

Micrometer

High-Accuracy Digimatic Micrometer SERIES 293

- Enabling 0.1 μm resolution measurement, this micrometer is ideal for customers who need to make highly accurate measurements with a hand-held tool.
- The High-Accuracy Digimatic Micrometer utilizes Mitutoyo's innovative 0.1 μm resolution ABS (absolute) rotary sensor and high-accuracy screw machining technology to reduce the Maximum permissible error to ±0.5 μm, delivering higher accuracy without sacrificing operability.
- A highly rigid frame and high-performance constant-force mechanism enable more stable measurement, while the clicks emitted while the workpiece is being measured assure the operator that measurement is proceeding normally.
- 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.
- The ABS (absolute) rotary sensor also eliminates the need to perform origin setting each time the power is turned on, letting you start measuring straight away. With no possibility of overspeed errors, the High-Accuracy Digimatic Micrometer also delivers a higher level of reliability.
- Carbide-tipped measuring faces



293-100-10

SPECIFICATIONS

	Metric	Inch/Metric
Order No.	293-100-10	293-130-10
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 <i>J_{MPE}</i>	±0.5 μm	±0.00002 in
Flatness/Parallelism	0.3 μm/0.6 μm	0.000012 in/0.000024 in
Measuring surface	ø3.2 mm	
Measuring force	7 to 9 N	
Measuring system	Electromagnetic induction type ABS rotary sensor	
Mass	400 g (440 g with heat shield attached)	
Power supply	Lithium battery (CR2032) x1	
Battery life	Approx. two years when used under normal conditions	

MeasurLink[®] ENABLED
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The displayed value is held while the spindle is withdrawn and the micrometer moved so that the display can be read at the operator's convenience. After cancelling the hold, the instrument returns to the previous measuring mode (absolute or incremental).

Resolution switching:

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

Function lock:

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

On/off:

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

Auto power off:

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

Measurement data output:

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

Error alarm:

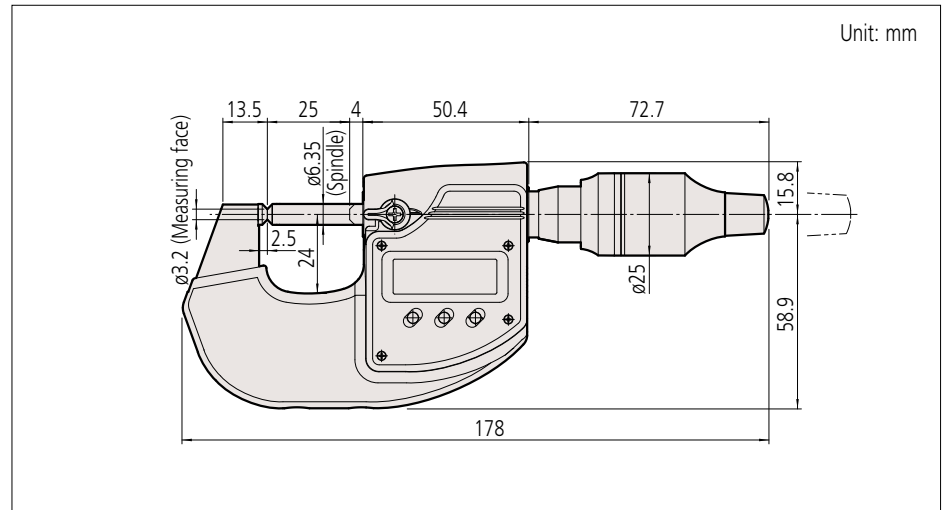
In the unlikely event of a display overflow or calculation error, an error message is displayed and measurement stops. Measurement cannot continue until the error is corrected.

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

Optional Accessories

Order No.	Type	Description
05CZA662	B	Connecting cable (1 m)
05CZA663	B	Connecting cable (2 m)
06AFM380B	B	USB Input Tool Direct (2 m)
02AZD790B	B	Connecting cables for U-WAVE-T (160 mm)
02AZE140B	B	Connecting cables for U-WAVE-T For foot switch

DIMENSIONS



Standard Accessories

- Heat shield (04AAB969A: 293-100-10
04AAB969B: 293-130-10) x1
- Lithium battery CR2032 (1 pc.), for initial operational checks (standard accessory)
- Spanner (200877) x1
- Screwdriver (04AAB985) x1
- Cleaning paper for measuring faces 1000 sheets
- Inspection certificate



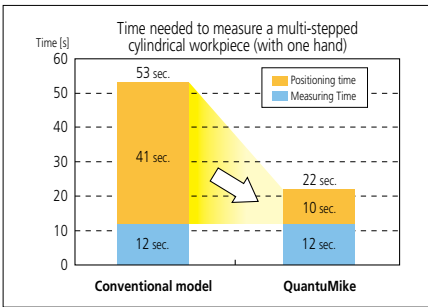
Note: To install the heat shield, use the screws attached to the bottom of the micrometer frame.

Micrometer

QuantuMike SERIES 293 — IP65 Micrometer with 2 mm/rev Spindle Feed

- Faster measurement is achieved by using a thread which feeds the spindle by 2 mm per revolution of the thimble. Our own technology for high precision thread-cutting enables such a fine and quick measurement.
- Positioning times are reduced by 60%* and measuring times by 35%* compared with a conventional micrometer.
- The ratchet thimble mechanism helps ensure repeatable results. The sound of the ratchet provides the user with a sense of confidence and the speeder enables the rapid spindle feed needed when measuring widely different dimensions.

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



293-140-30

SPECIFICATIONS

Metric		Order No.	Range (mm)	Resolution (mm)	Maximum permissible error J_{MPE} (μ m)	Flatness (μ m)	Parallelism (μ m)	Mass (g)	
with SPC data output		293-140-30	0 - 25	0.001	± 1	0.3	1	265	
		293-141-30	25 - 50				2	325	
		293-142-30	50 - 75		± 2		1	465	
		293-143-30	75 - 100				2	620	
without SPC data output		293-145-30	0 - 25		± 1		0.3	1	265
		293-146-30	25 - 50					2	325
		293-147-30	50 - 75		± 2			1	465
		293-148-30	75 - 100					2	620

Inch/Metric		Order No.	Range (in)	Resolution	Maximum permissible error J_{MPE} (in)	Flatness (in)	Parallelism (in)	Mass (g)	
with SPC data output		293-180-30	0 - 1	0.00005 in/ 0.001 mm	± 0.00005	0.000012	0.00004	265	
		293-181-30	1 - 2				0.00008	325	
		293-182-30	2 - 3		± 0.0001		0.00008	465	
		293-183-30	3 - 4				0.00008	620	
without SPC data output		293-185-30	0 - 1		± 0.00005		0.000012	0.00004	265
		293-186-30	1 - 2					0.00008	325
		293-187-30	2 - 3		± 0.0001			0.00008	465
		293-188-30	3 - 4					0.00008	620

- Dust/Water protection level: IP65 (IEC60529)*1
- Measuring force: 7 to 12 N*2
- Battery: SR44 (1 pc.), **938882**, for initial operational checks (standard accessory)
- Battery life: Approx. 2.4 years under normal use
- Length standard: 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 Rustproofing shall be applied after use.

*2 Measuring force when using the speeder ratchet (Apply a measuring force in the same condition as for measurement and then set the origin.)

MeasurLink[®] ENABLED
Data Management Software by Mitutoyo

U-WAVE fit



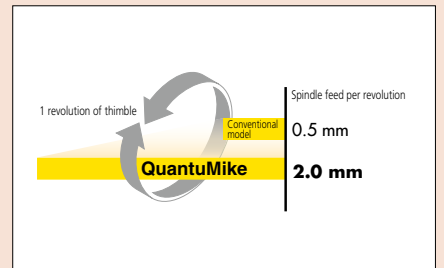
Dust- and Water-Protected
www.tuv.com
ID 1419032586



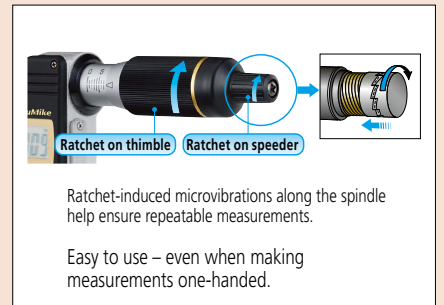
Measurement example



Quick measurement



Ratchet thimble mechanism



Functions

Origin point setting (ABS length measurement system):
Pressing the ORIGIN button resets the ABS origin at the current spindle position. Origin values can be set depending on each size.

Zero setting (INC length 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 when the instrument must be moved away from the workpiece before the reading can be recorded.

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.

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.

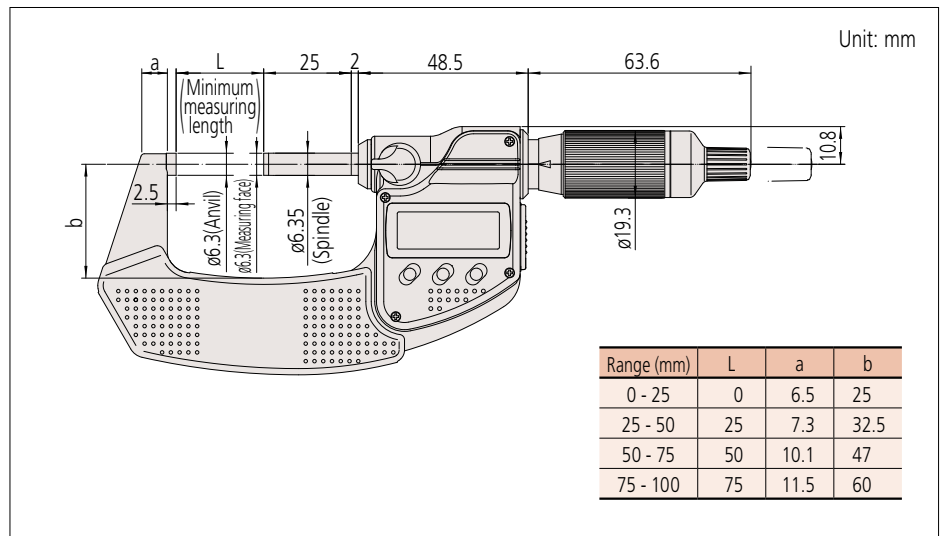
Data output*:
Models equipped with this function have an output port for transferring measurement data to a Statistical Process Control (SPC) system.

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

Optional Accessories

Order No.	Type	Description
05CZA662	B	Connecting cable (1 m)
05CZA663	B	Connecting cable (2 m)
06AFM380B	B	USB Input Tool Direct (2 m)
02AZD790B	B	Connecting cables for U-WAVE-T (160 mm)
02AZE140B	B	Connecting cables 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/ buzzer	Connecting unit for U-WAVE-TM/TMB

DIMENSIONS



B

Micrometer

Coolant Proof Micrometers SERIES 293 — with Dust/Water Protection Conforming to IP65 Level

- Superior environmental resistance.
- Ratchet thimble provides better operability for one-handed operation.
- Measuring faces: Carbide.
- 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. (Refer to page A-3 for details.)



SPECIFICATIONS

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

Inch / Metric									
	Order 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							470
	293-333-30	3 - 4							625
	293-334-30	0 - 1							280
	293-335-30	1 - 2							275
without SPC data output	293-336-30	1 - 2	0.00005 in / 0.001 mm	5 - 10	± 0.00005	0.00004	0.000012	With ratchet stop	335
	293-340-30	0 - 1							270
	293-341-30	1 - 2							330
	293-342-30	2 - 3							470
	293-343-30	3 - 4							625
	293-344-30	0 - 1							280
	293-345-30	1 - 2							340
	293-346-30	2 - 3							480
	293-347-30	3 - 4							635
	293-348-30	0 - 1							275

- Dust/water protection level: IP65 (IEC60529)*2
- Battery: SR44 (1 pc.), **938882**, for initial operational checks (standard accessory)
- Battery life: Approx. 2.4 years under normal use
- Length standard: 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

Measuring range: 100 mm or less

Unit: mm

Range (mm)	Order 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	2.5
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	

MeasurLink[®] ENABLED
Data Management Software by Mitutoyo

U-WAVE^{fit}



Dust- and Water-Protected
www.tuv.com
ID 0000640191



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:

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.

* Only models with the data output function

Auto power ON / OFF:

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

Error alarm:

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

Function lock:

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

Optional Accessories

Refer to page B-8.



Coolant Proof Micrometers SERIES 293 — with Dust/Water Protection Conforming to IP65 Level

Functions

Refer to page B-7.

Optional Accessories

Only for models with data output function

Order No.	Type	Description
05CZA662	B	Connecting cable (1 m)
05CZA663	B	Connecting cable (2 m)
06AFM380B	B	USB Input Tool Direct (2 m)
02AZD790B	B	Connecting cables for U-WAVE-T (160 mm)
02AZE140B	B	Connecting cables 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/ buzzer	Connecting unit for U-WAVE-TM/TMB

- Superior environmental resistance.
- Measuring faces: Carbide.
- 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. (Refer to page A-3 for details.)



SPECIFICATIONS

		Metric								
	Order No.	Range (mm)	Resolution (mm)	Measuring force*1 (N)	Maximum permissible error J_{MPE} (μ m)	Parallelism (μ m)	Flatness (μ m)	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							740	
	293-252-30	150 - 175							800	
	293-253-30	175 - 200			± 3	4			970	
	293-254-30	200 - 225			1100					
	293-255-30	225 - 250			± 4	5			1270	
	293-256-30	250 - 275							1370	
	293-257-30	275 - 300	1590							

		Inch / Metric								
	Order 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							740	
	293-352-30	6 - 7							800	
	293-353-30	7 - 8			± 0.00015	0.00016			970	
	293-354-30	8 - 9			1100					
	293-355-30	9 - 10			± 0.0002	0.0002			1270	
	293-356-30	10 - 11							1370	
	293-357-30	11 - 12	1590							

- Dust/water protection level: IP65 (IEC60529)*2
 - Battery:SR44 (1 pc.), **938882**, for initial operational checks (standard accessory)
 - Battery life: Approx. 2.4 years under normal use
 - Length standard: 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

Range (mm)	Order 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		152	6.5
275 - 300	293-257-30	275	166		

Unit: mm

Micrometer

MeasurLink[®] ENABLED
Data Management Software by Mitutoyo

Digimatic Outside Micrometers SERIES 293

- Constant measuring force: ratchet stop
- Interface Input Tools are available that enable the conversion of measurement data to keyboard signals that are then

directly input to cells in off-the-shelf spreadsheet software such as Excel. (Refer to page A-5 for details.)

- Measuring faces: Carbide



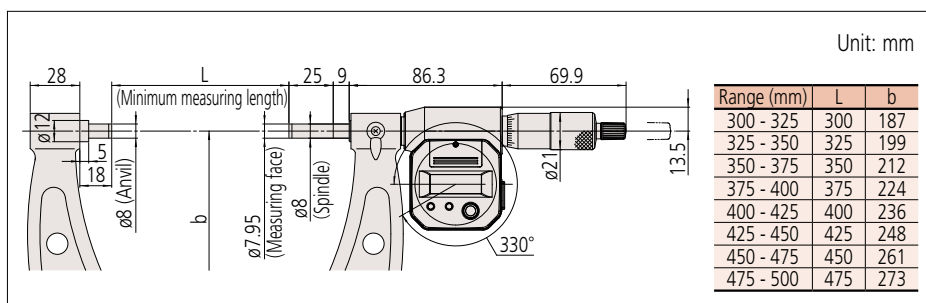
SPECIFICATIONS

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

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

- SR44 (2 pcs.), **938882**, for initial operational checks (standard accessory)
- Battery life: Approx. 1.8 years under normal use
- Length standard: 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: 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.

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

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

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

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

Optional Accessories

Order No.	Type	Description
04AZB512	CR	Connecting cable (1 m)
04AZB513	CR	Connecting cable (2 m)
959149	C	Connecting cable (1 m)
959150	C	Connecting cable (2 m)



Digimatic Outside Micrometers SERIES 293

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 alarm:

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

- Simple design and excluding the data output function keeps price economical.
- One switch operation (Origin Set) for easy use.
- Extended battery life of approximately 2.4 years.
- Equipped with Ratchet Stop for constant measuring force.
- Measuring faces: Carbide.



293-821-30

SPECIFICATIONS

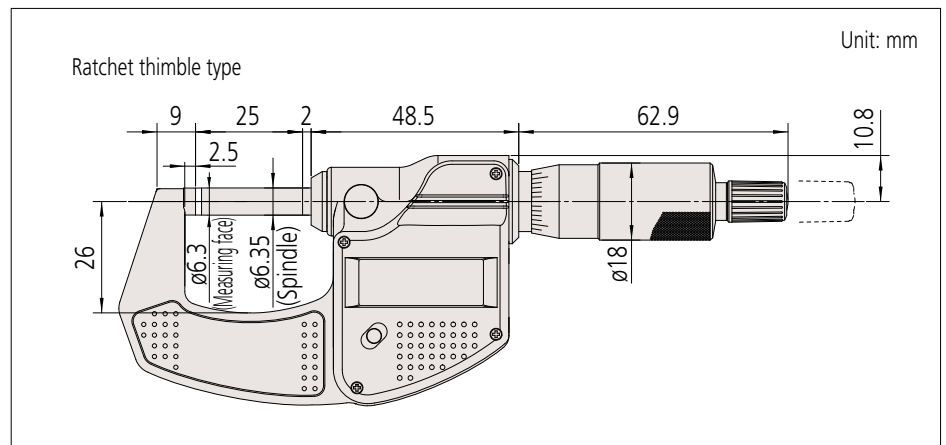
Metric		With ratchet stop					
Order No.	Range (mm)	Resolution (mm)	Measuring force (N)	Maximum permissible error J_{MPE} (μ m)	Flatness (μ m)	Parallelism (μ m)	Mass (g)
293-821-30	0 - 25	0.001	5 - 10	± 2	0.3	2	270

Inch/Metric		With ratchet stop					
Order No.	Range (in)	Resolution	Measuring force (N)	Maximum permissible error J_{MPE} (in)	Flatness (in)	Parallelism (in)	Mass (g)
293-831-30	0 - 1	0.00005 in/0.001 mm	5 - 10	± 0.0001	0.000012	0.00008	270

Inch/Metric		With friction thimble					
Order No.	Range (in)	Resolution	Measuring force (N)	Maximum permissible error J_{MPE} (in)	Flatness (in)	Parallelism (in)	Mass (g)
293-832-30	0 - 1	0.00005 in/0.001 mm	5 - 10	± 0.0001	0.000012	0.00008	270

- SR44 (1 pc.), **938882**, for initial operational checks (standard accessory)
- Length standard: Electromagnetic rotary sensor
- Battery life: Approx. 2.4 years under normal use
- Spanner (**301336**), 1 pc.

DIMENSIONS



Micrometer

MeasurLink[®] ENABLED
Data Management Software by Mitutoyo

ABSOLUTE[™]



Dust- and
Water-
Protected
www.tuv.com
ID 000063013

Quickmike SERIES 293 — IP65 ABSOLUTE Digimatic Micrometers

- The Quickmike provides a speedy spindle feed of 10 mm per thimble rotation which enables widely differently sized features to be measured quickly.
- Set the origin only once. The absolute linear scale maintains the origin throughout the life of battery, meaning no more zero setting (presetting) or overspeed error.
- Measuring faces: Carbide.
- Supplied with a Ratchet Stop for constant measuring force.



293-666-20

SPECIFICATIONS

Metric									
Order No.	Range (mm)	Resolution (mm)	Measuring force (N)	Maximum permissible error J_{MPE} (μ m)	Flatness (μ m)	Parallelism (μ m)	Constant measuring force	Mass (g)	Output function
293-666-20	0 - 30	0.001	5 - 12	± 2	0.3	2	Yes	275	With
293-667-20	25 - 55							340	
293-668-20	50 - 80			480					
293-669-20	75 - 105			585					

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

- SR44 (1 pc.), **938882**, for initial operational checks (standard accessory)
- Battery life: Approx. 5 years under normal use
- Approx. 18,000 hours in continuous use (1 year previous models **293-667/68/69/77/78/79**)
- Length standard: 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.

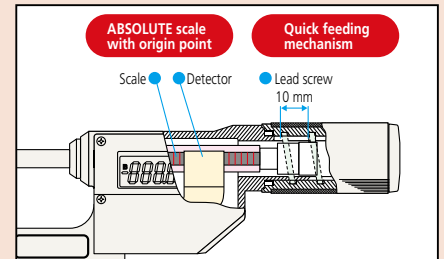
Measurement example



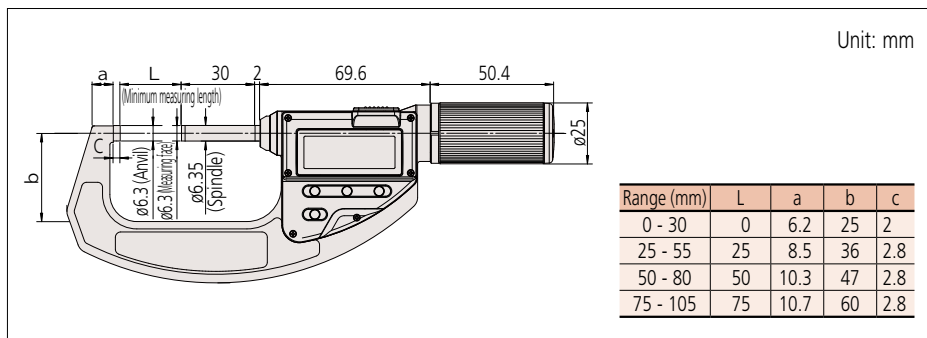
Optional Accessories

Order No.	Type	Description
05CZA662	B	Connecting cable (1 m)
05CZA663	B	Connecting cable (2 m)
06AFM380B	B	USB Input Tool Direct (2 m)
02AZD790B	B	Connecting cables for U-WAVE-T (160 mm)
02AZE140B	B	Connecting cables for U-WAVE-T For foot switch

Mechanism



DIMENSIONS



ABSOLUTE Digimatic Micrometers SERIES 227 — with Adjustable Measuring Force

Measurement example



Functions

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

Optional Accessories

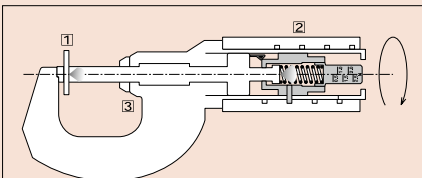
Order No.	Type	Description
05CZA662	B	Connecting cable (1 m)
05CZA663	B	Connecting cable (2 m)
06AFM380B	B	USB Input Tool Direct (2 m)
02AZD790B	B	Connecting cables for U-WAVE-T (160 mm)
02AZE140B	B	Connecting cables for U-WAVE-T For foot switch

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 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.)

- Digimatic micrometer dedicated to applications requiring a constant/low measuring force such as measuring wire, paper, and plastic/rubber parts.
- Measuring data can be hold at the measuring force setting. This function provides stable measurement and repeatability.
- Measuring force is adjustable (in steps) to suit various kinds of workpieces.
- Non-rotating spindle.
- Measuring faces: Carbide.



227-201-20

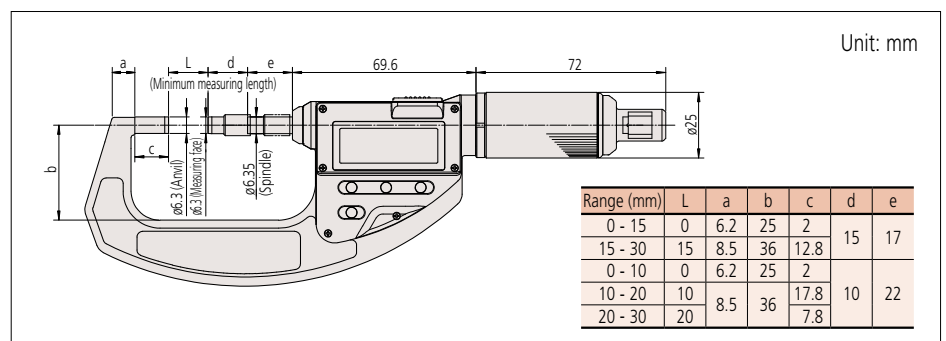
SPECIFICATIONS

Metric											
Order 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)	
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	$\pm (0.1 + \text{the selected measuring force}/10)$	within 0.1	300	
227-203-20	15 - 30									380	
227-205-20	0 - 10		2 - 10 (adjustable)							within 0.4	345
227-206-20	10 - 20										425
227-207-20	20 - 30										415

Inch / Metric											
Order 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)	
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	$\pm (0.1 + \text{the selected measuring force}/10)$	within 0.1	300	
227-213-20	0.6 - 1.2									380	
227-215-20	0 - 0.4		2 - 10 (adjustable)							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 $\pm 3^\circ$)
 - SR44 (1 pc.), **938882**, for initial operational checks (standard accessory)
 - Battery life: Approx. 5 years under normal use
 - Length standard: 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

Outside Micrometers SERIES 102

- Heat-insulated frame.
- Cut-away frame (behind anvil) for measuring in hard-to-reach places.
- Equipped with Ratchet Stop for constant measuring force.
- Measuring faces: Carbide.
- In addition to standard specification, a non-rotating spindle type tooth thickness micrometer (refer to page B-40 for details) is also available.



SPECIFICATIONS

Metric							
Order 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						

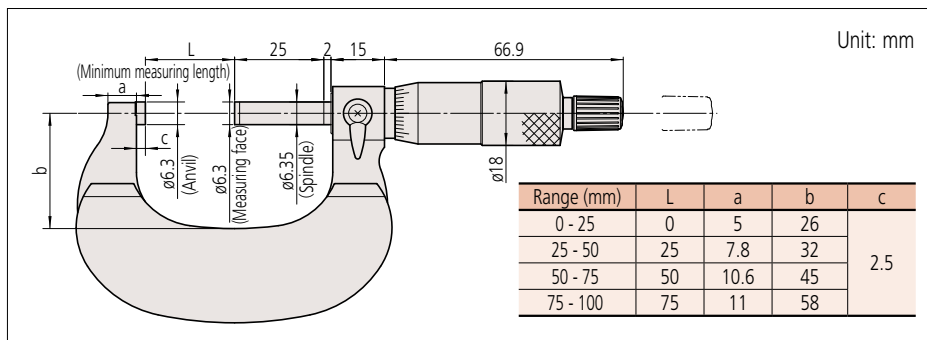
Metric							
Order No.	Range (mm)	Graduation (mm)	Measuring force (N)	Maximum permissible error J_{MPE} (μm)	Flatness (μm)	Parallelism (μm)	Constant measuring force
102-311	0 - 25	0.001	5 - 10	± 1	0.3	1	Ratchet stop
102-313							Friction thimble
102-312	25 - 50						Ratchet stop

Inch							
Order 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	0.0001	5 - 10	± 0.0001	0.000024	0.00008	Ratchet stop
102-330-10							Friction thimble
102-331-10	2 - 3						Ratchet stop
102-332-10	3 - 4			± 0.00015		0.00012	Ratchet stop

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

- 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)

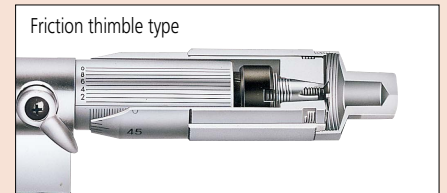
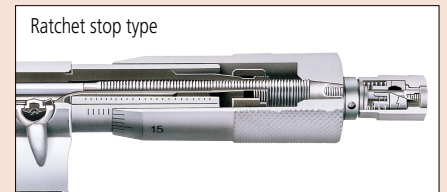
DIMENSIONS



Measurement example



Mechanism





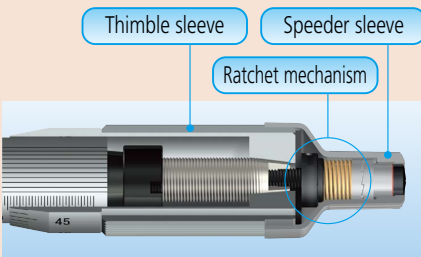
Ratchet Thimble Micrometer SERIES 102 — Outside Micrometers

Measurement example



- More accurate in easy one-handed operation.
- Ratchet function works both from the thimble and the speeder.
- Rotating the thimble/speeder causes the ratchet mechanism to operate and apply a constant measuring force to the workpiece.
- Heat-insulated frame.
- Measuring faces: Carbide.

Internal Structure



102-701

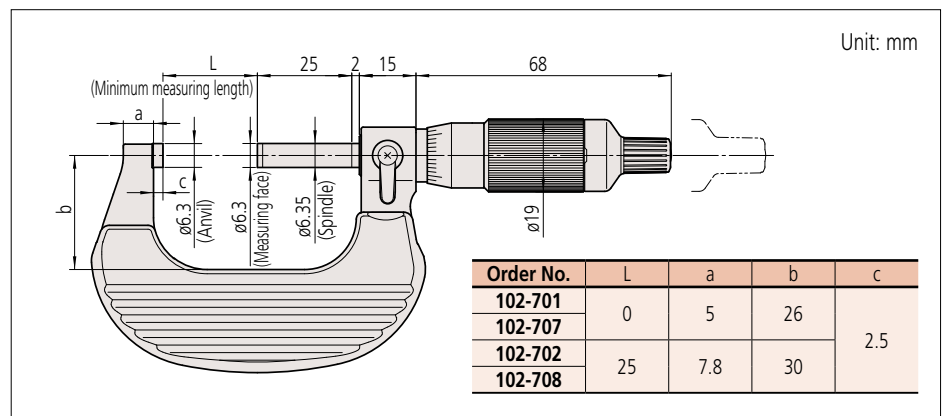
SPECIFICATIONS

Metric							
Order 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					
102-702	25 - 50	0.01					
102-708		0.001					270

Inch							
Order 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



Micrometer

Outside Micrometers SERIES 103

- Baked-enamel-finished frame.
- Measuring faces: Carbide.
- Equipped with Ratchet Stop for constant measuring force.



Measurement example



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

Metric With ratchet stop						
Order No.	Range (mm)	Graduation (mm)	MPE*1 *2 (μm)	Measuring force (N)	Flatness (μm)	Parallelism (μm)
103-137	0 - 25	0.01	±2	5 - 10	0.6	2
103-138	25 - 50	0.01				

• 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 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 B-82.



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

Inch With ratchet stop							
Order No.	Range (in)	Graduation (in)	MPE* ¹ (in)	Measuring force (N)	Flatness (in)	Parallelism (in)	
103-177	0 - 1	0.001	±0.0001	5 - 10	0.000024	0.00008	
103-131		0.0001					
103-178	1 - 2	0.001					
103-132		0.0001					
103-179	2 - 3	0.001					±0.00015
103-180	3 - 4						
103-181	4 - 5						
103-182	5 - 6						
103-183	6 - 7						
103-184	7 - 8						±0.0002
103-185	8 - 9						
103-186	9 - 10		±0.00025				
103-187	10 - 11						
103-188	11 - 12		±0.0003	10 - 15	0.00004	0.0002	
103-189	12 - 13						
103-190	13 - 14						
103-191	14 - 15						
103-192	15 - 16						
103-193	16 - 17	±0.00035					
103-194	17 - 18						
103-195	18 - 19	±0.0004					
103-196	19 - 20						
103-197	20 - 21	±0.00045					
103-198	21 - 22						
103-199	22 - 23	±0.0005					
103-200	23 - 24						
103-201	24 - 25	±0.00055					
103-202	25 - 26						
103-203	26 - 27	±0.0006					
103-204	27 - 28						
103-205	28 - 29	±0.00065					
103-206	29 - 30						
103-207	30 - 31	±0.0007					
103-208	31 - 32						
103-209	32 - 33	±0.00075					
103-210	33 - 34						
103-211	34 - 35	±0.00075					
103-212	35 - 36						
103-213	36 - 37	±0.00075					
103-214	37 - 38						
103-215	38 - 39	±0.00075					
103-216	39 - 40						

Inch With friction thimble						
Order No.	Range (in)	Graduation (in)	MPE* ¹ * ² (in)	Measuring force (N)	Flatness (in)	Parallelism (in)
103-135	0 - 1	0.0001	±0.0001	5 - 10	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 B-82.

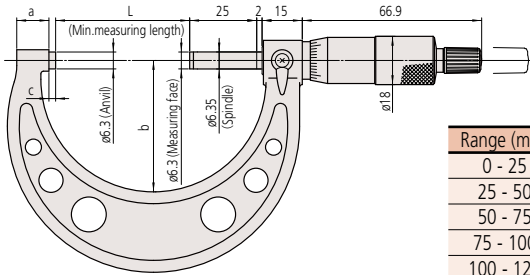
Micrometer

Outside Micrometers SERIES 103

DIMENSIONS

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

Unit: mm

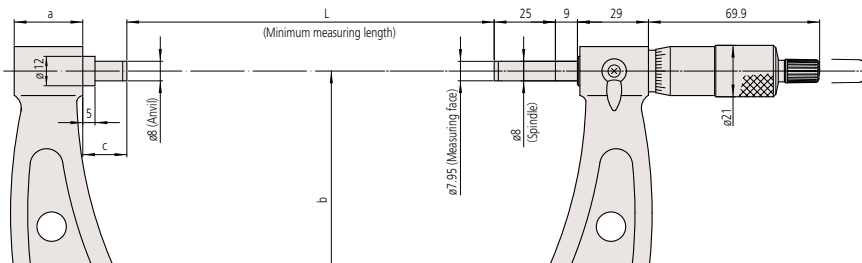


Range (mm)	L	a	b	c
0 - 25	0	9	28	2.5
25 - 50	25	10	38	
50 - 75	50	12	49	
75 - 100	75	14	60	
100 - 125	100	16.7	79	5.3
125 - 150	125	18.8	94	5.7
150 - 175	150	19.1	106	6.1
175 - 200	175	18.2	118	6.3
200 - 225	200	16.8	130	6.7
225 - 250	225	18	143	5.5
250 - 275	250		156	6.5
275 - 300	275		169	

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

Digit Outside Micrometers SERIES 193

Measurement example



- 193-901**
- Range: 0 - 75 mm
 - Graduation: 0.001 mm
 - Models included: **193-101, 193-102, 193-103**
2 micrometer standards



- 193-902**
- Range: 0 - 100 mm
 - Graduation: 0.001 mm
 - Models included: **193-101, 193-102, 193-103, 193-104**
3 micrometer standards

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



193-101

SPECIFICATIONS

Metric With ratchet stop						
Order 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		
193-101	0 - 25	±2		0.6	2	0.01
193-102	25 - 50					
193-103	50 - 75					
193-104	75 - 100	±3	3			

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

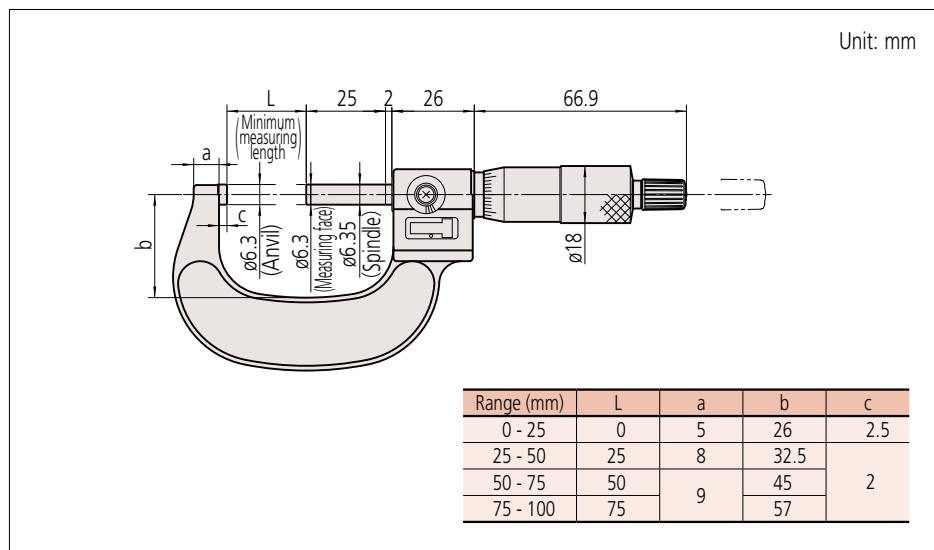
Inch Micrometer set				
Order No.	Range (in)	Models included	Flatness (in)	Parallelism (in)
193-923	0 - 3 (3 pcs./set)	• 193-211, 193-212, 193-213 • 2 micrometer standards	0.000024	0.00008

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

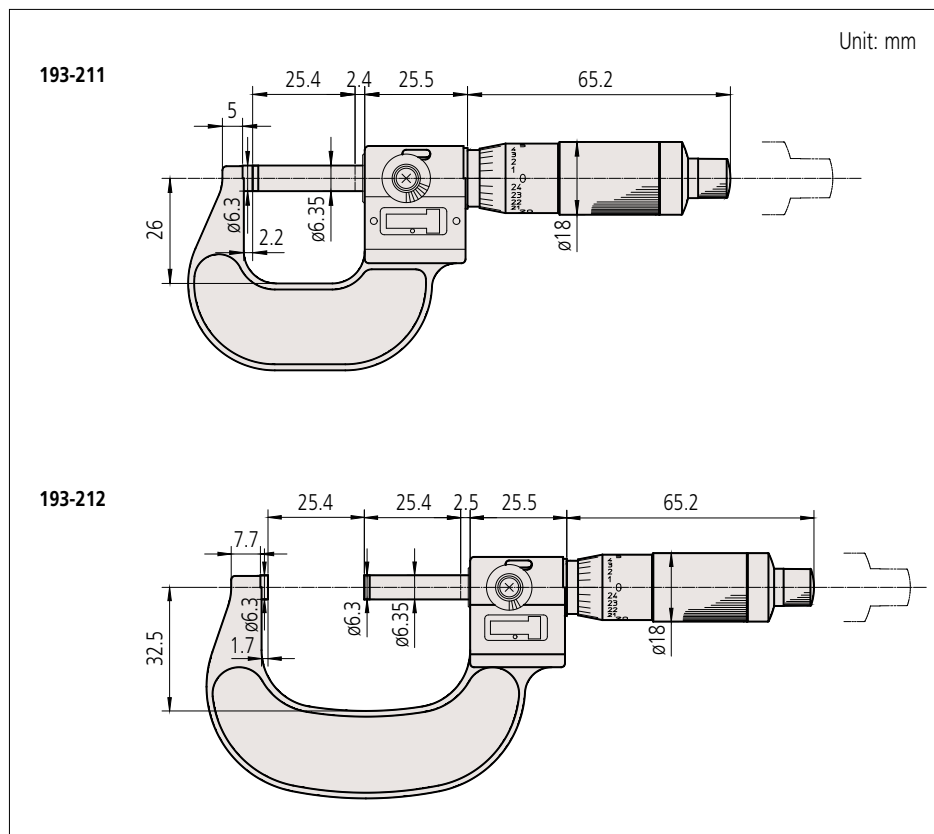
Micrometer

Digit Outside Micrometers SERIES 193

DIMENSIONS



DIMENSIONS



Outside Micrometers SERIES 406 — Non-Rotating Spindle Type

Measurement example



- The non-rotating spindle type does not apply rotational pressure to a measured object and is therefore suitable for measurement of soft materials and thin films.
- Measuring face of the spindle is carbide tipped.
- Spindle $\varnothing 6.35$ mm
- Equipped with Ratchet Stop for constant measuring force.



406-250-30

Optional Accessories

Order No.	Type	Description
05CZA662	B	Connecting cable (1 m)
05CZA663	B	Connecting cable (2 m)
06AFM380B	B	USB Input Tool Direct (2 m)
02AZD790B	B	Connecting cables for U-WAVE-T (160 mm)
02AZE140B	B	Connecting cables 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/ buzzer	Connecting unit for U-WAVE-TM/TMB

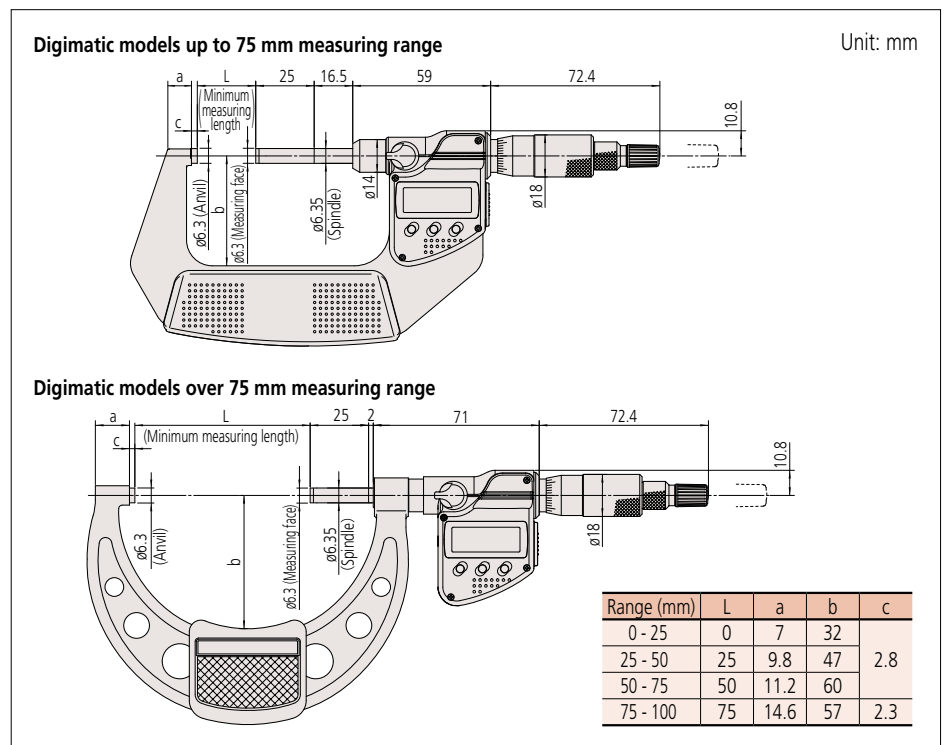
SPECIFICATIONS

Metric					
Order No.	Range (mm)	Resolution (mm)	Maximum permissible error J_{MPE} (μ m)	Flatness (μ m)	Parallelism (μ m)
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					
Order No.	Range (in)	Resolution	Maximum permissible error J_{MPE} (in)	Flatness (in)	Parallelism (in)
406-350-30	0 - 1	0.00005 in/ 0.001 mm	± 0.00015	0.000012	0.00012
406-351-30	1 - 2				
406-352-30	2 - 3		± 0.0002		0.00016
406-353-30	3 - 4				

- Battery: SR44 (1 pc.), **938882**, for initial operational checks (standard accessory)
- Battery life: Approx. 2.4 years under normal use
- Length standard: 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 B-7. Please note that these models are not water-proof.

DIMENSIONS



Micrometer

Indicator Type Micrometers SERIES 107

- Designed to mount a dial indicator for direct GO/ \pm NG judgment on mass-produced parts.
 - Anvil retracting trigger for quick measurement.
 - Various kinds of indicators* are selectable depending on the measurement type (accuracy required, measuring range, etc.).
 - Measuring faces: Carbide.
 - Anvil stroke: 3 mm.
- * Indicators with stems cannot be installed on this micrometer.



107-201
(Indicator shown is optional)

Measurement example



Typical Indicator Choice

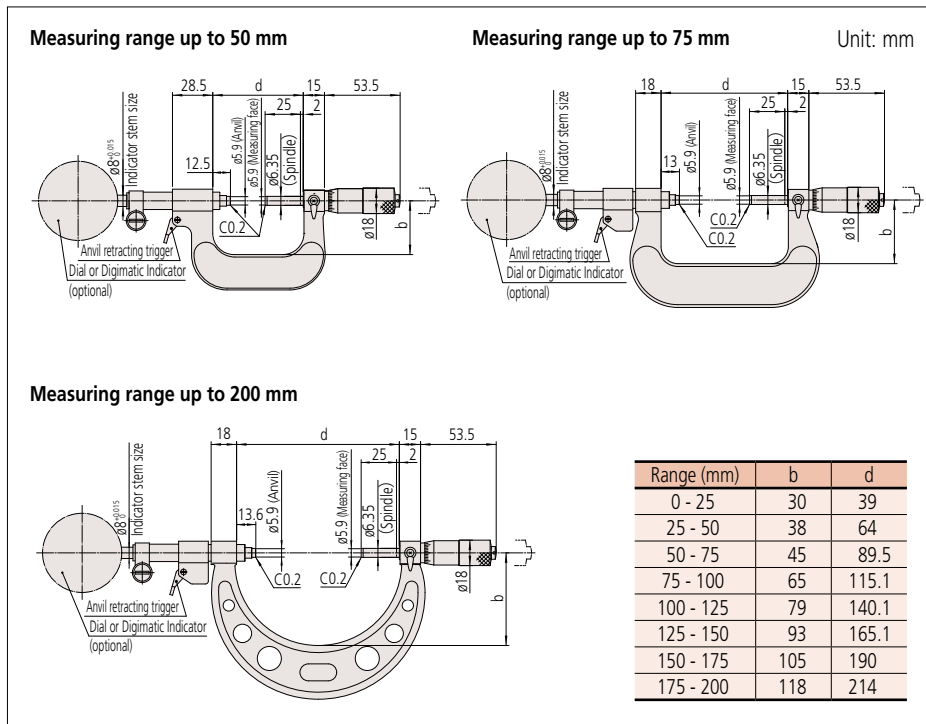
- Dial indicator (0.01 mm)/**2046AB**
- Dial indicator (0.001 mm)/**2109AB-10**
- ABS** Digimatic Indicator (0.01 mm)/**543-400B**
- ABS** Digimatic Indicator (0.001 mm)/**543-390B**

SPECIFICATIONS

Metric				
Order No.	Range (mm)	Spindle feed error (μ m)	Flatness (μ m)	Parallelism (μ m)
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.

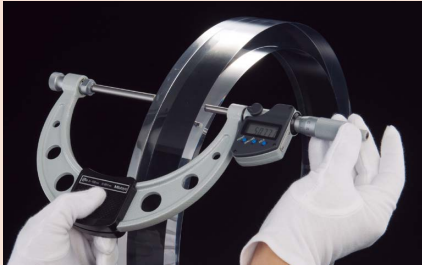
DIMENSIONS





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

Measurement example



Optional Accessories

Order No.	Type	Description
05CZA662	B	Connecting cables for 340-251-30, 340-252-30, 340-351-30 and 340-352-30 (1 m)
05CZA663	B	Connecting cables for 340-251-30, 340-252-30, 340-351-30 and 340-352-30 (2 m)
06AFM380B	B	USB Input Tool Direct (2 m)
02AZD790B	B	Connecting cables for U-WAVE-T (160 mm)
02AZE140B	B	Connecting cables 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/ buzzer	Connecting unit for U-WAVE-TM/TMB*
04AZB512	CR	Connecting cables (1 m) for 340-5XX, 340-7XX
04AZB513	CR	Connecting cables (2 m) for 340-5XX, 340-7XX
959149	C	Connecting cables (1 m) for 340-5XX, 340-7XX
959150	C	Connecting cables (2 m) for 340-5XX, 340-7XX

* 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).
- IP 65 water/dust protection (340-251-30, 340-252-30, 340-351-30, 340-352-30).
- Equipped with Ratchet Stop for constant measuring force.



SPECIFICATIONS

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

Inch / Metric									
Order No.	Range (in)	Resolution	Spindle feed error (in)	Flatness (in)	Parallelism (in)	Interchangeable anvils	Setting Qty	Standard Size (in)	Micrometer head stroke (in)
Digimatic (LCD)									
340-351-30	0 - 6	0.00005 in/ 0.001 mm	0.00015	0.000024	0.00012	6 pcs.	5	1 - 5	1
340-352-30	6 - 12	0.0001 in/ 0.001 mm			0.0002		6	6 - 11	
340-720	12 - 18				0.00026		6	12 - 17	
340-721	18 - 24				0.00032		6	18 - 23	
340-722	24 - 30				0.00038		6	24 - 29	
340-723	30 - 36				0.00044		6	30 - 35	

- Battery for series 340
340-251-30, 340-252-30, 340-351-30, 340-352-30: SR44 (1 pc.)
340-520 to 340-526 340-720 to 340-723: SR44 (2 pcs.)
938882, for initial operational checks (standard accessory)
 - 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)
 - Length standard: 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 B-7.
Please note that origin setting of these models is by presetting.
Optional connecting cable is available only for water-proof type (Digimatic model).
- Note 2: For functional details of 340-520 to 340-723, refer to page B-9.

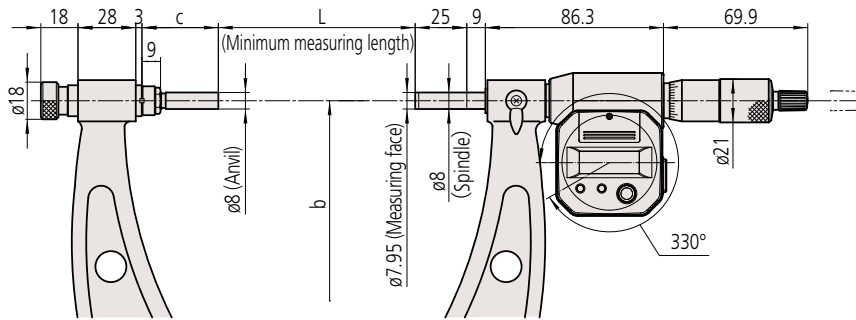
Micrometer

Outside Micrometers SERIES 340 — with Interchangeable Anvils

DIMENSIONS

Over 400 mm up to 1000 mm

Unit: mm



		L: Range (mm)				b
Range	300 - 400 mm models	300 - 325	325 - 350	350 - 375	375 - 400	224
Range	400 - 500 mm models	400 - 425	425 - 450	450 - 475	475 - 500	273
Range	500 - 600 mm models	500 - 525	525 - 550	550 - 575	575 - 600	332
Range	600 - 700 mm models	600 - 625	625 - 650	650 - 675	675 - 700	382
Range	700 - 800 mm models	700 - 725	725 - 750	750 - 775	775 - 800	430
Range	800 - 900 mm models	800 - 825	825 - 850	850 - 875	875 - 900	480
Range	900 - 1000 mm models	900 - 925	925 - 950	950 - 975	975 - 1000	530
Order No.	304001	304002	304003	304004		
c: Overall (mm)	87	62	37	12		
Interchangeable anvil	M3	M4	M5	M6		

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										
Order No.	Range (mm)	Graduation (mm)	Spindle feed error (μm)	Flatness (μm)	Parallelism (μm)	Interchangeable anvils	Setting Qty	Standard 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 pcs.	4	50 - 125			
104-140A	100 - 200				6 pcs.	6	100 - 175			
104-136A	150 - 300				6 pcs.	6	150 - 275			
104-141A	200 - 300			1.0	6	200 - 275	4	4		300 - 375
104-142A	300 - 400				7	400 - 475				
104-143A	400 - 500				8	500 - 575				
104-144A	500 - 600				9	600 - 675				
104-145A	600 - 700				10	700 - 775				
104-146A	700 - 800				11	800 - 875				
104-147A	800 - 900	12	900 - 975							
104-148A	900 - 1000									

Inch										
Order No.	Range (in)	Graduation (in)	Spindle feed error (in)	Flatness (in)	Parallelism (in)	Interchangeable anvils	Setting Qty	Standard 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				4 pcs.	4	2 - 5			
104-150	4 - 8				0.00016	6 pcs.	6	4 - 7		
104-138	6 - 12				0.0002	6 pcs.	6	6 - 11		
104-151	8 - 12				4 pcs.	4	8 - 11			
104-152	12 - 16				0.00004	0.00024	6 pcs.	6		12 - 15
104-201	12 - 18					0.00028	6 pcs.	6		12 - 17
104-153	16 - 20					0.00032	4 pcs.	4		16 - 19
104-202	18 - 24					6 pcs.	6	18 - 23		
104-154	20 - 24					4 pcs.	4	20 - 23		
104-155	24 - 28	0.00036	6 pcs.	6		24 - 27				
104-203	24 - 30	0.0004	0.0004	6 pcs.	6	24 - 29				
104-156	28 - 32		0.00044	4 pcs.	4	28 - 31				
104-204	30 - 36		6 pcs.	6	30 - 35					
104-157	32 - 36		4 pcs.	4	32 - 35					
104-158	36 - 40		0.00048	4 pcs.	4	36 - 39				
104-205	36 - 42		6 pcs.	6	36 - 41					

* The frame is fitted with a heat shield.

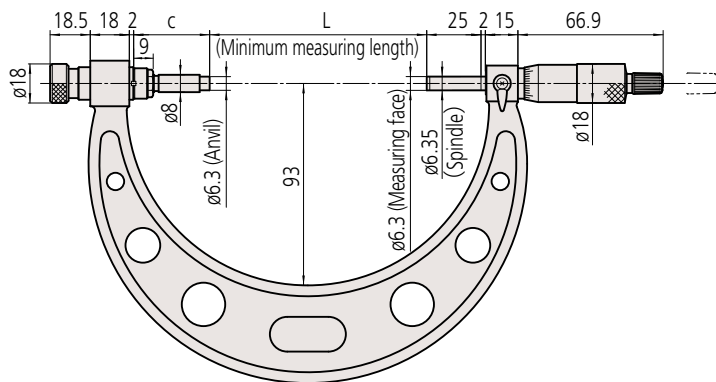
Micrometer

Outside Micrometers SERIES 104 — with Interchangeable Anvils

DIMENSIONS

Unit: mm

104-135A



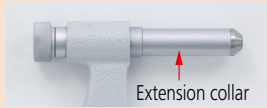
Interchangeable Anvil

		L: Range (mm)					
Range	0 - 150 mm models	0 - 25	25 - 50	50 - 75	75 - 100	100 - 125	125 - 150
Range	150 - 300 mm models	150 - 175	175 - 200	200 - 225	225 - 250	250 - 275	275 - 300
	Order No.	303950	303951	303952	303953	303954	303955
	c: Overall length (mm)	135	110	85	60	35	10
	Interchangeable anvil	M1	M2	M3	M4	M5	M6

		L: Range (mm)			
Range	300 - 400 mm models	300 - 325	325 - 350	350 - 375	375 - 400
Range	400 - 500 mm models	400 - 425	425 - 450	450 - 475	475 - 500
Range	500 - 600 mm models	500 - 525	525 - 550	550 - 575	575 - 600
Range	600 - 700 mm models	600 - 625	625 - 650	650 - 675	675 - 700
Range	700 - 800 mm models	700 - 725	725 - 750	750 - 775	775 - 800
Range	800 - 900 mm models	800 - 825	825 - 850	850 - 875	875 - 900
Range	900 - 1000 mm models	900 - 925	925 - 950	950 - 975	975 - 1000
	Order No.	304001	304002	304003	304004
	c: Overall length (mm)	87	62	37	12
	Interchangeable anvil	M3	M4	M5	M6

Outside Micrometers SERIES 105 — with Anvil Extension Collars

Extension collar



Extension collar

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



Extension collar

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

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



105-105

SPECIFICATIONS

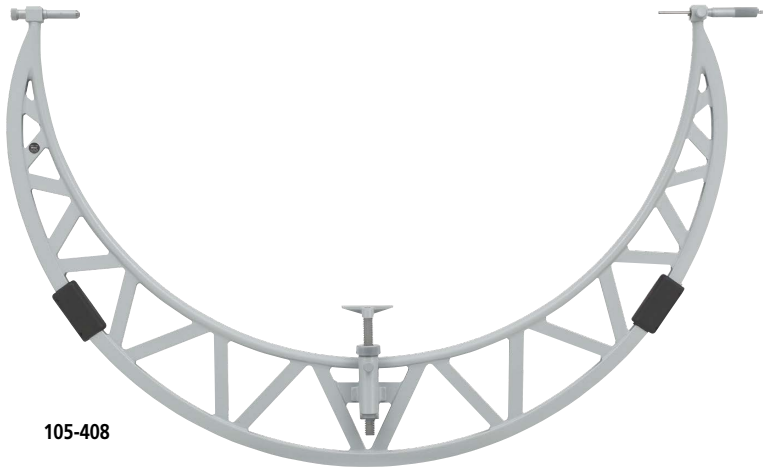
Metric							
Order No.	Range (mm)	Graduation (mm)	Extension Collars	Setting Standard	Spindle feed error (μm)	Flatness (μm)	Parallelism (μm)
105-103	500 - 600	0.01	1 pc. (50 mm)	2 pcs.	6	1.3	8
105-104	600 - 700						9
105-105	700 - 800						10
105-106	800 - 900						11
105-107	900 - 1000						12

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

Micrometer

Outside Micrometers SERIES 105 — with Anvil Extension Collars

- Large, lightweight micrometer with excellent strength based on a pipe-structure frame made of a combination of square and round pipes.
- Wide measuring range with anvil extension collars.
- 50 mm/2 in spindle stroke.
- Measuring faces: Carbide.
- Equipped with Ratchet Stop for constant measuring force.



105-408

SPECIFICATIONS

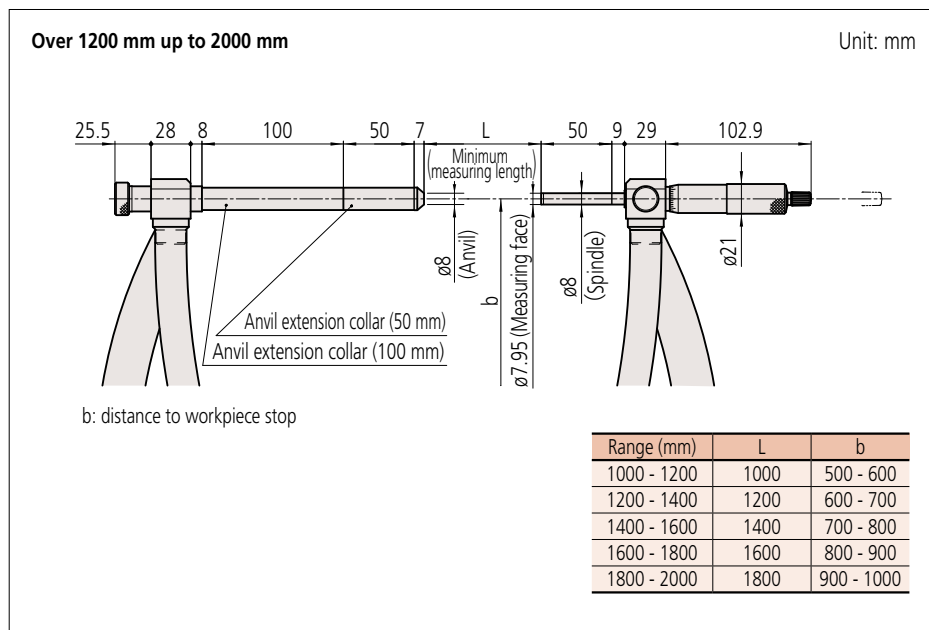
Metric							
Order No.	Range (mm)	Graduation (mm)	Extension Collars	Setting Standard (pcs.)	Spindle feed error (µm)	Flatness (µm)	Parallelism (µm)
(every 100 mm)							
105-408	1000 - 1100	0.01	1 pc. (50 mm)	2	6	1.3	13
105-409	1100 - 1200						14
105-410	1200 - 1300						15
105-411	1300 - 1400						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							
Order 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						0.00063
105-432	56 - 60						0.00067
105-433	60 - 64						0.00071
105-434	64 - 68						0.00075
105-435	68 - 72						0.00079
105-436	72 - 76						0.00083
105-437	76 - 80						0.00087

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

Measurement example



DIMENSIONS



B

Micrometer

Caliper Type Micrometers SERIES 343

- Effective for measuring workpiece features where access is difficult.
- Measuring faces: Carbide.
- Equipped with Ratchet Stop for constant measuring force.



343-250-30

SPECIFICATIONS

Metric					
Order No.	Range (mm)	Resolution (mm)	Maximum permissible error J_{MPE} (μm)	Flatness (μm)	Parallelism (μm)
Digimatic (LCD)					
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

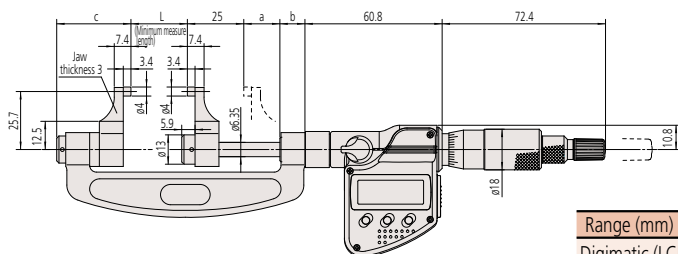
Inch / Metric					
Order No.	Range (in)	Graduation (in)	Maximum permissible error J_{MPE} (in)	Flatness (in)	Parallelism (in)
Digimatic (LCD)					
343-350-30	0 - 1	0.0005 in/ 0.001 mm	±0.00025	0.00012	0.00012
343-351-30	1 - 2		±0.0003		
343-352-30	2 - 3		±0.00035		
343-353-30	3 - 4		±0.0004		0.00016

- Battery: SR44 (1 pc.), **938882**, for initial operational checks (standard accessory)
 - Battery life: Approx. 2.4 years under normal use
 - Length standard: 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 B-7.
Please note that these models are not water-proof.

DIMENSIONS

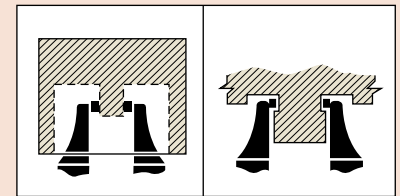
Digimatic
Measuring range up to 100 mm

Unit: mm



Range (mm)	L	a	b	C
Digimatic (LCD)				
0 - 25	0	16	11.1	32.9
25 - 50	25			
50 - 75	50			
75 - 100	75			

Measurement example



Optional Accessories (for series 343)

Order No.	Type	Description
05CZA662	B	Connecting cable (1 m)
05CZA663	B	Connecting cable (2 m)
06AFM380B	B	USB Input Tool Direct (2 m)
02AZD790B	B	Connecting cables for U-WAVE-T (160 mm)
02AZE140B	B	Connecting cables 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 / buzzer	Connecting unit for U-WAVE-TM/TMB

Caliper Type Micrometers SERIES 143



143-101

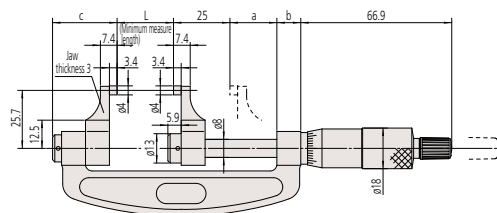
SPECIFICATIONS

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

• Standard accessories: Setting standard, 1 pc. (except for measuring range 0 to 25 mm (0 to 1 in) models), Spanner (301336), 1 pc.
Note: Please note that these models are not water-proof.

DIMENSIONS

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



Micrometer

Screw Thread Micrometers SERIES 125

- Fitted with one type of anvil/spindle tip for screw thread measurement.
- The measurement result is directly readable (no need for calculation).
- Equipped with Ratchet Stop for constant measuring force.
- Fixed anvil type to suit 60° threads.



125-103

Measurement example

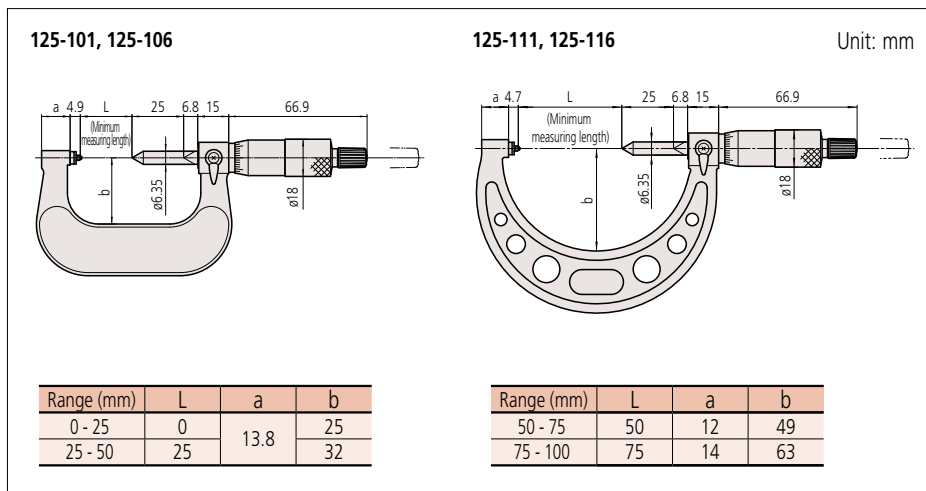


SPECIFICATIONS

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

• 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 B-70 for details.) The setting standard is for metric threads (unified) 60°.

DIMENSIONS





Dust- and
Water-
Protected
www.mitutoyo.com
ID 000000191

Applicable models: series 326

Measurement example



Optional Accessories (for series 326)

Order No.	Type	Description
05CZA662	B	Connecting cable (1 m)
05CZA663	B	Connecting cable (2 m)
06AFM380B	B	USB Input Tool Direct (2 m)
02AZD790B	B	Connecting cables for U-WAVE-T (160 mm)
02AZE140B	B	Connecting cables 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/ buzzer	Connecting unit for U-WAVE-TM/TMB

• For Metric/Unified threads (pair)

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

• For Whitworth threads (pair)

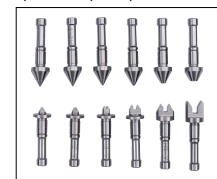
Order No.	Matching anvils/spindle tips included (mm)	Order No.	Matching anvils/spindle tips included (mm)
126-811	64 - 48 TPI	126-817	14 - 10 TPI
126-812	48 - 40 TPI	126-818	10 - 7 TPI
126-813	40 - 32 TPI	126-819	7 - 4.5 TPI
126-814	32 - 24 TPI	126-820	4.5 - 3.5 TPI
126-815	24 - 18 TPI	126-810	Set with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

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

- Use by installing a suitable interchangeable anvil/spindle tip pair.
- Direct reading of screw pitch diameter (no need for calculation).
- **Series 326** is a protection grade IP65, waterproof Digimatic screw thread micrometer with interchangeable anvil/spindle tip.
- 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 are optional.



Interchangeable anvils/
spindle tips (optional)



SPECIFICATIONS

Metric			
Order No.	Range (mm)	Resolution (mm)	Spindle feed error (µm)
Digimatic (LCD)			
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			
Order No.	Range (in)	Resolution	Spindle feed error (in)
Digimatic (LCD)			
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		

- Battery: SR44 (1 pc.), **938882**, for initial operational checks (standard accessory)
- Battery life: Approx. 2.4 years under normal use
- Length standard: 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 B-70 for details.) The setting standard is for metric threads (unified) 60°.

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



SPECIFICATIONS

Metric			
Order No.	Range (mm)	Graduation (mm)	Spindle feed error (µm)
Analog			
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			
Order No.	Range (in)	Graduation (in)	Spindle feed error (in)
Analog			
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		

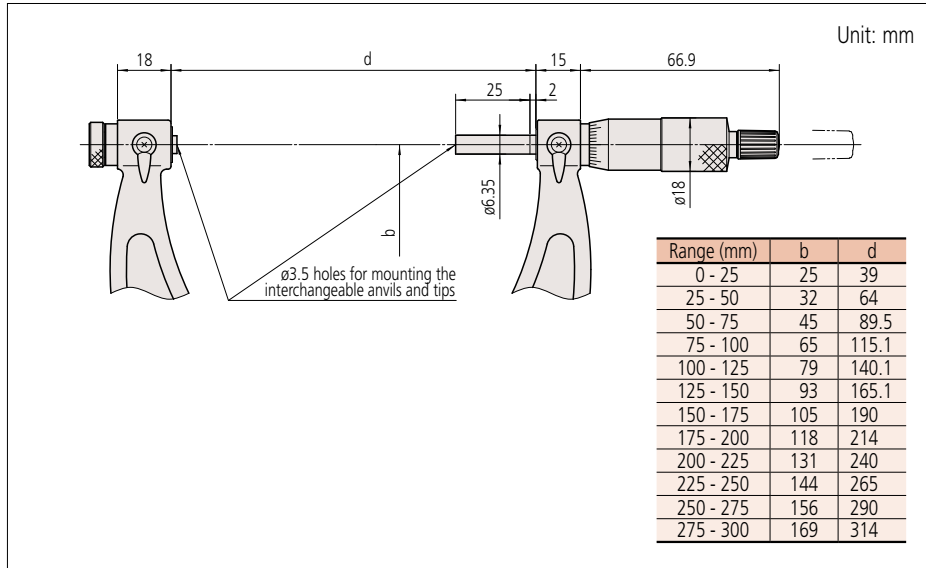
- Standard Accessories: Spanner (**301336**), 1 pc.

Note: A matching setting standard is supplied with each model (except for 0 to 25 mm measuring range). (Refer to page B-70 for details.) The setting standard is for metric threads (unified) 60°.

Micrometer

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

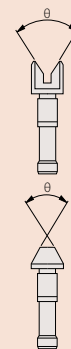
DIMENSIONS



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 $\theta=55^\circ$

Paper Thickness Micrometers SERIES 169 — Non-Rotating Spindle Type

Measurement example



- For paper thickness measurement.
- Non-rotating spindle.
- Anvil diameter 14.3 mm (without recess)
- Equipped with Ratchet Stop for constant measuring force. (8.02±0.8 N)



169-101-10

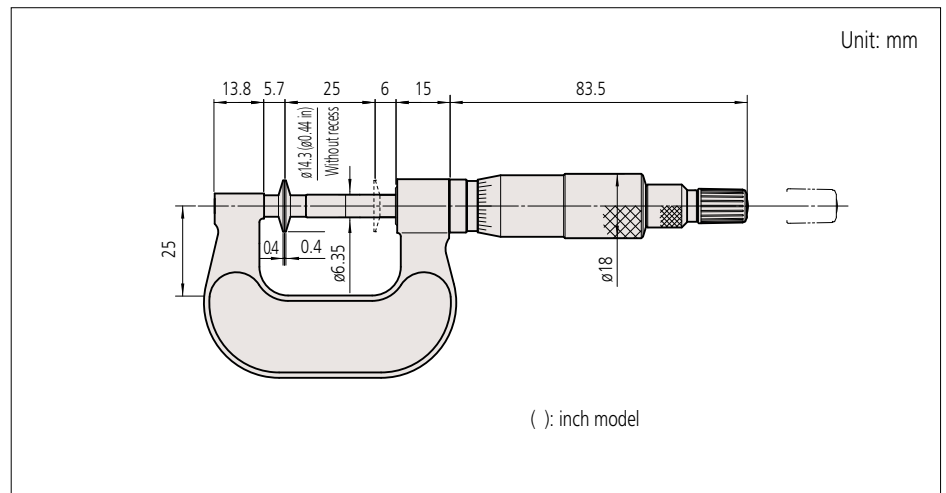
SPECIFICATIONS

Metric					
Order 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					
Order 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

Disk Micrometers SERIES 323

- Measures "root tangent length" of spur gears and helical gears.
- Determination of the root tangent length: refer to "Quick Guide to Precision Measuring Instruments" on page B-80.
- Equipped with Ratchet Stop for constant measuring force.
- Supplied with a setting standard (except for 0 to 25 mm/0 to 1 in measuring range).



323-250-30

SPECIFICATIONS

Metric

Order No.	Range (mm)	Resolution (mm)	Maximum permissible error J_{MPE} (μ m)	Flatness (μ m)	Parallelism (μ m)	Anvil dia. (mm)	Measurable module
Digimatic (LCD)							
323-250-30	0 - 25	0.001	± 4	1	4	$\varnothing 20$	0.5 - 6
323-251-30	25 - 50						
323-252-30	50 - 75		± 6				
323-253-30	75 - 100						

Inch / Metric

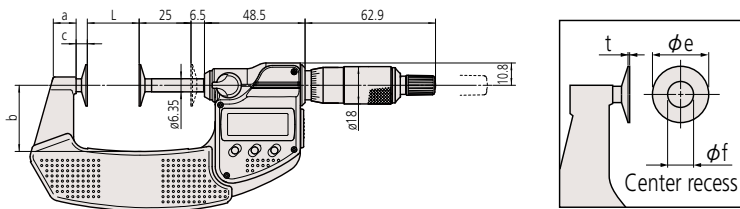
Order No.	Range (in)	Resolution	Maximum permissible error J_{MPE} (in)	Flatness (in)	Parallelism (in)	Anvil dia. (in)	Measurable module
Digimatic (LCD)							
323-350-30	0 - 1	0.00005 in / 0.001 mm	± 0.0002	0.00004	0.0002	0.787	0.5 - 6
323-351-30	1 - 2						
323-352-30	2 - 3		± 0.0003				
323-353-30	3 - 4						

- Battery: SR44 (1 pc.), **938882**, for initial operational checks (standard accessory)
 - Battery life: Approx. 2.4 years under normal use
 - Length standard: 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: Root tangent length measurement is not available for some types of gears.
 Note 2: For functional details, refer to page B-7.
 Optional connecting cable is available only for water-proof type (Digimatic model).

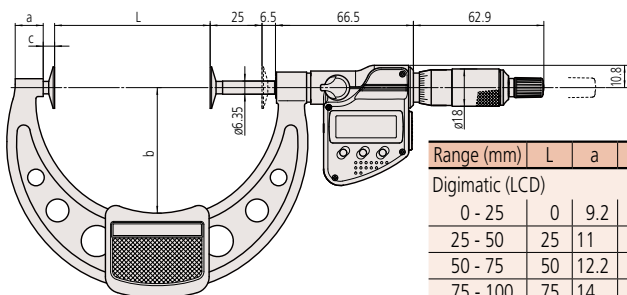
DIMENSIONS

Digimatic models up to 75 mm measuring range

Unit: mm



Digimatic models up to 100 mm measuring range



MeasurLink[®] ENABLED
Data Management Software by Mitutoyo

U-WAVE^{fit}



Measurement example



Optional Accessories

Order No.	Type	Description
05CZA662	B	Connecting cable (1 m)
05CZA663	B	Connecting cable (2 m)
06AFM380B	B	USB Input Tool Direct (2 m)
02AZD790B	B	Connecting cables for U-WAVE-T (160 mm)
02AZE140B	B	Connecting cables 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 / buzzer	Connecting unit for U-WAVE-TM/TMB

Disk Micrometers SERIES 223, 123

- Measures “root tangent length” of spur gears and helical gears.
- Determination of the root tangent length: refer to “Quick Guide to Precision Measuring Instruments” on page B-80.
- Equipped with Ratchet Stop for constant measuring force.
- Supplied with a setting standard (except for 0 to 25 mm/0 to 1 in measuring range).



123-101

SPECIFICATIONS

Metric							
Order 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	$\varnothing 20$	0.5 - 6
223-102	25 - 50						
Analog							
123-101	0 - 25	0.01	± 4	1	4	$\varnothing 20$	0.5 - 6
123-113*							
123-102	25 - 50		± 6	1.6	6	$\varnothing 30$	0.7 - 11
123-114*							
123-103	50 - 75		± 7	1.6	7	$\varnothing 30$	0.7 - 11
123-115*							
123-104	75 - 100		± 8	1.6	8	$\varnothing 30$	0.7 - 11
123-116*							
123-105	100 - 125		± 9	1.6	9	$\varnothing 30$	0.7 - 11
123-106	125 - 150						
123-107	150 - 175						
123-108	175 - 200						
123-109	200 - 225						
123-110	225 - 250						
123-111	250 - 275						
123-112	275 - 300						
Inch							
Order 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	0.787	0.5 - 6
Analog							
123-125	0 - 1	0.001	± 0.0002	0.00004	0.0002	0.787	0.5 - 6
123-126	1 - 2				0.0002		
123-127	2 - 3		± 0.0003		0.0003		
123-128	3 - 4				0.0003		

* The measuring disks 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.

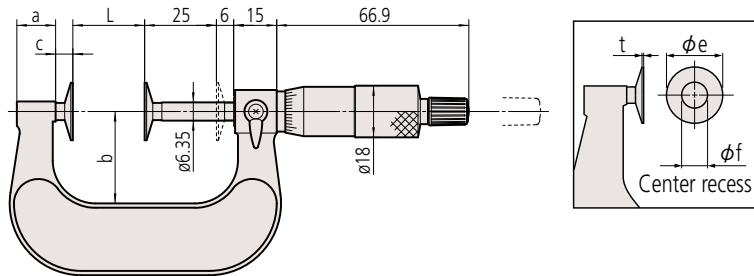
Micrometer

Disk Micrometers SERIES 223, 123

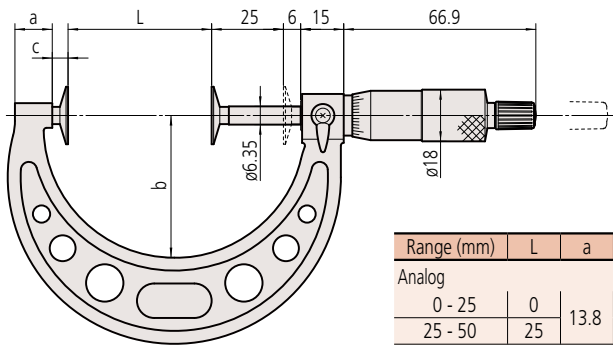
DIMENSIONS

Analog models up to 50 mm measuring range

Unit: mm



Analog models over 50 mm measuring range

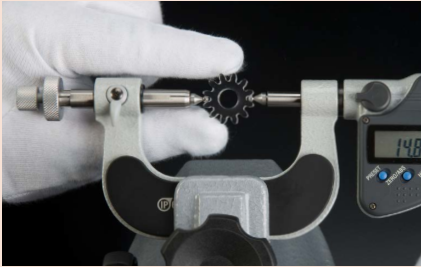


Range (mm)	L	a	b	c	e	f	t
Analog							
0 - 25	0	13.8	25	5.7	20	8 (9.8)	0.7 (0.7)
25 - 50	25		32				
50 - 75	50	12	49	5.5			
75 - 100	75	14	63				
100 - 125	100	12	79	6	30	12	1
125 - 150	125	14.5	94				
150 - 175	150	15.2	106				
175 - 200	175	14.5	118				
200 - 225	200	13.5	130				
225 - 250	225		143				
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

Measurement example



- Measures over-pin diameter of gears using precision steel (or carbide) ball anvils/spindle tips.
- IP65 Digimatic gear tooth micrometers.
- Determination of the over-pin diameter: refer to "Quick Guide to Precision Measuring Instruments" on page B-80.
- Interchangeable ball anvils/spindle tips for various gear modules (0.5 to 5.25) are optional.
- Ball anvil/spindle tips: optional.

Optional Accessories

Order No.	Type	Description
05CZA662	B	Connecting cable (1 m)
05CZA663	B	Connecting cable (2 m)
06AFM380B	B	USB Input Tool Direct (2 m)
02AZD790B	B	Connecting cables for U-WAVE-T (160 mm)
02AZE140B	B	Connecting cables 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/ buzzer	Connecting unit for U-WAVE-TM/TMB

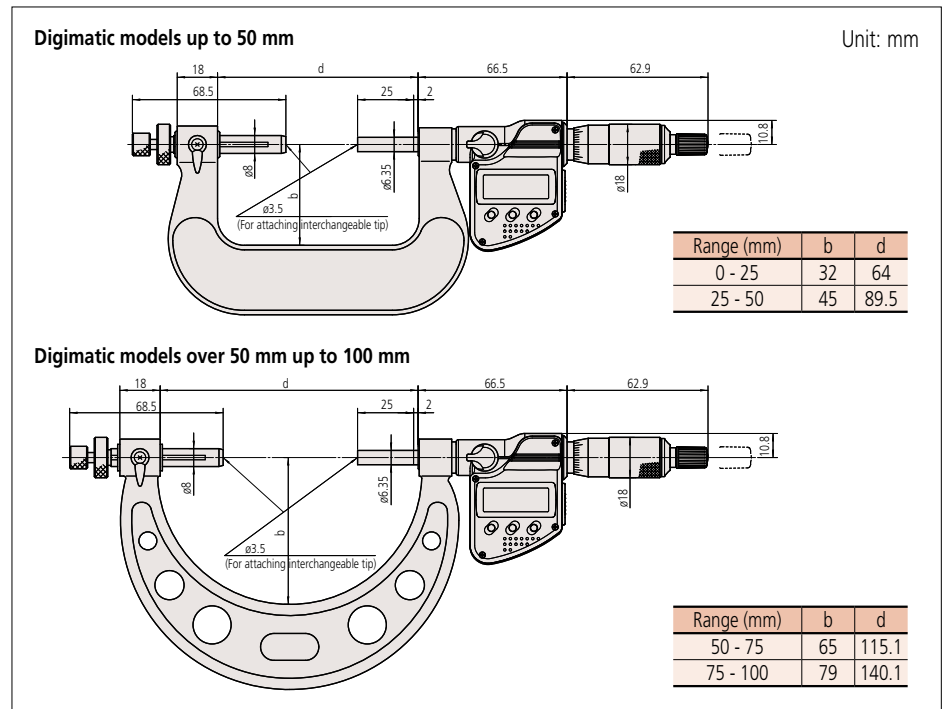


SPECIFICATIONS

Metric				Inch / Metric			
Order No.	Range (mm)	Resolution (mm)	Spindle feed error (μm)	Order No.	Range (in)	Resolution	Spindle feed error (in)
Digimatic (LCD)				Digimatic (LCD)			
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		

- Battery: SR44 (1 pc.), **938882**, for initial operational checks (standard accessory)
 - Battery life: Approx. 2.4 years under normal use
 - Length standard: 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 B-7.
Please note that origin setting of these models is by presetting. Optional connecting cable is available only for waterproof type (Digimatic model).

DIMENSIONS



Micrometer

Gear Tooth Micrometers SERIES 124 — Interchangeable Ball Anvil/Spindle Tip Type

- Measures over-pin diameter of gears using precision steel (or carbide) ball anvils/spindle tips.
- Determination of the over-pin diameter: refer to "Quick Guide to Precision Measuring Instruments" on page B-80.
- Interchangeable ball anvils/spindle tips for various gear modules (0.5 to 5.25) are optional.
- Equipped with Ratchet Stop for constant measuring force.
- Ball anvil/spindle tips: optional.



SPECIFICATIONS

Metric			
Order No.	Range (mm)	Graduation (mm)	Spindle feed error (µm)
Analog			
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	115.1
75 - 100	79	140.1
100 - 125	93	165.1
125 - 150	105	190
150 - 175	118	214
175 - 200	131	240
200 - 225	144	265
225 - 250	156	290
250 - 275	169	314
275 - 300	187	352

Optional Accessories

- Interchangeable ball anvil/spindle tip set

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

* 2 mm less for carbide-tipped type

IP65 ABSOLUTE™

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

Measurement example



Optional Accessories

Order No.	Type	Description
05CZA662	B	Connecting cable (1 m)
05CZA663	B	Connecting cable (2 m)
06AFM380B	B	USB Input Tool Direct (2 m)
02AZD790B	B	Connecting cables for U-WAVE-T (160 mm)
02AZE140B	B	Connecting cables 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/ buzzer	Connecting unit for U-WAVE-TM/TMB

**Disk Micrometers
SERIES 369 — Non-Rotating Spindle Type**

- Measures “root tangent length” of spur gears and helical gears.
- Determination of the root tangent length: refer to “Quick Guide to Precision Measuring Instruments” on page B-80.
- Non-rotating spindle type.
- Measurable range of gear pitch: 0.5 to 6 module.
- Equipped with Ratchet Stop for constant measuring force.



SPECIFICATIONS

Metric								
	Order No.	Range (mm)	Resolution (mm)	Anvil dia. (mm)	Maximum permissible error J_{MPE} (μm)	Flatness (μm)	Parallelism (μm)	Measuring force (N)
Digimatic (LCD)	369-250-30	0 - 25	0.001	20	±4	1	4	3 - 8
	369-251-30	25 - 50						
	369-252-30	50 - 75			±6		6	
	369-253-30	75 - 100						

Inch / Metric								
	Order No.	Range (in)	Resolution	Anvil dia. (in)	Maximum permissible error J_{MPE} (in)	Flatness (in)	Parallelism (in)	Measuring force (N)
Digimatic (LCD)	369-350-30	0 - 1	0.00005 in/ 0.001 mm	0.787	±0.0002	0.00004	0.0002	3 - 8
	369-351-30	1 - 2						
	369-352-30	2 - 3			±0.0003		0.0003	
	369-353-30	3 - 4						

- Battery: SR44 (1 pc.), **938882**, for initial operational checks (standard accessory)
- Battery life: Approx. 2.4 years under normal use
- Length standard: 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 B-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

Digimatic models up to 75 mm Unit: mm

Digimatic models over 75 mm

Range (mm)	L	a	b	c
0 - 25	0	7	32	12.9
25 - 50	25	9.8	47	
50 - 75	50	11.2	60	
75 - 100	75	13.5	60	5.5

Micrometer

Disk Micrometers SERIES 369, 227 — Non-Rotating Spindle Type

- Measures “root tangent length” of spur gears and helical gears.
- Determination of the root tangent length: refer to “Quick Guide to Precision Measuring Instruments” on page B-80.
- Non-rotating spindle type.
- 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 (LCD)
369-411-20

SPECIFICATIONS

Metric								
	Order No.	Range (mm)	Resolution (mm)	Anvil dia. (mm)	Maximum permissible error J_{MPE} (μm)	Flatness (μm)	Parallelism (μm)	Measuring force (N)
Quickmike type (LCD)	369-411-20	0 - 30	0.001	20	± 4	1	4	3 - 8
	369-412-20	25 - 55		14.3				0.5 - 2.5
Quickmike type adjustable measuring force (LCD)	227-221-20	0 - 15		3			2 - 10	
	227-223-20	0 - 10						

Inch/Metric								
	Order No.	Range (in)	Resolution	Anvil dia. (in)	Maximum permissible error J_{MPE} (in)	Flatness (in)	Parallelism (in)	Measuring force (N)
Quickmike type (LCD)	369-421-20	0 - 1.2	0.00005 in/ 0.001 mm	0.787	± 0.0002	0.00004	0.0002	3 - 8
	369-422-20	1 - 2.2						

- Battery: SR44 (1 pc.), **938882**, for initial operational checks (standard accessory)
 - Battery life: Approx. 5 years under normal use
 - Length standard: 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	0			

Disk Micrometers SERIES 169 — Non-Rotating Spindle Type

- Measures “root tangent length” of spur gears and helical gears.
- Determination of the root tangent length: refer to “Quick Guide to Precision Measuring Instruments” on page B-80.
- Non-rotating spindle type.
- Measurable range of gear pitch: 0.5 to 6 module.
- Equipped with Ratchet Stop for constant measuring force.



169-201-10

SPECIFICATIONS

Metric								
	Order 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	20	± 4	1	4	3 - 8
	169-202-10	25 - 50					6	
	169-205-10	50 - 75			± 6			
	169-207-10	75 - 100						

Inch								
	Order 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	0.787	± 0.0002	0.00004	0.0002	3 - 8
	169-204-10	1 - 2					0.0003	
	169-206-10	2 - 3			± 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

Unit: mm

Analog models up to 50 mm

Analog models over 50 mm

Range (mm)	L	a	b	c
0 - 25	0	13.8	25	5.7
25 - 50	25		32	
50 - 75	50	12	49	5.5
75 - 100	75	14	63	

Micrometer

Sheet Metal Micrometers SERIES 389

- Measures thickness of sheet metal.
- Measuring faces: Carbide.
- Profile of measuring faces: Flat-Flat, Spherical-Flat and Spherical-Spherical.
- Equipped with Ratchet Stop for constant measuring force.



SPECIFICATIONS

Metric							
Order No.	Range (mm)	Resolution (mm)	Maximum permissible error J_{MPE} (μm)	Flatness (μm)	Parallelism (μm)	Throat depth (mm)	Measuring surfaces
Digimatic (LCD)							
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							300*
389-252-30	25 - 50	0.001	±4	0.6	3	150	F-F
389-262-30							S-F
389-272-30							S-S

Inch / Metric							
Order No.	Range (in)	Resolution	Maximum permissible error J_{MPE} (in)	Flatness (in)	Parallelism (in)	Throat depth (in)	Measuring surfaces
Digimatic (LCD)							
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							12*
389-352-30	1 - 2	0.00005 in / 0.001 mm	±0.0002	0.000024	0.00012	6	F-F
389-362-30							S-F
389-372-30							S-S

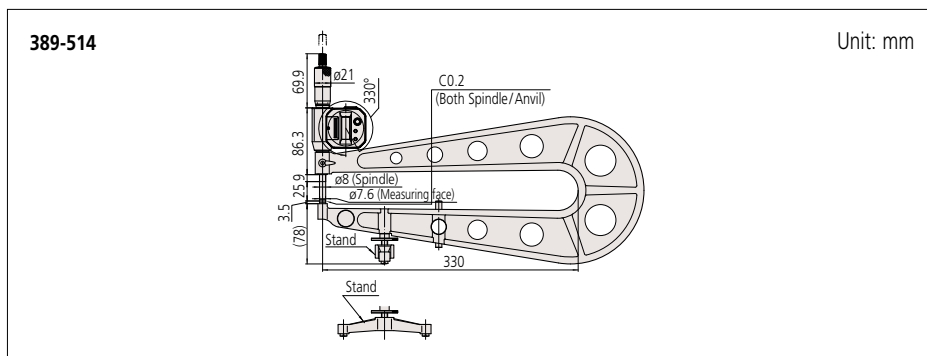
- Battery: SR44 (1 pc.), 938882, 2 pcs.: 389-514, 389-714 for initial operational checks (standard accessory)
- Battery life: Approx. 2.4 years under normal use (for 389-2XX, 3XX), Approx. 1.8 years under normal use (for 389-514, 714)
- Length standard: Electromagnetic rotary sensor
- Standard accessories: 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 B-7.

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

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

DIMENSIONS



MeasurLink[®] ENABLED
Data Management Software by Mitutoyo

U-WAVE^{fit}



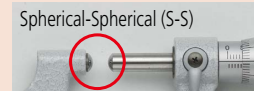
Dust- and
Water-
Protected
www.tuv.com
ID 000040191

Applicable models: series 389
(excluding 389-514 and 389-714)

Optional Accessories

Order No.	Type	Description
05CZA662	B	Connecting cables (1 m) : for series 389
05CZA663	B	Connecting cables (2 m) : for series 389
06AFM380B	B	USB Input Tool Direct (2 m)
02AZD790B	B	Connecting cables for U-WAVE-T (160 mm): for series 389
02AZE140B	B	Connecting cables for U-WAVE-T: for series 389 For foot switch
04AZB512	CR	Connecting cable (1 m): for 389-514
04AZB513	CR	Connecting cable (2 m): for 389-514
959149	C	Connecting cable (1 m): for 389-514
959150	C	Connecting cable (2 m): for 389-514
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/ buzzer	Connecting unit for U-WAVE-TM/TMB*

* Cannot be used with 389-514.



Sheet Metal Micrometers SERIES 118

- Measures thickness of sheet metal.
- Measuring faces: Carbide.
- Profile of measuring faces: Flat-Flat, Spherical-Flat and Spherical-Spherical.
- Equipped with Ratchet Stop for constant measuring force.



SPECIFICATIONS

Metric							
Order No.	Range (mm)	Graduation (mm)	Maximum permissible error J_{MPE} (μm)	Flatness (μm)	Parallelism (μm)	Throat depth (mm)	Measuring surfaces
Analog							
118-101	0 - 25	0.01	±4	0.6	3	100	F-F
118-102						150	S-F
118-114						150	S-S
118-103						300*	F-F
118-110						150	S-S
118-126	25 - 50		±4	0.6			

Inch							
Order No.	Range (in)	Graduation (in)	Maximum permissible error J_{MPE} (in)	Flatness (in)	Parallelism (in)	Throat depth (in)	Measuring surfaces
Analog							
118-129	0 - 1	0.0001	±0.0002	0.000024	0.00012	6	F-F
118-116							S-F
118-120							S-S
118-107						12*	F-F
118-112	1 - 2	0.001	±0.00025	0.00004		6	F-F
			±0.0002	0.000024			

- Standard accessories: Setting standard, 1 pc. (except for measuring range 0 to 25 mm (0 to 1 in) models)
- Spanner (200877), 1 pc. (for 118-1XX)
- Spanner (200154), 1 pc. (for 118-103/107)

* Models with a 300 mm (12 in) throat are equipped with a stand for convenience of measurement in the horizontal orientation as standard.

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

DIMENSIONS

Analog models

Unit: mm

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

Micrometer

Sheet Metal Micrometer SERIES 119

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



119-202

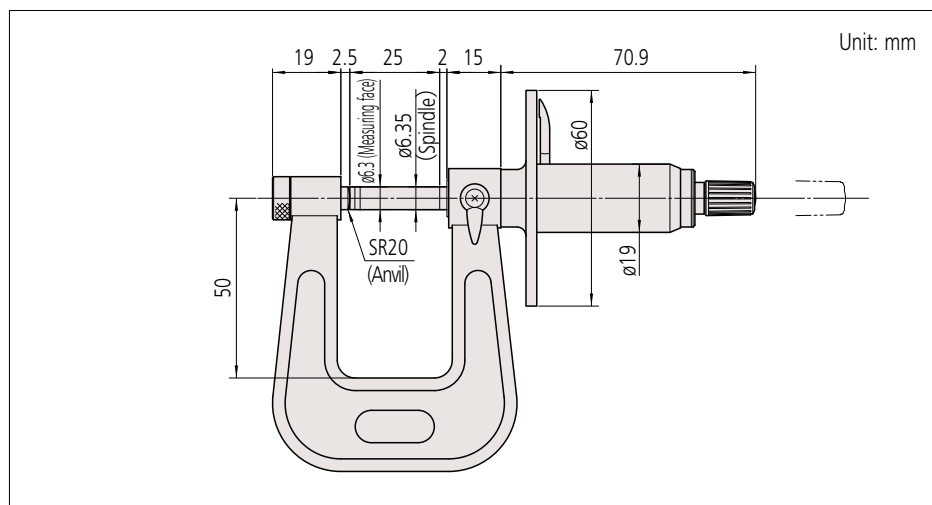
SPECIFICATIONS

Metric

Order 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

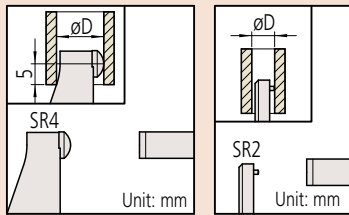




Dust- and
Water-
Protected
www.tuv.com
ID 000004091

Applicable models: **series 395**

Measurement example



Other than **115-101**

115-101

Optional Accessories

Order No.	Type	Description
05CZA662	B	Connecting cable for series 395 (1 m)
05CZA663	B	Connecting cable for series 395 (2 m)
06AFM380B	B	USB Input Tool Direct (2 m)
02AZD790B	B	Connecting cables for U-WAVE-T (160 mm)
02AZE140B	B	Connecting cables 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/ buzzer	Connecting unit for U-WAVE-TM/TMB

Tube Micrometers SERIES 395, 115, 295

- Measuring faces: Carbide.
(**115-101**: only the spindle is carbide tipped.)
- **series 395**: IP65 digimatic model.
- Equipped with Ratchet Stop for constant measuring force.



395-251-30

SPECIFICATIONS

Metric					
Order No.	Range (mm)	Resolution (mm)	Maximum permissible error J_{MPE} (μ m)	$\varnothing D$ (mm)	Flatness (μ m)
Digimatic (LCD)					
395-251-30	0 - 25	0.001	± 2	$\varnothing 15$	0.3
395-252-30	25 - 50			$\varnothing 19$	
395-253-30	50 - 75			$\varnothing 20$	
395-254-30	75 - 100			± 3	

Inch / Metric					
Order No.	Range (in)	Resolution	Maximum permissible error J_{MPE} (in)	$\varnothing D$ (in)	Flatness (in)
Digimatic (LCD)					
395-351-30	0 - 1	0.00005 in/ 0.001 mm	± 0.0001	$\varnothing 0.59$	0.000012
395-352-30	1 - 2			$\varnothing 0.75$	
395-353-30	2 - 3	± 0.00015	$\varnothing 0.79$		
395-354-30	3 - 4				

- Battery: SR44 (1 pc.), **938882**, for initial operational checks (standard accessory)
 - Battery life: Approx. 2.4 years under normal use
 - Length standard: 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 B-7.
Optional connecting cable is available only for water-proof type (Digimatic model).



115-115

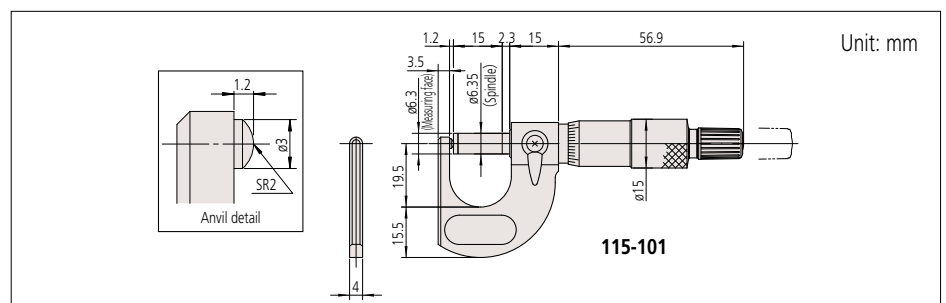
SPECIFICATIONS

Metric					
Order No.	Range (mm)	Graduation (mm)	Maximum permissible error J_{MPE} (μ m)	$\varnothing D$ (mm)	Flatness (μ m)
Analog					
115-101	0 - 15	0.01	± 3	$\varnothing 5.5$	0.6
115-115	0 - 25			$\varnothing 10$	
115-116	25 - 50			$\varnothing 11$	
115-117	50 - 75			$\varnothing 17$	
115-118	75 - 100		± 4	$\varnothing 18$	
Mechanical counter model					
295-115	0 - 25	0.01	± 3	$\varnothing 10$	0.6

Inch					
Order No.	Range (in)	Graduation (in)	Maximum permissible error J_{MPE} (in)	$\varnothing D$ (in)	Flatness (in)
Analog					
115-153	0 - 1	0.0001	± 0.00015	$\varnothing 0.40$	0.000024
Mechanical counter model					
295-153	0 - 1	0.0001	± 0.00015	$\varnothing 0.40$	0.000024

- 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 **115-101**), Spanner (**301336**), 1 pc. (for models other than **115-101**)

DIMENSIONS



115-101

Micrometer

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

- Measuring faces: Carbide. (115-201: only the spindle is carbide tipped.)
- Equipped with Ratchet Stop for constant measuring force.
- series 395: IP65 digimatic model.



395-271-30

SPECIFICATIONS

Metric					Inch / Metric				
Order No.	Range (mm)	Resolution (mm)	Maximum permissible error J_{MPE} (μm)	ϕD (mm)	Order No.	Range (in)	Resolution	Maximum permissible error J_{MPE} (in)	ϕD (in)
Digimatic (LCD)					Digimatic (LCD)				
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				395-372-30	1 - 2			
395-273-30	50 - 75			395-373-30	2 - 3	$\phi 0.75$			
395-274-30	75 - 100			± 3	$\phi 20$	395-374-30			3 - 4

- Battery: SR44 (1 pc.), 938882, for initial operational checks (standard accessory)
 - Battery life: Approx. 2.4 years under normal use
 - Length standard: 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 B-7.
Optional connecting cable is available only for water-proof type (Digimatic model).



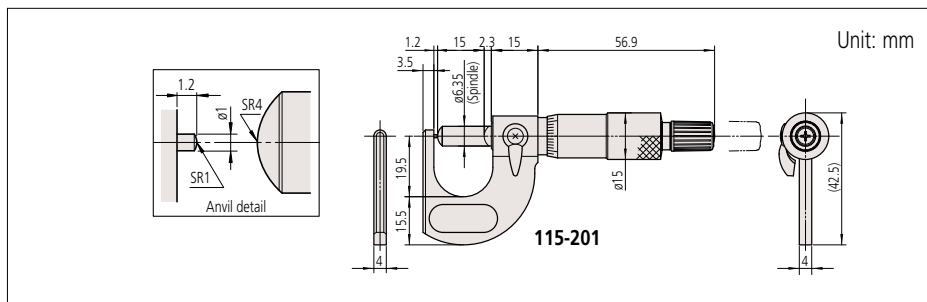
115-215

SPECIFICATIONS

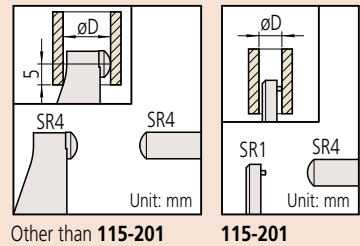
Metric					Inch				
Order No.	Range (mm)	Graduation (mm)	Maximum permissible error J_{MPE} (μm)	ϕD (mm)	Order No.	Range (in)	Graduation (in)	Maximum permissible error J_{MPE} (in)	ϕD (in)
Analog					Analog				
115-201	0 - 15	0.01	± 3	$\phi 5.5$	115-253	0 - 1	0.0001	± 0.00015	$\phi 0.40$
115-215	0 - 25			$\phi 10$	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			$\phi 18$	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



Optional Accessories

Order No.	Type	Description
05CZA662	B	Connecting cable for series 395 (1 m)
05CZA663	B	Connecting cable for series 395 (2 m)
06AFM380B	B	USB Input Tool Direct (2 m)
02AZD790B	B	Connecting cables for U-WAVE-T (160 mm)
02AZE140B	B	Connecting cables 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/ buzzer	Connecting unit for U-WAVE-TM/TMB



Dust- and Water-Protected
www.tuv.com
ID 000004091

Applicable models: series 395

Measurement example



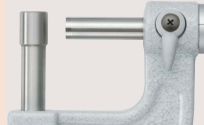
Type A (pin)

Type B (spherical)



Type C (cylindrical)

Type D (cylindrical)



Optional Accessories

Order No.	Type	Description
05CZA662	B	Connecting cable for series 395 (1 m)
05CZA663	B	Connecting cable for series 395 (2 m)
06AFM380B	B	USB Input Tool Direct (2 m)
02AZD790B	B	Connecting cables for U-WAVE-T (160 mm)
02AZE140B	B	Connecting cables 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/ buzzer	Connecting unit for U-WAVE-TM/TMB

Anvil shape

Unit: mm

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

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

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

- Spindle face: Carbide.
- **Series 395:** IP65 digimatic model.
- Equipped with Ratchet Stop for constant measuring force.



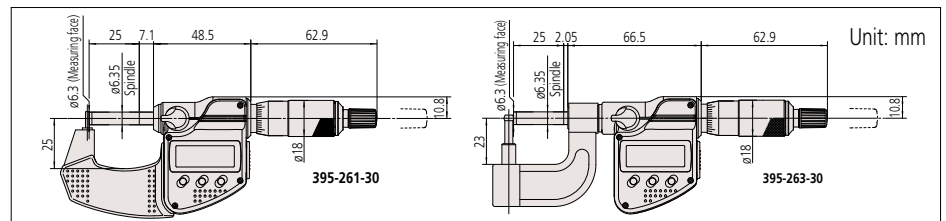
SPECIFICATIONS

Metric				
Order No.	Range (mm)	Resolution (mm)	Maximum permissible error J_{MPE} (µm)	Remarks
Digimatic (LCD)				
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				
Order No.	Range (in)	Resolution	Maximum permissible error J_{MPE} (in)	Remarks
Digimatic (LCD)				
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

- Battery: SR44 (1 pc.), **938882**, for initial operational checks (standard accessory)
 - Battery life: Approx. 2.4 years under normal use
 - Length standard: Electromagnetic rotary sensor
 - Standard accessories: Spanner (**301336**), 1 pc.
- Note: For functional details, refer to page B-7.
Optional connecting cable is available only for water-proof type (Digimatic model).

DIMENSIONS



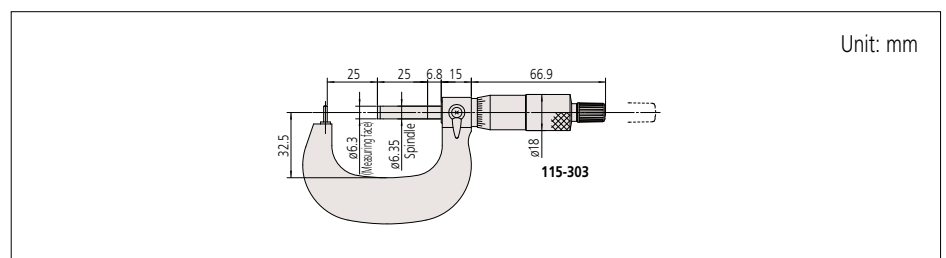
SPECIFICATIONS

Metric				
Order 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				Type A
115-309	25 - 50	0.01	±3	Type B
115-315				Type C
115-316	0 - 25	0.01	±3	Type D

Inch				
Order 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				Type C
115-314		0.0001		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.
- Equipped with Ratchet Stop for constant measuring force.



SPECIFICATIONS

Metric

Order No.	Range (mm)	Resolution (mm)	Maximum permissible error J_{MPE} (μ m)	Flatness (μ m)	Parallelism (μ m)	Remarks
Digimatic (LCD)						
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			
331-262-30	25 - 50					
331-263-30	50 - 75					
331-264-30*	75 - 100	± 3	3			

Inch / Metric

Order No.	Range (in)	Resolution	Maximum permissible error J_{MPE} (in)	Flatness (in)	Parallelism (in)	Remarks
Digimatic (LCD)						
331-351-30	0 - 1	0.00005 in/ 0.001 mm	± 0.0001	0.000012	0.00008	Type A
331-352-30	1 - 2					
331-353-30	2 - 3					
331-354-30	3 - 4		± 0.00015		0.00012	Type B
331-361-30	0 - 1		± 0.0001			
331-362-30	1 - 2					
331-363-30	2 - 3					
331-364-30	3 - 4	± 0.00015	0.00012			

- Battery: SR44 (1 pc.), **938882**, for initial operational checks (standard accessory)
- Battery life: Approx. 2.4 years under normal use
- Length standard: 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.

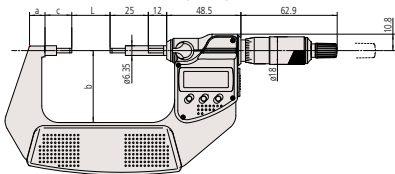
Note: For functional details, refer to page B-7.

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

DIMENSIONS

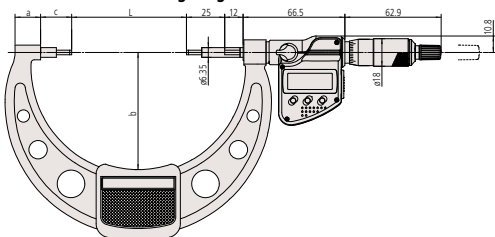
Digimatic models

Models up to 75 mm measuring range



Digimatic models

Models over 75 mm measuring range



Order 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	20.3
331-253-30	75	16.7	76	
331-254-30				
331-264-30				

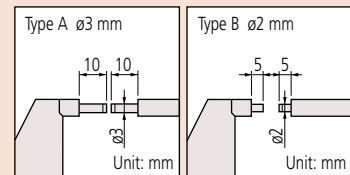
MeasurLink[®] ENABLED
Data Management Software by Mitutoyo

U-WAVE^{fit}



Dust- and
Water-
Protected
www.tuv.com
ID 000040791

Measurement example



Optional Accessories

Order No.	Type	Description
05CZA662	B	Connecting cable (1 m)
05CZA663	B	Connecting cable (2 m)
06AFM380B	B	USB Input Tool Direct (2 m)
02AZD790B	B	Connecting cables for U-WAVE-T (160 mm)
02AZE140B	B	Connecting cables 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/ buzzer	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.
- Equipped with Ratchet Stop for constant measuring force.



111-115

SPECIFICATIONS

Metric						
Order No.	Range (mm)	Graduation (mm)	Maximum permissible error J_{MPE} (μ m)	Flatness (μ m)	Parallelism (μ m)	Remarks
Analog						
111-215	0 - 25	0.01	± 3	0.3	2	Type B
111-115	0 - 25					
111-116	25 - 50					
111-117	50 - 75					
111-118	75 - 100		± 4		3	Type A
111-119	100 - 125					
111-120	125 - 150					
111-121	150 - 175					
111-122	175 - 200		± 5		4	
111-123	200 - 225					
111-124	225 - 250					
111-125	250 - 275					
111-126	270 - 300	± 6	5			
Mechanical counter model						
131-115	0 - 25	0.01	± 3	0.3	2	Type A

Inch						
Order No.	Range (in)	Graduation (in)	Maximum permissible error J_{MPE} (in)	Flatness (in)	Parallelism (in)	Remarks
Analog						
111-166	0 - 1	0.0001	± 0.00015	0.000012	0.00008	Type A

• 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

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

Micrometer

Point Micrometers SERIES 342

- Ideal tool for measuring drill web diameters, small grooves and other hard-to-reach points.
- The measuring points (carbide tipped) have approximately 0.3 mm radius.
- IP65 Digimatic micrometers.
- Equipped with Ratchet Stop for constant measuring force.



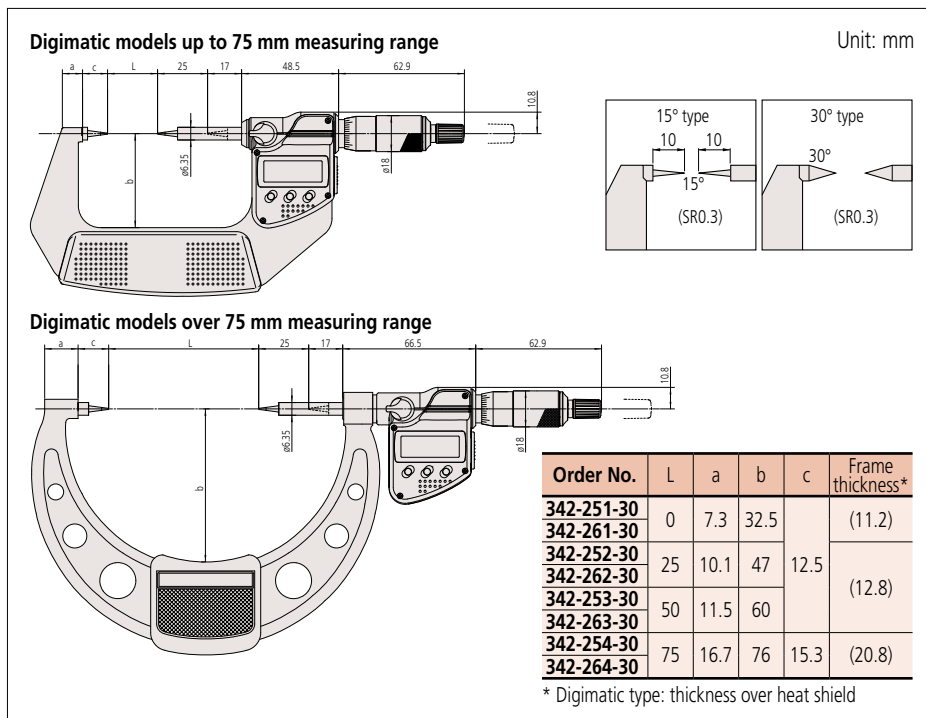
342-251-30

SPECIFICATIONS

Metric					Inch/Metric				
Order No.	Range (mm)	Resolution (mm)	Maximum permissible error J_{MPE} (μ m)	Point	Order No.	Range (in)	Resolution	Maximum permissible error J_{MPE} (in)	Point
Digimatic (LCD) (With carbide tip)					Digimatic (LCD) (With carbide tip)				
342-251-30	0 - 25	0.001	± 2	15°	342-351-30	0 - 1	0.00005 in/ 0.001 mm	± 0.0001	15°
342-252-30	25 - 50				342-352-30	1 - 2			
342-253-30	50 - 75		342-353-30	2 - 3					
342-254-30*	75 - 100		342-354-30	3 - 4					
342-261-30	0 - 25	0.001	± 3	30°	342-361-30	0 - 1	0.00005 in/ 0.001 mm	± 0.00015	30°
342-262-30	25 - 50				342-362-30	1 - 2			
342-263-30	50 - 75		342-363-30	2 - 3					
342-264-30*	75 - 100		342-364-30	3 - 4					

- Battery: SR44 (1 pc.), **938882**, for initial operational checks (standard accessory)
 - Battery life: Approx. 2.4 years under normal use
 - Length standard: 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 B-7.
Optional connecting cable is available only for water-proof type (Digimatic model).

DIMENSIONS



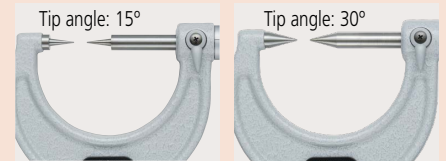
MeasurLink ENABLED
Data Management Software by Mitutoyo

U-WAVE fit



Dust- and
Water-
Protected
www.tuv.com
ID 0000640191

Measurement example



Optional Accessories

Order No.	Type	Description
05CZA662	B	Connecting cable (1 m)
05CZA663	B	Connecting cable (2 m)
06AFM380B	B	USB Input Tool Direct (2 m)
02AZD790B	B	Connecting cables for U-WAVE-T (160 mm)
02AZE140B	B	Connecting cables 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/ buzzer	Connecting unit for U-WAVE-TM/TMB

Point Micrometers SERIES 112, 142

- Ideal tool for measuring drill web diameters, small grooves and other hard-to-reach points.
- The measuring points (carbide tipped) have approximately 0.3 mm radius.
- Equipped with Ratchet Stop for constant measuring force.



112-201

SPECIFICATIONS

Metric					
Order No.	Range (mm)	Graduation (mm)	Maximum permissible error J_{MPE} (μ m)	Point	
Analog					
112-153	0 - 25	0.01	± 3	15°	
112-154	25 - 50				
112-155	50 - 75				
112-156	75 - 100				
112-201	0 - 25		± 3	30°	
112-202	25 - 50				
112-203	50 - 75				
112-204	75 - 100				
Analog (With carbide tip)					
112-165	0 - 25		0.01	± 3	15°
112-166	25 - 50				
112-167	50 - 75				
112-168	75 - 100				
112-213	0 - 25	± 3		30°	
112-214	25 - 50				
112-215	50 - 75				
112-216	75 - 100				
Mechanical counter model					
142-153	0 - 25	0.01		± 3	15°
142-201					30°

Inch							
Order 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						
112-225	0 - 1						
112-226	1 - 2						
Analog (With carbide tip)							
112-189	0 - 1		0.001	± 0.00015	15°		
112-190	1 - 2						
112-191	2 - 3						
112-237	0 - 1						
112-238	1 - 2			± 0.00015	30°		
Mechanical counter model							
142-177	0 - 1				0.001	± 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

Analog models measuring range

Unit: mm

Order No.	L	a	b	c	Frame thickness
112-153	0	10	38	12.5	(9)
112-154	25	12	49		(10)
112-155	50	14	60		(11)
112-156	75	16.7	79		(13)

Micrometer

V-Anvil Micrometers SERIES 314 — 3 Flutes and 5 Flutes

- Measures the outside diameter of taps and reamers with an odd number of flutes.
- Measures pitch diameter: refer to "Quick Guide to Precision Measuring Instruments" on page B-80.
- Measuring faces: Carbide.
- Equipped with Ratchet Stop for constant measuring force.



314-251-30

SPECIFICATIONS

Metric For 3-flute cutting tools						Inch / Metric For 3-flute cutting tools					
Order No.	Range (mm)	Resolution (mm)	Maximum permissible error J_{MPE} (μ m)	Anvil	Remarks	Order No.	Range (in)	Resolution	Maximum permissible error J_{MPE} (in)	Anvil	Remarks
Digimatic (LCD)											
314-251-30	1 - 15	0.001	± 4	60°	w/groove	314-351-30	0.05 - 0.6	0.00005 in/ 0.001 mm	± 0.0002	60°	w/groove
314-252-30	10 - 25				—						
314-253-30	25 - 40				± 5	—					
314-261-30	1 - 15				± 4	—					
314-262-30	10 - 25				—	—					

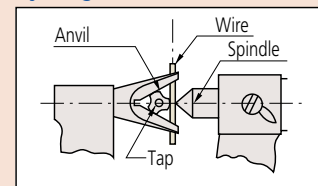
- Flatness: 0.3 μ m/0.000012 in (Spindle), 1.0 μ m/0.00004 in (Anvil)
- Battery: SR44 (1 pc.), **938882**, for initial operational checks (standard accessory)
- Battery life: Approx. 2.4 years under normal use
- Length standard: Electromagnetic rotary sensor
- Standard accessories: Spanner (**301336**), 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 B-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.

Measurement example



Pitch Diameter Measurement of Tap by Single-wire Method



Optional Accessories

Order No.	Type	Description
05CZA662	B	Connecting cable (1 m)
05CZA663	B	Connecting cable (2 m)
06AFM380B	B	USB Input Tool Direct (2 m)
02AZD790B	B	Connecting cables for U-WAVE-T (160 mm)
02AZE140B	B	Connecting cables 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/ buzzer	Connecting unit for U-WAVE-TM/TMB

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

- Measures the outside diameter of taps and reamers with an odd number of flutes.
- Measures pitch diameter: refer to "Quick Guide to Precision Measuring Instruments" on page B-80.
- Measuring faces: Carbide.
- Equipped with Ratchet Stop for constant measuring force.



114-121

SPECIFICATIONS

Metric For 3-flute cutting tools							
Order 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		± 4		w/groove		
114-102	10 - 25		± 5		—		
114-103	25 - 40		± 6		—		
114-104	40 - 55		± 7		—		
114-105	55 - 70		± 7		—		
114-106	70 - 85		± 7		—		
114-161	1 - 15		± 4		—		
114-162	10 - 25		± 4		—		

Inch For 3-flute cutting tools						
Order 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		—	
114-113	1 - 1.6		± 0.00025	—		
114-114	1.6 - 2.2	± 0.0003	—	—		

Metric For 5-flute cutting tools							
Order 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		± 4		w/groove		
114-122	25 - 45		± 5		—		
114-123	45 - 65		± 6		—		
114-124	65 - 85		± 7		—		
114-165	5 - 25		± 4		—		

Inch For 5-flute cutting tools					
Order 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°	—

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

DIMENSIONS

Unit: mm

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

Micrometer

Blade Micrometers SERIES 422 — Non-Rotating Spindle Type

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



SPECIFICATIONS

Metric						
Order No.	Range (mm)	Resolution (mm)	Maximum permissible error J_{MPE} (μm)	Parallelism (μm)	Remark	
Digimatic (LCD)						
422-230-30	0 - 25	0.001	±3	3	Type A	
422-231-30	25 - 50					
422-232-30	50 - 75					
422-233-30	75 - 100					
422-260-30	0 - 25		±3	3	Type B	
422-261-30	25 - 50					
422-270-30	0 - 25					Type C
422-271-30						

Inch / Metric						
Order No.	Range (in)	Resolution	Maximum permissible error J_{MPE} (in)	Parallelism (in)	Remark	
Digimatic (LCD)						
422-330-30	0 - 1	0.00005 in/ 0.001 mm	±0.00015	0.00015	Type A	
422-331-30	1 - 2					
422-332-30	2 - 3					
422-333-30	3 - 4					
422-360-30	0 - 1		±0.00015	0.00015	Type B	
422-361-30	1 - 2					
422-370-30	0 - 1					Type C
422-371-30						

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

Inch / Metric Quickmike type					
Order No.	Range (in)	Resolution	Maximum permissible error J_{MPE} (in)	Parallelism (in)	Remark
Digimatic (LCD)					
422-421-20	0 - 1.2	0.00005 in/ 0.001 mm	±0.00015	0.00015	Type A

- Battery: SR44 (1 pc.), **938882**, for initial operational checks (standard accessory)
- Battery life: Approx. 2.4 years under normal use (for **422-2XX, 3XX**)
Approx. 5 years under normal use (for **422-4XX**)
- Length standard: 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 B-7 Please note that these models are not water-proof.

Note 2: A heat shield is provided with Digimatic (LCD) as standard.

MeasurLink[®] ENABLED
Data Management Software by Mitutoyo

U-WAVE^{fit}

ABSOLUTE[™]

IP65

TÜV Rheinland
CERTIFIED

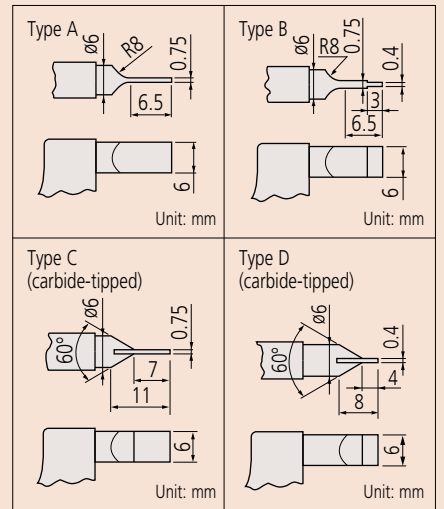
Quat- and
Water
Protected
www.tuv.com
ID: 0000000313

Applicable models:
series 422 Quickmike type

Measurement example



Type and Dimensions



Optional Accessories

Order No.	Type	Description
05CZA662	B	Connecting cable (1 m)
05CZA663	B	Connecting cable (2 m)
06AFM380B	B	USB Input Tool Direct (2 m)
02AZD790B	B	Connecting cables for U-WAVE-T (160 mm)
02AZE140B	B	Connecting cables 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/ buzzer	Connecting unit for U-WAVE-TM/TMB*

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

Micrometer

Blade Micrometers SERIES 122 — Non-Rotating Spindle Type

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



122-101-10

SPECIFICATIONS

Metric					
Order 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				
122-103-10	50 - 75				
122-104-10	75 - 100				
122-105-10	100 - 125				
122-106-10	125 - 150				
122-107-10	150 - 175		± 4	4	
122-108-10	175 - 200				
122-109-10	200 - 225				
122-110-10	225 - 250		± 5	5	
122-115-10	250 - 275				
122-116-10	275 - 300		± 6	6	
122-111-10	0 - 25				
122-112-10	25 - 50	± 3	3	Type B	
Analog (With carbide tip)					
122-161-10	0 - 25	0.01	± 3	3	Type C
122-162-10	25 - 50				Type D
122-141-10	0 - 25				
122-142-10	25 - 50				

Inch					
Order 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				
122-127-10	2 - 3		± 0.0002	0.0002	
122-128-10	3 - 4				
122-135-10	0 - 1		± 0.00015	0.00015	Type B
122-151-10					Type D

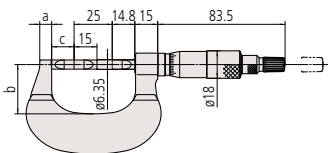
• Standard accessories: Setting standard, 1 pc. (except for measuring range 0 to 25 mm (0 to 1 in) models)
Spanner (301336), 1 pc.

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

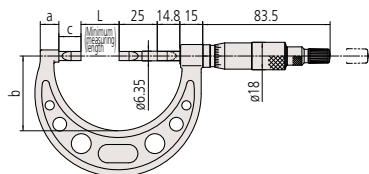
DIMENSIONS

Analog models up to 25 mm measuring range

Unit: mm



Analog models over 25 mm to 300 mm measuring range



Order No.	L	a	b	C
122-101-10	0	7.8	32	15
122-102-10	25	12.2	49	14.5
122-103-10	50	14.6	60	
122-104-10	75	16.7	79	17.5
122-105-10	100	18.8	94	17.9
122-106-10	125	19.1	106	18.3
122-107-10	150	18.2	118	18.5
122-108-10	175	16.8	130	18.9
122-109-10	200	18	143	17.7
122-110-10	225		156	18.7
122-115-10	250		169	
122-116-10	275		181	

Can Seam Micrometers SERIES 147

Measurement example



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



147-103

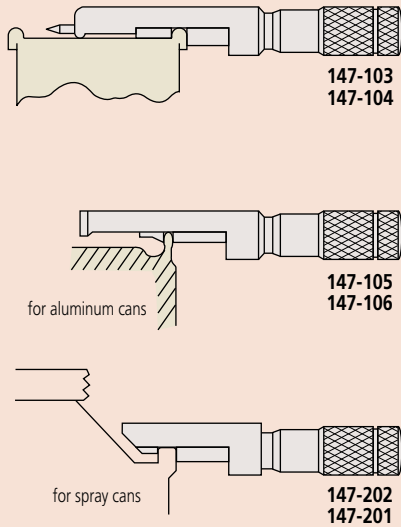
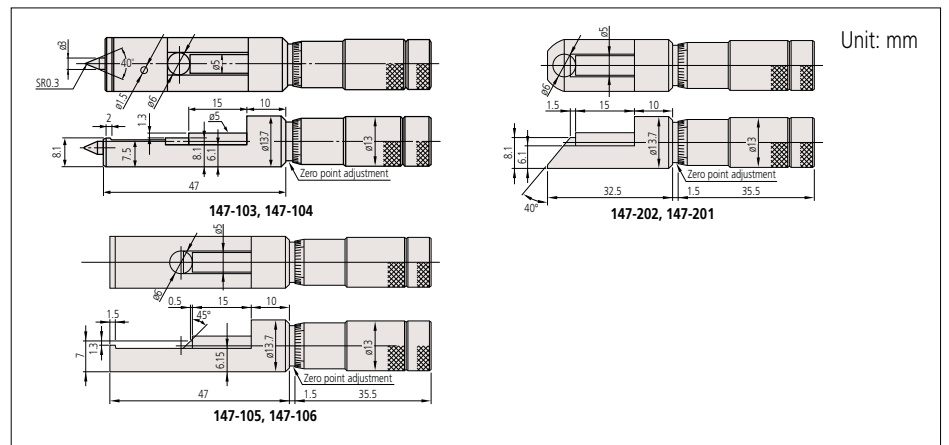
SPECIFICATIONS

Metric				
Order 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				
Order 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.

DIMENSIONS



Hub Micrometers SERIES 147

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



147-301

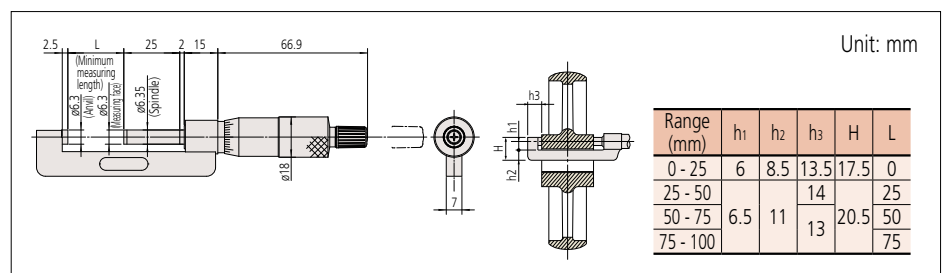
SPECIFICATIONS

Metric					
Order 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					
Order No.	Range (in)	Graduation (in)	Maximum permissible error J_{MPE} (in)	Flatness (in)	Parallelism (in)
147-351	0 - 1	0.001	± 0.0001	0.00024	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



Measurement example



Micrometer

Crimp Height Micrometers SERIES 342

- Measures the height of crimp contacts.
- Equipped with Ratchet Stop for constant measuring force.
- IP65 water/dust protection (Digimatic model).
- Model **342-451-20** is a Quickmike type model with spindle feed of 10 mm per thimble rotation.



Digimatic (LCD)
342-271-30



Quickmike type (LCD)
342-451-20

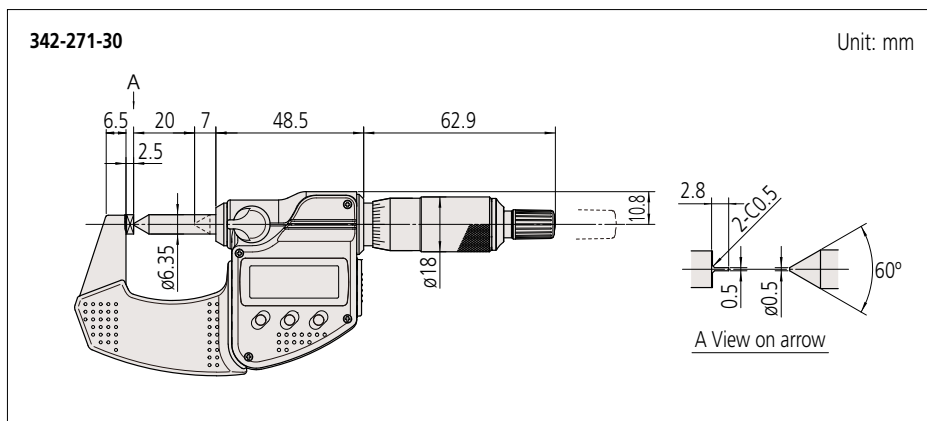
SPECIFICATIONS

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

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

- Battery: SR44 (1 pc.), **938882**, for initial operational checks (standard accessory)
 - 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**)
 - Length standard: 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 B-7
Optional connecting cable is available only for water-proof type (Digimatic model).

DIMENSIONS



MeasurLink[®] ENABLED Data Management Software by Mitutoyo **U-WAVE fit**

ABSOLUTE[™] IP65



Dust- and Water-Protected
www.tuv.com
ID: 000000191

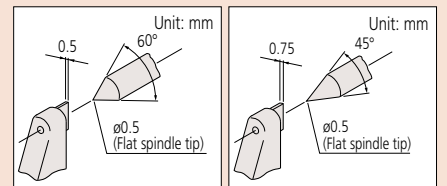


Dust- and Water-Protected
www.tuv.com
ID: 000000193

Measurement example



Anvil and spindle tip detail



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

Optional Accessories

Order No.	Type	Description
05CZA662	B	Connecting cable (1 m)
05CZA663	B	Connecting cable (2 m)
06AFM380B	B	USB Input Tool Direct (2 m)
02AZD790B	B	Connecting cables for U-WAVE-T (160 mm)
02AZE140B	B	Connecting cables 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/ buzzer	Connecting unit for U-WAVE-TM/TMB*

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

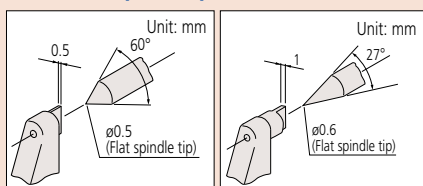
Crimp Height Micrometers SERIES 112,142

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



112-401

Anvil and spindle tip detail



112-401

142-402, 142-403

SPECIFICATIONS

Metric			
Order 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			
Order 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

- A selection of interchangeable anvils (rod anvils and V-anvils) enables measurement of tube thickness, rivet head height and similar features just by replacing the anvil to suit.
- IP65 water/dust protection (**series 317**).
- Equipped with Ratchet Stop for constant measuring force.



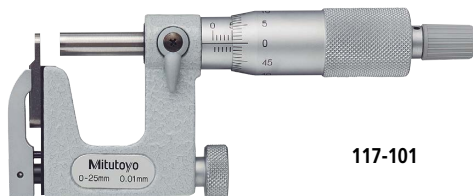
317-251-30

SPECIFICATIONS

Metric					
Order No.	Range (mm)	Resolution (mm)	Spindle feed error (µm)	Flatness (µm)	Parallelism (µm)
Digimatic (LCD)					
317-251-30	0 - 25	0.001	3	0.6 (Spindle face)/ 2 (Anvil face)	3
317-252-30	25 - 50				
Inch / Metric					
Order No.	Range (in)	Resolution	Spindle feed error (in)	Flatness (in)	Parallelism (in)
Digimatic (LCD)					
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				

- Battery: SR44 (1 pc.), **938882**, for initial operational checks (standard accessory)
- Battery life: Approx. 2.4 years under normal use
- Length standard: 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 B-7
Optional connecting cable is available only for water-proof type (Digimatic model).



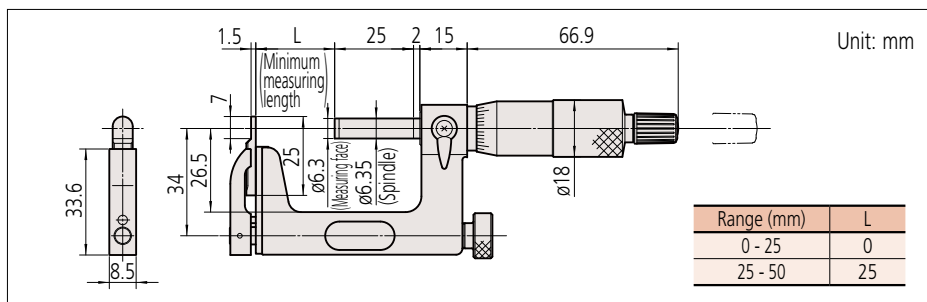
117-101

SPECIFICATIONS

Metric					
Order 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					
Order 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



MeasurLink ENABLED
Data Management Software by Mitutoyo

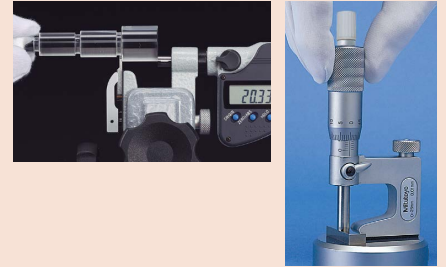
U-WAVE fit



Dust and Water-Protected
www.tuv.com
ID: 0000040191

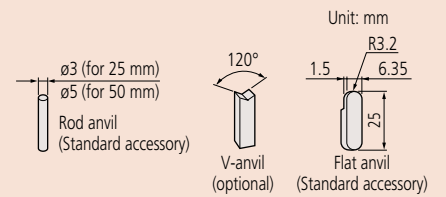
Applicable models: **series 317**

Measurement example



Optional Accessories

Order No.	Type	Description
05CZA662	B	Connecting cable (1 m)
05CZA663	B	Connecting cable (2 m)
06AFM380B	B	USB Input Tool Direct (2 m)
02AZD790B	B	Connecting cables for U-WAVE-T (160 mm)
02AZE140B	B	Connecting cables 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/ buzzer	Connecting unit for U-WAVE-TM/TMB



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

Limit Micrometers SERIES 113

Measurement example



- Dual-spindle design enables use as a GO/ \pm NG gage by setting upper and lower limits.
- Measuring faces: Carbide.



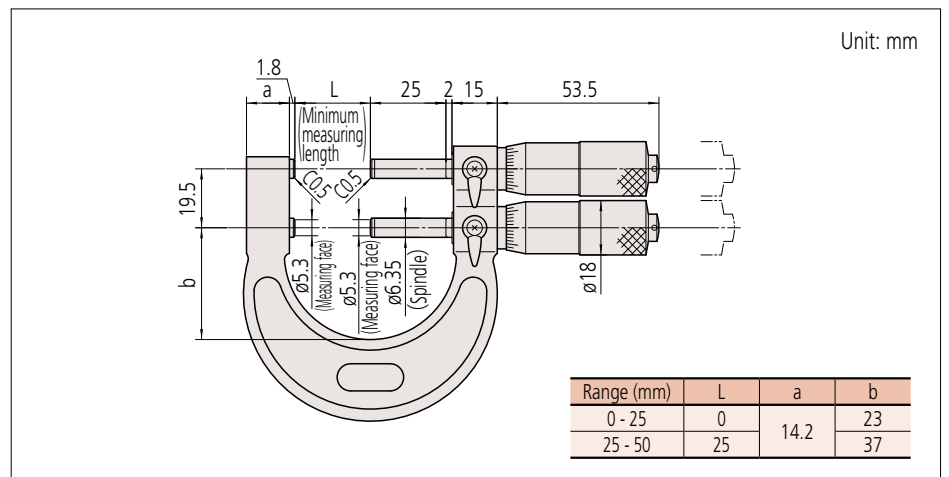
113-102

SPECIFICATIONS

Metric					
Order No.	Range (mm)	Graduation (mm)	Maximum permissible error J_{MPE} (μ m)	Flatness (μ m)	Parallelism (μ m)
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



Micrometer

Indicating Micrometers SERIES 510

- Suitable for pass/fail judgement of mass-produced components.
- Easy to use when operating one-handed due to retractable anvil.
- In the 25 mm measuring range, the model lineup offers a choice of 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.



510-121

SPECIFICATIONS

Metric												
Order 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

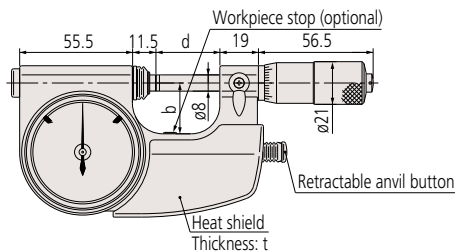
Inch												
Order No.	Range (in)	Spindle feed error (in)	Flatness (in)	Parallelism (in)	Dispersion of indication (in)	Dial indication accuracy (in)	Indicating range (in)	Graduation (in)	Dial graduation (in)	Measuring force (N)	Anvil retraction button	Mass (g)
510-131	0 - 1	0.00015	0.000012	0.000024	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

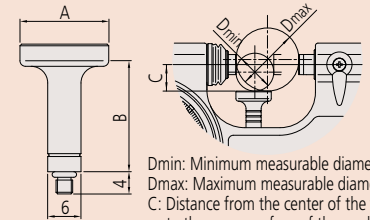


Workpiece Stop (optional)

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

Unit: mm

Range	A	B
Workpiece stop A 04AZA124	$\phi 16$	23
Workpiece stop B 04AZA125	$\phi 14$	20.5
Workpiece stop C 04AZA126	$\phi 14$	15



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

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

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

• 510-122 and 510-132

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

• 510-123 and 510-133

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

• 510-124 and 510-134

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

Measurement example



510-141

SPECIFICATIONS

Metric

Order 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			670								
510-123	50 - 75			820								
510-124	75 - 100			970								

Inch

Order 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	0.00012	0.000024	0.00002	0.00005	±0.0023	0.0001	0.00005	5 - 10	Left side	530
510-132	1 - 2			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



Dial Snap Meters SERIES 523

- Suitable for quick pass/fail inspection of mass-produced components.
- 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

Measurement example

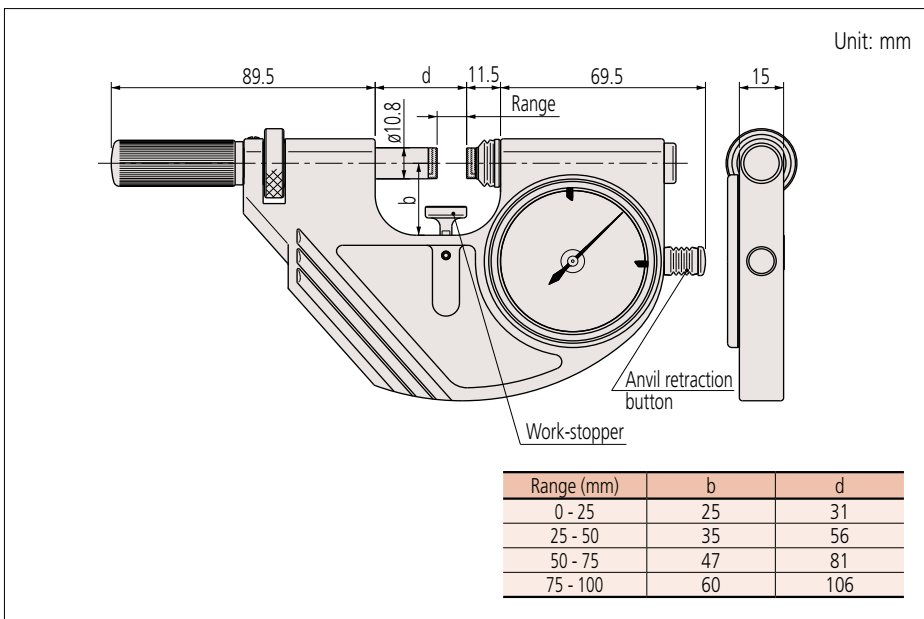


SPECIFICATIONS

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

Inch									
Order No.	Range (in)	Dial graduation (in)	Measuring force (N)	Flatness (in)	Parallelism (in)	Dispersion of indication (in)	Dial indication accuracy (in)	Indicating range (in)	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								840
523-133	2 - 3				950				
523-134	3 - 4				1080				

DIMENSIONS

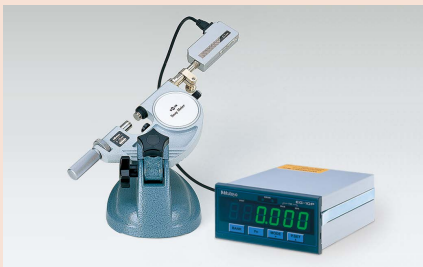


Snap Meters SERIES 523

Mounting example



ABS Digimatic Indicator



Linear Gage and counter

Typical Indicators Used with Gage

- ID-C (0.001 mm)/543-390B
- LGF-L (0.0001 mm)/542-181 & Counter 542-015

- Suited for the measurement of mass-produced parts.
- Various indicators (optional) are available to suit accuracy and resolution requirements.
- Measuring faces: Carbide.



523-141
(Indicator: optional)

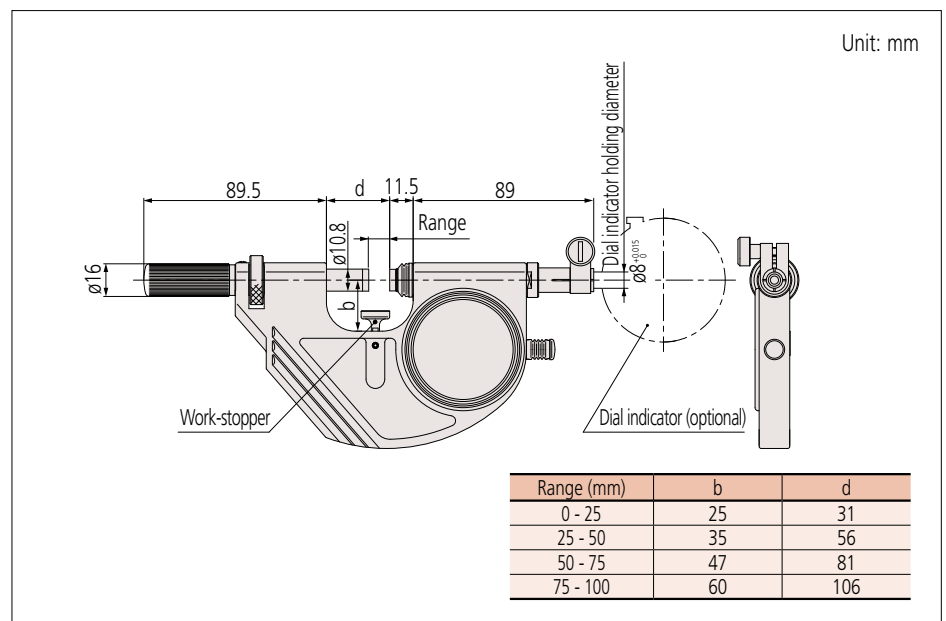
SPECIFICATIONS

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

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

* 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

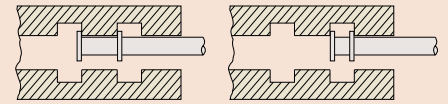
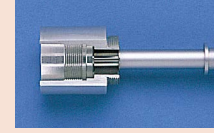
Groove Micrometers SERIES 146

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



146-221

Measurement example



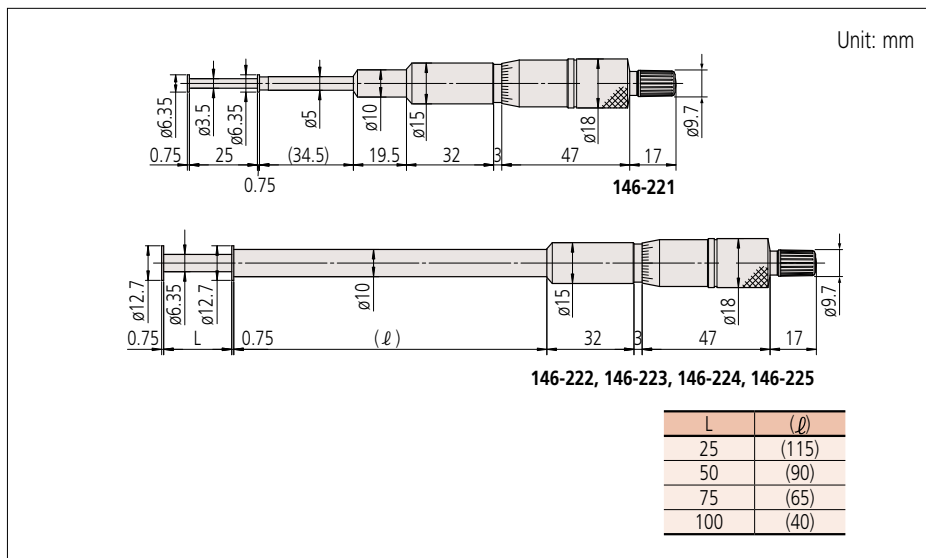
SPECIFICATIONS

Metric						
Order No.	Range Inside (mm)	Range Outside (mm)	Graduation (mm)	Maximum permissible error J_{MPE} (μm)	Parallelism (μm)	Flange (mm)
146-221	1.6 - 26.5	0 - 25	0.01	± 10	10	$\varnothing 6.35$
146-222						$\varnothing 12.7$
146-223	26.5 - 51.5	25 - 50				$\varnothing 12.7$
146-224	51.5 - 76.5	50 - 75				$\varnothing 12.7$
146-225	76.5 - 101.5	75 - 100				$\varnothing 12.7$

Inch						
Order No.	Range Inside (in)	Range Outside (in)	Graduation (in)	Maximum permissible error J_{MPE} (in)	Parallelism (in)	Flange (in)
146-231	0.055 - 1.05	0 - 1	0.001	± 0.0004	0.0004	$\varnothing 0.25$
146-232						$\varnothing 0.5$
146-233	1.05 - 2.05	1 - 2				$\varnothing 0.5$
146-234	2.05 - 3.05	2 - 3				$\varnothing 0.5$
146-235	3.05 - 4.05	3 - 4				$\varnothing 0.5$

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

DIMENSIONS



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 worn 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, compact, palm-sized device.
- Measurement of small, thin workpieces is possible by only a single operation.
- Electromagnetic induction type ABSOLUTE encoder is adopted.
- Built-in ABS (absolute) scale requires no zero-set every time the power is turned on. In addition, reliability has improved by eliminating overspeed errors.



700-119-30

SPECIFICATIONS

Metric				
Order No.	Range (mm)	Resolution (mm)	Accuracy* (mm)	Mass (g)
700-119-30	0 - 12	0.01	±0.02	100

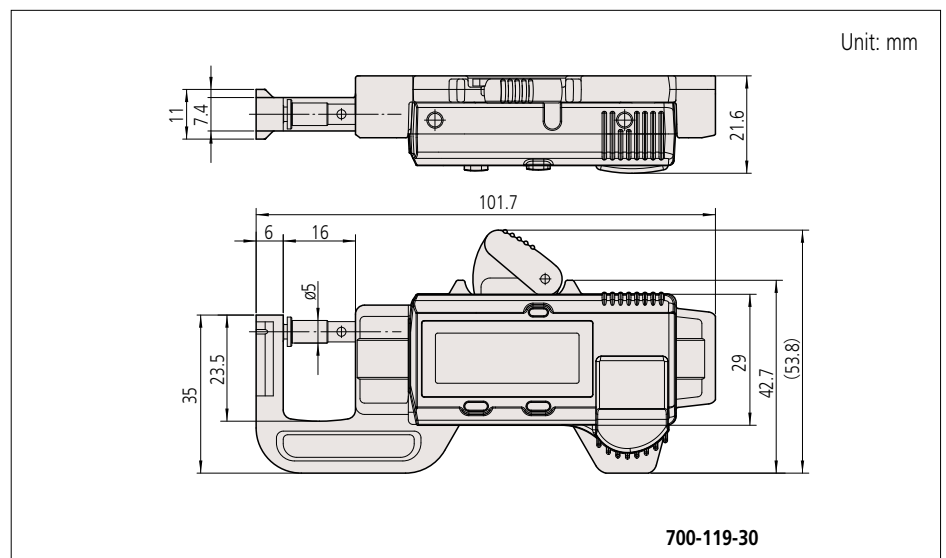
Inch / Metric				
Order No.	Range (in)	Resolution	Accuracy* (in)	Mass (g)
700-118-30	0 - 0.5	0.0005 in/0.01 mm	±0.001	100

• Battery: SR44 (1 pc.), **938882**, for initial operational checks (standard accessory)

• Battery life: Approx. 5 years under normal use

* Excluding quantizing error of ±1 count

DIMENSIONS



Micrometer

Telescoping Gage Set SERIES 155

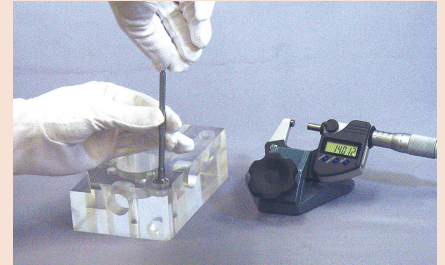
- A spring-loaded plunger expands within a bore (or groove) and is locked in place allowing measurement of diameter (or

width) with an outside micrometer after extraction.



155-905

Typical application



SPECIFICATIONS

Metric	
Order No.	Range (mm)
6-gage Set	
155-905	8 - 150
Gages included	
155-127	8 - 12.7
155-128	12.7 - 19
155-129	19 - 32
155-130	32 - 54
155-131	54 - 90
155-132	90 - 150

Inch	
Order No.	Range (in)
6-gage Set	
155-903	0.313 - 6
Gages included	
155-121	0.313 - 0.5
155-122	0.5 - 0.75
155-123	0.75 - 1.25
155-124	1.25 - 2.125
155-125	2.125 - 3.5
155-126	3.5 - 6

DIMENSIONS

Unit: mm

Range (mm)	L	øD	ød ₁	ød ₂
8 - 12.7	110	5	4	3
12.7 - 19		5.5	5	3.5
19 - 32				
32 - 54	150	8	7.5	6
54 - 90				
90 - 150				

Setting Standards for Outside Micrometers SERIES 167

Typical application



Micrometer Inspection Gauge Block Set

Refer to page E-11 for details.



516-152 / 153 / 154



Micro Checker (holder only)
516-607

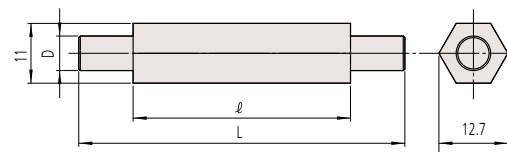
- Used for adjusting the reference point of outside micrometers.



167-108

SPECIFICATIONS and DIMENSIONS

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



Unit: mm

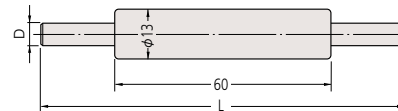
Metric

Order No.	Length <L> (mm)	Accuracy (μ m)	Parallelism (μ m)	Flatness (μ m)	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			40	

Inch

Order 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			40	

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



Unit: mm

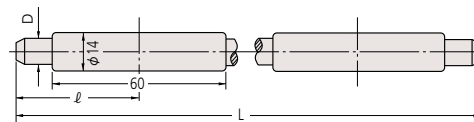
Metric

Order No.	Length <L> (mm)	Accuracy (μ m)	Parallelism (μ m)	Flatness (μ m)	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

Order 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

Order No.	Length <L> (mm)	Accuracy (μ m)	Parallelism (μ m)	Flatness (μ m)	ℓ (mm)	Diameter <D> (mm)
167-108	200	± 5.0	2.0	0.3	47	9.4
167-109	225	± 5.5			47	
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	

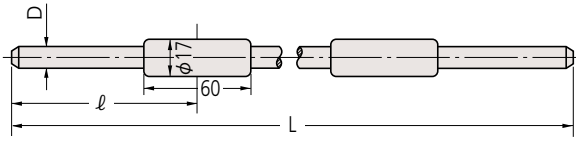
Inch

Order 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			47	
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	

Micrometer

Setting Standards for Outside Micrometers SERIES 167

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



Unit: mm

B

Metric						
Order No.	Length $\langle L \rangle$ (mm)	Accuracy (μm)	Parallelism (μm)	Flatness (μm)	ℓ (mm)	Diameter $\langle D \rangle$ (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						
Order No.	Length $\langle L \rangle$ (in)	Accuracy (in)	Parallelism (in)	Flatness (in)	ℓ (mm)	Diameter $\langle D \rangle$ (in)
167-160	20	± 0.0003	0.00008	0.00012	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

Setting Standards for Screw Thread Micrometers SERIES 167

Typical application



- Used for accurately setting screw thread micrometers at the start or end of the measuring range.



167-264
(60° screw)

Metric		
Order No.	Length (mm)	Accuracy (μm)
Metric (unified) $\theta=60^\circ$		
167-261	25	±4
167-262	50	±5
167-263	75	±6
167-264	100	±7
167-265	125	±8
167-266	150	±9
167-267	175	±10
167-268	200	±11
167-269	225	±12
167-270	250	±13
167-271	275	±14
Whitworth $\theta=55^\circ$		
167-272	25	±4
167-273	50	±5
167-274	75	±6
167-275	100	±7
167-276	125	±8
167-277	150	±9
167-278	175	±10
167-279	200	±11
167-280	225	±12
167-281	250	±13
167-282	275	±14

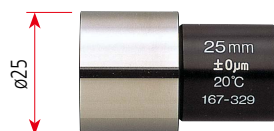
Inch		
Order No.	Length <L> (in)	Accuracy (in)
Metric (unified) $\theta=60^\circ$		
167-294	1	±0.00015
167-295	2	±0.0002
167-296	3	±0.00025
167-297	4	±0.0003
167-298	5	±0.00035
167-299	6	±0.0004
Whitworth $\theta=55^\circ$		
167-283	1	±0.00015
167-284	2	±0.0002
167-285	3	±0.00025
167-286	4	±0.0003
167-287	5	±0.00035
167-288	6	±0.0004

Setting Standards for V-Anvil Micrometers SERIES 167

Typical application



- Specially designed for accurately setting V-anvil micrometers.



167-329

Metric			
Order No.	Length (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	
167-335	115		
167-336	130		

Inch			
Order 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

Micrometer

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 B-81.
- Each set consists of 4 sizes to aid in testing parallelism at various angular positions of the micrometer spindle.



157-903

SPECIFICATIONS

Metric						
Order No.	Range of micrometer to be checked (mm)	Sizes of parallels included in set (mm)	Diameter (mm)	Flatness (μm)	Parallelism (μm)	Remarks (mm)
157-903	0 - 25	12.00, 12.12, 12.25, 12.37	ø30	0.1	0.2	For 25
157-904	25 - 50	25.00, 25.12, 25.25, 25.37				For 50

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

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

Metric		Metric	
Order No.	Thickness (mm)	Order No.	Thickness (mm)
157-101	12.00	157-105	25.00
157-102	12.12	157-106	25.12
157-103	12.25	157-107	25.25
157-104	12.37	157-108	25.37

Inch		Inch	
Order No.	Thickness (in)	Order No.	Thickness (in)
157-109	0.5000	157-113	1.0000
157-110	0.5062	157-114	1.0062
157-111	0.5125	157-115	1.0125
157-112	0.5187	157-116	1.0187

Optical Flats SERIES 158

- Used for inspecting the flatness of very flat surfaces. For details, refer to "Quick Guide to Precision Measuring Instruments" on page B-81.



158-118

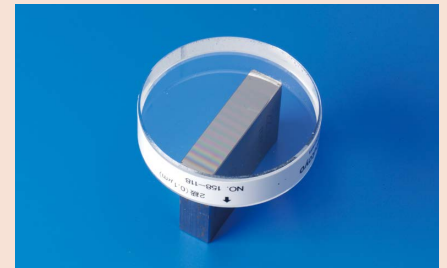
SPECIFICATIONS

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

Typical application



Typical application



3-Wire Units SERIES 313

Measurement example



- Attached to the measuring faces of both the spindle and anvil of the micrometer, enables measurement of pitch diameter of screw threads.
- Determination of the pitch diameter: refer to "Quick Guide to Precision Measuring Instruments" on page B-80.



SPECIFICATIONS

Order No. (One pair) (Support spindle dia.)	Wire dia. (mm)	Accuracy of wire diameter (mm)	Pitch		
			Metric thread (mm)	Unified thread (threads per inch)	Whitworth thread (threads per inch)
6.35 mm (0.25 in)					
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

Order 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.

Micrometer Oil

- Lubrication and rust-prevention oil.



SPECIFICATIONS

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

* Not available in certain countries and regions.

Micrometer

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.



Mounting example



SPECIFICATIONS

Analog type: 0 to 300 mm

Order No.		Color	Material
Ratchet	Speeder		
04GZA239	04GAA260	Gray	Plastic
985056	301708	Black	
985061	301709	Red	
985081	301713	Blue	
985071	301711	Yellow	
985076	301712	Green	
985066	301710	Brown	
950700	—	Gray	Steel

Analog/Digimatic types: 300 to 1000 mm

Order No.		Color	Material
Ratchet	Speeder		
04GZA243	04GAA260	Gray	Plastic
—	301708	Black	
—	301709	Red	
—	301713	Blue	
—	301711	Yellow	
—	301712	Green	
—	301710	Brown	
950701	—	Gray	Steel

Digimatic type 0 to 300 mm*

Order No.*		Color	Material
Ratchet	Speeder		
04AZB661	04GAA260	Gray	Plastic
04GZA241	04GAA260	Gray	
—	301708	Black	
—	301709	Red	
—	301713	Blue	
—	301711	Yellow	
—	301712	Green	
—	301710	Brown	
951588	—	Gray	Steel

* Cannot be used for analog types.

Color-coded speeder covers



SPECIFICATIONS

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

Mounting example



Micrometer Stands SERIES 156

Typical application



156-101-10

- Dedicated stand for micrometers.



156-101-10

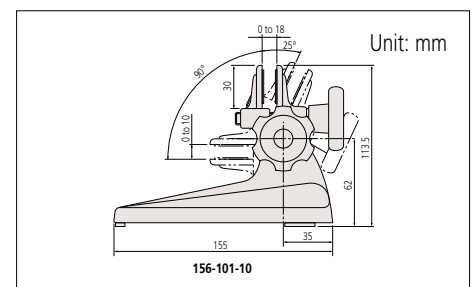
- Designed to allow benchtop use of hand micrometers or other gages which have frames suitable for gripping by the clamp. Reduces the influence of temperature changes due to body heat, enabling higher-accuracy measurement.

SPECIFICATIONS

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

* Items that cannot be mounted on these stands (Order 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

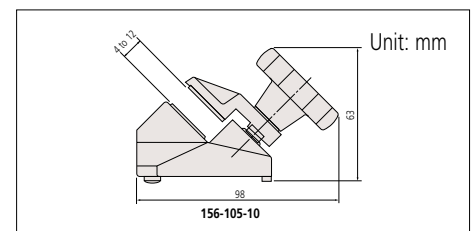
SPECIFICATIONS

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



156-105-10

DIMENSIONS



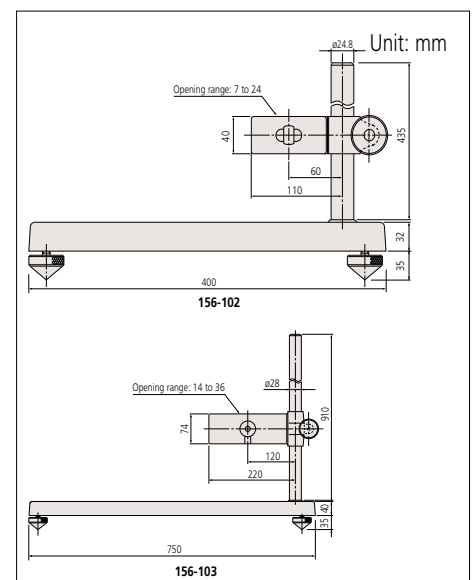
SPECIFICATIONS

Order 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

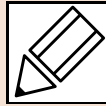


156-102

DIMENSIONS



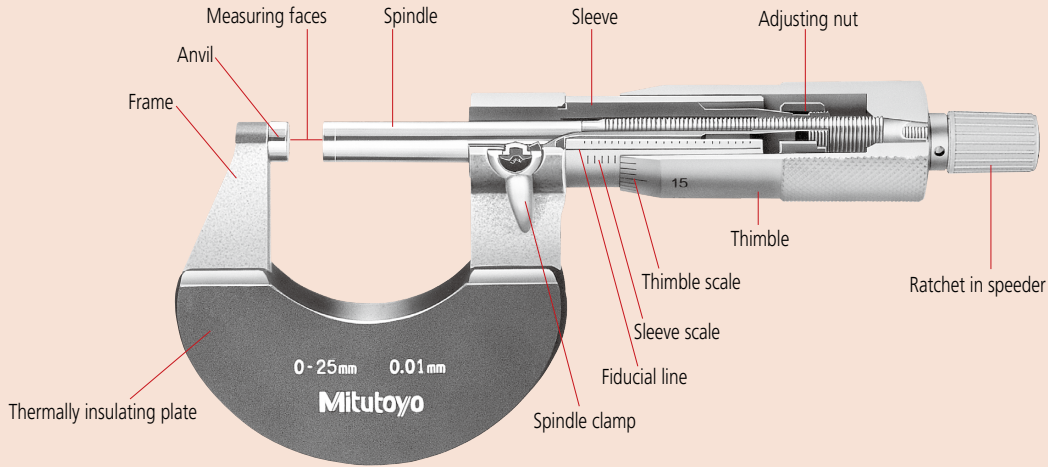
Quick Guide to Precision Measuring Instruments



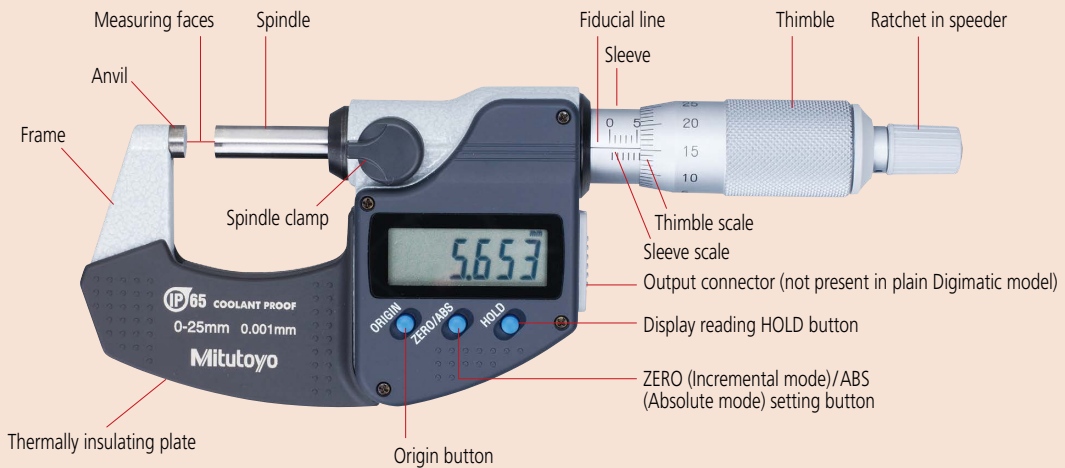
Micrometers

Nomenclature

Standard Analog Outside Micrometer

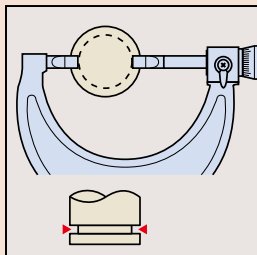


Digimatic Outside Micrometer



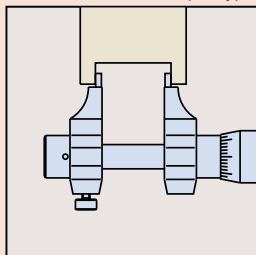
Special Purpose Micrometer Applications

Blade micrometer



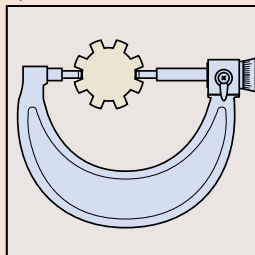
For inside diameter, and narrow groove measurement

Inside micrometer, caliper type



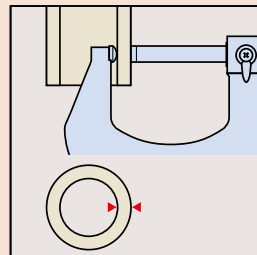
For small internal diameter, and groove width measurement

Spline micrometer



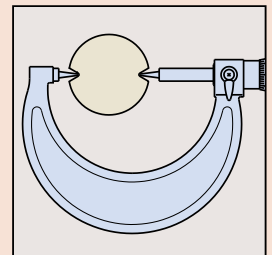
For splined shaft diameter measurement

Tube micrometer



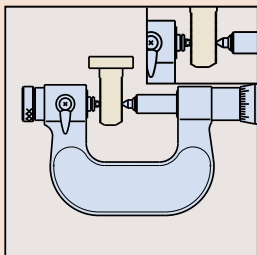
For pipe thickness measurement

Point micrometer



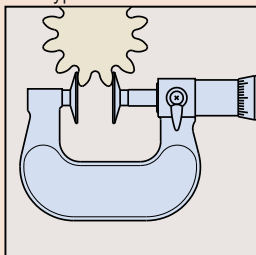
For root diameter measurement

Screw thread micrometer



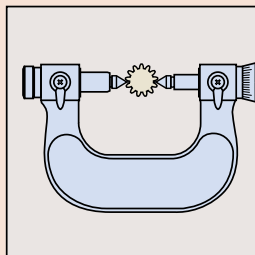
For effective thread diameter measurement

Disc type outside micrometer



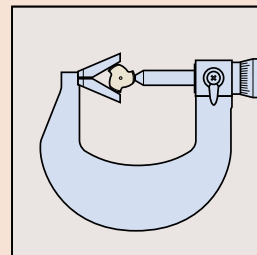
For root tangent measurement on spur gears and helical gears.

Ball tooth thickness micrometer



Measurement of gear over-pin diameter

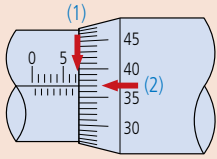
V-anvil micrometer



For measurement of 3- or 5-flute cutting tools

How to Read the Scale

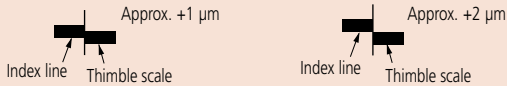
Micrometer with standard scale (graduation: 0.01 mm)



- (1) Sleeve scale reading 7. mm
 - (2) Thimble scale reading +0.37 mm
- Micrometer reading 7.37 mm

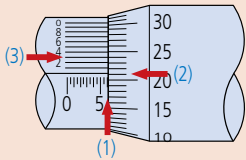
Note: 0.37 mm (2) is read at the position where the sleeve fiducial line is aligned to the thimble graduations.

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)

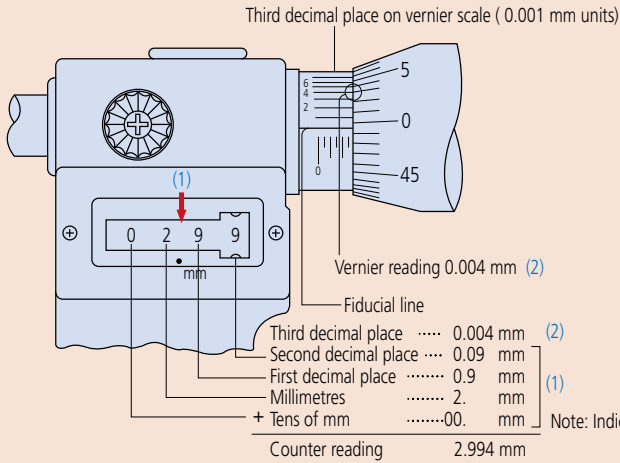
The vernier scale provided above the sleeve index line enables direct readings to be made to within 0.001 mm.



- (1) Sleeve scale reading 6. mm
 - (2) Thimble scale 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)

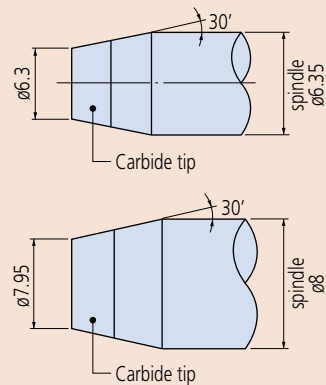


Note: 0.004 mm (2) is read at the position where a vernier graduation line corresponds with one of the thimble graduation lines.

Measuring Force Limiting Device

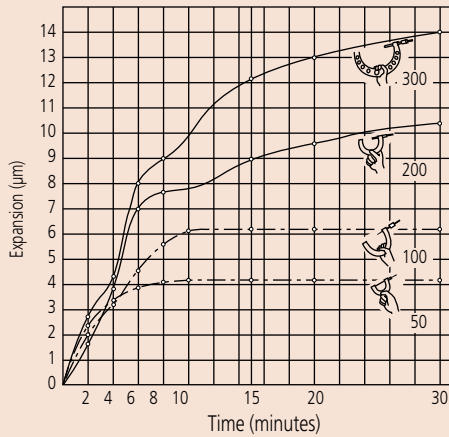
	Audible in operation	One-handed operation	Remarks
Ratchet stop	Yes	Unsuitable	Audible clicking operation causes micro-shocks
Friction thimble (F type)	No	Suitable	Smooth operation without shock or sound
Ratchet thimble	Yes	Suitable	Audible operation provides confirmation of constant measuring force

Measuring Face Detail



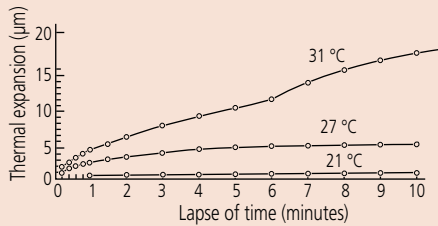
Note: The drawings above are for illustration only and are not to scale

Micrometer Expansion due to Holding Frame with the Bare Hand



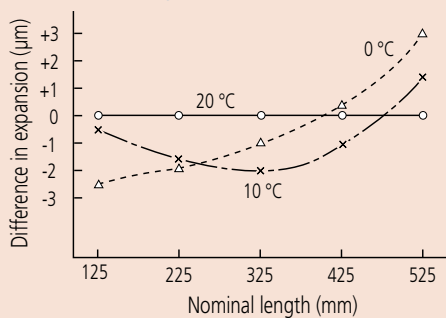
The above graph shows micrometer frame expansion due to heat transfer from hand to frame when the frame is held in the bare hand which, as can be seen, may result in a significant measurement error due to temperature-induced expansion. If the micrometer must be held by hand during measurement then try to minimize contact time. A heat insulator will reduce this effect considerably if fitted, or gloves may be worn. (Note that the above graph shows typical effects and is not guaranteed.)

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 also that it takes time until the expanded micrometer standard returns to the original length. (Note that the graph values are not guaranteed values but experimental values.)

Difference in Thermal Expansion between Micrometer and Length Standard



In the above experiment, after the micrometer and its standard were left at a room temperature of 20 °C for about 24 hours for temperature stabilization, the start point was adjusted using the micrometer standard. Then, the micrometer with its standard were left at the temperatures of 0 °C and 10 °C for about the same period of time, and the start point was tested for shift. The above graph shows the results for each of the sizes from 125 through 525 mm at each temperature. 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. (Note that the graph values are not guaranteed values but experimental values.)

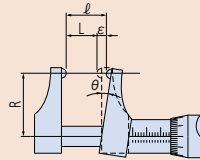
Effect of Changing Support Method and Orientation (Unit: µm)

Changing the support method and/or orientation of a micrometer after zero setting affects subsequent measuring results. The tables below highlight the measurement errors to be expected in three other cases after micrometers are zero-set in the 'Supported at the bottom and center' case. These actual results show that it is best to set and measure using the same orientation and support method.

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	-5.5
725	-9.5	-19.0
825	-5.0	-35.0
925	-14.0	-27.0
1025	-5.0	-40.0

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

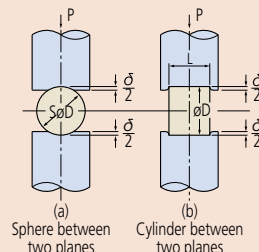
on the instrument's scale and this is an Abbe error ($\epsilon = l - L$ in the diagram). Spindle straightness error, play in the spindle guide or variation of measuring force can all cause (θ) to vary, and the error increases with R.

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.

Hertz's Formulae

Hertz's formulae give the apparent reduction in diameter of spheres and cylinders due to elastic compression when measured between plane surfaces. These formulae are 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: δ (μm)
 Diameter of sphere or cylinder: D (mm)
 Length of cylinder: L (mm)
 Measuring force: P (N)
 a) Apparent reduction in diameter of sphere
 $\delta_2 = 0.82 \sqrt{P^2/D}$
 b) Apparent reduction in diameter of cylinder
 $\delta_1 = 0.094 \cdot P/L \sqrt{1/D}$

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
Misaligned contact points	+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	±(3 + $\frac{L}{25}$) μm	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.	±8 μm assuming the error of half angle is ±23 minutes
Cumulative error	(±117+40) μm		+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°)

$$E = M - 3d + 0.866025P \quad \dots\dots(1)$$

Whitworth thread (55°)

$$E = M - 3.16568d + 0.960491P \quad \dots\dots(2)$$

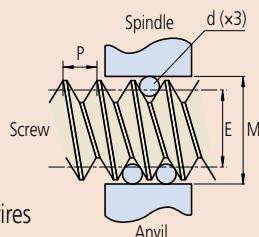
d = Wire diameter

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.	±18 μm assuming that the pitch error is 0.02 mm.	±3 μm
Error of half angle (workpiece)	1. Use the optimal wire diameter. 2. No correction is needed.	±0.3 μm	±0.3 μm
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.	±8 μm	±1 μm
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 μm	-1 μm
Cumulative error		In the worst case +20 μm -35 μm	When measured carefully +3 μm -5 μm

• One-wire method

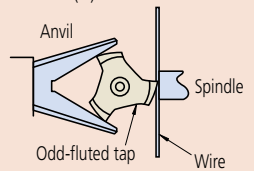
The pitch diameter of odd-fluted tap can be measured using the V-anvil micrometer with the one-wire method. Obtain the measured value (M₁) and calculate M with equation (3) or (4).

M₁ = Micrometer reading during one-wire measurement
D = Odd-fluted tap diameter

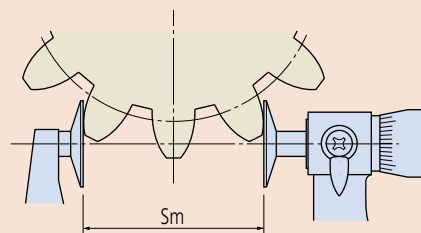
$$\text{Tap with three flutes: } M = 3M_1 - 2D \quad \dots\dots(3)$$

$$\text{Tap with five flutes: } M = 2.2360M_1 - 1.2360D \quad \dots\dots(4)$$

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):

$$Zm' = Z \cdot K(f) + 0.5 \quad (Zm \text{ is the integer closest to } Zm')$$

$$\text{where, } K(f) = \frac{1}{\pi} \{ \sec \alpha_0 \sqrt{(1+2f)^2 - \cos^2 \alpha_0} - \operatorname{inv} \alpha_0 - 2f \tan \alpha_0 \}$$

$$\text{and, } f = \frac{X}{Z}$$

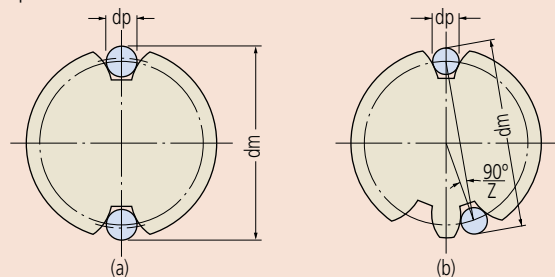
- m: Module
- α_0 : Pressure angle
- Z: Number of teeth
- X: Addendum modification coefficient
- Sm: Root tangent length
- Zm: Number of teeth within the root tangent length

$$\operatorname{inv} 20^\circ \cong 0.014904$$

$$\operatorname{inv} 14.5^\circ \cong 0.0055448$$

Gear Measurement

Over-pin method



For a gear with an even number of teeth:

$$dm = dp + \frac{dg}{\cos \alpha_0} = dp + \frac{Z \cdot m \cdot \cos \alpha_0}{\cos \alpha_0}$$

For a gear with an odd number of teeth:

$$dm = dp + \frac{dg}{\cos \alpha_0} \cdot \cos \left(\frac{90^\circ}{Z} \right) = dp + \frac{Z \cdot m \cdot \cos \alpha_0}{\cos \alpha_0} \cdot \cos \left(\frac{90^\circ}{Z} \right)$$

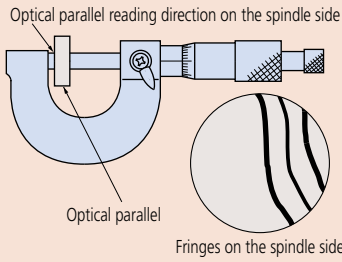
however,

$$\operatorname{inv} \theta = \frac{dp}{dg} - \frac{X}{Z} = \frac{dp}{Z \cdot m \cdot \cos \alpha_0} - \left(\frac{\pi}{2Z} - \operatorname{inv} \alpha_0 \right) + \frac{2 \tan \alpha_0}{Z} \cdot X$$

Obtain θ (inv θ) 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

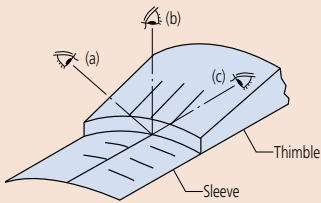


Parallelism can be estimated using an optical parallel held between the faces. First, wring the parallel to the anvil measuring face. Then close the spindle on the parallel using normal measuring force and count the number of red interference fringes seen on the measuring face of the spindle in white light. Each fringe represents a half wavelength difference in height ($0.32\ \mu\text{m}$ for red fringes).

In the above figure a parallelism of approximately $1\ \mu\text{m}$ is obtained from $0.32\ \mu\text{m} \times 3 = 0.96\ \mu\text{m}$.

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

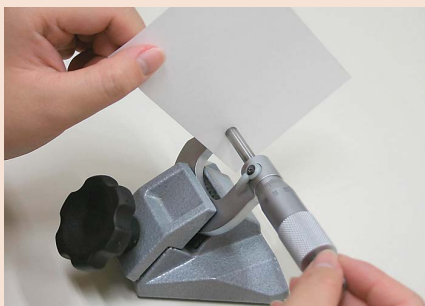


(b) Looking directly at the index line

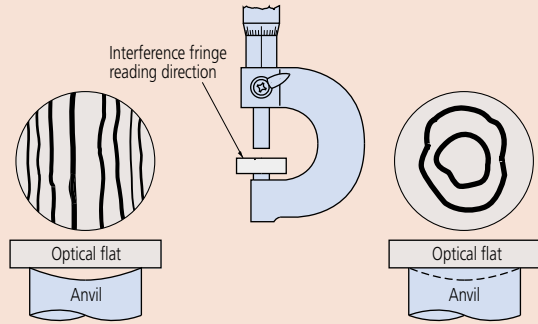


(c) From below the index line

- Wipe off the measuring faces of both the anvil and spindle with lint-free paper set the start (zero) point before measuring.



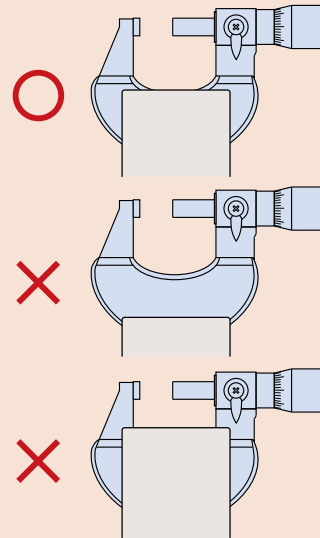
Testing Flatness of Micrometer Measuring Faces



Measuring face is curved by approximately $1.3\ \mu\text{m}$. ($0.32\ \mu\text{m} \times 4$ paired red fringes.)

Measuring face is concave (or convex) approximately $0.6\ \mu\text{m}$ deep. ($0.32\ \mu\text{m} \times 2$ continuous fringes)

- 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 it too tightly.



- Be careful not to drop or bump the micrometer on anything. Do not rotate the micrometer thimble using excessive force. If you believe a micrometer may have been damaged due to accidental mishandling, ensure that it is inspected for accuracy before further use.
- After a long storage period, or when there is no protective oil film visible, lightly apply anti-corrosion oil to the micrometer by wiping with a cloth soaked in it.
- 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.
 - When storing the micrometer, always leave a gap of 0.1 to $1\ \text{mm}$ between the measuring faces.
 - Do not store the micrometer in a clamped state.

Micrometer Performance Evaluation Method

JIS B 7502 was revised and issued in 2016 as the Japanese Industrial Standards of the micrometer, and the "Instrumental error" indicating the indication error of the micrometer has been changed to "Maximum Permissible Error (MPE) of indication".

The "Instrumental error" of the conventional JIS adopts acceptance criteria that the specification range (precision specification) equals acceptance range, and the OK/NG judgment does not include measurement uncertainty (Fig. 1). The "Maximum Permissible Error (MPE) of indication" of the new JIS employs the basic concept of the OK/NG judgment taking into account the uncertainty adopted in the ISO standard (ISO 14253-1).

The verification of conformity and nonconformity to the specifications is clearly stipulated to use the internationally recognized acceptance criteria (simple acceptance) when the specification range equals the acceptance range, and it is accepted that the specification range equals the acceptance range if a given condition considering uncertainty is met.

The above said internationally recognized acceptance criterion is ISO/TR 14253-6: 2012 (Fig. 2).

The following describes the standard inspection method including the revised content of JIS 2016.

Fig. 1 Conventional JIS Instrumental error
JIS B 7502-1994

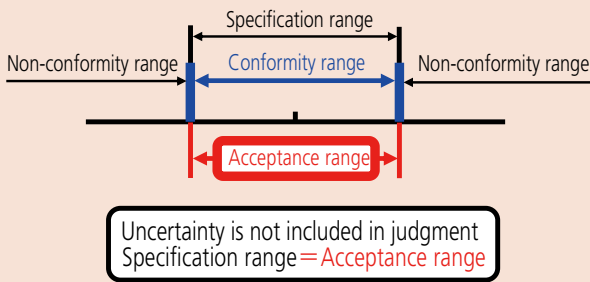
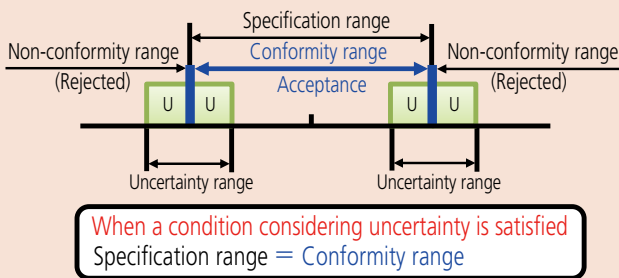


Fig. 2 New JIS Maximum Permissible Error (MPE)
JIS B 7502: 2016 (ISO/TR 14253- 6: 2012)



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 value 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 gage 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.

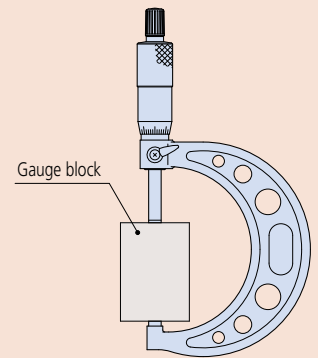


Fig. 3 Measurement of full surface contact error