, Optical parallel (t=12 mm)
	516-978	516-378	0: -#0	—	—	
	516-979	516-379	1: -#0	—	—	
10	516-980	516-380	2: -#0	—	—	1.00, 1.25, 1.50, 2, 3, 5, 10, 15, 20, 25 mm
	516-103	516-152	0: -#0	0: -#6	—	
	516-101	516-153	1: -#0	1: -#6	—	
10	—	516-154	2: -#0	—	—	2.2, 4.8, 7.8, 10.4, 12, 15.2, 17.4, 19.6, 22.6, 25 mm
	516-580	516-390	0: -#0	—	—	
	516-581	516-391	1: -#0	—	—	
10	516-582	516-392	2: -#0	—	—	2.5, 5.1, 7.7, 10.3, 12.9, 15, 17.6, 20.2, 22.8, 25 mm, Optical parallel (t=12 mm)
	516-106	516-156	0: -#0	—	—	
	516-107	516-157	1: -#0	—	—	
10	516-108	516-158	2: -#0	—	—	1.25, 1.50, 1, 2, 3, 5, 10, 15, 20, 25 mm, Micro Checker, Optical parallel (t=12 mm)
	516-132	516-182	0: -#0	—	—	
	516-133	516-183	1: -#0	—	—	
10	516-134	516-184	2: -#0	—	—	2.5, 5.1, 7.7, 10.3, 12.9, 15, 17.6, 20.2, 22.8, 25 mm, Micro Checker, Optical parallel (t=12 mm)
	516-135	516-185	0: -#0	—	—	
	516-136	516-186	1: -#0	—	—	
8	516-137	516-187	2: -#0	—	—	25, 50, 75, 100, 125, 150, 175, 200 mm
	—	516-547	—	K: -#6	—	
	—	516-164	K: -#0	00: -#6	—	
8	516-115	516-165	0: -#0	0: -#6	—	—
	516-116	516-166	1: -#0	1: -#6	—	
	516-117	516-167	2: -#0	2: -#6	—	

Inch Block Sets						
Blocks per set	Code No.		Standard/grade available and Suffix No.*1			Blocks included in set
	Steel	CERA	ISO/JIS	ASME	BS	
10	516-528	516-318	—	00: -#6	0: -#1	0.087, 0.189, 0.307, 0.409, 0.472, 0.598, 0.669, 0.772, 0.890, 1 in
	516-529	516-319	—	0: -#6	1: -#1	
	516-530	516-320	—	1: -#6	2: -#1	
10	516-552	516-559	—	K: -#6	—	0.105, 0.210, 0.315, 0.420, 0.500, 0.605, 0.710, 0.815, 0.920, 1 in, Optical parallel (t=0.5 in)
	516-921	516-321	—	00: -#6	0: -#1	
	516-922	516-322	—	0: -#6	1: -#1	
10	516-923	516-323	—	1: -#6	2: -#1	0.105, 0.210, 0.315, 0.420, 0.500, 0.605, 0.710, 0.815, 0.920, 1 in, Micro checker, Optical parallel (t=0.5 in)
	516-553	516-560	—	K: -#6	—	
	516-138	516-188	—	00: -#6	0: -#1	
9	516-139	516-189	—	0: -#6	1: -#1	0.0625, 0.100, 0.125, 0.200, 0.250, 0.300, 0.500, 1, 2 in, Optical parallel (t=0.5 in)
	516-140	516-190	—	1: -#6	2: -#1	
	516-554	516-561	—	K: -#6	—	
9	516-929	516-333	—	00: -#6	—	0.0625, 0.100, 0.125, 0.200, 0.250, 0.300, 0.500, 1, 2 in, Micro Checker, Optical parallel (t=0.5 in)
	516-930	516-334	—	0: -#6	—	
	516-931	516-335	—	1: -#6	—	
9	516-932	516-336	—	2: -#6	—	0.0625, 0.100, 0.125, 0.200, 0.250, 0.300, 0.500, 1, 2 in
	516-555	516-562	—	K: -#6	—	
	516-141	516-191	—	00: -#6	—	
9	516-142	516-192	—	0: -#6	—	0.0625, 0.100, 0.125, 0.200, 0.250, 0.300, 0.500, 1, 2 in
	516-143	516-193	—	1: -#6	—	
	516-144	516-194	—	2: -#6	—	
8	—	516-563	—	K: -#6	—	1, 2, 3, 4, 5, 6, 7, 8 in
	—	516-329	—	00: -#6	—	
	516-934	516-330	—	0: -#6	—	
8	516-935	516-331	—	1: -#6	—	—
	516-936	516-332	—	2: -#6	—	
	516-126	516-176	—	0: -#6	—	
8	516-127	516-177	—	1: -#6	—	—
	—	—	—	—	—	
	—	—	—	—	—	

SERIES 516 – Caliper Inspection Gauge Block Sets

SPECIFICATIONS

Metric Block Sets						
Blocks per set	Code No.		Standard/grade available and Suffix No.			Blocks included in set
	Steel	CERA	ISO/JIS	ASME	BS	
5	—	—	—	—	—	5 pcs.: 10.3, 24.5, 50, 75, 100 mm, Ceramic plain jaws, Holder (250 mm), Glove
4	516-526	516-566	1: -10	—	—	4 pcs.: 10, 30, 50, 125 mm, Setting ring (ø4 mm, ø10 mm), Pin gage (ø10 mm), Glove
	516-527	516-567	2: -10	—	—	
3	516-124	516-150	1: -10	—	—	3 pcs.: 30, 41.3, 131.4 mm, Setting ring (ø4 mm, ø25 mm), Glove
	516-125	516-151	2: -10	—	—	
2	516-122	516-172	1: -10	—	—	2 pcs.: 41.3, 131.4 mm, Setting ring (ø20 mm), Glove
	516-123	516-173	2: -10	—	—	

Gauge Blocks

Individual Metric Rectangular Gauge Blocks

- One or more gauge blocks can be purchased separately. If using only one length repeatedly, it is good practice to purchase discrete gauge blocks.
- Nominal sizes not shown in the list can also be manufactured.
- Each gauge block is supplied with an inspection certificate. When placing an order, please give us the code number with the suffix number corresponding to the applicable standard (see the suffix list).



SPECIFICATIONS

Metric Blocks

Length (mm)	Code No.*1	
	Steel	CERA
0.1	611821	—
0.11	611860	—
0.12	611861	—
0.13	611862	—
0.14	611863	—
0.15	611822	—
0.16	611864	—
0.17	611865	—
0.18	611866	—
0.19	611867	—
0.2	611823	—
0.21	611868	—
0.22	611869	—
0.23	611870	—
0.24	611871	—
0.25	611824	—
0.26	611872	—
0.27	611873	—
0.28	611874	—
0.29	611875	—
0.3	611825	—
0.31	611876	—
0.32	611877	—
0.33	611878	—
0.34	611879	—
0.35	611826	—
0.36	611880	—
0.37	611881	—
0.38	611882	—
0.39	611883	—
0.4	611827	—
0.41	611884	—
0.42	611885	—
0.43	611886	—
0.44	611887	—
0.45	611828	—
0.46	611888	—
0.47	611889	—
0.48	611890	—
0.49	611891	—
0.5	611506	613506
0.51	611892	—
0.52	611893	—

Length (mm)	Code No.*1	
	Steel	CERA
0.53	611894	—
0.54	611895	—
0.55	611896	—
0.56	611897	—
0.57	611898	—
0.58	611899	—
0.59	611900	—
0.6	611901	—
0.61	611902	—
0.62	611903	—
0.63	611904	—
0.64	611905	—
0.65	611906	—
0.66	611907	—
0.67	611908	—
0.68	611909	—
0.69	611910	—
0.7	611911	—
0.71	611912	—
0.72	611913	—
0.73	611914	—
0.74	611915	—
0.75	611916	—
0.76	611917	—
0.77	611918	—
0.78	611919	—
0.79	611920	—
0.8	611921	—
0.81	611922	—
0.82	611923	—
0.83	611924	—
0.84	611925	—
0.85	611926	—
0.86	611927	—
0.87	611928	—
0.88	611929	—
0.89	611930	—
0.9	611931	—
0.91	611932	—
0.92	611933	—
0.93	611934	—
0.94	611935	—
0.95	611936	—

Length (mm)	Code No.*1	
	Steel	CERA
0.96	611937	—
0.97	611938	—
0.98	611939	—
0.99	611940	—
0.991	611551	613551
0.992	611552	613552
0.993	611553	613553
0.994	611554	613554
0.995	611555	613555
0.996	611556	613556
0.997	611557	613557
0.998	611558	613558
0.999	611559	613559
1	611611	613611
1.0005	611520	613520
1.001	611521	613521
1.002	611522	613522
1.003	611523	613523
1.004	611524	613524
1.005	611525	613525
1.006	611526	613526
1.007	611527	613527
1.008	611528	613528
1.009	611529	613529
1.01	611561	613561
1.02	611562	613562
1.03	611563	613563
1.04	611564	613564
1.05	611565	613565
1.06	611566	613566
1.07	611567	613567
1.08	611568	613568
1.09	611569	613569
1.1	611570	613570
1.11	611571	613571
1.12	611572	613572
1.13	611573	613573
1.14	611574	613574
1.15	611575	613575
1.16	611576	613576
1.17	611577	613577
1.18	611578	613578
1.19	611579	613579

Note: Details of the overall sizes for forms of block are given on page 01-3 and the accuracy standards to which they are manufactured are given on page 01-5.

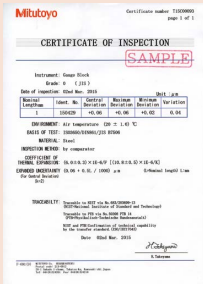


*1: Suffix No. (- ■■■■) for Selecting Standard and Certificate Provided

ISO/JIS				
Suffix No.	Grade	Inspection Certificate	Calibration Certificate	
			JCSS	RvA
-016	K	✓	✓	
-021	0	✓		
-026	0	✓	✓	
-031	1	✓		
-036	1	✓	✓	
-041	2	✓		
-046	2	✓	✓	

ASME			
Suffix No.	Grade	Inspection Certificate	Calibration Certificate
			JCSS
-516	K	✓	✓
-521	00	✓	
-531	0	✓	
-541	1	✓	
-551	2	✓	

BS			
Suffix No.	Grade	Inspection Certificate	Calibration Certificate
			JCSS
-116	K	✓	✓
-121	0	✓	
-126	0	✓	✓
-131	1	✓	
-136	1	✓	✓
-141	2	✓	
-146	2	✓	✓



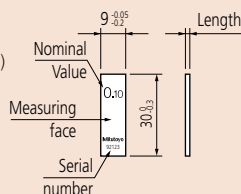
Inspection Certificate



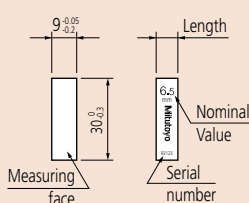
Dimensions

Unit: mm

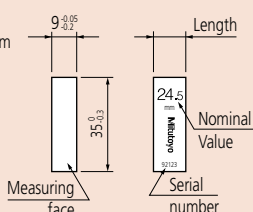
Nominal length:
0.1 mm to 5.5 mm
(0.004 in to 0.25 in)



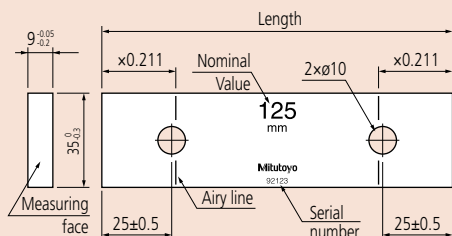
Nominal length:
6 mm to 10 mm
(0.3 in to 0.4 in)



Nominal length:
10.3 mm to 100 mm
(0.45 in to 4 in)



Nominal length 125 mm to 1000 mm (5 in to 20 in)



Length (mm)	Code No. *1	
	Steel	CERA
1.2	611580	613580
1.21	611581	613581
1.22	611582	613582
1.23	611583	613583
1.24	611584	613584
1.25	611585	613585
1.26	611586	613586
1.27	611587	613587
1.28	611588	613588
1.29	611589	613589
1.3	611590	613590
1.31	611591	613591
1.32	611592	613592
1.33	611593	613593
1.34	611594	613594
1.35	611595	613595
1.36	611596	613596
1.37	611597	613597
1.38	611598	613598
1.39	611599	613599
1.4	611600	613600
1.41	611601	613601
1.42	611602	613602
1.43	611603	613603
1.44	611604	613604
1.45	611605	613605
1.46	611606	613606
1.47	611607	613607
1.48	611608	613608
1.49	611609	613609
1.5	611641	613641
1.6	611516	613516
1.7	611517	613517
1.8	611518	613518
1.9	611519	613519
2	611612	613612
2.0005	611690	—
2.001	611691	—
2.002	611692	—
2.003	611693	—
2.004	611694	—
2.005	611695	—
2.006	611696	—
2.007	611697	—
2.008	611698	—
2.009	611699	—
2.01	611701	—
2.02	611702	—
2.03	611703	—
2.04	611704	—
2.05	611705	—
2.06	611706	—
2.07	611707	—
2.08	611708	—
2.09	611709	—
2.1	611710	—
2.11	611711	—
2.12	611712	—
2.13	611713	—
2.14	611714	—
2.15	611715	—
2.16	611716	—

Length (mm)	Code No. *1	
	Steel	CERA
2.17	611717	—
2.18	611718	—
2.19	611719	—
2.2	611720	—
2.21	611721	—
2.22	611722	—
2.23	611723	—
2.24	611724	—
2.25	611725	—
2.26	611726	—
2.27	611727	—
2.28	611728	—
2.29	611729	—
2.3	611730	—
2.31	611731	—
2.32	611732	—
2.33	611733	—
2.34	611734	—
2.35	611735	—
2.36	611736	—
2.37	611737	—
2.38	611738	—
2.39	611739	—
2.4	611740	—
2.41	611741	—
2.42	611742	—
2.43	611743	—
2.44	611744	—
2.45	611745	—
2.46	611746	—
2.47	611747	—
2.48	611748	—
2.49	611749	—
2.5	611642	613642
2.6	611750	—
2.7	611751	—
2.8	611752	—
2.9	611753	—
3	611613	613613
3.5	611643	613643
4	611614	613614
4.5	611644	613644
5	611615	613615
5.1	611850	613850
5.5	611645	613645
6	611616	613616
6.5	611646	613646
7	611617	613617
7.5	611647	613647
7.7	611851	613851
8	611618	613618
8.5	611648	613648
9	611619	613619
9.5	611649	613649
10	611671	613671
10.3	611852	613852
10.5	611650	613650
11	611621	613621
11.5	611651	613651
12	611622	613622
12.5	611652	613652
12.9	611853	613853

Length (mm)	Code No. *1	
	Steel	CERA
13	611623	613623
13.5	611653	613653
14	611624	613624
14.5	611654	613654
15	611625	613625
15.5	611655	613655
16	611626	613626
16.5	611656	613656
17	611627	613627
17.5	611657	613657
17.6	611854	613854
18	611628	613628
18.5	611658	613658
19	611629	613629
19.5	611659	613659
20	611672	613672
20.2	611855	613855
20.5	611660	613660
21	611631	613631
21.5	611661	613661
22	611632	613632
22.5	611662	613662
22.8	611856	613856
23	611633	613633
23.5	611663	613663
24	611634	613634
24.5	611664	613664
25	611635	613635
25.25	611754	613754
30	611673	613673
35	611755	613755
40	611674	613674
41.3	611857	613857
45	611756	613756
50	611675	613675
60	611676	613676
70	611677	613677
75	611801	613801
80	611678	613678
90	611679	613679
100	611681	613681
125	611802	613802
131.4	611858	613858
150	611803	613803
175	611804	613804
200	611682	613682
250	611805	613805
300	611683	613683
400	611684	613684
500	611685	613685
600	611840	—
700	611841	—
750	611842	—
800	611843	—
900	611844	—
1000	611845	—

Metric Wear Blocks

Length (mm)	Code No. *1 Tungsten carbide
1	612611
2	612612

Note: Details of the overall sizes for forms of block are given on page 01-3 and the accuracy standards to which they are manufactured are given on page 01-5.

Gauge Blocks

Individual Inch Rectangular Gauge Blocks

SPECIFICATIONS

Inch Blocks								
Length (in)	Code No.*1		Length (in)	Code No.*1		Length (in)	Code No.*1	
	Steel	CERA		Steel	CERA		Steel	CERA
0.004	611304	—	0.024	611324	—	0.0625	611303	613303
0.005	611305	—	0.025	611325	—	0.07	611107	—
0.006	611306	—	0.026	611326	—	0.078125 (5/64)	611103	613100
0.007	611307	—	0.027	611327	—	0.08	611108	—
0.008	611308	—	0.028	611328	—	0.09	611109	—
0.009	611309	—	0.029	611329	—	0.09375 (3/32)	611104	613101
0.01	611310	—	0.03	611330	—	0.1	611191	613191
0.011	611311	—	0.031	611331	—	0.100025	611111	613110
0.012	611312	—	0.03125 (1/32)	611101	613103	0.10005	611135	613135
0.013	611313	—	0.032	611332	—	0.100075	611112	613111
0.014	611314	—	0.033	611333	—	0.1001	611121	613121
0.015	611315	—	0.034	611334	—	0.1002	611122	613122
0.016	611316	—	0.035	611335	—	0.1003	611123	613123
0.017	611317	—	0.036	611336	—	0.1004	611124	613124
0.018	611318	—	0.037	611337	—	0.1005	611125	613125
0.019	611319	—	0.038	611338	—	0.1006	611126	613126
0.02	611320	—	0.039	611339	—	0.1007	611127	613127
0.02005	611240	—	0.04	611340	—	0.1008	611128	613128
0.0201	611231	—	0.041	611341	—	0.1009	611129	613129
0.0202	611232	—	0.042	611342	—	0.101	611141	613141
0.0203	611233	—	0.043	611343	—	0.102	611142	613142
0.0204	611234	—	0.044	611344	—	0.103	611143	613143
0.0205	611235	—	0.045	611345	—	0.104	611144	613144
0.0206	611236	—	0.046	611346	—	0.105	611145	613145
0.0207	611237	—	0.046875 (3/64)	611102	613104	0.106	611146	613146
0.0208	611238	—	0.047	611347	—	0.107	611147	613147
0.0209	611239	—	0.048	611348	—	0.108	611148	613148
0.021	611321	—	0.049	611349	—	0.109	611149	613149
0.022	611322	—	0.05	611105	613105	0.109375 (7/64)	611110	613102
0.023	611323	—	0.06	611106	—			

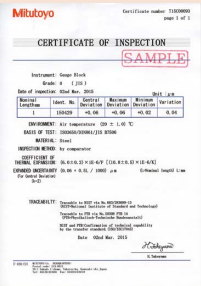
Note: Details of the overall sizes for forms of block are given on page 01-3 and the accuracy standards to which they are manufactured are given on page 01-5.



*1: Suffix No. (- ■■■■) for Selecting Standard and Certificate Provided

ASME			
Suffix No.	Grade	Inspection Certificate	Calibration Certificate
			JCSS
-516	K	✓	✓
-521	00	✓	
-531	0	✓	
-541	1	✓	
-551	2	✓	

BS			
Suffix No.	Grade	Inspection Certificate	Calibration Certificate
			JCSS
-121	0	✓	
-131	1	✓	
-141	2	✓	



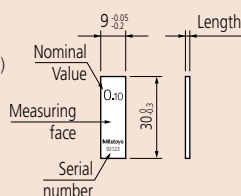
Inspection Certificate



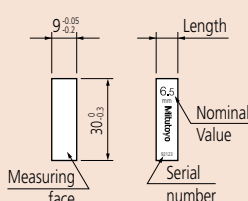
Dimensions

Unit: mm

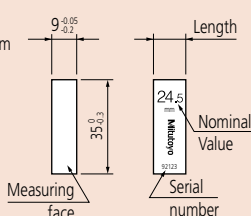
Nominal length:
0.1 mm to 5.5 mm
(0.004 in to 0.25 in)



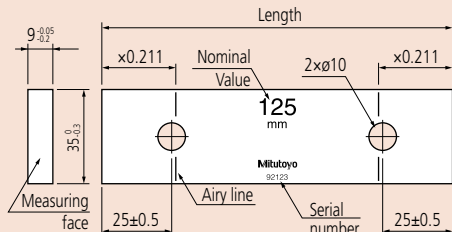
Nominal length:
6 mm to 10 mm
(0.3 in to 0.4 in)



Nominal length:
10.3 mm to 100 mm
(0.45 in to 4 in)



Nominal length 125 mm to 1000 mm (5 in to 20 in)



SPECIFICATIONS

Inch Blocks

Length (in)	Code No. *1	
	Steel	CERA
0.11	611150	613150
0.111	611151	613151
0.112	611152	613152
0.113	611153	613153
0.114	611154	613154
0.115	611155	613155
0.116	611156	613156
0.117	611157	613157
0.118	611158	613158
0.119	611159	613159
0.12	611160	613160
0.121	611161	613161
0.122	611162	613162
0.123	611163	613163
0.124	611164	613164
0.125	611165	613165
0.126	611166	613166
0.127	611167	613167
0.128	611168	613168
0.129	611169	613169
0.13	611170	613170
0.131	611171	613171
0.132	611172	613172
0.133	611173	613173
0.134	611174	613174
0.135	611175	613175
0.136	611176	613176
0.137	611177	613177
0.138	611178	613178

Length (in)	Code No. *1	
	Steel	CERA
0.139	611179	613179
0.14	611180	613180
0.141	611181	613181
0.142	611182	613182
0.143	611183	613183
0.144	611184	613184
0.145	611185	613185
0.146	611186	613186
0.147	611187	613187
0.148	611188	613188
0.149	611189	613189
0.15	611115	613115
0.16	611116	613116
0.17	611117	613117
0.18	611118	613118
0.19	611119	613119
0.2	611192	613192
0.21	611221	613221
0.25	611212	613212
0.3	611193	613193
0.315	611209	613209
0.35	611213	613213
0.375 (3/8)	611113	613112
0.4	611194	613194
0.420	611210	613210
0.45	611214	613214
0.5	611195	613195
0.55	611215	613215
0.6	611196	613196

Length (in)	Code No. *1	
	Steel	CERA
0.605	611211	613211
0.65	611216	613216
0.7	611197	613197
0.710	611220	613220
0.75	611217	613217
0.8	611198	613198
0.815	611226	613226
0.85	611218	613218
0.9	611199	613199
0.920	611227	613227
0.95	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 Blocks

Length (in)	Code No. *1	
	Tungsten carbide	
0.05	612105	
0.1	612191	

Note: Details of the overall sizes for forms of block are given on page 01-3 and the accuracy standards to which they are manufactured are given on page 01-5.
4 inch or more is not listed in the standard of British Standards Institution.

Gauge Blocks

Rectangular Gauge Block Accessories
SERIES 516

- Accessory sets for extending the range of application for rectangular gauge blocks.
- Available in 22-piece and 14-piece sets. Each accessory is also available separately for applications where a full set is not needed.
- Can be used with both steel and CERA blocks.



516-601
(22 pcs.)

SPECIFICATIONS

Item Description	Code No.	Nominal capacity/ dimension (mm)	Set		Quantity Supplied
			22 pcs. 516-601	14 pcs. 516-602	
Holder	619002	15 to 60		✓	1 pc.
	619003	5 to 100	✓	✓	
	619004	15 to 160	✓	✓	
	619005	20 to 250	✓	✓	
Base	619009	35	✓	✓	
Half-round jaw	619010*	2	✓	✓	One pair (2 pcs.)
	619011*	5	✓	✓	
	619012*	8	✓	✓	
	619013*	12	✓		
	619014*	20	✓		
Plain jaw	619018*	160	✓		
Scriber point	619019	—	✓	✓	1 pc.
Center point	619020	—	✓	✓	
Tram point	619021*	—	✓		One pair (2 pcs.)
Triangular straightedge	619022	100	✓	✓	1 pc.
	619023	160	✓		

* A single piece is supplied for each code number, except for half-round jaws, plain jaws (B type) and tram points, which are supplied as a two-pack.

Typical application



Half-round jaw (619013) 2 pcs.
Holder (619002) 1 pc.
Gauge block



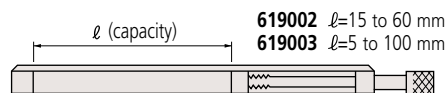
Base (619009) 1 pc.
Holder (619003) 1 pc.
Scriber point (619019) 1 pc.
Gauge block



Setting a bore gage using a holder with a pair of Type I half-round jaws arranged as flat contact surfaces

Holder

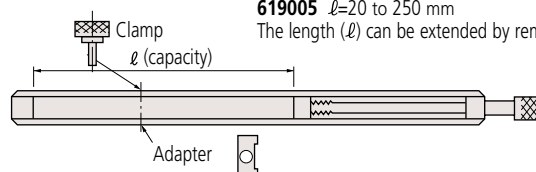
Thickness=15 mm
Width=29.5 mm



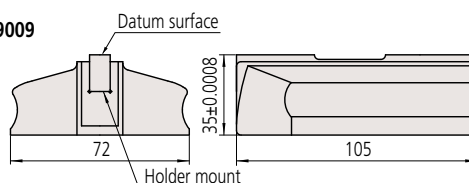
619004 $l=15$ to 160 mm

619005 $l=20$ to 250 mm

The length (l) can be extended by removing the adapter.



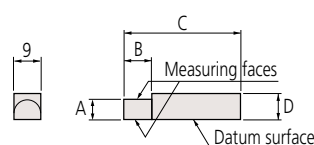
Base 619009



Flatness of the datum surface 0.5 μ m
Parallelism 0.8 μ m
Flatness of the bottom surface 1 μ m

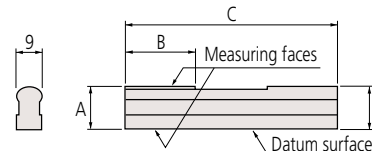
Half-round jaws

Type I



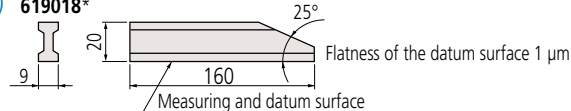
Flatness of the datum surface 0.5 μ m
Parallelism of A 0.5 μ m

Type II



Code No.	Type	Size (mm)	A (mm)	B (mm)	C (mm)	D (mm)
619010*	I	2	2±0.0005	5.5	40	7.5
619011*		5	5±0.0005	15.5	45	7.5
619012*		8	8±0.0005	20	50	8.5
619013*	II	12	12±0.0005	25	75	13
619014*		20	20±0.0005	25	125	20.5

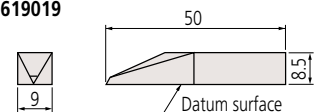
Plain jaw (B type) 619018*



Flatness of the datum surface 1 μ m

Scriber point

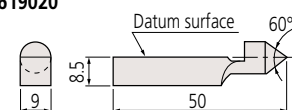
619019



Flatness of the datum surface 0.5 μ m

Center point

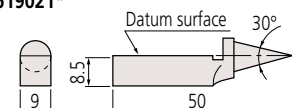
619020



Eccentricity tolerance of the point ±10 μ m
Flatness of the datum surface 0.5 μ m

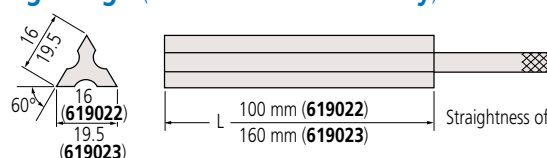
Tram point

619021*



Eccentricity tolerance of the point ±10 μ m
Flatness of the datum surface 0.5 μ m

Triangular straightedge (for handheld use only)



Straightness of the edges 1.2 μ m

* A single piece is supplied for each code number, except for half-round jaws, plain jaws (B type) and tram points, which are supplied as a two-pack.

Gauge Blocks

Accessories for Rectangular Gauge Blocks over 100 mm
SERIES 516

- Specially designed for long rectangular gauge blocks of 100 mm and over which have two coupling holes in the body: coupling of two long gauge blocks, a stack of regular gauge blocks and attachment of jaws is possible.
- Can be used with both long steel and CERA blocks.

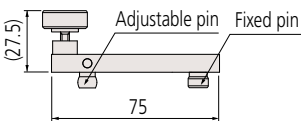


516-605
(14 pcs.)

SPECIFICATIONS

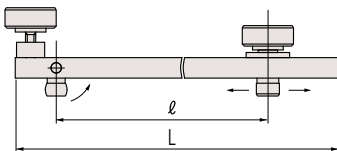
Set code No.	Code No.	Description	Quantity Supplied
516-605	619031	Connector A	1 pc.
	619032	Connector B	
	619033	Connector C	
	619034	Connector D	
	619035	Connector E	
	619036	Adapter	3 pcs.
	619009	Base	1 pc.
	619018	Plain jaw (B-type)	2 pcs.
	619013	Half-round jaw	
	619019	Scriber point	1 pc.

Connector A 619031



Used for directly coupling two long gauge blocks.

Connectors B and C



Adapter (2 pcs.) 619036

In addition to connecting long gauge blocks, the holders can also connect long gauge blocks with other types of gauge blocks inserted in between. Connector B is for gauge blocks with nominal size of 40 mm or less, and connector C for gauge blocks with nominal size of 150 mm or less (connector C can also be used to connect hole-less gauge blocks of 100 mm or less with various types of jaw). Adapters can be used to attach jaws on the edges of long gauge blocks.

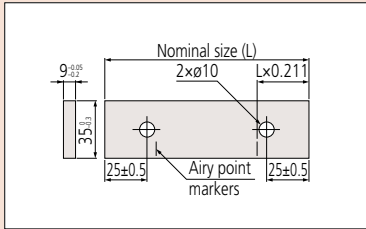
Typical application



Using an A-type connector



Use of B-type connectors in gage construction



Coupling holes in long gauge blocks

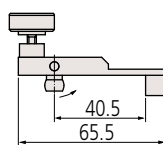
Typical application



Setting a dial test indicator to a long-gauge-block stack attached to the base with a D-type connector

Connector D

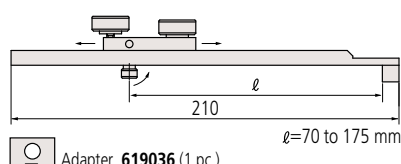
619034



Used for attaching a long gauge block directly to the base.

Connector E

619035

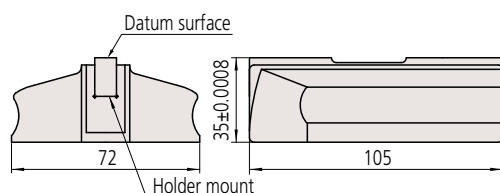


Adapter 619036 (1 pc.)

Used for attaching a long gauge block to the base over a stack of regular gauge blocks wrung between the base and long gauge block. The length l is highly adjustable to accommodate the variable length of the stack.

Base

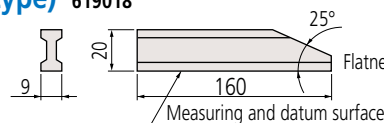
619009



Flatness of the datum surface $0.5\ \mu\text{m}$
Parallelism $0.8\ \mu\text{m}$
Flatness of the bottom surface $1\ \mu\text{m}$

Plain jaw (B-type)

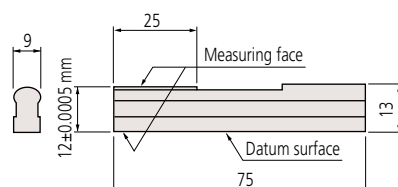
619018



Flatness of the datum surface $1\ \mu\text{m}$

Half-round jaw

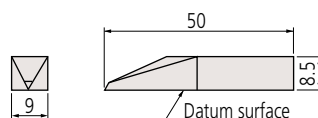
619013



Flatness of the datum surface $0.5\ \mu\text{m}$
Parallelism $0.5\ \mu\text{m}$

Scriber point

619019



Flatness of the datum surface $0.5\ \mu\text{m}$

Example of use of accessories with long gauge blocks

The table below shows the appropriate combination of long rectangular gauge blocks and accessories for making inside and outside measurements in the approximate range 300 mm to 1000 mm in 100 mm steps. The numbers in the table represent the number of gauge blocks or accessories in use. Note that the ranges shown do not take into account the combined thickness of the half-round jaws for inside measurement (24 mm) and the length of any regular gauge block stack used.

Items	Code No.	300 mm		400 mm		500 mm		600 mm		700 mm		800 mm		900 mm		1000 mm	
		Inner	Outer	Inner	Outer	Inner	Outer	Inner	Outer	Inner	Outer	Inner	Outer	Inner	Outer	Inner	Outer
Rectangular gauge block (nominal dimension)	200 mm	611682						1	1								
	300 mm	611683	1	1						1	1	1	1				
	400 mm	611684			1	1		1	1	1	1			1	1		
	500 mm	611685					1	1				1	1	1	1	2	2
Connector A	619031							1	1	1	1	1	1	1	1	1	1
Connector B*	619032	2		2		2		2		2		2		2		2	
Half-round jaws 2 pcs./set	619013	2		2		2		2		2		2		2		2	
Adapter	619036	(2)		(2)		(2)		(2)		(2)		(2)		(2)		(2)	

* Provided with adapters (2 pcs.).

Gauge Blocks



Metric/Inch Square Gauge Block Sets

SERIES 516 — Metric Block Sets, Long Block Sets, Wear Block Sets

- A square gauge block can retain stable orientation both longitudinally and laterally. A wide range of application measurements can be made. From various sets of 2 pieces up to 112 pieces, you can select the best type for your application.
- Always use genuine gauge block accessories.



Steel 112-block set



Steel 103-block set



Steel 76-block set



Steel 47-block set



Steel 32-block set

Wear block set



Tungsten Carbide

Long block set



Steel 8-block set

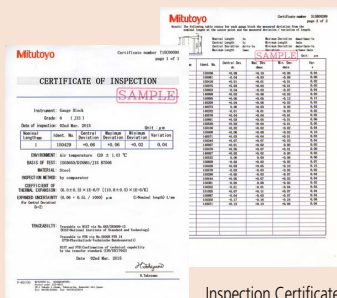
These square wear gauge blocks made of cemented carbide have excellent resistance to abrasion, making them ideal for protecting the ends of a stack of blocks subject to frequent use. Available in two nominal sizes: 1 mm and 2 mm. We recommend that these wear gauge blocks of both sizes be wrung firmly to the stack when in use.



*1: Suffix No. (■) for Selecting Standard and Certificate Provided

ISO/JIS		
Suffix No.	Inspection Certificate	Calibration Certificate JCSS
1	✓	
6	✓	✓

ASME		
Suffix No.	Inspection Certificate	Calibration Certificate JCSS
1	✓	



Inspection Certificate

SPECIFICATIONS

Metric Block Sets

Blocks per set	Code No.		Standard/grade available and Suffix No.*1		Blocks included in set		
	Steel	CERA	ISO/JIS	ASME	Size (mm)	Step (mm)	Qty.
112	516-437	—	—	00: -■6	1.005		1
	516-438	—	0: -■0	0: -■6	1.001 - 1.009	0.001	9
	516-439	—	1: -■0	1: -■6	1.01 - 1.49	0.01	49
	516-440	—	2: -■0	2: -■6	0.5 - 24.5	0.5	49
	—	—	—	—	25 - 100	25	4
103	516-441	—	—	00: -■6	1.005		1
	516-442	—	0: -■0	0: -■6	1.01 - 1.49	0.01	49
	516-443	—	1: -■0	1: -■6	0.5 - 24.5	0.5	49
	516-444	—	2: -■0	2: -■6	25 - 100	25	4
	—	—	—	—	—	—	—
76	516-449	—	—	00: -■6	1.005		1
	516-450	—	0: -■0	0: -■6	1.01 - 1.49	0.01	49
	516-451	—	1: -■0	1: -■6	0.5 - 9.5	0.5	19
	516-452	—	2: -■0	2: -■6	10 - 40	10	4
	—	—	—	—	50 - 100	25	3
47	516-457	—	—	00: -■6	1.005		1
	516-458	—	0: -■0	0: -■6	1.01 - 1.09	0.01	9
	516-459	—	1: -■0	1: -■6	1.1 - 1.9	0.1	9
	516-460	—	2: -■0	2: -■6	1 - 24	1	24
	—	—	—	—	25 - 100	25	4
32	516-465	—	—	00: -■6	1.005		1
	516-466	—	0: -■0	0: -■6	1.01 - 1.09	0.01	9
	516-467	—	1: -■0	1: -■6	1.1 - 1.9	0.1	9
	516-468	—	2: -■0	2: -■6	1 - 9	1	9
	—	—	—	—	10 - 30	10	3
	—	—	—	—	60		1

Metric Long Block Sets

Blocks per set	Code No.		Standard/grade available and Suffix No.*1		Blocks included in set		
	Steel	CERA	ISO/JIS	ASME	Size (mm)	Step (mm)	Qty.
8	516-751	—	—	00: -■6	125, 150, 175	25	3
	516-752	—	0: -■0	0: -■6	200, 250	50	2
	516-753	—	1: -■0	1: -■6	300, 400, 500	100	3
	516-754	—	2: -■0	2: -■6	—	—	—

Metric Wear Block Sets

Blocks per set	Code No.		Standard/grade available and Suffix No.*1		Blocks included in set		
	Steel	CERA	ISO/JIS	ASME	Size (mm)	Step (mm)	Qty.
2	516-820	—	0: -■0	—	1	—	2
	516-821	—	1: -■0	—	—	—	—
2	516-822	—	0: -■0	—	2	—	2
	516-823	—	1: -■0	—	—	—	—

Inch Block Sets

Blocks per set	Code No.		Standard/grade available and Suffix No.*1		Blocks included in set		
	Steel	CERA	ISO/JIS	ASME	Size (in)	Step (in)	Qty.
81	516-401	516-201	—	00: -■6	0.1001 - 0.1009	0.0001	9
	516-402	516-202	—	0: -■6	0.101 - 0.149	0.001	49
	516-403	516-203	—	1: -■6	0.05 - 0.95	0.05	19
	516-404	516-204	—	2: -■6	1 - 4	1	4
	—	—	—	—	—	—	—
36	516-421	516-221	—	00: -■6	0.05		1
	516-422	516-222	—	0: -■6	0.1001 - 0.1009	0.0001	9
	516-423	516-223	—	1: -■6	0.101 - 0.109	0.001	9
	516-424	516-224	—	2: -■6	0.11 - 0.19	0.01	9
	—	—	—	—	0.1 - 0.5	0.1	5
28	516-417	—	—	00: -■6	0.02005		1
	516-418	—	—	0: -■6	0.0201 - 0.0209	0.0001	9
	516-419	—	—	1: -■6	0.021 - 0.029	0.001	9
	516-420	—	—	2: -■6	0.010 - 0.090	0.01	9
	—	—	—	—	—	—	—

Inch Long Block Sets

Blocks per set	Code No.		Standard/grade available and Suffix No.*1		Blocks included in set		
	Steel	CERA	ISO/JIS	ASME	Size (in)	Step (in)	Qty.
8	516-762	—	—	0: -■0	5 - 7	1	3
	516-763	—	—	1: -■0	8, 10, 12	2	3
	—	—	—	—	16, 20	4	2

Inch Wear Block Sets

Blocks per set	Code No.		Standard/grade available and Suffix No.*1		Blocks included in set		
	Carbide	CERA	ISO/JIS	ASME	Size (in)	Step (in)	Qty.
2	516-824	516-846	—	0: -■0	0.05	—	2
	516-825	516-847	—	1: -■0	—	—	—
2	516-826	516-844	—	0: -■0	0.1	—	2
	516-827	516-845	—	1: -■0	—	—	—

Gauge Blocks

Individual Metric Square Gauge Blocks

- One or more gauge blocks can be purchased separately. Purchasing them loose is helpful. If using only one length repeatedly, it is good practice to purchase discrete gauge blocks.
- Each gauge block is supplied with an inspection certificate. When placing an order, please give us the code number with the suffix number corresponding to the applicable standard (see the suffix list).
- We make custom length gauge blocks.
- Always use genuine gauge block accessories.



SPECIFICATIONS

Metric Blocks		
Length (mm)	Code No.	
	Steel	CERA
0.5	614506	—
1	614611	—
1.0005	614520	—
1.001	614521	—
1.002	614522	—
1.003	614523	—
1.004	614524	—
1.005	614525	—
1.006	614526	—
1.007	614527	—
1.008	614528	—
1.009	614529	—
1.01	614561	—
1.02	614562	—
1.03	614563	—
1.04	614564	—
1.05	614565	—
1.06	614566	—
1.07	614567	—
1.08	614568	—
1.09	614569	—
1.1	614570	—
1.11	614571	—
1.12	614572	—
1.13	614573	—
1.14	614574	—
1.15	614575	—
1.16	614576	—
1.17	614577	—
1.18	614578	—
1.19	614579	—
1.2	614580	—
1.21	614581	—
1.22	614582	—
1.23	614583	—
1.24	614584	—
1.25	614585	—
1.26	614586	—
1.27	614587	—
1.28	614588	—
1.29	614589	—
1.3	614590	—
1.31	614591	—
1.32	614592	—

Length (mm)	Code No.	
	Steel	CERA
1.33	614593	—
1.34	614594	—
1.35	614595	—
1.36	614596	—
1.37	614597	—
1.38	614598	—
1.39	614599	—
1.4	614600	—
1.41	614601	—
1.42	614602	—
1.43	614603	—
1.44	614604	—
1.45	614605	—
1.46	614606	—
1.47	614607	—
1.48	614608	—
1.49	614609	—
1.5	614641	—
1.6	614516	—
1.7	614517	—
1.8	614518	—
1.9	614519	—
2	614612	—
2.5	614642	—
3	614613	—
3.5	614643	—
4	614614	—
4.5	614644	—
5	614615	—
5.5	614645	—
6	614616	—
6.5	614646	—
7	614617	—
7.5	614647	—
8	614618	—
8.5	614648	—
9	614619	—
9.5	614649	—
10	614671	—
10.5	614650	—
11	614621	—
11.5	614651	—
12	614622	—
12.5	614652	—

Length (mm)	Code No.	
	Steel	CERA
13	614623	—
13.5	614653	—
14	614624	—
14.5	614654	—
15	614625	—
15.5	614655	—
16	614626	—
16.5	614656	—
17	614627	—
17.5	614657	—
18	614628	—
18.5	614658	—
19	614629	—
19.5	614659	—
20	614672	—
20.5	614660	—
21	614631	—
21.5	614661	—
22	614632	—
22.5	614662	—
23	614633	—
23.5	614663	—
24	614634	—
24.5	614664	—
25	614635	—
30	614673	—
40	614674	—
50	614675	—
60	614676	—
75	614801	—
100	614681	—
125	614802	—
150	614803	—
175	614804	—
200	614682	—
250	614805	—
300	614683	—
400	614684	—
500	614685	—

Metric Wear Blocks	
Length (mm)	Code No. Tungsten carbide
1	615611
2	615612

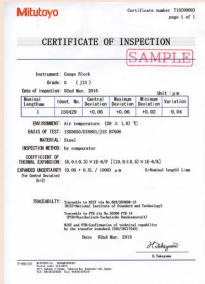
Note: Details of the overall sizes for forms of block are given on pages 01-3 and 01-26, and the accuracy standards to which they are manufactured are given on page 01-5.



Suffix No. (- ■■■) for Selecting Standard and Certificate Provided

ISO/JIS			
Suffix No.	Grade	Inspection Certificate	Calibration Certificate JCSS
-021	0	✓	
-026	0	✓	✓
-031	1	✓	
-036	1	✓	✓
-041	2	✓	
-046	2	✓	✓

ASME			
Suffix No.	Grade	Inspection Certificate	Calibration Certificate JCSS
-521	00	✓	
-531	0	✓	
-541	1	✓	
-551	2	✓	

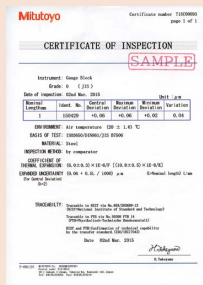


Inspection Certificate



*1: Suffix No. (-■■■■) for Selecting Grade and Certificate Provided

ASME			
Suffix No.	Grade	Inspection Certificate	Calibration Certificate
-521	00	✓	
-531	0	✓	
-541	1	✓	
-551	2	✓	

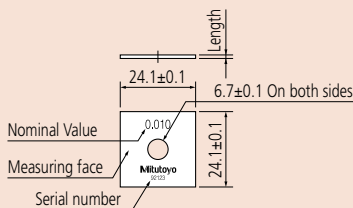


Inspection Certificate

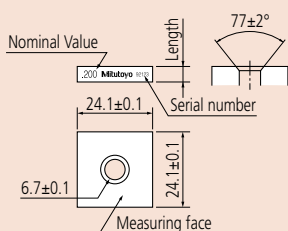
Dimensions

Unit: mm

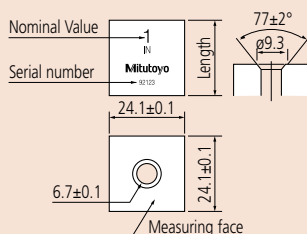
Nominal length: 0.5 mm to 4.5 mm (0.010 in to 0.19 in)



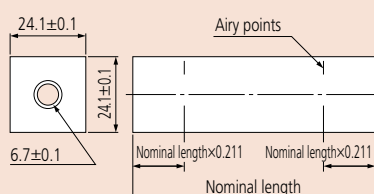
Nominal length: 5 mm to 14.5 mm (0.2 in to 0.450 in)



Nominal length: 15 mm to 500 mm (0.500 in to 20 in)



Nominal length: 125 mm to 500 mm (5 in to 20 in)



SPECIFICATIONS

Inch Blocks

Length (in)	Code No.*1	
	Steel	CERA
0.01	614310	—
0.02005	614240	—
0.0201	614231	—
0.0202	614232	—
0.0203	614233	—
0.0204	614234	—
0.0205	614235	—
0.0206	614236	—
0.0207	614237	—
0.0208	614238	—
0.0209	614239	—
0.02	614320	—
0.021	614321	—
0.022	614322	—
0.023	614323	—
0.024	614324	—
0.025	614325	—
0.026	614326	—
0.027	614327	—
0.028	614328	—
0.029	614329	—
0.03	614330	—
0.03125 (1/32)	614301	—
0.04	614340	—
0.046875 (3/64)	614302	—
0.05	614105	616105
0.06	614106	—
0.0625	614303	616303
0.07	614107	—
0.078125 (5/64)	614304	—
0.08	614108	—
0.09	614109	—
0.09375 (3/32)	614305	—
0.1	614191	616191
0.100025	614307	—
0.10005	614135	616135
0.100075	614308	—
0.1001	614121	616121
0.1002	614122	616122
0.1003	614123	616123
0.1004	614124	616124
0.1005	614125	616125
0.1006	614126	616126
0.1007	614127	616127
0.1008	614128	616128
0.1009	614129	616129
0.101	614141	616141
0.102	614142	616142
0.103	614143	616143
0.104	614144	616144
0.105	614145	616145

Length (in)	Code No.*1	
	Steel	CERA
0.106	614146	616146
0.107	614147	616147
0.108	614148	616148
0.109	614149	616149
0.109375 (7/64)	614306	—
0.11	614150	616150
0.111	614151	616151
0.112	614152	616152
0.113	614153	616153
0.114	614154	616154
0.115	614155	616155
0.116	614156	616156
0.117	614157	616157
0.118	614158	616158
0.119	614159	616159
0.12	614160	616160
0.121	614161	616161
0.122	614162	616162
0.123	614163	616163
0.124	614164	616164
0.125	614165	616165
0.126	614166	616166
0.127	614167	616167
0.128	614168	616168
0.129	614169	616169
0.13	614170	616170
0.131	614171	616171
0.132	614172	616172
0.133	614173	616173
0.134	614174	616174
0.135	614175	616175
0.136	614176	616176
0.137	614177	616177
0.138	614178	616178
0.139	614179	616179
0.14	614180	616180
0.141	614181	616181
0.142	614182	616182
0.143	614183	616183
0.144	614184	616184
0.145	614185	616185
0.146	614186	616186
0.147	614187	616187
0.148	614188	616188
0.149	614189	616189
0.15	614115	616115
0.16	614116	616116
0.17	614117	616117
0.18	614118	616118
0.19	614119	616119
0.2	614192	616192

Length (in)	Code No.*1	
	Steel	CERA
0.25	614212	616212
0.3	614193	616193
0.35	614213	616213
0.375 (3/8)	614309	—
0.4	614194	616194
0.45	614214	616214
0.5	614195	616195
0.55	614215	616215
0.6	614196	616196
0.65	614216	616216
0.7	614197	616197
0.75	614217	616217
0.8	614198	616198
0.85	614218	616218
0.9	614199	616199
0.95	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	—

Note: Details of the overall sizes for forms of block are given on page 01-3 and the accuracy standards to which they are manufactured are given on page 01-5.

Inch Wear Blocks	
Length (in)	Code No. Tungsten carbide
0.05	615105
0.1	615191

Gauge Blocks

Square Gauge Block Accessories Set
SERIES 516

- Mitutoyo offers the gauge block accessories set to expand the variety of square gauge block applications. Square gauge blocks with a hole at their center are much more widely used than rectangular gauge blocks. We also sell the accessories loose to meet your needs.
- Always use genuine gauge block accessories.



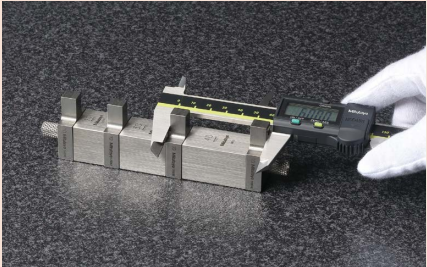
516-611

SPECIFICATIONS

Metric			Inch		
Code No.	Included in set	Quantity Supplied	Code No.	Included in set	Quantity Supplied
516-611			516-612		
619070	Half-round jaw 2 mm	2 pcs.	619050	Half-round jaw 0.125 in	2 pcs.
619071	Half-round jaw 5 mm		619051	Half-round jaw 0.25 in	
619072	Plain jaw 10 mm		619052	Plain jaw 0.5 in	
619073	Center point 2 mm	1 pc.	619053	Center point 0.1 in	1 pc.
619054	Scriber point		619054	Scriber point	
619074	Base 10 mm		619055	Base 0.5 in	
619056	Stud	2 pcs.	619056	Stud	2 pcs.
619057	Flat head screw 1 1/4 in		619057	Flat head screw 1 1/4 in	
619058	Flat head screw 5/8 in		619058	Flat head screw 5/8 in	
619059	Slotted head nut		619059	Slotted head nut	
619060	Adjustable tie rod 6 in		619060	Adjustable tie rod 6 in	
619061	Adjustable tie rod 4 1/2 in	1 pc.	619061	Adjustable tie rod 4 1/2 in	1 pc.
619062	Tie rod 3 in		619062	Tie rod 3 in	
619063	Tie rod 2 1/4 in		619063	Tie rod 2 1/4 in	
619064	Tie rod 1 1/2 in		619064	Tie rod 1 1/2 in	
619065	Tie rod 3/4 in	2 pcs.	619065	Tie rod 3/4 in	2 pcs.
619066	Knurled head screw		619066	Knurled head screw	

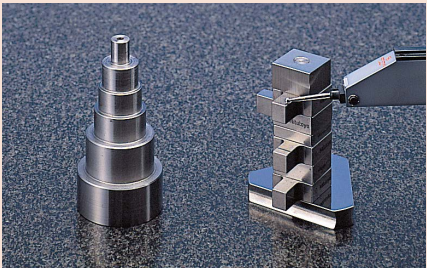
Note: 2 pcs. of half-round jaw, plain jaw, stud, flat head screw, slotted head nut, adjustable tie rod, and knurled head screw are included in each set. Please note that the abovementioned code number indicates only 1 set.

Typical application



Using plain jaws, tie rods, knurled head screws and gauge blocks, a gage was constructed to enable rapid comparison measurement of a stepped workpiece. (Sample workpiece)

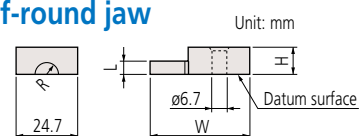
Measurement example



Using a base, plain jaws, tie rods, flat head screws and gauge blocks, a gage was constructed to enable rapid comparison measurement of a stepped workpiece. (Sample workpiece)

Note: Accuracy when using third-party accessories is not guaranteed.

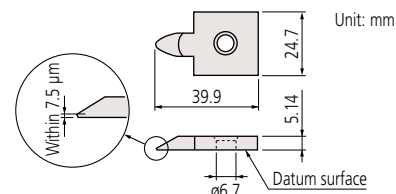
Half-round jaw



Code No.	R (mm)	L (mm)	W (mm)	H (mm)
619070	1.95	2	33.6	5.3
619071	4.95	5	39.9	10.3

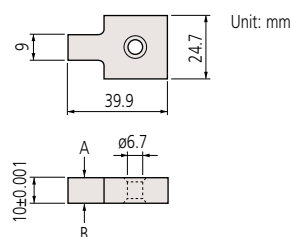
- Flatness 0.5 μm
- Parallelism of L 0.5 μm
- Tolerance of L $\pm 0.5 \mu\text{m}$

Scriber point 619054



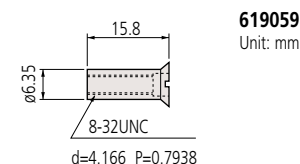
- Flatness of datum surface 0.5 μm

Plain jaw 619072



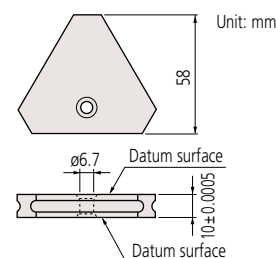
- Flatness 0.12 μm
- Parallelism 0.12 μm
- A and B are datum surfaces

Slotted head nut



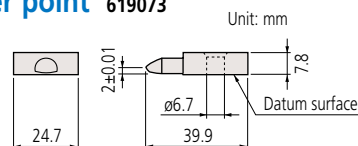
d=4.166 P=0.7938

Base 619074



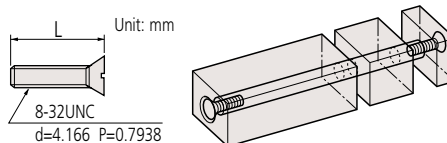
- Flatness 1.5 μm
- Parallelism 1.5 μm
(The surface within 1.5 mm of edge is excluded)

Center point 619073



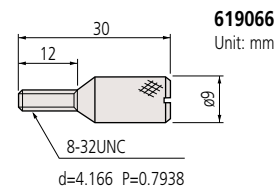
- Flatness 0.5 μm

Flat head screw



Code No.	L (mm)
619057	31.6
619058	15.8

Knurled head screw



- Contraction caused by the clamping force

The minimum recommended torque to be applied to the clamping screws is approximately 600 mN·m. The chart below shows the approximate length contraction of a 100 mm gage stack using typical torque values.

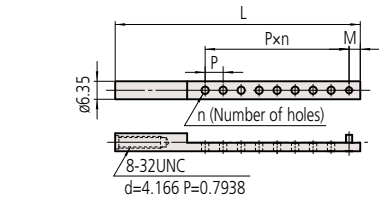
Driver	Contraction
Torque Driver 600 mN·m	0.2 $\mu\text{m}/100 \text{ mm}$
Ordinary Driver 700 to 800 mN·m	0.3 $\mu\text{m}/100 \text{ mm}$

Gauge Blocks

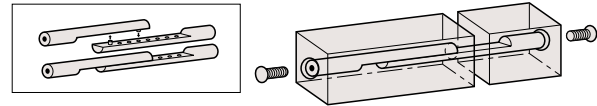
Square Gauge Block Accessories Set
SERIES 516

Adjustable tie rod

Unit: mm

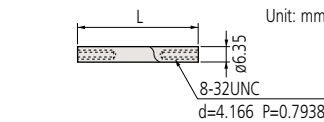


Code No.	L (mm)	M (mm)	P (mm)	n (Number of holes)
619060	124.5	3.85	6.35	14
619061	86.5	3.95	6.35	8

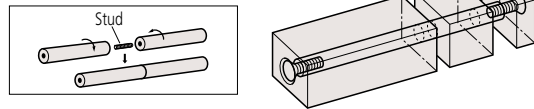


Tie rod

Unit: mm

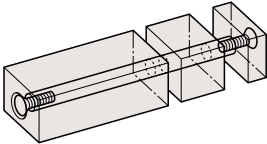
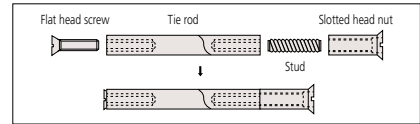
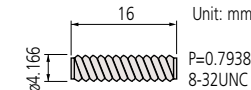


Code No.	L (mm)
619065	19
619064	38
619063	57
619062	76



Stud 619056

Unit: mm



Accessories used for combining square gauge blocks

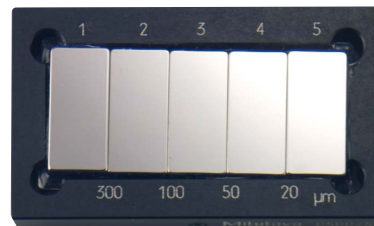
Overall length (mm)		Min.	21	36	34	41	45	58	64	72	77	82	91	95	109	117
Code No.	Included in set	Max.	30	43	43	50	60	72	79	88	91	97	107	109	125	135
619059	Slotted head nut		1	1		1										
619058	Flat head screw		1		2	1	2	1	2		1	2		1		1
619057				1				1		2	1		2	1	2	1
619056	Stud					1										1
619065	Tie rod				1	1										1
619064							1	1		1						
619063									1		1		1			
619062												1		1	1	1
619061	Adjustable tie rod															
619060																

Overall length (mm)		Min.	130	148	121	167	143	160	205	180	223	240	258	295	375
Code No.	Included in set	Max.	150	169	180	184	210	255	270	285	288	345	363	445	520
619059	Slotted head nut														
619058	Flat head screw				2			2							
619057			2	2		2	2		2	2	2	2	2	2	2
619056	Stud		1	1		1			1		1	1	1	1	2
619065	Tie rod		1												
619064				1											
619063						1			1		1				
619062			1	1			1				1		1		1
619061	Adjustable tie rod				2		2		2		2			2	2
619060								2		2		2	2	2	2

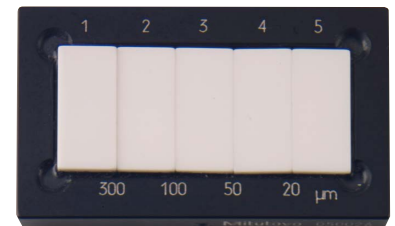


Step Master SERIES 516

- Step master is a master gage of different height that is useful 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.



Steel type
516-199



Ceramic type
516-499

SPECIFICATIONS

Steel type

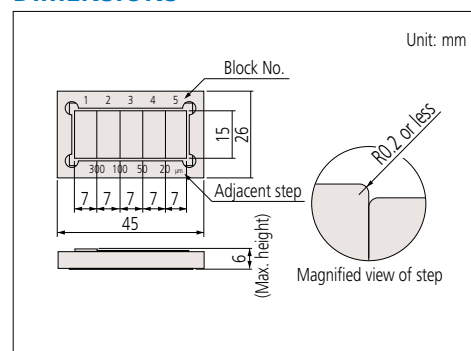
Code No.	516-198					516-199				
Block No.	1	2	3	4	5	1	2	3	4	5
Cumulative step (μm)	0	10	15	17	18	0	300	400	450	470
Step value between adjacent blocks (μm)		10	5	2	1		300	100	50	20

Ceramic type

Code No.	516-498					516-499				
Block No.	1	2	3	4	5	1	2	3	4	5
Cumulative step (μm)	0	10	15	17	18	0	300	400	450	470
Step value between adjacent blocks (μm)		10	5	2	1		300	100	50	20

Note: ○○○○ - ○○○○ -24: Provided with Calibration Certificate

DIMENSIONS



Custom-made Blocks & Gages

Gauge blocks

- We can provide gauge blocks in sizes for your specific needs. You can request a particular size you frequently use or a special size in small increments that cannot be created by wringing.
- Nominal size range
 - 0.1 mm to 1000 mm (steel)
 - 0.5 mm to 500 mm (ceramic)
 - 30 mm to 1000 mm (ZERO CERA Blocks)
- Nominal size increment
 - 0.0005 mm (up to 100 mm)
 - 0.001 mm (over 100 mm)
- Cross section (same as the standard product)
 - Nominal length of 10 mm or less: 30×9 mm
 - Nominal length of more than 10 mm: 35×9 mm
 - Square types are also available.

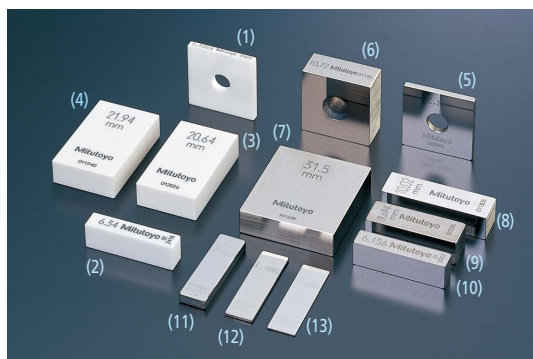
Reference gages

- We can provide gages in special dimensions not specified by JIS. Free yourself from the time-consuming work of gage creation by using our service that creates precision spacers and other gages in your preferred sizes. Gages with a hole or specified mark can also be created. Please contact us for details.
- Step masters
 - We can create your preferred height difference between adjacent blocks.

Notes on "coupling holes" on custom gauge blocks:

- Steel, from 100 mm to less than 500 mm
 - Without coupling holes
 - (Let us know if a hole is required)
- Steel, from 500 mm to less than 1000 mm
 - With coupling holes
 - (Let us know if a hole is not required)
- Ceramic, from 100 mm to less than 500 mm
 - With coupling holes
 - (Let us know if a hole is not required)

Special gauge blocks



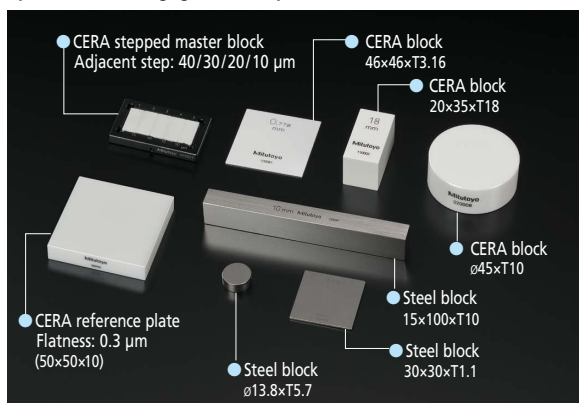
Ceramic

- (1) Square gauge block (2.1005 mm)
- (2) Rectangular gauge block (6.34 mm)
- (3) Rectangular gauge block (20.64 mm)
- (4) Rectangular gauge block (21.94 mm)

Steel

- (5) Square gauge block (2.2065 mm)
- (6) Square gauge block (10.72 mm)
- (7) Rectangular gauge block (31.5 mm)
- (8) Rectangular gauge block (10.02 mm)
- (9) Rectangular gauge block (9.694 mm)
- (10) Rectangular gauge block (6.156 mm)
- (11) Rectangular gauge block (3.603 mm)
- (12) Rectangular gauge block (1.1505 mm)
- (13) Rectangular gauge block (0.555 mm)

Special reference gages and step master (T: nominal size)



Unit: mm

Maintenance Kit for Gauge Blocks SERIES 516

Typical application



Recommendation for Regular Calibration

As is widely known, gauge blocks are end measures based on distance measurements traceable to the wavelength of the iodine stabilized He-Ne laser. Because they serve as the standard based on which measuring instruments are adjusted, even the smallest of errors can be critical. Therefore, we recommend periodical calibration even when use is infrequent. Please calibrate your gauge blocks as described in the table below (best practices may vary according to frequency of use and grade).

Application	Cycle (years)	Grade
Reference standard	1 to 2	K
Calibration	2	K or 0
Inspection	2	0 or 1
Shop floor	0.5 to 1	1 or 2

As an accredited calibration laboratory, Mitutoyo offers a periodical calibration service for gauge blocks. Our regular calibration service features:

- Gauge blocks manufactured by any maker can be calibrated.
 - Cleaning and removal of burrs.
 - Central dimension and dimensional deviations of each block are measured.
 - Calibration results are provided for immediate use and for building a calibration history of each block.
- For detailed information, contact the nearest Mitutoyo sales office.

- Maintenance kit for gauge blocks includes all the necessary maintenance tools for removing burrs and contamination, and applying anti-corrosion treatment after use.



516-650E

Code No. 516-650E

Tools and accessories included:

- (1) Ceraston (**601645**)
(both sides finished by lapping)
(100×25×12 mm)
- (2) Optical flat (**158-117**)
(ø45, 12 mm thickness, Flatness 0.2 μm)
Used to check the wringing of thin gauge blocks and for the presence of burrs.
- (3) Tweezers (**600004**)
Used for handling thin gauge blocks.
- (4) Blower brush (**600005**)
Used for blowing dust from measuring surfaces.
- (5) Cleaning paper (**600006**)
(lens paper, 82×304 mm, 500 pcs.)
Used for wiping off rust-preventative oil and contamination. Lint free.
- (6) Artificial leather mat (B4 size, Artificial buckskin) (**600007**)
Used as a gauge block mat in order to avoid scratches on the work table.
- (7) Reagent bottle (**600008**)
(polyethylene container, 100 ml)
Bottle of wiping solution.
(Mitutoyo employs n-Heptane for solvent.)
- (8) Gloves (**600009**)
Used for handling large gauge blocks.
Effective for the prevention of corrosion and thermal expansion.

Gauge Blocks

Ceraston SERIES 516 — Accessory for Gauge Block Maintenance

- Alumina-ceramic abrasive stone for removing burrs from hard materials such as ceramics that ordinary stones cannot handle.
- The grinding stones can be used on CERA Blocks and other steel gauge blocks. They are useful for removing burrs on any precision-processed surface.
- Excellent in durability and ease of removing burrs compared to Arkansas stones.
- Both sides can be used.



601644
150 (W) x 50 (D) x 20 (H) mm



601645
100 (W) x 25 (D) x 12 (H) mm

Typical application



Removing burrs

Figure 1

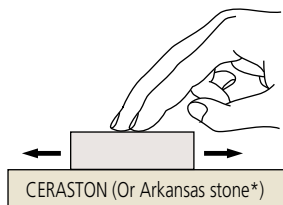
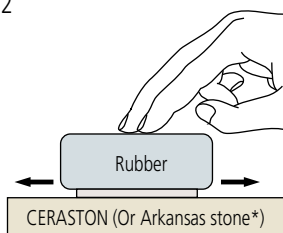


Figure 2



- (1) Wipe any dust and oil film from the gauge block and the Ceraston (or Arkansas stone*) using a solvent.
- (2) Place the gauge block on the Ceraston (or Arkansas stone*) so that the measuring face that has burrs is on the abrasive surface of the stone. While applying light pressure, move the gauge block back and forth about ten times (Fig. 1). Use a rubber block for thin gauge 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 an abrasive stone. If so, discard the gauge block.

* Mitutoyo does not offer Arkansas stones.



Gauge block set for comparator calibration (optional)

Standard type **516-145-E2**



Special bridge-type block

516-145-E2

Gauge Block Comparator GBCD-100A SERIES 565 — Automatic Comparator with Dual Gage Heads

- Measures Rectangular Gauge Blocks and Square Gauge Blocks through automatic comparison with an appropriate Reference gauge block in the size range 0.5 mm to 100 mm.
- The measurement result is not affected by any warping of thinner gauge blocks due to the use of upper and lower gage heads (dual-head system).
- Measurement configuration: 1 cycle of automatic comparison measurement with a Reference gauge block.



SPECIFICATIONS

Metric					
Range	Resolution	Accuracy (95% confidence interval)	Upper gaging head		
			Type	Measuring force	Contact point
0.5 mm - 100 mm	0.01 μ m	$\pm(0.03 + 0.3L/1000) \mu$ m* L=Gauge block length (mm)	Mu-Checker	0.8 N	Carbide contact point of radius 20 mm
Lower gaging head			Operating conditions		
Type	Measuring force	Contact point			
Mu-Checker	0.4 N	Carbide contact point of radius 5 mm	20 °C $\pm$ 1 °C Humidity: 58% RH $\pm$ 15% RH (Under less temperature change, and hot or cold direct air flow should be avoided.)		

* Not including the uncertainty of reference gauge block and influence of temperatures.

Gauge Block Calibration



Gauge Block Comparator GBCD-250
SERIES 565 — Manual Comparator with Dual Gage Heads

- Measures Rectangular Gauge Blocks and Square Gauge Blocks through manual comparison with an appropriate Reference gauge block in the size range 0.1 mm to 250 mm.
- The measurement result is not affected by any warping of thinner gauge blocks due to the use of upper and lower gage heads (dual-head system).



SPECIFICATIONS

Metric						
Range		Resolution (Effective indication)	Accuracy (95% confidence interval) [Comparison measurement of the same nominal length]		Accuracy (95% confidence interval) [Dimensional deviations between Reference gauge block and measurement gauge block: ±3 mm]	
0.1 mm - 250 mm		0.001 μm (0.01 μm)	±(0.03 + 0.3L/1000) μm* L=Gauge block length (mm)		±(0.06 + 0.3L/1000) μm* L=Gauge block length (mm)	
Upper gaging head			Lower gaging head			Operating conditions
Type	Measuring force	Contact point	Type	Measuring force	Contact point	
Linear Gage	0.4 N	Carbide contact point of radius 20 mm	Linear Gage	0.2 N	Carbide contact point of radius 5 mm	20 °C±1 °C Humidity: 30% RH to 60% RH (Under less temperature change, and hot or cold direct air flow should be avoided.)

* Not including the uncertainty of reference gauge block and influence of temperatures.

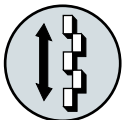
Reference Gages

Height Master
SERIES 515

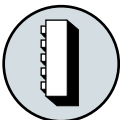
- For calibrating and setting height gages.
- Staggered arrangement of block stack have two measuring faces on the same level, one facing up and the other down (except for 515-310).



515-322



Staggered 20 mm blocks (movable)



Vertical orientation



Riser block

SPECIFICATIONS

Metric		
Code No.	515-322	
Range (H)	5 < H ≤ 310 mm	
Graduation (analog scale)	0.001 mm	
Block step	20 mm (staggered)	
Micrometer adjustment	20 mm	
Micrometer feed	0.5 mm/rev	
Block pitch accuracy	±1.5 μm	
Parallelism of blocks	1.0 μm	
Feed error	±1.0 μm	
Retrace error	1.0 μm	
Mass	23 kg	

Inch		
Code No.	515-310	515-311
Range (H)	0.2 in < H ≤ 12.2 in	
Graduation (analog scale)	0.00001 in	
Block step	0.5 in (straight)	1 in (staggered)
Micrometer adjustment	1 in	
Micrometer feed	0.025 in/rev	
Block pitch accuracy	±50 μin	
Parallelism of blocks	40 μin	
Feed error	±40 μin	
Retrace error	40 μin	
Mass	23 kg	

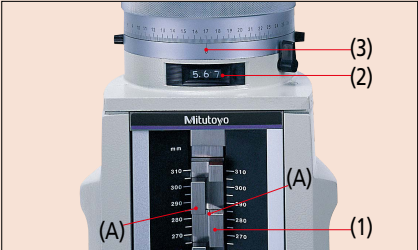
Note 1: The block pitch accuracy and the parallelism of blocks are relative to the main unit reference surface.
Note 2: Supplied with a wooden storage case as standard.



Typical application



Reading



(A) Height A	
(1) Scale	280. mm
(2) Counter	5.67 mm
(3) Thimble	0.000 mm
	285.670 mm

Function

Zero setting
Origin-setting
Origin restoration
Data hold
Auto power off
Data output

Optional Accessories

Code No.	Type	Description
959149	C	connection cable (1 m)
959150	C	connection cable (2 m)

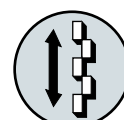
Digital Height Master SERIES 515

- For calibrating and setting height gages.

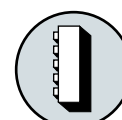


515-374

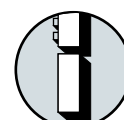
- Staggered arrangement of block stack have two measuring faces on the same level, one facing up and the other down.
- Equipped with a data output port that enables incorporation into measurement networking and statistical process control systems. (Refer to page 09-3 for details)



Staggered 20 mm
blocks (movable)



Vertical
orientation



Riser block

SPECIFICATIONS

Metric				
Code No.		515-374	515-376	515-378
Range (H)		10 < H ≤ 310 mm	10 < H ≤ 460 mm	10 < H ≤ 610 mm
Resolution (digital display)		0.001 mm		
Block step		20 mm (staggered)		
Micrometer adjustment		20 mm		
Micrometer feed		0.5 mm/rev		
Block pitch accuracy	0 < H ≤ 310 mm	±1.5 μm		
	310 < H ≤ 460 mm	—	±2.5 μm	
	460 < H ≤ 610 mm	—	—	±3.5 μm
Parallelism of blocks	0 < H ≤ 310 mm	2.0 μm		
	310 < H ≤ 610 mm	—	2.5 μm	
Feed error		±2.0 μm		±2.5 μm
Retrace error		2.0 μm		2.5 μm
Mass		9.5 kg	13.6 kg	16 kg

Inch				
Code No.		515-375	515-377	515-379
Range (H)		0.5 in < H ≤ 12 in	0.5 in < H ≤ 18 in	0.5 in < H ≤ 24 in
Resolution (digital display)		0.0001 in		
Block step		1 in (staggered)		
Micrometer adjustment		1 in		
Micrometer feed		0.025 in/rev		
Block pitch accuracy	0 < H ≤ 12 in	±100 μin		
	12 in < H ≤ 18 in	—	±100 μin	
	18 in < H ≤ 24 in	—	—	±150 μin
Parallelism of blocks	0 < H ≤ 12 in	50 μin		
	12 in < H ≤ 18 in	—	100 μin	
Feed error		±100 μin		
Retrace error		100 μin		
Mass		9.5 kg	13.6 kg	16 kg

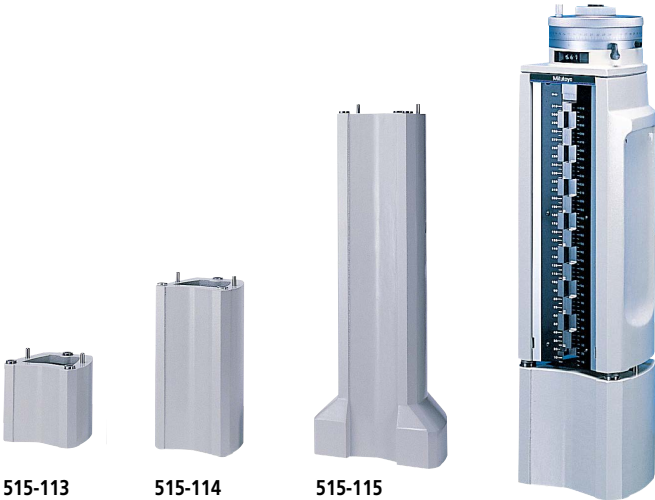
- Display: 6 digits
 - Power source: SR44 battery (2 pcs.), **938882** included as standard (for operational checks)
 - Battery life: Approx. 1.8 years under normal use
- Note: The block pitch accuracy and the parallelism of blocks are based on main unit reference surface, which does not include the retrace error.

Reference Gages

Height Master
SERIES 515 — Optional accessories

Riser Blocks
SERIES 515

- The measuring range of a Height Master can be extended by using riser blocks.
- They can also be used on Square Master models **311-215** and **311-225**. (Refer to page 01-46 for details)



SPECIFICATIONS

Metric				
Code No.	Height (mm)	Accuracy (μm)	Variation in length (μm)	Mass (kg)
515-113	150	±0.6	0.6	5.7
515-114	300	±1.0	0.8	9.8
515-115	600	±2.0	1.0	26.8

Inch				
Code No.	Height (in)	Accuracy (μin)	Variation in length (μin)	Mass (kg)
515-116	6	±20	20	4.8
515-117	12	±40	30	11.3
515-118	24	±80	40	31



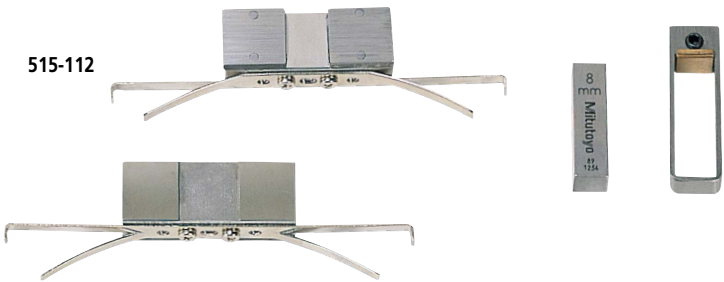
Typical application



Bore gage zero-setting

Auxiliary Block Kit SERIES 515 – for Bore Gage

- Used for efficient zero-setting of dial bore gages and tubular inside micrometers (18 - 150 mm) on a Height Master.



SPECIFICATIONS

Metric	
Code No.	Model
515-110	Universal Height Master
515-111	Digital Height Master (515-374/376/378)
515-112	Height Master (515-322)
Inch	
Code No.	Model
515-119	Universal Height Master, Height Master (515-310)
515-120	Digital Height Master (515-375/377/379)
515-121	Height Master (515-311)

Reference Gages

Universal Height Master
SERIES 515 — Usable in Vertical and Horizontal Orientations

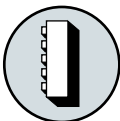
- The Universal Height Master is designed for both vertical and horizontal orientation, providing a wide range of applications such as accuracy checking of machine tool table movements.
- Analog display by the built-in counter – the appearance and specifications are the same as **515-322**. (Refer to page 01-37 for details)



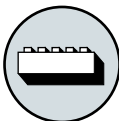
515-520



Single-row 10 mm blocks (movable)



Vertical orientation



Horizontal orientation



Riser block

SPECIFICATIONS

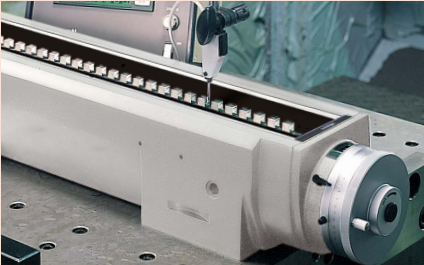
Metric			
Code No.		515-520	515-523
Range (H)		5 < H ≤ 610 mm	5 < H ≤ 1010 mm
Graduation (analog scale)		0.001 mm	
Block step		10 mm (straight)	
Micrometer adjustment		20 mm	
Micrometer feed		0.5 mm/rev	
Block pitch accuracy	H ≤ 310 mm	±1.5 μm	
	310 < H ≤ 610 mm	±2.5 μm	
	610 < H ≤ 1010 mm	—	±3.5 μm
Parallelism of blocks	H ≤ 610 mm	1.5 μm	
	610 < H ≤ 1010 mm	—	2.0 μm
Feed error		±1.2 μm	±1.5 μm
Retrace error		1.2 μm	1.5 μm
Mass		42 kg	63.5 kg

Inch			
Code No.		515-512	515-510 515-513
Range (H)		0.2 in < H ≤ 18.2 in	0.2 in < H ≤ 24.2 in 0.2 in < H ≤ 40.2 in
Graduation (analog scale)		0.00001 in	
Block step		0.5 in (straight)	
Micrometer adjustment		1 in	
Micrometer feed		0.025 in/rev	
Block pitch accuracy	H ≤ 12 in	±50 μin	
	12 in < H ≤ 24 in	—	±100 μin
	24 in < H ≤ 40 in	—	±150 μin
Parallelism of blocks	H ≤ 24 in	60 μin	
	24 in < H ≤ 40 in	—	80 μin
Feed error		±40 μin	±60 μin
Retrace error		40 μin	60 μin
Mass		42 kg	63.5 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.



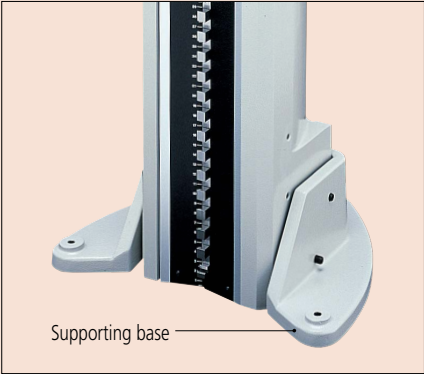
Typical application



Using in horizontal orientation

Optional Accessories

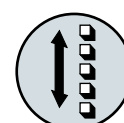
Supporting base
900574 (Dedicated for the Universal Height Master. Provided for **515-523** and **515-513** as standard.)
• Stable vertical orientation is available.



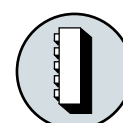
Supporting base

Check Master SERIES 515

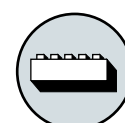
- Designed to check the accuracy of table movements of machine tools and calibrate CMMs. Permanently wrung stack of gauge blocks is housed in a rigid frame.
- Can be used in either vertical or horizontal orientation.



Single-row
10 mm (0.5 in) blocks



Vertical
orientation



Horizontal
orientation

SPECIFICATIONS

Metric					
Code No.		515-720	515-721	515-722	515-723
Range (H)		310 mm	450 mm	610 mm	1010 mm
Block step		10 mm			
Block pitch accuracy	$H \leq 310$ mm	± 2.5 μ m			
	$310 < H \leq 610$ mm	—	—	± 3.5 μ m	—
	$610 < H \leq 1010$ mm	—	—	—	± 5.0 μ m
	$1010 < H \leq 1510$ mm	—	—	—	± 8.0 μ m
Parallelism of blocks	$H \leq 310$ mm	1.2 μ m			
	$310 < H \leq 610$ mm	—	—	1.5 μ m	—
	$610 < H \leq 1010$ mm	—	—	—	2.0 μ m
	$1010 < H \leq 1510$ mm	—	—	—	2.5 μ m
Mass		7 kg	10 kg	13 kg	22 kg

Inch				
Code No.		515-710	515-711	515-712
Range (H)		12.5 in	18.5 in	24.5 in
Block step		0.5 in		
Block pitch accuracy	$H \leq 12.5$ in	± 100 μ in		
	12.5 in $< H \leq 24.5$ in	—	± 150 μ in	
	24.5 in $< H \leq 40.5$ in	—	—	± 200 μ in
Parallelism of blocks	$H \leq 12.5$ in	50 μ in		
	12.5 in $< H \leq 24.5$ in	—	60 μ in	
	24.5 in $< H \leq 40.5$ in	—	—	80 μ in
Mass		7 kg	10 kg	13 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.

Reference Gages



Standard Scales
SERIES 182 — Made of Low Expansion Glass

- High-precision glass scales manufactured under Mitutoyo’s leading-edge Linear Scale production technology. They are considered top-grade length standards.
- Standard scales can be used as a traceable standard of length for calibrating measuring instruments.

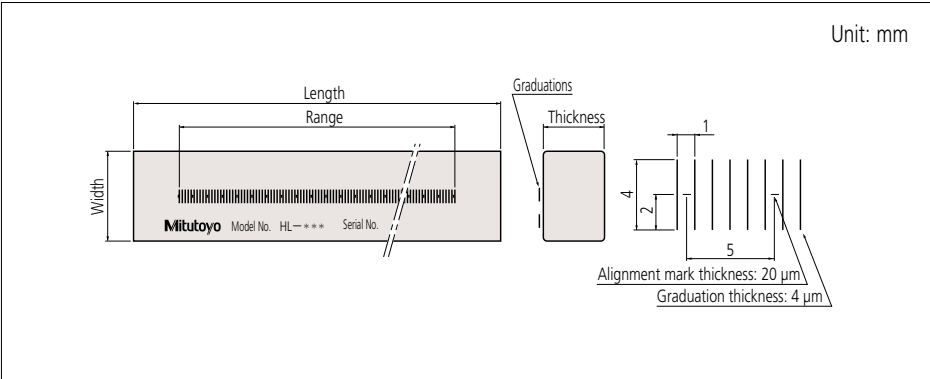


SPECIFICATIONS

Metric						
Code No.	Range (mm)	Length (mm)	Width (mm)	Thickness (mm)	Graduation thickness (μm)	Graduation (mm)
182-501-50	250	280	20	10	4	1
182-501-60*						
182-502-50	500	530	30	20	4	1
182-502-60*						

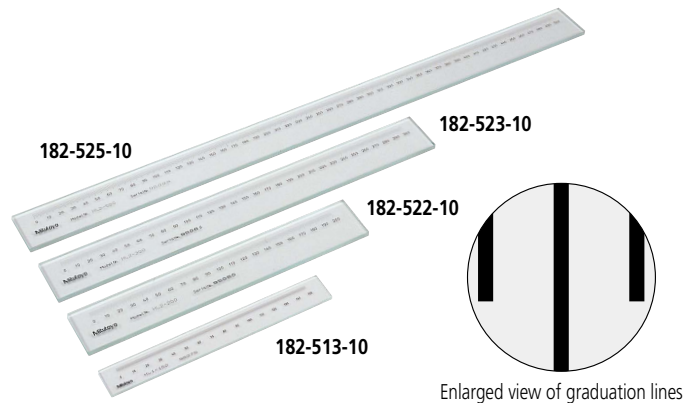
- Material: Low expansion glass
- Thermal expansion coefficient: $(0.00\pm0.02)\times10^{-6}/K$
- Accuracy (at 20 °C): $(0.5 + L/1000) \mu m$, L=Measured length (mm)
- * With English JCSS certificate.

DIMENSIONS



Working Standard Scales SERIES 182

- High-precision glass scales manufactured under Mitutoyo's leading-edge Linear Scale production technology. They are available in various types and sizes to suit to your application.
- Ideal for checking magnification accuracy of profile projectors and microscopes, and the table feeding accuracy of measuring equipment.

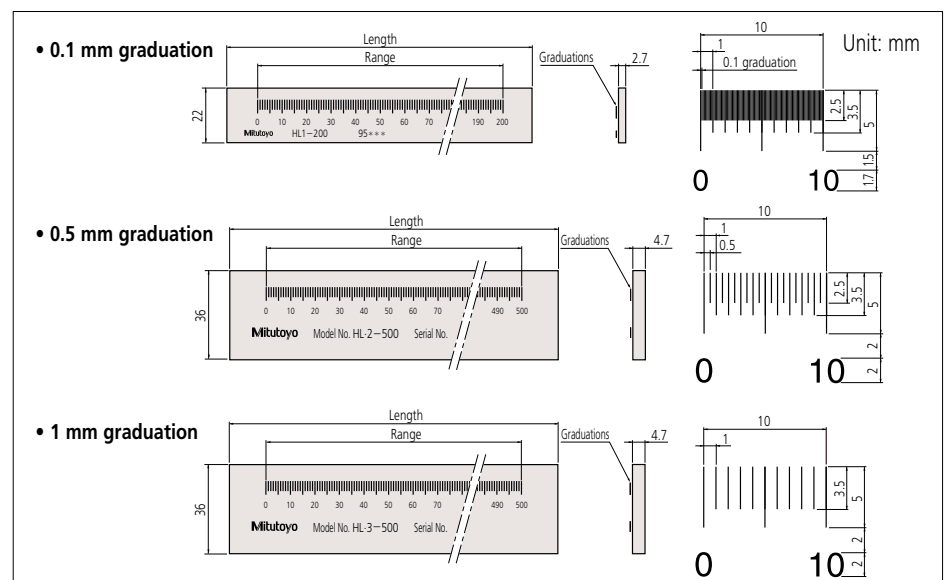


SPECIFICATIONS

Metric						
Code No.	Range (mm)	Graduation (mm)	Length (mm)	Inspection pitch (mm)	Graduation thickness (μm)	Mass (kg)
182-511-10	50	0.1	75	5	20	0.23
182-512-10	100		125	10		0.24
182-513-10	150		175			0.25
182-514-10	200		225			0.26
182-521-10	100	0.5	130	20	50	0.27
182-522-10	200		230			0.32
182-523-10	300		330			0.57
182-524-10	400		430			0.71
182-525-10	500	1	530	25	100	0.86
182-531-10	250		280			0.55
182-532-10	500		530			1.22
182-533-10	750		780			0.23
182-534-10	1000		1030			1.54

- Material: Soda-lime glass
 - Thermal expansion coefficient: $8.5 \times 10^{-6}/K$
 - Accuracy (at 20 °C): $(1.5 + 2L/1000) \mu m$, L=Measured length (mm)
- Note: An inspection certificate produced by a standard scale automatic calibration system is supplied as standard.

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 and CMMs.
- Four precision-lapped reference surfaces, finished using ultra-precision technology built on our experience in gauge blocks.
- Better than 1 µm/300 mm straightness and perpendicularity of each (four) reference surface. In addition, front and back faces are accurate to better than 5 µm/300 mm.
- Three nominal sizes are available (90×110, 160×210 and 260×310 mm) so that you can select the size that best suits the application.



311-113

SPECIFICATIONS

Code No.	Dimension (W×L×T) (mm)	Perpendicularity tolerance (µm)		Straightness tolerance (µm)		Mass (kg)
		Reference surface	Front/ back faces	Reference surface	Front/ back faces	
311-111	90×110×25	1	5	1	5	1.5
311-112	160×210×25					5.0
311-113*	260×310×30					14.0

- Dedicated wooden case is provided.
- * Supplied with a removable handle.



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			
Code 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			
Code 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			
Code 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			
Code 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	1/50 in, 1/100 in, 1 mm, 0.5 mm	24 in/600 mm	1.18
182-106		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		6 in/150 mm	0.75

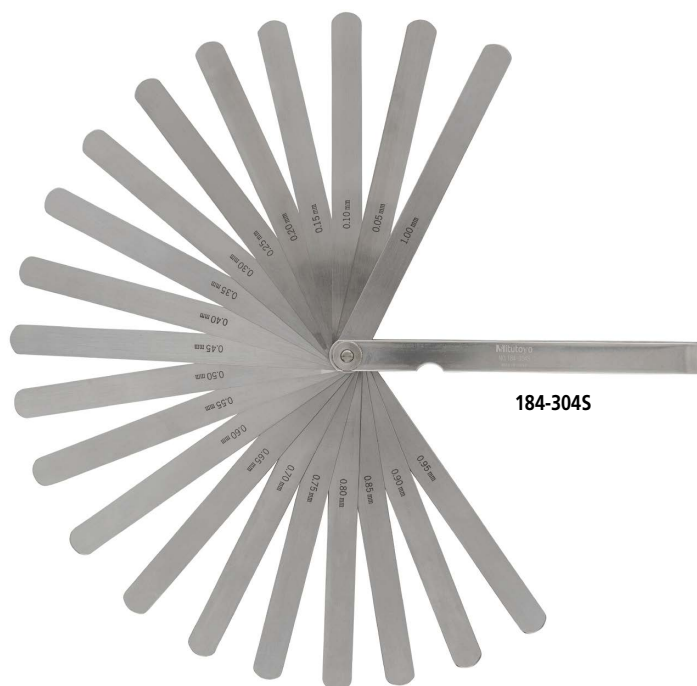
Inch/Metric Fully-Flexible Rules			
Code No.	Graduations	Range	Width (in)
182-205	1/32 in, 1/64 in, 1 mm, 0.5 mm	6 in/150 mm	0.47
182-225		12 in/300 mm	0.47
182-245		18 in/450 mm	0.75
182-265	1/50 in, 1/100 in, 1 mm, 0.5 mm	24 in/600 mm	0.75
182-206		6 in/150 mm	0.47
182-226		12 in/300 mm	0.47
182-207	1/10 in, 1/100 in, 1 mm, 0.5 mm	6 in/150 mm	0.47
182-208		6 in/150 mm	0.47

Inch Wide Rigid Rules			
Code 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	1/50, 1/100, 1/32, 1/64	24	1.18
182-102		6	0.75
182-122		12	0.98
182-142	1/10, 1/100, 1/32, 1/64	18	1.18
182-162		24	1.18
182-103		6	0.75
182-123	1/10, 1/100, 1/32, 1/64	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			
Code 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	1/50, 1/100, 1/32, 1/64	24	0.75
182-202		6	0.47
182-222		12	0.47
182-242	1/10, 1/100, 1/32, 1/64	18	0.75
182-262		24	0.75
182-203		6	0.47
182-223	1/10, 1/100, 1/32, 1/64	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

Thickness Gages SERIES 184

- Metric thickness gages are available with tapered leaves.
- Each leaf is marked with its thickness.
- Each leaf is detachable if necessary.



SPECIFICATIONS

Metric			
Code No.	Range (mm)	Composition of leaves	Remarks
184-313S	0.05 - 1	28 leaves: 0.05 - 0.15 mm by 0.01 mm, 0.2 - 1 mm by 0.05 mm	—
184-303S		28 leaves: 0.05 - 0.15 mm by 0.01 mm, 0.2 - 1 mm by 0.05 mm	Long leaf
184-304S	0.05 - 1	20 leaves: 0.05 - 1 mm by 0.05 mm	Long leaf
184-305S	0.05 - 1	13 leaves: 0.05 - 0.3 mm by 0.05 mm, 0.4 - 1 mm by 0.1 mm	—
184-301S		13 leaves: 0.05 - 0.3 mm by 0.05 mm, 0.4 - 1 mm by 0.1 mm	Long leaf
184-306S	0.05 - 0.8	10 leaves: 0.05 - 0.2 mm by 0.05 mm, 0.3 - 0.8 mm by 0.1 mm	—
184-308S		10 leaves: 0.05 - 0.2 mm by 0.05 mm, 0.3 - 0.8 mm by 0.1 mm	Long leaf
184-307S	0.03 - 0.5	13 leaves: 0.03 - 0.1 mm by 0.01 mm, 0.2 - 0.5 mm by 0.1 mm, 0.15 mm	—
184-302S		13 leaves: 0.03 - 0.1 mm by 0.01 mm, 0.2 - 0.5 mm by 0.1 mm, 0.15 mm	Long leaf

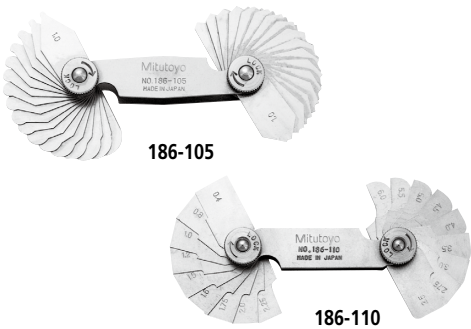
DIMENSIONS

Unit: mm			
	Code 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

Reference Gages

Radius Gages
SERIES 186

- Radius size is stamped on each gage leaf.
- Each leaf comprises an internal and an external radius gage of the same size.
- With locking clamp.

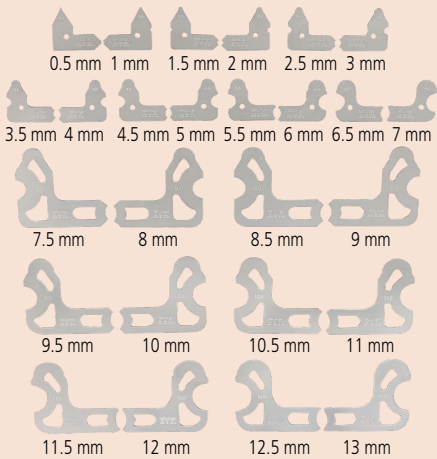


SPECIFICATIONS

Metric				
Code No.	Range (mm)	Accuracy	Composition of leaves	Remarks
186-110	0.4 - 6	±0.04 mm	18 leaves: 0.4, 0.8, 1, 1.2, 1.5, 1.6 mm, 1.75 - 3 mm by 0.25 mm, 3.5 - 6 mm by 0.5 mm	90° arc
186-902	0.5 - 13		26 leaves: 0.5 - 13 mm by 0.5 mm	90° arc, separate part type
186-105	1 - 7		34 leaves: 1 - 3 mm by 0.25 mm, 3.5 - 7 mm by 0.5 mm	180° arc
186-106	7.5 - 15		32 leaves: 7.5 - 15 mm by 0.5 mm	180° arc
186-107	15.5 - 25		30 leaves: 15.5 - 20 mm by 0.5 mm, 21 - 25 mm by 1 mm	180° arc

Inch				
Code No.	Range (in)	Accuracy	Composition of leaves	Remarks
186-103	1/32 - 17/64	±0.002 in	16 leaves: 1/32 in - 17/64 in by 64ths	90° arc
186-101	1/32 - 1/4		30 leaves: 1/32 in - 1/4 in by 64ths	180° arc
186-102	17/64 - 1/2		32 leaves: 17/64 in - 1/2 in by 64ths	180° arc
186-104	9/32 - 33/64		16 leaves: 9/32 in - 33/64 in by 64ths	90° arc
186-901*	1/64 - 1/2		25 leaves: 1/64 in - 17/64 in by 64ths, 9/32 in - 1/2 in by 32nds	Holder
186-903	1/64 - 17/64	±0.0016 in	17 leaves: 1/64 in - 17/64 in by 64ths	—
186-904	9/32 - 1/2		8 leaves: 9/32 in - 1/2 in by 32nds	—
186-905	9/16 - 1		8 leaves: 9/16 in - 1 in by 16ths	Holder
186-906	0.010 - 0.500		26 leaves: 0.10 in - 0.30 in by 0.005 in 0.40 in - 0.100 in by 0.010 in 0.120 in - 0.300 in by 0.020 in 0.350 in - 0.500 in by 0.050 in	Holder
186-907	0.550 - 1		10 leaves: 0.550 in - 1 in by 0.50 in	—

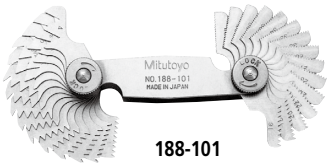
* Each gage has five measuring locations.



Composition of leaves for 186-902

Thread Pitch Gages
SERIES 188

- Thread pitch is stamped on each gage.
- Metric, Unified, and Whitworth screw pitch gages.



SPECIFICATIONS

Metric Screw Pitch Gages

Code No.	Range (mm)	Integration pitch error	Composition of leaves
188-130	0.35 - 6	±0.05 mm	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, 6 mm and 60° angle gage
188-122	0.4 - 7		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, 7 mm
188-121	0.4 - 7		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, 7 mm

Unified Screw Pitch Gages

Code No.	Range	Integration pitch error	Composition of leaves
188-111	4 - 42 TPI	±0.002 in	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.

Metric and Unified Screw Pitch Gage Set

Code No.	Range	Integration pitch error	Composition of leaves
188-151	0.4 - 7 mm/4 - 42 TPI	±0.05 mm/ ±0.002 in	51 leaves: Set of 188-122 and 188-111

Whitworth Screw Pitch Gages

Code No.	Range	Integration pitch error	Composition of leaves
188-101	4 - 42 TPI	±0.002 in	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
188-102	4 - 60 TPI		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

Function

- Presetting

Digimatic Universal Protractor SERIES 187

- Data output function makes it easy to gather statistical data.
- Can be attached to height gages using a gage holder (**950750**, metric)
- Setting preset value.
- Removable blade.



187-501

SPECIFICATIONS

Code No.	Blade length	Range	Resolution	Accuracy	Repeatability	Remarks (standard accessory)
187-501	150 mm	-360° to +360°	1' (0.01°)	±2' (±0.03°)	1'	Height gage holder (950750)
187-502	300 mm					Height gage holder (950750)
187-551	6 in					Height gage holder (950749)
187-552	12 in					Height gage holder (950749)

- Power source: CR2032 battery (1 pc.), included as standard (for operational checks)
- Battery life: 2,000 hours

Universal Bevel Protractor SERIES 187

- High-precision instrument for accurate angle measurement on machines, molds, and jigs.
- There is no height difference between the main scale and Vernier. The scale magnifier can reduce parallax differences.
- The fine adjustment knob allows for fine feed adjustment.
- Graduation: 5'



187-901-10



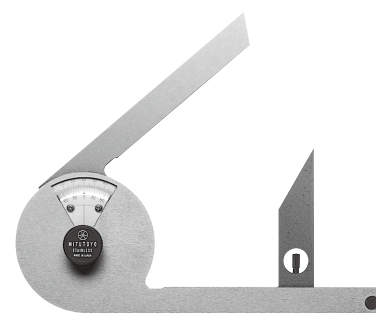
SPECIFICATIONS

Metric		
Code 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

Inch		
Code 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

Bevel Protractor SERIES 187

- Consists of three sheets of stainless steel, the middle one of which is made for angle measurements.



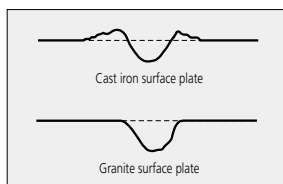
187-201

SPECIFICATIONS

Code No.	Blade length (mm)	Range	Graduation	Blade edge angle	Mass (g)	Remarks
187-201	137	90°x4 (360°)	5' (0° to 90° to 0°)	30° and 60°	260	w/60°, 30° edges

Black Granite Surface Plates SERIES 517

- The plates are made of natural granite that is uniform in structure and largely averse to deterioration. (Natural stones may have unique patterns on their surface.)
- Granite surface plate has many advantages over cast iron surface plates: Twice as hard as cast iron.
- Free from wringing effects, 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.
- Use these plates in a stable temperature environment. Since flatness error occurs when there is a temperature difference between the working surface and the underside, avoid working in direct sunlight. Also, do not place a plate in the vicinity of an air conditioner or heater. (Recommended environment: Temperature 20 ± 1 °C, Humidity $58 \pm 2\%$)



Machining of optional through holes, screw bushings, etc.

Through holes and screw holes (bushings) can be machined to order on surface plates. For detailed information, contact the nearest Mitutoyo sales office.

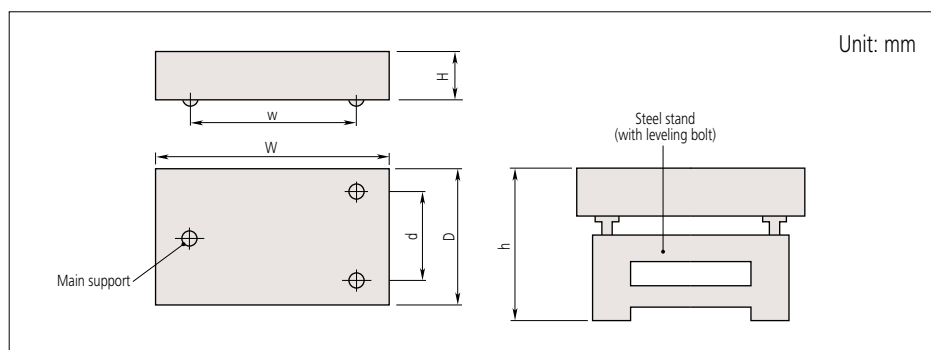
SPECIFICATIONS

Code No.	Grade	Size (mm)			Flatness (μm)	Mass (kg)	Optional stands for black granite surface plates			h (mm)
		WxDxH	d	w			Standard type	with safety frame	with casters (with safety frame)	
517-401-4	00	300×300×100	240	240	2	27	—	—	—	—
517-301	0				3					
517-101	1				5					
517-411-4	00	450×300×100	240	390	2	40	—	—	—	—
517-311	0				3					
517-111	1				6					
517-414-4	00	600×450×100	370	500	2.5	80	517-203-2	517-203R	517-203CR	755 to 775
517-314	0				4					
517-114	1				8					
517-403-4	00	600×600×130	500	500	2.5	140	517-204-2	517-204R	517-204CR	755 to 775
517-303	0				5					
517-103	1				8					
517-405-4	00	750×500×130	420	630	3	146	517-205-2	517-205R	517-205CR	755 to 775
517-305	0				5					
517-105	1				9					
517-407-4	00	1000×750×150	630	700	3	337	517-206-2	517-206R	517-206CR	755 to 775
517-307	0				6					
517-107	1				12					
517-409-4	00	1000×1000×150	700	700	3.5	450	517-207-2	517-207R	517-207CR	735 to 775
517-309	0				7					
517-109	1				13					
517-413-4	00	1500×1000×200	700	1100	4	900	517-208-4	517-208R	517-208CR	735 to 775
517-313-4	0				8					
517-113-4	1				16					
517-410-4	00	2000×1000×250	700	1500	4.5	1500	517-209-4	517-209R	517-209CR	735 to 775
517-310-4	0				9.5					
517-110-4	1				19					
517-416-4	00	2000×1500×300	1100	1500	5	2700	517-210-4	517-210R	517-210CR	735 to 775
517-316-4	0				10					
517-116-4	1				20					
*1	00	2000×2000×350	1500	1500	5.5	4200	—	—	—	700 to 706*2
*1	0				11					
*1	1				22					
*1	00	3000×1500×400	1100	2000	6.5	5400	—	—	—	700 to 706*2
*1	0				12.5					
*1	1				25					
*1	00	3000×2000×500	1500	2000	7	9000	—	—	—	700 to 706*2
*1	0				13.5					
*1	1				27					

*1 2000×2000 or larger is available by special order. Consult your local Mitutoyo sales office.

*2 Distance from the bottom of the large granite plate block mount to the granite plate top surface.

DIMENSIONS



SPECIFICATIONS: Main and auxiliary supports for large surface plates

Code No.	Applicable surface plates
	Size (WxDxH) (mm)
06AAY174	2000×2000×350
06AAY175	3000×1500×400
06AAY176	3000×2000×500

02

Micrometers

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.



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.



Ultra-high Accuracy Digimatic Micrometer



High-speed and High-accuracy Digimatic Micrometer QuantuMike



Coolant Proof Micrometers

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Micrometer

02
Micrometers

Ultra-high Accuracy Digimatic Micrometer
SERIES 293

- The flagship model, featuring unparalleled high accuracy and resolution.
- Maximum Permissible Error (J_{MPE}) of $\pm 0.5\text{ }\mu\text{m}$ is achieved with our innovative $0.1\text{ }\mu\text{m}$ 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.



SPECIFICATIONS

	Metric	Inch/Metric
Code No.	293-100-20	293-130-20
Measuring range	0 – 25 mm	0 – 1 in
Resolution	0.0001 mm/0.0005 mm (switchable)	0.000005 in/0.00002 in 0.0001 mm/0.0005 mm (switchable)
Maximum permissible error J_{MPE}	$\pm 0.5\text{ }\mu\text{m}$	$\pm 0.00002\text{ in}$
Flatness	$0.3\text{ }\mu\text{m}$	0.000012 in
Parallelism	$0.6\text{ }\mu\text{m}$	0.000024 in
Measuring surface	$\phi 3.2\text{ mm}$	
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) $\times 1$	
Battery life	Approx. two years when used under normal conditions	

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Data Management Software by Mitutoyo

ABSOLUTE[™]



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 $0.1\text{ }\mu\text{m}$ measurement is not required, the resolution can be switched to $0.5\text{ }\mu\text{m}$.

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.

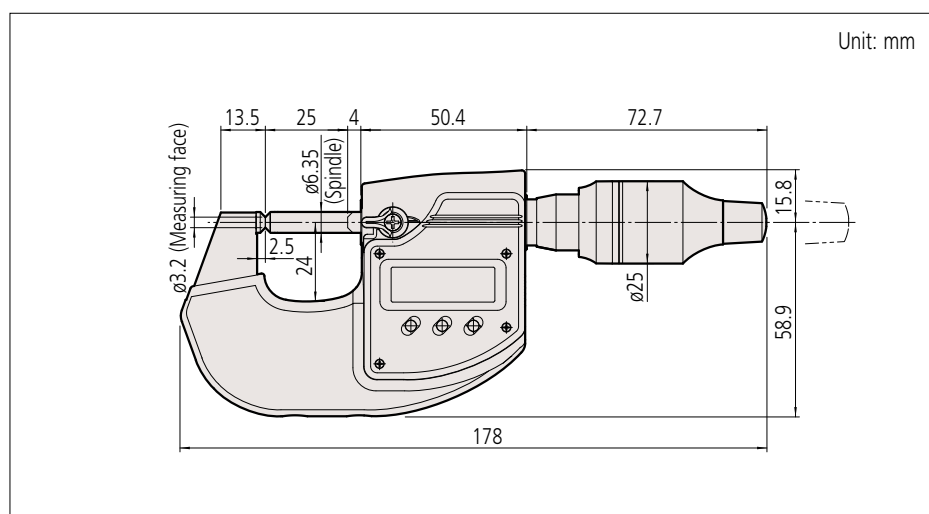
Error display:
In the unlikely event of a display overflow or calculation error, an error message is displayed and measurement stops. Measurement cannot continue until the error is corrected.
Also, if the battery voltage drops below a certain point, the battery indicator will turn on before measurement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

Outside Micrometers (Digimatic)

Optional Accessories

Code 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



Heat shield



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

Micrometer

02
Micrometers

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

- The spindle moves four times faster than that of the standard micrometer, enabling faster, easier measurement even when it is repeated many times over.
- The approach speed warning function can detect collision with a workpiece at excessive speed, helping inexperienced users obtain reliable and accurate measurement results.
- The calculation function can calculate offsets added to measurement results before they are passed to a machine. This eliminates errors and the effort needed for calculation, helping reduce the number of rejected machined items.
- The Calibration alert function helps with effective measuring instrument management.
- Bidirectional serial communication supported.



293-140-40

SPECIFICATIONS

Metric							
Code No.	Range (mm)	Resolution (mm)	Measuring force*1 (N)	Maximum permissible error J_{MPE} (μm)	Flatness (μm)	Parallelism (μm)	Mass (g)
With SPC data output							
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
Inch / Metric							
Code No.	Range (in)	Resolution	Measuring force*1 (N)	Maximum permissible error J_{MPE} (in)	Flatness (in)	Parallelism (in)	Mass (g)
With SPC data output							
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		0.00008	465
293-183-40	3 - 4						620

- Dust/Water protection level: IP65 (IEC60529)*2
- Power source: CR2032 battery (1 pc.), included as standard (for operational checks)
- Battery life: Approx. 2 years under normal use
- Position detection method: Electromagnetic rotary sensor
- Standard accessories: Setting standard, 1 pc. (except for 0 to 25 mm (0 to 1 in) models), Spanner (301336), 1 pc.
- *1 Measuring force when using the speeder ratchet (Apply a measuring force in the same condition as for measurement and then set the origin.)
- *2 Rustproofing shall be applied after use.

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U-WAVE^{fit}

IP65

TÜV Rheinland
CERTIFIED

Dust- and
Water-
Protected
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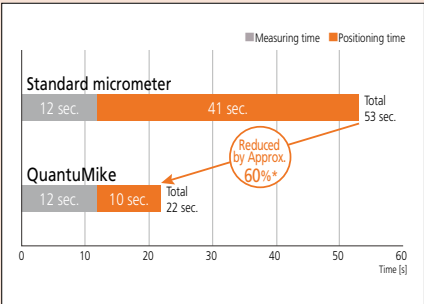
PROPRIETARY
INSPECTION
CERTIFICATE

DIGIMATIC S1

Measurement example

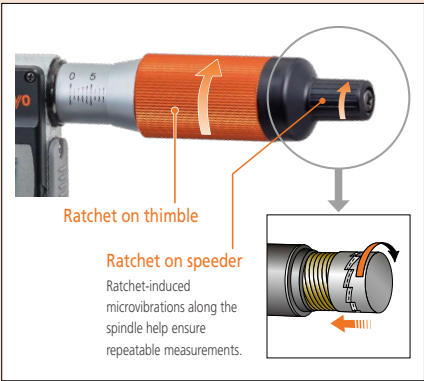


Comparison of time needed to measure a 6-stepped workpiece (with one hand)



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

Ratchet thimble mechanism



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:

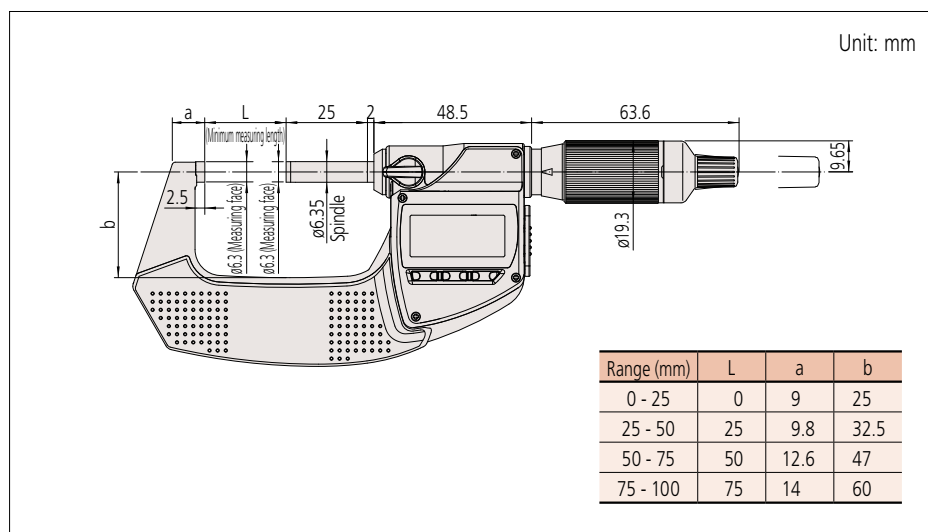
In the unlikely event of a display overflow or calculation error, an error message is displayed and measurement stops. Measurement cannot continue until the error is corrected.

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

Code 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

DIMENSIONS



Micrometer

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.



293-230-30

SPECIFICATIONS

Metric

293-230-30

Mitutoyo

Code No.	Range (mm)	Resolution (mm)	Measuring force*1 (N)	Maximum permissible error J_{MPE} (μm)	Parallelism (μm)	Flatness (μm)	Constant measuring force	Mass (g)	
With SPC data output									
293-230-30	0 - 25	0.001	5 - 10	±1	1	0.3	With ratchet stop	270	
293-231-30	25 - 50								330
293-232-30	50 - 75			±2	2				470
293-233-30	75 - 100								625
293-234-30	0 - 25		7 - 12	±1	1		With ratchet thimble	280	
293-235-30	25 - 50								340
293-236-30	50 - 75			±2	2				480
293-237-30	75 - 100								635
Without SPC data output									
293-240-30	0 - 25	0.001	5 - 10	±1	1	0.3	With ratchet stop	270	
293-241-30	25 - 50								330
293-242-30	50 - 75			±2	2				470
293-243-30	75 - 100								625
293-244-30	0 - 25		7 - 12	±1	1		With ratchet thimble	280	
293-245-30	25 - 50								340
293-246-30	50 - 75			±2	2				480
293-247-30	75 - 100								635

Inch / Metric								
Code No.	Range (in)	Resolution	Measuring force*1 (N)	Maximum permissible error J_{MPE} (in)	Parallelism (in)	Flatness (in)	Constant measuring force	Mass (g)
With SPC data output								
293-330-30	0 - 1	0.00005 in / 0.001 mm	5 - 10	±0.00005	0.00004	0.000012	With ratchet stop	270
293-331-30	1 - 2							330
293-332-30	2 - 3		±0.0001	0.00008	470			
293-333-30	3 - 4				625			
293-334-30	0 - 1		7 - 12		280			
293-335-30			5 - 10	±0.00005	0.00004		275	
293-336-30	1 - 2				335			
Without SPC data output								
293-340-30	0 - 1	0.00005 in / 0.001 mm	5 - 10	±0.00005	0.00004	0.000012	With ratchet stop	270
293-341-30	1 - 2							330
293-342-30	2 - 3		±0.0001	0.00008	470			
293-343-30	3 - 4				625			
293-344-30	0 - 1		±0.00005	0.00004	280			
293-345-30	1 - 2							340
293-346-30	2 - 3	±0.0001	0.00008	480				
293-347-30	3 - 4					635		
293-348-30	0 - 1	5 - 10	±0.00005	0.00004	With friction thimble	275		
293-349-30		7 - 12	±0.0001		With ratchet thimble	280		

- Dust/water protection level: IP65 (IEC60529)*2
 - Power source: SR44 battery (1 pc.), **938882** included as standard (for operational checks)
 - Battery life: Approx. 2.4 years under normal use
 - Position detection method: Electromagnetic rotary sensor
 - Standard accessories: Setting standard, 1 pc. (except for 0 to 25 mm (0 to 1 in) models), Spanner (**301336**), 1 pc.
 - *1 Measuring force when using the speeder ratchet (Apply a measuring force in the same condition as for measurement and then set the origin.)
 - *2 Rustproofing shall be applied after use.
- Note: All digits of models over 125 mm (5 in) measuring range are presettable.

DIMENSIONS

Ratchet stop		Ratchet thimble type		Unit: mm	
Range (mm)	Code No.	L	a	b	c
0 - 25	293-230-30/293-240-30	0	6.5	25	2.5
25 - 50	293-231-30/293-241-30	25	7.3	32.5	
50 - 75	293-232-30/293-242-30	50	10.1	47	
75 - 100	293-233-30/293-243-30	75	11.5	60	
0 - 25	293-234-30/293-244-30	0	6.5	25	2.5
25 - 50	293-235-30/293-245-30	25	7.3	32.5	

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 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.

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

Refer to page 02-8.

Micrometer sets

293-962-30 (Metric)

- Range: 0 - 75 mm (3 pcs./set)
- Models included:
293-230-30, 293-231-30, 293-232-30

293-963-30 (Metric)

- Range: 0 - 100 mm (4 pcs./set)
- Models included:
293-230-30, 293-231-30, 293-232-30, 293-233-30

293-966-30 (Metric)

- Range: 0 - 50 mm (2 pcs./set)
- Models included: **293-230-30, 293-231-30**

293-960-30 (Inch/Metric)

- Range: 0 - 2 in (3 pcs./set)
- Models included:
293-330-30, 293-331-30, 293-332-30

293-961-30 (Inch/Metric)

- Range: 0 - 3 in (4 pcs./set)
- Models included:
293-330-30, 293-331-30, 293-332-30, 293-333-30

Functions

Refer to page 02-7.

Optional Accessories

Only for models with data output function

Code 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

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.
- Models equipped with a Digimatic output port can form part of a statistical process control or networked measurement system.



293-252-30

SPECIFICATIONS

Metric								
Code No.	Range (mm)	Resolution (mm)	Measuring force*1 (N)	Maximum permissible error J_{MPE} (μm)	Parallelism (μm)	Flatness (μm)	Constant measuring force	Mass (g)
With SPC data output								
293-250-30	100 - 125	0.001	5 - 10	±2	3	0.3	With ratchet stop	600
293-251-30	125 - 150			±3				740
293-252-30	150 - 175				800			
293-253-30	175 - 200				4			970
293-254-30	200 - 225							1100
293-255-30	225 - 250							1270
293-256-30	250 - 275							1370
293-257-30	275 - 300			5	1590			
Inch / Metric								
Code No.	Range (in)	Resolution	Measuring force*1 (N)	Maximum permissible error J_{MPE} (in)	Parallelism (in)	Flatness (in)	Constant measuring force	Mass (g)
With SPC data output								
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			±0.00015	0.00016			740
293-352-30	6 - 7							800
293-353-30	7 - 8			±0.0002	0.0002			970
293-354-30	8 - 9							1100
293-355-30	9 - 10							1270
293-356-30	10 - 11							1370
293-357-30	11 - 12							1590

- Dust/water protection level: IP65 (IEC 60529)*²
 - Power source: SR44 battery (1 pc.), **938882** included as standard (for operational checks)
 - Battery life: Approx. 2.4 years under normal use
 - Position detection method: Electromagnetic rotary sensor
 - Standard accessories: Setting standard, 1 pc. (except for 0 to 25 mm (0 to 1 in) models), Spanner (**301336**), 1 pc.
- *1 Measuring force when using the speeder ratchet (Apply a measuring force in the same condition as for measurement and then set the origin.)
- *2 Rustproofing shall be applied after use.
- Note: All digits of models over 125 mm (5 in) measuring range are presettable.

DIMENSIONS

Unit: mm					
Range (mm)	Code No.	L	a	b	c
100 - 125	293-250-30	100	16.7	76	5.3
125 - 150	293-251-30	125	18.8	90	5.7
150 - 175	293-252-30	150	19.1	103	6.1
175 - 200	293-253-30	175	18.2	115	6.3
200 - 225	293-254-30	200	16.8	126	6.7
225 - 250	293-255-30	225	18	139	5.5
250 - 275	293-256-30	250	18	152	6.5
275 - 300	293-257-30	275	18	166	6.5

Micrometer

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Digimatic Outside Micrometers SERIES 293

- This large Digimatic micrometer series is available in various sizes up to 500 mm. It features a ratchet stop for constant measuring force.
- Measuring faces: Carbide tipped
- 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.



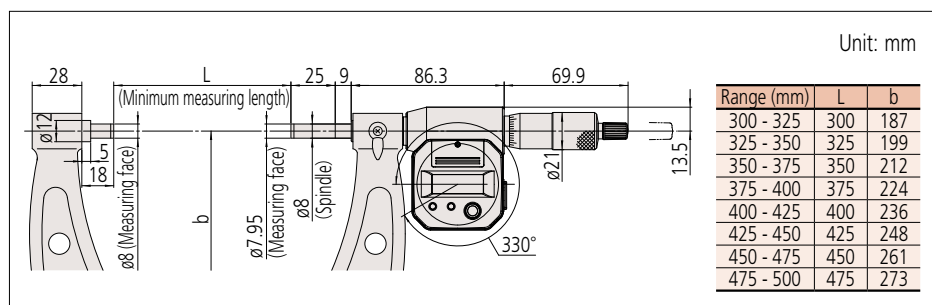
293-582

SPECIFICATIONS

Metric						
Code No.	Range (mm)	Resolution (mm)	Measuring force (N)	Maximum permissible error J_{MPE} (μm)	Flatness (μm)	Parallelism (μm)
With SPC data output						
293-582	300 - 325	0.001	10 - 15	±6	0.6	5
293-583	325 - 350			±7		6
293-584	350 - 375					
293-585	375 - 400					
293-586	400 - 425					
293-587	425 - 450					
293-588	450 - 475			±8		7
293-589	475 - 500					
Inch / Metric						
Code No.	Range (in)	Resolution	Measuring force (N)	Maximum permissible error J_{MPE} (in)	Flatness (in)	Parallelism (in)
With SPC data output						
293-782	12 - 13	0.0001 in / 0.001 mm	10 - 15	±0.0003	0.000024	0.0002
293-783	13 - 14			±0.00035		0.00024
293-784	14 - 15					
293-785	15 - 16					
293-786	16 - 17					
293-787	17 - 18					
293-788	18 - 19			±0.0004		0.00028
293-789	19 - 20					

- Power source: SR44 battery (2 pcs.), **938882** included as standard (for operational checks)
- Battery life: Approx. 1.8 years under normal use
- Position detection method: Electromagnetic rotary sensor
- Standard accessories: Setting standard, 1 pc., Spanner (**200154**), 1 pc.

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 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

Code No.	Type	Description
264-020	—	USB Input Tool Series USB Keyboard Signal Conversion Type IT-020U
04AZB512	CR	Connection cable (1 m)
04AZB513	CR	Connection cable (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



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.

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.
- Extended battery life of approximately 2.4 years, which helps reduce the number of battery replacements required.
- Equipped with Ratchet Stop for constant measuring force.
- Measuring faces: Carbide tipped



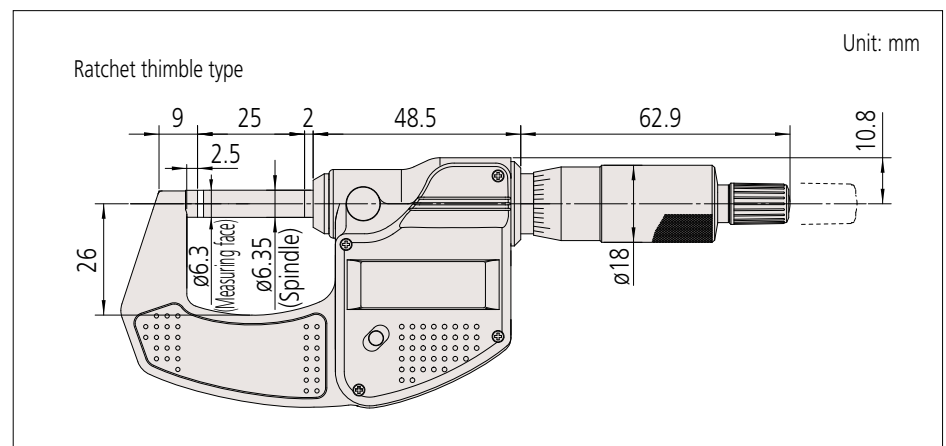
293-821-30

SPECIFICATIONS

Metric		With ratchet stop					
Code No.	Range (mm)	Resolution (mm)	Measuring force (N)	Maximum permissible error J_{MPE} (μ m)	Flatness (μ m)	Parallelism (μ m)	Mass (g)
Without SPC data output							
293-821-30	0 - 25	0.001	5 - 10	± 2	0.3	2	270
Inch / Metric		With ratchet stop					
Code No.	Range (in)	Resolution	Measuring force (N)	Maximum permissible error J_{MPE} (in)	Flatness (in)	Parallelism (in)	Mass (g)
Without SPC data output							
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					
Code No.	Range (in)	Resolution	Measuring force (N)	Maximum permissible error J_{MPE} (in)	Flatness (in)	Parallelism (in)	Mass (g)
Without SPC data output							
293-832-30	0 - 1	0.00005 in/0.001 mm	5 - 10	± 0.0001	0.000012	0.00008	270

- Power source: SR44 battery (1 pc.), **938882** included as standard (for operational checks)
- Battery life: Approx. 2.4 years under normal use
- Position detection method: Electromagnetic rotary sensor
- Spanner (**301336**), 1 pc.

DIMENSIONS



Micrometer

02
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 for constant measuring force.



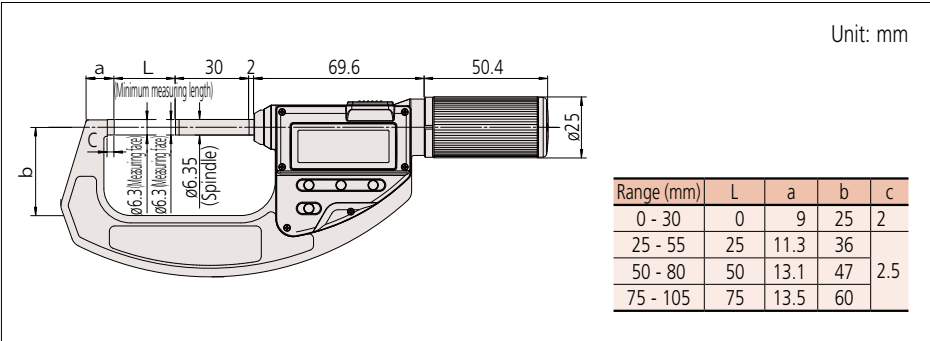
293-666-20

SPECIFICATIONS

Metric									
Code No.	Range (mm)	Resolution (mm)	Measuring force (N)	Maximum permissible error J_{MPE} (μm)	Flatness (μm)	Parallelism (μm)	Constant measuring force	Mass (g)	
With SPC data output									
293-666-20	0 - 30	0.001	5 - 12	±2	0.3	2	Yes	275	
293-667-20	25 - 55			±3		3		340	
293-668-20	50 - 80							480	
293-669-20	75 - 105			585					
Inch / Metric									
Code No.	Range (in)	Resolution	Measuring force (N)	Maximum permissible error J_{MPE} (in)	Flatness (in)	Parallelism (in)	Constant measuring force	Mass (g)	
With SPC data output									
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			±0.00015		0.00012		0.00012	340
293-678-20	2 - 3.2								480
293-679-20	3 - 4.2			585					

- Power source: SR44 battery (1 pc.), 938882 included as standard (for operational checks)
- Battery life: Approx. 5 years under normal use
- Position detection method: Electrostatic capacity absolute sensor
- Standard accessories: Setting standard, 1 pc. (except for measuring range 0 to 30 mm (0 to 1.2 in) models)
- Maximum response speed: without limit
- The non-rotating spindle enables even inexperienced operators to perform measurements repeatably and accurately.

DIMENSIONS



Range (mm)	L	a	b	c
0 - 30	0	9	25	2
25 - 55	25	11.3	36	2.5
50 - 80	50	13.1	47	
75 - 105	75	13.5	60	

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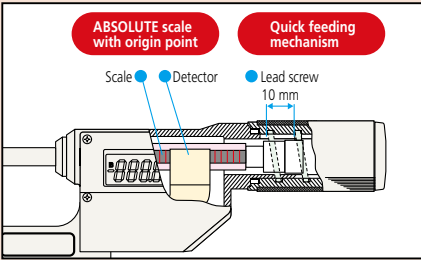
Measurement example



Optional Accessories

Code 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



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

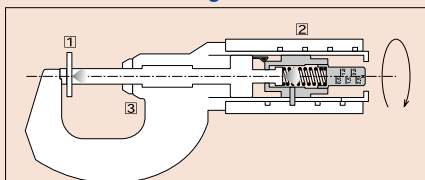
Code No.	Type	Description
264-020	—	USB Input Tool Series USB Keyboard Signal Conversion Type IT-020U
05CZA662	B	Connection cable (1 m)
05CZA663	B	Connection cable (2 m)
06AFM380B	B	USB Input Tool Direct (2 m)
02AZD730G	IP67	U-WAVE-T
02AZD880G	Buzzer	U-WAVE-T
02AZE200	—	U-WAVE-T mounting bracket
02AZD790B	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.)
- It is suitable for measuring flexible workpieces such as electric wire, paper, and rubber.
- Non-rotating spindle reduces workpiece deformation.
- Measuring faces: Carbide tipped



227-201-20

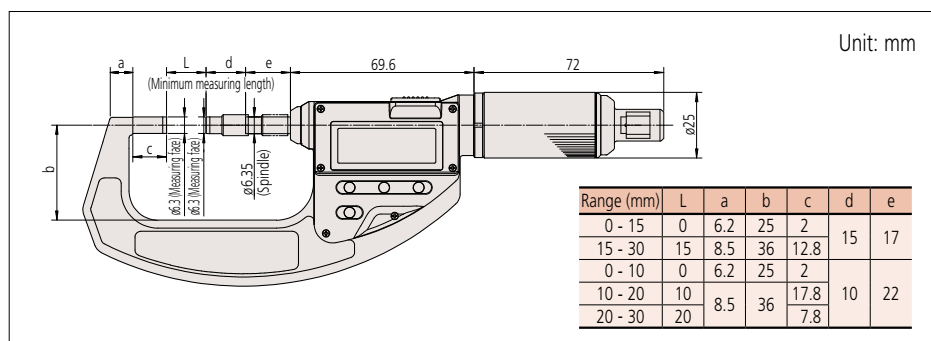
SPECIFICATIONS

Metric										
Code No.	Range (mm)	Resolution (mm)	Measuring force (N)	Maximum permissible error J_{MPE} (μm)	Flatness (μm)	Parallelism (μm)	Measuring force (N)	Accuracy of the selected measuring force* (N)	Repeatability of measuring force* (N)	Mass (g)
With SPC data output										
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		2 - 10 (adjustable)				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
Inch / Metric										
Code No.	Range (in)	Resolution	Measuring force (N)	Maximum permissible error J_{MPE} (in)	Flatness (in)	Parallelism (in)	Measuring force (N)	Accuracy of the selected measuring force* (N)	Repeatability of measuring force* (N)	Mass (g)
With SPC data output										
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		2 - 10 (adjustable)				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

- Measurement posture: horizontal orientation only (Recommended spindle inclination: within ±3°)
- Power source: SR44 battery (1 pc.), **938882** included as standard (for operational checks)
- Battery life: Approx. 5 years under normal use
- Position detection method: Electrostatic capacity absolute sensor
- Standard accessories: Setting standard, 1 pc. (except for measuring range 0 to 15 mm (0 to 0.6 in)/0 to 10 mm (0 to 0.4 in) models), Screwdriver (**210183**), 1 pc.

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

DIMENSIONS



Micrometer

02
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
- Spindle $\varnothing 6.35$ mm
- Equipped with Ratchet Stop for constant measuring force.



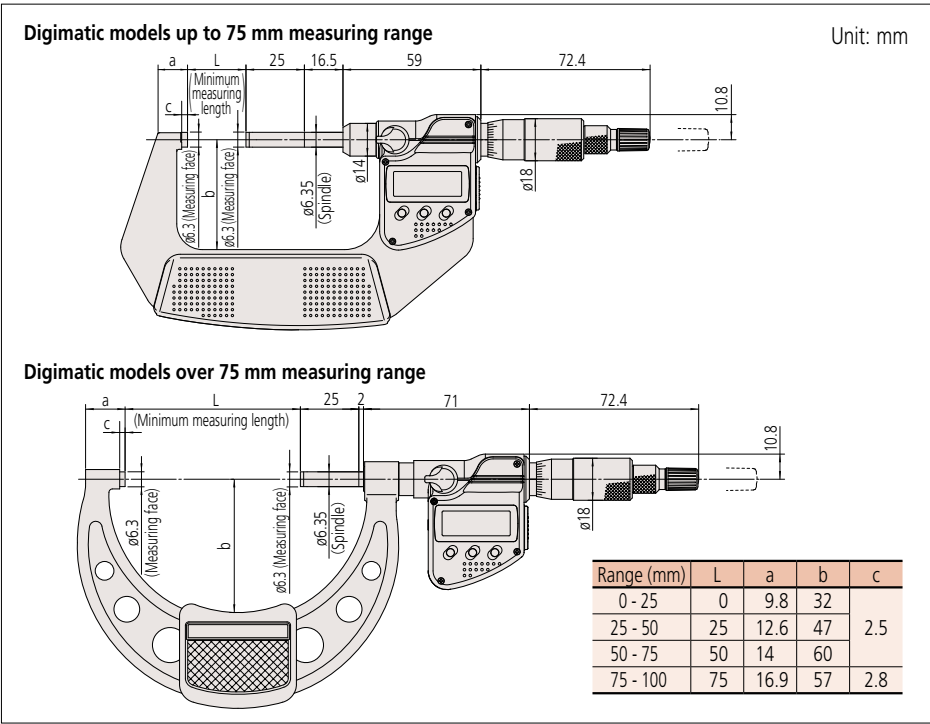
406-250-30

SPECIFICATIONS

Metric					
Code No.	Range (mm)	Resolution (mm)	Maximum permissible error J_{MPE} (μm)	Flatness (μm)	Parallelism (μm)
With SPC data output					
406-250-30	0 - 25	0.001	±3	0.3	3
406-251-30	25 - 50				
406-252-30	50 - 75		±4		4
406-253-30	75 - 100				
Inch / Metric					
Code No.	Range (in)	Resolution	Maximum permissible error J_{MPE} (in)	Flatness (in)	Parallelism (in)
With SPC data output					
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		±0.0002		0.00016
406-353-30	3 - 4				

- Power source: SR44 battery (1 pc.). **938882** included as standard (for operational checks)
 - Battery life: Approx. 2.4 years under normal use
 - Position detection method: Electromagnetic rotary sensor
 - Standard accessories: Setting standard, 1 pc. (except for measuring range 0 to 25 mm (0 to 1 in) models) Spanner (**301336**), 1 pc.
- Note: For functional details of **series 406**, refer to page 02-7. Please note that these models are not water-proof.

DIMENSIONS



Measurement example



Optional Accessories

Code 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

Outside Micrometers (Digimatic)

Applicable models:
340-251-30, 340-252-30, 340-351-30, 340-352-30

Measurement example



Optional Accessories

Code No.	Type	Description
264-020	—	USB Input Tool Series USB Keyboard Signal Conversion Type IT-020U
05CZA662	B	Connection cable for 340-251-30, 340-252-30, 340-351-30 and 340-352-30 (1 m)
05CZA663	B	Connection cable for 340-251-30, 340-252-30, 340-351-30 and 340-352-30 (2 m)
04AZB512	CR	Connection cable (1 m) for 340-5XX, 340-7XX
04AZB513	CR	Connection cable (2 m) for 340-5XX, 340-7XX
959149	C	Connection cable (1 m) for 340-5XX, 340-7XX
959150	C	Connection cable (2 m) for 340-5XX, 340-7XX
06AFM380B	B	USB Input Tool Direct (2 m)
06AFM380C	C	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
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*

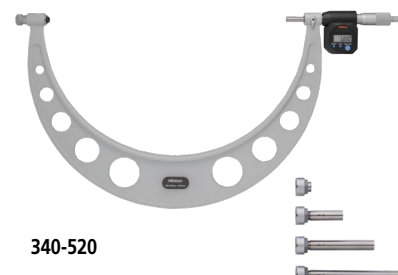
* Only 340-251-30, 340-252-30, 340-351-30 and
340-352-30 can be attached.

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.



340-251-30



340-520

SPECIFICATIONS

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

Inch / Metric									
Code No.	Range (in)	Resolution	Spindle feed error (in)	Flatness (in)	Parallelism (in)	Interchangeable anvils	Setting Qty	Standard Size (in)	Micrometer head stroke (in)
With SPC data output									
340-351-30*	0 - 6	0.0001 in/ 0.001 mm	0.00015	0.000024	0.00012	6 pcs.	5	1 - 5	1
340-352-30*	6 - 12				0.0002		6 - 11		
340-720	12 - 18				0.00028		12 - 17		
340-721	18 - 24			0.00004	0.00036		18 - 23		
340-722	24 - 30				0.0004		24 - 29		
340-723	30 - 36				0.00044		30 - 35		

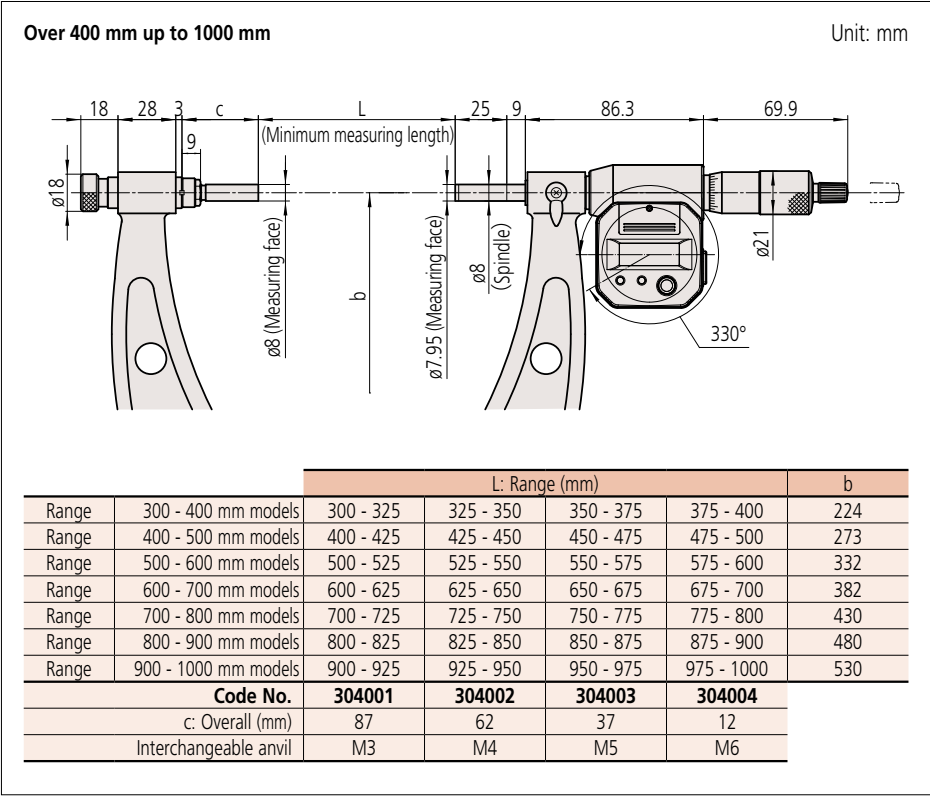
- * IP65 model.
- Power source for 340-251-30, 340-252-30, 340-351-30, 340-352-30: SR44 battery (1 pc.), 938882 included as standard (for operational checks)
 - Power source for 340-520 to 340-526, 340-720 to 340-723: SR44 battery (2 pcs.), 938882 included as standard (for operational checks)
 - Battery life: Approx. 2.4 years under normal use (for 340-2XX, 340-3XX)
Approx. 1.8 years under normal use (for 340-5XX, 340-7XX)
 - Position detection method: Electromagnetic rotary sensor (for series 340)
 - Standard accessories: Spanner (301336), 1 pc.
(for maximum measuring range up to 300 mm (12 in)), Spanner (200154), 1 pc.
(for maximum measuring range 400 mm (16 in) or over)
- Note 1: For functional details of 340-251-30, 340-252-30, 340-351-30, 340-352-30, refer to page 02-7.
Please note that origin setting of these models is by presetting.
- Note 2: For functional details of 340-520 to 340-723, refer to page 02-9.

Micrometer

02
Micrometers

Outside Micrometers
SERIES 340 — with Interchangeable Anvils

DIMENSIONS



Outside Micrometers (Digimatic)



Measurement example



Mechanism

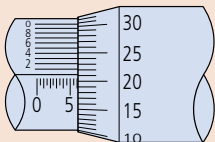
Ratchet stop type



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.

- Cut-away frame (behind anvil) for measuring in hard-to-reach places.
- Equipped with Ratchet Stop for constant measuring force.
- Measuring faces: Carbide tipped



Ratchet stop
102-301

SPECIFICATIONS

Metric									
Code No.	Range (mm)	Graduation (mm)	Measuring force (N)	Maximum permissible error J_{MPE} (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			±3		3			
102-304	75 - 100								

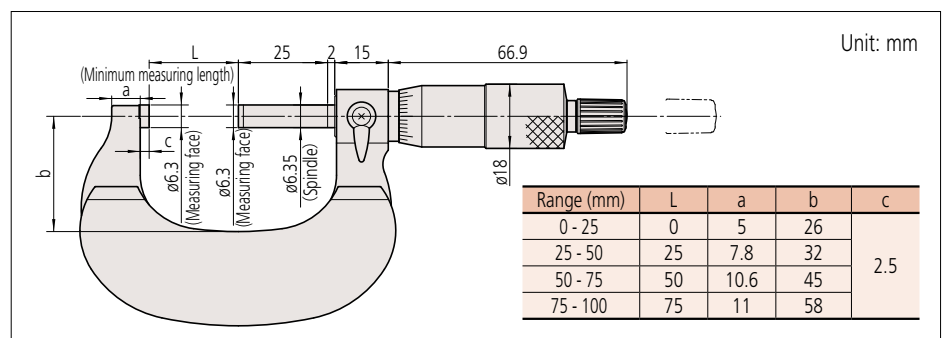
Metric	With vernier scale							
Code No.	Range (mm)	Graduation (mm)	Measuring force (N)	Maximum permissible error J_{MPE} (μm)	Flatness (μm)	Parallelism (μm)	Constant measuring force	
102-311	0 - 25	0.001	5 - 10	±1	0.3	1	Ratchet stop	
102-313				±2			Friction thimble	
102-312	25 - 50						Ratchet stop	

Inch								
Code No.	Range (in)	Graduation (in)	Measuring force (N)	Maximum permissible error J_{MPE} (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			±0.00015			0.00012	Ratchet stop
102-330-10								Friction thimble
102-331-10	2 - 3			±0.00015	0.00012	Ratchet stop		
102-332-10	3 - 4					Ratchet stop		

Metric Micrometer set		
Code No.	Range (mm)	Models included
102-911-40	0 - 100 (Four micrometers per set)	• 102-301 • 102-302 • 102-303 • 102-304 • 3 micrometer standards

- Standard accessories: Setting standard, 1 pc. (except for measuring range 0 to 25 mm models)
- Spanner (301336), 1 pc. (for measuring range 0 to 25 mm/25 to 50 mm models)
- Spanner (200877), 1 pc. (for measuring range 50 to 75 mm/75 to 100 mm models)

DIMENSIONS



Micrometer

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.
- Clearly audible ratchet operation for reassurance that measurement is being performed at constant, preset force.
- Heat-insulated frame.
- Measuring faces: Carbide tipped



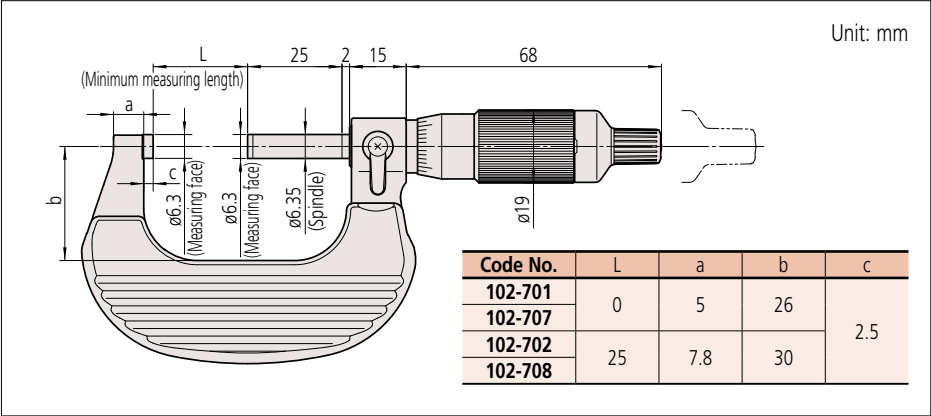
102-701

SPECIFICATIONS

Metric							
Code No.	Range (mm)	Graduation (mm)	Measuring force (N)	Maximum permissible error J_{MPE} (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					
102-708		0.001					
Inch							
Code No.	Range (in)	Graduation (in)	Measuring force (N)	Maximum permissible error J_{MPE} (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

• Standard accessories: Setting standard, 1 pc. (except for measuring range 0 to 25 mm (0 to 1 in) models), Spanner (301336), 1 pc.

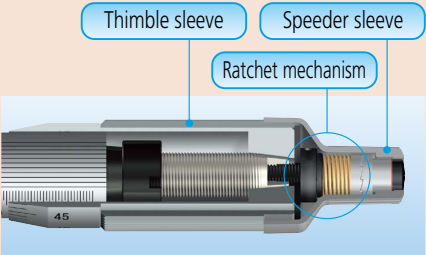
DIMENSIONS



Measurement example



Internal structure





103-913-40

- Range: 0 - 150 mm (6 pcs./set)
- Models included: **103-137, 103-138, 103-139, 103-140, 103-141, 103-142,**
5 micrometer standards



103-914-40

- Range: 0 - 300 mm (12 pcs./set)
- Models included: **103-137, 103-138, 103-139, 103-140, 103-141, 103-142, 103-143, 103-144, 103-145, 103-146, 103-147, 103-148**
11 micrometer standards



103-915

- Range: 150 - 300 mm (6 pcs./set)
- Models included: **103-143, 103-144, 103-145, 103-146, 103-147, 103-148,**
6 micrometer standards

103-927-10

- Range: 0 - 75 mm (3 pcs./set)
- Models included: **103-137, 103-138, 103-139-10**

103-913-50

- Range: 50 - 150 mm (6 pcs./set)
- Models included:
**103-137, 103-138, 103-139-10, 103-140-10,
 103-141-10, 103-142-10**

103-914-50

- Range: 50 - 300 mm (12 pcs./set)
- Models included:
**103-137, 103-138, 103-139-10, 103-140-10,
 103-141-10, 103-142-10, 103-143-10, 103-144-10,
 103-145-10, 103-146-10, 103-147-10, 103-148-10**

103-915-10

- Range: 150 - 300 mm (6 pcs./set)
- Models included:
**103-143-10, 103-144-10, 103-145-10, 103-146-10,
 103-147-10, 103-148-10**

Micrometer

Outside Micrometers SERIES 103

- This is a simple, classic analog micrometer that represents the roots of our company's foundation.
- Measuring faces: Carbide tipped
- Equipped with Ratchet Stop for constant measuring force.



Metric	With ratchet stop					
Code No.	Range (mm)	Measuring force (N)	Graduation (mm)	MPE*1 (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		0.01	±3		3
103-140-10	75 - 100					
103-141-10	100 - 125			±4		4
103-142-10	125 - 150					
103-143-10	150 - 175			±5		5
103-144-10	175 - 200					
103-145-10	200 - 225			±6		6
103-146-10	225 - 250					
103-147-10	250 - 275	10 - 15		0.01	±7	7
103-148-10	275 - 300					
103-149	300 - 325		±8		8	
103-150	325 - 350					
103-151	350 - 375		±9		9	
103-152	375 - 400					
103-153	400 - 425		±10		10	
103-154	425 - 450					
103-155	450 - 475		±11		11	
103-156	475 - 500					
103-157	500 - 525		±12		12	
103-158	525 - 550					
103-159	550 - 575		±13		13	
103-160	575 - 600					
103-161	600 - 625		±14		14	
103-162	625 - 650					
103-163	650 - 675	±15	15			
103-164	675 - 700					
103-165	700 - 725	±16	16			
103-166	725 - 750					
103-167	750 - 775	±17	17			
103-168	775 - 800					
103-169	800 - 825	±18	18			
103-170	825 - 850					
103-171	850 - 875	±19	19			
103-172	875 - 900					
103-173	900 - 925	±20	20			
103-174	925 - 950					
103-175	950 - 975	±21	21			
103-176	975 - 1000					

Metric	With ratchet stop					
Code No.	Range (mm)	Measuring force (N)	Graduation (mm)	MPE*1 *2 (μm)	Flatness (μm)	Parallelism (μm)
103-137	0 - 25	5 - 10	0.01	±2	0.6	2
103-138	25 - 50		0.001			
103-255	50 - 75			3		
103-256	75 - 100					
103-257	100 - 125					
103-258	125 - 150					

- * Standard accessories: Setting standard, 1 pc. (except for measuring range 0 to 25 mm (0 to 1 in) models), Spanner (**301336**), 1 pc. (for maximum measuring range up to 300 mm (12 in)), Spanner (**200154**), 1 pc. (for maximum measuring range 325 mm (13 in) or over)
- *1 MPE: Maximum permissible error MPE
- *2 Maximum permissible error of the indication measured by contacting the full measuring face with the object to be measured. MPE is a term specified by JIS B 7502: 2016 which has been prepared based on ISO 3611: 2010 with some modifications of the technical contents. The measurement method has not been changed from JIS B 7502: 1994. For details refer to page 13-10.

Micrometer

02

Micrometers

Inch	With ratchet stop							
Code No.	Range (in)	Measuring force (N)	Graduation (in)	MPE*1 (in)	Flatness (in)	Parallelism (in)		
103-177	0 - 1	5 - 10	0.001	±0.0001	0.000024	0.00008		
103-131			0.0001					
103-178			0.001					
103-132			0.0001					
103-179	2 - 3		10 - 15	0.001		±0.00015	0.00012	
103-180	3 - 4							
103-181	4 - 5							
103-182	5 - 6							
103-183	6 - 7					±0.0002	0.00016	
103-184	7 - 8							
103-185	8 - 9							
103-186	9 - 10							
103-187	10 - 11					±0.00025	0.0002	
103-188	11 - 12							
103-189	12 - 13							
103-190	13 - 14							
103-191	14 - 15					±0.0003	0.00024	
103-192	15 - 16							
103-193	16 - 17							
103-194	17 - 18							
103-195	18 - 19					±0.00035	0.00028	
103-196	19 - 20							
103-197	20 - 21							
103-198	21 - 22							
103-199	22 - 23	±0.0004			0.00032			
103-200	23 - 24							
103-201	24 - 25							
103-202	25 - 26							
103-203	26 - 27	±0.00045	0.00036					
103-204	27 - 28							
103-205	28 - 29							
103-206	29 - 30							
103-207	30 - 31	±0.0005	0.0004					
103-208	31 - 32							
103-209	32 - 33							
103-210	33 - 34							
103-211	34 - 35	±0.00055	0.00044					
103-212	35 - 36							
103-213	36 - 37							
103-214	37 - 38							
103-215	38 - 39	±0.0006	0.00048					
103-216	39 - 40							
103-217	0 - 1			5 - 10	0.0001	±0.0007	0.000024	0.00008
103-218	2 - 3					±0.0001		
103-219	3 - 4	±0.00015						
103-220	4 - 5	±0.0002						
103-221	5 - 6	±0.00025						
103-222	6 - 7	±0.0002	0.00016					
103-223	7 - 8							
103-224	8 - 9							
103-225	9 - 10							
103-226	10 - 11							
	11 - 12							

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

• Standard accessories: Setting standard, 1 pc. (except for measuring range 0 to 25 mm (0 to 1 in) models)- (301336), 1 pc. (for maximum measuring range up to 300 mm (12 in)), Spanner (200154), 1 pc. (for maximum measuring range 325 mm (13 in) or over)

*1 MPE: Maximum permissible error J_{MPE}

*2 Maximum permissible error of the indication measured by contacting the full measuring face with the object to be measured. J_{MPE} is a term specified by JIS B 7502: 2016 which has been prepared based on ISO 3611: 2010 with some modifications of the technical contents. The measurement method has not been changed from JIS B 7502: 1994. For details refer to page 13-10.



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

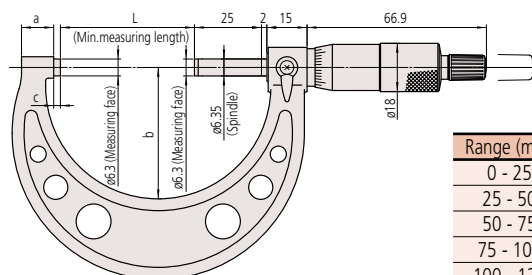
Outside Micrometers (Analog)

Outside Micrometers SERIES 103

DIMENSIONS

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

Unit: mm

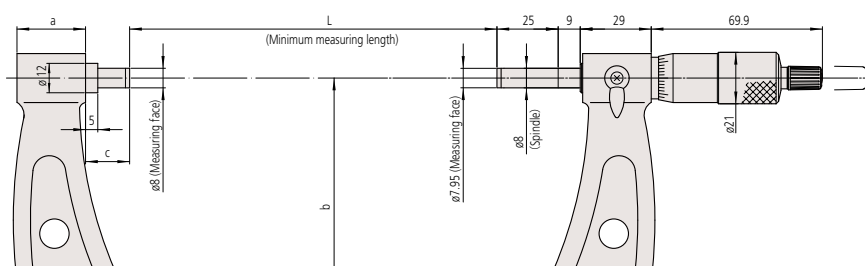


Range (mm)	L	a	b	c
0 - 25	0	9	28	2.5
25 - 50	25	10	38	
50 - 75	50	12	49	
75 - 100	75	14	60	
100 - 125	100	16.7	79	5.3
125 - 150	125	18.8	94	5.7
150 - 175	150	19.1	106	6.1
175 - 200	175	18.2	118	6.3
200 - 225	200	16.8	130	6.7
225 - 250	225	18	143	5.5
250 - 275	250		156	6.5
275 - 300	275		169	

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		355	40
625 - 650	625			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		430	40
775 - 800	775			15
800 - 825	800		455	40
825 - 850	825			15
850 - 875	850		480	40
875 - 900	875			15
900 - 925	900		505	40
925 - 950	925			15
950 - 975	950		530	40
975 - 1000	975			15

Micrometer

Digit Outside Micrometers
SERIES 193

- Mechanical digit counter with 0.01 mm or 0.001 in resolution for quick and error-free reading.
- Counter resolution 0.01 mm
- Measuring faces: Carbide tipped
- Equipped with Ratchet Stop for constant measuring force.



SPECIFICATIONS

Metric	With ratchet stop				
Code No.	Range (mm)	Maximum permissible error J_{MPE} (μm)	Flatness (μm)	Parallelism (μm)	Graduation (mm)
193-111	0 - 25	±2	0.6	2	0.001 (reading is obtained with vernier)
193-112	25 - 50				
193-113	50 - 75				
193-114	75 - 100	±3		3	0.01
193-101	0 - 25	±2		2	
193-102	25 - 50				
193-103	50 - 75				
193-104	75 - 100	±3		3	
Inch With friction thimble					
Code No.	Range (in)	Maximum permissible error J_{MPE} (in)	Flatness (in)	Parallelism (in)	Graduation (in)
193-211	0 - 1	±0.0001	0.000024	0.00008	0.0001
193-212	1 - 2				
Inch With ratchet stop					
Code No.	Range (in)	Maximum permissible error J_{MPE} (in)	Flatness (in)	Parallelism (in)	Graduation (in)
193-213	2 - 3	±0.0001	0.000024	0.00008	0.0001
193-214	3 - 4	±0.00015		0.00012	
Metric	Micrometer set				
Code 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)				3
• 193-101, 193-102, 193-103, 193-104 • 3 micrometer standards					
Inch	Micrometer set				
Code 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

• Standard accessories: Setting standard, 1 pc. (except for measuring range 0 to 25 mm (0 to 1 in) models), Spanner (301336), 1 pc.

Measurement example



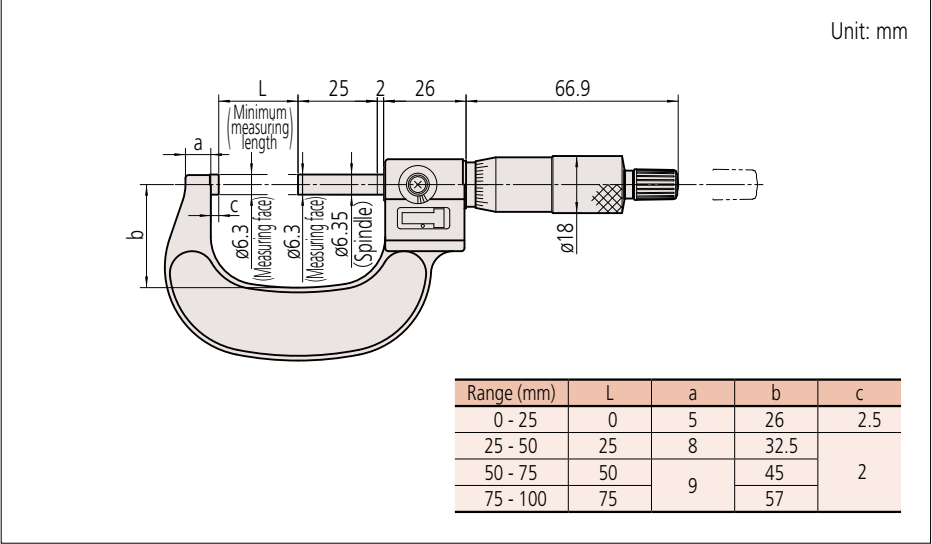
- 193-901**
- Range: 0 - 75 mm
 - Graduation: 0.01 mm
 - Models included: 193-101, 193-102, 193-103
2 micrometer standards



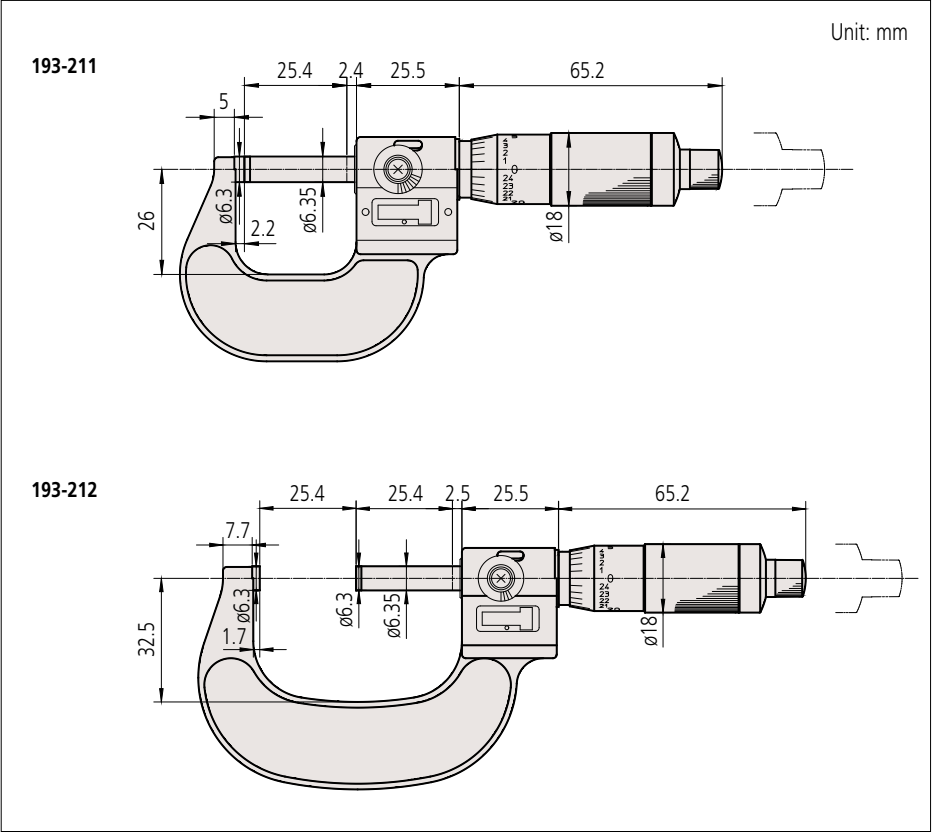
- 193-902**
- Range: 0 - 100 mm
 - Graduation: 0.01 mm
 - Models included: 193-101, 193-102, 193-103, 193-104
3 micrometer standards

Digit Outside Micrometers
SERIES 193

DIMENSIONS



DIMENSIONS



Micrometer

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.



SPECIFICATIONS

Metric									
Code No.	Range (mm)	Graduation (mm)	Spindle feed error (μm)	Flatnessr (μm)	Parallelism (μm)	Interchangeable anvils	Setting Standard Qty/	Size (mm)	Micrometer head stroke (mm)
Analog									
104-171*	0 - 50	0.01	3	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					6 pcs.	6	100 - 175	
104-136A	150 - 300			5	150 - 275				
104-141A	200 - 300			1.0	6	4 pcs.	4	200 - 275	
104-142A	300 - 400				7			300 - 375	
104-143A	400 - 500				8			400 - 475	
104-144A	500 - 600				9			500 - 575	
104-145A	600 - 700				10			600 - 675	
104-146A	700 - 800				11			700 - 775	
104-147A	800 - 900				12			800 - 875	
104-148A	900 - 1000							900 - 975	
Inch									
Code No.	Range (in)	Graduation (in)	Spindle feed error (in)	Flatness (in)	Parallelism (in)	Interchangeable anvils	Setting Standard Qty/	Size (in)	Micrometer head stroke (in)
Analog									
104-165	0 - 2	0.0001	0.00015	0.000024	0.00008	1 pc.	1	1	1
104-149	0 - 4				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					0.0002	6	4 - 7	
104-138	6 - 12							6 - 11	
104-151	8 - 12			0.00004	0.00024	4 pcs.	4	8 - 11	
104-152	12 - 16					6 pcs.	6	12 - 15	
104-201	12 - 18				0.00028	4 pcs.	4	12 - 17	
104-153	16 - 20					6 pcs.	6	16 - 19	
104-202	18 - 24				0.00032	4 pcs.	4	18 - 23	
104-154	20 - 24					6 pcs.	6	20 - 23	
104-155	24 - 28				0.00036	4 pcs.	4	24 - 27	
104-203	24 - 30					6 pcs.	6	24 - 29	
104-156	28 - 32				0.0004	4 pcs.	4	28 - 31	
104-204	30 - 36					6 pcs.	6	30 - 35	
104-157	32 - 36				0.00044	4 pcs.	4	32 - 35	
104-158	36 - 40					6 pcs.	6	36 - 39	
104-205	36 - 42				0.00048	6 pcs.	6	36 - 41	

* The frame is fitted with a heat shield.

Micrometer

Outside Micrometers
SERIES 105 — with Anvil Extension Collars

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



Extension collar



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



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

SPECIFICATIONS

Metric							
Code No.	Range (mm)	Graduation (mm)	Extension Collars	Setting Standard	Spindle feed error (μm)	Flatness (μm)	Parallelism (μm)
105-103	500 - 600	0.01	1 pc. (50 mm)	2 pcs.	6	1.3	8
105-104	600 - 700						9
105-105	700 - 800						10
105-106	800 - 900						11
105-107	900 - 1000						12

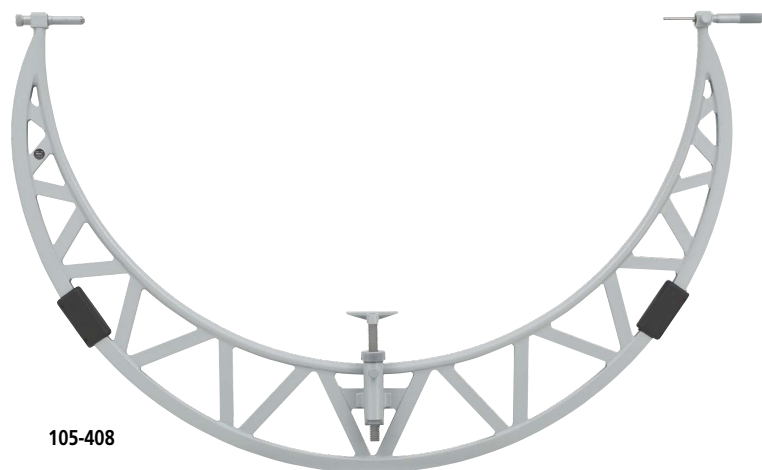
• Standard Accessories: Spanner (**200154**), 1 pc.

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.
- 50 mm/2 in spindle stroke.
- Includes workpiece stopper.
- Measuring faces: Carbide tipped
- Equipped with Ratchet Stop for constant measuring force.



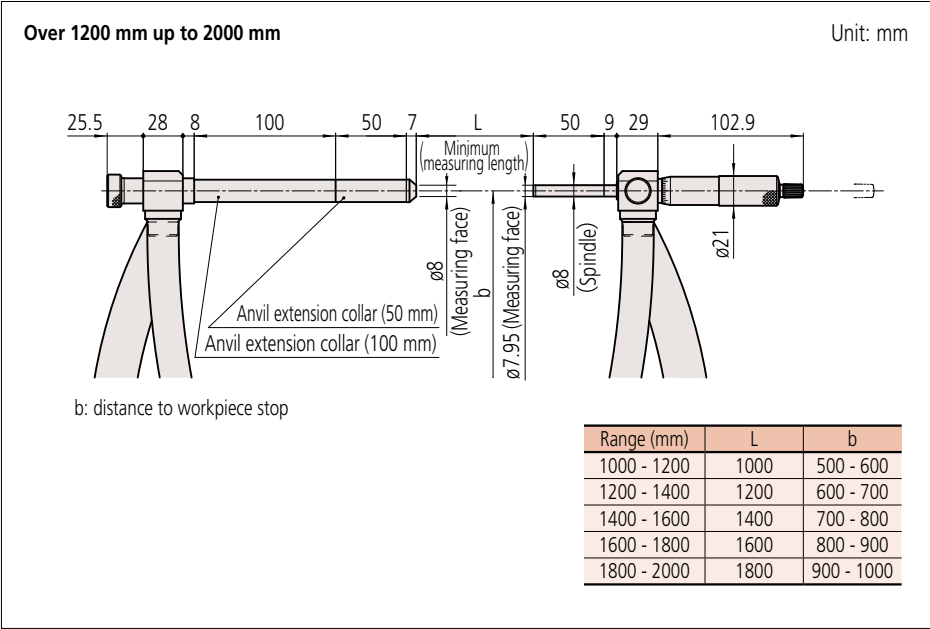
105-408

SPECIFICATIONS

Metric							
Code No.	Range (mm)	Graduation (mm)	Extension Collars	Setting Standard (pcs.)	Spindle feed error (μm)	Flatness (μm)	Parallelism (μm)
(every 100 mm)							
105-408	1000 - 1100	0.01	1 pc. (50 mm)	2	6	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)	6	1.3	14
105-419	1200 - 1400						16
105-420	1400 - 1600						18
105-421	1600 - 1800						20
105-422	1800 - 2000						22
Inch							
Code No.	Range (in)	Graduation (in)	Extension Collars	Setting Standard (pcs.)	Spindle feed error (in)	Flatness (in)	Parallelism (in)
105-428	40 - 44	0.001	1 pc. (2 in)	2	0.0003	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

• Standard Accessories: Spanner (200154), 1 pc.

DIMENSIONS



Indicator Type Micrometers SERIES 107

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 (0.0005 mm): **543-700B**

- Designed to mount a dial indicator for direct GO/±NG judgment for mass-produced parts.
- Anvil retracting trigger for quick measurement.

- Various kinds of indicators* are available depending on the measurement type (accuracy required, measuring range, etc.).
- Measuring faces: Carbide tipped
- Anvil stroke: 3 mm

* Only stems of $\phi 8$ diameter are supported, but even these may not be supported by some models. Please contact our Customer Support Center or your nearest Mitutoyo sales office for detailed specifications.



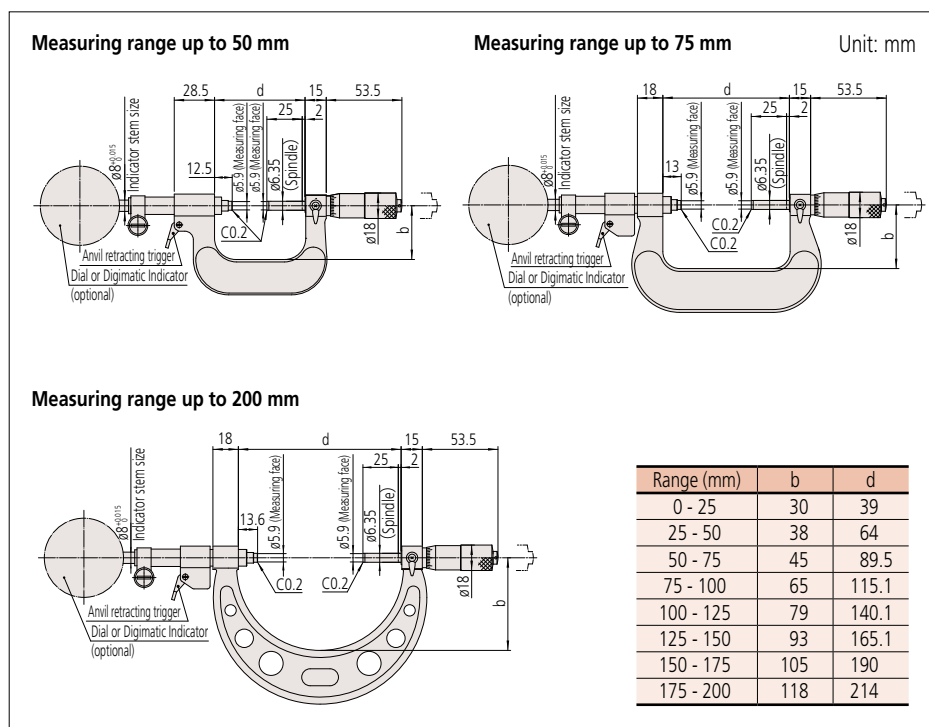
107-201
(Indicator shown is optional)

SPECIFICATIONS

Metric				
Code No.	Range (mm)	Spindle feed error (μm)	Flatness (μm)	Parallelism (μm)
107-201	0 - 25	3	0.6	2
107-202	25 - 50			
107-203	50 - 75			
107-204	75 - 100			
107-205	100 - 125			3
107-206	125 - 150			
107-207	150 - 175			
107-208	175 - 200			

- Setting standard, 1 pc. (except for measuring range 0 to 25 mm models), Spanner (**301336**), 1 pc.

DIMENSIONS



Micrometer

02
Micrometers

Caliper Type Micrometers
SERIES 343

- 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.



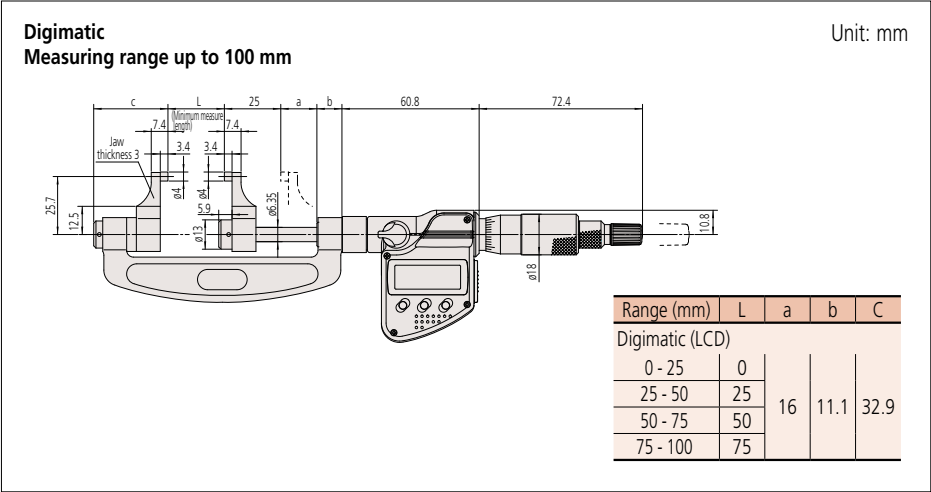
SPECIFICATIONS

Metric					
Code No.	Range (mm)	Resolution (mm)	Maximum permissible error J _{MPE} (μm)	Flatness (μm)	Parallelism (μm)
With SPC data output					
343-250-30	0 - 25	0.001	±5	0.3	3
343-251-30	25 - 50		±6		
343-252-30	50 - 75		±7		
343-253-30	75 - 100		±8		4

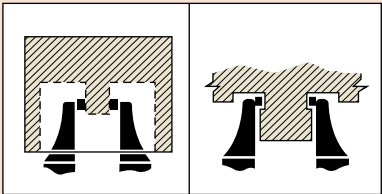
Inch / Metric					
Code No.	Range (in)	Graduation (in)	Maximum permissible error J _{MPE} (in)	Flatness (in)	Parallelism (in)
With SPC data output					
343-350-30	0 - 1	0.00005 in/ 0.001 mm	±0.00025	0.00012	0.00012
343-351-30	1 - 2		±0.0003		
343-352-30	2 - 3		±0.00035		
343-353-30	3 - 4		±0.0004		0.00016

- Power source: SR44 battery (1 pc.), **938882** included as standard (for operational checks)
 - Battery life: Approx. 2.4 years under normal use
 - Position detection method: Electromagnetic rotary sensor
 - Standard accessories: Setting standard, 1 pc. (except for measuring range 0 to 25 mm (0 to 1 in) models), Spanner (**301336**), 1 pc.
- Note: For functional details of **series 343**, refer to page 02-7.
Please note that these models are not water-proof.

DIMENSIONS



Measurement example



Optional Accessories (for series 343)

Code 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

Special Purpose Micrometers

Micrometer

Screw Thread Micrometers
SERIES 125

- 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.



125-103

Measurement example



SPECIFICATIONS

Metric				
Code No.	Thread to be measured (Metric/Unified)	Range (mm)	Spindle feed error (μm)	Graduation (mm)
125-101	0.4 - 0.5 mm/64 - 48 TPI	0 - 25	3	0.01
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	0.4 - 0.5 mm/64 - 48 TPI	25 - 50		
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	0.6 - 0.9 mm/44 - 28 TPI	50 - 75		
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	0.6 - 0.9 mm/44 - 28 TPI	75 - 100		
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			

• Standard Accessories: Spanner (301336), 1 pc.
Note: A matching setting standard is supplied with each model (except for 0 to 25 mm measuring range). (Refer to page 02-73 for details.) The setting standard is for metric threads (unified) 60°.

DIMENSIONS

125-101, 125-106

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

125-111, 125-116

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

Unit: mm

Measurement example



Optional Accessories (for series 326)

Code 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)

Code 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)

Code No.	Matching anvils/spindle tips included (mm)	Code 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		

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.

Interchangeable anvils/
spindle tips (optional)



326-251-30

SPECIFICATIONS

Metric			
Code No.	Range (mm)	Resolution (mm)	Spindle feed error (μm)
With SPC data output			
326-251-30	0 - 25	0.001	3
326-252-30	25 - 50		
326-253-30	50 - 75		
326-254-30	75 - 100		

Inch/Metric			
Code No.	Range (in)	Resolution	Spindle feed error (in)
With SPC data output			
326-351-30	0 - 1	0.00005 in/ 0.001 mm	0.00015
326-352-30	1 - 2		
326-353-30	2 - 3		
326-354-30	3 - 4		

- Power source: SR44 battery (1 pc.), 938882 included as standard (for operational checks)
- Battery life: Approx. 2.4 years under normal use
- Position detection method: Electromagnetic rotary sensor
- Standard Accessories: Spanner (301336), 1 pc.

Note 1: A matching setting standard is supplied with each model (except for 0 to 25 mm measuring range). (Refer to page 02-73 for details.) The setting standard is for metric threads (unified) 60°.

Note 2: For functional details, refer to page 02-7. Please note that origin setting of these models is by presetting. Optional connection cable is available only for water-proof type (Digimatic model).



126-125

SPECIFICATIONS

Metric			
Code No.	Range (mm)	Graduation (mm)	Spindle feed error (μm)
126-125	0 - 25	0.01	3
126-126	25 - 50		
126-127	50 - 75		
126-128	75 - 100		
126-129	100 - 125		
126-130	125 - 150		
126-131	150 - 175		
126-132	175 - 200		
126-133	200 - 225		
126-134	225 - 250		
126-135	250 - 275		
126-136	275 - 300		

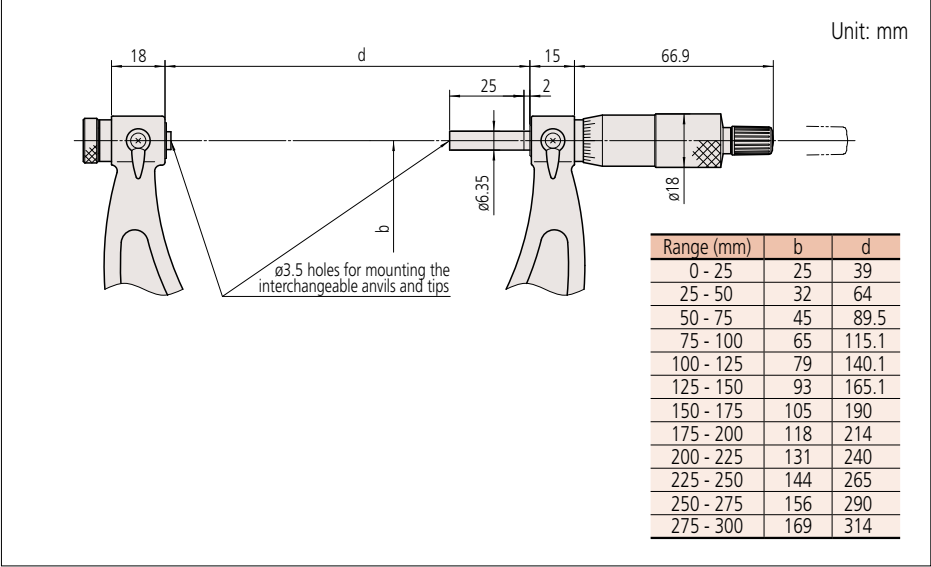
Inch			
Code No.	Range (in)	Graduation (in)	Spindle feed error (in)
126-137	0 - 1	0.001	0.00015
126-138	1 - 2		
126-139	2 - 3		
126-140	3 - 4		
126-141	4 - 5		
126-142	5 - 6		
126-143	6 - 7		
126-901	0 - 1		
126-902	1 - 2		
126-903	2 - 3		
126-904	3 - 4		
126-905	4 - 5		
126-906	5 - 6		

- Standard Accessories: Spanner (301336), 1 pc.

Note: A matching setting standard is supplied with each model (except for 0 to 25 mm measuring range). (Refer to page 02-73 for details.) The setting standard is for metric threads (unified) 60°.

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

DIMENSIONS



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 $\theta=55^\circ$

Micrometer

Disc Micrometers SERIES 223, 123

- Can be used for making root tangent measurements on spur gears and helical gears.
- Determination of the root tangent length: refer to "Quick Guide to Precision Measuring Instruments" on page 13-8.
- Equipped with Ratchet Stop for constant measuring force.



123-101

SPECIFICATIONS

Metric							
Code No.	Range (mm)	Graduation (mm)	Maximum permissible error J_{MPE} (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*							
123-102	25 - 50		±6		6		
123-114*							
123-103	50 - 75		±7	1.6	7	ø30	0.7 - 11
123-115*							
123-104	75 - 100		±8		8		
123-116*							
123-105	100 - 125		±9		9		
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						

Inch							
Code No.	Range (in)	Graduation (in)	Maximum permissible error J_{MPE} (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						
123-128	3 - 4						

* The measuring discs have carbide tips.

• Standard accessories: Setting standard, 1 pc. (except for measuring range 0 to 25 mm (0 to 1 in) models), Spanner (301336), 1 pc.

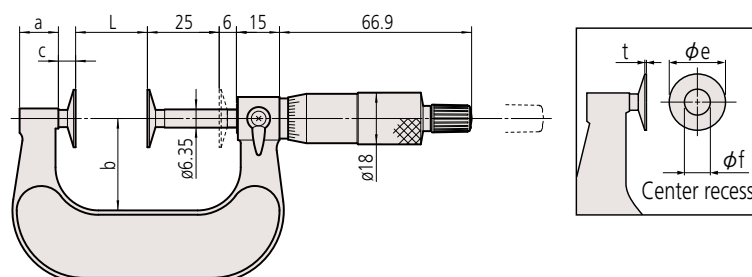
Note: Root tangent length measurement is not available for some types of gears.

Disc Micrometers SERIES 223, 123

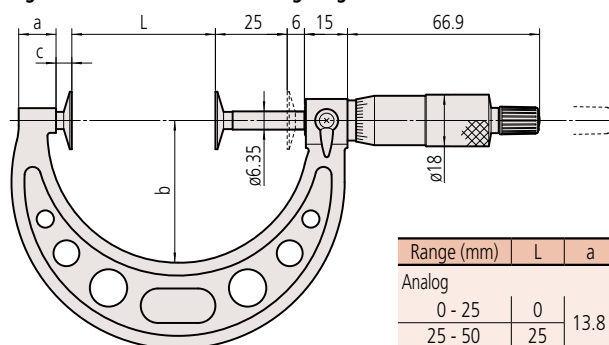
DIMENSIONS

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	5.5			
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.

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.
- Determination of the over-pin diameter: refer to "Quick Guide to Precision Measuring Instruments" on page 13-8.
- Interchangeable ball anvils/spindle tips for various gear modules (0.5 to 5.25) are optional.



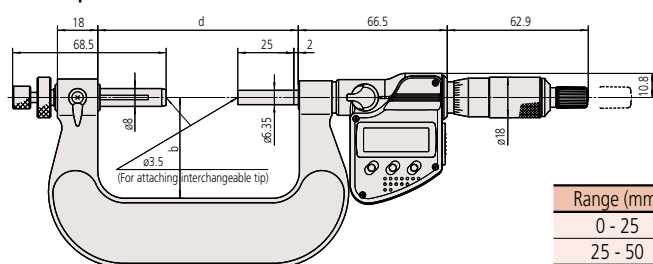
SPECIFICATIONS

Metric				Inch / Metric			
Code No.	Range (mm)	Resolution (mm)	Spindle feed error (μm)	Code No.	Range (in)	Resolution	Spindle feed error (in)
With SPC data output				With SPC data output			
324-251-30	0 - 25	0.001	3	324-351-30	0 - 1	0.00005 in/ 0.001 mm	0.00015
324-252-30	25 - 50			324-352-30	1 - 2		
324-253-30	50 - 75			324-353-30	2 - 3		
324-254-30	75 - 100			324-354-30	3 - 4		

- Power source: SR44 battery (1 pc.), **938882** included as standard (for operational checks)
 - Battery life: Approx. 2.4 years under normal use
 - Position detection method: Electromagnetic rotary sensor
 - Standard accessories: Setting standard, 1 pc. (except for measuring range 0 to 25 mm (0 to 1 in) models), Spanner (**301336**), 1 pc.
- Note: For functional details, refer to page 02-7.
- Please note that origin setting of these models is by presetting. Optional connection cable is available only for water-proof type (Digimatic model).

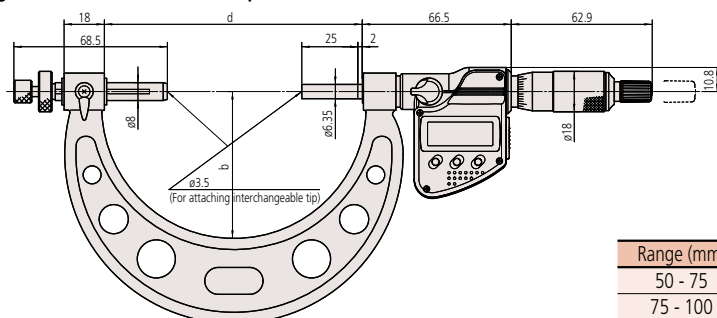
DIMENSIONS

Digimatic models up to 50 mm



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

Digimatic models over 50 mm up to 100 mm



Range (mm)	b	d
50 - 75	65	115.1
75 - 100	79	140.1

Measurement example



Optional Accessories

Code 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

Gear Tooth Micrometers

SERIES 124 — Interchangeable Ball Anvil/Spindle Tip Type

Optional Accessories

- Interchangeable ball anvil/spindle tip set

Code 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 ($\frac{3}{64}$ in)	0.7 - 0.8	35 - 30
124-821	1.5	0.9 - 1	28 - 26
124-804	1.588 ($\frac{1}{16}$ in)	0.9 - 1	28 - 26
124-805	2.0	1.25	22
124-806	2.381 ($\frac{3}{32}$ in)	1.5	17
124-822	2.5	1.5	17
124-807	3.0	1.75	15
124-808	3.175 ($\frac{1}{8}$ in)	—	14
124-823	3.5	2	13
124-809	3.969 ($\frac{5}{32}$ in)	2	13
124-810	4.0	2.25	11
124-824	4.5	2.5	10
124-811	4.763 ($\frac{3}{16}$ in)	2.5	10
124-812	5.0	2.75	9
124-813	5.556 ($\frac{7}{32}$ in)	3.0 - 3.25	8
124-814	6.0	3.5	7
124-815	6.35 ($\frac{1}{4}$ in)	3.75	7
124-816	7.0	4.0	6.5
124-817	7.144 ($\frac{9}{32}$ in)	4.25	6
124-818	7.938 ($\frac{5}{16}$ in)	4.5	5.5
124-819	8.0	4.75	5.5
124-820	8.731 ($\frac{11}{32}$ in)	5.0 - 5.25	5

* 2 mm less for /carbide-tipped type

- Intended for making over-pin diameter measurements on gears using precision ball anvils/spindle tips (optional).
- Determination of the over-pin diameter: refer to "Quick Guide to Precision Measuring Instruments" on page 13-8.
- Interchangeable ball anvils/spindle tips for various gear modules (0.5 to 5.25) are optional.
- Equipped with Ratchet Stop for constant measuring force.



SPECIFICATIONS

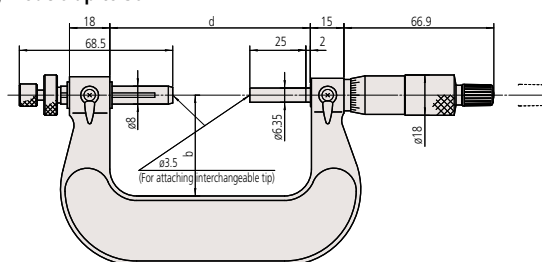
Metric			
Code No.	Range (mm)	Graduation (mm)	Spindle feed error (μm)
124-173	0 - 25	0.01	3
124-174	25 - 50		
124-175	50 - 75		
124-176	75 - 100		
124-177	100 - 125		
124-178	125 - 150		
124-179	150 - 175		
124-180	175 - 200		
124-181	200 - 225		
124-182	225 - 250		
124-183	250 - 275		
124-195	275 - 300		

- Standard accessories: Setting standard, 1 pc. (except for measuring range 0 to 25 mm models), Spanner (**301336**), 1 pc.

DIMENSIONS

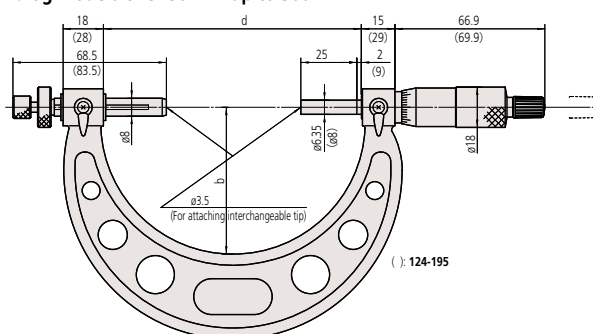
Analog models up to 50 mm

Unit: 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.
75 - 100	79	140.
100 - 125	93	165.
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

Micrometer

Disc Micrometers
SERIES 369 — Non-rotating Spindle Type

- Can be used for making root tangent measurements on spur gears and helical gears.
- Determination of the root tangent length: refer to “Quick Guide to Precision Measuring Instruments” on page 13-8.
- 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.



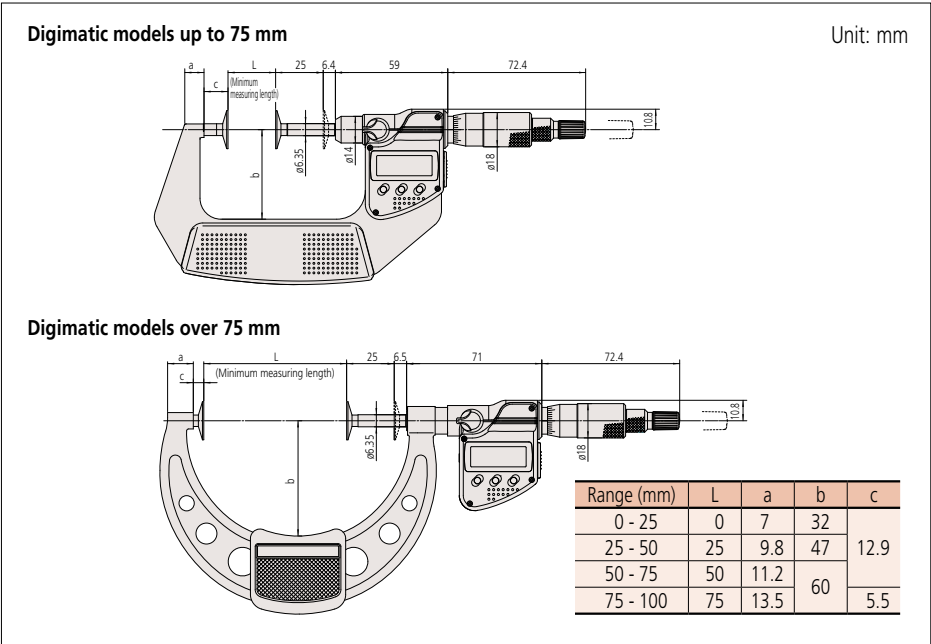
SPECIFICATIONS

Metric							
Code No.	Range (mm)	Resolution (mm)	Anvil dia. (mm)	Maximum permissible error J_{MPE} (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			±6		6	
369-252-30	50 - 75						
369-253-30	75 - 100						
Inch / Metric							
Code No.	Range (in)	Resolution	Anvil dia. (in)	Maximum permissible error J_{MPE} (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			±0.0003		0.0003	
369-352-30	2 - 3						
369-353-30	3 - 4						

- Power source: SR44 battery (1 pc.), **938882** included as standard (for operational checks)
- Battery life: Approx. 2.4 years under normal use
- Position detection method: Electromagnetic rotary sensor
- Standard accessories: Setting standard, 1 pc. (except for measuring range 0 to 25 mm (0 to 1 in) models)
Spanner (**301336**), 1 pc.

Note 1: For functional details, refer to page 02-7. Please note that these models are not water-proof.
Note 2: Root tangent length measurement is not available for some types of gears.

DIMENSIONS



Measurement example



Optional Accessories

Code 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.
- Determination of the root tangent length: refer to "Quick Guide to Precision Measuring Instruments" on page 13-8.
- 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
369-411-20

SPECIFICATIONS

Metric								
	Code No.	Range (mm)	Resolution (mm)	Anvil dia. (mm)	Maximum permissible error J_{MPE} (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		ø14.3			3	0.5 - 2.5
	227-223-20	0 - 10						2 - 10

Inch / Metric								
	Code No.	Range (in)	Resolution	Anvil dia. (in)	Maximum permissible error J_{MPE} (in)	Flatness (in)	Parallelism (in)	Measuring force (N)
Quickmike type	369-421-20	0 - 1.2	0.00005 in / 0.001 mm	ø0.787	±0.0002	0.00004	0.0002	3 - 8
	369-422-20	1 - 2.2						

- Power source: SR44 battery (1 pc.), **938882** included as standard (for operational checks)
 - Battery life: Approx. 5 years under normal use
 - Position detection method: Electrostatic capacity absolute sensor
 - Standard accessories: Setting standard, 1 pc. (except for measuring range 0 to 10 mm/0 to 15 mm/0 to 30 mm (0 to 1/0 to 1.2 in) models), Screwdriver (**210183**), 1 pc.
- Note: Root tangent length measurement is not available for some types of gears.

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					

Micrometer

Disc Micrometers
SERIES 169 — Non-rotating Spindle Type

- Can be used for making root tangent measurements on spur gears and helical gears.
- Determination of the root tangent length: refer to “Quick Guide to Precision Measuring Instruments” on page 13-8.
- 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.



169-201-10

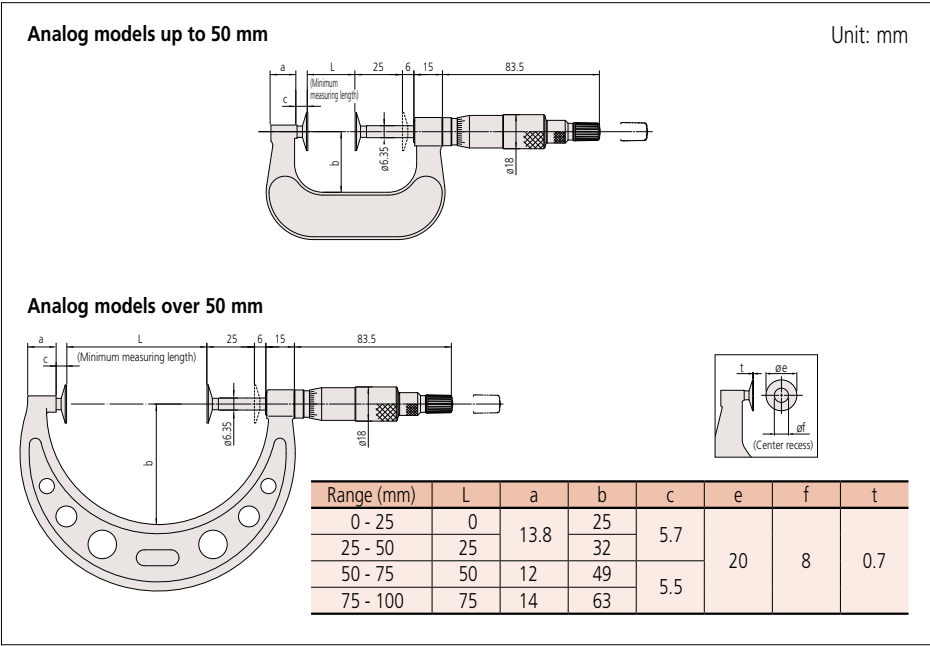
SPECIFICATIONS

Metric										
	Code No.	Range (mm)	Graduation (mm)	Anvil dia. (mm)	Maximum permissible error J_{MPE} (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								
	169-205-10	50 - 75			±6		6			
	169-207-10	75 - 100								

Inch										
	Code No.	Range (in)	Graduation (in)	Anvil dia. (in)	Maximum permissible error J_{MPE} (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								
	169-206-10	2 - 3			±0.0003		0.0003			
	169-208-10	3 - 4								

• Standard accessories: Setting standard, 1 pc. (except for measuring range 0 to 25 mm (0 to 1 in) models)
Spanner (301336), 1 pc.
Note: Root tangent length measurement is not available for some types of gears.

DIMENSIONS



Paper Thickness Micrometers SERIES 169 — Non-rotating Spindle Type

Measurement example



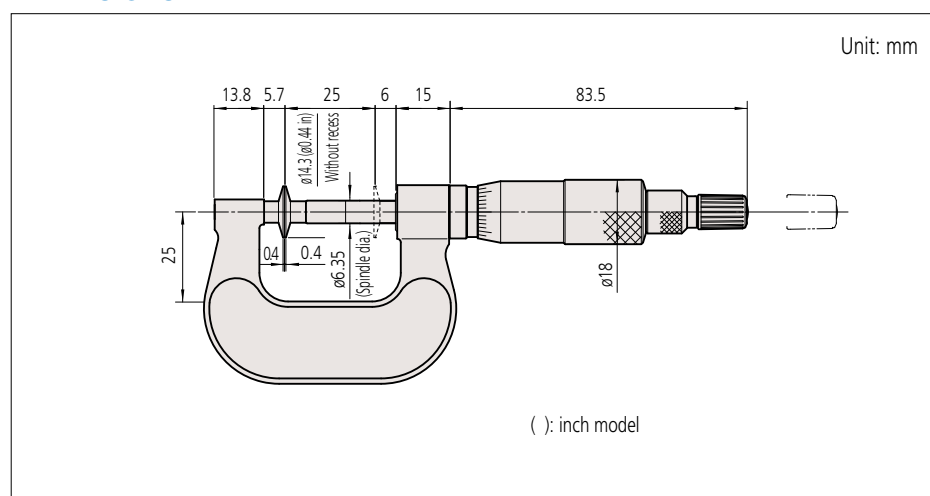
SPECIFICATIONS

Metric					
Code No.	Range (mm)	Graduation (mm)	Maximum permissible error J_{MPE} (μm)	Flatness (μm)	Parallelism (μm)
169-101-10	0 - 25	0.01	±4	1	3

Inch					
Code No.	Range (in)	Graduation (in)	Maximum permissible error J_{MPE} (in)	Flatness (in)	Parallelism (in)
169-103-10	0 - 1	0.001	±0.0002	0.00004	0.00015

- Standard Accessories: Spanner (**301336**), 1 pc.

DIMENSIONS



Micrometer

Sheet Metal Micrometers SERIES 389

- The U-shaped micrometer is ideal for measuring the thickness of sheet metal at a considerable distance from the edge.
- IP65 water/dust protection (except for **389-514** and **389-714**).
- Measuring faces: Carbide tipped
- Profile of measuring faces: Flat-Flat, Spherical-Flat and Spherical-Spherical.
- Equipped with Ratchet Stop for constant measuring force.



389-251-30



SPECIFICATIONS

Metric							
Code No.	Range (mm)	Resolution (mm)	Maximum permissible error J_{MPE} (μm)	Flatness (μm)	Parallelism (μm)	Throat depth (mm)	Measuring surfaces
Digimatic							
389-251-30	0 - 25	0.001	±4	0.6	3	150	F-F
389-261-30							S-F
389-271-30							S-S
389-514	25 - 50	0.001	±5	1	3	300*	F-F
389-252-30							S-F
389-262-30							S-S
389-272-30							
Inch / Metric							
Code No.	Range (in)	Resolution	Maximum permissible error J_{MPE} (in)	Flatness (in)	Parallelism (in)	Throat depth (in)	Measuring surfaces
Digimatic							
389-351-30	0 - 1	0.00005 in / 0.001 mm	±0.0002	0.000024	0.00012	6	F-F
389-361-30							S-F
389-371-30							S-S
389-714	1 - 2	0.00005 in / 0.001 mm	±0.00025	0.00004	0.00012	12*	F-F
389-352-30							S-F
389-362-30							S-S
389-372-30							

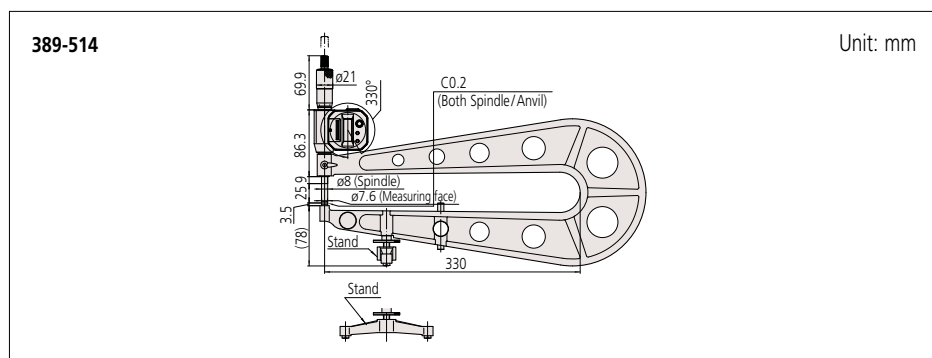
- Power source for **389-2XX, 3XX**: SR44 battery (1 pc.), **938882** included as standard (for operational checks)
- Power source for **389-514, 714**: SR44 battery (2 pcs.), **938882** included as standard (for operational checks)
- Battery life: Approx. 2.4 years under normal use (for **389-2XX, 3XX**), Approx. 1.8 years under normal use (for **389-514, 714**)
- Position detection method: Electromagnetic rotary sensor
- Standard accessories: Setting standard, 1 pc. (except for measuring range 0 to 25 mm (0 to 1 in) models)
- Spanner (**301336**), 1 pc. (for **389-2XX, 3XX**)
- Spanner (**200154**), 1 pc. (for **389-514, 714**)
- * Models with a 300 mm (12 in) throat are equipped with a stand for convenience of measurement in the horizontal orientation as standard.

Note 1: For functional details of **389-251-30/389-252-30/389-351-30/389-352-30** refer to page 02-7.

Note 2: For functional details of **389-514/389-714** refer to page 02-9.

Note 3: In spherical-flat anvil type micrometers, the measuring face on the anvil side is spherical.

DIMENSIONS



Optional Accessories

Code No.	Type	Description
264-020	—	USB Input Tool Series USB Keyboard Signal Conversion Type IT-020U
05CZA662	B	Connection cable (1 m): for series 389
05CZA663	B	Connection cable (2 m): for series 389
04AZB512	CR	Connection cable (1 m): for 389-514
04AZB513	CR	Connection cable (2 m): for 389-514
959149	C	Connection cable (1 m): for 389-514
959150	C	Connection cable (2 m): for 389-514
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): for series 389
02AZE140B	B	Connection cable for U-WAVE-T : for series 389 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*

* Cannot be used with **389-514**.

Standard, Flat-Flat (F-F)



Spherical-Flat (S-F)



Spherical-Spherical (S-S)



Micrometer

Sheet Metal Micrometer
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.



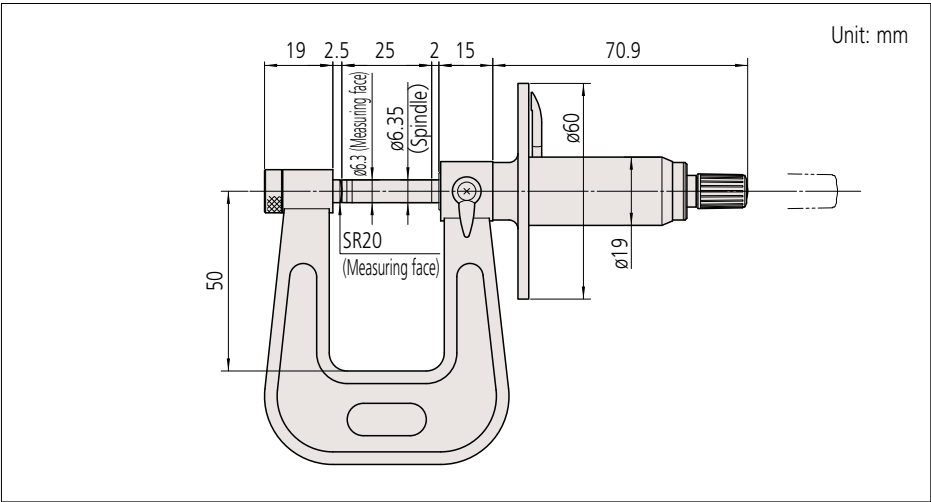
119-202

SPECIFICATIONS

Metric				
Code No.	Range (mm)	Graduation (mm)	Maximum permissible error J_{MPE} (μm)	Throat depth (mm)
119-202	0 - 25	0.01	± 4	50

• Standard Accessories: Spanner (200168), 1 pc.

DIMENSIONS



Measurement example



Micrometer

Tube Micrometers

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

- Designed to measure workpieces with concave-concave surfaces. The spherical anvil and spindle respectively come into contact with the workpiece at a point, thus increasing measurement accuracy.
- IP65 water/dust protection (**series 395**).
- Equipped with Ratchet Stop for constant measuring force.



395-271-30

SPECIFICATIONS

Metric					Inch/Metric				
Code No.	Range (mm)	Resolution (mm)	Maximum permissible error J_{MPE} (μ m)	ϕD (mm)	Code No.	Range (in)	Resolution	Maximum permissible error J_{MPE} (in)	ϕD (in)
Digimatic					Digimatic				
395-271-30	0 - 25	0.001	± 2	$\phi 15$	395-371-30	0 - 1	0.00005 in/ 0.001 mm	± 0.0001	$\phi 0.59$
395-272-30	25 - 50			$\phi 19$	395-372-30	1 - 2			$\phi 0.75$
395-273-30	50 - 75		± 3	$\phi 20$	395-373-30	2 - 3		± 0.00015	$\phi 0.79$
395-274-30	75 - 100				395-374-30	3 - 4			

- Power source: SR44 battery (1 pc.), **938882** included as standard (for operational checks)
 - Battery life: Approx. 2.4 years under normal use
 - Position detection method: Electromagnetic rotary sensor
 - Standard accessories: Setting standard, 1 pc. (except for measuring range 0 to 25 mm (0 to 1 in) models), Spanner (**301336**), 1 pc.
- Note: For functional details, refer to page 02-7.
Optional connection cable is available only for water-proof type (Digimatic model).



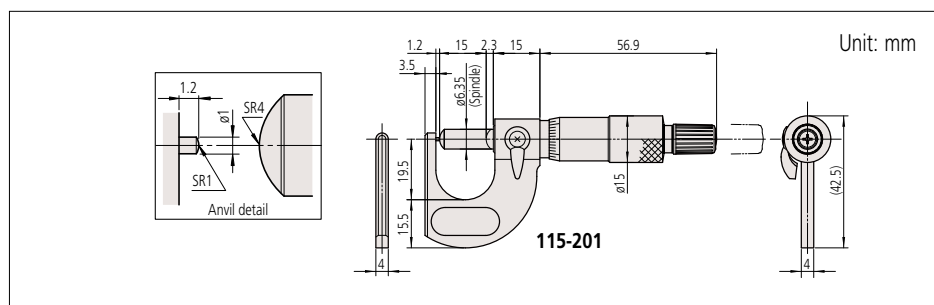
115-215

SPECIFICATIONS

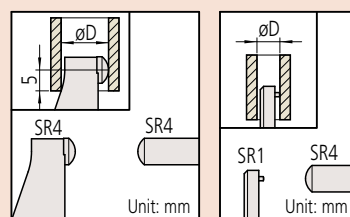
Metric					Inch				
Code No.	Range (mm)	Graduation (mm)	Maximum permissible error J_{MPE} (μ m)	ϕD (mm)	Code No.	Range (in)	Graduation (in)	Maximum permissible error J_{MPE} (in)	ϕD (in)
Analog					Analog				
115-201	0 - 15	0.01	± 3	$\phi 5.5$	115-253	0 - 1	0.0001	± 0.00015	$\phi 0.40$
115-215	0 - 25			$\phi 10$	115-242	1 - 2	0.001		$\phi 0.44$
115-216	25 - 50			$\phi 11$	115-243	2 - 3			$\phi 0.67$
115-217	50 - 75			$\phi 17$	Mechanical counter model				
115-218	75 - 100		± 4	$\phi 18$	295-253	0 - 1	0.0001	± 0.00015	$\phi 0.40$
Mechanical counter model									
295-215	0 - 25	0.01	± 3	$\phi 10$					

- Standard accessories: Setting standard, 1 pc. (except for measuring range 0 to 15 mm/0 to 25 mm (0 to 1 in) models)
- Spanner (**200168**), 1 pc. (for **115-201**), Spanner (**301336**), 1 pc. (for models other than **115-201**)

DIMENSIONS



Measurement example



Other than **115-201**

115-201

Optional Accessories

Code 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

Measurement example



Type A (pin)

Type B (spherical)



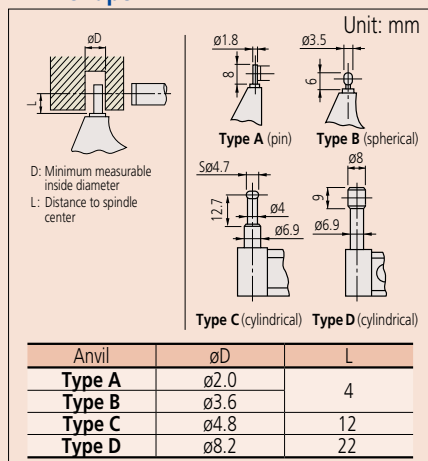
Type C (cylindrical)

Type D (cylindrical)

Optional Accessories

Code 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



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.



395-261-30

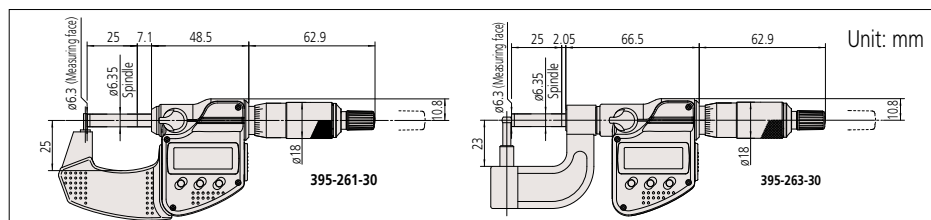
SPECIFICATIONS

Metric				
Code No.	Range (mm)	Resolution (mm)	Maximum permissible error J_{MPE} (μm)	Remarks
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

Inch / Metric				
Code No.	Range (in)	Resolution	Maximum permissible error J_{MPE} (in)	Remarks
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

- Power source: SR44 battery (1 pc.), 938882 included as standard (for operational checks)
 - Battery life: Approx. 2.4 years under normal use
 - Position detection method: Electromagnetic rotary sensor
 - Standard accessories: Spanner (301336), 1 pc.
- Note: For functional details, refer to page 02-7.
Optional connection cable is available only for water-proof type (Digimatic model).

DIMENSIONS



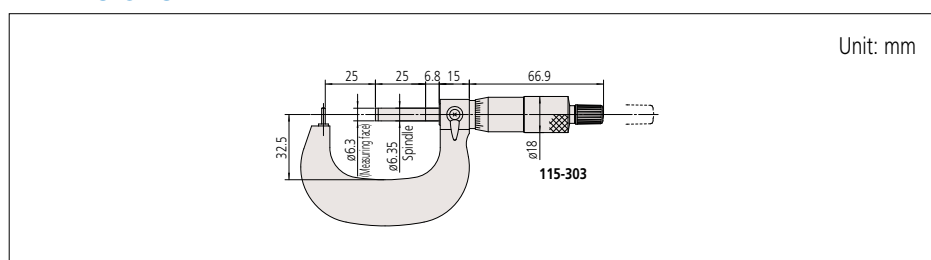
SPECIFICATIONS

Metric						
Code No.	Range (mm)	Graduation (mm)	Maximum permissible error J_{MPE} (μm)	Remarks		
Analog						
115-302	0 - 25	0.01	±3	Type A		
115-308				Type B		
115-303	25 - 50			Type A		
115-309				Type B		
115-315	0 - 25			Type C		
115-316				Type D		

Inch				
Code No.	Range (in)	Graduation (in)	Maximum permissible error J_{MPE} (in)	Remarks
Analog				
115-305	0 - 1	0.001	±0.00015	Type A
115-313		0.0001		Type C
115-314				Type D

- Standard accessories: Setting standard, 1 pc. (except for measuring range 0 to 25 mm (0 to 1 in) models)
- Spanner (301336), 1 pc.

DIMENSIONS



Micrometer

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

Metric							
Code No.	Range (mm)	Resolution (mm)	Maximum permissible error J_{MPE} (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	Type B	
331-261-30	0 - 25		±2		2		
331-262-30	25 - 50						
331-263-30	50 - 75		±3				
331-264-30*	75 - 100				3		

Inch / Metric							
Code No.	Range (in)	Resolution	Maximum permissible error J_{MPE} (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		±0.00015		0.00012	Type B	
331-354-30	3 - 4						
331-361-30	0 - 1		±0.0001		0.00008		
331-362-30	1 - 2						
331-363-30	2 - 3		±0.00015				
331-364-30	3 - 4				0.00012		

- Power source: SR44 battery (1 pc.), **938882** included as standard (for operational checks)
 - Battery life: Approx. 2.4 years under normal use
 - Position detection method: Electromagnetic rotary sensor
 - Standard accessories: Setting standard, 1 pc. (except for measuring range 0 to 25 mm (0 to 1 in) models), Spanner (**301336**), 1 pc.
 - * Made to order.
- Note: For functional details, refer to page 02-7.
Optional connection cable is available only for water-proof type (Digimatic model).

DIMENSIONS

Digimatic models
Models up to 75 mm measuring range

Digimatic models
Models over 75 mm measuring range

Code No.	L	a	b	c
331-251-30	0	7.3	32.5	17.5
331-261-30	25	10.1	47	
331-252-30	50	11.5	60	
331-253-30	75	16.7	76	20.3
331-262-30				
331-263-30				
331-254-30				
331-264-30				

MeasurLink[®] ENABLED
Data Management Software by Mitutoyo

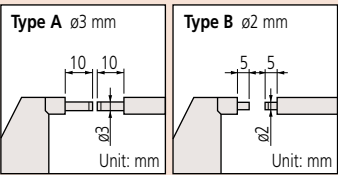
U-WAVE^{fit}

IP65

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Dust- and
Water-
Protected

Measurement example



Optional Accessories

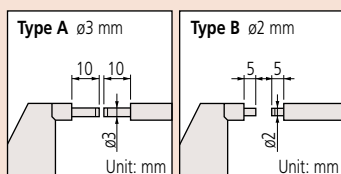
Code No.	Type	Description
264-020	—	USB Input Tool Series USB Keyboard Signal Conversion Type IT-020U
05CZA662	B	Connection cable (1 m)
05CZA663	B	Connection cable (2 m)
06AFM380B	B	USB Input Tool Direct (2 m)
02AZD730G	IP67	U-WAVE-T
02AZD880G	Buzzer	U-WAVE-T
02AZE200	—	U-WAVE-T mounting bracket
02AZD790B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

Spline Micrometers SERIES 111, 131

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



111-115



SPECIFICATIONS

Metric								
Code No.	Range (mm)	Graduation (mm)	Maximum permissible error J_{MPE} (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							
111-117	50 - 75							
111-118	75 - 100		±4		3			
111-119	100 - 125							
111-120	125 - 150		±5		4			
111-121	150 - 175							
111-122	175 - 200		±6		5			
111-123	200 - 225							
111-124	225 - 250							
111-125	250 - 275							
111-126	270 - 300							
Mechanical counter model								
131-115	0 - 25	0.01	±3	0.3	2	Type A		
Inch								
Code No.	Range (in)	Graduation (in)	Maximum permissible error J_{MPE} (in)	Flatness (in)	Parallelism (in)	Measuring face		
Analog								
111-166	0 - 1	0.0001	±0.00015	0.000012	0.00008	Type A		
131-166			±0.000015					
• Standard accessories: Setting standard, 1 pc. (except for measuring range 0 to 25 mm (0 to 1 in) models), Spanner (301336), 1 pc.								

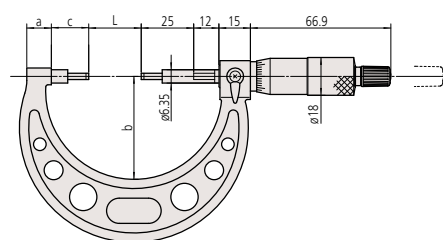
• Standard accessories: Setting standard, 1 pc. (except for measuring range 0 to 25 mm (0 to 1 in) models), Spanner (301336), 1 pc.

DIMENSIONS

Analog models

Unit: mm

Models up to 300 mm measuring range



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

Micrometer

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.



342-251-30

SPECIFICATIONS

Metric				
Code No.	Range (mm)	Resolution (mm)	Maximum permissible error J_{MPE} (μm)	Point
Digimatic (With carbide tip)				
342-251-30	0 - 25	0.001	±2	15°
342-252-30	25 - 50			
342-253-30	50 - 75		±3	
342-254-30	75 - 100			
342-261-30	0 - 25	0.001	±2	30°
342-262-30	25 - 50			
342-263-30	50 - 75		±3	
342-264-30	75 - 100			

Inch / Metric				
Code No.	Range (in)	Resolution	Maximum permissible error J_{MPE} (in)	Point
Digimatic (With carbide tip)				
342-351-30	0 - 1	0.00005 in/ 0.001 mm	±0.0001	15°
342-352-30	1 - 2			
342-353-30	2 - 3		±0.00015	
342-354-30	3 - 4			
342-361-30	0 - 1	0.00005 in/ 0.001 mm	±0.0001	30°
342-362-30	1 - 2			
342-363-30	2 - 3		±0.00015	
342-364-30	3 - 4			

- Power source: SR44 battery (1 pc.), 938882 included as standard (for operational checks)
 - Battery life: Approx. 2.4 years under normal use
 - Position detection method: Electromagnetic rotary sensor
 - Standard accessories: Setting standard, 1 pc. (except for measuring range 0 to 25 mm (0 to 1 in) models), Spanner (301336), 1 pc.
- Note: For functional details, refer to page 02-7.
- Optional connection cable is available only for water-proof type (Digimatic model).

DIMENSIONS

Digimatic models up to 75 mm measuring range

Unit: mm

Digimatic models over 75 mm measuring range

Code No.	L	a	b	c	Frame thickness*
342-251-30	0	7.3	32.5		(11.2)
342-261-30					
342-252-30	25	10.1	47	12.5	(12.8)
342-262-30					
342-253-30	50	11.5	60		
342-263-30					
342-254-30	75	16.7	76	15.3	(20.8)
342-264-30					

* Digimatic type: thickness over heat shield

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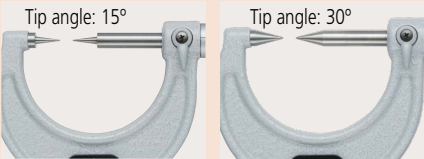
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IP65

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Dust- and
Water-
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Measurement example



Optional Accessories

Code 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

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.



112-201

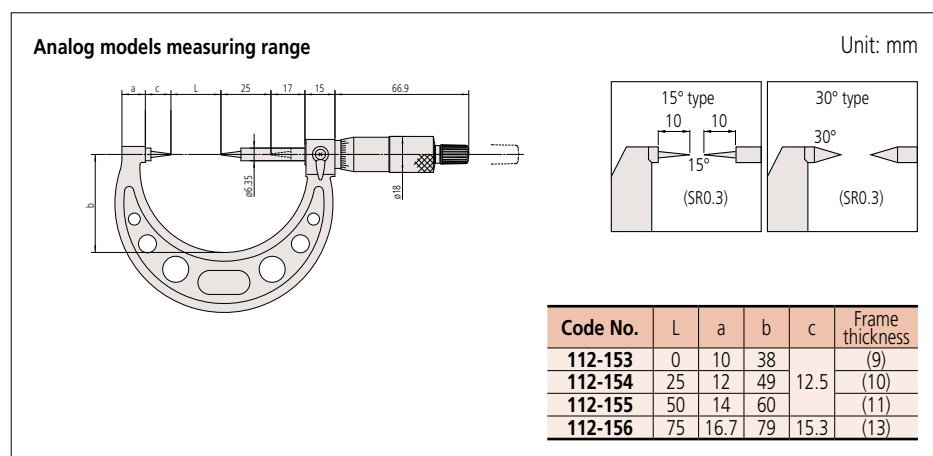
SPECIFICATIONS

Metric				
Code No.	Range (mm)	Graduation (mm)	Maximum permissible error J_{MPE} (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	
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	
112-216	75 - 100			
Mechanical counter model				
142-153	0 - 25	0.01	±3	15°
142-201				30°

Inch					
Code No.	Range (in)	Graduation (in)	Maximum permissible error J_{MPE} (in)	Point	
Analog					
112-177	0 - 1	0.001	±0.00015	15°	
112-178	1 - 2			30°	
112-225	0 - 1			±0.00015	15°
112-226	1 - 2				30°
Analog (With carbide tip)					
112-189	0 - 1	0.001	±0.00015	15°	
112-190	1 - 2			30°	
112-191	2 - 3			±0.00015	15°
112-237	0 - 1				30°
112-238	1 - 2			±0.00015	15°
Mechanical counter model					
142-177	0 - 1		±0.00015	15°	
142-225				30°	

• Standard accessories: Setting standard, 1 pc. (except for measuring range 0 to 25 mm (0 to 1 in) models), Spanner (301336), 1 pc.

DIMENSIONS



Micrometer

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.
- Measures pitch diameter: refer to "Quick Guide to Precision Measuring Instruments" on page 13-8.
- Measuring faces: Carbide tipped
- Equipped with Ratchet Stop for constant measuring force.



314-251-30

SPECIFICATIONS

Metric For 3-flute cutting tools					
Code No.	Range (mm)	Resolution (mm)	Maximum permissible error J_{MPE} (μ m)	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		± 4		—

- Flatness: 0.3 μ m/0.000012 in (Spindle), 1.0 μ m/0.00004 in (Anvil)
- Power source: SR44 battery (1 pc.), **938882** included as standard (for operational checks)
- Battery life: Approx. 2.4 years under normal use
- Position detection method: Electromagnetic rotary sensor
- Standard accessories: Spanner (**301336**), 1 pc. (for maximum measuring range up to 40 mm (1.6 in)), Setting Standards for V-Anvil Micrometer

Note: For functional details, refer to page 02-7.

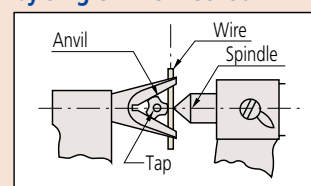
The models above use the same connection cables and connection units as our IP rated micrometers but these digital V-Anvil Micrometers are not IP rated.

Inch / Metric For 3-flute cutting tools					
Code No.	Range (in)	Resolution	Maximum permissible error J_{MPE} (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		± 0.00025		—
314-353-30	1 - 1.6		± 0.0002		—
314-361-30	0.05 - 0.6		± 0.0002		—
314-362-30	0.4 - 1		± 0.0002		—

Measurement example



Pitch diameter measurement of tap by single-wire method



Optional Accessories

Code 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

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.
- Measures pitch diameter: refer to "Quick Guide to Precision Measuring Instruments" on page 13-8.
- Measuring faces: Carbide tipped
- Equipped with Ratchet Stop for constant measuring force.



114-121

SPECIFICATIONS

Metric For 3-flute cutting tools					
Code No.	Range (mm)	Graduation (mm)	Maximum permissible error J_{MPE} (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		±4		—
114-103	25 - 40		±5		—
114-104	40 - 55		±6		—
114-105	55 - 70		±6		—
114-106	70 - 85		±7		—
114-107	85 - 100		±7		—
114-108	100 - 115		±8		—
114-109	115 - 130		±9		—
114-110	130 - 145		±9		—
114-161	1 - 15	0.01	±4	60°	—
114-162	10 - 25		±4		—

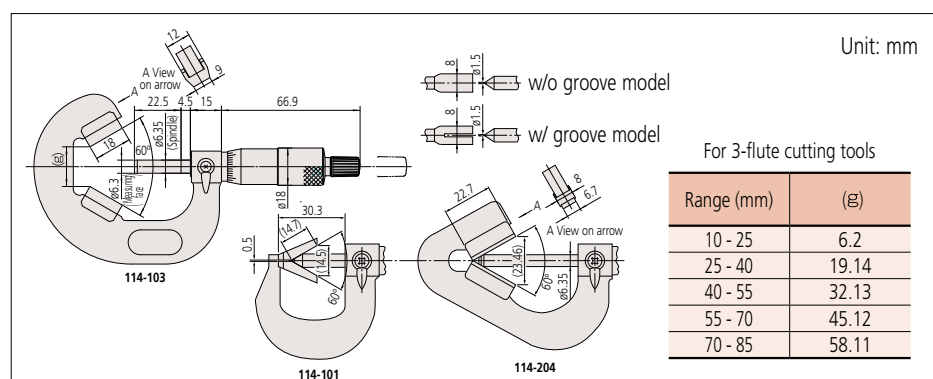
Metric For 5-flute cutting tools					
Code No.	Range (mm)	Graduation (mm)	Maximum permissible error J_{MPE} (μm)	Anvil	Remarks
Analog Anvil, Spindle (With carbide tip)					
114-137	2.3 - 25	0.01	±4	108°	—
Analog Spindle (With carbide tip)					
114-121	5 - 25	0.01	±4	108°	w/groove
114-122	25 - 45		±5		—
114-123	45 - 65		±6		—
114-124	65 - 85		±7		—
114-165	5 - 25		±4		—

- Flatness: 0.6 μm/0.000024 in (Spindle), 1.3 μm/0.000052 in (Anvil)
- Standard accessories: Spanner (301336), 1 pc. (for 114-204, 202, 101, 102, 103, 104, 161, 162, 163, 113, 114, 137, 135, 121, 122, 165)
Spanner (200877), 1 pc. (for 114-105, 106, 107, 108, 109, 110, 123, 124)
Setting Standards for V-Anvil Micrometer

Inch For 3-flute cutting tools					
Code No.	Range (in)	Graduation (in)	Maximum permissible error J_{MPE} (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		—

Inch For 5-flute cutting tools					
Code No.	Range (in)	Graduation (in)	Maximum permissible error J_{MPE} (in)	Anvil	Remarks
Analog Anvil, Spindle (With carbide tip)					
114-135	0.09 - 1	0.0001	±0.0002	108°	—

DIMENSIONS



Micrometer

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.



SPECIFICATIONS

Metric					
Code No.	Range (mm)	Resolution (mm)	Maximum permissible error J_{MPE} (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		±4	4	
422-233-30	75 - 100				
422-260-30	0 - 25		±3	3	Type B
422-261-30	25 - 50				Type C
422-270-30	0 - 25				Type D
422-271-30					

Inch / Metric					
Code No.	Range (in)	Resolution	Maximum permissible error J_{MPE} (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		±0.0002	0.0002	
422-333-30	3 - 4				
422-360-30	0 - 1		±0.00015	0.00015	Type B
422-361-30	1 - 2				Type C
422-370-30	0 - 1				Type D
422-371-30					

Metric Quickmike type					
Code No.	Range (mm)	Resolution (mm)	Maximum permissible error J_{MPE} (μm)	Parallelism (μm)	Remark
Digimatic					
422-411-20	0 - 30	0.001	±3	3	Type A
422-412-20	25 - 55				

Inch / Metric Quickmike type					
Code No.	Range (in)	Resolution	Maximum permissible error J_{MPE} (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				

- Power source: SR44 battery (1 pc.), **938882** included as standard (for operational checks)
- Battery life: Approx. 2.4 years under normal use (for **422-2XX, 3XX**)
Approx. 5 years under normal use (for **422-4XX**)
- Position detection method: Electromagnetic rotary sensor (for **422-2XX, 3XX**)
Electrostatic capacity absolute sensor (for **422-4XX**)
- Standard accessories: Setting standard, 1 pc. (except for measuring range 0 to 25 mm/0 to 30 mm (0 to 1 in/0 to 1.2 in) models), Spanner (**301336**), 1 pc. (for **422-2XX, 3XX**)

Note 1: For functional details, refer to page 02-7. Please note that these models are not water-proof.

Note 2: A heat shield is provided with Digimatic models as standard.

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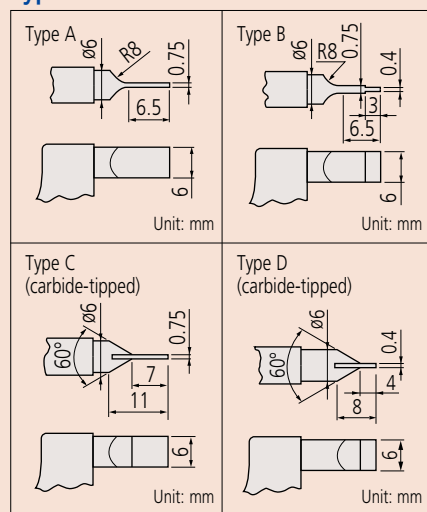
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Applicable models:
series 422 Quickmike type

Measurement example



Type and dimensions

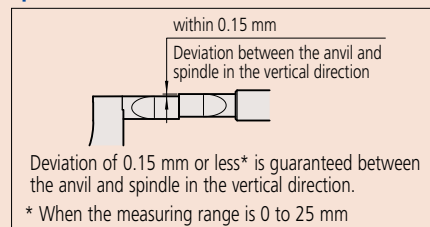


Optional Accessories

Code 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*

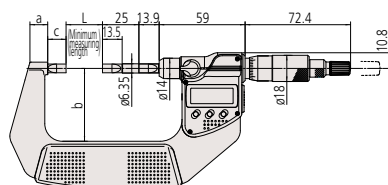
* Only series 422 (except for Quickmike type) can be attached.

Deviation between the anvil and spindle in the vertical direction

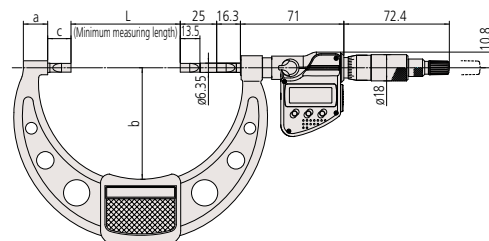


DIMENSIONS

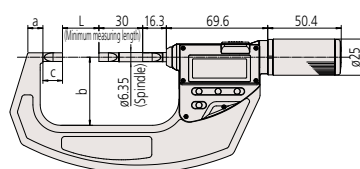
Digimatic models up to 50 mm measuring range



Digimatic models over 50 mm to 100 mm measuring range



Quickmike type



Code No.	L	a	b	C
422-230-30	0	11	31	12.5
422-231-30	25	12.2	50	12.6
422-232-30	50	14.6	57	13
422-233-30	75	16.7	76	16
422-260-30	0	11	31	12.5
422-261-30	25	12.2	50	12.6
422-270-30	0	11	31	12.5
422-271-30		8.5	36	13.5
422-411-20	25	10.3	47	
422-412-20				

Micrometer

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.
- Non-rotating spindle type.
- Carbide-tipped measuring faces are available.
- Equipped with Ratchet Stop for constant measuring force.



SPECIFICATIONS

Metric						
Code No.	Range (mm)	Graduation (mm)	Maximum permissible error J_{MPE} (μm)	Parallelism (μm)	Remark	
Analog						
122-101-10	0 - 25	0.01	±3	3	Type A	
122-102-10	25 - 50			4		
122-103-10	50 - 75					
122-104-10	75 - 100		±4	5		
122-105-10	100 - 125					
122-106-10	125 - 150		±5	6		
122-107-10	150 - 175					
122-108-10	175 - 200		±6	3	Type B	
122-109-10	200 - 225					
122-110-10	225 - 250		±3	3	Type C	
122-115-10	250 - 275					
122-116-10	275 - 300		±3	3	Type D	
122-111-10	0 - 25					
122-112-10	25 - 50					
Analog (With carbide tip)						
122-161-10	0 - 25	0.01	±3	3	Type C	
122-162-10	25 - 50					
122-141-10	0 - 25					
122-142-10	25 - 50					
Inch						
Code No.	Range (in)	Graduation (in)	Maximum permissible error J_{MPE} (in)	Parallelism (in)	Remark	
Analog						
122-125-10	0 - 1	0.0001	±0.00015	0.00015	Type A	
122-126-10	1 - 2			0.0002		
122-127-10	2 - 3					
122-128-10	3 - 4		±0.0002	0.00015		
122-135-10	0 - 1					
122-151-10	0 - 1		±0.00015		Type B	
		Type D				

• Standard accessories: Setting standard, 1 pc. (except for measuring range 0 to 25 mm (0 to 1 in) models)
Spanner (301336), 1 pc.

Note: A heat shield is provided with 122-125-10, 122-135-10, 122-151-10 as standard.

DIMENSIONS

Unit: mm

Analogue models up to 25 mm measuring range

Code 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	17.5
122-104-10	75	16.7	79	17.9
122-105-10	100	18.8	94	18.3
122-106-10	125	19.1	106	18.5
122-107-10	150	18.2	118	18.9
122-108-10	175	16.8	130	17.7
122-109-10	200	18	143	156
122-110-10	225		156	169
122-115-10	250		169	181
122-116-10	275		181	

Analogue models over 25 mm to 300 mm measuring range

Can Seam Micrometers SERIES 147

Measurement example



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



147-103

SPECIFICATIONS

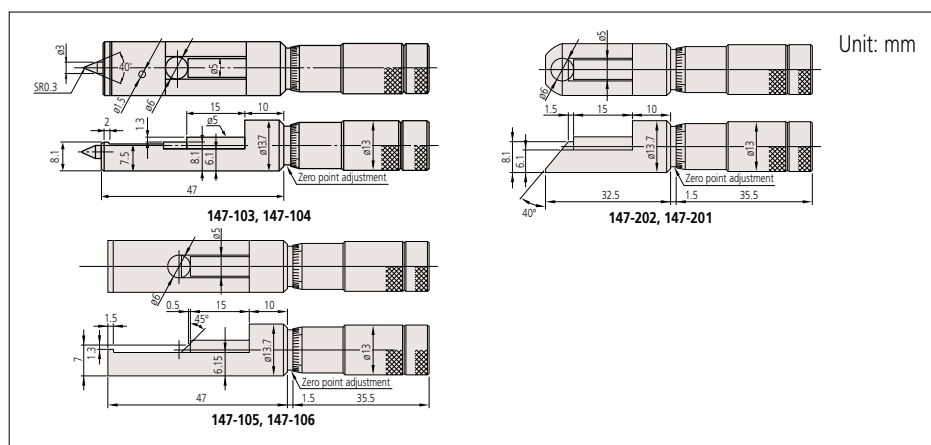
Metric				
Code No.	Range (mm)	Graduation (mm)	Maximum permissible error J_{MPE} (μm)	Remarks
147-103*	0 - 13	0.01	±3	—
147-105				for aluminum cans
147-202				for spray cans

Inch				
Code No.	Range (in)	Graduation (in)	Maximum permissible error J_{MPE} (in)	Remarks
147-104*	0 - 0.5	0.001	±0.00015	—
147-106				for aluminum cans
147-201				for spray cans

• Standard Accessories: Spanner (200168), 1 pc. Spanner (202863), 1 pc.

* For depth measurements up to 5 mm.

DIMENSIONS



Hub Micrometers SERIES 147

Measurement example



- Measures hub thickness and shoulders inside a bore.
- Measuring faces: Carbide tipped
- Equipped with Ratchet Stop for constant measuring force.



147-301

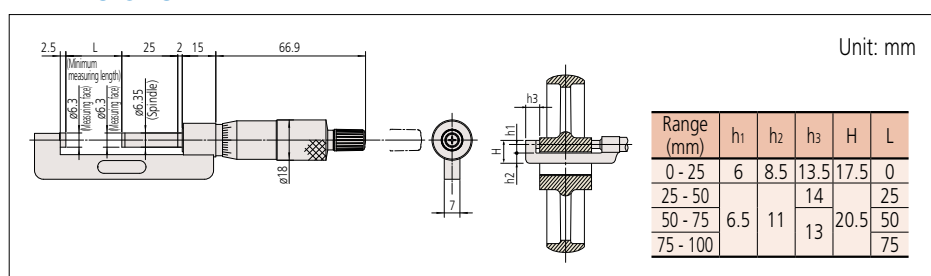
SPECIFICATIONS

Metric					
Code No.	Range (mm)	Graduation (mm)	Maximum permissible error J_{MPE} (μm)	Flatness (μm)	Parallelism (μm)
147-301	0 - 25	0.01	±2	0.6	3
147-302	25 - 50				
147-303	50 - 75				
147-304	75 - 100		±3		

Inch					
Code No.	Range (in)	Graduation (in)	Maximum permissible error J_{MPE} (in)	Flatness (in)	Parallelism (in)
147-351	0 - 1	0.001	±0.0001	0.000024	0.00012
147-352	1 - 2				
147-353	2 - 3				
147-354	3 - 4		±0.00015		

• Standard Accessories: Setting standard, 1 pc. (except for measuring range 0 to 25 mm (0 to 1 in) models), Spanner (301336), 1 pc.

DIMENSIONS



Micrometer

Crimp Height Micrometers SERIES 342

- Measures the height of crimp contacts.
- Point spindle
- IP65 water/dust protection (Digimatic model).
- Equipped with Ratchet Stop for constant measuring force.



Digimatic
342-271-30



Quickmike type
342-451-20

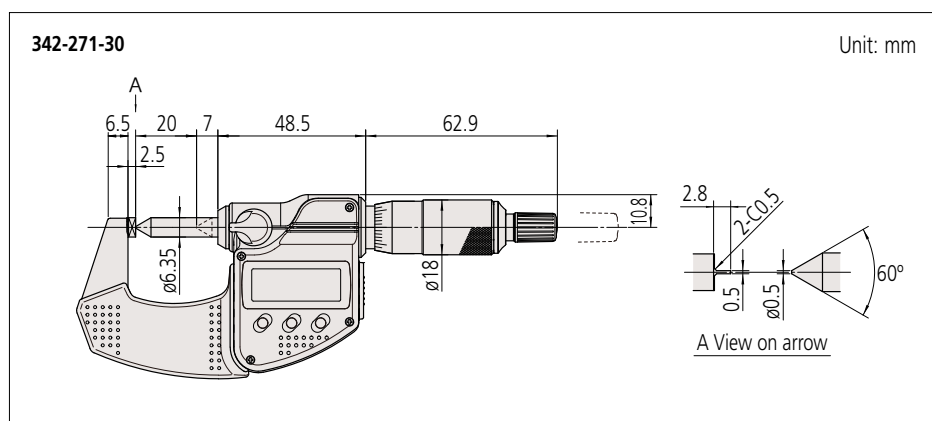
SPECIFICATIONS

Metric			
Code No.	Range (mm)	Resolution (mm)	Maximum permissible error J_{MPE} (μm)
Digimatic			
342-271-30	0 - 20	0.001	±3
Quickmike			
342-451-20	0 - 15	0.001	±3

Inch/Metric			
Code No.	Range (in)	Resolution	Maximum permissible error J_{MPE} (in)
Digimatic			
342-371-30	0 - 0.8	0.00005 in/ 0.001 mm	±0.00015

- Power source: SR44 battery (1 pc.), **938882** included as standard (for operational checks)
 - Battery life: Approx. 2.4 years under normal use (for **342-271-30/342-371-30**)
Approx. 5 years under normal use (for **342-451-20**)
 - Position detection method: Electromagnetic rotary sensor (for **342-271-30/342-371-30**)
Electrostatic capacity absolute sensor (for **342-451-20**)
 - Standard accessories: Spanner (**301336**), 1 pc. (except for **342-451-20**)
- Note: For functional details, refer to page 02-7.
Optional connection cable is available only for water-proof type (Digimatic model).

DIMENSIONS



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U-WAVE^{fit}

ABSOLUTE[™]

IP65



Dust- and
Water-
Protected
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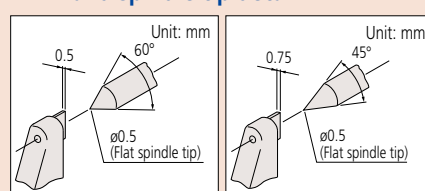


Dust- and
Water-
Protected
www.tuv.com
ID 000003013

Measurement example



Anvil and spindle tip detail



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

Optional Accessories

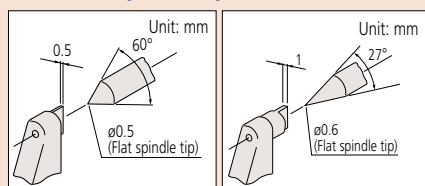
Code No.	Type	Description
264-020	—	USB Input Tool Series USB Keyboard Signal Conversion Type IT-020U
05CZA662	B	Connection cable (1 m)
05CZA663	B	Connection cable (2 m)
06AFM380B	B	USB Input Tool Direct (2 m)
02AZD730G	IP67	U-WAVE-T
02AZD880G	Buzzer	U-WAVE-T
02AZE200	—	U-WAVE-T mounting bracket
02AZD790B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

Crimp Height Micrometers SERIES 112,142

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

Anvil and spindle tip detail



112-401

142-402, 142-403



112-401

SPECIFICATIONS

Metric			
Code No.	Range (mm)	Graduation (mm)	Maximum permissible error J_{MPE} (μm)
Mechanical counter model			
142-402	0 - 25	0.01	±3
142-403		0.001	

Metric			
Code No.	Range (mm)	Graduation (mm)	Maximum permissible error J_{MPE} (μm)
Analog			
112-401	0 - 25	0.01	±3

- Standard accessories: Spanner (301336), 1 pc.

Micrometer

"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.



317-251-30

SPECIFICATIONS

Metric					
Code No.	Range (mm)	Resolution (mm)	Spindle feed error (μm)	Flatness (μm)	Parallelism (μm)
Digimatic					
317-251-30	0 - 25	0.001	3	0.6 (Spindle face)/ 2 (Anvil face)	3
317-252-30	25 - 50				
Inch / Metric					
Code No.	Range (in)	Resolution	Spindle feed error (in)	Flatness (in)	Parallelism (in)
Digimatic					
317-351-30	0 - 1	0.00005 in/0.001 mm	0.00015	0.000024 (Spindle face)/ 0.00008 (Anvil face)	0.00012
317-352-30	1 - 2				

- Power source: SR44 battery (1 pc.), **938882** included as standard (for operational checks)
- Battery life: Approx. 2.4 years under normal use
- Position detection method: Electromagnetic rotary sensor
- Standard accessories: Setting standard, 1 pc. (except for measuring range 0 to 25 mm (0 to 1 in) models)

Spanner (**301336**), 1 pc.

Note: For functional details, refer to page 02-7.

Optional connection cable is available only for water-proof type (Digimatic model).



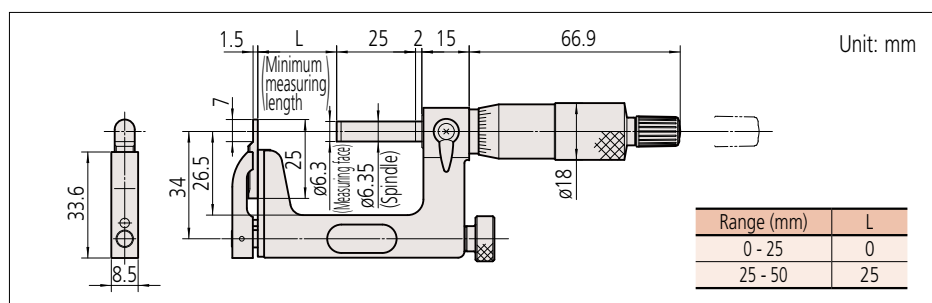
117-101

SPECIFICATIONS

Metric					
Code No.	Range (mm)	Graduation (mm)	Spindle feed error (μm)	Flatness (μm)	Parallelism (μm)
Analog					
117-101	0 - 25	0.01	3	0.6 (Spindle face)/ 2 (Anvil face)	3
117-102	25 - 50				
Inch					
Code No.	Range (in)	Graduation (in)	Spindle feed error (in)	Flatness (in)	Parallelism (in)
Analog					
117-107	0 - 1	0.0001	0.00015	0.000024 (Spindle face)/ 0.00008 (Anvil face)	0.00012
117-108	1 - 2				

- Standard accessories: Setting standard, 1 pc. (except for measuring range 0 to 25 mm (0 to 1 in) models), Spanner (**200877**), 1 pc.

DIMENSIONS



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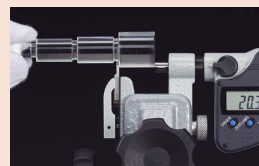
IP65

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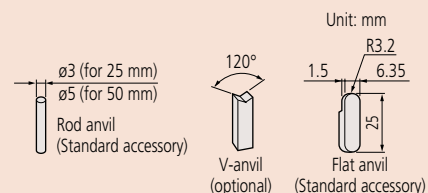
Applicable models: **series 317**

Measurement example



Optional Accessories

Code 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



Code 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 series 117 , for 0-25 mm ø58x14.2 mm (optional)

Limit Micrometers SERIES 113

Measurement example



- Can be used as a Go/No-go gage by setting the upper and lower limits.
- Measuring faces: Carbide tipped



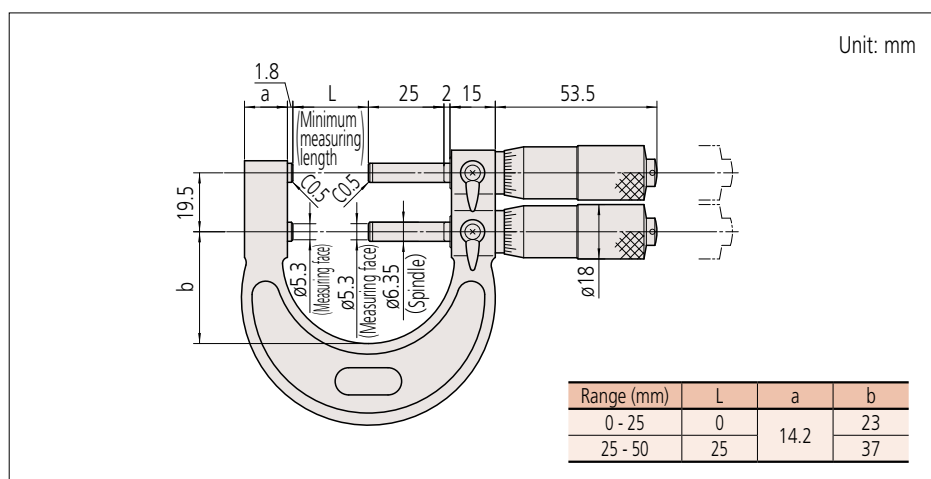
113-102

SPECIFICATIONS

Metric					
Code No.	Range (mm)	Graduation (mm)	Maximum permissible error J_{MPE} (μm)	Flatness (μm)	Parallelism (μm)
113-102	0 - 25	0.01	±3	0.6	3
113-103	25 - 50				

- Standard Accessories: Setting standard, 1 pc. (except for measuring range 0 to 25 mm and 0 to 1 in models)
Spanner (200877), 1 pc.

DIMENSIONS



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 25 mm measuring range, models are available that offer left or right positioning of the anvil-retraction button.
- Greatly improved accuracy: indication error and graduation of 1 μm .
- IP protection level: 54, coolant-splash resistant during grinding process.



SPECIFICATIONS

Metric												
Code No.	Range (mm)	Spindle feed error (μm)	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	Mass (g)
510-121	0 - 25	3	0.3	0.6	0.4	1	±0.06	0.001	0.001	5 - 10	Right side	520

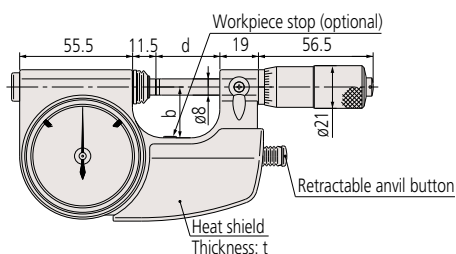
Inch												
Code No.	Range (in)	Spindle feed error (in)	Flatness (in)	Parallelism (in)	Dispersion of indication (in)	Dial indication accuracy (in)	Indicating range (in)	Graduation (in)	Dial graduation (in)	Measuring force (N)	Anvil retraction button	Mass (g)
510-131	0 - 1	0.00015	0.000012	0.000024	0.00002	0.00005	±0.0023	0.0001	0.00005	5 - 10	Right side	520

- Standard Accessories: Spanner (**200154**), 1 pc.

DIMENSIONS

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

Unit: mm



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



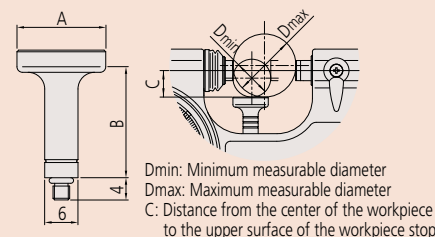
Measurement example



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



- Code 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

Measurement example



510-141

SPECIFICATIONS

Metric

Code No.	Range (mm)	Spindle feed error (μm)	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	Mass (g)
510-141	0 - 25	3	0.3	0.6	0.4	1	±0.06	0.001	0.001	5 - 10	Left side	530
510-122	25 - 50			1								670
510-123	50 - 75											820
510-124	75 - 100											970

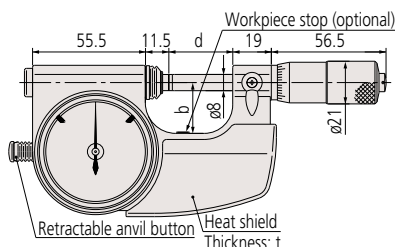
Inch

Code No.	Range (in)	Spindle feed error (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	Mass (g)							
510-151	0 - 1	0.00015	0.000012	0.000024	0.00002	0.00005	±0.0023	0.0001	0.00005	5 - 10	Left side	530							
510-132	1 - 2			0.00004								670							
510-133	2 - 3											820							
510-134	3 - 4											970							

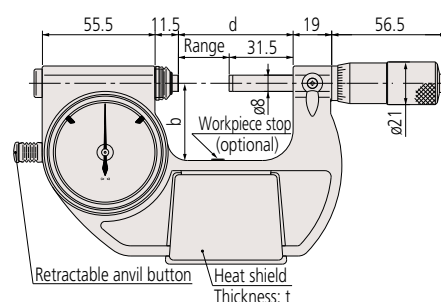
- Standard Accessories: Setting standard, 1 pc. (except for measuring range 0 to 25 mm (0 to 1 in) models)
Spanner (200154), 1 pc.

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	

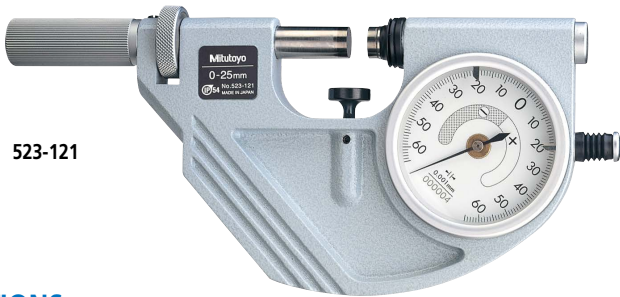
Micrometer



02 Dial Snap Meters
SERIES 523

Micrometers

- 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 1 μm.
- IP protection level: 54, coolant-splash resistant during grinding process.
- Hard-coated crystal: enhanced oil and scratch resistance.



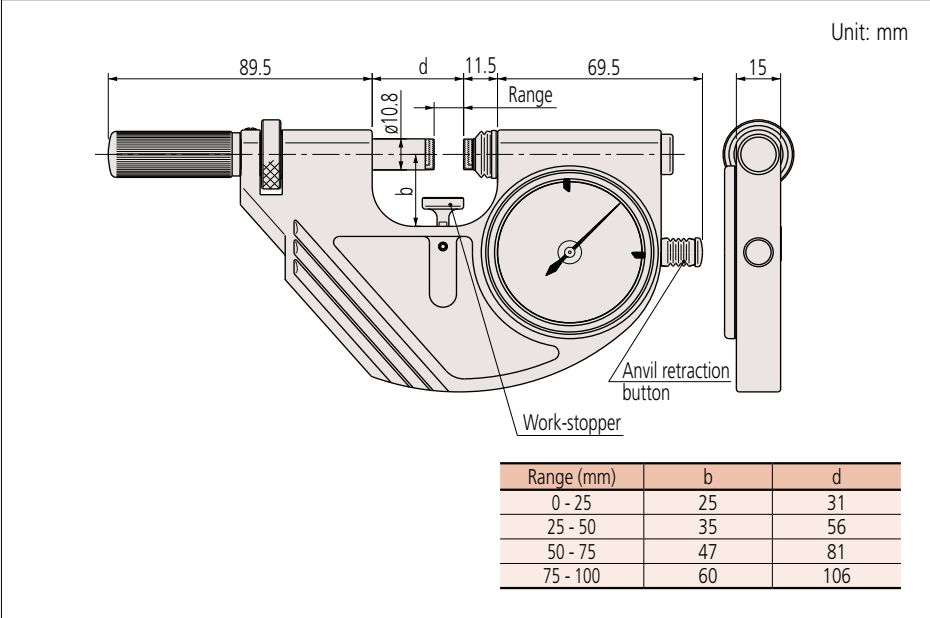
523-121

SPECIFICATIONS

Metric									
Code No.	Range (mm)	Dial graduation (mm)	Measuring force (N)	Flatness (μm)	Parallelism (μm)	Dispersion of indication (μm)	Dial indication accuracy (μm)	Indicating range (mm)	Mass (g)
523-121	0 - 25	0.001	5 - 10	0.3	0.6	0.4	1	±0.06	740
523-122	25 - 50				1				840
523-123	50 - 75								950
523-124	75 - 100								1080

Inch												
Code No.	Range (in)	Dial graduation (in)	Measuring force (N)	Flatness (in)	Parallelism (in)	Dispersion of indication (in)	Dial indication accuracy (in)	Indicating range (in)	Mass (g)			
523-131	0 - 1	0.00005	5 - 10	0.000012	0.000024	0.00002	0.00005	±0.0023	740			
523-132	1 - 2				0.00004				840			
523-133	2 - 3								950			
523-134	3 - 4								1080			

DIMENSIONS



Measurement example



Special Purpose Micrometers



Snap Meters SERIES 523

Mounting example



ABS Digimatic Indicator



Linear Gage and counter

Typical indicators used with gage

- ID-C (0.0005 mm): **543-700B**
- LGF-L (0.0001 mm): **542-192** & Counter **542-075** & Conversion plug **21HZA195**

- 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



523-141
(Indicator: optional)

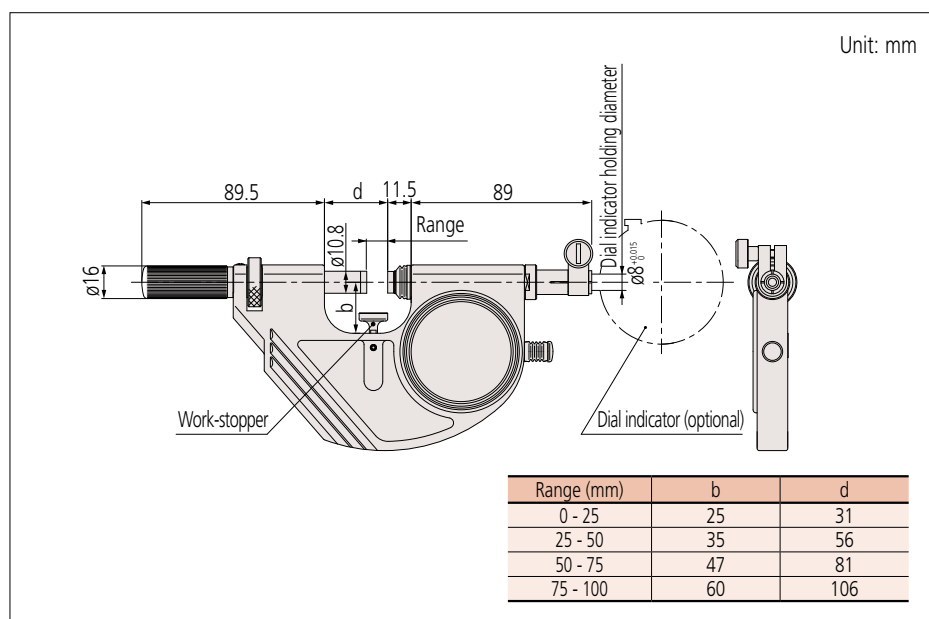
SPECIFICATIONS

Metric							
Code 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					1	920
523-144	75 - 100						1050

Inch							
Code 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					0.00004	920
523-154	3 - 4						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



Micrometer

Groove Micrometers
SERIES 146

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



146-221

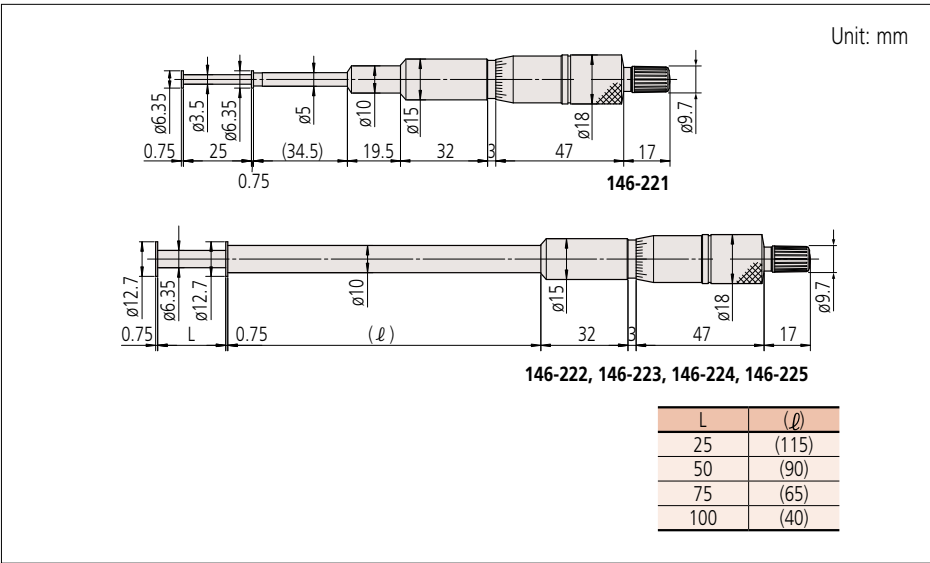
SPECIFICATIONS

Metric						
Code No.	Range Inside (mm)	Range Outside (mm)	Graduation (mm)	Maximum permissible error <i>JMPE</i> (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				

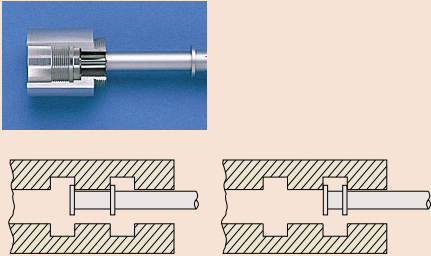
Inch						
Code No.	Range Inside (in)	Range Outside (in)	Graduation (in)	Maximum permissible error <i>JMPE</i> (in)	Parallelism (in)	Flange (in)
146-231	0.055 - 1.05	0 - 1	0.001	±0.0004	0.0004	ø0.25
146-232						ø0.5
146-233	1.05 - 2.05	1 - 2				
146-234	2.05 - 3.05	2 - 3				
146-235	3.05 - 4.05	3 - 4				

• Standard accessories: Spanner (301336), 1 pc.

DIMENSIONS



Measurement example



QUICKmini SERIES 700

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.

- Lightweight and palm-sized.
- Highly suitable for quick dimensional inspection of small, thin and delicate objects.



700-119-30

SPECIFICATIONS

Metric						
Code 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

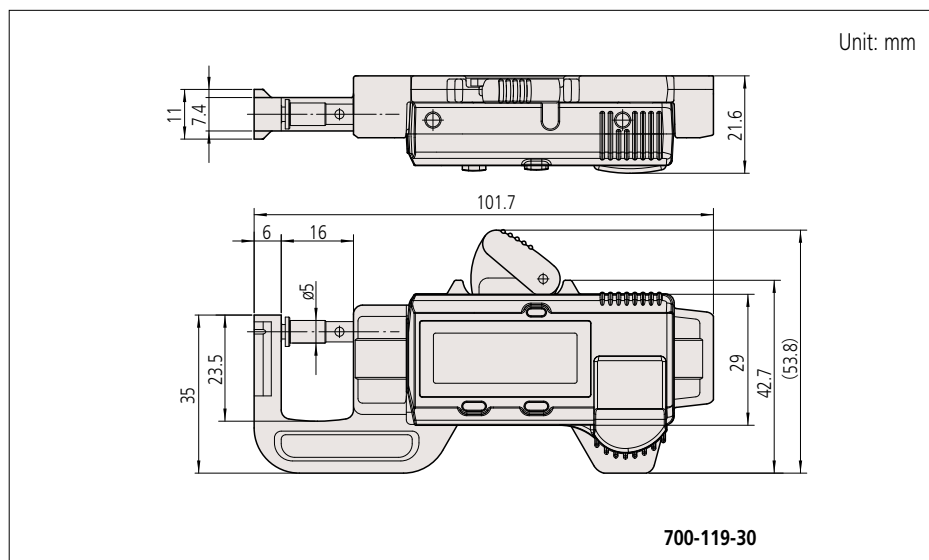
Inch / Metric						
Code No.	Range (in)	Resolution	Accuracy* (in)	Maximum response speed	Measuring force (N)	Mass (g)
700-118-30	0 - 0.5	0.0005 in/0.01 mm	±0.001	Unlimited	2 or less	100

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

• Battery life: Approx. 5 years under normal use

* Excluding quantizing error of ±1 count

DIMENSIONS



Micrometer

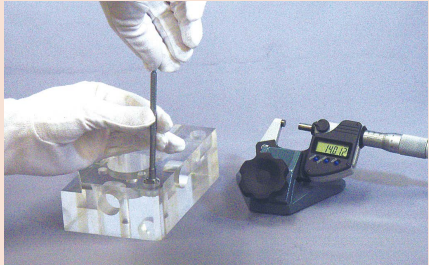
02
Micrometers

Telescoping Gage Set
SERIES 155

- The 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.



Typical application

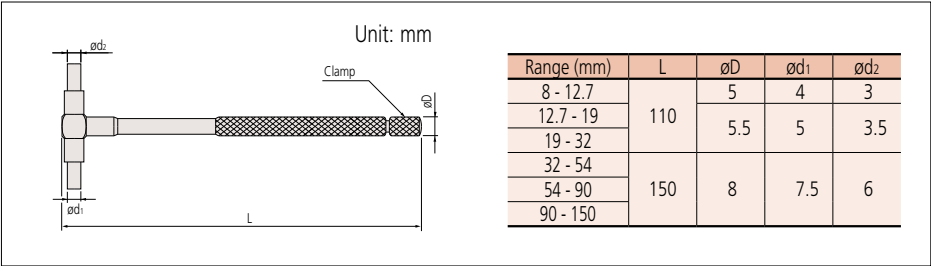


SPECIFICATIONS

Metric	
Code 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

Inch	
Code 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

DIMENSIONS



Typical application



Optical Parallels SERIES 157

- Designed to inspect parallelism and flatness of measuring faces of micrometers. For details, refer to "Quick Guide to Precision Measuring Instruments" on page 13-9.
- Each set consists of 4 sizes to enable testing parallelism at quarter-turn positions of the micrometer spindle.



157-903

SPECIFICATIONS

Metric						
Code No.	Range of micrometer to be checked (mm)	Sizes of parallels included in set (mm)	Diameter (mm)	Flatness (μm)	Parallelism (μm)	Remarks
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

Inch						
Code No.	Range of micrometer to be checked (in)	Sizes of parallels included in set (in)	Diameter (mm)	Flatness (μm)	Parallelism (μm)	Remarks
157-901	0 - 1	0.5000, 0.5062, 0.5125, 0.5187	ø30	0.1	0.2	For 25
157-902	1 - 2	1.0000, 1.0062, 1.0125, 1.0187				For 50

Note: Also available individually, using the following Code No.

Metric		Metric	
Code No.	Thickness (mm)	Code 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

Inch		Inch	
Code No.	Thickness (in)	Code 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

Optical Flats SERIES 158

- Used for inspecting the flatness of measuring faces with high accuracy. For details, refer to "Quick Guide to Precision Measuring Instruments" on page 13-9.



158-118

SPECIFICATIONS

Metric				Inch			
Code No.	Thickness (mm)	Diameter (mm)	Flatness grade (μm)	Code No.	Thickness (in)	Diameter (in)	Flatness grade (in)
158-117	12	45	0.2	158-121	0.5	1.8	0.000008
158-118			0.1	158-122			0.000004
158-119	15	60	0.2	158-123	0.6	2.4	0.000008
158-120			0.1	158-124			0.000004

Typical application



Micrometer

Setting Standards for Outside Micrometers
SERIES 167

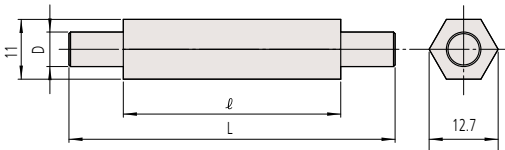
- Used for setting the zero point on outside micrometers.



167-108

SPECIFICATIONS and DIMENSIONS

167-101 to 167-103
167-141 to 167-143

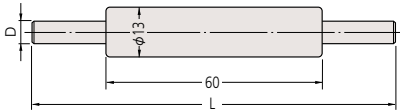


Unit: mm

Metric						
Code No.	Length <L> (mm)	Accuracy (μm)	Parallelism (μm)	Flatness (μm)	ℓ (mm)	Diameter <D> (mm)
167-101	25	±1.5	2.0	0.3	18	6.35
167-102	50	±2.0			40	
167-103	75	±2.5				

Inch						
Code No.	Length <L> (in)	Accuracy (in)	Parallelism (in)	Flatness (in)	ℓ (mm)	Diameter <D> (in)
167-141	1	±0.00005	0.00008	0.000012	18	0.25
167-142	2	±0.0001			40	
167-143	3	±0.0001				

167-104 to 167-107
167-144 to 167-147

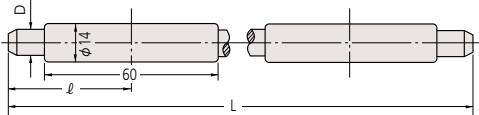


Unit: mm

Metric						
Code No.	Length <L> (mm)	Accuracy (μm)	Parallelism (μm)	Flatness (μm)	ℓ (mm)	Diameter <D> (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				

Inch						
Code No.	Length <L> (in)	Accuracy (in)	Parallelism (in)	Flatness (in)	Diameter <D> (in)	
167-144	4	±0.0001	0.00008	0.000012	0.31	
167-145	5	±0.00015				
167-146	6					
167-147	7					

167-108 to 167-119
167-148 to 167-159



Unit: mm

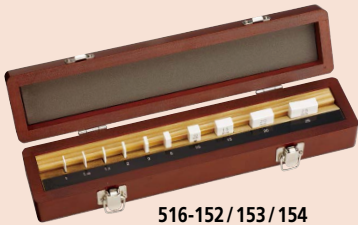
Metric						
Code No.	Length <L> (mm)	Accuracy (μm)	Parallelism (μm)	Flatness (μm)	ℓ (mm)	Diameter <D> (mm)
167-108	200	±5.0	2.0	0.3	47	9.4
167-109	225	±5.5				
167-110	250	±6.0			52	
167-111	275	±6.5			57	
167-112	300	±7			64	
167-113	325	±7.5			69	
167-114	350	±8			74	
167-115	375	±8.5			80	
167-116	400	±9			85	
167-117	425	±9.5			90	
167-118	450	±10			95	
167-119	475	±10.5			101	

Inch						
Code No.	Length <L> (in)	Accuracy (in)	Parallelism (in)	Flatness (in)	ℓ (mm)	Diameter <D> (in)
167-148	8	±0.00015	0.00008	0.000012	47	0.37
167-149	9	±0.0002				
167-150	10	±0.0002			52	
167-151	11	±0.0002			57	
167-152	12	±0.00025			64	
167-153	13	±0.00025			69	
167-154	14	±0.00025			74	
167-155	15	±0.00025			80	
167-156	16	±0.00025			85	
167-157	17	±0.00025			90	
167-158	18	±0.00025			95	
167-159	19	±0.0003			101	

Typical application



Micrometer Inspection Gauge Block Set
Refer to page 01-13 for details.



516-152/153/154

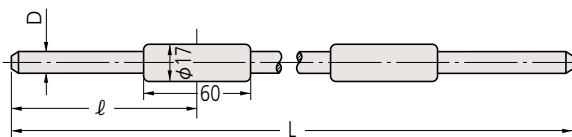


Micro Checker (holder only)
516-607

Setting Standards for Outside Micrometers SERIES 167

167-120 to 167-404
167-160 to 167-180

Unit: mm



Metric						
Code No.	Length <L> (mm)	Accuracy (μm)	Parallelism (μm)	Flatness (μm)	ℓ (mm)	Diameter <D> (mm)
167-120	500	±11	2.0	0.3	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			158	
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	

Inch						
Code No.	Length <L> (in)	Accuracy (in)	Parallelism (in)	Flatness (in)	ℓ (mm)	Diameter <D> (in)
167-160	20	±0.0003	0.00008	0.000012	106	0.47
167-161	21	±0.0003			112	
167-162	22	±0.0003			117	
167-163	23	±0.0003			122	
167-164	24	±0.0003			128	
167-165	25	±0.00035			133	
167-166	26	±0.00035			138	
167-167	27	±0.00035			142	
167-168	28	±0.00035			147	
167-169	29	±0.00035			153	
167-170	30	±0.00035			158	
167-171	31	±0.00035			164	
167-172	32	±0.00035			170	
167-173	33	±0.00035			175	
167-174	34	±0.00035			180	
167-175	35	±0.00035			185	
167-176	36	±0.00035			191	
167-177	37	±0.0004			196	
167-178	38	±0.0004			201	
167-179	39	±0.0004			207	
167-180	40	±0.0004			211	

Note: Available up to 79 in

Micrometer

Setting Standards for Screw Thread Micrometers SERIES 167

- Used to set the zero point of screw thread micrometers.



167-264
(60° screw)

Metric		
Code No.	Length <L> (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

Inch		
Code No.	Length <L> (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

Typical application



Setting Standards for V-anvil Micrometers SERIES 167

- Used for setting the zero point of V-anvil micrometers.



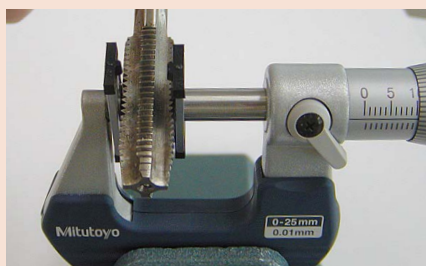
Metric			
Code No.	Length <L> (mm)	Accuracy (μm)	Type
167-327	5	± 2	Plug
167-328	10		
167-329	25		
167-330	40	± 3	Ring
167-331	55		
167-332	70		
167-333	85		
167-334	100	± 5	Ring
167-335	115		
167-336	130		

Inch			
Code No.	Length <L> (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

Typical application



Measurement example

3-Wire Units
SERIES 313

- Enables pitch diameter measurements of screw threads when attached to the measuring faces of both the spindle and anvil of a micrometer.
- Determination of the pitch diameter: refer to "Quick Guide to Precision Measuring Instruments" on page 13-8.



SPECIFICATIONS

Code No. (One pair) (Support spindle dia.) 6.35 mm (0.25 in)	Wire dia. (mm)	Accuracy of wire diameter (mm)	Pitch		
			Metric thread (mm)	Unified thread (threads per inch)	Whitworth thread (threads per inch)
952131	0.170	±0.002	0.2, 0.25, 0.3	80	—
952132	0.195		0.35	72	—
952133	0.220		0.4	64	—
952134	0.250		0.45	56	60
952135	0.290		0.5	48	48
952136	0.335		0.6	44, 40	40
952137	0.390		0.7	36	36
952138	0.455		0.75, 0.8	32	32
952139	0.530		0.9	28	28, 26
952140	0.620		1.0	24	24, 22
952141	0.725		1.25	20	20, 19, 18
952142	0.895		1.5	18, 16	16
952143	1.100		1.75, 2.0	14, 13, 12	14, 12
952144	1.350		2.5	11, 10	11, 10
952145	1.650		3.0	9, 8	9, 8
952146	2.050		3.5	7	7
952147	2.550		4, 4.5	6	6
952148	3.200		5, 5.5, 6	5, 4.5	5, 4.5

3-Wire Units set

Code No.	Set	Wire dia. (mm)	Support spindle dia. (mm)
313-101	18	0.170 - 3.200	6.35

Note 1: Special-specification 3-wire units with a wire diameter other than those listed above (ø0.15 mm or more) can also be made to order.

Note 2: Due to potential obstruction, the 3-wire unit cannot be used with screws having an external diameter exceeding ø50 mm.

Lubricant for Measuring Tools

- The oil is for maintaining measuring tools.

Note: May not be used for some parts such as the spindle of a dial indicator or Digimatic indicator.



SPECIFICATIONS

Code No.	Product name	Remarks
207000*	Micrometer oil	Grease (32 ml)

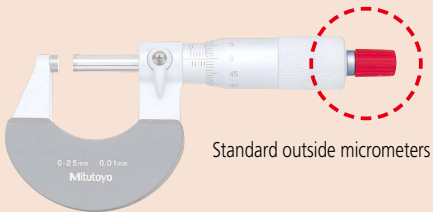
* Not available in certain countries and regions.

Micrometer

02
Micrometers

Color-Coded Ratchet 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.



SPECIFICATIONS

Analog type: 0 to 300 mm

Code 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: 300 to 1000 mm

Code 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 0 to 300 mm*

Code 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

Code No.	Color
04GAA899	Black
04GAA900	Red
04GAA901	Yellow
04GAA902	Green
04GAA903	Blue
04AAB208	Gray



Accessories, Options

Typical application



156-101-10

Micrometer Stands SERIES 156

- Dedicated stand for micrometers.
- 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.



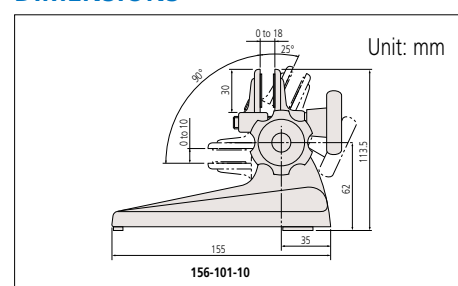
156-101-10

SPECIFICATIONS

Code No.	Measuring range of standard outside micrometer	Remarks
156-101-10	15 - 100 mm (0.6- 4 in)*	Adjustable angle type

* Items that cannot be mounted on these stands
(Code No. 406-253-30, 323-253-30, 331-254-30, 342-254-30, 342-264-30, 369-253-30, 422-232-30, 422-233-30, etc.)

DIMENSIONS



Typical application



156-105-10

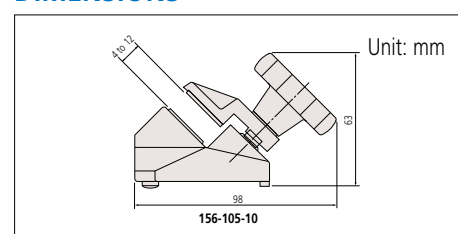


156-105-10

SPECIFICATIONS

Code No.	Measuring range of standard outside micrometer	Remarks
156-105-10	25, 50 mm (1, 2 in)	Fixed angle type

DIMENSIONS



Typical application



156-102



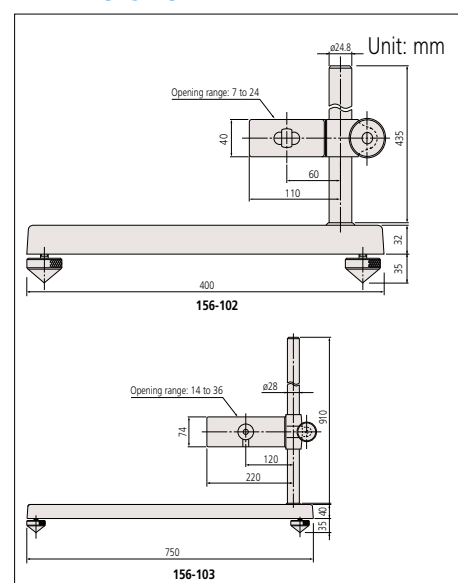
156-102

156-103

SPECIFICATIONS

Code No.	Measuring range of standard outside micrometer	Remarks
156-102	100 - 300 mm (4 - 12 in)	Vertical type
156-103	325 - 1000 mm (13 - 40 in)	Vertical type

DIMENSIONS



03

Micrometer Heads

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.



Digimatic Micrometer Heads



Micrometer Heads (Fine Spindle Feed of 0.1 mm/rev)

INDEX

Digimatic Micrometer Heads (Digital display)

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Micrometer Heads (Analog display/Standard type/High function type)

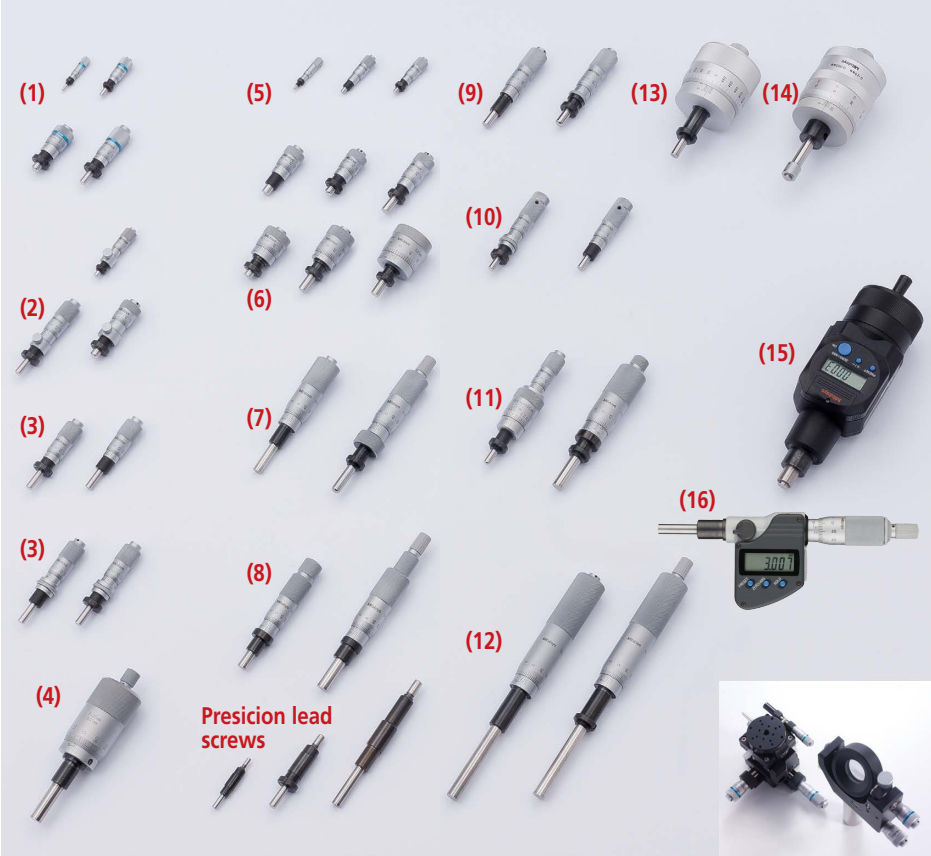
Small/Ultra-small Type	03-7
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Micrometer Head Selection Guide

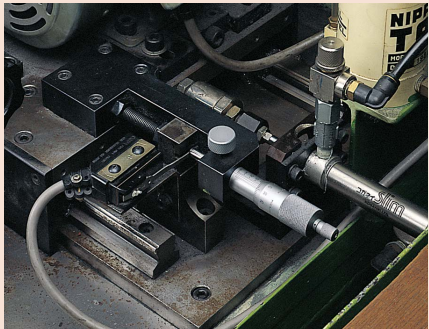
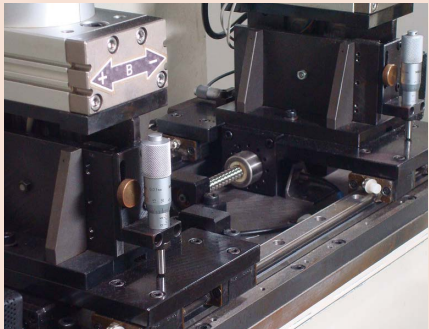
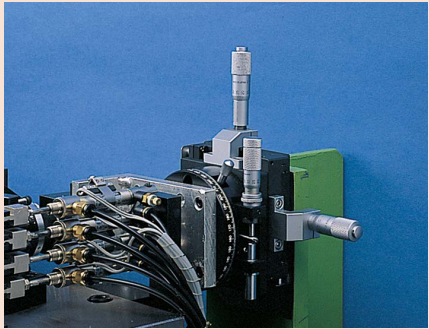
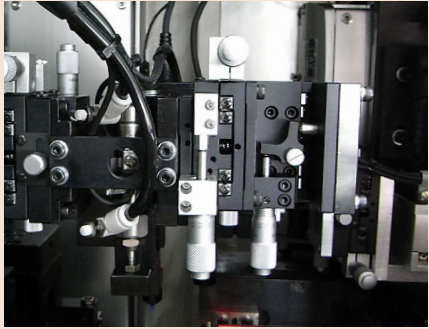
03
Micrometer Heads



Also refer to “Quick Guide to Precision Measuring Instruments” from page 13-11.

Range	Main feature of head		Series	Page
1 mm/0.02 in	High-Function	Differential Screw Thread Translator (Extra-Fine Feed) Type	110	03-37 to 03-38
2.5 mm/0.05 in	High-Function	Differential Screw Thread Translator (Extra-Fine Feed) Type (11)		03-37 to 03-38
5 mm/0.2 in	High-Function	Fine Spindle Feed of 0.1 mm/rev (1)	148	03-34 to 03-35
	Standard	Small/Ultra-small Type (5)		03-7 to 03-8
6.5 mm/0.25 in	Standard	Locking-screw Type (2)		03-28 to 03-31
	High-Function	Fine Spindle Feed of 0.1 mm/rev (1)		03-34 to 03-35
	High-Function	Fine Spindle Feed of 0.25 mm/rev		03-36
	Standard	Small/Ultra-small Type (5)		03-7 to 03-8
10 mm	Standard	Short Thimble with Choice of Diameter (6)	152	03-9 to 03-11
	High-Function	Large Thimble Type (13)		03-39 to 03-40
	Standard	Locking-screw Type (2)	148	03-28 to 03-31
13 mm/0.5 in	High-Function	Fine Spindle Feed of 0.25 mm/rev	110	03-36
	High-Function	Differential Screw Thread Translator (Extra-Fine Feed) Type (11)		03-37 to 03-38
	Standard	Short Thimble with Choice of Diameter (6)		03-9 to 03-11
	Standard	Small Standard Type (3)		03-12 to 03-14
15 mm/0.5 in	Standard	Small Thimble Diameter Standard Type (10)	148	03-15 to 03-17
	High-Function	Non-rotating Spindle Type (8)		03-32
	High-Function	Quick Spindle Feed of 1 mm/rev (4)		03-33
	Standard	Small Standard Type with Carbide-tipped Spindle (9)		03-18 to 03-19
25 mm/1 in	Digimatic	Clear digital display, Non-rotating spindle and IP 65 rated version (16)	350	03-4 to 03-6
		Clear digital display, Non-rotating spindle		
	High-Function	Non-rotating Spindle Type (8)	153	03-32
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		Digit Counter Type	250	03-43
	Standard	Medium-sized Standard Type (7)	150	03-20 to 03-23
		Medium-sized Standard Type with 8 mm Diameter Spindle	151	03-24 to 03-27
50 mm/2 in	Digimatic	(15)	164	03-4
	High-Function	Large Thimble Type	152	03-39 to 03-40
		Long Stroke Non-rotating Spindle	197	03-42
60 - 75 mm	Standard	Medium-sized Standard Type with 8 mm Diameter Spindle (12)	151	03-24 to 03-27
	Micro Jack		7	03-43

Digimatic Micrometer Heads (Digital display)



Functions (series 164)

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.

Data output:

Equipped with output port for transferring measurement data to a Statistical Process Control (SPC) and measurement system.

Auto power ON/OFF:

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

Error alarm:

In case of an overflow on the display or a computing error, an error message appears on the display 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 indicator appears well before the micrometer becomes unusable.

Optional Accessories

Code No.	Type	Description
264-020	—	USB Input Tool Series USB Keyboard Signal Conversion Type IT-020U
05CZA662	B	Connection cable (1 m): for series 350 (IP65)
05CZA663	B	Connection cable (2 m): for series 350 (IP65)
959149	C	Connection cable for series 164 (1 m)
959150	C	Connection cable for series 164 (2 m)
06AFM380B	B	USB Input Tool Direct for series 350 (IP65) (2 m)
06AFM380C	C	USB Input Tool Direct for series 164 (2 m)
02AZD790B	B	Connection cable for U-WAVE-T (160 mm): for series 350 (IP65)
02AZE140B	B	Connection cable for U-WAVE-T For foot switch: for series 350 (IP65)
02AZD790C	C	Connection cable for U-WAVE-T (160 mm): for series 164
02AZE140C	C	Connection cable for U-WAVE-T For foot switch: for series 164
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*

* Cannot be used with **164-163** and **164-164**

Digimatic Micrometer Heads SERIES 164, 350

- Easy-to-read digital display.

- All models support data output.



164-163



350-281-30 (IP65)

SPECIFICATIONS

Metric									
Code No.	Range (mm)	Resolution (mm)	Graduation (mm)	Stem	Stem dia. (mm)	Spindle end	Graduation features	Maximum permissible error J_{MPE} (μm)	
164-163	0 - 50	0.001	—	Plain	18	Flat (carbide tip)	Standard	±3	
350-251-30* ¹	0 - 25		0.01	W/clamp nut	10				
350-252-30* ¹				Plain					Spherical (SR4) (carbide tip)
350-253-30* ¹				W/clamp nut					
350-254-30* ¹				Plain					
350-281-30* ²				W/clamp nut	Flat (carbide tip)				
350-282-30* ²				Plain		Spherical (SR4) (carbide tip)			
350-283-30* ²				W/clamp nut					
350-284-30* ²				Plain					
350-261-30* ²				12	Flat				
350-271-30* ²									
350-272-30* ¹						Spherical (SR4) (carbide tip)			
350-273-30* ²									
350-274-30* ¹									

Inch / Metric								
Code No.	Range (in)	Resolution	Graduation	Stem	Stem dia. (in)	Spindle end	Graduation features	Maximum permissible error J_{MPE} (in)
164-164	0 - 2	0.00005 in/ 0.001 mm	0.001 in/ 0.01 mm	Plain	0.709	Flat (carbide tip)	Standard	±0.00015
350-351-30*1	0 - 1			W/clamp nut	0.375			
350-352-30*1				Plain				
350-353-30*1				W/clamp nut				
350-354-30*1				Plain				
350-357-30*1				0.5	Flat (carbide tip)			
350-381-30*2						Spherical (SR4) (carbide tip)		
350-382-30*2								
350-383-30*2								
350-384-30*2								
350-361-30*2								

- Power source for **series 350**: SR44 battery (1 pc.), **938882** included as standard (for operational checks)
Power source for **series 164**: SR44 battery (2 pcs.), **938882** included as standard (for operational checks)
- Battery life: Approx. 2.4 years under normal use (for **350-XXX**)
Approx. 1.8 years under normal use (for **164-163, 164**)

- Measuring face: Material/Carbide tip, Hardness/90 HRA or more, Lapped

- Scale finishing: Satin-chrome plated

*1 These models are not water-proof.

*2 IP65 dust/water protection type. Stem diameter of IP65 type is 12 mm.

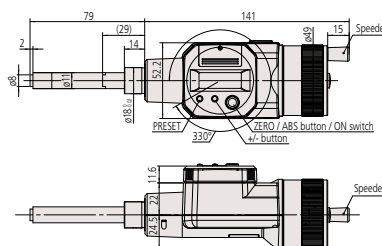
Note: For functional details of **series 350** refer to page 02-7. Origin setting is by presetting.

DIMENSIONS

Plain Stem



Plain stem

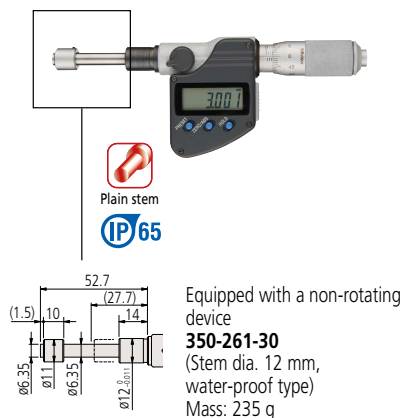


Unit: mm

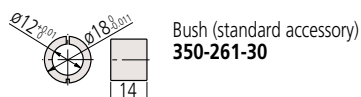
164-163 Rotatable display Mass: 490 g
() : with spindle fully retracted.

DIMENSIONS

Unit: mm



Equipped with a non-rotating device
350-261-30
 (Stem dia. 12 mm,
 water-proof type)
 Mass: 235 g



*1 Other dimensions are the same as **350-281-30**.
(): with spindle fully retracted.

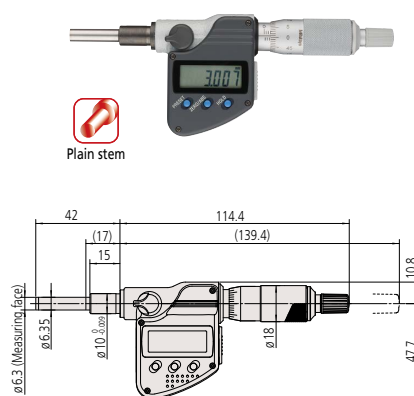
Diagram of a digital depth gauge with a 300 mm scale. The gauge has a black frame with a digital display showing '300.7'. It features a red stem locknut and a red spherical face. The gauge is labeled 'SR4' and '350-284-30'.

*2 Other dimensions are the same as **350-282-30**.
(): with spindle fully retracted.

DIMENSIONS

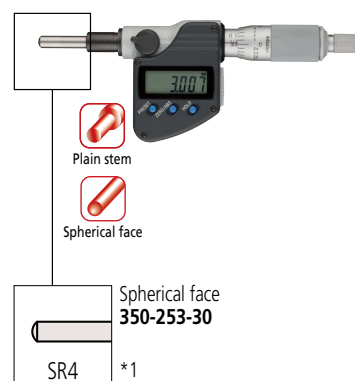
Plain Stem

Unit: mm



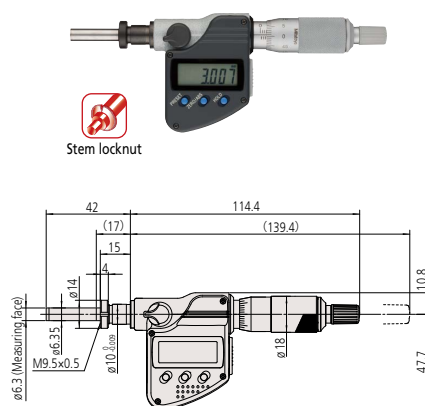
350-251-30

(Stem dia. 10 mm, for general use) Mass: 230 g

*1 Other dimensions are the same as **350-251-30**.

(): with spindle fully retracted.

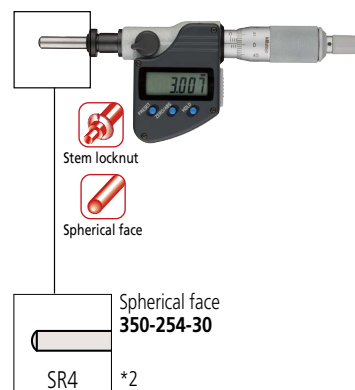
Stem Locknut



- 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

Metric						
Code No.	Range (mm)	Stem dia. (mm)	Stem	Spindle end	Graduation	Maximum permissible error J_{MPE} (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			Plain	Spherical (SR3)		
148-207-10			W/clamp nut			
148-209-10			Plain	Flat	Reverse reading	
148-211-10			W/clamp nut			
Inch						
Code No.	Range (in)	Stem dia. (in)	Stem	Spindle end	Graduation	Maximum permissible error J_{MPE} (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			Plain	Spherical (SR3)		
148-208-10			W/clamp nut			
148-210-10*			Plain	Flat	Reverse reading	
148-212-10*			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
- Scale finishing: Satin-chrome plated
- * Made-to-order models

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.

Micrometer Head

Micrometer Heads
SERIES 148 — Short Thimble with Choice of Diameter

- Short body design maintains measuring range for limited space applications.
- Three types of thimble diameters can be selected depending on applications.

SPECIFICATIONS

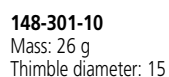
Metric						
Code No.	Range (mm)	Maximum permissible error J_{MPE} (μm)	Stem dia. (mm)	Stem	Spindle end	Thimble dia. (mm)
148-301-10	0 - 6.5	±2	9.5	Plain	Flat	15
148-302-10				W/clamp nut		
148-303-10				Plain	Spherical (SR4)	20
148-304-10				W/clamp nut		
148-313-10				Plain	15	
148-314-10	W/clamp nut					
148-307-10	0 - 13			Plain	Flat	15
148-308-10				W/clamp nut		
148-309-10				Plain		20
148-310-10				W/clamp nut		
148-311-10				Plain		29
148-312-10				W/clamp nut		

- Graduation: 0.01 mm
- Spindle pitch: 0.5 mm
- Measuring face: Material/Alloy tool steel, Hardness/60 HRC or more, Lapped
- Scale finishing: Satin-chrome plated

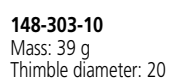
Inch						
Code No.	Range (in)	Maximum permissible error J_{MPE} (in)	Stem dia. (in)	Stem	Spindle end	Thimble dia. (in)
148-351-10	0 - 0.25	±0.0001	0.375	Plain	Flat	0.59
148-352-10				W/clamp nut		
148-353-10				Plain		0.79
148-354-10				W/clamp nut		
148-357-10	0 - 0.5			Plain		0.59
148-358-10				W/clamp nut		
148-359-10				Plain		0.79
148-360-10				W/clamp nut		

- Graduation: 0.001 in
- Spindle pitch: 0.025 in
- Measuring face: Material/Alloy tool steel, Hardness/60 HRC or more, Lapped
- Scale finishing: Satin-chrome plated

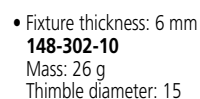
Plain Stem



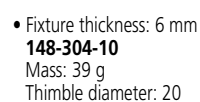
*1 Other dimensions are the same as **148-301-10**.



Unit: mm



*2 Other dimensions are the same as **148-302-10**.



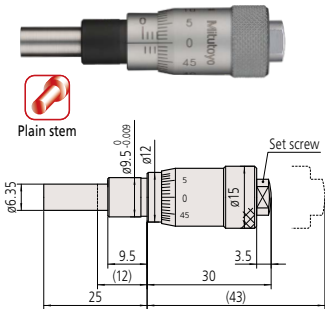
(): with spindle fully retracted.

Micrometer Head

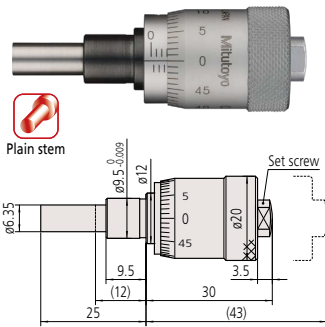
Micrometer Heads
SERIES 148 — Short Thimble with Choice of Diameter

DIMENSIONS

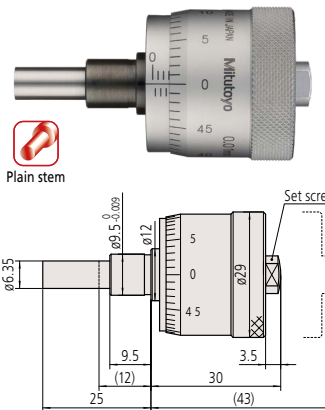
Plain Stem



148-307-10
Mass: 35 g Thimble diameter: 15



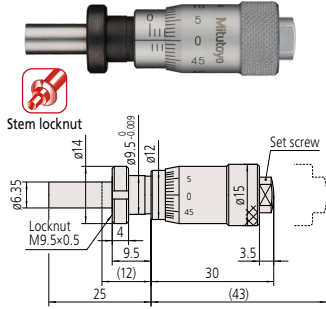
148-309-10
Mass: 55 g Thimble diameter: 20



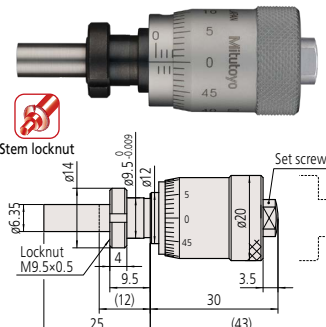
148-311-10
Mass: 103 g Thimble diameter: 29

Stem Locknut

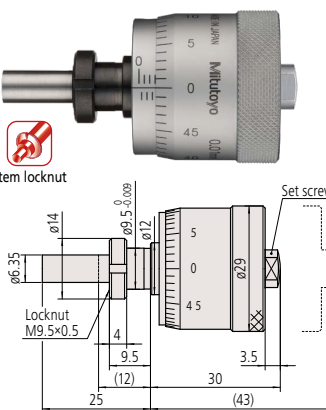
Unit: mm



• 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.

Micrometer Heads SERIES 148 — Small Standard Type

- Measuring range: 13 mm

SPECIFICATIONS

Metric						
Code No.	Range (mm)	Maximum permissible error J_{MPE} (μm)	Stem dia. (mm)	Stem	Spindle end	Graduation features
148-104-10	0 - 13	±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*		

- Graduation: 0.01 mm
- Spindle pitch: 0.5 mm
- Measuring face: Material/Alloy tool steel, Hardness/60 HRC or more, Lapped
- Scale finishing: Satin-chrome plated
- * With spindle lock

Inch						
Code No.	Range (in)	Maximum permissible error J_{MPE} (in)	Stem dia. (in)	Stem	Spindle end	Graduation features
148-112-10	0 - 0.5	± 0.0001	0.375	Plain	Flat	Standard
148-111-10*2				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		

- Graduation: 0.001 in
- Spindle pitch: 0.025 in
- Measuring face: Material/Alloy tool steel, Hardness/60 HRC or more, Lapped
- Scale finishing: Satin-chrome plated
- *¹ With spindle lock
- *² Made-to-order models

Micrometer Head

Micrometer Heads
SERIES 148 — Small Standard Type

DIMENSIONS

Plain Stem Mass: 30 g

Unit: mm

148-104-10

Plain Stem and Spindle Lock Mass: 40 g

148-121-10

Plain stem

Spherical face

Reverse reading

148-801-10

148-821-10

148-803-10

148-823-10

***1**

***2**

***1** Other dimensions are the same as **148-104-10**.

***2** Other dimensions are the same as **148-121-10**.
(): with spindle fully retracted.

Micrometer Head

Micrometer Heads
SERIES 148 — Small Thimble Diameter Standard Type

- Measuring range: 13 mm
- The thimble can be set to zero at any position by loosening the setscrew.

SPECIFICATIONS

Metric						
Code No.	Range (mm)	Maximum permissible error J_{MPE} (μm)	Stem dia. (mm)	Stem	Spindle end	Special features
148-503	0 - 13	±2	9.5	Plain	Flat	Standard
148-508				W/clamp nut		
148-506				Plain* ¹		
148-504				W/clamp nut* ¹	Spherical (SR4)	
148-853				Plain		
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

- Graduation: 0.01 mm
- Spindle pitch: 0.5 mm
- Measuring face: Material/Alloy tool steel, Hardness/60 HRC or more, Lapped
- Scale finishing: Satin-chrome plated
- *1 With spindle lock
- *2 Made-to-order models

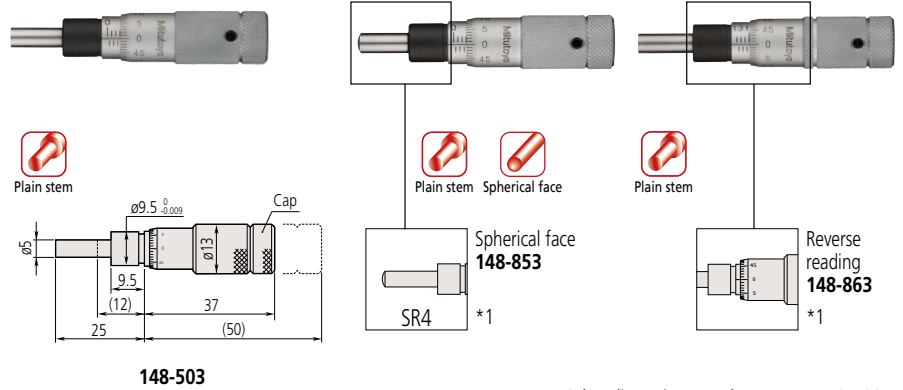
Inch						
Code No.	Range (in)	Maximum permissible error J_{MPE} (in)	Stem dia. (in)	Stem	Spindle end	Special features
148-501	0 - 0.5	±0.0001	0.375	Plain	Flat	Standard
148-507*2				W/clamp nut		
148-505				Plain*1		
148-502				W/clamp nut*1	Spherical (SR4)	
148-851				Plain		
148-852				W/clamp nut*1		
148-861				Plain	Flat	Reverse reading
148-862				W/clamp nut*1		

- Graduation: 0.001 in
- Spindle pitch: 0.025 in
- Measuring face: Material/Alloy tool steel, Hardness/60 HRC or more, Lapped
- Scale finishing: Satin-chrome plated
- *1 With spindle lock
- *2 Made-to-order models

DIMENSIONS

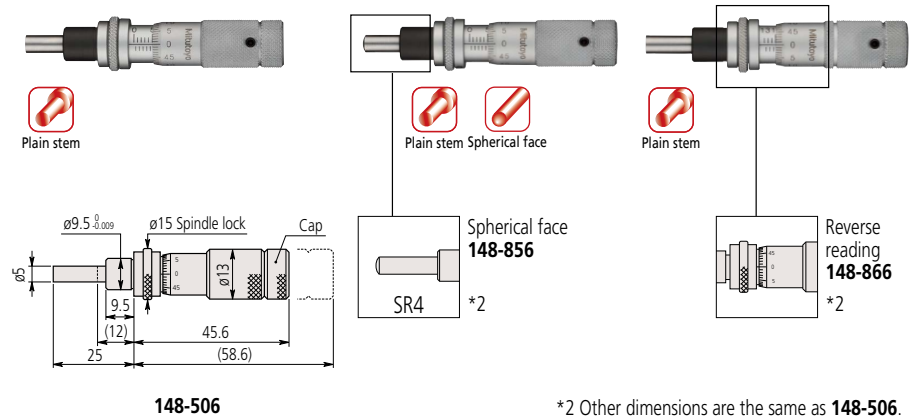
Plain Stem Mass: 35 g

Unit: mm



*1 Other dimensions are the same as 148-503.

Plain Stem and Spindle Lock Mass: 35 g

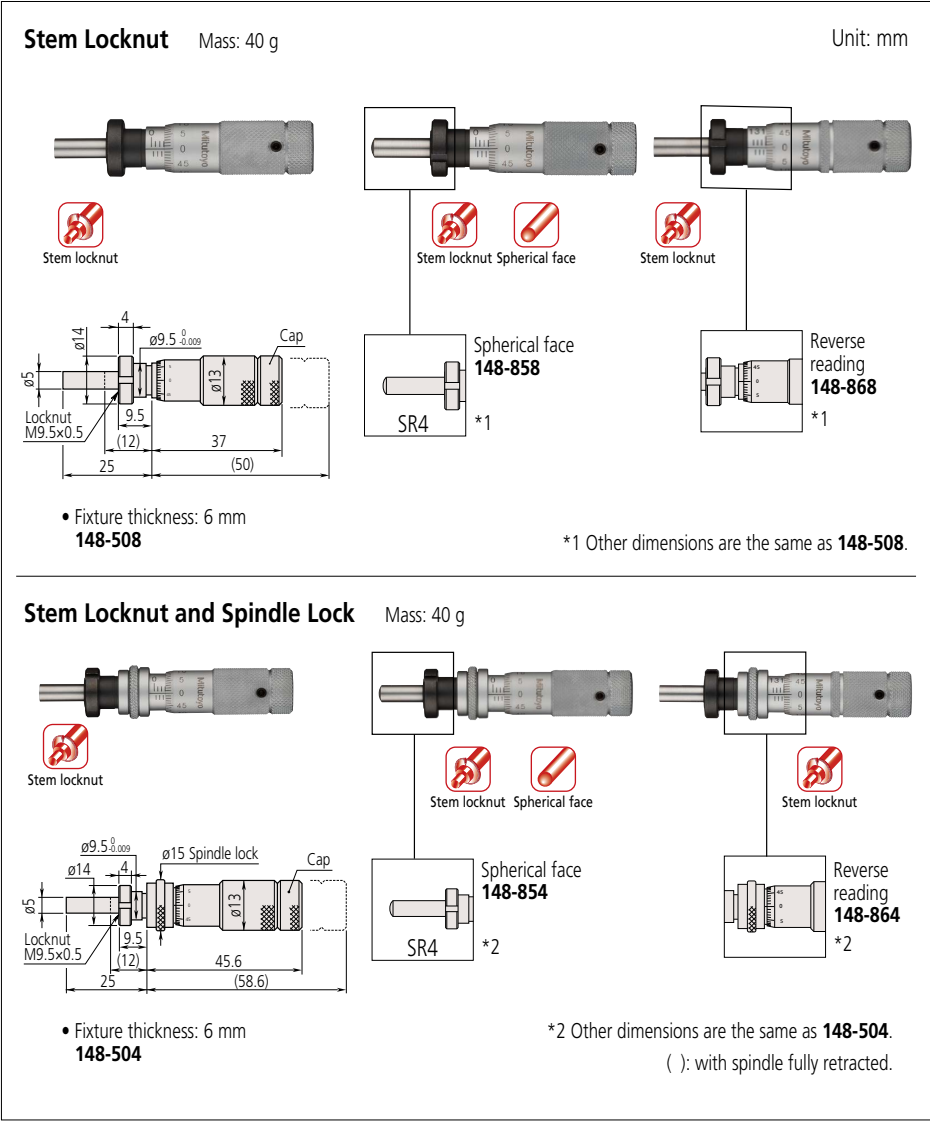


*2 Other dimensions are the same as 148-506.
(): with spindle fully retracted.

Micrometer Head

Micrometer Heads
SERIES 148 — Small Thimble Diameter Standard Type

DIMENSIONS



Micrometer Heads

SERIES 149 — Small Standard Type with Carbide-tipped Spindle

- Carbide-tipped spindle provides high abrasion resistance.

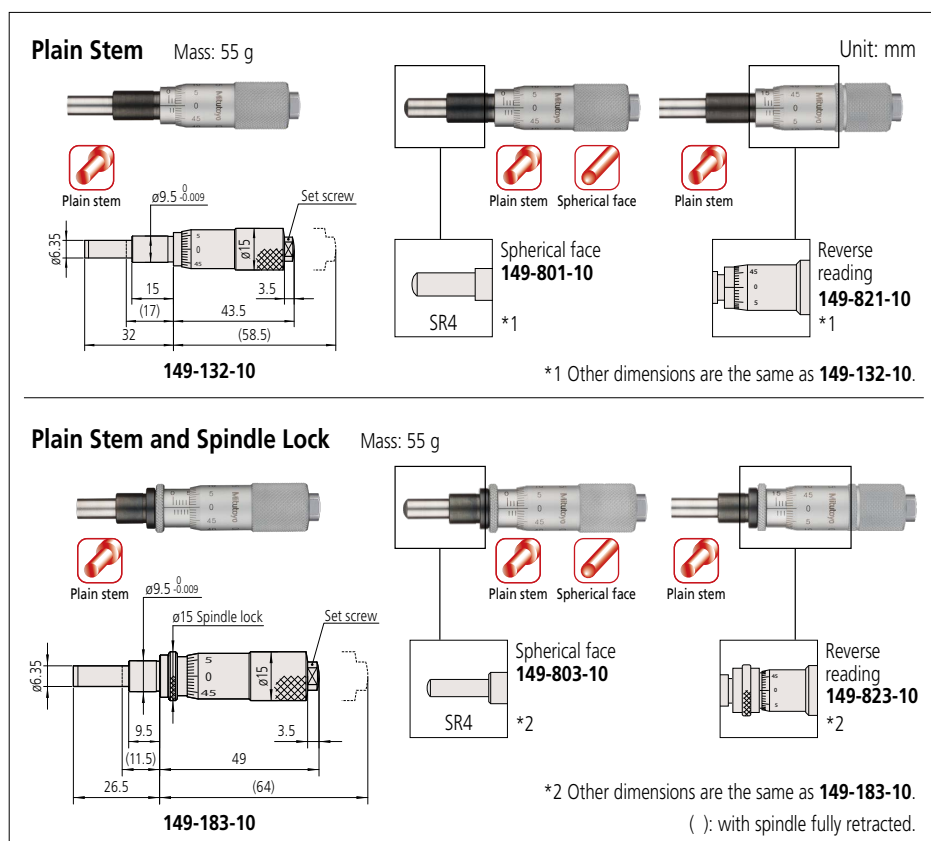
SPECIFICATIONS

Metric						
Code No.	Range (mm)	Maximum permissible error J_{MPE} (μm)	Stem dia. (mm)	Stem	Spindle end	Graduation features
149-132-10	0 - 15	±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		
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		
149-803-10* ²				Plain* ¹	Spherical (SR4) (carbide tip)	Standard
149-804-10* ²				W/clamp nut* ¹		
149-823-10* ²	Plain* ¹	Flat (carbide tip)	Reverse reading			
149-824-10* ²	W/clamp nut* ¹					

Inch						
Code No.	Range (in)	Maximum permissible error J_{MPE} (in)	Stem dia. (in)	Stem	Spindle end	Graduation features
149-148-10	0 - 0.5	±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		
149-811-10				Plain		
149-812-10				W/clamp nut		
149-831-10* ²				Plain	Spherical (SR4) (carbide tip)	Reverse reading
149-832-10* ²				W/clamp nut		
149-181* ²				Plain* ¹	Flat (carbide tip)	Standard
				W/clamp nut* ¹		

- Graduation: 0.01 mm or 0.001 in
- Spindle pitch: 0.5 mm or 0.025 in
- Measuring face: Material/Carbide tip, Hardness/90 HRA or more, Lapped
- Scale finishing: Satin-chrome plated
- *1 With spindle lock *2 Made-to-order models *3 W/ratchet (**149-181**) is available

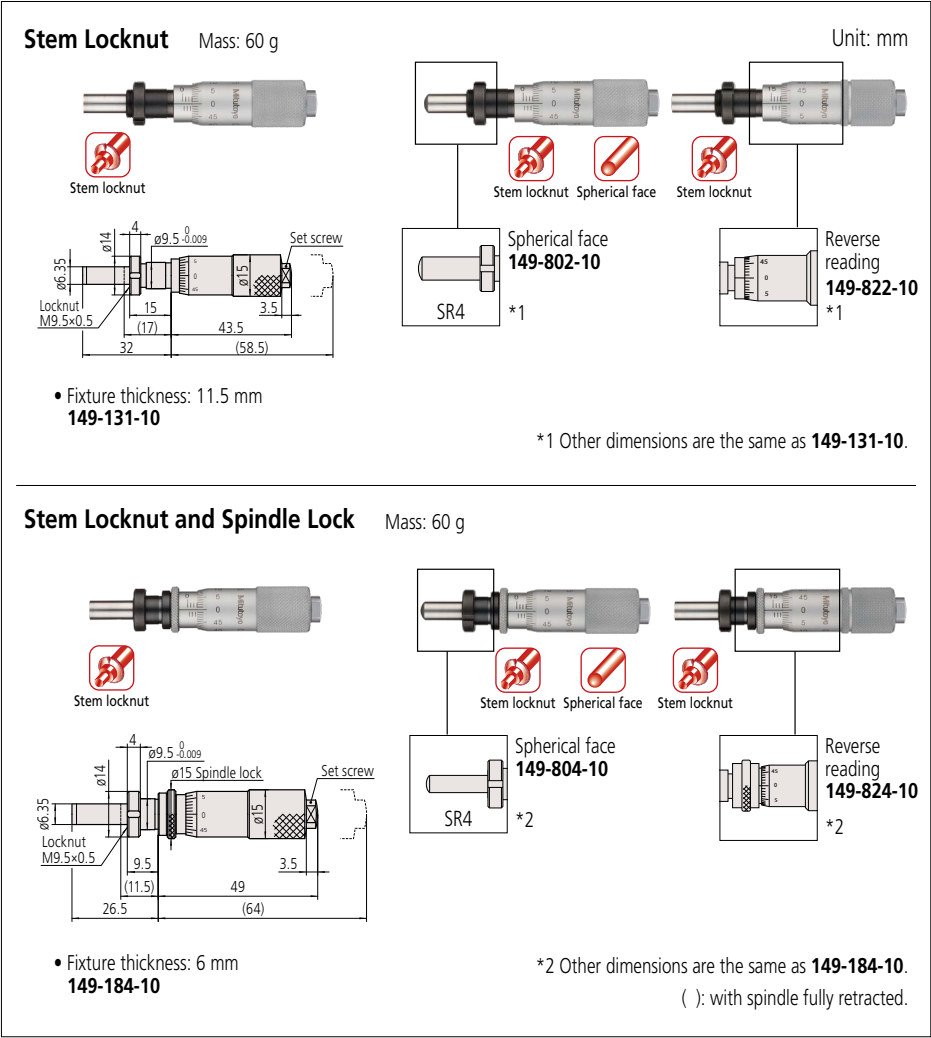
DIMENSIONS



Micrometer Head

Micrometer Heads
SERIES 149 — Small Standard Type
with Carbide-tipped Spindle

DIMENSIONS



Micrometer Heads SERIES 150 — Medium-sized Standard Type

- Measuring range: 25 mm

SPECIFICATIONS

Metric							
Code No.	Range (mm)	Maximum permissible error J_{MPE} (μm)	Stem dia. (mm)	Stem	Spindle end	Special features	
150-192	0 - 25	±2	10	Plain	Flat (carbide tip)	Standard	
150-191				W/clamp nut			
150-209				Plain* ¹			
150-210				W/clamp nut* ¹			
150-801				Plain	Spherical (SR4) (carbide tip)		
150-802				W/clamp nut			
150-821				Plain	Flat (carbide tip)		Reverse reading
150-822				W/clamp nut			
150-190				Plain			
150-189				W/clamp nut			
150-183* ²				Plain* ¹		W/vernier (0.001 mm)	
150-184				W/clamp nut* ¹			
150-196-10				Plain			
150-195-10				W/clamp nut			
150-211-10				Plain* ¹			W/o ratchet stop
150-212-10				W/clamp nut* ¹			
150-803* ²				Plain* ¹	Spherical (SR4) (carbide tip)	Standard	
150-804* ²				W/clamp nut* ¹			
150-823* ²				Plain* ¹	Flat (carbide tip)	Reverse reading	
150-824* ²				W/clamp nut* ¹			

- Graduation: 0.01 mm, 0.001 mm (w/vernier)
- 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
- Scale finishing: Satin-chrome plated
- *1 With spindle lock
- *2 Made-to-order models

Inch							
Code No.	Range (in)	Maximum permissible error J_{MPE} (in)	Stem dia. (in)	Stem	Spindle end	Special features	
150-208	0 - 1	± 0.0001	0.375	Plain	Flat (carbide tip)	Standard	
150-207				W/clamp nut			
150-213* ²				Plain* ¹			
150-214* ²				W/clamp nut* ¹			
150-811				Plain	Spherical (SR4) (carbide tip)		
150-812				W/clamp nut			
150-831				Plain	Flat (carbide tip)		Reverse graduation
150-832				W/clamp nut			
150-206				Plain		W/vernier (0.0001 in)	
150-205* ²				W/clamp nut			
150-215* ²				Plain* ¹			
150-216* ²				W/clamp nut* ¹			
150-198-10				Plain			W/o ratchet stop
150-197-10				W/clamp nut			
150-217* ²				Plain* ¹			
150-218* ²				W/clamp nut* ¹			

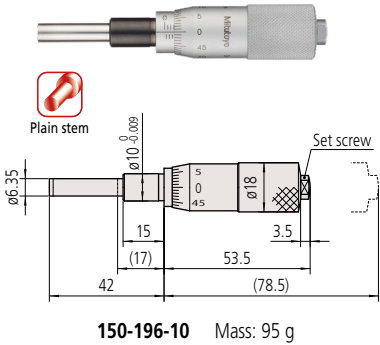
- Graduation: 0.001 in or 0.0001 in (w/vernier)
- Spindle pitch: 0.025 in
- Measuring face: Material/Carbide tip (Only long spindle model is alloy tool steel), Hardness/90 HRA or more (Only long spindle model is 60 HRC or more), Lapped
- Scale finishing: Satin-chrome plated
- *1 With spindle lock
- *2 Made-to-order models

Micrometer Head

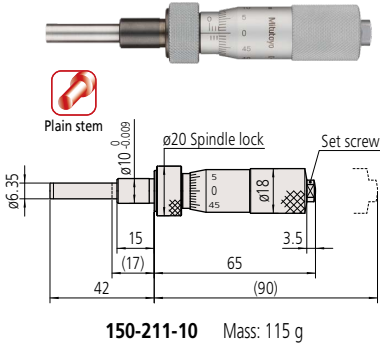
Micrometer Heads
SERIES 150 — Medium-sized Standard Type

DIMENSIONS

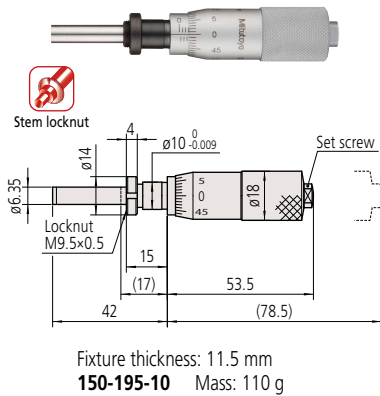
Plain Stem



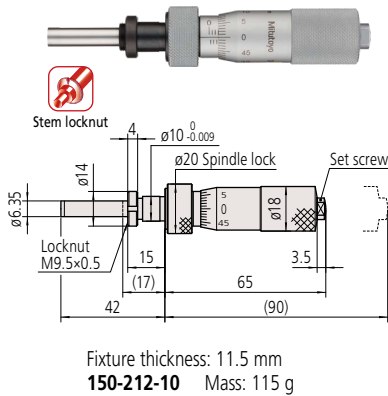
Plain Stem and Spindle Lock Unit: mm



Stem Locknut



Stem Locknut and Spindle Lock



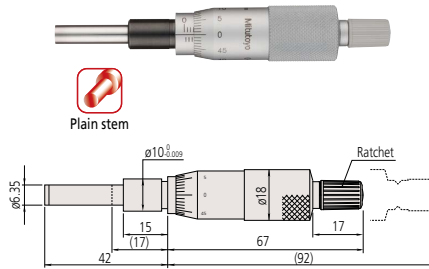
() : with spindle fully retracted.

DIMENSIONS

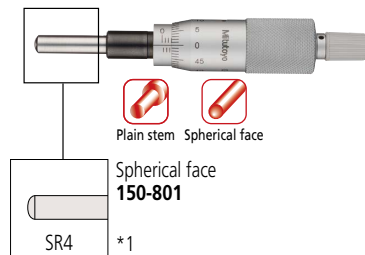
(): with spindle fully retracted.

Unit: mm

Plain Stem Mass: 95 g

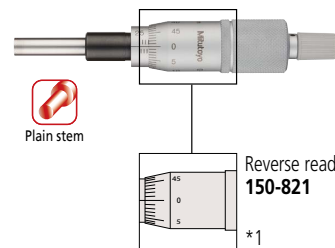


150-192



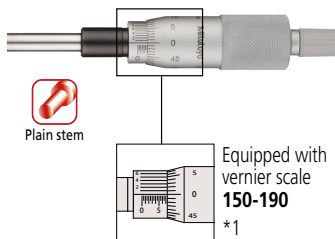
Plain stem Spherical face

Spherical face
150-801



Plain stem

Reverse reading
150-821

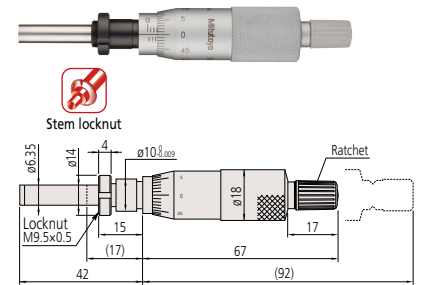


Plain stem

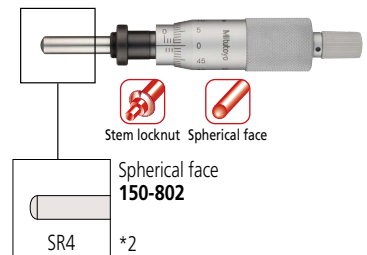
Equipped with
vernier scale
150-190

*1 Other dimensions are the same as **150-192**.

Stem Locknut Mass: 100 g

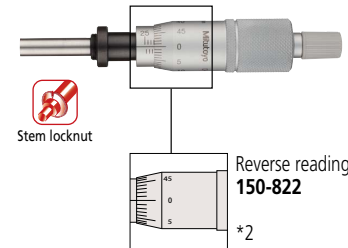


• Fixture thickness: 11.5 mm
150-191



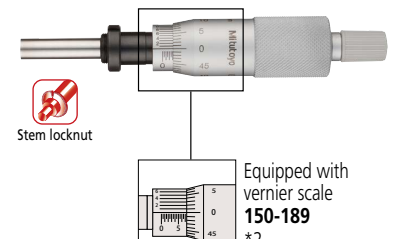
Stem locknut Spherical face

Spherical face
150-802



Stem locknut

Reverse reading
150-822



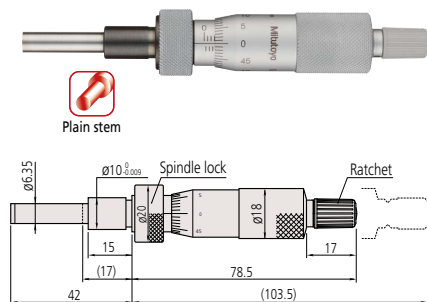
Stem locknut

Equipped with
vernier scale
150-189

*2 Other dimensions are the same as **150-191**.

DIMENSIONS

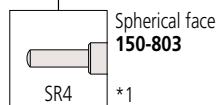
Mass: 110 g



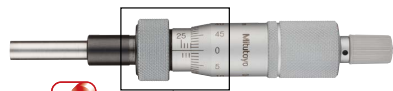
150-209



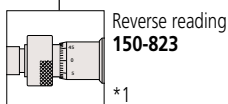
Plain stem Spherical face



Spherical face
150-803



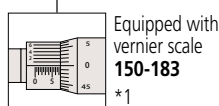
Plain stem



Reverse reading
150-823



Plain stem



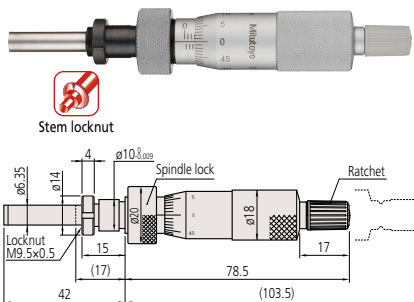
Equipped with
vernier scale
150-183

*1 Other dimensions are the same as **150-209**.

(): with spindle fully retracted.

Unit: mm

Mass: 115 g

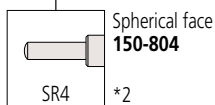


- Fixture thickness: 11.5 mm

150-210



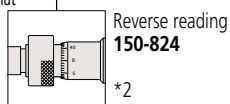
Stem locknut Spherical face



Spherical face
150-804



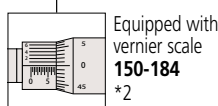
Stem lock



Reverse reading
150-824



Stem lock



Equipped with
vernier scale
150-184

*2 Other dimensions are the same as **150-210**.

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).

SPECIFICATIONS

Metric						
Code No.	Range (mm)	Maximum permissible error J_{MPE} (μm)	Stem dia. (mm)	Stem	Spindle end	Special features
151-224	0 - 25	±2	12	Plain	Flat (carbide tip)	—
151-223				W/clamp nut		
151-214* ²				Plain* ¹		
151-213* ²				W/clamp nut* ¹		
151-222				Plain		W/vernier (0.001 mm)
151-221				W/clamp nut		
151-212* ²				Plain* ¹		
151-211* ²				W/clamp nut* ¹		
151-227-10				Plain		W/o ratchet stop
151-228-10				W/clamp nut		
151-225-10				Plain* ¹		
151-226-10				W/clamp nut* ¹		
151-256	0 - 50	±4		Plain		—
151-255				W/clamp nut		W/o ratchet stop
151-260-10				Plain		
151-259-10				W/clamp nut		W/o ratchet stop

- Graduation: 0.01 mm, 0.001 mm (w/vernier)
- Spindle pitch: 0.5 mm
- Measuring face: Material/Carbide tip, Hardness/90 HRA or more, Lapped
- Scale finishing: Satin-chrome plated
- *1 With spindle lock
- *2 Made-to-order models

Inch						
Code No.	Range (in)	Maximum permissible error J_{MPE} (in)	Stem dia. (in)	Stem	Spindle end	Special features
151-240	0 - 1	±0.0001	0.5	Plain	Flat (carbide tip)	—
151-239				W/clamp nut		
151-238				Plain		W/vernier (0.0001 in)
151-237				W/clamp nut		
151-241-10* ²				Plain* ¹		W/o ratchet stop
151-242-10* ²				W/clamp nut* ¹		
151-243-10* ²				Plain* ¹		W/o ratchet stop (0.0001 in)
151-244-10* ²				W/clamp nut* ¹		
151-272	0 - 2	±0.0002		Plain		—
151-271				W/clamp nut		

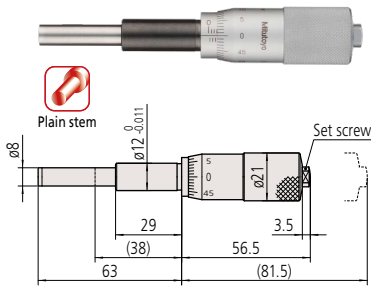
- Graduation: 0.001 in or 0.0001 in (w/vernier)
- Spindle pitch: 0.025 in
- Measuring face: Material/Carbide tip, Hardness/90 HRA or more, Lapped
- Scale finishing: Satin-chrome plated
- *1 With spindle lock
- *2 Made-to-order models

Micrometer Head

Micrometer Heads
SERIES 151 — Medium-sized Standard Type
with 8 mm Diameter Spindle

DIMENSIONS

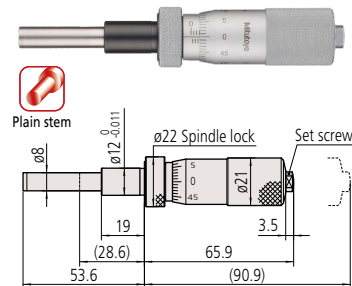
Plain Stem



151-227-10 Mass: 150 g

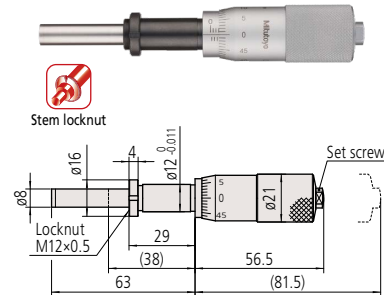
Plain Stem and Spindle Lock

Unit: mm



151-225-10 Mass: 165 g

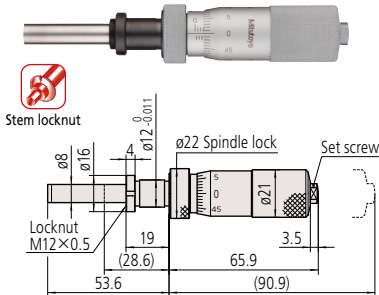
Stem Locknut



- Fixture thickness: 25.5 mm

151-228-10 Mass: 155 g

Stem Locknut and Spindle Lock



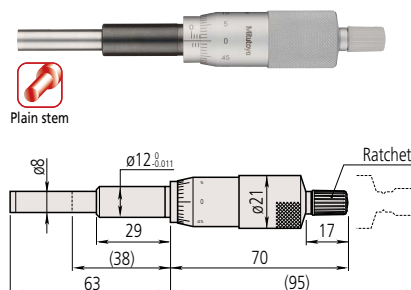
- Fixture thickness: 15.5 mm

151-226-10 Mass: 165 g

() : with spindle fully retracted.

DIMENSIONS

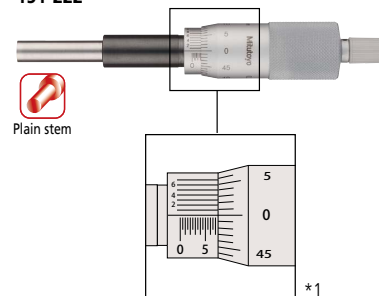
Plain Stem



151-224 Mass: 150 g

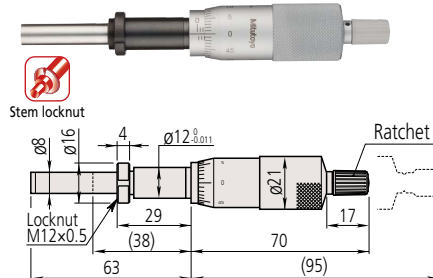
Equipped with vernier scale
151-222

Unit: mm



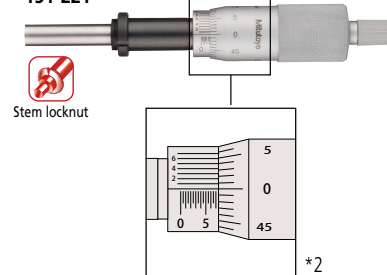
*1 Other dimensions are the same as **151-224**.

Stem Locknut



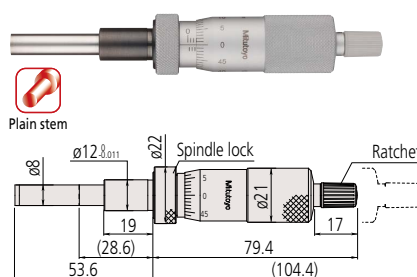
• Fixture thickness: 25.5 mm
151-223 Mass: 155 g

Equipped with vernier scale
151-221



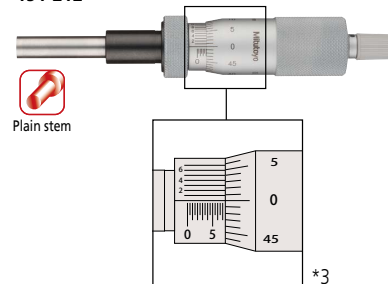
*2 Other dimensions are the same as **151-223**.

Stem Locknut and Spindle Lock



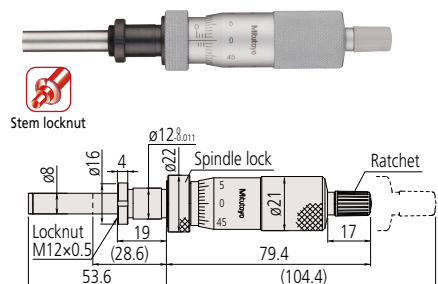
151-214 Mass: 160 g

Equipped with vernier scale
151-212



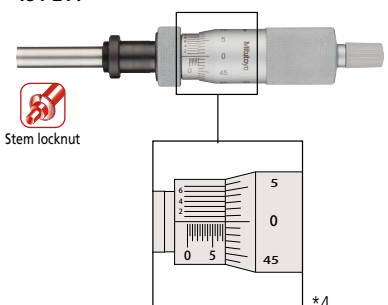
*3 Other dimensions are the same as **151-214**.

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.

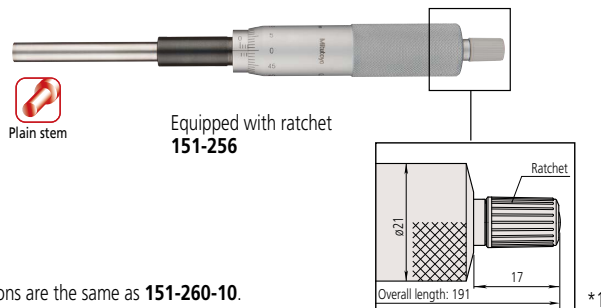
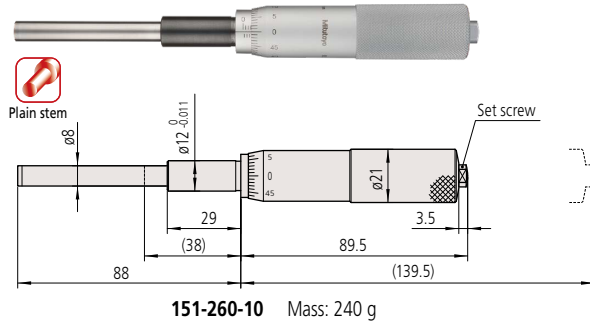
Micrometer Head

Micrometer Heads SERIES 151 — Medium-sized Standard Type with 8 mm Diameter Spindle

DIMENSIONS

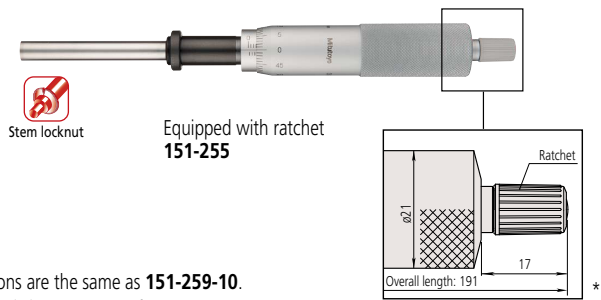
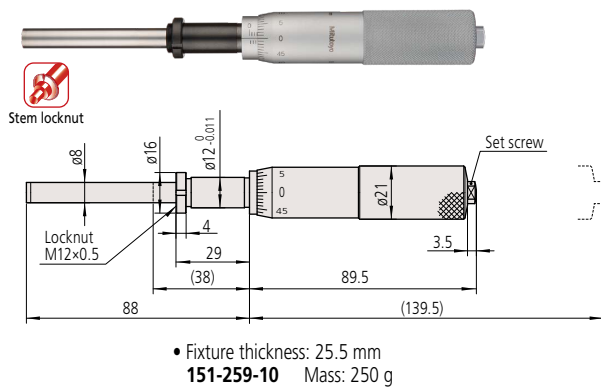
Plain Stem

Unit: mm



*1 Other dimensions are the same as 151-260-10.

Stem Locknut



*2 Other dimensions are the same as 151-259-10.
() : with spindle fully retracted.

Secure spindle



Locking screw



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.

SPECIFICATIONS

Metric

Code No.	Range (mm)	Graduation (mm)	Stem dia. (mm)	Stem	Spindle end	Graduation features	Maximum permissible error J_{MPE} (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		Standard	±2		
148-151-10				W/clamp nut						
148-152-10				Plain	Spherical (SR4)					
148-153-10				W/clamp nut						
148-316-10	0 - 6.5			Plain	Flat				Standard	±2
148-317-10				W/clamp nut						
148-318-10				Plain	Spherical (SR4)					
148-319-10				W/clamp nut						

- Measuring face: Material/Alloy tool steel, Hardness/60 HRC or more, Lapped
- Scale finishing: Satin-chrome plated

Inch

Code No.	Range (in)	Graduation (in)	Stem dia. (in)	Stem	Spindle end	Graduation features	Maximum permissible error J_{MPE} (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			
148-162-10				Plain	Spherical (SR4)		
148-163-10				W/clamp nut			
148-326-10	0 - 0.25			Plain	Flat		
148-327-10				W/clamp nut			
148-328-10				Plain	Spherical (SR4)		
148-329-10				W/clamp nut			

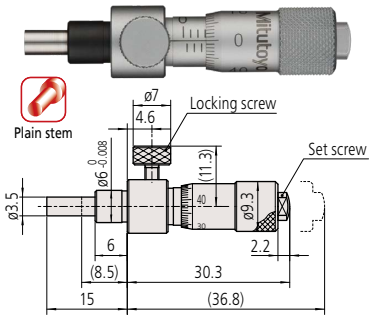
- Measuring face: Material/Alloy tool steel, Hardness/60 HRC or more, Lapped
- Scale finishing: Satin-chrome plated

Micrometer Head

Micrometer Heads
SERIES 148 — Locking-screw Type

DIMENSIONS

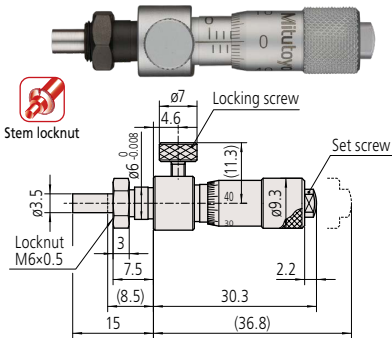
Plain Stem



148-220-10 Mass: 16 g

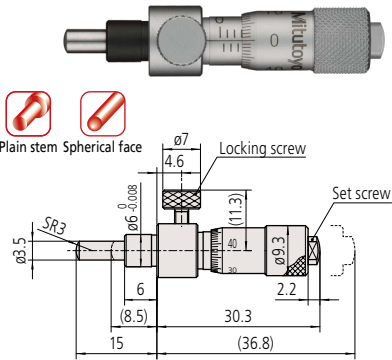
Stem Locknut

Unit: mm



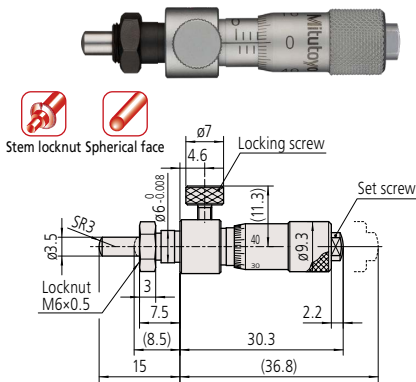
• Fixture thickness: 4 mm
148-221-10 Mass: 17 g

Plain Stem



Spherical face (SR3)
148-222-10 Mass: 16 g

Stem Locknut

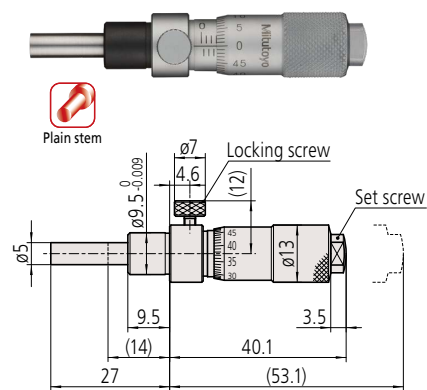


Spherical face (SR3) • Fixture thickness: 4 mm
148-223-10 Mass: 17 g

() : with spindle fully retracted.

DIMENSIONS

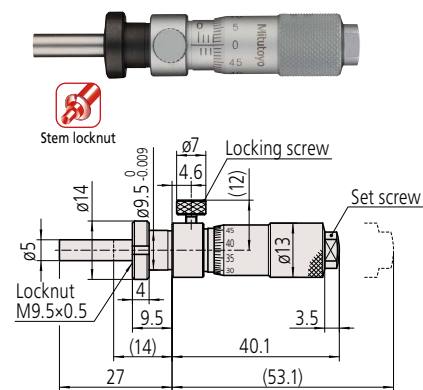
Plain Stem



148-150-10 Mass: 40 g

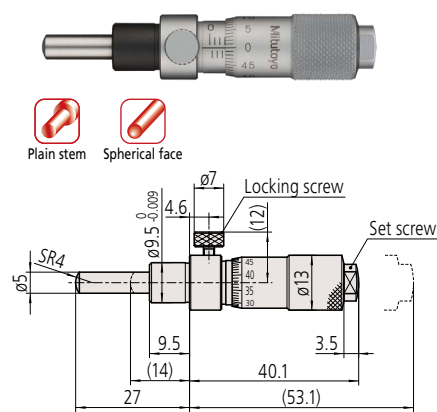
Stem Locknut

Unit: mm



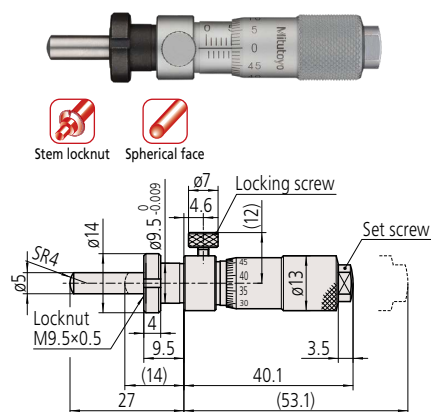
• Fixture thickness: 6 mm
148-151-10 Mass: 43 g

Plain Stem



Spherical face (SR4)
148-152-10 Mass: 40 g

Stem Locknut

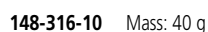


Spherical face (SR4) • Fixture thickness: 6 mm
148-153-10 Mass: 43 g

(): with spindle fully retracted.

Micrometer Heads SERIES 148 — Locking-screw Type

Plain Stem



Stem Locknut

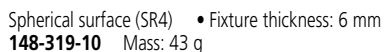
Unit: mm



Plain Stem



Stem Locknut



(): with spindle fully retracted.

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

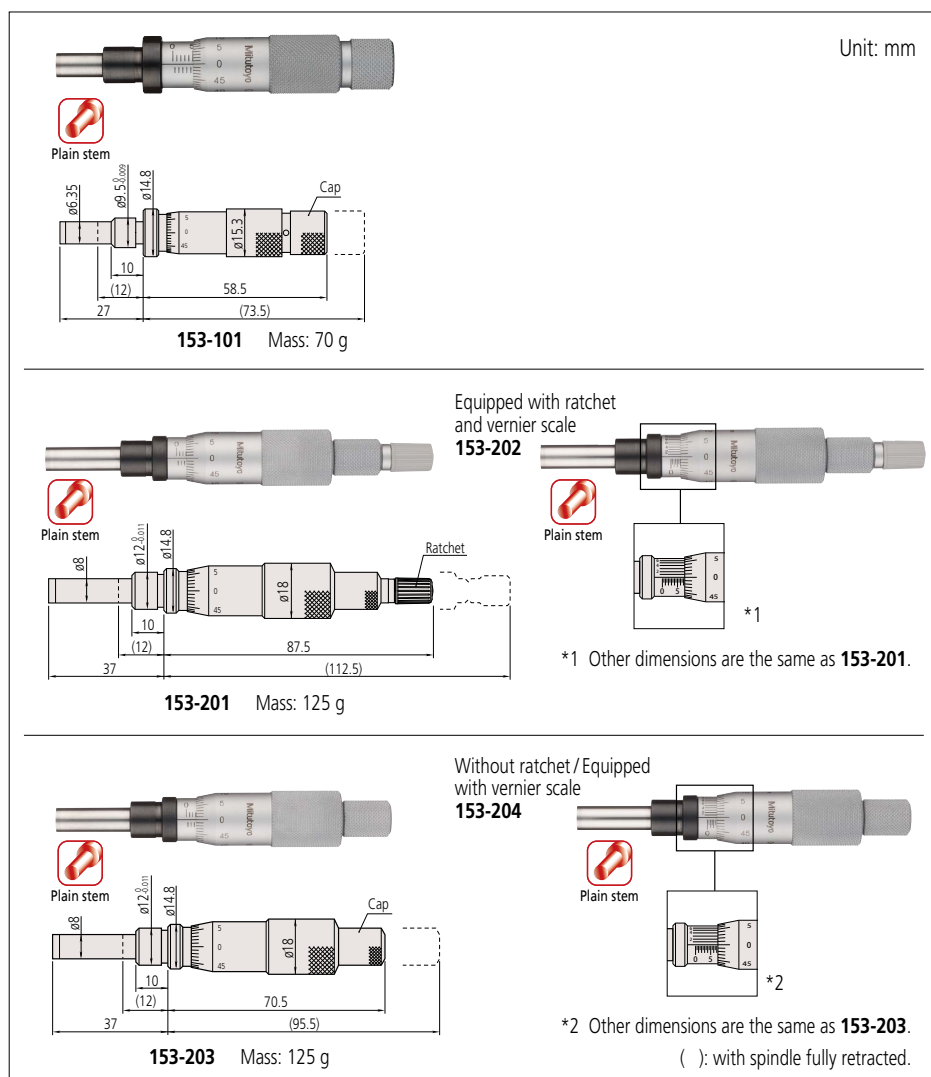
Metric								
Code No.	Range (mm)	Graduation (mm)	Graduation features	Stem dia. (mm)	Stem	Spindle end	Spindle pitch (mm)	Maximum permissible error J_{MPE} (μm)
153-101	0 - 15	0.01	Standard	9.5	Plain	Flat (carbide tip)	0.5	±3
153-201*1	0 - 25	0.001	W/vernier (0.001 mm)	12				
153-202*1		0.01	Standard					
153-203		0.001	W/vernier (0.001 mm)					
153-204								
Inch								
Code No.	Range (in)	Graduation (in)	Special features	Stem dia. (in)	Stem	Spindle end	Spindle pitch (in)	Maximum permissible error J_{MPE} (in)
153-108*2	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	0.0001	Standard	0.5				
153-206*1		0.001	W/vernier (0.0001 in)					
153-207		0.001	Standard					
153-208		0.0001	W/vernier (0.0001 in)					

• Measuring face: Material/Carbide tip, Hardness/90 HRA or more, Lapped

• Scale finishing: Satin-chrome plated

*1 With ratchet stop *2 Made-to-order model

DIMENSIONS



Micrometer Head

Micrometer Heads
SERIES 152 — Quick Spindle Feed of 1 mm/rev

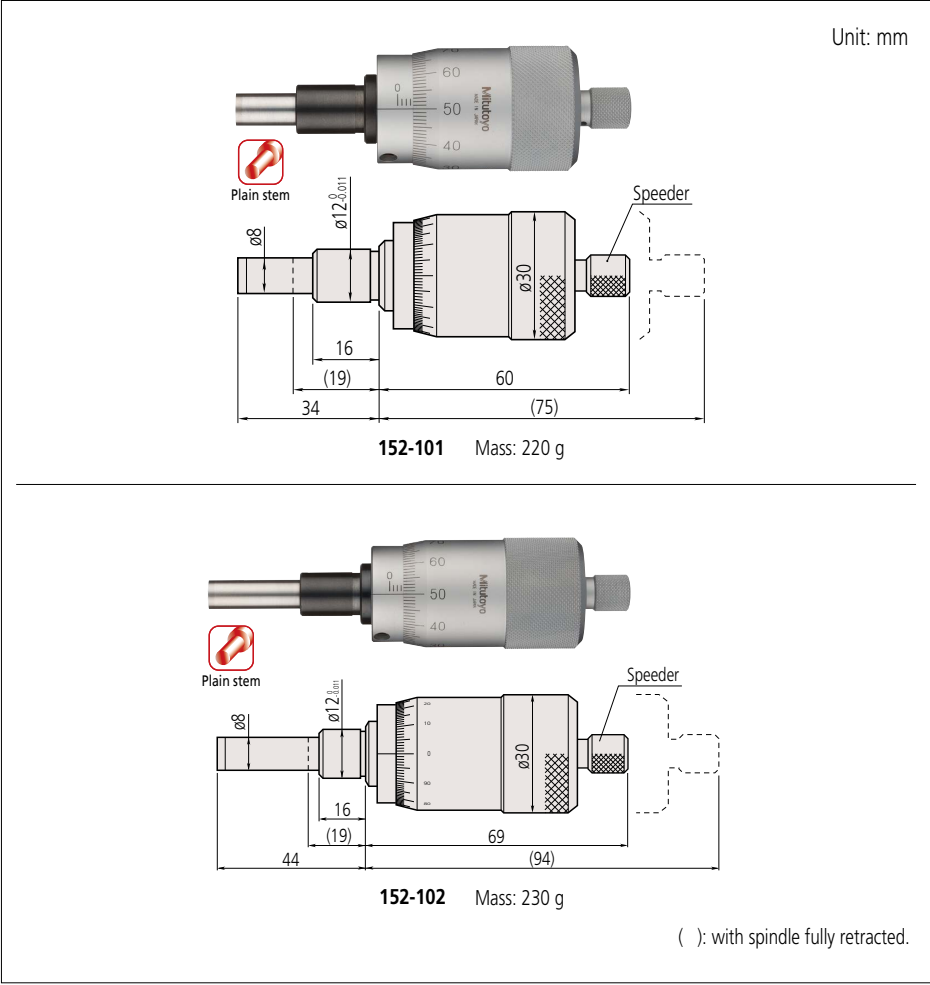
- This model enables double-speed spindle feeding of 1 mm/rev (compared with 0.5 mm/rev on typical products) to enable quick positioning.
- It also has a good load-bearing capacity.

SPECIFICATIONS

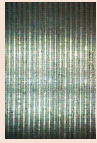
Metric							
Code No.	Range (mm)	Graduation (mm)	Stem dia. (mm)	Stem	Spindle end	Spindle pitch (mm)	Maximum permissible error J_{MPE} (μm)
152-101	0 - 15	0.01	12	Plain	Flat (carbide tip)	1	±2
152-102	0 - 25						

- Measuring face: Material/Carbide tip, Hardness/90 HRA or more, Lapped
- Scale finishing: Satin-chrome plated

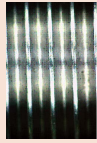
DIMENSIONS



Spindle Pitch



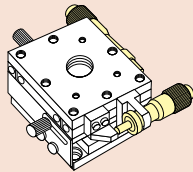
Pitch=0.1 mm



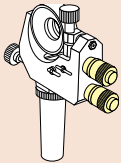
Pitch=0.5 mm

Typical Applications

- Semiconductor-wafer positioning machinery and optical component alignment units, etc.
- Precision X-Y table positioning



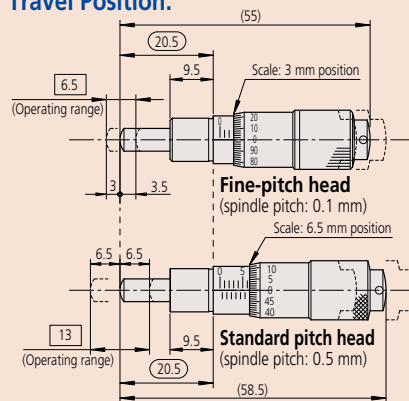
- Precision adjustment of mirror in holder



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

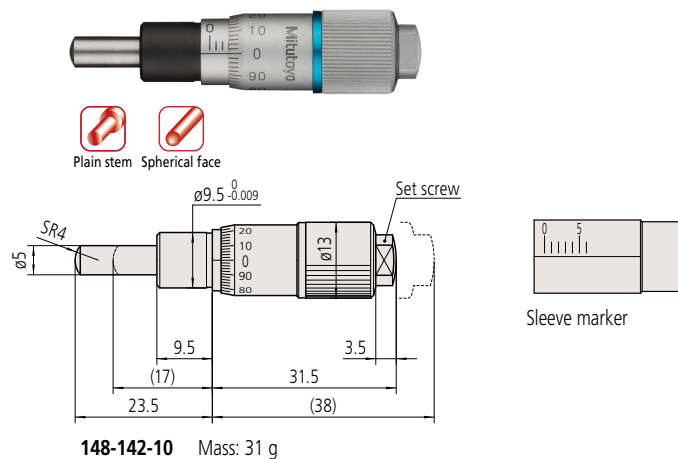
Metric								
Code No.	Range (mm)	Graduation (mm)	Stem dia. (mm)	Stem	Spindle end	Spindle pitch (mm)	Maximum permissible error J_{MPE} (μm)	Special features
148-142-10	0 - 6.5	0.002	9.5	Plain	Spherical (SR4)	0.1	±2	—
148-143-10				W/clamp nut				
148-342-10				Plain				
148-343-10			W/clamp nut	6	Spherical (SR3)			
148-242-10			Plain					
148-243-10	W/clamp nut							
148-244	0 - 5	0.004	3.5	Plain	Spherical (SR1.5)	±5	Small thimble diameter	
148-245				W/clamp nut				

- Measuring face: Material/Alloy tool steel, Hardness/60 HRC or more, Lapped
- Scale finishing: Satin-chrome plated

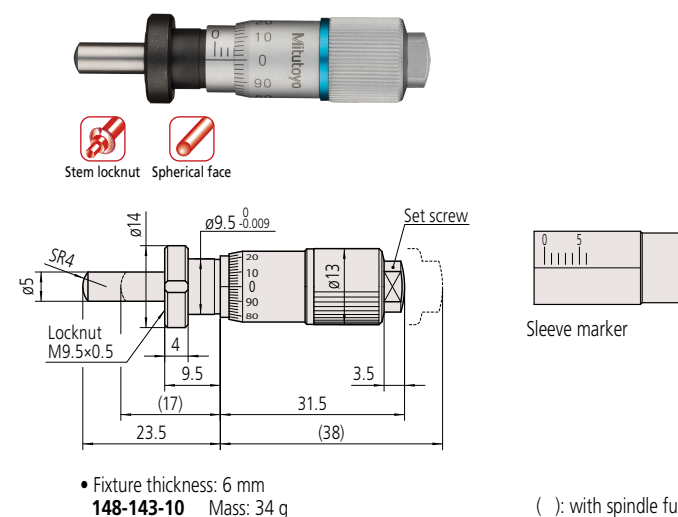
DIMENSIONS

Plain Stem

Unit: mm



Stem Locknut



- Fixture thickness: 6 mm
- 148-143-10 Mass: 34 g

(): with spindle fully retracted.

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

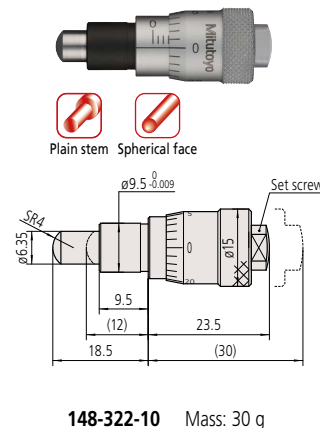
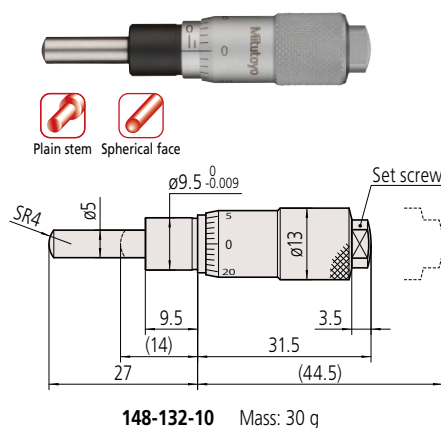
Metric							
Code No.	Range (mm)	Graduation (mm)	Stem dia. (mm)	Stem	Spindle end	Spindle pitch (mm)	Maximum permissible error J_{MPE} (μm)
148-132-10	0 - 13	0.01	9.5	Plain	Spherical (SR4)	0.25	± 2
148-133-10				W/clamp nut			
148-322-10	0 - 6.5	0.01	9.5	Plain	Spherical (SR4)	0.25	± 2
148-323-10				W/clamp nut			

- Measuring face: Material/Alloy tool steel, Hardness/60 HRC or more, Lapped
- Scale finishing: Satin-chrome plated

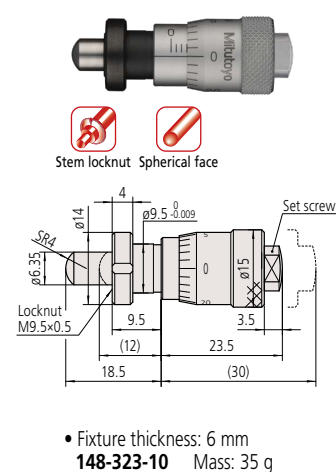
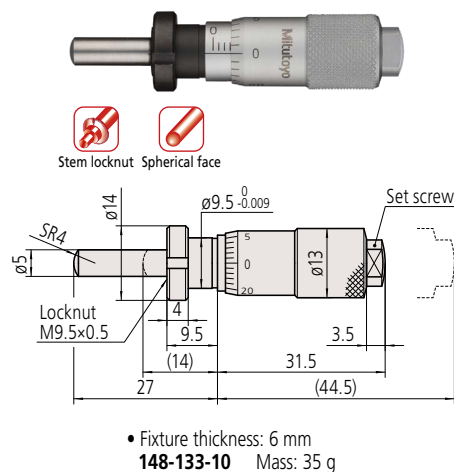
DIMENSIONS

Plain Stem

Unit: mm



Stem Locknut



(): 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 (0.05 mm/rev), resulting in high-resolution measurements.

SPECIFICATIONS

Metric				
Code No.	Range (mm)		Graduation (mm)	
110-101	0 - 2.5		0.001	
110-102			0.0001	
110-105-10	0 - 1		0.001	
110-106-10			0.0001	
110-107-10			0.001	
110-108-10			0.0001	
110-502-10	Thimble (fine)	0 - 0.2	Thimble (fine)	0.0005
	Thimble (coarse)	0 - 13	Thimble (coarse)	0.01

Code No.	Stem dia. (mm)	Stem	Spindle end	Maximum permissible error J_{MPE}^{*2} (μm)
110-101	12	W/clamp nut	Flat (carbide tip)	±5/±1.5
110-102				±3/±1.5
110-105-10			Spherical (SR10) (carbide tip)	
110-106-10				
110-107-10			Spherical	
110-108-10	±3/±1.5			
110-502-10	9.5		Spherical	±3/±1.5

Inch				
Code No.	Range (in)		Graduation (in)	
110-111	0 - 0.05		0.00002	
110-112			0.000005	
110-115-10*1	0 - 0.02		0.00002	
110-116-10*1			0.000005	
110-117-10*1			0.00002	
110-118-10*1			0.000005	
110-504-10	Thimble (fine)	0 - 0.006	Thimble (fine)	0.00002
	Thimble (coarse)	0 - 0.5	Thimble (coarse)	0.001

Code No.	Stem dia. (in)	Stem	Spindle end	Maximum permissible error J_{MPE}^{*2} (in)
110-111	0.5	W/clamp nut	Flat (carbide tip)	±0.00025/±0.00006
110-112				±0.00015/±0.00006
110-115-10 ^{*1}			Spherical (SR10) (carbide tip)	
110-116-10 ^{*1}				
110-117-10 ^{*1}			±0.00015/±0.00006	
110-118-10 ^{*1}	0.375			±0.00015/±0.00006
110-504-10				

- 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

- Scale finishing: Satin-chrome plated

*1 Made-to-order models

*2 Wide range/narrow range

DIMENSIONS

Unit: mm

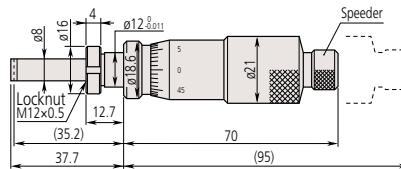
- Differential movement mechanism with double spindle.
- Non-rotating spindle.
- Fixture thickness: 9.5 mm



Equipped with vernier scale



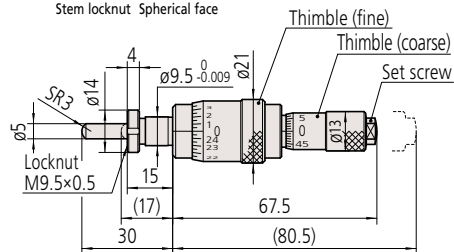
Stem locknut

**110-101****110-102** Equipped with vernier scale

- Dual thimble
- Fixture thickness: 11.5 mm



Stem locknut Spherical face

**110-502-10** Mass: 95 g

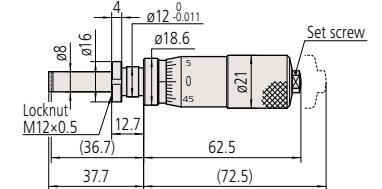
- Differential movement mechanism with double spindle.
- Non-rotating spindle.
- Fixture thickness: 9.5 mm



Equipped with vernier scale



Stem locknut

**110-105-10****110-106-10** Equipped with vernier scale Mass: 150 g

Spherical face



Equipped with vernier scale



SR10 Stem locknut Spherical face

110-107-10**110-108-10** Equipped with vernier scale

(): with spindle fully retracted.

Micrometer Head

Micrometer Heads
SERIES 152 — Large Thimble Type

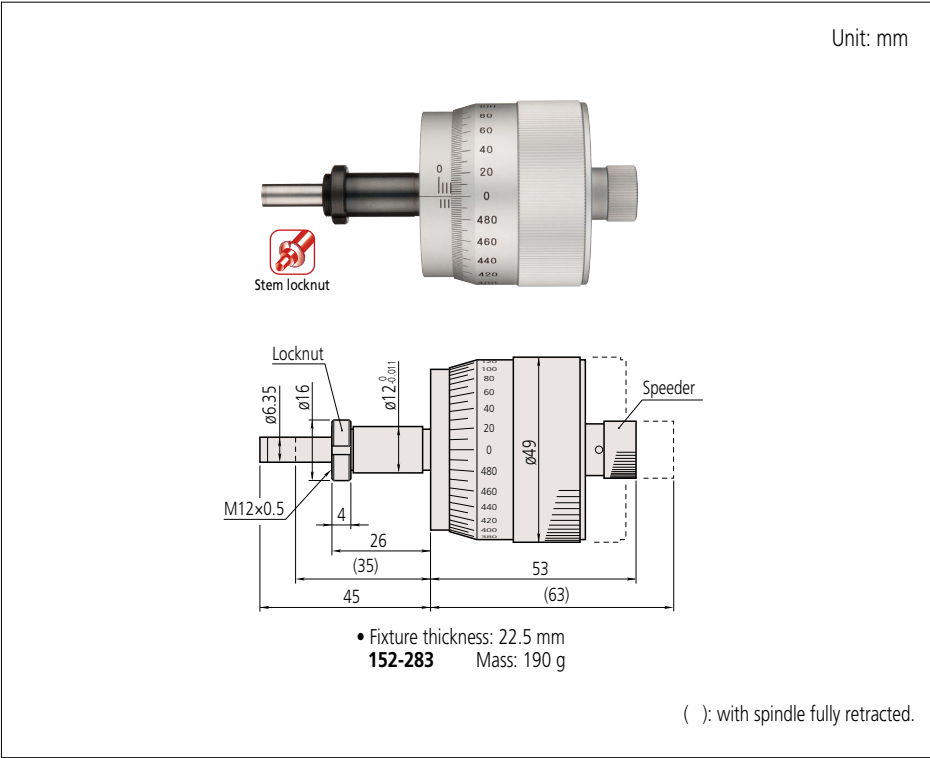
- Large-diameter thimble for fine adjustment and positioning.

SPECIFICATIONS

Metric								
Code No.	Range (mm)	Graduation (mm)	Graduation features	Stem dia. (mm)	Stem	Spindle end	Spindle pitch (mm)	Maximum permissible error <i>J</i> MPE (μm)
152-283	0 - 10	0.002	Standard	12	W/clamp nut	Flat (carbide tip)	0.5	±2
152-332	0 - 25		Bidirectional		Plain			±4
152-380	0 - 50							

- Measuring face: Material/Carbide tip, Hardness/90 HRA or more, Lapped
- Scale finishing: White anodized aluminum

DIMENSIONS

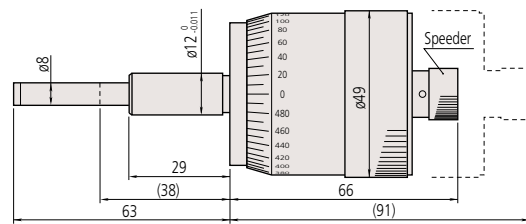


DIMENSIONS

Unit: mm



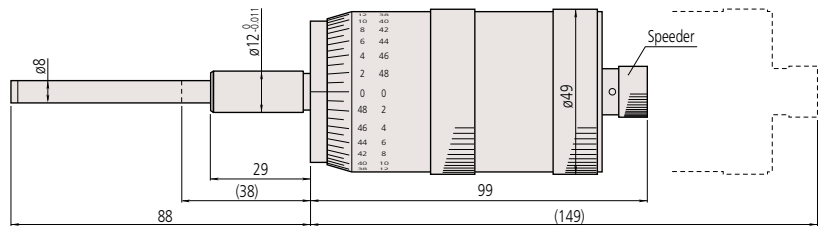
 Plain stem



152-332 Mass: 310 g



 Plain stem



152-380 Mass: 460 g

(): with spindle fully retracted.

Micrometer Head

Micrometer Heads
SERIES 152 — XY-Stage Type

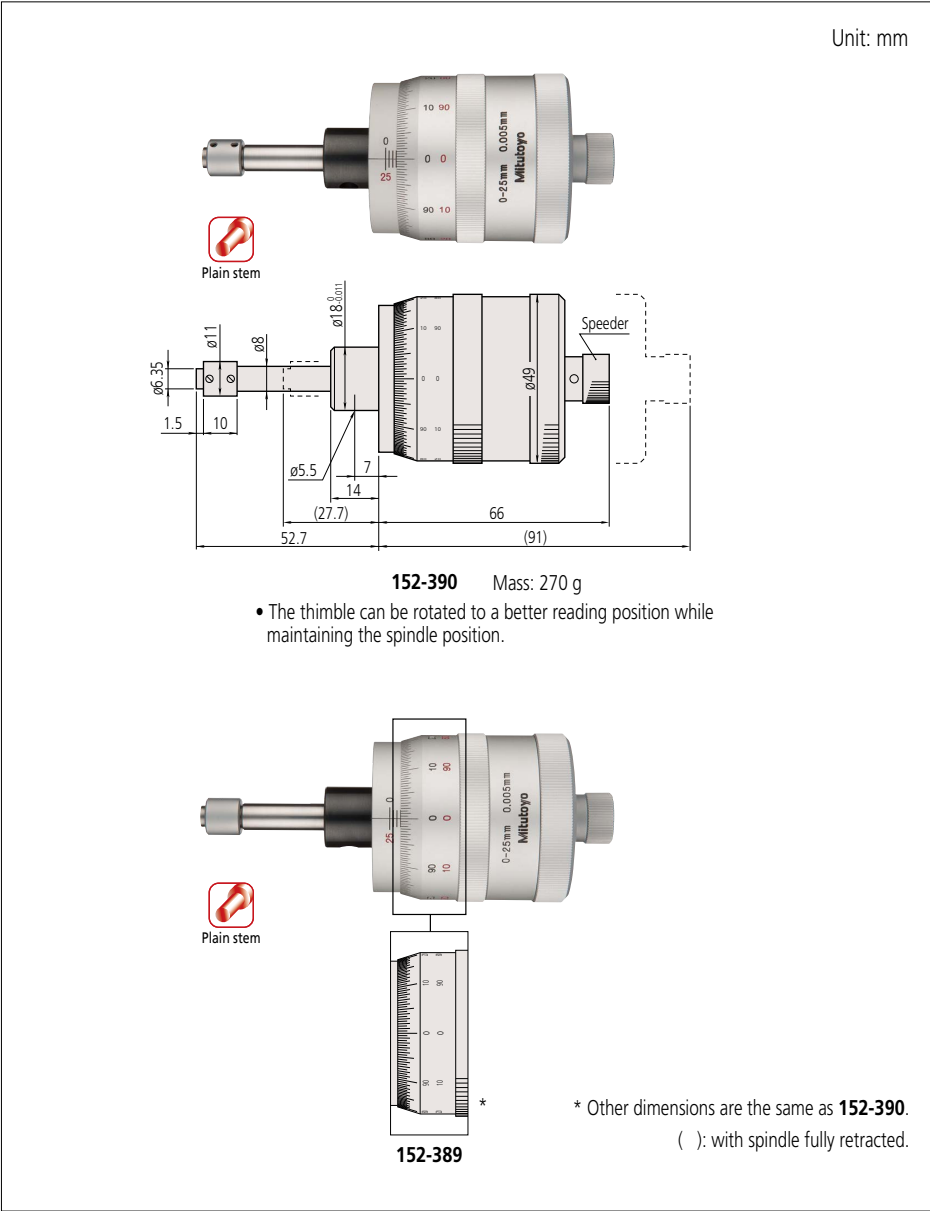
- Designed for cross-travel stage translation in the X and Y axes. Bidirectional graduation for easy reading in both directions.

SPECIFICATIONS

Metric							
Code No.	Range (mm)	Graduation (mm)	Graduation features	Stem dia. (mm)	Stem	Spindle pitch (mm)	Maximum permissible error J_{MPE} (μm)
152-390	0 - 25	0.005	for Y axis, bidirectional	18	Plain	1	±2
152-389							

- 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

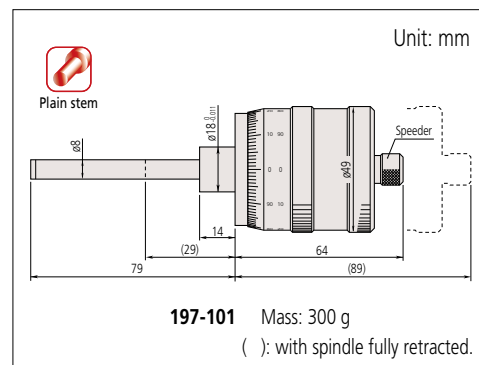


Micrometer Heads SERIES 197 — Long Stroke Non-rotating Spindle

- 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.



DIMENSIONS



SPECIFICATIONS

Metric									
Code No.	Range	Graduation	Graduation features	Stem dia.	Stem	Spindle end	Spindle pitch	Maximum permissible error J_{MPE}	
197-101	0 - 50 mm	0.005 mm	Bidirectional	18 mm	Plain	Flat (carbide tip)	1 mm	$\pm 5 \mu m$	

Inch									
Code No.	Range	Graduation	Graduation features	Stem dia.	Stem	Spindle end	Spindle pitch	Maximum permissible error J_{MPE}	
197-201	0 - 2 in	0.0002 in	Bidirectional	0.709 in	Plain	Flat (carbide tip)	0.05 in	± 0.0001 in	

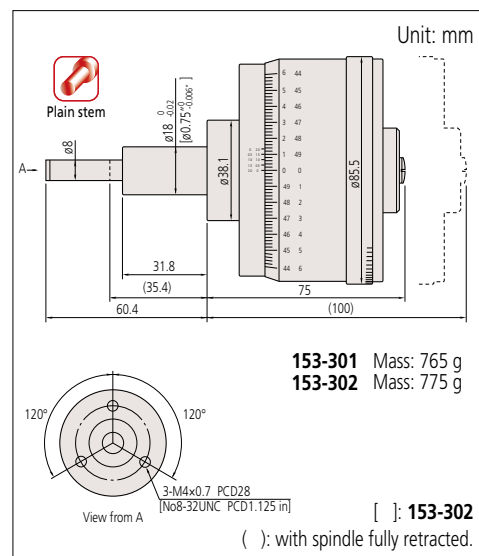
- Measuring face: Material/Carbide tip, Hardness/90 HRA or more, Lapped
- Scale finishing: White anodized aluminum

Micrometer Heads SERIES 153 — High Accuracy and Resolution

- Fine graduation and high accuracy model, suitable for inspection equipment.
- Non-rotating spindle type.



DIMENSIONS



SPECIFICATIONS

Metric									
Code No.	Range	Graduation	Graduation features	Stem dia.	Stem	Spindle end	Spindle pitch	Maximum permissible error J_{MPE}^*	
153-301	0 - 25 mm	0.0005 mm (vernier)	Bidirectional	18 mm	Plain	Flat (carbide tip)	0.5 mm	$\pm 1 / \pm 0.5 \mu m$	

Inch									
Code No.	Range	Graduation	Graduation features	Stem dia.	Stem	Spindle end	Spindle pitch	Maximum permissible error J_{MPE}^*	
153-302	0 - 1 in	0.00001 in (vernier)	Bidirectional	0.75 in	Plain	Flat (carbide tip)	0.025 in	± 0.00005 in / ± 0.00003 in	

- Measuring face: Material/Carbide tip, Hardness/90 HRA or more, Lapped
- Scale finishing: White anodized aluminum
- * Wide range/narrow range

03

Micrometer Heads

- 
- 250-30

250-301

Inch								
Code No.	Range (in)	Graduation (in)	Stem dia. (in)	Stem	Spindle end	Spindle pitch (in)	Graduation features	Maximum permissible error J_{MPE} (in)
250-312	0 - 1	0.0001	0.375	Plain	Flat (carbide tip)	0.025	Vernier scale	$\pm .0001$

-
- Technical drawing of the 250-301 tool, showing dimensions and labels. The drawing includes a side view of the tool with a spindle lock and a ratchet. Dimensions are given in mm. The tool has a plain stem with a diameter of $\phi 6.35$ and a length of 42 mm. The main body has a diameter of $\phi 10_{-0.009}^0$ and a length of 15 mm. The spindle lock has a diameter of $\phi 18$ and a length of 26.8 mm. The ratchet has a length of 93.8 mm. The total length of the tool is 118.8 mm. A label '250-301' is shown below the drawing, along with the mass 'Mass: 165 g' and a note '(): with spindle fully retracted.'
- Unit: mm
- 250-301 Mass: 165 g (): with spindle fully retracted.

Optional Accessories

- 
- A Mitutoyo 7850 Depth Gauge is shown. It features a stainless steel body with a depth rod and a base. The scale is marked in inches (0 to 10) and millimeters (0 to 100). The brand name "Mitutoyo" is visible on the scale.

7850

[illegible]

A hand in a white glove is shown adjusting a dial on a large, dark, rectangular object, likely a piece of scientific equipment. The object has a textured, dark surface and is supported by two cylindrical stands. A small, rectangular, metallic component is placed on top of the object. The background is a solid blue color.

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.

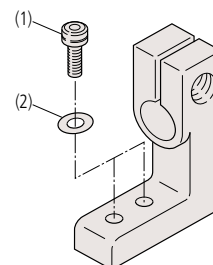
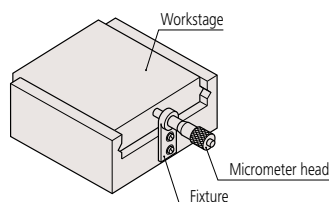


SPECIFICATIONS

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 (Code 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

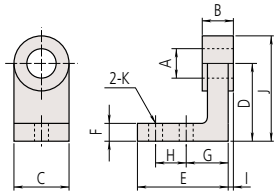
Micrometer Head

Micrometer Heads
Mounting Fixtures

03

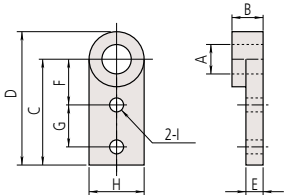
Micrometer Heads

Fixtures for micrometer heads with stem locknut



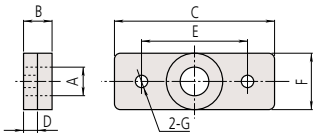
(Unit: mm)

Code 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		11.5	20	30	35	7	16	12	1.75	40	ø4.5
303578	ø10										



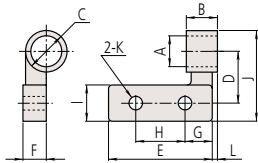
(Unit: mm)

Code 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		11.5	40	50	6.5	18	15	20	ø4.5
303582	ø10								



(Unit: mm)

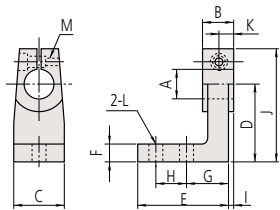
Code No.	A	B	C	D	E	F	G
303561	ø9.5	6	40	3.5	30	15	ø3.4
303570		11.5	60	5.5	40	20	ø4.5
303580	ø10						



(Unit: mm)

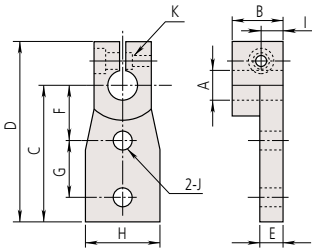
Code No.	A	B	C	D	E	F	G	H	I	J	K	L
303565	ø9.5	6		15	25		7.5	10	10	27.5	ø3.4	0.75
303574		11.5	ø15	20	40	8.5	10	20	15	35	ø4.5	1.25
303584	ø10											

Fixtures for plain stem type micrometer heads



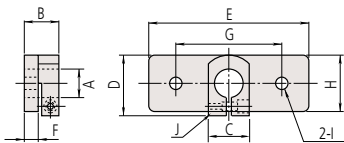
(Unit: mm)

Code 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
303569		14.5	20	30	35	7	16	12	3.25	4.25	7.25	ø4.5	0.5
303579	ø10												



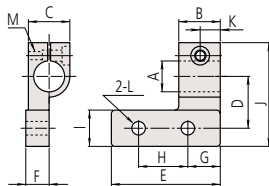
(Unit: mm)

Code 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
303573		14.5	40	52.5	6	18	15	20	7.25	ø4.5	0.5
303583	ø10										



(Unit: mm)

Code No.	A	B	C	D	E	F	G	H	I	J
303562	ø9.5	9		20	40	3	30	15	ø3.4	M3x
303571		14.5	15	22.5	60	5	40	20	ø4.5	0.5
303581	ø10									



(Unit: mm)

Code 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
303575		14.5	15	20	40	8.5	10	20	15	40	7.25	ø4.5	0.5
303585	ø10												

Optional Accessories

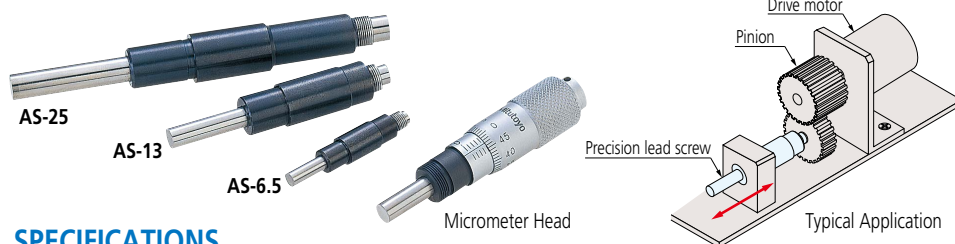
Main applications:

- 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.

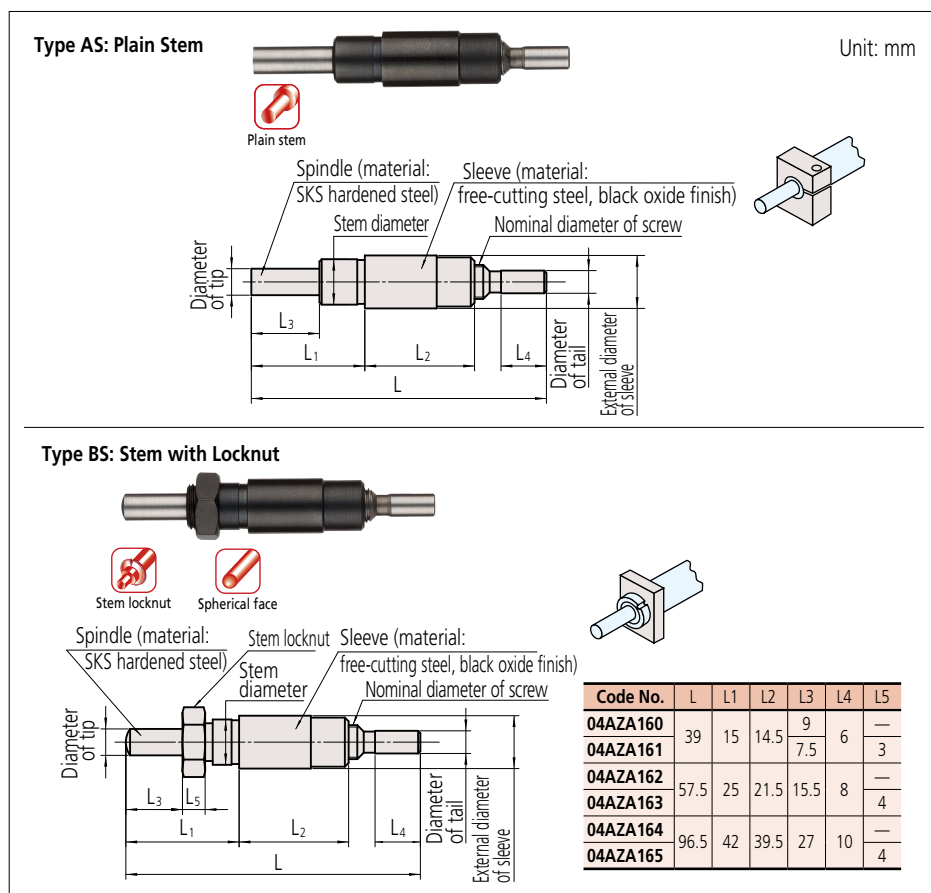


SPECIFICATIONS

Code 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} _{-0.008}	ø3.5	ø3 ^{+0.01} _{-0.01}	M4.5x0.5	ø7	Hardened	10
04AZA161	BS-6.5										11
04AZA162	AS-13	0 - 13		±2	ø9.5 ^{+0.009} _{-0.009}	ø5	ø5 ^{+0.012} _{-0.012}	M7.35x0.5	ø10.5		27
04AZA163	BS-13										30
04AZA164	AS-25	0 - 25	0.5	±2	ø10 ^{+0.009} _{-0.009}	ø6.35	ø6 ^{+0.015} _{-0.015}		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



04

Calipers

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.



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.



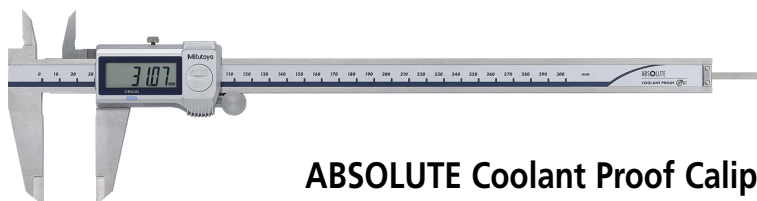
Measuring Instruments Shipped with Inspection Certificate

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.

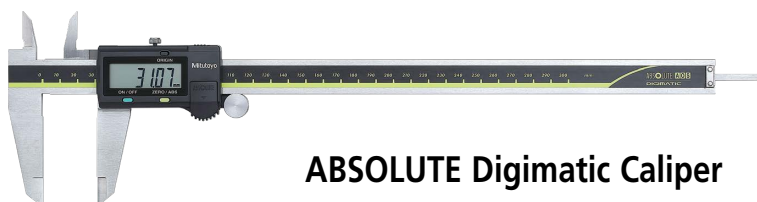
ABSOLUTE[™]

ABSOLUTE Linear Encoder

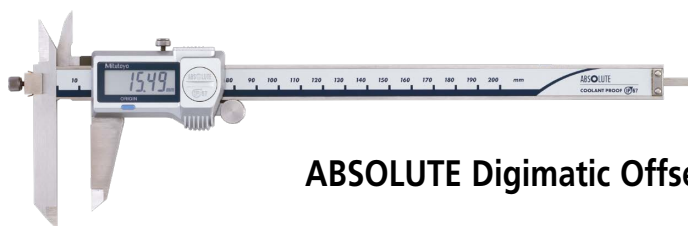
Mitutoyo developed the unique ABSOLUTE method to retain position information after the power is turned off. The origin is set once - thereafter the live position is displayed when the power is turned on.



ABSOLUTE Coolant Proof Caliper



ABSOLUTE Digimatic Caliper



ABSOLUTE Digimatic Offset Caliper

INDEX

Calipers

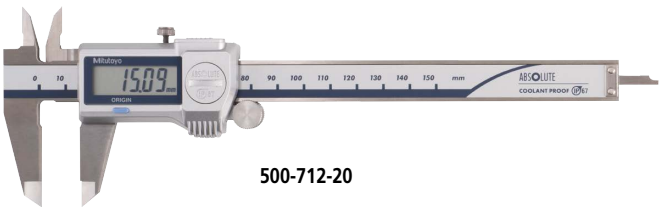
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ABSOLUTE Digimatic Caliper	04-5
ABSOLUTE Digimatic Long Caliper	04-9
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Calipers

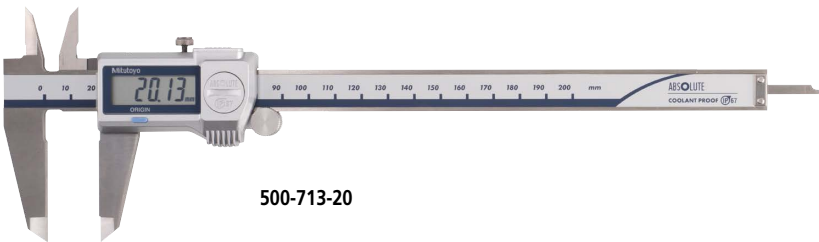
ABSOLUTE Coolant Proof Caliper
SERIES 500 — with Dust/Water Protection Conforming to IP67 Level

04
Calipers

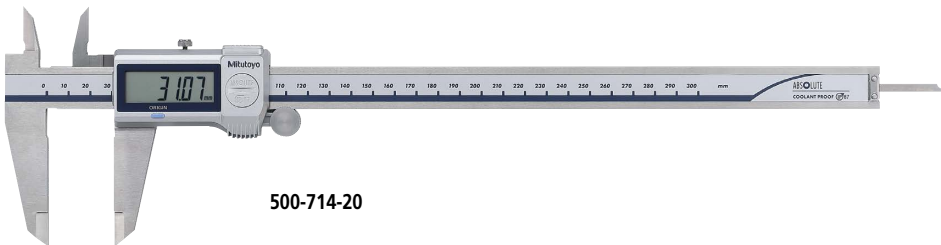
- Rated to IP67: can be used in workshop conditions exposed to coolant, water, dust or oil. The digital display can reduce human error by preventing incorrect reading of measurement results.
- Incorporates Mitutoyo's ABSOLUTE measurement system. No need to reset the origin after switching on. Eliminates 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 page 09-3.)
- Carbide-tipped jaw calipers are optimal for rough finished parts, castings, grindingstones, etc.



500-712-20



500-713-20



500-714-20

Calipers

MeasurLink[®] ENABLED
Data Management Software by Mitutoyo

U-WAVE^{fit}

ABSOLUTE[™]

IP67

TÜV Rheinland
CERTIFIED

Dust- and
Water-
Protected
www.mitutoyo.com
ID 0000045042

PROPRIETARY
INSPECTION
CERTIFICATE

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 04-4.
- 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 page 09-23 for details.)

Code 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.

LCD



Remarkably easy to read display

IP67 protection level



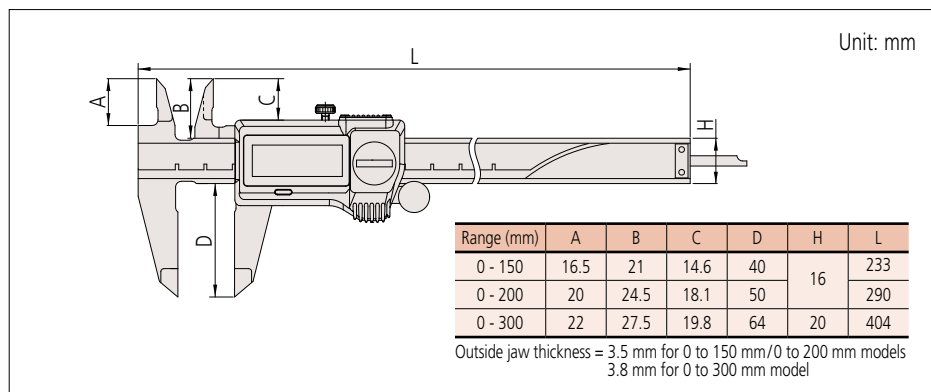
SPECIFICATIONS

Metric										
Code No.	Range (mm)	Resolution (mm)	Maximum permissible error (mm)*1		Measurement data output port	Mass (g)	Thumb roller	Remarks		
			EMPE	SMPE						
500-702-20*3	0 - 150	0.01	±0.02	±0.04	—	168	✓	—		
500-703-20*3	0 - 200					198				
500-706-20*3	0 - 150					168				
500-707-20*3	0 - 200					198				
500-709-20	0 - 150				168	—	Depth bar ø1.9 mm			
500-716-20					168					
500-717-20	0 - 200				198	—				
500-712-20	0 - 150				168					
500-713-20	0 - 200				198					
500-719-20	0 - 150				168					
500-721-20	0 - 150				168	✓	Carbide-tipped jaws for outside measurement			
500-722-20	0 - 200				198					
500-723-20	0 - 150				168					
500-724-20	0 - 200				198					
500-727-20	0 - 150				168	—	Carbide-tipped jaws for outside and inside measurement			
500-728-20	0 - 200				198					
500-714-20	0 - 300				±0.03	±0.05	—	350	✓	—
500-718-20								345	—	
500-704-20*3		350	✓							
500-708-20*3		345	—							

Inch / Metric								
Code No.	Range	Resolution	Maximum permissible error*1		Measurement data output port	Mass (g)	Thumb roller	Remarks
			EMPE	SMPE				
500-720-20	0 - 6 in/0 - 150 mm	0.0005 in/ 0.01 mm	±0.001 in/ ±0.02 mm	±0.002 in/ ±0.04 mm	✓	168	—	Depth bar ø1.9 mm
500-731-20*3	0 - 8 in/0 - 200 mm				—	198	✓	Carbide-tipped jaws for outside measurement
500-732-20*3	0 - 8 in/0 - 200 mm					168		Carbide-tipped jaws for outside and inside measurement
500-733-20*3	0 - 6 in/0 - 150 mm					198		Carbide-tipped jaws for outside measurement
500-734-20*3	0 - 8 in/0 - 200 mm					168		Carbide-tipped jaws for outside measurement
500-735-20	0 - 6 in/0 - 150 mm				✓	198	✓	Carbide-tipped jaws for outside and inside measurement
500-736-20	0 - 8 in/0 - 200 mm					168		Carbide-tipped jaws for outside and inside measurement
500-737-20	0 - 6 in/0 - 150 mm					198		Carbide-tipped jaws for outside and inside measurement
500-738-20	0 - 8 in/0 - 200 mm					168	—	—
500-752-20*3	0 - 6 in/0 - 150 mm				—	198		
500-753-20*3	0 - 8 in/0 - 200 mm				✓	168	✓	Depth bar ø1.9 mm
500-762-20	0 - 6 in/0 - 150 mm					198		
500-763-20	0 - 8 in/0 - 200 mm					168		
500-768-20*3	0 - 6 in/0 - 150 mm				—	168		
500-769-20	0 - 6 in/0 - 150 mm				✓	168	✓	Depth bar ø1.9 mm
500-764-20	0 - 12 in/0 - 300 mm		±0.0015 in/ ±0.03 mm	±0.0025 in/ ±0.05 mm	✓	350		
500-754-20*3					—	350	✓	—

- Dust/Water protection level: IP67 (IEC60529)*2
 - 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
 - With depth bar
- *1 The Partial Surface Contact Error (EMPE) and Shift Error (SMPE) are terms defined by ISO 13385-1:2019.
 *2 Although these models are IP67 rated, care should be taken to dry tool after use.
 *3 Without SPC data output.

DIMENSIONS



Calipers

ABSOLUTE Digimatic Caliper
SERIES 500 — with Exclusive ABSOLUTE Encoder Technology

04
Calipers

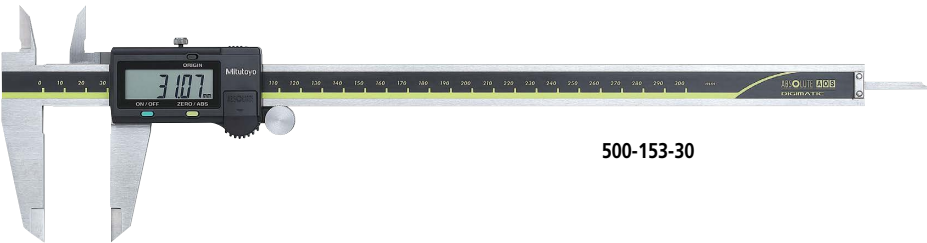
- This is a standard digital caliper. The digital display can reduce human error by preventing incorrect reading of measurement results.
- Incorporates Mitutoyo's ABSOLUTE measurement system. No need to reset the origin after switching on. Eliminates overspeed errors.
- Carbide-tipped jaw calipers are 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 page 09-3.)



500-151-30



500-182-30



500-153-30



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 04-6.
- Data hold: With the optional hold unit, the function can hold the displayed value (cannot be used with the output function).

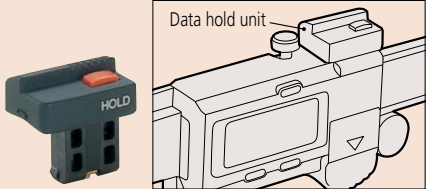
Optional Accessories

(Note: Usable only for models with SPC data output. Refer to page 09-23 for details.)

Code 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 04-6 to 04-7.

Data hold unit



959143

SPECIFICATIONS

Metric											
Code No.	Range (mm)	Resolution (mm)	Maximum permissible error (mm)*		Measurement data output port	Mass (g)	Depth bar	Fine adjustment	Remarks		
			E_{MPE}	S_{MPE}							
500-150-30	0 - 100	0.01	± 0.02	± 0.04	✓	143	ø1.9 mm rod	with thumb roller	—		
500-180-30					—			—			
500-151-30					✓			168		Blade	with thumb roller
500-154-30	0 - 150					Carbide-tipped jaws for outside and inside measurement					
500-155-30							ø1.9 mm rod				
500-158-30									—		
500-181-30											
500-152-30	0 - 200				✓	198	Blade	with thumb roller		Carbide-tipped jaws for outside measurement	
500-156-30								Carbide-tipped jaws for outside and inside measurement			
500-157-30											
500-182-30								—	—	—	
500-153-30	0 - 300		± 0.03	± 0.05	✓	350	with thumb roller				
500-161-30	0 - 150		± 0.02	± 0.04		168	ø1.9 mm rod	—			
500-162-30	0 - 200					198					
500-184-30	0 - 150				—	168					
500-201-30	0 - 100				✓	143			Blade		
500-203-30	0 - 150					168			ø1.9 mm rod		
500-205-30	0 - 300		± 0.03	± 0.05		345	Blade	—			
500-233-30	0 - 150		± 0.02	± 0.04	✓	168			Carbide-tipped jaws for outside measurement		
500-234-30									Carbide-tipped jaws for outside and inside measurement		
500-235-30	0 - 200								Carbide-tipped jaws for outside measurement		
500-236-30									Carbide-tipped jaws for outside and inside measurement		

- 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
- * The Partial Surface Contact Error (E_{MPE}) and Shift Error (S_{MPE}) are terms defined by ISO 13385-1:2019.

ABSOLUTE Digimatic Caliper
SERIES 500 — with Exclusive ABSOLUTE Encoder Technology

04
Calipers

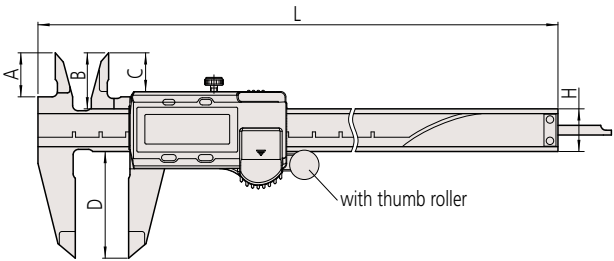
Inch / Metric		Resolution	Maximum permissible error*		Measurement data output port	Mass (g)	Depth bar	Fine adjustment	Remarks		
Code No.	Range		EMPE	SMPE							
500-170-30	0 - 4 in/ 0 - 100 mm	0.0005 in/ 0.01 mm	±0.001 in/ ±0.02 mm	±0.002 in/ ±0.04 mm	✓	143	ø0.075 inch rod	with thumb roller	—		
500-195-30					—						
500-171-30	0 - 6 in/ 0 - 150 mm				✓	Blade	ø0.075 inch rod		Carbide-tipped jaws for outside measurement		
500-174-30									Carbide-tipped jaws for outside and inside measurement		
500-175-30									—		
500-178-30						168	—		Carbide-tipped jaws for outside measurement		
500-196-30									Carbide-tipped jaws for outside and inside measurement		
500-159-30									—	Carbide-tipped jaws for outside measurement	
500-160-30										Carbide-tipped jaws for outside and inside measurement	
500-191-30										—	—
500-202-30								—			
500-172-30	0 - 8 in/ 0 - 200 mm				✓	198	Blade	with thumb roller	Carbide-tipped jaws for outside measurement		
500-176-30									Carbide-tipped jaws for outside and inside measurement		
500-177-30									—		
500-197-30									Carbide-tipped jaws for outside measurement		
500-163-30								Carbide-tipped jaws for outside and inside measurement			
500-164-30								—	—		
500-204-30								350	✓	with thumb roller	Carbide-tipped jaws for outside measurement
500-173-30											Carbide-tipped jaws for outside and inside measurement
500-167-30	Carbide-tipped jaws for outside and inside measurement										
500-168-30	—										
500-193-30	Carbide-tipped jaws for outside measurement										
500-165-30	0 - 12 in/ 0 - 300 mm				±0.0015 in/ ±0.03 mm	±0.0025 in/ ±0.05 mm	—			Carbide-tipped jaws for outside and inside measurement	
500-166-30											

• 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
* The Partial Surface Contact Error (EMPE) and Shift Error (SMPE) are terms defined by ISO 13385-1:2019.

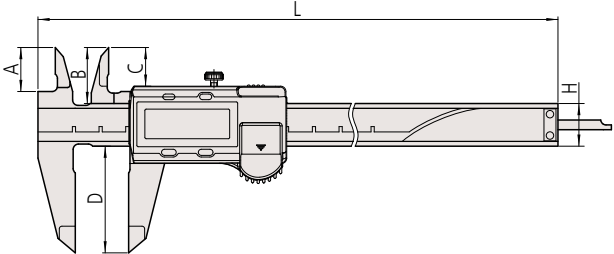
DIMENSIONS

Unit: mm

With thumb roller



Without thumb roller

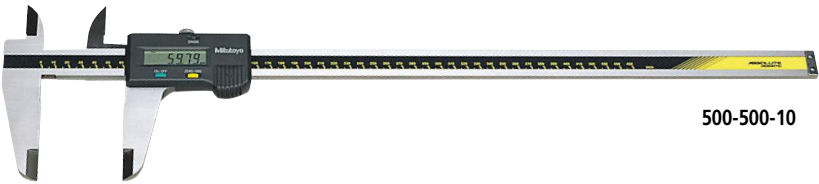


Range (mm)	A	B	C	D	H	L
0 - 100	16.5	21	14.5	40	16	182
0 - 150						233
0 - 200	20	24.5	18	50	20	290
0 - 300	22	27.5	19.8	64		404

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 Long 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 Mitutoyo's 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 page 09-3.)



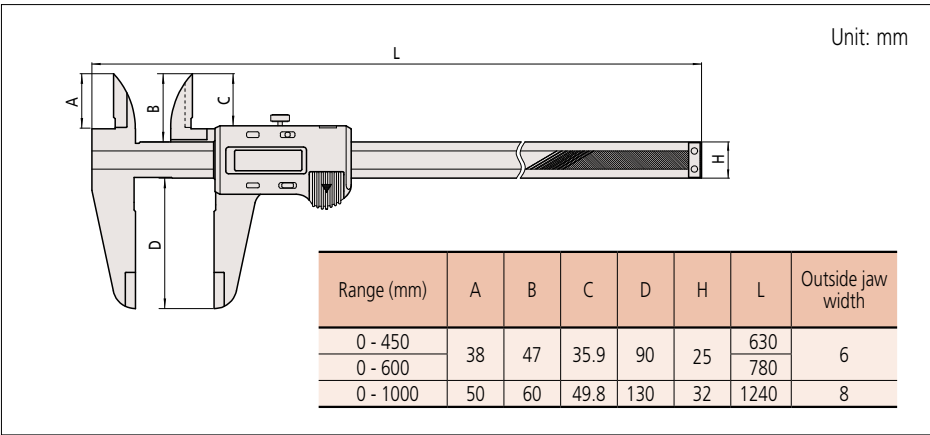
SPECIFICATIONS

Metric					
Code No.	Range (mm)	Resolution (mm)	Maximum permissible error (mm)*		Mass (g)
			<i>E</i> MPE	<i>S</i> MPE	
500-500-10	0 - 450	0.01	±0.05	±0.07	1170
500-501-10	0 - 600				1350
500-502-10	0 - 1000		±0.07	±0.09	3300

Inch / Metric					
Code No.	Range	Resolution	Maximum permissible error*		Mass (g)
			<i>E</i> MPE	<i>S</i> MPE	
500-505-10	0 - 18 in/0 - 450 mm	0.0005 in/0.01 mm	±0.002 in/±0.05 mm	±0.003 in/±0.07 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	±0.004 in/±0.09 mm	3300

- Power source: SR44 battery (1 pc.). **938882** included as standard (for operational checks)
- Battery life: Approx. 3.5 years under normal use
- Response speed: Unlimited
- * The Partial Surface Contact Error (*E*MPE) and Shift Error (*S*MPE) are terms defined by ISO 13385-1:2019.

DIMENSIONS

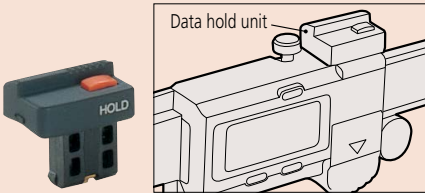


Optional Accessories

Code 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

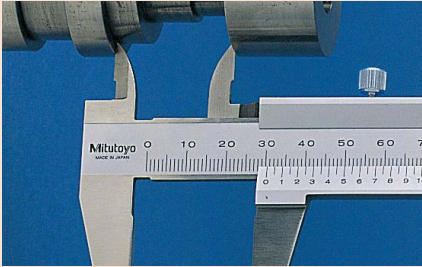
* IP-67 is applied to this **U-WAVE-T**, but not to the calipers on page 04-9.

Data hold unit

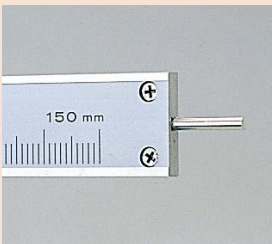


959143

Measurement example



Round depth bar type



530-102

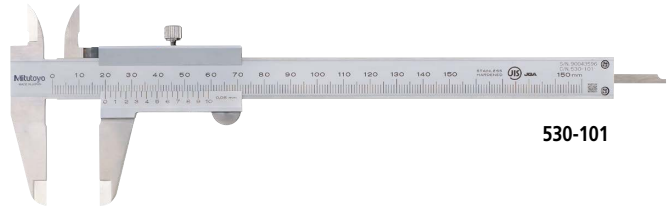
Carbide-tipped jaws for outside measurement



530-320

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.



530-101

SPECIFICATIONS

Metric						
Code No.	Range (mm)	Graduation (mm)	Maximum permissible error (mm)*		Depth bar	Remarks
			EMPE	SMPE		
530-101	0 - 150	0.05	±0.05	±0.07	Blade	—
530-122		0.02	±0.03	±0.05		High accuracy model
530-108	0 - 200	0.05	±0.05	±0.07		—
530-123		0.02	±0.03	±0.05		High accuracy model
530-109	0 - 300	0.05	±0.08	±0.10		—
530-124		0.02	±0.04	±0.06		High accuracy model

Code No.	Range (mm)	Graduation (mm)	Maximum permissible error (mm)*		Depth bar	Remarks
			EMPE	SMPE		
530-100	0 - 100	0.05	±0.05	±0.07	ø1.9 mm rod	—
530-102	0 - 150				Blade	—
530-320						Carbide-tipped jaws for outside measurement
530-335						Carbide-tipped jaws for outside and inside measurement
530-321	0 - 200		±0.08	±0.10	Carbide-tipped jaws for outside measurement	
530-322	0 - 300				Carbide-tipped jaws for outside measurement	
530-501	0 - 600				—	—
530-502	0 - 1000	±0.15	±0.17	—	—	

Metric/Inch		with metric/inch double scale				
Code No.	Range	Graduation	Maximum permissible error		Depth bar	Remarks
			EMPE	SMPE		
530-104	0 - 150 mm/ 0 - 6 in	0.05 mm (1/128 in)	±0.05 mm/ ±0.5/128 in	±0.07 mm/ ±0.5/128 in	Blade	—
530-316		0.02 mm (0.001 in)	±0.03 mm/ ±0.001 in	±0.05 mm/ ±0.002 in		Clamping screw below the slider
530-312			±0.03 mm/ ±0.001 in	±0.05 mm/ ±0.002 in		High accuracy model: ±0.03 mm
530-114	0 - 200 mm/ 0 - 8 in	0.05 mm (1/128 in)	±0.05 mm/ ±0.5/128 in	±0.07 mm/ ±0.5/128 in		—
530-118		0.02 mm (0.001 in)	±0.03 mm/ ±0.001 in	±0.05 mm/ ±0.002 in		High accuracy model: ±0.03 mm
530-115	0 - 300 mm/ 0 - 12 in	0.05 mm (1/128 in)	±0.08 mm/ ±0.5/128 in	±0.10 mm/ ±0.5/128 in		—
530-119		0.02 mm (0.001 in)	±0.04 mm/ ±0.0015 in	±0.06 mm/ ±0.0025 in	High accuracy model: ±0.04 mm	

Inch		with inch/inch double scale				
Code No.	Range (in)	Graduation (in)	Maximum permissible error (in)		Depth bar	Remarks
			EMPE	SMPE		
530-105	0 - 6	0.001 (1/128)	±0.001/±0.5/128	±0.002/±0.5/128	Blade	—
530-116	0 - 8					

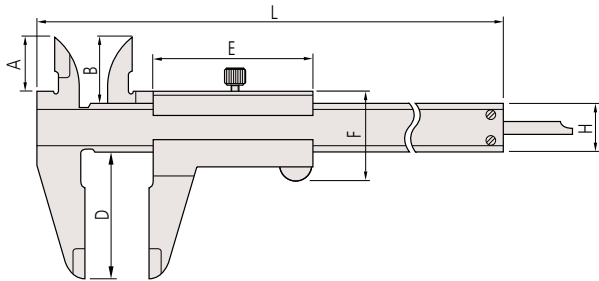
* The Partial Surface Contact Error (EMPE) and Shift Error (SMPE) are terms defined by ISO 13385-1:2019.

Vernier Caliper
SERIES 530 — Standard Model

04
Calipers

DIMENSIONS

Unit: mm



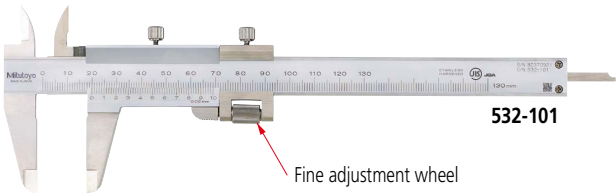
Range (mm)	A	B	D	E	F	H	L	Outside jaw thickness
0 - 100	17	21.5	40	53.5	30	16	182	3
0 - 150							229	
0 - 200							288	
0 - 300	22	27.5	64	66.5	36	20	404	3.8
0 - 600	38	47	90	89	50	25	780	6
0 - 1000	50	60	130	111	61	32	1240	8

Note: **530-100** and **530-102** incorporate a round depth bar (ø1.9 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.

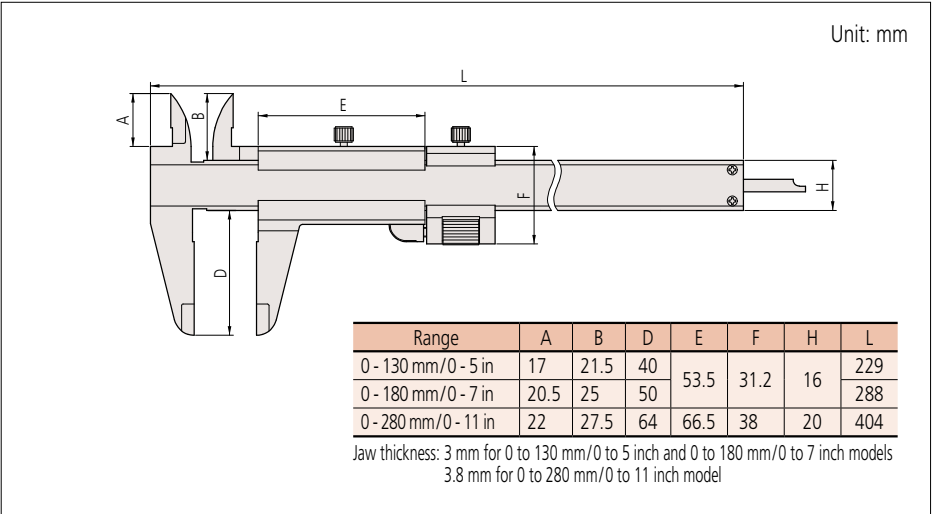


SPECIFICATIONS

Metric						
Code No.	Range (mm)	Graduation (mm)	Maximum permissible error (mm)*		Depth bar	Remarks
			EMPE	SMPE		
532-101	0 - 130	0.02	±0.03	±0.05	Blade	with fine adjustment
532-102	0 - 180					
532-103	0 - 280		±0.04	±0.06		
Metric/Inch with metric/inch double scale						
Code No.	Range	Graduation	Maximum permissible error*		Depth bar	Remarks
			EMPE	SMPE		
532-119	0 - 130 mm/0 - 5 in	0.02 mm (0.001 in)	±0.03 mm/0.001 in	±0.05 mm/0.002 in	Blade	with fine adjustment
532-120	0 - 180 mm/0 - 7 in					
532-121	0 - 280 mm/0 - 11 in		±0.04 mm/0.0015 in	±0.06 mm/0.0025 in		

* The Partial Surface Contact Error (EMPE) and Shift Error (SMPE) are terms defined by ISO 13385-1:2019.

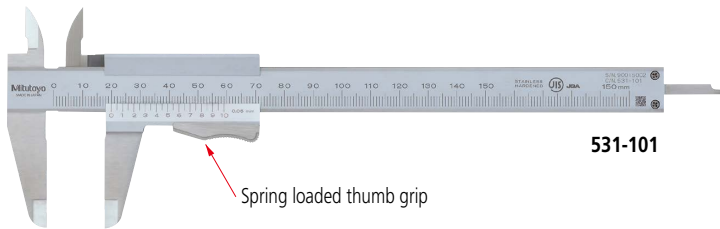
DIMENSIONS



Calipers

Vernier Caliper
SERIES 531 — with Thumb Grip

- 04
- Calipers
- 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.



531-101

SPECIFICATIONS

Metric						
Code No.	Range (mm)	Graduation (mm)	Maximum permissible error (mm)*		Depth bar	Remarks
			EMPE	SMPE		
531-101	0 - 150	0.05	±0.05	±0.07	Blade	—
531-102	0 - 200					
531-103	0 - 300					

Metric / Inch with metric/inch double scale						
Code No.	Range	Graduation	Maximum permissible error*		Depth bar	Remarks
			EMPE	SMPE		
531-122	0 - 150 mm/0 - 6 in	0.05 mm (1/128 in)	±0.05 mm/±0.5/128 in	±0.07 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	±0.05 mm/0.002 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	±0.07 mm/±0.5/128 in		—
531-129		0.02 mm (0.001 in)	±0.03 mm/0.001 in	±0.05 mm/0.002 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	±0.10 mm/±0.5/128 in		—
531-112		0.02 mm (0.001 in)	±0.04 mm/0.0015 in	±0.06 mm/0.0025 in		High accuracy model

* The Partial Surface Contact Error (EMPE) and Shift Error (SMPE) are terms defined by ISO 13385-1:2019.

DIMENSIONS

Unit: mm

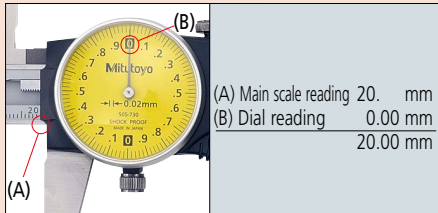
* (): Dimension in 0 to 300 mm/0 to 12 inch model

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



Reading



The series provides two types; Graduation 0.02 mm (2 mm/rev.) and Graduation 0.01 mm (1 mm/rev.).

Dial Caliper
SERIES 505

- Easy-to-read yellow dial reduces the effect of parallax.
- The font used on the dial face and the main scale is easy to read.
- Large finger rest aids ease of use.



SPECIFICATIONS

Metric

Code No.	Range (mm)	Graduation (mm)	Maximum permissible error (mm)*2		Remarks
			EMPE	SMPE	
505-730	0 - 150	0.02, 2/rev	±0.03	±0.05	—
505-734					Carbide-tipped jaws for outside measurement
505-735					Carbide-tipped jaws for outside and inside measurement
505-731	0 - 200	0.01, 1/rev	±0.04	±0.06	—
505-745	0 - 300				
505-732*1	0 - 150		±0.02	±0.04	
505-733*1	0 - 200		±0.03	±0.05	

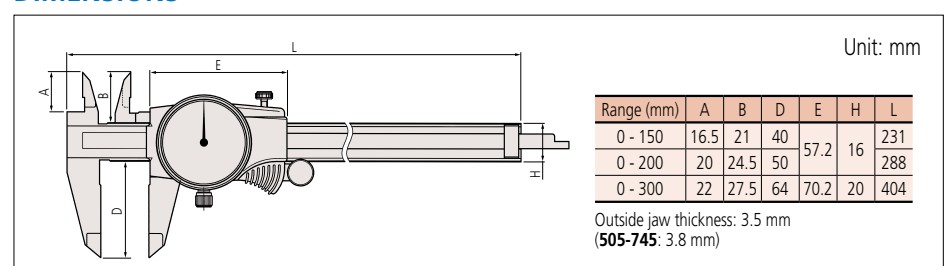
Inch

Code No.	Range (in)	Graduation (in)	Maximum permissible error (in)*2		Remarks	
			EMPE	SMPE		
505-740J	0 - 6	0.001, 0.2/rev	±0.001	±0.002	—	
505-742J*1						
505-742-56J						
505-742-51J						
505-736*1		0.001, 0.1/rev			Carbide-tipped jaws for outside measurement	
505-738*1					Carbide-tipped jaws for outside and inside measurement	
505-744		0.001, 0.2/rev			Carbide-tipped jaws for outside measurement	
505-742-52J		0.001, 0.1/rev			—	
505-742-53J						
505-742-54J						
505-742-55J						
505-741J	0 - 8	0.001, 0.2/rev	±0.002	±0.0025	—	
505-743J*1		0.001, 0.1/rev				
505-737*1		0.001, 0.2/rev				Carbide-tipped jaws for outside measurement
505-739*1						Carbide-tipped jaws for outside and inside measurement
505-749	0 - 12	0.001, 0.1/rev			—	
505-746*1		0.001, 0.2/rev				
505-750		0.001, 0.2/rev				Carbide-tipped jaws for outside measurement
505-747*1		0.001, 0.1/rev				Carbide-tipped jaws for outside and inside measurement
505-748*1						

*1 Silver cover type

*2 The Partial Surface Contact Error (EMPE) and Shift Error (SMPE) are terms defined by ISO 13385-1:2019.

DIMENSIONS



Calipers

ABSOLUTE Coolant Proof Carbon Fiber Caliper
SERIES 552 — with Standard 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.



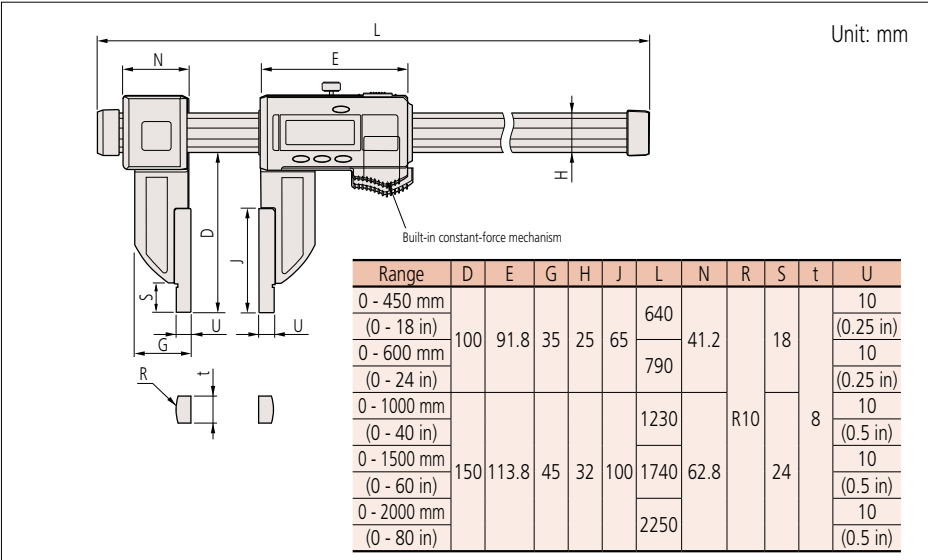
SPECIFICATIONS

Metric				
Code No.	Range (mm)*1	Resolution (mm)	Maximum permissible error (mm)*2	
			EMPE	SMPE
552-302-10	0 - 450 (20.1 - 470)	0.01	±0.04	±0.04
552-303-10	0 - 600 (20.1 - 620)		±0.04	±0.04
552-304-10	0 - 1000 (20.1 - 1020)		±0.05	±0.05
552-305-10	0 - 1500 (20.1 - 1520)		±0.09	±0.09
552-306-10	0 - 2000 (20.1 - 2020)		±0.12	±0.12

Inch / Metric				
Code No.	Range*1	Resolution	Maximum permissible error*2	
			EMPE	SMPE
552-312-10	0 - 18 in/0 - 450 mm (0.504 - 18.5 in/12.8 - 462.7mm)	0.0005 in/0.01 mm	±0.002 in/±0.04 mm	±0.002 in/±0.04 mm
552-313-10	0 - 24 in/0 - 600 mm (0.504 - 24.5 in/12.8 - 612.7 mm)		±0.002 in/±0.05 mm	±0.002 in/±0.05 mm
552-314-10	0 - 40 in/0 - 1000 mm (1.004 - 41 in/25.5 - 1025.4 mm)		±0.004 in/±0.09 mm	±0.004 in/±0.09 mm
552-315-10	0 - 60 in/0 - 1500 mm (1.004 - 61 in/25.5 - 1525.4 mm)		±0.005 in/±0.12 mm	±0.005 in/±0.12 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	±0.005 in/±0.12 mm

- Dust/Water protection level: IP66 (IEC60529)*3
 - 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: Stainless Steel Hardened
 - *1 (): Dimension in inside measurement
 - *2 The Partial Surface Contact Error (EMPE) and Shift Error (SMPE) are terms defined by ISO 13385-1:2019.
 - *3 Rustproofing shall be applied after use if caliper was in contact with coolant.
- Note: A constant-force mechanism is used in the finger rest; however, this is only an auxiliary mechanism to avoid measurement error caused by excessive measuring force. To measure with good accuracy, use the minimum necessary measuring force for the caliper measuring faces to make sufficient contact with the workpiece. Refer to page 13-21 for details.

DIMENSIONS



Measurement example



Functions

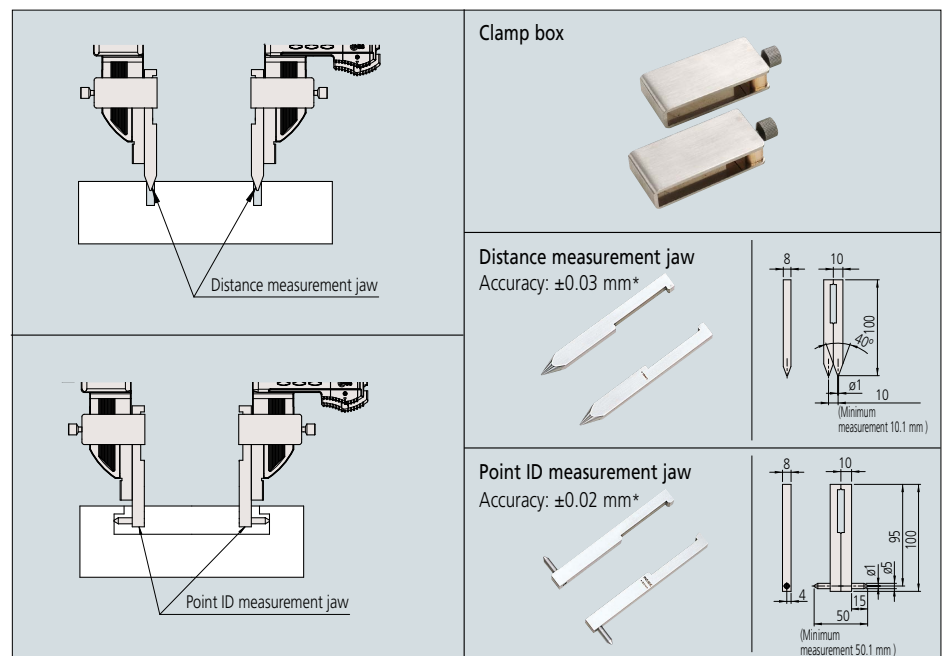
- Zero-setting
- Data hold: Pressing the HOLD switch displays "H" on the LCD display and holds (retains) the display of value. Moving the slider in this state does not change the displayed value. Pressing the switch again cancels the state, allowing you to start measurement again.
- Offsetting: Pressing 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

Code 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

Metric		
	552-302-10, 552-155-10, 552-303-10 and 552-156-10	552-304-10, 552-305-10 and 552-306-10
Clamp box (1 pair)	914053	914054
Distance measurement jaw (1 pair)	914055	
Point ID measurement jaw (1 pair)	914057	
Inch / Metric		
	552-312-10, 552-165-10, 552-313-10 and 552-166-10	552-314-10, 552-315-10 and 552-316-10
Clamp box (1 pair)	914053	914054
Distance measurement jaw (1 pair)	914056	
Point ID measurement jaw (1 pair)	914058	



* Accuracies shown in the diagrams are of each accessory and accuracy resulting in mounting them on the main body is not guaranteed.

Calipers

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.



SPECIFICATIONS

Code No.	Range (mm)*1	Resolution (mm)	Maximum permissible error (mm)*2	
			EMPE	SMPE
552-150-10	0 - 450 (20.1 - 470)	0.01	±0.06	±0.06
552-151-10	0 - 600 (20.1 - 620)		±0.06	±0.06
552-152-10	0 - 1000 (20.1 - 1020)		±0.07	±0.07
552-153-10	0 - 1500 (20.1 - 1520)		±0.11	±0.11
552-154-10	0 - 2000 (20.1 - 2020)		±0.14	±0.14

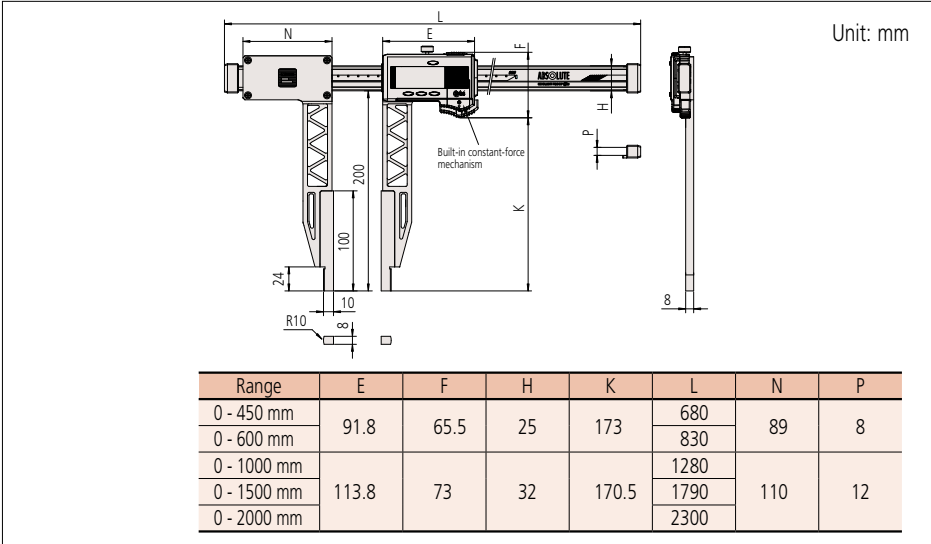
Code No.	Range*1	Resolution	Maximum permissible error*2	
			EMPE	SMPE
552-160-10	0 - 18 in/0 - 450 mm (0.504 - 18.5 in/12.8 - 462.7 mm)	0.0005 in/0.01 mm	±0.0025 in/±0.06 mm	±0.0025 in/±0.06 mm
552-161-10	0 - 24 in/0 - 600 mm (0.504 - 24.5 in/12.8 - 612.7 mm)		±0.0025 in/±0.06 mm	±0.0025 in/±0.06 mm
552-162-10	0 - 40 in/0 - 1000 mm (1.004 - 41 in/25.5 - 1025.4 mm)		±0.003 in/±0.07 mm	±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	±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	±0.0055 in/±0.14 mm

- Dust/Water protection level: IP66 (IEC 60529)*3
- 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: Stainless Steel Hardened

*1 (): Dimension in inside measurement
*2 The Partial Surface Contact Error (EMPE) and Shift Error (SMPE) are terms defined by ISO 13385-1:2019.
*3 Rustproofing shall be applied after use if caliper was in contact with coolant.

Note: A constant-force mechanism is used in the finger rest; however, this is only an auxiliary mechanism to avoid measurement error caused by excessive measuring force. To measure with good accuracy, use the minimum necessary measuring force for the caliper measuring faces to make sufficient contact with the workpiece. Refer to page 13-21 for details.

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

Code 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.
- Zirconia ceramic contact surfaces make it possible to measure weakly magnetic workpieces; however, measurement of strongly magnetic workpieces may not be possible, as metal parts are used for the caliper's main body.



552-156-10

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 caliper 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

Code 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

SPECIFICATIONS

Metric				
Code No.	Range (mm)* ¹	Resolution (mm)	Maximum permissible error (mm)* ²	
552-155-10	0 - 450 (20.1 - 470)	0.01	EMPE	SMPE
552-156-10	0 - 600 (20.1 - 620)		±0.04	±0.04
552-156-10	0 - 600 (20.1 - 620)		±0.04	±0.04

Inch/Metric				
Code No.	Range* ¹	Resolution	Maximum permissible error* ²	
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	EMPE	SMPE
552-166-10	0 - 24 in/0 - 600 mm (0.504 - 24.5 in/12.8 - 612.7 mm)		±0.002 in/±0.04 mm	±0.002 in/±0.04 mm

- Dust/Water protection level: IP66 (IEC 60529)*³
- 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

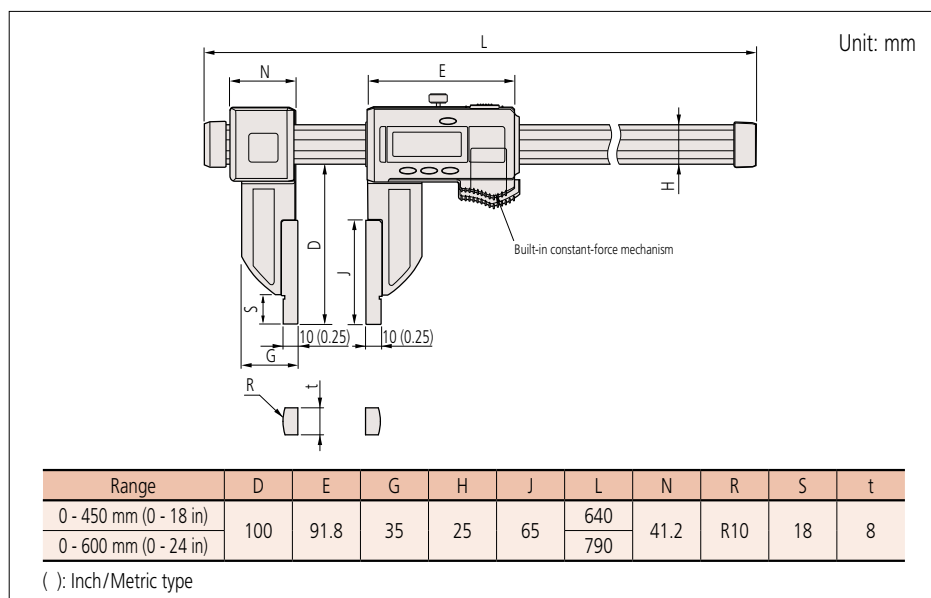
*1 (): Dimension in inside measurement

*2 The Partial Surface Contact Error (EMPE) and Shift Error (SMPE) are terms defined by ISO 13385-1:2019.

*3 Rustproofing shall be applied after use if caliper was in contact with coolant.

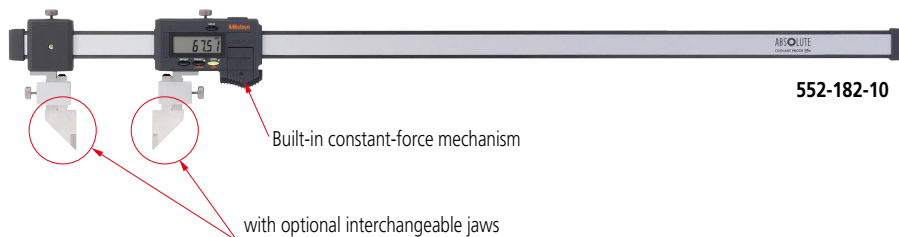
Note: A constant-force mechanism is used in the finger rest; however, this is only an auxiliary mechanism to avoid measurement error caused by excessive measuring force. To measure with good accuracy, use the minimum necessary measuring force for the caliper measuring faces to make sufficient contact with the workpiece. Refer to page 13-21 for details.

DIMENSIONS



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

Metric				
Code No.	Range (mm)	Resolution (mm)	Maximum permissible error (mm)*1	
			<i>E</i> MPe	<i>S</i> MPe
552-181-10	0 - 450	0.01	±0.04	
552-182-10	0 - 600			
552-183-10	0 - 1000			
552-184-10	0 - 1500			
552-185-10	0 - 2000		±0.12	

Inch / Metric				
Code No.	Range	Resolution	Maximum permissible error*1	
			<i>E</i> MPe	<i>S</i> MPe
552-191-10	0 - 18 in/0 - 450 mm	0.0005 in/0.01 mm	±0.002 in/±0.04 mm	
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		±0.005 in/±0.12 mm	

- Dust/Water protection level: IP66 (IEC 60529)*2
- 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

*1 The Partial Surface Contact Error (*E*MPe) and Shift Error (*S*MPe) are terms defined by ISO 13385-1:2019.

*2 Rustproofing shall be applied after use if caliper was in contact with coolant.

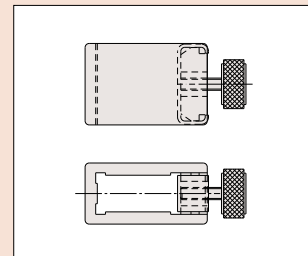
Note1: The Maximum permissible error (MPE) values described above were measured using a dedicated outside measurement inspection tool.

Note2: A constant-force mechanism is used in the finger rest; however, this is only an auxiliary mechanism to avoid measurement error caused by excessive measuring force. To measure with good accuracy, use the minimum necessary measuring force for the caliper measuring faces to make sufficient contact with the workpiece. Refer to page 13-21 for details.

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 caliper 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

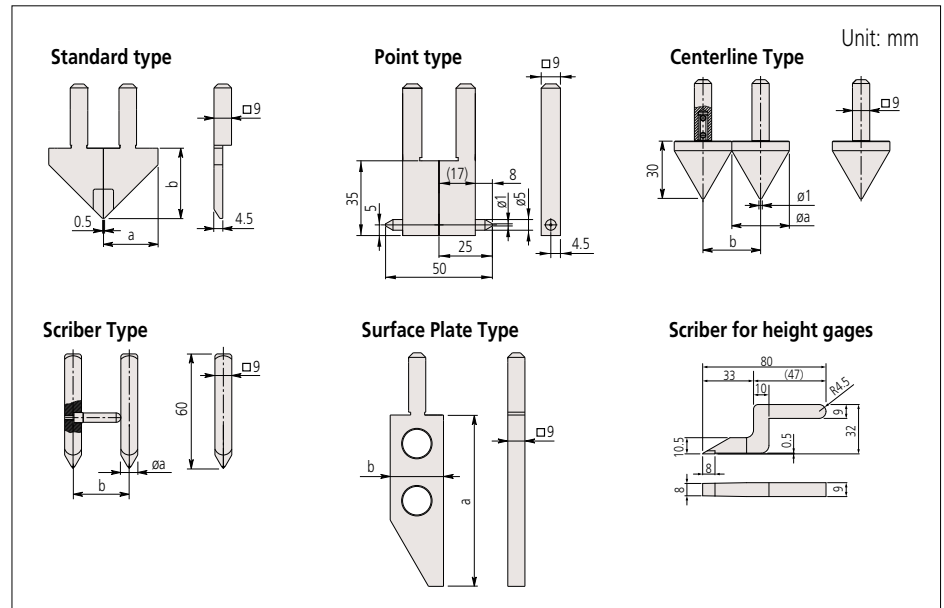
Optional Accessories

Code 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

Code No.	Components	a	b
07CZA056	Right (07CAA044), Left (07CAA045)	28 mm (1.1 in)	36 mm (1.2 in)

Note: 1 set

Point Type

Code No.	Components	a	b
07CZA058	07CZA041x2 pcs.	25 mm	50 mm
07CZA059	07CZA048x2 pcs.	1 in	2 in

Centerline Type

Code No.	Components	a	b
07CZA057	07CZA039x2 pcs.	30 mm	30 mm
07CZA060	07CZA047x2 pcs.	1.2 in	1.2 in

Scriber Type

Code No.	Components	a	b
07CZA055	Right (07CZA042), Left (07CZA043)	8 mm	30 mm
07CZA061	Right (07CZA042), Left (07CZA049)	0.31 in	1.2 in

Surface Plate Type

Code No.	a	b
07CZA044	90 mm (3.5 in)	28 mm (1.1 in)

Note: Note that the error arising from the combination of surface plates is outside the scope of accuracy guarantee.

Scriber for height gages

Code No.
07GZA000

Type	Applicable calipers	Range	Maximum permissible error*	
			EMPE	SMPE
Standard type	552-181-10 (552-191-10)	0 - 450 mm (0 - 18 in)	±0.06 mm (±0.0025 in)	
	552-182-10 (552-192-10)	0 - 600 mm (0 - 24 in)	±0.07 mm (±0.0030 in)	
	552-183-10 (552-193-10)	0 - 1000 mm (0 - 40 in)	±0.11 mm (±0.0045 in)	
	552-184-10 (552-194-10)	0 - 1500 mm (0 - 60 in)	±0.14 mm (±0.0055 in)	
	552-185-10 (552-195-10)	0 - 2000 mm (0 - 80 in)	±0.17 mm (±0.0070 in)	
Point type	552-181-10 (552-191-10)	Inside: 50.1 - 500 mm (2.004 - 20 in) Outside: 0 - 450 mm (0 - 18 in)	±0.09 mm (±0.0035 in)	
	552-182-10 (552-192-10)	Inside: 50.1 - 650 mm (2.004 - 26 in) Outside: 0 - 600 mm (0 - 24 in)	±0.09 mm (±0.0035 in)	
	552-183-10 (552-193-10)	Inside: 50.1 - 1050 mm (2.004 - 42 in) Outside: 0 - 1000 mm (0 - 40 in)	±0.10 mm (±0.0040 in)	
	552-184-10 (552-194-10)	Inside: 50.1 - 1550 mm (2.004 - 62 in) Outside: 0 - 1500 mm (0 - 60 in)	±0.14 mm (±0.0055 in)	
	552-185-10 (552-195-10)	Inside: 50.1 - 2050 mm (2.004 - 82 in) Outside: 0 - 2000 mm (0 - 80 in)	±0.17 mm (±0.0070 in)	
	552-181-10 (552-191-10)	30.1 - 480 mm (1.204 - 19.2 in)	±0.08 mm (±0.0030 in)	
	552-182-10 (552-192-10)	30.1 - 630 mm (1.204 - 25.2 in)	±0.10 mm (±0.0040 in)	
	552-183-10 (552-193-10)	30.1 - 1030 mm (1.204 - 41.2 in)	±0.13 mm (±0.0055 in)	
	552-184-10 (552-194-10)	30.1 - 1530 mm (1.204 - 61.2 in)	±0.16 mm (±0.0065 in)	
	552-185-10 (552-195-10)	30.1 - 2030 mm (1.204 - 81.2 in)	±0.18 mm (±0.0070 in)	
Centerline type	552-181-10 (552-191-10)	30.1 - 480 mm (1.204 - 19.2 in)	±0.11 mm (±0.0045 in)	
	552-182-10 (552-192-10)	30.1 - 630 mm (1.204 - 25.2 in)	±0.15 mm (±0.0060 in)	
	552-183-10 (552-193-10)	30.1 - 1030 mm (1.204 - 41.2 in)	±0.18 mm (±0.0070 in)	
	552-184-10 (552-194-10)	30.1 - 1530 mm (1.204 - 61.2 in)	±0.20 mm (±0.0080 in)	
	552-185-10 (552-195-10)	30.1 - 2030 mm (1.204 - 81.2 in)	±0.22 mm (±0.0087 in)	
Scriber type	552-181-10 (552-191-10)	0 - 450 mm (0 - 17.7 in)	±0.10 mm (±0.0040 in)	
	552-182-10 (552-192-10)	0 - 600 mm (0 - 23.7 in)	±0.11 mm (±0.0045 in)	
	552-183-10 (552-193-10)	0 - 1000 mm (0 - 39.4 in)	±0.15 mm (±0.0060 in)	
	552-184-10 (552-194-10)	0 - 1500 mm (0 - 59.4 in)	±0.18 mm (±0.0070 in)	
	552-185-10 (552-195-10)	0 - 2000 mm (0 - 79.6 in)	±0.20 mm (±0.0080 in)	
Surface plate type + Scriber type for height gages	552-181-10 (552-191-10)	Outside: 0 - 450 mm (0 - 18 in)	±0.12 mm (±0.0050 in)	
	552-182-10 (552-192-10)	Outside: 0 - 600 mm (0 - 24 in)	±0.13 mm (±0.0055 in)	
	552-183-10 (552-193-10)	Outside: 0 - 1000 mm (0 - 40 in)	±0.17 mm (±0.0070 in)	
	552-184-10 (552-194-10)	Outside: 0 - 1500 mm (0 - 60 in)	±0.20 mm (±0.0080 in)	
	552-185-10 (552-195-10)	Outside: 0 - 2000 mm (0 - 80 in)	±0.22 mm (±0.0087 in)	
Surface plate type + Point type	552-181-10 (552-191-10)	15.1 - 465 mm (0.6 - 18.6 in)	±0.11 mm (±0.0045 in)	
	552-182-10 (552-192-10)	15.1 - 615 mm (0.6 - 24.6 in)	±0.12 mm (±0.0050 in)	
	552-183-10 (552-193-10)	15.1 - 1015 mm (0.6 - 40.6 in)	±0.16 mm (±0.0065 in)	
	552-184-10 (552-194-10)	15.1 - 1515 mm (0.6 - 60.6 in)	±0.19 mm (±0.0075 in)	
	552-185-10 (552-195-10)	15.1 - 2015 mm (0.6 - 80.6 in)	±0.22 mm (±0.0087 in)	

() : Inch/Metric models

Note: The values described in the above table are MPE values when attached to a caliper.

Calipers

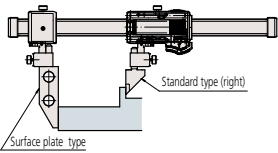
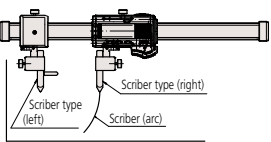
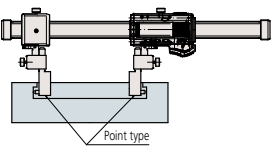
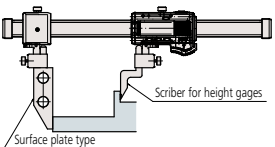
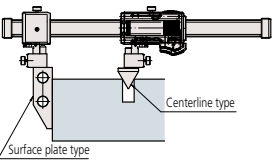
Optional accessories

Interchangeable jaws

04

Calipers

Typical applications

Surface plate type + Standard type  Standard type (right) Surface plate type	Scriber type  Scriber type (left) Scriber type (right) Scriber (arc)
Point type  Point type	Surface plate type + Scriber for height gages  Scriber for height gages Surface plate type
Surface plate type + Centerline type  Centerline type Surface plate type	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.

Calipers

Measurement example



Optional Accessories

Code 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 page 09-3.)
- 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 (**Code 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**).



SPECIFICATIONS

Metric					
Code No.	Range (mm)* ¹	Resolution (mm)	Maximum permissible error (mm)* ²		Remarks
			EMPE	SMPE	
550-301-20	0 - 200 (10.1 - 210)	0.01	±0.03	±0.03	IP67, with offset
550-331-20	0 - 300 (10.1 - 310)		±0.04	±0.04	IP67, with offset/preset function for easy inside measurement
550-203-10	0 - 450 (20.1 - 470)		±0.05	±0.05	—
550-205-10	0 - 600 (20.1 - 620)		±0.05	±0.05	—
550-207-10	0 - 1000 (20.1 - 1020)		±0.07	±0.07	—

Inch / Metric					
Code No.	Range* ¹	Resolution	Maximum permissible error* ²		Remarks
			EMPE	SMPE	
550-311-20	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	±0.0015 in/ ±0.03 mm	IP67, with offset
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	±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	±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)		±0.003 in/ ±0.07 mm	±0.003 in/ ±0.07 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	±0.003 in/ ±0.07 mm	—

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

• Position detection method: ABSOLUTE electromagnetic induction linear encoder

• Response speed: Unlimited

*1 (): Inside measurement

*2 The Partial Surface Contact Error (EMPE) and Shift Error (SMPE) are terms defined by ISO 13385-1:2019.

DIMENSIONS

Unit: mm

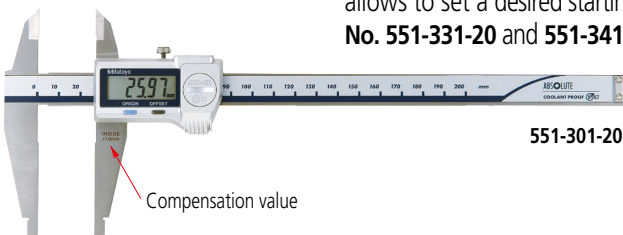
Range (mm)	D	G	S	W	H	t	R
0 - 200 (0 - 8 in)*	60	5 (5.08)*	8	76	16	3	5 (5.08)*
0 - 300 (0 - 12 in)*	75		12	95	20	3.8	
0 - 450 (0 - 18 in)*	100	10 (6.35)*	18	125	25	6	10 (6.35)*
0 - 600 (0 - 24 in)*	140		24	172	32	8	
0 - 1000 (0 - 40 in)*	140	10 (12.7)*	24	172	32	8	10 (12.7)*

* 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.
- Incorporates Mitutoyo's ABSOLUTE measurement system. No need to reset the origin after switching on.
- 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.
- 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 (**Code No. 551-301-20, 551-331-20, 551-311-20 and 551-341-20**). Preset function allows to set a desired starting point (**Code No. 551-331-20 and 551-341-20**).



SPECIFICATIONS

Metric					
Code No.	Range (mm)*1	Resolution (mm)	Maximum permissible error (mm)*2		Remarks
			EMPE	SMPE	
551-301-20	0 - 200 (10.1 - 210)	0.01	±0.03	±0.03	IP67, with offset
551-331-20	0 - 300 (10.1 - 310)		±0.04	±0.04	IP67, with offset/preset function for easy inside measurement
551-204-10	0 - 500 (20.1 - 520)		±0.06	±0.06	—
551-206-10	0 - 750 (20.1 - 770)		±0.02 in/	±0.002 in/	
551-207-10	0 - 1000 (20.1 - 1020)		±0.07	±0.07	

Inch / Metric					
Code No.	Range*1	Resolution	Maximum permissible error*2		Remarks
			EMPE	SMPE	
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	±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	±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	±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	±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)		±0.003 in/ ±0.07 mm	±0.003 in/ ±0.07 mm	

- Power source: SR44 battery (1 pc.), **938882** included as standard (for operational checks)
- Response speed: Unlimited
- *1 (): Inside measurement
- *2 The Partial Surface Contact Error (EMPE) and Shift Error (SMPE) are terms defined by ISO 13385-1:2019.

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			10 (12.7)*	20	32	8	10 (12.7)*
0 - 1000 (0 - 40 in)*	56	43.8						

* Inch model

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U-WAVE^{fit}

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IP67

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Measurement example



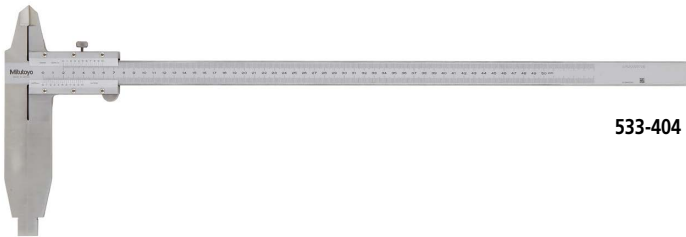
Optional Accessories

Code 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.



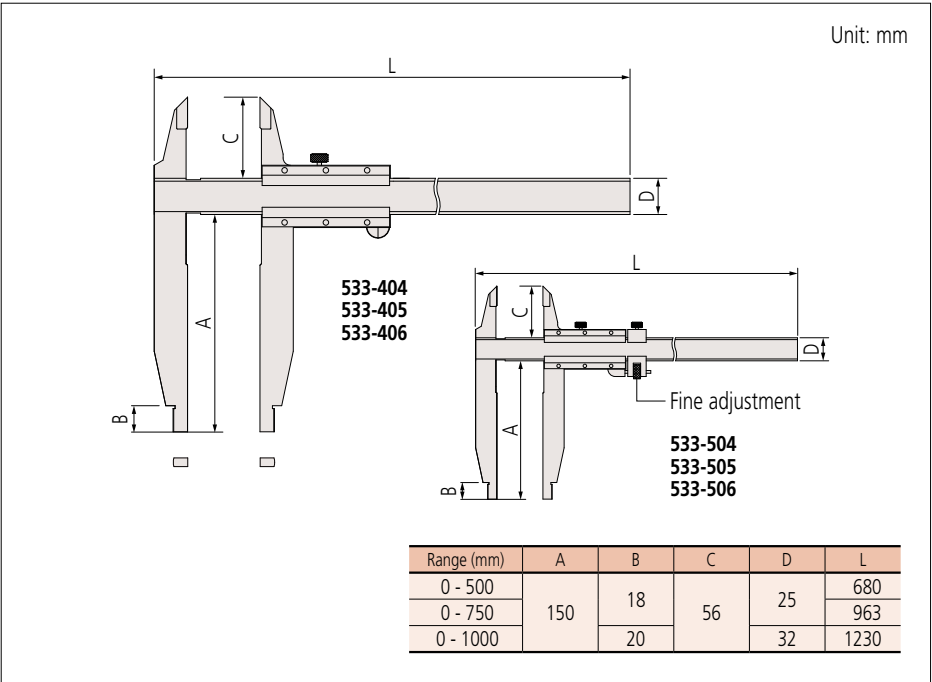
533-404

SPECIFICATIONS

Metric					
Code No.	Range (mm)* ¹	Resolution (mm)	Maximum permissible error (mm)* ²		Remarks
533-404	0 - 500 (20.1 - 520)	0.05	±0.10	±0.10	—
533-405	0 - 750 (20.1 - 770)		±0.12	±0.12	
533-406	0 - 1000 (20.1 - 1020)		±0.15	±0.15	
533-504	0 - 500 (20.1 - 520)	0.02	±0.05	±0.05	with fine adjustment
533-505	0 - 750 (20.1 - 770)		±0.06	±0.06	
533-506	0 - 1000 (20.1 - 1020)		±0.07	±0.07	

*1 (): Inside measurement
 *2 The Partial Surface Contact Error (E_{MPE}) and Shift Error (S_{MPE}) are terms defined by ISO 13385-1:2019.

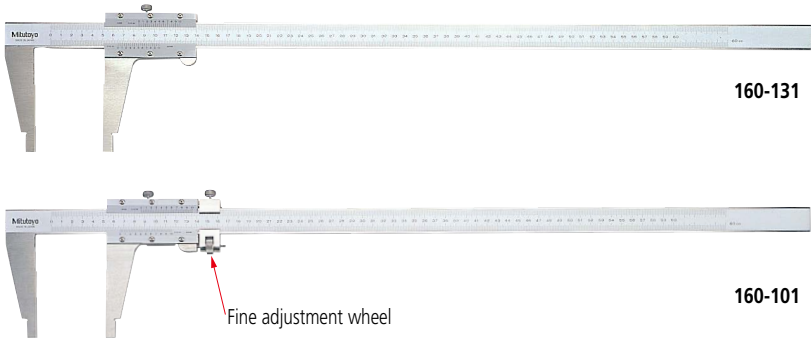
DIMENSIONS



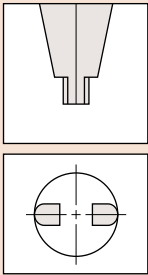
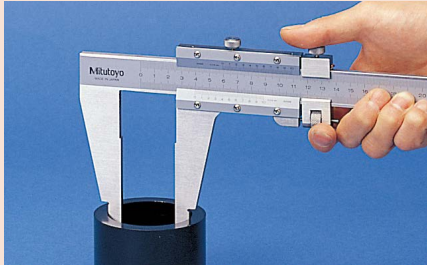
Calipers

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 (Code No. 160-127/128/101/104).



Measurement example



Radiused jaws for accurate ID measurement

SPECIFICATIONS

Metric		with inside measurement Vernier scale			
Code No.	Range (mm)*1	Minimum reading (mm)	Maximum permissible error (mm)*2		Remarks
			EMPE	SMPE	
160-130	0 (20.1) - 450	0.05	±0.10	±0.10	without fine adjustment
160-131	0 (20.1) - 600				
160-132	0 (20.1) - 1000		±0.15	±0.15	

*1 (): Minimum dimension in ID measurement
*2 The Partial Surface Contact Error (EMPE) and Shift Error (SMPE) are terms defined by ISO 13385-1:2019.

Metric		with inside measurement Vernier scale			
Code No.	Range (mm)*1	Minimum reading (mm)	Maximum permissible error (mm)*2		Remarks
			EMPE	SMPE	
160-127	0 (10.1) - 300	0.02	±0.04	±0.04	with fine adjustment
160-128	0 (20.1) - 450		±0.05	±0.05	
160-101	0 (20.1) - 600				
160-104	0 (20.1) - 1000		±0.07	±0.07	

*1 (): Minimum dimension in ID measurement
*2 The Partial Surface Contact Error (EMPE) and Shift Error (SMPE) are terms defined by ISO 13385-1:2019.

Metric/Inch		with metric/inch double scale			
Code No.	Range*1	Minimum reading	Maximum permissible error*2		Remarks
			EMPE	SMPE	
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	±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	±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	±0.07 mm/ ±0.003 in	
160-155	0 - 1000 mm/0 - 40 in (20.1 - 1000 mm/0.791 - 24 in)				

*1 (): Minimum dimension in ID measurement
*2 The Partial Surface Contact Error (EMPE) and Shift Error (SMPE) are terms defined by ISO 13385-1:2019.

Measurement example



Inch		with inside measurement Vernier scale			
Code No.	Range (in)* ¹	Minimum reading (in)	Maximum permissible error (in)* ²		Remarks
			<i>E</i> _{MPE}	<i>S</i> _{MPE}	
160-124	0 (0.304) - 12	0.001	±0.0015	±0.0015	—
160-116	0 (0.504) - 18		±0.002	±0.002	
160-102	0 (0.504) - 24		±0.003	±0.003	
160-105	0 (1.004) - 40		±0.003	±0.003	

*1 (): Minimum dimension in ID measurement

*2 The Partial Surface Contact Error (*E*_{MPE}) and Shift Error (*S*_{MPE}) are terms defined by ISO 13385-1:2019.

Inch / Metric		with inch/metric double scale			
Code No.	Range* ¹	Minimum reading	Maximum permissible error** ²		Remarks
			<i>E</i> _{MPE}	<i>S</i> _{MPE}	
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	±0.0015 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	±0.002 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	±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)		±0.003 in/ ±0.07 mm	±0.003 in/ ±0.07 mm	+1 in/25.4 mm to reading in inside measurement

*1 (): Minimum dimension in ID measurement

*2 The Partial Surface Contact Error (*E*_{MPE}) and Shift Error (*S*_{MPE}) are terms defined by ISO 13385-1:2019.

DIMENSIONS

Unit: mm

Range	D	E	F	H	L	M	R	S	t
0 - 300 mm/0 - 12 in	75	103	38	20	445	10	R5	12	3.8
0 - 450 mm*	100	89	—	25	630	14.8	R10	18	6
0 - 450 mm/0 - 18 in		112	51		780				
0 - 600 mm*		89	—						
0 - 600 mm/0 - 24 in		112	51						
0 - 1000 mm*	140	111	—	32	1240	17		24	8
0 - 1000 mm/0 - 40 in		150	62.5						

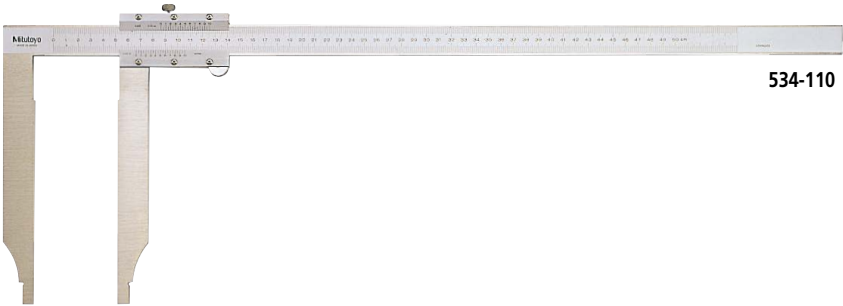
* Without fine adjustment

* Without fine adjustment

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.



SPECIFICATIONS

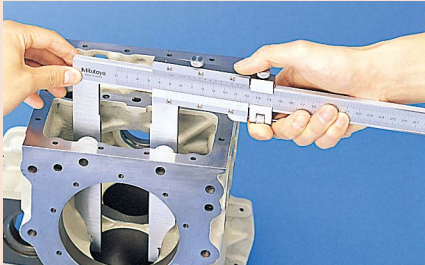
Metric		with inside measurement Vernier scale			
Code No.	Range (mm)*1	Graduation (mm)	Maximum permissible error (mm)*2		Remarks
			EMPE	SMPE	
534-109	0 (10.1) - 300	0.05	±0.07	±0.07	without fine adjustment
534-110	0 (20.1) - 500		±0.13	±0.13	

*1 (): Minimum dimension in ID measurement
*2 The Partial Surface Contact Error (EMPE) and Shift Error (SMPE) are terms defined by ISO 13385-1:2019.

Metric /Inch		with metric/inch double scale			Remarks
Code No.	Range* ¹	Graduation	Maximum permissible error* ²		
			EMPE	SMPE	
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	±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	±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	±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	±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	±0.16 mm/ ±1/128 in	
534-107		0.02 mm/ 0.001 in	±0.08 mm/ ±0.003 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	±0.2 mm/ ±1/128 in	
534-108		0.02 mm/ 0.001 in	±0.1 mm/ ±0.004 in	±0.1 mm/ ±0.004 in	

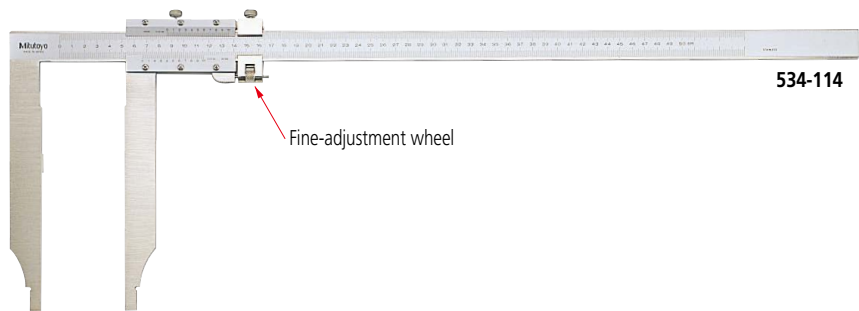
*1 (): Minimum dimension in ID measurement
*2 The Partial Surface Contact Error (EMPE) and Shift Error (SMPE) are terms defined by ISO 13385-1:2019.
Note: For external dimensions, refer to page 04-28.

Measurement example



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

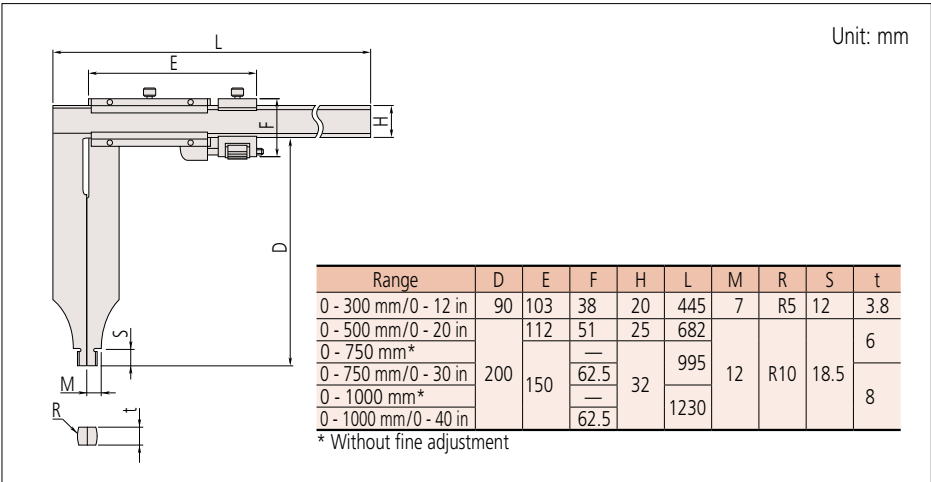
Metric		with inside measurement Vernier scale			
Code No.	Range (mm)* ¹	Graduation (mm)	Maximum permissible error (mm)* ²		Remarks
534-113	0 (10.1) - 300	0.02	±0.04	±0.04	with fine adjustment
534-114	0 (20.1) - 500		±0.06	±0.06	
534-115	0 (20.1) - 750		±0.08	±0.08	
534-116	0 (20.1) - 1000		±0.10	±0.10	

*1 (): Minimum dimension in ID measurement
 *2 The Partial Surface Contact Error ($EMPE$) and Shift Error ($SMPE$) are terms defined by ISO 13385-1:2019.

Inch		with inside measurement Vernier scale			
Code No.	Range (in)* ¹	Graduation (in)	Maximum permissible error (in)* ²		Remarks
534-117	0 (0.304) - 12	0.001	±0.0015	±0.0015	with fine adjustment
534-118	0 (0.804) - 20		±0.0025	±0.0025	
534-119	0 (0.804) - 30		±0.003	±0.003	
534-120	0 (0.804) - 40		±0.004	±0.004	

*1 (): Minimum dimension in ID measurement
 *2 The Partial Surface Contact Error ($EMPE$) and Shift Error ($SMPE$) are terms defined by ISO 13385-1:2019.

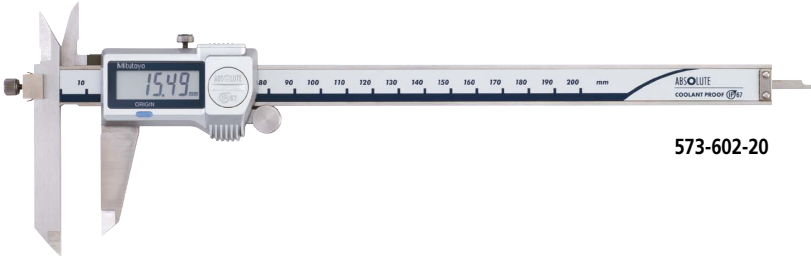
DIMENSIONS



Calipers

Offset Caliper
SERIES 573 — ABSOLUTE Digimatic Type

- The beam-mounted jaw can be adjusted to facilitate measurement of stepped sections.



573-602-20

SPECIFICATIONS

Metric		Digimatic model		
Code No.	Range (mm)	Resolution (mm)	Maximum permissible error (mm)*2	
			EMPE	SMPE
573-601-20	0 - 150	0.01	±0.02	±0.04
573-611-20*1	0 - 150			
573-602-20	0 - 200			
573-612-20*1	0 - 200		±0.03	±0.05
573-604-20	0 - 300			
573-614-20*1	0 - 300			

Inch / Metric		Digimatic model		
Code No.	Range	Resolution	Maximum permissible error*2	
			EMPE	SMPE
573-701-20	0 - 6 in/0 - 150 mm	0.0005 in/0.01 mm	±0.001 in/±0.02 mm	±0.002 in/±0.04 mm
573-702-20	0 - 8 in/0 - 200 mm		±0.0015 in/±0.03 mm	±0.0025 in/±0.05 mm
573-704-20	0 - 12 in/0 - 300 mm			

- Dust/Water protection level: IP67 (IEC 60529)*3
 - Power source: SR44 battery (1 pc.), 938882 included as standard (for operational checks)
 - Battery life: Approx. 5 years under normal use
 - Position detection method: ABSOLUTE electromagnetic induction linear encoder
 - Response speed: Unlimited
- *1 Without thumb roller
*2 The Partial Surface Contact Error (EMPE) and Shift Error (SMPE) are terms defined by ISO 13385-1:2019.
*3 Rustproofing shall be applied after use if caliper was in contact with coolant.

DIMENSIONS

Unit: mm

Digimatic model

Code 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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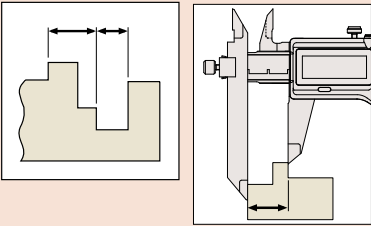
U-WAVE^{fit}

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IP67

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Measurement example



Optional Accessories

Code 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				
Code No.	Range (mm)	Graduation (mm)	Maximum permissible error (mm)*	
			<i>E</i> _{MPE}	<i>S</i> _{MPE}
536-101	0 - 150	0.05	±0.05	±0.07
536-102	0 - 200			
536-103	0 - 300		±0.08	±0.10

Metric				
Code No.	Range (mm)	Graduation (mm)	Maximum permissible error (mm)*	
			<i>E</i> _{MPE}	<i>S</i> _{MPE}
536-221	0 - 150	0.05	±0.05	±0.07
536-222	0 - 200			
536-223	0 - 300		±0.08	±0.10

* The Partial Surface Contact Error (*E*_{MPE}) and Shift Error (*S*_{MPE}) are terms defined by ISO 13385-1:2019.

DIMENSIONS

Unit: mm											
Code 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	15	20	(23.5)	135	3.8

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.



SPECIFICATIONS

Metric Digimatic model		Resolution (mm)	Maximum permissible error (mm)*2	
Code No.	Range (mm)		EMPE	SMPE
573-605-20	10.1 - 160	0.01		±0.03
573-615-20*1	10.1 - 160			
573-606-20	10.1 - 210			±0.04
573-616-20*1	10.1 - 210			
573-608-20	10.1 - 310			
573-618-20*1	10.1 - 310			

Inch / Metric Digimatic model		Resolution	Maximum permissible error*2	
Code No.	Range		EMPE	SMPE
573-705-20	0.404 - 6.4 in/10.26 - 160.16 mm	0.0005 in/0.01 mm		±0.0015 in/±0.03 mm
573-706-20	0.404 - 8.4 in/10.26 - 210.16 mm			±0.0015 in/±0.04 mm
573-708-20	0.404 - 12.4 in/10.26 - 310.16 mm			

- Dust/Water protection level: IP67 (IEC 60529)*3
- Power source: SR44 battery (1 pc.), **938882** included as standard (for operational checks)
- Battery life: Approx. 5 years under normal use
- Position detection method: ABSOLUTE electromagnetic induction linear encoder
- Response speed: Unlimited
- *1 Without thumb roller
- *2 The Partial Surface Contact Error (EMPE) and Shift Error (SMPE) are terms defined by ISO 13385-1:2019.
- *3 Rustproofing shall be applied after use if caliper was in contact with coolant.

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	

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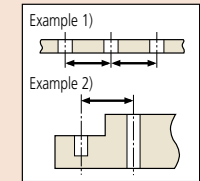
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IP67

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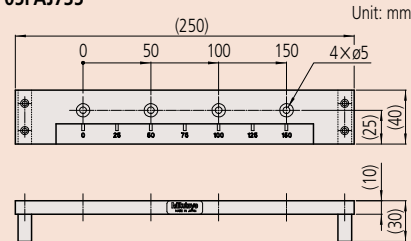
Measurement example



Optional Accessories

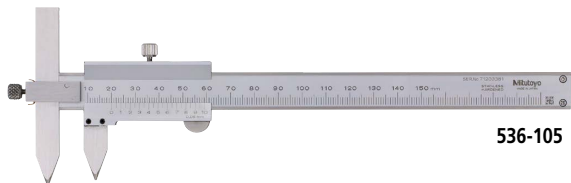
Code No.	Type	Description
264-020	—	USB Input Tool Series USB Keyboard Signal Conversion Type IT-020U
05CZA624	A	Connection cable for IT/DP/MUX (1 m)
05CZA625	A	Connection cable for IT/DP/MUX (2 m)
06AFM380A	A	USB Input Tool Direct (2 m)
02AZD730G	IP67	U-WAVE-T
02AZD880G	Buzzer	U-WAVE-T
02AZE200	—	U-WAVE-T 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

Metric		Analog model		
Code No.	Range (mm)	Graduation (mm)	Maximum permissible error (mm)*	
			E_{MPE}	S_{MPE}
536-105	10.1 - 150	0.05		±0.05
536-106	10.1 - 200			±0.05
536-107	10.1 - 300			±0.08

* The Partial Surface Contact Error (E_{MPE}) and Shift Error (S_{MPE}) are terms defined by ISO 13385-1:2019.

DIMENSIONS

Unit: mm

Analog model

Range (mm)	H	W	t	Applicable hole
10 - 150	16	75	3	ø1.5 - ø9.5 mm
10 - 200	16	75	3	
10 - 300	20	100	3.8	

ABSOLUTE Back-Jaw Centerline Caliper
SERIES 573 — Center-to-Center & Edge-to-Center Types

- 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

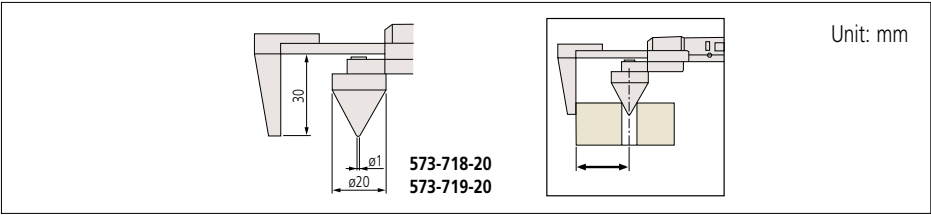


SPECIFICATIONS

Code No.	Range (mm)	Resolution (mm)	Maximum permissible error (mm)*2	
			EMPE	SMPE
573-718-20*1	10.1 - 200	0.01		±0.10
573-719-20*1	10.1 - 300			±0.15

- Power source: SR44 battery (1 pc.), **938882** included as standard (for operational checks)
- Position detection method: ABSOLUTE electromagnetic induction linear encoder
- Response speed: Unlimited
- *1 Applicable hole diameter: $\phi 1.5$ - $\phi 19.5$ mm
- *2 The Partial Surface Contact Error (EMPE) and Shift Error (SMPE) are terms defined by ISO 13385-1:2019.

DIMENSIONS



Center-to-center distance type

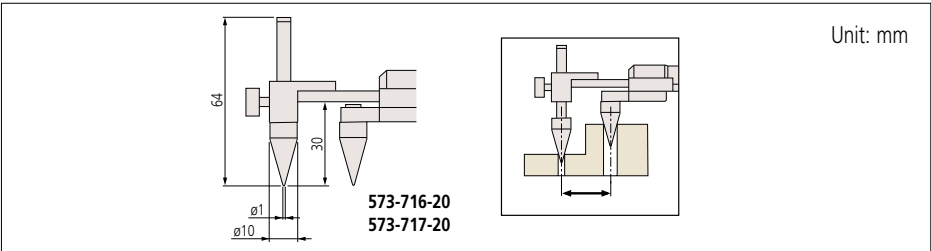


SPECIFICATIONS

Code No.	Range (mm)	Resolution (mm)	Maximum permissible error (mm)*2	
			EMPE	SMPE
573-716-20*1	10.1 - 200	0.01		±0.10
573-717-20*1	10.1 - 300			±0.15

- Power source: SR44 battery (1 pc.), **938882** included as standard (for operational checks)
- Position detection method: ABSOLUTE electromagnetic induction linear encoder
- Response speed: Unlimited
- *1 Applicable hole diameter: $\phi 1.5$ - $\phi 19.5$ mm
- *2 The Partial Surface Contact Error (EMPE) and Shift Error (SMPE) are terms defined by ISO 13385-1:2019.

DIMENSIONS

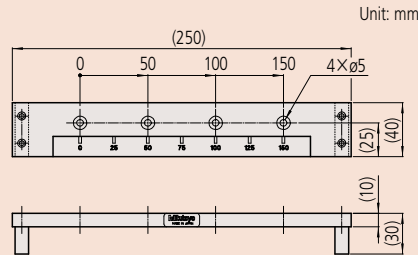


Optional Accessories

Code 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.

Measurement example



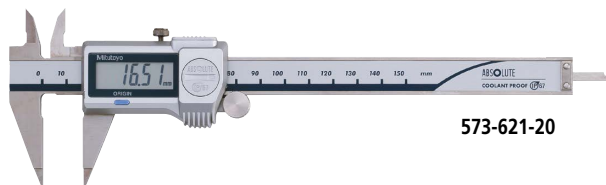
Optional Accessories (for series 573)

Code 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.



573-621-20

SPECIFICATIONS

Metric Digimatic model				
Code No.	Range (mm)	Resolution (mm)	Maximum permissible error (mm)*2	
			EMPE	SMPE
573-621-20	0 - 150	0.01	±0.02	±0.04
573-625-20	0 - 150			
573-622-20*1	0 - 150			
573-626-20*1	0 - 150			

Inch/Metric Digimatic model				
Code No.	Range	Resolution	Maximum permissible error*2	
			EMPE	SMPE
573-721-20	0 - 6 in/0 - 150 mm	0.0005 in/0.01 mm	±0.001 in/±0.02 mm	±0.002 in/±0.04 mm
573-725-20				

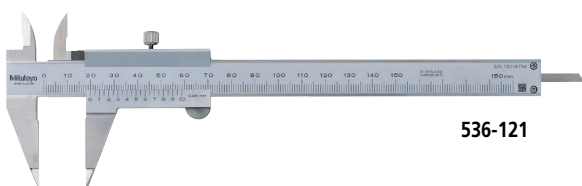
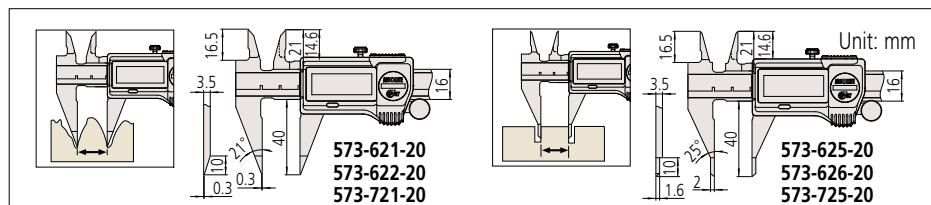
- Dust/Water protection level: IP67 (IEC 60529)*3
- Power source: SR44 battery (1 pc.), **938882** included as standard (for operational checks)
- Battery life: Approx. 5 years under normal use
- Position detection method: ABSOLUTE electromagnetic induction linear encoder
- Response speed: Unlimited
- With depth bar

*1 Without thumb roller

*2 The Partial Surface Contact Error (EMPE) and Shift Error (SMPE) are terms defined by ISO 13385-1:2019.

*3 Rustproofing shall be applied after use if caliper was in contact with coolant.

DIMENSIONS



536-121

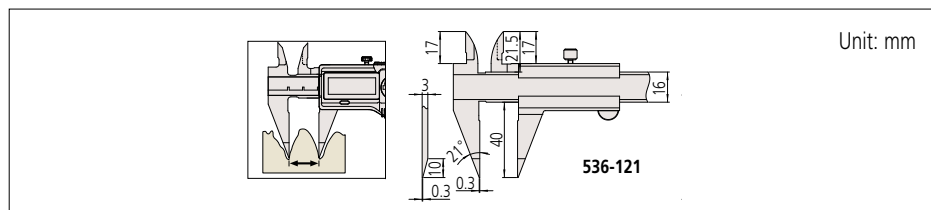
SPECIFICATIONS

Metric Analog model				
Code No.	Range (mm)	Graduation (mm)	Maximum permissible error (mm)*	
			EMPE	SMPE
536-121	0 - 150	0.05	±0.05	±0.07

- With depth bar

* The Partial Surface Contact Error (EMPE) and Shift Error (SMPE) are terms defined by ISO 13385-1:2019.

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.



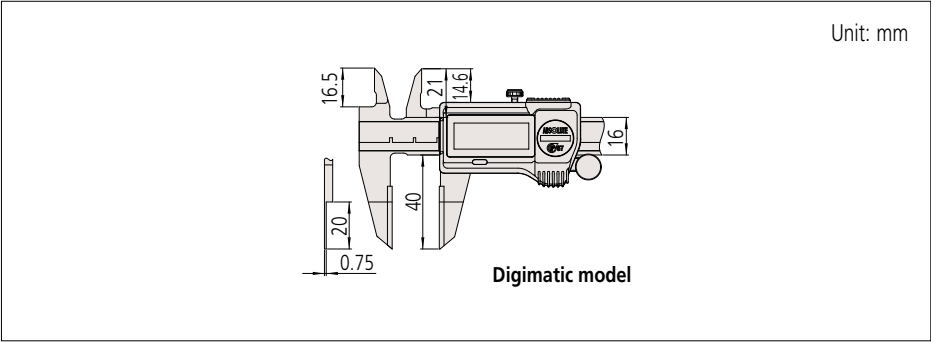
573-634-20

SPECIFICATIONS

Metric Digimatic model				
Code No.	Range (mm)	Resolution (mm)	Maximum permissible error (mm)*2	
			EMPE	SMPE
573-634-20	0 - 150	0.01	±0.02	±0.04
573-635-20*1	0 - 150			
Inch / Metric Digimatic model				
Code No.	Range	Resolution	Maximum permissible error*2	
			EMPE	SMPE
573-734-20	0 - 6 in/0 - 150 mm	0.0005 in/0.01 mm	±0.001 in/±0.02 mm	±0.002 in/±0.04 mm

- Dust/Water protection level: IP67 (IEC 60529)*3
 - Power source: SR44 battery (1 pc.), **938882** included as standard (for operational checks)
 - Battery life: Approx. 5 years under normal use
 - Position detection method: ABSOLUTE electromagnetic induction linear encoder
 - Response speed: Unlimited
- *1 Without thumb roller
*2 The Partial Surface Contact Error (EMPE) and Shift Error (SMPE) are terms defined by ISO 13385-1:2019.
*3 Rustproofing shall be applied after use if caliper was in contact with coolant.

DIMENSIONS



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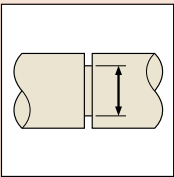
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ID 000045042

Measurement example

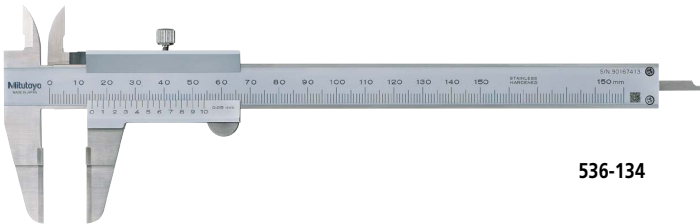


Optional Accessories (for series 573)

Code 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		
Code No.	Range (mm)	Graduation (mm)	Maximum permissible error (mm)*	
			<i>E</i> _{MPE}	<i>S</i> _{MPE}
536-134	0 - 150	0.05	±0.05	±0.07
536-135	0 - 200		±0.05	±0.07
536-136	0 - 300		±0.08	±0.10

* The Partial Surface Contact Error (*E*_{MPE}) and Shift Error (*S*_{MPE}) are terms defined by ISO 13385-1:2019.

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

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



573-642-20

Inside groove type



573-645-20

Point jaw type



573-646-20

SPECIFICATIONS

Metric Digimatic model					
Code No.	Range (mm)	Resolution (mm)	Maximum permissible error (mm)*3		Remarks
			EMPE	SMPE	
573-642-20	10 - 200	0.01		±0.05	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			±0.03	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.

Inch / Metric Digimatic model					
Code No.	Range	Resolution	Maximum permissible error*3		Remarks
			EMPE	SMPE	
573-742-20	0.4 - 8 in/ 10 - 200 mm	0.0005 in/ 0.01 mm		±0.002 in/ ±0.05 mm	Knife-edge type, Measurable min.
573-745-20*2	0.404 - 6.4 in/ 10.26 - 160.16 mm			±0.0015 in/ ±0.03 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.

- Dust/Water protection level: IP67 (IEC 60529)*4
- Power source: SR44 battery (1 pc.), **938882** included as standard (for operational checks)
- Battery life: Approx. 5 years under normal use
- Position detection method: ABSOLUTE electromagnetic induction linear encoder
- Response speed: Unlimited
- *1 Without thumb roller
- *2 Includes the offsetting function, which indicates the actual measurement value.
- *3 The Partial Surface Contact Error (EMPE) and Shift Error (SMPE) are terms defined by ISO 13385-1:2019.
- *4 Rustproofing shall be applied after use if caliper was in contact with coolant.

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ABSOLUTE[™]

IP67



Measurement example



Optional Accessories

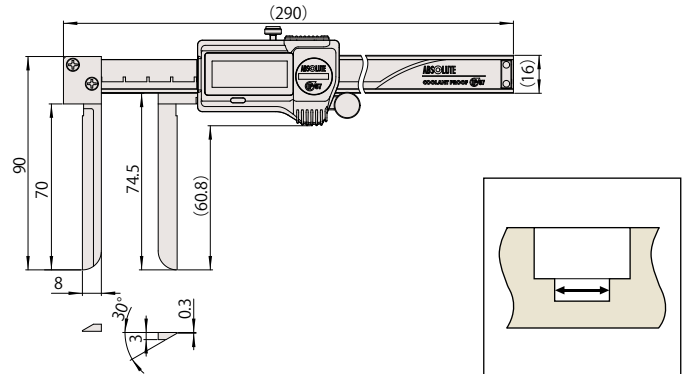
Code No.	Type	Description
264-020	—	USB Input Tool Series USB Keyboard Signal Conversion Type IT-020U
05CZA624	A	Connection cable for IT/DP/MUX (1 m)
05CZA625	A	Connection cable for IT/DP/MUX (2 m)
06AFM380A	A	USB Input Tool Direct (2 m)
02AZD730G	IP67	U-WAVE-T
02AZD880G	Buzzer	U-WAVE-T
02AZE200	—	U-WAVE-T 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).

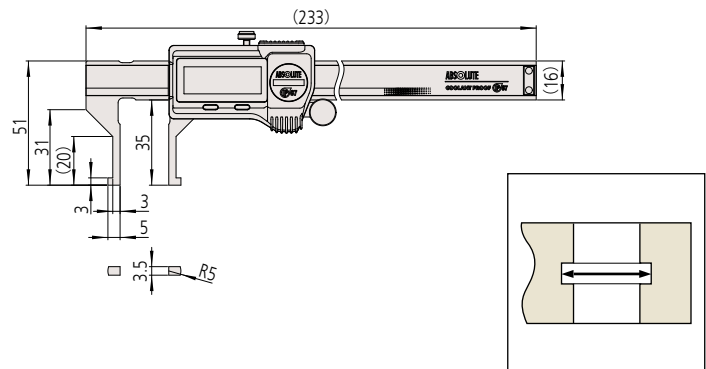
DIMENSIONS

Unit: mm

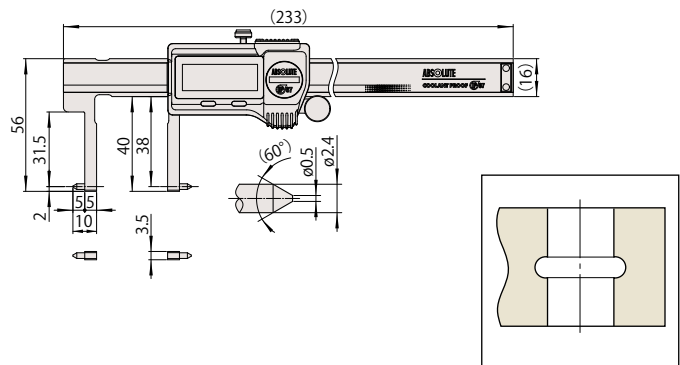
Knife-edge type: 573-642-20, 573-643-20, 573-742-20



Inside groove type: 573-645-20, 573-647-20, 573-745-20



Point jaw type: 573-646-20, 573-648-20, 573-746-20

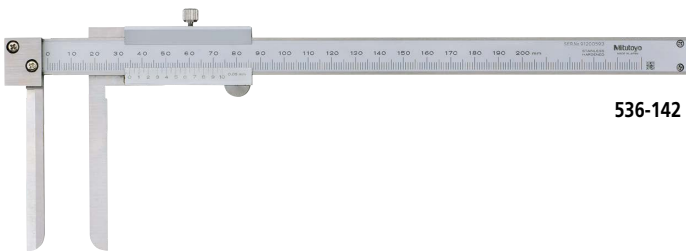


Calipers

ABSOLUTE Inside Caliper
SERIES 536 — Knife-edge/Inside Groove/Point Jaw Type

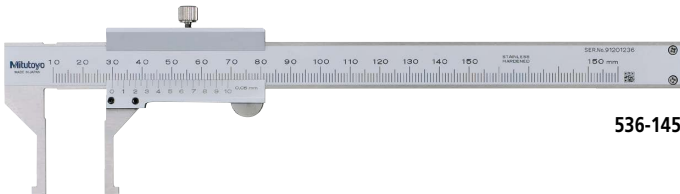
- Specially designed for inside measurement.
Select the right model for your workpiece shape.

Knife-edge type



536-142

Inside groove type



536-145

Point jaw type



536-146

SPECIFICATIONS

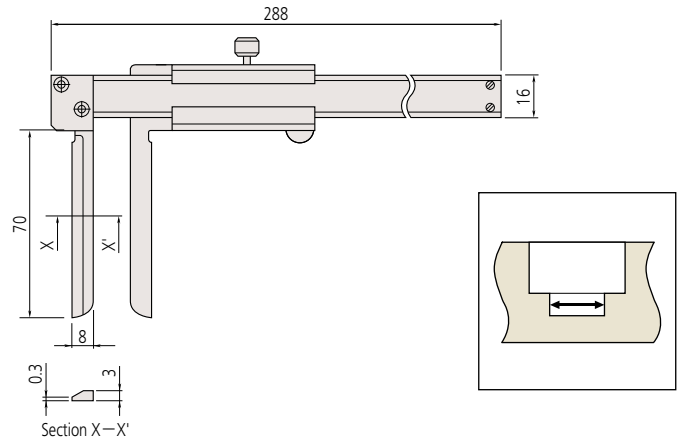
Metric		Analog model			
Code No.	Range (mm)	Graduation (mm)	Maximum permissible error (mm)*		Remarks
			EMPE	SMPE	
536-142	10 - 200	0.05		±0.12	Knife-edge type, Measurable min.
536-145	10.1 - 150			±0.05	Inside groove type, Measurable min.
536-146	20.1 - 150				Point jaw type, Measurable min.
536-147	30.1 - 300			±0.08	Point jaw type, Measurable min.
536-148	70.1 - 450			±0.10	Point jaw type, Measurable min.
536-149	70.1 - 600			±0.12	Point jaw type, Measurable min.

* The Partial Surface Contact Error (EMPE) and Shift Error (SMPE) are terms defined by ISO 13385-1:2019.

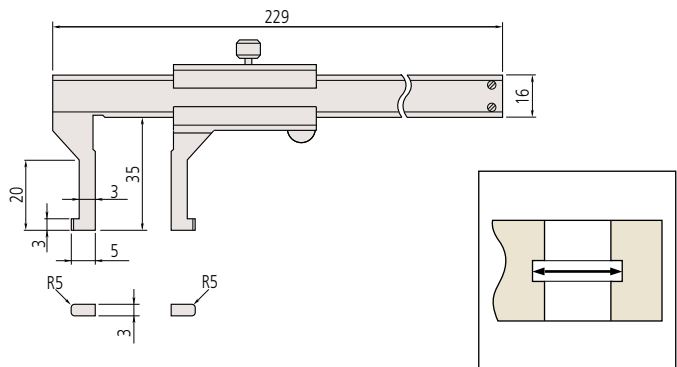
DIMENSIONS

Knife-edge type: 536-142

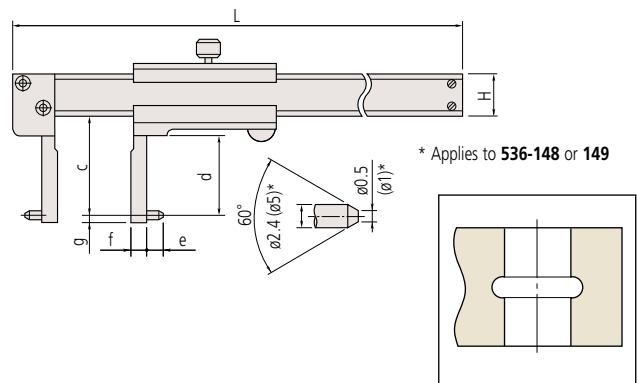
Unit: mm



Inside groove type: 536-145



Point jaw type: 536-146, 147, 148, 149



* Applies to 536-148 or 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 our Customer Support Center.

Calipers

Neck Caliper
SERIES 573, 536 — ABSOLUTE Digimatic and Vernier Types

- Can measure wall thickness, inside bores, and recesses.

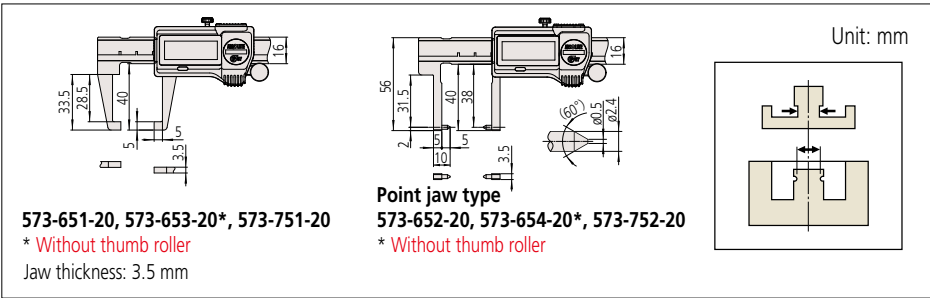


SPECIFICATIONS

Metric Digimatic model					Inch / Metric Digimatic model				
Code No.	Range (mm)	Resolution (mm)	Maximum permissible error (mm)*3		Code No.	Range	Resolution	Maximum permissible error*3	
573-651-20	0 - 150	0.01	±0.03		573-751-20	0 - 6 in/ 0 - 150 mm	0.0005 in/ 0.01 mm	±0.0015 in/ ±0.03 mm	
573-652-20*1	0 - 150				573-752-20*1	0 - 6 in/ 0 - 150 mm			
573-653-20*2	0 - 150								
573-654-20*1*2	0 - 150								

- Dust/Water protection level: IP67 (IEC 60529)*4
- Power source: SR44 battery (1 pc.), **938882** included as standard (for operational checks)
- Battery life: Approx. 5 years under normal use
- Position detection method: ABSOLUTE electromagnetic induction linear encoder
- Response speed: Unlimited
- *1 Point jaw type
- *2 Without thumb roller
- *3 The Partial Surface Contact Error (EMPE) and Shift Error (SMPE) are terms defined by ISO 13385-1:2019.
- *4 Rustproofing shall be applied after use if caliper was in contact with coolant.

DIMENSIONS



Point jaw type

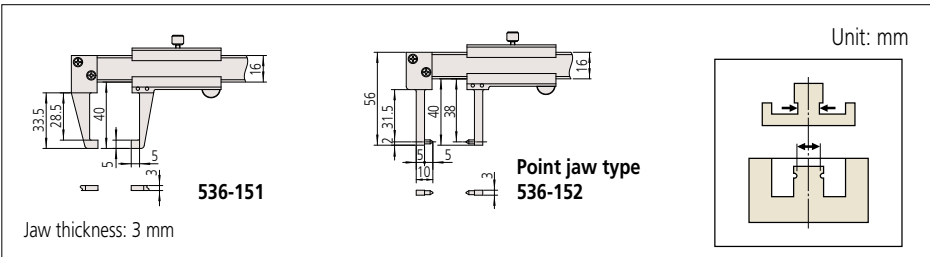


SPECIFICATIONS

Metric Analog model				
Code No.	Range (mm)	Graduation (mm)	Maximum permissible error (mm)*1	
536-151	0 - 150	0.05	±0.05	
536-152*2				

- *1 The Partial Surface Contact Error (EMPE) and Shift Error (SMPE) are terms defined by ISO 13385-1:2019.
- *2 Point jaw type

DIMENSIONS



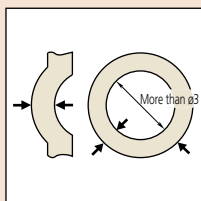
Measurement example



Optional Accessories (for series 573)

Code 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

Measurement example



Optional Accessories (for series 573)

Code 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 page 09-3.)



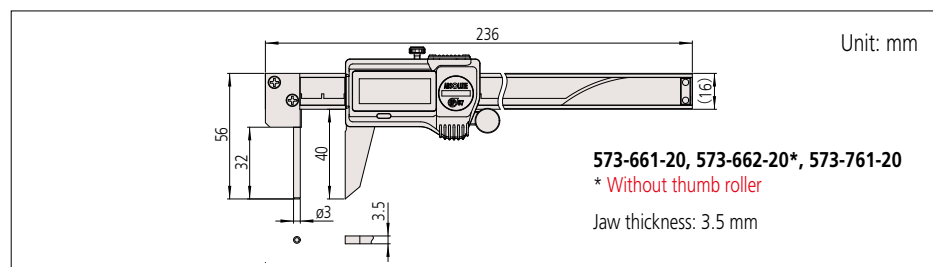
573-661-20

SPECIFICATIONS

Metric Digimatic model					Inch / Metric Digimatic model				
Code No.	Range (mm)	Resolution (mm)	Maximum permissible error (mm)*2		Code No.	Range	Resolution	Maximum permissible error*2	
573-661-20	0 - 150	0.01	EMPE	SMPE	573-761-20	0 - 6 in/ 0 - 150 mm	0.0005 in/ 0.01 mm	EMPE	SMPE
573-662-20*1	0 - 150		±0.05					±0.002 in/ ±0.05 mm	

- Dust/Water protection level: IP67 (IEC 60529)*3
- Power source: SR44 battery (1 pc.), **938882** included as standard (for operational checks)
- Battery life: Approx. 5 years under normal use
- Position detection method: ABSOLUTE electromagnetic induction linear encoder
- Response speed: Unlimited
- *1 Without thumb roller
- *2 The Partial Surface Contact Error (EMPE) and Shift Error (SMPE) are terms defined by ISO 13385-1:2019.
- *3 Rustproofing shall be applied after use if caliper was in contact with coolant.

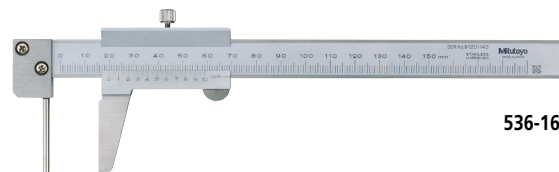
DIMENSIONS



573-661-20, 573-662-20*, 573-761-20

* Without thumb roller

Jaw thickness: 3.5 mm



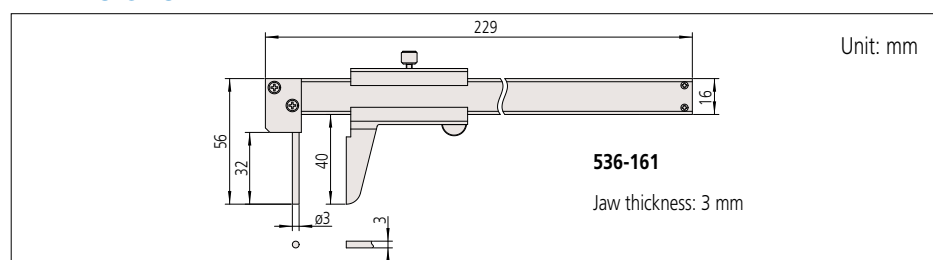
536-161

SPECIFICATIONS

Metric Analog model				
Code No.	Range (mm)	Graduation (mm)	Maximum permissible error (mm)*	
536-161	0 - 150	0.05	EMPE	SMPE
			±0.05	

- * The Partial Surface Contact Error (EMPE) and Shift Error (SMPE) are terms defined by ISO 13385-1:2019.

DIMENSIONS



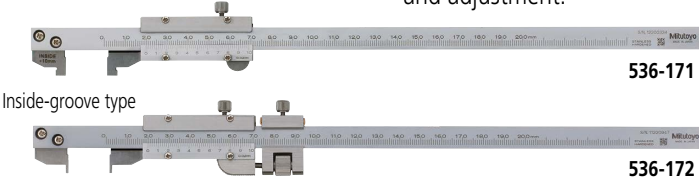
536-161

Jaw thickness: 3 mm

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

Code No.	Range (mm)*1	Graduation (mm)	Maximum permissible error (mm)*2		Remarks
			EMPE	SMPE	
536-171	0 - 200 (10.1 - 200)	0.02	±0.03	±0.03	—
536-172	0 - 200 (2.1 - 200)				with fine adjustment

*1 (): Dimension in inside measurement
*2 The Partial Surface Contact Error (EMPE) and Shift Error (SMPE) are terms defined by ISO 13385-1:2019.

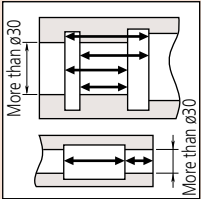
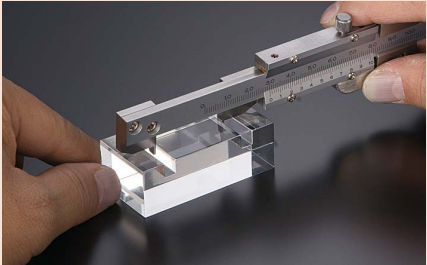
DIMENSIONS

Unit: mm

Code No.	D	F	L	N	P	S	t	W
536-171*1	12	—	320	—	5	4	3.5	28
536-172*2	12	28.5	320	20	1	4	3.5	28

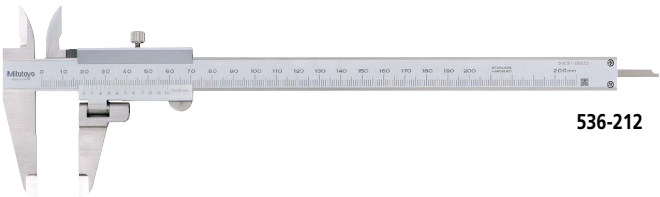
*1 Inside measuring face is R5.
*2 Inside measuring face is flat.

Measurement example



Swivel Vernier Caliper
SERIES 536 — Moving Jaw Type

- The moving jaw can be rotated to measure sectioned shafts.
- Can measure outside and inside dimensions, depth, and steps.



SPECIFICATIONS

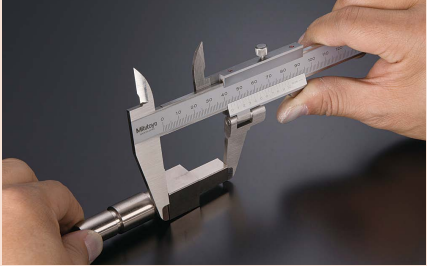
Code No.	Range (mm)	Graduation (mm)	Maximum permissible error (mm)*		Remarks
			EMPE	SMPE	
536-212	0 - 200	0.05	±0.05	±0.07	with depth bar

* The Partial Surface Contact Error (EMPE) and Shift Error (SMPE) are terms defined by ISO 13385-1:2019.

DIMENSIONS

Unit: mm

Measurement example



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

Code 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



573-191-30

SPECIFICATIONS

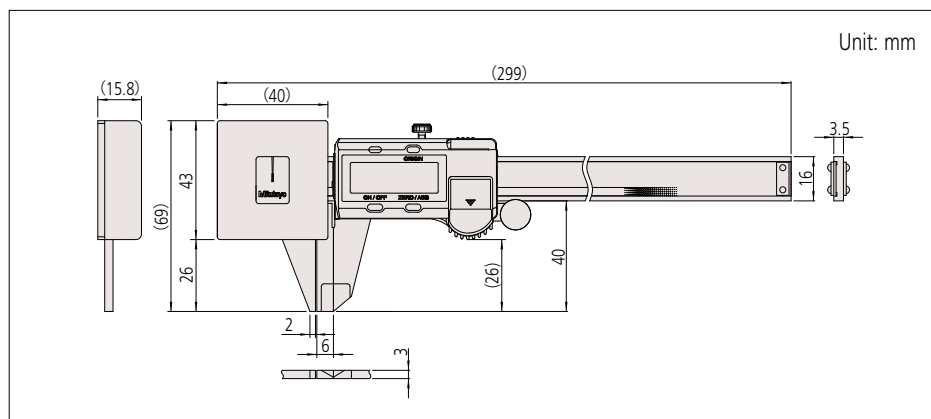
Metric				
Code No.	Range (mm)	Resolution (mm)	Maximum permissible error (mm)*	
			EMPE	SMPE
573-191-30	0 - 180	0.01	±0.05	

Inch / Metric				
Code No.	Range	Resolution	Maximum permissible error*	
			EMPE	SMPE
573-291-30	0 - 7 in/0 - 180 mm	0.0005 in/0.01 mm	±0.002 in/±0.05 mm	

- Power source: SR44 battery (1 pc.), **938882** included as standard (for operational checks)
- Position detection method: ABSOLUTE electromagnetic inductive linear encoder
- Response speed: Unlimited
- * The Partial Surface Contact Error (EMPE) and Shift Error (SMPE) are terms defined by ISO 13385-1:2019.

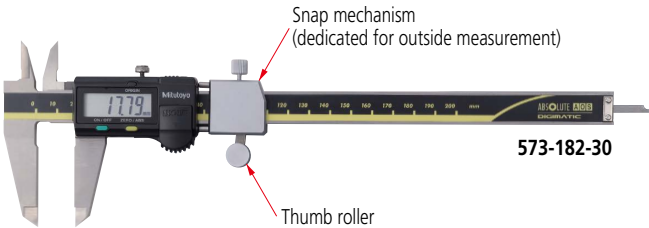
Note: Dedicated for outside measurement (depth bar is not fitted).

DIMENSIONS



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

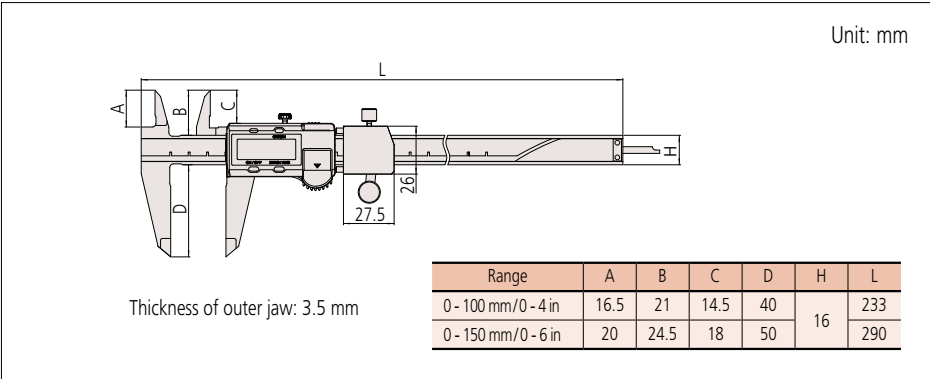


SPECIFICATIONS

Metric				
Code No.	Range (mm)	Resolution (mm)	Maximum permissible error (mm)*	
			EMPE	SMPE
573-181-30	0 - 100	0.01	±0.02	±0.04
573-182-30	0 - 150			
Inch / Metric				
Code No.	Range	Resolution	Maximum permissible error*	
			EMPE	SMPE
573-281-30	0 - 4 in/0 - 100 mm	0.0005 in/0.01 mm	±0.001 in/±0.02 mm	±0.002 in/±0.04 mm
573-282-30	0 - 6 in/0 - 150 mm			

- Power source: SR44 battery (1 pc.). **938882** included as standard (for operational checks)
 - Position detection method: ABSOLUTE electromagnetic inductive linear encoder
 - Response speed: Unlimited
- * The Partial Surface Contact Error (EMPE) and Shift Error (SMPE) are terms defined by ISO 13385-1:2019.

DIMENSIONS



Measurement example



Optional Accessories

Code 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

05

Height Gages

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.



Linear Height



QM-Height



ABSOLUTE Digimatic Height Gage

INDEX

High-precision Height Gage

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QM-Height	05-5

Digimatic Height Gage

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ABSOLUTE Digimatic Height Gage (Standard Model)	05-10

Height Gage

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Dial Height Gage	05-13

Accessories, Options

Height Gage (Optional Accessories for Height Gages)	05-14
CERA Caliper Checker	05-16

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.



518-361-11

SPECIFICATIONS

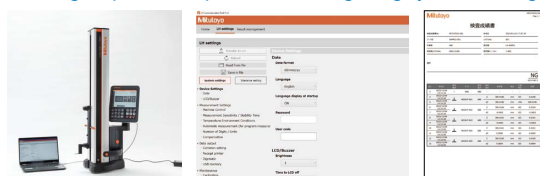
Model		LH-600F	LH-600FG
Code No.	mm inch/mm	518-360-11 518-360-13	518-361-11 518-361-13
Power grip		Without power grip	With power grip
Measuring range (Stroke)		0 to 977 mm (600 mm) 0 to 38 in (24 in)	
Resolution		0.0001/0.001/0.01/0.1 mm (selectable) 0.000001/0.00001/0.0001/0.001 in (selectable)	
Accuracy	Indication accuracy*1	$\pm (1.1 + 0.6L/600) \mu\text{m}$, L = Arbitrary measuring height (mm)	
	Repeatability*1	Plane: $0.4 \mu\text{m}$ (2σ), Hole: $0.9 \mu\text{m}$ (2σ)	
	Perpendicularity (forward and backward)*2	$5 \mu\text{m}$	
	Straightness (forward and backward)*2	$4 \mu\text{m}$	
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 100-240 V $\pm$ 10% 50/60 Hz/Battery (NiMH)	
Battery operation time*3		Battery powered (standard): 4 hours*4, Powered by 2 batteries: 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)	

- 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 $\phi 5$ stepped probe is used.
- *2: Guaranteed when using the Lever Head (519-521) and Mu-Checker (519-561).
- *3: 25% operation of vertical movement by suspension and motor
- *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.

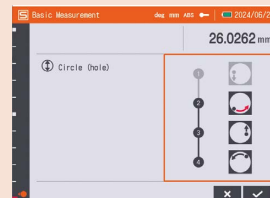
- * Available at Mitutoyo website for free download.
- * To connect to a PC, use a USB cable (type A-B).



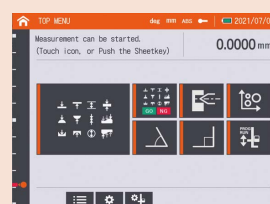
Adjustable to easy-to-see angle



Measurement guidance

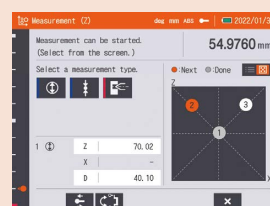


Intuitive operation thanks to guidance



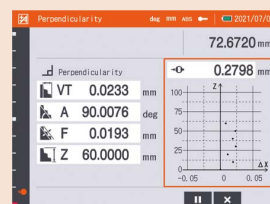
Home screen

Measurement menu display is easy to understand visually. The guidance makes it easy for first-time users to operate the system.



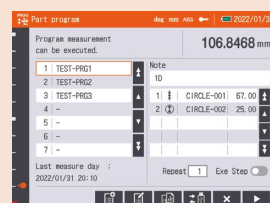
2D measurement - Pre-placement -

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.



Part program measurement

You can easily create, execute, edit, and even display the results of part programs.

Product catalog
E12012



Video



Optional products for outputting measurement data

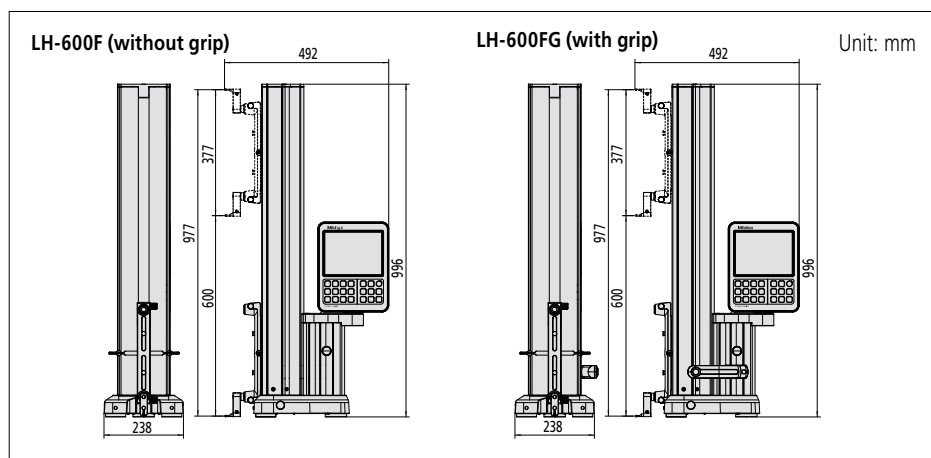
Code No.	Product name
12AAY481	Receipt printer (for Japan)* ¹
12AAY482	Receipt printer (for North America)* ¹
12AAY483	Receipt printer (for EU countries, excluding the UK)* ¹
12AAY484	Receipt printer (for the UK)* ¹
12AAN052	Printer paper for receipt printer (set of 10)
12AAY485	Printer mounting attachment
12AAN146	Connection cable for printer
—	(USB memory device)* ²
12BAF812	USB cable (type A - type B) (2 m)
543-700B	Digimatic indicator (ID-C0512NXB)
543-701B	Digimatic indicator (ID-C0512MNXB)
519-521	Lever head probe MLH-521
519-561	Mu-checker M-561
936937	Digimatic cable (1 m)
965014	Digimatic cable (2 m)
264-505	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)

*1 A small printer (optionally battery-powered) that can be mounted on the main unit.

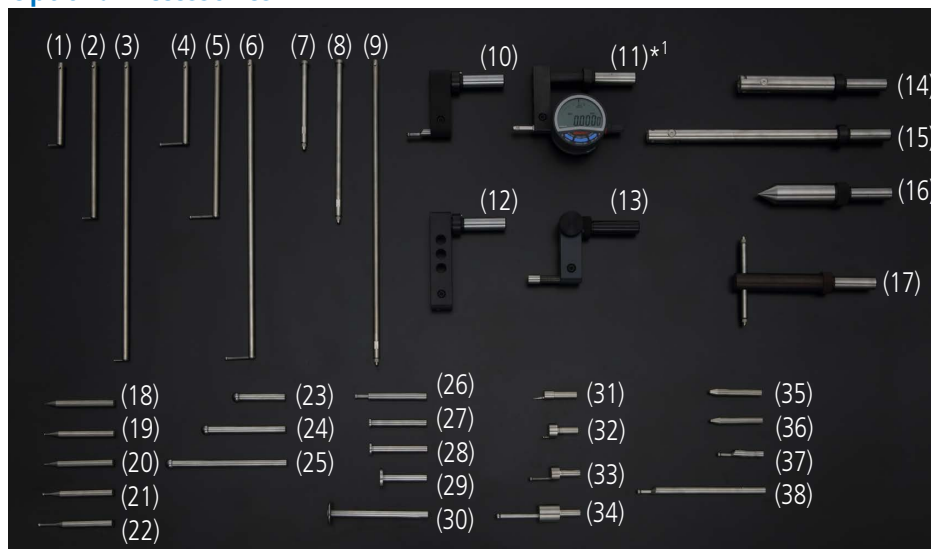
It includes a printer cable and mounting bracket.

*2 USB memory devices should be formatted with FAT16/32. NTFS and exFAT are not supported.

DIMENSIONS



Optional Accessories



No.	Code 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 12AAA837	Dial indicator holder (mm type)* ¹ 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)

*1 A dial indicator is not included.

*2 For enabling CMM stylus to be used.

*3 The stylus is attached to ø5 stepped probe (**12AAY343**) and provided as standard.

Note 1: A gauge block may be required for zero-setting depending on the probe and contact point.

Note 2: Refer to the **E12012** catalog for more details.

No.	Code 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* ²
(36)	226117	M2 CMM stylus adapter* ²
(37)	05HAA394	ø5 ball stylus* ³
(38)	12AAY597	ø5 ball stylus L130
	12AAF712	Additional battery pack

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

Code No.	Metric	518-240	518-242	518-244	518-246
	Inch/ Metric	518-241	518-243	518-245	518-247
Measuring range (stroke)		0 to 465 mm (350 mm/14 in)	0 to 715 mm (600 mm/24 in)	0 to 465 mm (350 mm/14 in)	0 to 715 mm (600 mm/24 in)
Resolution	Metric	0.001 mm/0.005 mm (Selectable)			
	Inch/Metric	0.001/0.005 mm 0.00005/0.0001/0.0002 in (Selectable)			
Accuracy	Indication accuracy* ¹	± (2.4 + 2.1L/600) μm			
	Repeatability* ¹	2 σ ≤ 1.8 μm			
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±0.5 N			
Data output ports		Digimatic/USB* ³			
Air-floating system		Not included		Included (for positioning only)* ⁴	
Power source		Alkaline AA/LR6 batteriesx4 (standard accessories)/AC adapter (optional accessory)* ⁵ / Supports NiMH (HR6) rechargeable batteriesx4			
Battery life guidelines* ⁶		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)			

- Standard Accessories: **05HZA148** ϕ 5 mm stepped probe, **12AAA715** Probe diameter calibration block, Alkaline batteries x4 (AA/LR6) (For operational checks)

*1 Indication accuracy and repeatability represent the values obtained when the standard ϕ 5 stepped probe is used. It should be used in an environment as close to 20 °C as possible, with minimal temperature changes. In the case of diameter, minimum (maximum) value, circle pitch or difference measurement, measuring errors may be larger than the accuracy ratings listed in the table due to variations in measuring force during a scanning measurement, which differs from height measurement.

*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**) and Mu-checker (**519-551**).

*3 Requires special communication driver. Consult your local Mitutoyo Sales Office for details.

*4 These can be downloaded from the Mitutoyo web site. <https://www.mitutoyo.co.jp/eng/contact/products/usb/index.html>

*4 When using a model with the air-floating system, it is advisable to use a JIS 1 class, or higher, surface plate. Using on surfaces with scratches or unevenness may prevent the system operating to the specified performance.

*5 The AC adapter cannot be used to recharge rechargeable batteries.

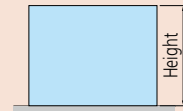
*6 Battery life depends on the operating conditions. In particular, it is more economical to use the optional AC adapter to power the instrument if the application requires prolonged use of the air-floating system.

MeasurLink[®] ENABLED
Data Management Software by Mitutoyo

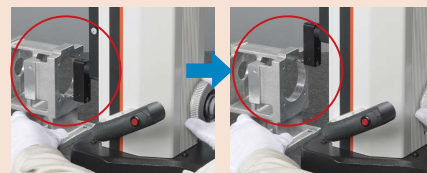
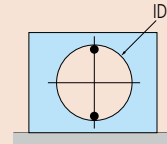


Measurement example

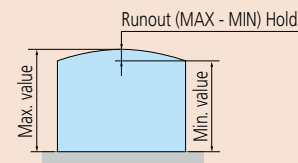
- Height measurement



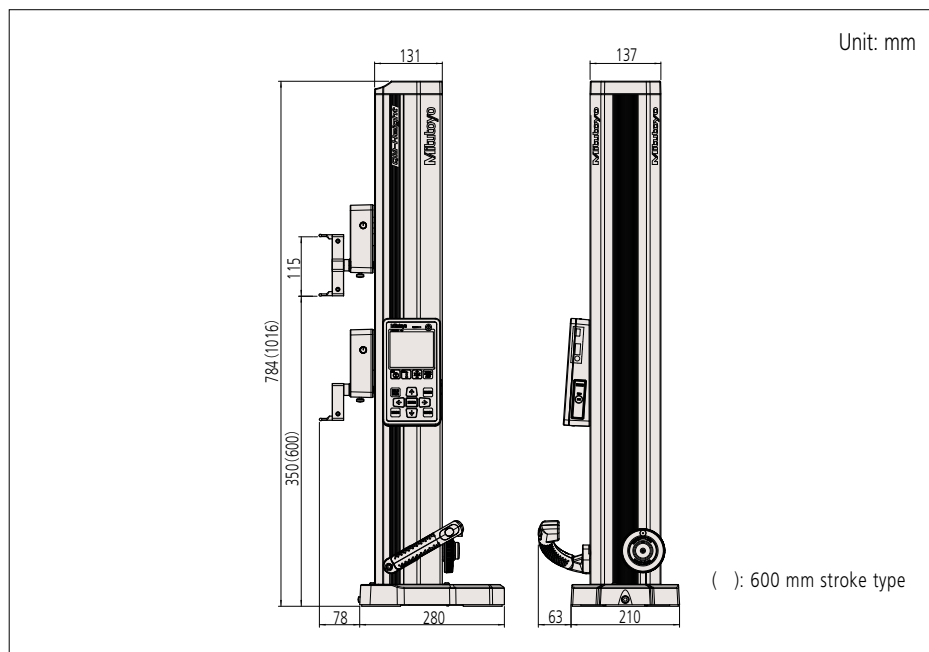
- ID measurement



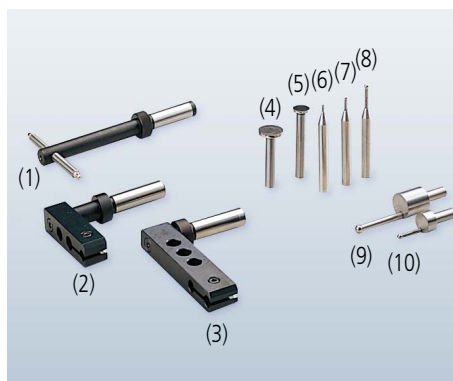
- Runout measurement



DIMENSIONS



Optional Accessories



Optional accessories that enable centralized data management

Code No.	Item name
Small printer equipped with Data Logger	
264-505	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

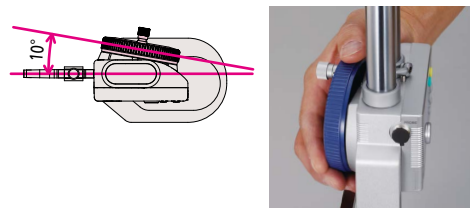
Item	Code No.	Description
Depth probe		
(1)	12AAC072	Depth probe
Special holder		
(2)	12AAA792	Holder for dial indicator
(3)	12AAA793	Holder (Long)
Interchangeable contact points for ø5 mm stepped probe		
(4)	957265	ø20 mm disk
(5)	957264	ø14 mm disk
(6)	957261	ø2 mm ball (coaxial type)
(7)	957262	ø3 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	AD620JA for Japan/U.S.
	06AGZ369D	AD620D for the EU
	06AGZ369E	AD620E for the UK
	06AGZ369K	AD620K for Korea
	06AGZ369DC	AD620DC for China
Other		
	05HZA173	Scriber*

* Used for measurements, cannot be used for scribing.
Note: A gauge 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

- Double-column structure ensures stable measurements.
- Ergonomic base fits comfortably in the hand.
- Inclined handle improves slider ergonomics.
- Bidirectional touch-trigger probe is available as an optional accessory.
- Provided with a long scribe (150 mm).



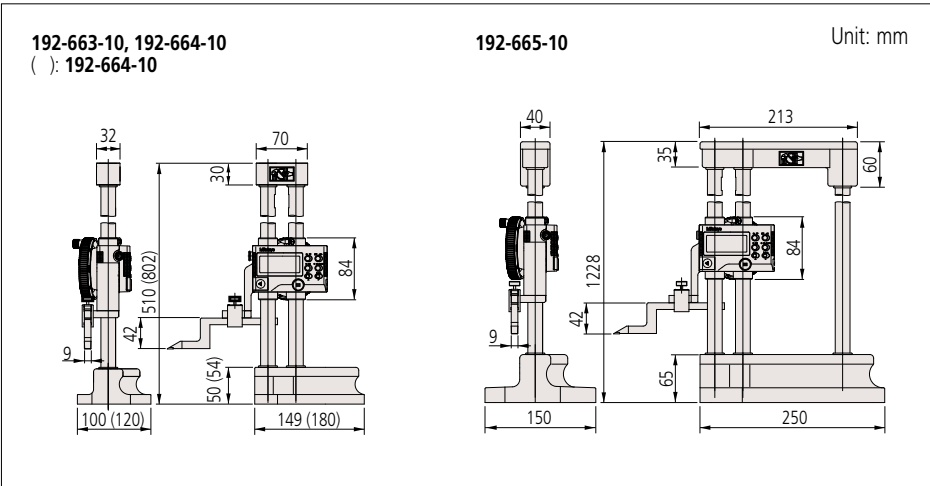
SPECIFICATIONS

Metric						
Code No.	Range (mm)	Resolution (mm)	Maximum permissible error E_{MPE} (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

Inch / Metric						
Code No.	Range (in)	Resolution	Maximum permissible error E_{MPE} (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		±0.0015		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		±0.0025		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
- * Maximum permissible error, E_{MPE} is the term (notation) used in JIS B 7517: 2018, revised based on ISO/TR 14253-6: 2012.

DIMENSIONS



Functions (Refer to page 05-8)

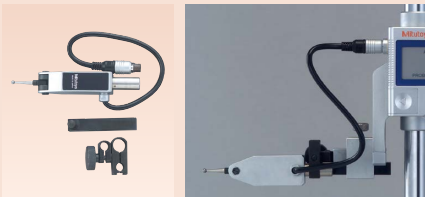
Standard Accessories

Code 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

Code No.	Type	Description
264-020	—	USB Input Tool Series USB Keyboard Signal Conversion Type IT-020U
905338	F	Connection cable for IT/DP/MUX (1 m)
905409	F	Connection cable for IT/DP/MUX (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:**
192-007 (mm), **192-008** (inch)
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**.



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 page 09-3.)
- 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.

- Double-column structure ensures stable measurements.
- Ergonomic base fits comfortably in the hand.
- Cannot be used with bidirectional touch-trigger probe.



192-613-10

Standard Accessories

Code No.	Description	Models
07GZA000	Scriber	192-613-10
		192-614-10
		192-615-10
900258	Scriber	192-630-10
		192-631-10
		192-632-10
05GZA033	Scriber clamp box	192-613-10
		192-614-10
		192-615-10
901385	Scriber clamp box	192-630-10
		192-631-10
		192-632-10

Optional Accessories

Code No.	Type	Description
264-020	—	USB Input Tool Series USB Keyboard Signal Conversion Type IT-020U
905338	F	Connection cable for IT/DP/MUX (1 m)
905409	F	Connection cable for IT/DP/MUX (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

SPECIFICATIONS

Metric						
Code No.	Range (mm)	Resolution (mm)	Maximum permissible error E_{MPE} (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

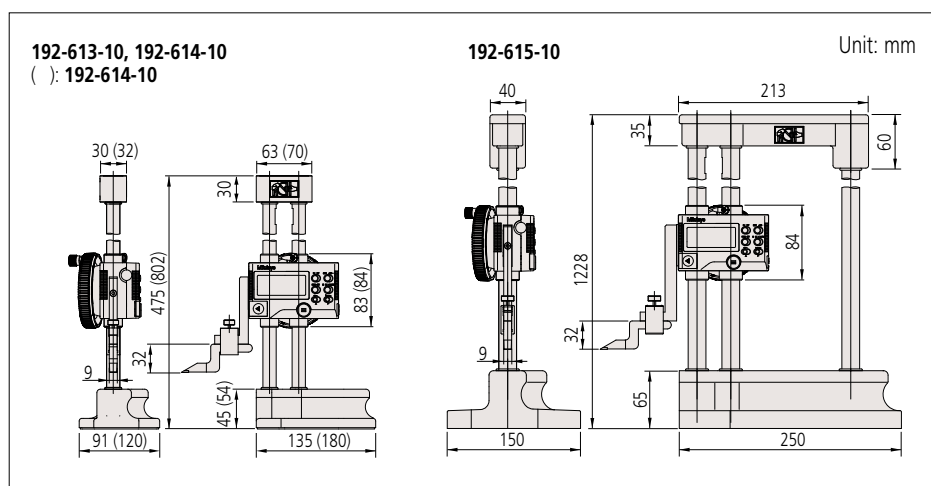
Inch/Metric						
Code No.	Range (in)	Resolution	Maximum permissible error E_{MPE} (in)*	Response speed (mm/s)	Height (mm)	Mass (kg)
192-630-10	0 - 12	0.01 mm/0.005 mm (selectable)	±0.001	Approx. 500	475	4.7
192-631-10	0 - 18		±0.002		649	7.5
192-632-10	0 - 24	0.0005 in/0.0002 in (selectable)	±0.002		802	8.3
192-633-10	0 - 40		±0.003		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

* Maximum permissible error, E_{MPE} is the term (notation) used in JIS B 7517: 2018, revised based on ISO/TR 14253-6: 2012.

DIMENSIONS



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.



Equipped with **U-WAVE-T/TC/TCB**
Note: When attaching the **U-WAVE**, use commercially available double-sided tape, etc.

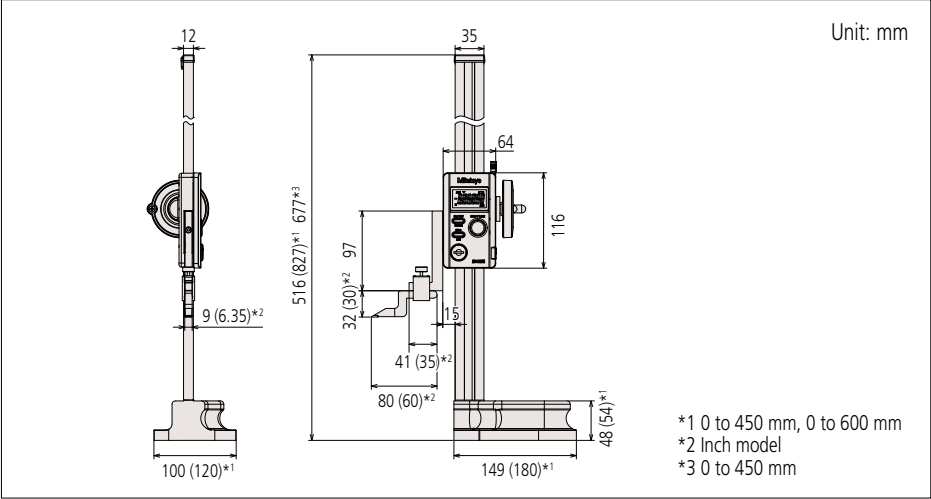
SPECIFICATIONS

Metric					
Code No.	Range (mm)	Resolution (mm)	Maximum permissible error E_{MPE} (mm)*	Response speed	Mass (kg)
570-402	0 - 300	0.01	±0.03	Unlimited	4.6
570-404	0 - 600		±0.05		6.4

Inch / Metric						
Code No.	Range	Resolution	Maximum permissible error E_{MPE} *	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		±0.0020 in/±0.05 mm		5.9	
570-414	0 to 24 in/0 to 600 mm				6.4	

- Power source: SR44 battery (1 pc.), **938882** included as standard (for operational checks)
- Battery life: Approx. 5 years
- * Maximum permissible error, E_{MPE} is the term (notation) used in JIS B 7517: 2018, revised based on ISO/TR 14253-6: 2012.

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 page 09-3.)
- **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

Code 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

Code No.	Type	Description
264-020	—	USB Input Tool Series USB Keyboard Signal Conversion Type IT-020U
905338	F	Connection cable for IT/DP/MUX (1 m)
905409	F	Connection cable for IT/DP/MUX (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 pages 07-84 and 07-85 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

Code 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

Code 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 **570-227** and **244**, the dedicated holding bar (**953639**, overall length 50 mm) is recommended for use. However, MPE (Maximum permissible error) may be larger because the measurement point is further from the beam.



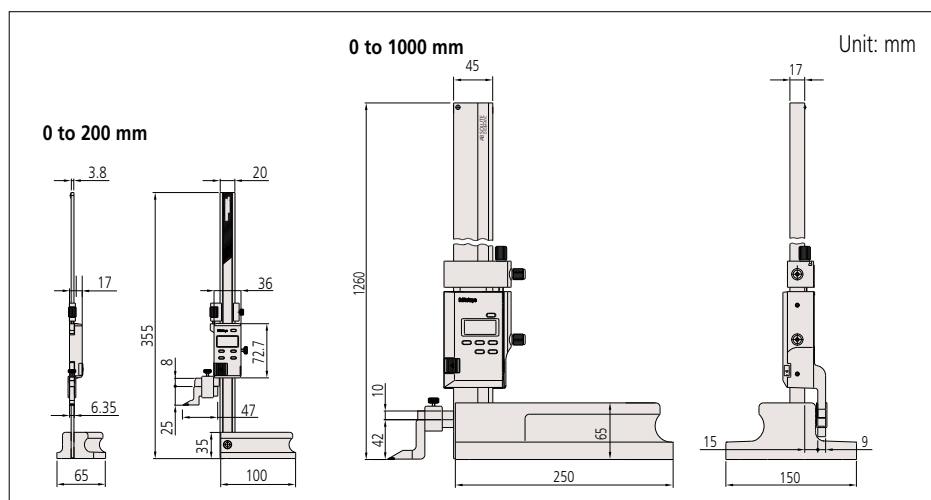
570-227

SPECIFICATIONS

Metric						
Code No.	Range (mm)	Resolution (mm)	Fine feed (mm)	Maximum permissible error E_{MPE} (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
Inch / Metric						
Code No.	Range (in)	Resolution	Fine feed (in)	Maximum permissible error E_{MPE} (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

- Power source: SR44 battery (1 pc.), **938882** included as standard (for operational checks)
- Battery life: Approx. 5,000 hours under normal use
- * Maximum permissible error, E_{MPE} is the term (notation) used in JIS B 7517: 2018, revised based on ISO/TR 14253-6: 2012.

DIMENSIONS



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)



SPECIFICATIONS

Metric							
Code No.	Range (mm)	Minimum reading (mm)	Scale adjustment (mm)	Fine feed (mm)	Maximum permissible error E_{MPE} (mm)*	Height (mm)	Mass (kg)
506-207	0 - 200	0.02	—	4	±0.03	341	1.4
514-102	0 - 300		15		±0.04	525	3.1
514-104	0 - 450		7	±0.05	675	3.4	
514-106	0 - 600				870	7.4	
514-108	0 - 1000		25	6	±0.07	1340	20

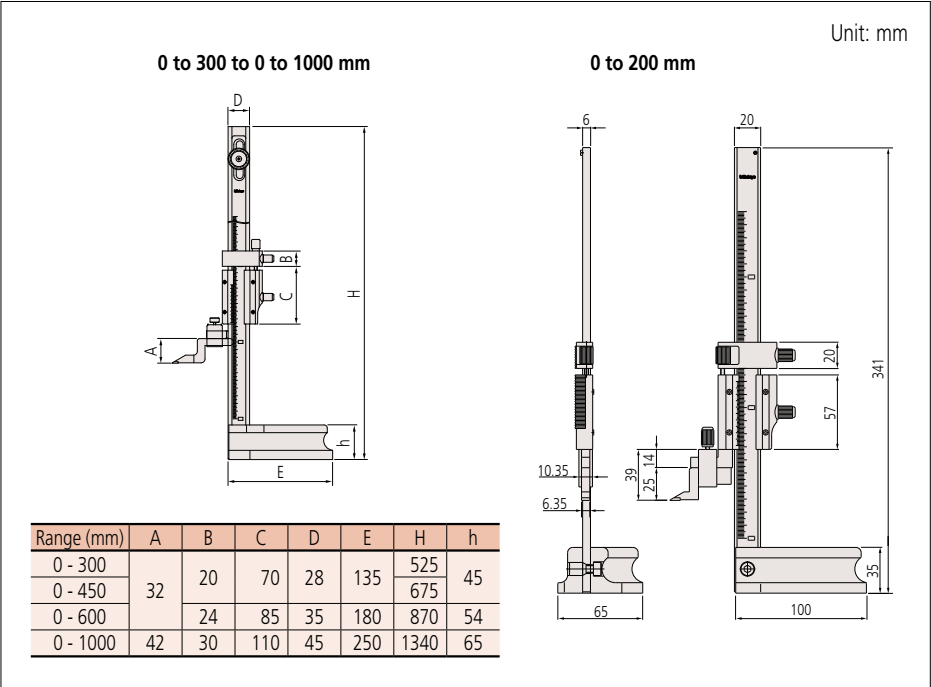
Inch / Metric							
Code No.	Range (in)	Minimum reading	Scale adjustment (in)	Fine feed (in)	Maximum permissible error E_{MPE} (in)*	Height (mm)	Mass (kg)
506-208	0 - 8	0.001 in/0.02 mm	—	0.16	±0.001	341	1.4
514-103	0 - 12		0.6		±0.002	525	3.1
514-105	0 - 18					675	3.4
514-107	0 - 24			0.27		870	7.4
514-109	0 - 40		1	0.24	±0.003	1340	20

• Reading magnifier (optional): **514-102, 104, 106: 07GZA003, 514-108: 07GZA015**
* Maximum permissible error, *E_{MPE}* is the term (notation) used in JIS B 7517: 2018, revised based on ISO/TR 14253-6: 2012.

Standard Accessories

Code 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

DIMENSIONS



05 Height Gages

Height Gage

- 
- 192-130

Metric					
Code No.	Range (mm)	Graduation (mm)	Maximum permissible error E_{MPE} (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

Inch					
Code No.	Range (in)	Graduation (in)	Maximum permissible error E_{MPE} (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

* Maximum permissible error, E_{MPE} is the term (notation) used in JIS B 7517: 2018, revised based on ISO/TR 14253-6: 2012.

0 to 300 mm (0 to 450 mm, 0 to 600 mm)

0 to 1000 mm

Unit: mm

Code 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

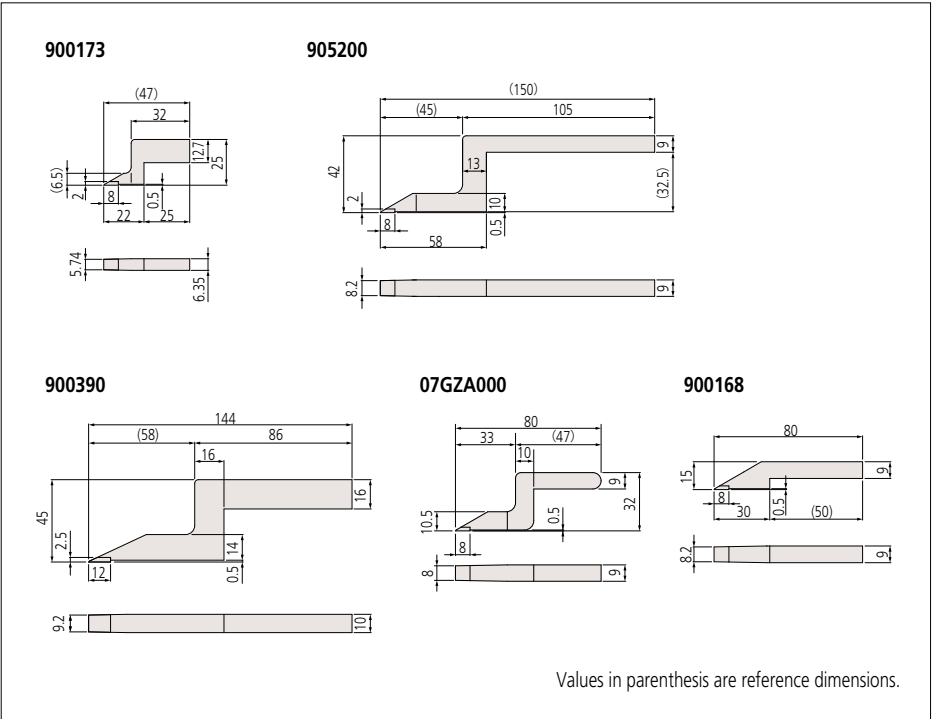
Height Gage
Optional Accessories for Height Gages

SPECIFICATIONS (Scriber)

Metric	
Code 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)
	514 Series Vernier Height Gages (514-108, 514-109)
900390	514 Series Vernier Height Gage (514-170)
Inch	
Code 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)
	574 Series Heightmatic (574-212-1, 574-211-1, 574-210-1)
905201	192 Series Digimatic Height Gages (192-670-10, 192-671-10, 192-672-10, 192-673-10)
	570 Series Digimatic Height Gage (570-248)

DIMENSIONS (Scriber)

Unit: mm



Values in parenthesis are reference dimensions.

Height Gage

Height Gage Optional Accessories for Height Gages

Dial Test Indicators

- For information about the attachment of dial test indicators, refer to page 07-84.

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 scribe 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 page 01-51)

Center Probe



951144

- Allows quick measurement of center-to-center distance between holes.
- Measurable hole diameters: 1 to 38 mm
- Mounting bar section: 9x9 mm

Depth Gage Attachment

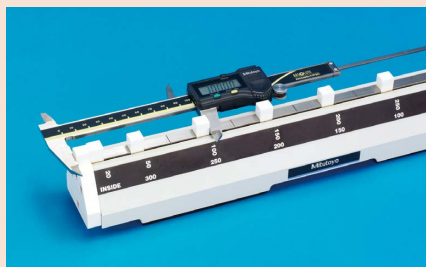


900764

- 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 pages 07-63 and 07-64.)
- Mounting bar section: 9x9 mm
- Holding bar length: 100 mm



Typical applications



Checking accuracy of caliper (outside measurement)



Checking accuracy of caliper (inside measurement)



Checking accuracy of height gage

Optional Accessories

- 602162: Wooden case for 300 mm, 12 inch model
- 602164: Wooden case for 600 mm model

CERA Caliper Checker SERIES 515

- Designed to inspect calipers.
- Can also stand perpendicular to a surface for height gage inspection.



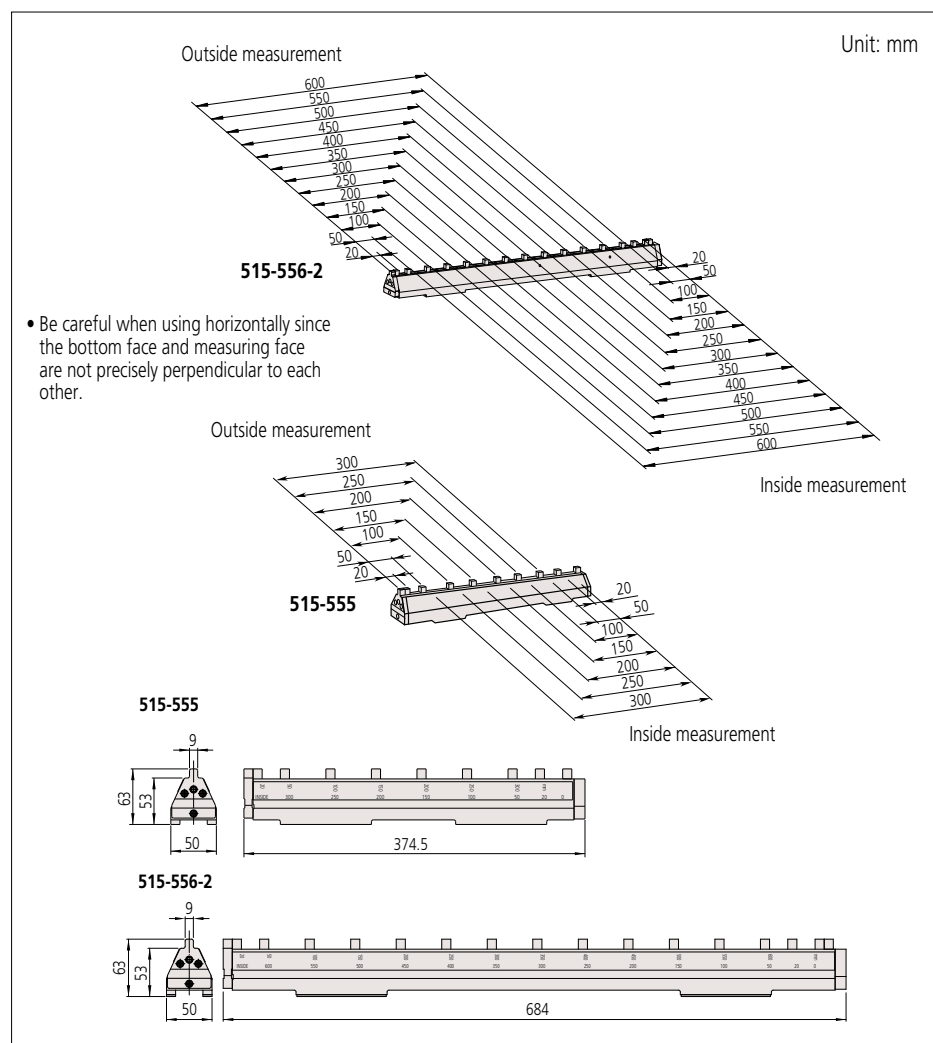
SPECIFICATIONS

Metric					
Code No.	Range (mm)	Block pitch accuracy*		Parallelism of blocks*	
515-555	0 - 300	20 - 300 mm	350 - 600 mm	20 - 300 mm	350 - 600 mm
515-556-2	0 - 600	±5.0 µm	—	2.0 µm	—
			±7.0 µm		4.0 µm
					8.5
Inch					
Code No.	Range (in)	Block pitch accuracy*		Parallelism of blocks*	
515-565	0 - 12	1 - 12 in	1 - 12 in	0.00008 in	—
		±0.0002 in			4

* 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



06

Depth Gages

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.



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

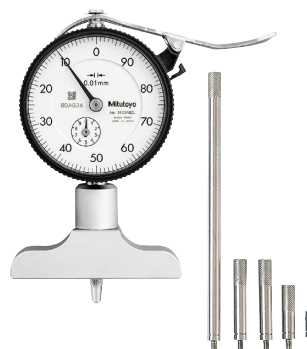
Mitutoyo developed the unique ABSOLUTE method to retain position information after the power is turned off. The origin is set once - thereafter the live position is displayed when the power is turned on.



Depth Micrometer



ABSOLUTE Digimatic Depth Gauge



Dial Depth Gauge

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Depth Gage (Indicator type)

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ABSOLUTE Digimatic Depth Gage 06-19

Depth Micrometer SERIES 329, 129 — Interchangeable Rod Type

- Interchangeable rods provide a wide measuring range.
- Data output function allows integration into statistical process control and measurement systems. (Refer to page 09-3.)



329-250-30

SPECIFICATIONS

Metric									
Code No.	Range (mm)	Resolution (mm)	Base (mm)	Spindle feed error (μm)	Flatness of reference surface (base) (μm)	Flatness of measuring face (rod) (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 / Metric									
Code No.	Range (in)	Resolution	Base (in)	Spindle feed error	Flatness of reference surface (base) (in)	Flatness of measuring face (rod) (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												
Code No.	Range (mm)	Graduation (mm)	Base (mm)	Spindle feed error (μm)	Flatness of reference surface (base) (μm)	Flatness of measuring face (rod) (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	63.5×16	3	1.3	0.3	5	±3	1			
129-155			101.6×16		2				2			
129-109	0 - 50		63.5×16		1.3				2	6	±4	4
129-113			101.6×16		2							
129-110	0 - 75		63.5×16		1.3		7	±6	7			
129-114			101.6×16		2							7
129-111	0 - 100		63.5×16		1.3				4			
129-115			101.6×16		2					4		
129-112	0 - 150		63.5×16		1.3		6					
129-116			101.6×16		2			6				
129-152	0 - 300		63.5×16		1.3		10					
129-153			101.6×16		2			10				

Inch											
Code No.	Range (in)	Graduation (in)	Base (in)	Spindle feed error (in)	Flatness of reference surface(base) (in)	Flatness of measuring face (rod) (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		0.00030		3		
129-130			4x0.63		0.00008			±0.00020		4	
129-127	0 - 4		2.5x0.63		0.00005		6				
129-131			4x0.63		0.00008				12		
129-128	0 - 6		2.5x0.63		0.00005		0.00035			±0.00030	4
129-132			4x0.63		0.00008			6			
129-149	0 - 12		2.5x0.63		0.00005		0.00050		±0.00020	4	
129-150			4x0.63		0.00008			6			
129-331	0 - 4		2.4x0.63		0.00005		0.00030		±0.00020	4	
129-332	0 - 6						0.00035	6			

- Power source: SR44 battery (1 pc.), **938882** included as standard (for operational checks)
- Battery life*: Approx. 2.4 years under normal use
- * Digimatic models
- Position detection method: Electromagnetic induction ABSOLUTE encoder
- 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

Code 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 Micrometer SERIES 329, 129 — Interchangeable Rod Type

Interchangeable rod (Optional Accessories)

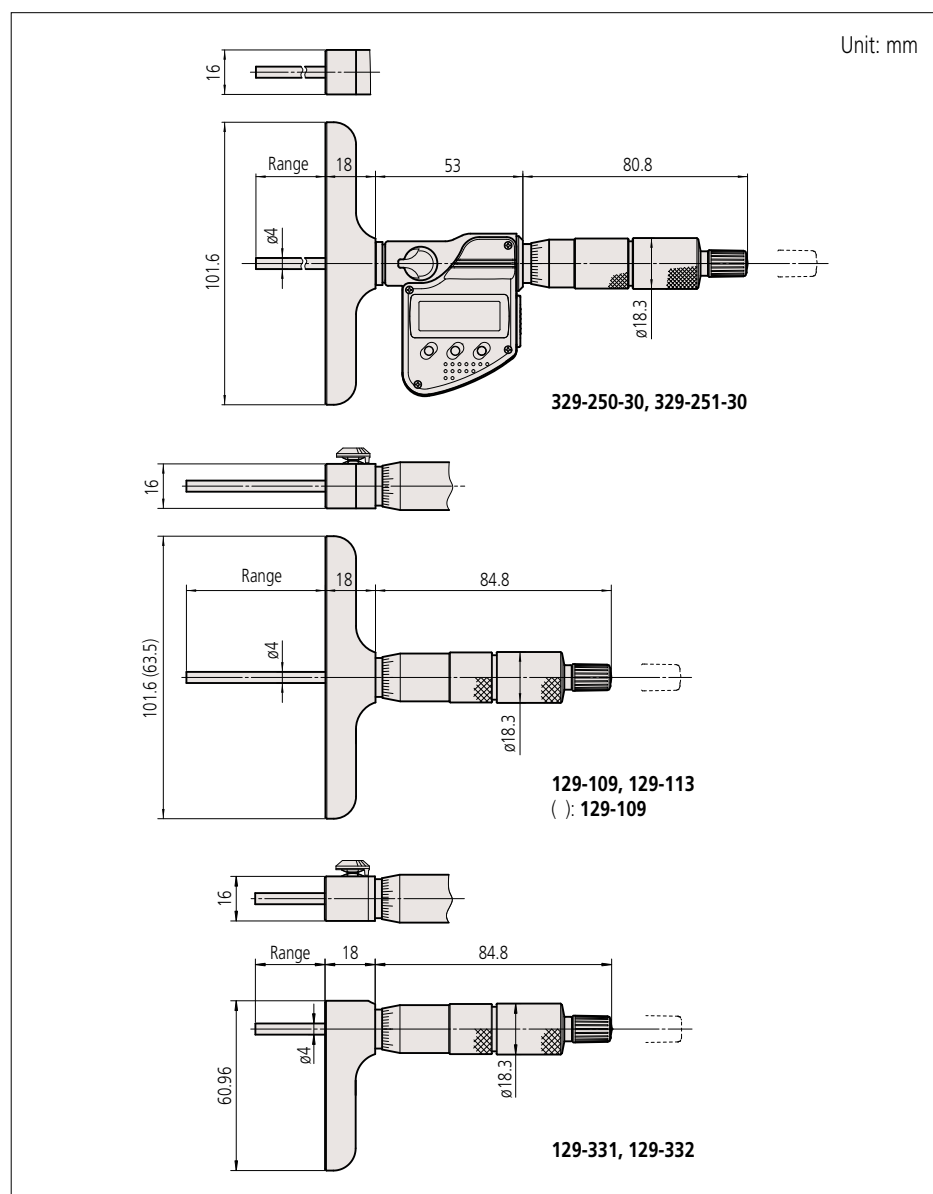
(Check and adjust the origin point before measurement)



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	Code 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	Code 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

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	Code 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	Code 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

DIMENSIONS

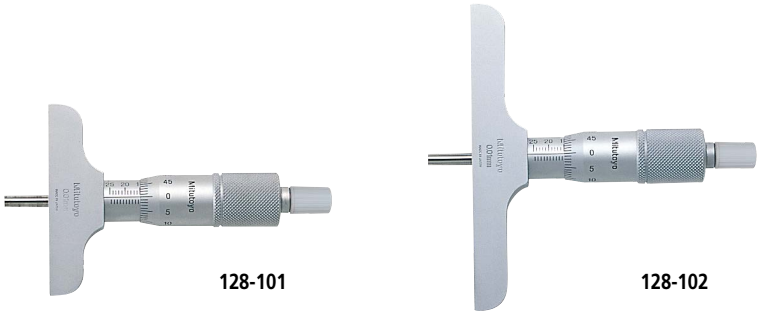
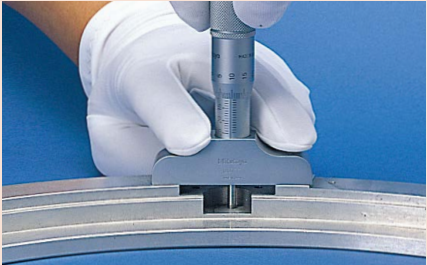


Depth Gage

Depth Micrometer
SERIES 128

- Measuring rod diameter: $\varnothing 4$ mm.
- With measuring rod clamp.
Note: The clamp is unseen in the picture.
- Carbide-tipped measuring rod model is available.
- With ratchet stop for constant measuring force.

Measurement example



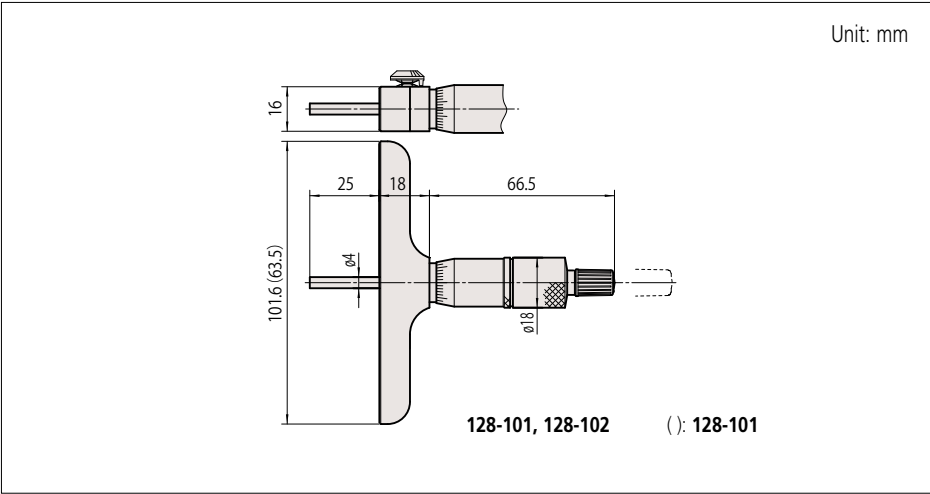
SPECIFICATIONS

Metric							
Code No.	Range (mm)	Graduation (mm)	Maximum permissible error J_{MPE} (μm)	Flatness of reference surface (base) (μm)	Flatness of measuring face (rod) (μm)	Parallelism between reference face and measuring rod face (μm)	Base (mm)
128-101	0 - 25	0.01	± 3	1.3	0.3	within 5	63.5 $\times$ 16
128-103*							
128-102				2			101.6 $\times$ 16
128-104*							

Inch							
Code No.	Range (in)	Graduation (in)	Maximum permissible error J_{MPE} (in)	Flatness of reference surface (base) (in)	Flatness of measuring face (rod) (in)	Parallelism between reference face and measuring rod face (in)	Base (in)
128-105	0 - 1	0.001	± 0.00015	0.000052	0.000012	within 0.00025	2.5 $\times$ 0.63
128-106				0.00008			4 $\times$ 0.63

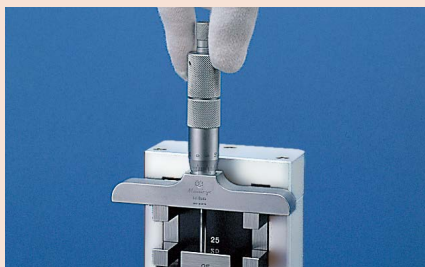
- Standard Accessories: 301336 Spanner
- * With carbide-tipped measuring rod

DIMENSIONS





Measurement example

Depth Micro Checker
SERIES 515

- The Depth Micro Checker is designed to efficiently check the zero point of a depth micrometer.



515-570



515-571

SPECIFICATIONS

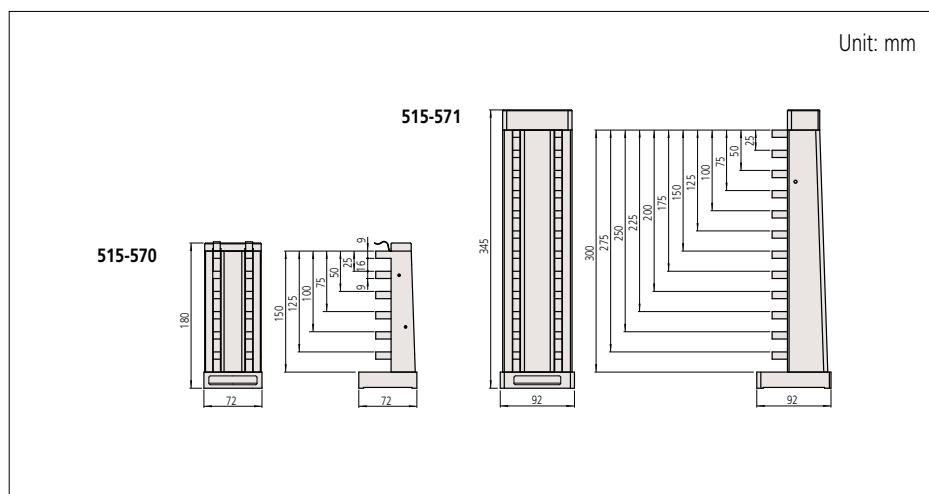
Metric

Code No.	Range (mm)	Block pitch accuracy	Anvil block accuracy (μm)
515-570	0 - 150	$\pm(1 + L/150) \mu\text{m}$, L=Length to check (mm)	± 0.5
515-571	0 - 300		

Inch

Code No.	Range (in)	Block pitch accuracy	Anvil block accuracy (μin)
515-575	0 - 6	$\pm(40 + L/0.15) \mu\text{in}$, L=Length to check (in)	± 20

DIMENSIONS



Depth Gage

ABSOLUTE Digimatic Depth Gage
SERIES 571

- Enables stable depth measurement with a resolution of 0.01 mm.
- Coolant proof type IP67 rated.
- Data output function allows integration into statistical process control and measurement systems.(Refer to page 09-3.)
- Optional longer extension bases are available.



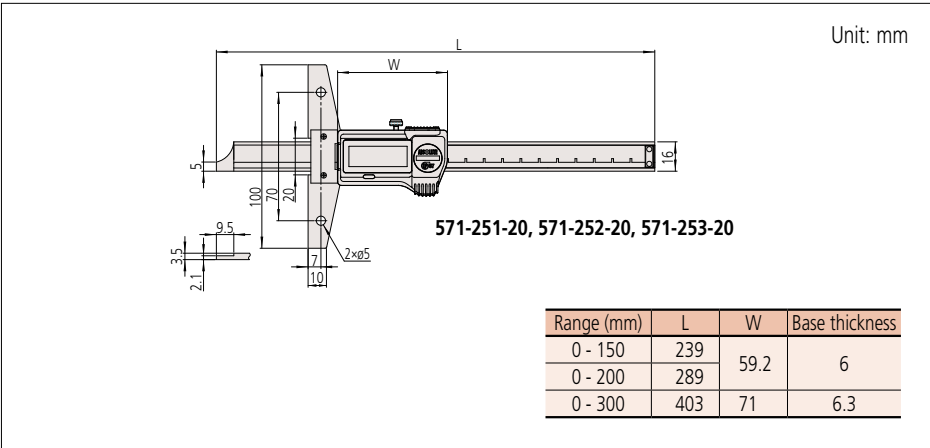
SPECIFICATIONS

Metric				
Code No.	Range (mm)	Resolution (mm)	Base (WxT) (mm)	Maximum permissible error E_{MPE} (mm)* ¹
571-251-20	0 - 150	0.01	100x6	±0.02
571-252-20	0 - 200		100x6.3	±0.03
571-253-20	0 - 300			

Inch / Metric				
Code No.	Range (in)	Resolution	Base (WxT) (in)	Maximum permissible error E_{MPE} (in)* ¹
571-261-20	0 - 6	0.0005 in/ 0.01mm	3.93x0.23	±0.001 in/±0.02 mm
571-262-20	0 - 8		3.93x0.25	±0.0015 in/±0.03 mm
571-263-20	0 - 12			

- 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
 - Response speed: Unlimited
- *1 Maximum permissible error, E_{MPE} , is the term defined by ISO 13385-2:2011.
*2 Rustproofing shall be applied after use if caliper was in contact with coolant.

DIMENSIONS



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IP67

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Measurement example



Optional Accessories

Code 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

Optional Accessories

Code 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**.

ABSOLUTE Digimatic Depth Gauge SERIES 571

- Enables stable depth measurement with a resolution of 0.01 mm.
- Data output function allows integration into statistical process control and measurement systems.(Refer to page 09-3.)
- Optional longer extension bases are available.



SPECIFICATIONS

Metric					
Code No.	Range (mm)	Resolution (mm)	Battery life	Base (W×T) (mm)	Maximum permissible error E_{MPE} (mm)*1
571-201-30	0 - 150	0.01	Approx. 5 years	100×6	±0.02
571-202-30	0 - 200			100×6.3	±0.03
571-203-30	0 - 300		Approx. 3 years	250×10	±0.05
571-204-10*2	0 - 450				±0.06
571-205-10*2	0 - 600				±0.07
571-206-10*2	0 - 750				±0.07
571-207-10*2	0 - 1000				±0.07

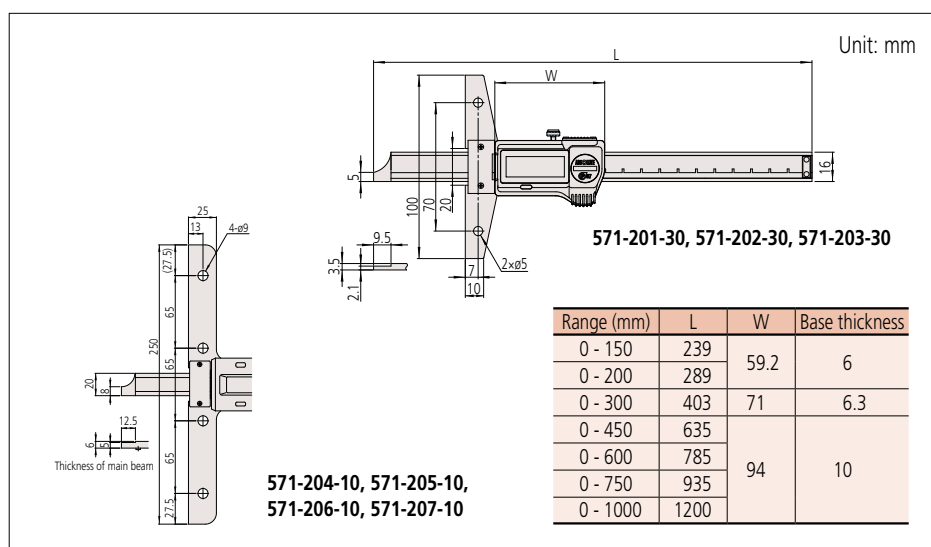
Inch / Metric					
Code No.	Range (in)	Resolution	Battery life	Base (W×T) (in)	Maximum permissible error E_{MPE} (in)*1
571-211-30	0 - 6	0.0005 in/ 0.01mm	Approx. 5 years	3.93×0.23	±0.001 in/±0.02 mm
571-212-30	0 - 8			3.93×0.25	±0.0015 in/±0.03 mm
571-213-30	0 - 12		Approx. 3 years	9.8×0.39	±0.002 in/±0.05 mm
571-214-10*2	0 - 18				±0.0025 in/±0.06 mm
571-215-10*2	0 - 24				±0.0025 in/±0.06 mm
571-216-10*2	0 - 30				±0.0025 in/±0.07 mm
571-217-10*2	0 - 40				±0.0025 in/±0.07 mm

- Power source: SR44 battery (1 pc.), **938882** included as standard (for operational checks)
- Position detection method: Electrostatic capacity absolute sensor
- Response speed: Unlimited

*1 Maximum permissible error, E_{MPE} , is the term defined by ISO 13385-2:2011.

*2 Cannot be used with **U-WAVE-TC**

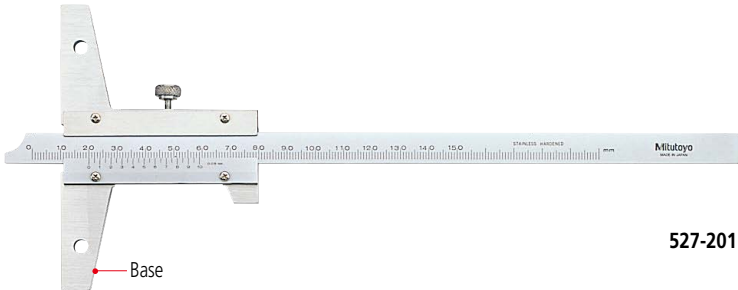
DIMENSIONS



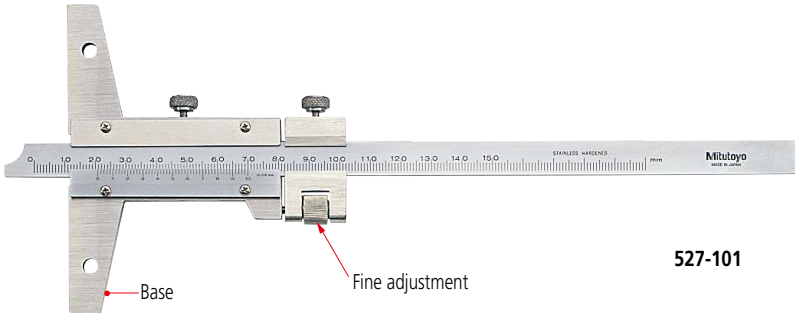
Depth Gage

Vernier Depth Gage
SERIES 527

- Standard Vernier gage for depth measurement.
- Optional longer extension bases are available.



527-201



527-101

SPECIFICATIONS

Metric					
Code No.	Range (mm)	Minimum reading (mm)	Base (W×T) (mm)	Maximum permissible error <i>E</i> _{MPE} (mm)*	Remarks
527-201	0 - 150	0.05	100×6.5	±0.05	—
527-202	0 - 200			±0.08	
527-203	0 - 300			±0.10	
527-204	0 - 600		250×10	±0.15	
527-205	0 - 1000			±0.15	

Metric					
Code No.	Range (mm)	Minimum reading (mm)	Base (W×T) (mm)	Maximum permissible error <i>E</i> _{MPE} (mm)*	Remarks
527-101	0 - 150	0.02	100×6.5	±0.03	with fine adjustment
527-102	0 - 200			±0.04	
527-103	0 - 300			±0.05	
527-104	0 - 600		250×10	±0.07	
527-105	0 - 1000			±0.07	

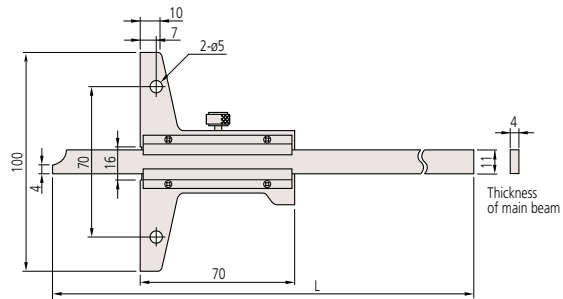
Metric					
Code No.	Range (mm)	Minimum reading (mm)	Base (W×T) (mm)	Maximum permissible error <i>E</i> _{MPE} (mm)*	Remarks
527-121	0 - 150	0.02	100×6.5	±0.03	—
527-122	0 - 200				
527-123	0 - 300				

Inch					
Code No.	Range (in)	Minimum reading (in)	Base (W×T) (in)	Maximum permissible error <i>E</i> _{MPE} (in)*	Remarks
527-111	0 - 6	0.001	3.93×0.25	±0.001	with fine adjustment
527-112	0 - 8			±0.0015	
527-113	0 - 12		9.8×0.39	±0.002	
527-114	0 - 24			±0.003	
527-115	0 - 40				

* Maximum permissible error, *E*_{MPE}, is the term defined by ISO 13385-2:2011.

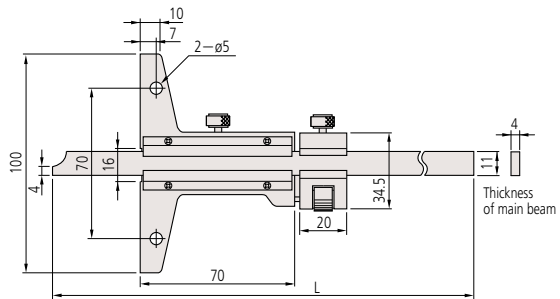
DIMENSIONS

Unit: mm



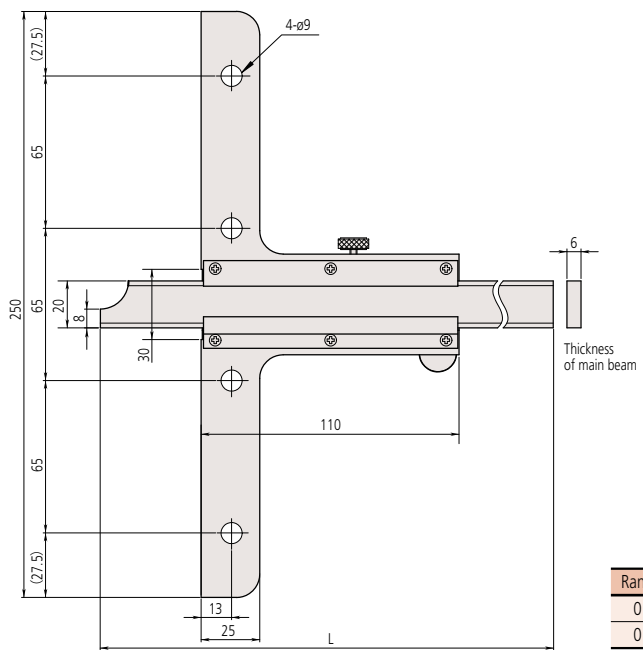
527-201, 527-202, 527-203

Range (mm)	L
0 - 150	260
0 - 200	310
0 - 300	410



527-101, 527-102, 527-103

Range (mm)	L
0 - 150	260
0 - 200	310
0 - 300	410



527-204, 527-205, 527-104, 527-105

Range (mm)	L
0 - 600	800
0 - 1000	1200

Depth Gage

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.
- 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.



SPECIFICATIONS

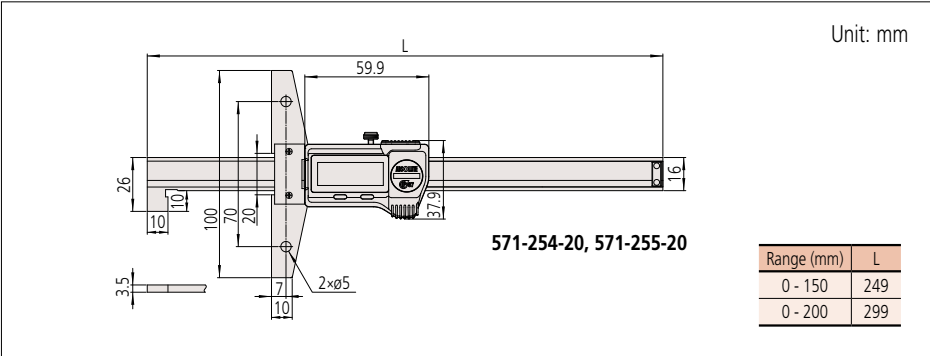
Metric				
Code No.	Range (mm): L1 (L2 and L3)	Resolution (mm)	Base (W×T) (mm)	Maximum permissible error <i>E_{MPE}</i> (mm)*1
571-254-20	10.1 - 160 (0 - 150)	0.01	100×6	±0.03
571-255-20	10.1 - 210 (0 - 200)			

Inch / Metric				
Code No.	Range: L1 (L2 and L3)	Resolution	Base (W×T) (mm)	Maximum permissible error <i>E_{MPE}</i> *1
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)			

- 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
- Response speed: Unlimited

*1 Maximum permissible error, *E_{MPE}*, is the term defined by ISO 13385-2:2011.
*2 Rustproofing shall be applied after use if caliper was in contact with coolant.

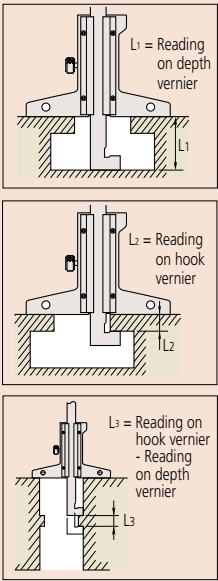
DIMENSIONS



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Typical applications



Optional Accessories

Code 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

Depth Gauge

Depth Gauge
SERIES 571 — Pin-end Type

- ABSOLUTE Point-Type Digimatic Depth Gauge is suitable for measuring inside narrow holes.
- Optional longer extension bases are available.
- Data output function allows integration into statistical process control and measurement systems.(Refer to page 09-3.)
- Coolant proof type IP67 rated.



SPECIFICATIONS

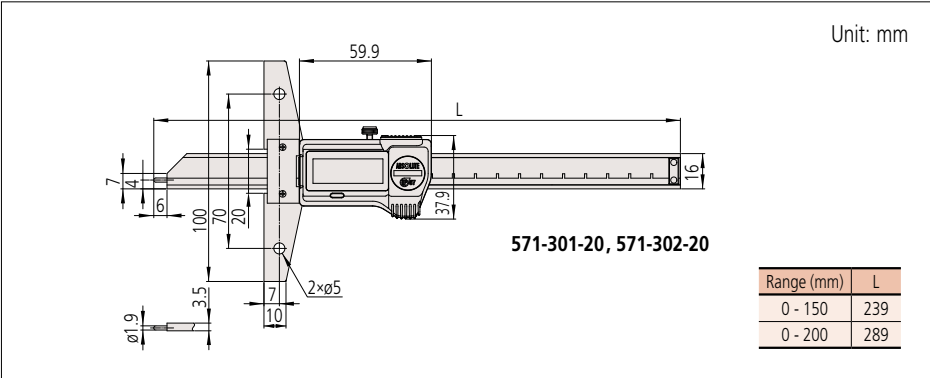
Metric				
Code No.	Range (mm): L1 (L2 and L3)	Resolution (mm)	Base (W×T) (mm)	Maximum permissible error <i>E_{MPE}</i> (mm)*1
571-301-20	0 - 150	0.01	100×6	±0.02
571-302-20	0 - 200			

Inch / Metric				
Code No.	Range: L1 (L2 and L3)	Resolution	Base (W×T) (mm)	Maximum permissible error <i>E_{MPE}</i> *1
571-311-20	0 - 150 mm/0 - 6 in	0.0005 in/0.01 mm	100×6	±0.001 in/±0.02 mm
571-312-20	0 - 200 mm/0 - 8 in			

- 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
- Response speed: Unlimited

*1 Maximum permissible error, *E_{MPE}*, is the term defined by ISO 13385-2:2011.
*2 Rustproofing shall be applied after use if caliper was in contact with coolant.

DIMENSIONS



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IP67

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Optional Accessories

Code 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

Measurement example



Optional Accessories

Code 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

Mini Depth Gage SERIES 571

- Digital display with 0.01 mm resolution.
- Enables measurement of tread depth.
- ABSOLUTE Digimatic Depth Gage.
- Data output function allows integration into statistical process control and measurement systems. (Refer to page 09-3.)
- Coolant proof type IP67 rated.



SPECIFICATIONS

Metric				
Code No.	Range (mm)	Resolution (mm)	Base (mm)	Maximum permissible error E_{MPE} (mm)* ¹
571-100-20	0 - 25	0.01	60 (thickness 6.65)	±0.02

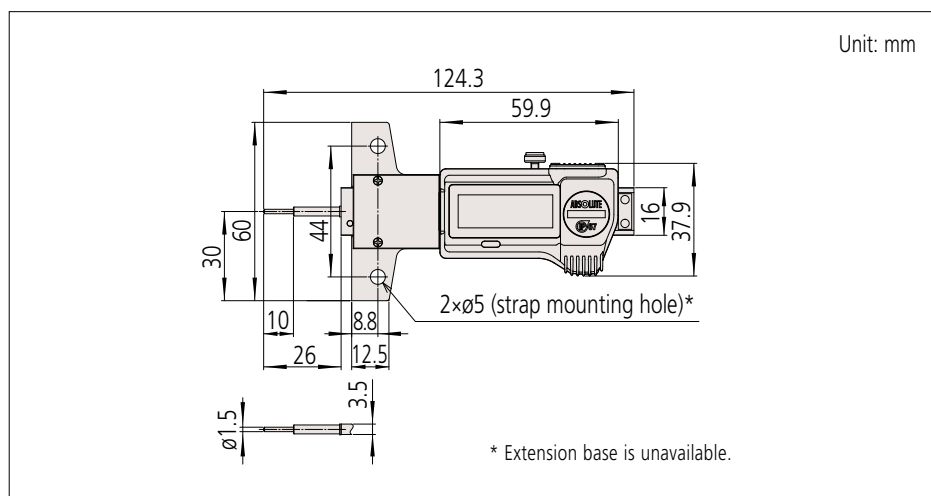
Inch / Metric				
Code No.	Range (in)	Resolution (in)	Base (in)	Maximum permissible error E_{MPE} (in)* ¹
571-200-20	0 - 1	0.0005	2.36	±0.001

- 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.
- Response speed: Unlimited

*¹ Maximum permissible error, E_{MPE} , is the term defined by ISO 13385-2:2011.

*² Rustproofing shall be applied after use if caliper was in contact with coolant.

DIMENSIONS



Depth Gage

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 300 mm or less range models.
- For over 300 mm range models, special-size extensions are available as shown on the left.



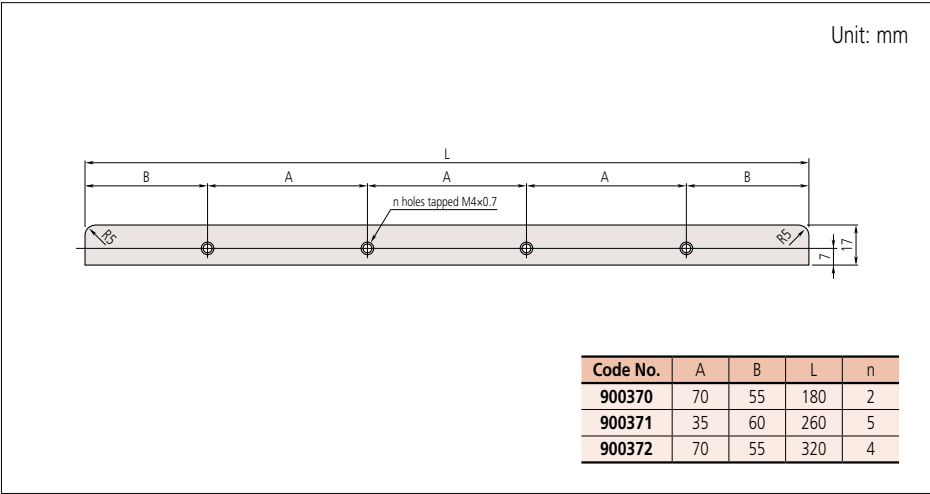
900372

SPECIFICATIONS

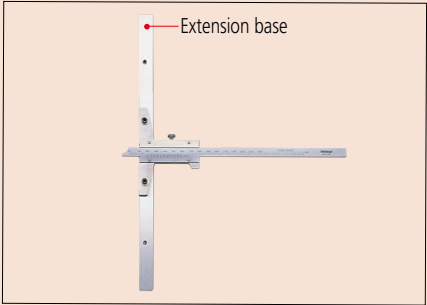
Metric				
Code No.	Size L (mm)	Thickness (mm)	Material	n
900370	180	8	SUS	2
900371	260			5
900372	320			4

Inch				
Code No.	Size L (in)	Thickness (in)	Material	n
900367	7	0.3	SUS	2
900368	10			5
900369	12			4

DIMENSIONS



Example of attaching the extension base



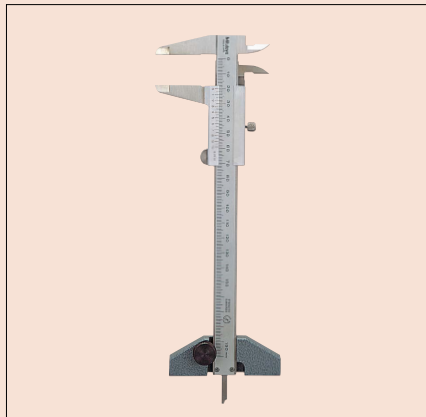
Special size/specifications

Extension bases, to size of specifications other than standard, available by special order. Please consult your local Mitutoyo Sales Office.

Example of special size

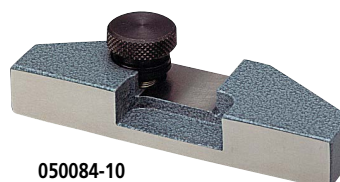
Measuring range of depth gage	L (mm)
300 mm or less	400
	500
	600
450 mm or more	400
	500
	600
	700
	800

Example of attaching the depth gage attachment



Depth Gage Attachment Optional Accessory for Calipers

- Attaching this depth gage attachment to the depth measurement face of the caliper makes depth measurement accurate and secure.



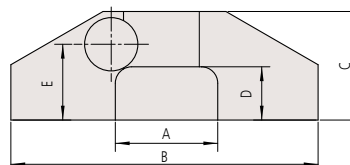
050084-10

SPECIFICATIONS

Metric		
Code No.	Size (mm)	Applicable measuring range of caliper
050083-10	75	100 mm, 150 mm, 200 mm, 4 in, 6 in and 8 in
050084-10	100	100 mm, 150 mm, 200 mm, 4 in, 6 in and 8 in
050085-10	125	300 mm (12 in)

DIMENSIONS

Unit: mm



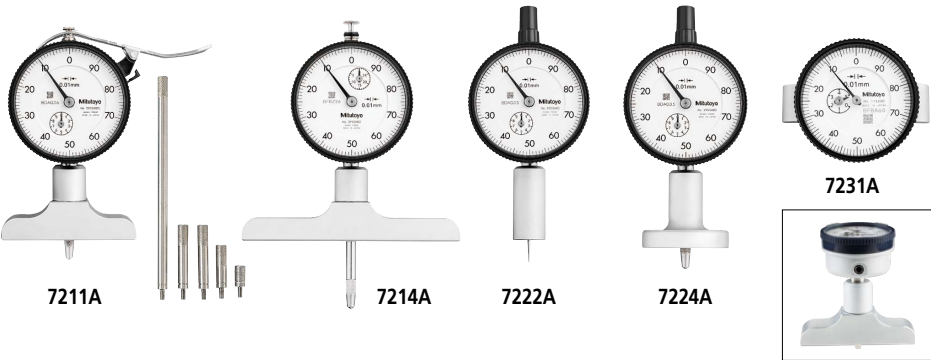
Size (mm)	A	B	C	D	E	T
75	25	75	26.5	13	18.5	12
100		100				
125	30	125	28.5		20	14

T: Base thickness

Depth Gage

Dial Depth Gage
SERIES 7

- Optimal for hole, narrow groove and step measurement.



SPECIFICATIONS

Metric									
Code No.	Range (mm)	Graduation (mm)	Stroke (mm)	Accuracy (μm)	Measuring force (N)	Base			
						W (mm)	T (mm)	Flatness (μm)	Mounting position of a dial indicator
7210A	0 - 10	0.01	10	±15	1.4	40	16	5	1
7211A	0 - 200					63.5			
7212A						101.6			
7213A			63.5						
7214A	0 - 210		30	±30	2.5	101.6			
7220A	0 - 200		10	±15	1.4	100	18		2
7221A						150			3
7222A						ø16			1
7223A	ø25								
7224A	ø40								
7231A	0 - 200		5			63.5	16		

Code No.	Contact point*1	Extension rod*2	Indicator*3 (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		3 pcs. (30, 60, 90 mm)	2952AB for Depth Gage
7213A		5 pcs. (10, 20, 30, 30, 100 mm)	2902AB for Depth Gage
7214A		5 pcs. (10, 20, 30, 30, 100 mm)	2902AB for Depth Gage
7220A	Provided with a needle point (137413)	—	2902AB for Depth Gage
7221A		—	2902AB for Depth Gage
7222A		—	2902AB for Depth Gage
7223A		—	2902AB for Depth Gage
7224A	Provided with a carbide-tipped ball point (21JAA224: 17 mm)	5 pcs. (10, 20, 30, 30, 100 mm)	1162A for Depth Gage (Back plunger type)
7231A		Interchangeable contact point (21JAA226)	1162A for Depth Gage (Back plunger type)

*1 Caution should be exercised when exchanging a contact point of a Depth Gage (Dial/Digimatic Indicator):

- If a different size contact point is mounted, displacement of the contact point from the base contact surface will be changed and as a result, measurement range may not be maintained.
- A contact point cannot be mounted to a Depth Gage if its diameter is too large for the hole diameter of the base.
- Parallelism adjustment with the bottom face of the base is required when mounting a flat contact point such as the flat/needle or carbide-tipped contact point.

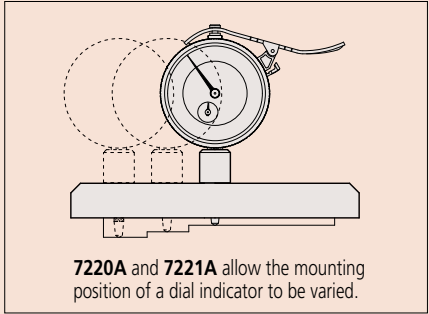
*2 Caution should be exercised when using an extension rod:

- If the total length of the extension rod exceeds 110 mm (4.5 in) use the instrument in a vertical position (contact point downward).
- Use a master gage (such as gauge blocks) to perform zero-setting when the extension rod is mounted. (Master gage is an optional accessory.)

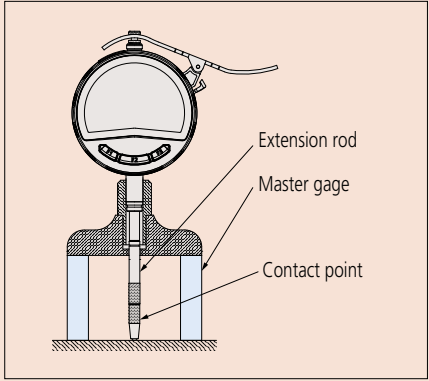
*3 Caution should be exercised when indicators are used on a Depth Gage:

- When the indicator is exchanged and a longer extension rod is connected, the contact-point may deflect significantly with an adverse effect on measuring accuracy.
- Code No.543-710B/543-712B for Depth Gage has a measuring force less than 1.5 N. (Refer to page 06-19.)

Typical application



When using an extension rod



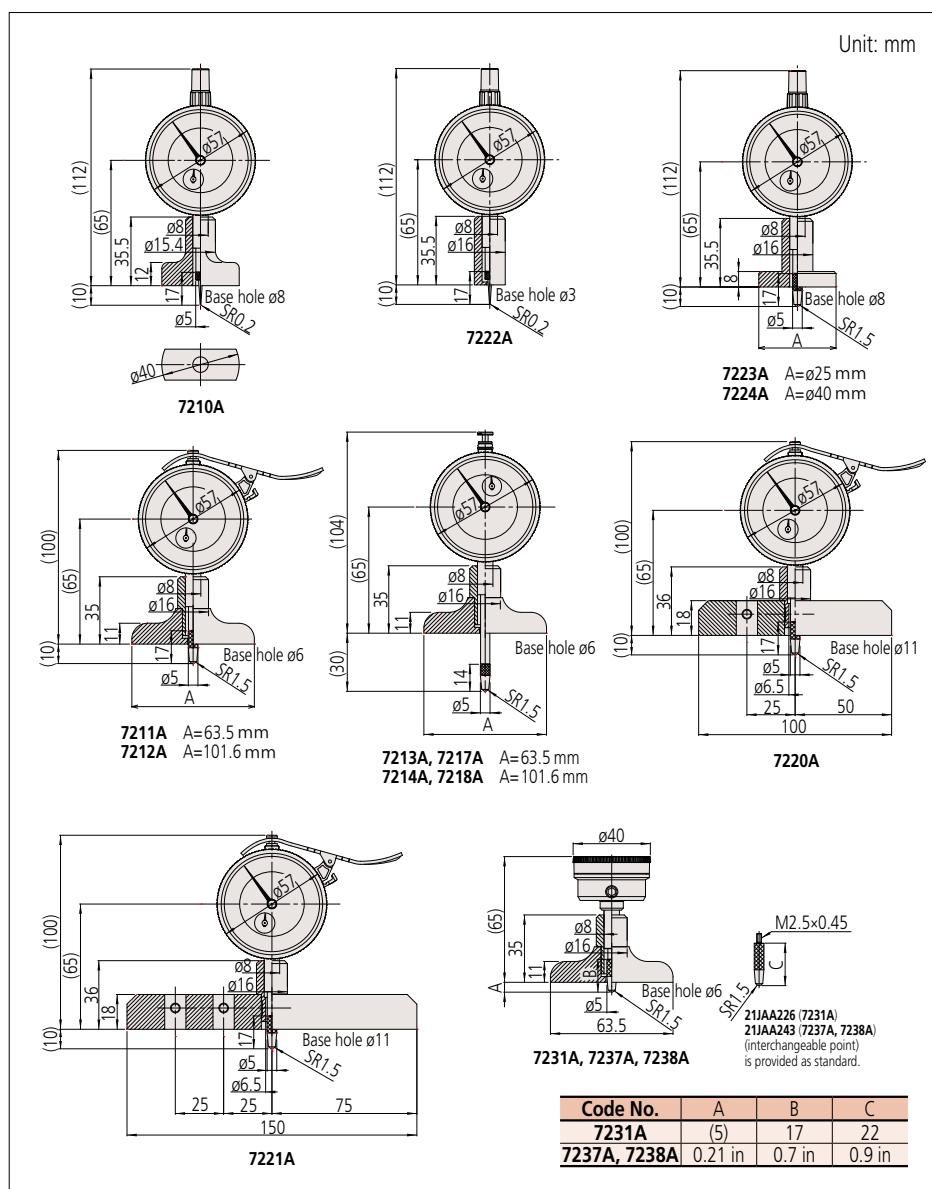
SPECIFICATIONS

Inch									
Code No.	Range (in)	Graduation (in)	Stroke (in)	Accuracy (in)	Measuring force (N)	Base			
						W (in)	T (in)	Flatness (in)	Mounting position of a dial indicator
7217A	0 - 8	0.001	1	±0.002	2.0	2.5	0.63	0.0002	1
7218A						4			
7237A			0.2		1.4	2.5			
7238A						4			

Code 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) Interchangeable contact point (21JZA243: 0.9 in)	1168A for Depth Gage (Back plunger type)
7237A			
7238A			

* Refer to corresponding notes on page 06-17.

DIMENSIONS



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 page 09-3.)



SPECIFICATIONS

Metric										
Code No.	Range (mm)	Resolution (mm)	Stroke (mm)	Accuracy (μm)	Measuring force (N)	Base				
						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		0.0005 (0.001/0.01 mm selectable)		±5		101.6		2		
547-251A						63.5				
547-252A						101.6				

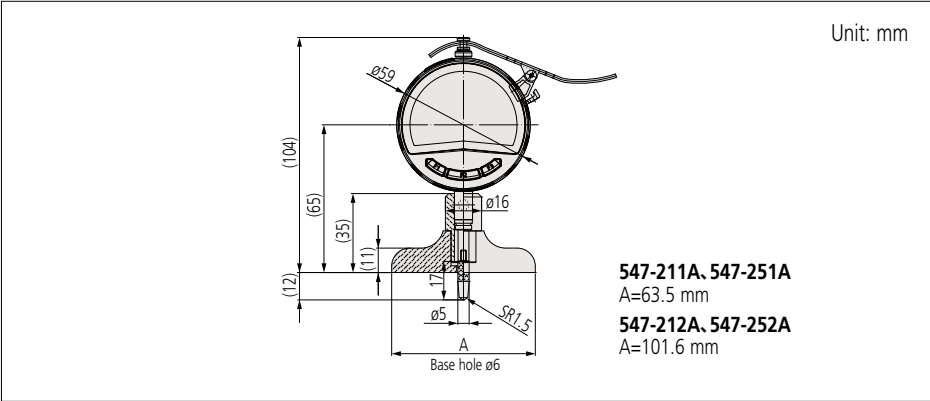
Code No.	Contact point*	Extension rod*	Indicator*
547-211A	Provided with a carbide-tipped ball point (211AA224)	5 pcs. (10, 20, 30, 30, 100 mm)	543-710B
547-212A			543-700B
547-251A			
547-252A			

Inch / Metric								
Code No.	Range (in)	Resolution	Stroke (in)	Accuracy (in)	Measuring force (N)	Base		
						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				2.5				
547-258A		0.00002 in (0.00005/0.0001/0.0005 in 0.0005/0.001/0.01 mm selectable)		±0.0002		4		0.00008

Code No.	Contact point*	Extension rod*	Indicator*
547-217A	Provided with a carbide-tipped ball point (211ZA242)	4 pcs. (0.5 in, 1 in, 2 in, 4 in)	543-712B
547-218A			543-702B
547-257A			
547-258A			

* Refer to corresponding notes on page 06-17.

DIMENSIONS



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

Code 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)

* One 06AGQ001F is necessary for each Digimatic indicator.

07

Indicators

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.



**ABSOLUTE Digimatic Indicator
ID-CNX
(Digimatic S1 supported)**



**Dial Indicator
Standard Type, 0.01 mm Graduation**



Dial Test Indicator

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Precautions for use



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 lift the spindle at least 0.2 mm from the lowest rest point.

Digimatic 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 07-2.

SPECIFICATIONS

Metric		ISO/JIS Type							
Code No. *3	Range (mm)	Resolution (mm)	Maximum permissible error (MPE)*1 (mm)				Maximum permissible limit (MPL)	Power source	Mass (g)
			Partial measuring range P_{MPE}	Total measuring range E_{MPE}	Hysteresis H_{MPE}	Repeatability R_{MPE}	Measuring force (N)		
543-855	12.7	0.0005/ 0.001/0.01 (selectable)	0.0025	0.0025	0.002	0.002	1.5 or less	AC adapter (5.9 V)	180
543-855B (flat back)							1.8 or less		170
543-851	25.4		0.004	0.004			2.3 or less		240
543-853	50.8		0.003	0.003			2.3 or less		330
543-857									

Inch / Metric		ASME/ANSI/AGD Type							
Code No.*3	Range	Resolution	Maximum permissible error (MPE)*1 (in)			Maximum permissible limit (MPL)	Power source	Mass (g)	
			Overall*2	Hysteresis	Repeatability	Measuring force (N)			
543-856	0.5 in/ 12.7 mm	0.00002/ 0.00005/ 0.0001/	±0.00010	0.00008	0.00008	1.5 or less	AC adapter (5.9 V)	200	
543-856B (flat back)		0.0005/ 0.001 in,						170	
543-852	1 in/ 25.4 mm	0.0005/ 0.001 in,						1.8 or less	240
543-854	2 in/ 50.8 mm	0.005/ 0.001/ 0.01 mm (selectable)				±0.00016			2.3 or less
543-858			±0.00012						

- Display: 7-digit display, sign, and analog bar with 2-color backlight
- Response speed: Unlimited

*1 These values apply to normal measurements at 20 °C.

*2 Overall magnification and linearity

*3 To denote your AC power cable add the following suffixes to the code No.: **A** for UL/CSA and PSE, **D** for CEE, **DC** for CCC, **E** for BS, **K** for KC, **No suffix** is required for JIS/100 V.

MeasurLink[®] ENABLED
Data Management Software by Mitutoyo

ABSOLUTE[™]



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

Product catalog
E12049



Video



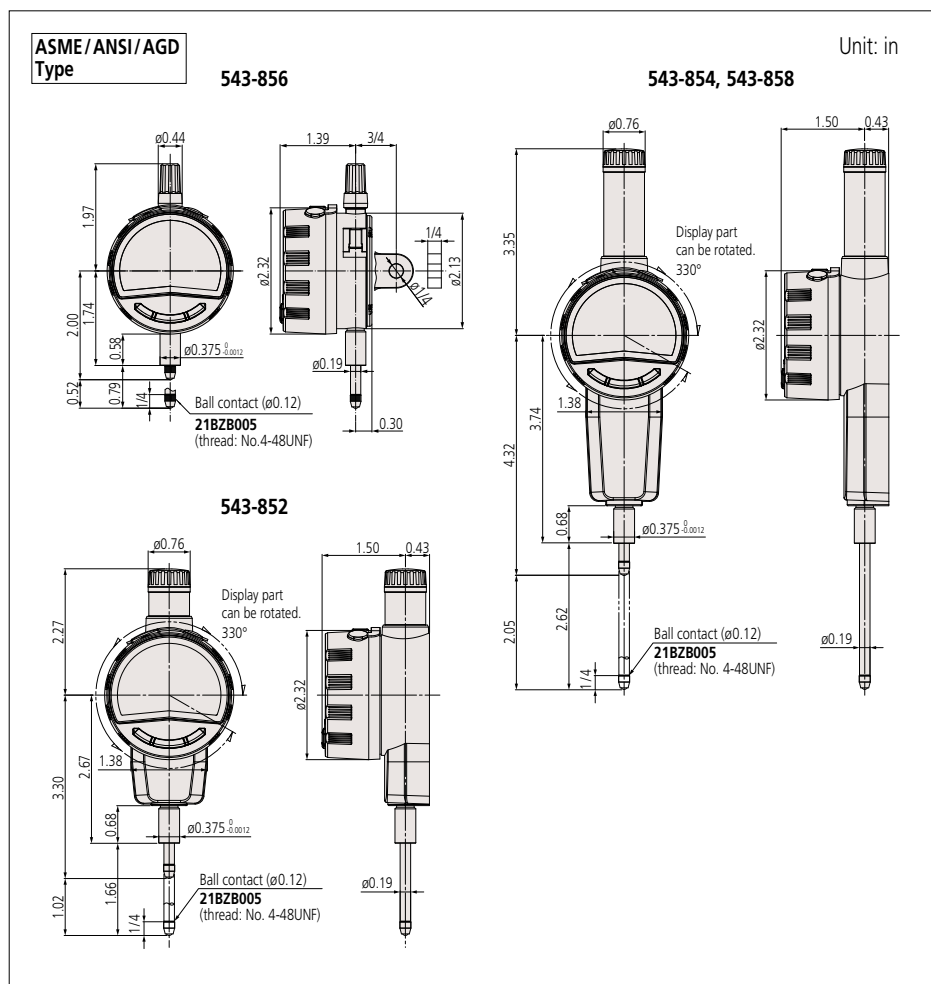
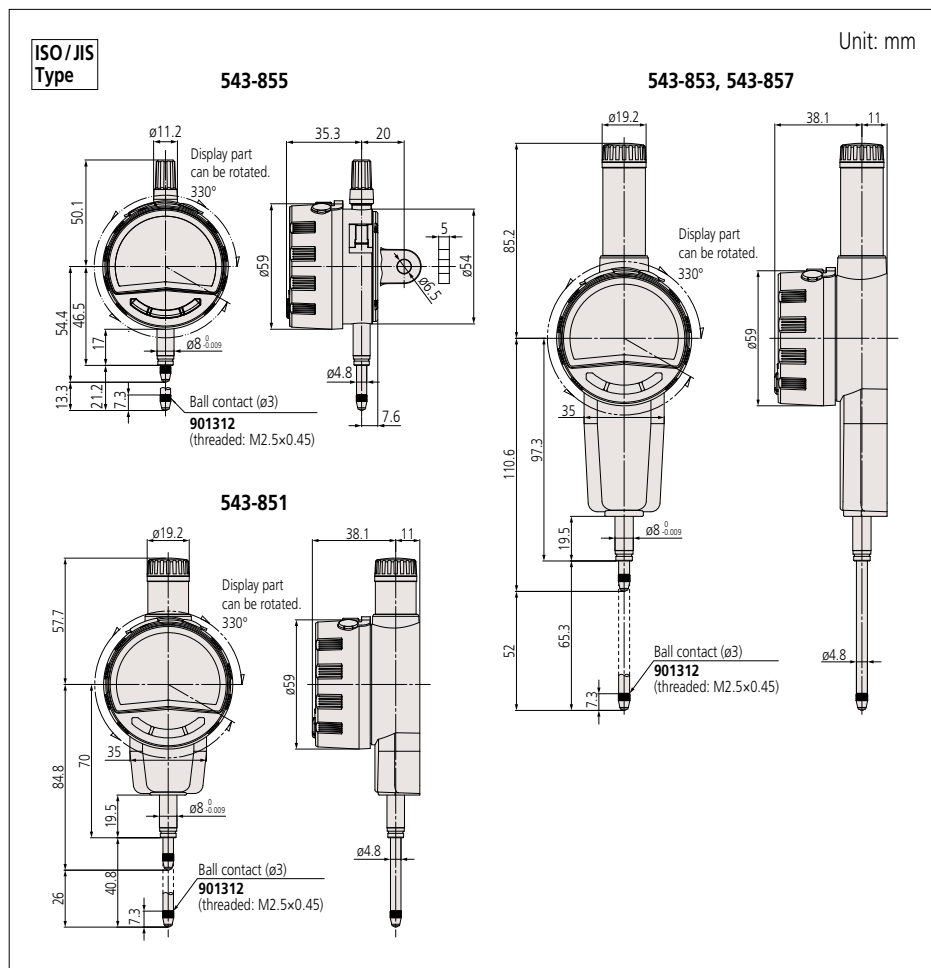
Mitutoyo

Optional Accessories

Code 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
Lifting lever:
21EZA198 (12.7 mm/0.5 inch type)
Lifting cable:
21JZA295 Stroke 12.7 mm: 12.7 mm/0.5 inch type
With auto-stop function:
21JZA301 (overall length 300 mm) 12.7 mm/0.5 inch type
Lifting knob:
21EZA105 (12.7 mm/0.5 inch type)
21EZA197 (25.4 mm/1 inch type)
21EZA200 (50.8 mm/2 inch type)
Lifting lever: **21EAA426**
(supplied with 25.4 mm and 50.8 mm models as standard.)
- Auxiliary spindle spring:
02ACA571 (25.4 mm/1 inch type)
02ACA773 (50.8 mm/2 inch type)
- Measurement data collection software
USB-ITPAK V3.0: 06AGR543
- Contact points for Mitutoyo's Digimatic indicators (optional)
Refer to pages 07-63 to 07-68 for details.
- Interchangeable back covers (optional)
Refer to pages 07-69 to 07-70 for details.
- Measuring stands (optional)
Refer to pages 07-97 to 07-103 for details.

DIMENSIONS





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 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.

- Equipped with a data output port that enables incorporation into measurement networking and statistical process control systems. (Refer to page 09-3)

* Refer to "Precautions for use" on page 07-2.



Measuring range
12.7 mm
543-700B



Measuring range
25.4 mm
543-720B

SPECIFICATIONS

Metric		ISO/JIS Type								
Code No.		Range (mm)	Resolution (mm)	Maximum permissible error (MPE)*1 (mm)				Maximum permissible limit (MPL)	Mass (g)	
w/lug	Flat back			Partial measuring range P_{MPE}	Total measuring range E_{MPE}	Hysteresis H_{MPE}	Repeatability R_{MPE}		Measuring force (N)	w/lug
543-700	543-700B	12.7	0.0005/ 0.001/0.01 (selectable)	0.003	0.003	0.002	0.002	1.5 or less	175	165
543-705*2	543-705B*2							0.4 to 0.7	170	160
—	543-720B							1.8 or less	—	195
—	543-730B							2.3 or less	—	260
543-710	543-710B	12.7	0.01	0.02	0.02	0.02	0.01	0.9 or less	170	160
543-715*2	543-715B*2							0.2 to 0.5	165	155
—	543-725B							1.8 or less	—	190
—	543-735B							2.3 or less	—	245

Inch / Metric		ISO/JIS Type								
Code No.		Range	Resolution	Maximum permissible error (MPE)*3 (mm)				Maximum permissible limit (MPL)	Mass (g)	
w/lug	Flat back			Partial measuring range P_{MPE}	Total measuring range E_{MPE}	Hysteresis H_{MPE}	Repeatability R_{MPE}	Measuring force (N)	w/lug	Flat back
543-701	543-701B	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	0.003	0.002	0.002	1.5 or less	175	165
543-706*2	543-706B*2							0.4 to 0.7	170	160
—	543-721B			1 in/25.4 mm	1.8 or less	—	195			
—	543-731B			2 in/50.8 mm	2.3 or less	—	260			
543-711	543-711B	0.5 in/12.7 mm	0.0005 in/ 0.01 mm	0.02	0.02	0.02	0.01	0.9 or less	170	160
543-716*2	543-716B*2							0.2 to 0.5	165	155
—	543-726B			1 in/25.4 mm	1.8 or less	—	190			
—	543-736B			2 in/50.8 mm	2.3 or less	—	245			

Inch / Metric		ASME/ANSI/AGD Type								
Code No.		Range	Resolution	Maximum permissible error (MPE)*3 (in)			Maximum permissible limit (MPL)	Mass (g)		
w/lug	Flat back			Overall*4	Hysteresis	Repeatability		Measuring force (N)	w/lug	Flat back
543-702	543-702B	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*2	543-707B*2		0.4 to 0.7				190	160		
—	543-722B		1 in/25.4 mm				1.8 or less	—	195	
—	543-732B	2 in/50.8 mm	0.0005 in/0.01 mm	±0.00020	0.0010	0.0005	2.3 or less	—	260	
543-712	543-712B	0.5 in/12.7 mm		±0.0010			0.9 or less	190	160	
543-717*2	543-717B*2	1 in/25.4 mm		0.2 to 0.5			185	155		
—	543-727B	2 in/50.8 mm	0.0005 in/0.01 mm	±0.0015	0.0010	0.0005	1.8 or less	—	190	
—	543-737B	2 in/50.8 mm					2.3 or less	—	245	

- Display: 7-digit display, sign, and analog bar
- Power source: CR2032 battery (1 pc.), included as standard (for operational checks)
- 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.)
- Response speed: Unlimited (except for scanning measurement)

*1 These values apply to normal measurements at 20 °C (Resolution: 0.0005 mm, Calculation coefficient: A=1)

*2 Low measuring force *3 These values apply to normal measurements at 20 °C. *4 Overall magnification and linearity

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.

Product catalog
E12049



Video



Optional Accessories

Code 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

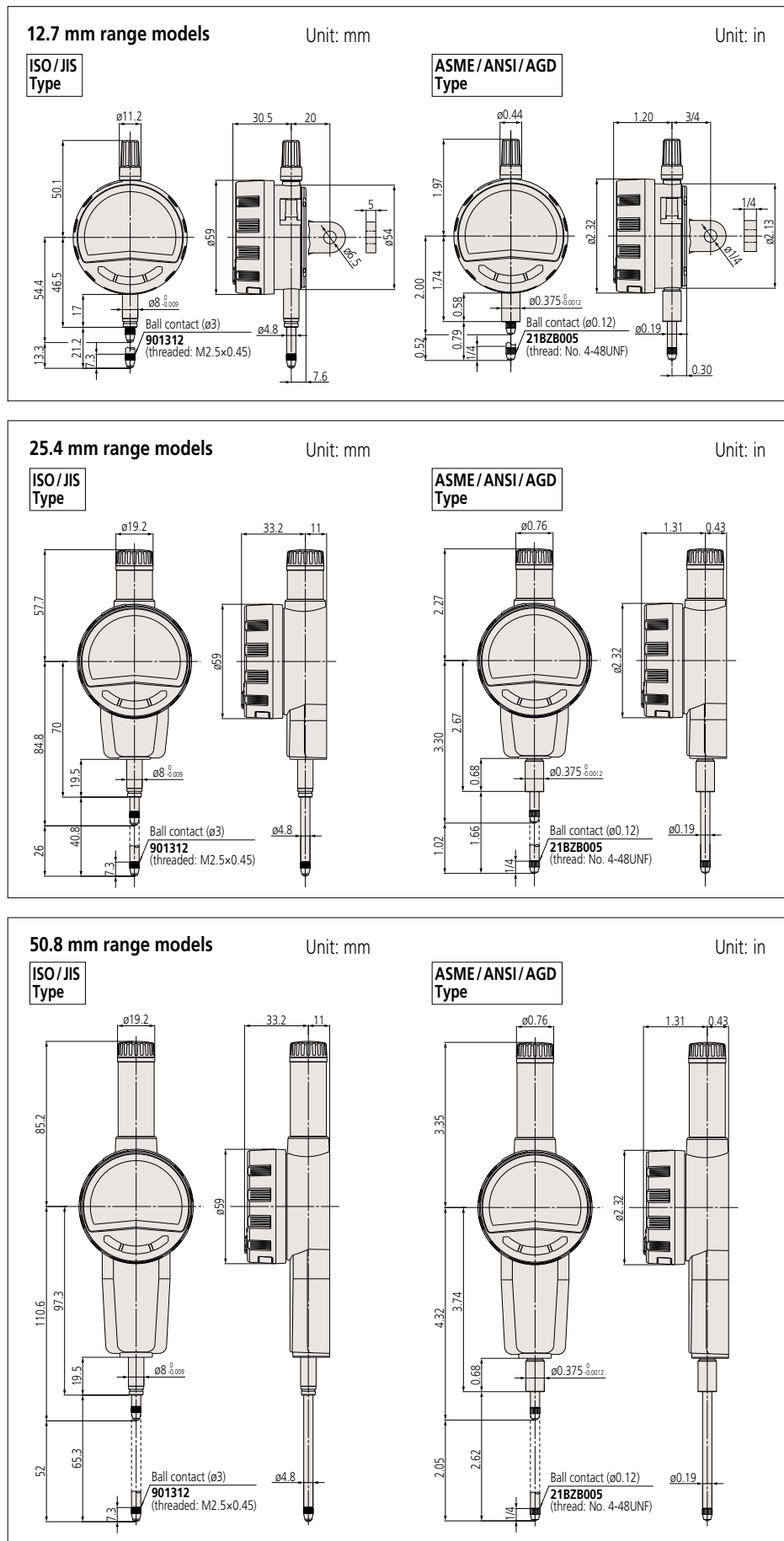
Connecting unit
fitted to an indicator
(12.7 mm type)

Typical application of
U-WAVE-TM/TMB mounting bracket
(with **543-725B**)



- Lifting
Lifting lever: **21EZA198** (12.7 mm/0.5 inch type)
Lifting cable: **21JZA295** Stroke 12.7 mm: 12.7 mm/0.5 inch type
(This cannot be used on low measuring force model.)
With auto-stop function: **21JZA301** (overall length 300 mm) 12.7 mm/0.5 inch type
(This cannot be used on low measuring force model.)
Lifting knob: **21EZA105** (12.7 mm/0.5 inch type)
(This cannot be used on low measuring force model.)
21EZA197 (25.4 mm/1 inch type)
21EZA200 (50.8 mm/2 inch type)
Lifting lever: **21EAA426**
(supplied with 25.4 mm and 50.8 mm models as standard.)
- Auxiliary spindle spring:
02ACA571 (25.4 mm/1 inch type*)
02ACA773 (50.8 mm/2 inch 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 07-63 to 07-68 for details.
- Interchangeable back covers (optional)
Refer to pages 07-69 to 07-70 for details.
- Measuring stands (optional)
Refer to pages 07-97 to 07-103 for details.

DIMENSIONS



Note: Products with a code No. suffixed "B" have a plain back, and other models have a center-lug back. Refer to pages 07-69 to 07-70 for details of the backs.

Digimatic 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 page 09-3)

* Refer to "Precautions for use" on page 07-2.



543-575

543-585

SPECIFICATIONS

Metric		ISO/JIS Type						Remarks
Code No.	Range (mm)	Resolution (mm)	Maximum permissible error (MPE)*1 (mm)				Maximum permissible limit (MPL)	
			Partial measuring range P_{MPE}	Total measuring range E_{MPE}	Hysteresis H_{MPE}	Repeatability R_{MPE}	Measuring force (N)	
543-570	12.7	0.01	0.02	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	0.003/0.01	0.002	0.002	2.5 or less	Slim type
543-585	5.08						2.0 or less	Back Plunger type

Inch / Metric		ASME/ANSI/AGD Type					
Code No.	Range (in)	Resolution	Maximum permissible error (MPE)*1 (in)			Maximum permissible limit (MPL)	Remarks
			Overall*2	Hysteresis	Repeatability	Measuring force (N)	
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

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

*1 These values apply to normal measurements at 20 °C.

*2 Overall magnification and linearity

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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IP66

PROPRIETARY INSPECTION CERTIFICATE

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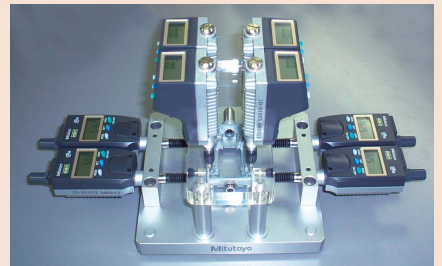
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Applicable models:
543-57X

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

Code 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 07-63 to 07-68 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**)

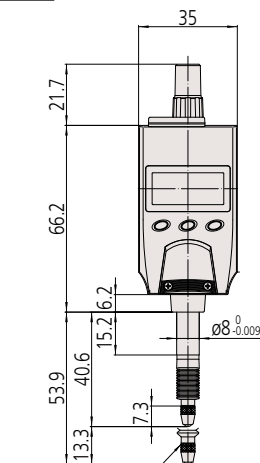
DIMENSIONS

Slim Type

ID-N

ISO/JIS Type

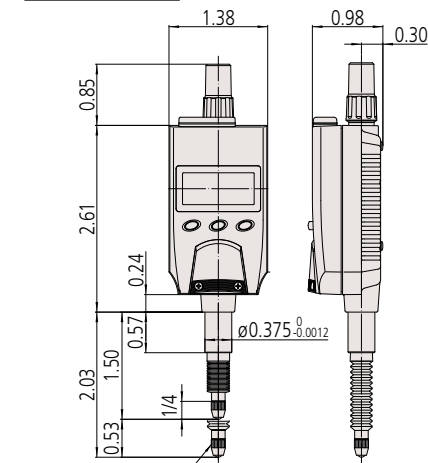
Unit: mm



Ball contact (Ø3)
901312
(thread: M2.5×0.45)

ASME/ANSI/AGD Type

Unit: in

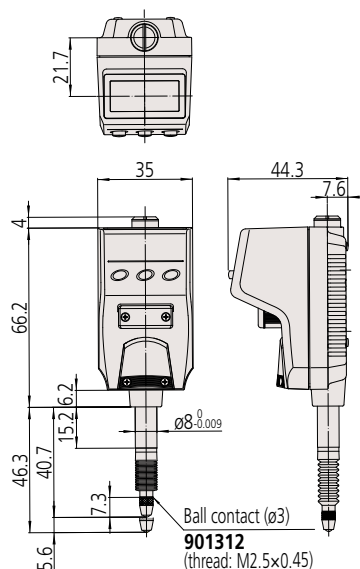


Ball contact (Ø0.12)
21BZB005
(thread: No. 4-48UNF)

Back plunger Type

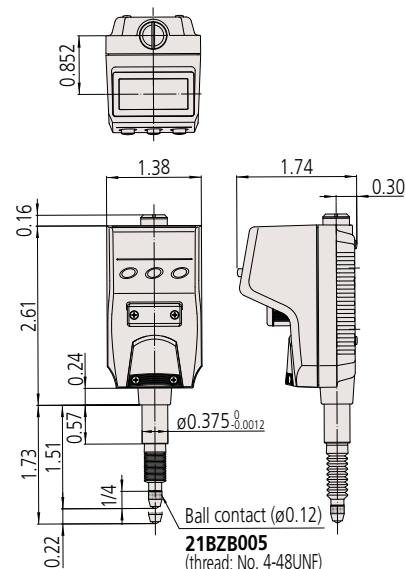
ID-B

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)

Digimatic 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 page 09-3)
- * Refer to "Precautions for use" on page 07-2.



SPECIFICATIONS

Metric		ISO/JIS Type									
Code No.	Range (mm)	Resolution (mm)	Maximum permissible error (MPE)*1 (mm)				Maximum permissible limit (MPL) Measuring force (N)	Back type	Battery life*2	Mass (g)	Dust/Water protection level*3
			Partial measuring range P_{MPE}	Total measuring range E_{MPE}	Hysteresis H_{MPE}	Repeatability R_{MPE}					
543-790-10	12.7	0.001	0.003	0.003	0.002	0.002	1.5 or less	With lug	Approx. 18,000 hours (Continuous use)	150	IP42
543-790B-10								Flat		140	
543-794-10							2.5 or less	With lug	Approx. 5 years (Normal use)	155	IP53
543-794B-10								Flat		155	
543-781-10	12.7	0.01	0.02	0.02	0.02	0.01	1.5 or less	With lug	Approx. 20,000 hours (Continuous use)	150	IP42
543-781B-10								Flat		140	

Inch / Metric		ISO/JIS Type									
Code No.	Range	Resolution	Maximum permissible error (MPE)*1 (mm)				Maximum permissible limit (MPL) Measuring force (N)	Back type	Battery life*2	Mass (g)	Dust/Water protection level*3
			Partial measuring range P_{MPE}	Total measuring range E_{MPE}	Hysteresis H_{MPE}	Repeatability R_{MPE}					
543-791-10	0.5 in / 12.7 mm	0.00005 in / 0.001 mm	0.003	0.003	0.002	0.002	1.5 or less	With lug	Approx. 18,000 hours (Continuous use)	150	IP42
543-791B-10								Flat		140	
543-795-10							2.5 or less	With lug	Approx. 5 years (Normal use)	155	IP53
543-795B-10								Flat		155	
543-782-10	0.5 in / 12.7 mm	0.0005 in / 0.01 mm	0.02	0.02	0.02	0.01	1.5 or less	With lug	Approx. 20,000 hours (Continuous use)	150	IP42
543-782B-10								Flat		140	

Inch / Metric		ASME/ANSI/AGD Type								
Code No.	Range	Resolution	Maximum permissible error (MPE)*1 (in)			Maximum permissible limit (MPL)	Back type	Battery life*2	Mass (g)	Dust/Water protection level*3
			Overall*4	Hysteresis	Repeatability	Measuring force (N)				
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		0.00005 in / 0.001 mm				2.5 or less	With lug	155	IP53	
543-796B-10							Flat	155		
543-783-10	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		

- Display: 6-digit display, sign
- Usable orientation: All
- Position detection method: ABSOLUTE electrostatic linear encoder
- Power source: SR44 battery (1 pc.), **938882** included as standard (for operational checks)
- Response speed: Unlimited (except for scanning measurement)

*1 These values apply to normal measurements at 20 °C.

*2 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.

*3 This is only valid when the data socket cover is in place. Does not apply if the cover is removed, a lifting accessory is attached, or a connection cable is attached.

*4 Overall magnification and linearity

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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

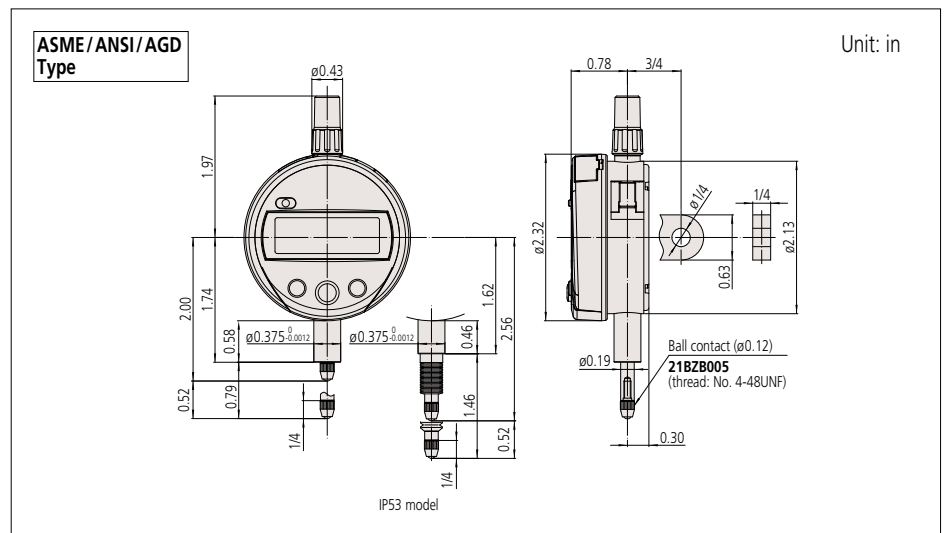
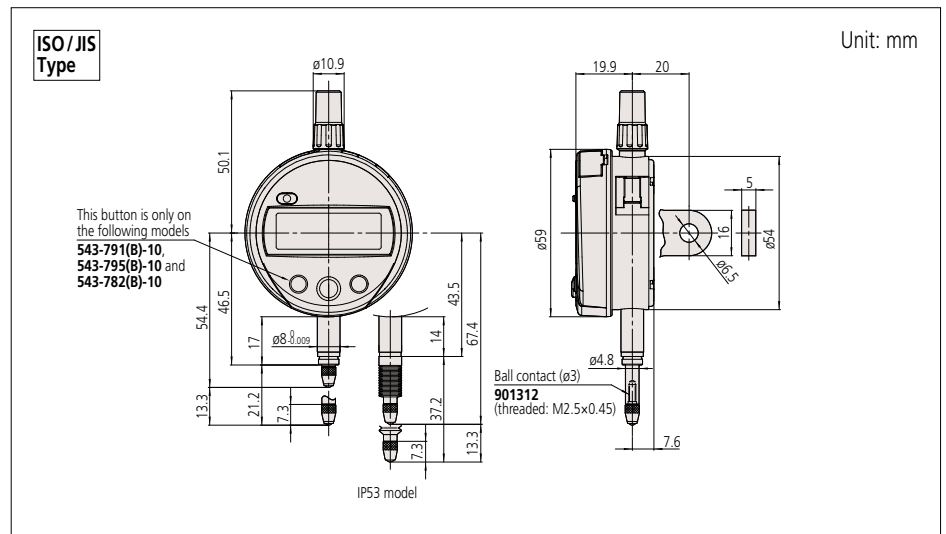
Code No.	Type	Description
264-020	—	USB Input Tool Series USB Keyboard Signal Conversion Type IT-020U
905338	F	Connection cable (1 m)
905409	F	Connection cable (2 m)
06AFM380F	F	USB Input Tool Direct* (2 m)
02AZD790F	F	Connection cable for U-WAVE-T (160 mm)
02AZE140F	F	Connection cable for U-WAVE-T For 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 pages 09-15 to 09-17 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 07-63 to 07-68 for details.
- Interchangeable back covers (optional)
Refer to pages 07-69 to 07-70 for details.
- Measuring stands (optional)
Refer to pages 07-97 to 07-103 for details.

Mitutoyo

DIMENSIONS





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 page 09-3)

* Refer to "Precautions for use" on page 07-2.



575-121

SPECIFICATIONS

Metric		ISO/JIS Type					
Code No.	Range (mm)	Resolution (mm)	Maximum permissible error (MPE)* ¹ (mm)				Maximum permissible limit (MPL)
			Partial measuring range P_{MPE}	Total measuring range E_{MPE}	Hysteresis H_{MPE}	Repeatability R_{MPE}	Measuring force (N)
575-121	25.4	0.01	0.02	0.02	0.02	0.01	1.8 or less

Inch / Metric		ISO/JIS Type					
Code No.	Range	Resolution	Maximum permissible error (MPE)* ¹ (mm)				Maximum permissible limit (MPL)
			Partial measuring range P_{MPE}	Total measuring range E_{MPE}	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	0.02	0.01	1.8 or less

Inch / Metric		ASME/ANSI /AGD type				
Code No.	Range	Resolution	Maximum permissible error (MPE)* ¹ (in)			Maximum permissible limit (MPL)
			Overall* ²	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

- Display: 5-digit display, sign
- Power source: SR44 battery (1 pc.), **938882** included as standard (for operational checks)
- Battery life: Approx. 20,000 hours of continuous use. Approx. 5 years under normal use.

Note: It varies depending on use frequency and method. Please take the values as rough indications.

- Lifting lever: **21EAA426** (standard accessory)

*¹ These values apply to normal measurements at 20 °C.

*² Overall magnification and linearity

Function

- Origin set (Zero-setting)
- Measuring direction switching
- Data output
- Low battery voltage alarm display
- Error alarm display

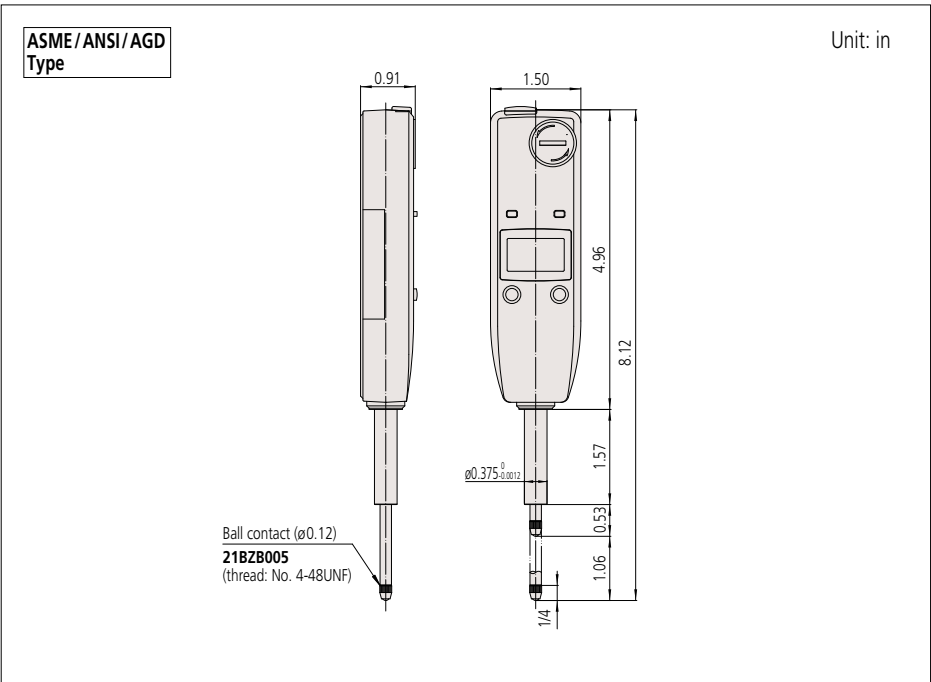
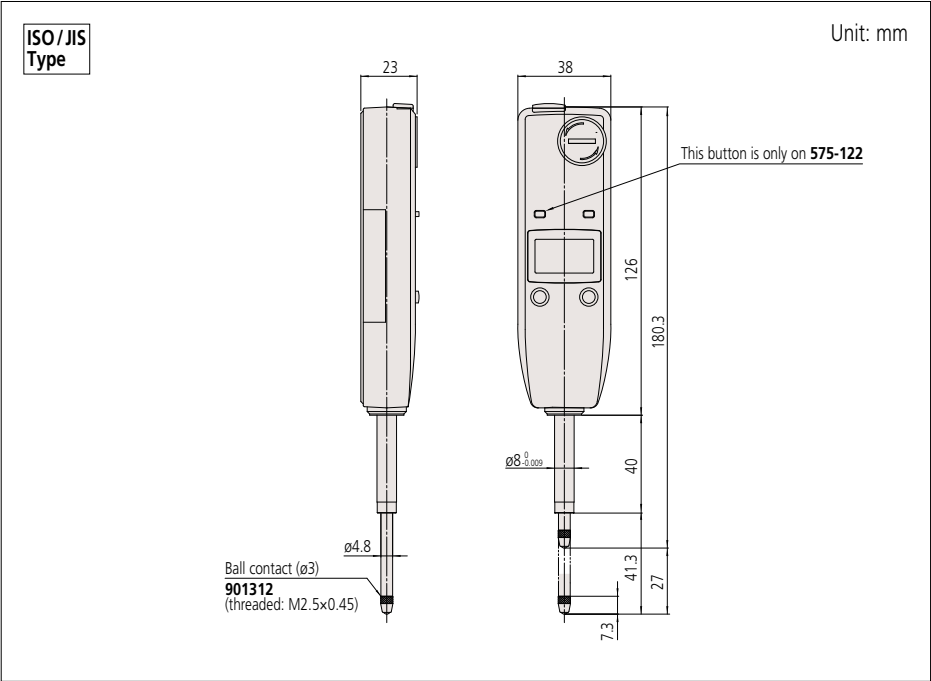
Optional Accessories

Code 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 pages 09-15 to 09-17 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 07-63 to 07-68 for details.
- Measuring stands (optional)
Refer to pages 07-97 to 07-103 for details.

DIMENSIONS



Digimatic 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 page 09-3)
- 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 07-2.



543-300-10

SPECIFICATIONS

Metric		ISO/JIS Type							
Code No.	Range (mm)	Resolution (mm)	Maximum permissible error (MPE)* ¹ (mm)				Maximum permissible limit (MPL)	Battery life (normal use)* ²	Mass (g)
			Partial measuring range P_{MPE}	Total measuring range L_{MPE}	Hysteresis H_{MPE}	Repeatability R_{MPE}	Measuring force (N)		
543-300-10	12.7	0.001/0.01 (selectable)	0.003	0.003	0.003	0.002	1.5 or less	Approx. 1 year	180
543-300B-10 (flat back)									170

Inch / Metric		ISO/JIS Type							
Code No.	Range	Resolution	Maximum permissible error (MPE)* ¹ (mm)				Maximum permissible limit (MPL)	Battery life (normal use)* ²	Mass (g)
			Partial measuring range P_{MPE}	Total measuring range L_{MPE}	Hysteresis H_{MPE}	Repeatability R_{MPE}	Measuring force (N)		
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	0.003	0.002	1.5 or less	Approx. 1 year	180
543-301B-10 (flat back)									170

Inch / Metric		ASME/ANSI /AGD type						
Code No.	Range	Resolution	Maximum permissible error (MPE)* ¹ (in)			Maximum permissible limit (MPL)	Battery life (normal use)* ²	Mass (g)
			Overall* ³	Hysteresis	Repeatability	Measuring force (N)		
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

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

*1 These values apply to normal measurements at 20 °C.

*2 Applies only if not connected to a data processor. Battery life depends on use of the indicator. Use the above value as a guide only.

*3 Overall magnification and linearity

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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

Code 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.



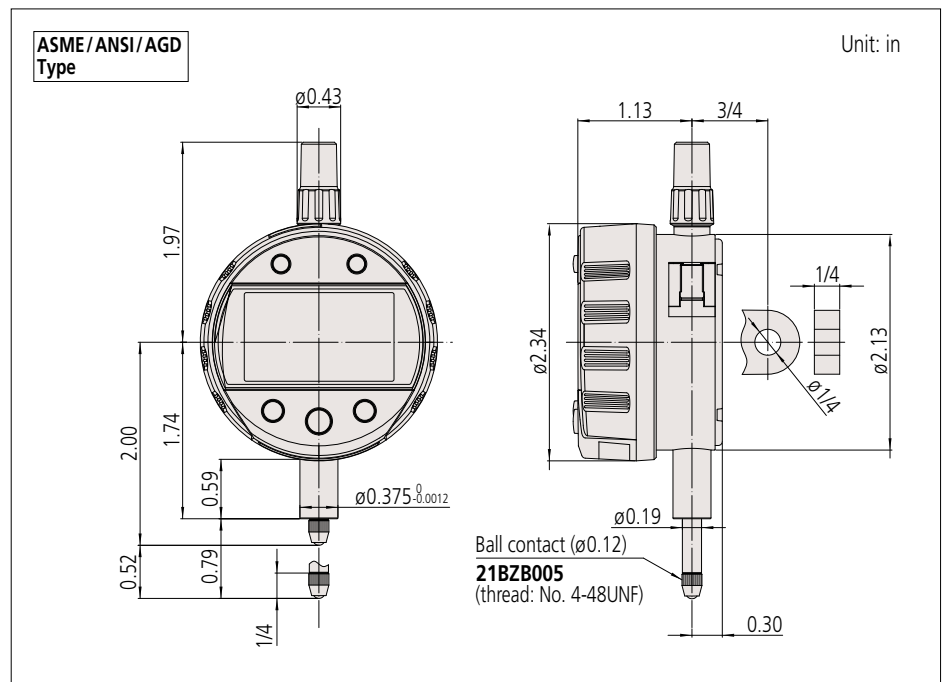
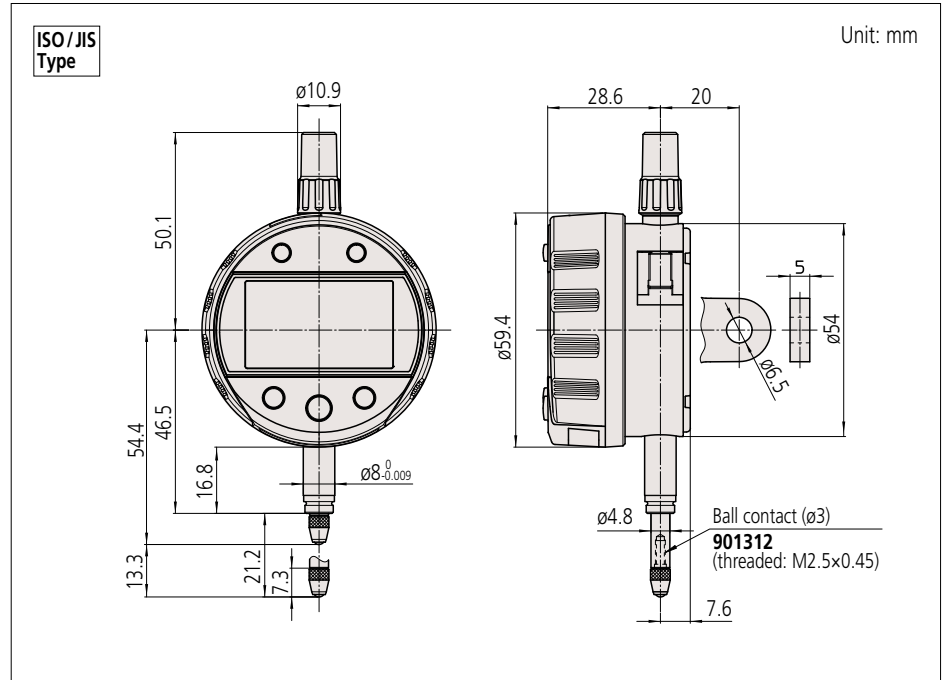
Parameter setup kit



Parameter setting software

- Contact points for Mitutoyo's Digimatic indicators (optional)
Refer to pages 07-63 to 07-68 for details.
- Interchangeable back covers (optional)
Refer to pages 07-69 to 07-70 for details.
- Measuring stands (optional)
Refer to pages 07-97 to 07-103 for details.

DIMENSIONS



Digimatic 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 08-31 to 08-48 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.



543-310B-10

SPECIFICATIONS

Metric		ISO/JIS Type							
Code No.	Range (mm)	Resolution (mm)	Maximum permissible error (MPE)* ¹ (mm)				Maximum permissible limit (MPL)	Battery life (normal use)* ²	Mass (g)
			Partial measuring range P_{MPE}	Total measuring range E_{MPE}	Hysteresis H_{MPE}	Repeatability R_{MPE}			
543-310B-10	12.7	0.001/0.01 (selectable)	0.003	0.003	0.003	0.002	1.5 or less	Approx. 1 year	170

Inch / Metric		ISO/JIS Type							
Code No.	Range	Resolution	Maximum permissible error (MPE)* ¹ (mm)				Maximum permissible limit (MPL)	Battery life (normal use)* ²	Mass (g)
			Partial measuring range P_{MPE}	Total measuring range E_{MPE}	Hysteresis H_{MPE}	Repeatability R_{MPE}			
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	0.003	0.002	1.5 or less	Approx. 1 year	170

Inch / Metric		ASME/ANSI /AGD type						
Code No.	Range	Resolution	Maximum permissible error (MPE)* ¹ (in)			Maximum permissible limit (MPL)	Battery life (normal use)* ²	Mass (g)
			Overall* ³	Hysteresis	Repeatability	Measuring force (N)		
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

- Power source: CR2032 battery (1 pc.), included as standard (for operational checks)

*1 These values apply to normal measurements at 20 °C.

*2 Applies only if not connected to a data processor. Battery life depends on use of the indicator. Use the above value as a guide only.

*3 Overall magnification and linearity

Note: Flat-back type only.

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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 07-13.

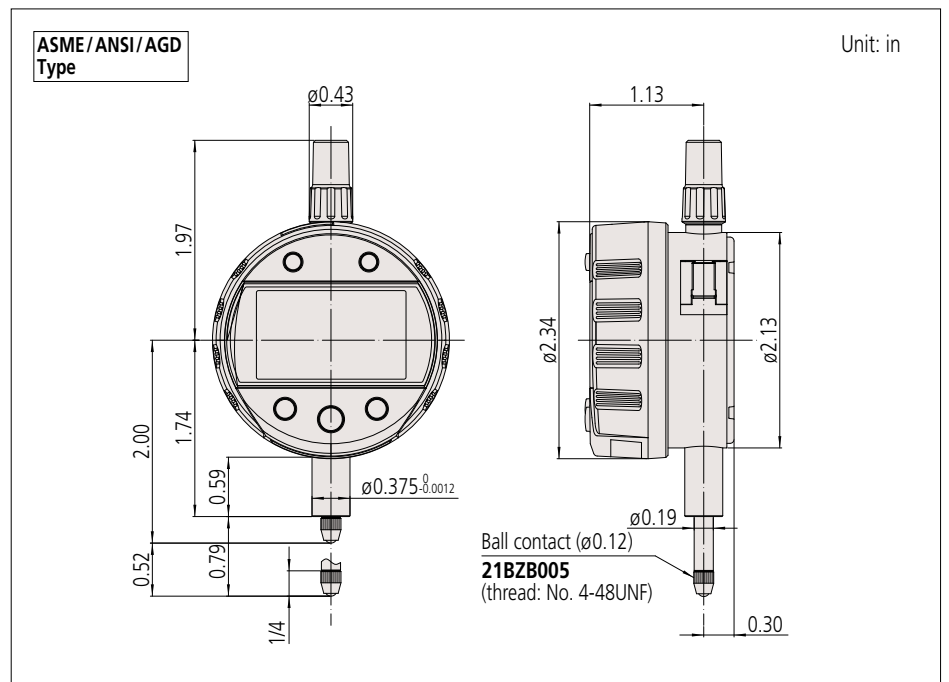
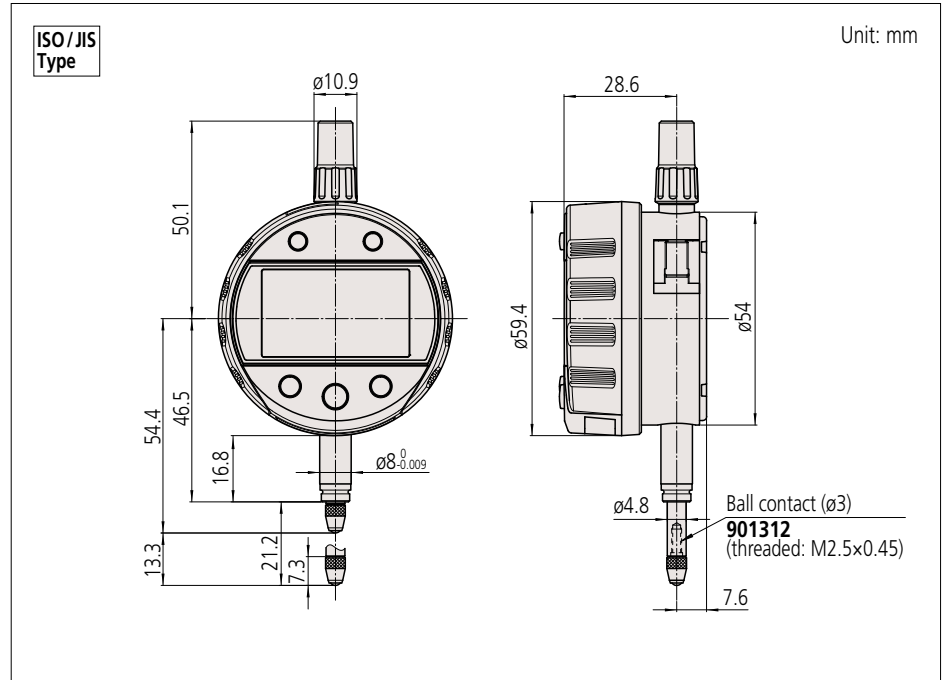
- Parameter setup kit (optional)
Refer to page 07-13 for details.

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 08-49 and 08-50 for details.

DIMENSIONS



Digimatic 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

Metric		ISO/JIS Type							
Code No.	Range (mm)	Resolution (selectable)	Maximum permissible error (MPE)*1*2 (mm)				Maximum permissible limit (MPL)	Battery life (normal use)*4	Mass (g)
			Partial measuring range P_{MPE}	Total measuring range E_{MPE}	Hysteresis H_{MPE}	Repeatability R_{MPE}	Measuring force (N)		
543-340B-10	12.7	12 steps*4	0.003	0.003	0.003	0.002	1.5 or less	Approx. 1 year	170
543-590B-10	25.4						1.8 or less*3		190
543-595B-10	50.8						2.3 or less*3		260

Inch / Metric		ISO/JIS Type							
Code No.	Range	Resolution (selectable)	Maximum permissible error (MPE)*1*2 (mm)				Maximum permissible limit (MPL)	Battery life (normal use)*4	Mass (g)
			Partial measuring range P_{MPE}	Total measuring range E_{MPE}	Hysteresis H_{MPE}	Repeatability R_{MPE}	Measuring force (N)		
543-341B-10	0.5 in / 12.7 mm	12 steps*4	0.003	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*3		190
543-596B-10	2 in / 50.8 mm						2.3 or less*3		260

Inch / Metric		ASME/ANSI /AGD type						
Code No.	Range	Resolution (selectable)	Maximum permissible error (MPE)*1*2 (in)			Maximum permissible limit (MPL)	Battery life (normal use)*4	Mass (g)
			Overall *5	Hysteresis	Repeatability	Measuring force (N)		
543-342B-10	0.5 in/ 12.7 mm	12 steps*4	±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*3		190
543-597B-10	2 in/ 50.8 mm					2.3 or less*3		260

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

*1 These values apply to normal measurements at 20 °C.

*2 Valid for resolution set to 0.001 mm/0.00005 in and coefficients A=1, B=0 and C=0.

*3 Applies for a spindle orientation between the spindle pointing vertically downward to the spindle horizontal.

*4 Applies only if not connected to a data processor. Battery life depends on use of the indicator. Use the above value as a guide only.

*5 Overall magnification and linearity

Note: Flat-back type only.

MeasurLink[®] ENABLED
Data Management Software by Mitutoyo

ABSOLUTE[™]



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 07-13.

- Lifting

Lifting lever **21EZA198** (12.7 mm/0.5 inch type)

Lifting knob **21EZA105** (12.7 mm/0.5 inch type)

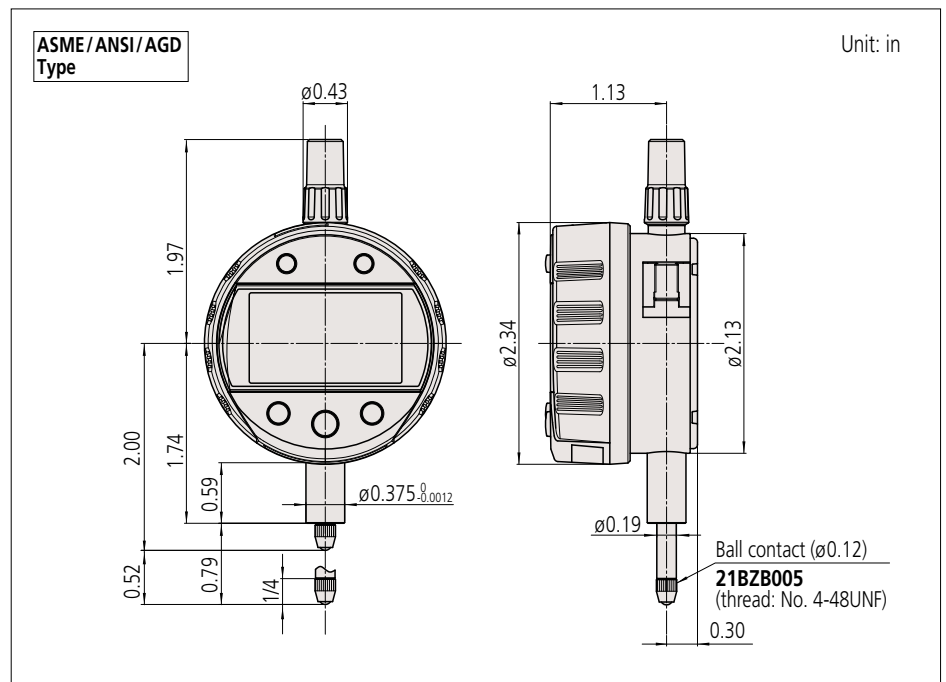
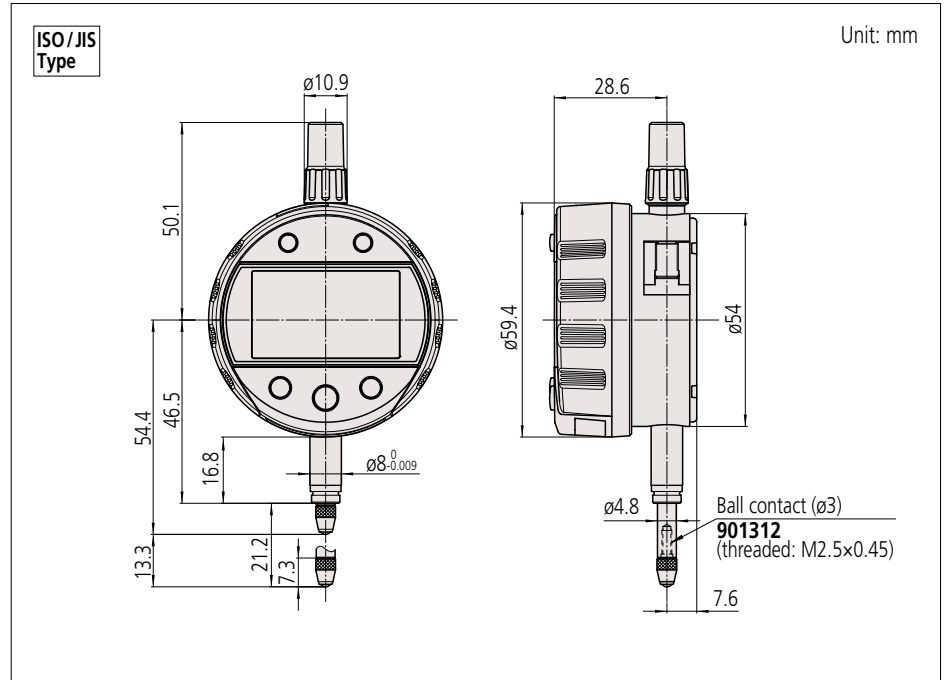
21EZA197 (25.4 mm/1 inch type)

21EZA200 (50.8 mm/2 inch type)

- Parameter setup kit (optional)

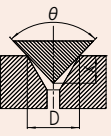
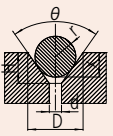
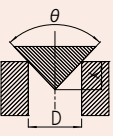
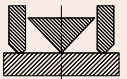
Refer to page 07-13 for details.

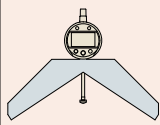
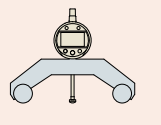
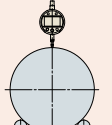
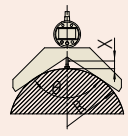
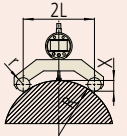
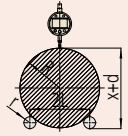
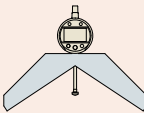
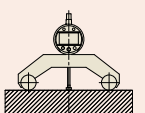
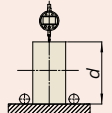
DIMENSIONS



Digimatic Indicators

Examples of measuring various features

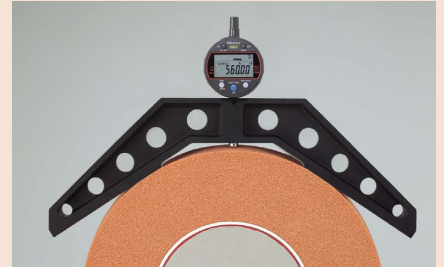
Item		D=Countersink diameter/Groove width; H=Countersink depth/Groove depth			
Fixture type*1					
Contact point		Cone	Ball	Cone	
Measuring method x: Spindle displacement					
Calculation		D=Ax	D=Ax+B	H=Ax+B	D=Ax
Coefficient values	A	$-2 \tan \frac{\theta}{2}$	$-2 \tan \frac{\theta}{2}$	-1	$-2 \tan \frac{\theta}{2}$
	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	$-\frac{\sin \frac{\theta}{2}}{1 - \sin \frac{\theta}{2}}$	$\frac{1}{2}$	$-\frac{1}{2}$	$\frac{1}{2}$
	B	0	$-r$	r	$-r$
	C	0	$\frac{L^2}{2}$	$-\frac{L^2}{2}$	$\frac{L^2}{2}$
Origin offset value (function ON/OFF)		d (OFF)	0 (OFF)	0 (OFF)	d (ON)
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.

Typical applications



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: **21EZA345**
To denote your AC power cable add the following suffixes to the code No.: **A** for UL/CSA, **D** for CEE, **DC** for CCC, **E** for KC. **No suffix** is required for JIS/100VAC.
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 07-63 to 07-68 for details.
 - Interchangeable back covers (optional)
Refer to pages 07-69 to 07-70 for details.

Output signals and display

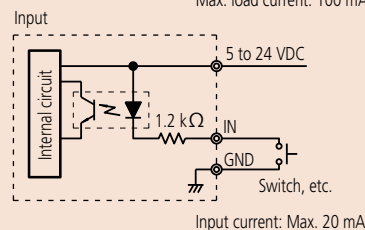
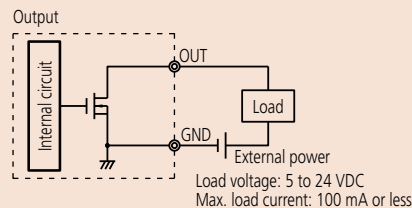
Wire	- NG	OK	+ NG	ABS data composition error
Orange (- NG)	Low	High	High	High
Green (OK)	High	Low	High	High
Brown (+ NG)	High	High	Low	High
LED	Red	Green	Red	Red flashing
Display	◀	○	▶	"x.xx" indication

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	O	Tolerance judgment
Green	OK	O	result output: Only the terminal corresponding to a judgment result is set to the low level.
Brown	+ NG	O	
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

- Enables the GO/NG 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/NG 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 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 07-2.



543-350-10

SPECIFICATIONS

Metric		ISO/JIS Type						Mass (g)
Code No.	Range (mm)	Resolution (mm)	Maximum permissible error (MPE)*1 (mm)				Maximum permissible limit (MPL)	
			Partial measuring range P_{MPE}	Total measuring range E_{MPE}	Hysteresis H_{MPE}	Repeatability R_{MPE}	Measuring force (N)	
543-350-10	12.7	0.001/0.01 (selectable)	0.003	0.003	0.003	0.002	2.5 or less	295
543-350B-10 (flat back)								285

Inch / Metric		ISO/JIS Type						Mass (g)
Code No.	Range	Resolution	Maximum permissible error (MPE)*1 (mm)				Maximum permissible limit (MPL)	
			Partial measuring range P_{MPE}	Total measuring range E_{MPE}	Hysteresis H_{MPE}	Repeatability R_{MPE}	Measuring force (N)	
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	0.003	0.002	2.5 or less	295
543-351B-10 (flat back)								285

Inch / Metric		ASME/ANSI /AGD type					
Code No.	Range	Resolution	Maximum permissible error (MPE)*1 (in)			Maximum permissible limit (MPL)	Mass (g)
			Overall*2	Hysteresis	Repeatability	Measuring force (N)	
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

*1 These values apply to normal measurements at 20 °C.

*2 Overall magnification and linearity

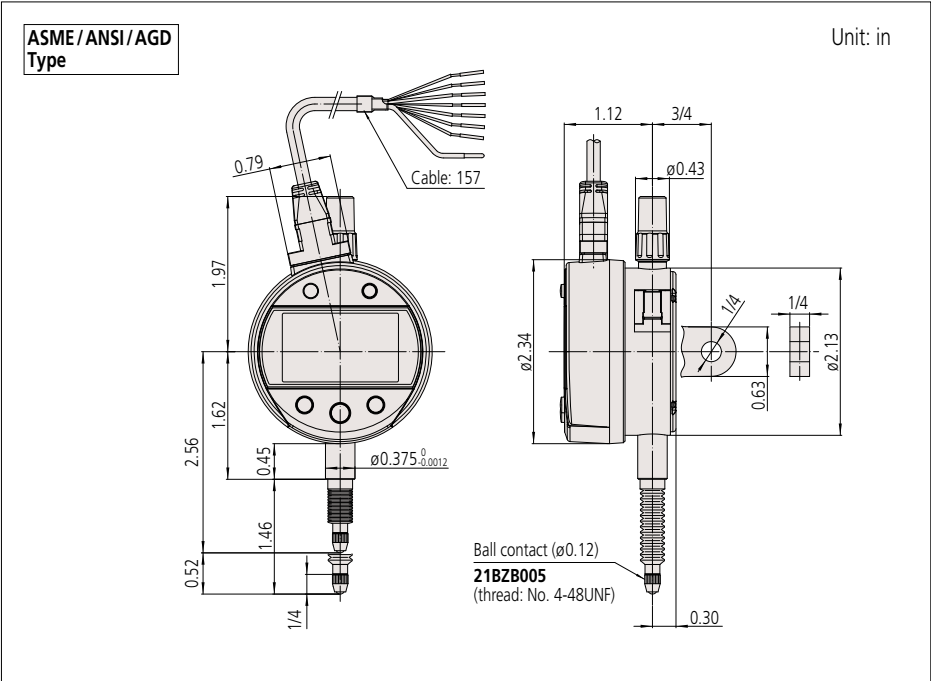
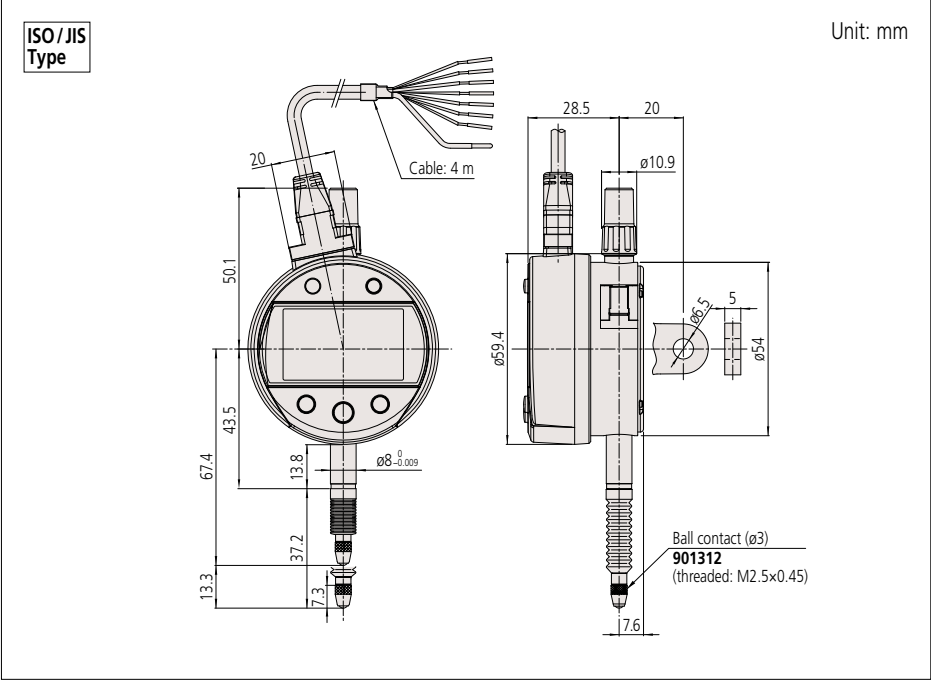
Note 1: Display readout does not rotate.

Note 2: MAX/MIN holding: sample rate is 100 readings/s; max. rate of change of reading is 100 μ m/s or less.

Note 3: Standard contact point: **901312** (ISO/JIS type), **21BZB005** (ANSI/AGD type)

ABSOLUTE Digimatic Indicator ID-CJX
SERIES 543 — Signal Output Function Type

DIMENSIONS



Application example using comparator stand



Comparator stand
215-505-10

Optional Accessories

Code 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 07-63 to 07-68 for details.
- Granite comparator stands (optional)
Refer to page 07-101 for details.
- Comparator stands (optional)
Refer to page 07-102 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 0.5 μ m 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)



543-563

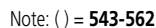
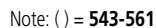
SPECIFICATIONS

Metric		ISO/JIS Type						
Code No.*2	Range (mm)	Resolution (mm)	Maximum permissible error (MPE)*1 (mm)				Maximum permissible limit (MPL)	Mass (g)
			Partial measuring range P_{MPE}	Total measuring range E_{MPE}	Hysteresis H_{MPE}	Repeatability R_{MPE}	Measuring force (N)	
543-561	30.48	0.0005/ 0.001 (selectable)	0.0015	0.0015	0.0015	0.001	2.0 or less	290
543-563	60.96		0.0025	0.0025	0.0025		2.5 or less	305

Inch/Metric		ASME/ANSI/AGD Type						
Code No.*2	Range	Resolution	Maximum permissible error (MPE)*1 (in)			Maximum permissible limit (MPL)	Mass (g)	
			Overall*3	Hysteresis	Repeatability	Measuring force (N)		
543-562	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	
543-564	2.4 in/ 60.96 mm		±0.00010	0.00010		2.5 or less		

- Display: 7-digit display, sign, and analog bar with 2-color backlight
- Power source: 5.9 V DC (via AC adapter) **06AGZ369***
- * To denote your AC power cable add the following suffixes to the code No.: **JA** for UL/CSA and PSE, **D** for CEE, **DC** for CCC, **E** for BS, **K** for KC
- Position detection method: Photoelectric-type reflection linear encoder
- Response speed: Approx. 1000 mm/s
- Lifting lever: **21EAA426** (standard accessory)
- *1 These values apply to normal measurements at 20 °C.
- *2 To denote your AC power cable add the following suffixes to the code No.: **A** for UL/CSA, **D** for CEE, **DC** for CCC, **E** for BS, **K** for KC, **No suffix** is required for JIS/100 V
- *3 Overall magnification and linearity
- Note 1: The indicator can output SPC (Digimatic) data consisting of up to 6 digits in full. If the data consists of 7 digits the first digit is not output (example: 123.4565 mm is output as 23.4565 mm).
- Note 2: Regarding origin setting, refer to "Precautions for use" on page 07-2.
- Note 3: The orientation for use can be from vertical (contact point pointing downward) to horizontal (spindle in horizontal orientation).

Digimatic Indicators



EC Counter SERIES 542 — Low-cost, Modular Type Display Unit

Functions

- Preset
- Tolerance judgment (3 steps)

- 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 96×48 mm)

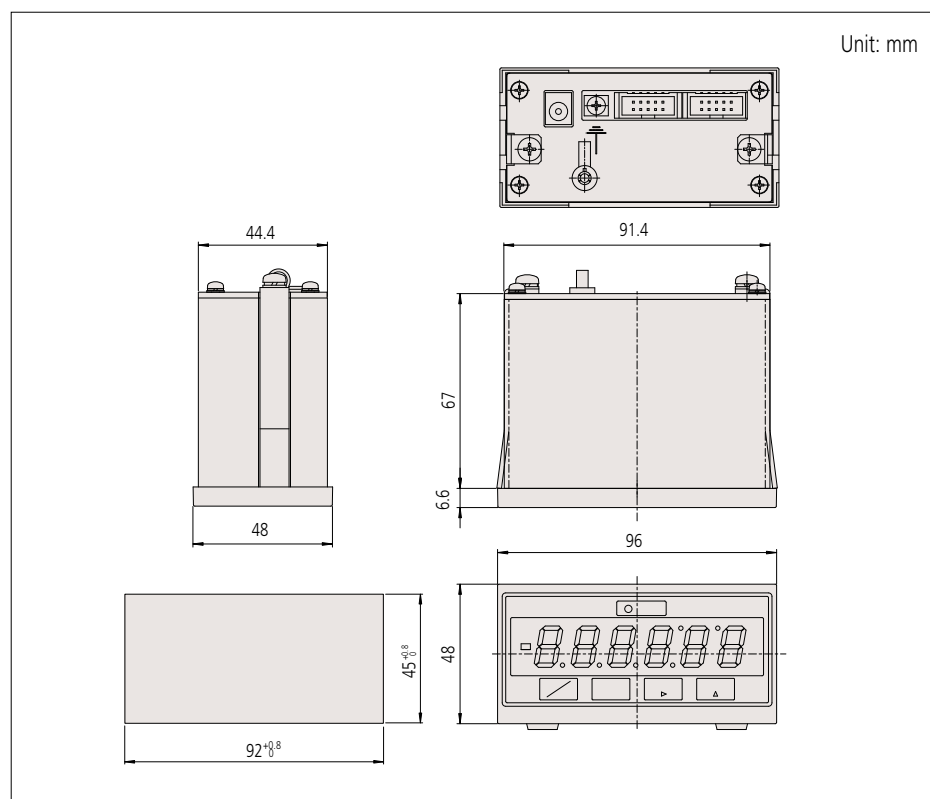


542-007

SPECIFICATIONS

Code No.	542-007*
Resolution () indicates maximum display range	0.01 mm (± 9999.99)/0.0005 in (± 99.9995 in)/0.001 in (± 999.999 in) 0.001 mm (± 9999.999)/0.00005 in (± 9.99995 in)/0.0001 in (± 99.999 in) [automatic setting by gage]
Tolerance judgment display	LED display (3 steps: Amber, Green, Red)
External output (switching type)	Tolerance judgment output Data 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) × 48 (H) × 84.6 (D) mm
Power Source	AC adapter: 12BAR954 AC cable: 12BAK729 (Japan), 12BAK730 (U.S.), 12BAK731 (EU), 12BAK734 (UK), 12BAK732 (China), 12BAK733 (Korea)
Standard Accessories	AC adapter, AC cable, rubber feet
Mass	500 g

DIMENSIONS



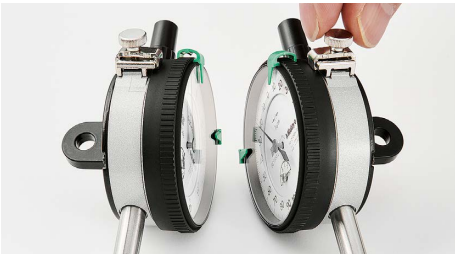
Dial Indicators

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's 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.

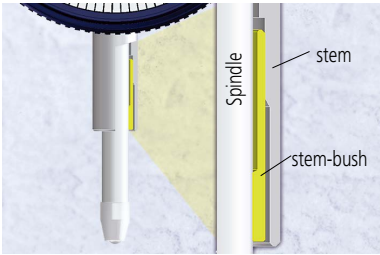
FEATURES: A Series (SERIES 2, 3, 4)



- 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).

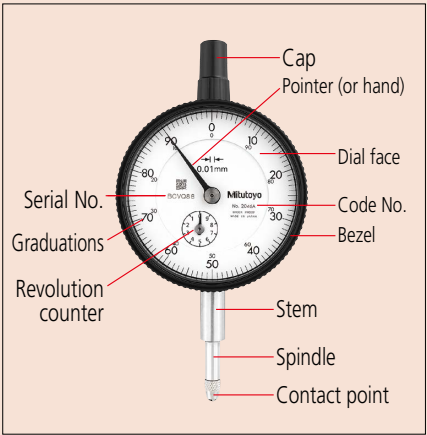


- The optional limit hands (1) can be moved without interfering with the optional bezel clamp (2).

- 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.

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

Metric		ISO/JIS type									
Code No.		Graduation (mm)	Range (range/rev) (mm)	Maximum permissible error (MPE) (μm)						Dial reading	Measuring force (N)
w/lug	Flat-back			Indication error				Hysteresis	Repeat-ability		
				1/10 Rev	1/2 Rev	1 Rev	Measuring range				
2046A	2046AB	0.01	10 (1)	5	9	10	13	3	3	±0-100	1.4 or less
2046A-09	2046AB-09	0.01	10 (1)	5	9	10	15	3	3	±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	±0-100	1.4 or less
2044A	2044AB	0.01	5 (1)	5	9	10	12	3	3	±0-100	1.4 or less
2044A-09	2044AB-09	0.01	5 (1)	5	9	10	12	3	3	±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

Note: Completed products inspection is performed in the vertical orientation (contact point downward) and the stated accuracy is guaranteed.

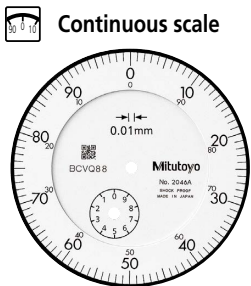
DIMENSIONS

ISO/JIS Type		Unit: mm									
Code 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 07-63 to 07-68 for details of contact points.

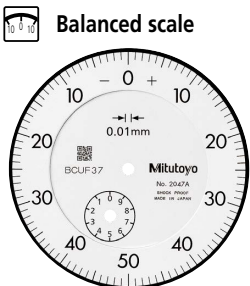
Dial Indicators

SERIES 2 — Standard Type, 0.01 mm Graduation



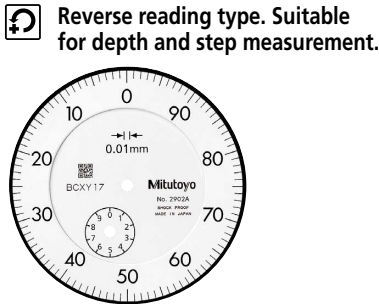
Graduation: 0.01 mm,
Measuring range: 10 mm

2046A
With damper at top rest point
Shockproof



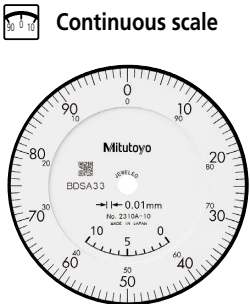
Graduation: 0.01 mm,
Measuring range: 10 mm

2047A
With damper at top rest point



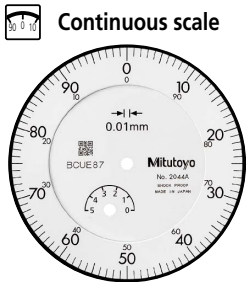
Graduation: 0.01 mm,
Measuring range: 10 mm

2902A
With damper at top rest point



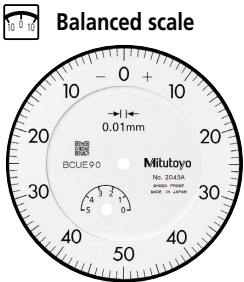
Graduation: 0.01 mm,
Measuring range: 10 mm

2310A-10
With coaxial revolution counter
Jeweled bearing



Graduation: 0.01 mm,
Measuring range: 5 mm

2044A
With damper at top rest point
With damper at top rest point
Shockproof



Graduation: 0.01 mm,
Measuring range: 5 mm

2045A
With damper at top rest point

Optional Accessories

- Limit hand (2 pcs.): **21AZB195**



- Bezel clamp: **21AZB148**



FEATURES

Metric		ISO/JIS type							
Code No.		Flat-back	Shockproof	Shockproof	Shockproof	Shockproof	Shockproof	Shockproof	Shockproof
w/lug	Flat-back	Shockproof	Shockproof	Shockproof	Shockproof	Shockproof	Shockproof	Shockproof	Shockproof
2046A	2046AB	✓					✓		
2046A-09	2046AB-09	✓		✓					
2047A	2047AB		✓				✓		
2902A	2902AB			✓			✓		
2310A-10	2310AB-10	✓					✓	✓	
2044A	2044AB	✓					✓		
2044A-09	2044AB-09	✓		✓					
2045A	2045AB		✓				✓		

**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		ISO/JIS type									
Code No.		Graduation (mm)	Range (range/rev) (mm)	Maximum permissible error (MPE) (μm)						Dial reading	Measuring force (N)
w/lug	Flat-back			Indication error				Hysteresis	Repeat-ability		
				1/10 Rev	1/2 Rev	1 Rev	Measuring range				
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

Note: Completed products inspection is performed in the vertical orientation (contact point downward) and the stated accuracy is guaranteed.

DIMENSIONS

ISO/JIS
Type

Unit: mm

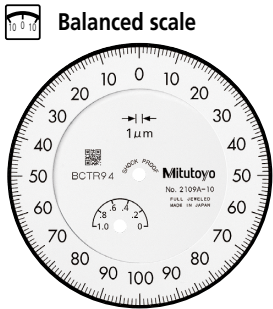
Technical drawing of a dial indicator showing dimensions A through I. A detail view of the contact point shows a diameter of 5 mm. The main body has diameters of 6.5 mm, 8.0 mm, and 4.8 mm. The mounting thread is M2.5x0.45.

Code 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 07-63 to 07-68 for details of contact points.

Dial Indicators

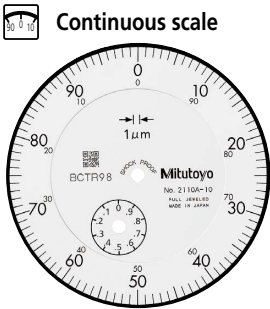
SERIES 2 — Standard Type, 0.001 mm & 0.005 mm Graduation



Graduation: 0.001 mm,
Measuring range: 1 mm

Shockproof

Jeweled bearing

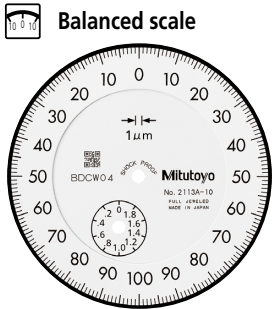


Graduation: 0.001 mm,
Measuring range: 1 mm

Double scale spacing

Shockproof

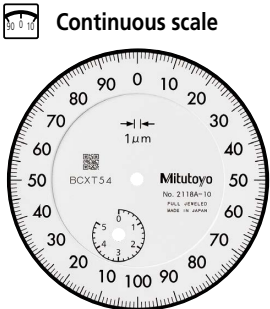
Jeweled bearing



Graduation: 0.001 mm,
Measuring range: 2 mm

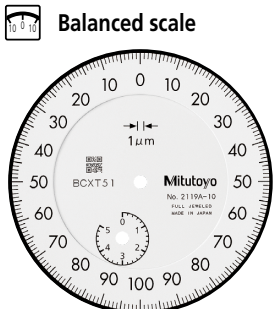
Shockproof

Jeweled bearing



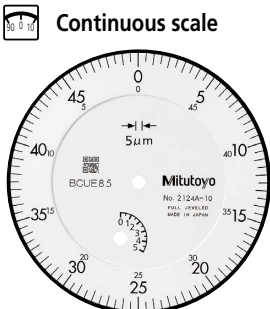
Graduation: 0.001 mm,
Measuring range: 5 mm

Jeweled bearing



Graduation: 0.001 mm,
Measuring range: 5 mm

Jeweled bearing



Graduation: 0.005 mm,
Measuring range: 5 mm

Jeweled bearing

Optional Accessories

- Limit hand (2 pcs.), Bezel clamp
- Refer to page 07-27 for details.

FEATURES

Metric		ISO/JIS type					
Code 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	✓				✓	

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		ISO/JIS type									
Code No.		Graduation (mm)	Range (range/rev) (mm)	Maximum permissible error (MPE) (μm)						Dial reading	Measuring force (N)
w/lug	Flat-back			Indication error				Hysteresis	Repeat-ability		
				1/10 Rev	1/2 Rev	1 Rev	Measuring range				
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

Note: Completed products inspection is performed in the vertical orientation (contact point downward) and the stated accuracy is guaranteed.

DIMENSIONS

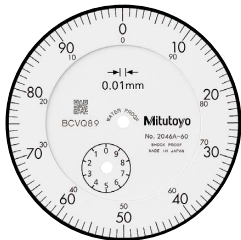
Code No.		A	B	C	D	E	F	G	H	I	Mass (g)	
2046A-60	2046AB-60	47.2	74.7	57	18.1	20	12.3	33.9	52	7.6	w/lug	Flat-back
											147	138
2044A-60	2044AB-60	47.2	70	57	18.1	20	12.3	29.2	52	7.6	147	138
											149	140
2109A-70	2109AB-70	47.2	65.3	57	18.1	20	12.3	24.5	52	7.6	150	141
											150	141

Note: Refer to pages 07-63 to 07-68 for details of contact points.

Dial Indicators

SERIES 2 — Water-proof Type, 0.01 mm & 0.001 mm Graduation

Continuous scale



Graduation: 0.01 mm,
Measuring range: 10 mm

2046A-60

- Waterproof
- With damper at top rest point

Continuous scale

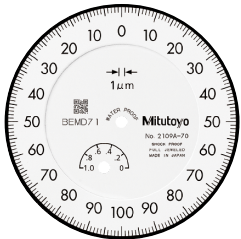


Graduation: 0.01 mm,
Measuring range: 5 mm

2044A-60

- Waterproof
- With damper at top rest point

Balanced scale

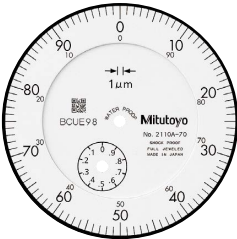


Graduation: 0.001 mm,
Measuring range: 1 mm

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						
Code No.	Flat-back	30°/15°	15°/7.5°	60°	Shockproof	Jeweled bearing	Double scale spacing	Waterproof
2046A-60	2046AB-60	✓			✓	✓		
2044A-60	2044AB-60	✓			✓	✓		
2109A-70	2109AB-70		✓	✓	✓	✓		
2110A-70	2110AB-70	✓		✓	✓	✓	✓	

Optional Accessories

- Limit hand (2 pcs.): **21AZB195**



- Bezel clamp: **21AZB148** (for metric type)
21RZA065 (for inch type)



21AZB148



SERIES 2 — Standard Type, Inch Reading

SPECIFICATIONS

Inch		ANSI/AGD type						
Code 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)	±0.001/±0.001/±0.001	0.0002	±0.0002	±0-100	1.8 or less
2415A	2415AB	0.001	0.5 (0.1)	±0.001/±0.001/±0.001	0.0002	±0.0002	0-50-0	1.8 or less
2914A	2914AB	0.001	0.5 (0.1)	±0.001/±0.001/±0.001	0.0002	±0.0002	100-0	1.8 or less
2506A	2506AB	0.0005	0.125 (0.05)	±0.0005/±0.0005/—	0.00016	±0.0001	±0-50	1.8 or less
2507A	2507AB	0.0005	0.125 (0.05)	±0.0005/±0.0005/—	0.00016	±0.0001	0-25-0	1.8 or less
2514A	2514AB	0.0005	0.5 (0.05)	±0.0005/±0.0005/±0.0015	0.00016	±0.0001	±0-50	1.8 or less
2922A	2922AB	0.0005	0.125 (0.05)	±0.0005/±0.0005/—	0.00016	±0.0001	0-25-0	1.8 or less
2356A-10	2356AB-10	0.0001	0.25 (0.01)	±0.0002/±0.0002/±0.0003/±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)	±0.0002/±0.0002/±0.0003/±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)	±0.0001/±0.0001/—	0.0001	±0.00003	0-10	2.0 or less
2803A-10	2803AB-10	0.0001	0.025 (0.01)	±0.0001/±0.0001/—	0.0001	±0.00003	0-5-0	2.0 or less
2804A-10	2804AB-10	0.0001	0.05 (0.01)	±0.0001/±0.0001/±0.0002	0.0001	±0.00003	0-10	2.0 or less
2805A-10	2805AB-10	0.0001	0.05 (0.01)	±0.0001/±0.0001/±0.0002	0.0001	±0.00003	0-5-0	2.0 or less
2905A-10	2905AB-10	0.0001	0.05 (0.01)	±0.0001/±0.0001/±0.0002	0.0001	±0.00003	10-0	2.0 or less
2923A-10	2923AB-10	0.0001	0.05 (0.01)	±0.0001/±0.0001/±0.0002	0.0001	±0.00003	0-5-0	2.0 or less

Note: Completed products inspection is performed in the vertical orientation (contact point downward) and the stated accuracy is guaranteed.

FEATURES

Inch							
Code No.		S	P	D	R	L	T
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	✓		✓		✓	

SERIES 2 — Standard Type, Inch Reading

DIMENSIONS

ANSI/AGD
Type

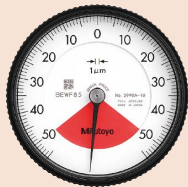
Unit: in

Code 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



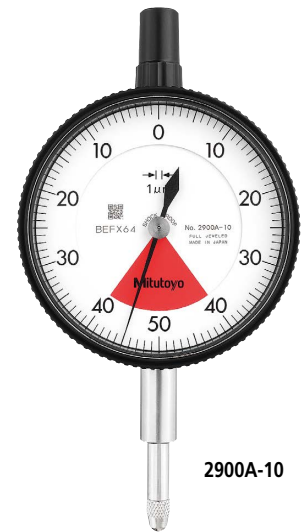
SERIES 2 — Standard One Revolution Type for Error-free Reading

One revolution type Back Plunger dial gages are also available. (Refer to pages 07-59 to 07-62 for details.)



2990A-10

- The one revolution dial indicator prevents the possibility of reading errors.
- Mitutoyo's unique 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

SPECIFICATIONS

Metric		ISO/JIS type ANSI/AGD type										
Code No.		Graduation (mm)	Range (range/rev) (mm)	Maximum permissible error (MPE) (μm)					Hysteresis	Repeat-ability	Dial reading	Measuring force (N)
w/lug	Flat-back			Indication error								
				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	

Inch											
Code 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					
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		

Note: Completed products inspection is performed in the vertical orientation (contact point downward) and the stated accuracy is guaranteed.

Special specifications

Upon request, we can manufacture custom types with changed graduation numbers, graduation lines, dead zones, etc. Please contact your local Mitutoyo Sales Office for more information.

SERIES 2 — Standard One Revolution Type for Error-free Reading

DIMENSIONS

ISO/JIS
Type

Unit: mm

Code 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 07-63 to 07-68 for details of contact points.

ANSI/AGD
Type

Unit: in

Code 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

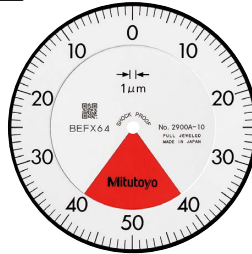
Note: Refer to pages 07-63 to 07-68 for details of contact points.

Optional Accessories

- Limit hand (2 pcs.), Bezel clamp
- Refer to page 07-31 for details.



Balanced scale



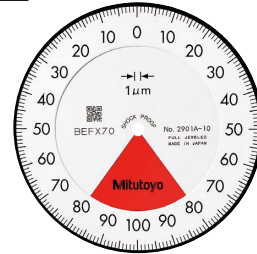
Graduation: 0.001 mm,
Measuring range: 0.08 mm

2900A-10

- One revolution
 - Shockproof
 - Jeweled bearing
- 2900A-72
- One revolution
 - Shockproof
 - Dustproof
 - Jeweled bearing



Balanced scale



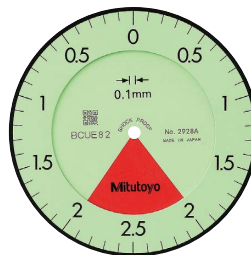
Graduation: 0.001 mm,
Measuring range: 0.16 mm

2901A-10

- One revolution
- Shockproof
- Jeweled bearing



Balanced scale



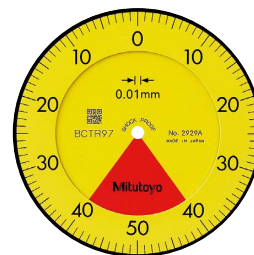
Graduation: 0.1 mm,
Measuring range: 4 mm

2928A

- One revolution
- Shockproof



Balanced scale



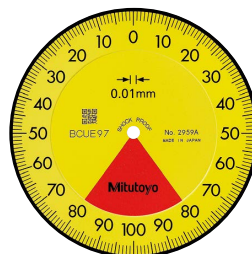
Graduation: 0.01 mm,
Measuring range: 0.8 mm

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

Metric ☐ ISO/JIS type ☐ ANSI/AGD type

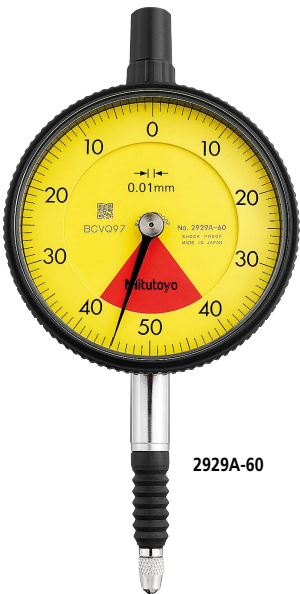
Code No.							
w/lug	Flat-back						
2928A	2928AB	✓	✓	✓			
2929A	2929AB	✓	✓	✓			
2929A-62	2929AB-62	✓	✓	✓		✓	
2959A	2959AB	✓	✓	✓			
2900A-10	2900AB-10	✓	✓	✓			✓
2900A-72	2900AB-72	✓	✓	✓		✓	✓
2901A-10	2901AB-10	✓	✓	✓			✓

Code No.							
w/lug	Flat-back						
2909A-62	2909AB-62	✓	✓	✓		✓	
2910A-10	2910AB-10	✓	✓	✓			✓



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.
- Mitutoyo’s unique 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

Metric		ISO/JIS type								ANSI/AGD type	
Code No.		Graduation (mm)	Range (range/rev) (mm)	Maximum permissible error (MPE) (μm)						Dial reading	Measuring force (N)
w/lug	Flat-back			Indication error				Hysteresis	Repeat-ability		
				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

Inch		Accuracy (in)								Repeat-ability (in)	Dial reading	Measuring force (N)
Code No.		Graduation (in)	Range (range/rev) (in)	First 1 Rev/2.5 Rev/10 Rev			Retrace					
w/lug	Flat-back											
2910A-72	2910AB-72	0.0001	0.008/0.01	±0.0001/—/—			0.0001		±0.00003	4-0-4	2.5 or less	

Note: Completed products inspection is performed in the vertical orientation (contact point downward) and the stated accuracy is guaranteed.

Special specifications

Upon request, we can manufacture custom types with changed graduation numbers, graduation lines, dead zones, etc. Please contact your local Mitutoyo Sales Office for more information.

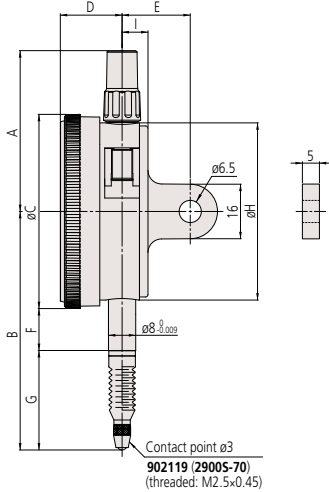
Optional Accessories

- Limit hand (2 pcs.), Bezel clamp
- Refer to page 07-31 for details.

DIMENSIONS

ISO/JIS
Type

Unit: mm

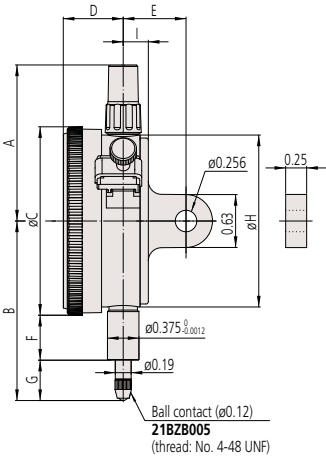


Code No.	A	B	C	D	E	F	G	H	I	Mass (g)	
										w/lug	Flat-back
2929A-60	47.2	70	57	18.1	20	12.3	29.2	52	7.6	146	137
2900A-70	47.2	67	57	18.1	20	12.3	26.2	52	7.6	150	141

Note: Refer to pages 07-63 to 07-68 for details of contact points.

ANSI/AGD
Type

Unit: in

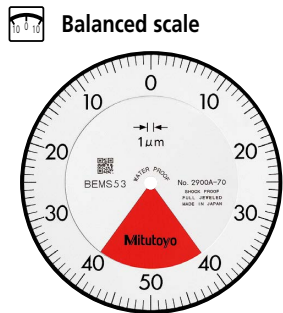


Code No.	A	B	C	D	E	F	G	H	I	Mass (g)	
										w/lug	Flat-back
2910A-72	1.86	2.02	2.24	0.71	3/4	0.54	0.36	2.05	0.30	150	141

Note: Refer to pages 07-63 to 07-68 for details of contact points.

Dial Indicators

SERIES 2 — Standard One Revolution Type for Error-free Reading, Water-proof Type



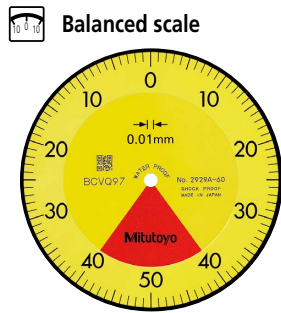
Graduation: 0.001 mm,
Measuring range: 0.08 mm

 **One revolution**

 **Shockproof**

 **Waterproof**

 **Jeweled bearing**



Graduation: 0.01 mm,
Measuring range: 0.8 mm

 **One revolution**

 **Shockproof**

 **Waterproof**

FEATURES

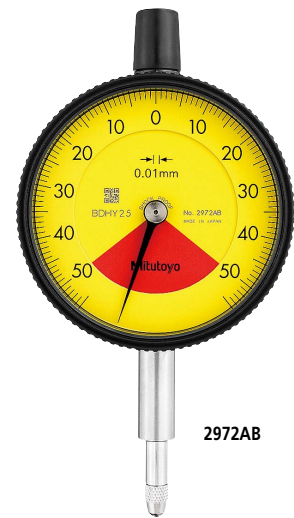
Metric		ISO/JIS type		ANSI/AGD type	
Code No.					
w/lug	Flat-back				
2929A-60	2929AB-60	✓	✓	✓	✓
2900A-70	2900AB-70	✓	✓	✓	✓

Inch		ISO/JIS type		ANSI/AGD type	
Code No.					
w/lug	Flat-back				
2910A-72	2910AB-72	✓	✓	✓	✓



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.
- Mitutoyo's unique 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.



SPECIFICATIONS

Metric		ISO/JIS type ANSI/AGD type									
Code No.		Graduation (mm)	Range (range/rev) (mm)	Maximum permissible error (MPE) (μm)						Dial reading	Measuring force (N)
w/lug	Flat-back			Indication error				Hysteresis	Repeat-ability		
				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

Inch											
Code 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					
—	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		

Note: Completed products inspection is performed in the vertical orientation (contact point downward) and the stated accuracy is guaranteed.

Special specifications

Upon request, we can manufacture custom types with changed graduation numbers, graduation lines, dead zones, etc. Please contact your local Mitutoyo Sales Office for more information.

Dial Indicators

SERIES 2 — Standard One Revolution Type for Error-free Reading, Lightweight Type

DIMENSIONS

ISO / JIS
Type

Unit: mm

Flat back lid and internal frame are integral molding.

Optional Back lid installation holes (4 locations)

Installation example of back lid with lug

ANSI / AGD
Type

Unit: in

Flat back lid and internal frame are integral molding.

Optional Back lid installation holes (4 locations)

Ball contact (Ø0.12)
21BZB005
(thread: No. 4-48 UNF)

Note 1: When installing an optional back (refer to pages 07-69 to 07-70 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.

Metric									
Code 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	

Inch									
Code 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	

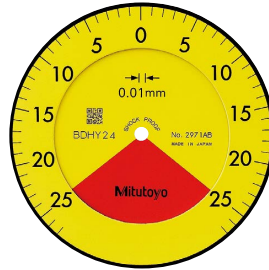
Note: Refer to pages 07-63 to 07-68 for details of contact points.

Optional Accessory
• Limit hand (2 pcs.): 21AZB195





Balanced scale



Graduation: 0.01 mm,
Measuring range: 0.5 mm

2971AB

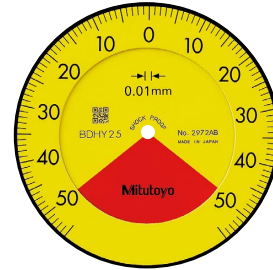
One revolution

Shockproof

Dustproof



Balanced scale



Graduation: 0.01 mm,
Measuring range: 1 mm

2972AB

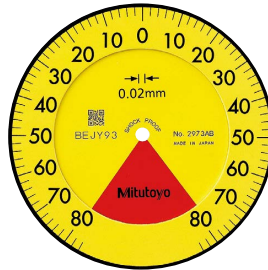
One revolution

Shockproof

Dustproof



Balanced scale



Graduation: 0.02 mm,
Measuring range: 1.6 mm

2973AB

One revolution

Shockproof

Dustproof

FEATURES

Metric ☐ ISO/JIS type ☐ ANSI/AGD type

Code No.		10 0 10	One revolution	Shockproof	Dustproof
w/lug	Flat-back				
—	2971AB	✓	✓	✓	✓
—	2972AB	✓	✓	✓	✓
—	2973AB	✓	✓	✓	✓

Inch

Code No.		10 0 10	One revolution	Shockproof	Dustproof
w/lug	Flat-back				
—	2976AB	✓	✓	✓	✓
—	2977AB	✓	✓	✓	✓
—	2978AB	✓	✓	✓	✓

Dial Indicators



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

Metric		ISO/JIS type ANSI/AGD type									
Code No.		Graduation (mm)	Range (range/rev) (mm)	Maximum permissible error (MPE) (μm)						Dial reading	Measuring force (N)
w/lug	Flat-back			Indication error				Hysteresis	Repeat- ability		
				1/10 Rev	1/2 Rev	1 Rev	Measuring range				
2050A	2050AB	0.01	20 (1)	8	10	15	20	5	4	±0-100	2.0 or less
2050A-60*	2050AB-60*	0.01	20 (1)	8	10	15	20	5	4	±0-100	2.5 or less
2050A-19	2050AB-19	0.01	20 (1)	8	10	15	20	5	4	±0-100	2.0 or less
2320A-10	2320AB-10	0.01	20 (1)	8	10	15	20	5	4	±0-100	2.0 or less
2052A	2052AB	0.01	30 (1)	10	12	15	25	7	5	±0-100	2.5 or less
2052A-19	2052AB-19	0.01	30 (1)	10	12	15	25	7	5	±0-100	2.5 or less
2330A-10	2330AB-10	0.01	30 (1)	10	12	15	25	7	5	±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 ($\varnothing 8$).

Note: Completed products inspection is performed in the vertical orientation (contact point downward) and the stated accuracy is guaranteed.

Inch											
Code 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					
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		

Note: Completed products inspection is performed in the vertical orientation (contact point downward) and the stated accuracy is guaranteed.

Optional Accessories

- Limit hand (2 pcs.): **21AZB195**



- Bezel clamp: **21AZB148** (for metric type)
21RZA065 (for inch type)
21RZA067 (for **2424A(B)-19**)

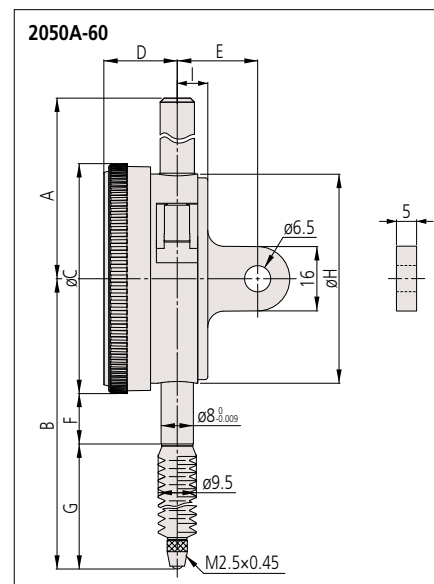
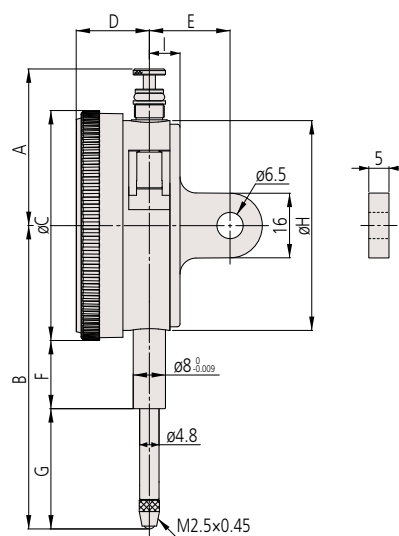


21AZB148

DIMENSIONS

ISO/JIS
Type

Unit: mm

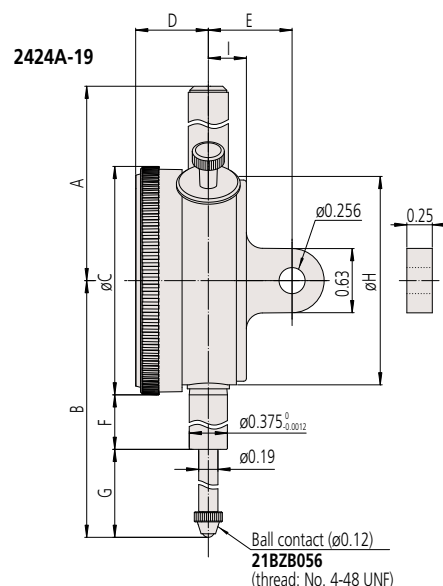


Code No.	A	B	C	D	E	F	G	H	I	Mass (g)	
										w/lug	Flat-back
2050A	38.5	75.2	57	18.1	20	16.9	29.8	52	7.6	149	140
2050A-60	58.2	87.2	57	18.1	20	12.3	46.4	52	7.6	155	146
2050A-19	38.5	75.2	57	18.1	20	16.9	29.8	52	7.6	149	140
2320A-10	38.5	75.2	57	18.1	20	16.9	29.8	52	7.6	150	141
2052A	38.5	88.7	57	18.1	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 07-63 to 07-68 for details of contact points.

ANSI/AGD
Type

Unit: in

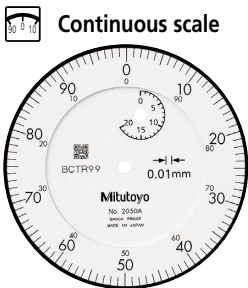


Code No.	A	B	C	D	E	F	G	H	I	Mass (g)	
										w/lug	Flat-back
2416A	1.53	3.02	2.24	0.71	3/4	0.54	1.37	2.05	0.30	164	139
2416A-06	1.53	3.02	2.24	0.71	3/4	0.54	1.37	2.05	0.30	164	139
2416A-10	1.53	3.02	2.24	0.71	3/4	0.54	1.37	2.05	0.30	164	139
2417A	1.53	3.02	2.24	0.71	3/4	0.54	1.37	2.05	0.30	164	139
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 07-63 to 07-68 for details of contact points.

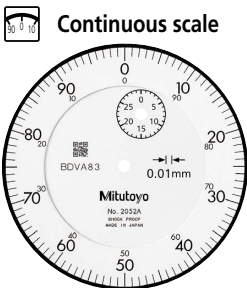
Dial Indicators

SERIES 2 — Long Stroke Type



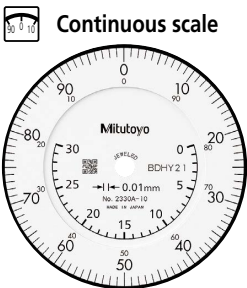
Graduation: 0.01 mm,
Measuring range: 20 mm

- 2050A
- With damper at lowest rest point
- 2050A-19
- Shockproof
 - Jeweled bearing
 - With damper at lowest rest point
- 2050A-60
- Waterproof



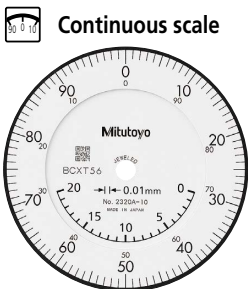
Graduation: 0.01 mm,
Measuring range: 30 mm

- 2052A
- With damper at lowest rest point
- 2052A-19
- Shockproof
 - Jeweled bearing
 - With damper at lowest rest point



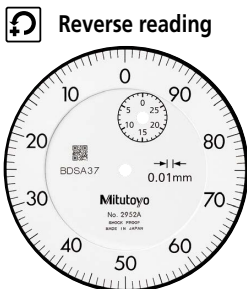
Graduation: 0.01 mm,
Measuring range: 30 mm

- 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

Metric		ISO/JIS type		ANSI/AGD type	
Code No.		30 0 10	10 0 10	30 0 10	10 0 10
w/lug	Flat-back				
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		✓	✓	

Inch		30 0 10	10 0 10	30 0 10	10 0 10
Code No.					
w/lug	Flat-back				
2416A	2416AB	✓			
2416A-06	2416AB-06	✓			
2416A-10	2416AB-10	✓		✓	
2417A	2417AB		✓		
2424A-19	2424AB-19	✓	✓	✓	✓
2776A	2776AB	✓			
2904A	2904AB			✓	



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.



07
Indicators

SPECIFICATIONS

Metric		ISO/JIS type										ANSI/AGD type	
Code No.		Graduation (mm)	Range (range/rev) (mm)	Maximum permissible error (MPE) (μm)						Dial reading	Measuring force (N)		
w/lug	Flat-back			Indication error				Hysteresis	Repeat-ability				
				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		

Inch		Accuracy (in)										Repeat-ability (in)	Dial reading	Measuring force (N)
Code No.		Graduation (in)	Range (range/rev) (in)	First 1 Rev/2.5 Rev/10 Rev		Retrace	Accuracy (in)	Hysteresis						
w/lug	Flat-back													
1921A-10	1921AB-10	0.001	0.1 (0.04)	±0.001/±0.001/—		0.0002	±0.0002	0-20-0	1.8 or less					
1923A-10	1923AB-10	0.0005	0.05 (0.02)	±0.0005/±0.005/—		0.00016	±0.0001	0-10-0	1.8 or less					
1925A-10	1925AB-10	0.0001	0.025 (0.01)	±0.0002/±0.0002/—		0.0001	±0.00003	0-5-0	1.8 or less					

Note: Completed products inspection is performed in the vertical orientation (contact point downward) and the stated accuracy is guaranteed.

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

Metric

Unit: mm

Code 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

Inch

Unit: in

Code 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

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

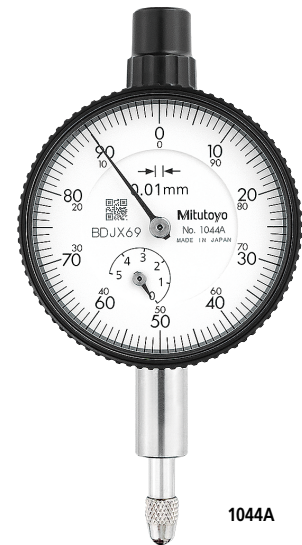
Balanced scale

Graduation: 0.01 mm,
Measuring range: 4 mm

1003A

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

Metric												ISO/JIS type	ANSI/AGD type
Code No.		Graduation (mm)	Range (range/rev) (mm)	Maximum permissible error (MPE) (μm)						Dial reading	Measuring force (N)		
w/lug	Flat-back			Indication error				Hysteresis	Repeat-ability				
				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	±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	±0-100	1.4 or less		
1044A-15	1044AB-15	0.01	5 (1)	8	10	11	13	4	3	±0-100	0.4 or less*		
1044A-60	1044AB-60	0.01	5 (1)	8	10	11	13	4	3	±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	±0-50	1.4 or less		

* For low measuring force type, use in the vertical orientation.

Note: Completed products inspection is performed in the vertical orientation (contact point downward) and the stated accuracy is guaranteed.

Inch									
Code 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
1410A	1410AB	0.001	0.25 (0.1)	±0.001/±0.001/—		0.0002	±0.0002	0-100	1.4 or less
1411A	1411AB	0.001	0.25 (0.1)	±0.001/±0.001/—		0.0002	±0.0002	0-50-0	1.4 or less
1410A-10	1410AB-10	0.001	0.25 (0.1)	±0.001/±0.001/—		0.0002	±0.0002	0-100	1.4 or less
1780A	1780AB	0.001	0.125 (0.05)	±0.001/±0.001/—		0.0002	±0.0002	0-50	1.4 or less
1781A	1781AB	0.001	0.125 (0.05)	±0.001/±0.001/—		0.0002	±0.0002	0-25-0	1.4 or less
1506A	1506AB	0.0005	0.125 (0.05)	±0.0005/±0.0005/—		0.00016	±0.0001	0-50	1.4 or less
1507A	1507AB	0.0005	0.125 (0.05)	±0.0005/±0.0005/—		0.00016	±0.0001	0-25-0	1.4 or less
1670A	1670AB	0.0005	0.1 (0.04)	±0.0005/±0.0005/—		0.00016	±0.0001	0-40	1.4 or less
1671A	1671AB	0.0005	0.1 (0.04)	±0.0005/±0.0005/—		0.00016	±0.0001	0-20-0	1.4 or less
1802A-10	1802AB-10	0.0001	0.025 (0.01)	±0.0001/±0.0001/—		0.0001	±0.00003	0-10	1.5 or less
1803A-10	1803AB-10	0.0001	0.025 (0.01)	±0.0001/±0.0001/—		0.0001	±0.00003	0-5-0	1.5 or less

Note: Completed products inspection is performed in the vertical orientation (contact point downward) and the stated accuracy is guaranteed.

07 Indicators

Dial Indicators

Ministry guarantees the product quality.

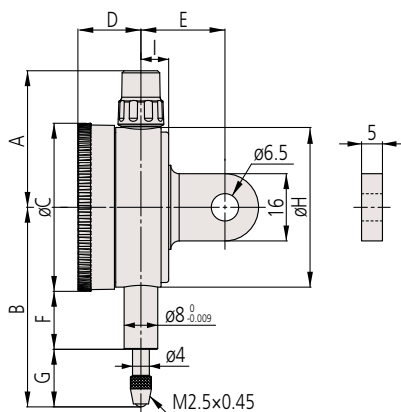
PROPRIETARY INSPECTION CERTIFICATE

Ministry guarantees the product quality.

- Limit hand (2 pcs.): **21AAB363**



- Bezel clamp: **21RZA149**



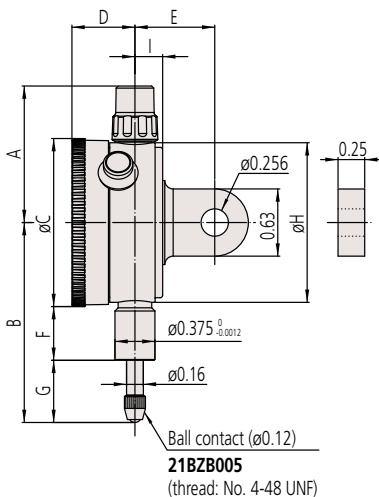
Unit: mm

Code 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

Note: Refer to pages 07-63 to 07-68 for details of contact points.

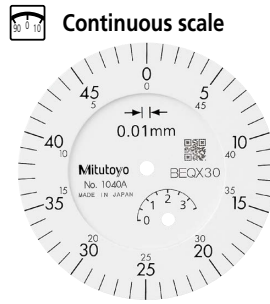
ANSI / AGD
Type

Unit: in



Code 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

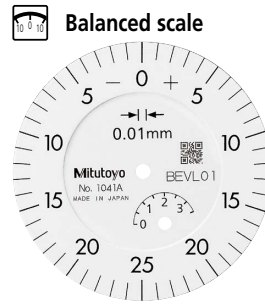
Note: Refer to pages 07-63 to 07-68 for details of contact points.



Graduation: 0.01 mm,
Measuring range: 3.5 mm

1040A

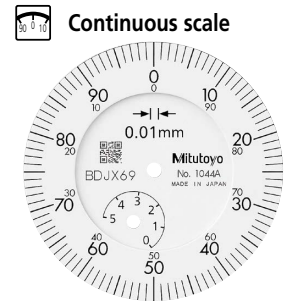
Double scale spacing



Graduation: 0.01 mm,
Measuring range: 3.5 mm

1041A

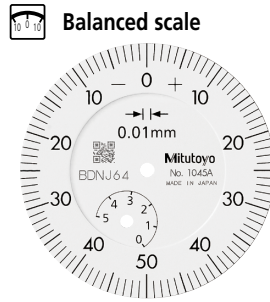
Double scale spacing



Graduation: 0.01 mm,
Measuring range: 5 mm

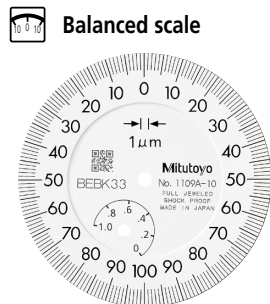
1044A

Jeweled bearing



Graduation: 0.01 mm,
Measuring range: 5 mm

1045A

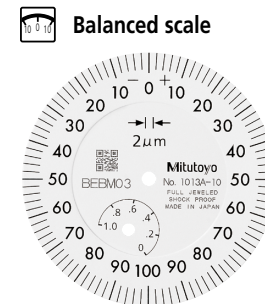


Graduation: 0.001 mm,
Measuring range: 1 mm

1109A-10

Shockproof

Jeweled bearing

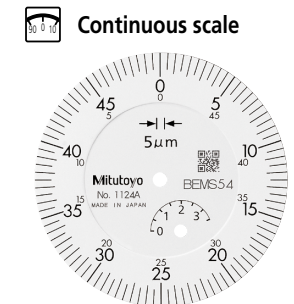


Graduation: 0.002 mm,
Measuring range: 3.5 mm

1013A-10

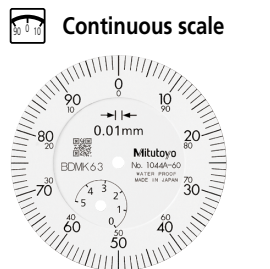
Shockproof

Jeweled bearing



Graduation: 0.005 mm,
Measuring range: 3.5 mm

1124A



Graduation: 0.01 mm,
Measuring range: 5 mm

1044A-60

Waterproof

FEATURES

Metric ☐ ISO/JIS type ☐ ANSI/AGD type

Code 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						

Code 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						

Dial Indicators

SERIES 1 — Compact One Revolution Type for Error-free Reading

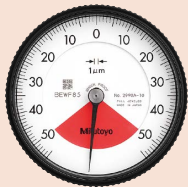
- The one revolution dial indicator (compact type) prevents the possibility of reading errors.
- Mitutoyo's unique shock-proof mechanism is incorporated, providing improved resistance to shock due to sudden spindle retraction caused by impact.
- The indicator is highly durable thanks to its oil- and 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 07-59 to 07-62 for details.)



2990A-10

SPECIFICATIONS

Metric												ISO/JIS type	ANSI/AGD type
Code No.		Graduation (mm)	Range (range/rev) (mm)	Maximum permissible error (MPE) (μm)						Dial reading	Measuring force (N)		
w/lug	Flat-back			Indication error				Hysteresis	Repeat-ability				
				1/10 Rev	1/2 Rev	1 Rev	Measuring range						
1929A	1929AB	0.01	1 (1.4)	7	—	—	11	4	3	50-0-50	1.4 or less		
1929A-62	1929AB-62	0.01	1 (1.4)	7	—	—	11	4	3	50-0-50	1.4 or less		
1900A-10	1900AB-10	0.001	0.1 (0.14)	2.5	—	—	5	2	1	50-0-50	1.5 or less		
1900A-72	1900AB-72	0.001	0.1 (0.14)	2.5	—	—	5	2	1	50-0-50	1.5 or less		

Inch											
Code 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						
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		

Note: Completed products inspection is performed in the vertical orientation (contact point downward) and the stated accuracy is guaranteed.

DIMENSIONS

ISO/JIS Type

Unit: mm

ANSI/AGD Type

Unit: in

Metric															
Code 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		

Inch															
Code 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		

Note: Refer to pages 07-63 to 07-68 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 local Mitutoyo Sales Office for more information.

Optional Accessories

- Limit hand (2 pcs.), Bezel clamp
- Refer to page 07-49 for details.



Balanced scale



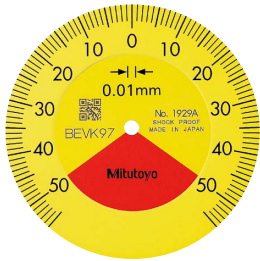
Graduation: 0.001 mm,
Measuring range: 0.1 mm

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

Metric		ISO/JIS type		ANSI/AGD type	
Code No.		w/lug		Flat-back	
1929A	1929AB	✓	✓	✓	✓
1929A-62	1929AB-62	✓	✓	✓	✓
1900A-10	1900AB-10	✓	✓	✓	✓
1900A-72	1900AB-72	✓	✓	✓	✓

Inch		ISO/JIS type		ANSI/AGD type	
Code No.		w/lug		Flat-back	
1909A-62	1909AB-62	✓	✓	✓	✓
1910A-72	1910AB-72	✓	✓	✓	✓

Dial Indicators



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.

Optional Accessories

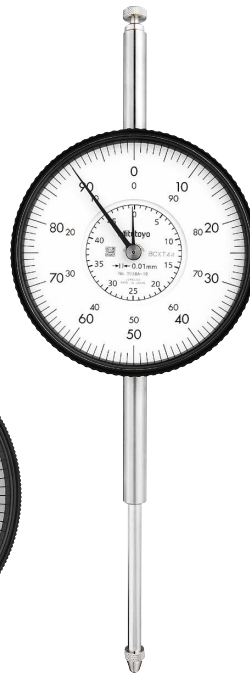
- Limit hand (2 pcs.), Bezel clamp
Refer to page 07-31 for details.



3109A-10



4046A



3058A-19

SPECIFICATIONS

ISO/JIS type ANSI/AGD type

Metric		ISO/JIS type										ANSI/AGD type	
Code No.		Graduation (mm)	Range (range/rev) (mm)	Maximum permissible error (MPE) (μm)						Dial reading	Measuring force (N)		
w/lug	Flat-back			Indication error				Hysteresis	Repeat-ability				
				1/10 Rev	1/2 Rev	1 Rev	Measuring range						
3046A	3046AB	0.01	10 (1)	5	9	10	15	3	3	±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	±0-100	2.0 or less		
3052A-19	3052AB-19	0.01	30 (1)	10	12	15	25	7	5	±0-100	2.5 or less		
3058A-19	3058AB-19	0.01	50 (1)	10	12	15	30	8	5	±0-100	3.0 or less		
3060A-19*1	3060AB-19*1	0.01	80 (1)	12	17	20	45	9	5	±0-100	3.0 or less		
3062A-19*1	3062AB-19*1	0.01	100 (1)	12	17	20	50	9	5	±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	±0-100	1.4 or less		

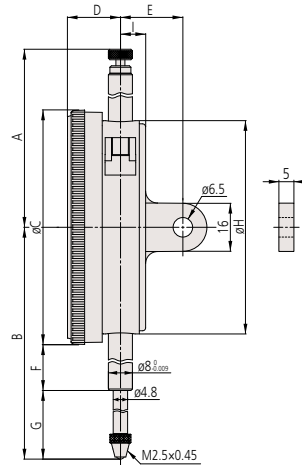
Inch								
Code No.		Graduation (in)	Range (range/rev) (in)	Accuracy*2 (in)		Repeat-ability (in)	Dial reading	Measuring force (N)
w/lug	Flat-back			First 1 Rev/2.5 Rev/10 Rev	Retrace			
3414A	3414AB	0.001	0.5 (0.1)	±0.001/±0.001/±0.001	0.0002	±0.0002	±0-100	1.8 or less
3415A	3415AB	0.001	0.5 (0.1)	±0.001/±0.001/±0.001	0.0002	±0.0002	0-50-0	1.8 or less
3416A	3416AB	0.001	1 (0.1)	±0.001/±0.001/±0.002	0.0002	±0.0002	±0-100	1.8 or less
3417A	3417AB	0.001	1 (0.1)	±0.001/±0.001/±0.002	0.0002	±0.0002	0-50-0	1.8 or less
3424A-19	3424AB-19	0.001	2 (0.1)	±0.001/±0.001/±0.002 / ±0.003 (20 Rev)	0.00033	±0.0002	±0-100	3.0 or less
3426A-19*1	3426AB-19*1	0.001	3 (0.1)	±0.001/±0.001/±0.002/±0.003 (20 Rev)/±0.005 (Over 20 Rev)	0.00033	±0.0002	±0-100	3.0 or less
3428A-19*1	3428AB-19*1	0.001	4 (0.1)	±0.001/±0.001/±0.002/±0.003 (20 Rev)/±0.005 (Over 20 Rev)	0.00033	±0.0002	±0-100	3.5 or less
3802A-10	3802AB-10	0.0001	0.025 (0.01)	±0.0001/±0.0001/—	0.0001	±0.00003	0-10	2.0 or less
3803A-10	3803AB-10	0.0001	0.025 (0.01)	±0.0001/±0.0001/—	0.0001	0±.00003	0-5-0	2.0 or less
4887A-19*1	4887AB-19*1	0.001	3 (0.1)	±0.001/±0.001/±0.002/±0.003 (20 Rev)/±0.005 (Over 20 Rev)	0.00033	±0.0002	±0-100	3.0 or less

*1 Use in a vertical orientation (contact point downward) for the long stroke model.

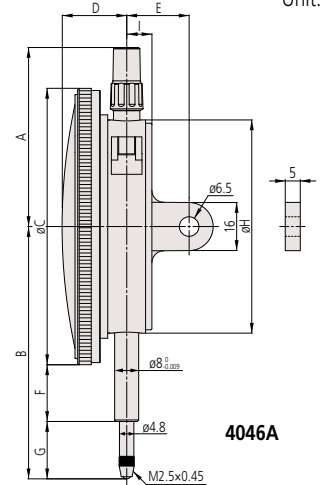
*2 Completed products inspection is performed in the vertical orientation (contact point downward) and the stated accuracy is guaranteed.

DIMENSIONS

ISO/JIS
Type



Unit: mm



4046A

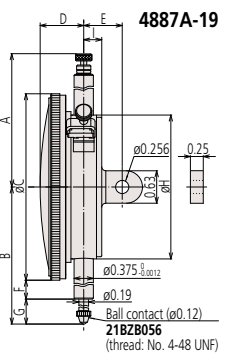
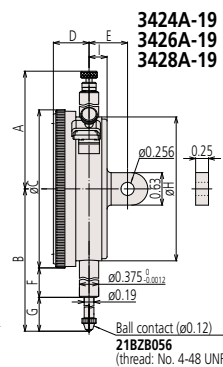
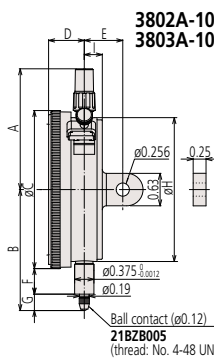
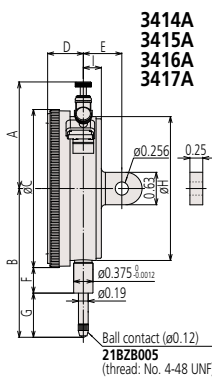
Code No.	A	B	C	D	E	F	G	H	I
3046A	59.6	75.5	78	17.7	21	15.9	20.6	71	9
3047A	59.6	75.5	78	17.7	21	15.9	20.6	71	9
3050A	52.6	94	78	17.7	21	25.9	29.1	71	9
3052A-19*	72.9	104.3	78	17.7	21	25.9	39.4	71	9
3058A-19*	81.9	142.3	78	17.7	21	43.9	59.4	71	9
3060A-19*	120.9	202.3	78	17.7	21	73.9	89.4	71	9
3062A-19*	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 07-63 to 07-68 for details of contact points.

ANSI/AGD
Type

Unit: in



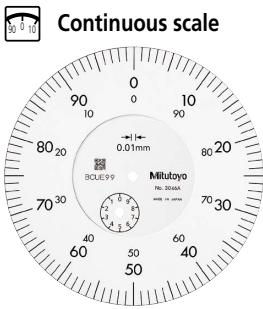
Code No.	A	B	C	D	E	F	G	H	I
3414A	2.07	2.89	3.07	0.70	3/4	0.50	0.86	2.80	0.35
3415A	2.07	2.89	3.07	0.70	3/4	0.50	0.86	2.80	0.35
3416A	2.07	3.39	3.07	0.70	3/4	0.50	1.36	2.80	0.35
3417A	2.07	3.39	3.07	0.70	3/4	0.50	1.36	2.80	0.35
3424A-19*	3.31	5.88	3.07	0.70	3/4	1.99	2.35	2.80	0.35
3426A-19*	4.84	7.80	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.

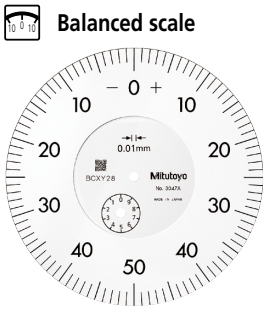
Note: Refer to pages 07-63 to 07-68 for details of contact points.

Dial Indicators

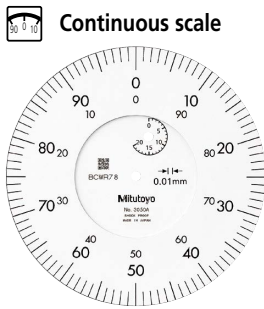
SERIES 3, 4 — Long Stroke Type, Large Diameter



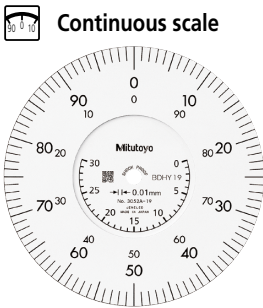
Graduation: 0.01 mm, Measuring range: 10 mm



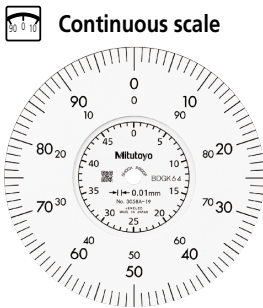
Graduation: 0.01 mm, Measuring range: 10 mm



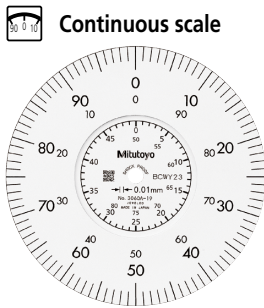
Graduation: 0.01 mm, Measuring range: 20 mm



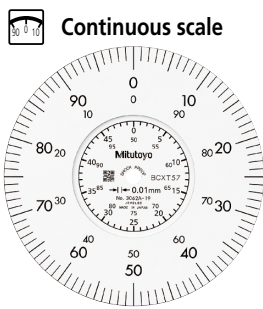
Graduation: 0.01 mm, Measuring range: 30 mm



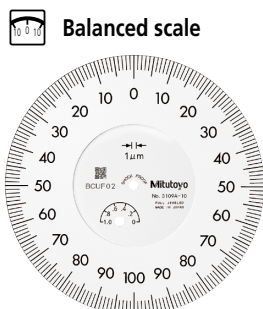
Graduation: 0.01 mm, Measuring range: 50 mm



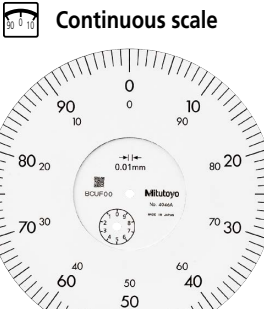
Graduation: 0.01 mm, Measuring range: 80 mm



Graduation: 0.01 mm, Measuring range: 100 mm



Graduation: 0.001 mm, Measuring range: 1 mm



Graduation: 0.01 mm, Measuring range: 10 mm

FEATURES

Metric		ISO/JIS type						
Code 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	✓						

Inch		ANSI/AGD type						
Code 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	✓		✓		✓	✓	



Optional Accessories

- Backs (See pages 07-69 to 07-70)
- Contact points (See pages 07-63 to 07-68)

ANSI/AGD Type Metric Dial Indicators with $\varnothing 3/8$ inch Stem and #4-48UNF-Thread Contact Point Compatible Type

SPECIFICATIONS

Metric		SERIES 1					ANSI/AGD type		
Code 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)	±10/±10/—		3	±2	0-100	1.4 or less
1231A-01	1231AB-01	0.01	2.5 (1)	±10/±10/—		3	±2	0-50-0	1.4 or less
1044A-01	1044AB-01	0.01	5 (1)	±10/±10/±13		3	±3	±0-100	1.4 or less
1045A-01	1045AB-01	0.01	5 (1)	±10/±10/±13		3	±3	0-50-0	1.4 or less
1010A-11	1010AB-11	0.002	0.5 (0.2)	±2/±2/—		2	±1	0-20	1.5 or less
1011A-11	1011AB-11	0.002	0.5 (0.2)	±2/±2/—		2	±1	0-10-0	1.5 or less

Metric		SERIES 2						
Code 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)	±10/±10/—	3	±3	0-50-0	1.4 or less
2046A-01	2046AB-01	0.01	10 (1)	±10/±10/±13	3	±3	±0-100	1.4 or less
2046A-11	2046AB-11	0.01	10 (1)	±10/±10/±13	3	±3	±0-100	1.4 or less
2047A-01	2047AB-01	0.01	10 (1)	±10/±10/±13	3	±3	0-50-0	1.4 or less
2047A-11	2047AB-11	0.01	10 (1)	±10/±10/±13	3	±3	0-50-0	1.4 or less
2902A-01	2902AB-01	0.01	10 (1)	±10/±10/±13	3	±3	100-0	1.4 or less
2050A-01	2050AB-01	0.01	20 (1)	±10/±10/±15/±20 (20 Rev)	4	±3	±0-100	2.0 or less
2056A-01	2056AB-01	0.01	25 (1)	±10/±10/±15/±20 (20 Rev)/ ±25 (Over 20 Rev)	4	±3	±0-100	2.5 or less
2109A-11	2109AB-11	0.001	1 (0.2)	±3/±3/±4	2	±0.3	0-10-0	1.5 or less
2119A-11	2119AB-11	0.001	5 (0.2)	±7/±7/±8/±10 (20 Rev)/ ±10 (Over 20 Rev)	2.5	±0.3	0-10-0	1.5 or less

Note: Completed products inspection is performed in the vertical orientation (contact point downward) and the stated accuracy is guaranteed.

FEATURES

Metric		ANSI/AGD type	
Code No.			
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		

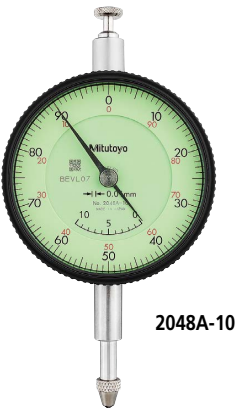
Metric		ANSI/AGD type	
Code No.			
w/lug	Flat-back		
2231A-01	2231AB-01		
2046A-01	2046AB-01		
2046A-11	2046AB-11		
2047A-01	2047AB-01		
2047A-11	2047AB-11		
2902A-01	2902AB-01		
2050A-01	2050AB-01		
2056A-01	2056AB-01		
2109A-11	2109AB-11		
2119A-11	2119AB-11		

Dial Indicators

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



Optional Accessories

- Limit hand (2 pcs.), Bezel clamp
- Refer to page 07-27 for details.

SPECIFICATIONS

Metric											
Code No.		Graduation (mm)	Range (range/rev) (mm)	Maximum permissible error (MPE) (μm)						Dial reading	Measuring force (N)
w/lug	Flat-back			Indication error				Hysteresis	Repeat-ability		
				1/10 Rev	1/2 Rev	1 Rev	Measuring range				
2048A-10	2048AB-10	0.01	10 (1)	5	9	10	15	3	3	±0-100	1.4 or less

Note: Completed products inspection is performed in the vertical orientation (contact point downward) and the stated accuracy is guaranteed.

DIMENSIONS

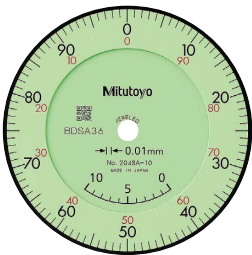
ISO/JIS Type

Unit: mm

Code No.	A	B	C	D	E	F	G	H	I	Mass (g)	
2048A-10	47.4	64.9	57	18.1	20	16.9	19.5	52	7.6	w/lug	Flat-back
										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						
Code No.						
w/lug	Flat-back					
2048A-10	2048AB-10	✓	✓		✓	✓



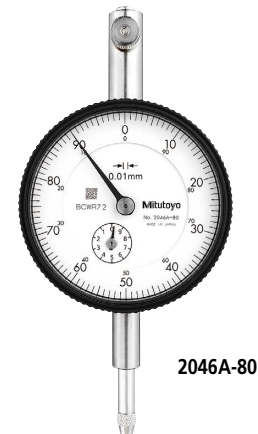
Optional Accessories

- Limit hand (2 pcs.), Bezel clamp
Refer to page 07-27 for details.

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**.

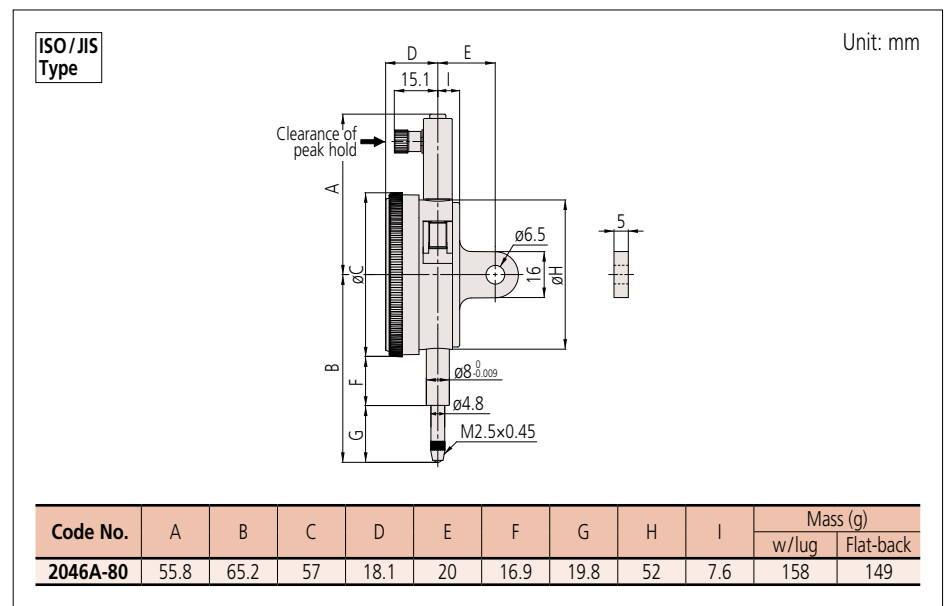
**2046A-80**

SPECIFICATIONS

Metric		ISO/JIS type									
Code No.		Graduation (mm)	Range (range/rev) (mm)	Maximum permissible error (MPE) (μm)						Dial reading	Measuring force (N)
w/lug	Flat-back			Indication error				Hysteresis	Repeat-ability		
				1/10 Rev	1/2 Rev	1 Rev	Measuring range				
2046A-80	2046AB-80	0.01	10 (1)	5	9	10	15	—	—	±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**

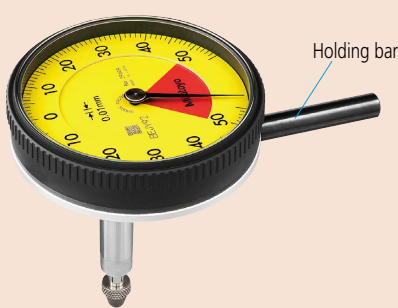
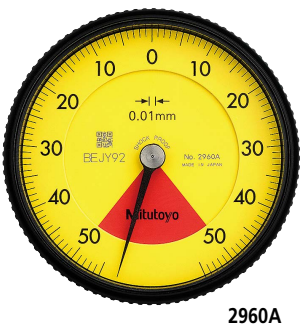
FEATURES

Code No.					
w/lug	Flat-back				
2046A-80	2046AB-80	✓		✓	

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 levelling machine tool tables or inspection jigs, and for use in situations where standard dial indicators are difficult to read.
- Mitutoyo's unique 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.



SPECIFICATIONS

Metric	ISO/JIS type							ANSI/AGD type		
Code No.	Graduation (mm)	Range (range/rev) (mm)	Maximum permissible error (MPE) (μm)						Dial reading	Measuring force (N)
			Indication error				Hysteresis	Repeat-ability		
			1/10 Rev	1/2 Rev	1 Rev	Measuring range				
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

Inch								
Code 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

Note 1: Completed products inspection is performed in the vertical orientation (contact point downward) and the stated accuracy is guaranteed.
Note 2: The bezel clamp cannot be used.

DIMENSIONS

ISO/JIS Type

2960A

2990A-10

Unit: mm

ANSI/AGD Type

2961A

2991A-10

Unit: in

Note 1: The shoulder on a contact point (standard accessory) for **2960A** and **2961A** 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.
Note 2: Refer to pages 07-63 to 07-68 for details of contact points.

Holding bar (optional)

Code 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

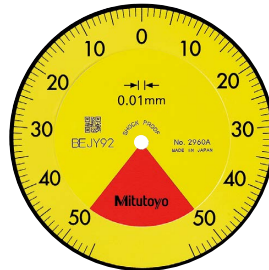
- Limit hand (2 pcs.)
Refer to page 07-41 for details.

Special specifications

Upon request, we can manufacture custom types with changed graduation numbers, graduation lines, dead zones, etc. Please contact your local Mitutoyo Sales Office for more information.



Balanced scale



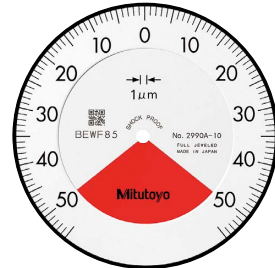
Graduation: 0.01 mm,
Measuring range: 1 mm

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

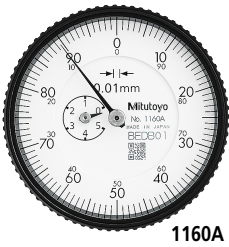
FEATURES

Metric		ISO/JIS type		ANSI/AGD type	
Code No.					
2960A	✓	✓	✓		✓
2990A-10	✓	✓	✓	✓	✓
Inch		ISO/JIS type		ANSI/AGD type	
Code No.					
2961A	✓	✓	✓		✓
2991A-10	✓	✓	✓	✓	✓

Dial Indicators

Back Plunger Type Dial Indicators
SERIES 1

- Back plunger type dial indicators are suitable for mounting onto levelling 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 Mitutoyo's proprietary shock-proofing mechanism, have excellent durability and shock resistance.



SPECIFICATIONS

Metric	ISO/JIS type							ANSI/AGD type		
Code No.	Graduation (mm)	Range (range/rev) (mm)	Maximum permissible error (MPE) (μm)						Dial reading	Measuring force (N)
			Indication error				Hysteresis	Repeat-ability		
			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	±0-100	1.4 or less
1162A	0.01	5 (1)	8	12	14	16	4	3	100-0	1.4 or less

Inch							
Code 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)	±0.001/—/—	0.0002	±0.0002	20-0-20	1.4 or less
1166A	0.001	0.2 (0.05)	±0.001/±0.001/±0.001	0.00033	±0.0002	±0-50	1.4 or less
1167A	0.001	0.2 (0.05)	±0.001/±0.001/±0.001	0.00033	±0.0002	0-25-0	1.4 or less
1168A	0.001	0.2 (0.05)	±0.001/±0.001/±0.001	0.00033	±0.0002	50-0	1.4 or less

Note 1: Completed products inspection is performed in the vertical orientation (contact point downward) and the stated accuracy is guaranteed.
Note 2: The bezel clamp cannot be used.

Holding bar (optional)

Code 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 Accessories

- Limit hand (2 pcs.): **21AB363**



DIMENSIONS

ISO/JIS Type

Unit: mm

ANSI/AGD Type

Unit: in

Code 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

Code 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 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.
Note 2: Refer to pages 07-63 to 07-68 for details of contact points.



Continuous scale



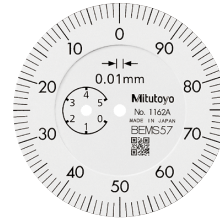
Graduation: 0.01 mm,
Measuring range: 5 mm

1160A

Back Plunger



Reverse reading



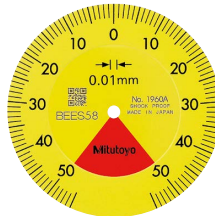
Graduation: 0.01 mm,
Measuring range: 5 mm

1162A

Back Plunger



Balanced scale



Graduation: 0.01 mm,
Measuring range: 1 mm

1960A

One revolution

Shockproof

Back Plunger

FEATURES

Metric

☐ ISO/JIS type ☐ ANSI/AGD type

Code No.						
1960A		✓	✓	✓		✓
1160A	✓					✓
1162A					✓	✓

Inch

Code No.						
1961A		✓	✓	✓		✓
1166A	✓					✓
1167A		✓				✓
1168A					✓	✓

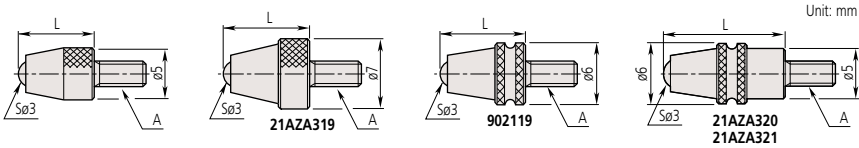
Dial Indicators

Optional Accessories for Digimatic and Dial Indicators and Linear Gages

Contact points, extension rod

- The thread of all contact points is M2.5 (P=0.45)×5 mm.
- 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



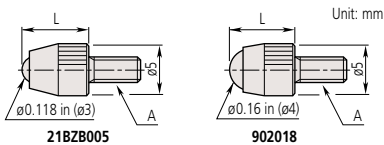
Note: Contact points for water-proof indicators are equipped with a groove to locate the rubber boot.

A: M2.5×0.45

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	—



901312



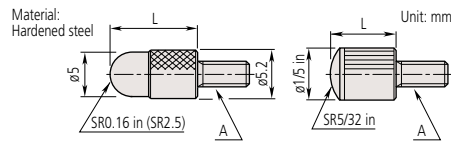
902119

A: 4-48UNF

Material	Carbide	Plastic
L (in)		
1/4	21BZB005	902018

Shell Type Point

Contact point with a large radius.
Optimal for use on flat surfaces.

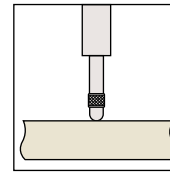


A: M2.5x0.45

Code No.	L (mm)
101386	5
101118	10
137393	15
101387	20
101388	25
21AAA254	30

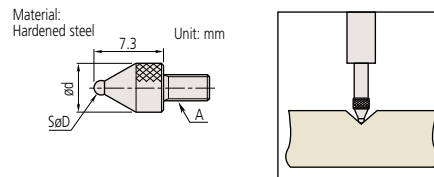
A: 4-48UNF

Code 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



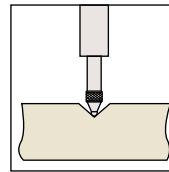
Ball point

Optimal for workpieces with deep indentations.



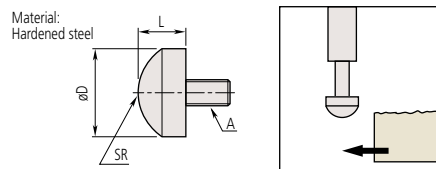
A: M2.5x0.45

Code 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	



Spherical Point

A large radius makes this contact point optimal for use where the workpiece needs to slide from the side.

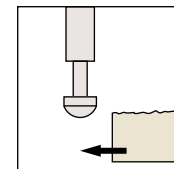


A: M2.5x0.45

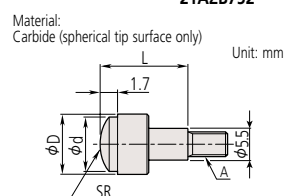
Code No.	ØD (mm)	L (mm)	SR (mm)
111460	5.5	3	5
125258	7.9	5	5
101119	10	5	7

A: 4-48UNF

Code No.	ØD (in)	L (in)	SR (in)
101205	1/2	1/8	0.35
101204	3/8	3/32	0.28



Spherical Point (Carbide)



A: M2.5x0.45

Code 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

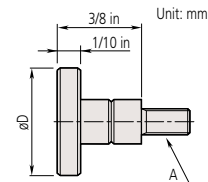
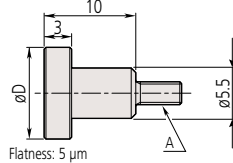
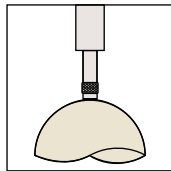
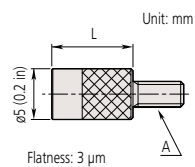
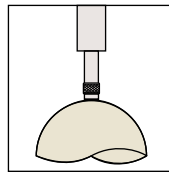


131365

Material:
Hardened steel



101117



A: M2.5×0.45

Code No.	L
131365	8
21AAB715	10

A: 4-48UNF

Code No.	L (in)
133017	5/16
21AAA043	1/2
21AAA044	3/4
21AAA045	1

A: M2.5×0.45

Code No.	øD
101117	10
21AAB711	15
21AAB712	20
21AAB713	25
21AAB714	30

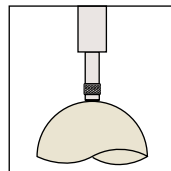
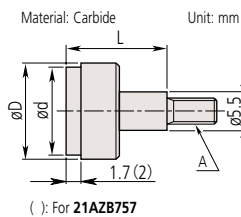
A: 4-48UNF

Code No.	øD (in)
101188	1/2
101189	3/8

Flat Point (Carbide)



21AZB758



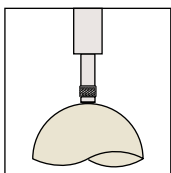
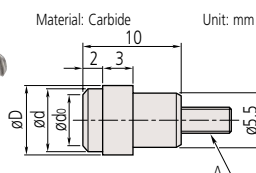
A: M2.5×0.45

Code 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



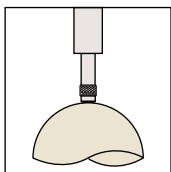
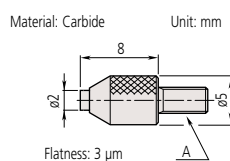
A: M2.5×0.45

Code No.	ød ₀	ød	øD
21AZB754	3	6.4	7
21AZB755	4.5	8	9

Flatness: 3 µm



21AZB759



A: M2.5×0.45

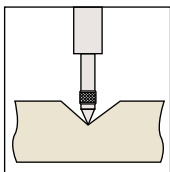
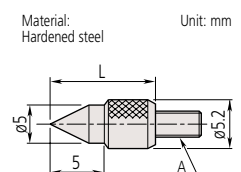
Code No.
21AZB759

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: M2.5×0.45

Code No.	Tip angle	L
101120	60°	10

A: 4-48UNF

Code No.	Tip angle	L (in)
101190	60°	1/2

A: M2.5×0.45

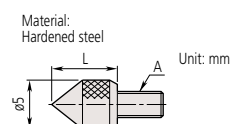
Code No.	Tip angle	L
101385	90°	5

A: 4-48UNF

Code No.	Tip angle	L (in)
101191	90°	1/4



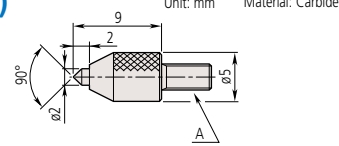
101385



Conical Point (Carbide)



21AZB764

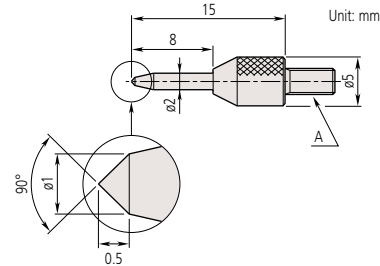


A: M2.5×0.45

Code No.
21AZB764



21AZB765



A: M2.5×0.45

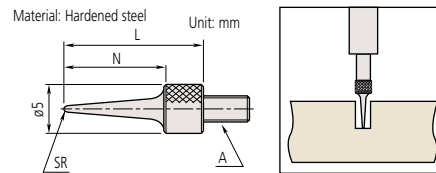
Code No.
21AZB765

Needle Point

Suitable for probing the bottom of a groove or hole.



101121



A: M2.5×0.45

Code No.	N	L	SR
101121	11	15	0.4
137413	13	17	0.2
21AAA255	21	25	0.4
21AAA256	31	35	0.4

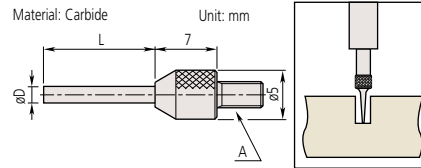
A: 4-48UNF

Code No.	L (in)	SR (in)
21AAA030	0.6	0.016
21AAA046	1	0.016
21AAA047	1 1/2	0.016
21AAA048	2	0.016

Needle Point (Carbide)



137257



A: M2.5×0.45

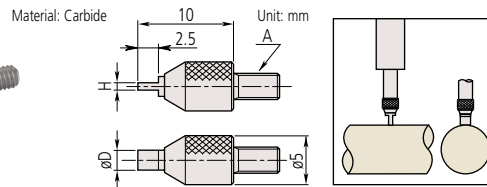
Code No.	øD	L
120066	0.45	3
21AAA329	0.45	5
120065	1	3
21AAA330	1	5
21AAA331	1	8
21AAA332	1	10
21AAA333	1	20
21AAA334	1	40
21AAA335	1.5	5
21AAA336	1.5	10
120064	1.5	13
21AAA337	1.5	20
21AAA338	1.5	40
137257	2	8
21AAA257	2	18
21AAA258	2	28
21AAA339	2	40

Blade Point (Carbide)

Suitable for measuring cylinders.



21AZB768

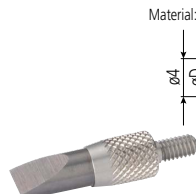


A: M2.5×0.45

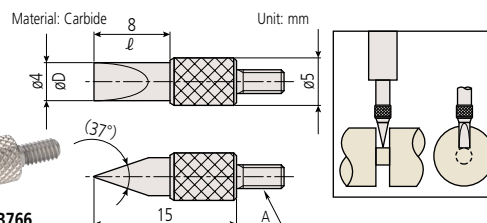
Code No.	H	øD
21AZB767	0.4	2
21AZB768	0.6	2
21AZB769	1	4

Knife Edge Point (Carbide)

Suitable for measuring narrow groove diameter, etc.



21AZB766



A: M2.5×0.45

Code No.
21AZB766

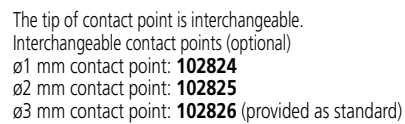
07 Indicators

Dial Indicators

* 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.



Code No.
900393



Dial Indicators

Dial Indicators



Code No.
901991

Note 2: High-accuracy roller with 5 μm runout is also available. (Special order item)

Interchangeable Contact Point Set

This set consists of six types of popular contact points for extending the use of an indicator to many applications.

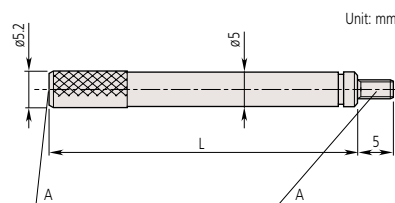


Set code No. **7822**

M2.5x0.45

Code No.	Contact points included
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



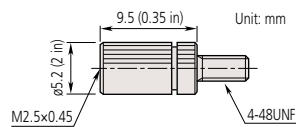
Unit: mm

A: M2.5x0.45

Code 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

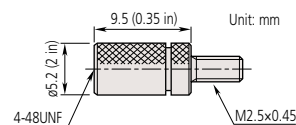
A: 4-48UNF

Code No.	L (in)
139167	1/2
301655	1
301657	2
301659	4



Unit: mm

Code No.
21AAA011



Unit: mm

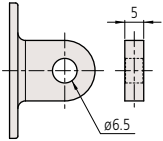
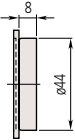
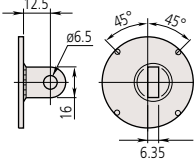
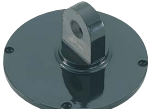
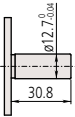
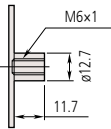
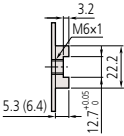
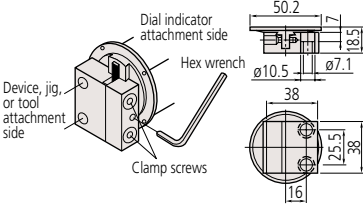
Code No.
21AAA012

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 (): Small type	
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)		Unit: 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.

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

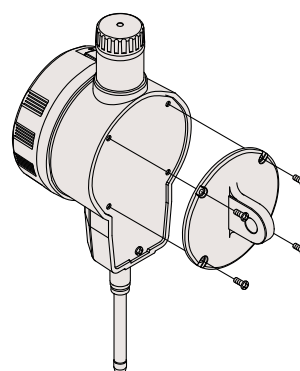
Metric									
Bezel diameter	31 mm	36 mm	40 mm	40 mm (W/D proof models)	55.6/57 mm	55.6 mm (W/D proof models)	57 mm (W/D proof models)	78/92 mm	
Back Covers	Lug-on-Center Back	190561	137905	101210	101210	101040		21AZB230	100691
	Flat Back	191559	137906	101211	136872	101039	192910	21AZB231	100836
	Magnetic Back	—				900928			900929
	Back with Offset Lug	—				101167			—
	Back with Post	—	193172			101169			—
	Back with Screw Mount	—	193173 (M6×1)			136023 (M6×1)			—
	Adjustable Back	—	136025 (M6×1)			136026 (M6×1)			—
	Back with Adjustable Bracket	—				901963			—

Inch									
Bezel diameter	1.22 in	1.57 in	1.57 in (W/D proof models)	2.19/2.24 in	2.19 in (W/D proof models)	2.24 in (W/D proof models)	3.07/3.62 in		
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 (#1/4-20UNC)			101168 (#1/4-20UNC)			—
	Back with Adjustable Bracket	—				901963			—

Digimatic Indicators

Series/model		•ID-FNX Series (12.7 mm models) •ID-CNX Series (12.7 mm models) •ID-CAX Series •ID-SX Series		•ID-FNX Series (25.4, 50.8 mm models)* •ID-CNX Series (25.4, 50.8 mm models)*		•ID-CJX Series •ID-SPX Series	
Type	ISO/JIS	ASME/ANSI / AGD	ISO/JIS	ASME/ANSI / AGD	ISO/JIS	ASME/ANSI / AGD	
Back Covers	Lug-on-Center Back	101040	101306	101040	101306	21AZB230	21BZB104
	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 below.



Dial Indicators

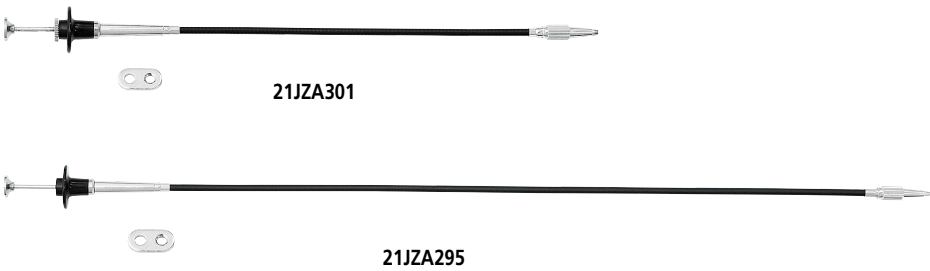
Spindle Lifting Lever and Cable Optional Accessories for Digimatic and Dial Indicators

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



21JZA301: with auto-stop function (300 mm)
21JZA295: without auto-stop function (500 mm)

Note 1: 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.)

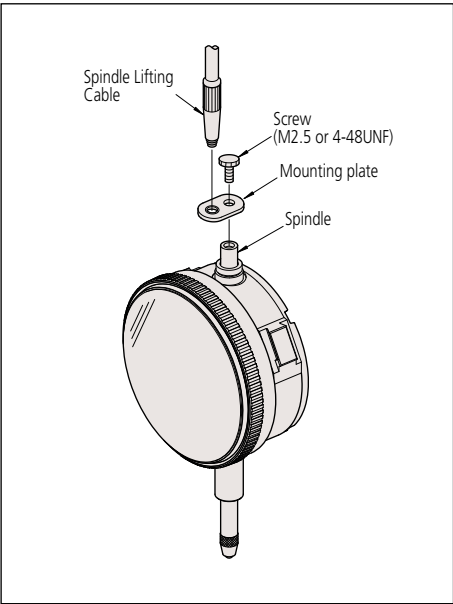
Spindle Lifting Lever

21EAA426

Suitable for 4.8 mm spindle diameter.



Typical application



Spindle Lifting Lever (A type)

902100*1

Use for A type SERIES **1** dial indicators.



Spindle Lifting Lever (S type)

902100*1

Use for S type SERIES **1** dial indicators.



21EZA198*2

Use for A type SERIES **2**, **3**, and **4** dial indicators (up to 10 mm/0.4 in).



21AZB149: Lever
101171: Stop screw

21AZB149*2

Use for S type SERIES **2**, **3**, and **4** dial indicators (up to 10 mm/0.4 in).



21AZB150*2

Use for A type SERIES **2** and **3** dial indicators (from 10 mm/0.4 in up to 20 mm/0.8 in).



21AZB150*2

Use for S type SERIES **2** and **3** dial indicators (from 10 mm/0.4 in up to 20 mm/0.8 in).



Spindle Lifting Lever (for ID-SS, ID-SX, ID-CX, ID-CNX)

21EZA198*1*3



21AZB149: Lever
101171: Stop screw

*1 Before use, replace the stop screw with the standard accessory.

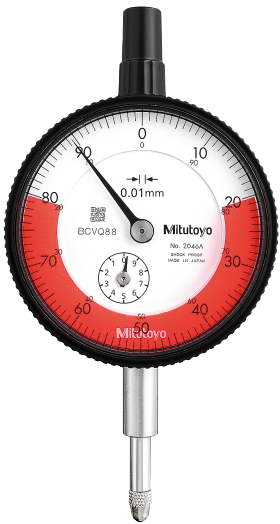
*2 Use the stop screw already fixed to the dial indicator body.

*3 Stop screw is for mm model.

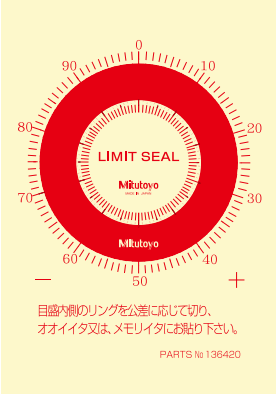
Dial Indicators

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



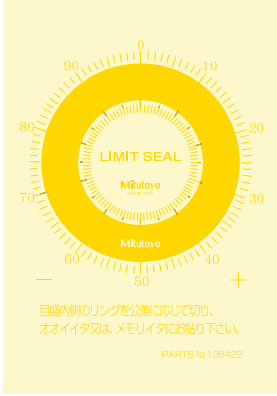
136420
(10 sheets/set)

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	Code 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.

Replacing bezels and graduation plates

A bezel and graduation plate must be swaged together so that the graduation plate always rotates with the bezel. Assemblies comprised of a swaged bezel and graduation plate are available for some models.

Code No. of dial indicators	Code No. of swaged assemblies
2046A	21AZB650
2109A-10	21AZB693



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)

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 attached.

- 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 code No. includes an "S" and "T".

Special repairing technique is necessary for repair work. Note that we cannot guarantee accuracy if critical parts are disassembled.

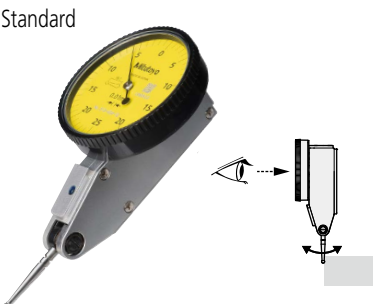
We recommend that you use our repair service to operate the instrument with peace of mind.

Dial Test Indicators

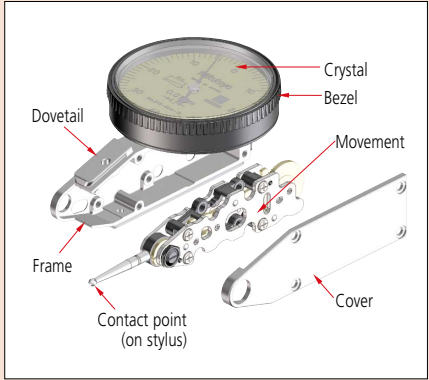
SERIES 513 — Dial Test Indicator Features

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.



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)

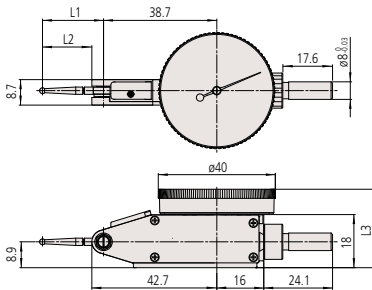


Dial Test Indicator SERIES 513 — Standard Type

DIMENSIONS

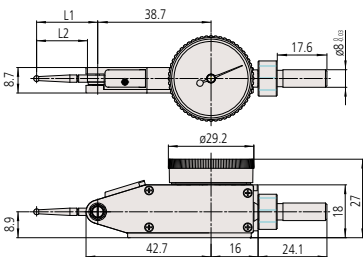
Standard

Unit: mm



Code 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			
513-426-10E/A	22.2	18.7	28
513-474-10E			
513-424-10E/A/T	37.4	33.9	27
513-414-10E/A/T			
513-415-10E/A/T	44.5	41.0	
513-477-10E			

Compact



Type	Code 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: 513-908-10E (Metric)

513-404-10E: Dial test indicator
7014-10: Mini magnetic stand

513-907-10E (inch)

513-402-10E: Dial test indicator
7014E-10: Mini magnetic stand



513-404-10E
Contact point No. 103006



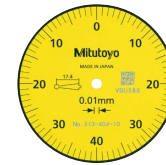
513-415-10E
Contact point No. 136013



513-465-10E
Contact point No. 103011



513-402-10E
Contact point No. 133195

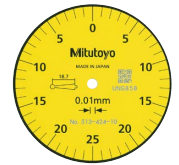


Graduation: 0.01 mm
Range: 0.8 mm

513-404-10E/10A/10T

Standard

Carbide contact point



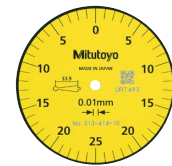
Graduation: 0.01 mm
Range: 0.5 mm

513-424-10E/10A/10T

Standard

Double scale spacing

Carbide contact point



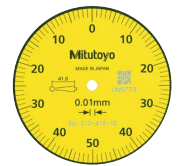
Graduation: 0.01 mm
Range: 0.5 mm

513-414-10E/10A/10T

Long contact point

Carbide contact point

Double scale spacing

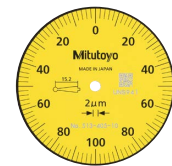


Graduation: 0.01 mm
Range: 1.0 mm

513-415-10E/10A/10T

Long contact point

Carbide contact point

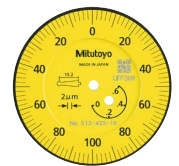


Graduation: 0.002 mm
Range: 0.2 mm

513-405-10E/10A/10T

Standard

Carbide contact point

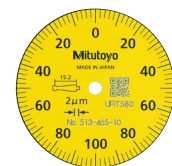


Graduation: 0.002 mm
Range: 0.6 mm

513-425-10E/10A

With revolution counter

Carbide contact point

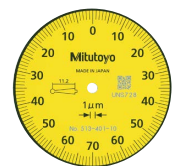


Graduation: 0.002 mm
Range: 0.2 mm

513-465-10E

Compact

Carbide contact point



Graduation: 0.001 mm
Range: 0.14 mm

513-401-10E

High accuracy

Carbide contact point



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

Note: 513-4XX-10 is indicated on the dial face and the inspection certificate.

The code 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

Metric

Code No.			Graduation (mm)	Range (mm)	Dial reading	Maximum permissible error (MPE)*1 (μm)				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.	10 scale divisions	Hysteresis	Repeatability									
513-424-10E	513-424-10A	513-424-10T	0.01	0.5	0-25-0	6	—	5	4	3	45	0.3 or less			✓	✓	✓	✓	✓
513-478-10E	—	—				10					41								
513-466-10E	—	—				16					45								
513-414-10E	513-414-10A	513-414-10T				10					41								
513-426-10E	513-426-10A	—		1.5	0-40-0	16	10	5	4	3	45	0.2 or less 0.4 or less	✓	✓	✓	✓	✓	✓	✓
513-404-10E	513-404-10A	513-404-10T				16					45								
513-474-10E	—	—		0.8	0-40-0	9	—	5	4	3	45	0.3 or less	✓	✓	✓	✓	✓	✓	✓
513-464-10E	—	—				9					41								
513-415-10E	513-415-10A	513-415-10T		1.0	0-50-0	10	—	5	5	3	45	0.2 or less	✓	✓	✓	✓	✓	✓	✓
513-477-10E	—	—				10					45								
513-405-10E	513-405-10A	513-405-10T	0.002	0.2	0-100-0	4	—	2	3	1	45	0.3 or less	✓	✓	✓	✓	✓	✓	✓
513-475-10E	—	—				4					41								
513-465-10E	—	—				7					45								
513-425-10E	513-425-10A	—				7					41								
513-401-10E	—	—	0.001	0.14	0-70-0	4	—	3	3	1	45	0.4 or less	✓	✓	✓	✓	✓	✓	✓
513-471-10E	—	—				4					45								
513-908-10E ²	—	—	0.01	0.8	0-40-0	9	—	5	4	3	45	0.3 or less	✓	✓	✓	✓	✓	✓	✓

Inch

Code No.			Graduation (in)	Range (in)	Dial reading	Maximum permissible error (MPE)*1 (in)			Mass (g)	Measuring force (N)								
Basic set	Plus set	Full set				One rev.	Hysteresis	Repeatability										
513-402-10E	–	513-402-10T	0.0005	0.03	0-15-0	±0.0005	0.0002	±0.0002	45	0.3 or less				✓			✓	
513-472-10E	–	–								0.2 or less			✓			✓		
513-412-10E	–	513-412-10T							41		✓				✓			
513-479-10E	–	–													✓			
513-462-10E	–	–							41						✓		✓	
513-407-10E	–	513-407-10T	0.00005	0.008	0-4-0	±0.0001	0.0001	±0.00004	45	0.3 or less							✓	
513-403-10E	–	513-403-10T	0.0001									✓			✓			
513-473-10E	–	–									✓				✓			
513-463-10E	–	–													✓			
513-907-10E ⁽²⁾	–	–	0.0005	0.03	0-15-0	±0.0005	0.0002	±0.0002	45				✓			✓	✓	

Metric/Inch

Code No.			Graduation	Range	Dial reading	Maximum permissible error (MPE)*1 (μm)				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	Hysteresis	Repeatability										
513-409-10E	—	513-409-10T	0.002 mm /0.001 in	0.2 mm /0.0076 in	0-10-0 /0-38-0	4	2	3	1	45	0.3 or less	✓	✓	✓	✓	✓	✓	✓	✓

Inch/Metric

Code No.			Graduation	Range	Dial reading	Maximum permissible error (MPE)*1 (in)			Mass (g)	Measuring force (N)								
Basic set	Plus set	Full set				One rev.	Hysteresis	Repeatability										
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							✓	

*1 We guarantee the accuracy of completed products by inspecting them with the dial face facing upward.

*2 A set consisting of **513-404-10E** and **7014-10**.

*3 A set consisting of **513-402-10E** and **7014E-10**.

Note: Stem with dovetail groove is not included in the mass.

Set Configuration: Metric and Metric/Inch

Full set

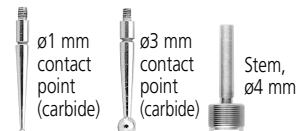
513-4XX-10T

Swivel clamp
(**900321**, for ø4 mm stem,
ø8 mm stem, and dovetail)

Metric holding
bar (L: 100 mm)

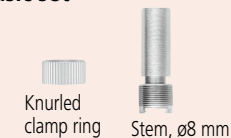
Plus set

513-4XX-10A

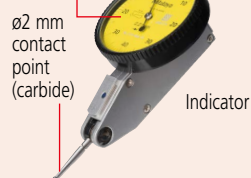


Basic set

513-4XX-10E



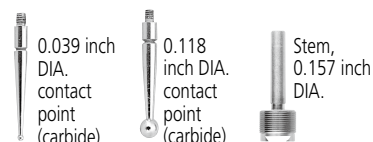
513-4XX-10 is indicated
on the dial face.



Set Configuration: Inch and Inch/Metric

Full set

513-4XX-10T

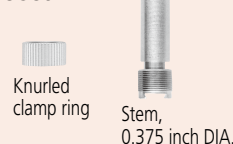


Swivel clamp
(**900322**, for 0.157
inch DIA. stem, 0.375 inch
DIA. stem, and dovetail)

Inch
holding bar
(L: 4 in)

Basic set

513-4XX-10E



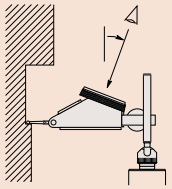
513-4XX-10 is indicated on the dial face.



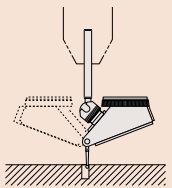


Example of use of a test indicator with a tilted dial face

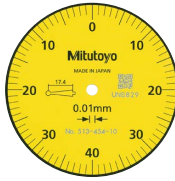
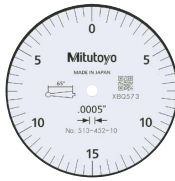
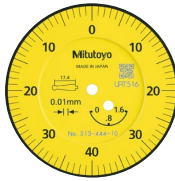
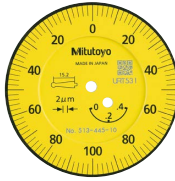
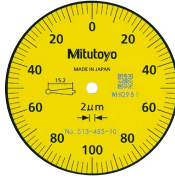
- The dial face obliquely faces upward, allowing users to read the graduations from the user's side. It is convenient when probing on the side of a large workpiece and the workbench is high.



- 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	 Carbide contact point Graduation: 0.01 mm Range: 0.8 mm
 513-452-10E/10T Contact point No. 133195	 Carbide contact point Graduation: 0.0005 in Range: 0.03 in
 513-444-10E/10A/10T Contact point No. 103006	 ☒ With revolution counter ☐ Carbide contact point Graduation: 0.01 mm Range: 1.6 mm
 513-445-10E/10A/10T Contact point No. 103011	 ☒ With revolution counter ☐ Carbide contact point Graduation: 0.002 mm Range: 0.4 mm
 513-484-10E/10A/10T Contact point No. 103006	 ☐ Carbide contact point Graduation: 0.01 mm Range: 0.8 mm
 513-485-10E Contact point No. 103011	 ☐ Carbide contact point Graduation: 0.002 mm Range: 0.2 mm

Note: **513-4XX-10** is indicated on the dial face and the inspection certificate.
The code No. with suffix (E/A/T) is a set item which includes accessories. The main unit is not available as a standalone item.

 With revolution counter
 Long contact point
 Carbide contact point

Metric			Standard (20° tilted face) type												
Code No.			Graduation (mm)	Range (mm)	Dial reading	Maximum permissible error (MPE)* (µm)				Mass (g)	Measuring force (N)				Remarks
Basic set	Plus set	Full set				Measuring range	One rev.	10 scale divisions	Hysteresis						
513-444-10E	513-444-10A	513-444-10T	0.01	1.6	0-40-0	16	10	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	1						
Inch			Standard (20° tilted face) type												
Code No.			Graduation (in)	Range (in)	Dial reading	Maximum permissible error (MPE)* (in)				Mass (g)	Measuring force (N)				Remarks
Basic set	Plus set	Full set				One rev.	First 2.5 rev.	Hysteresis	Repeatability						
—	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				Black dial
—	513-442-16A	513-442-16T									0.3 or less				
—	513-446-10A	513-446-10T									0.2 or less				
—	513-446-16A	513-446-16T									0.2 or less				
—	513-443-10A	513-443-10T	0.0001	0-4-0	±0.0002	±0.0002	0.0001	±0.00004	0.3 or less					Black dial	
—	513-443-16A	513-443-16T							0.3 or less						
—	513-443-10E	513-443-10T							0.3 or less						

Metric	Vertical type																	
Code No.			Graduation (mm)	Range (mm)	Dial reading	Maximum permissible error (MPE)* (µm)				Mass (g)	Measuring force (N)				Remarks			
Basic set	Plus set	Full set				Measuring range	One rev.	10 scale divisions	Hysteresis							Repeatability		
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		0.8	0-40-0	9	—											✓
513-455-10E	513-455-10A	513-455-10T	0.002	0.2	0-100-0	4	—	2	3	1								✓

Inch			Vertical type											
Code No.			Graduation (in)	Range (in)	Dial reading	Maximum permissible error (MPE)* (in)			Mass (g)	Measuring force (N)				Remarks
Basic set	Plus set	Full set				One rev.	First 2.5 rev.	Hysteresis	Repeatability					
513-452-10T	—	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			Horizontal Type													
Code No.			Graduation (mm)	Range (mm)	Dial reading	Maximum permissible error (MPE)* (µm)				Mass (g)	Measuring force (N)				Remarks	
Basic set	Plus set	Full set				Measuring range	One rev.	10 scale divisions	Hysteresis							Repeatability
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		0.8	0-40-0	9	—							✓		
513-485-10E	—	—	0.002	0.2	0-100-0	4	—	2	3	1					✓	

Inch			Horizontal Type													
Code No.			Graduation (in)	Range (in)	Dial reading	Maximum permissible error (MPE)* (in)				Mass (g)	Measuring force (N)				Remarks	
Basic set	Plus set	Full set				One rev.	First 2.5 rev.	Hysteresis	Repeatability							
—	513-482-10A	513-482-10T	0.0005	0.03	0-15-0	±0.0005	—	0.0002	±0.0002	53	0.3 or less				✓	

* Standard (20° Tilted Face) Type, Vertical Type: We guarantee the accuracy of completed products by inspecting them with the dial face facing upward.
Horizontal Type: We guarantee the accuracy of completed products by inspecting them with the dial face vertical.
Note: **51X-4X-1X** is indicated on the dial face and the inspection certificate.
The code No. with suffix (E/A/T) is a set item which includes accessories. The main unit is not available as a standalone item.

Standard (20° Tilted Face) Type

Unit: mm

Code No.	L1	L2
513-445-10E	18.7	15.2
513-444-10E	20.9	17.4

Horizontal Type

Code 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

Code No.	L1	L2
513-454-10E	20.9	17.4
513-455-10E	18.7	15.2
513-456-10E	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.

Full set

Swivel clamp
**(900321, for Ø4 mm stem,
Ø8 mm stem, and dovetail)**

513-4XX-10T

Metric holding
bar (L: 100 mm)

ø1 mm
contact
point
(carbide)

ø3 mm
contact
point
(carbide)

Stem,
ø4 mm

Knurled clamp ring

Stem $\varnothing 8$ mm

513-4XX-10 is indicated on the dial face.

ø2 mm
contact
point
(carbide)

Indicator

Full set

Swivel clamp
**(900322, for 0.157
inch DIA. stem, 0.375 inch
DIA. stem, and dovetail)**

513-4XX-1XT

Inch
holding bar
(L: 4 in)

0.039 inch
DIA. contact
point
(carbide)

0.118
inch DIA.
contact
point
(carbide)

Stem,
0.157 inch
DIA.

Knurled clamp ring

Stem, 0.375 inch DIA.

513-4XX-1X is indicated on the dial face.

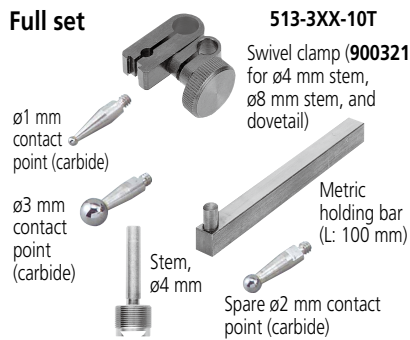


Indicator

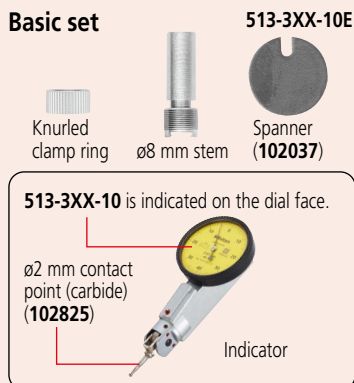


Set Configuration: Metric

Full set



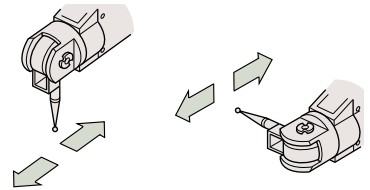
Basic set



Dial Test Indicator SERIES 513 — Universal Type



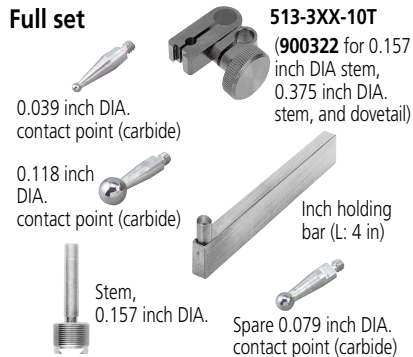
Universal Type



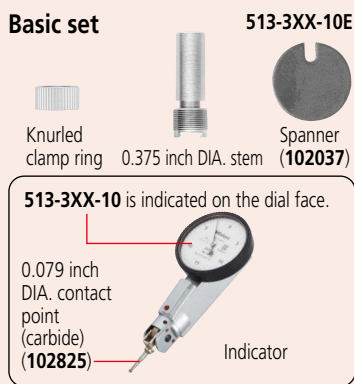
- The direction of the probe movement can be freely changed by rotating the contact point section of the indicator.

Set Configuration: Inch

Full set



Basic set



SPECIFICATIONS

Metric

Code No.		Graduation (mm)	Range (mm)	Dial reading	Maximum permissible error (MPE)* (μm)				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
					Measuring range	One rev.	10 scale divisions	Hysteresis	Repeatability										
513-304-10E	513-304-10T	0.01	0.8	0-40-0	9	—	5	4	3	71	0.3 or less								

Inch

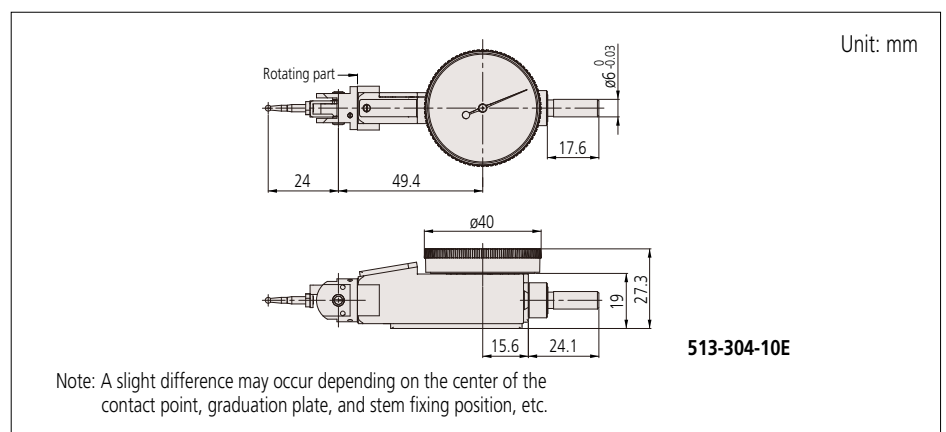
Code No.		Graduation (in)	Range (in)	Dial reading	Maximum permissible error (MPE)* (in)			Mass (g)	Measuring force (N)	High accuracy	With revolution counter	Long contact point	Standard	Double scale spacing	Compact	Dustproof	Carbide contact point	Ruby contact point
					One rev.	Hysteresis	Repeatability											
513-302-10E	513-302-10T	0.0005	0.03	0-15-0	±0.0005	0.0003	±0.0003	71	0.3 or less									

* The accuracy is guaranteed when used with the dial face facing upward and the contact point oriented as shown in the figure.

Note: 513-3XX-10 is indicated on the dial face and the inspection certificate.

The code No. with suffix (E/T) is a set item which includes accessories. The main unit is not available as a standalone item.

DIMENSIONS



Note: A slight difference may occur depending on the center of the contact point, graduation plate, and stem fixing position, etc.

Optional Accessories

- Swivel clamps (See page 07-84)
- Holding bars (See page 07-85)
- Stems (See page 07-85)

102824: ø1 mm contact point (carbide)

102825: ø2 mm contact point (carbide)

102826: ø3 mm contact point (carbide)

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.

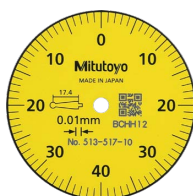
Note 1: Attaching a contact point of incorrect length will lead to measurement failure.

- 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 07-83 for notes on differences with models that do not have a clutch lever.

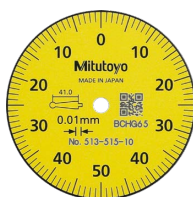
- A $\varnothing 2$ mm carbide contact point is supplied as standard.
- Metric Dial Test Indicator is inspected according to JIS B 7533:2015. We guarantee accuracy by inspecting with the dial face facing upward.



Graduation: 0.01 mm
Range: 0.8 mm

513-517-10E/
513-517-10T

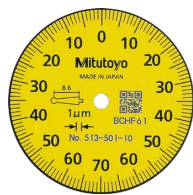
- ☒ Standard
- ☒ Compact
- ☒ Carbide contact point



Graduation: 0.01 mm
Range: 1 mm

513-515-10E/
513-515-10T

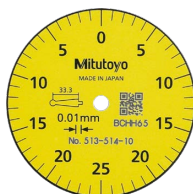
- ☒ Long contact point
- ☒ Compact
- ☒ Carbide contact point



Graduation: 0.001 mm
Range: 0.14 mm

513-501-10E/
513-501-10T

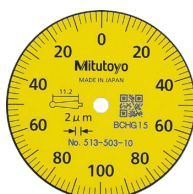
- ☒ High accuracy
- ☒ Compact
- ☒ Carbide contact point



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

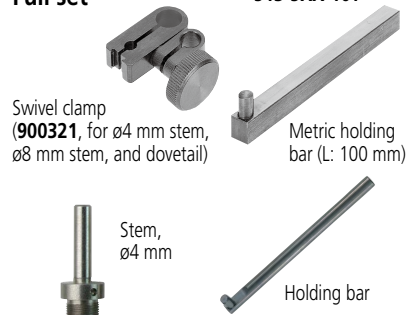
- ☒ Standard
- ☒ Compact
- ☒ Carbide contact point



Set Configuration: Metric

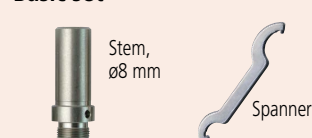
Full set

513-5XX-10T



Basic set

513-5XX-10E



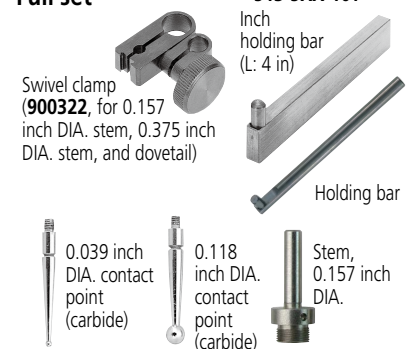
513-5XX-10 is indicated on the dial face.



Set Configuration: Inch

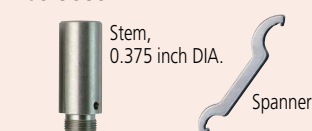
Full set

513-5XX-10T



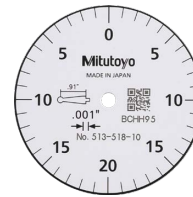
Basic set

513-5XX-10E



513-5XX-10 is indicated on the dial face.

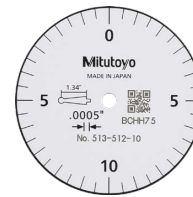




Graduation: 0.001 in
Range: 0.04 in

**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

Metric

Code No.		Graduation (mm)	Range (mm)	Dial reading	Maximum permissible error (MPE)* (μm)					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	Hysteresis	Repeatability										
513-517-10E	513-517-10T	0.01	0.8	0-40-0	9	—	5	4	3	50	0.3 or less								
513-514-10E	513-514-10T	0.01	0.5	0-25-0	10	—	5	5	3	51	0.3 or less								
513-515-10E	513-515-10T	0.01	1	0-50-0	10	—	5	5	3	51	0.3 or less								
513-503-10E	513-503-10T	0.002	0.2	0-100-0	4	—	2	3	1	50	0.4 or less								
513-501-10E	513-501-10T	0.001	0.14	0-70-0	4	—	2	3	1	50	0.5 or less								

Inch

Code No.		Graduation (in)	Range (in)	Dial reading	Maximum permissible error (MPE)* (in)				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.	Hysteresis	Repeatability										
513-518-10E	513-518-10T	0.001	0.04	0-20-0	±0.001	—	0.0002	±0.0004	50	0.3 or less								
513-512-10E	513-512-10T	0.0005	0.02	0-10-0	±0.0005	—	0.0002	±0.0002	51	0.3 or less								
513-504-10E	513-504-10T	0.0001	0.01	0-5-0	±0.0002	—	0.0001	±0.00004	50	0.3 or less								

* We guarantee the accuracy of completed products by inspecting them with the dial face facing upward.

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 the of the significant deterioration in the operation, repair is required.

Note 2: Stem is not included in the mass.

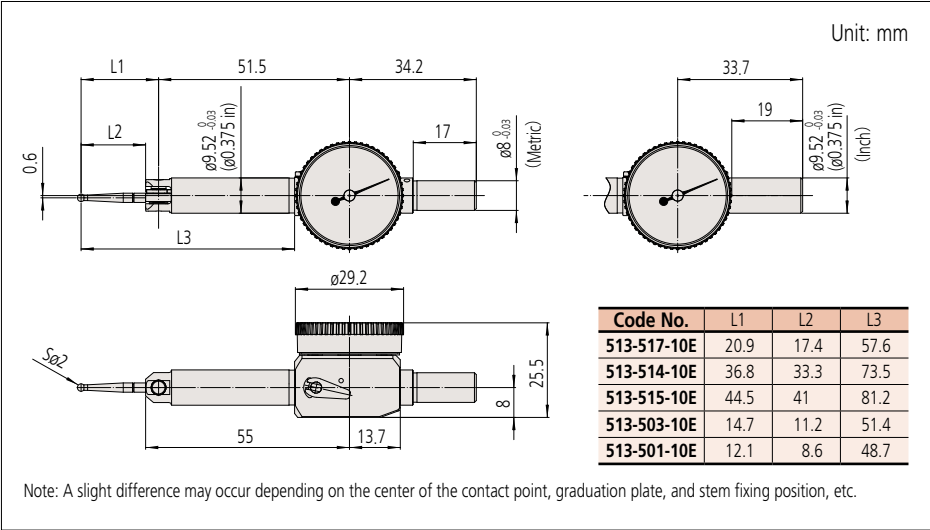
Note 3: **513-SXX-10** is indicated on the dial face and the inspection certificate.

The code No. with suffix (E/T) is a set item which includes accessories. The main unit is not available as a standalone item.

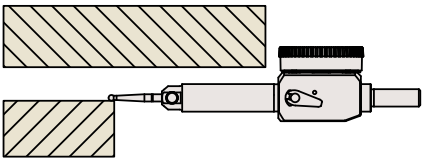
Dial Test Indicators

Pocket Type Dial Test Indicator
SERIES 513

DIMENSIONS

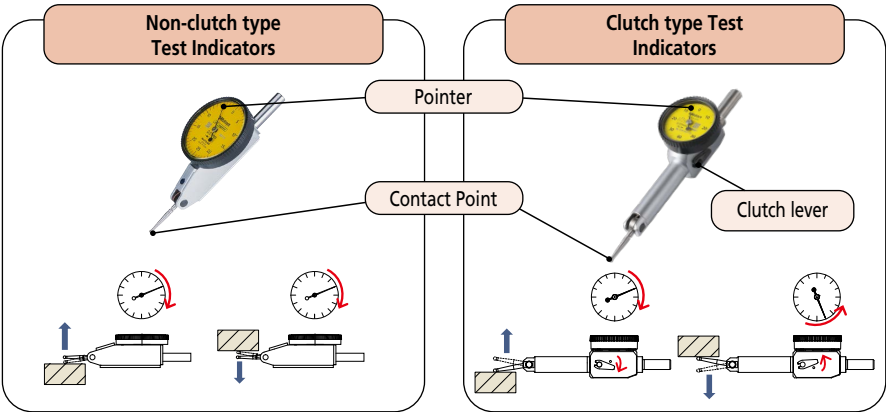


Pocket type can be fixed at the body (at $\varnothing 9.52$ ($\varnothing 0.375$ in))



The slim body allows measurements in shallow space.

There are two types of Mitutoyo Dial Test Indicator:
The non-clutch type (without a clutch lever) and the clutch type (with a clutch lever)

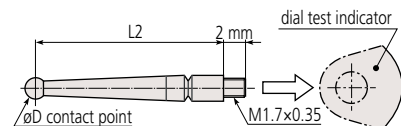


In the non-clutch type, although the contact point may move either in the upward or downward direction, the pointer always rotates clockwise.
In the clutch type, if the clutch lever is set in one position the contact point moves in the upward direction and the pointer rotates clockwise. Conversely, if the lever is set in the other position the contact point moves in the downward direction and the pointer rotates counterclockwise.

Contact points, Stems and Holders Optional Accessories for Dial Test Indicators

Contact point (for Metric Models Only*)

* Except for universal type dial test indicator (513-304-10).



Ø0.5 mm contact point (Steel) **Ø0.7 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)

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)

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)

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)

Swivel Clamps

For Ø6 mm stem,
Ø8 mm stem, and
dovetail



902053

For Ø4 mm stem,
Ø8 mm stem, and
dovetail

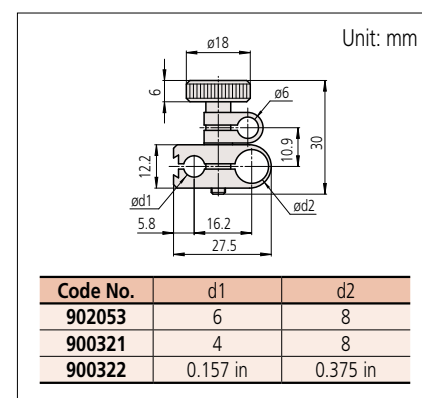


900321

For 0.157 inch DIA. stem,
0.375 inch DIA. stem,
and dovetail



900322

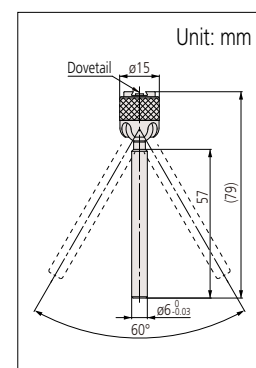
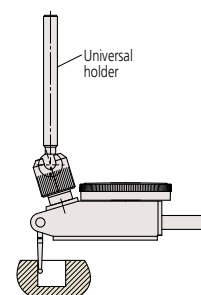


Universal Holder (dovetail clamp)

- 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.



21CZA233 (Ø8 mm stem)
21CZA231 (0.25 inch DIA. stem)
21CZA229 (Ø6 mm stem)



Dial Test Indicators

Contact points, Stems and Holders
Optional Accessories for Dial Test Indicators

Spanner



Holding Bars

953638 (Length: 50 mm)
900209 (Length: 100 mm)

900211 (Length: 115 mm/4.528 in)

953639 (Length: 2 in)
900306 (Length: 4 in)

Stems with Knurled Clamp Ring

21CZB131

21CZB129

21CZB130

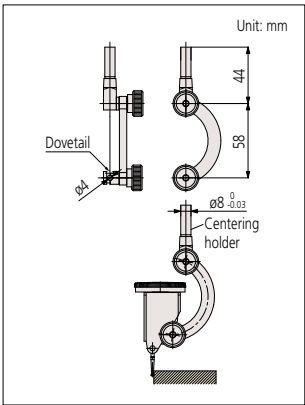
Stem DIA. ød	Stem with dovetail (Individual item)	Nut (Individual item)	Full set (Stem with dovetail+Nut)
	Code No.		
ø4	21CAB106	190322	21CZB131
ø6	21CAB103	190322	21CZB128
ø8	21CAB104	190322	21CZB129
ø0.375 in	21CAB105	190322	21CZB130

Centering Holder

- Allows large diameter cylinders or holes to be centered on a machine tool.

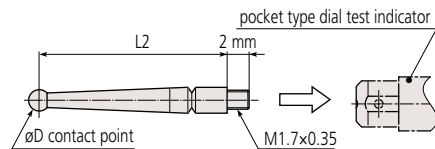


901959 (ø8 mm stem)
901997 (0.25 inch DIA. stem)



Optional Accessories for Pocket Type Dial Test Indicators

Contact point (for Metric Models Only)



**ø0.5 mm contact point
(Steel)**



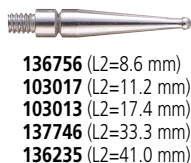
190547 (L2=11.2 mm)
190549 (L2=17.4 mm)
190656 (L2=41.0 mm)

**ø0.7 mm contact point
(Steel)**



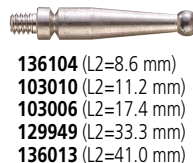
190548 (L2=11.2 mm)
190550 (L2=17.4 mm)
190655 (L2=41.0 mm)

**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)**



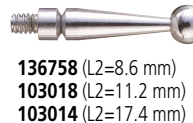
136104 (L2=8.6 mm)
103010 (L2=11.2 mm)
103006 (L2=17.4 mm)
129949 (L2=33.3 mm)
136013 (L2=41.0 mm)

**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)**



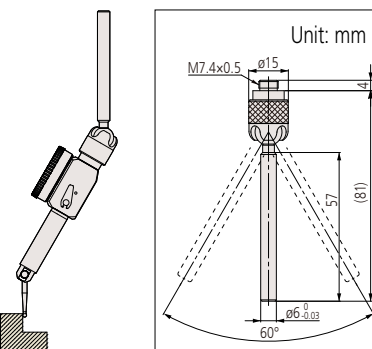
136758 (L2=8.6 mm)
103018 (L2=11.2 mm)
103014 (L2=17.4 mm)
137747 (L2=33.3 mm)
136236 (L2=41.0 mm)

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.



21CZA234 (ø8 mm stem)
21CZA232 (0.25 inch DIA. stem)
21CZA230 (ø6 mm stem)



Swivel Clamps

For ø6 mm stem,
ø8 mm stem,
and dovetail



902053

For ø4 mm stem
and ø8 mm stem,
and dovetail

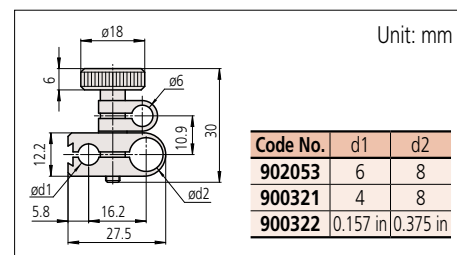


900321

For 0.157 inch DIA. stem
and 0.375 inch DIA. stem,
and dovetail



900322



Spanner



301336

Holding Bars



9x9 mm

900209 (Length: 100 mm)



ø8 mm (0.315 inch DIA)

900211 (Length: 115 mm)



0.25x0.5 in

953639 (Length: 2 in)

900306 (Length: 4 in)

Note: Suitable for height gages with a scriber section of 12.7x6.35 mm.

Stems

ø4 mm
(0.157 inch DIA.)

ø8 mm
(0.315 inch DIA.)

0.375 inch DIA.



102036



102822

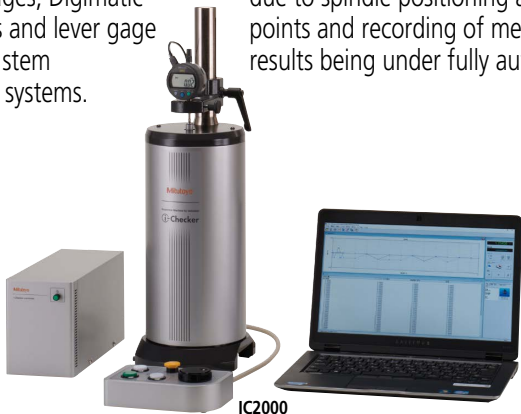


102081

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 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

Code No.		170-402	170-403
Measuring Range		100 mm	
Resolution		0.01 μm	
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	
Measurement method		Semi-automatic measurement	
		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 bush	with 3/8 in bush

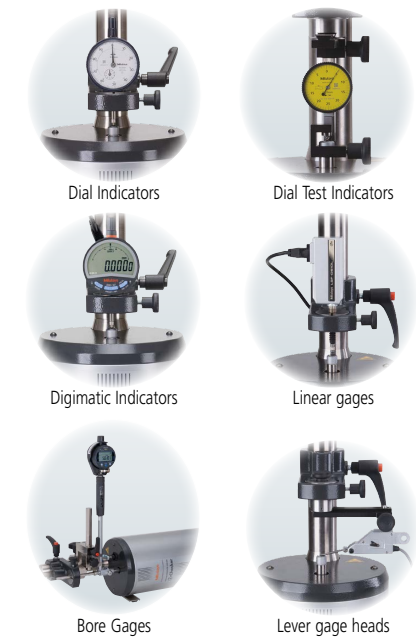
*1 Automatic measurement requires the indicator's connection cable. Additionally some form of indicator, along with the normally connected accessory (the optional accessory for the indicator such as a Digimatic power-supply unit in an EF counter) will be required.
*2 The indicator measured via RS-232C has the capability to receive data from the main unit and output the counter value.



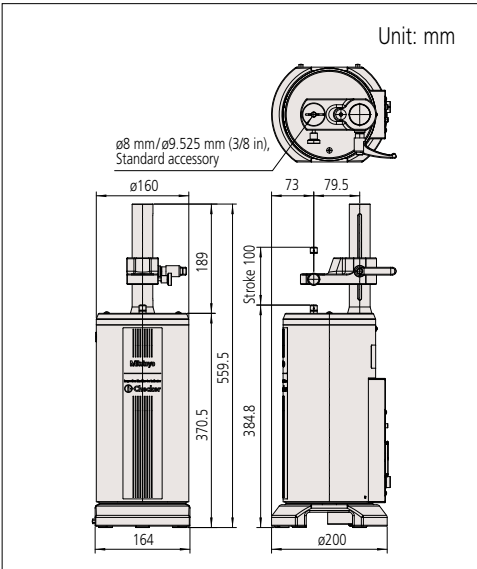
Typical application for Dial Test Indicator Accessory Set



Typical application using dial test indicator attachment set (02ASK000)



DIMENSIONS





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 0.01 mm resolution/graduation dial indicators, dial test indicators and bore gages.
- With the optional stand, inspection of dial bore gages becomes possible.
- Measuring range: 0 to 25 mm.
Accepts $\varnothing 6$ mm, $\varnothing 8$ mm, 1/4 in and 3/8 in indicator stems.



170-102-12

SPECIFICATIONS

Metric				
Code No.	Micrometer head		Accuracy (μ m)	
	Graduation (mm)	Range (mm)	Feed accuracy (25 mm stroke)	Hysteresis
170-102-12	0.001	0 - 25	± 2	0.5

Inch				
Code No.	Micrometer head		Accuracy (in)	
	Graduation (in)	Range (in)	Feed accuracy (25 mm stroke)	Hysteresis
170-101-10	0.0001	0 - 1	± 0.0001	0.00002

SERIES 521 — Calibration Tester

- Accuracy tester for 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: $\varnothing 4$ mm to $\varnothing 10$ mm.



521-103

SPECIFICATIONS

Metric				
Code No.	Micrometer head		Accuracy (μ m)	
	Graduation (mm)	Range (mm)	Indication accuracy	Hysteresis
521-103	0.0002	0 - 1	± 0.2	0.2
521-105	0.0002	0 - 5	± 0.8	0.8

Inch				
Code No.	Micrometer head		Accuracy (in)	
	Graduation (in)	Range (in)	Indication accuracy	Hysteresis
521-104	0.00001	0 - 0.05	± 0.00001	0.00001
521-106	0.00001	0 - 0.2	± 0.00003	0.00003

Thickness Gages
SERIES 547, 7

Standard Type (Resolution: 0.01 mm)

- 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 547-401A)



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)
- Battery life: Approx. 2.5 years under normal use (Approx. 2,700 hours of continuous use)
- Response speed: Unlimited (except for scanning measurement)
- Zero-setting (INC system)
- Presetting (ABS system)
- Measuring direction switching
- Tolerance judgment
- Resolution switching (For models with 0.0005 mm resolution)
- 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 07-90.

- Measurement Data Management **USB-ITPAK V3.0: 06AGR543**

SPECIFICATIONS

Metric					
Code 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

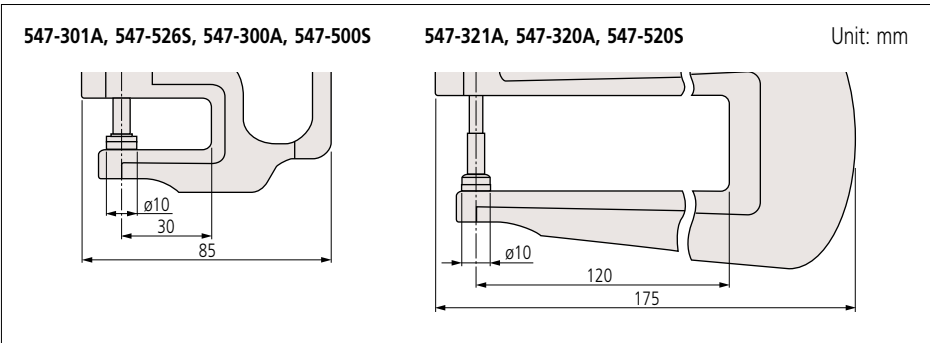
Code No.	Accuracy (μm)	Measuring force (N)	Mass (g)	Remarks	
547-301A	±20	1.5 or less	245	Standard, ceramic point/anvil	
547-321A	±20	1.5 or less	385	Deep throat, ceramic point/anvil	

Inch / Metric					
Code 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*	30 mm (1.18 in)	ø10 mm (ø0.39 in) Flat	0.0002 in/0.005 mm
547-300A	0.0005 in/0.01 mm	0 - 0.4	30 mm (1.18 in)	ø10 mm (ø0.39 in) Flat	0.005 in/0.01 mm
547-500S*	0.0005 in/0.01 mm	0 - 0.47*	30 mm (1.18 in)	ø10 mm (ø0.39 in) Flat	0.005 in/0.01 mm
547-320A	0.0005 in/0.01 mm	0 - 0.4	120 mm (4.72 in)	ø10 mm (ø0.39 in) Flat	0.005 in/0.01 mm
547-520S*	0.0005 in/0.01 mm	0 - 0.47*	120 mm (4.72 in)	ø10 mm (ø0.39 in) Flat	0.005 in/0.01 mm

Code 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.

DIMENSIONS



Optional Accessories

Code 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: 0.0005 mm)



547-401A

SPECIFICATIONS

Metric					
Code 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
Code No.	Accuracy (μm)	Measuring force (N)	Mass (g)	Remarks	
547-401A	±3	3.5 or less	275	High accuracy, carbide point anvil	
Inch/Metric					
Code 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	21 mm (0.83 in)	ø6.3 mm (ø0.25 in) Flat	0.0001 in/0.003 mm
Code 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	

DIMENSIONS

547-401A, 547-400A

Unit: mm

Dial Indicator Applications

Thickness Gages
SERIES 547, 7

Standard Type (Graduation: 0.01 mm)

- Integrated moulding of the bezel and crystal ensures protection against water and oil penetration via the front face.



7301A



7321A

SPECIFICATIONS

Metric					
Code 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

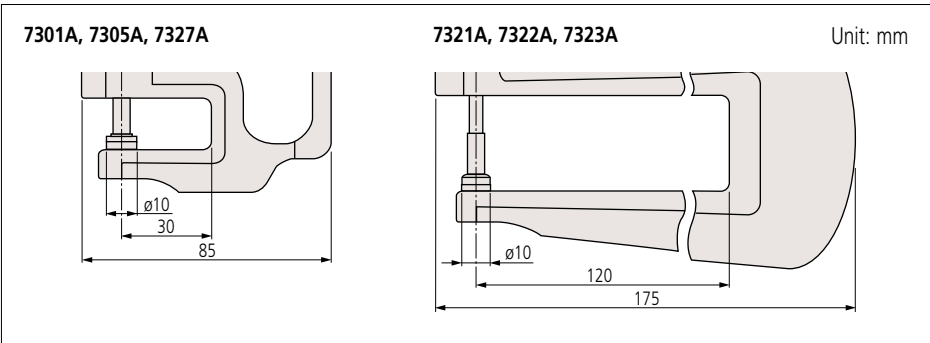
Code No.	Accuracy (μm)	Measuring force (N)	Mass (g)	Remarks
7327A	±5	1.5 or less	225	Fine dial reading, ceramic point/anvil
7301A	±15	1.4 or less	205	Standard, ceramic point/anvil
7305A	±20	2.0 or less	220	Standard, ceramic point/anvil
7321A	±15	1.4 or less	370	Deep throat, ceramic point/anvil
7323A	±22	2.0 or less	370	Deep throat, ceramic point/anvil

Inch					
Code 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

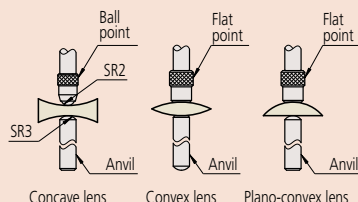
Code No.	Accuracy (in)	Measuring force (N)	Mass (g)	Remarks
7326A	±0.0002	2.0 or less	205	Fine dial reading, ceramic point/anvil
7300A	±0.001	1.8 or less	205	Standard, ceramic point/anvil
7304A	±0.002	1.8 or less	220	Standard, ceramic point/anvil
7322A	±0.002	1.8 or less	370	Deep throat, ceramic point/anvil

Note: The dial indicator needs to be reset when a contact point is replaced.

DIMENSIONS



Typical applications



- 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)
- Battery life: Approx. 2.5 years under normal use
Approx. 2,700 hours of continuous use
- Response speed: Unlimited (except for scanning measurement)
- Zero-setting (INC system)
- Presetting (ABS system)
- Measuring direction switching
- Tolerance judgment
- Resolution switching (For models with 0.0005 mm resolution)
- 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 07-90.

- 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.



547-313A

7313A

SPECIFICATIONS

Metric					
Code 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
Code No.	Accuracy (μm)	Measuring force (N)	Mass (g)	Remarks	
547-313A	±20	1.5 or less	265	Lens thickness	

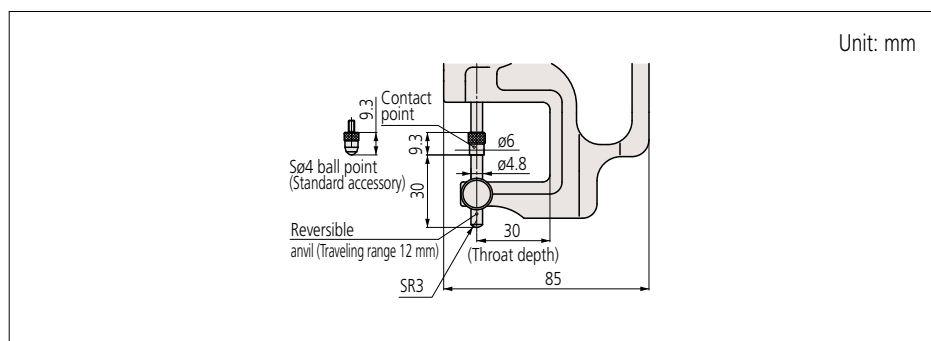
Inch / Metric					
Code No.	Resolution	Range (in)	Measuring depth	Contact point, Anvil	Parallelism of Contact point, Anvil
547-312A	0.0005 in/0.01 mm	0 - 0.4	30 mm (1.18 in)	ø6 mm (ø0.24 in) Flat (Contact point) ø4.8 mm (ø0.19 in) Flat (Anvil)	0.005 in/0.01 mm
547-512A*	0.0005 in/0.01 mm	0 - 0.47*	30 mm (1.18 in)	ø6 mm (ø0.24 in) Flat (Contact point) ø4.8 mm (ø0.19 in) Flat (Anvil)	0.005 in/0.01 mm
Code 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					
Code 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
Code No.	Accuracy (μm)	Measuring force (N)	Mass (g)	Remarks	
7313A	±15	1.4 or less	215	Lens thickness	
Inch					
Code 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
Code No.	Accuracy (in)	Measuring force (N)	Mass (g)	Remarks	
7312A	±0.001	1.8 or less	215	Lens thickness	

Note: The dial indicator needs to be reset when a contact point is replaced.

DIMENSIONS



Dial Indicator Applications

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

Metric				
Code 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)

Code No.	Accuracy (μm)	Measuring force (N)	Mass (g)	Remarks
547-360A	±20	1.5 or less	230	Pipe gage

Inch / Metric				
Code No.	Resolution	Range (in)	Measuring depth	Contact point, Anvil
547-361A	0.0005 in/0.01 mm	0 - 0.4	20 mm (0.79 in)	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*	20 mm (0.79 in)	ø3 mm (ø0.12 in) Flat (Contact point) ø3.5 mm (ø0.14 in) Ball (Anvil)

Code 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				
Code 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)

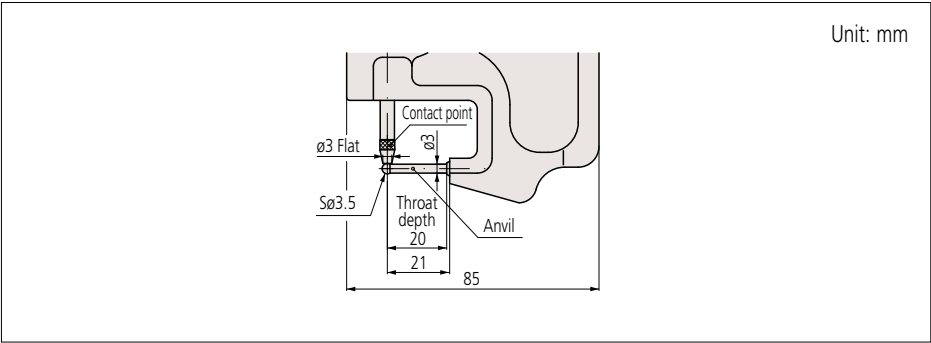
Code No.	Accuracy (μm)	Measuring force (N)	Mass (g)	Remarks
7360A	±15	1.4 or less	200	Pipe gage

Inch				
Code 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)

Code No.	Accuracy (in)	Measuring force (N)	Mass (g)	Remarks
7361A	±0.001	1.8 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 (7-digit for models with 0.0005 mm resolution)
- Power source: CR2032 battery (1 pc.), included as standard (for operational checks)
- Battery life: Approx. 2.5 years under normal use
Approx. 2,700 hours of continuous use
- Response speed: Unlimited (except for scanning measurement)
- Zero-setting (INC system)
- Presetting (ABS system)
- Measuring direction switching
- Tolerance judgment
- Resolution switching (For models with 0.0005 mm resolution)
- 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 07-90.

- Measurement Data Management **USB-ITPAK V3.0: 06AGR543**

- 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)
- Battery life: Approx. 2.5 years under normal use
Approx. 2,700 hours of continuous use
- Response speed: Unlimited (except for scanning measurement)
- Zero-setting (INC system)
- Presetting (ABS system)
- Measuring direction switching
- Tolerance judgment
- Resolution switching (For models with 0.0005 mm resolution)
- 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 07-90.

- 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

Metric					
Code 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
Code No.	Accuracy (μm)	Measuring force (N)	Mass (g)	Remarks	
547-315A	±20	1.5 or less	260	Blade thickness	

Inch / Metric					
Code 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	30 mm (1.18 in)	t=1 mm (0.04 in) Blade	0.005 in/0.01 mm
547-516A*	0.0005 in/0.01 mm	0 - 0.47*	30 mm (1.18 in)	t=1 mm (0.04 in) Blade	0.005 in/0.01 mm
Code 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	

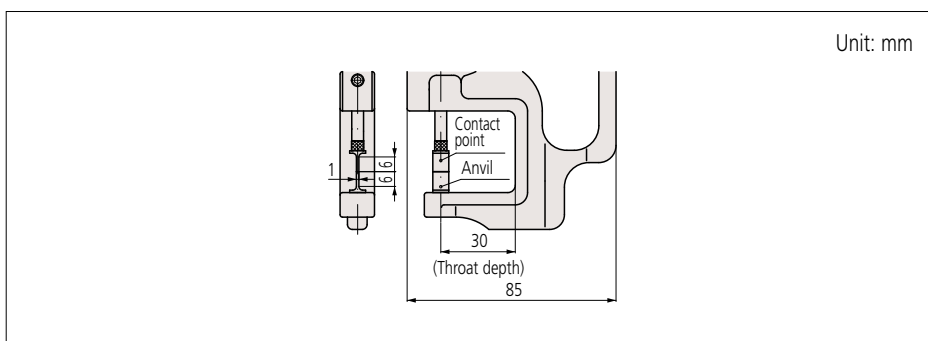
* Using **ID-SX** Digimatic indicator.

Metric					
Code 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
Code No.	Accuracy (μm)	Measuring force (N)	Mass (g)	Remarks	
7315A	±15	1.4 or less	220	Blade thickness	

Inch					
Code 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
Code No.	Accuracy (in)	Measuring force (N)	Mass (g)	Remarks	
7316A	±0.001	1.8 or less	220	Blade thickness	

Note: The dial indicator needs to be reset when a contact point is replaced.

DIMENSIONS



Unit: mm

Dial Indicator Applications

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			
Code 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			
Code 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.

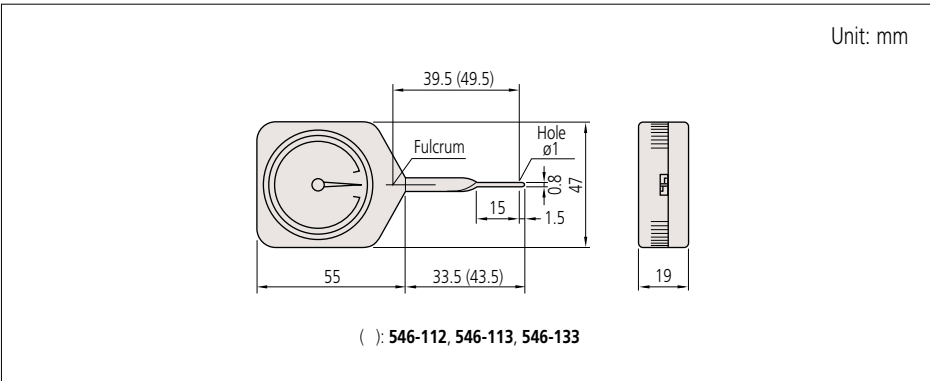
N-scale models

Standard			
Code 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			
Code 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



Dial Snap Gage SERIES 201

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))

- 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: 25 mm/1 in. Adjustment nut: adjusts the setting anvil to the nominal size required within the measuring range.
- Clamp: clamps the setting anvil at the required position.



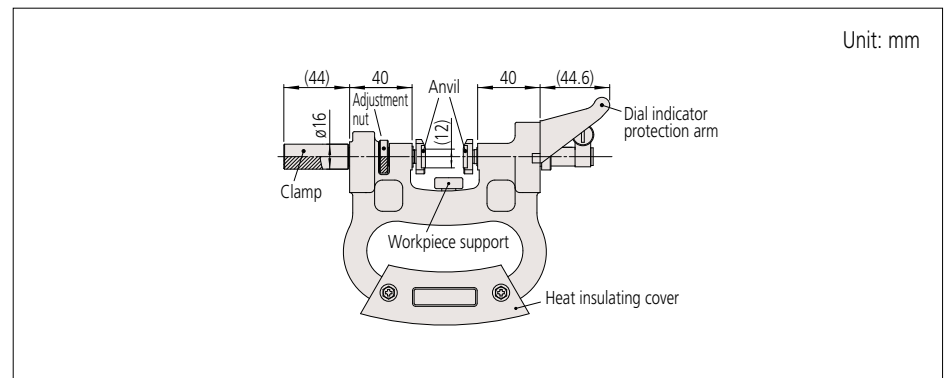
SPECIFICATIONS

Metric			
Code No.	Range (mm)	Parallelism (μm)	Measuring force* (N)
201-101	0 - 25	5	15±3
201-102	25 - 50		
201-103	50 - 75		
201-104	75 - 100		
201-105	100 - 125		
201-106	125 - 150		
201-107	150 - 175		
201-108	175 - 200		
201-109	200 - 225		
201-110	225 - 250		
201-111	250 - 275		
201-112	275 - 300		

Inch			
Code No.	Range (in)	Parallelism (in)	Measuring force* (N)
201-151	0 - 1	0.00025	15±3
201-152	1 - 2		
201-153	2 - 3		
201-154	3 - 4		
201-155	4 - 5		
201-156	5 - 6		
201-157	6 - 7		
201-158	7 - 8		
201-159	8 - 9		
201-160	9 - 10		
201-161	10 - 11		
201-162	11 - 12		

* 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



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

SPECIFICATIONS

Code 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	Without magnet ON/OFF
7031-10	Universal magnetic stand	ø6 mm, ø8 mm, ø0.375 in, with dovetail	Approx. 300 N	With mechanical locking system
7032-10	Universal magnetic stand	ø6 mm, ø8 mm, ø0.375 in, with dovetail	Approx. 600 N	With mechanical locking system
7033-10	Universal magnetic stand	ø6 mm, ø8 mm, ø0.375 in, with dovetail	Approx. 600 N	With mechanical locking system

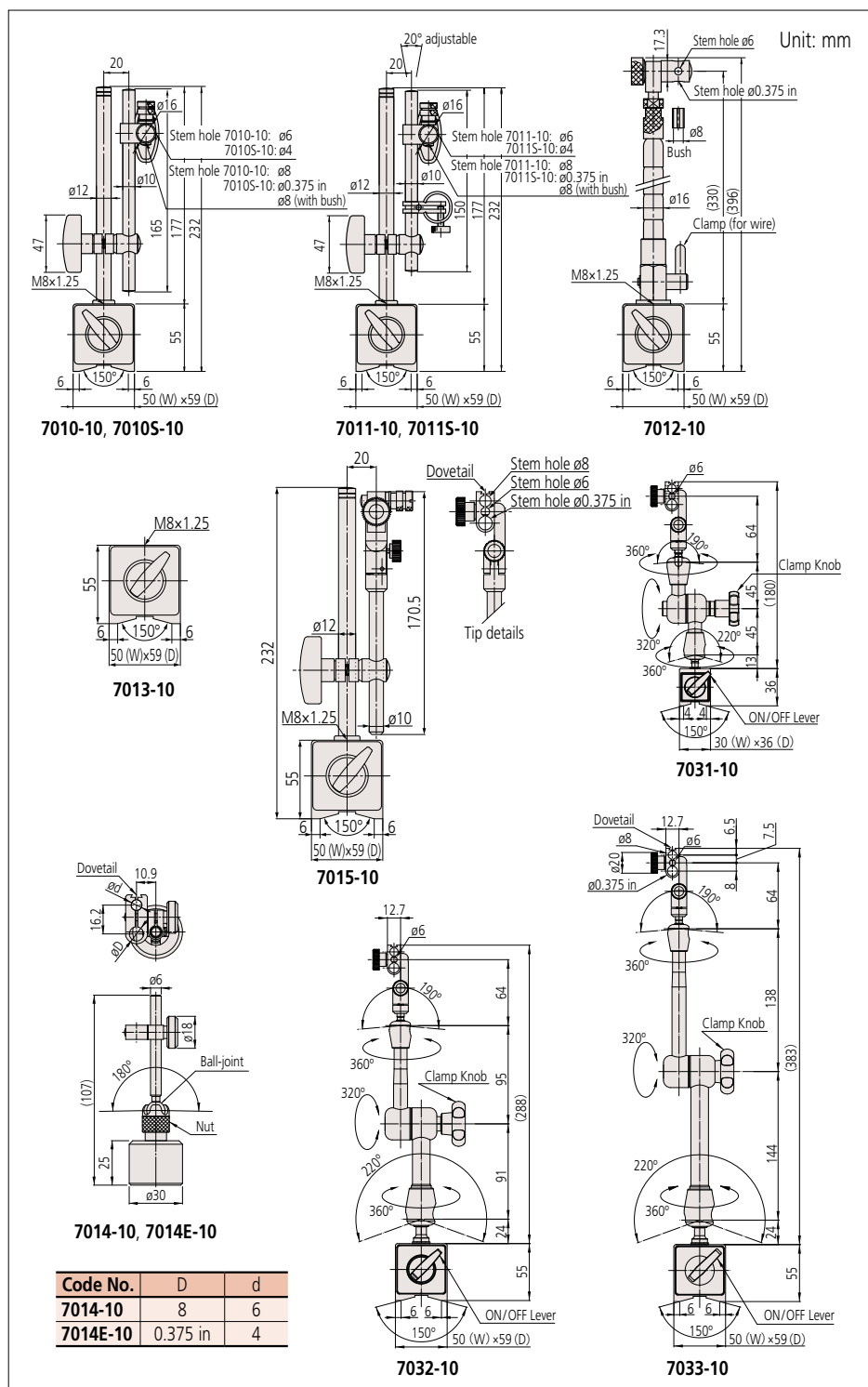
*1 The magnetic holding force applies to that needed for vertical separation from a thick and flat steel object.

*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



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: 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.



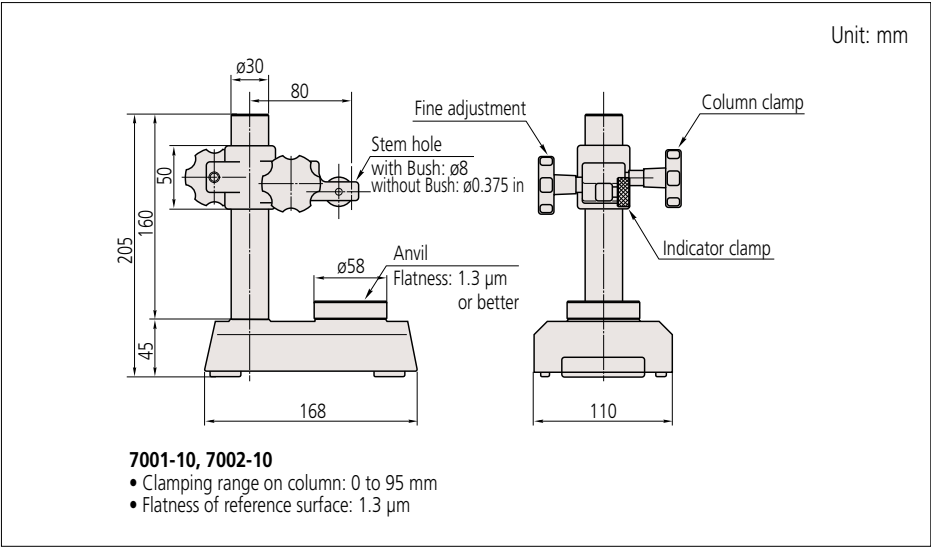
7002-10
(with ø58 mm non-serrated anvil)

SPECIFICATIONS

Metric			
Code No.	Clamping range on column (mm)	Stem hole (mm)	Remarks
7001-10	0 to 95	ø8, 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



Optional Accessories

101462: Hardened steel serrated anvil
(standard accessory for **7001-10**)

Unit: mm

Hardened steel

Dimensions: ø58, 14

101461: Hardened steel non-serrated anvil
(standard accessory for **7002-10**)

Unit: mm

Hardened steel

Dimensions: ø58, 14

101463: Hardened steel domed anvil* (optional)
* Not available for **7007-10**.

Unit: mm

Hardened steel

Dimensions: SR20, ø32, 11, 26, ø58



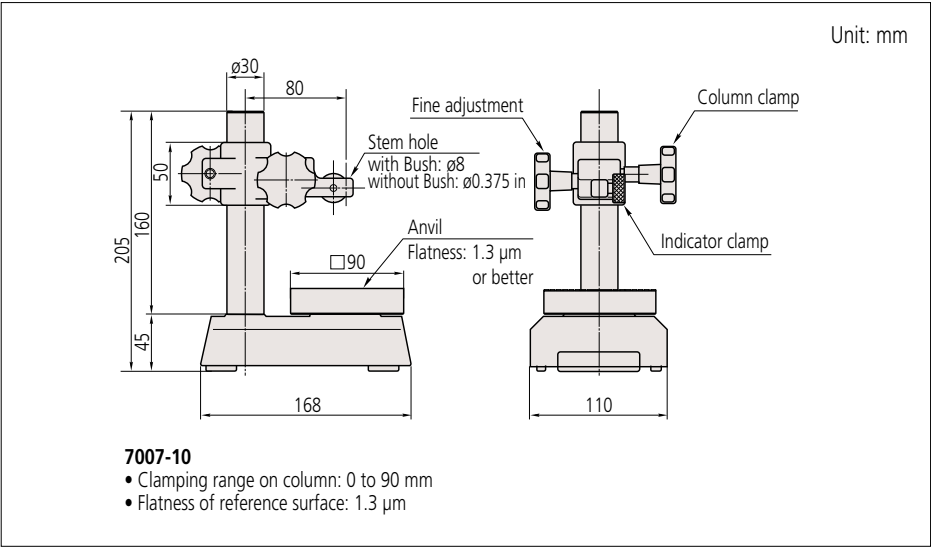
7007-10
(with 90 mm square semi-serrated anvil)

SPECIFICATIONS

Metric			
Code No.	Clamping range on column (mm)	Stem hole (mm)	Remarks
7007-10	0 to 90	ø8, ø0.375 in	With square anvil

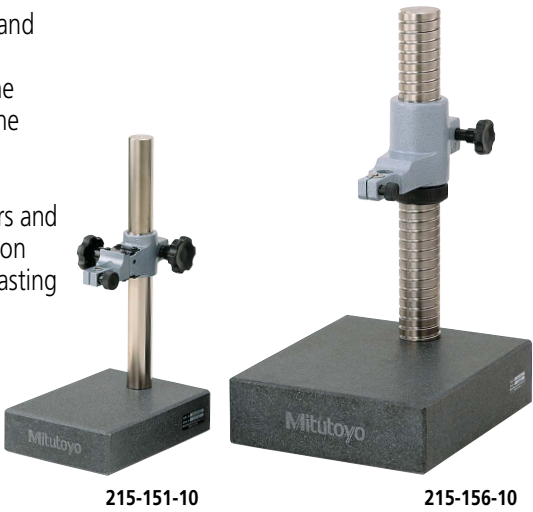
Note 1: Perpendicularity of the stem hole to the anvil is better than 0.4 mm/100 mm
Note 2: Take note that when mounting high-accuracy Linear Gages (with resolution of 0.1 µm or better) to these stands, accuracy may be affected depending on the perpendicularity of the mounting hole to the top surface of the anvil (cosine effect).
Note 3: Compact dial indicators (bezel ø31, ø36) are not suitable for use with these stands.

DIMENSIONS



SERIES 215 — Granite Base Comparator Stands

- The plates are made of natural stone and will hardly deteriorate over time. (While the appearance of natural stone base varies according to the source, the high stability for which this material is known can always be relied upon.)
- 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.



Optional Accessories

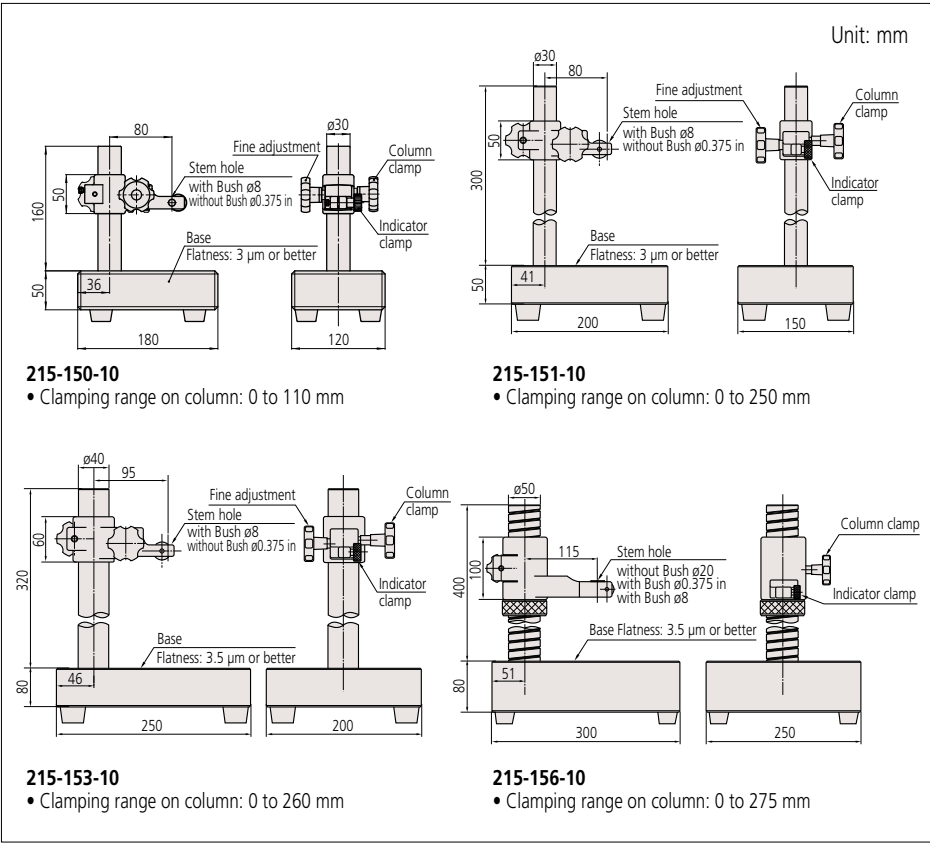
ø15 mm bush (for 215-156-10, 215-505-10):
21JAA331

SPECIFICATIONS

Code No.	Granite base size (WxDxH) (mm)	Clamping range on column (mm)	Stem hole (mm)	Remarks
215-150-10	120x180x50	0 to 110	ø8, 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, ø0.375 in, ø20	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



SERIES 215 — Cast Iron Base Comparator Stands

Example of attaching the Digimatic Indicator



Digimatic Indicator ID-H.

Optional Accessories

Refer to page 07-101.

- 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.



215-405-10

SPECIFICATIONS

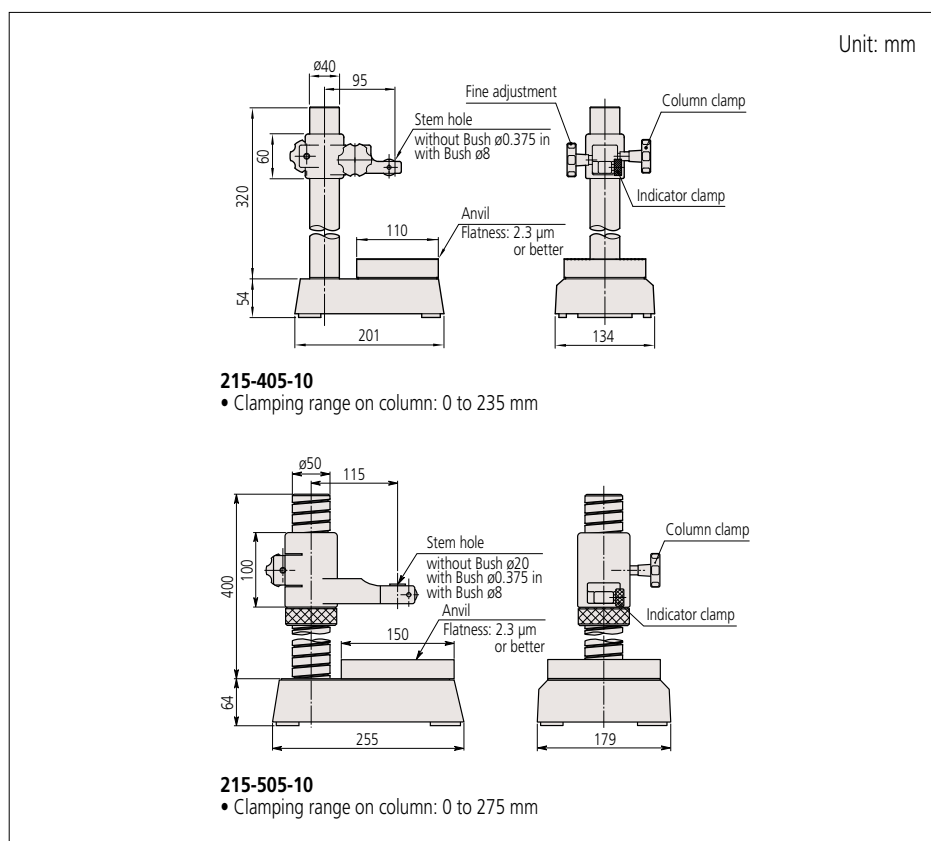
Code No.	Anvil	Clamping range on column (mm)	Micromotion mechanism (Adjustment range)	Stem hole (mm)
215-405-10	Square semi-serrated anvil (110×110 mm)	0 to 235	Vertical fine adjustment (1 mm)	ø0.375 in, ø8 with Bush
215-505-10	Square semi-serrated anvil (150×150 mm)	0 to 275	Micromotion screw	ø20, ø0.375 in with Bush, ø8 with Bush

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 519 — Transfer Stands

- Transfer Stands are designed for comparison measurements of size using a dial indicator or Digimatic Indicator.



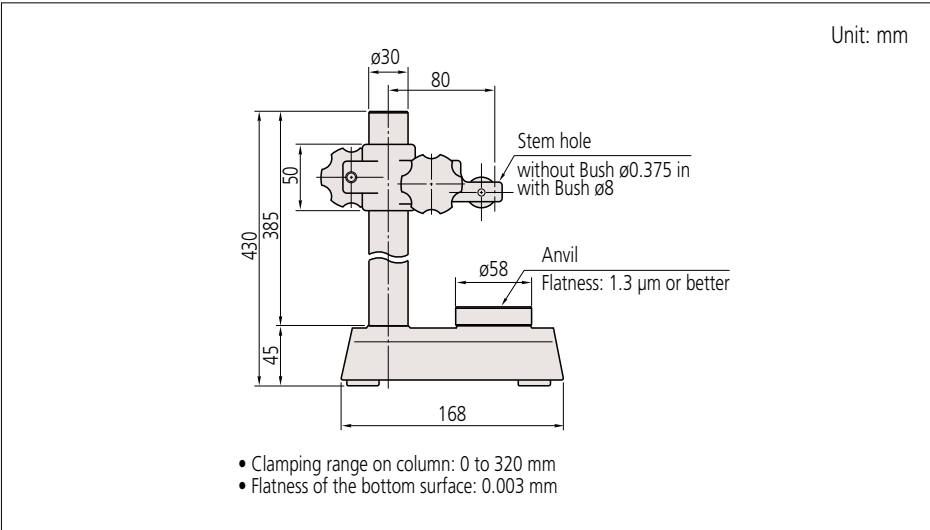
519-109-10
(with a serrated anvil)

SPECIFICATIONS

Metric				
Code No.	Anvil	Clamping range on column (mm)	Micromotion adjustment range (mm)	Stem hole (mm)
519-109-10	With a serrated anvil (ø58 mm)	0 to 320	1	ø0.375 in, ø8 with Bush

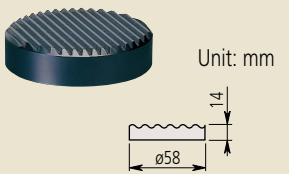
Note 1: Perpendicularity of the stem hole to the anvil is better than 0.4 mm/100 mm.
Note 2: Take note that when mounting high-accuracy Linear Gages (with resolution of 0.1 µm or better) to these stands, accuracy may be affected depending on the perpendicularity of the mounting hole to the top surface of the anvil (cosine effect).
Note 3: Compact dial indicators (bezel ø31, ø36) are not suitable for use with these stands.

DIMENSIONS

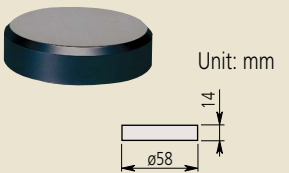


Optional Accessories

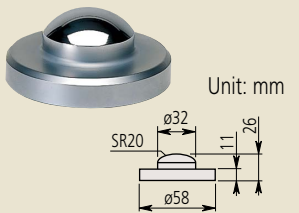
101462: Hardened steel serrated anvil (standard accessory)



101461: Hardened steel non-serrated anvil (optional)



101463: Hardened steel domed anvil (optional)



08

Inside Measuring Instruments

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 Holtest



Holtest



ABSOLUTE Borematic



Inside Micrometers (Caliper Type)



Bore Gages

INDEX

Holtest

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Borematic

ABSOLUTE Borematic	08-13
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Digimatic Holtest
SERIES 468 — Three-point Bore Micrometers

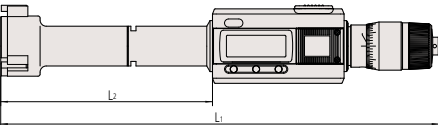
- These three-point bore Digimatic micrometers for inside measurement are suitable for highly accurate measurements.
- Can measure deep holes using an extension rod (optional).
- Can measure close to the bottom of a blind hole.
- Titanium-coated measuring pins provide excellent durability and impact 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

Metric				
Code No.	Range*2 (mm)	Resolution (mm)	Maximum permissible error J _{MPE} (μm)*1	Extension Rod (optional)
468-161	6 - 8	0.001	±2 (maximum difference 2)	952322 (100 mm)
468-162	8 - 10			
468-163	10 - 12			
468-164	12 - 16		±3 (maximum difference 3)	952621 (150 mm)
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		±5 (maximum difference 5)	
468-175	125 - 150			
468-176	150 - 175			
468-177	175 - 200		±6 (maximum difference 6)	
468-178	200 - 225			
468-179	225 - 250			
468-180	250 - 275			
468-181	275 - 300			

- Power source: SR44 battery (1 pc.), 938882 included as standard (for operational checks)
 - Battery life: Approx. 1.2 years under normal use
 - Position detection method: Electromagnetic induction-type rotary encoder
 - *1 Additionally, the difference in permissible error allowable is limited to a value within this range, as given in parentheses, and is measured with the entire measuring surface in contact with the object measured.
 - *2 The measurement range cannot be enlarged by measuring heads that are not standard-supplied (the accuracy is not guaranteed).
- 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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ID 0000021605

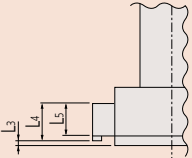


Measurement example



Reference dimensions when measuring a blind hole

Range (mm)	L3 (mm)	L4 (mm)	L5 (mm)
6 - 12	2 or below	—	2.5
12 - 20	—	5.6	3.5
20 - 30	0.3 or below	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



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

Code 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

* Add suffix to Code No.; **G** for Asia, Europe and the Americas, **H** for Brazil and **J** for Korea.

Mounting bracket (optional)

A bracket used to fix a micrometer on the MS-R micrometer stand.
04AZB157



For details of Special-order Products, refer to page 13-16.

Optional Accessories

Code 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

* Add suffix to Code No.; **G** for Asia, Europe and the Americas,
H for Brazil and **J** for Korea.

Interchangeable Head Sets



468-971



468-972



468-973



468-974

Metric		
Set code No.	Range* (mm)	Content 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.

Inch / Metric		
Set code No.	Range* (in)	Content 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
		Extension rod (100 mm) 1 pc.
		Spanner 2 pcs. Hex wrench 1 pc. Phillips screwdriver 1 pc.
468-977	0.5 - 0.8	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.
		Extension rod (150 mm) 1 pc.
		Spanner 2 pcs. Hex wrench 1 pc. Phillips screwdriver 1 pc.
468-978	0.8 - 2	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.
		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.
468-979	2 - 4	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.
		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. Phillips screwdriver 1 pc.

* The measurement range cannot be enlarged by measuring heads that are not standard-supplied (the accuracy is not guaranteed).

Digimatic Holtest
SERIES 468 — Three-point Bore Micrometers

Interchangeable Head Sets



Setting rings are supplied as standard
(ø125, ø175) (Packed separately)

468-975

Accessories (optional)
Refer to page 08-4.

Metric			Inch / Metric		
Set code No.	Range* (mm)	Content of set	Set code No.	Range* (in)	Content of set
468-975	100 - 200	Display unit	468-980	4 - 8	Display unit
		100 - 200 mm 1 pc.			4 - 8 in 1 pc.
		Measuring head			Measuring head
		100 - 125 mm 1 pc.			4 - 5 in 1 pc.
		125 - 150 mm 1 pc.			5 - 6 in 1 pc.
		150 - 175 mm 1 pc.			6 - 7 in 1 pc.
		175 - 200 mm 1 pc.			7 - 8 in 1 pc.
		Setting ring (ø125, ø175) 1 pc. each			Setting ring 1 pc. each
		Extension rod (150 mm) 1 pc.			(5 in DIA., 7 in DIA.)
		Spanner 2 pcs.			Extension rod (150 mm) 1 pc.
468-975	100 - 200	Hex wrench 1 pc.		4 - 8	Spanner 2 pcs.
		Phillips screwdriver 1 pc.			Hex wrench 1 pc.
					Phillips screwdriver 1 pc.

* The measurement range cannot be enlarged by measuring heads that are not standard-supplied (the accuracy is not guaranteed).

Accessories (optional)

Refer to page 08-4.

Non-interchangeable Head Sets



468-981



468-982



468-983



468-984



468-985

Metric			
Set code No.	Range*2 (mm)	Content of set	Extension rod (optional)
468-981	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 Spanner 2 pcs. Hex wrench 1 pc. Phillips screwdriver 1 pc.	100 mm 1 pc.
468-982	12 - 25	Display unit 12 - 16 mm 1 pc. 16 - 20 mm 1 pc. 20 - 25 mm 1 pc. Setting ring (ø16, ø20) 1 pc. each Spanner 2 pcs. Hex wrench 1 pc. Phillips screwdriver 1 pc.	150 mm 2 pcs.*1
468-983	25 - 50	Display unit 25 - 30 mm 1 pc. 30 - 40 mm 1 pc. 40 - 50 mm 1 pc. Setting ring (ø30, ø40) 1 pc. each Spanner 1 pc. Hex wrench 1 pc. Phillips screwdriver 1 pc.	150 mm 1 pc.
468-984	50 - 75	Display unit 50 - 63 mm 1 pc. 62 - 75 mm 1 pc. Setting ring (ø62) 1 pc. Spanner 1 pc. Hex wrench 1 pc. Phillips screwdriver 1 pc.	150 mm 1 pc.
468-985	75 - 100	Display unit 75 - 88 mm 1 pc. 87 - 100 mm 1 pc. Setting ring (ø87) 1 pc. Spanner 1 pc. Hex wrench 1 pc. Phillips screwdriver 1 pc.	150 mm 1 pc.

Inch / Metric			
Set code No.	Range*2 (in)	Content of set	Extension rod (optional)
468-986	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 Spanner 2 pcs. Hex wrench 1 pc. Phillips screwdriver 1 pc.	100 mm 1 pc.
468-987	0.5 - 1	Display unit 0.5 - 0.65 in 1 pc. 0.65 - 0.8 in 1 pc. 0.8 - 1 in 1 pc. Setting ring (0.65 in DIA., 0.8 in DIA.) 1 pc. each Spanner 2 pcs. Hex wrench 1 pc. Phillips screwdriver 1 pc.	150 mm 2 pcs.*1
468-988	1 - 2	Display unit 1 - 1.2 in 1 pc. 1.2 - 1.6 in 1 pc. 1.6 - 2 in 1 pc. Setting ring (1.2 in DIA., 1.6 in DIA.) 1 pc. each Spanner 1 pc. Hex wrench 1 pc. Phillips screwdriver 1 pc.	150 mm 1 pc.
468-989	2 - 3	Display unit 2 - 2.5 in 1 pc. 2.5 - 3 in 1 pc. Setting ring (2.5 in DIA.) 1 pc. Spanner 1 pc. Hex wrench 1 pc. Phillips screwdriver 1 pc.	150 mm 1 pc.
468-990	3 - 4	Display unit 3 - 3.5 in 1 pc. 3.5 - 4 in 1 pc. Setting ring (3.5 in DIA.) 1 pc. Spanner 1 pc. Hex wrench 1 pc. Phillips screwdriver 1 pc.	150 mm 1 pc.

*1 Total 2 pcs. of extension rods: Code No. **952621** (for measuring range 12 to 16 mm, 16 to 20 mm) and code No. **952622** (for measuring range 20 to 25 mm).

Two extension rods cannot be connected due to the different mounting positions.

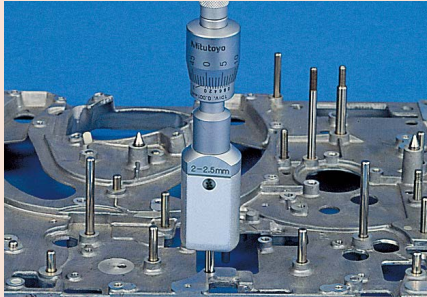
*2 The measurement range cannot be enlarged by measuring heads that are not standard-supplied (the accuracy is not guaranteed).

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 2 to 6 mm 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 6 mm range models) provide excellent durability and impact resistance.
- Three-point type can measure deep holes by attaching an extension rod (optional).



Measurement example



SPECIFICATIONS

Metric				
Code No.	Range*2 (mm)	Graduation (mm)	Maximum permissible error J_{MPE} (μm)*1	Extension Rod (optional)
(Two-point)		0.001	± 2 (maximum difference 2)	—
368-001	2 - 2.5			
368-002	2.5 - 3			
368-003	3 - 4			
368-004	4 - 5			
368-005	5 - 6			
(Three-point)		0.001	± 2 (maximum difference 2)	952322 (100 mm)
368-161	6 - 8			
368-162	8 - 10			
368-163	10 - 12			
368-164	12 - 16			
368-165	16 - 20			
368-166	20 - 25			
368-167	25 - 30			
368-168	30 - 40			
368-169	40 - 50			
368-170	50 - 63			
368-171	62 - 75	0.005	± 3 (maximum difference 3)	952621 (150 mm)
368-172	75 - 88			
368-173	87 - 100			
368-174	100 - 125			
368-175	125 - 150			
368-176	150 - 175			
368-177	175 - 200			
368-178	200 - 225			
368-179	225 - 250			
368-180	250 - 275			
368-181	275 - 300			

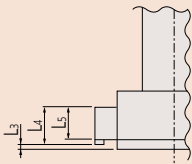
Inch				
Code No.	Range*2 (in)	Graduation (in)	Maximum permissible error J_{MPE} (in)*1	Extension Rod (optional)
(Two-point)		0.0001	± 0.0001 (maximum difference 0.0001)	—
368-021	0.08 - 0.1			
368-022	0.1 - 0.12			
368-023	0.12 - 0.16			
368-024	0.16 - 0.2			
368-025	0.2 - 0.24			
368-026	0.24 - 0.28			
(Three-point)		0.0001	± 0.0001 (maximum difference 0.0001)	952322 (100 mm)
368-261	0.275 - 0.35			
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	0.0002	± 0.00015 (maximum difference 0.00015)	952621 (150 mm)
368-267	1 - 1.2			
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			
368-274	4 - 5			
368-275	5 - 6			
368-276	6 - 7	0.0002	± 0.00025 (maximum difference 0.00025)	952623 (150 mm)
368-277	7 - 8			
368-278	8 - 9			
368-279	9 - 10			
368-280	10 - 11			
368-281	11 - 12			

*1 Additionally, the difference in permissible error allowable is limited to a value within this range, as given in parentheses, and is measured with the entire measuring surface in contact with the object measured.

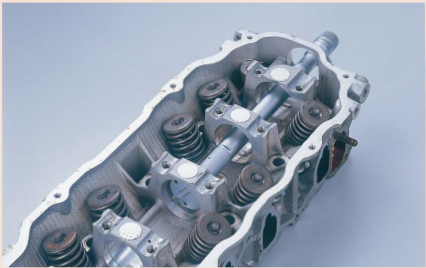
*2 The measurement range cannot be enlarged by measuring heads that are not standard-supplied (the accuracy is not guaranteed).
Note: Setting rings are optional.

Reference dimensions when measuring a blind hole

Range (mm)	L ₃ (mm)	L ₄ (mm)	L ₅ (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



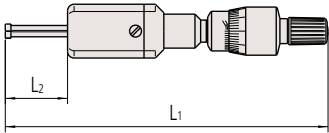
Typical application of Extension Rod



For details of Special-order Products, refer to page 13-16.

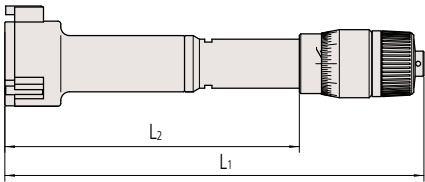
DIMENSIONS

Unit: mm



Range	L ₂	L ₁
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	L ₂	L ₁
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
SERIES 368 — Three-point/Two-point Bore Micrometers

Non-interchangeable Head Sets

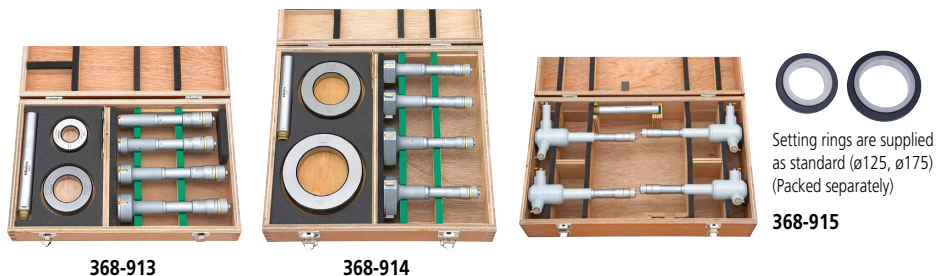


Metric			
Set code No.	Range* (mm)	Graduation (mm)	Content of Set
(Two-point)			
368-906	2 - 3	0.001	Micrometer head unit
			2 - 2.5 mm 1 pc.
			2.5 - 3 mm 1 pc.
			Setting ring (ø2.5) 1 pc.
368-907	3 - 6	0.001	Hex wrench 1 pc.
			Micrometer head unit
			3 - 4 mm 1 pc.
			4 - 5 mm 1 pc.
368-911	6 - 12	0.001	5 - 6 mm 1 pc.
			Setting ring (ø4, ø5) 1 pc. each
			Hex wrench 1 pc.
			Micrometer head unit
368-912	12 - 20	0.005	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.
			Micrometer head unit

Inch			
Set code No.	Range* (in)	Graduation (in)	Content of Set
(Two-point)			
368-926	0.08 - 0.12	0.0001	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.
368-927	0.12 - 0.28	0.0001	Hex wrench 1 pc.
			Micrometer head unit
			0.12 - 0.16 in 1 pc.
			0.16 - 0.2 in 1 pc.
368-916	0.275 - 0.5	0.0001	0.2 - 0.24 in 1 pc.
			0.24 - 0.28 in 1 pc.
			Setting ring (0.16 in DIA., 0.24 in DIA.) 1 pc. each
			Hex wrench 1 pc.
368-917	0.5 - 0.8	0.0002	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 (0.35 in DIA., 0.5 in DIA.) 1 pc. each
			Extension rod (100 mm) 1 pc.
			Spanner 2 pcs.
			Hex wrench 1 pc.
			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

* The measurement range cannot be enlarged by measuring heads that are not standard-supplied (the accuracy is not guaranteed).

Non-interchangeable Head Sets



Metric				Inch			
Set code No.	Range* (mm)	Graduation (mm)	Content of Set	Set code No.	Range* (in)	Graduation (in)	Content of Set
(Three-point)	20 - 50	0.005	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.	(Three-point)	0.8 - 2	0.0002	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.
			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.				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.
			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.				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.
368-913				368-918			
368-914				368-919			
368-915				368-920			

* The measurement range cannot be enlarged by measuring heads that are not standard-supplied (the accuracy is not guaranteed).

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).



Measurement example



Reference dimensions when measuring a blind hole

Range (mm)	L ₃ (mm)	L ₅ (mm)
12 - 20	2.6 or below	3.5
20 - 30	3.4 or below	5.2
30 - 50		10.0
50 - 100		14.0
100 - 300	19.6 or below	13.8

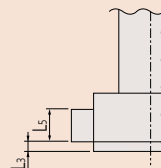
SPECIFICATIONS

Metric Individual					Inch Individual										
Code No.	Range* ² (mm)	Graduation (mm)	Maximum permissible error J_{MPE} (μm)* ¹	Extension Rod (optional)	Code No.	Range* ² (in)	Graduation (in)	Maximum permissible error J_{MPE} (in)* ¹	Extension Rod (optional)						
368-764	12 - 16	0.005	±3 (maximum difference 3)	952621 (150 mm)	368-864	0.5 - 0.65	0.0002	±0.00015 (maximum difference 0.00015)	952621 (150 mm)						
368-765	16 - 20			952622 (150 mm)	368-865	0.65 - 0.8			952622 (150 mm)						
368-766	20 - 25				368-866	0.8 - 1									
368-767	25 - 30				368-867	1 - 1.2									
368-768	30 - 40				368-868	1.2 - 1.6									
368-769	40 - 50				368-869	1.6 - 2									
368-770	50 - 63		±4 (maximum difference 4)	952623 (150 mm)	368-870	2 - 2.5		±0.0002 (maximum difference 0.0002)	952623 (150 mm)						
368-771	62 - 75				368-871	2.5 - 3									
368-772	75 - 88				368-872	3 - 3.5									
368-773	87 - 100		±5 (maximum difference 5)		368-873	3.5 - 4		±0.00025 (maximum difference 0.00025)							
368-774	100 - 125				368-874	4 - 5									
368-775	125 - 150				368-875	5 - 6									
368-776	150 - 175	±6 (maximum difference 6)			368-876	6 - 7	±0.0003 (maximum difference 0.0003)								
368-777	175 - 200				368-877	7 - 8									
368-778	200 - 225				368-878	8 - 9									
368-779	225 - 250				368-879	9 - 10									
368-780	250 - 275				368-880	10 - 11									
368-781	275 - 300				368-881	11 - 12									

*1 Additionally, the difference in permissible error allowable is limited to a value within this range, as given in parentheses, and is measured with the entire measuring surface in contact with the object measured.

*2 The measurement range cannot be enlarged by measuring heads that are not standard-supplied (the accuracy is not guaranteed).

Note: Setting rings are optional.



For details of Special-order Products, refer to page 13-16.

DIMENSIONS

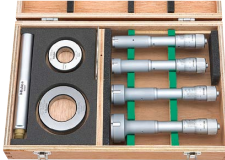
Unit: mm		Range			L ₂	L ₁
		12 - 16, 16 - 20			82	126 - 130
		20 - 25, 25 - 30			94	137 - 142
		30 - 40, 40 - 50			102	145 - 155
		50 - 63, 62 - 75, 75 - 88, 87 - 100			105	150 - 163
		100 - 125, 125 - 150, 150 - 175, 175 - 200, 200 - 225, 225 - 250, 250 - 275, 275 - 300			161	227 - 252

Note: External appearance differs depending on the measuring range.

Non-interchangeable Head Sets



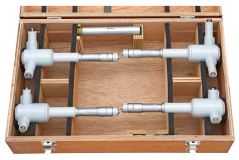
368-991



368-992



368-993



Setting rings are supplied as standard (ø125, ø175) (Packed separately)

368-994

Metric			
Code No.	Range* (mm)	Graduation (mm)	Content of Set
368-991	12 - 20	0.01	Micrometer head unit
			12 - 16 mm 1 pc.
			16 - 20 mm 1 pc.
			Setting ring (ø16) 1 pc.
			Extension rod (150 mm) 1 pc.
368-992	20 - 50	0.01	Spanner 2 pcs.
			Hex wrench 1 pc.
			Micrometer head unit
			20 - 25 mm 1 pc.
			25 - 30 mm 1 pc.
368-993	50 - 100	0.005	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.
368-994	100 - 200	0.005	Hex wrench 1 pc.
			Micrometer head unit
			100 - 125 mm 1 pc.
			125 - 150 mm 1 pc.
			150 - 175 mm 1 pc.
368-995	0.5 - 0.8	0.0002	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.

Inch			
Code No.	Range* (in)	Graduation (in)	Content 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.
368-996	0.8 - 2	0.0002	Spanner 2 pcs.
			Hex wrench 1 pc.
			Micrometer head unit
			0.8 - 1 in 1 pc.
			1 - 1.2 in 1 pc.
368-997	2 - 4	0.0002	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.
368-998	4 - 8	0.0002	Hex wrench 1 pc.
			Micrometer head unit
			4 - 5 in 1 pc.
			5 - 6 in 1 pc.
			6 - 7 in 1 pc.
368-999	8 - 12	0.0002	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.

* The measurement range cannot be enlarged by measuring heads that are not standard-supplied (the accuracy is not guaranteed).

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).



DIMENSIONS

Unit: mm

Range	L2	L1
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.

MeasurLink[®] ENABLED
Data Management Software by Mitutoyo



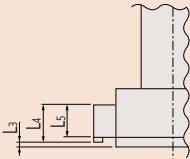
ABSOLUTE[™]

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 - 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

Code 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)
02AZD730*	IP67	U-WAVE-T
02AZD880*	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

* Add suffix to Code No.; **G** for Asia, Europe and the Americas,
H for Brazil and **J** for Korea.

For details of Special-order Products,
refer to page 13-16.

SPECIFICATIONS

Metric		Individual			
Code No.	Range*2 (mm)	Resolution (mm)	Maximum permissible error J_{MPE} (μm)*1	Mass (g)	Extension Rod (optional)
568-361-10	6 - 8	0.001	±5 (maximum difference 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		±6 (maximum difference 6)	540	952622 (150 mm)
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	

Inch / Metric		Individual			
Code No.	Range*2 (in)	Resolution	Maximum permissible error J_{MPE} (in)*1	Mass (g)	Extension Rod (optional)
568-461-10	0.275 - 0.35	0.00005 in/ 0.001 mm	±0.00025 (maximum difference 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		±0.0003 (maximum difference 0.0003)	540	952622 (150 mm)
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	

- Response speed: Unlimited
- Power source: SR44 battery (1 pc.), **938882** included as standard (for operational checks)
- Position detection method: Electrostatic capacitance type absolute encoder
- Battery life: Approx. 5 years under normal use. Approx. 10,000 hours in continuous use.

*1 Additionally, the difference in permissible error allowable is limited to a value within this range, as given in parentheses, and is measured with the entire measuring surface in contact with the object measured.

*2 The measurement range cannot be enlarged by measuring heads that are not standard-supplied (the accuracy is not guaranteed).

Note: Setting rings are optional.

ABSOLUTE Borematic
SERIES 568 — ABSOLUTE Digimatic Snap-Open Bore Gages

Interchangeable-head Bore Gage Sets

Optional Accessories
Refer to page 08-13.



568-924-10



568-926-10

Metric		
Code No.	Range (mm)	Content of Set
568-924-10	6 - 12	Display unit 1 pc.
		Measuring head 1 pc.
		6 - 8 mm 1 pc.
		8 - 10 mm 1 pc.
		10 - 12 mm 1 pc.
		Attachment 1 pc.
568-925-10	12 - 25	Setting ring (ø8, ø10) 1 pc. each
		Spanner 3 pcs.
		Display unit 1 pc.
		Measuring head 1 pc.
		12 - 16 mm 1 pc.
		16 - 20 mm 1 pc.
568-926-10	25 - 50	20 - 25 mm 1 pc.
		Attachment 2 pcs.
		Setting ring (ø16, ø20) 1 pc. each
		Spanner 2 pcs.
		Display unit 1 pc.
		Measuring head 1 pc.
568-927-10	50 - 100	25 - 30 mm 1 pc.
		30 - 40 mm 1 pc.
		40 - 50 mm 1 pc.
		Attachment 1 pc.
		Setting ring (ø30, ø40) 1 pc. each
		Spanner 2 pcs.

Inch / Metric		
Code No.	Range (in)	Content of Set
568-928-10	0.275 - 0.5	Display unit 1 pc.
		Measuring head 1 pc.
		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 1 pc.
		0.5 - 0.65 in 1 pc.
		0.65 - 0.8 in 1 pc.
568-930-10	1 - 2	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.
		Display unit 1 pc.
		Measuring head 1 pc.
568-936-10	2 - 4	1 - 1.2 in 1 pc.
		1.2 - 1.6 in 1 pc.
		1.6 - 2 in 1 pc.
		Attachment 1 pc.
		Setting ring (1.2 in DIA., 1.6 in DIA.) 1 pc. each
		Spanner 2 pcs.

Non-interchangeable-head Snap-open Bore Gage Sets

Each set includes complete gages (display units and measuring heads for each size).



Metric		
Code No.	Range (mm)	Content 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.

Inch / Metric		
Code No.	Range (in)	Content 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.
		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.

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 Gauge Block Accessory Set, CERA inside Micro Checker or a setting ring, is required for accurately setting the micrometer before measuring. (refer to pages 01-19 to 01-22, 08-30, and 08-53 for details)



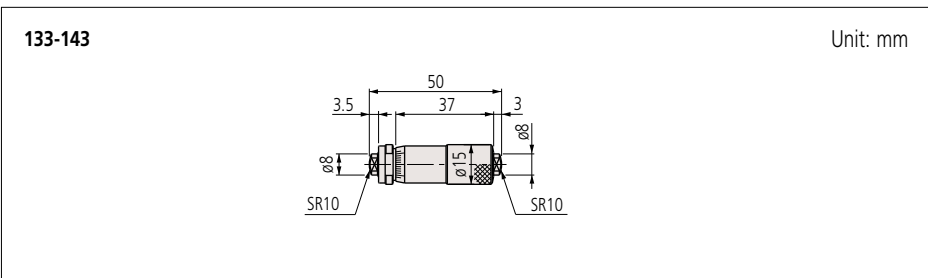
133-143

SPECIFICATIONS

Metric Individual			
Code No.	Range (mm)	Graduation (mm)	Maximum permissible error <i>J_{MPE}</i> (μm)
133-143	50 - 75	0.01	±3

Inch Individual			
Code No.	Range (in)	Graduation (in)	Maximum permissible error <i>J_{MPE}</i> (in)
133-223	2 - 3	0.001	±0.00015

DIMENSIONS



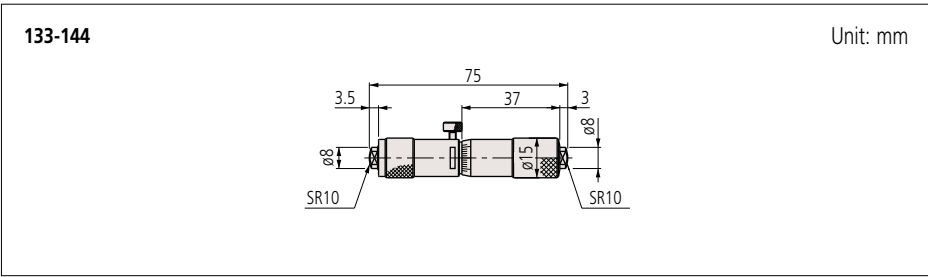
133-144

SPECIFICATIONS

Metric Individual			
Code No.	Range (mm)	Graduation (mm)	Maximum permissible error <i>J_{MPE}</i> (μm)
133-144	75 - 100	0.01	±4

Inch Individual			
Code No.	Range (in)	Graduation (in)	Maximum permissible error <i>J_{MPE}</i> (in)
133-224	3 - 4	0.001	±0.0002

DIMENSIONS



Measurement example



Micrometer Set



- 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

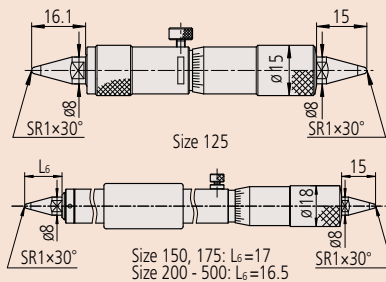
- 133-903 (Inch)**
• Range: 2 - 6 in (4 heads/set)
• Models included:
133-223 133-224
133-225 133-226
with fitted case

- 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

Special sizes and specifications other than standard can be custom-made by special order. Please contact your local Mitutoyo Sales Office for more information.

Example

Measuring face: point
For models with a measuring range 100 - 500 mm



133-152

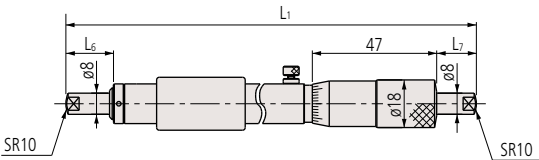
SPECIFICATIONS

Metric	Individual		
Code No.	Range (mm)	Graduation (mm)	Maximum permissible error J_{MPE} (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		
133-152	275 - 300		±7
133-153	300 - 325		
133-154	325 - 350		±8
133-155	350 - 375		
133-156	375 - 400		±9
133-157	400 - 425		
133-158	425 - 450		
133-159	450 - 475		±10
133-160	475 - 500		
133-161	500 - 525		±11
133-162	525 - 550		
133-163	550 - 575		±12
133-164	575 - 600		
133-165	600 - 625		±13
133-166	625 - 650		
133-167	650 - 675		±14
133-168	675 - 700		
133-169	700 - 725		±15
133-170	725 - 750		
133-171	750 - 775		±16
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		

Inch Individual			
Code No.	Range (in)	Graduation (in)	Maximum permissible error J_{MPE} (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		± 0.0003
133-230	9 - 10		
133-231	10 - 11		
133-232	11 - 12		

DIMENSIONS

133-145 to 133-180



Unit: mm

Code 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 Gauge Block Accessory Set, CERA inside Micro Checker or a setting ring (nominal size 300 mm or less), is required for accurately setting the micrometer before measuring. (refer to pages 01-19 to 01-22, and 08-53 for details)



SPECIFICATIONS

Metric							
Code No.	Range (mm)	Resolution (mm)	Spindle feed error* (μm)	Micrometer head stroke (mm)	Extension rods		Display unit (mm)
					Qty	Size (mm)	
337-101	200 - 225	0.001	3	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.)	

Inch / Metric							
Code No.	Range (in)	Resolution	Spindle feed error* (in)	Micrometer head stroke (in)	Extension rods		Display unit (in)
					Qty	Size (in)	
337-102	8 - 9	0.0001 in/ 0.001 mm	0.00015	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.)	

- Power source: SR44 battery (1 pc.), 938882 included as standard (for operational checks)
 - Battery life: Approx. 1.2 years under normal use
 - Position detection method: Electromagnetic induction-type rotary encoder
- * "Spindle feed error" refers to the difference between the maximum and minimum indication error values within the measuring range of the micrometer head

MeasurLink[®] ENABLED
Data Management Software by Mitutoyo



Applicable models:
SERIES 337



Measurement example



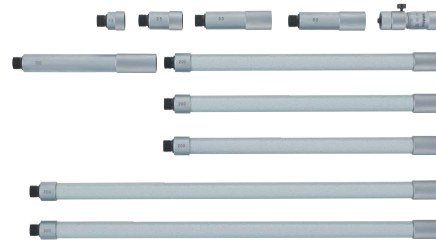
Functions

- Zero-setting
- Origin restoration
- Data hold
- 2-point Preset
- Function lock
- Automatic power ON/OFF
- Error alarm
- Data output

Optional Accessories

Code 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

* Add suffix to Code No.; **G** for Asia, Europe and the Americas,
H for Brazil and **J** for Korea.



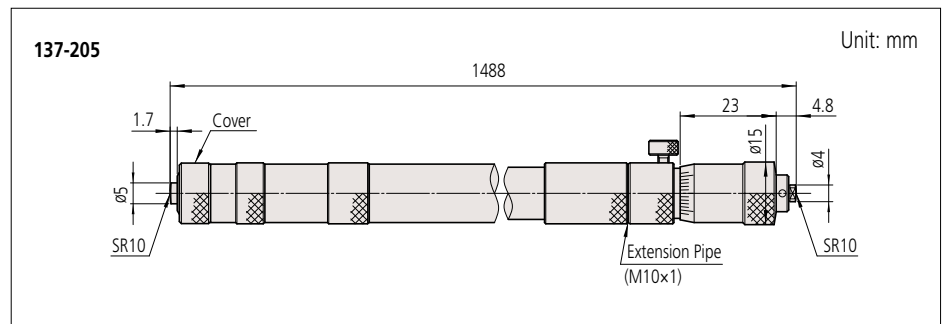
137-205

SPECIFICATIONS

Metric							
Code No.	Range (mm)	Graduation (mm)	Spindle feed error* (μm)	Micrometer head stroke (mm)	Extension rods		Main unit (mm)
					Qty	Size (mm)	
137-201	50 - 150	0.01	3	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	3	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.)	
Inch							
Code No.	Range (in)	Graduation (in)	Spindle feed error* (in)	Micrometer head stroke (in)	Extension rods		Main unit (in)
					Qty	Size (in)	
137-211	2 - 6	0.001	0.00015	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	0.00015	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.)	

* "Spindle feed error" refers to the difference between the maximum and minimum indication error values within the measuring range of the micrometer head

DIMENSIONS



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 Gauge Block Accessory Set or a setting ring, is required for accurately setting the micrometer before measuring. (refer to pages 01-19 to 01-22 and 08-53 for details)



137-011

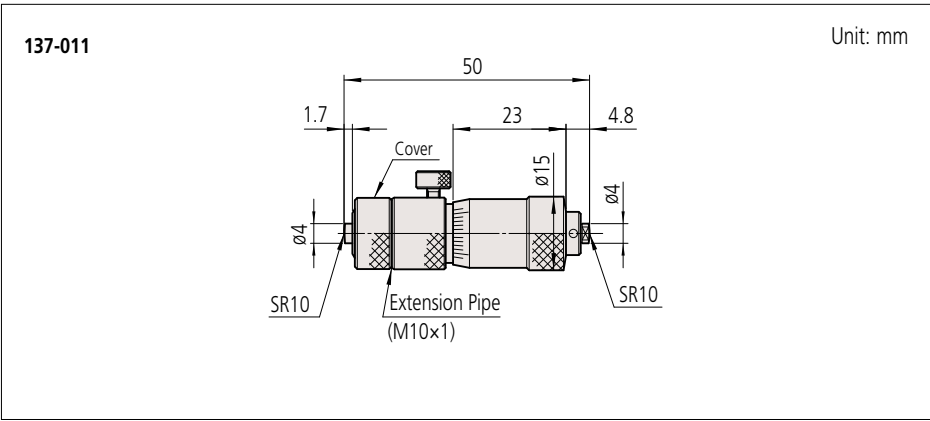
SPECIFICATIONS

Metric				
Code No.	Range (mm)	Spindle feed error* (μm)	Graduation (mm)	Micrometer head stroke (mm)
137-011	50 - 63	3	0.01	13
Carbide-tipped 137-013				

Inch				
Code No.	Range (in)	Spindle feed error* (in)	Graduation (in)	Micrometer head stroke (in)
137-012	2 - 2.5	0.00015	0.001	0.5
Carbide-tipped 137-014				

* "Spindle feed error" refers to the difference between the maximum and minimum indication error values within the specification range of the micrometer head

DIMENSIONS



Measurement example



Functions

Zero-setting
Origin restoration
Data hold
Function lock
Automatic power ON/OFF
2-point Preset
Error alarm
Data output

Optional Accessories

Code 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

* Add suffix to Code No.; **G** for Asia, Europe and the Americas,
H for Brazil and **J** for Korea.

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.



339-301

SPECIFICATIONS

Metric							
Code No.	Range (mm)	Resolution (mm)	Spindle feed error* (μm)	Micrometer head stroke (mm)	Qty	Extension pipes Size (mm)	Display unit (mm)
339-101	200 - 225	0.001	3	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.)	

Inch/Metric							
Code No.	Range (in)	Resolution	Spindle feed error* (in)	Micrometer head stroke (in)	Qty	Extension pipes Size (in)	Display unit (in)
339-102	8 - 9	0.0001 in/ 0.001 mm	0.00015	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.)	

- Power source: SR44 battery (1 pc.), **938882** included as standard (for operational checks)
- Battery life: Approx. 1.2 years under normal use
- Position detection method: Electromagnetic induction-type rotary encoder
- * "Spindle feed error" refers to the difference between the maximum and minimum indication error values within the measuring range of the micrometer head

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.



139-177

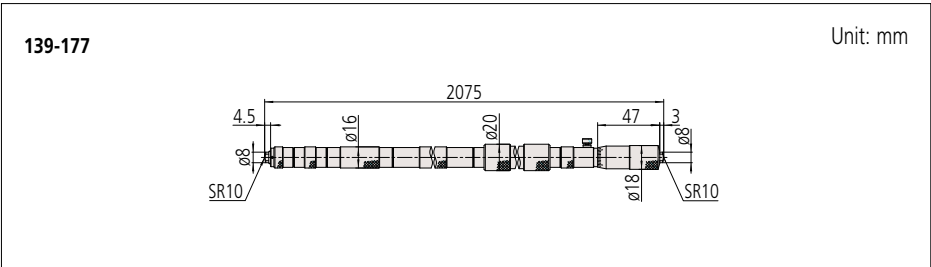
SPECIFICATIONS

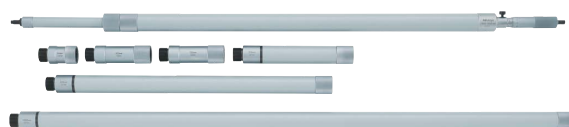
Metric							
Code No.	Range (mm)	Graduation (mm)	Spindle feed error* (μm)	Micrometer head stroke (mm)	Extension pipes		Main unit (mm)
					Qty	Size (mm)	
139-173	100 - 500	0.01	3	25	4	25, 50, 100, 200	100 - 125
139-174	100 - 900				5	25, 50, 100, 200, 400	
139-175	100 - 1300				6	25, 50, 100, 200, 400 (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.)	

Inch							
Code No.	Range (in)	Graduation (in)	Spindle feed error* (in)	Micrometer head stroke (in)	Extension pipes		Main unit (in)
					Qty	Size (in)	
139-178	4 - 20	0.001	0.00015	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.)	

* "Spindle feed error" refers to the difference between the maximum and minimum indication error values within the measuring range of the micrometer head

DIMENSIONS





140-158

SPECIFICATIONS

Metric

Code No.	Range (mm)	Graduation (mm)	Spindle feed error* (μm)	Micrometer head stroke (mm)	Extension pipes		Main unit (mm)
					Qty	Size (mm)	
140-157	1000 - 2000	0.01	6	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.)	

Inch

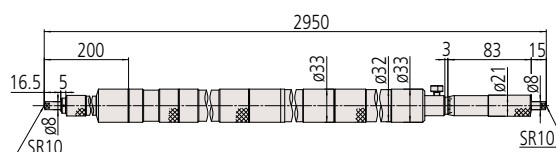
Code No.	Range (in)	Graduation (in)	Spindle feed error* (in)	Micrometer head stroke (in)	Extension pipes		Main unit (in)
					Qty	Size (in)	
140-161	40 - 80	0.001	0.0003	2	5	2, 4 (2 pcs.), 8, 20	40 - 42
140-162	40 - 120				6	2, 4 (2 pcs.), 8, 20, 40	
140-163	40 - 160				7	2, 4 (2 pcs.), 8, 20, 40 (2 pcs.)	
140-164	40 - 200				8	2, 4 (2 pcs.), 8, 20, 40 (3 pcs.)	

* "Spindle feed error" refers to the difference between the maximum and minimum indication error values within the measuring range of the micrometer head

DIMENSIONS

140-158

Unit: mm



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 Gauge Block Accessory Set, CERA Inside Micro Checker or a setting ring, is required for accurately setting the micrometer before measuring. (refer to pages 01-19 to 01-22, 08-30, and 08-53 for details)



139-001

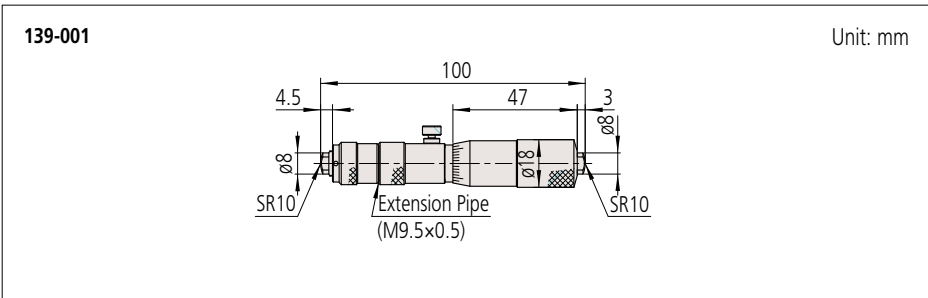
SPECIFICATIONS

Metric				
Code No.	Range (mm)	Spindle feed error* (μm)	Graduation (mm)	Micrometer head stroke (mm)
139-001	100 - 125	3	0.01	25

Inch				
Code No.	Range (in)	Spindle feed error* (in)	Graduation (in)	Micrometer head stroke (in)
139-002	4 - 5	0.00015	0.001	1

* "Spindle feed error" refers to the difference between the maximum and minimum indication error values within the specification range of the micrometer head

DIMENSIONS



Measurement example



Optional Accessories

Code 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
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

* Add suffix to Code No.; **G** for Asia, Europe and the Americas, **H** for Brazil and **J** for Korea.

- 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 Gauge Block Accessory Set, CERA Inside Micro Checker (more than 25 mm) or a setting ring (nominal size below 300 mm), is required for accurately setting the micrometer before measuring. (refer to pages 01-19 to 01-22, 08-30, and 08-53 for details)



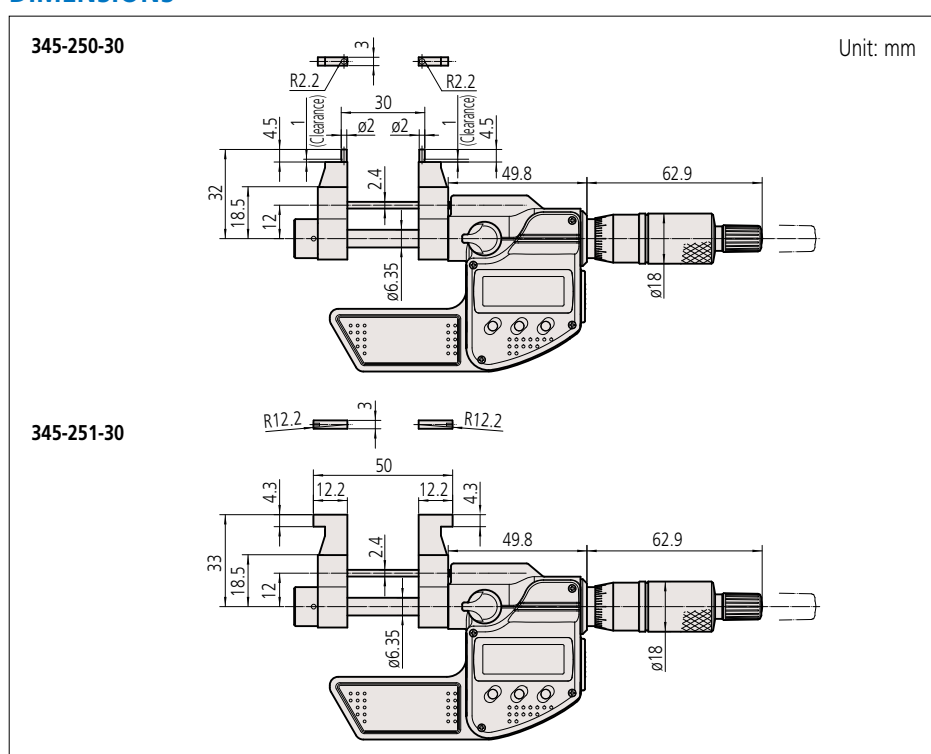
SPECIFICATIONS

Metric					
Code No.	Range (mm)	Resolution (mm)	Maximum permissible error J_{MPE} (μm)	Jaw	Mass (g)
345-250-30	5 - 30	0.001	±5	Pin	320
345-251-30	25 - 50		±6	Anvil	325

Inch / Metric					
Code No.	Range (in)	Resolution	Maximum permissible error J_{MPE} (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

- Power source: SR44 battery (1 pc.), **938882** included as standard (for operational checks)
 - Battery life: Approx. 2.4 years under normal use
 - Position detection method: Electromagnetic induction-type rotary encoder
- Note 1: For the functions, refer to **SERIES 293** with SPC data output on page 02-7.
 This model is NOT water-proof. Also, the original setting is the free preset type.
- Note 2: The minimum pitch circle measurement is $\varnothing 5$ mm with pin type (**345-250-30**, **345-350-30**).

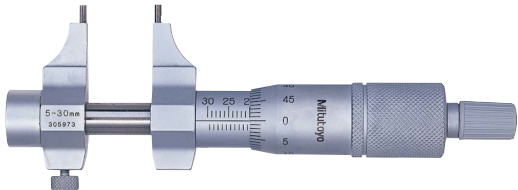
DIMENSIONS



Inside Micrometers

Inside Micrometers
SERIES 145 — Caliper Type

- This is an analog version of the SERIES 345 calliper type micrometer for inside measurement.
- Carbide-tipped measuring faces.
- Equipped with a constant measuring-force device.
- An optional reference gage, such as Gauge Block Accessory Set, CERA Inside Micro Checker (more than 25 mm) or a setting ring (nominal size below 300 mm), is required for accurately setting the micrometer before measuring. (refer to pages 01-19 to 01-22, 08-30, and 08-53 for details)



145-185

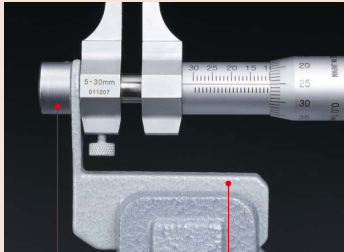
SPECIFICATIONS

Metric					
Code No.	Range (mm)	Graduation (mm)	Maximum permissible error <i>J_{MPE}</i> (μm)	Jaw	Mass (g)
145-185	5 - 30	0.01	±5	Pin	130
145-186	25 - 50		±6	Anvil	140

Inch					
Code No.	Range (in)	Graduation (in)	Maximum permissible error <i>J_{MPE}</i> (in)	Jaw	Mass (g)
145-193	0.2 - 1.2	0.001	±0.00025	Pin	130
145-194	1 - 2		±0.0003	Anvil	140

Note: The minimum pitch circle measurement is ø5 mm with pin type (145-185, 145-193).

Accessories for 145-185/186/193/194
(optional)



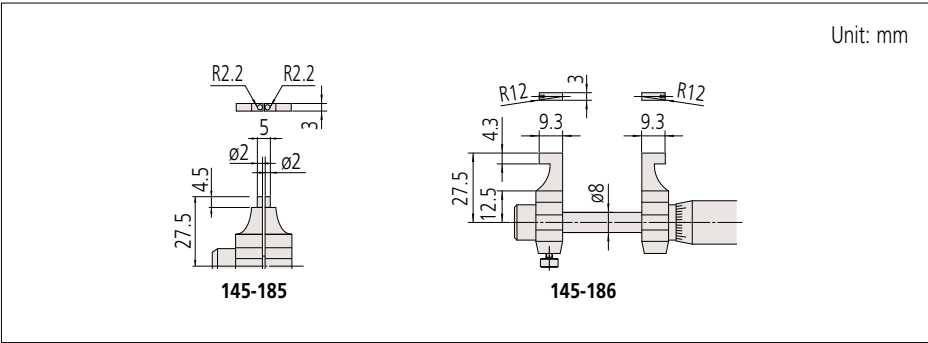
Cap (300401) Holder (300400)

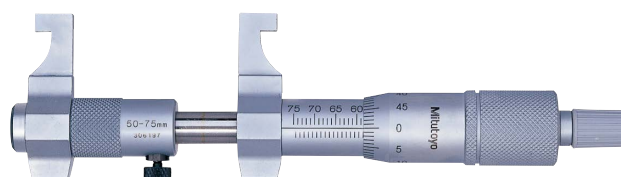
Note 1: This instrument requires the cap and the holder for mounting on a micrometer stand.
Note 2: It may not be applicable to a custom specification.

Optional Accessories

Refer to page 08-26.

DIMENSIONS





145-187

SPECIFICATIONS

Metric

Code No.	Range (mm)	Graduation (mm)	Maximum permissible error J_{MPE} (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				230
145-191	150 - 175		± 10		250
145-192	175 - 200				270
145-217	200 - 225		± 11		310
145-218	225 - 250				330
145-219	250 - 275		± 12		350
145-220	275 - 300				370
145-221	300 - 325		± 16		390
145-222	325 - 350				410
145-223	350 - 375				430
145-224	375 - 400		± 21		450
145-225	400 - 425				470
145-226	425 - 450				490
145-227	450 - 475				510
145-228	475 - 500				530

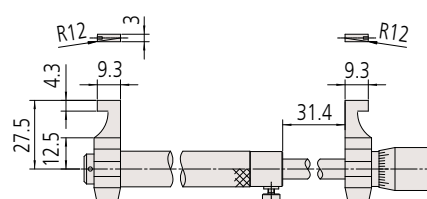
Inch

Code No.	Range (in)	Graduation (in)	Maximum permissible error J_{MPE} (in)	Jaw	Mass (g)
145-195	2 - 3	0.001	± 0.00035	Anvil	160
145-196	3 - 4		± 0.0004		180

DIMENSIONS

145-187 to 145-220

Unit: mm

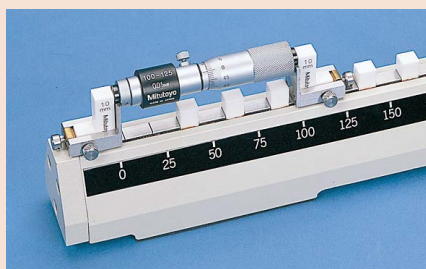


Inside Micrometers





Measurement example



Standard accessory set



Support clamps **940286*** Pair
 Auxiliary block 10 mm **602195** 2 pcs.
 Collar **60324** 1 pc.
 Clamp screwdriver **600324** 1 pc.
 * Code No. is equivalent to a pair (2 pcs.)

Wooden box (optional)

602160 (for 515-585)
602163 (for 515-586)

CERA Inside Micro Checker SERIES 515

- The Inside Micro Checker is designed to act as a setting standard for inside micrometers.
- Applicable for SERIES **133**, **139** and **145** (over 50 mm). Not applicable for SERIES **137**, **141**, **337** and **339**.



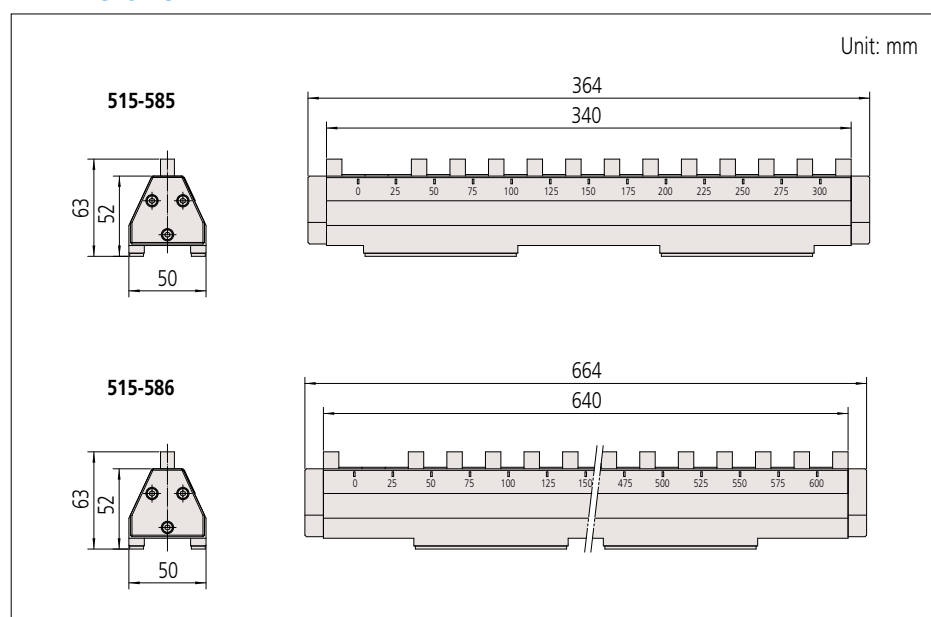
515-585

SPECIFICATIONS

Code 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: Please note that the bottom surface and the contact faces are not precisely perpendicular to each other.

DIMENSIONS



Bore Gages

Bore Gages SERIES 526 — for Extra Small Holes

- This bore gage is designed to measure small holes of 1 to 7 mm diameter.
- The dial indicator is optional. Refer to page 08-52 for recommended indicators.
- Optional stand (**215-120-10**) is available for efficient measurement of multiple small holes.



526-170-11

Note: The dial indicator and the dial protection cover are optional.
Refer to page 08-52 for details.

SPECIFICATIONS

Metric							
Code 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	2109AB-10 (Graduation: 0.001 mm)	21DZA000	
526-162-20	1.50 - 3.95	4		526-160-10			
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	
526-163-20	1.50 - 3.95	4		526-160-10			
526-153-20	3.70 - 7.30	6		526-150-10			
526-170-11	0.95 - 1.55	4		526-170-10	Not supplied	Not supplied	Supplied
526-160-11	1.50 - 3.95	4		526-160-10			
526-150-11	3.70 - 7.30	6		526-150-10			
526-172-21	0.95 - 1.55	4		526-170-10	2109AB-10 (Graduation: 0.001 mm)	21DZA000	
526-162-21	1.50 - 3.95	4		526-160-10			
526-152-21	3.70 - 7.30	6		526-150-10			
526-173-21	0.95 - 1.55	4		526-170-10	2046AB (Graduation: 0.01 mm)	21DZA000	
526-163-21	1.50 - 3.95	4		526-160-10			
526-153-21	3.70 - 7.30	6		526-150-10			

Inch								
Code 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	2923AB-10 (Graduation: 0.0001 in)	21DZA000		
526-166-20	0.059 - 0.156	0.00016		526-165-10				
526-156-20	0.146 - 0.287	0.00024		526-155-10	Not supplied	Not supplied	Supplied	
526-175-11	0.037 - 0.061	0.00016		526-175-10				
526-165-11	0.059 - 0.156	0.00016		526-165-10	2923AB-10 (Graduation: 0.0001 in)	21DZA000		
526-155-11	0.146 - 0.287	0.00024		526-155-10				
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				

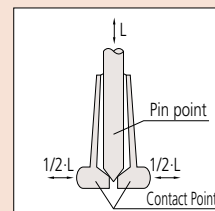
* Accuracy of the bore gage alone.

Note: Setting rings are not supplied with some models. Please purchase them separately if necessary. For details of setting rings, refer to page 08-53.

Measurement example



Measurement Principle



Setting Rings (Metric)

Nominal size

- Code 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

- Code 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

- Code 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

Setting Rings (Inch)

Nominal size

- Code 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

- Code 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

- Code No. 526-155-11 etc.

177-364: 0.16 in

177-365: 0.18 in

177-366: 0.20 in

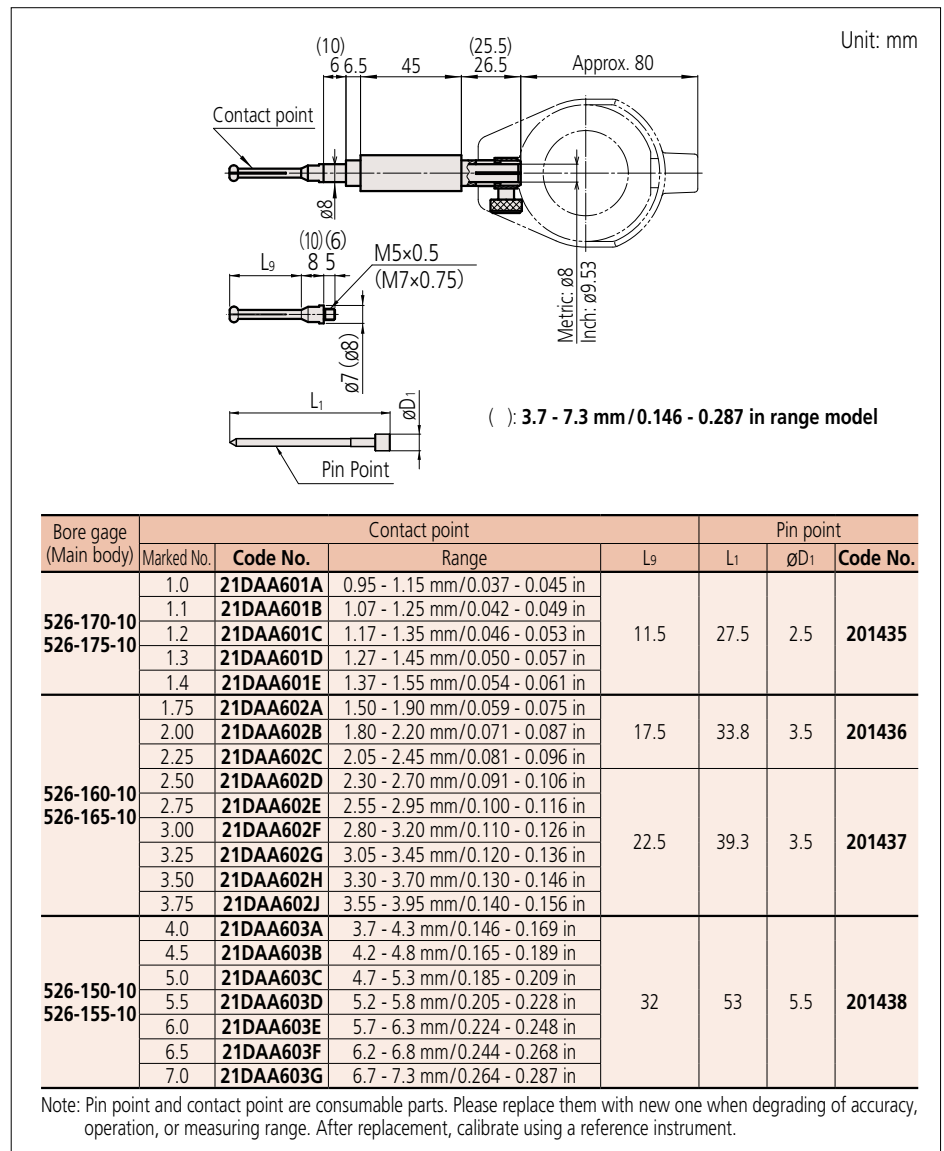
177-367: 0.22 in

177-368: 0.24 in

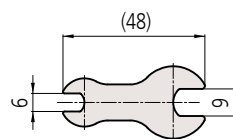
177-369: 0.26 in

177-370: 0.28 in

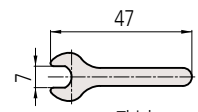
DIMENSIONS



Spanner
210188

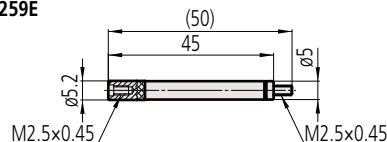


102148

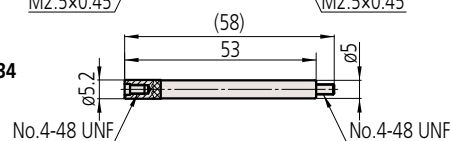


Thickness: 1.5

Extension rod
21AAA259E



213634



() : 3.7 - 7.3 mm / 0.146 - 0.287 in range model

Bore gage	Spanner	Extension rod
526-170-10	210188	21AAA259E
526-160-10	102148	
526-150-10	102148	
526-175-10	210188	213634
526-165-10	102148	
526-155-10	102148	

Note: This is not a component for extending the probing depth. (Standard Accessory)

Bore Gages

Bore Gages
SERIES 526 — for Extra Small Holes

- This bore gage is designed to measure small holes of 7 to 18 mm diameter.
- The dial indicator is optional. Refer to page 08-52 for recommended indicators.
- Optional stand (215-120-10) is available for efficient measurement of multiple small holes.



526-101

Note: The dial indicator and the dial protection cover are optional.
Refer to page 08-52 for details.

SPECIFICATIONS

Metric							
Code 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)		
526-127-20	10 - 18	6		526-102			
Inch							
Code 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)		
526-120-20	0.4 - 0.7	0.00024		526-104			

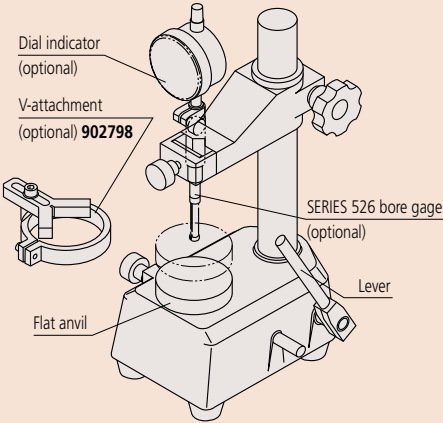
* Accuracy of the bore gage alone.
Note: Setting rings are not supplied.
Please purchase them separately if necessary. For details of the setting rings, refer to page 08-53.

DIMENSIONS

Bore Gage Stand
SERIES 215

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 workpiece.



- Optimal for efficient measurement of multiple small holes with a bore gage. (SERIES 526)

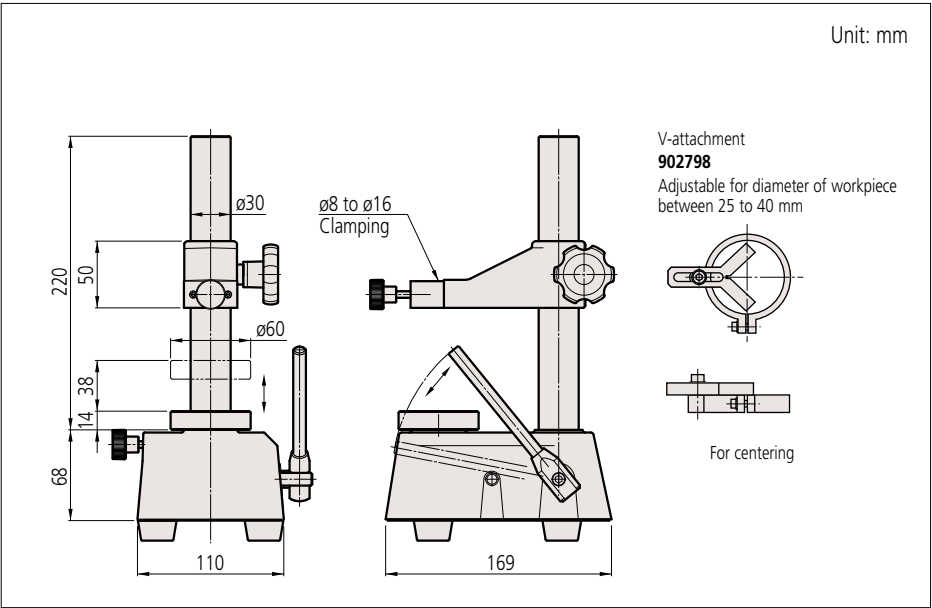


215-120-10

SPECIFICATIONS

Code No.	Measuring table displacement (mm)	Measuring table
215-120-10	38	Anvil (ø60 mm)

DIMENSIONS



Bore Gages

Bore Gages SERIES 511 — for Small Holes

- This bore gage is designed to measure the diameters of very small holes.
- The dial indicator is optional. Refer to page 08-52 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 08-53 to 08-55.



511-201

Note: The dial indicator and the dial protection cover are optional.
Refer to page 08-52 for details.

SPECIFICATIONS

Metric							
Code 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

Code No.	Content 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

Inch							
Code 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

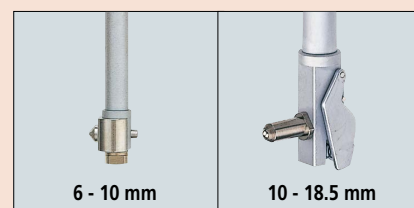
Code No.	Content of set					Probing depth (in)
	Bore gage	Dial indicator	Dial protection cover	Anvil	Interchangeable Washer	
511-214	511-214	Not supplied	Not supplied	9 pcs.	Not supplied	2
511-205	511-205				1 pc.	4
511-212-20	511-214	2923AB-10 (Graduation: 0.0001 in)	21DZA000	9 pcs.	Not supplied	2
511-206-20	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

* Accuracy of the bore gage alone.

Measurement example



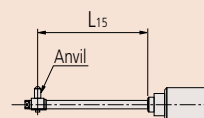
Contact Points



The dial protection cover, recommended indicators

Refer to page 08-52.

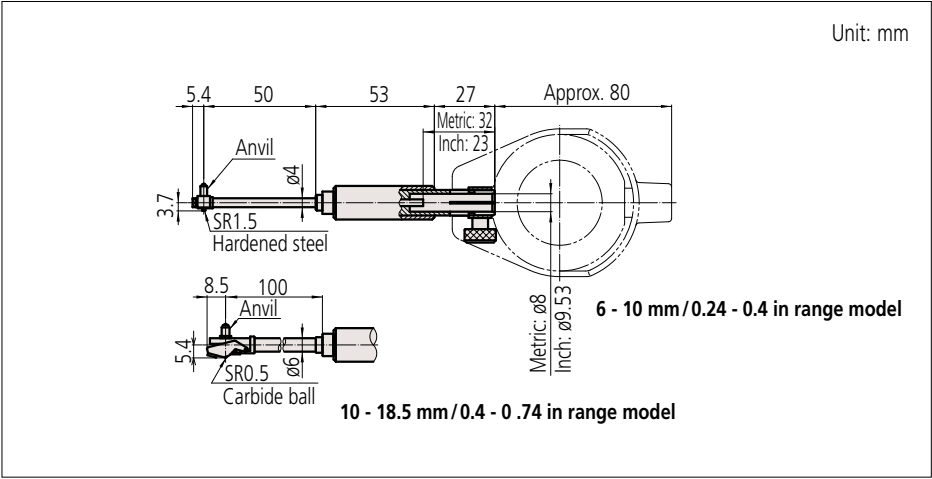
Example



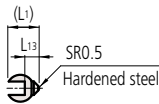
Length below the grip

Model	L15 (mm)
511-209	100, 150, 200, 250
511-201	50, 150, 200, 250, 300

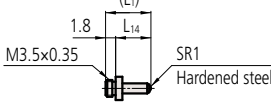
DIMENSIONS



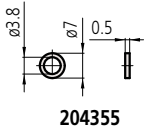
511-209 / 511-214
Anvil



511-201 / 511-205
Anvil



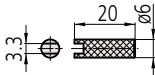
Interchangeable washer
(Supplied only with 511-201 / 511-205)



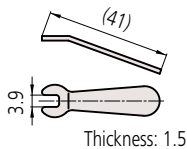
STANDARD ACCESSORIES

Bore gage (Main body)	Anvil					Interchangeable Washer	Spanner
	Marked No.	Code No.	Indication of measuring size	L ₁	L ₁₃	Code No.	Code No.
511-209 511-214	1	952168	6.0 mm / 0.24 in	4.7	1.2	Not supplied	206709
	2	952169	6.5 mm / 0.26 in	5.3	1.7		
	3	952170	7.0 mm / 0.28 in	5.8	2.2		
	4	952414	7.5 mm / 0.30 in	6.3	2.7		
	5	952415	8.0 mm / 0.32 in	6.8	3.2		
	6	952416	8.5 mm / 0.34 in	7.3	3.7		
	7	952417	9.0 mm / 0.36 in	7.8	4.2		
	8	952418	9.5 mm / 0.38 in	8.3	4.7		
	9	952419	10.0 mm / 0.40 in	8.8	5.2		
Bore gage (Main body)	Anvil					Interchangeable Washer	Spanner
	Marked No.	Code No.	Indication of measuring size	L ₁	L ₁₄	Code No.	Code No.
511-201 511-205	1	204356	10 mm / 0.40 in	3.8	2	204355	204354
	2	204357	11 mm / 0.44 in	4.8	3		
	3	204358	12 mm / 0.48 in	5.8	4		
	4	204359	13 mm / 0.52 in	6.8	5		
	5	204360	14 mm / 0.56 in	7.8	6		
	6	204361	15 mm / 0.60 in	8.8	7		
	7	204362	16 mm / 0.64 in	9.8	8		
	8	204363	17 mm / 0.68 in	10.8	9		
	9	204364	18 mm / 0.72 in	11.8	10		

Spanner
206709



204354



Unit: mm

Bore Gages

Bore Gages SERIES 511

- This is a bore gage for measuring 18 to 400 mm inside diameter. 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.



511-702

Note: The dial indicator and the dial protection cover are optional. Refer to page 08-52 for details.

SPECIFICATIONS

Metric										
Code No.	Range (mm)	Stroke of contact point (mm)	Accuracy* (μm)	Repeatability* (μm)	Adjacent error* (μm)	Measuring force (N)	Guide force (N)			
511-701	18 - 35	1.2	2	0.5	1	4 or less	6 or less			
511-702	35 - 60									
511-703	50 - 150	1.6				5 or less	10 or less			
511-704	100 - 160									
511-705	160 - 250					6 or less	15 or less			
511-706	250 - 400									
511-721-20	18 - 35	1.2	2	0.5	1	4 or less	6 or less			
511-722-20	35 - 60									
511-723-20	50 - 150	1.6				5 or less	10 or less			
511-724-20	100 - 160									
511-725-20	160 - 250					6 or less	15 or less			
511-726-20	250 - 400									
511-711-20	18 - 35	1.2	2	0.5	1	4 or less	6 or less			
511-712-20	35 - 60									
511-713-20	50 - 150	1.6				5 or less	10 or less			
511-714-20	100 - 160									
511-715-20	160 - 250					6 or less	15 or less			
511-716-20	250 - 400									
511-921-20	18 - 150	See SPECIFICATIONS of 511-701/702/703								
511-922-20										
511-925-10										

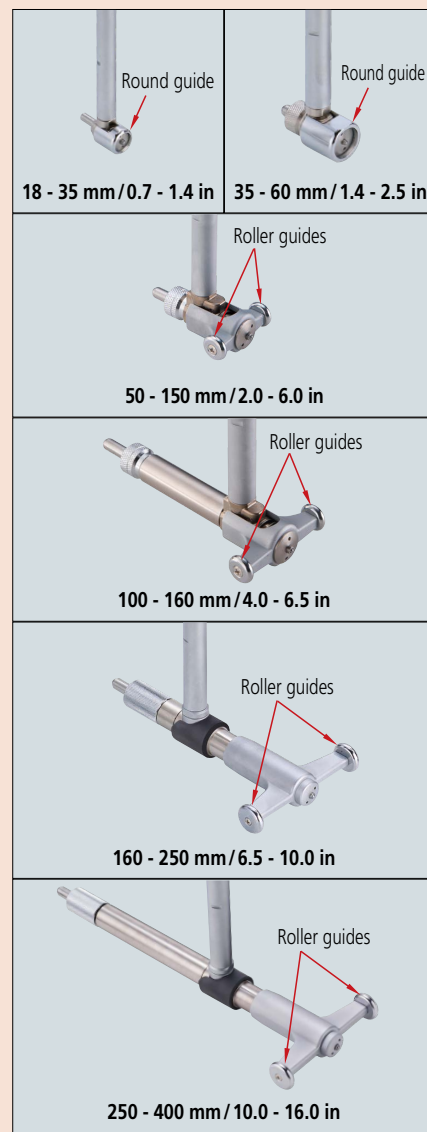
Code No.	Content of set							Probing depth (mm)	
	Bore gage	Dial indicator	Dial protection cover	Anvil	Interchangeable Washer	Sub-Anvil	Spanner		
511-701	511-701	Not supplied	Not supplied	9 pcs.	2 pcs.	Not supplied	1 pc.	100	
511-702	511-702			6 pcs.	4 pcs.	Not supplied	Not supplied	150	
511-703	511-703			11 pcs.					
511-704	511-704			13 pcs.	7 pcs.	Not supplied		250	
511-705	511-705			6 pcs.					
511-706	511-706			5 pcs.		1 pc.			
511-721-20	511-701	2109AB-10 (Graduation: 0.001 mm)	21DZA000	9 pcs.	2 pcs.	Not supplied	1 pc.	100	
511-722-20	511-702			6 pcs.	4 pcs.	Not supplied	Not supplied	150	
511-723-20	511-703			11 pcs.		1 pc.			
511-724-20	511-704			13 pcs.	7 pcs.	Not supplied		250	
511-725-20	511-705			6 pcs.					
511-726-20	511-706			5 pcs.		1 pc.			
511-711-20	511-701	2046AB (Graduation: 0.01 mm)	21DZA000	9 pcs.	2 pcs.	Not supplied	1 pc.	100	
511-712-20	511-702			6 pcs.	4 pcs.	Not supplied	Not supplied	150	
511-713-20	511-703			11 pcs.		1 pc.			
511-714-20	511-704			13 pcs.	7 pcs.	Not supplied		250	
511-715-20	511-705			6 pcs.					
511-716-20	511-706			5 pcs.		1 pc.			
511-921-20	Set of	2046AB	21DZA000	See SPECIFICATIONS of 511-701/702/703					
511-922-20	511-701/	2109AB-10							
511-925-10	702/703	543-310B							

* Accuracy of the bore gage alone.

Note 1: A 50 mm sub-anvil is supplied with 511-703, and a 75 mm sub-anvil is supplied with 511-706.

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 08-51.

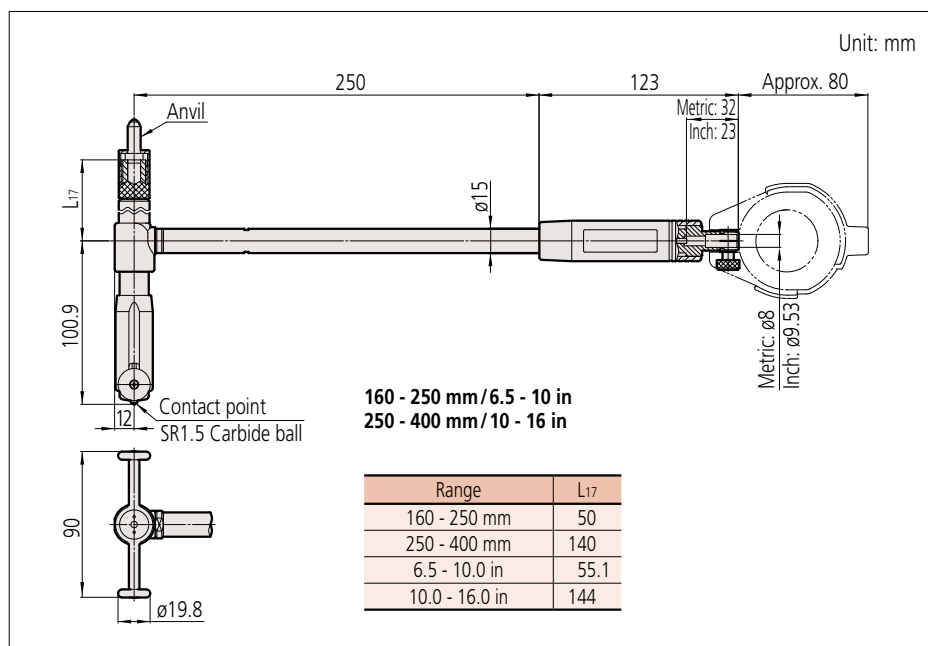
The dial protection cover, recommended indicators

Refer to page 08-52.

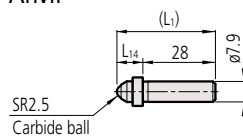
Setting rings

Refer to pages 08-53 to 08-56.

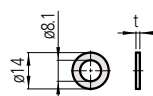
DIMENSIONS



Anvil



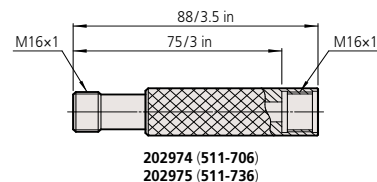
Interchangeable washer



t (mm)	Code 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)**



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.	Code No.	Indication of measuring size	L1	L14
511-705 511-735	1	21DZA241A	160 mm/6.50 in	38	10
	2	21DZA241B	175 mm/7.09 in	53	25
	3	21DZA241C	190 mm/7.68 in	68	40
	4	21DZA241D	205 mm/8.27 in	83	55
	5	21DZA241E	220 mm/8.86 in	98	70
	6	21DZA241F	235 mm/9.45 in	113	85
511-706 511-736 () Using 75 mm/3 in Sub-Anvil	1	21DZA241A	250 mm (325 mm)/10.00 in (13.00 in)	38	10
	2	21DZA241B	265 mm (340 mm)/10.59 in (13.59 in)	53	25
	3	21DZA241C	280 mm (355 mm)/11.18 in (14.18 in)	68	40
	4	21DZA241D	295 mm (370 mm)/11.77 in (14.77 in)	83	55
	5	21DZA241E	310 mm (385 mm)/12.36 in (15.36 in)	98	70

Bore Gages

Bore Gages
SERIES 511 — Short Leg Type

- This is a bore gage for measuring 18 to 160 mm inside diameter.
- 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.



511-761

Note: The dial indicator and the dial protection cover are optional.
Refer to page 08-52 for details.

SPECIFICATIONS

Metric							
Code No.	Range (mm)	Stroke of contact point (mm)	Accuracy* (μm)	Repeatability* (μm)	Adjacent error* (μm)	Measuring force (N)	Guide force (N)
511-761	18 - 35	1.2	2	0.5	1	4 or less	6 or less
511-762	35 - 60					5 or less	10 or less
511-763	50 - 150	1.6	2	0.5	1	4 or less	6 or less
511-764	100 - 160					5 or less	10 or less
511-771-20	18 - 35	1.2	2	0.5	1	4 or less	6 or less
511-772-20	35 - 60					5 or less	10 or less
511-773-20	50 - 150	1.6	2	0.5	1	4 or less	6 or less
511-774-20	100 - 160					5 or less	10 or less
511-766-20	18 - 35	1.2	2	0.5	1	4 or less	6 or less
511-767-20	35 - 60					5 or less	10 or less
511-768-20	50 - 150	1.6	2	0.5	1	4 or less	6 or less
511-769-20	100 - 160					5 or less	10 or less

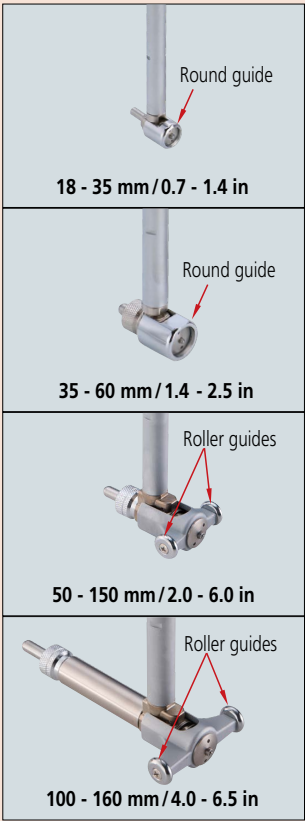
Code No.	Content of set							Probing depth (mm)
	Bore gage	Dial indicator	Dial protection cover	Anvil	Interchangeable Washer	Sub-Anvil	Spanner	
511-761	511-761	Not supplied	Not supplied	9 pcs.	2 pcs.	Not supplied	1 pc.	50
511-762	511-762			6 pcs.	4 pcs.	1 pc.	Not supplied	
511-763	511-763			11 pcs.		Not supplied	Not supplied	
511-764	511-764			13 pcs.		Not supplied	Not supplied	
511-771-20	511-761	2109AB-10 (Graduation: 0.001 mm)	21DZA000	9 pcs.	2 pcs.	Not supplied	1 pc.	50
511-772-20	511-762			6 pcs.	4 pcs.	1 pc.	Not supplied	
511-773-20	511-763			11 pcs.		Not supplied	Not supplied	
511-774-20	511-764			13 pcs.		Not supplied	Not supplied	
511-766-20	511-761	2046AB (Graduation: 0.01 mm)	21DZA000	9 pcs.	2 pcs.	Not supplied	1 pc.	50
511-767-20	511-762			6 pcs.	4 pcs.	1 pc.	Not supplied	
511-768-20	511-763			11 pcs.		Not supplied	Not supplied	
511-769-20	511-764			13 pcs.		Not supplied	Not supplied	

* Accuracy of the bore gage alone.
Note 1: A 50 mm sub-anvil is supplied with 511-763.
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



The dial protection cover, recommended indicators
Refer to page 08-52.

SPECIFICATIONS

Inch							
Code 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						
511-784	4.0 - 6.5	0.063	0.00008	0.00002	0.00004	4 or less	6 or less
511-791-20	0.7 - 1.4	0.047				5 or less	10 or less
511-792-20	1.4 - 2.5						
511-793-20	2.0 - 6.0						
511-794-20	4.0 - 6.5	0.063	0.00008	0.00002	0.00004	4 or less	6 or less
511-786-20	0.7 - 1.4	0.047				5 or less	10 or less
511-787-20	1.4 - 2.5						
511-788-20	2.0 - 6.0						
511-789-20	4.0 - 6.5	0.063				5 or less	10 or less

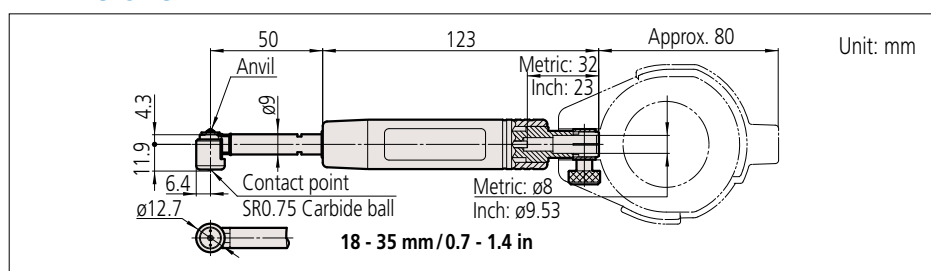
Code No.	Content of set							Probing depth (in)	
	Bore gage	Dial indicator	Dial protection cover	Anvil	Interchangeable Washer	Sub-Anvil	Spanner		
511-781	511-781	Not supplied	Not supplied	9 pcs.	2 pcs.	Not supplied	1 pc.	2	
511-782	511-782			6 pcs.	4 pcs.	1 pc.	Not supplied		
511-783	511-783			11 pcs.					
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.

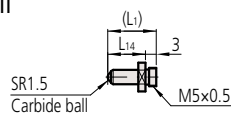
Note 1: A 2" sub-anvil is supplied with 511-783.

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.)

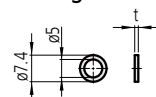
DIMENSIONS



Anvil

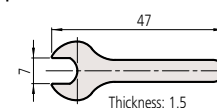


Interchangeable washer



t (mm)	Code No.
0.5	205623
1	205624

Spanner 102148



STANDARD ACCESSORIES

Bore gage (Main body)	Anvil				
	Marked No.	Code No.	Indication of measuring size	L1	L14
511-761 511-781	1	21DZA213A	18 mm/0.71 in	5.5 mm/0.22 in	2.5 mm/0.10 in
	2	21DZA213B	20 mm/0.79 in	7.5 mm/0.30 in	4.5 mm/0.18 in
	3	21DZA213C	22 mm/0.87 in	9.5 mm/0.37 in	6.5 mm/0.26 in
	4	21DZA213D	24 mm/0.94 in	11.5 mm/0.45 in	8.5 mm/0.33 in
	5	21DZA213E	26 mm/1.02 in	13.5 mm/0.53 in	10.5 mm/0.41 in
	6	21DZA213F	28 mm/1.10 in	15.5 mm/0.61 in	12.5 mm/0.49 in
	7	21DZA213G	30 mm/1.18 in	17.5 mm/0.69 in	14.5 mm/0.57 in
	8	21DZA213H	32 mm/1.26 in	19.5 mm/0.77 in	16.5 mm/0.65 in
	9	21DZA213J	34 mm/1.34 in	21.5 mm/0.85 in	18.5 mm/0.73 in

80 Inside Measuring Instruments

Bore Gages

Refer to page 08-38.



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.)

Bore Gages

Mitutoyo

Measurement example



The dial protection cover, recommended indicators

Refer to page 08-52.

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.



511-803

Note: The dial indicator and the dial protection cover are optional.
Refer to page 08-52 for details.

SPECIFICATIONS

Metric							
Code 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					6 or less	15 or less
511-805	150 - 250						20 or less
511-806	250 - 400						
511-807	400 - 600					6 or less	15 or less
511-808	600 - 800						20 or less
511-823-20	60 - 100	1.6	2	0.5	1	5 or less	10 or less
511-824-20	100 - 160					6 or less	15 or less
511-825-20	150 - 250						20 or less
511-826-20	250 - 400						
511-827-20	400 - 600					6 or less	15 or less
511-828-20	600 - 800						20 or less
511-813-20	60 - 100	1.6	2	0.5	1	5 or less	10 or less
511-814-20	100 - 160					6 or less	15 or less
511-815-20	150 - 250						20 or less
511-816-20	250 - 400						
511-817-20	400 - 600					6 or less	15 or less
511-818-20	600 - 800						20 or less

Code No.	Content 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.		250
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.		250
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.		250

* Accuracy of the bore gage alone.

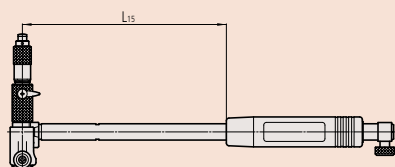
Note 1: Storage boxes for 511-807/808 models are made of wood. The boxes of other models are made of plastic.

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.)

Special sizes and specifications other than standard can be custom-made by special order. Please contact your local Mitutoyo Sales Office for more information.

Example



Length below the grip

Model	L15 (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

Bore Gages
SERIES 511 — with Micrometer Head

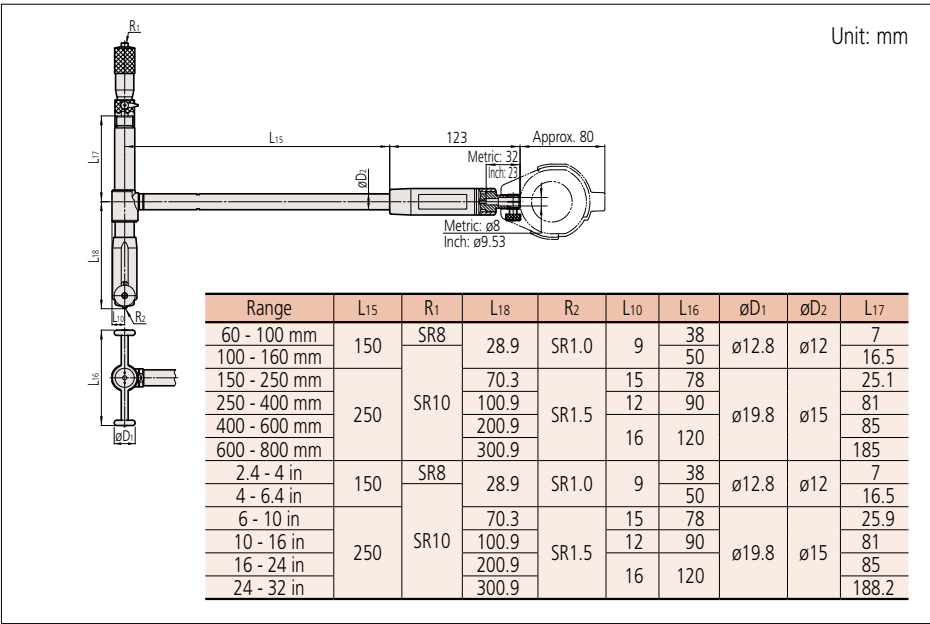
SPECIFICATIONS

Inch							
Code 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					6 or less	15 or less
511-835	6.0 - 10.0						20 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					6 or less	15 or less
511-854-20	4.0 - 6.4						20 or less
511-855-20	6.0 - 10.0						
511-856-20	10.0 - 16.0						
511-857-20	16.0 - 24.0	0.063	0.00008	0.00002	0.00004	5 or less	10 or less
511-858-20	24.0 - 32.0					6 or less	15 or less
511-843-20	2.4 - 4.0						20 or less
511-844-20	4.0 - 6.4						
511-845-20	6.0 - 10.0						
511-846-20	10.0 - 16.0	0.063	0.00008	0.00002	0.00004	6 or less	15 or less
511-847-20	16.0 - 24.0						20 or less
511-848-20	24.0 - 32.0						

Code No.	Content 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.	2 pcs.	10
511-835	511-835				4 pcs.		
511-836	511-836				3 pcs.		
511-837	511-837				2 pcs.		
511-838	511-838	2923AB-10 (Graduation: 0.0001 in)	21DZA000	1 pc.	2 pcs.	3 pcs.	4
511-853-20	511-833				3 pcs.	2 pcs.	6
511-854-20	511-834				4 pcs.		
511-855-20	511-835				3 pcs.		
511-856-20	511-836				2 pcs.	2 pcs.	10
511-857-20	511-837	2922AB (Graduation: 0.0005 in)	21DZA000	1 pc.	2 pcs.		
511-858-20	511-838				3 pcs.	2 pcs.	6
511-843-20	511-833				4 pcs.		
511-844-20	511-834				3 pcs.	2 pcs.	10
511-845-20	511-835				2 pcs.		
511-846-20	511-836	0.063	0.00008	0.00002	0.00004	6 or less	15 or less
511-847-20	511-837						20 or less
511-848-20	511-838						

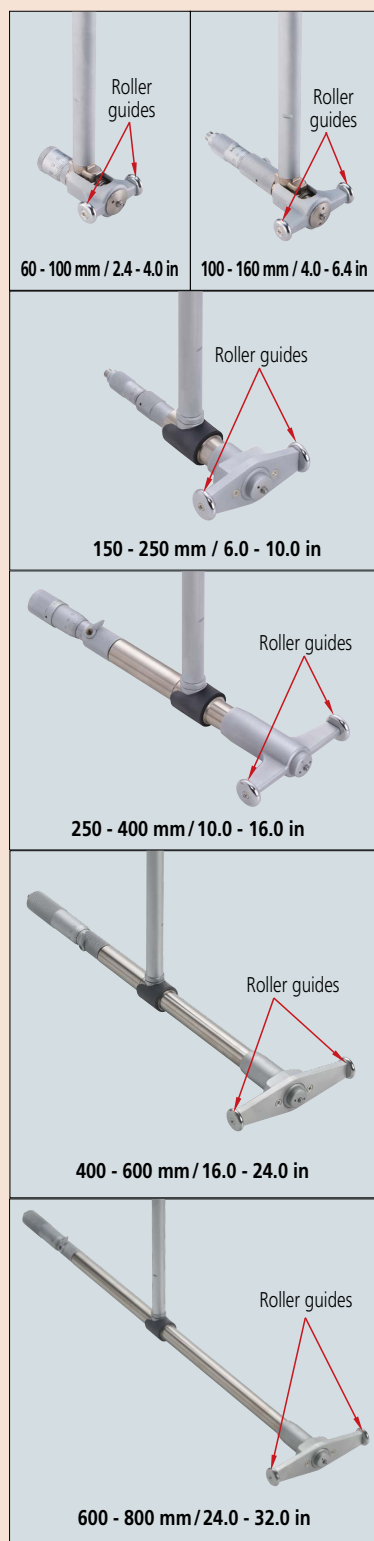
* Accuracy of the bore gage alone.
Note 1: Storage boxes for 511-837/838 models are made of wood. The boxes of other models are made of plastic.
Note 2: It is not permissible to expand measuring range using sub-anvils other than as supplied as standard accessories.
(The measurement accuracy in such cases is not guaranteed.)

DIMENSIONS



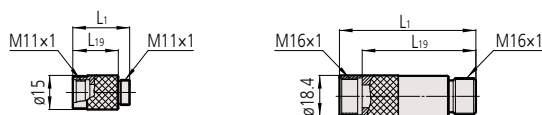
Recommended Digimatic Indicators
Refer to page 08-38.

Contact Points



Sub-anvil

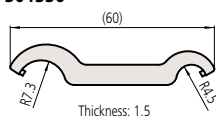
Unit: mm



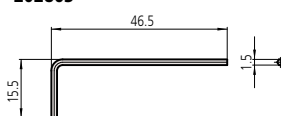
Note: It is not permissible to use a sub-anvil other than as supplied as a standard accessory, or widen a measuring range by using multiple sub-anvils. (The measurement accuracy in such cases is not guaranteed.)

Spanner

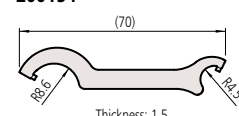
301336



202863



200154



STANDARD ACCESSORIES

Metric								
Bore gage (Main body)	Micrometer head			Sub-Anvil				Spanner
	Code No.	Stroke (mm)	Screw size	Marked No. (mm)	Code No.	L ₁ (mm)	L ₁₉ (mm)	Code No.
511-803	21DZA267	10	M11×1	10	208892	15	10	301336 (2 pcs.) 202863 (1 pc.)
				20	208894	25	20	
511-804	21DZA268	13	M11×1	10	208892	15	10	301336 (2 pcs.)
				20	208894 (2 pcs.)	25	20	
511-805	21DZA268	13	M11×1	10	208892	15	10	301336 (2 pcs.)
				20	208894 (2 pcs.)	25	20	
				50	21DAA492	55	50	
511-806	953118	25	M16×1	25	208926	35	25	200154 (2 pcs.)
				50	208928 (2 pcs.)	60	50	
511-807	953120	50	M16×1	50	208928	60	50	200154 (2 pcs.)
				100	208932	110	100	
511-808	953120	50	M16×1	50	208928	60	50	200154 (2 pcs.)
				100	208932	110	100	

Inch								
Bore gage (Main body)	Micrometer head			Sub-Anvil				Spanner
	Code No.	Stroke (in)	Screw size	Marked No. (in)	Code No.	L ₁ (in)	L ₁₉ (in)	Code No.
511-833	21DZA272	0.4	M11×1	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	M11×1	0.4	208893	0.6	0.4	301336 (2 pcs.)
				0.8	208895 (2 pcs.)	1.0	0.8	
511-835	21DZA273	0.5	M11×1	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	M16×1	1	208927	1.4	1	200154 (2 pcs.)
				2	208929 (2 pcs.)	2.4	2	
511-837	902313	2.0	M16×1	2	208929	2.4	2	200154 (2 pcs.)
				4	208933	4.4	4	
511-838	902313	2.0	M16×1	2	208929	2.4	2	200154 (2 pcs.)
				4	208933	4.4	4	

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.



511-415

Note: The dial indicator and the dial protection cover are optional.
Refer to page 08-52 for details.

SPECIFICATIONS

Metric

Code No.	Range (mm)	Stroke of contact point (mm)	Accuracy* (μm)	Repeatability* (μm)	Adjacent error* (μm)	Measuring force (N)	Guide force (N)	Content of set					Probing depth (mm)
								Bore gage	Dial indicator	Dial protection cover	Anvil	Washer	
511-415	15 - 35							511-415			11 pcs.	1 pc.	150
511-416	35 - 60	1.2	4	1	1	4 or less	6 or less	511-416	Not supplied	Not supplied	6 pcs.	4 pcs.	
511-417	50 - 150					5 or less	10 or less	511-417			11 pcs.		
511-425-20	15 - 35							511-415	2046AB (Graduation: 0.01 mm)	21DZA000	11 pcs.	1 pc.	150
511-426-20	35 - 60	1.2	4	1	1	4 or less	6 or less	511-416			6 pcs.	4 pcs.	
511-427-20	50 - 150					5 or less	10 or less	511-417			11 pcs.		
511-435-20	15 - 35							511-415	2109AB-10 (Graduation: 0.001 mm)	21DZA000	11 pcs.	1 pc.	150
511-436-20	35 - 60	1.2	4	1	1	4 or less	6 or less	511-416			6 pcs.	4 pcs.	
511-437-20	50 - 150					5 or less	10 or less	511-417			11 pcs.		

Inch

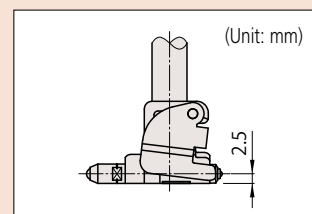
Code No.	Range (in)	Stroke of contact point (in)	Accuracy* (in)	Repeatability* (in)	Adjacent error* (in)	Measuring force (N)	Guide force (N)	Content of set					Probing depth (in)
								Bore gage	Dial indicator	Dial protection cover	Anvil	Washer	
511-418	0.6 - 1.4							511-418			11 pcs.	1 pc.	6
511-419	1.4 - 2.4	0.047	0.00016	0.00004	0.00004	4 or less	6 or less	511-419	Not supplied	Not supplied	6 pcs.	4 pcs.	
511-420	2.0 - 6.0					5 or less	10 or less	511-420			11 pcs.		
511-428-20	0.6 - 1.4							511-418	2922AB (Graduation: 0.0005 in)	21DZA000	11 pcs.	1 pc.	6
511-429-20	1.4 - 2.4	0.047	0.00016	0.00004	0.00004	4 or less	6 or less	511-419			6 pcs.	4 pcs.	
511-430-20	2.0 - 6.0					5 or less	10 or less	511-420			11 pcs.		
511-438-20	0.6 - 1.4							511-418	2923AB-10 (Graduation: 0.0001 in)	21DZA000	11 pcs.	1 pc.	6
511-439-20	1.4 - 2.4	0.047	0.00016	0.00004	0.00004	4 or less	6 or less	511-419			6 pcs.	4 pcs.	
511-440-20	2.0 - 6.0					5 or less	10 or less	511-420			11 pcs.		

* 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

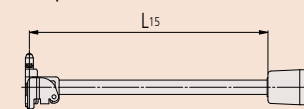
Refer to page 08-51.

The dial protection cover, recommended indicators

Refer to page 08-52.

Special sizes and specifications other than standard can be custom-made by special order. Please contact your local Mitutoyo Sales Office for more information.

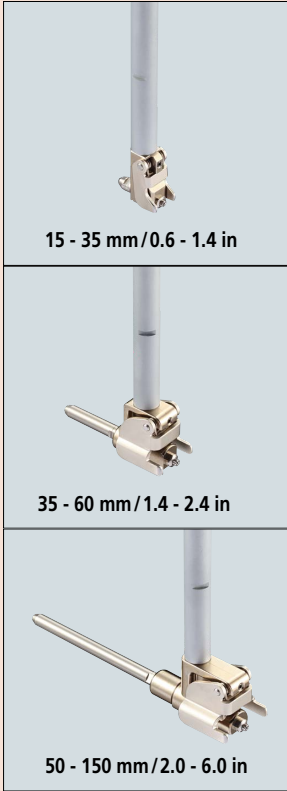
Example



Length below the grip

Model	L15 (mm)
511-415/416/417	50, 150, 200, 250, 300 400, 500

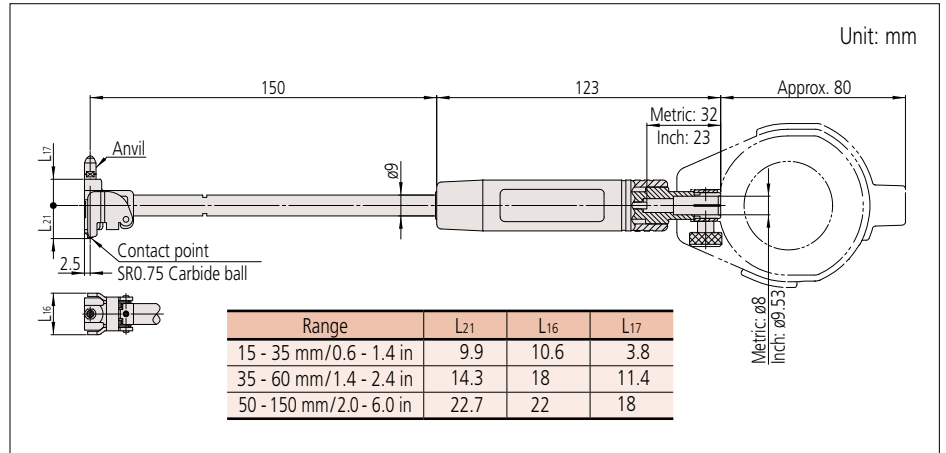
Contact Points



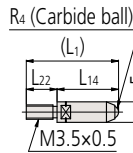
Recommended Digimatic Indicators

Refer to page 08-38.

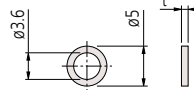
DIMENSIONS



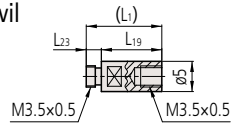
Anvil



Interchangeable washer

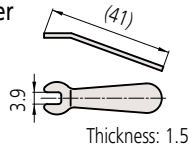


Sub-anvil



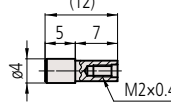
Note: It is not permissible to use a sub-anvil other than as supplied as a standard accessory, or widen a measuring range by using multiple sub-anvils. (The measurement accuracy in such cases is not guaranteed.)

Spanner 204354

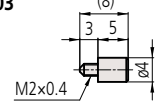


Thickness: 1.5

Washer holder 212202



Locking screw 212203



STANDARD ACCESSORIES

Bore gage (Main body)	Anvil							Interchangeable washer		Sub-Anvil		
	Marked No.	Code No.	Indication of measuring size	L1	L22	R4	L14	Code No.	t	Code No.	L23	L19
511-415 511-418 () Using 10 mm/0.4 in Sub-Anvil	1	21DZA376A	15 mm (25 mm)/0.59 in (0.98 in)	4.5	2.5	SR1	2	212127	0.5 mm/0.02 in	21DAA563	2.5	10 mm/ 0.4 in
	2	21DZA376B	16 mm (26 mm)/0.63 in (1.02 in)	5.5			3					
	3	21DZA376C	17 mm (27 mm)/0.67 in (1.06 in)	6.5			4					
	4	21DZA376D	18 mm (28 mm)/0.71 in (1.10 in)	7.5			5					
	5	21DZA376E	19 mm (29 mm)/0.75 in (1.14 in)	8.5			6					
	6	21DZA376F	20 mm (30 mm)/0.79 in (1.18 in)	9.5			7					
	7	21DZA376G	21 mm (31 mm)/0.83 in (1.22 in)	10.5	SR1.5	8						
	8	21DZA376H	22 mm (32 mm)/0.87 in (1.26 in)	11.5		9						
	9	21DZA376J	23 mm (33 mm)/0.91 in (1.30 in)	12.5		10						
	10	21DZA376L	24 mm (34 mm)/0.94 in (1.34 in)	13.5		11						
	11	21DZA376M	25 mm (35 mm)/0.98 in (1.38 in)	14.5		12						
511-416 511-419	1	21DZA404A	35 mm/1.38 in	17.5	7.5	SR1.5	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	40 mm/1.57 in	22.5			15					
	3	21DZA404C	45 mm/1.77 in	27.5			20					
	4	21DZA404D	50 mm/1.97 in	32.5			25					
	5	21DZA404E	55 mm/2.17 in	37.5			30					
	6	21DZA404F	60 mm/2.36 in	42.5			35					
511-417 511-420 () Using 50 mm/2 in Sub-Anvil	1	21DZA404A	50 mm (100 mm)/1.97 in (3.94 in)	17.5	7.5	SR1.5	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	55 mm (105 mm)/2.17 in (4.13 in)	22.5			15					
	3	21DZA404C	60 mm (110 mm)/2.36 in (4.33 in)	27.5			20					
	4	21DZA404D	65 mm (115 mm)/2.56 in (4.53 in)	32.5			25					
	5	21DZA404E	70 mm (120 mm)/2.76 in (4.72 in)	37.5			30					
	6	21DZA404F	75 mm (125 mm)/2.95 in (4.92 in)	42.5			35					
	7	21DZA404G	80 mm (130 mm)/3.15 in (5.12 in)	47.5			40					
	8	21DZA404H	85 mm (135 mm)/3.35 in (5.31 in)	52.5			45					
	9	21DZA404J	90 mm (140 mm)/3.54 in (5.51 in)	57.5			50					
	10	21DZA404L	95 mm (145 mm)/3.74 in (5.71 in)	62.5			55					
	11	21DZA404M	100 mm (150 mm)/3.94 in (5.91 in)	67.5			60					

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.



511-501

SPECIFICATIONS

Metric		
Code 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*1	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*2	Approx. 2,000 hours under normal use.	
Position detection method	ABSOLUTE electrostatic linear encoder	
Sampling frequency*3	50 times/s	
Dust / Water protection level*4	IP53 (IEC 60529, JIS C 0920)	
Display	· 7 segments 6 digits decimal numeric with minus sign, Unit (mm) · Tolerance judge indication · Analog indication	
Net weight	500 g	570 g

Inch		
Code 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*1	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*2	Approx. 2,000 hours under normal use.	
Position detection method	ABSOLUTE electrostatic linear encoder	
Sampling frequency*3	50 times/s	
Dust / Water protection level*4	IP53 (IEC 60529, JIS C 0920)	
Display	· 7 segments 6 digits decimal numeric with minus sign, Unit (in/mm) · Tolerance judge indication · Analog indication	
Net weight	500 g	570 g

*1 A quantizing error is excluded.

*2 When the usage time per day is eight hours.

*3 If the contact point detecting speed is over 50 µm/s, the peak value may not be displayed correctly.

*4 The level indicated is valid only if the output connector cap is installed.

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 joined, and a maximum length of 2 m is allowed.

Optional Accessories

Code 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)
02AZD730*	IP67	U-WAVE-T
02AZD880*	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

* Add suffix to Code No.; **G** for Asia, Europe and the Americas,
H for Brazil and **J** for Korea.

- Typical application



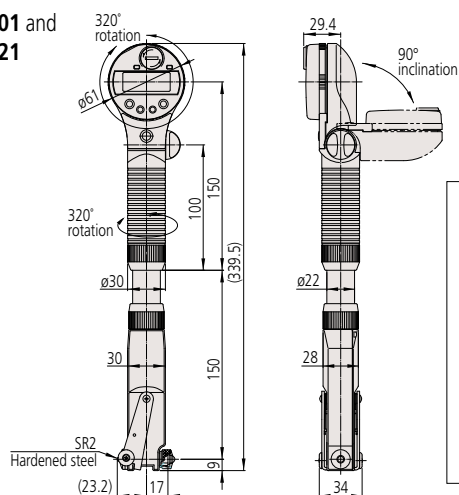
516-118-60 with calibration certificate

Description*		Code No.	Qty
Nominal length (mm)	1	611611-021	1
	2	611612-021	1
	3	611613-021	1
	5	611615-021	1
	10	611671-021	1
	20	611672-021	1
	30	611673-021	1
	40	611674-021	1
Flat jaw		630030	1 pair (2 pcs.)
Holder 160 mm		619004	1
Inspection certificate (8 pcs.)		—	1

516-119-60 with calibration certificate

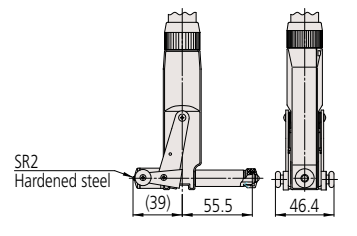
Description*		Code No.	Qty
Nominal length (mm)	1	614611-021	1
	2	614612-021	1
	3	614613-021	1
	5	614615-021	1
	10	614671-021	1
	20	614672-021	1
	30	614673-021	1
40	614674-021	1	
Flat jaw		619072	1 pair (2 pcs.)
Tie rod 3 in		619062	1
Tie rod 2 1/4 in		619063	1
Tie rod 1 1/2 in		619064	1
Flat head screw 1 1/4 in		619057	2
Flat head screw 5/8 in		619058	2
Inspection certificate (8 pcs.)		—	1

**511-501 and
511-521**

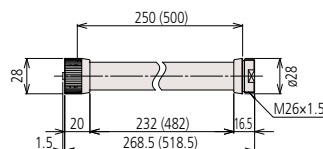


Unit: mm

511-502 and 511-522

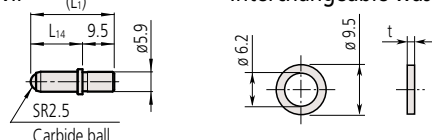


Unit: mm



Bore gage	Anvil					Interchangeable washer	
(Main body)	Marked No.	Code No.	Indication of measuring size	L ₁ (mm)	L ₁₄ (mm)	Code No.	t
511-501 511-521	1	21DZA232A	45 mm/1.8 in	15	5.5	205457 205458 205459 205460	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	21DZA232B	50 mm/2.0 in	20	10.5		
	3	21DZA232C	55 mm/2.2 in	25	15.5		
	4	21DZA232D	60 mm/2.4 in	30	20.5		
	5	21DZA232E	65 mm/2.6 in	35	25.5		
	6	21DZA232F	70 mm/2.8 in	40	30.5		
	7	21DZA232G	75 mm/3.0 in	45	35.5		
	8	21DZA232H	80 mm/3.2 in	50	40.5		
	9	21DZA232J	85 mm/3.4 in	55	45.5		
	10	21DZA232L	90 mm/3.6 in	60	50.5		
	11	21DZA232M	95 mm/3.8 in	65	55.5		
	12	21DZA232N	100 mm/4.0 in	70	60.5		
511-502 511-522	1	21DZA232A	100 mm/4.0 in	15	5.5	205457 205458 205459 205460	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	21DZA232B	105 mm/4.2 in	20	10.5		
	3	21DZA232C	110 mm/4.4 in	25	15.5		
	4	21DZA232D	115 mm/4.6 in	30	20.5		
	5	21DZA232E	120 mm/4.8 in	35	25.5		
	6	21DZA232F	125 mm/5.0 in	40	30.5		
	7	21DZA232G	130 mm/5.2 in	45	35.5		
	8	21DZA232H	135 mm/5.4 in	50	40.5		
	9	21DZA232J	140 mm/5.6 in	55	45.5		
	10	21DZA232L	145 mm/5.8 in	60	50.5		
	11	21DZA232M	150 mm/6.0 in	65	55.5		
	12	21DZA232N	155 mm/6.2 in	70	60.5		
	13	21DZA232P	160 mm/6.4 in	75	65.5		

Unit: mm

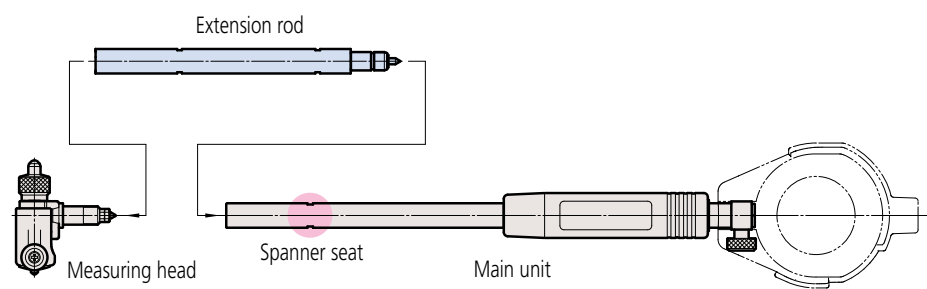


Bore Gages

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	Extension rod length (mm)					Extension rod diameter (mm)	Spanner code No.
Code 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							
511-702/511-732	953552	953553	953554	953555	953556	ø12	212556 (2 pcs.)
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							

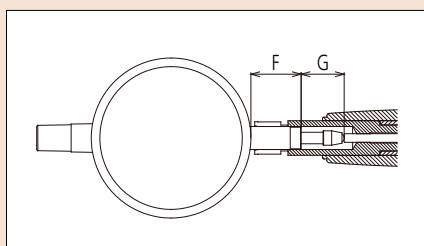
Note 1: If an extension rod is attached, the measuring accuracy may degrade due to factors such as rod deflection.
Note 2: Spanner is supplied as standard.

Recommended Indicators Accessories for Bore Gages

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.



- These are the recommended indicators for bore gages. Select the best one for your application.

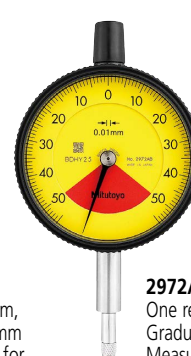
RECOMMENDED INDICATORS



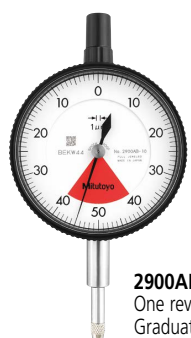
2046AB
Graduation 0.01 mm,
Measuring range 10 mm
Refer to page 07-26 for
details.



2109AB-10
Graduation 0.001 mm,
Measuring range 1 mm
Refer to page 07-28 for
details.



2972AB
One revolution type,
Graduation 0.01 mm,
Measuring range 1 mm
Refer to page 07-40 for
details.



2900AB-10
One revolution type,
Graduation 0.001 mm,
Measuring range 0.08 mm
Refer to page 07-34 for
details.



543-310B-10
ABSOLUTE Digimatic
Indicator
Resolution 0.001 mm
Refer to page 07-15 for
details.

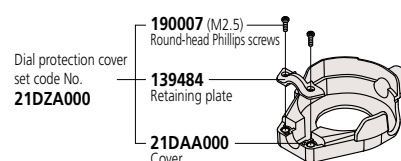


543-700B
Resolution 0.0005 mm
Refer to page 07-5 for
details.

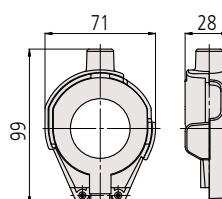
Note: Settings should be modified prior to use. Refer to the user's manual for details.

DIAL PROTECTION COVER

- The cover protects the indicator from unexpected impact while handling the bore gage.
- Can also be used for **543-310B-10**, an ABS Digimatic indicator for bore gages.
Note: This protect cover is intended to be attached to a bore gage and cannot be used for a dial indicator or Digimatic indicator alone.



Unit: mm



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 0.001 mm increments. (Measuring position of dimension is the center of the height T.)

Steel Setting Rings



177-300

CERA Setting Rings

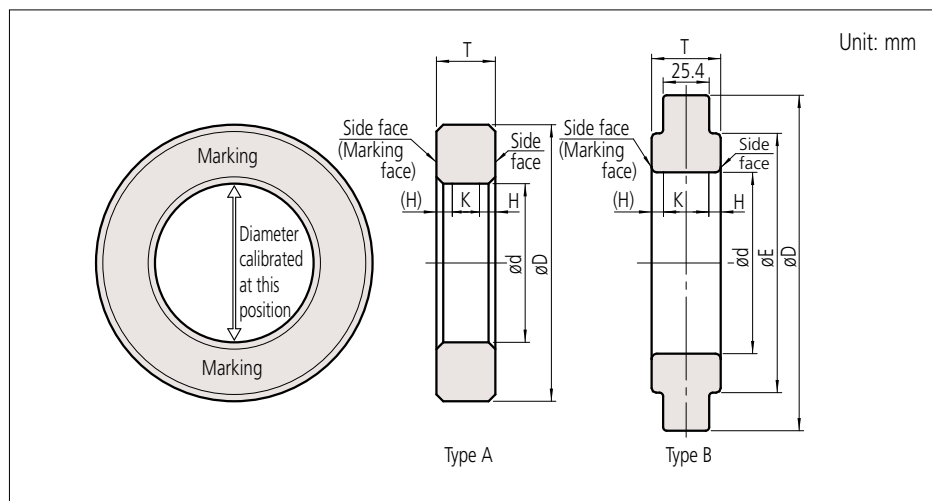


177-432

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)

DIMENSIONS



Suffix

177-*-62:** With Inspection Certificate (provides a record of the calibrated diameter) and Calibration Certificate

177-*-82:** With Inspection Certificate (provides a record of the calibrated diameter), Calibration Certificate, and Traceability System Chart

Note 1: The Inspection Certificate is not a substitute for a calibration certificate as it is undated.

Note 2: A more detailed inspection certificate describing roundness and cylindricity is available on request.

SPECIFICATIONS

Steel Setting Rings

Metric										
Code No.	Nominal size ϕ d (mm)	Dimensions (mm)			Type	Accuracy				
		ϕ D	ϕ E	T		Tolerance between the nominal size and the actual 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.

Bore Gages

Setting Rings
SERIES 177 — Accessories for Inside Micrometers, Holtest and Dial Bore Gages

Inch										
Code No.	Nominal size ød (in)	Dimensions (mm)			Type	Accuracy				
		øD	øE	T		Tolerance between the nominal size and the actual 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 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.

SPECIFICATIONS

CERA Setting Rings

Metric										
Code No.	Nominal size ϕ d (mm)	Dimensions (mm)			Type	Accuracy				
		ϕ D	ϕ E	T		Tolerance between the nominal size and the actual 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

Inch										
Code No.	Nominal size ϕ d (in)	Dimensions (mm)			Type	Accuracy				
		ϕ D	ϕ E	T		Tolerance between the nominal size and the actual 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

*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.

Bore Gages

Bore Gage Checker
SERIES 515

- The Bore Gage Checker allows easy setting of dial bore gages with ranges of 18 mm (0.7 in) through 400 mm (16 in) using gauge blocks.
- Can be used in both vertical and horizontal positions.

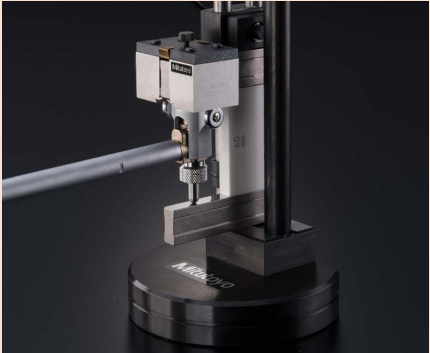


515-590

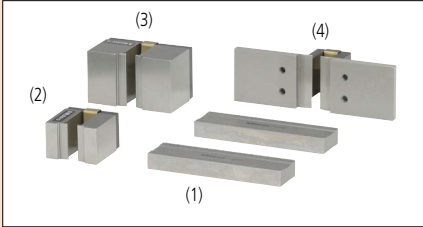
SPECIFICATIONS

Code No.	Applicable range	Flatness of parallel jaw	Parallelism of parallel jaw
515-590	18 - 400 mm (0.7 - 16 in)	0.5 μm	1 μm

Measurement example



Standard Accessories



- (1) Parallel jaw 2 pcs. **630030**
- (2) Attachment A **940088**
- (3) Attachment B **940089**
- (4) Attachment C **940090**

09

Measurement Data Management

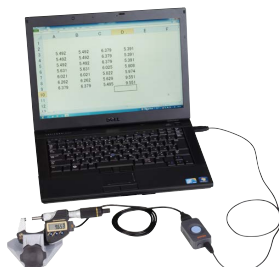
MeasurLink® ENABLED

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.



Digimatic Gage/PC Data Input Device Input Tools

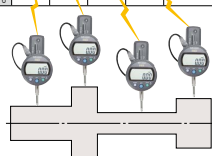
USB-ITN/IT-020U/IT-007R



Measurement Data Wireless Communication System

U-WAVE Series

	A	B	C	D	G
1	Displacement (1)	Displacement (2)	Displacement (3)	Displacement (4)	Measurement date and time
2	0.281	0.162	0.121	0.051	2013/4/1 7:30:00
3	0.279	0.152	0.133	0.064	2013/4/1 7:30:05
4	0.265	0.149	0.142	0.089	2013/4/1 7:30:10
5					
6					



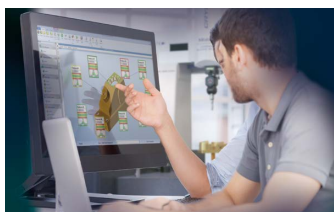
Measurement Data Collection Software

USB-ITPAK V3.0/V2.1



Mini-Printer Equipped with Data Logging Function

DP-1VA LOGGER



Measurement Data Network System

MeasurLink®

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Gage connector dimensions	09-22

SPC Software

Measurement Data Network System MeasurLink®	09-25
Real-Time Standard/Real-Time Professional/Real-Time Professional 3D	09-27
MeasurLink® Report Scheduler	09-28
Process Analyzer Professional	09-29
Process Manager	09-29
Gage R&R	09-30
Gage Management	09-30

Example of Measurement Data Management System Design

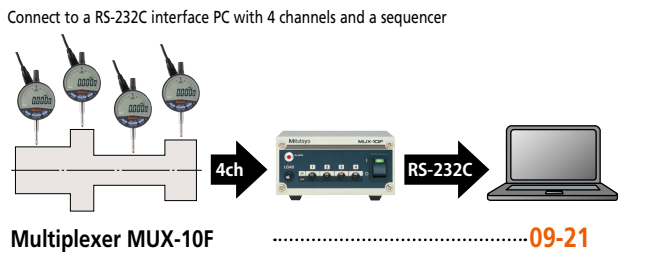
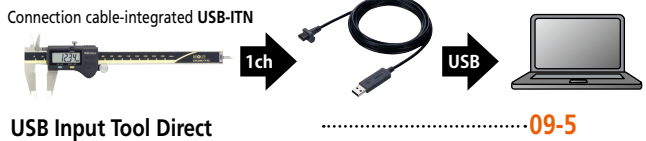
A system for recording and analyzing measurement results from various Mitutoyo measuring instruments for quality assurance purposes.

Recording measurement results

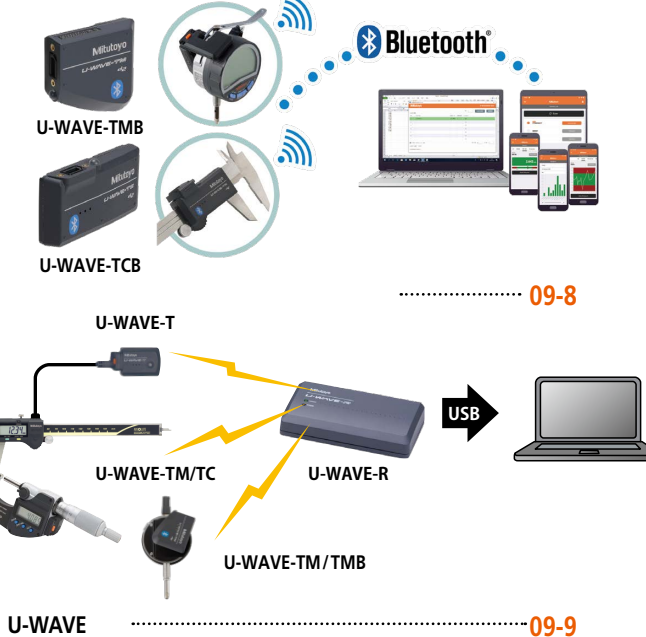
No more transcribing



Direct data input to a PC



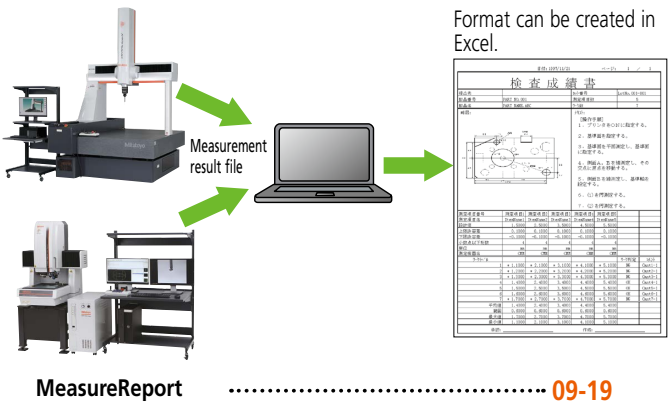
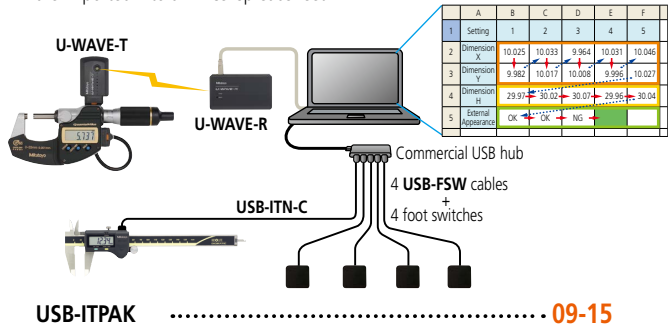
Wireless



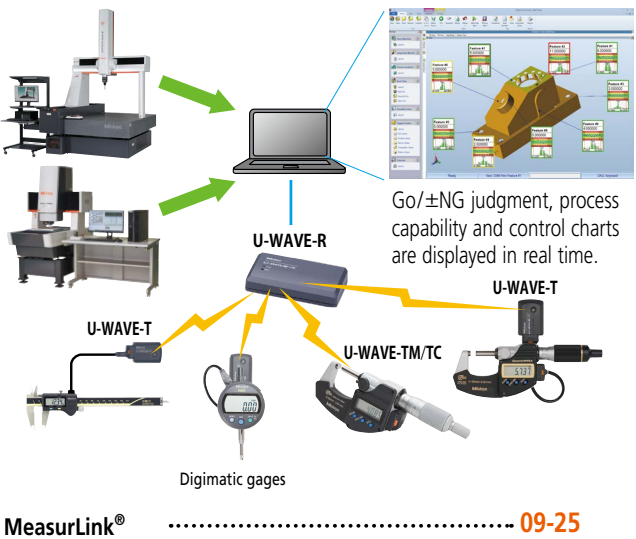
Software dedicated to inspection and quality control

Inspection certificate creation

Measurement data from calipers and micrometers are imported into an Excel spreadsheet.

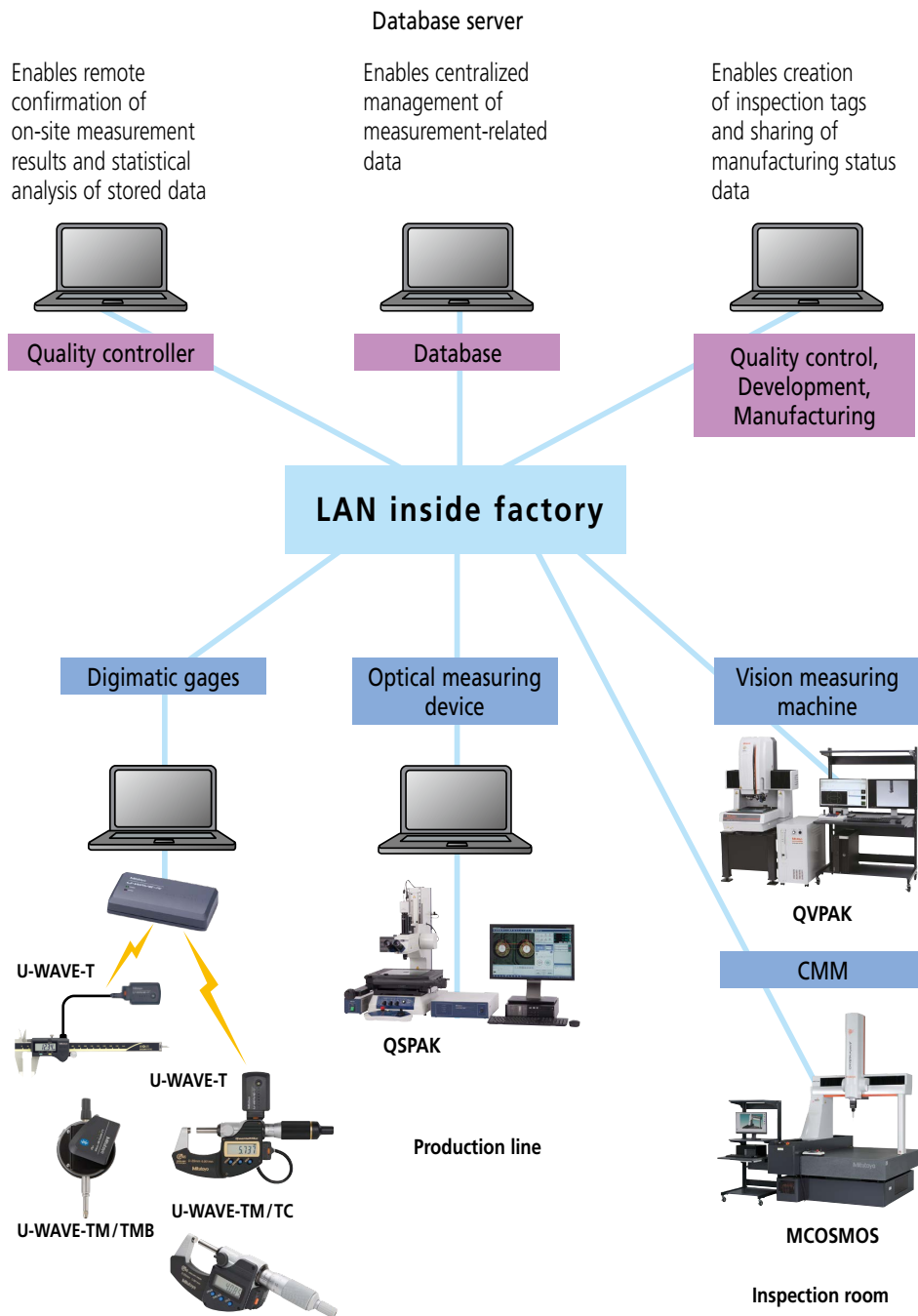


Statistical Process Control



Network the quality control information of whole the factory

Unify and control the measurement results through the network



Other peripheral devices and software

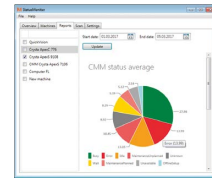
Condition Monitor

Conduct preventive maintenance through CMM status monitoring



Status Monitor

Can remotely monitor measuring machines



Note: For details on the above, contact your local Mitutoyo sales office.

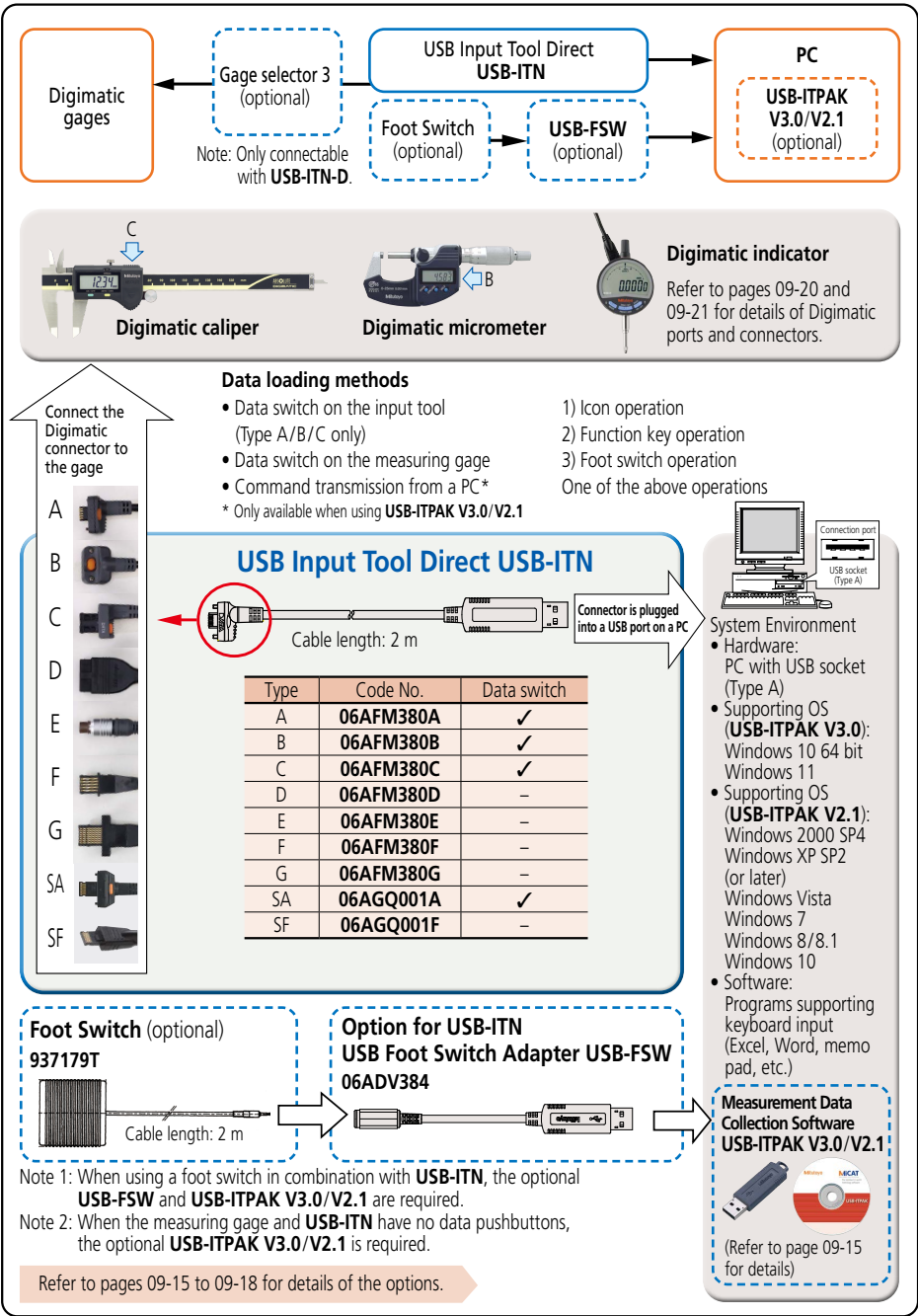
Measurement Data Management

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 09-15), you can easily create Microsoft Excel worksheets, enabling further improvement of work efficiency.

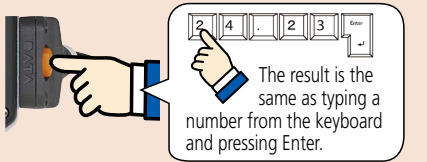


USB-ITN System Configuration



The input tool is automatically recognized as an HID* keyboard device (a standard Windows driver) just by connecting it to a USB port.
* HID (Human Interface Device)

Input data to the PC with the push of a button



Connection example



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/V2.1**: Virtual COM port (VCP)
 - Communication speed: 12 Mbps (Full Speed)
 - Power source: USB bus power
 - Mass: 59 g
 - 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.

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

Main Specifications of IT-020U

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/V2.1**: 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 is automatically recognized as an HID* keyboard device (a standard Windows driver) just by connecting it to a USB port.

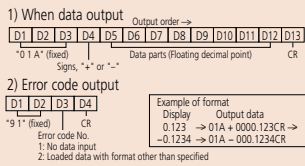
* HID (Human Interface Device)

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.

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



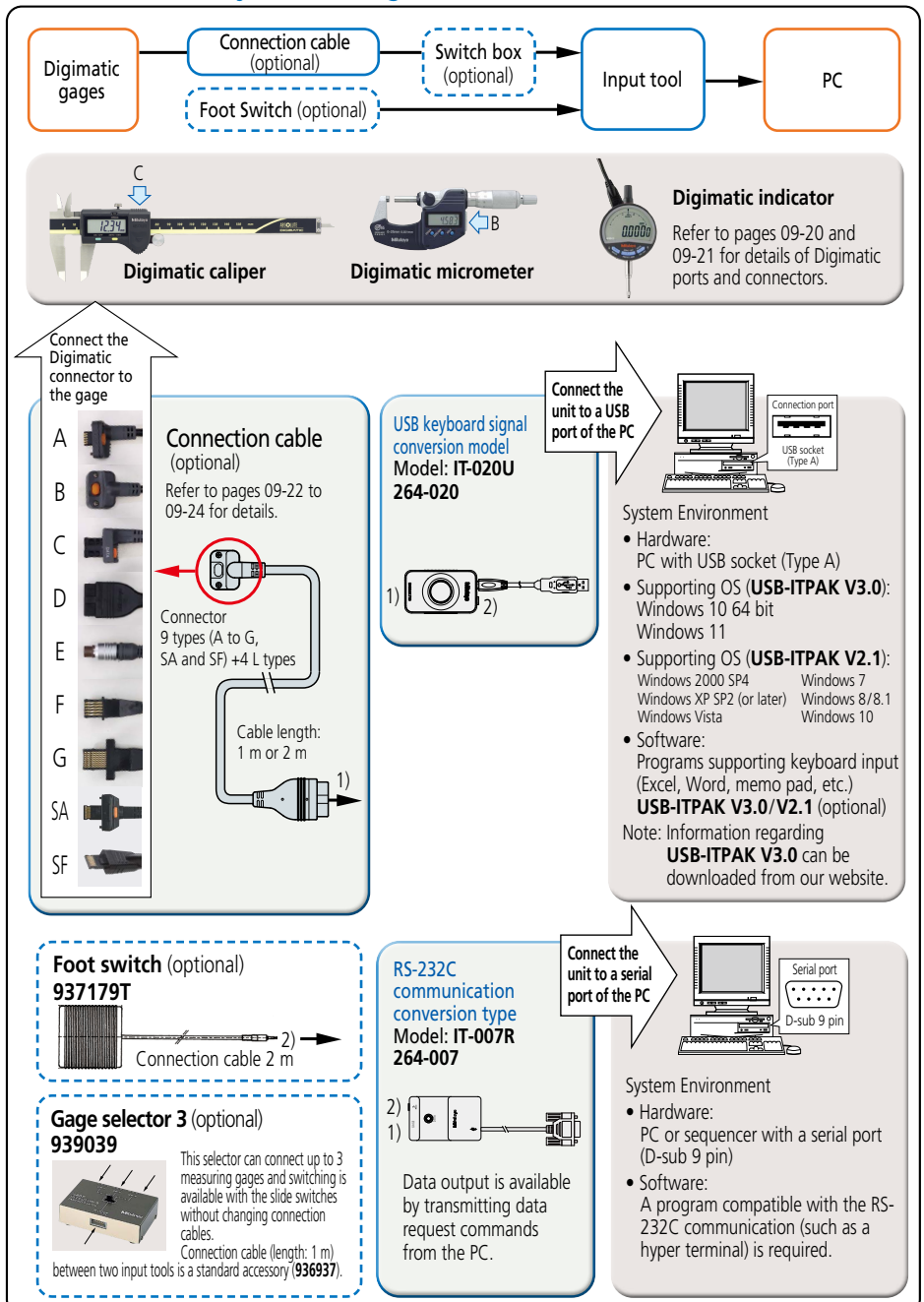
IT-020U

• It can be connected to various types of measuring instruments using optional connection cables.
• When using with optional software (refer to page 09-15), you can easily create Microsoft Excel worksheets, enabling further improvement of work efficiency.



IT-007R

IT-020U/IT-007R System Configuration



Measurement Data Management

What is the U-WAVE Series?

- The **U-WAVE** Measurement Data Wireless 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.

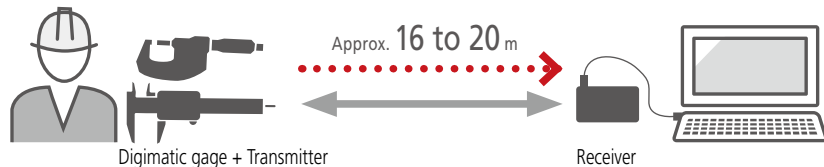
Instantly transfer data wirelessly to your PC, smartphone or tablet.



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



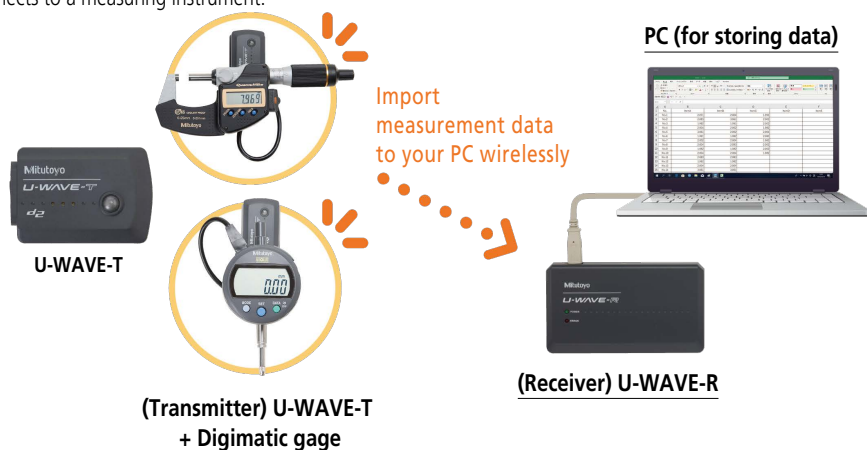
*May be affected by the electromagnetic environment.

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

The following three types are currently available.

U-WAVE

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.

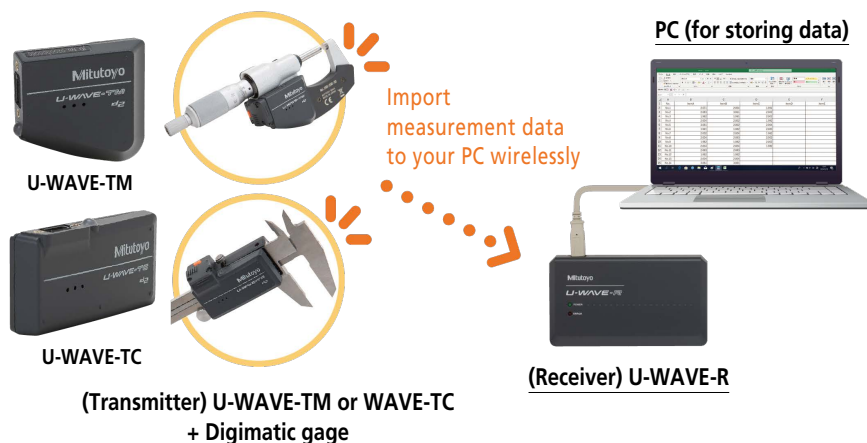


Product catalog
E12051



U-WAVE fit

While inheriting the functions and performance of **U-WAVE**, these models have been made smaller and thinner, and have improved operability, being designed specifically for use with small digimatic gages.



U-WAVE fit 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.



Function comparison table

	U-WAVE	U-WAVE fit* ¹	U-WAVE fit Bluetooth®* ¹
Transmission method	Original <based on IEEE802.15.4 (2.4 GHz)>		
Communication distance	Approx. 20 m (line of sight)		Approx. 16 m (line of sight)
Connectible model	Digimatic gages	Digimatic small measuring instruments* ³	
Dedicated application/software	U-WAVEPAK (included with U-WAVE receiver) USB-ITPAK * ²		U-WAVEPAK-BW U-WAVEPAK-BM U-WAVE Navi USB-ITPAK * ²

*1 Please check the list of compatible models since the unit may not be attachable to some models.

*2 The device may not be recognised when using older versions of Windows OS.

*3 A Digimatic indicator (**ID-CNX**) can also be connected using a connecting unit.

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Measurement Data Management

Measurement Data Wireless Communication System

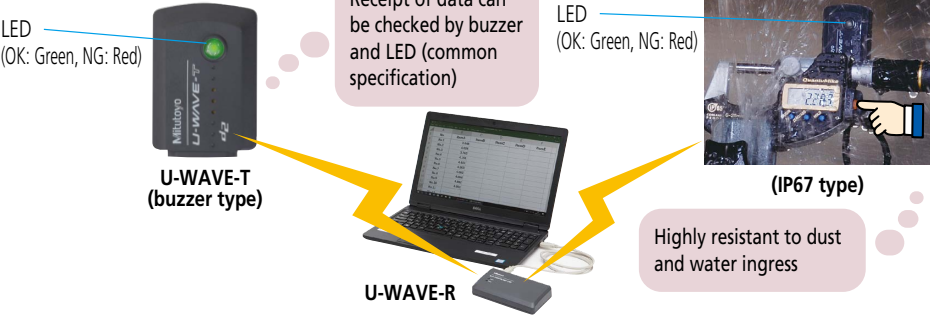
U-WAVE-T

- The system using our proprietary communication method features stable communication and low power consumption, resulting in improved work efficiency.
- It can be connected to various types of tools using optional special connection cables.

Model	U-WAVE-T (IP67 type)	U-WAVE-T (buzzer type)
Code No.*	02AZD730G/02AZD730H/02AZD730J	02AZD880G/02AZD880H/02AZD880J
Protection Rating	IP67	None
Data reception indication	LEDs	buzzer and LEDs
Power source	Lithium battery CR2032×1	
Battery life	Approx. 400,000 transmissions	
Dimensions (mm)	44×29.6×18.5	
Mass (g)	23	

* To use this product, conformity to the applicable radio law in each country is required. Code number differs depending on the destination country. Please contact your nearest Mitutoyo sales office.

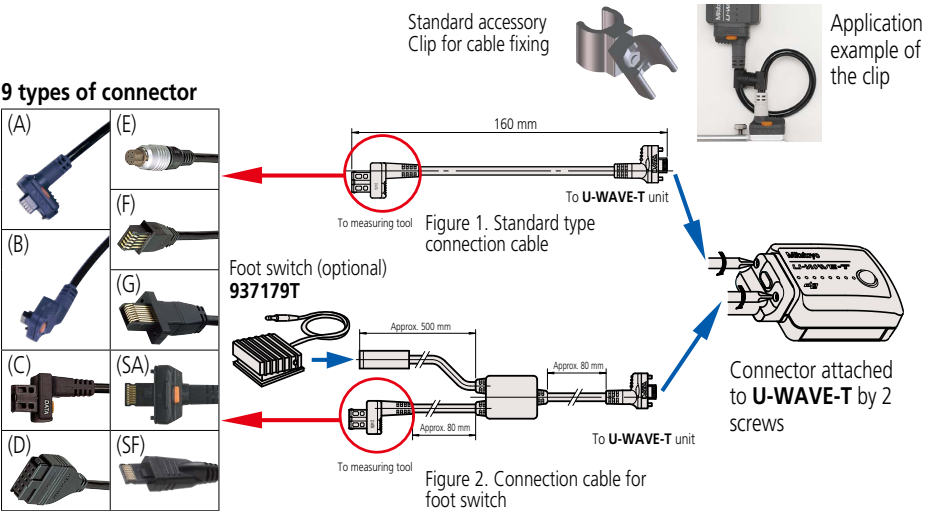
U-WAVE-T system configuration



U-WAVE-T dedicated connection cable

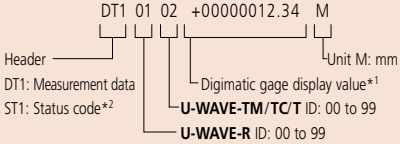
A dedicated cable connects a Digimatic gage to **U-WAVE-T**. Check the connector (A to G, SA and SF; refer to pages 09-23 and 09-24 for details) compatible with the Digimatic gage to be used and select either standard type (figure 1) or foot switch type (figure 2) according to your application.

Type	Standard connection cable Code No.	Connection cable for foot switch Code No.
(A) Water-proof model with output button	02AZD790A	02AZE140A
(B) Water-proof model with output button	02AZD790B	02AZE140B
(C) With data-out button	02AZD790C	02AZE140C
(D) 10-pin plain type	02AZD790D	02AZE140D
(E) 6-pin round type	02AZD790E	02AZE140E
(F) Plain type straight	02AZD790F	02AZE140F
(G) Plain type straight water-proof model	02AZD790G	02AZE140G
(SA) Water-proof straight model with data output button	02AZF960	02AZF960
(SF) Straight standard type	02AZG011	02AZG021



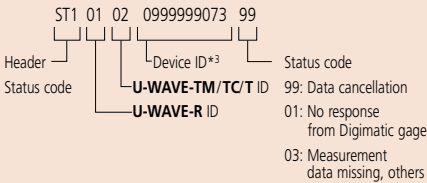
• Data format

Example of format when the Digimatic gage displays 12.34



*1 Data interface function is switchable to "Measurement value only" e.g.) 12.34

*2 Example of status code format



*3 Unique number assigned to **U-WAVE** at shipment

Notes on Identification of Measurement Data and Multiple Systems Operation

Following the above format, the **U-WAVE** data format starts with a 4-digit code where the first two digits represent receiver channels and the last two are transmitter channels. The large number of transmitter/receiver combinations possible with this scheme ensures that the receivers in a factory measurement system only accept data from the intended transmitters, even when several receivers are all within communication range of different transmitters using the same channel. Different frequency bands (up to 15 available) may also be used to further ensure that there are no communication problems between adjacent **U-WAVE-R** units.

U-WAVE-T (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	0 mW (1 dBm) or less
Modulation method	DS-SS (Direct Sequence - Spread Spectrum) Resistant to interfering signals and noise
Communication frequency	2.405 to 2.475 GHz
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.

Note: Please purchase **U-WAVE-T** in the country where you intend to use it.

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.

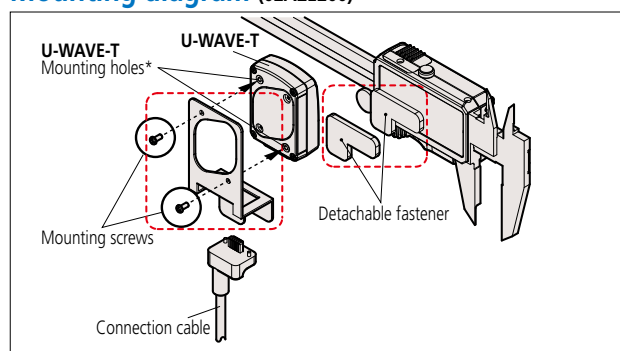


U-WAVE-T mounting bracket
02AZE200

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

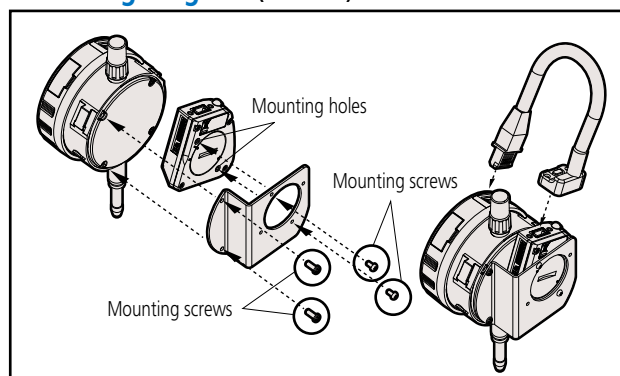
U-WAVE-TM/TMB
mounting bracket for **Digimatic**
indicator

02AZF670/02AZF675

Standard accessories

- Mounting screw: 4 pcs.

Mounting diagram (02AZF670)



U-WAVE-T mounting bracket for QM-Height

U-WAVE-T mounting bracket for
QM-Height
02AZE990

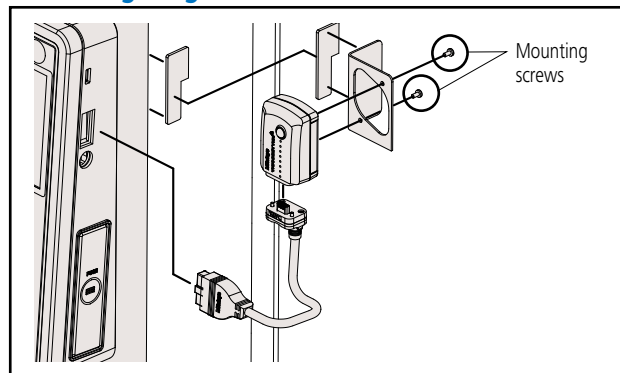
Standard accessories

- Detachable fastener: 2 pcs.
(mirror-imaged)
- Mounting screw: 2 pcs.



Mounting
bracket

Mounting diagram (02AZE990)



* The two **U-WAVE-T** mounting holes are on a relatively fragile plastic part. Be careful not to apply too much force when tightening.

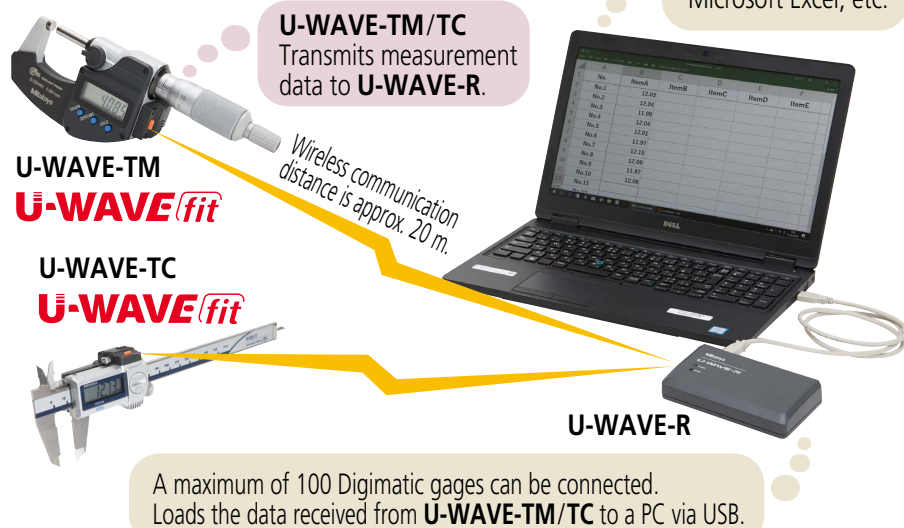
Product catalog
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Measurement Data Wireless Communication System U-WAVE-TM/TC (U-WAVE fit)

- While inheriting the functions and performance of **U-WAVE**, these models have been made smaller and thinner, and have improved operability, being 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.
- 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.
- The wireless system without cabling can keep the workplace tidy and increase workability during measurement.
- Installing the optional **USB-ITPAK V3.0/V2.1** 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.

Note: Please purchase **U-WAVE-TM/TC/R** in the country where you intend to use it.

U-WAVE-R

Model	U-WAVE-R
Code No.*	02AZD810D/02AZD810E/02AZD810F
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

* Code number differs depending on the destination country.

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-R main unit



USB2.0 cable (1 m) attached

U-WAVEPAK



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

Product catalog
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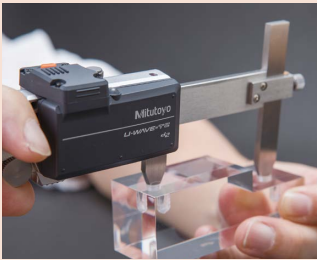
Video



Typical applications



U-WAVE-TM (264-622)



U-WAVE-TC (264-621)

Transmitter/connecting unit



264-622



02AZF310



264-621



02AZF300

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	
Code No.	264-622	264-623	264-620	264-621
Model	U-WAVE-TM (IP67 type)	U-WAVE-TM (buzzer type)	U-WAVE-TC (IP67 type)	U-WAVE-TC (buzzer type)
Protection Rating	IP67	N/A	IP67	N/A
Data reception indication	LEDs	buzzer and LEDs	LEDs	buzzer and LEDs
Power source	Lithium battery CR2032×1			
Battery life	Approx. 400,000 times continuous data transmission			
External dimensions (mm)	41.9×12.9×38.8		56×11.45×30.4	
Mass (g)	18			

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

Code No.	02AZF310	02AZF300	02AZF960	02AZF700
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)

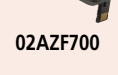
Note 1: **02AZF310** ensures water-proof performance only when attached to measuring instruments of IP67 type.

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.

* **02AZF960** is applicable to new models (**293-14X-40/293-18X-40**). Refer to 02-5.

Compatibility of measuring tool and unit

Digimatic gage	Connecting unit/connecting cable	Transmitter	Receiver
Digimatic Micrometers	Standard type  02AZF310	 Buzzer type U-WAVE-TM 264-623	 U-WAVE-R 02AZD810D Design registered in Japan
	QuantuMike* (Refer to 02-5)  02AZF960	 IP67 type U-WAVE-TM 264-622	
Digimatic Calipers	Standard type  02AZF300	 Buzzer type U-WAVE-TC 264-621	
	Coolant-proof type  02AZF310	 IP67 type U-WAVE-TC 264-620	
Digimatic Indicators and Others	ID-CNX/ID-FNX Series (12.7 mm type only)  02AZF700	 Buzzer type U-WAVE-TM 264-623	
	Connecting cable  Other  Bracket	 IP67 type U-WAVE-TM 264-622	
		 Buzzer type U-WAVE-T 02AZD880G	
		 IP67 type U-WAVE-T 02AZD730G	

* To use this product, conformity to the applicable radio law in each country is required. Code number differs depending on the destination country. Please contact your nearest Mitutoyo sales office.

* **02AZF960** is applicable to new models (**293-14X-40/293-18X-40**). Refer to 02-5.

Measurement Data Management

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

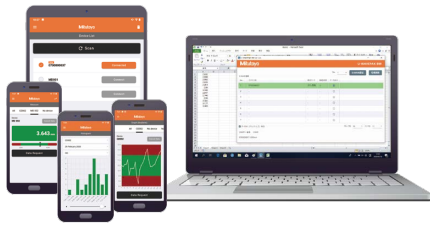
- Bluetooth® communication allows for wireless transmission of measurement data from Digimatic micrometers and calipers to PCs, smartphones, tablets and other such terminals.
- Bluetooth® communication does not require a conventional receiver unit (U-WAVE-R) which improves operability and reduces costs. 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

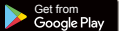
U-WAVE-TCB





Example of attaching the Digimatic indicator

Measurement Navigation Applications

Application	 Mitutoyo U-WAVE Navi	 U-WAVEPAK-BM	 U-WAVEPAK-BW
Purpose	Using the application, create a measurement procedure, display and navigate the measurement, and manage the measurement results	Measure a workpiece to perform a simple trend management	Up to seven units of U-WAVE-TCB/TMB can be set up. Measuring results can be transferred to Excel spread sheet.
Possible actions (Functions)	- Create/perform a measurement procedure (including GO/NG judgement) - Navigate a measurement procedure - Manage/transfer a measurement procedure - Display a list of measurement results - Transfer a measurement result	- Go/±NG judgment - Data logging - Graphical display of measurement result - Display the histogram of measurement results - Transfer a measurement result (log data)	Identification of data origin Upper application (connection with USB-ITPAK , MeasurLink)
Display language	Japanese/English (Depends on the OS settings)	16 languages including English*	Japanese/English (Depends on the OS settings)
Compatible OS	Android 7.0 or later (iOS not supported)  Available from Google Play for free download.  U-WAVE Navi	Android 7.0 or later/iOS 10.0 or later  U-WAVEPAK-BM (English version only) can be downloaded for free from each app store.   U-WAVEPAK-BM	DL from the following URL https://www2.mitutoyo.co.jp/eng/contact/products/u-wave/index2.html

* Japanese, English, German, French, Italian, Polish, Portuguese, Hungarian, Korean, Chinese (traditional/simplified), Vietnamese, Thai, Malay, Indonesian, Spanish
Note1: Google Play and the Google Play logo are trademarks of Google LLC. Apple and the Apple logo are trademarks of Apple Inc.
Note2: We cannot guarantee the operation of this application and **U-WAVE TMB/TCB** with all Bluetooth® equipped devices.

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: Please purchase **U-WAVE-TMB/TCB** in the country where you intend to use it.
- Note 2: **U-WAVE-TMB/TCB** is not compatible with **U-WAVE fit**, for which communication specifications are different.
- Note 3: Connectivity of **U-WAVE-TMB/TCB** to every single Bluetooth® device is not guaranteed.

USB-ITPAK V3.0



Download software



Allows for use of all functions of the software when connected to a PC

USB-ITPAK V2.1



Allows for use of the software when connected to a PC

Typical applications



U-WAVE-TMB (264-626)



U-WAVE-TCB (264-625)

Transmitter/connecting unit



264-626



02AZF310



264-625



02AZF300

SPECIFICATIONS

	For Digimatic micrometers		For Digimatic calipers	
Code No.	264-626	264-627	264-624	264-625
Model	U-WAVE-TMB (IP67 type)	U-WAVE-TMB (buzzer type)	U-WAVE-TCB (IP67 type)	U-WAVE-TCB (buzzer type)
Protection level	IP67	N/A	IP67	N/A
Data reception indication	LED	LED, buzzer	LED	LED, buzzer
Power source	Lithium battery CR2032×1			
Battery life	Windows OS: Approx. 3 months, iOS/Android: Approx. 1 year			
Mass (g)	18			

Choose a connecting unit compatible with your gage.

Code No.	02AZF310	02AZF300	02AZF960	02AZF700
Protection level	IP67	N/A	IP67	N/A
Mass (g)	6			10
Connectable transmitter	U-WAVE-TMB/TCB (IP67 type)	U-WAVE-TCB (for standard type)	U-WAVE-TM (for QuantuMike*)	ID-CNX/ID-FNX (12.7mm type only)

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

* 02AZF960 is applicable to new models (293-14X-40/293-18X-40). Refer to 02-5.

Compatibility of measuring tool and unit

Digimatic gage		Connecting unit/connecting cable		Transmitter	
Digimatic Micrometers		Standard type	 02AZF310	 Buzzer type U-WAVE-TMB 264-627	
		QuantuMike* (Refer to 02-5)	 02AZF960	 IP67 IP67 type U-WAVE-TMB 264-626	
Digimatic Calipers		Standard type	 02AZF300	 Buzzer type U-WAVE-TCB 264-625	
		Coolant-proof type	 02AZF310	 IP67 IP67 type U-WAVE-TCB 264-624	
Digimatic Indicators		ID-CNX/ID-FNX Series (12.7 mm type only)	 02AZF700	 Buzzer type U-WAVE-TMB 264-627	 IP67 IP67 type U-WAVE-TMB 264-626

* 02AZF960 is applicable to new models (293-14X-40/293-18X-40). Refer to 02-5.

Product catalog
E12051



Measurement Data Management

Measurement Data Collection Software USB-ITPAK V3.0/V2.1

(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/V2.1** creates a procedure to input data from gages equipped with Digimatic output to Excel spreadsheets via **IT-016U**, **IT-020U**, **USB-ITN** or **U-WAVE**. This optional software facilitates the daily inspection work for mass-produced products.

V2.1	V3.0	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	Setting of measuring instrument: Sets the calibration year and month, preset values, zero-setting, etc. for a measuring instrument
—	✓ 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 **USB-ITN-SF/IT-020U**. ✓: Can be used —: Cannot be used

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

Note 2: For **V3.0**, features common with **V2.1** can be used by purchasing **V3.0 (06AGR543)** and connecting a USB dongle to your PC.

Main features of USB-ITPAK V3.0/V2.1

- **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 (refer to page 09-17 for details).
- **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) IT-020U/USB-ITN	For Windows 2000/XP Up to 100 units*3 For Windows Vista/7/8/8.1/10/11 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
2) USB-FSW		• Control/identification of connecting gage VCP (Virtual COM port)
3) U-WAVE-R Up to 100 gages connectable to each U-WAVE-R . U-WAVE-T ID: 00 to 99		Switch from HID to VCP for (1) and (2). The VCP driver software is supplied with USB-ITPAK .

- **Data loading time:** when using **IT-020U/USB-ITN**, 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

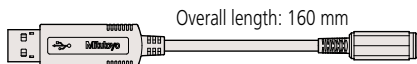
This USB adapter for connecting a PC is required when using the Foot Switch (**937179T**) in **USB-ITN**. A dedicated VCP driver for this adapter is included in **USB-ITPAK**.

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



Optional Accessories

Model	USB-ITPAK V3.0	USB-ITPAK V2.1
Code No.	06AGR543 (USB dongle only)	06AFM386 (Software+USB dongle)
Compatible OS (Windows)	Windows 10 64 bit only Windows 11	Windows 2000 SP4 to Windows 10
Compatible Excel version	Excel 2010, 2013, 2016, 2021, Microsoft 365	Excel 2002, 2003, 2007, 2010, 2013, 2016, Microsoft 365

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

USB-ITPAK V3.0



USB dongle



Allows for use of all functions of the software when connected to a PC

USB-ITPAK V2.1



USB dongle



Allows for use of the software when connected to a PC

Operating environment

Compatible OS*1	USB-ITPAK V3.0: Windows 10 (64 bit only) Windows 11
	USB-ITPAK V2.1: Windows 2000 SP4 Windows XP SP2 or later Windows Vista Windows 7 Windows 8 Windows 8.1 Windows 10
Supported Excel versions*2	USB-ITPAK V3.0: 2010, 2013, 2016, 2021 Microsoft 365
	USB-ITPAK V2.1: 2002, 2003, 2007, 2010, 2013, 2016 Microsoft 365
Hard disk	USB-ITPAK V3.0: Free space of more than 15 MB USB-ITPAK V2.1: Free space of more than 10 MB
CD-ROM drive	For program installation*4
USB port*3	2 ports or more
Monitor resolution	USB-ITPAK V3.0: 1024×768, 256 colors or more USB-ITPAK V2.1: 800×600, 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 (17 languages)
Japanese, English, German, French, Spanish, Italian, Czech, Swedish, Turkish, Polish, Hungarian, Russian, Korean, Chinese (traditional/simplified), Dutch, Portuguese
- Operation manual (PDF file)
Japanese, English, German

Code No.

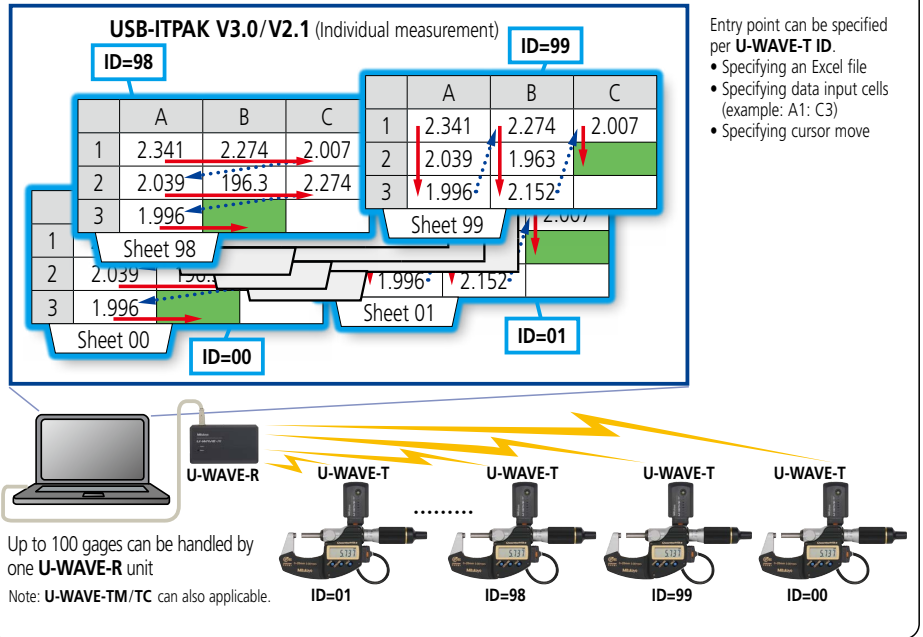
Model	USB-FSW
Code No.	06ADV384

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

<Data sorting of individual measurements>

Data from multiple Digimatic gages sent to separate Excel sheets

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



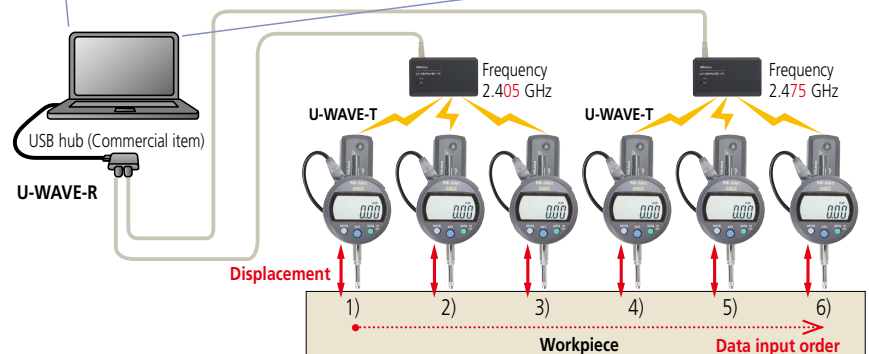
<timer input + measurement date/time display during simultaneous measurement>

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 seconds 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).

Measurement Data Management

Measurement Data Management
USB-ITPAK V3.0/V2.1 (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 Example of measurement using input according to pre-registered procedures

(Measurement example) The outside diameters at X and Y and length (H) of 5 workpieces are measured in order, as shown below. Finally, a visual inspection is performed (for scratches, uneven coloring, etc.) to determine Go/±NG judgment.

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).

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".

U-WAVE-T, U-WAVE-TM/TC, U-WAVE-R, USB-ITN-C, USB-FSW x4 pcs. Foot switch x4 pcs.

* No data request for U-WAVE.

* These are common options for IT-020U, USB-ITN, and U-WAVE. They cannot be used with IT-007R.

	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		

Cell that will receive next input is highlighted in green.

Simultaneous measurement Example of measurement involving importing data from multiple Digimatic gages at once

(Measurement example) Batch (simultaneous) measurement of 4 heights (A to D) of the workpiece shown below.

U-WAVE-R, USB-ITN-F x2 pcs., USB-FSW x2 pcs. Foot switch x2 pcs., U-WAVE-T x2 pcs.

	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				

Note: When using U-WAVE for batch measurement, it will operate in "Event Drive mode."

Individual measurement Example of simultaneous work by multiple operators

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

Operator 1: USB-ITN-C, USB-FSW x2 pcs. Foot switch x2 pcs.

Operator 2: U-WAVE-T, USB-FSW x2 pcs. Foot switch x2 pcs.

	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: Cell that will receive next input

Operator 2: Cell that will receive next input

Notes on using USB-ITPAK V3.0/V2.1:

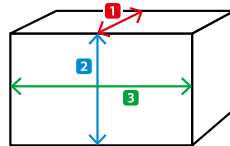
- Do not merge the cells in the specified range as a measurement data input.
- During measurement, the Microsoft Excel worksheet cannot be modified in any way apart from entering data. If you need to modify the sheet, it is necessary to abort or finish the measurement.
- If the OS build version is old,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

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 labour and time for inspection and greatly increases efficiency.

Equipped with an automatic sorting function for sorting input measurement data [Easy input mode]

This function can be implemented even if the measuring instrument does not support bidirectional serial communication. After setting, measurement values are automatically sorted into an Excel sheet as needed.



Only the number of measurement items is preset.
(Example: number of measurement items = 3)

- 1 D: 10 mm
- 2 H: 20 mm
- 3 W: 30 mm

With normal input (Entered into column A only.)

	A	B
1	10.11	
2	20.05	
3	29.99	
4	10.54	
5	20.45	

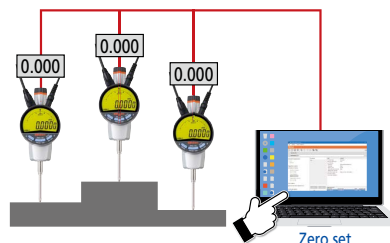
With automatic sorting function (Once entered into column A, similar data is automatically classified.)

	A	B	C	D	E
1	10.11		10.11	20.05	29.99
2	20.05		10.54	20.45	29.5
3	29.99		9.78	20.3	30.4
4	10.54		9.99	20.07	30.22
5	20.45				

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

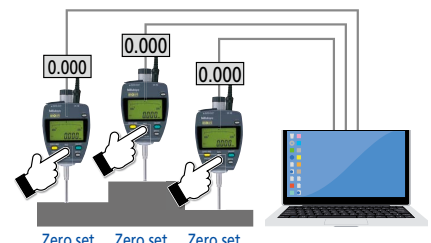
Function example (1) Control of ID-C/ID-F from PC

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.

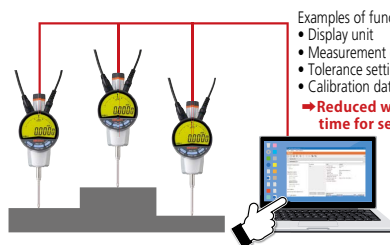
Instruments not supporting bidirectional serial communication + USB-ITPAK



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

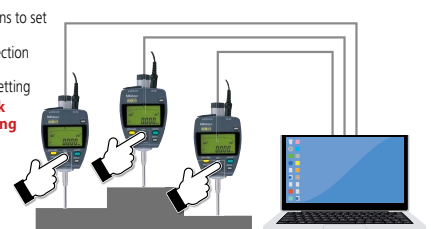
Function example (2) Measuring instrument setting

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 **IT-020U**. It is not possible with measuring instruments not supporting Digimatic S1 or **U-WAVE** Series.

Measurement Data Management

Data Conversion Program into Inspection Certificates in Excel Format MeasureReport

- Data from a measurement result file generated with a CMM, vision measuring machine or other machine can be output to an inspection certificate generated with Excel. Data from multiple measuring machines can be combined into a single inspection certificate (up to 200 measurement items).
- A customized format can be created for an inspection sheet using simple editing (copy & paste, etc.) by using a sample format as the template.
- The computation function is available for tolerance judgment, workpiece judgment, statistical calculation and other types of processing at inspection-certificate generation time.

Create inspection certificate from measurement result file for each measuring machine (PC data processing)

CMM
MCOSMOS,
MICROPAK2700
MICROPAK700



Measurement result file

Vision Measuring Systems
QVPAK, QSPA
QIPAK



Measurement result file

Optical Instruments
Vision Unit
QSPA



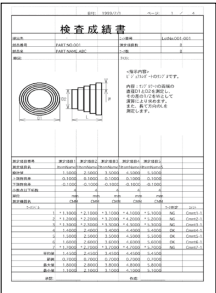
Measurement result file

- File conversion: Supported file formats
<CMM>
1) **MCOSMOS** ASCII file (**Geopak-3**)
2) **MPK2700** statistic file (Binary format)
3) **MPK2700** ASCII file (Text format)
- <Vision Measuring Systems>
1) QUICK VISION **QVPAK-QV Report**
2) QUICK SCOPE **QSPA** measurement result file
3) QUICK IMAGE **QIPAK** measurement result file
- <Optical Instruments>
1) Vision Unit **QSPA** measurement result file

Measurement result file conversion



Select and extract data, design value, tolerance value, etc., and output in specified Excel format.



Example of inspection certificate.

Excel inspection certificate creation macro program

- Measurement result file, data loaded from on-line communication, or data specified from database file of MeasurLink® can be output to an Excel table.
- Original format can be created by simple editing with sample style as a template. Desired template style can be automatically created by specifying required number of items and workpieces.
- Tolerance judgment (★ marked in NG data), workpiece judgment (OK or NG is indicated in judgment column), statistical analysis, page break are automatically processed.
- Data from several measuring machines can be combined in one inspection certificate.

Main specifications of MeasureReport

- Document creation:
Automatic creation of template sample style (Number of items × number of workpieces specified)
- GO/±NG Judgment:
Tolerance judgment (marked in NG value)
Workpiece judgment (OK or NG in judgment column)
- Statistical analysis: mean, maximum, minimum, range, standard deviation, Cp, Cpk, fraction defective, number of defectives, etc. 15 items in total.
- Capacity:
1) Measurement result file conversion
2) On-line data input
Max. 200 items × Max. 2,000 workpieces
3) MeasurLink® database import
Max. 200 items × Max. 2,000 workpieces or
Max. 2,000 items × Max. 200 workpieces
- File combined:
A maximum of 10 measurement files can be specified and both measurement items and workpieces can be combined respectively.
- Printing and saving of inspection certificate:
Automatic printing and saving in Excel format
- Comment output to the inspection certificate:
30 items including part number and lot number can be input.
- Workpiece drawing output to the inspection certificate:
Image files (bmp, jpg) can be displayed in arbitrary positions.
- Others:
Decimal point digit justification, error display, automatic page break

MeasureReport operation environment (recommended)

OS	Windows 2000 Windows XP Windows Vista (32-bit) Windows 7 (32-bit/64-bit) Windows 10 (64-bit)
Microsoft Excel	2000/2002/2003/2007/2010/2013/2016/2019 (Only 32-bit edition is available regardless of Windows version. It doesn't work on 64-bit Windows.)
CPU	Processor of 1 GHz or more
Memory	2 GB or more
Hard disk	3 GB or more free space
Display	1024×768 or larger
Drive	CD-ROM or DVD drive (required for installation)

**Analysis
by PC**

```

SUB GR. NO.      1
4      26.58    mm
2      26.77    mm
3      28.72    mm
5      27.61    mm
5      27.41    mm
6      23.84    mm
7      26.57    mm

Z
PART NO.:      28.3486 mm
TIME 14:40     4.90

DATE 19/8/27
TIME 14:40

NAME:

SUB GR. NO.      1
1      27.77    mm
2      27.13    mm
3      27.68    mm
4      27.90    mm
5      27.90    mm
6      26.90    mm
7      28.85    mm

Z
PART NO.:      27.7320 mm
TIME 14:40     1.99

DATE 19/8/27
TIME 14:40

NO OF SUB GR.    2
SAMPLE SIZE      5

V      27.0407 mm
R-COLL 27.0407 mm
R-COLL 3.4880 mm
R-COLL 3.4880 mm
R-COLL 0.2849 mm

```


Mitutoyo

Measurement Data Management

Digimatic/RS-232C Interface Unit Multiplexer MUX-10F

- Multiplexer **MUX-10F** is a measurement data transfer device that converts incoming Digimatic output measurement data to RS-232C and outputs it to other devices such as a PC and sequencer.
- Up to four measuring instruments with Digimatic output can be connected.



SPECIFICATIONS

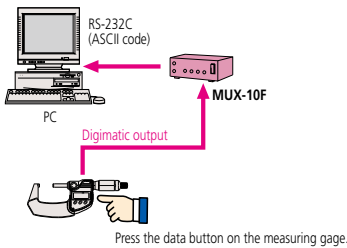
Code No.	264-002*
Model	MUX-10F
Data input port	4 channels for Digimatic gages
Output: (RS-232C)	Data transmission method: Half-duplex, Data transmission code: ASCII/JIS, Data length: 8 bits Parity check: None, Stop bit: 1, Data transmission speed: 300/600/1200/2400/4800/9600/19200 bps
Power source	AC adapter (9 V, 500 mA)
External dimensions	91.4 (W) x92.5 (D) x50.4 (H) mm

* To denote your AC line voltage add the following suffixes. **A** for North America, **D** for Europe, **E** for UK, **K** for Korea, **DC** for China, and no suffix is required for Japan.
Note 1: Communication software is not included.
Note 2: Separately purchase the cables. Refer to pages 09-23 and 09-24 for cable types.

Typical Application

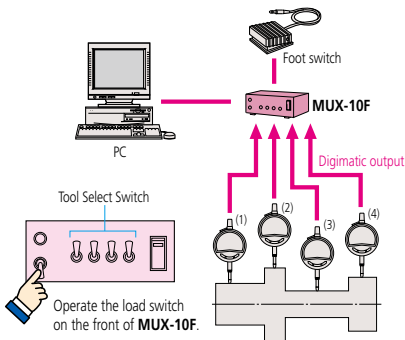
Data input using the data button on the Digimatic gage

- If the Digimatic gage has a data button, data is sent to the **MUX-10F** from the gage, converted to RS-232C and sent out.



Data input using the load switch

- If the Digimatic gage does not have a data button, or when simultaneous measurements are performed, the **MUX-10F** load switch is used to poll data from the measuring gage(s) selected by the tool selection switch (es), converted to RS-232C, and sent out.
- If multiple measuring gages are selected by the tool selection switch, data is input in the order of channels 1 through 4.
- Optional foot switch (**937179T**) is available for quick data entry.

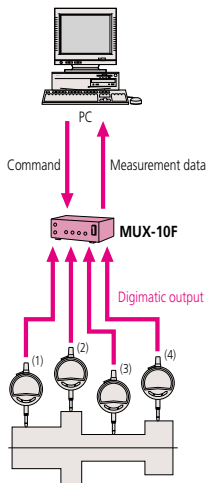


Data input using the external commands

- Data from a specified measuring gage connected to **MUX-10F** can be polled (ch 1 to 4) by inputting a command from the PC.

Commands (ASCII)	Transfer channels
1 (ASCII code31) CR	1
2 (ASCII code32) CR	2
3 (ASCII code33) CR	3
4 (ASCII code34) CR	4
*A (ASCII code41) CR	1, 2, 3, 4
*B (ASCII code42) CR	1, 2, 4
*C (ASCII code43) CR	1, 3, 4
*D (ASCII code44) CR	2, 3, 4
E (ASCII code45) CR	1, 2, 3
F (ASCII code46) CR	1, 2
G (ASCII code47) CR	1, 3
H (ASCII code48) CR	1, 4
I (ASCII code49) CR	2, 3
J (ASCII code50) CR	2, 4
K (ASCII code51) CR	3, 4

* Command will operate the same as previous **MUX-10** when 4-channel mode is turned off.



Connector specification



Pin No.	Signal	Function	in/out
1	CD		out
2	RD	Received data	out
3	TD	Communication data	in
4			
5	GND	Ground	
6	DR		out
7			
8	CS		out
9			

Note: For connection with a PC, use a commercially available RS-232C straight cable.

Data format

1) When data output

D1 D2 D3 D4 D5 D6 D7 D8 D9 D10 D11 D12 D13 CR

Model: + or -
Measurement item: A - LSD (Floating decimal point)
Channel No.: 1 to 4
Data format code No.: 0

2) Example of format

Display (CH1) -0.018
Output data 01 A - 0000.018 CR

Display (CH2) 0.1234
Output data 02 A+000.1234 CR

The smallest input channel number data is output first in the output stream, with the others following in ascending order.

3) Error code output

D1 D2 D3 D4 CR

Error code No.:
Channel No.: 1 to 4
Error format: 9

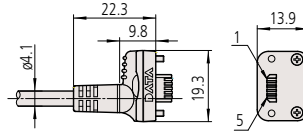
1: No data input
2: Loaded data with format other than specified

Digimatic data cable specifications (Dimensions)

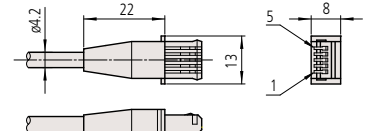
Gage connector dimensions

Unit: mm

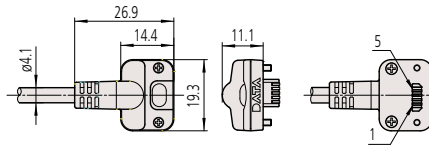
- A)** 1) 06AFM380A
2) 05CZA624 (1 m)
05CZA625 (2 m)



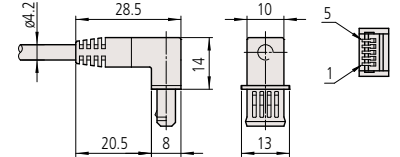
- F)** 1) 06AFM380F
2) 905338 (1 m)
905409 (2 m)



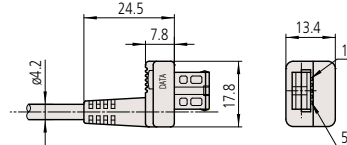
- B)** 1) 06AFM380B
2) 05CZA662 (1 m)
05CZA663 (2 m)



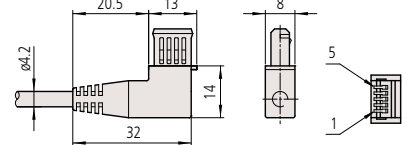
- FB)** 1) No applicable models
2) 905689 (1 m)
905690 (2 m)



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

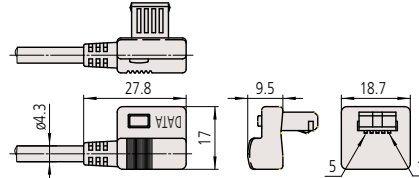


- FR)** 1) No applicable models
2) 905691 (1 m)
905692 (2 m)

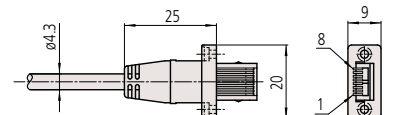


FL) and FR) is symmetrical and the same size.

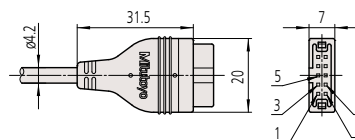
- CR)** 1) No applicable models
2) 04AZB512 (1 m)
04AZB513 (2 m)



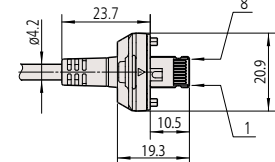
- G)** 1) 06AFM380G
2) 21EAA194 (1 m)
21EAA190 (2 m)



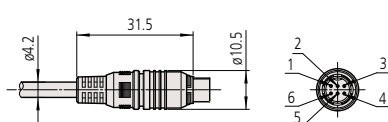
- D)** 1) 06AFM380D
2) 936937 (1 m)
965014 (2 m)



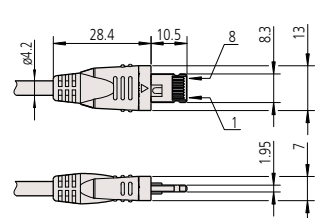
- SA)** 1) 06AGQ001A
2) 06AGL111 (1 m)
06AGL121 (2 m)



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



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



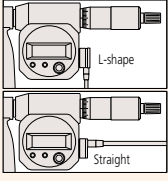
Note: (1), (2) and (3) are for connecting cables listed in 09-23 and 09-24.

Measurement Data Management

Connection cables and applicable models

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 Code 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) IT-020U/IT-007R/DP-1VA LOGGER/MUX-10F/EC Counter  Connector (13 types, 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
	Code 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 09-22.	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 - Laser Scan Micrometers - Litematic - Linear gage counter (EH)	Picture of Digimatic port					
	Applicable models	- 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.	- 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.	- 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.	Digimatic micrometer 293-582/293-583, etc. 389-514/389-714  Type C straight connectors are available, but may interfere with thimble operation.	- 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) EB (Note 1) and (Note 4), EC-101D (Note 1) - Litematic VL-B/S-B (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

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**, **IT-020U**, 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: **IT-020U** 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	 • 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	 • Digimatic bore gage 511-501/511-502 , etc. • Hardness testing machines HH-300	 • Digimatic depth gage Digimatic type (ID-CX)	 • Digimatic indicator ID-N ID-B	 • Digimatic micrometer QuantuMike (293-14X-40/293-18X-40)	 • Digimatic indicator ID-CNX ID-FNX • Digimatic depth gage Digimatic type (ID-CNX) • Digimatic thickness gage Digimatic type (ID-CNX)
	[How to check the code 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. The general catalog can also be viewed on the Mitutoyo website. Web address: https://www.mitutoyo.co.jp/ • Regarding discontinued models not listed in the general catalog (1) How to look for items from the general catalog For a digimatic indicator, you can check the "New and Old Product Compatibility Table" for compatible connecting cables. (2) How to look for items from the Mitutoyo website You can search the "Parts List". Enter the code number of the Digimatic gage you want to search for. Example: 293-421, 500-151, etc.					

Measurement Data Management

MeasurLink® ENABLED
Data Management Software by Mitutoyo

Measurement Data Network System MeasurLink®

- **MeasurLink®** is a data management modular software system that enables collecting data from a wide range of Mitutoyo measuring tools and systems including Coordinate Measuring Machines. It supports the “visualization of quality” by showing quality information important for judging the status of processes, such as control charts and process capability indexes, in an easy-to-understand way.

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

Is the inspection record data utilized to solve quality-related problems?

Current problem

- Data is not leveraged effectively
- Data is at discrete locations
- Management using spreadsheet software
- Every problem needs to be checked with a field operator
- Statistical processing is difficult to learn

Hard to identify problems with only numerical data

Hard to respond quickly since it takes time to enter and analyze data. Unsure about reliability of analysis.

Isn't there any quicker, simpler and more reliable management method?

SPC management can be easily done by combining Mitutoyo measuring instruments and MeasurLink®.

The SPC management can be done with MeasurLink® using a surprisingly simple procedure

MeasurLink® Real-Time

Proactive management

Range of dispersion

Process capability

MeasurLink® is an IoT platform for quality management that realizes “Visualization of quality”.



- **Centralized monitoring from all MeasurLink® data collection terminals networked together on the shop floor**

Enables easy networking through the Database Server (SQL Server). It comprises the six software packages shown in the figure below, and allows for choosing/combining functions necessary for the purpose, such as “data collection” in the inspection room or on the shop floor, or “process monitoring/analysis” by the manager.



Measurement Data Management

MeasurLink® Data Collection/Analysis Software

Real-Time Standard (RT Std)

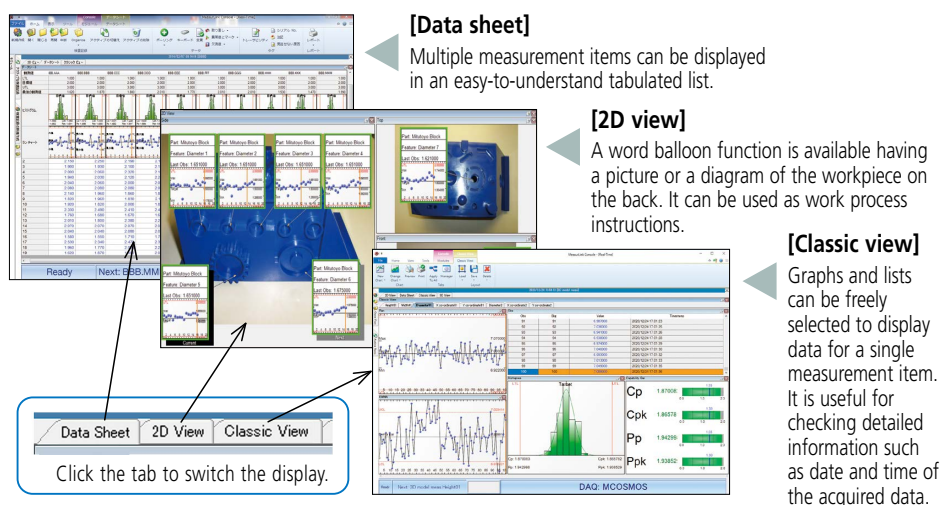
Real-Time Professional (RT Pro)

Real-Time Professional 3D (RT Pro 3D)

- **Real-Time** is the Statistical Process Control (SPC) MeasurLink® module that collects data from Mitutoyo and third-party measuring devices and systems to provide analysis functionality in real-time by displaying control charts or process capability indexes.

Various data views

Collected data can be displayed in various views, such as data lists, work instruction images, statistical analysis results, etc. The views can be switched easily according to the needs of the operator.



Adding traceability information

Traceability information for each workpiece can be added, for example, serial no., lot no., inspector name, machine no., or cause of problems and remedies. Traceability will also support Barcode scanners for easy error free entry.

This information can be used as search criteria when extracting data using the filtering function (**RT Pro/RT Pro 3D**) when a problem occurs.

Alarm function

The operator and management are notified when an "Out of Tolerance" or other events occur.

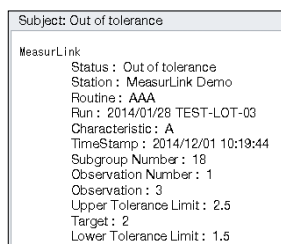
The method of notification can be selected from a pop-up window, E-mail (Fig. 1), audible alarm or log file.

Events possible to be logged

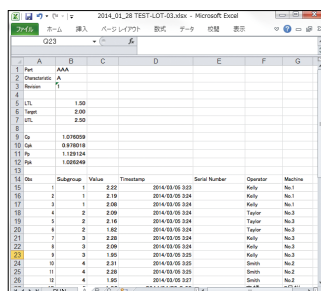
- Measurement data
- Retake/modify data
- Failed data tests
- Assignable Cause and Corrective Action

Exporting data to an Excel file

Measurement data can output to an Excel file. This function is useful if the data needs to be used in a department that does not have **MeasurLink®**. (Fig. 2)



(Fig. 1) Alarm notification by E-mail



(Fig. 2) Export to Excel

MeasurLink® System Requirements

- Operating environments
[Operating System]
Microsoft Windows 7 (32-bit/64-bit)
Microsoft Windows 7 SP1
Microsoft Windows 8.1 (32-bit/64-bit)
(Microsoft Windows 8.1 RT is not supported)
Windows 10 (32-bit/64-bit)
(Windows 10 Mobile and IoT editions are not supported)
Windows 11 (64 bit)
[Database]
Microsoft SQL Server 2017 Standard/Enterprise Edition
Microsoft SQL Server 2016 Standard/Enterprise Edition
Microsoft SQL Server 2014 Standard/Business Intelligence/Enterprise Edition
SQL 2019 Standard/Enterprise

RT Std/RT Pro/RT Pro 3D Common Functions

- Connectable measuring instruments
- Measuring tool with Digimatic output
(equipped with PC data processing unit)
- [Supported interfaces]
 - Wireless (USB) **U-WAVE/U-WAVE fit (VCP)**
 - Wired (USB) **IT-020U/USB-ITN (VCP or HID)**
 - Wireless (D-sub 9 pin) **IT-007R, MUX-10F, DP-1VA LOGGER**, and others
- Various RS-232C devices (partially restricted)
- Screen display mode when collecting data
 - Classic view
 - Data sheet
 - 2D view
 - Part data sheet, etc.
- Statistical Analysis result
[Chart]
Xbar-R, Xbar-S, X-Rs control charts, Histogram, Run chart, Pre-control chart, Tier chart, Box plot chart, Meter chart, Indicator bar, Multivariate data control chart, etc.
[Statistics]
Maximum value, Minimum value, Standard deviation, Average $\pm 3\sigma/4\sigma/6\sigma$, Process capability indexes (Cp, Cpk, Pp, Ppk), Defect ratio, etc.
- Alarm function
[Target items]
 - Out of tolerance
 - 1 point exceeds control limit line (following are related to management chart)
 - Consecutive 9 points on one side of center line
 - 6 points successively increasing or decreasing
 - Others including 8 judgment criteria for Shewhart control chart
- Adding traceability information
- Measurement date (automatically added)
- Serial No. (Keyboard entry)
- Special causes and remedies
- Selection from comment list registered as an option
- Enter from keyboard when measuring classified title registered as an option
(e.g. Lot No. LOT 001)
- Report print out function
Measurement values, analysis calculation results and various charts can be arranged to output according to requirements.
- Export function of measurement results
 - Excel
 - Text
 - QIF
 - AQDEF
- Security function
Once the access authorization is set, it requires "User name" and "Password" input before the program will start. Data editing actions such as reference, entry and changes require authorization according to the user's role in order to preserve data integrity.
- Operation languages (19 languages)
English, Japanese, French, German, Dutch, Spanish, Swedish, Polish, Italian, Turkish, Korean, Chinese (simplified/traditional), Thai, Hungarian, Czech, Finnish, Portuguese, Russian

RT Pro/RT Pro 3D Common Functions

- Connectable measuring instrument
 - Mitutoyo Measurement Data Management System (equipped with PC data processing unit)
- [Supported data processing software]
- CMM: **MCOSMOS V3.2** or later
 - Vision System: **QVPAK V10.0** or later/**QSPAK V10.2** or later/**QSPAK MSE V3.1** or later/**QIPAK V4.1** or later
 - Vision unit: **QSPAK VUE V4.1** or later
 - Surface Roughness/contour instruments: **FORMTRACEPAK V5.311** or later
 - Roundness instruments: **ROUNDPAK V7.0** or later
 - Hardness testing machines: **AVPAK V2.0** or later
 - Filter function
 - Keyword items for data extraction
 - Measurement data (year, month, day, time, week, etc.)
 - Serial No.
 - Traceability information (e.g. Inspectors, Machine No., etc.)
 - Alarm item
 - Import function for text data
- A custom import template can be built to collect data in **Real-Time Pro/Pro 3D**. MeasurLink® supports ASCII file types such as CSV and TXT with minimum required information (e.g. part name, characteristic name and measurement values, etc.) In addition, MeasurLink® supports QIF, AQDEF, and QMD file types.

RT Pro 3D functions

- Screen display mode when collecting data
- 3D view

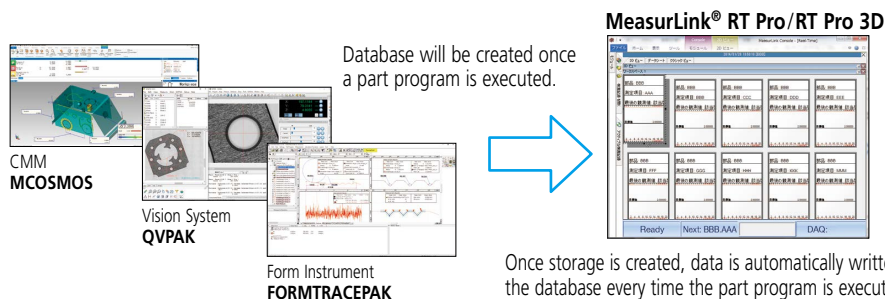
Data collection/analysis software Real-Time functional comparison

Functions		Data collection software		
		Real-Time Standard	Real-Time Professional	Real-Time Professional 3D
Collected data display	Classic view	✓	✓	✓
	Data sheet	✓	✓	✓
	2D view	✓	✓	✓
	3D view (Hoops)			✓
Data extract	Filter		✓	✓
Input from tools and devices	Measuring tools (RS-232C, USB)	✓	✓	✓
	Measuring instruments (DDE)		✓	✓
Text input	Import		✓	✓

- **RT Pro/RT Pro 3D** enables customers to connect and acquire data from Mitutoyo coordinate measuring machines, vision and form measuring systems via native integration (DDE).

• Automatic linking with part programs

To automate the process of linking the CMM, Vision or Form system with MeasurLink®, some easy setup is needed on the device and in MeasurLink®. Then, when the part program is executed, the measurement system will send the part and measurement information to MeasurLink®, along with any tagged data related to the measurement. A new run can be created in **Real-Time Pro/Pro 3D**, or the data can be added to an existing run. The charts and statistics will continuously update and be displayed in the view.



• Filtering function

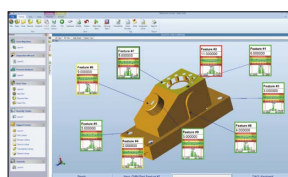
Required data can be easily extracted based on the date and time of the measurement, added comments, or alarms.

• Import function

Measurement data saved in ASCII files can be loaded. Also, a feature to customize a template for loading according to the format is provided.

• RT Pro 3D is a full-spec package

The feature to be measured can be displayed in detail using 3D CAD data.



[3D view]

3D graphics library HOOPS displays real view of the workpiece using an hsf file created from 3D CAD data. The displayed workpiece image can be freely turned, translated, or scaled so that you can get a clear view of the feature to be measured. The word balloons and lead lines that display the measurement result and measured feature will move following the CAD data translation.

MeasurLink® Automatic Report Generation Program MeasurLink® Report Scheduler

Automatically generates a report created by the **Real-Time (RT Std/RT Pro/RT Pro 3D)** or **Process Analyzer Professional** modules, each of which is connected to the network according to a specified schedule.

The Use of MeasurLink® Report Scheduler

• Typical applications

- Automatic generation of a weekly report specified from among last week's data.
- Automatic report generation by extracting only data with tag information about "tool replacement" (due to wear, breakage, etc.)
- Automatic generation of a daily report for each shift by filtering inspection record data on the basis of a shift

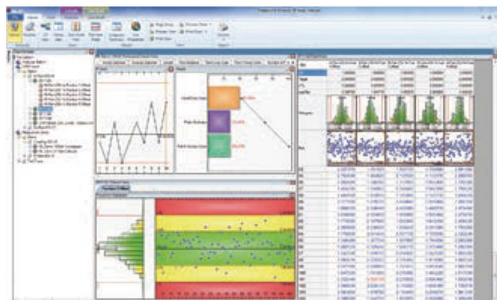


MeasurLink® Report Scheduler common functions

• Report output destinations

- Printer, file, E-mail (as an attached document)

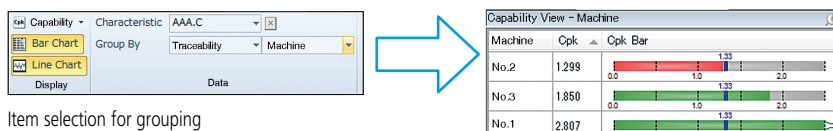
- **Process Analyzer** is optional software for a manager who accesses the database created by the **Real-Time** data collection software to review measurement results and perform statistic analyses.



The same data displayable by data collection software can be displayed, including measurement results, charts, and statistical calculation results with the look and feel of Windows Explorer.

Data can be extracted or grouped by selecting the date and time and other traceability information as keywords.

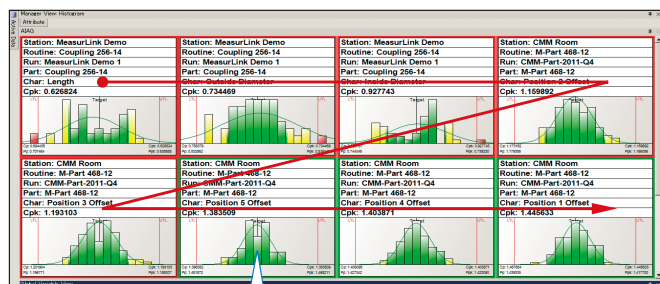
Example) Grouping by Machine No. Cp, Cpk comparison



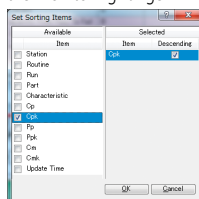
Cpk value and bar graph per machine

- 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.

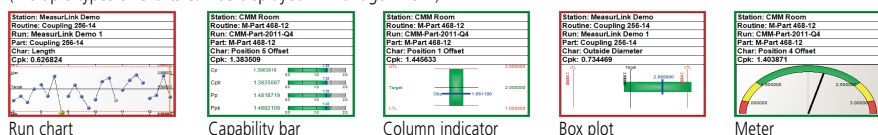
Displays various types of charts as an at-a-glance guide. The manager can narrow down all items of data currently being measured into a specific monitoring range of those of critical importance or sort those data (in ascending or descending order) on the basis of process capability index.



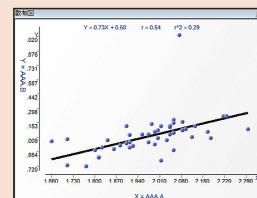
Possible to sort charts in the view and narrow down the monitoring range.



Selects various charts such as run charts and histograms to display as an at-a-glance guide. (Multiple types of charts can be displayed in Manager View.)



- Exporting function of measurement result
- Excel



Scatter plots: The relationship between two items can be plotted.

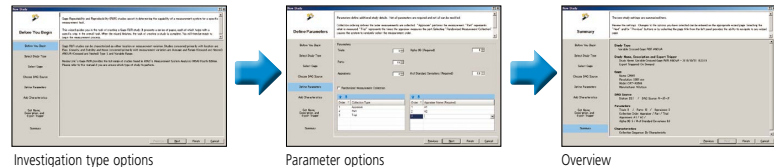
- Filter function
- Keyword items for data extraction
 - Measurement data (year, month, day, time, week, etc.)
 - Serial No.
 - Traceability information (e.g. Inspectors, Machine No., etc.)
 - Alarm item
- Data processing
 - Data file merging, Copying
 - Editing
- Data processing capability
 - Old runs can be archived so they are not available for collection in Real-Time.
- Electronic signature function
 - Provides support for medical and pharmaceutical manufacturers electronic records, including audit trails, e-signatures and advanced security.
 - Conforms to FDA 21CFR Part 11

MeasurLink® Evaluation/Analysis Software for Measurement System Analysis (MSA) Gage R&R

The evaluation and analysis software supports measurement system analysis (MSA) required by IATF 16949. It uses a statistical method to analyze variations attributable to differences in accuracy among measuring instruments or operators in order to build an optimum measurement system.

• Automatic calculation of MSA evaluation results

This allows the operator to simply input an evaluation method/evaluation condition and measurement data with the Wizard function. The operator can implement MSA evaluation simply by selecting an "investigation type option", "Measuring instrument option", "data input source option", "parameter option", etc.



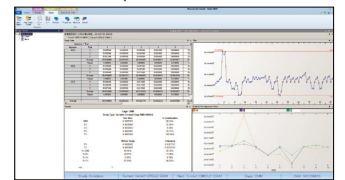
• Evaluation method compliant with MSA (fourth edition)

The software can implement evaluation using the following methods.

- 1) Measurement value tolerance Gage R&R variance analysis method
- 2) Measurement value tolerance Gage R&R range & average method
- 3) Measurement value branching Gage R&R variance analysis method
- 4) Measurement value branching Gage R&R average & range method
- 5) Measurement value range method
- 6) Measurement value simplified method
- 7) Measurement value MSA4
- 8) Deviation
- 9) Linearity
- 10) Stability

• Analysis chart view

Various charts such as the control chart are effective for analysis/judgment on variations due to operator, the adequacy of gage accuracy, etc., and remedies for problems.



• Registration of gage-specific information

1. Registration of information on gages within the system

This allows registration of gage information on the following items and association with evaluated results.

Registration items: Gage name, maker, model, resolution, unit, measuring range, etc.

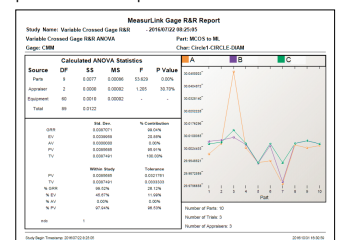
2. Information link between MeasurLink® Gage Management and this software

This software can use measuring instruments information that has been registered in **Gage Management** directly as options.

Additionally, **Gage R&R** evaluation results are reflected in the measuring instruments information, which means the expiry dates determined by **Gage R&R** can be managed by **Gage Management** as well.

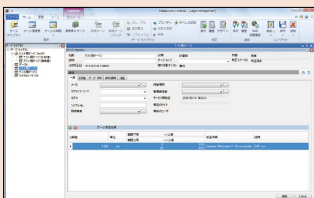
• Output of results as a report

Evaluated results and charts can be printed as a report.

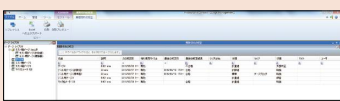


• Confirmation of detailed gage information

Allows confirmation of detailed information on individual gages. The software allows you to display a list of gages depending on "Calibration Overdue", "Next Month Due", etc., by setting a calibration date and confirm detailed information on the calibration history of gages.



Display of detailed gage information



Display of gages listed depending on calibration date



Display of calibration history

MeasurLink® Gage Management Software Gage Management

This software can help you plan and implement a reliable calibration schedule with a powerful retrieval function in addition to recording and controlling the status of measuring instruments. Measuring instrument information can be viewed from any networked terminal on which **Gage Management** is installed since the information is centrally managed in a database. Measuring instruments information can be shared between software packages linked to **Gage R&R**.

• Creation of a list of calibration-targeted gages from the gage management table

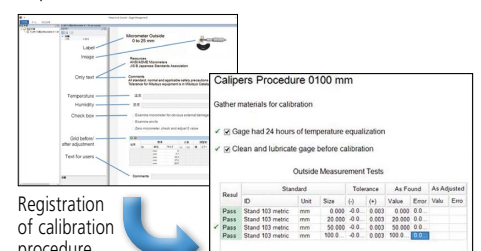
The target gages are retrieved from a variety of search items such as gage ID, gage type, model, maker, distributor, calibration date, current usage state and location to create the list.



Gage management table

• Registration and running a calibration procedure

Allows simple registration of the calibration procedure for each measuring instruments and implementation of the calibration.



Registration of calibration procedure

Calibration run

10

Portable Surface Roughness Testers

Toolmakers' Microscopes

Hardness Testers



SJ-210 Series



SJ-310 Series

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.



Toolmakers' Microscopes TM Series
TM-505B



Rebound Type Portable Hardness Tester
HH-411



Durometers for Sponge, Rubber and Plastics
HH-300

INDEX

Portable Surface Roughness Testers

SURFTTEST SJ-210	10-3
SURFTTEST SJ-310	10-4
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Toolmakers' Microscopes

Toolmakers' Microscopes TM-505B/TM-1005B	10-7
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Hardness Testers

Rebound Type Portable Hardness Tester HH-411	10-8
Durometers for Sponge, Rubber and Plastics HH-300	10-9

Portable Surface Roughness Tester Surftest SJ-210
SERIES 178

Enhancing your manufacturing with unparalleled performance

- Compact body to carry around or use on-site.
- It can be connected to a PC for greater convenience.
<Simplified communication program>
- Human error, such as failure to save data and unintended deletion, can be prevented.
- Reliable measurements by contact detection with a visual display of contact status.
- Stabilizer helps eliminate erroneous measurements.



SPECIFICATIONS

Model		Standard drive unit		Retractable drive unit		Transverse tracing drive unit	
		SJ-210 (0.75 mN type)	SJ-210 (4 mN type)	SJ-210 (0.75 mN type)	SJ-210 (4 mN type)	SJ-210 (0.75 mN type)	SJ-210 (4 mN type)
Code No.	mm	178-560-11	178-560-12	178-562-11	178-562-12	178-564-11	178-564-12
	inch/mm	178-561-11	178-561-12	178-563-11	178-563-12	178-565-11	178-565-12
X axis		16.0 mm				5.6 mm	
Measuring range	Range	360 μm (-200 μm to +160 μm)					
	Detector Range/Resolution	360 μm/0.02 μm, 100 μm/0.006 μm, 25 μm/0.002 μm					
Measuring force/Stylus tip shape		Depends on the code number: 0.75 mN/2 μmR 60° (when the code number ends with "-11") 4 mN/5 μmR 90° (when the code number ends with "-12")					
Applicable standards		JIS B 0601:2001, JIS B 0601:1994, JIS B 0601:1982, VDA, ISO:1997, ANSI					
Assessed profiles		Primary profile, Roughness profile, DF profile, Roughness motif profile					
Parameters		Ra, Ry, Rz, Rq, Rt, Rmax*1, Rp, Rv, R3z, Rsk, Rku, Rc, RPC, Rsm, Rz1max*2, S, HSC, RzJIS*3, Rppi, RΔa, RΔq, Rlr, Rmr, Rmr(c), Rδc, Rk, Rpk, Rvk, Mr1, Mr2, A1, A2, Vo, Rpm, tp*4, Htp*4, R, Rx, AR, Possible Customize					
Analysis graphs		Bearing area curve, Amplitude distribution curve					
Filters		Gaussian, 2CR75, PC75					
Cut-off length	λc	0.08, 0.25, 0.8, 2.5 mm					
	λs*5	2.5, 8 μm					
Sampling length		0.08, 0.25, 0.8, 2.5 mm					
Number of sampling lengths		x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, arbitrary length (0.3 to 16.0 mm: 0.01 mm interval)				x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, arbitrary length (0.3 to 5.6 mm: 0.01 mm interval)	
Functions GO/NG judgment*6		By max value/16%/Standard deviation					

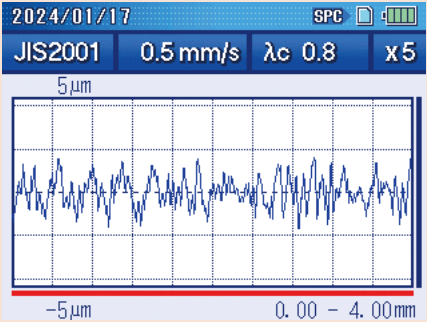
*1 Calculation is available only when selecting the VDA, ANSI, or JIS '82 standard.
*2 Calculation is available only when selecting the ISO '97 standard.
*3 Calculation is available only when selecting the JIS '01 standard.
*4 Calculation is available only when selecting the ANSI standard.
*5 Not available when selecting the JIS '82 standard.
*6 Standard deviation only can be selected in ANSI. 16% rule cannot be selected in VDA.



Measuring by monitoring the waveform in real time.



Can be combined with height gage for easy positioning.

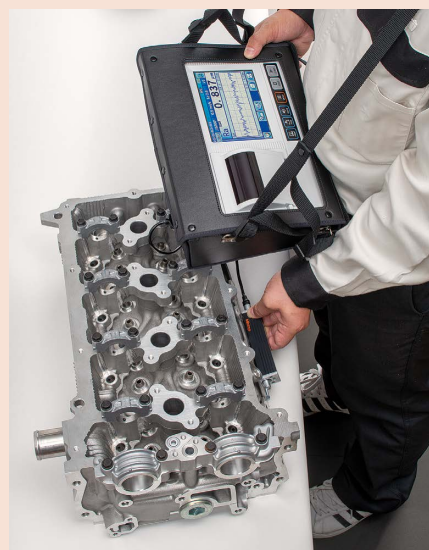


Waveform display for checking scuffmarks and surface texture.

Portable Surface Roughness Tester Surftest SJ-310 SERIES 178

Advanced portable model with a built-in printer allows various kinds of measurement and analysis functions

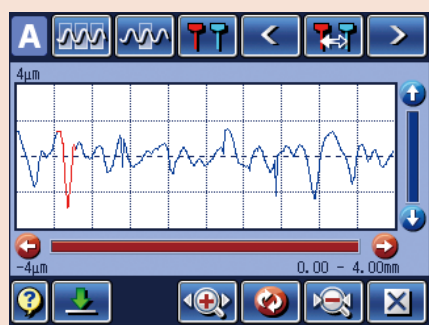
- Great visibility makes measurement easier.
<Large 5.7-inch color graphic LCD touch panel>
- The high-speed printer can output measurement results anywhere, anytime.
- It can be connected to a PC for greater convenience.
<Simplified communication program>
- The simultaneous two-profile assessment function enables advanced utilization of measurement data.
- The delete function can expand the range of data utilization.
- Up to three parameters and 300 statistical measurements are supported.



Easy to carry and has a built-in printer for on-site printing.



Easy-to-operate touch panel.



The delete function can expand the range of data utilization.

SPECIFICATIONS

Model	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)	
Code No.	mm	178-570-21	178-570-22	178-572-21	178-572-22	178-574-21	178-574-22
	inch/mm	178-571-21	178-571-22	178-573-21	178-573-22	178-575-21	178-575-22
X axis		16.0 mm				5.6 mm	
Measuring range	Range	360 μm (-200 μm to +160 μm)					
	Detector	360 μm/0.02 μm, 100 μm/0.006 μm, 25 μm/0.002 μm					
Range/Resolution							
Measuring force/Stylus tip shape		Depends on the code number: 0.75 mN/2 μmR 60° (when the code number ends with "-21") 4 mN/5 μmR 90° (when the code number ends with "-22")					
Applicable standards		JIS B 0601:2001, JIS B 0601:1994, JIS B 0601:1982, VDA, ISO:1997, ANSI					
Assessed profiles		Primary profile, Roughness profile, DF profile, Roughness motif profile, Waviness motif profile					
Parameters		Ra, Ry, Rz, Rq, Rt, Rmax ^{*1} , Rp, Rv, R3z, Rsk, Rku, Rc, RPC, Rsm, Rz1max ^{*2} , S, HSC, Rz1S ^{*3} , Rppi, RΔa, RΔq, Rlr, Rmr, Rmr(c), R δ c, Rk, Rpk, Rvk, Mr1, Mr2, A1, A2, Vo, λ a, λ q, L0, Rpm, tp ^{*4} , Htp ^{*4} , R, Rx, AR, V, AW, Wx, Wte, Possible Customize					
Analysis graphs		Bearing area curve, Amplitude distribution curve					
Filters		Gaussian, 2CR75, PC75					
Cut-off length	λ c	0.08, 0.25, 0.8, 2.5, 8 mm					
	λ s ^{*5}	2.5, 8 μm					
Sampling length		0.08, 0.25, 0.8, 2.5, 8 mm					
Number of sampling lengths		x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, Arbitrary (0.3 to 16.0 mm: 0.01 mm Interval)				x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, Arbitrary (0.3 to 5.6 mm: 0.01 mm Interval)	
Functions GO/NG judgment ^{*6}		Max rule/16% rule/Average rule/Standard deviation (1 σ, 2 σ, 3 σ)					

*1 Calculation is available only when selecting the VDA, ANSI, or JIS '82 standard.

*2 Calculation is available only when selecting the ISO '97 standard.

*3 Calculation is available only when selecting the JIS '01 standard.

*4 Calculation is available only when selecting the ANSI standard.

*5 Not available when selecting the JIS '82 standard.

*6 Standard deviation only can be selected in ANSI. 16% rule cannot be selected in VDA.

Mounting example



Optional Accessories for Drive Units

•Nosepiece for flat surfaces



12AAA217

- SJ-310 standard accessory for standard/detector retracting type. (not for transverse tracing type)

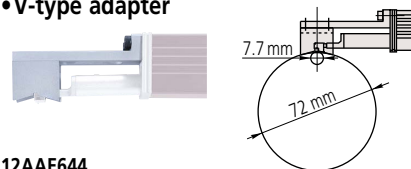
•Nosepiece for cylindrical surfaces



12AAA218

- SJ-310 standard accessory for standard/detector retracting type. (not for transverse tracing type)

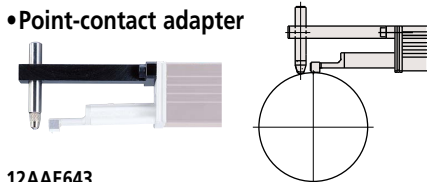
•V-type adapter



12AAE644

- SJ-210/SJ-310 Transverse tracing type standard accessory.
- Dedicated to the transverse tracing type.

•Point-contact adapter

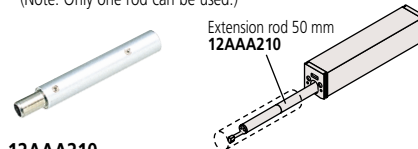


12AAE643

- SJ-210/SJ-310 Transverse tracing type standard accessory.
- Dedicated to the transverse tracing type.

•Extension rod (50 mm)

(Note: Only one rod can be used.)



12AAA210

- Not for transverse tracing type.
- Not applicable to upward measurement.

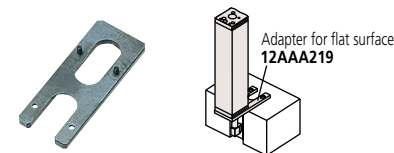
•Extension cable (1 m)

(Note: Only one rod can be used.)

12BAA303

- For the connection between the calculation display unit and drive unit.

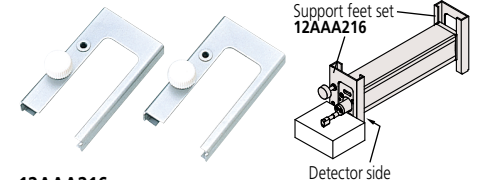
•Adapter for flat surface



12AAA219

- Not for transverse tracing type.

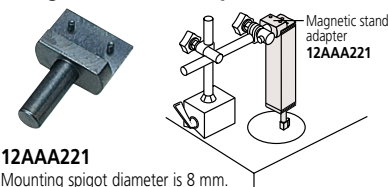
•Support feet set



12AAA216

- SJ-310 standard accessory for standard/detector retracting type. (not for transverse tracing type)
- Adjustment range is 28 mm from bottom face.

•Magnetic stand adapter



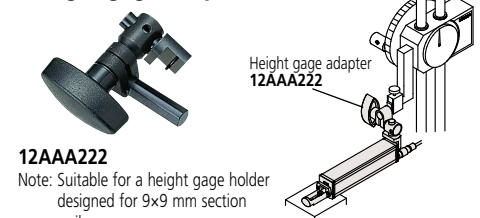
12AAA221

Mounting spigot diameter is 8 mm.

12AAA220

Mounting spigot diameter is 9.5 mm.

•Height gage adapter



12AAA222

Note: Suitable for a height gage holder designed for 9x9 mm section scribers.

TM
SERIES 176 — Toolmakers' Microscopes

- Compact universal toolmakers' microscope that can be installed on any site.
- The newly designed LED light ensures clear observation. It also provides excellent color reproduction.
- Attaching an optional circular LED light expands the range of observation.
- **TM-505B** achieves a maximum measuring height of 115 mm despite the compact size.
- Digimatic micrometer head (**164-163**, **164-164**, optional) makes measurement easy and precise.



TM-505B

Note: Micrometer heads are optional.

SPECIFICATIONS

Model		TM-505B	TM-1005B
Code No.		176-818-11	176-819-11
Optical tube		Monocular type (Vertical tilt angle: 30°)	
Observation image		Erect	
Eyepiece protractor		Resolution (graduation): 1°, Rotation angle: 360°, Resolution (angle): 6', Adjustable zero point	
Eyepiece		Standard accessory: 15X (field number: 13), Options: 10X, 20X	
Objective		Standard accessory: 2X, Optional: 5X, 10X	
Microscope head	Maximum height of workpiece	115 mm	107 mm
	Focusing method	Manual (Coarse feed)	
Illumination unit	Transmitted illumination	Stepless brightness adjustment, White LED light source with green filter	
	Reflected illumination	Oblique single-source type, Stepless brightness adjustment, White LED light source	
Cross-travel stage	Measuring range	50×50 mm	100×50 mm (An optional 50 mm gauge block is required to cover full range. A CERA block is recommended.)
	Table size	152×152 mm	240×152 mm
	Usable area of the stage glass	96×96 mm	154×96 mm
	Maximum stage glass loading	5 kg	
Linear measurement method		Micrometer head*	
Resolution		Depends on the micrometer head specifications* 164-163 (mm): 0.001 mm or 164-164 (inch/mm): 0.00005 in/0.001 mm	
Micrometer head travel range		164-163 (mm): 50 mm or 164-164 (inch/mm): 2 in/50 mm	
Power source		AC100 to 240 V 50/60 Hz Maximum power consumption: 4.2 W	
Mass		14 kg	15 kg

* Micrometer heads are optional for **TM-505B** and **TM-1005B**.

Angle Index (Standard Accessory)



HARDMATIC HH-411 SERIES 810 — Rebound Type Portable Hardness Tester

- Excellent operability that performs hardness tests with the touch of a key and a compact body allows users to measure hardness in the field. This instrument is best suited for on-site hardness tests such as large molds, railroad track, and welded spots in structures.



SPECIFICATIONS

Code No.	810-299-21	810-298-21
Model	HH-411	
Hardness display range	Leeb hardness: 1 to 999 HL	
Display range* ¹ (This display range varies depending on the conversion table used.)	Vickers hardness: 43 to 950 HV Brinell hardness: 20 to 896 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) Tensile strength: 499 to 1999 MPa
Shore hardness (HS) conversion	VHS (JIS B7731)	HSD
Detector	Impact hammer with integrated detector and carbide-ball tip (D type)	
Display	7-segment LCD	
Specimen requirements	Test points: At least 5 mm from specimen edges and at intervals of at least 3 mm Min. thickness: 5 mm; mass: 5 kg or more (However, specimens with a mass between 0.1 and 5 kg can be tested if fixed to a strong support.)	
Power source	Alkaline AA battery (2 pcs.)* ² or optional AC adapter (battery life: 70 hours)	
External dimensions/Mass	Detector: ø28×175 mm in length, 120 g Display (W×D×H): 70×35×110 mm, 200 g	

*1 For **HH-411**, display values are guaranteed based on Leeb hardness. Converted values are for reference only.

*2 Alkaline AA batteries are not included as standard. Please use commercially available batteries.

HARDMATIC HH-300

SERIES 811 — Durometers for Sponge, Rubber and Plastics

- These are available in two types: a compact type that can fit in the palm of your hand, and a long type with a slim, easy-to-hold stem. Both are available with an analog or digital indicator.

Compact type



811-330-10 HH-330
811-336-10 HH-336
811-338-10 HH-338

Long type



811-332-10 HH-332
811-334-10 HH-334

SPECIFICATIONS

Code No.	811-330-10	811-332-10	811-334-10
Model	HH-330	HH-332	HH-334
Type	Compact	Long	
Display specification	Digital		
Measurement target	Soft rubber, sponge, felt, hard film, fabric	General rubber, soft plastic	Hard rubber, hard plastic, ebonite
Category in standards	Type E	Type A	Type D
Needle shape	Shaft diameter	ø1.25 mm	
	Tip shape	Circular truncated cone	Cone
	Tip angle	35°	30°
	Tip diameter	ø0.79 mm	—
	Tip curvature	—	0.1 mm
Power source	SR44 battery (1 pc.), 938882 included as standard (for operational checks)		
External dimensions (WxDxH)	59x40x147 mm	59x41x190 mm	
Mass	290 g	310 g	

Code No.	811-336-10	811-336-11	811-338-10	811-338-11
Model	HH-336	HH-336-01	HH-338	HH-338-01
Type	Compact			
Display specification	Digital			
Measurement target	General rubber, soft plastic		Hard rubber, hard plastic, ebonite	
Category in standards	Type A		Type D	
Needle shape	Shaft diameter	ø1.25 mm		
	Tip shape	Circular truncated cone		Cone
	Tip angle	35°		30°
	Tip diameter	ø0.79 mm		—
	Tip curvature	—		0.1 mm
Power source	SR44 battery (1 pc.), 938882 included as standard (for operational checks)			
External dimensions (WxDxH)	59x40x147 mm			
Mass	290 g			

Optional Accessories for Dual-purpose Stand CTS Series

Code No.	811-019	811-012	811-013
Model	CTS-101	CTS-102	CTS-103
Applicable models	HH-332	HH-334/338/338-01	HH-336/336-01

- Hardness measurements by a durometer are performed by simply holding the instrument against the surface of a specimen and reading the indicated value.
- This type of hardness tester is most widely used for hardness testing of sponge, rubber, plastics and other soft materials.

Compact type



811-329-10 HH-329
811-335-10 HH-335
811-337-10 HH-337

Long type



811-331-10 HH-331
811-333-10 HH-333

SPECIFICATIONS

Code No.	811-329-10	811-331-10	811-333-10
Model	HH-329	HH-331	HH-333
Type	Compact	Long	
Display specification	Analog		
Measurement target	Soft rubber, sponge, felt, hard film, fabric	General rubber, soft plastic	Hard rubber, hard plastic, ebonite
Category in standards	Type E	Type A	Type D
Needle shape	Shaft diameter	ø1.25 mm	
	Tip shape	Circular truncated cone	Cone
	Tip angle	35°	30°
	Tip diameter	ø0.79 mm	—
	Tip curvature	—	0.1 mm
External dimensions (WxDxH)	68x34x146 mm	68x35x188 mm	
Mass	300 g	320 g	

Code No.	811-335-10	811-335-11	811-337-10	811-337-11
Model	HH-335	HH-335-01	HH-337	HH-337-01
Type	Compact			
Display specification	Analog			
Measurement target	General rubber, soft plastic		Hard rubber, hard plastic, ebonite	
Category in standards	Type A		Type D	
Needle shape	Shaft diameter	ø1.25 mm		
	Tip shape	Circular truncated cone		Cone
	Tip angle	35°		30°
	Tip diameter	ø0.79 mm		—
	Tip curvature	—		0.1 mm
External dimensions (W×D×H)	68×34×146 mm			
Mass	300 g			

Optional Accessories for Dual-purpose Stand CTS Series

Code No.	811-019	811-012	811-013
Model	CTS-101	CTS-102	CTS-103
Applicable models	HH-331	HH-333/337/337-01	HH-335/335-01

11

Sensors and Embedded Equipment



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)



Contact Sensors (Linear Gage)



Litematic



Laser Scan Micrometers



**Non-contact
Line-laser Sensor**



**NC Linear Scale
(Linear Encoder)**



**Digital Readout System
(DRO)**

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Contact Sensors

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Non-contact Sensors

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Video

Sensors and Embedded Equipment

Mitutoyo offers a variety of contact sensors that can accurately measure not only the movement amount of equipment but also the dimensions of workpieces to be measured, as well as non-contact sensors that can accurately measure the outlines and clearances of cylinders, surface texture of workpieces, etc.



Product catalog
E13022

Contact Sensors (Linear Gage)

A wide range of products are available to best suit your measurement needs, including space-saving, environment resistant, cost, and accuracy. They can help you build an optimized production environment.



IP67 G



Environment-resistant Linear Gage (Slim type)

LG200

The vibration/shock resistance of the **LG100** Series is delivered in a slimmer body. Approximately 1/5 cross section compared with **LG100**.

- Measuring range: 10 mm
- Resolution: 1 μm /0.5 μm /0.1 μm



Video



IP67 G



Environment-resistant, Linear Gage

LG100

High-accuracy gage head suitable for in-line and in-laboratory use. Assures the repeatability (2σ) of 0.3 μm and the narrow range accuracy of 0.5 μm (arbitrary 20 μm range).

- Measuring range: 10 mm/25 mm/50 mm
- Resolution: 1 μm /0.5 μm /0.1 μm



Video



IP66



ABSOLUTE Digimatic Linear Gage

LGS-1012P

ABSOLUTE electrostatic capacitance type encoder makes it possible to maintain the reference point even when the power is switched off.

- Measuring range: 12.7 mm
- Resolution: 10 μm



High-accuracy/resolution Linear Gage

LGH

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.

- Measuring range: 10 mm
- Resolution: 0.01 μm /0.005 μm

Contact Sensors (Linear Gage Counter)

A wide range of products are available to best suit your measurement needs, including space-saving, environment resistant, cost, and accuracy. They can help you build an optimized production environment.



Linear Gage Counter (Display Unit)

EJ-102N/NE Counter and Interface Unit

This is a compact counter for linear gages and industrial interface units.



Product catalog
E13022

Linear Gage Counter (Display Unit)

EH Counter

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.



Product catalog
E13022



Linear Gage Counter (Display Unit)

EC Counter

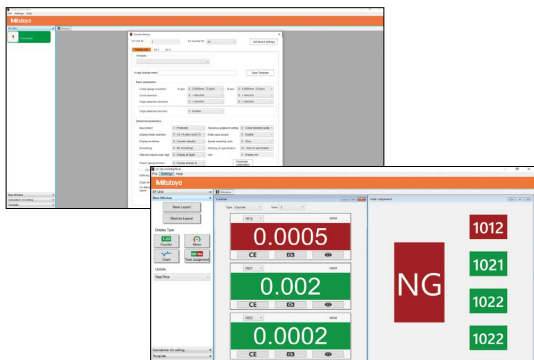
This Digimatic display can be connected to Linear gages with Digimatic output (LGS).



Product catalog
E13022

Contact Sensors (Linear Gage Software)

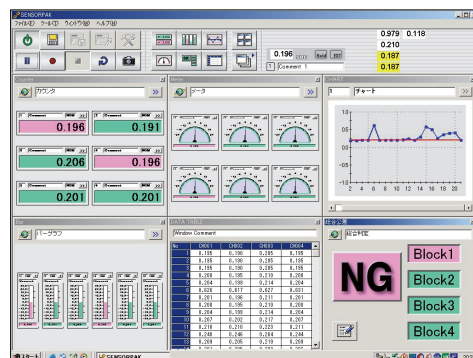
A wide range of products are available to best suit your measurement needs, including space-saving, environment resistant, cost, and accuracy. They can help you build an optimized production environment.



Application Software

LG QuickSetupTool

LG QuickSetupTool is a free software tool for use with the **EJ** counter when connected via the optional USB interface. All kinds of settings normally carried out with counter operating keys now can be easily applied from a computer.



Measurement Data Loading Software

SENSORPAK

This software facilitates loading measurement data onto a personal computer from a linear gage counter with RS-232C/USB output (**EH Counter**), or from a Litematic display (**VL**).



Product catalog
E13022

High-accuracy/resolution Measuring Machine Litematic

These high-resolution Digimatic measuring units can accurately measure the thickness and height of workpieces that are susceptible to a measuring force.



High-accuracy/resolution Measuring Machine Litematic

VL-50-B/50S-B

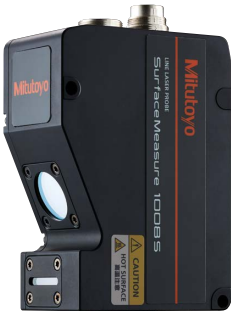
Features low and constant measuring force suitable for measuring high-precision parts and easily deformed workpieces such as functional thin films. Measuring force can be selected from 0.01 N, 0.15 N and 1.0 N.

- Measuring range: 50 mm
- Resolution: 1.0 μm /0.1 μm /0.01 μm (selectable)



Product catalog
E13022

Non-contact Line-laser Sensor



Non-contact Line-laser Sensor

SurfaceMeasure1008S

This line-laser sensor combines the optical technology and sensor technology of Mitutoyo.

- Maximum measuring width: 100 mm
- Measuring range: 80 mm
- Z-axis repeatability: 0.5 μ m



Product catalog
E13023



Master2410

Optional Accessory

Sensor Networking Hub Master

In the multi-sensor system, this device is used for distributing power to sensors and synchronizing the sensors.



Non-contact Line-laser Sensor

SurfaceMeasure0303S

This line-laser sensor combines the optical technology and sensor technology of Mitutoyo.

- Maximum measuring width: 32.5 mm
- Measuring range: 25 mm
- Z-axis repeatability: 0.4 μ m



Product catalog
E13023



Optional Accessory

GoMax NX

A calculation unit that accelerates measurement processing without using a PC.

Non-contact Line-laser Sensor



Optional Accessory

Master Cable

Cable for the connection between sensor and Master.



Optional Accessory

Power and Ethernet Cable

Cable to supply and control power without using the Master for the sensor.



Optional Accessory

I/O Cable

Cable to connect the external I/O device to the sensor.



High-accuracy Non-contact In-line Measuring System/Laser Scan Micrometers

These instruments feature extremely high-speed measurement capabilities thanks to an ultra-high-precision scan motor. They can also meet high-precision needs such as linearity precision.

IP67



Measuring Unit

LSM-02-A

LSM sensor developed for in-line and automated equipment.

- Measuring range: 0.005 mm to 2 mm
- Guaranteed repeatability (2σ): $\pm 0.015 \mu\text{m}$ ($\phi 1 \text{ mm}$)
- Guaranteed linearity: $\pm 0.3 \mu\text{m}$
- Scanning rate: 3,200 scans/s

IP67



Measuring Unit

LSM-30-A

LSM sensor developed for in-line and automated equipment.

- Measuring range: 0.3 mm to 30 mm
- Guaranteed repeatability (2σ): $\pm 0.06 \mu\text{m}$ ($\phi 10 \text{ mm}$)
- Guaranteed linearity: $\pm 1.0 \mu\text{m}$
- Scanning rate: 3,200 scans/s



Controller for LSM Developed for In-line and Automated Equipment

LSM-CU-A

- Can be connected to **LSM-02-A/LSM-30-A**.
- Compact, thin design that fits in a distribution board or inside equipment.
- Easily mountable on a DIN rail without the need for tools.
- USB Type-C, I/O ports, and industrial interfaces (optional).
- Configuration software included as standard for easy configuration.

EtherNet/IP



EtherCAT



PROFINET



CC-Link I/TSN



Interface Unit

I/F Module

Four types of interfaces are available so you can select the right one to meet your production line requirements.

The controller design enables insertion of a module without changing the layout.



High-accuracy Non-contact In-line Measuring System/Laser Scan Micrometers

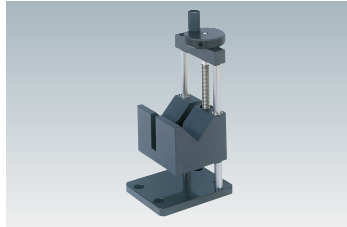
These instruments feature extremely high-speed measurement capabilities thanks to an ultra-high-precision scan motor. They can also meet high-precision needs such as linearity precision.



Optional Accessory

Standard Calibration Gage Set

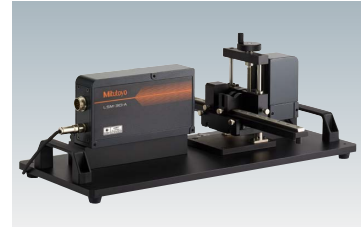
Standard calibration gage set suitable for calibration of Laser Scan Micrometers.



Optional Accessory

Workstage

Easy set-up and height adjustment enables high-precision measurement.
Applicable model: **LSM-30-A**



Optional Accessory

Adjustable Workstage

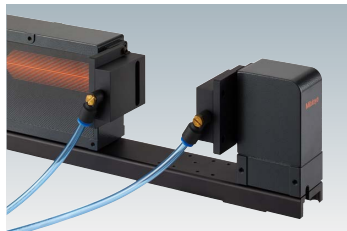
Vertical/horizontal slide mechanism enables easy measurement of various workpiece diameters.
Applicable model: **LSM-30-A**



Optional Accessory

Wire Guiding Pulley

Used for supporting measurement of outside diameter of fine wire-like materials such as magnetic wire or fiber.
Applicable model: **LSM-02-A**



Optional Accessory

Air Shield

Air blows from the air outlet installed on the laser section to clear dust adhering to the laser window.
Applicable model: **LSM-30-A**



Optional Accessory

Laser Beam Stabilization Shield

This suppresses variation of measured values caused by spatial fluctuation of the measurement environment.
Applicable model: **LSM-30-A**



Optional Accessory

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.

NC Linear Scale (Linear Encoder)

The linear encoder detects the amount of linear movement and displacement and can output as digital data. They are useful for positioning and controlling CNC machines, semiconductor manufacturing equipment, inspection equipment, etc.



ABSOLUTE Linear Scale (separate type)

ABS ST700

ABSOLUTE measurement with exposed scales. Non-contact detection is optimal for high speed and high acceleration devices such as linear motors.

- Detection method: Electromagnetic induction
- Maximum effective range: 6000 mm
- Resolution: 0.1 μm
- Maximum response speed: 5000 mm/s



Incremental Linear Scale (separate type)

ST36

A high-accuracy model that outputs a 2-phase sine wave of 4 μm signal period. There are four types of output signal forms selectable for your specifications.

- Detection method: Optical
- Maximum effective range: 3000 mm
- Resolution: 0.01 μm
- Maximum response speed: 1200 mm/s



ABSOLUTE Linear Scale (separate type)

ABS ST1300

The telecentric imaging optical system is used for detecting the position. Outstanding robustness against contamination and GAP allowance compared to earlier optical types. There are three types of attachment methods available according to the application.

- Detection method: Optical
- Maximum effective range: 12000 mm
- Resolution: 0.001 μm
- Maximum response speed: 8000 mm/s



Incremental Linear Scale (separate type)

ST46-EZA

Includes an automatic adjustment function for the signal (EZA function) at the push of a button. A wide range of specifications are available to best suit your application(s). With the "setup indicator" installed on the connector shell, adjustment while attached is easy without the need of an oscilloscope or PC.

- Detection method: Optical
- Maximum effective range: 3000 mm
- Resolution: 0.05 μm
- Maximum response speed: 2600 mm/s



NC Linear Scale (Linear Encoder)

The linear encoder detects the amount of linear movement and displacement and can output as digital data. They are useful for positioning and controlling CNC machines, semiconductor manufacturing equipment, inspection equipment, etc.



ABSOLUTE Linear Scale (assembly type)

ABS AT1300

The telecentric imaging optical system is used for detecting the position. Features outstanding robustness against contamination and scuffing compared to earlier optical types. The best-in-class, smallest resolution of 0.001 μm as an ABSOLUTE scale. Space-saving, slim body.

- Detection method: Optical
- Maximum effective range: 2200 mm
- Resolution: 0.001 μm
- Maximum response speed: 3000 mm/s



Product catalog
E13005



ABSOLUTE Linear Scale (assembly type)

ABS AT1100

Electromagnetic induction type with excellent water and oil resistance. Features a structure that can prevent coolant entry and is dust proof as well. This manufacturing site-ready linear scale provides more reliable operation compared with conventional models.

- Detection method: Electromagnetic induction
- Maximum effective range: 3040 mm
- Resolution: 0.05 μm
- Maximum response speed: 3000 mm/s



Product catalog
E13005



Video



Incremental Linear Scale (assembly type)

AT211-A, AT211-B

This is a slim, sealed, 2-phase, square-wave scale that can be directly connected to a control unit.

- Detection method: Optical
- Maximum effective range: 1500 mm
- Resolution: 0.1 μm
- Maximum response speed: 2000 mm/s



Product catalog
E13005

Digital Readout System (DRO)

The products can be installed on any type of machine tool and increase work efficiency by digitally displaying count values.



Incremental Linear Scale (assembly type)

AT103

A wide choice of measuring range is available in this standard type scale unit. Connectable to the **KA-200** counter or **PSU-200**.

- Detection method: Optical
- Maximum effective range: 6000 mm
- Maximum response speed: 2000 mm/s



Product catalog
E13000



Incremental Linear Scale (assembly type)

AT113

Slim spar type with unit sectional dimensions of 22x35 mm. Connectable to the **KA-200** counter or **PSU-200**.

- Detection method: Optical
- Maximum effective range: 1500 mm
- Maximum response speed: 2000 mm/s



Product catalog
E13000

IP67



ABSOLUTE Linear Scale (assembly type)

ABS AT715

Electromagnetic induction principle means scales are unaffected by contamination.

- Detection method: Electromagnetic induction
- Maximum effective range: 3000 mm
- Resolution: 1 μ m
- Maximum response speed: 833 mm/s



Product catalog
E13000



Counter (Display Unit)

KA-200

A high-performance display unit that has special functions for lathes and milling machines as standard.



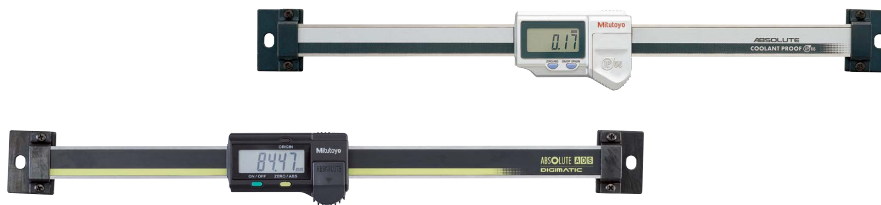
Product catalog
E13000

ABSOLUTE Digimatic Scale Units

The scale units developed from digital callipers can be installed to position a small machine tool, jig, tool, etc.



Applicable models: SD-G



Digimatic Scale Units

SD

SD Series can be easily mounted on jigs, tools, and small machine tools to enable accurate positioning.

- Detection method: Electromagnetic induction, Electrostatic capacitance
- Maximum effective range: 1000 mm
- Resolution: 0.01 mm
- Response speed: Unlimited

Accessories, Options

Various signal controller units and programs for linear gages are available.



Pulse Signal Interface Unit

PSU-200

The **PSU-200**, which can convert a sine wave into a square wave signal and output it, allows the use of a linear gage with a CNC feedback system or measurement control equipment to improve positioning accuracy and resolution.



Serial Signal Interface Unit

PSU-251/252

PSU-251 Series is a serial signal interface unit for incremental linear scales.



Product catalog
E13005



Product catalog
E13005

12

Measuring Equipment



Coordinate Measuring Machines



Vision Measuring Systems



Optical Measuring Instruments



Form Measuring Systems



Hardness Testing Machines

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Coordinate Measuring Machines

These coordinate measuring machines help determine spatial coordinates in 3 directions (X, Y and Z) on a workpiece surface to accurately capture the position and shape. Mitutoyo offers a wide range of models and probes to suit your application.

Standard CNC CMM

Suitable for automated measurements of small and medium-sized workpieces. The line-up includes various models that can be installed in temperature-controlled rooms and next to production lines.



Bridge Type Standard CNC CMM

CRYSTA-Apex V500/700/900

Versatile CNC coordinate measuring machines providing high-accuracy, high-speed, and high-acceleration measurements.

$E_{0,MPE}: 1.7 + 3L/1000 \mu m^*$
(L: Measuring length in mm)



Product catalog
E16026

5-axis CNC CMM

A 5-axis CNC CMM is also available for efficient measurement of workpieces that have complex shapes with free-form surfaces.



5-axis CNC CMM

CRYSTA-Apex EX 1200R

A versatile CNC coordinate measuring machine equipped with REVO-2, a 5-axis control-scanning probe head.

$E_{0,MPE}: 2.9 + 4L/1000 \mu m^*$
(L: Measuring length in mm)



Product catalog
E16015

High-accuracy CNC CMM

This brings together our advanced precision measurement technologies. The line-up includes models with high-speed and high-acceleration movements.



High-accuracy CNC CMM

STRATO-Apex 500/700/900

High-accuracy CNC coordinate measuring machines with a first term accuracy specification of $0.7 \mu m$.

$E_{0,MPE}: 0.7 + 2.5L/1000 \mu m^*$
(L: Measuring length in mm)



Product catalog
E16001



High-accuracy CNC CMM

STRATO-Active

Offers both high performance and cost-effective measurements.

$E_{0,MPE}: 1.2 + 3L/1000 \mu m^*$
(L: Measuring length in mm)



Product catalog
E16035

* Specifications vary by configuration, size and thermal environment.



Ultra-high Accuracy CNC CMM

LEGEX 500/700/900 Takumi Model*2

Ultra-high accuracy CNC coordinate measuring machines, boasting best-in-class accuracy (the first term accuracy specification of $0.23 \mu\text{m}$), created by thoroughly eliminating error factors and providing excellent straightness and perpendicularity through sophisticated techniques by qualified artisans.

$E_{0,MPE}: 0.23 + L/1000 \mu\text{m}^{*1}$
(L: Measuring length in mm)

*2 Takumi is a Japanese word meaning "artisan" with superb craftsmanship.

Product catalog
E16012

Gantry Type High-accuracy CNC CMM

STRATO-Apex G

A CNC coordinate measuring machine with a moving bridge and installation base designed to provide high-accuracy measurement of large and heavy workpieces.

*1 Specifications vary by configuration, size and thermal environment.

Large-sized CNC CMM

The line-up includes models that can measure large workpieces such as car bodies and large structures.

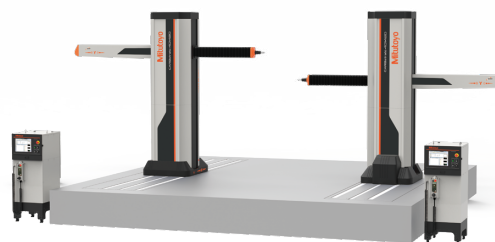


Bridge Type Standard CNC CMM

**CRYSTA-Apex V1200/1600/2000
STRATO-Apex 1600/2000**

Large CNC coordinate measuring machines developed to facilitate quality evaluation and assembly of large workpieces.

$E_{0,MPE}: 2.3 + 3L/1000 \mu\text{m}^{*1}$
 $E_{0,MPE}: 2.5 + 4L/1000 \mu\text{m}^{*1}$
(L: Measuring length in mm)

Product catalog
E16026Product catalog
E16001

Horizontal Arm Type CNC CMM for Automobile Bodies

CARBstrato

The **CARBstrato** Series is a large CNC CMM and offers the world's largest class measurement range, making it possible to measure car bodies.

Shop-floor/In-line Use Models

The machines can be installed in-line or next to a production line to detect nonconforming products early on. They can reduce risks in the manufacturing process and improve productivity.



Shop-floor Type CNC CMM

MiSTAR 555

Designed for use on any size shop floor.

$E_{0,MPE}: 2.2 + 3L/1000 \mu m^*$
(L: Measuring length in mm)



Product catalog
E16028



Video



In-line CNC CMM

MACH-V 9106

The CNC coordinate measuring machine for in-line use provides high acceleration and high-speed movement to enable high-throughput measurements.

$E_{0,MPE}: 2.5 + 3.5L/1000 \mu m^*$
(L: Measuring length in mm)



Product catalog
E16010



In-line, Horizontal CNC CMM

MACH-3A 653

A horizontal CNC coordinate measuring machine for in-line use that can not only save space but also increase throughput with high acceleration, high-speed movement, and high-speed measurement. An optional index table allows more flexible measurements.

$E_{0,MPE}: 2.2 + 3.5L/1000 \mu m^*$
(L: Measuring length in mm)



Product catalog
E16010



Compact In-line CNC CMM

MACH Ko-ga-me

A standalone CNC CMM measuring head can also be integrated with a single- or multi-axis machine to create a system to measure larger workpieces.

$E_{0,MPE}: 2.4 + 5.7L/1000 \mu m^*$
(L: Measuring length in mm)

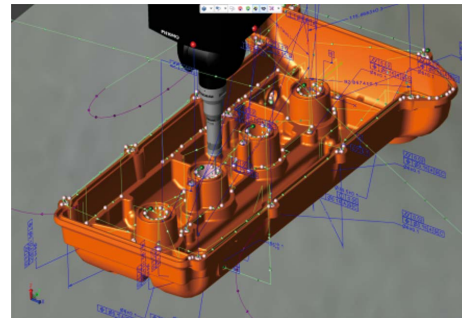
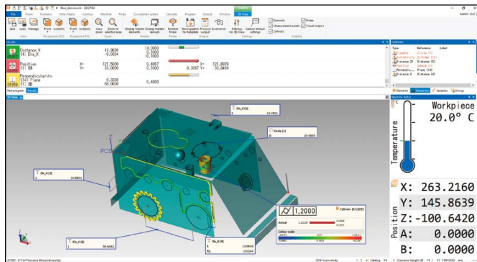


Product catalog
E16010

* Specifications vary by configuration, size and thermal environment.

Software

The line-up includes different types of dedicated software for evaluation and processing of data measured by coordinate measuring machines.



Data Processing Software

MCOSMOS

The software package includes data processing programs for coordinate measuring machines. Features a wealth of functions for connecting to 3D CAD models.



Product catalog
E16008

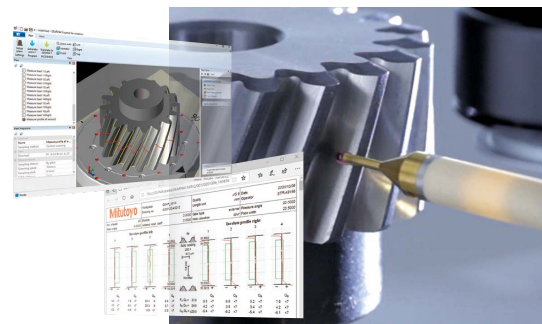
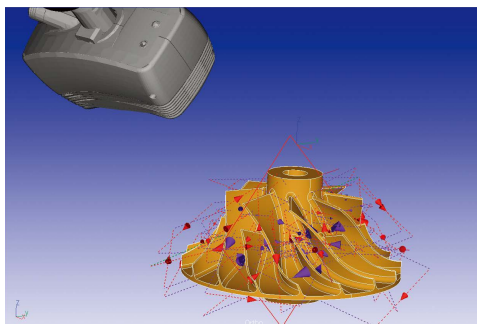
Automatic Measurement Program Generation Software

MiCAT Planner

The software is designed to import 3D CAD models and automatically complete high-quality measurement programs with one click. Time needed to create a measurement program can be greatly reduced.



Product catalog
E16019



Point Cloud Data Measurement Software

MSURF

With **SurfaceMeasure**, a non-contact line laser probe, the software can capture workpiece surface points and execute data analysis and evaluation. Linked with **MCOSMOS**, it can execute fully automatic contact and non-contact measurements.



Product catalog
E16005

Gear Measurement Evaluation Software

GEARPAK Express

Evaluation of tooth profile deviations, measurements, and evaluations of face widths, cylindrical shafts, keyways, etc. can be performed in a single program.



Video

Probes

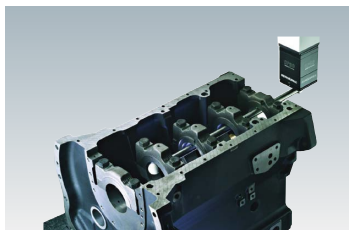
Various contact and non-contact probing systems are available to measure a wide range of workpieces.



Compact High-accuracy Scanning Probe

SP25M

A compact high-accuracy scanning probe that can be automatically adjusted in orientation.



High-accuracy Scanning Probe

SP80

A high-accuracy scanning probe usable with a long stylus.



High-accuracy and Low Measuring Force Scanning Probe

MPP-310Q

A high-accuracy scanning probe suitable for center alignment measurements and clamped workpiece scanning.



Non-contact Line-laser Probe

SurfaceMeasure

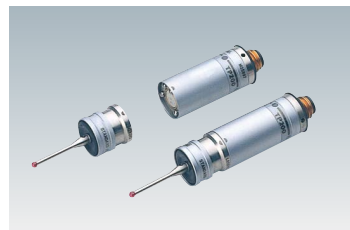
A non-contact line-laser probe that can collect a large volume of 3D profile data from a workpiece surface.



Vision Probe

QVP

Useful for vision measurements of a large and heavy workpiece that cannot be placed on a vision measuring system.



Compact High-accuracy Touch-trigger Probe

TP200

A high-accuracy touch-trigger probe is capable of changing styli automatically.



Roughness Probe

SURFTEST PROBE

A probe for surface roughness measurement.



5-axis Control Touch-trigger Probe Head

PH20

A 5-axis control touch-trigger probe head without limitations in the probe orientation angle.



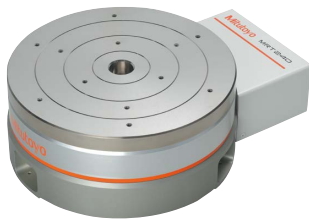
Motorized Probe Head

PH10MQ

This probe head allows automatic control of positioning (up to 720 directions) of the mounted probe. It is possible to mount **SP25M**, **SurfaceMeasure**, **QVP**, **TP200**, and **SURFTEST** probes to this probe head.

Options

Various options for easier and more efficient measurement with coordinate-measuring machines are available.



MRT240



MRT320



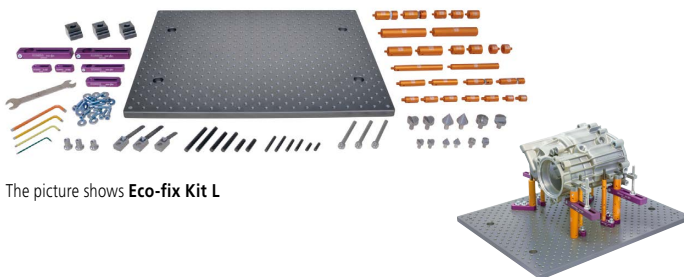
QS600/800

Rotary Table for CNC CMM

MRT240, MRT320, QS600/800

The rotary table helps ensure high-accuracy, highly efficient measurements of a rotating workpiece (a gear, impeller, cylindrical cam, etc.). Used in conjunction with a scanning probe to perform synchronous scanning, a wide variety of contour measurements can be taken, expanding the range of the supported applications.

Eco-fix Kit



The picture shows **Eco-fix Kit L**

Receiver plate set (optional)



Clamping System

Eco-fix Kit

Our tools can be joined as building blocks to create a clamping system in order to clamp a unique workpiece. Using such a clamping system to clamp your specific workpiece can remove the need to create a dedicated clamping system.

Vision Measuring Systems

Our vision measuring systems can provide a wide range of measurements in a single system. We have a comprehensive line-up to meet various needs.

Standard CNC Vision Measuring System

Vision measuring systems with high functionality and operability make it possible to perform non-contact measurement of various workpieces.



Vision Measuring System Equipped with Color Camera and Zoom

QV Active

A versatile CNC vision measuring system equipped with a color camera and a zoom unit with replaceable lens.

E_{1X}/E_{1Y} : 2 + 3L/1000 μm
(L: Measuring length in mm)



Product catalog
E14022



Standard CNC Vision Measuring System

QV APEX Pro

A CNC vision measuring system with newly developed illumination and control technology for high-speed, high-accuracy measurement.

$E_{UX}/E_{UY, MPE}$: 1.5 + 3L/1000 μm
(L: Measuring length in mm)



Product catalog
E14028



Video

High-accuracy CNC Vision Measuring System

This is a high-accuracy version of the standard CNC model.



Ultra-high Accuracy CNC Vision Measuring System

QV ULTRA

An ultra-high accuracy CNC vision measuring system with a first term accuracy of $E_{UX}/E_{UY, MPE}$ is 0.35 μm that is enabled by adopting a highly rigid structure and eliminating error factors.

$E_{UX}/E_{UY, MPE}$: 0.35 + 1.3L/1000 μm
(L: Measuring length in mm)



Product catalog
E14002



High-accuracy CNC Vision Measuring System

QV HYPER Pro

The **QV HYPER Pro** is a highly accurate model that is equipped with a high-resolution/high-accuracy scale.

$E_{UX}/E_{UY, MPE}$: 0.8 + 2L/1000 μm
(L: Measuring length in mm)



Product catalog
E14028

CNC Vision Measuring System with Multiple Sensors

Multi-sensor design allows versatile and flexible measurements.



CNC Vision Measuring System Equipped with Non-contact Displacement Sensor

QVH4 Pro

A complex measuring system with a non-contact displacement sensor that is optimal for measuring steep surfaces or surfaces with different reflection rates.

$E_{UX}/E_{UY, MPE}$: 1.5 + 3L/1000 μm (for QVH4 Apex Pro model)

$E_{UX}/E_{UY, MPE}$: 0.8 + 2L/1000 μm (for QVH4 Hyper Pro model)
(L: Measuring length in mm)



Product catalog
E14028



CNC Vision Measuring System Equipped with Non-contact Displacement Sensor

QVH1 Pro

A complex measuring system for micro-form measurement that uses a non-contact displacement sensor with a minimum laser spot diameter.

$E_{UX}/E_{UY, MPE}$: 1.5 + 3L/1000 μm (for QVH1 Apex Pro model)

$E_{UX}/E_{UY, MPE}$: 0.8 + 2L/1000 μm (for QVH1 Hyper Pro model)
(L: Measuring length in mm)



Product catalog
E14028



CNC Vision Measuring System Equipped with a Touch-trigger Probe

QVTP Pro

A complex measuring system with a touch-trigger probe suitable for contact measurements of the sides and height of a workpiece.

$E_{UX}/E_{UY, MPE}$: 1.5 + 3L/1000 μm (for QVTP Pro model)

$E_{UX}/E_{UY, MPE}$: 0.8 + 2L/1000 μm (for QVTP Hyper Pro model)
(L: Measuring length in mm)



Product catalog
E14028



CNC Vision Measuring System Equipped with a Touch-trigger Probe

QVTP Active

A complex measuring system with a touch-trigger probe suitable for contact measurements of the sides and height of a workpiece.

E_{1X}/E_{1Y} : 2 + 3L/1000 μm

(L: Measuring length in mm)



Product catalog
E14022

High-accuracy 3D Measuring System

QVWLI can measure coordinates and dimensions and assess micro-3D forms without contact in a single machine. 3D data captured by the **WLI** optical system enables 3D surface texture analysis and 3D roughness analysis.



Non-contact 3D Measuring System

QVWLI Pro

A high-accuracy 3D measuring system with a WLI optical system that can measure micro-forms to the sub-micrometer level.

$E_{UX}/E_{UY, MPE}$: $0.8 + 2L/1000 \mu m$
(L: Measuring length in mm)



Product catalog
E14001

Large-sized CNC Vision Measuring System

The moving bridge design makes it suitable for measuring large objects as well as small, thin objects. The fixed stage design allows for a more simplified design of the workpiece fixture.



Large-sized Vision Measuring System

QV ACCEL

A vision measuring system with a moving-bridge structure suitable for measurements of a large workpiece.

E_{1X}/E_{1Y} : $1.5 + 3L/1000 \mu m$
(L: Measuring length in mm)



Product catalog
E14028

Micro-form Measuring System



CNC Vision Measuring Machine with Micro-form Scanning Probe

MiSCAN Vision System

A complex measuring system designed for scanning measurements with a stylus ball diameter as small as $125 \mu m$.

$E_{1X}/E_{1Y, MPE}$: $1.5 + 3L/1000 \mu m$
 $E_{1X}/E_{1Y, MPE}$: $0.8 + 2L/1000 \mu m$ (for MVS Hyper model)
 $E_{0, MPE}$: $1.9 + 4L/1000 \mu m$ (when using MPP-NANO probe system)
 $E_{0, MPE}$: $1.9 + 4L/1000 \mu m^*$ (when using SP25M probe system)
(L: Measuring length in mm)



Product catalog
E14024



Video

The versatile, high-accuracy micro-form measuring system can measure a wide range of workpieces, from micro-forms to larger pieces.



Micro-form Measuring System

UMAP Vision System TYPE2

Designed for micro-dimension and form measurements with a stylus ball diameter as small as $15 \mu m$.

$E_{UX}/E_{UY, MPE}$: $0.8 + 2L/1000 \mu m$ (for UVS Hyper model)
 $E_{UX}/E_{UY, MPE}$: $0.35 + 1.3L/1000 \mu m$ (for UVS ULTRA model)
 $E_{1X}/E_{1Y, MPE}$: $1.5 + 3L/1000 \mu m^*$ (when using UMAP probe system)
(L: Measuring length in mm)

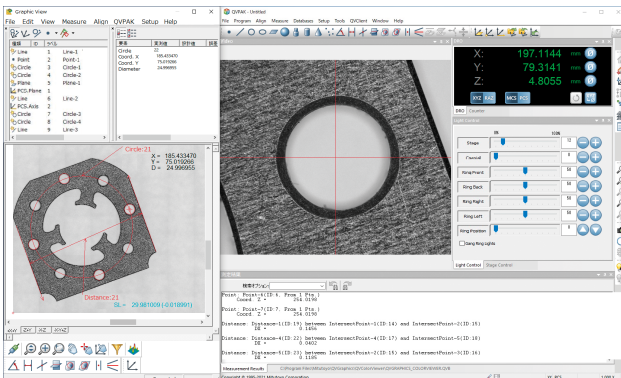


Product catalog
E14000

* Specifications vary by configuration, size and thermal environment.

Software

A wide variety of software applications with high functionality and operability are available to support all kinds of measurements, including simple and complex measurements.



Data Processing Software for QV

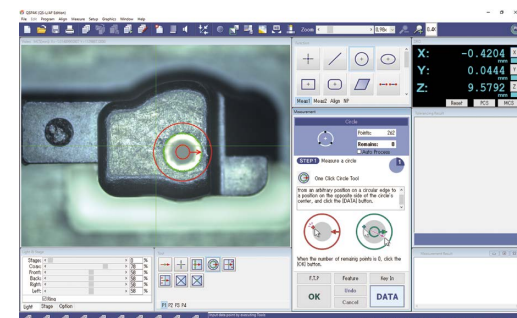
QVPAK

Software for high-performance vision measurement and for form analysis using different displacement sensors.

Note: Software for **MISCAN Vision System** is **MCOSMOS** (Refer to page 12-6).



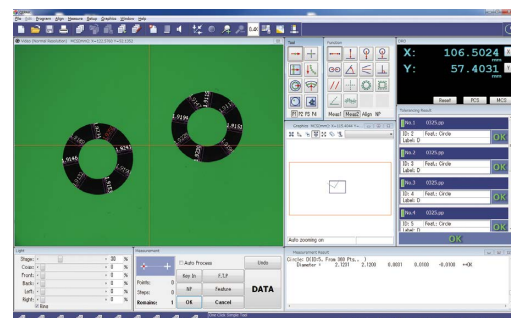
Product catalog
E14028



Software for QS-L/AF

QSPAK

Easy-to-use software provides stable measurements, even for inexperienced operators.



Software for QI

QIPAK

With a long focal depth, a wide field of view can be measured with one click without the need of focusing on a stepped workpiece.

Manual 3D Vision Measuring System

With a fast auto focus function built in as standard, the manual stage vision measuring system can perform height measurements as well in a single system. This ensures reliable measurement of details.



Manual Stage Vision Measuring System

QS-L/AFC

A vision measuring system with a color camera with high-precision, high-speed auto focus.

Measuring accuracy (X Y): $(2.2 + 0.02L) \mu\text{m}$
(L: Measuring length in mm)



Product catalog
E14004

Manual 2D Vision Measuring System

The 2D color vision measuring system can stably and accurately measure workpieces of various shapes and sizes. Displaying a whole workpiece can significantly increase measurement efficiency.



2D Color Vision Measuring System

QI

A 2D vision measuring system that has an optical system with deep depth of focus and a screen providing a wide field of view, enabling highly efficient measurements.

$E_{1XY}: \pm (3.5 + 0.02L) \mu\text{m}$
(L: Measuring length in mm)



Product catalog
E14009

Optical Measuring Instruments

A wide variety of optical measuring instruments with in-house-developed lenses, the “eyes” of optical measuring instruments, are available to respond to various measuring applications.

Profile Projector

The projectors display a workpiece image magnified at an accurate ratio on a screen to improve efficiency of measurement, inspection, and observation. They can be installed in various locations such as inspection laboratories and manufacturing and processing sites.



High-accuracy Profile Projector

PJ-H30

A high-end model in the **PJ** Series that can provide a clear and sharp projected image.

Screen effective diameter: $\phi 306$ mm
Projected image: Erect



Product catalog
E14005



Profile Projector

PJ-PLUS

A profile projector with highly durable, energy-efficient LED illumination and a built-in counter.

Screen effective diameter: $\phi 315$ mm
Projected image: Inverted-reversed
Illumination: White LED



Product catalog
E14005



Profile Projector

PV-5110

Equipped with a large 500 mm screen.
Projected images can be easily traced or compared with a template.

Screen effective diameter: $\phi 508$ mm
Projected image: Inverted-reversed



Product catalog
E14005



Profile Projector

PH-3515F

A profile projector suitable for measurement and observation of an end mill, cutter, circular saw, etc. of cutting tools.

Screen effective diameter: $\phi 353$ mm
Projected image: Erect-reversed



Product catalog
E14005

Measuring Microscope

Best-in-class accuracy is guaranteed for all models of the series. The intuitive positioning function ensures accuracy and ease of use.



Measuring Microscope with Z-axis Motor Drive

MF-J/MF-UJ/MF-UK

High-accuracy measuring microscopes with a motor drive that can bring the microscope into focus in the "blink of an eye" (approximately 1 second).

Measuring accuracy (X Y): $(2.2 + 0.02L) \mu\text{m}$

(L: Measuring length in mm)

Observation image: Bright-field/Dark-field/Polarization/Differential Interference Contrast

Z axis feed mechanism: Motor drive



Measuring Microscope

MF-U

Integration of metallurgical and measurement microscope functions provides high-resolution observation and a high-accuracy measurement solution.

Measuring accuracy (X Y): $(2.2 + 0.02L) \mu\text{m}$

(L: Measuring length in mm)

Observation image: Bright-field/Dark-field



Product catalog
E14003



Measuring Microscope

MF

An easy-to-use, standard measuring microscope model with a dedicated long working distance ML objective lens.

Measuring accuracy (X Y): $(2.2 + 0.02L) \mu\text{m}$

(L: Measuring length in mm)

Observation image: Bright-field



Product catalog
E14003



Video



Toolmakers' Microscope

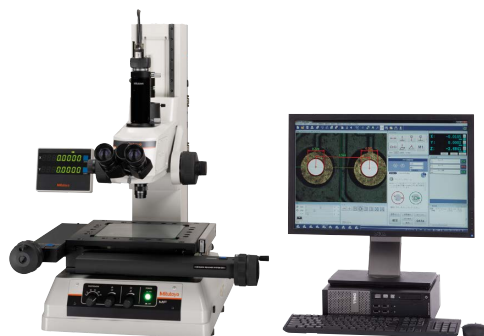
TM500

A toolmakers' microscope with an LED illumination useful for observation of a sharp and clear image.

Measuring range: 50x50 mm, 100x50 mm

Maximum load: 5 kg

Data Processing Unit



Vision Unit Retrofit for Microscopes

Vision Unit

Helps increase measurement efficiency and reduce human errors due to operator's skill by providing automatic edge detection and other image processing functions.



Product catalog
E14008



2D Data Processing Unit

QM-Data200

A 2D data processing unit connected to a projector or measuring microscope and used for calculation.



Product catalog
E14008

Microscope Unit

The microscope units have great track records of integration into systems and support a wide variety of observation methods. They are suitable for inspection and analysis of electronic semiconductors and metal parts.



Microscope Unit

FS70

A microscope unit with eyepieces, designed for integration with an instrument.

Supports variable magnification by employing a revolver and can be used for microfabrication with YAG lasers.

Observation image: Bright-field, Bright/Dark-field, Polarization, Differential Interference Contrast



Product catalog
E14020



Video Microscope Unit/Wide-field Video Microscope Unit

VMU/WIDE VMU

Microscope unit for incorporating into optical systems.

Models in the line-up can support observation of an actual field of view of $\phi 30$ mm.

Suitable for various types of observation (bright-field, bright/dark-field, and near-infrared) and laser processing.

Observation image: Bright-field, Bright/Dark-field



Product catalog
E14020



Video



Objectives

The line-up of objective lenses supports a wide range of wavelength bands, from ultraviolet light and visible light to near-infrared light. They can be used in observation, inspection, and laser processing.

Visible radiation range objectives (**VIS**)



Bright-field observation, long working distance, plan apochromat lens.

Visible radiation range objectives (**VIS**)



Bright-field observation/dark-field observation, long working distance, plan apochromat lens.

Near-infrared radiation range objectives (**NIR**)



Bright-field observation/near-infrared observation/laser processing, long working distance, plan apochromat lens.

Near-ultraviolet radiation range objectives (**NUV**)



Bright-field observation/near-ultraviolet observation/laser processing, long working distance, plan apochromat lens.

Ultraviolet radiation range objectives (**UV**)



Bright-field observation/ultraviolet observation/laser processing, long working distance, plan lens.

Varifocal Lens

The line-up of ultra-high-speed varifocal lenses can significantly expand the depth of focus. They help reduce the inspection time and greatly increase the observation efficiency.



Varifocal Lens

TAGLENS-T1

Captures a clear image with a deep depth of focus by adjusting the focal length at a high speed.

Resonance frequency: 70 kHz

Effective aperture: $\phi 11$ mm



Product catalog
E14025



Video



Relay Optical System Microscope Unit

VMU-T1

Microscope unit for configuring a varifocal optical system by incorporating **TAGLENS-T1**, the objective and the camera.



Pulse Illumination Unit for TAGLENS

PLS

Combined with **TAGLENS-T1**, the ultra-high-speed LED pulse illuminator enables capture of an image in focus at a desired point as well as focus stacking.

Form Measuring Systems

The line-up includes a wide range of measuring systems that can capture various form properties such as surface roughness, contour, and roundness.

Roundness/Cylindricity/Surface Roughness/Contour Measuring System



Roundness/Cylindricity Measuring System

ROUNDTRACER EXTREME

The CNC form measuring system can measure surface roughness, contour, and roundness/cylindricity in a single system.

Rotational accuracy (Radial direction): $(0.02 + 3.5H/10000) \mu\text{m}$

(H: Probing height in mm)

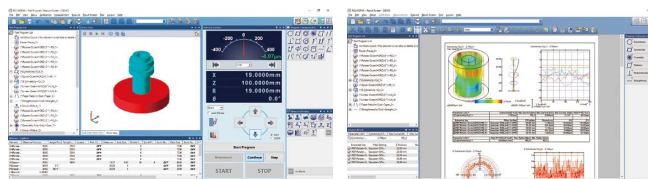
Maximum load: 60 kg



Product catalog
E15032



Video



Roundness/Cylindricity Measurement/Analysis Software

ROUNDPAK

A wide variety of parameters including those for roundness/cylindricity, as well as flatness and parallelism, are provided as standard features. Special analyses, such as design value best-fit analysis, harmonic analysis, and peak and bottom detection on a circle, are supported.

A high-end system which can combine roundness, contour and surface roughness measurements into one device. It can reduce the measurement time and improve productivity by streamlining processes.



High-speed High-accuracy Roundness/Cylindricity Measuring System

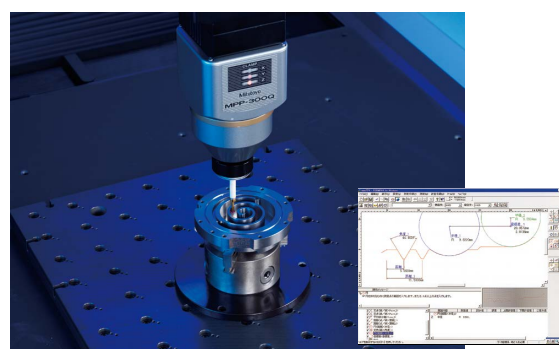
ROUNDTRACER FLASH

A non-contact form measuring system that can evaluate dimensions and form profiles in a few seconds with a 2D image sensor.

Probing height: 100 mm, 300 mm

Probing diameter: 60 mm

Maximum load: 6 kg



Two-dimensional Primary Profile Analyzing Software

FORMTRACEPAK-AP

Optional software for 2D contour analysis and roughness analysis of measurement points obtained by the main programs of vision 3D/roundness measuring systems.

Surface Roughness and Contour Measuring System (Surface Texture Measuring Instrument)



Surface Roughness and Contour Measuring System

FORMTRACER Avant D3000/4000

Complex measuring systems that can support both surface roughness and contour measurement in a single system by switching the detector without turning off the machine.

Measuring range (X axis): 100 mm, 200 mm

Roughness measuring range (Z1 axis): 800 μm /80 μm /8 μm

Contour measuring range (Z1 axis): Contour 60 mm



Product catalog
E15030



CNC Surface Texture Measuring System

FORMTRACER Extreme CS-5000CNC/CS-H5000CNC

High-accuracy CNC surface measuring instrument that can support both surface roughness and contour evaluation in a single measurement.

Measuring range (X axis): 200 mm

Measuring range (Z1 axis): 12 mm/24 mm



Product catalog
E15021

The hybrid model supports surface roughness measurement and contour measurement on a single system, reducing the time required for changeover and measurement.



CNC Surface Roughness and Contour Measuring System

FORMTRACER Extreme SV-C4500CNC FORMTRACER Extreme SV-C4500CNC HYBRID TYPE1

Complex CNC measuring systems that can support both surface roughness and contour measurement in a single system by switching the detector without turning off the machine.

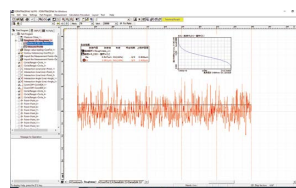
Measuring range (X axis): 200 mm

Roughness measuring range (Z1 axis): 800 μm /80 μm /8 μm

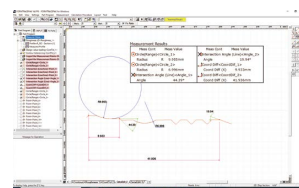
Contour measuring range (Z1 axis): Contour 60 mm



Product catalog
E15021



Surface roughness analysis



Contour analysis

Surface Texture Analysis Program

FORMTRACEPAK

Helps with overall operation from measuring system control, surface roughness analysis, and contour analysis/tolerancing, to inspection report creation.

Contour Measuring Instrument

The line-up includes measuring systems designed for contour measurement that can perform easy, accurate and quick form measurement.



High-performance Contour Measuring Instrument

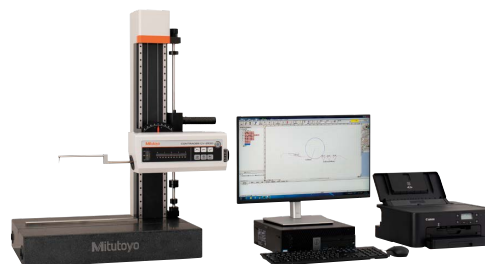
FORMTRACER Avant C3000/4000

Digital contour measuring instruments with a high-speed drive and various time-saving functions for efficient measurement.

Measuring range (X axis): 100 mm, 200 mm
Measuring range (Z1 axis): 60 mm



Product catalog
E15030



Contour Measuring Instrument

CONTRACER CV-2100

Contour measuring instruments for easy, accurate, fast measurements by concentrating measurement control switches at the front of the unit.

Measuring range (X axis): 100 mm
Measuring range (Z1 axis): 50 mm



Product catalog
E15020

Surface Roughness Instrument

These measuring systems are designed for surface roughness measurement. The line-up includes various models such as portable and stationary types to support different applications.



High-performance Contour Measuring Instrument

FORMTRACER Avant S3000

Surface roughness instruments with a high-speed drive and an automatic changeover unit for efficient measurement.

Measuring range (X axis): 100 mm, 200 mm
Measuring range (Z1 axis): 800 μ m/80 μ m/8 μ m



Product catalog
E15030



CNC Surface Roughness Instrument

SURFTEST Extreme SV-3000CNC

A CNC surface roughness instrument suitable for automatic measurements of a large, heavy, complex-shaped workpiece.

Measuring range (X axis): 200 mm
Measuring range (Z1 axis): 800 μ m/80 μ m/8 μ m



Product catalog
E15021

Surface Roughness Instrument

These measuring systems are designed for surface roughness measurement. The line-up includes various models such as portable and stationary types to support different applications.



Surface Roughness Instrument

SURFTEST SJ500/SV-2100 **SURFTEST SJ-500P/SV-2100M4**

High-accuracy, high-performance surface roughness instruments with a dedicated control unit that provides an easy-to-see display and simple operation.

Measuring range (X axis): 50 mm, 100 mm
Measuring range (Z1 axis): 800 μ m/80 μ m/8 μ m



Compact Surface Roughness Instrument

SURFTEST SJ-410

Compact surface roughness instruments with a large high-visibility color LCD that helps with micro-form evaluation.

Measuring range (X axis): 25 mm, 50 mm
Measuring range (Z1 axis): 800 μ m/80 μ m/8 μ m



Product catalog
E15006



Product catalog
E15014



Compact Surface Roughness Instrument

SURFTEST SJ-210/310

Compact, portable, and easy-to-use surface roughness instruments for on-site surface measurements.

Measuring range (X axis): 5.6 mm, 16 mm
Measuring range (Z1 axis): 360 μ m



Product catalog
E15028

Roundness Measuring Instrument

These measuring systems are designed for roundness and cylindricity measurement. The line-up includes various models from small to large sizes to measure different workpieces.



High-performance Roundness/Cylindricity Measuring System

ROUNDTEST RA-2200 ROUNDTEST RA-2200 PLUS

D type: Enhanced procedure of centering and leveling adjustment
A type: Automated centering and leveling adjustment
Medium-sized roundness measuring systems that can reduce workload of operator.

Rotational accuracy (Radial direction): $(0.02 + 3.5H/10000) \mu\text{m}$

(H: Probing height in mm)

Maximum load: 30 kg



Product catalog
E15001



Roundness/Cylindricity Measuring System

ROUNDTEST RA-1600

The body is compact but still achieves a wide measuring range.
Provides high accuracy comparable to high-end models.

Rotational accuracy (Radial direction): $(0.02 + 6H/10000) \mu\text{m}$

(H: Probing height in mm)

Maximum load: 25 kg



Product catalog
E15000



High-accuracy Roundness/Cylindricity Measuring System

ROUNDTEST RA-H5200 ROUNDTEST RA-H5200 PLUS

Large roundness measuring systems designed to perform automatic centering and leveling adjustments and high-speed, high-accuracy measurements.

Rotational accuracy (Radial direction): $(0.02 + 3.5H/10000) \mu\text{m}$

(H: Probing height in mm)

Maximum load: 80 kg



Product catalog
E15011



Compact Roundness Measuring Instrument

ROUNDTEST RA-120/120P ROUNDTEST RA-10

Easy-to-operate compact roundness measuring instruments.

Rotational accuracy (Radial direction): $(0.04 + 6H/10000) \mu\text{m}$

(H: Probing height in mm)

Maximum load: 10 kg, 25 kg



Product catalog
E15008

Hardness Testing Machines

A wide variety of hardness testing machines are available for quality control. The line-up includes affordable to high-end models that can be selected to meet your application.

Micro Vickers/ Vickers Hardness Testing Machine

These hardness testing machines can be used to test a wide range of workpieces including metal materials and heat-treated parts. An advanced model supporting automated continuous testing is also available to improve productivity.



Micro Vickers Hardness Testing Machine

HM-100

Basic micro Vickers hardness testing machine models for reading indentations visually.

Applicable standards: JIS B7725/ISO 6507-2
Test force: 98.07 - 9,807 mN (10 - 1,000 gf)



Product catalog
E17001



Micro Vickers Hardness Testing Machine

HM-210A/220A

Instruments with integrated calculations and an electromagnetic loading mechanism for setting a desired test force.

Applicable standards: JIS B7725/ISO 6507-2
Test force: 98.07 - 9,807 mN (10 - 1,000 gf), 0.4903 - 19,610 mN (0.05 - 2,000 gf)



Product catalog
E17001



Micro Vickers Hardness Testing Machine (Automatic Type)

HM-210/220

Reduces person-to-person variation and increases test efficiency by automating measurements of indentations and stage movement.

Applicable standards: JIS B7725/ISO 6507-2
Test force: 98.07 - 9,807 mN (10 - 1,000 gf), 0.4903 - 19,610 mN (0.05 - 2,000 gf)



Vickers Hardness Testing Machine

HV-110A/120A

Easy-to-operate Vickers hardness-testing machines that allow for test force switching on a touch panel.

Applicable standards: JIS B7725/ISO 6507-2
Test force: 9.807 - 490.3 N (1 - 50 kgf), 2.942 - 294.2 N (0.3 - 30 kgf)



Product catalog
E17001



Vickers Hardness Testing Machine (Automatic Type)

HV-110/120

Reduces person-to-person variation and increases test efficiency by automating measurements of indentations and stage movement.

Applicable standards: JIS B7725/ISO 6507-2

Test force: 9.807 - 490.3 N (1 - 50 kgf), 2.942 - 294.2 N (0.3 - 30 kgf)



Rebound Type Portable Hardness Tester

HH-411

Compact portable hardness testers with high operability allowing for hardness testing with one touch.

Leeb hardness: 1 to 999 HL



Product catalog
E17001



Portable Hardness Tester

HH-300

Hardness testers for testing sponge, rubber, and plastic materials by simply pressing the probe against the workpiece.

Display: Analog/Digital



Product catalog
E17001

Rockwell Hardness Testing Machine

The line-up includes various models, ranging from a large high-end model that can withstand large and heavy workpieces to a small model that is very affordable.



CNC Rockwell Hardness Testing Machine

HR-610A/620A

Allows a large and heavy workpiece to be tested without being cut into pieces.

A motorized X-axis stage (optional) has been installed to support automation.

Test force: 29.42 - 1,839 N (3 - 187.5 kgf), 9,807 - 2,452 N (1 - 250 kgf)
Maximum load: 100 kg



Product catalog
E17011



Video



CNC Rockwell Hardness Testing Machine

HR-620B

A motorized Y-axis stage is included as standard.

A fully-automated Rockwell hardness-testing machine can be built, including the workpiece transfer process.

Test force: 9,807 - 2,452 N (1 - 250 kgf)
Maximum load: 100 kg



Rockwell Hardness Testing Machine

HR-200/300/400

The line-up offers digital display type and analog display type Rockwell hardness-testing machines.

Applicable standards: JIS B7726/ISO 6508-2, ASTM E18-20 (Excludes HR-200)
Test force: 588.4 - 1,471 N (60 - 150 kgf)



Product catalog
E17000



Rockwell Hardness Testing Machine

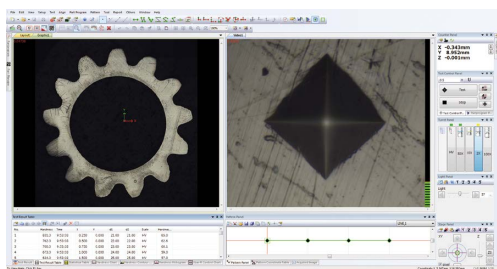
HR-530/530L

Rockwell hardness-testing machines with a unique structure that allows for testing the hardness of the inner surface of a workpiece without cutting it into pieces.

Applicable standards: JIS B7726/ISO 6508-2, ASTM E18-20
Test force: 588.4 - 1,471 N (60 - 150 kgf)
Maximum load: 20 kg



Product catalog
E17001



Software for Hardness Testing

AVPAK

Software for workpiece image capturing, automatic measurement of indentations, automatic continuous testing with a specific pattern, testing machine control for efficient testing of multiple workpieces, result evaluation, and report creation.



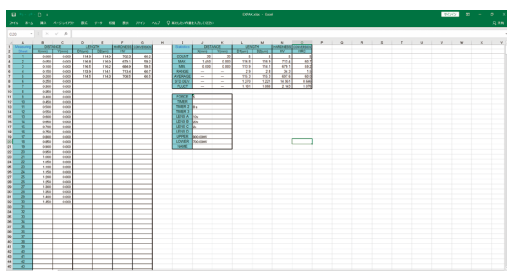
Product catalog
E17001



Software for External Control

FORMEio

An automation system can be built by connecting the software to hardness-testing machines. (**HV-110, HV-120, HM-210, HM-220 and HR-600 Series**)



Data Processing Software for Hardness Testing

EXPAK

Measurement results from a hardness-testing machine can be imported to spreadsheet software.

13

Quick Guide to Precision Measuring Instruments



Micrometers



Calipers



Height Gages

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Quick Guide to Precision Measuring Instruments

You can access our "Quick Guide to Precision Measuring Instruments" catalog pdf file here.
Get useful information about our instrument products, including measuring tools.



General Term in Measurement: Quality Control

Quality Control (QC)

Methods and their system for economically producing products or services of a quality that meets customer requirements.

Process Quality Control

Activities to control the manufacturing process, reduce product variation, and keep product variation low. Process improvement and standardization as well as technology accumulation are promoted through these activities.

Statistical Process Control (SPC)

Process quality control through statistical methods.

Population

Population A group of all items that have characteristics to be considered for improving and controlling processes and quality of product. Ordinarily, the population is the group that is going to be handled based on a sample.

Lot

Collection of product produced under the same conditions.

Sample

An item of product (or items) taken out of the population to investigate its characteristics.

Sample Size

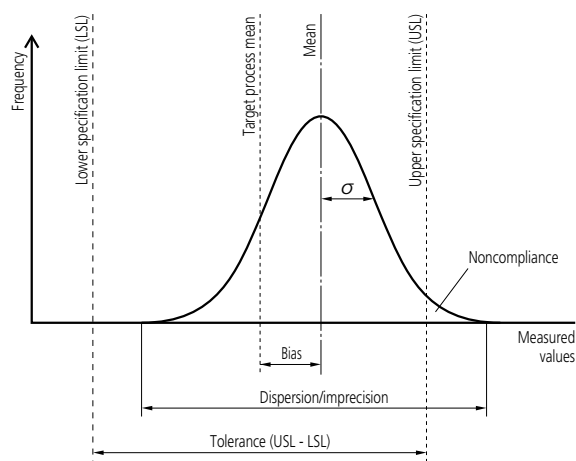
Number of product items in the sample.

Bias

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

Dispersion, Imprecision

Variation in the values of a target characteristic in relation to the mean value. 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 divisions and shows the number of values (appearance frequency) in each division in the form of a bar graph. This makes it easier to understand the rough average or the approximate extent of dispersion. A diagram indicating a symmetrical bell-shaped distribution shows what is called "normal distribution."

Process Capability

Process-specific performance demonstrated when the following conditions are met:

- The process is sufficiently standardized,
- Any causes of malfunctions are eliminated,
- The process is in a state of statistical control.

The process capability is represented by mean ± 3 or 6σ when the quality characteristic output from the process shows normal distribution. This indicates standard deviation.

Process Capability Index (PC 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 3 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 ± 3 from the mean.

Bilateral tolerance

$$C_p = \frac{USL - LSL}{6 \times \sigma}$$

USL: Upper specification limit

LSL: Lower specification limit

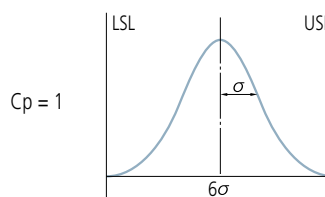
Unilateral tolerance ... If only the upper limit is stipulated

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

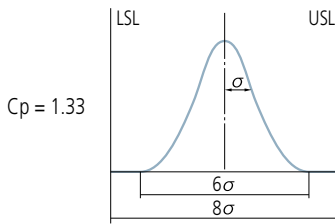
Unilateral tolerance ... If only the lower limit is stipulated

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

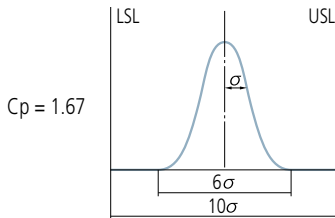
Specific examples of a process capability index (C_p) (bilateral tolerance)



The process capability is barely achieved as the 6 sigma process limits are coincident with the tolerance limits.



The process capability is the minimum value that can be generally accepted as it is no closer than 1 sigma to the tolerance limits.



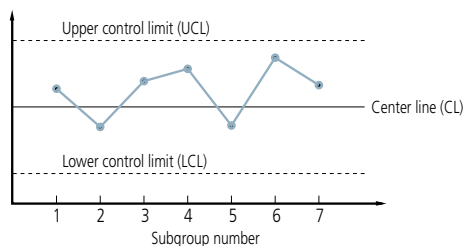
The process capability is sufficient as it is no closer than 2 sigma to the tolerance limits.

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

Note: A process capability index that takes into account the deviation between the specification center and the process mean is generally called C_{pk} . It is the upper tolerance (USL minus the mean) divided by 3 (half of process capability) or the lower tolerance (the mean value minus LSL) divided by 3, whichever is smaller.

Control Chart

Used to control the process by separating variations into those due to chance causes in the process and those due to a malfunction. It consists of one center line (CL) and the control limit lines rationally 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.



Chance Causes

These causes of variation are of relatively low importance. Chance causes are technologically or economically impossible to eliminate even if they can be identified.

X-R Control Chart

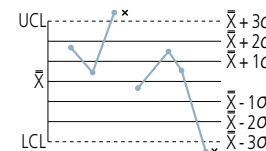
A control chart used for process control that provides the most information on the process. An X-R control chart consists of the following:

- A control chart that uses the mean of each subgroup for control to monitor abnormal bias of the process mean,
- An R control chart that uses the range for control to monitor abnormal variation.

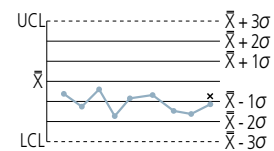
Usually, both charts are used together.

How to Read the Control Chart

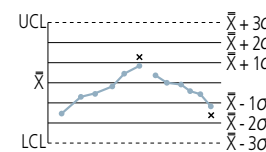
Typical trends of successive point position in the control chart that are considered undesirable are shown below. These determination rules only provide a guideline. Take the process-specific variation into consideration when making determination rules. Assuming that the upper and the lower control limits are 3 away from the center line, divide the control chart into six regions at intervals of 1 to apply the following rules. These rules are applicable to the X control chart and the X control chart. Note that these 'trend rules for action' were formulated assuming a normal distribution.



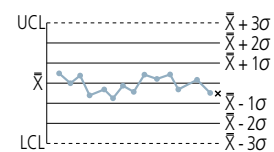
- (1) There is a point beyond either of the control limit lines (± 3).



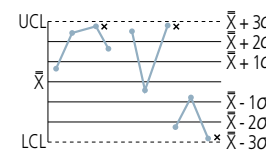
- (2) Nine consecutive points are to one side of the center line.



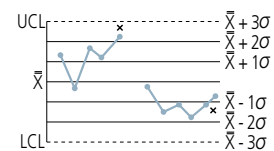
- (3) Six points consecutively increase or decrease.



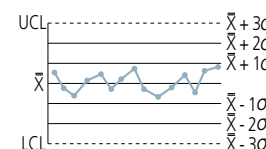
- (4) 14 points alternately increase and decrease.



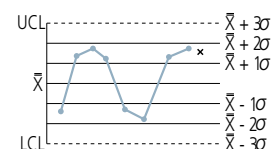
- (5) Two of three consecutive points are over ± 2 from the center line on either side.



- (6) Four of five consecutive points are over ± 1 from the center line on either side.



- (7) There are 15 consecutive points within ± 1 from the center line.



- (8) There are eight consecutive points over ± 1 from the center line.

Note: This part of 'Quick Guide to Precision Measuring Instruments' (pages 13-3 and 13-4) has been written by Mitutoyo based on its own interpretation of the JIS Quality Control Handbook published by the Japanese Standards Association.

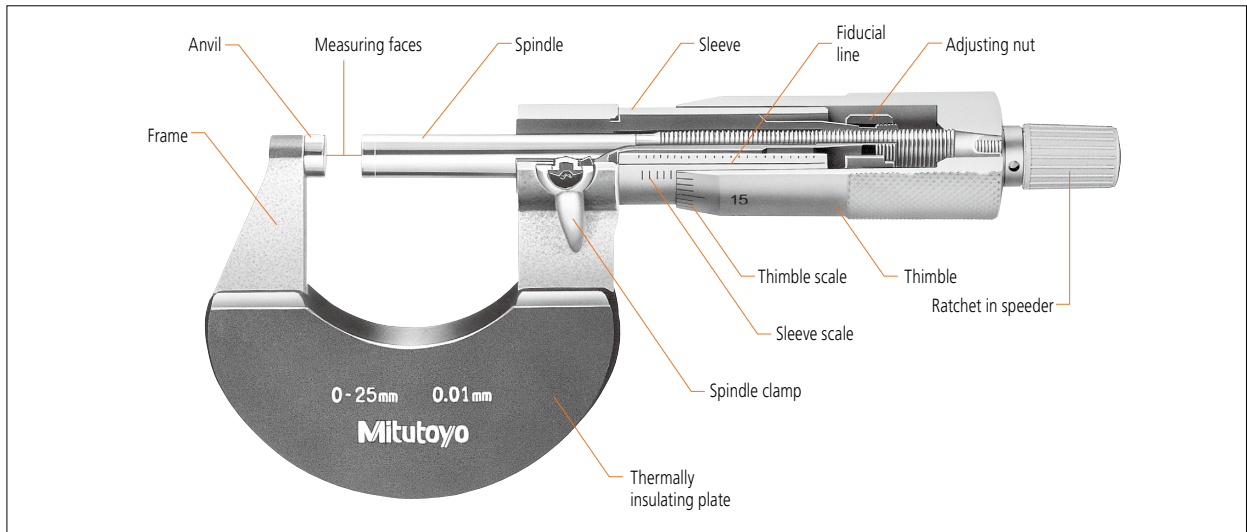
References

- JIS Quality Control Handbook (Japanese Standards Association) Z 8101:1981 Z 8101-1:1999 Z 8101-2:1999 Z 9020:1999 Z 9021:1998

Micrometers

Nomenclature

Standard Analog Outside Micrometer

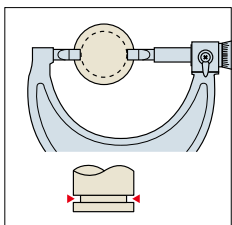


Digimatic Outside Micrometer



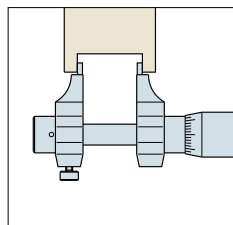
Special Purpose Micrometer Applications

For inside diameter, and narrow groove measurement



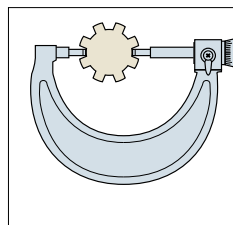
Blade micrometer

For small internal diameter, and groove width measurement



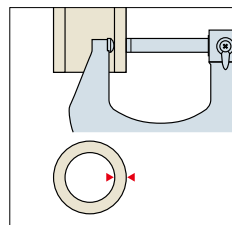
Inside micrometer, calliper type

For splined shaft diameter measurement



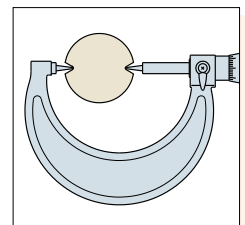
Spline micrometer

For pipe thickness measurement



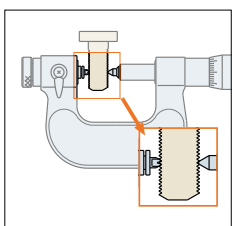
Spherical face micrometer

For root diameter measurement



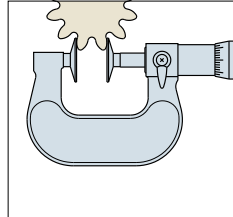
Point micrometer

Screw pitch diameter



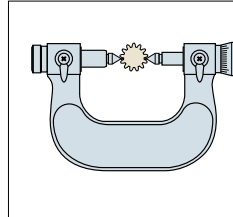
Screw thread micrometer

For root tangent measurement on spur gears and helical gears.



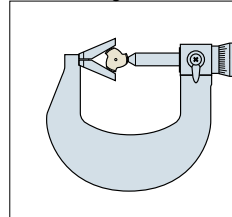
Disc type outside micrometer

Measurement of gear over-pin diameter



Ball tooth thickness micrometer

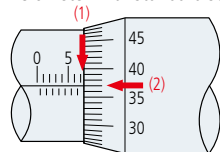
For measurement of 3- or 5-flute cutting tools



V-anvil micrometer

How to Read the Scale

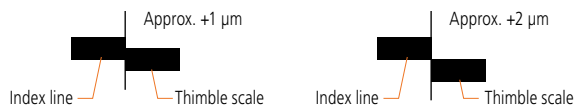
■ Micrometer with standard scale (graduation: 0.01 mm)



(1) Outer sleeve reading	7. mm
(2) Thimble reading	+ 0.37 mm
Micrometer reading	7.37 mm

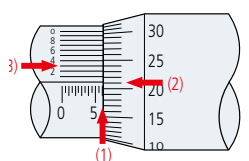
Note: 0.37 mm (2) is read at the position where the sleeve fiducial line is aligned to the thimble graduations.

The thimble scale can be read directly to 0.01 mm, as shown above, but may also be estimated to 0.001 mm when the lines are nearly coincident because the line thickness is 1/5 of the spacing between them.



■ Micrometer with vernier scale (graduation: 0.001 mm)

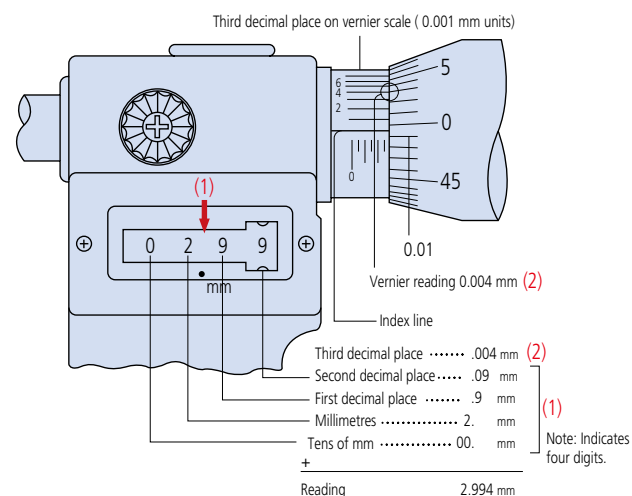
The vernier scale provided above the sleeve index line enables direct readings to be made to within 0.001 mm.



(1) Outer sleeve reading	6. mm
(2) Thimble reading	0.21 mm
(3) Reading from the vernier scale marking and thimble graduation line	+0.003 mm
Micrometer reading	6.213 mm

Note: 0.21 mm (2) is read at the position where the index line is between two graduations (21 and 22 in this case). 0.003 mm (3) is read at the position where one of the vernier graduations aligns with one of the thimble graduations.

■ Micrometer with mechanical-digit display (digital step: 0.001 mm)

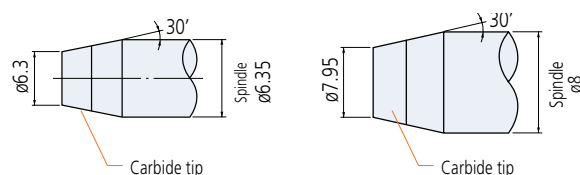


Note: 0.004 mm (2) is read at the position where a vernier graduation line corresponds with one of the thimble graduation lines.

Measuring Force Limiting Device

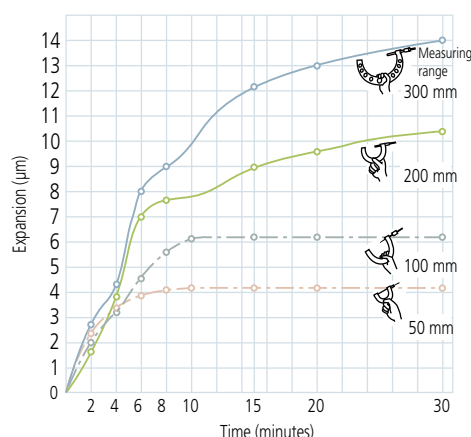
Varieties	Audible in operation	One-handed operation	Remarks
Ratchet stop 	Yes	Unsuitable	Audible clicking operation causes micro-shocks
Friction thimble (F type) 	No	Suitable	Smooth operation without shock or sound
Ratchet thimble 	Yes	Suitable	Audible operation provides confirmation of constant measuring force

Measuring Face Detail



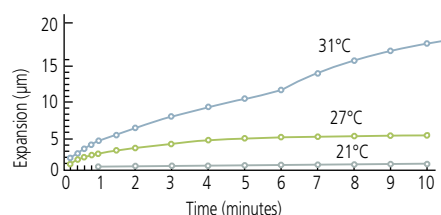
Note: The drawings above are for illustration only and are not to scale

Micrometer Expansion Due to Holding Frame with the Bare Hand



*The above graph shows micrometer frame expansion due to heat transfer from hand to frame when the frame is held in the bare hand which, as can be seen, may result in a significant measurement error due to temperature-induced expansion. When measuring by hand, care must be taken because the reference point will change (note that the graph values are not guaranteed values but experimental values).

Length Standard Expansion with Change of Temperature (for 200 mm Bar Initially at 20 °C)

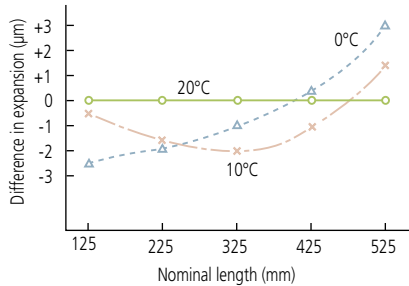


The above experimental graph shows how a particular micrometer standard expanded with time as people whose hand temperatures were different (as shown) held the end of it at a room temperature of 20 °C.

This graph shows that it is important not to set a micrometer while directly holding the micrometer standard but to make adjustments only while wearing gloves or lightly supporting the length standard by its heat insulators.

When performing a measurement, note that it takes time until the expanded micrometer standard returns to the original length.

Difference in Thermal Expansion Between Micrometer and Length Standard



*Values are not guaranteed values but experimental values.

The above graph shows the results for each of the sizes from 125 through 525 mm at each temperature under the following time-series conditions.

- 1. The micrometer and its standard were left at a room temperature of 20°C for about 24 hours.
 - 2. The start point was adjusted using the micrometer standard after the temperature of the micrometer and the standard stabilized.
 - 3. The micrometer with its standard were left at the temperatures of 0°C and 10°C for about one hour.
 - 4. Measurement of each start point.
- This graph shows that both the micrometer and its standard must be left at the same location for at least several hours before adjusting the start point.

Hooke's Law

Hooke's law states that strain in an elastic material is proportional to the stress causing that strain, providing the strain remains within the elastic limit for that material.

Effect of Changing Support Method and Orientation

(Unit: μm)

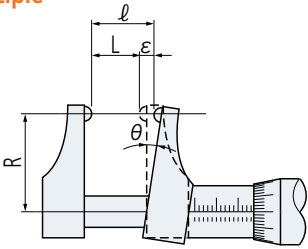
The tables below show how the zero point changes due to differences in support orientation—such "Supported only at the center," "Supported at the center in a lateral orientation," and "Supported by hand downward"—after zero setting in the "Supported at the bottom and center" case. If the start point is not aligned using the same support method and orientation as the actual measurement, the values will change from the positions shown in the table below. Therefore, aligning the start point using the same support method and orientation as the measurement is recommended.

Supporting method	Supported at the bottom and center	Supported only at the center
Attitude		
Maximum measuring length (mm)		
325	0	-5.5
425	0	-2.5
525	0	-5.5
625	0	-11.0
725	0	-9.5
825	0	-18.0
925	0	-22.5
1025	0	-26.0

Supporting method	Supported at the center in a lateral orientation.	Supported by hand downward.
Attitude		
Maximum measuring length (mm)		
325	+1.5	-4.5
425	+2.0	-10.5
525	-4.5	-10.0
625	0.0	-5.5
725	-9.5	-19.0
825	-5.0	-35.0
925	-14.0	-27.0
1025	-5.0	-40.0

*Values are not guaranteed values but experimental values.

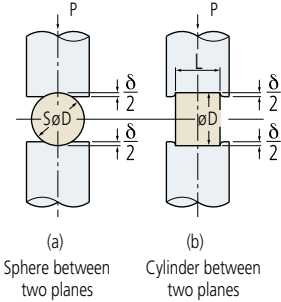
Abbe's Principle



Abbe's principle states that "maximum accuracy is obtained when the scale and the measurement axes are common". This is because any variation in the relative angle (θ) of the moving measuring jaw on an instrument, such as a caliper jaw micrometer, causes displacement that is not measured on the instrument's scale and this is an Abbe error ($\epsilon = l - L$ in the diagram). Spindle straightness error, play in the spindle guide or variation of measuring force can all cause (θ) to vary, and the error increases with R.

Hertz's Formula

Hertz's formula give the apparent reduction in diameter of spheres and cylinders due to elastic compression when measured between plane surfaces. The formula is useful for determining the deformation of a workpiece caused by the measuring force in point and line contact situations.



Assuming that the material is steel and units are as follows:
Modulus of elasticity: $E = 205 \text{ GPa}$
Amount of deformation: $\delta (\mu\text{m})$
Diameter of sphere or cylinder: $D (\text{mm})$
Length of cylinder: $L (\text{mm})$
Measuring force: $P (\text{N})$
a) Apparent reduction in diameter of sphere
 $\delta_1 = 0.82 \sqrt[3]{P/D}$
b) Apparent reduction in diameter of cylinder
 $\delta_2 = 0.094 \times (P/L)^{1/3} \sqrt[3]{1/D}$

Major Measurement Errors of the Screw Micrometer

Error cause	Maximum possible error	Precautions for eliminating errors	Error that might not be eliminated even with precautions
Micrometer feed error	3 μm	1. Correct the micrometer before use.	±1 μm
Anvil angle error	±5 μm assuming the error of a half angle is 15 minutes	1. Measure the angle error and correct the micrometer. 2. Adjust the micrometer using the same thread gage as the workpiece.	±3 μm expected measurement error of half angle
Due to anvil difference	+10 μm		+3 μm
Influence of measuring force	±10 μm	1. Use a micrometer with a low measuring force if possible. 2. Always use the ratchet stop. 3. Adjust the micrometer using a thread gage with the same pitch.	+3 μm
Angle error of thread gage	±10 μm	1. Perform correction calculation (angle). 2. Correct the length error. 3. Adjust the micrometer using the same thread gage as the workpiece.	+3 μm
Length error of thread gage	$\pm (3 + \frac{L}{25}) \mu\text{m}$	1. Perform correction calculation. 2. Adjust the micrometer using the same thread gage as the workpiece.	±1 μm
Workpiece thread angle error	JIS 2 grade error of half angle ±229 minutes -91 μm +71 μm	1. Minimize the angle error as much as possible. 2. Measure the angle error and perform correction calculation. 3. Use the three-wire method for a large angle error.	Error of half angle ±8 μm at ±23 minutes
Cumulative error	(±117+40)μm	Aggregate value of possible errors	+26 μm -12 μm

Screw Pitch Diameter Measurement

Three-wire method

The screw pitch diameter can be measured with the three-wire method as shown in the figure.

Calculate the pitch diameter (E) with equations (1) and (2).

Metric thread or unified screw (60°)

$$E = M - 3d + 0.866025P \quad \text{..... (1)}$$

Whitworth thread (55°)

$$E = M - 3.16568d + 0.960491P \quad \text{..... (2)}$$

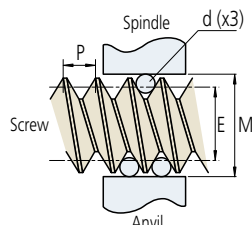
d = Wire diameter

E = Screw pitch diameter

M = Micrometer reading including three wires

P = Screw pitch

(Convert inches to millimeters for unified screws.)



Thread type	Optimal wire size at D
Metric thread or unified screw (60°)	0.577P
Whitworth thread (55°)	0.564P

Major Measurement Errors of the Three-wire Method

Error cause	Precautions for eliminating errors	Possible error	Error that might not be eliminated even with precautions
Pitch error (Workpiece)	1. Correct the pitch error $\delta p = \delta E$ 2. Measure several points and adopt their average. 3. Reduce single pitch errors.	Pitch error $\pm 18 \mu\text{m}$ at 0.02 mm	$\pm 3 \mu\text{m}$
Error of half angle (Workpiece)	1. Use the optimal wire diameter. 2. No correction is needed.	$\pm 0.3 \mu\text{m}$	$\pm 0.3 \mu\text{m}$
Error due to anvil difference	1. Use the optimal wire diameter. 2. Use the wire which has a diameter close to the average at the one wire side.	$\pm 8 \mu\text{m}$	$\pm 1 \mu\text{m}$
Wire diameter error	1. Use the predetermined measuring force appropriate for the pitch. 2. Use the predetermined width of measurement edge. 3. Use a stable measuring force.	$-3 \mu\text{m}$	$-1 \mu\text{m}$
Cumulative error		In the worst case $+20 \mu\text{m}$ $-35 \mu\text{m}$	When measured carefully $+3 \mu\text{m}$ $-5 \mu\text{m}$

One-wire method

The pitch diameter of odd-fluted tap can be measured using the V-anvil micrometer with the one-wire method. Obtain the measured value (M_1) and calculate M with equation (3) or (4).

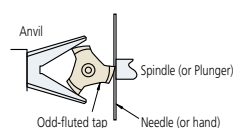
M_1 = Micrometer reading during one-wire measurement

D = Odd-fluted tap diameter

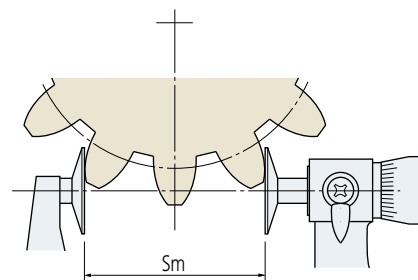
Tap with three flutes : $M = 3M_1 - 2D$ (3)

Tap with five flutes : $M = 2.2360M_1 - 1.2360D$ (4)

Then, assign the calculated M to equation (1) or (2) to calculate the pitch diameter (E).



Root Tangent Length



Formula for calculating a root tangent length (Sm):

$$Sm = m \cos \alpha_0 \{ \pi (Zm - 0.5) + Z \operatorname{inv} \alpha_0 \} + 2Xm \sin \alpha_0$$

Formula for calculating the number of teeth within the root tangent length (Zm):

$$Zm' = Z \cdot K(f) + 0.5 \quad (Zm \text{ is the integer closest to } Zm')$$

$$\text{Here, } K(f) = \frac{1}{\pi} \{ \sec \alpha_0 \sqrt{(1 + 2f)^2 - \cos^2 \alpha_0} - \operatorname{inv} \alpha_0 - 2f \tan \alpha_0 \}$$

$$\text{However, } f = \frac{X}{Z}$$

m: Module

α_0 : Pressure angle

Z: Number of teeth

X: Addendum modification coefficient

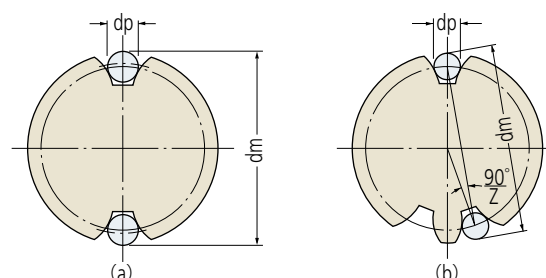
Sm : Root tangent length

Zm : Number of teeth within the root tangent length

$$\begin{aligned} \operatorname{inv} 20^\circ &= 0.014904 \\ \operatorname{inv} 14.5^\circ &= 0.0055448 \end{aligned}$$

Gear Measurement

Over-pin method



For a gear with an even number of teeth:

$$dm = dp + \frac{dg}{\cos \phi} = dp + \frac{z \cdot m \cdot \cos \alpha_0}{\cos \phi}$$

For a gear with an odd number of teeth:

$$dm = dp + \frac{dg}{\cos \phi} \cdot \cos \left(\frac{90^\circ}{z} \right) = dp + \frac{z \cdot m \cdot \cos \alpha_0}{\cos \phi} \cdot \cos \left(\frac{90^\circ}{z} \right)$$

However,

$$\operatorname{inv} \phi = \frac{dp}{dg} - \frac{X}{2} = \frac{dp}{z \cdot m \cdot \cos \alpha_0} - \left(\frac{\pi}{2z} - \operatorname{inv} \alpha_0 \right) + \frac{2 \tan \alpha_0}{z} \cdot X$$

Obtain ϕ ($\operatorname{inv} \phi$) from the involute function table.

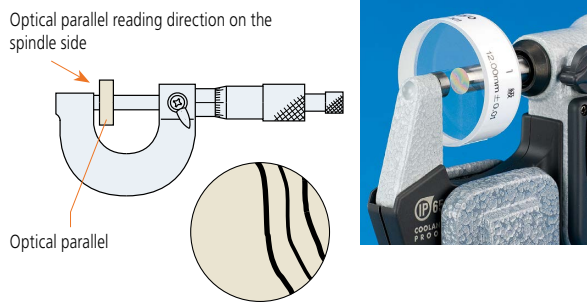
z: Number of teeth

α_0 : Pressure angle teeth

m: Module

X: Addendum modification coefficient

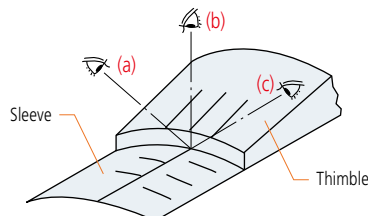
Testing Parallelism of Micrometer Measuring Faces



1. Wring the parallel to the anvil measuring face.
2. Close the spindle on the parallel using standard measuring force and count the number of red interference fringes seen on the measuring face of the spindle in white light.
In the above figure a parallelism of approximately $1\text{ }\mu\text{m}$ is obtained from $0.32\text{ }\mu\text{m} \times 3 = 0.96\text{ }\mu\text{m}$.

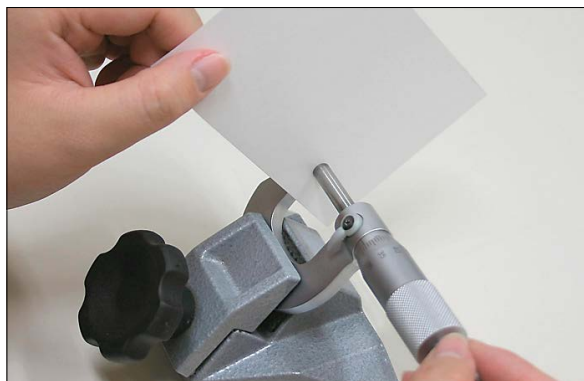
General Notes on Using the Micrometer

- Carefully check the type, measuring range, accuracy, and other specifications to select the appropriate model for your application.
- Leave the micrometer and workpiece at room temperature long enough for their temperatures to equalize before making a measurement.
- Look directly at the fiducial line when taking a reading against the thimble graduations.
If the graduation lines are viewed from an angle, the correct alignment position of the lines cannot be read due to parallax error.

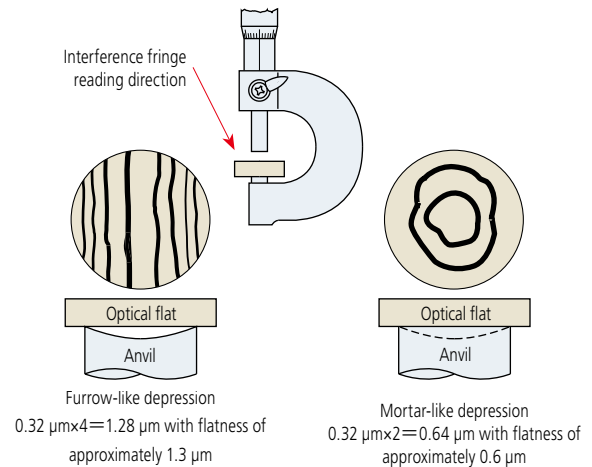


(a) From above the index line (b) Looking directly at the index line (c) From below the index line

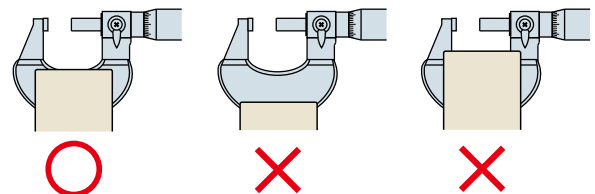
- Wipe off the measuring faces of both the anvil and spindle with lint-free paper set the start (zero) point before measuring.



Testing Flatness of Micrometer Measuring Faces



- Wipe away any dust, chips and other debris from the circumference and measuring face of the spindle as part of daily maintenance. In addition, sufficiently wipe off any stains and fingerprints on each part with dry cloth.
- Use the constant-force device correctly so that measurements are performed with the correct measuring force.
- When attaching the micrometer onto a micrometer stand, the stand should clamp the center of the micrometer frame.
Do not clamp with excessive force when attaching.



- Be careful not to drop or bump the micrometer on anything.
Do not rotate the micrometer thimble using excessive force.
- After using the Micrometer for a long period of time or when there is no protective oil film visible, lightly apply anti-corrosion oil by wiping it with a cloth soaked with the oil.
- Notes on storage:
 - Avoid storing the micrometer in direct sunlight.
 - Store the micrometer in a ventilated place with low humidity.
 - Store the micrometer in a place with little dust.
 - Store the micrometer in a case or other container, which should not be kept on the floor.
 - Store with the measuring faces open about 0.1 to 1 mm .
 - Do not store the micrometer in a clamped state.

Micrometer Performance

JIS B 7502 was revised and issued in 2016 as the Japanese Industrial Standards of the micrometer and "Industrial error" which indicates micrometer performance, was changed to "Indication error".

Full surface contact error is the most important micrometer indication error. The indication error is limited by the maximum permissible error (MPE). In other words, MPE has the same meaning as tolerance. The following describes the standard inspection method including the revised content of JIS 2016.

Maximum Permissible Error of Full Surface Contact Error J MPE [JIS B 7502: 2016]

The full surface contact error of the outside micrometer is an indication error measured by contacting the entire measuring surface with the object to be measured at an arbitrary point in the measuring range.

The full surface contact error can be obtained by adjusting the reference point using a constant pressure device with the minimum measuring length of the micrometer, inserting a grade 0 or 1 gauge block prescribed in JIS B 7506 or an equivalent or higher gauge between the measuring surfaces (Fig. 3), and then subtracting the dimensions of the gauge block from the indication value of the micrometer using a constant pressure device.

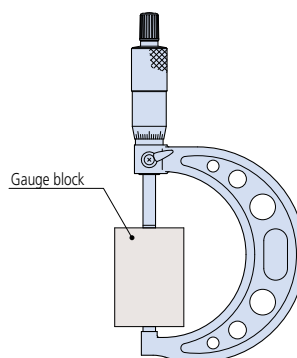


Fig: Measurement of full surface contact error

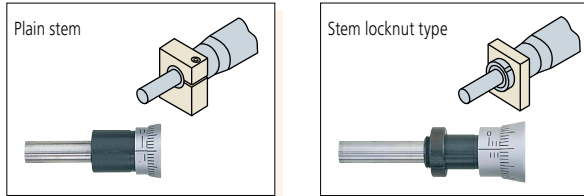
Micrometer Heads

Key Factors in Selection

Key factors in selecting a micrometer head are the measuring range, spindle face, stem, graduations, thimble diameter, etc.

Select the micrometer that best suits your purpose by referring to its particular characteristics.

Stem

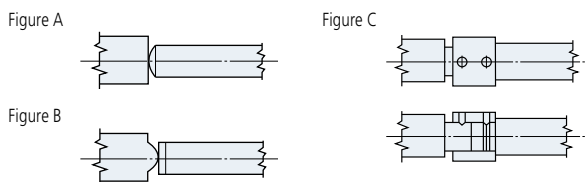


- The stem used to mount a micrometer head is classified as a "plain type" or "clamp nut type" as illustrated above. The stem diameter is manufactured to a nominal Metric or Imperial size with an h6 tolerance.
- The installations method have the following features:
 - Clamp nut stem: Allows fast and secure clamping of the linear gage head.
 - Plain stem: Wider range of application with positional adjustment in the axial direction on final installation, but requires a split-fixture clamping arrangement or adhesive fixing.
- General-purpose mounting fixtures are available as optional accessories.

Measuring Faces



- A flat measuring face is often specified where a micrometer head is used as a measurement tool.
- When a micrometer head is used as a feed device, a spherical face can minimize errors due to misalignment (Figure A). Alternatively, the flat face and spherical face can be reversed so that the spindle can bear against a sphere, such as a carbide ball (Figure B).
- A non-rotating spindle type micrometer head or one fitted with an antirotation device on the spindle (Figure C) can be used if a twisting action on the workpiece must be avoided.
- If a micrometer head is used as a stop, then a flat face both on the spindle and the face it contacts provides durability.



Non-Rotating Spindle

A non-rotating spindle type head does not exert a twisting action on a workpiece, which may be an important factor in some applications.

Spindle Thread Pitch

- The standard type head has a 0.5 mm pitch.
- 1 mm-pitch type:
 - Quicker to positioning, etc., than the standard type and avoids the possibility of a 0.5 mm reading error. Excellent load-bearing characteristics due to larger screw thread.
- 0.25 mm or 0.1 mm-pitch type
 - This type is the best for fine-feed or fine-positioning applications.

Constant-force Device

- A micrometer head fitted with a constant-force device (ratchet or friction thimble) is recommended for measurement applications.
- If using a micrometer head as a stop, or where saving space is a priority, a head without a ratchet is probably the best choice.



Micrometer head with constant-force device



Micrometer head without constant-force device (no ratchet)

Spindle Clamp

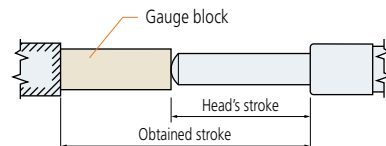
- When using a micrometer head as a stopper, problems caused by loosening can be prevented by using a micrometer head with a spindle clamp. The spindle clamp also prevents the spindle from changing position when the clamp is operated, providing the user with peace of mind.



Measuring Range (Stroke)

- When choosing a measuring range for a micrometer head, allow an adequate margin in consideration of the expected measurement stroke. Six stroke ranges, 5 mm to 50 mm, are available for standard micrometer heads.
- If a long stroke of over 50 mm is required, the concurrent use of a gauge block can extend the effective measuring range. (Figure D)

Figure D



- In this guide, the range (or stroke end) of the thimble is indicated by a dashed line. Consider the thimble as moving within the range of the stroke ends to the position indicated by the line when designing the jig.

Ultra-fine Feed Applications

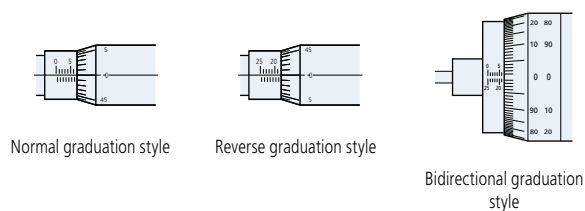
- Dedicated micrometer heads are available for manipulator applications, etc., which require ultra-fine feed or adjustment of spindle.

Thimble Diameter

- The diameter of a thimble greatly affects its usability and the "fineness" of positioning. A small-diameter thimble allows quick positioning whereas a large-diameter thimble allows fine positioning and easy reading of the graduations. Some models combine the advantages of both features by mounting a coarse-feed thimble (speeder) on the large-diameter thimble.



Graduation Styles

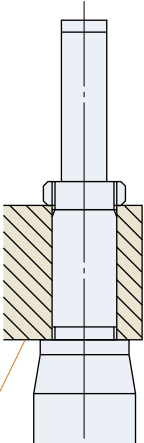
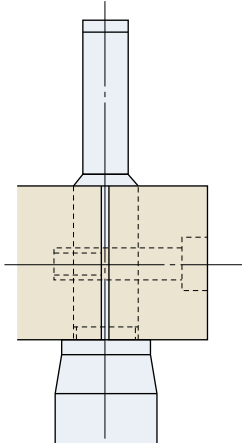
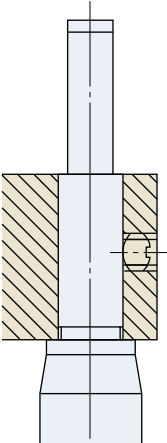


- Care is needed when taking a reading from a mechanical micrometer head, especially if the user is unfamiliar with the model.
- The "normal graduation" style, identical to that of an outside mounted micrometer, is the standard. For this style the reading increases as the spindle retracts into the body.
- On the contrary, in the "reverse graduation" style the reading increases as the spindle advances out of the body.
- The "bidirectional graduation style" is intended to facilitate measurement in either direction. The numbers are displayed in black and red in the respective directions for easy reading.
- Micrometer heads with a mechanical or electronic digital display, which allow direct reading of a measurement value, are also available. These types are free from misreading errors. A further advantage is that the electronic digital display type can enable computer-based storage and statistical processing of measurement data.

Guidelines for Self-made Fixtures

A micrometer head should be mounted by the stem. It must be mounted securely and precisely using a clamping method that does not exert excessive compression on the stem. There are three common mounting methods as shown below. Method (3) is not recommended. Adopt methods (1) or (2) wherever possible.

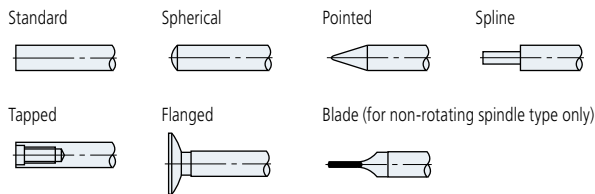
(Unit: mm)

Mounting method	(1) Clamp nut				(2) Split-body clamp				(3) Setscrew clamp				
													
	Face A												
	Stem diameter	ø9.5	ø10	ø12	ø18	ø9.5	ø10	ø12	ø18	ø9.5	ø10	ø12	ø18
	Mounting hole	G7				G7				H5			
Fitting tolerance (mm)	+0.005 to +0.020		+0.006 to +0.024		+0.005 to +0.020		+0.006 to +0.024		0 to +0.006		0 to +0.008		
Precautions	Care should be taken to make Face A square to the mounting hole. The stem can be clamped without any problem at squareness within 0.16/6.5.				Remove burrs generated on the wall of the mounting hole by the slitting operation.				M3x0.5 or M4x0.7 is an appropriate size for the setscrew. Limit countersinking into stem to 90°x0.5 and be careful not to damage the stem in the process.				

Custom-built Products (Product Example Introductions)

Micrometer heads have applications in many fields of science and industry and Mitutoyo offers a wide range of standard models to meet customers' needs. Mitutoyo can also custom build a head incorporating features better suited to your special application. Please feel free to contact Mitutoyo about the possibilities - even if only one custom-manufactured piece is required.

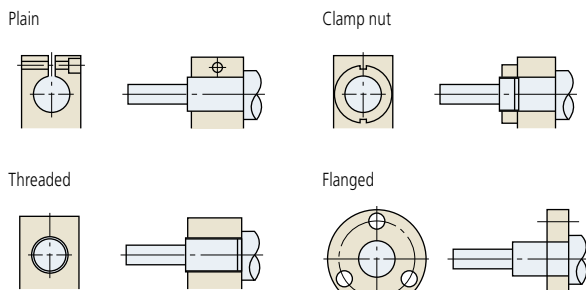
1. Spindle-end types



*A long spindle type is also available. Please consult Mitutoyo for details.

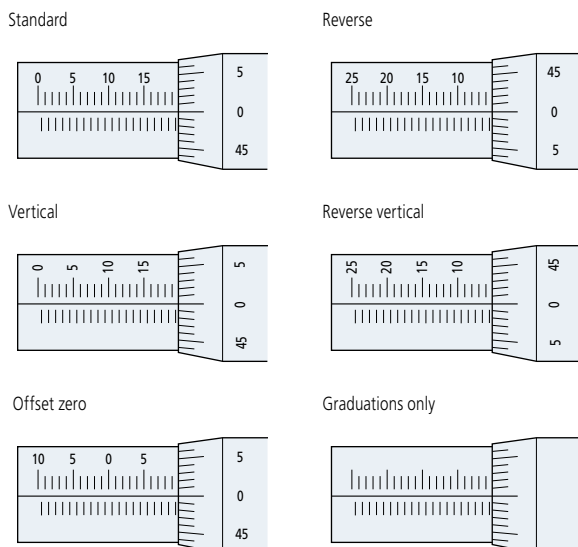
2. Stem types

A custom stem can be manufactured to suit the mounting fixture.



3. Scale graduation schemes

Various barrel and thimble scale graduation schemes, such as reverse and vertical, are available. Please consult Mitutoyo for ordering a custom scheme not shown here.



4. Logo engraving

A specific logo can be engraved as required.

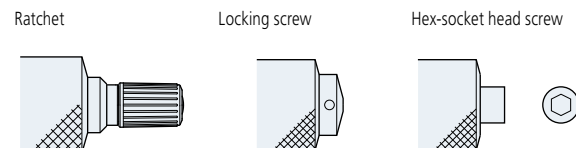
5. Motor Coupling

Couplings for providing motor drive to a head can be designed.



6. Thimble mounting

Thimble mounting methods including a ratchet, setscrew, and hex-socket head screw types are available.



7. Spindle-thread pitch

Pitches of 1 mm for fast-feed applications or 0.25 mm and 0.1 mm for fine-feed can be supplied as alternatives to the standard 0.5 mm. Inch pitches are also supported. Please consult Mitutoyo for details.

8. Lubricant for spindle threads

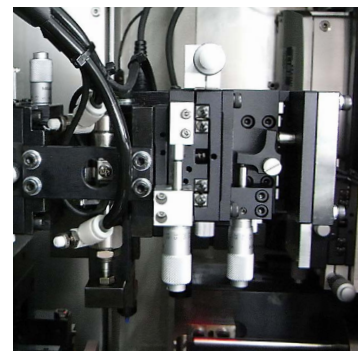
Lubrication arrangements can be specified by the customer.

9. All-stainless construction

All components of a head can be manufactured in stainless steel.

10. Simple packaging

Large-quantity orders of micrometer heads can be delivered in simple packaging for OEM purposes.



Maximum Loading Capacity of Micrometer Heads

The maximum loading capacity of a micrometer head depends mainly on the method of mounting. It also depends greatly on the conditions of usage, such whether the loading is static or dynamic or whether the head will be used as a stopper, for example. Therefore the maximum loading capacity of each model cannot be definitively specified. The loading limits recommended by Mitutoyo (at less than 100,000 revolutions if used for measuring within the guaranteed accuracy range) and the results of static load tests using a small micrometer head are given below.

1. Recommended maximum loading limit

		Maximum loading limit
Standard type	Spindle pitch: 0.5 mm	39.2 N ((4 kgf) *
	Spindle pitch: 0.1 mm/0.25 mm	19.6 N (2 kgf)
High-functionality type	Spindle pitch: 0.5 mm	39.2 N (4 kgf)
	Spindle pitch: 1.0 mm	58.8 N (6 kgf)
	Non-rotating spindle	19.6 N (2 kgf)
	MHF micro-fine feed type (with a differential mechanism)	19.6 N (2 kgf)

* Up to approx. 19.6 kgf only for MHT

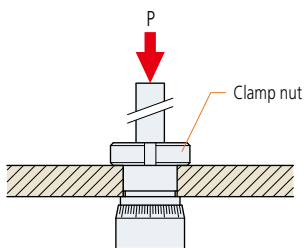
2. Static load test for micrometer heads (using 148-104/148-103 for this test)

(Test method)

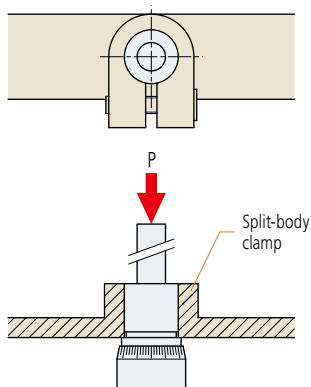
Micrometer heads were set up as shown and the force at which the head was damaged or pushed out of the fixture with a static load was applied in direction P.

(In the tests no account was taken of the guaranteed accuracy range.)

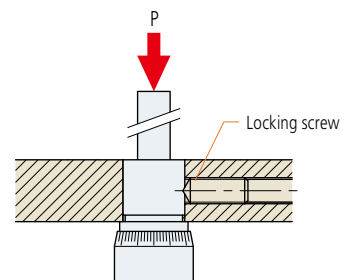
(1) Clamp nut



(2) Split-body clamp

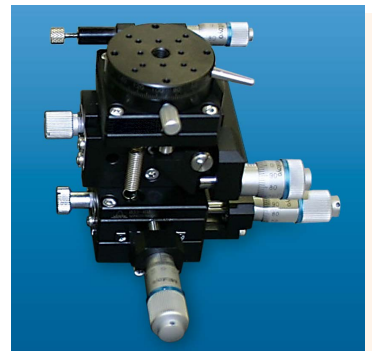
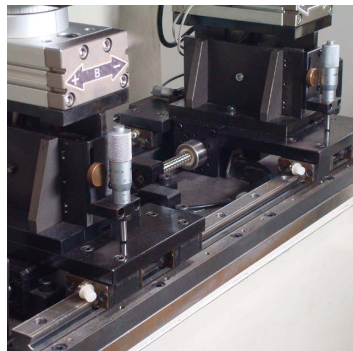
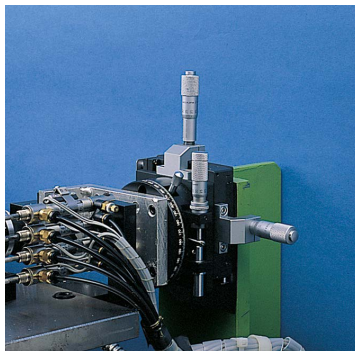
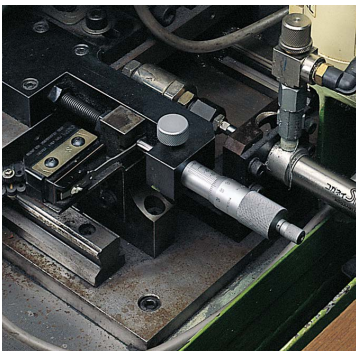


(3) Setscrew clamp



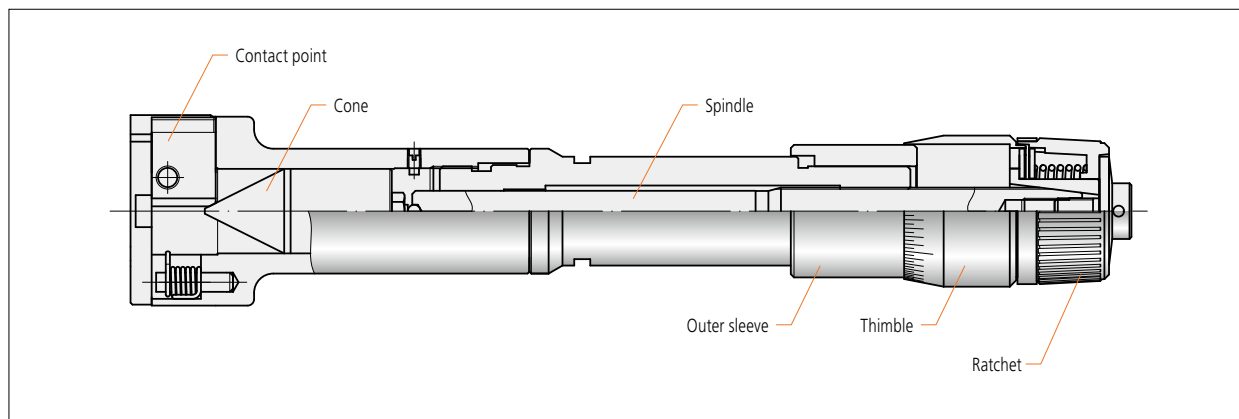
Mounting method	Damaging / dislodging load
(1) Clamp nut	Damage to the main unit will occur at 8.63 to 9.8 kN (880 to 1000 kgf).
(2) Split-body clamp	The main unit will be pushed out of the fixture at 0.69 to 0.98 kN (70 to 100 kgf).
(3) Setscrew clamp	Damage to the setscrew will occur at 0.69 to 1.08 kN (70 to 110 kgf).

Note: These load values should only be used as an approximate guide.



Inside Measuring Instruments

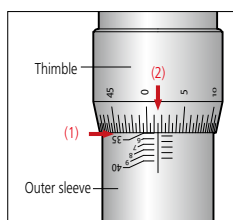
Nomenclature (Holtest)



Taking Readings

Graduation 0.005 mm

(1) Outer sleeve reading:	35 mm
(2) Thimble reading:	0.015 mm
Holtest reading:	35.015 mm

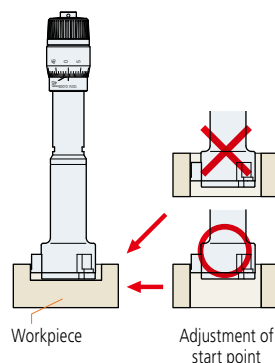


Changes in Measured Values at Different Measuring Points

When Holtest is used, the measured value differs between measurement across the anvil and the measurement only at the tip of the anvil due to the product mechanism.

Adjust the start point under the same condition before measurement.

When you use the tip of the anvil for measurement, adjust the start point for using the tip of the anvil.



Measurement Error Due to Inside Micrometer Temperature Change

Temperature changes cause measuring tools to produce errors in measurement. When making a measurement by holding an inside micrometer directly in the hand, it is necessary to prevent expansion of the micrometer due to body temperature by holding the thermally insulating plate with gloves, etc.

Effect of Misalignment on Accuracy (Inside Micrometer)

Figure 1

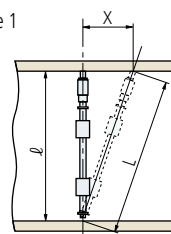
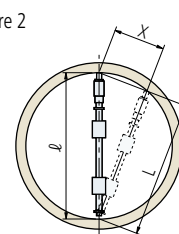


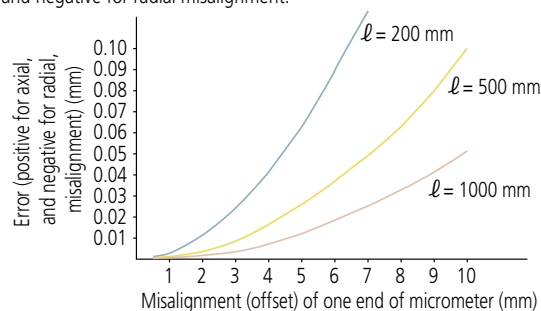
Figure 2



l : Inside diameter to be measured
 L : Length measured with axial offset X
 X : Offset in axial direction
 Δl : Error in measurement
 $\Delta l : L - l$
 $= \sqrt{l^2 + X^2} - l$

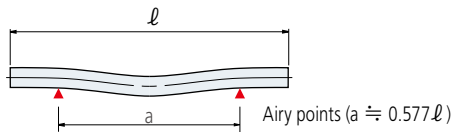
l : Inside diameter to be measured
 L : Length measured with axial offset X
 X : Offset in axial direction
 Δl : Error in measurement
 $\Delta l : L - l$
 $= \sqrt{l^2 + X^2} - l$

If the Inside Micrometer is misaligned in the axial or radial direction by an offset distance X when a measurement is taken, as in Figures 1 and 2, then that measurement will be in error as shown in the graph below (constructed from the formula given above). The error is positive for axial misalignment and negative for radial misalignment.

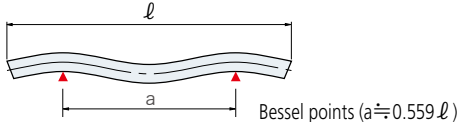


Airy and Bessel Points

When a length standard bar or inside micrometer lies horizontally, supported as simply as possible at two points, it bends under its own weight into a shape that depends on the spacing of those points.



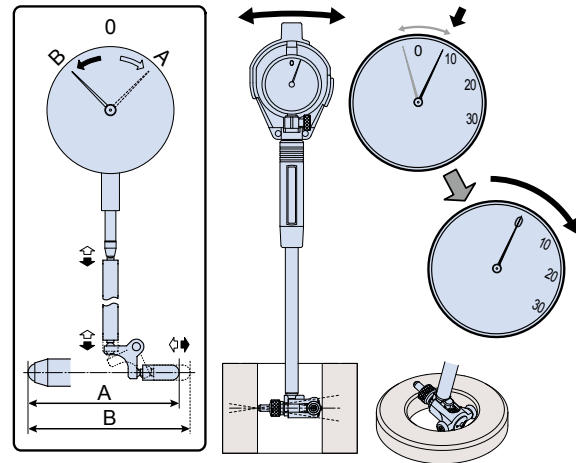
The ends of a bar (or micrometer) can be made exactly horizontal by spacing the two supports symmetrically as shown above.



The change in length of a bar (or micrometer) due to bending can be minimized by spacing the two supports symmetrically as shown above.

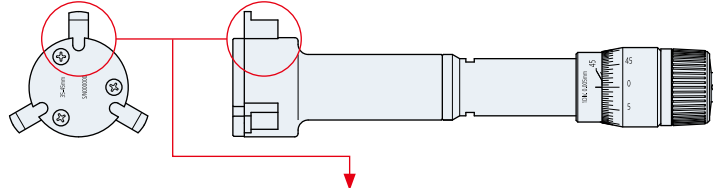
Reference Point Setting (2-point Gages)

Conduct reference point setting with a ring gage or cylinder master gage. Insert the bore gage into the ring gage, vertically or horizontally swing the bore gage, and set the point where the indicator reads the maximum value as the reference point.



Custom-ordered Products (Holtest / Borematic)

Mitutoyo can custom-build an inside micrometer best suited to your special application. Please feel free to contact Mitutoyo about the possibilities - even if only one custom-manufactured piece is required. Please note that, depending on circumstances, such a micrometer will usually need to be used with a master setting ring for accuracy assurance. (A custom-ordered micrometer can be made compatible with a master ring supplied by the customer. Please consult Mitutoyo.)



Type	Workpiece profile (example)	Contact point tip profile (example)	Remarks
Square groove			- Can measure the diameter of variously shaped inside grooves and splines. - Minimum measurable groove diameter: Approximately 16 mm (differs depending on the workpiece profile.) - Dimension l should be as follows: For W = less than 2 mm: l = less than 2 mm For W = 2 mm or more: l = 2 mm as the standard value which can be modified according to circumstances. - The number of splines or serrations is limited to a multiple of 3. - Details of the workpiece profile should be provided at the time of placing a custom-order. - If your application needs a measuring range different from that of the standard inside micrometer an additional initial cost for the master ring gage will be required.
Round groove			
Spline			
Serration			
Screw			

*Mitutoyo will manufacture products to accommodate other applications.

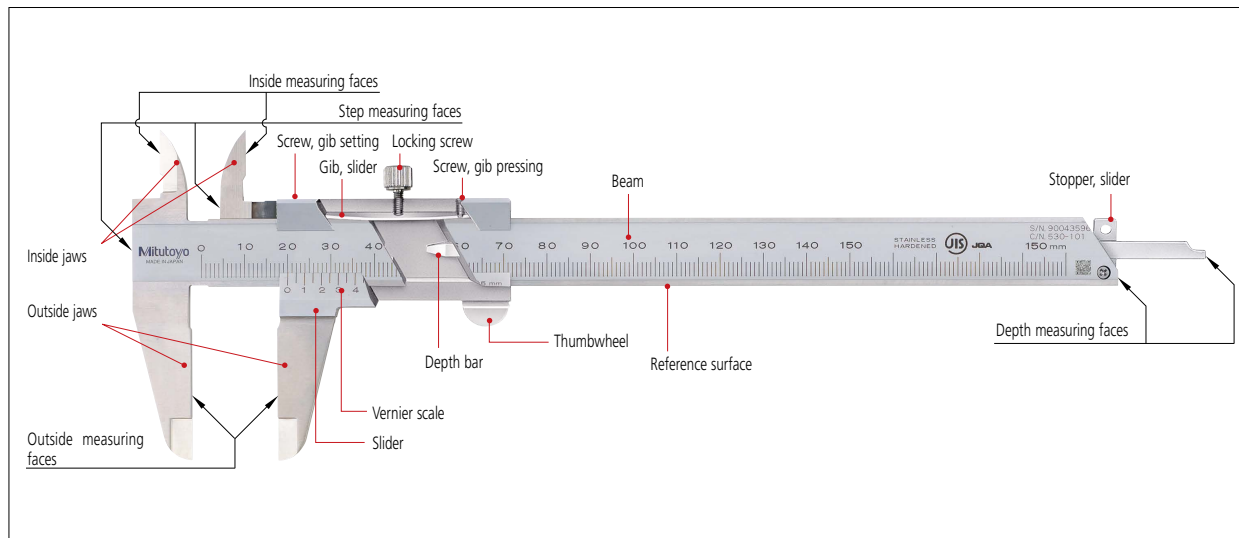
*Prices, delivery times, and other details will vary depending on the nature and content of the special order.

*Please contact your nearest Mitutoyo sales office for orders.

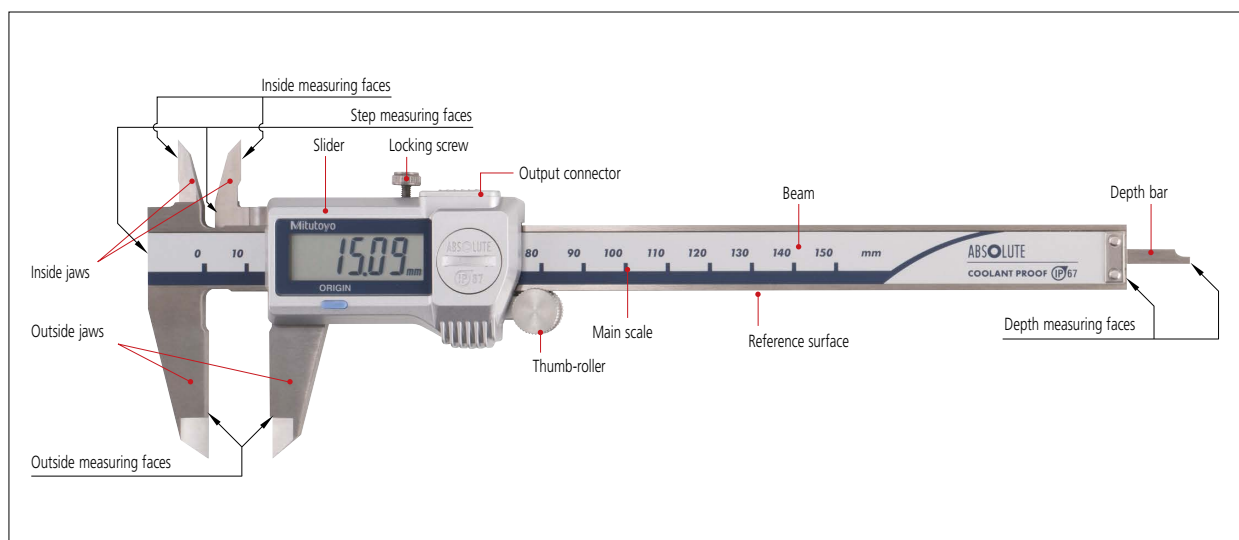
Calipers

Nomenclature

Vernier Caliper

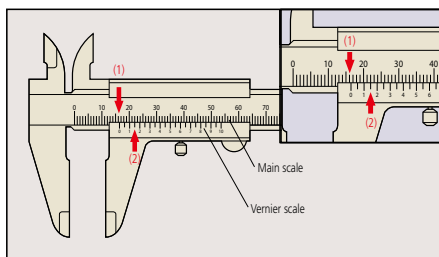


Absolute Digimatic Caliper



Taking Readings

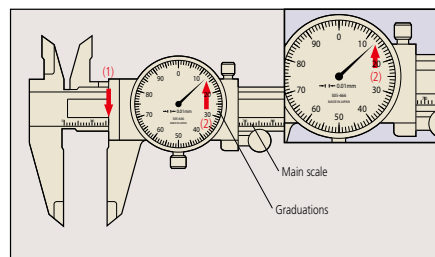
Calipers



Minimum reading: 0.05 mm

(1) Main scale reading:	16 mm
(2) Vernier scale reading:	0.15 mm
Calipers reading:	16.15 mm

Dial Calipers



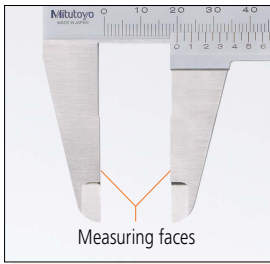
Minimum reading: 0.01 mm

(1) Main scale reading:	16 mm
(2) Graduations reading:	0.13 mm
Dial calipers reading:	16.13 mm

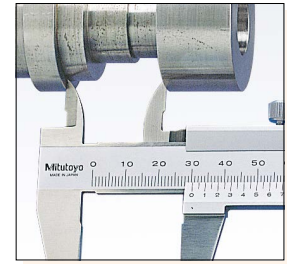
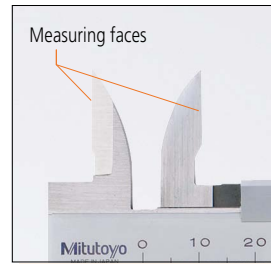
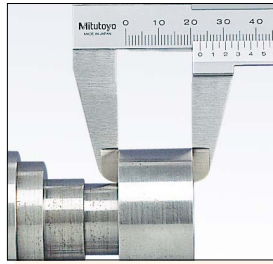
Note: Above left, 0.15 mm (2) is read at the position where a main scale graduation line corresponds with a vernier graduation line.

Measurement Examples

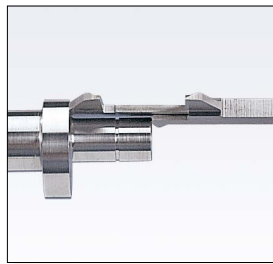
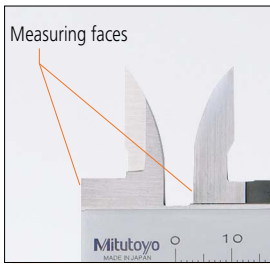
Outside measurement



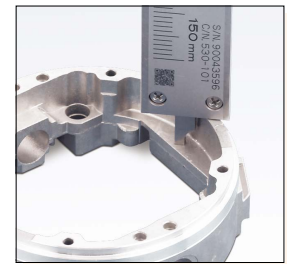
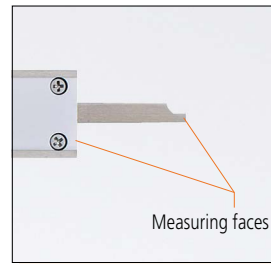
Inside measurement



Step measurement

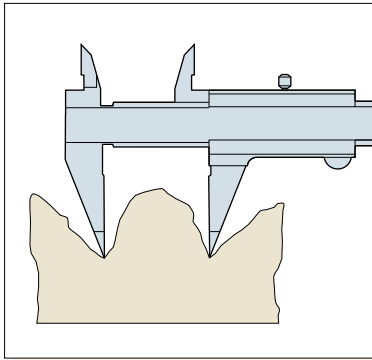


Depth measurement



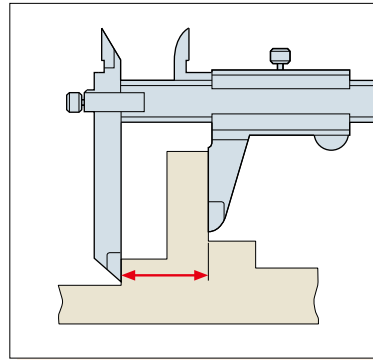
Special Purpose Caliper Applications

For uneven surface measurement



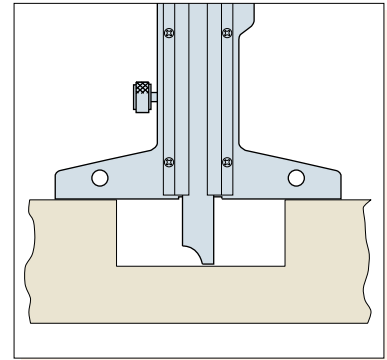
Point jaw type

For stepped feature measurement



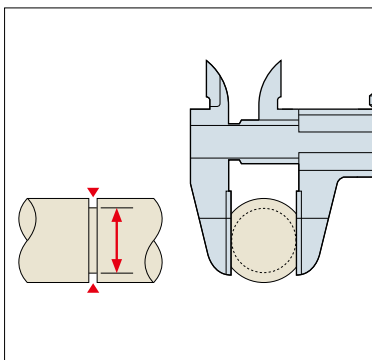
Offset jaw type

For depth measurement

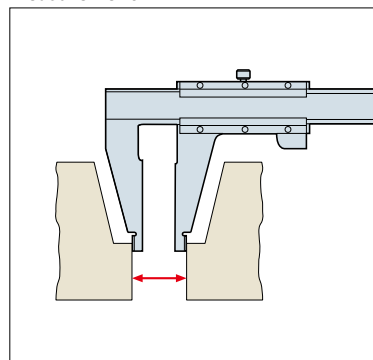


Depth type

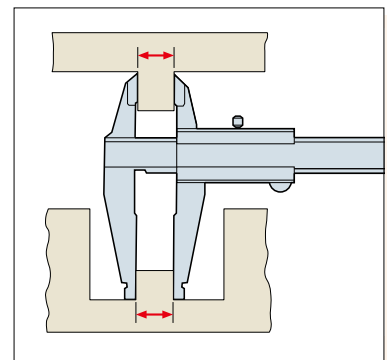
For diameter of narrow groove measurement



Blade jaw type

Ordinary outside measurement
For inside diameter of stepped hole measurement

Neck-type calipers

Ordinary outside measurement
For stepped hole measurement

Tube thickness-type calipers

Vernier Scale

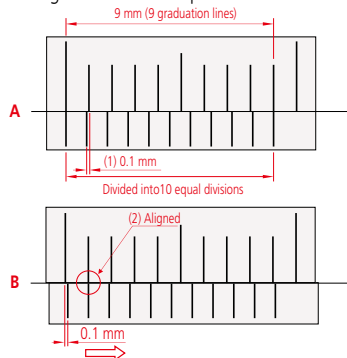
This is a short auxiliary scale that enables accurate interpolation between the divisions of a longer scale without using mechanical magnification.

Specifically, n divisions on a vernier scale are the same length as $n-1$ divisions on the main scale it works with, and n defines the division (or interpolation) ratio.

The example below is for $n = 10$.

The main scale is graduated in mm, and so the vernier scale is 9 mm (10 divisions) long, the same as 9 mm (9 divisions) on the main scale.

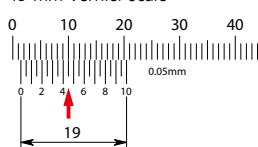
This produces a difference in length of 0.1 mm (1) as shown in figure A (the 1st vernier graduation is aligned with the first main scale graduation). If the vernier scale is slid 0.1 mm to the right as shown in figure B, the 2nd graduation line on the vernier scale moves into alignment with the 2nd line on the main scale (2), and so enables easy reading of the 0.1 mm displacement.



Some early calipers divided 19 divisions on the main scale by 20 vernier divisions to provide 0.05 mm resolution. However, the closely spaced lines proved difficult to read and so, since the 1970s, a long vernier scale that uses 39 main scale divisions to spread the lines is generally used instead, as shown below.

Vernier scale

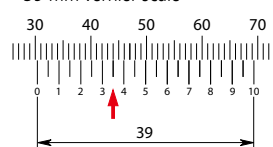
- 19 mm Vernier scale



Reading: 1.45 mm

(long vernier scale)

- 39 mm vernier scale



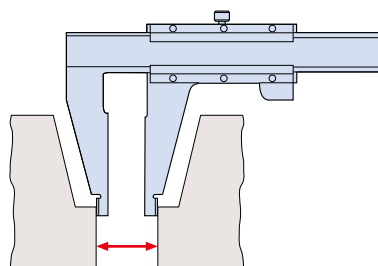
Reading: 30.35 mm

Calipers were made that gave an even finer resolution of 0.02 mm. These required a 49-division vernier scale dividing 50 main scale divisions. However, they were difficult to read and are now hard to find since Digital calipers with an easily read display and resolution of 0.01 mm appeared.

About Long Calipers

Steel rules are commonly used when measuring to a limited accuracy. Long Calipers are used for further accuracy than a Steel Rule, but less than a Micrometer. A long caliper is very convenient for its user friendliness but does require some care in use.

- Minimum reading and indication error differ (see Mitutoyo's catalog values for details)
- Pay attention to how the calipers are supported, as measurement errors due to deflection tend to occur.
- When using the inside measuring faces, pay attention to measuring force as the faces are furthest away from the reference surface.
- When using a long-jaw caliper, pay attention to measuring force even when using the outside measuring faces.



Small Hole Measurement with an M-type Caliper

A structural error d occurs when you measure the internal diameter of a small hole.

● True internal diameter (ϕD : 5 mm)
Unit mm

ϕD : True internal diameter

ϕd : Measured diameter

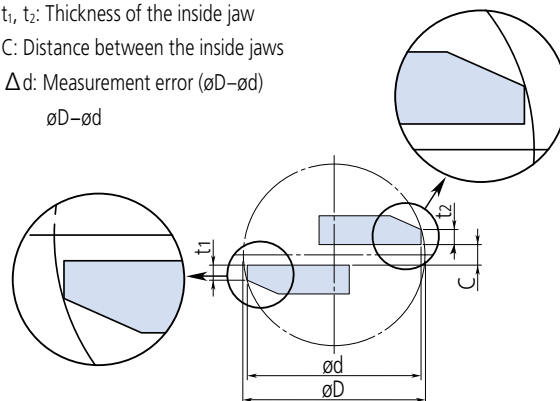
t_1, t_2 : Thickness of the inside jaw

C : Distance between the inside jaws

Δd : Measurement error ($\phi D - \phi d$)

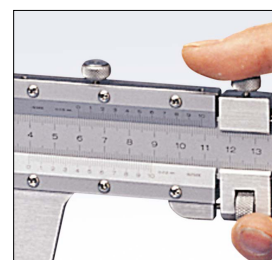
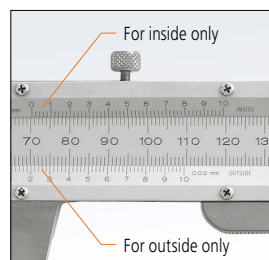
$\phi D - \phi d$

$t_1 + t_2 + C$	0.3	0.5	0.7
Δd	0.009	0.026	0.047



Inside Measurement with a CM-type Caliper

Because the inside measuring faces of a CM-type caliper are at the tips of the jaws, attention must be given to measuring force. Additionally, the parallelism of the measuring faces and step differences of the jaws are problematic. The radius of curvature of the measuring faces must be less than 1/2 of the combined dimensions of the inside measurement section. In contrast to an M-type caliper, a CM-type caliper cannot measure small holes below the combined measurement size. Mitutoyo CM-type calipers are provided with an extra scale on the slider for inside measurements so they can be read directly without the need for calculation. The elimination of calculations reduces measurement errors.



General Notes on Use of Caliper

1. Potential causes of error

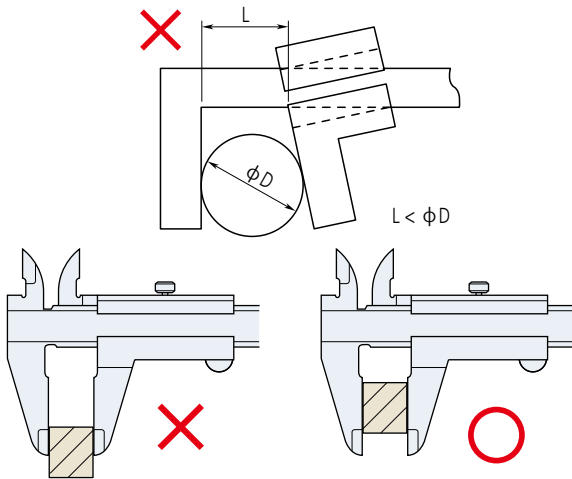
The main factors behind caliper errors are:

- Excessive measuring force
- Differential thermal expansion due to a temperature difference between the caliper and workpiece
- Effect of the thickness of the knife-edge jaws and the clearance between these jaws during measurement of the diameter of a small hole
- Graduation accuracy
- Reference edge straightness
- Main scale flatness on the beam
- Squareness of the jaws

There is no problem with the caliper if these error factors are within the indication error.

Handling notes have been added to the JIS so that consumers can appreciate the error factors caused by the structure of the caliper before use. These notes relate to the measuring force and stipulate that "as the caliper does not have a constant-force device, you must measure a workpiece with an appropriate even measuring force.

Take extra care when you measure it with the root or tip of the jaw because a large error could occur in such cases."



2. Inside measurement

Insert the inside jaw as deeply as possible before measurement.
Read the maximum indicated value during inside measurement.
Read the minimum indicated value during groove width measurement.

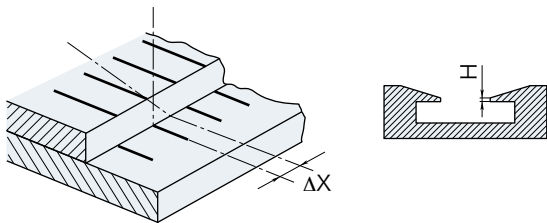
3. Depth measurement

Read the minimum indicated value during depth measurement.

4. Parallax error when reading the scales

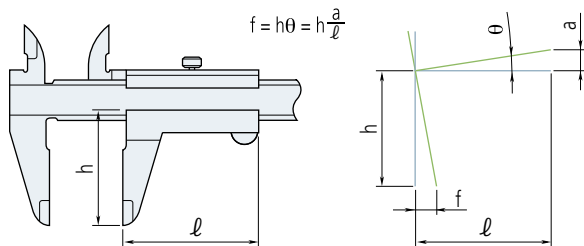
Look straight at the vernier graduation line when checking the alignment of vernier graduation lines to the main scale graduation lines.

If you look at a vernier graduation line from an oblique direction, a parallax effect is caused by the difference between the tip of the vernier scale and the main scale. Consequently, the matching position appears to be off by ΔX as shown in the figure below, resulting in a reading error of the measured value. To avoid this error, the JIS stipulates that the step height should be no more than 0.3 mm.



5. Moving Jaw Tilt Error

The guide face provides the basis for the caliper's slider. Consequently, measurement errors result when the face becomes warped, as shown in the figure. This error can be represented by the same calculation formula for errors caused by nonconformance to Abbe's Principle.



Example: Assume that the error slope of the jaws due to tilt of the slider is 0.01 mm in 50 mm and the outside measuring jaws are 40 mm deep, then the error (at the jaw tip) is calculated as $(40/50) \times 0.01 \text{ mm} = 0.008 \text{ mm}$.

$$f = 40 \text{ mm} \times 0.01 \div 50 = 0.008 \text{ mm}$$

The effects of a guide face that is worn or deformed because it was handled carelessly cannot be ignored.

6. Relationship between accuracy and temperature

The main scale of a caliper is engraved (or mounted on) stainless steel, and although the linear thermal expansion coefficient is equal to that of the most common workpiece material, steel, i.e. $(10.2 \pm 1) \times 10^{-6} / \text{K}$, note that other workpiece materials, the room temperature and the workpiece temperature may affect measurement accuracy.

7. Handling

Caliper jaws are sharp, and therefore the instrument must be handled with care to avoid personal injury.

Avoid damaging the scale of a digital caliper and do not engrave an identification number or other information on it with an electric marker pen. Avoid damaging a caliper by subjecting it to impact with hard objects or by dropping it on a bench or the floor.

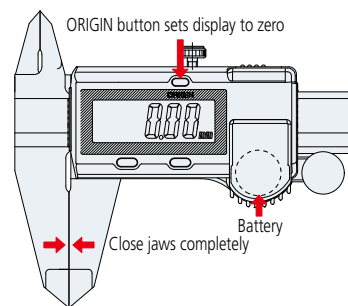
8. Maintenance of beam sliding surfaces and measuring faces

Wipe away dust and dirt from the sliding surfaces and measuring faces with a dry soft cloth before using the caliper.

9. Checking and setting the origin before use

Close the jaws and ensure that the vernier scale (or display) reads zero before using the caliper.

When using a Digimatic caliper, reset the origin (ORIGIN button) after replacing the battery.



10. Handling after use

After using the caliper, completely wipe off any water and oil and lightly apply anti-corrosion oil before storage.

Wipe off water from a waterproof caliper as well because it may also rust.

11. Notes on storage:

Avoid direct sunlight, high temperatures, low temperatures, and high humidity during storage.

If a digital caliper will not be used for more than three months, remove the battery before storage.

Do not leave the jaws of a caliper completely closed during storage.

Caliper Performance

Caliper performance specified in the Japanese Industrial Standard JIS B 7507 for calipers was revised in 2016 (JIS B 7507: 2016) to JIS B 7507: 2016: The term "instrumental error" that was used until 1993 was changed to "indication error."

Partial surface contact error is the most important caliper indication error. The indication error is limited by the maximum permissible error (MPE). In other words, MPE has the same meaning as tolerance.

The following describes the standard inspection method including the revised content of JIS 2016.

Maximum Permissible Error E_{MPE} of Partial Measuring Surface Contact Error in a Conventional Caliper [JIS B 7507:2016]

The partial measuring surface contact error of a caliper is an indication error applied to the outside measurement.

Table 1 shows the Maximum Permissible Error E_{MPE} of the indication value of the partial measuring surface contact error.

The maximum permissible error E_{MPE} of an inside measurement can be obtained by measuring the inside dimensions using the inside measuring faces at any position within the measuring range using gauge blocks or an equivalent or higher gauge (**Fig. 1**) and subtracting the gauge dimension from the indicated value of the caliper.

Table 1: Maximum permissible error E_{MPE} of partial measuring face contact of conventional calipers (Unit: mm)

Measurement length	Scale interval, graduation or resolution	
	0.05	0.02
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 the straightness, flatness and parallelism of the measuring surface.

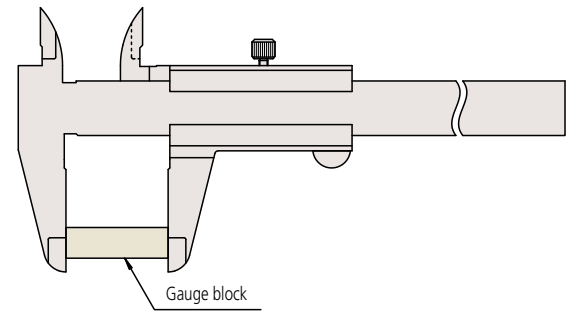


Fig. 1: Determining of partial measuring surface contact error (example)

Maximum Permissible Error of Scale Shift Error S_{MPE} [JIS B 7507: 2016]

The scale shift error in a caliper is an indication error of the inside measurement, depth measurement, etc., if measuring surfaces other than the outside measuring surfaces are used.

The Maximum Permissible Error S_{MPE} of the indication value for inside measurement is given in **Table 1**. The Maximum Permissible Error S_{MPE} of depth measurement is obtained by adding 0.02 mm to a value in **Table 1**.

The maximum permissible error S_{MPE} of an inside measurement can be obtained by measuring the inside dimensions using the inside measuring faces at any position within the measuring range using gauge blocks or an equivalent or higher gauge (**Fig. 2**) and subtracting the gauge dimension from the indicated value of the caliper.

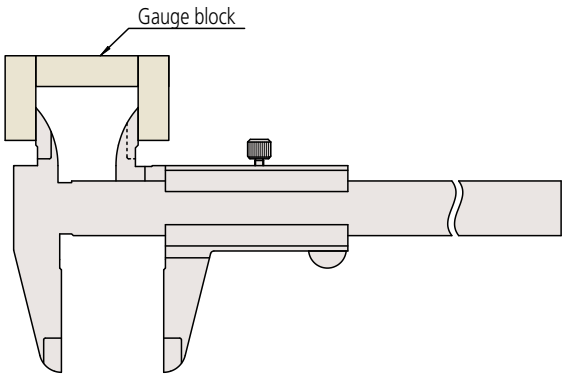


Fig. 2: Determining inside measurement indication error (example)

Partial Surface Contact Error E [ISO 13385-1:2019, JIS B 7507:2022]

The partial surface contact error of a caliper is an indication error applied to outside measurement.

The ISO-2019 standard quantifies for each measuring range the testing method and criteria, such as test points, number of tests, and testing arrangement that were previously left to the manufacturers' own criteria. (Fig. 1, Table 1)

Fig. 1

Ex.) For a caliper with a measuring range of 150 mm, the revised standard requires five or more test points.

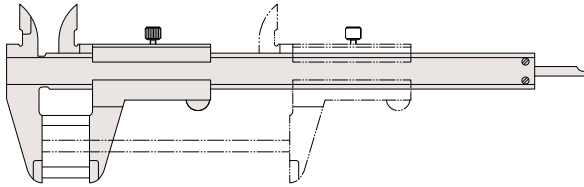


Table 1: Number of partial surface contact error test points

Measuring range (mm)	Minimum number of test points
150	5
300	6
1000	7
1,000 or more	8

Furthermore, the revised standards require testing in 90% or more points within the product measuring range as well as testing at the root and tip of the jaw at the maximum/minimum point. Therefore, it is important to conduct tests following the newly defined standard.

The following is an example of measurement for a 150 mm caliper. To comply with the ISO 13358-1:2019 standard, the minimum number of test points is five for a 150 mm caliper (Fig. 1).

Five or more test points are necessary to comply with the ISO 13385-1:2019 and JIS B7507:2022 standards. These include testing at the maximum and minimum point, as well as at the root and tip of the measuring unit. These test points must add up to a total of five.

Shift Error S

The Shift Error for calipers is the error of indication for areas other than the outside measuring face.

In ISO13385-1:2019 and JIS B 7507:2022, all measurement errors other than outside measurement errors (inside, depth, step, and I.D. measurement error) are shift errors. Test points and their number were newly quantified as the type of errors included in the Scale Shift Error were better specified.

(Fig. 2, 3, Table 2)

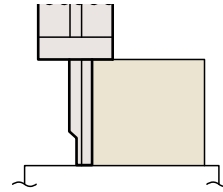


Table 2
Ex.) Step and depth measurement

[ISO 13385-1:2019]		
Test numbering	Test point	Reference standard
1	Less than 50 mm	Gauge block

Figure 2: Scale Shift Error measurement
example-depth measurement

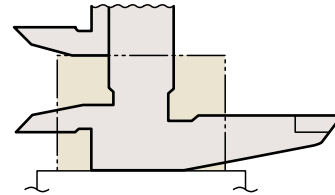


Figure 3: Scale Shift Error measurement
example-step measurement

For depth measurement or step measurement, the standard specifically requires one or more test points at less than 50 mm and a testing arrangement using gauge blocks among other items.

(See Table 3)

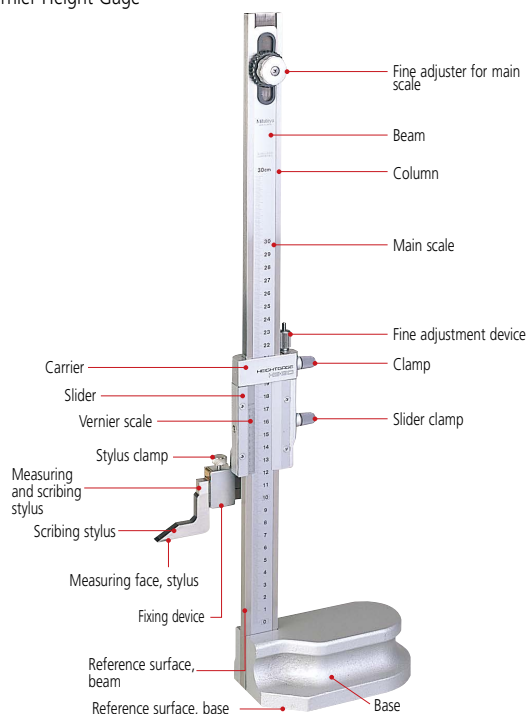
Responses to ISO 13385-1:2019 and JIS B 7507:2022

The ISO standard for calipers, ISO 13385-1, was revised and published as ISO 13385-1:2019 in August 2019. Additionally, the Japanese Industrial Standard JIS B 7507 for calipers was revised based on ISO 13385-1:2019, and published as JIS B 7507:2022 in May 2022. The major point of these revisions is that they specifically quantify the notation and the inspection methods, etc., related to caliper accuracy. This quantification does not affect the quality of calipers manufactured in the past, as they were measured and inspected in a standardized way in line with certain methods and criteria.

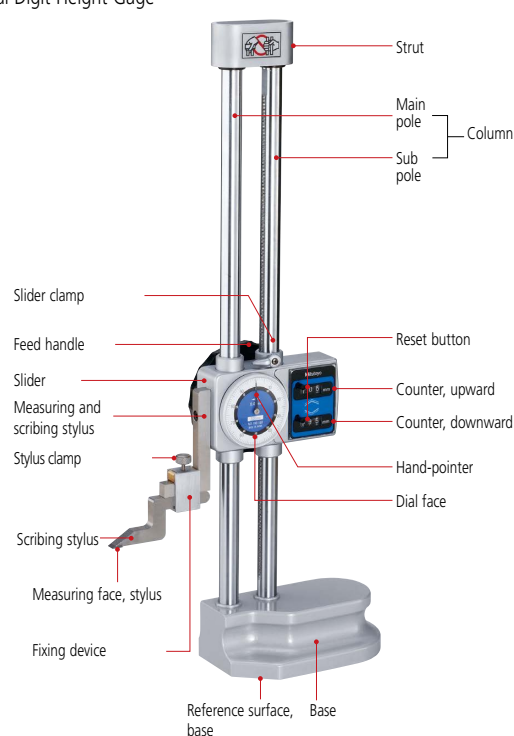
Height Gages

Nomenclature

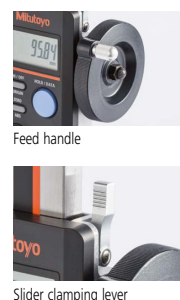
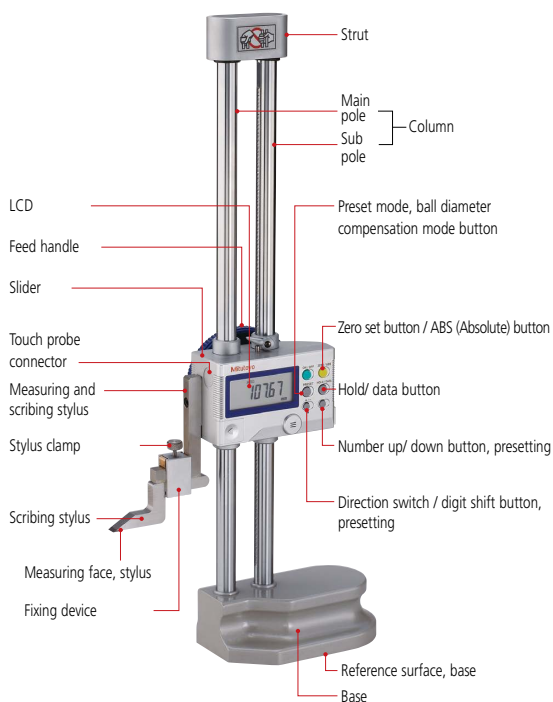
Vernier Height Gage



Mechanical Digit Height Gage



Digimatic Height Gages



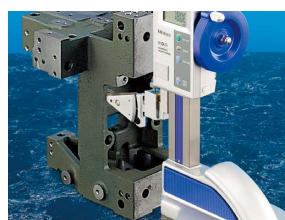
Height Gage Applications with Optional Accessories and Other Measuring Tools



Test indicator attachment



Touch probe attachment



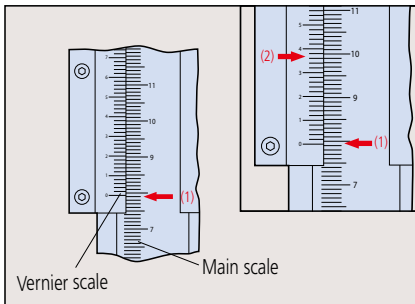
Center probe attachment



Depth gage attachment

Taking Readings

Vernier Height Gage

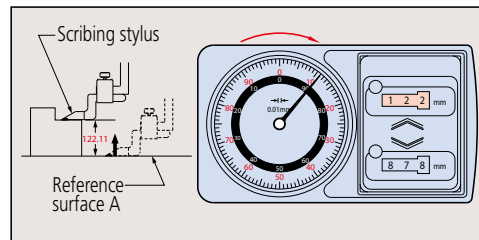


Minimum reading: 0.02 mm

(1) Main scale reading:	79 mm
(2) Vernier scale reading:	0.36 mm
Vernier height gage reading:	79.36 mm

Mechanical Digit Height Gage

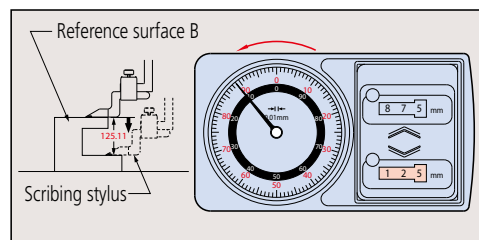
Measuring upwards from a reference surface



(1) Counter reading:	122 mm
(2) Graduations reading:	0.11 mm

Mechanical digit height gage reading:
122.11 mm

Measuring downwards from a reference surface



(1) Counter reading:	125 mm
(2) Graduations reading:	0.11 mm

Mechanical digit height gage reading:
125.11 mm

General Notes on Use of Height Gages

1. Potential causes of error

Given that this height gage is a measuring instrument that does not conform to Abbe's principle, the following error factors are possible.

- Parallax error
- Excessive measuring force
- Differential thermal expansion due to a temperature difference with the workpiece
- Structure of the height gage.

In particular, structure and error factors related to a "reference edge warping" and "scraper installation" described below should be fully understood before use.

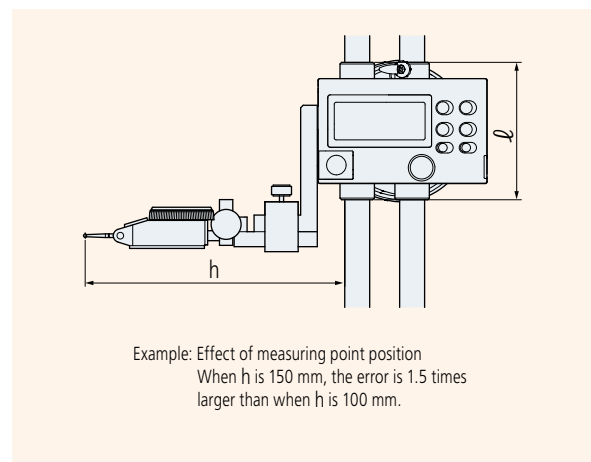
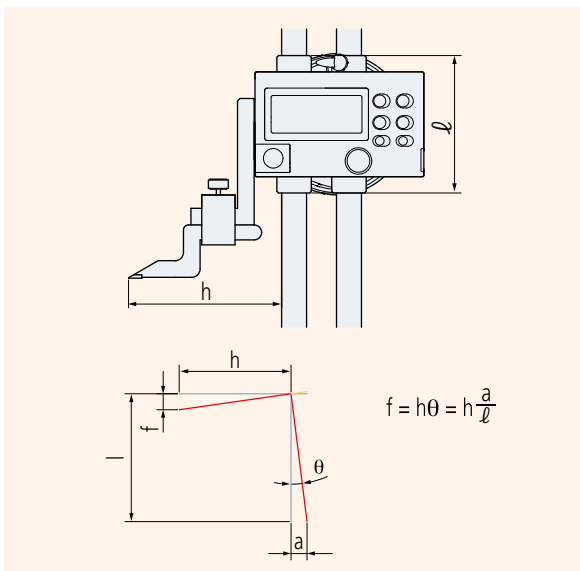
2. Reference edge (column) warping and scriber installation

As shown in the following figure, measurement errors result when using the height gage if the reference column, which guides the slider, becomes warped. This error can be represented by the same calculation formula for errors caused by nonconformance to Abbe's Principle.

Here, installing the scriber (or a lever-type dial indicator) requires careful consideration because it affects the size of any error due to a warped reference column by increasing dimension h in the above formula. Specifically, pay attention to the following when installing the scriber.

- Make sure that the dimension h in the following formula is not too large.
- Install the scriber, etc., so that it does not protrude too far forward from the main body.

Be careful when using an optional long scriber or lever-type dial indicator, as the error factor will grow larger.

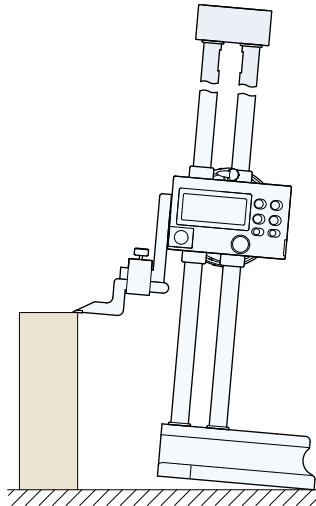


3. Lifting of the base from the reference surface

The height gage's slider can be moved with the driving handle and adjustor. After the slider contacts the workpiece, the base may lift from the surface plate if excessive downwards force is used on the slider (measuring force is applied). This results in measurement error.

For accurate setting, move the slider slowly downwards until the scribe is just felt to lightly touch the workpiece.

Always make certain that the surface plate and height gage base reference surface are free of dust or burrs.



4. Error due to inclination of the main scale (column)

According to JIS standards, the perpendicularity of the column reference edge to the base reference surface should be better than

$$(0.01 + \frac{L}{1000}) \text{ mm} \quad L \text{ indicates the measuring length (unit: mm)}$$

This is not a very onerous specification. For example, the perpendicularity limit allowable is 0.61 mm when L is 600 mm.

This is because this error factor has a small influence and does not change the inclination of the slider, unlike a warped column.

5. Relationship between accuracy and temperature

Height gages are made of several materials. Note that some combinations of workpiece material, room temperature, and workpiece temperature may affect measuring accuracy if this effect is not allowed for by performing a correction calculation.

6. A height gauge scribe tip is very sharp. Handle with care to avoid any personal injury.
7. Do not damage a digital height gage scale by engraving an identification number or other information on it with an electric marker pen.
8. Carefully handle a height gage so as not to drop it or bump it against anything.

Notes on Using the Height Gage

1. Keep the column, which guides the slider, clean. If dust or dirt accumulates on it, sliding becomes difficult, leading to errors in setting and measuring.
2. When scribing, securely lock the slider in position using the clamping arrangements provided.
It is advisable to confirm the setting after clamping because the act of clamping on some height gages can alter the setting slightly. If this is so, allowance must be made when setting to allow for this effect.
3. Parallelism between the scribe measuring face and the base reference surface should be 0.01 mm or better.
Check that there are no dust or burrs on the mounting surface when installing the scribe or lever-type dial indicator before measurement. Keep the scribe and other parts securely fixed in place during measurement.
4. If the main scale of the height gage can be moved, move it as required to set the zero point, and securely tighten the fixing nuts.
5. Because of parallax errors, always look at the scale from the front when taking readings.

6. Handling after use

Completely wipe off any water and oil and lightly apply anti-corrosion oil before storage.

7. Notes on storage:

- Avoid direct sunlight, high temperatures, low temperatures, and high humidity during storage.
- If a digital height gage will not be used for more than three months, remove the battery before storage.
- If a protective cover is provided, use the cover during storage to prevent dust from adhering to the column.

Height Gage Performance

JIS B 7517 was revised and issued in 2018 as the Japanese Industrial Standards for height gage, and the "Instrumental error" indicating the performance of a height gage was changed to "Indication error."

Height measurement error is the most important height gage indication error. The indication error is limited by the maximum permissible error (MPE). In other words, MPE has the same meaning as tolerance.

The following describes the standard inspection method including the revised content of JIS 2018.

Maximum Permissible Error of Height Measurement E_{MPE}
[JIS B 7517: 2018]

The height measurement error in a height gage is the indication error when the reference edge (column) is perpendicular to the base reference surface and the direction of contact is downward.

Table 1 shows the maximum permissible height measurement error E_{MPE} . The maximum permissible error E_{MPE} for a height measurement can be obtained by measuring a gauge block, or equivalent, with a height gage on a precision surface plate (Fig. 1) and then subtracting the gauge block size from the measured size.

Table 1: Maximum permissible height measurement error E_{MPE} of a conventional height gage

(Unit: mm)

Measurement 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
Over 300, 400 or less	± 0.09	
Over 400, 500 or less	± 0.10	± 0.05
Over 500, 600 or less	± 0.11	
Over 600, 700 or less	± 0.12	± 0.06
Over 700, 800 or less	± 0.13	
Over 800, 900 or less	± 0.14	± 0.07
Over 900, 1000 or less	± 0.15	

Note: E_{MPE} includes the measurement error arising from straightness, flatness of the measuring surface and parallelism with the reference surface.

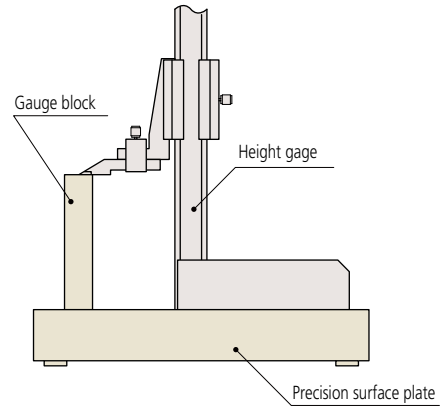
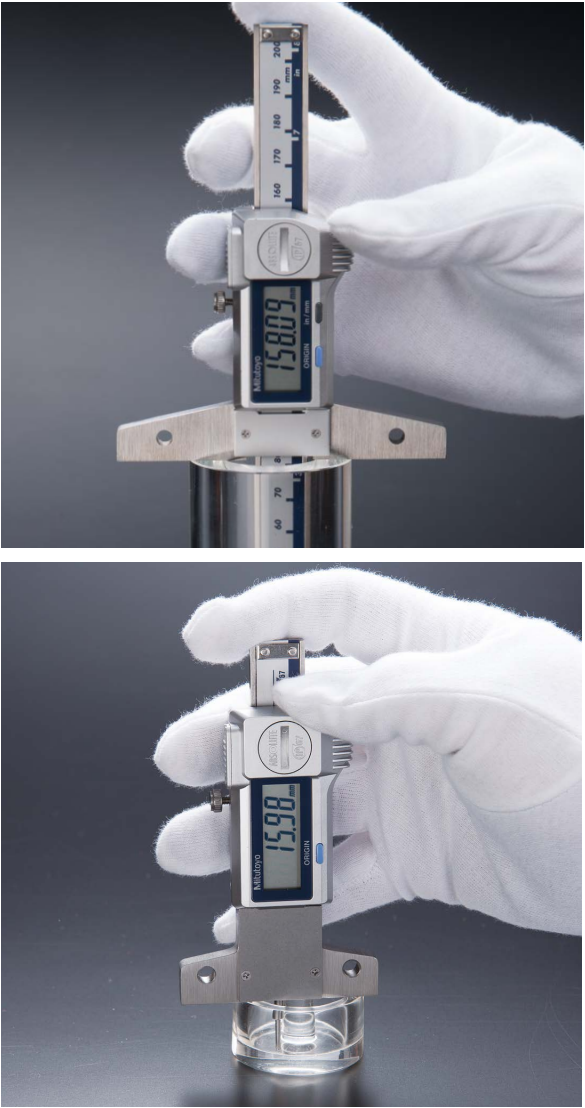


Fig. 1: Determination of height measurement error

Depth Gages

Depth Gage Performance

JIS B 7518 was revised and issued in 2018 as the Japanese Industrial Standards for depth gage, and the “Instrumental error” indicating the performance of a depth gage was changed to “Indication error.” Partial surface contact error is the most important depth gage indication error. The indication error is limited by the maximum permissible error (MPE). In other words, MPE has the same meaning as tolerance. The following describes the standard inspection method including the revised content of JIS 2018.



Maximum Permissible Error of Depth Measurement E_{MPE} [JIS B 7518: 2018]

The Maximum Permissible Error E_{MPE} of a depth gage is an indication error applied to depth measurement.

Table 1 shows the Maximum Permissible Error E_{MPE} of the indication value of the partial measuring surface contact error.

The maximum permissible error E_{MPE} for a depth measurement can be obtained by measuring the height of two equal length gauge blocks, or equivalent, with a height gage on a precision surface plate (Fig. 1) and then subtracting the gauge block size from the measured size.

Table 1: Maximum permissible error E_{MPE} of partial measuring face contact of a conventional depth gage

(Unit: mm)

Measurement 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
Over 300, 400 or less	± 0.09	
Over 400, 500 or less	± 0.10	± 0.05
Over 500, 600 or less	± 0.11	

Note: E_{MPE} includes the measurement error arising from straightness, flatness of the measuring surface and parallelism with the reference surface.

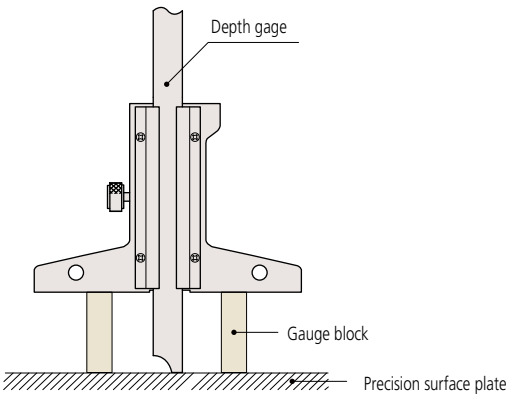


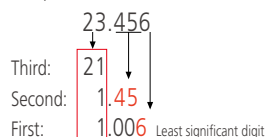
Fig. 1: Measurement of partial measuring surface contact error

Gauge Blocks

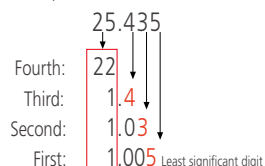
Select Gauge Blocks to be Combined to Make Up the Size Required for the Stack.

- (1) Selection, preparation and assembly of a gauge block stack
Select gauge blocks with consideration for the following points:
 - a. Use the minimum number of blocks whenever possible.
 - b. Select thick gauge blocks whenever possible.
 - c. Select the size from the one that has the least significant digit required, and then work back through the more significant digits.

Example: For 23.456 mm



Example: For 25.435 mm



- (2) Clean the gauge blocks with an appropriate cleaning agent.
- (3) Check the measuring faces for burrs. When inspecting for burrs, use an optical flat as follows:

Fig. 1

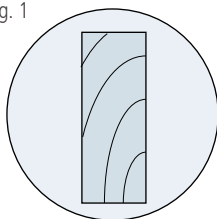
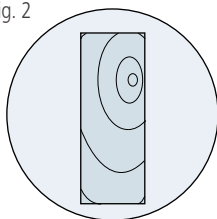


Fig. 2



- a. Wipe each measuring face clean.
- b. Gently place the optical flat on the gauge block measuring face.
- c. Lightly slide the optical flat to check that the interference fringes disappear. (Fig. 1, Fig. 2)
Judgment 1: If no interference fringes appear, it is assumed that there is a large burr or contaminant on the measuring face.
- d. Lightly press the optical flat to check that the interference fringes disappear.
Judgment 2: If the interference fringes disappear, no burr exists on the measuring face.
Judgment 3: If some interference fringes remain locally while the flat is gently moved to and fro, a burr exists on the measuring face. If the fringes move along with the optical flat, there is a burr on the optical flat.
- e. Remove burrs by referring to the figures.

Fig. 3

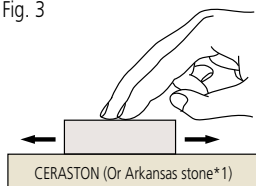
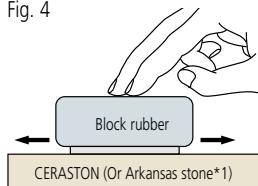


Fig. 4

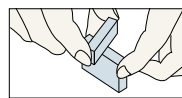


- (1) Wipe any dust and oil films from the gauge block and the Ceraston (or Arkansas stone)*1 using a solvent.
- (2) Place the gauge block on the Ceraston (or Arkansas stone)*1 so that the measuring face that has burrs is on the abrasive surface of the stone. While applying light pressure, move the gauge block to and fro about ten times (Fig. 3).
For thin gauge blocks, use a block rubber that makes it easy to apply even pressure (Fig. 4).
- (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 an abrasive stone. Replacement with a new gauge block is recommended when burrs cannot be removed.

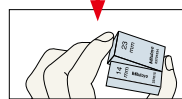
*1 Mitutoyo does not offer Arkansas stones.

- (4) Apply a very small amount of oil to the measuring face and spread it evenly across the face. Wipe the face until the oil film is almost entirely removed. Use grease, spindle oil, Vaseline, or other recommended oils.
- (5) Gently overlay the faces of the gauge blocks to be wrung together.
There are three methods to use (a, b and c as shown below) according to the size of blocks being wrung:

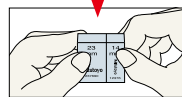
a. Wringing thick gauge blocks



Cross the gauge blocks at 90° in the middle of the measuring faces.

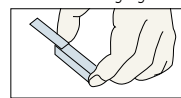


Rotate the gauge blocks while applying slight force to them. Slide the gauge block to check for a feeling of adhesion.

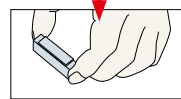


Align the measuring faces with each other.

b. Wringing a thick gauge block to a thin gauge block



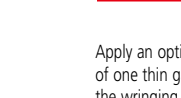
Overlap one side of a thin gauge block on one side of a thick gauge block.



Slide the thin gauge block while pressing the entire overlapped area to align the measuring faces with each other.



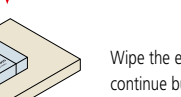
Then, wring the other thin gauge block onto the first thin gauge block.



Finally, remove the thick gauge block from the stack.



Apply an optical flat to the surface of one thin gauge block to check the wringing state.



Irregular interference fringes



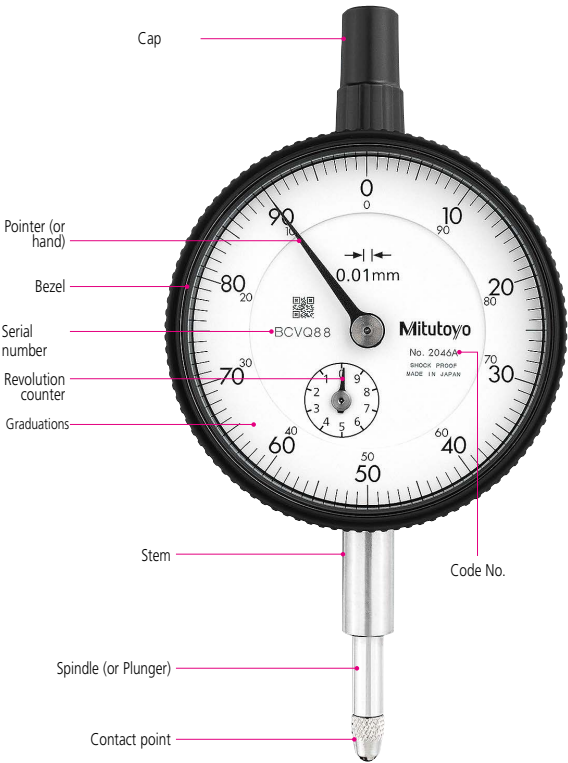
Wipe the exposed measuring face(s) and continue building up the stack, in the same manner as above, until complete.

Definition of the Meter

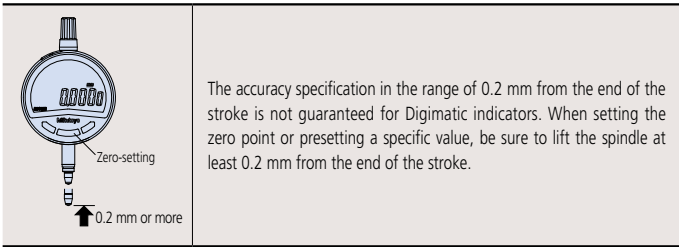
The 17th General Conference of Weights and Measures in 1983 decided on a new definition of the meter unit as the length of the path traveled by light in a vacuum during a time interval of 1/299 792 458 of a second. The gauge block is the practical realization of this unit and as such is used widely throughout industry.

Dial Indicators, Digital Indicators and Test Indicators

Nomenclature



Setting the origin of a digital indicator



Care of the spindle

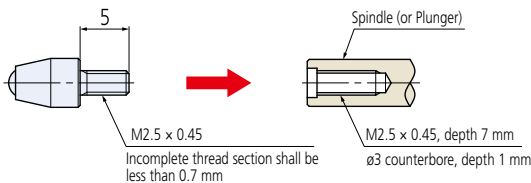
- Do not lubricate the spindle. Doing so might cause dust to accumulate, resulting in a malfunction.
- If the spindle movement is poor, wipe the upper and lower spindle surfaces with a dry or alcohol-soaked cloth. If the movement is not improved by cleaning, contact Mitutoyo for repair.
- Before making a measurement or calibration, confirm that the spindle moves smoothly by moving it upward and downward and check the stability of the zero point.

Dial Indicator and Digital Indicator Mounting

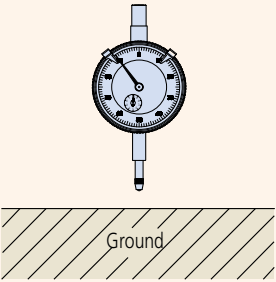
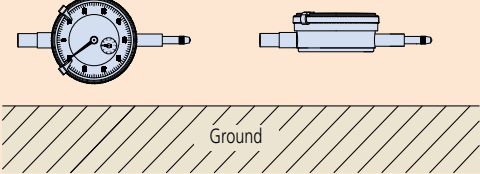
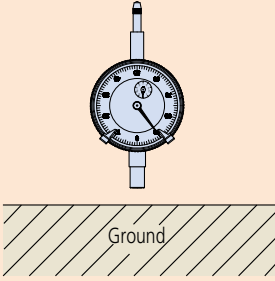
Stem mounting	Method	Clamping the stem directly with a screw 	Clamping the stem by split-clamp fastening
	Precautions	• Mounting hole tolerance: $\varnothing 8G7 (+0.005 \text{ to } 0.02)$ • Clamping screw: M4 to M6 • Clamping position: 8 mm or more from the lower edge of the stem • Maximum clamping torque: 150 N-cm when clamping with a single M5 screw • Note that excessive clamping torque may adversely affect spindle movement.	• Mounting hole tolerance: $\varnothing 8G7 (+0.005 \text{ to } 0.02)$
Lug mounting	Method		
	Note	• Lugs can be changed 90° in orientation according to the application. (The lug is set horizontally when shipped.) • Lugs of some Series 1 models (No.1911A-10, 1913A-10 and 1003A), however, cannot be altered to horizontal. • Fix the spindle so that it is perpendicular to the measuring face. A large inclination may cause measurement error.	

Contact Point

- Screw thread is standardized on M2.5 x 0.45 (Length: 5 mm).
- Incomplete thread section at the root of the screw shall be less than 0.7 mm when fabricating a contact point.



Measuring Orientation

Attitude		Remarks
Vertical position (contact point downward)		—
Lateral position (spindle horizontal)		If measurement is performed in the lateral orientation, or upside-down orientation, the measuring force is less than in the vertical orientation. In this case be sure to check the operation and repeatability of the indicator. For guaranteed-operation specifications according to the operating orientation refer to the specific product descriptions in the catalog.
Upside-down position (contact point upward)		

Maximum permissible error

Unit: μm

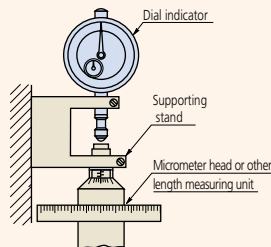
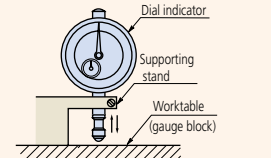
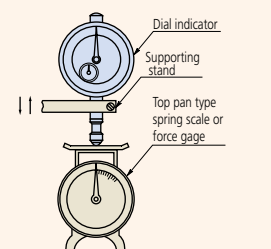
		Maximum permissible error (MPE) by measurement characteristics -- dial indicators with bezel dia. 50 mm or larger											Maximum permissible error (MPE) by measurement characteristics --dial indicators with bezel dia. 50 mm or smaller and Back Plunger type dial indicators							
Graduation (mm)		0.01								0.005	0.001			0.01				0.005	0.002	0.001
Measuring range (mm)		1 or less	Over 1 and up to 3	Over 3 and up to 5	Over 5 and up to 10	Over 10 and up to 20	Over 20 and up to 30	Over 30 and up to 50	Over 50 and up to 100	5 or less	1 or less	Over 1 and up to 2	Over 2 and up to 5	1 or less	Over 1 and up to 3	Over 3 and up to 5	Over 5 and up to 10	5 or less	1 or less	1 or less
Retrace error		3	3	3	3	5	7	8	9	3	2	2	3	4	4	4	5	3.5	2.5	2
Repeatability		3	3	3	3	4	5	5	5	3	0.5	0.5	1	3	3	3	3	3	1	1
Indication error	Arbitrary 1/10 revolution	5	5	5	5	8	10	10	12	5	2	2	3.5	8	8	8	9	6	2.5	2.5
	Arbitrary 1/2 revolution	8	8	9	9	10	12	12	17	9	3.5	4	5	11	11	12	12	9	4.5	4
	One revolution	8	9	10	10	15	15	15	20	10	4	5	6	12	12	14	14	10	5	4.5
	Entire measuring range	8	10	12	15	25	30	40	50	12	5	7	10	15	16	18	20	12	6	5

Note 1: The maximum permissible error (MPE) for one-revolution dial indicators does not specify the indication error of an arbitrary 1/2 and 1 revolution.

Note 2: The MPE represents the value at 20 °C, which JIS B 0680 defines as the standard temperature.

Note 3: If the manufacturer has not specified dial indicator's measurement characteristics, the indicator must meet both maximum permissible error (MPE) and measurement force permissible limits (MPL) at any position within the measuring range in any posture.

Dial Indicator Standard B7503 : 2017 (Extract from JIS/Japanese Industrial Standards)

Item	Model	Measuring method (zero-point fixed)	Evaluation method (performance evaluation by moving the zero point)	Measurement examples
Indication error	Indication error over the entire measuring range	One-revolution dial indicator and multi-revolution dial indicator Set the dial indicator on the supporting stand, and read the indication error ^{*1} of the next point while gradually retracting the spindle. - Every 1/10 revolution for the first two revolutions ^{*2} - Every half revolution from two to five revolutions - Every revolution from five to ten revolutions - Every five revolutions from 10 to 50 revolutions - Every ten revolutions after 50 revolutions Next, after retracting the spindle for more than three graduations of the long hand, extend the spindle gradually and read the indication error at the same measurement point in the retract direction.	Obtain the difference between the maximum and the minimum values of indication error of all measurement points in both retract and extend directions.	
	1/10 revolution indication error		During the first two revolutions in both retract and extend directions, obtain the maximum difference of the indication error among the adjacent measurement points per 1/10 revolutions. ^{*3}	
	1/2 revolution indication error		During the first five revolutions in both retract and extend directions, obtain the maximum difference of the maximum and the minimum indication errors over the measuring range per 1/2 revolutions.	
	1 revolution indication error		During the first ten revolutions in both retract and extend directions, obtain the maximum difference of the maximum and the minimum indication errors over the measuring range per one revolution.	
Retrace error	One-revolution dial indicator and multi-revolution dial indicator		Obtain the maximum difference of all the measuring points in reference to the indication error at the same measuring point in both forward and backward directions.	
Repeatability	One-revolution dial indicator and multi-revolution dial indicator	Set the dial indicator on the supporting stand, retract the spindle at a desired position within the measuring range. Then, extend the spindle quickly and slowly five times and read each value.	Obtain the maximum difference among five indication values.	
Measuring force		Set the dial indicator on the supporting stand, retract and extend the spindle continuously and gradually, and read the measuring force at the zero and end points.	Obtain the maximum measuring force, the minimum measuring force, and the difference of the measuring force in both retract and extend directions at the same measurement point.	

*1: For how to read the indication error, either read the input quantity of the measuring instrument aligning the long hand to the graduation, or read the indication value of the dial indicator according to the moving amount of the measuring instrument.

*2: With the one-revolution dial indicator, read the indication error per 10 graduations.

*3: With the one-revolution dial indicator, obtain the maximum difference of the indication error in the interval of adjacent 10 graduations.

Mitutoyo's Response to Dial Indicator JIS B 7503:2017

- We guarantee the accuracy of completed products by inspecting them in the vertical posture. Standard-attached inspection certificate includes inspection data.
- We issue paid-for calibration results for horizontal or opposite posture if required.

Digital indicators JIS B 7563 : 2021 (Extract from JIS/Japanese Industrial Standards)

Item.	Measuring method (zero-point fixed)	Evaluation method (performance evaluation by moving the zero point)	Measurement examples
Indication error over a portion of the measuring range (in the forward direction) Indication error over the entire measuring range (in the forward direction) E_{MPE} Retrace error H_{MPE}	Set the digital indicator on the supporting stand and read the indication error while gradually retracting the spindle. Next, after retracting the spindle for at least 0.1 mm, extend the spindle gradually and read the indication error at the same measurement point in the retract direction. a) The points of measurement for the partial measuring range shall be at least 6 points (preferably equally spaced) within a range of 50 times the minimum reading from the zero point, including the zero point. b) The points of measurement for the entire measuring range shall consist of 11 or more points (preferably equally spaced), including the zero and end points. c) For how to read the indication error, either read the input quantity of the measuring instrument with the digital indicator value, or read the digital indicator value according to the moving amount of the measuring instrument.	Obtain the difference between the maximum and the minimum values of indication error of all measurement points of the partial measuring range in the forward direction. Obtain the difference between the maximum and the minimum values of indication error of all measurement points of the entire measuring range in the forward direction. a) Include the measurement points in the partial measuring range when determining the indication error for the entire measuring range. Obtain the maximum difference in reference to the indication error at the same measuring point in both forward and backward directions for the partial measuring range and entire measuring range.	
Repeatability R_{MPE}	Set the digital indicator on the supporting stand, retract the contact point into any position within the measuring range, and actuate it five times in the backward direction. Move the contact point quickly and slowly and read the indicated value each time.	Obtain the maximum difference among five indication values.	
Measuring force MPL	Set the digital indicator on the supporting stand, retract and extend the spindle continuously and gradually, and read the measuring force at the zero and end points.	Obtain the maximum measuring force, the minimum measuring force, and the difference of the measuring force in both retract and extend directions at the same measurement point.	

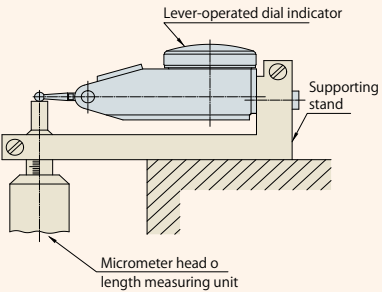
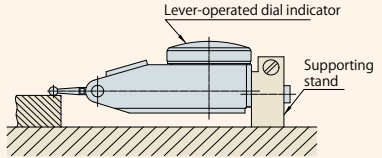
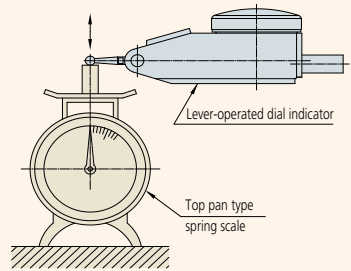
Digital indicator maximum permissible error (MPE)

Characteristic	Minimum reading (mm)	0.01				0.001				0.0005			
	Partial measuring range (mm)	0.5				0.05				0.025			
	Measuring range (mm)	15 or less	Over 15 and up to 30	Over 30 and up to 60	Over 60 and up to 100	15 or less	Over 15 and up to 30	Over 30 and up to 60	Over 60 and up to 100	15 or less	Over 15 and up to 30	Over 30 and up to 60	Over 60 and up to 100
Indication error over a portion of the measuring range (in the forward direction) P_{MPE} (μm)		20		40		3		5		3		5	
Indication error over the entire measuring range (in the forward direction) E_{MPE} (μm)		20		40		3		5		3		5	
Retrace error H_{MPE} (μm)		20				3				3			
Repeatability R_{MPE} (μm)		20				2				2			

Mitutoyo's Response to Digital Indicators JIS B 7563:2021

- We guarantee the accuracy of completed products by inspecting them in the vertical posture. Standard-attached inspection certificate includes inspection data.
- We issue paid-for calibration results for horizontal or opposite posture if required.

Lever-Operated Dial Indicator Standard B7533 : 2015 (Extract from JIS/Japanese Industrial Standards)

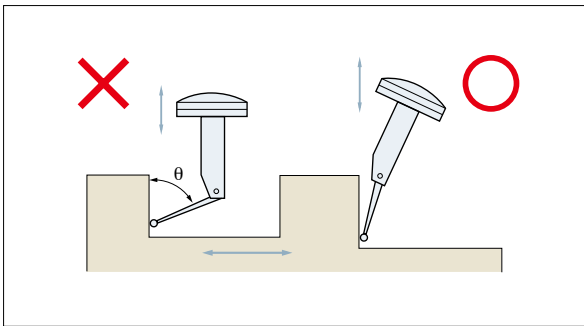
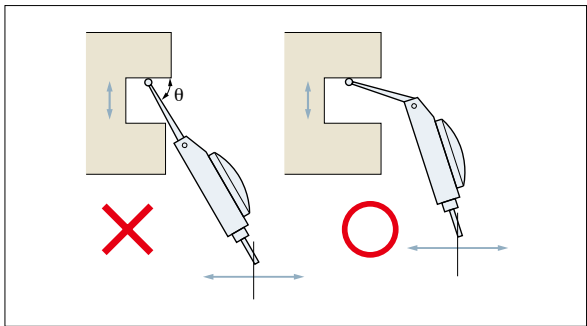
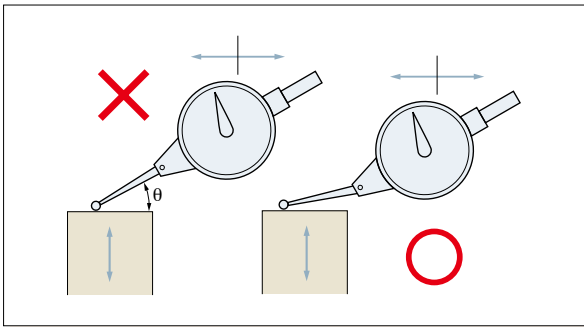
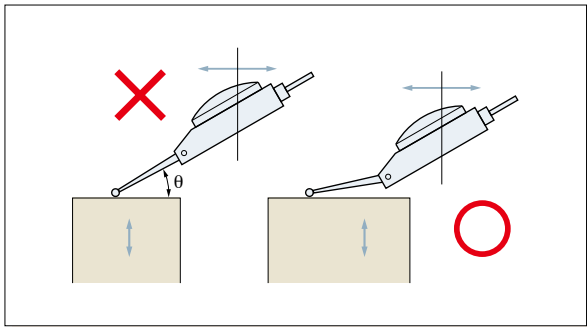
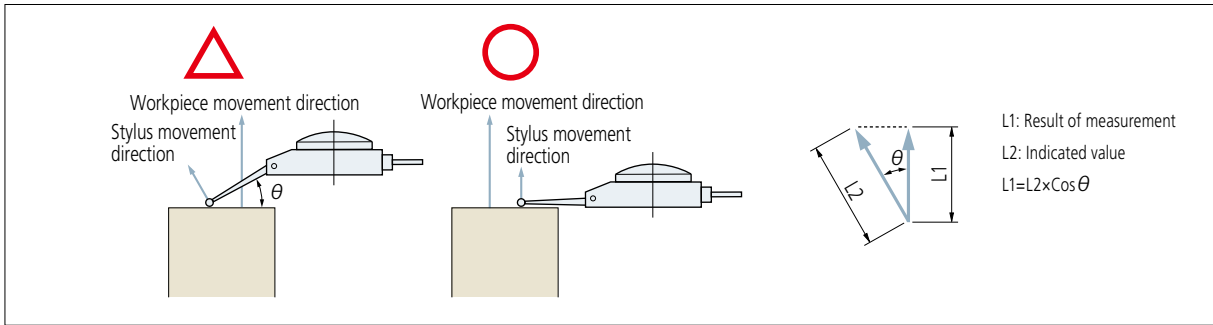
No.	Item.	Measuring method	Measuring point	Evaluation method	Diagram
1	Indication error over the entire measuring range (in the forward direction)	Holding the dial test indicator (lever type), define the reference point at near the contact point resting point where the indication and error of indication is set zero. Then, move the contact point in the forward direction and read the error of indication at each measuring point. Next, after moving the contact point for more than three graduations from the end of the measuring range, move the contact point in the backward direction and read the error of indication at the same measurement point in the forward direction. (The forward direction is the direction against the measuring force to the contact point of the lever-operated dial indicator; the backward direction is the measuring force applied direction.)	Per 10 graduations in the forward and backward direction from the reference point to the end point.	Obtain the difference between the maximum and the minimum values of indication error of all measurement points in the forward direction. In the forward direction from the reference point to the end point, obtain the maximum difference of the indication error among the adjacent measurement points per 10 graduations. In the forward direction from the reference point to the end point, obtain the maximum difference of the maximum and the minimum indication errors to be read by the zero-point fixed method over the measuring range per 1 revolution.	
2	10 graduations indication error				
3	1 revolution indication error				
4	Retrace error			Obtain the maximum difference in reference to the indication error at the same measuring point in both forward and backward directions among all the measurement points.	
5	Repeatability	Holding the dial test indicator (lever type) with its stylus parallel with the top face of the measuring stage, move the contact point quickly and slowly five times at a desired position within the measuring range and read the indication at each point.	At arbitrary points within the measuring range	Obtain the maximum difference of the five measured values.	
6	Measuring force	Holding the dial test indicator (lever type), move the contact point in the forward and backward directions continuously and gradually, and read the measuring force in the measuring range.	Reference point and end point within the measuring range	Obtain the maximum and the minimum values in reference to the measuring force.	

● Maximum permissible error and permissible limits

Graduation (mm)		0.001/0.002			0.01			
Revolution		1 revolution	Multi-revolution		1 revolution		Multi-revolution	
Measuring range (mm)		0.3 or less	Over 0.3, up to 0.5	Over 0.5, up to 0.6	0.5 or less	Over 0.5, up to 1.0	Over 1.0, up to 1.6	
						$L_1 \leq 35$	$35 < L_1$	
Indication error (μm)	Measuring range (μm)	4	6	7	6	9	10	16
	One revolution	—	5	5	—	—	—	10
	10 scale divisions (μm)	2	2	2	5	5	5	5
Retrace error (μm)		3	4	4	4	4	5	5
Repeatability (μm)		1	1	1	3	3	3	3
Measuring force (N)	Max.	0.5	0.5	0.5	0.5	0.5	0.5	0.5
	Min.	0.01	0.01	0.01	0.01	0.01	0.01	0.01

Dial Test Indicators and the Cosine Effect

Always minimize the angle between movement directions during use.



When the test indicator's contact point comes into contact with the measuring face, an error will occur depending on the angle. When bringing the contact point into contact with the measuring face, set the angle θ shown in the figure as small as possible. The measured value will vary depending on the value of θ . Correct the measured value from the θ value according to the table.

Result of measurement = indicated value x compensation value

Compensating for a non-zero angle

Angle	Compensation value
10°	0.98
20°	0.94
30°	0.87
40°	0.77
50°	0.64
60°	0.50

Examples

If a 0.002 mm measurement is indicated on the dial at various values of θ , the result of measurements are:

$$\theta = 10^\circ \quad 0.002 \text{ mm} \times 0.98 = 0.00196 \text{ mm}$$

$$\theta = 20^\circ \quad 0.002 \text{ mm} \times 0.94 = 0.00188 \text{ mm}$$

$$\theta = 30^\circ \quad 0.002 \text{ mm} \times 0.87 = 0.00174 \text{ mm}$$

- Mitutoyo's Response to Lever-operated Dial Indicator B 7533 : 2015

We guarantee the accuracy of completed products as follows.

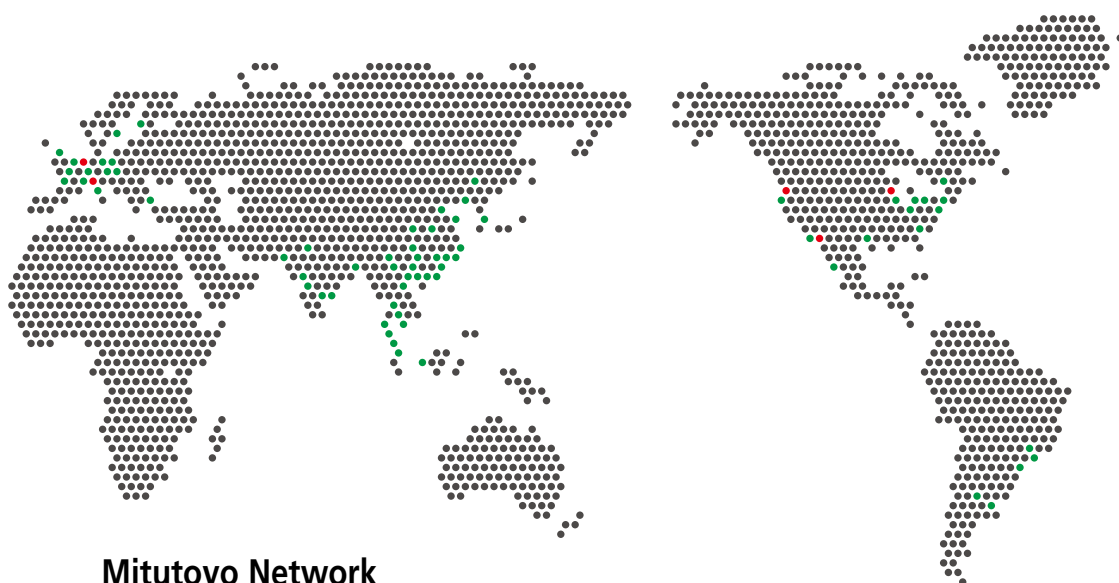
- Vertical, tilted, and perpendicular: We perform inspections with the dial face up.
- Horizontal: We perform inspections with the dial face in a vertical posture.

Standard-attached inspection certificate includes inspection data.

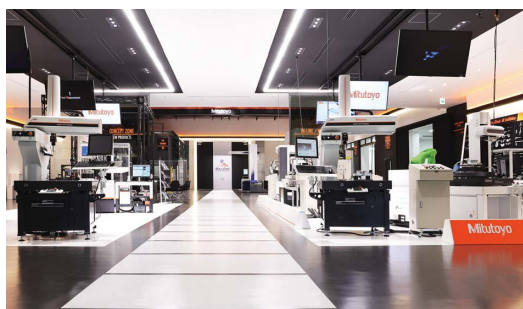
- We issue paid-for calibration results for other postures not mentioned above if required.

14

Network Service



Mitutoyo Network



M³ Solution Center



**Measuring instruments
that include a certificate of
inspection**

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Mitutoyo Network

Global network spanning 30 countries · region worldwide.

Following the establishment of MTI Corporation (U.S.) in 1963, Mitutoyo has been expanding its market throughout the world. Currently, the company has R&D, manufacturing, sales, and engineering service bases in 30 countries · region, as well as network of distributors in more than 60 countries. Mitutoyo maintains its rock-solid status as a leading global manufacturer providing services tailored to each regional society.

- Sales
- Research and Development





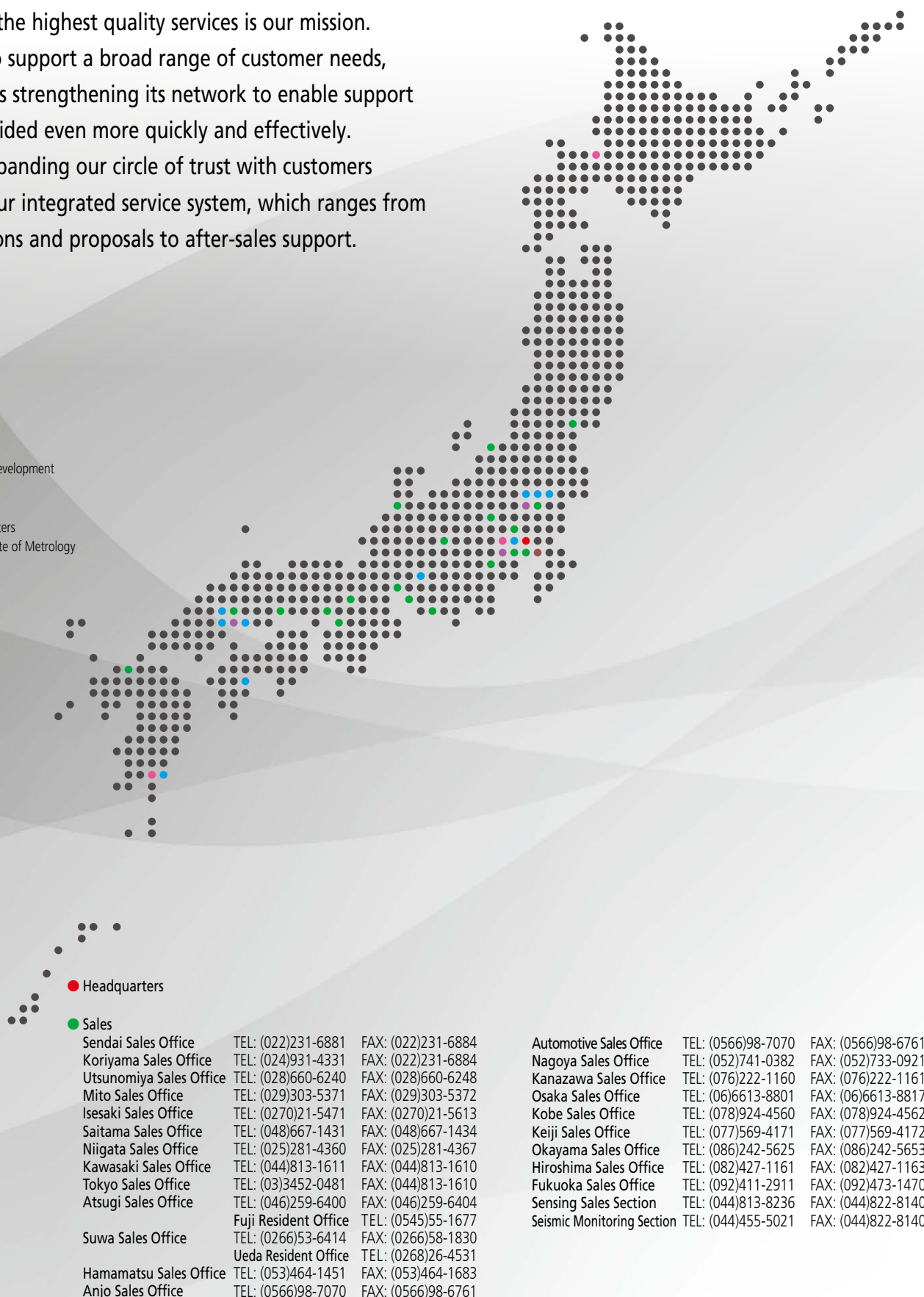
Please see the detail for Japan and Global locations or network.



Network Service

Providing the highest quality services is our mission. In order to support a broad range of customer needs, Mitutoyo is strengthening its network to enable support to be provided even more quickly and effectively. We are expanding our circle of trust with customers through our integrated service system, which ranges from consultations and proposals to after-sales support.

- Headquarters
- Research and Development
- Manufacturing
- Sales
- Calibration Centers
- Mitutoyo Institute of Metrology



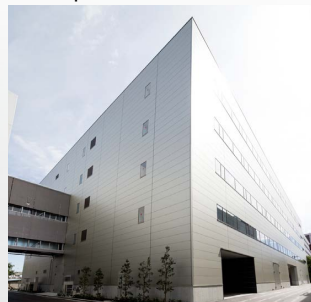
● Headquarters

● Sales

Sendai Sales Office	TEL: (022)231-6881	FAX: (022)231-6884
Koriyama Sales Office	TEL: (024)931-4331	FAX: (022)231-6884
Utsunomiya Sales Office	TEL: (028)660-6240	FAX: (028)660-6248
Mito Sales Office	TEL: (029)303-5371	FAX: (029)303-5372
Isesaki Sales Office	TEL: (0270)21-5471	FAX: (0270)21-5613
Saitama Sales Office	TEL: (048)667-1431	FAX: (048)667-1434
Niigata Sales Office	TEL: (025)281-4360	FAX: (025)281-4367
Kawasaki Sales Office	TEL: (044)813-1611	FAX: (044)813-1610
Tokyo Sales Office	TEL: (03)3452-0481	FAX: (044)813-1610
Atsugi Sales Office	TEL: (046)259-6400	FAX: (046)259-6404
	Fuji Resident Office	TEL: (0545)55-1677
Suwa Sales Office	TEL: (0266)53-6414	FAX: (0266)58-1830
	Ueda Resident Office	TEL: (0268)26-4531
Hamamatsu Sales Office	TEL: (053)464-1451	FAX: (053)464-1683
Anjo Sales Office	TEL: (0566)98-7070	FAX: (0566)98-6761

Automotive Sales Office	TEL: (0566)98-7070	FAX: (0566)98-6761
Nagoya Sales Office	TEL: (052)741-0382	FAX: (052)733-0921
Kanazawa Sales Office	TEL: (076)222-1160	FAX: (076)222-1161
Osaka Sales Office	TEL: (06)6613-8801	FAX: (06)6613-8817
Kobe Sales Office	TEL: (078)924-4560	FAX: (078)924-4562
Keiji Sales Office	TEL: (077)569-4171	FAX: (077)569-4172
Okayama Sales Office	TEL: (086)242-5625	FAX: (086)242-5653
Hiroshima Sales Office	TEL: (082)427-1161	FAX: (082)427-1163
Fukuoka Sales Office	TEL: (092)411-2911	FAX: (092)473-1470
Sensing Sales Section	TEL: (044)813-8236	FAX: (044)822-8140
Seismic Monitoring Section	TEL: (044)455-5021	FAX: (044)822-8140

Kawasaki
(Headquarters/Kawasaki Plant)



Utsunomiya



Small Tool Plant/Microcord Plant

Hiroshima



Kure Plant

Kochi



Kochi plant



Kiyohara Plant



Shiwa Plant

Miyazaki



Miyazaki plant

Nakatsugawa



Nakatsugawa plant



Kure Plant/Shiwa Plant (Gohara)



Sendai Sales Office



Utsunomiya Sales Office



Suwa Sales Office



Anjo Sales Office



Osaka Sales Office



Hiroshima Sales Office



Fukuoka Sales Office

● Calibration Centers

Utsunomiya Calibration Center
Kawasaki Calibration Center
Hiroshima Calibration Center

TEL: (028) 656-1432 FAX: (028) 656-8443
TEL: (044) 813-8214 FAX: (044) 813-8223
TEL: (0823) 70-3820 FAX: (0823) 70-3833

M³ Solution Centers

UTSUNOMIYA
TOKYO
SUWA
ANJO
OSAKA
HIROSHIMA

TEL: (028)656-1607 FAX: (028)656-9624
TEL: (044)813-1611 FAX: (044)813-1610
TEL: (0266)53-6414 FAX: (0266)58-1830
TEL: (0566)98-7070 FAX: (0566)98-6761
TEL: (06)6613-8801 FAX: (06)6613-8817
TEL: (082)427-1161 FAX: (082)427-1163

● Mitutoyo Institute of Metrology
Kawasaki

TEL: (044) 822-4124 FAX: (044) 822-4000

● Research and Development
Kawasaki Research and
Development Center

TEL: (044) 822-4137 FAX: (044) 822-4127

● Manufacturing

Kawasaki Plant
Small Tool Plant
Microcord Plant
Kiyohara Plant
Nakatsugawa Plant
Kure Plant
Shiwa Plant
Kure Plant/Shiwa Plant (Gohara)
Kochi Plant
Miyazaki Plant

TEL: (044) 822-4132 FAX: (044) 844-9835
TEL: (028) 656-1111 FAX: (028) 656-2164
TEL: (028) 656-1111 FAX: (028) 656-4720
TEL: (028) 667-4811 FAX: (028) 667-4810
TEL: (0573) 68-8201 FAX: (0573) 68-8210
TEL: (0823) 71-6111 FAX: (0823) 74-4104
TEL: (082) 433-2077 FAX: (082) 433-2695
TEL: (0823) 77-1721 FAX: (0823) 77-1724
TEL: (0887) 52-8181 FAX: (0887) 52-9451
TEL: (0985) 86-2591 FAX: (0985) 86-0827

M³ Solution Center



M³ Solution Center

M³ = Mitutoyo, Measurement, Metrology

Specialists in each field meet each customer's needs in detail

In order to meet the precise needs of customers, Mitutoyo has built a domestic sales network. Along with strengthening the company's ability to rapidly and accurately satisfy customer needs, the company has also built an extensive after-sales network. Mitutoyo has also created its M³ Solution Centers that are specifically designed to address measurement-related challenges from customers. Here, effective solutions to out-of-the-ordinary requirements can be found through demonstrations of the company's products and latest technology, in combination with consultations with Mitutoyo's metrology experts.

M³ Solution Center (U.S.A.)



M³ Solution Center Ingolstadt (Germany)



Mitutoyo Canada Inc. (Canada)



M³ Solution Center TOULOUSE (France)



Through M³ Solution Centers across the world, we offer optimum measuring solutions to our customers.

In recent years, as the reduction of lead times has become a major theme in manufacturing in the category of large measuring equipment such as coordinate measuring machines, including car body CMMs and form measuring instruments, demand for CNC machines (computer numerical control automated measuring machines) has been rising. Moreover, along with a similar increase in demand for 3D CAD, non-contact measurement using laser sensor probes has become common for 3D measuring machines. By providing M³ Solution Centers in various locations across the world, Mitutoyo is in a position to offer its technologies in hardware, software, sensor, automatic control, handling system fields, along with various types of tools combined with third-party technology to answer customers' issues relating to advanced measurements.

A network spanning Japan, Asia, Europe, and America provides solutions to all kinds of problems on a global basis.

Our mission is to provide optimum solutions tailored to the measurement-related needs of our customers in a speedy and accurate manner. In order to effectively respond to the various requests and tasks given to us by customers all around the world, Mitutoyo has set up M³ Solution Centers that promote our measuring technologies to a worldwide audience. Our collaborative network, which spans Japan, Asia, Europe, and America, allows us to respond to needs on a global basis.

M³ Solution Center Taichung (Taiwan)



M³ Solution Center (Singapore)



MSA Technical Center (India)



M³ Solution Center (South Korea)



*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.



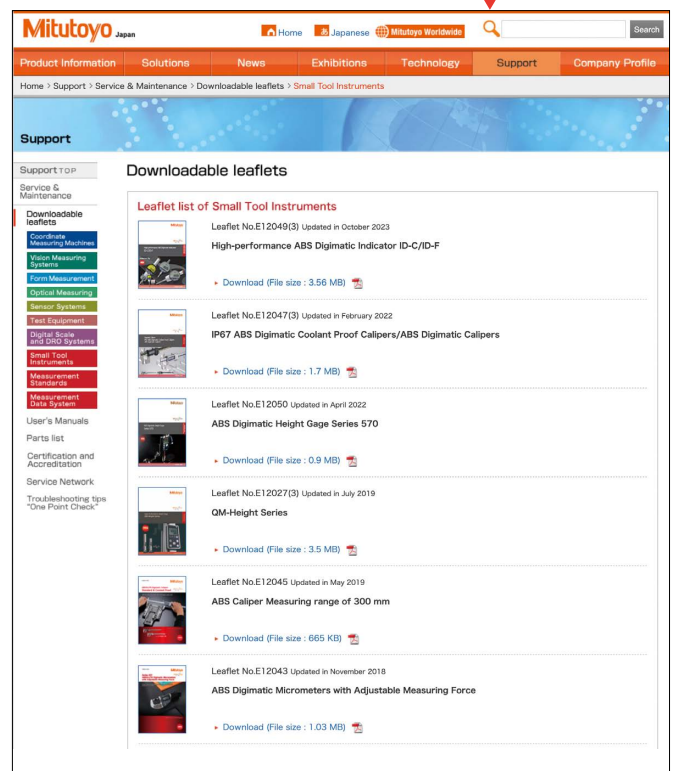
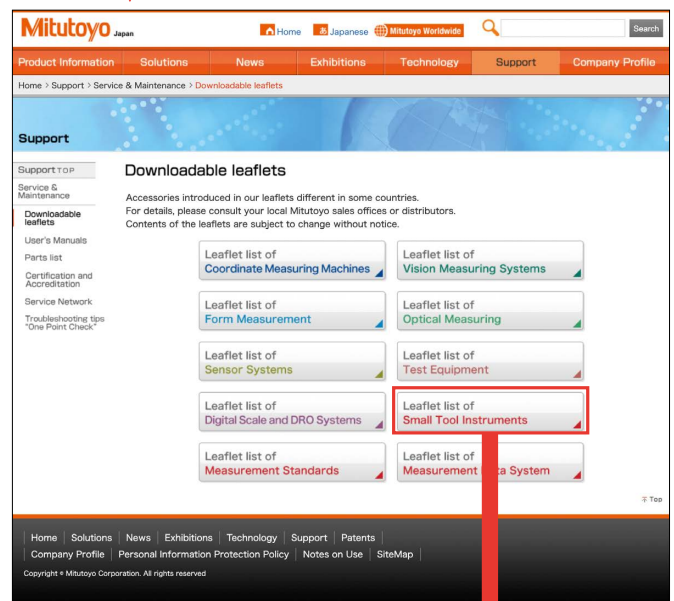
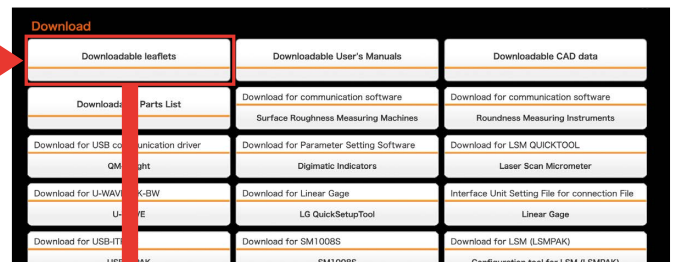
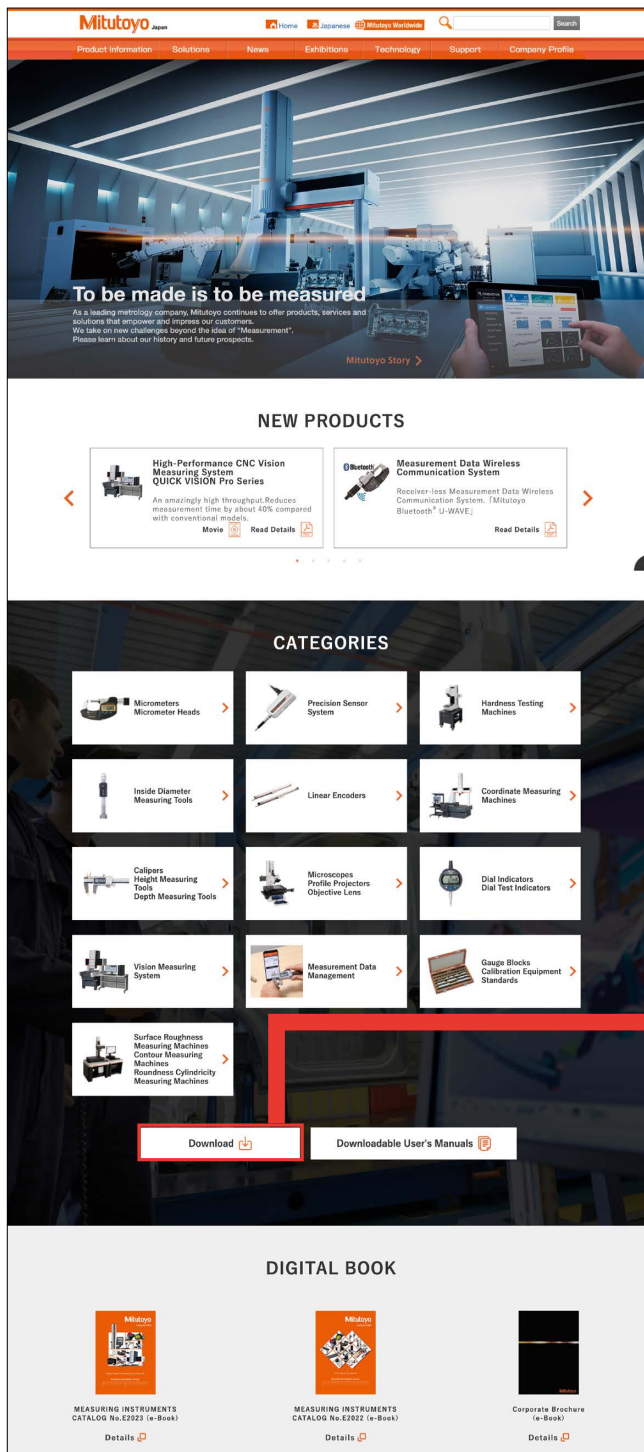
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	ABSOLUTE Digimatic Indicator ID-U	07-11 to 07-12
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Note: Some products mentioned above will not be accompanied with an inspection certificate as standard.

Download service on Mitutoyo website

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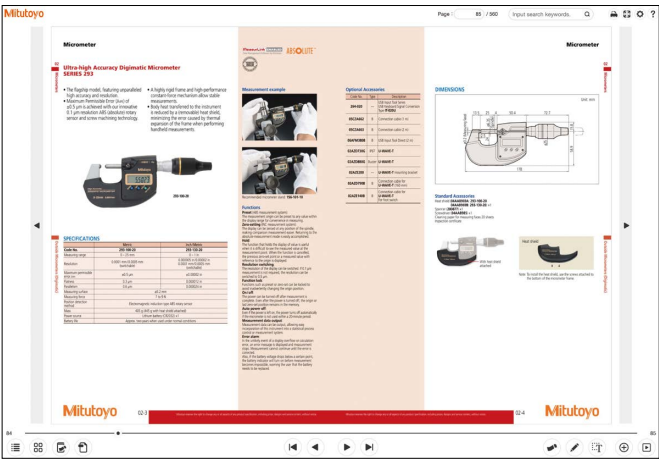
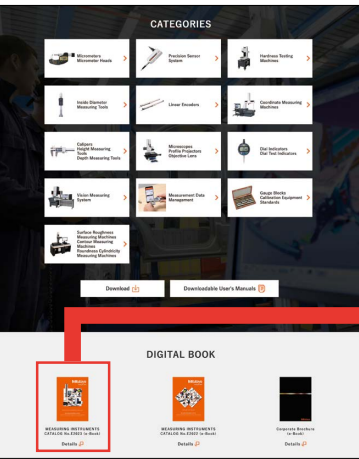
If you are interested in any of our products listed in the General Catalog, please contact your local Mitutoyo sales office or visit our website.

Also, the catalog can be downloaded in PDF format (partially excluded) at our website. (See the above image.)

URL: <https://www2.mitutoyo.co.jp/eng/>

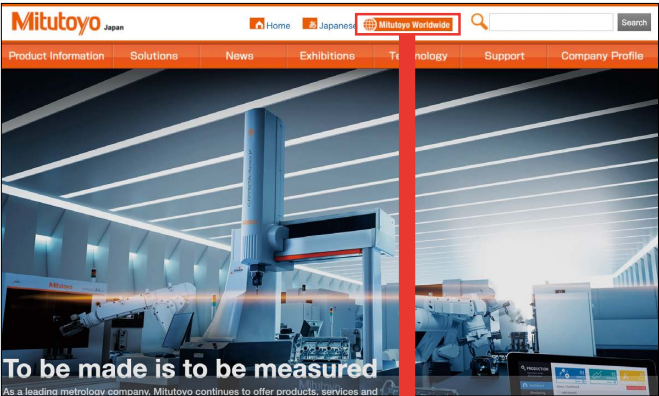
Online catalog

Mitutoyo Measuring Instruments Catalog is available on our website. You can look through all pages of the catalog on your screen as though turning pages of a book.

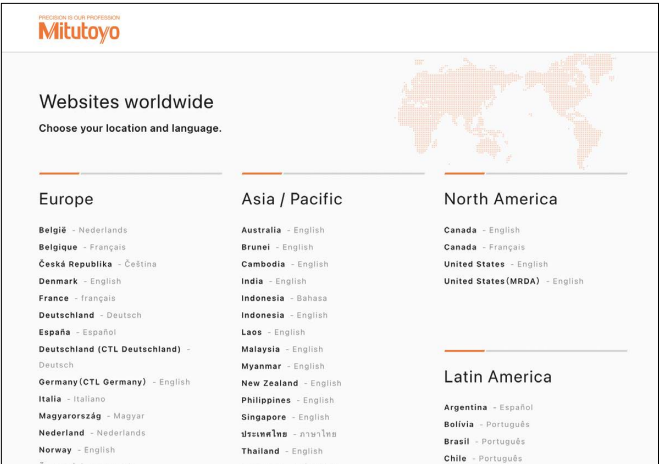


Note: For the latest information of the products listed in the catalog, please refer to our website.

MITUTOYO Worldwide



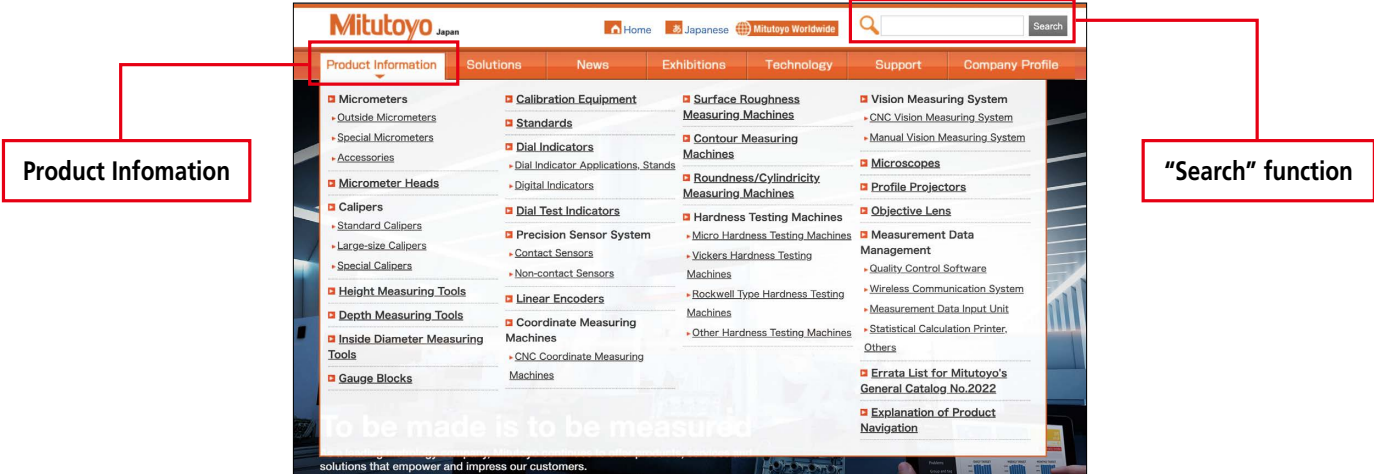
This page will guide you to each Mitutoyo local corporation.



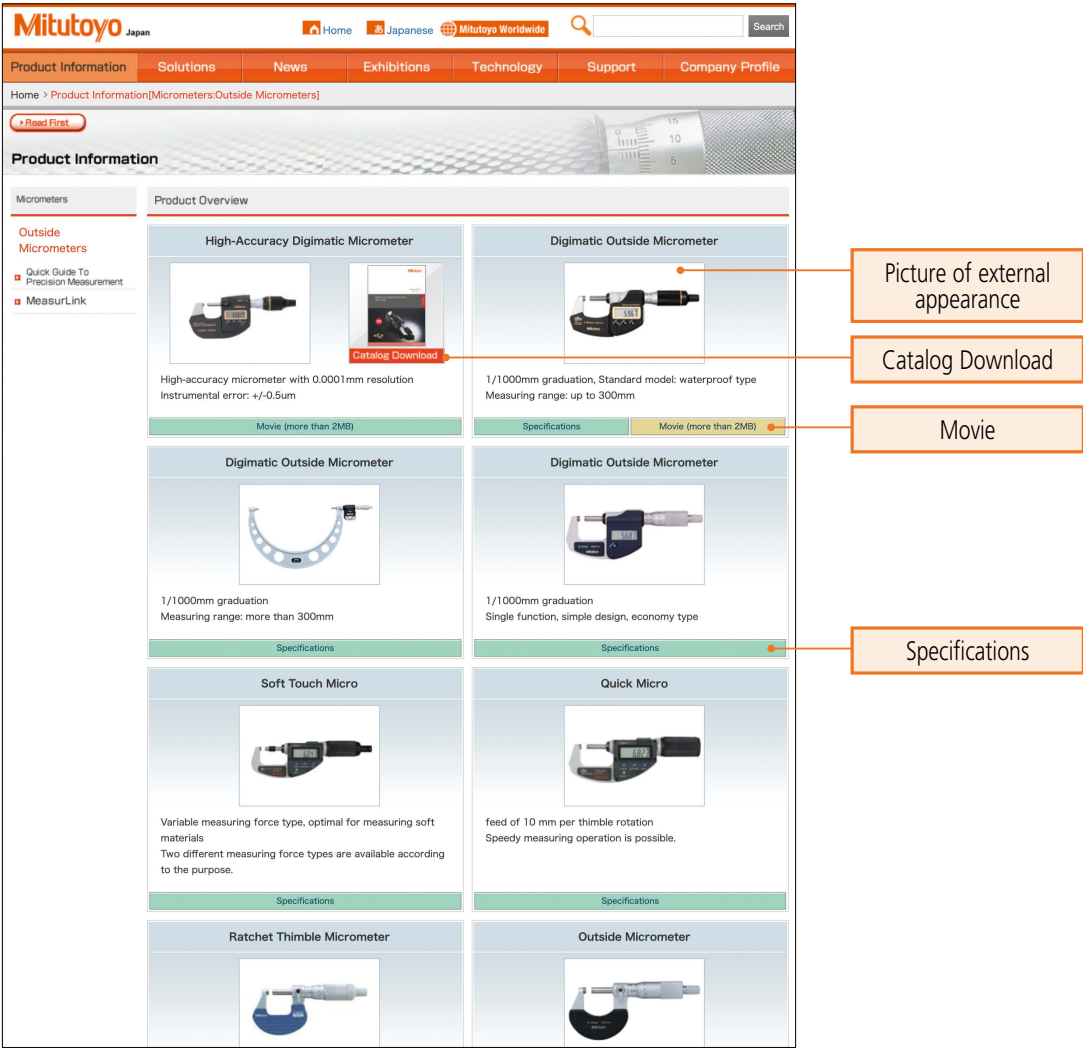
Introduction to our website and product pages

Product pages on our website

The content of this general catalog is also available on our website.



Landing page on our website



Product Information



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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Tel: (66)2080 3565
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