

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

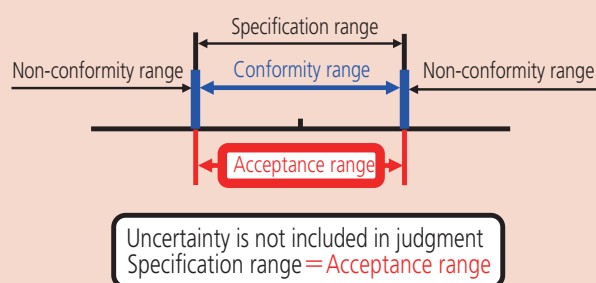
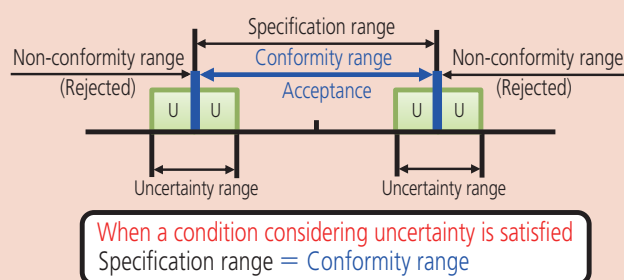


Fig. 2 New JIS Maximum Permissible Error (MPE)
JIS B 7502: 2016 (ISO/TR 14253- 6: 2012)



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.

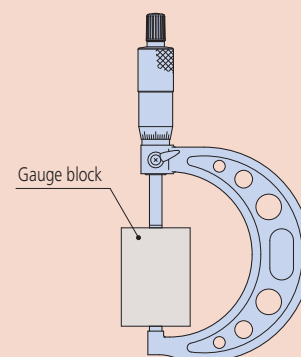
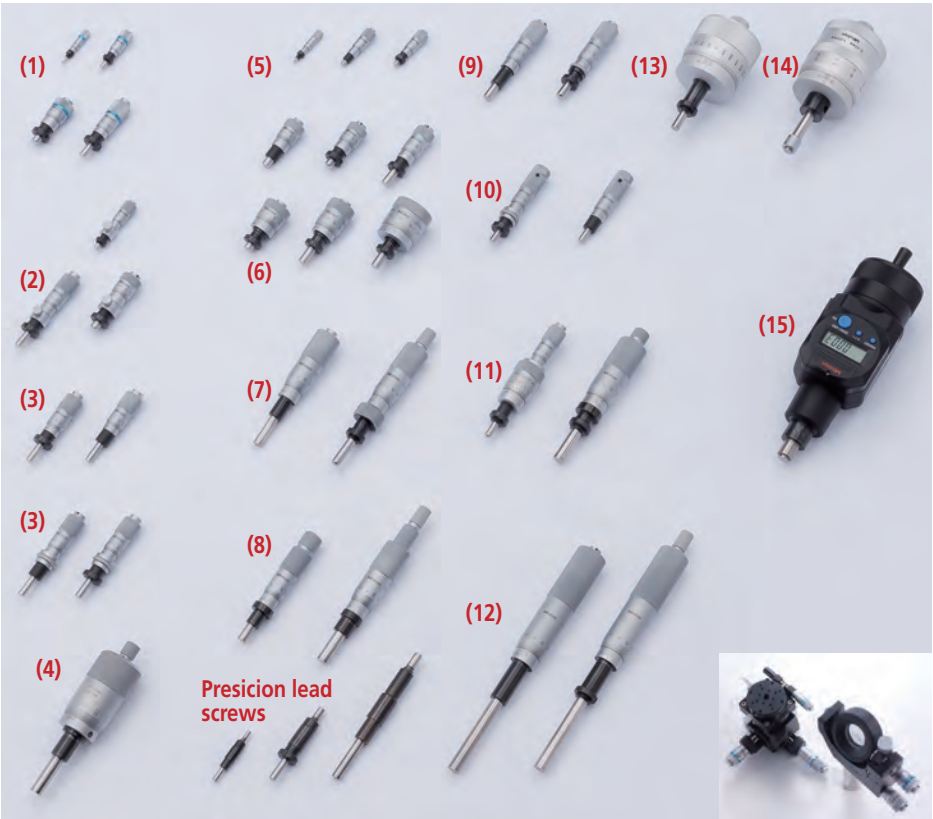


Fig. 3: Measurement of full surface contact error

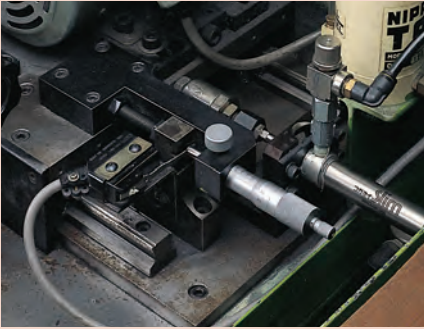
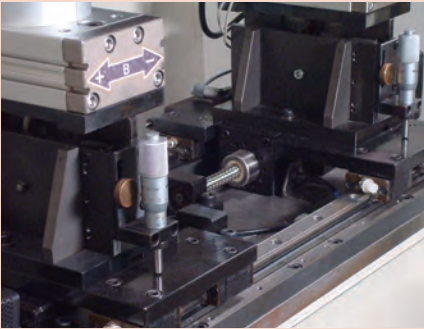
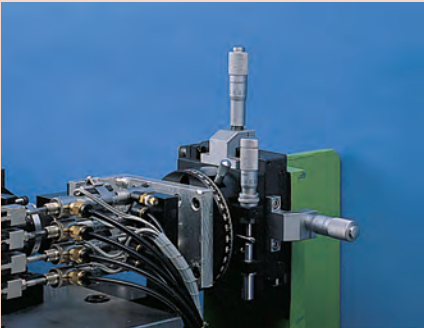
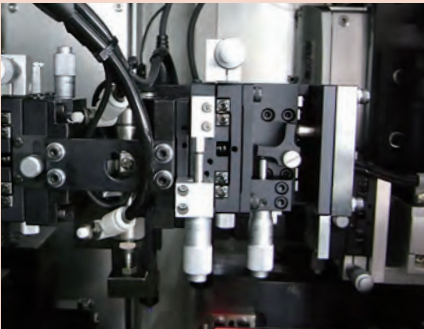
Micrometer Head Selection Guide

SELECTION TABLE



Also refer to “Quick Guide to Precision Measuring Instruments” from page B-127.

Range	Main feature of head		Series	Page
1 mm/0.02 in	High-Function	Differential Screw Translator (Extra-Fine Feed) Type	110	B-117 to B-118
2.5 mm/0.05 in	High-Function	Differential Screw Translator (Extra-Fine Feed) Type (11)		B-117 to B-118
5 mm/0.2 in	High-Function	Fine Spindle Feed of 0.1 mm/rev (1)	148	B-114 to B-115
	Standard	Small/Ultra-small Type (5)		B-87 to B-88
6.5 mm/0.25 in	Standard	Locking-screw Type (2)	152	B-108 to B-111
	High-Function	Fine Spindle Feed of 0.1 mm/rev (1)		B-114 to B-115
	High-Function	Fine Spindle Feed of 0.25 mm/rev		B-116
	Standard	Small/Ultra-small Type (5)		B-87 to B-88
10 mm	Standard	Short Thimble with Choice of Diameter (6)	148	B-89 to B-91
	High-Function	Large Thimble Type (13)		B-119 to B-120
13 mm/0.5 in	Standard	Locking-screw Type (2)	110	B-108 to B-111
	High-Function	Fine Spindle Feed of 0.25 mm/rev		B-116
	High-Function	Differential Screw Translator (Extra-Fine Feed) Type (11)		B-117 to B-118
	Standard	Short Thimble with Choice of Diameter (6)		B-89 to B-91
15 mm/0.5 in	Standard	Small Standard Type (3)	148	B-92 to B-94
	Standard	Small Thimble Diameter Standard Type (10)		B-95 to B-97
	High-Function	Non-rotating Spindle Type (8)		B-112
	High-Function	Quick Spindle Feed of 1 mm/rev (4)		B-113
25 mm/1 in	Standard	Small Standard Type with Carbide-Tipped Spindle (9)	149	B-98 to B-99
	Digimatic		350	B-84 to B-86
	High-Function	Non-rotating Spindle Type (8)	153	B-112
		Quick Spindle Feed of 1 mm/rev	152	B-113
		Large Thimble Type		B-119 to B-120
		XY-Stage Type (14)		B-121
		High Accuracy and Resolution	153	B-122
		Digit Counter Type	250	B-123
50 mm/2 in	Standard	Medium-sized Standard Type (7)	150	B-100 to B-103
		Medium-sized Standard Type with 8 mm Diameter Spindle	151	B-104 to B-107
	Digimatic		164	B-84
	High-Function	Large Thimble Type	152	B-119 to B-120
60 - 75 mm	High-Function	Long Stroke Non-rotating Spindle	197	B-122
	Standard	Medium-sized Standard Type with 8 mm Diameter Spindle (12)	151	B-104 to B-107
	Micro Jack		7	B-123





Dust- and
Water-
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Applicable models:
**350-28X-30, 350-261-30,
350-38X-30 and 350-361-30**

Functions (series 164)

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

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

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

Auto power ON/OFF:
The reading on the 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 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 indicator appears well before the micrometer becomes unusable.

Optional Accessories

Order No.	Type	Description
959149	C	Connecting cables for series 164 (1 m)
959150	C	Connecting cables for series 164 (2 m)
06AFM380C	C	USB Input Tool Direct for series 164 (2 m)
02AZD790C	C	Connecting cables for U-WAVE-T (160 mm): for series 164
02AZE140C	C	Connecting cables for U-WAVE-T For foot switch: for series 164
05CZA662	B	Connecting cables (1 m): for series 350 (IP65)
05CZA663	B	Connecting cables (2 m): for series 350 (IP65)
06AFM380B	B	USB Input Tool Direct for series 350 (IP65) (2 m)
02AZD790B	B	Connecting cables for U-WAVE-T (160 mm): for series 350 (IP65)
02AZE140B	B	Connecting cables for U-WAVE-T For foot switch: for series 350 (IP65)
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 **164-163** and **164-164**

Micrometer Head

Digimatic Micrometer Heads SERIES 164, 350

- Equipped with digital display and output.
- 350-28X-30, 350-261-30, 350-38X-30** and **350-361-30** are protection grade IP65, water-proof Digimatic micrometer heads.
- Digimatic models can be easily integrated into statistical process control and measurement systems.



164-163

SPECIFICATIONS

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

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

- Battery for **series 350**
SR44 (1 pc.), **938882** for initial operation checks (standard accessory)
- Battery for **series 164**
SR44 (2 pcs.), **938882** for initial operation checks (standard accessory)
- Battery life: Approx. 2.4 years under normal use (for **350-XXX**)
Approx. 1.8 years under normal use (for **164-163, 164**)
- Length standard: Electromagnetic rotary sensor Spanner (**301336**), 1 pc. (for **350-XXX**)
Screwdriver (**05CAA952**), 1 pc. (for **164-163, 164**)
- Measuring face: Material/Carbide tip, Hardness/90 HRA or more, Lapped
- Scale finishing: Satin-chrome plated
- *1 These models are not water-proof.
- *2 **IP65 dust / water protection type**. Stem diameter of IP65 type is 12 mm.

Note 1: For functional details of **series 350** refer to page B-7. Origin setting is by presetting.

Note 2: Refer to page B-129 for details of the recommended maximum loading limit.

DIMENSIONS

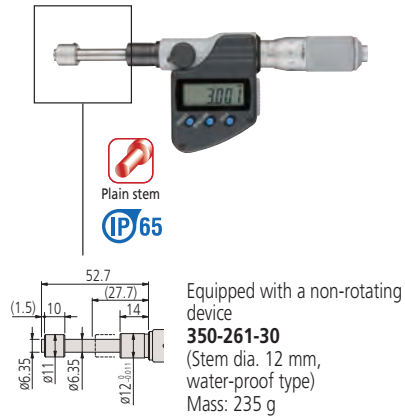
Plain Stem

Unit: mm

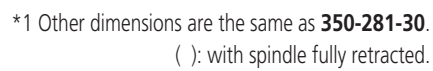
164-163 Rotatable display Mass: 490 g
(): with spindle fully retracted.

B

Unit: mm



Bush (standard accessory)
350-261-30



Stem locknut

Spherical face

IP65

Spherical face
350-284-30

SR4

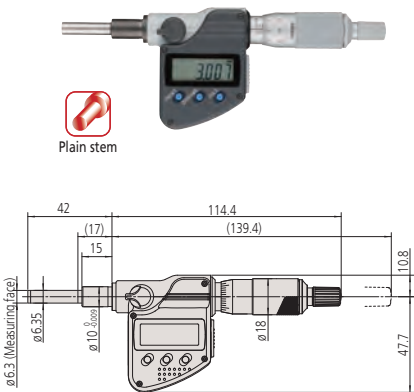
*2

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

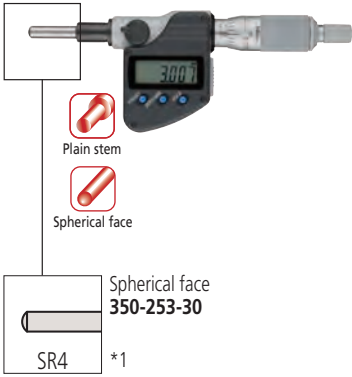
DIMENSIONS

Plain Stem

Unit: mm

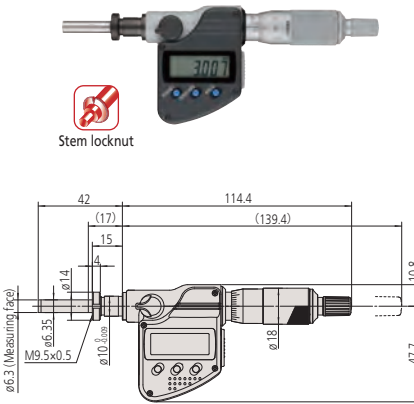


350-251-30
(Stem dia. 10 mm, for general use) Mass: 230 g

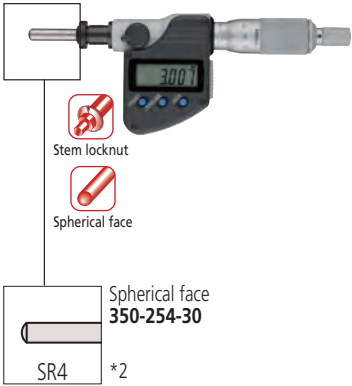


*1 Other dimensions are the same as **350-251-30**.
(): with spindle fully retracted.

Stem Locknut

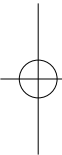


• Fixture thickness: 11.5 mm
350-252-30
(Stem dia. 10 mm, for general use) Mass: 230 g



*2 Other dimensions are the same as **350-252-30**.
(): with spindle fully retracted.

B



Micrometer Head

Micrometer Heads
SERIES 148 — Small/Ultra-small Type

- Miniature micrometer heads for ease of incorporating into machines.

SPECIFICATIONS

Metric						
Order No.	Range (mm)	Stem dia. (mm)	Stem	Spindle end	Graduation	Maximum permissible error <i>JMPE</i> (μm)
148-215	0 - 5	3.5	Plain	Spherical (SR1.5)	Standard	±5
148-216			W/clamp nut			
148-201-10	0 - 6.5	6	Plain	Flat		
148-203-10			W/clamp nut			
148-205-10			Plain	Spherical (SR3)		
148-207-10			W/clamp nut			
148-209-10			Plain	Flat		
148-211-10			W/clamp nut		Reverse reading	
Inch						
Order No.	Range (in)	Stem dia. (in)	Stem	Spindle end	Graduation	Maximum permissible error <i>JMPE</i> (in)
148-217	0 - 0.2	0.156	Plain	Spherical (SR1.5)	Standard	±0.00025
148-218			W/clamp nut			
148-202-10	0 - 0.25	0.25	Plain	Flat		
148-204-10			W/clamp nut			
148-206-10			Plain	Spherical (SR3)		
148-208-10			W/clamp nut			
148-210-10*			Plain	Flat		
148-212-10*			W/clamp nut		Reverse reading	

- Graduation: 0.02 mm (148-215, 148-216), 0.01 mm or 0.001 in
 - Measuring face: Material/Alloy tool steel, Hardness/60 HRC or more, Lapped
 - Scale finishing: Satin-chrome plated
 - * Made-to-order models
- Note: Refer to page B-129 for details of the recommended maximum loading limit.

DIMENSIONS

Plain Stem

148-215 Mass: 4 g

Unit: mm

Spherical face
148-205-10

SR3 *

148-201-10 Mass: 10 g

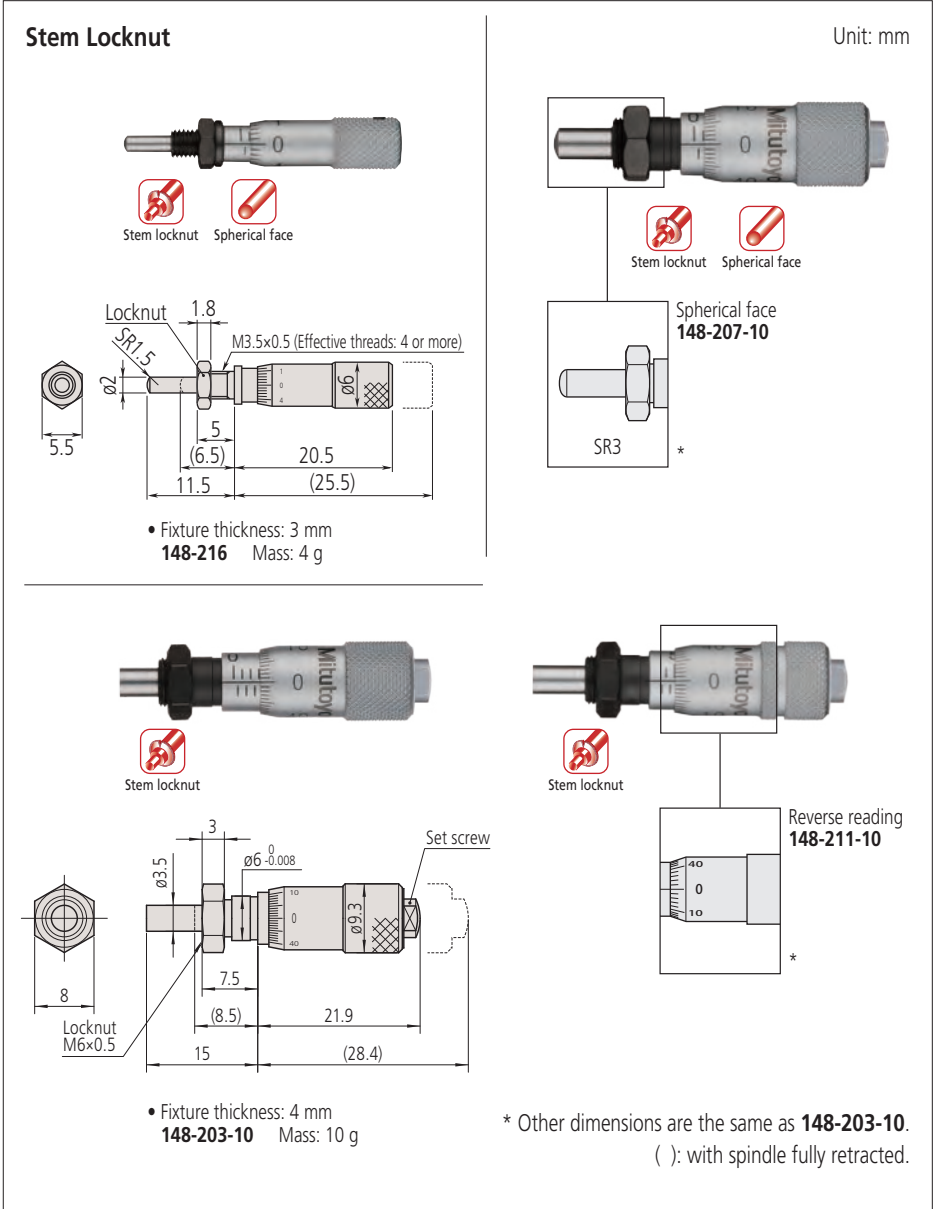
Reverse reading
148-209-10

* Other dimensions are the same as 148-201-10.
() : with spindle fully retracted.

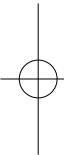


Micrometer Heads
SERIES 148 — Small/Ultra-small Type

DIMENSIONS



B



Micrometer Head

Micrometer Heads SERIES 148 — Short Thimble with Choice of Diameter

- Short body design maintains measuring range for limited space applications.
- Available in three thimble diameters to provide ease-of-reading options.

SPECIFICATIONS

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

- Graduation: 0.01 mm
 - Spindle pitch: 0.5 mm
 - Measuring face: Material/Alloy tool steel, Hardness/60 HRC or more, Lapped
 - Scale finishing: Satin-chrome plated
- Note: Refer to page B-129 for details of the recommended maximum loading limit.

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

- Graduation: 0.001 in
 - Spindle pitch: 0.025 in
 - Measuring face: Material/Alloy tool steel, Hardness/60 HRC or more, Lapped
 - Scale finishing: Satin-chrome plated
- Note: Refer to page B-129 for details of the recommended maximum loading limit.

Plain Stem

Plain stem

Spherical face
148-313-10

SR4 *1

148-301-10

Mass: 26 g

Thimble diameter: 15

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

Stem Locknut

Unit: mm

Stem locknut

Spherical face
148-314-10

SR4 *2

• Fixture thickness: 6 mm

148-302-10

Mass: 26 g

Thimble diameter: 15

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

Plain stem

Spherical face
148-313-10

SR4 *1

148-303-10

Mass: 39 g

Thimble diameter: 20

Stem locknut

Spherical face
148-314-10

SR4 *2

• Fixture thickness: 6 mm

148-304-10

Mass: 39 g

Thimble diameter: 20

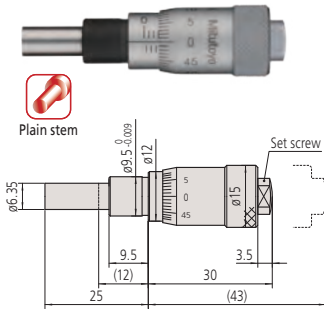
(): with spindle fully retracted.

Micrometer Head

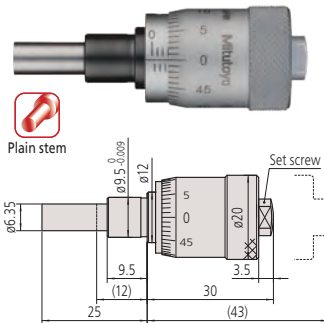
Micrometer Heads
SERIES 148 — Short Thimble with Choice of Diameter

DIMENSIONS

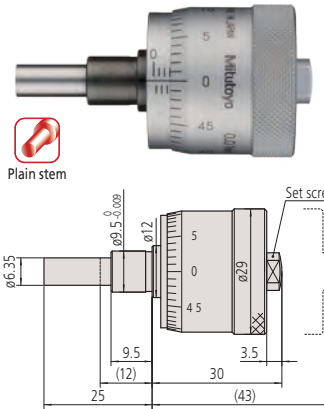
Plain Stem



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



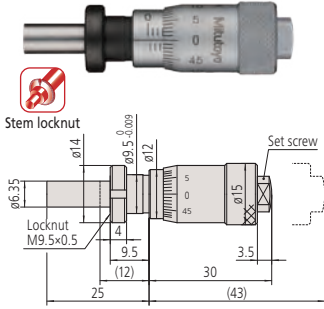
148-309-10
Mass: 55 g Thimble diameter: 20



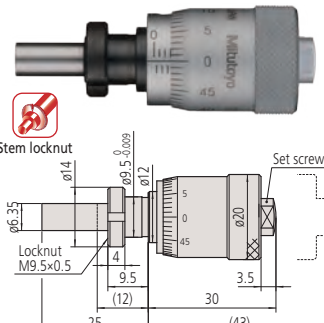
148-311-10
Mass: 103 g Thimble diameter: 29

Stem Locknut

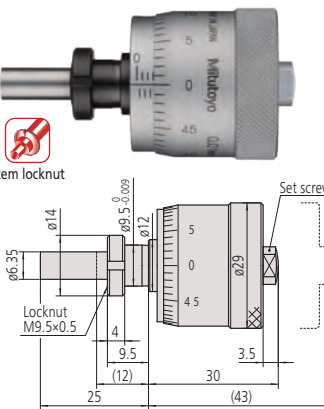
Unit: mm



• Fixture thickness: 6 mm
148-308-10
Mass: 35 g Thimble diameter: 15



• Fixture thickness: 6 mm
148-310-10
Mass: 55 g Thimble diameter: 20



• Fixture thickness: 6 mm
148-312-10
Mass: 103 g Thimble diameter: 29

(): with spindle fully retracted.

Micrometer Heads
SERIES 148 — Small Standard Type

- Measuring range of 13 mm.

SPECIFICATIONS

Metric						
Order No.	Range (mm)	Maximum permissible error J_{MPE} (μm)	Stem dia. (mm)	Stem	Spindle end	Graduation features
148-104-10	0 - 13	±2	9.5	Plain	Flat	Standard
148-103-10				W/clamp nut		
148-121-10				Plain*		
148-120-10				W/clamp nut*		
148-801-10				Plain	Spherical (SR4)	
148-802-10				W/clamp nut		
148-803-10				Plain*		
148-804-10				W/clamp nut*		
148-821-10				Plain	Flat	Reverse reading
148-822-10				W/clamp nut		
148-823-10				Plain*		
148-824-10				W/clamp nut*		

- Graduation: 0.01 mm
 - Spindle pitch: 0.5 mm
 - Measuring face: Material/Alloy tool steel, Hardness/60 HRC or more, Lapped
 - Scale finishing: Satin-chrome plated
 - * With spindle lock
- Note: Refer to page B-129 for details of the recommended maximum loading limit.

Inch						
Order No.	Range (in)	Maximum permissible error J_{MPE} (in)	Stem dia. (in)	Stem	Spindle end	Graduation features
148-112-10	0 - 0.5	± 0.0001	0.375	Plain	Flat	Standard
148-111-10*2				W/clamp nut		
148-123-10				Plain*1		
148-122-10				W/clamp nut*1		
148-811-10				Plain	Spherical (SR4)	
148-812-10				W/clamp nut		
148-813-10				Plain*1		
148-814-10				W/clamp nut*1		
148-831-10				Plain	Flat	Reverse reading
148-832-10				W/clamp nut		
148-833-10				Plain*1		
148-834-10				W/clamp nut*1		

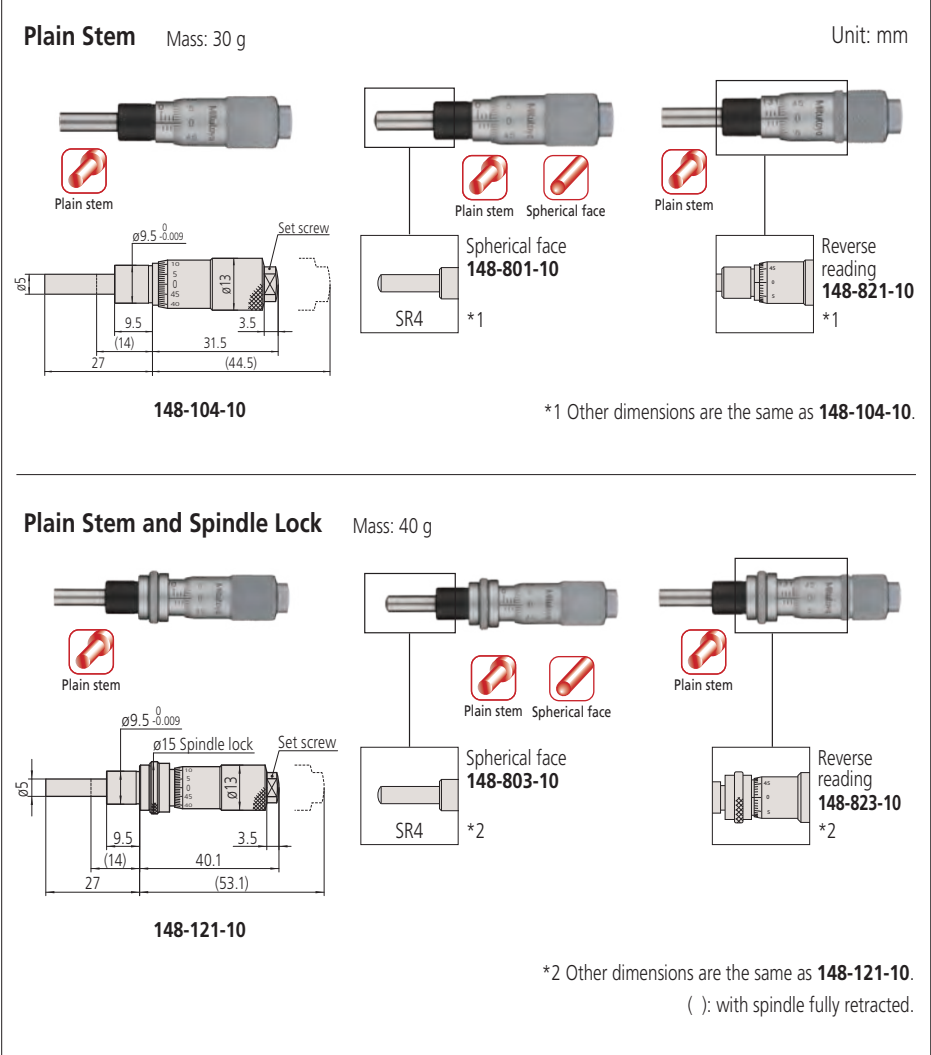
- Graduation: 0.001 in
 - Spindle pitch: 0.025 in
 - Measuring face: Material/Alloy tool steel, Hardness/60 HRC or more, Lapped
 - Scale finishing: Satin-chrome plated
 - *1 With spindle lock
 - *2 Made-to-order models
- Note: Refer to page B-129 for details of the recommended maximum loading limit.

B

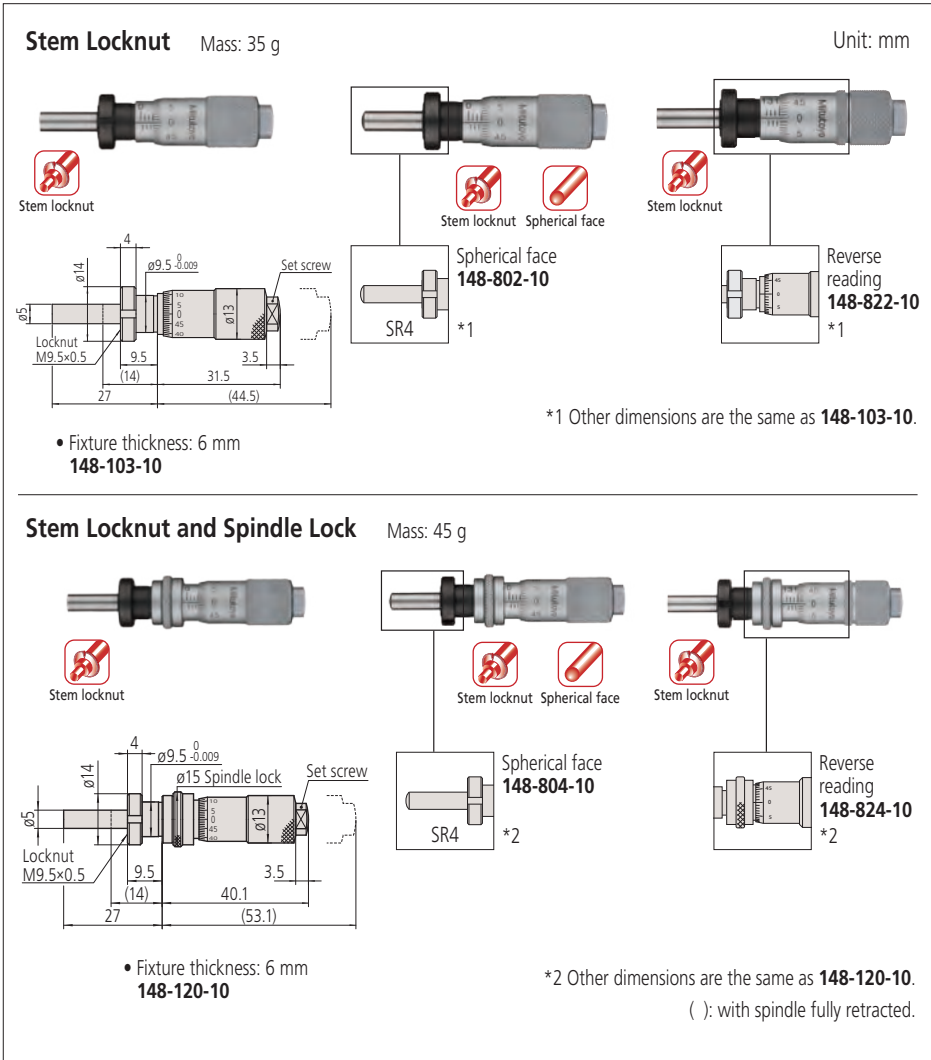
Micrometer Head

Micrometer Heads
SERIES 148 — Small Standard Type

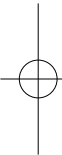
DIMENSIONS



DIMENSIONS



B



Micrometer Head

Micrometer Heads SERIES 148 — Small Thimble Diameter Standard Type

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

SPECIFICATIONS

Metric						
Order No.	Range (mm)	Maximum permissible error J_{MPE} (μm)	Stem dia. (mm)	Stem	Spindle end	Special features
148-503	0 - 13	±2	9.5	Plain	Flat	Standard
148-508				W/clamp nut		
148-506				Plain* ¹		
148-504				W/clamp nut* ¹		
148-853				Plain	Spherical (SR4)	
148-854				W/clamp nut* ¹		
148-863				Plain	Flat	Reverse reading
148-864				W/clamp nut* ¹		
148-858* ²				W/clamp nut	Spherical (SR4)	Standard
148-866* ²				Plain* ¹	Flat	Reverse reading
148-856* ²				Plain* ¹	Spherical (SR4)	Standard
148-868* ²				W/clamp nut	Flat	Reverse reading

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

*1 With spindle lock

*2 Made-to-order models

Note: Refer to page B-129 for details of the recommended maximum loading limit.

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

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

*1 With spindle lock

*2 Made-to-order models

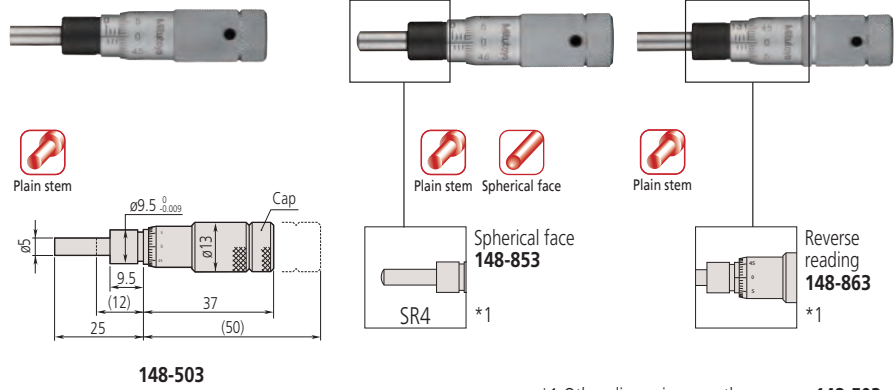
Note: Refer to page B-129 for details of the recommended maximum loading limit.

DIMENSIONS

Plain Stem

Mass: 35 g

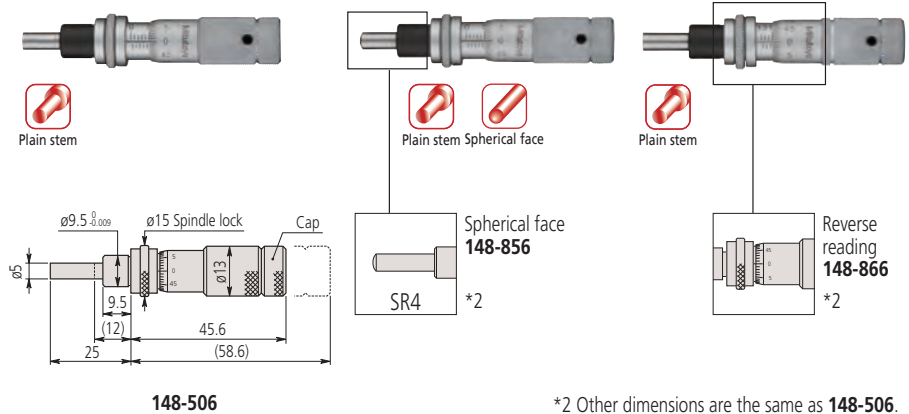
Unit: mm



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

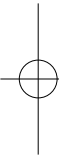
Plain Stem and Spindle Lock

Mass: 35 g



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

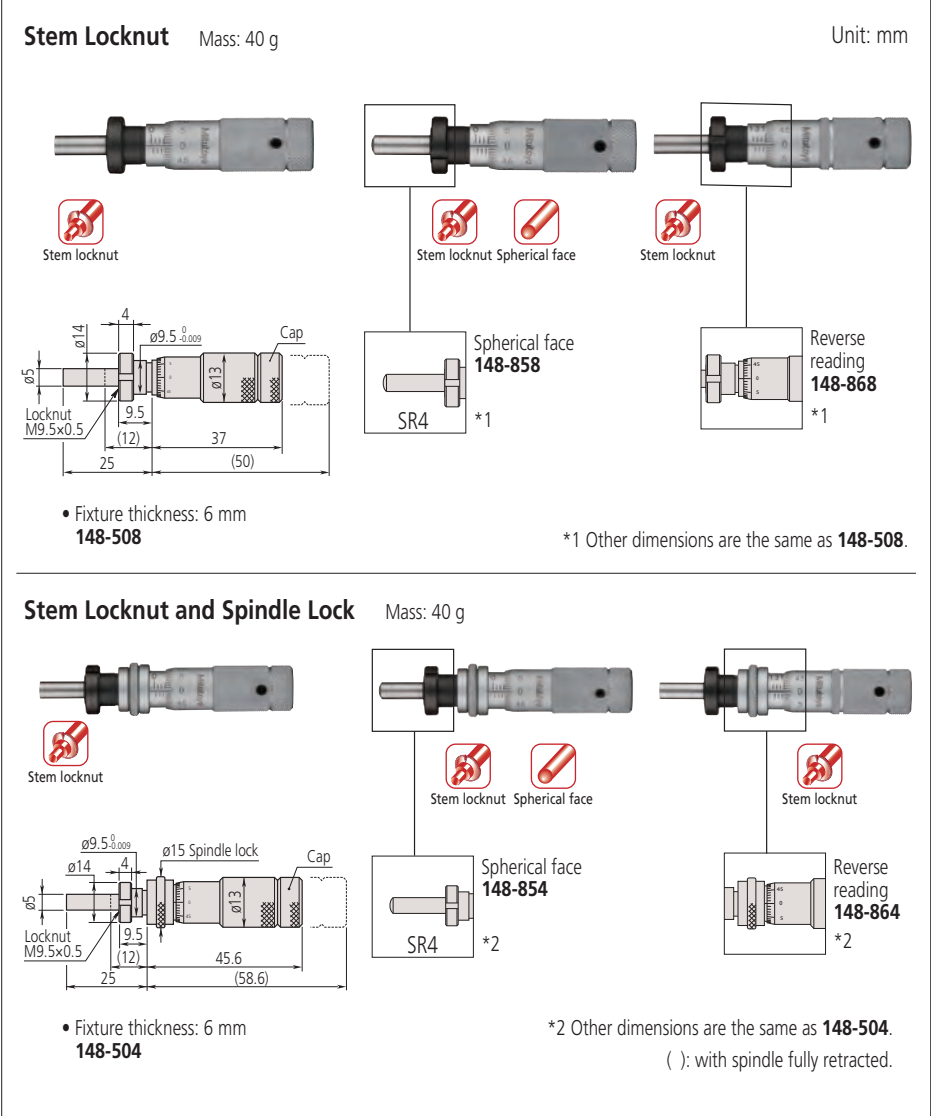
B



Micrometer Head

Micrometer Heads
SERIES 148 — Small Thimble Diameter Standard Type

DIMENSIONS



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

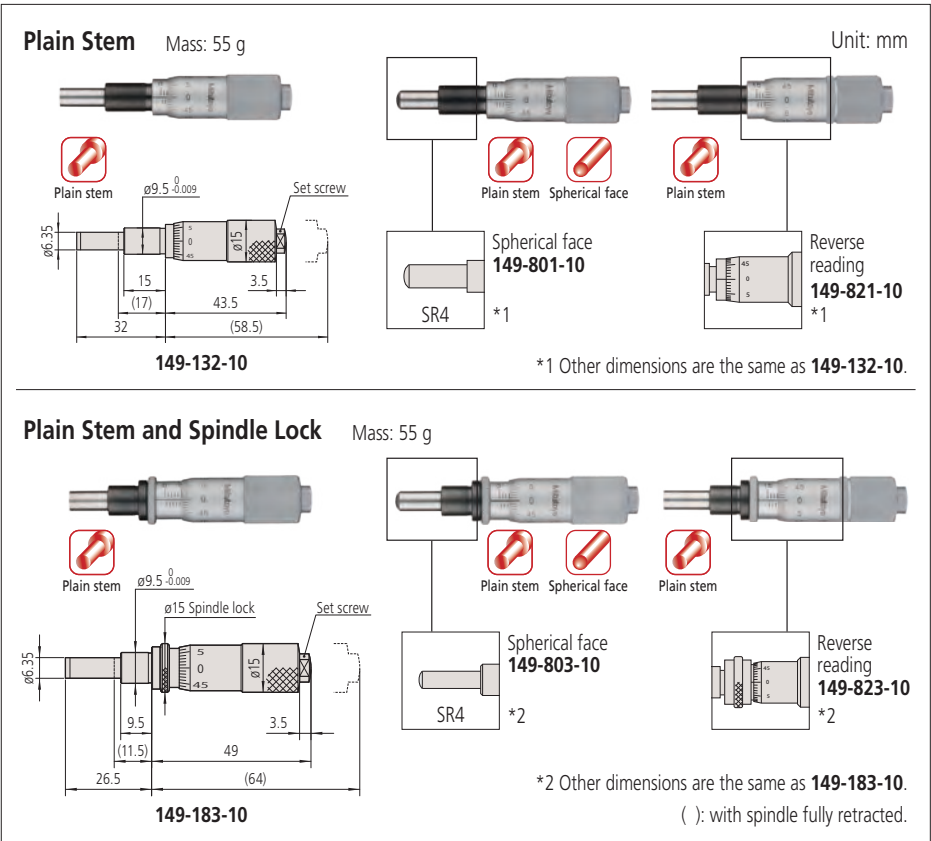
- Carbide-tipped spindle provides high abrasion resistance.

SPECIFICATIONS

Metric						
Order No.	Range (mm)	Maximum permissible error J_{MPE} (μm)	Stem dia. (mm)	Stem	Spindle end	Graduation features
149-132-10	0 - 15	±2	9.5	Plain	Flat (carbide tip)	Standard
149-131-10				W/clamp nut		
149-183-10				Plain ^{*1}		
149-184-10				W/clamp nut ^{*1}	Spherical (SR4) (carbide tip)	
149-801-10				Plain		
149-802-10				W/clamp nut		
149-821-10				Plain	Flat (carbide tip)	Reverse reading
149-822-10				W/clamp nut		
149-803-10 ^{*2}				Plain ^{*1}	Spherical (SR4) (carbide tip)	Standard
149-804-10 ^{*2}				W/clamp nut ^{*1}		
149-823-10 ^{*2}				Plain ^{*1}	Flat (carbide tip)	Reverse reading
149-824-10 ^{*2}				W/clamp nut ^{*1}		
Inch						
Order No.	Range (in)	Maximum permissible error J_{MPE} (in)	Stem dia. (in)	Stem	Spindle end	Graduation features
149-148-10	0 - 0.5	±0.0001	0.375	Plain	Flat (carbide tip)	Standard
149-147-10				W/clamp nut		
149-185-10 ^{*3}				Plain ^{*1}		
149-182-10				W/clamp nut ^{*1}	Spherical (SR4) (carbide tip)	
149-811-10				Plain		
149-812-10				W/clamp nut		
149-831-10 ^{*2}				Plain	Flat (carbide tip)	Reverse reading
149-832-10 ^{*2}				W/clamp nut		
149-181 ^{*2}				Plain ^{*1}		

- Graduation: 0.01 mm or 0.001 in
 - Spindle pitch: 0.5 mm or 0.025 in
 - Measuring face: Material/Carbide tip, Hardness/90 HRA or more, Lapped
 - Scale finishing: Satin-chrome plated
 - *1 With spindle lock *2 Made-to-order models *3 W/ratchet (**149-181**) is available
- Note: Refer to page B-129 for details of the recommended maximum loading limit.

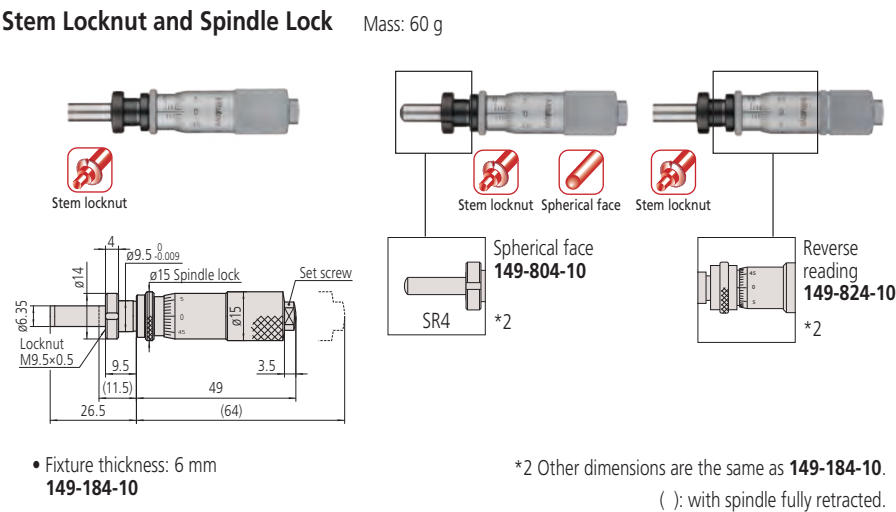
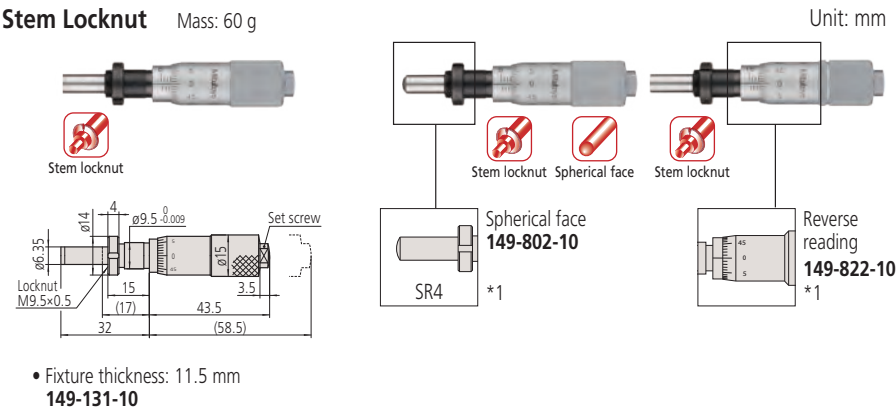
DIMENSIONS



Micrometer Head

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

DIMENSIONS



Micrometer Heads
SERIES 150 — Medium-sized Standard Type

- Measuring range of 25 mm.

SPECIFICATIONS

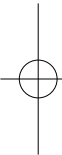
Metric						
Order No.	Range (mm)	Maximum permissible error J_{MPE} (μm)	Stem dia. (mm)	Stem	Spindle end	Special features
150-192	0 - 25	±2	10	Plain	Flat (carbide tip)	Standard
150-191				W/clamp nut		
150-209				Plain* ¹		
150-210				W/clamp nut* ¹		
150-801				Plain	Spherical (SR4) (carbide tip)	
150-802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

- Graduation: 0.01 mm, 0.001 mm (w/vernier)
 - Spindle pitch: 0.5 mm
 - Measuring face: Material/Carbide tip (Only long spindle model is alloy tool steel), Hardness/90 HRA or more (Only long spindle model is 60 HRC or more), Lapped
 - Scale finishing: Satin-chrome plated
 - *1 With spindle lock
 - *2 Made-to-order models
- Note: Refer to page B-129 for details of the recommended maximum loading limit.

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

- Graduation: 0.001 in or 0.0001 in (w/vernier)
 - Spindle pitch: 0.025 in
 - Measuring face: Material/Carbide tip (Only long spindle model is alloy tool steel), Hardness/90 HRA or more (Only long spindle model is 60 HRC or more), Lapped
 - Scale finishing: Satin-chrome plated
 - *1 With spindle lock
 - *2 Made-to-order models
- Note: Refer to page B-129 for details of the recommended maximum loading limit.

B

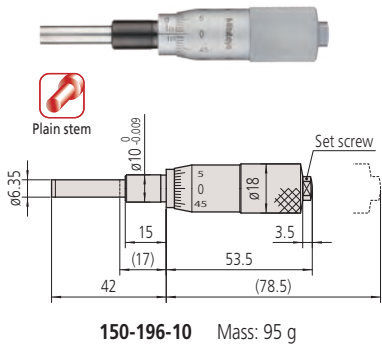


Micrometer Head

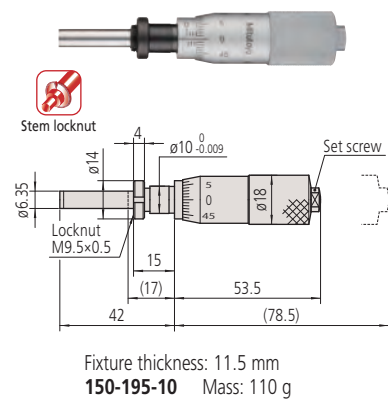
Micrometer Heads
SERIES 150 — Medium-sized Standard Type

DIMENSIONS

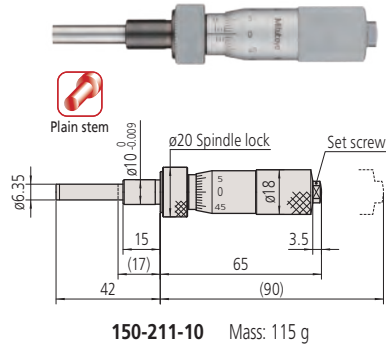
Plain Stem



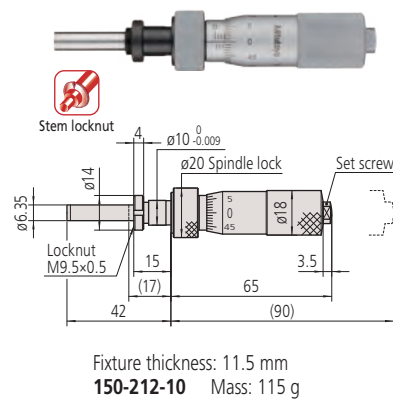
Stem Locknut



Plain Stem and Spindle Lock Unit: mm

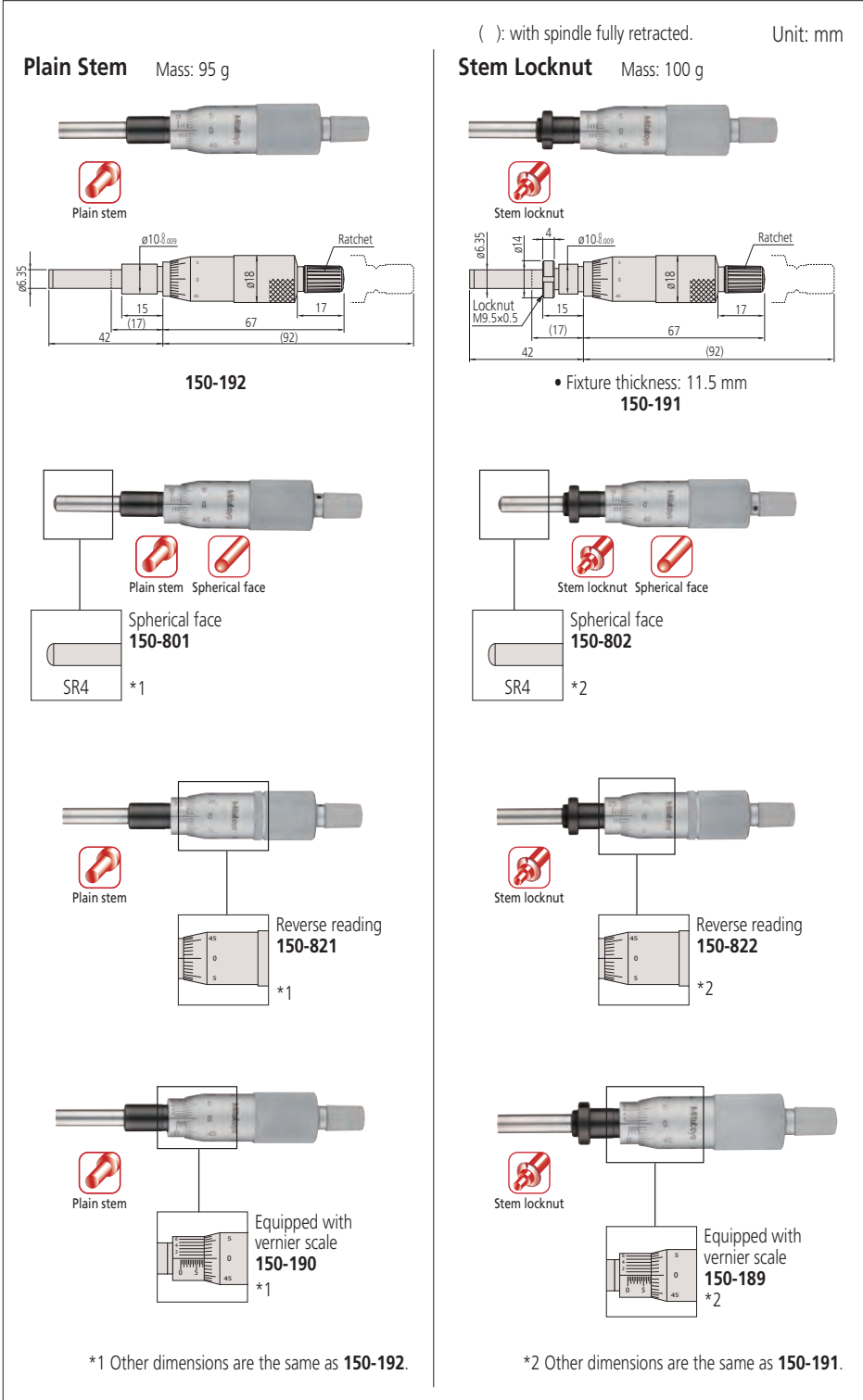


Stem Locknut and Spindle Lock

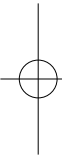


() : with spindle fully retracted.

DIMENSIONS



B



Micrometer Heads

SERIES 150 — Medium-sized Standard Type

Plain Stem and Spindle Lock

Stem Locknut and Spindle Lock

Mass: 115 g

Stem Locknut and Spindle Lock



Plain stem

150-209



Stem locknut

- Fixture thickness: 11.5 mm

150-210



Plain stem Spherical face

Spherical face
150-803

SR4



Plain stem

Reverse reading
150-823

*1



Plain stem

Equipped with vernier scale
150-183

*

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



Stem locknut Spherical face

Spherical face
150-804

SR4



Stem locknut

Reverse reading
150-824

*2



Stem locknut

Equipped with vernier scale
150-184

*2

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

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

- Larger spindle (ø8 mm) for heavy-duty applications (normally ø6.35 mm).

SPECIFICATIONS

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

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

Note: Refer to page B-129 for details of the recommended maximum loading limit.

Inch						
Order No.	Range (in)	Maximum permissible error J_{MPE} (in)	Stem dia. (in)	Stem	Spindle end	Special features
151-240	0 - 0.1	±0.0001	0.5	Plain	Flat (carbide tip)	—
151-239				W/clamp nut		W/vernier (0.0001 in)
151-238				Plain		
151-237				W/clamp nut		
151-241-10*2				Plain*1		W/o ratchet stop
151-242-10*2				W/clamp nut*1		W/o ratchet stop (0.0001 in)
151-243-10*2				Plain*1		
151-244-10*2				W/clamp nut*1		—
151-272	0 - 0.2	±0.0002		Plain		
151-271				W/clamp nut		

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

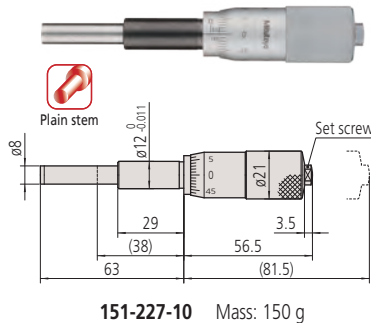
Note: Refer to page B-129 for details of the recommended maximum loading limit.

Micrometer Head

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

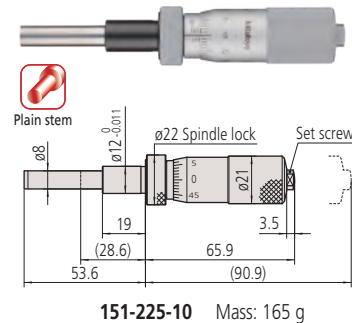
DIMENSIONS

Plain Stem

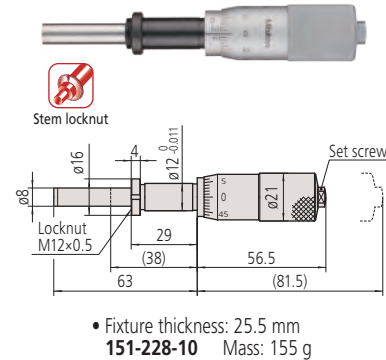


Plain Stem and Spindle Lock

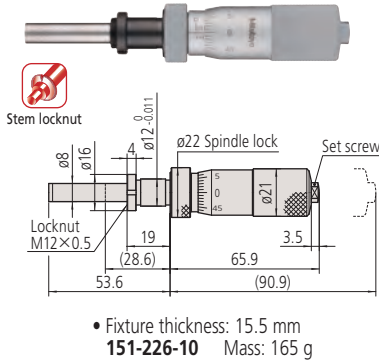
Unit: mm



Stem Locknut



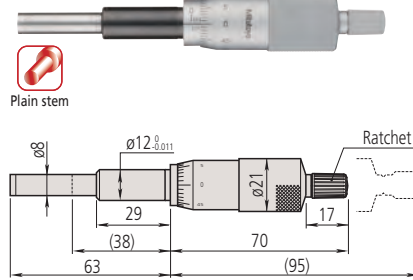
Stem Locknut and Spindle Lock



() : with spindle fully retracted.

DIMENSIONS

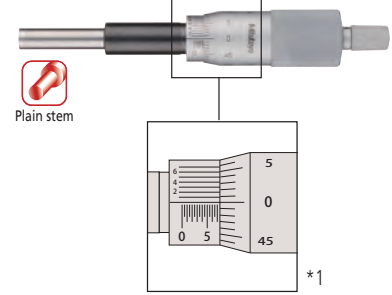
Plain Stem



151-224 Mass: 150 g

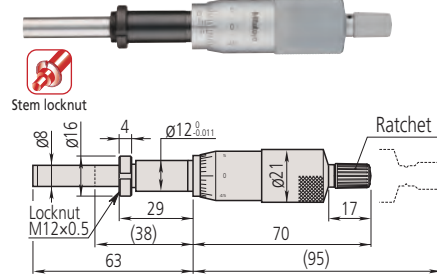
Equipped with vernier scale
151-222

Unit: mm



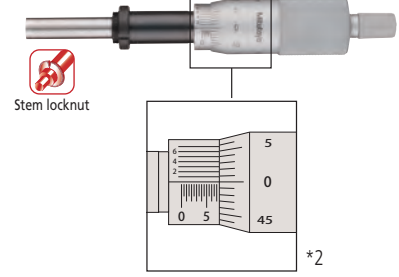
*1 Other dimensions are the same as **151-224**.

Stem Locknut



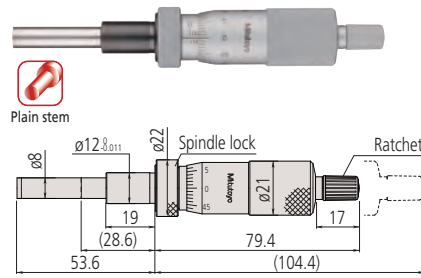
• Fixture thickness: 25.5 mm
151-223 Mass: 155 g

Equipped with vernier scale
151-221



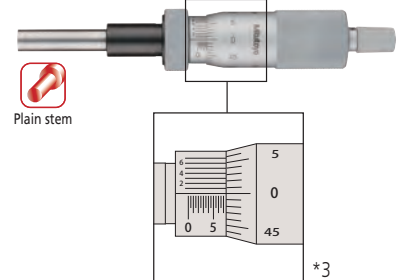
*2 Other dimensions are the same as **151-223**.

Stem Locknut and Spindle Lock



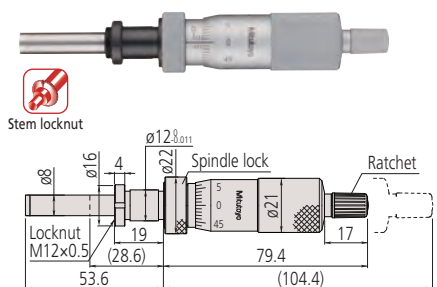
151-214 Mass: 160 g

Equipped with vernier scale
151-212



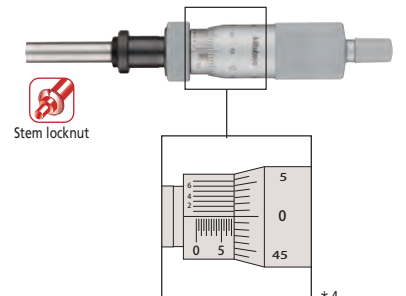
*3 Other dimensions are the same as **151-214**.

Stem Locknut and Spindle Lock



• Fixture thickness: 15.5 mm
151-213 Mass: 165 g

Equipped with vernier scale
151-211



*4 Other dimensions are the same as **151-213**.
(): with spindle fully retracted.

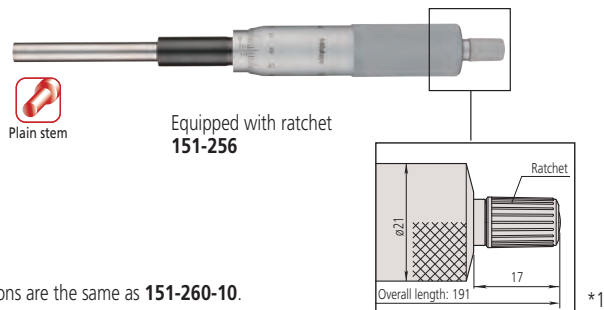
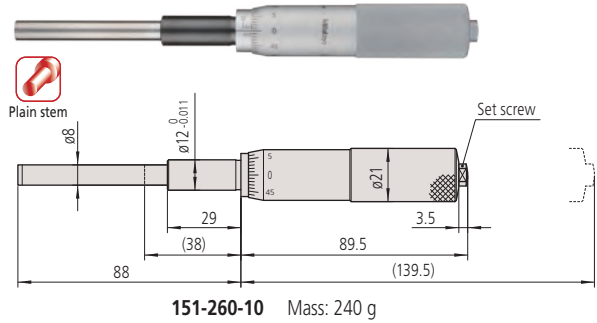
Micrometer Head

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

DIMENSIONS

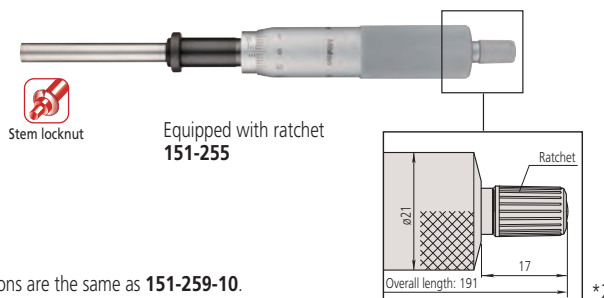
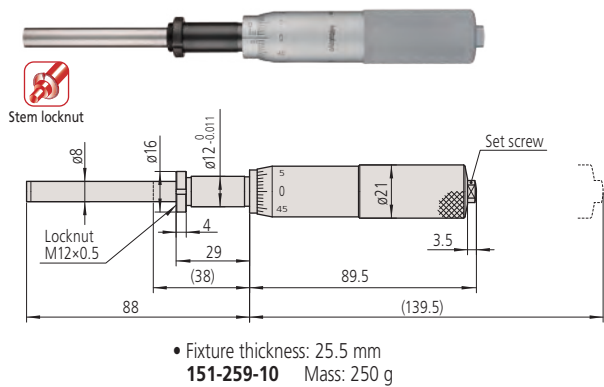
Plain Stem

Unit: mm



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

Stem Locknut



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

Micrometer Heads
SERIES 148 — Locking-screw Type

Secure spindle



- Locking screw provides secure locking at any position of the spindle.
- Position of the locking screw is the same as the sleeve index line.

SPECIFICATIONS

Metric								
Order No.	Range (mm)	Graduation (mm)	Stem dia. (mm)	Stem	Spindle end	Graduation features	Maximum permissible error J_{MPE} (μm)	
148-220-10	0 - 6.5	0.01	6	Plain	Flat	Standard	±5	
148-221-10				W/clamp nut				
148-222-10				Plain	Spherical (SR3)			
148-223-10				W/clamp nut				
148-150-10	0 - 13		9.5	Plain	Flat		±2	
148-151-10				W/clamp nut				
148-152-10				Plain	Spherical (SR4)			
148-153-10				W/clamp nut				
148-316-10	0 - 6.5			Plain	Flat			
148-317-10				W/clamp nut				
148-318-10				Plain	Spherical (SR4)			
148-319-10				W/clamp nut				

- Measuring face: Material/Alloy tool steel, Hardness/60 HRC or more, Lapped
 - Scale finishing: Satin-chrome plated
- Note: Refer to page B-129 for details of the recommended maximum loading limit.

Inch							
Order No.	Range (in)	Graduation (in)	Stem dia. (in)	Stem	Spindle end	Graduation features	Maximum permissible error J_{MPE} (in)
148-230-10	0 - 0.25	0.001	0.25	Plain	Flat	Standard	±0.00025
148-231-10				W/clamp nut			
148-232-10				Plain	Spherical (SR3)		
148-233-10				W/clamp nut			
148-160-10	0 - 0.5		0.375	Plain	Flat		±0.0001
148-161-10				W/clamp nut			
148-162-10				Plain	Spherical (SR4)		
148-163-10				W/clamp nut			
148-326-10	0 - 0.25			Plain	Flat		
148-327-10				W/clamp nut			
148-328-10				Plain	Spherical (SR4)		
148-329-10				W/clamp nut			

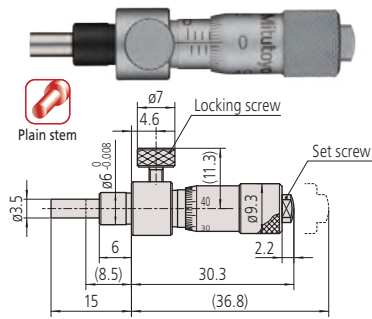
- Measuring face: Material/Alloy tool steel, Hardness/60 HRC or more, Lapped
 - Scale finishing: Satin-chrome plated
- Note: Refer to page B-129 for details of the recommended maximum loading limit.

Micrometer Head

Micrometer Heads
SERIES 148 — Locking-screw Type

DIMENSIONS

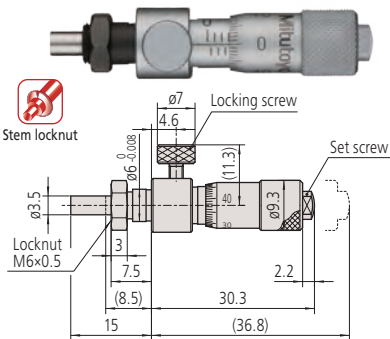
Plain Stem



148-220-10 Mass: 16 g

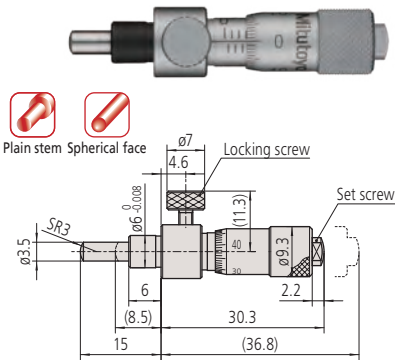
Stem Locknut

Unit: mm



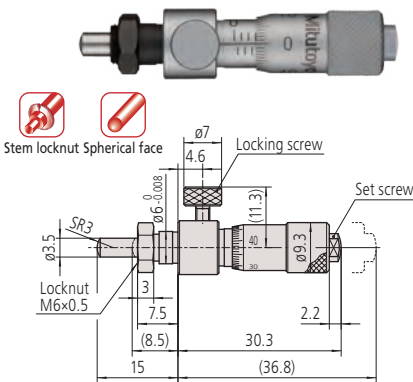
• Fixture thickness: 4 mm
148-221-10 Mass: 17 g

Plain Stem



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

Stem Locknut

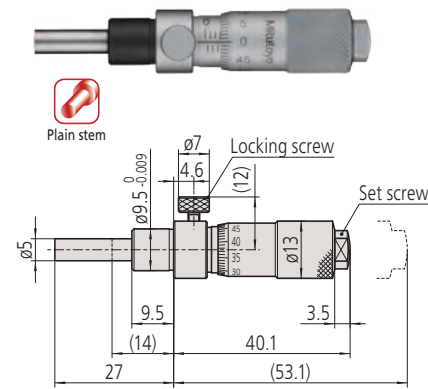


Spherical face (SR3) • Fixture thickness: 4 mm
148-223-10 Mass: 17 g

(): with spindle fully retracted.

DIMENSIONS

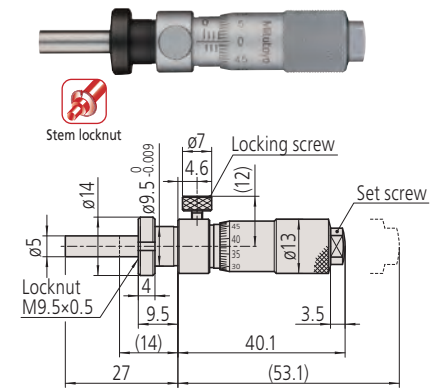
Plain Stem



148-150-10 Mass: 40 g

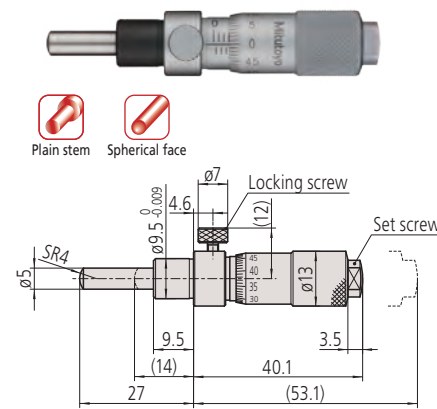
Stem Locknut

Unit: mm



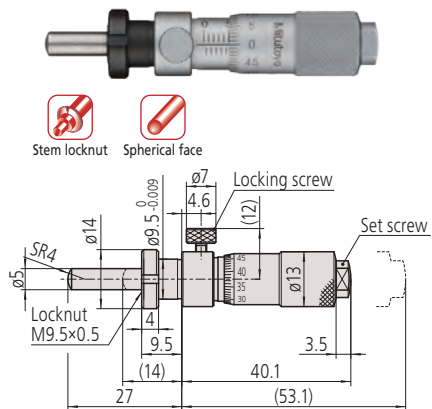
• Fixture thickness: 6 mm
148-151-10 Mass: 43 g

Plain Stem



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

Stem Locknut



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

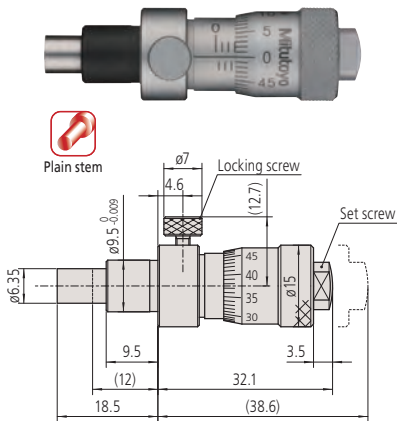
() : with spindle fully retracted.

Micrometer Head

Micrometer Heads
SERIES 148 — Locking-screw Type

DIMENSIONS

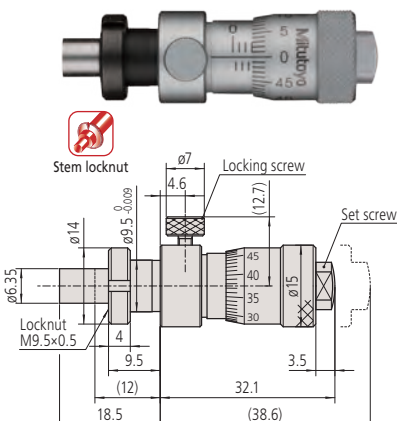
Plain Stem



148-316-10 Mass: 40 g

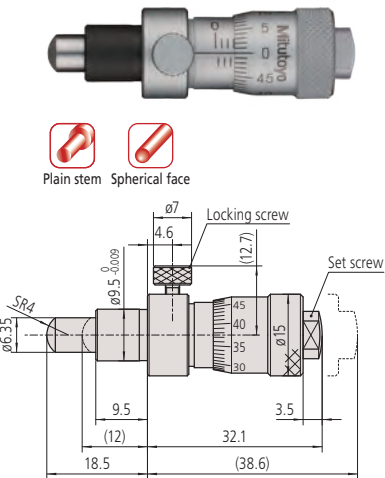
Stem Locknut

Unit: mm



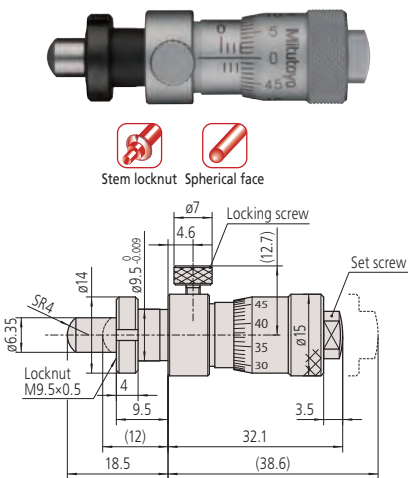
• Fixture thickness: 6 mm
148-317-10 Mass: 43 g

Plain Stem



Spherical surface (SR4)
148-318-10 Mass: 40 g

Stem Locknut



Spherical surface (SR4) • Fixture thickness: 6 mm
148-319-10 Mass: 43 g

() : with spindle fully retracted.

Micrometer Heads
SERIES 153 — Non-rotating Spindle Type

- Micrometer head with non-rotating spindle.
- Torsion-free feed reduces workpiece deformation and wear.

SPECIFICATIONS

Metric								
Order No.	Range (mm)	Graduation (mm)	Graduation features	Stem dia. (mm)	Stem	Spindle end	Spindle pitch (mm)	Maximum permissible error <i>J</i> _{MPE} (μm)
153-101	0 - 15	0.01	Standard	9.5	Plain	Flat (carbide tip)	0.5	±3
153-201* ¹	0 - 25			12				
153-202* ¹								
153-203								
153-204		0.001	W/vernier (0.001 mm)					

Inch								
Order No.	Range (in)	Graduation (in)	Special features	Stem dia. (in)	Stem	Spindle end	Spindle pitch (in)	Maximum permissible error <i>J</i> _{MPE} (in)
153-108* ²	0 - 0.5	0.001	W/vernier (0.0001 in)	0.375	Plain	Flat (carbide tip)	0.025	±0.00015
153-205* ¹	0 - 1			0.5				
153-206* ¹								
153-207								
153-208		0.0001	W/vernier (0.0001 in)					

- Measuring face: Material/ Carbide tip, Hardness/90 HRA or more, Lapped
 - Scale finishing: Satin-chrome plated
 - *1 With ratchet stop *2 Made-to-order model
- Note: Refer to page B-129 for details of the recommended maximum loading limit.

DIMENSIONS

Unit: mm

153-101 Mass: 70 g

Equipped with ratchet and vernier scale

153-202

153-201 Mass: 125 g

*1 Other dimensions are the same as 153-201.

Without ratchet / Equipped with vernier scale

153-204

153-203 Mass: 125 g

*2 Other dimensions are the same as 153-203. () : with spindle fully retracted.

B

Micrometer Head

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

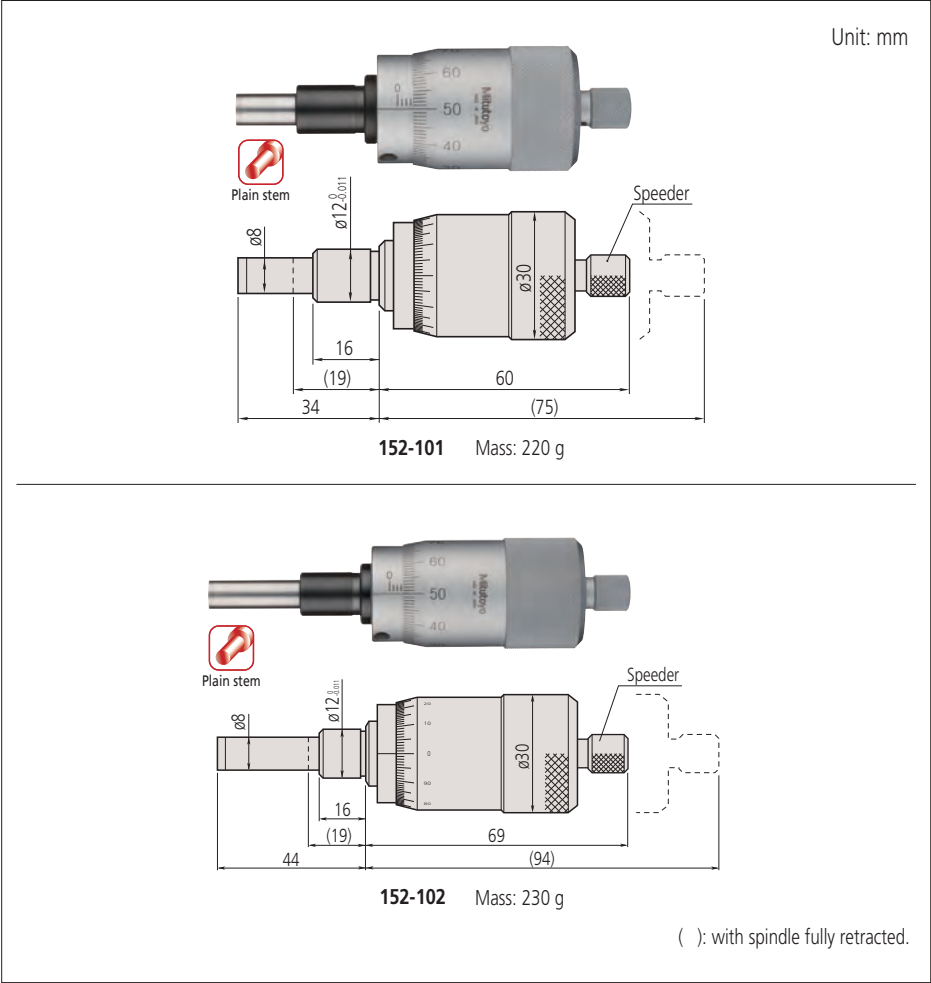
- Micrometer head with 1 mm spindle pitch enables quick feeding and positioning.
- The larger screw thread also provides greater load-bearing capacity than a standard head.

SPECIFICATIONS

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

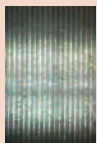
- Measuring face: Material/Carbide tip, Hardness/90 HRA or more, Lapped
 - Scale finishing: Satin-chrome plated
- Note: Refer to page B-129 for details of the recommended maximum loading limit.

DIMENSIONS

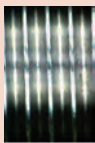


Micrometer Head

Spindle Pitch



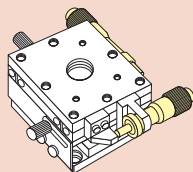
Pitch=0.1 mm



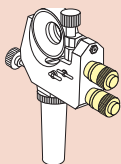
Pitch=0.5 mm

Typical Applications

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



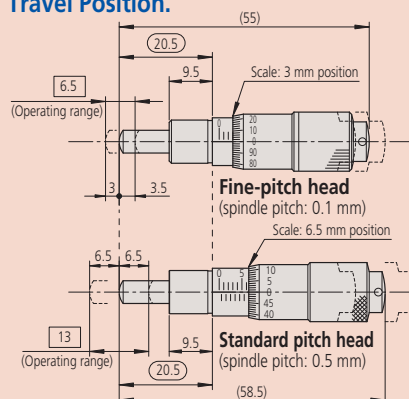
- Precision adjustment of mirror in holder



Precision adjustment of mirror in holder



Comparison of Mounting Dimensions Between a Fine-pitch Head and a Standard-pitch Head at the Mid-range Travel Position.



Note: While the fine-pitch micrometer head has a measuring range of 6.5 mm, the standard head has a larger range of 13 mm. When replacing a standard head, the fine-pitch type can use the common range in the middle of the spindle travel. The standard and compact types of fine-pitch head are otherwise completely interchangeable.

Micrometer Heads
SERIES 148 — Fine Spindle Feed of 0.1 mm/rev

- Highly accurate 0.1 mm pitch thread is only one-fifth of that used for a standard-pitch head (0.5 mm).
- External dimensions are compatible with standard 0.5 mm pitch heads.

SPECIFICATIONS

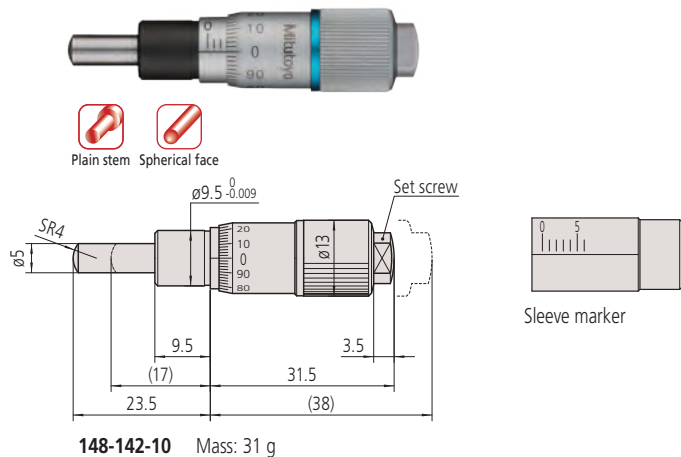
Metric								
Order No.	Range (mm)	Graduation (mm)	Stem dia. (mm)	Stem	Spindle end	Spindle pitch (mm)	Maximum permissible error J_{MPE} (μm)	Special features
148-142-10	0 - 6.5	0.002	9.5	Plain	Spherical (SR4)	0.1	±2	—
148-143-10				W/clamp nut				
148-342-10				Plain				
148-343-10			W/clamp nut	6	Plain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

- Measuring face: Material/Alloy tool steel, Hardness/60 HRC or more, Lapped
 - Scale finishing: Satin-chrome plated
- Note: Refer to page B-129 for details of the recommended maximum loading limit.

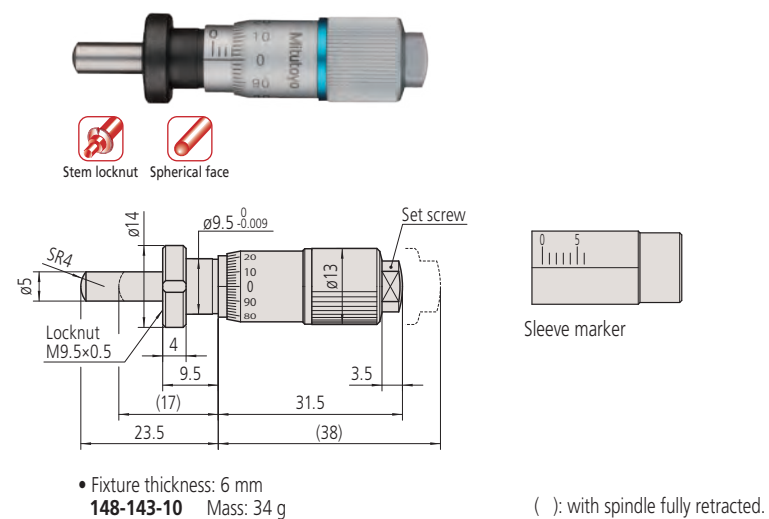
DIMENSIONS

Plain Stem

Unit: mm



Stem Locknut

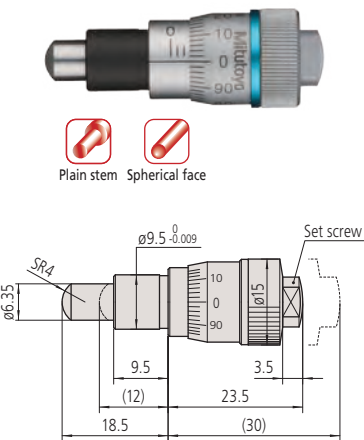


Micrometer Head

Micrometer Heads
SERIES 148 — Fine Spindle Feed of 0.1 mm/rev

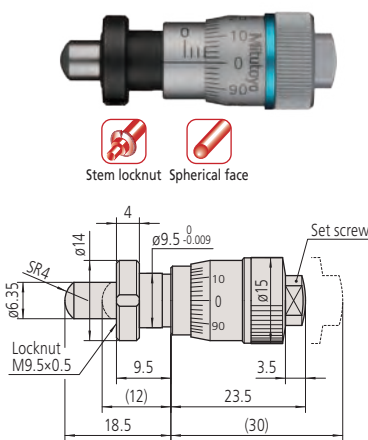
DIMENSIONS

Plain Stem



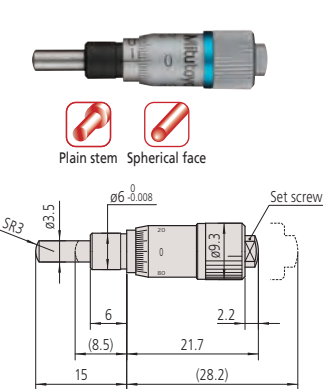
148-342-10 Mass: 29 g

Stem Locknut



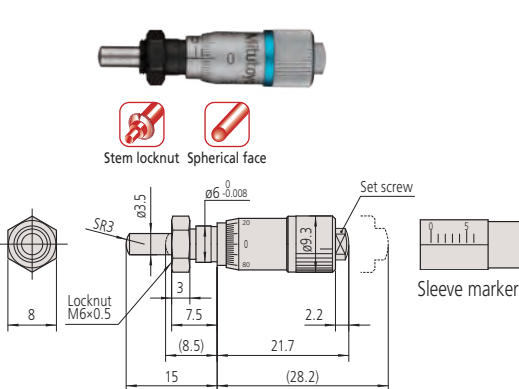
• Fixture thickness: 6 mm
148-343-10 Mass: 31 g

Plain Stem



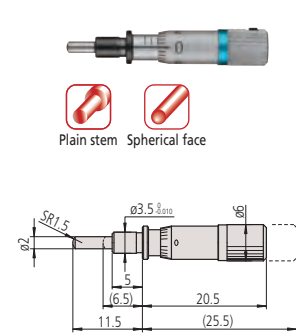
148-242-10 Mass: 10 g

Stem Locknut



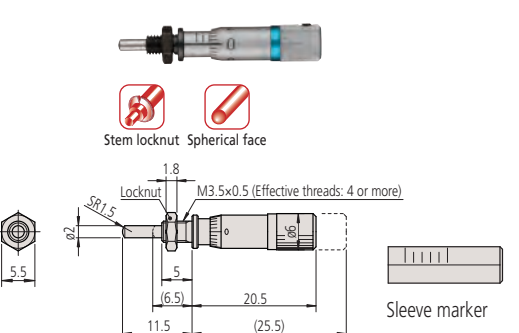
• Fixture thickness: 4 mm
148-243-10 Mass: 10 g

Plain Stem



148-244 Mass: 4 g

Stem Locknut



• Fixture thickness: 3 mm
148-245 Mass: 5 g

(): with spindle fully retracted.

Micrometer Head

Micrometer Heads
SERIES 148 — Fine Spindle Feed of 0.25 mm/rev

- Micrometer head with 0.25 mm spindle pitch is convenient for fine-feed and fine-positioning applications.

SPECIFICATIONS

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

- Measuring face: Material/Alloy tool steel, Hardness/60 HRC or more, Lapped
 - Scale finishing: Satin-chrome plated
- Note: Refer to page B-129 for details of the recommended maximum loading limit.

DIMENSIONS

Plain Stem

Unit: mm

Plain stem Spherical face

SR4 $\phi 5$ $\phi 9.5^{+0}_{-0.009}$ $\phi 13$ Set screw
9.5 (14) 31.5 3.5
27 (44.5)

148-132-10 Mass: 30 g

Plain stem Spherical face

SR4 $\phi 6.35$ $\phi 9.5^{+0}_{-0.009}$ $\phi 15$ Set screw
9.5 (12) 23.5 3.5
18.5 (30)

148-322-10 Mass: 30 g

Stem Locknut

Stem locknut Spherical face

SR4 $\phi 5$ $\phi 14$ $\phi 9.5^{+0}_{-0.009}$ $\phi 13$ Set screw
Locknut M9.5×0.5 4 9.5 (14) 31.5 3.5
27 (44.5)

• Fixture thickness: 6 mm
148-133-10 Mass: 35 g

Stem locknut Spherical face

SR4 $\phi 6.35$ $\phi 14$ $\phi 9.5^{+0}_{-0.009}$ $\phi 15$ Set screw
Locknut M9.5×0.5 4 9.5 (12) 23.5 3.5
18.5 (30)

• Fixture thickness: 6 mm
148-323-10 Mass: 35 g

(): with spindle fully retracted.

B

Micrometer Head

Micrometer Heads SERIES 110 — Differential Screw Thread Translator (Extra-Fine Feed) Type

- The differential movement of spindle thread and nut allows ultra-fine feeding.

SPECIFICATIONS

Metric					
Order No.	Range (mm)		Graduation (mm)		Graduation features
110-101	0 - 2.5		0.001		Standard
110-102			0.0001		Fine
110-105-10	0 - 1		0.001		Standard
110-106-10			0.0001		Fine
110-107-10			0.001		Standard
110-108-10			0.0001		Fine
110-502-10	Thimble (fine)	0 - 0.2	Thimble (fine)	0.0005	Dual scales; 0.2 mm fine-feed range
	Thimble (coarse)	0 - 13	Thimble (coarse)	0.01	
Order No.	Stem dia. (mm)	Stem	Spindle end		Maximum permissible error J_{MPE}^{*2} (μm)
110-101	12	W/clamp nut	Flat (carbide tip)		±5/±1.5
110-102					±3/±1.5
110-105-10			Spherical (SR10) (carbide tip)		
110-106-10					
110-107-10			Spherical		
110-108-10			Spherical		±3/±1.5
110-502-10	9.5		Spherical		±3/±1.5

Inch					
Order No.	Range (in)		Graduation (in)		Graduation features
110-111	0 - 0.05		0.00002		Standard
110-112			0.000005		Fine
110-115-10*1	0 - 0.02		0.00002		Standard
110-116-10*1			0.000005		Fine
110-117-10*1			0.00002		Standard
110-118-10*1			0.000005		Fine
110-504-10	Thimble (fine)	0 - 0.006	Thimble (fine)	0.00002	Dual scales; 0.2 mm/0.006 in fine-feed range
	Thimble (coarse)	0 - 0.5	Thimble (coarse)	0.001	
Order No.	Stem dia. (in)	Stem	Spindle end		Maximum permissible error J_{MPE}^{*2} (in)
110-111	0.5	W/clamp nut	Flat (carbide tip)		±0.00025/±0.00006
110-112					±0.00015/±0.00006
110-115-10*1			Spherical (SR10) (carbide tip)		
110-116-10*1					
110-117-10*1			Spherical		
110-118-10*1	Spherical		±0.00015/±0.00006		
110-504-10	0.375		Spherical		±0.00015/±0.00006

- Measuring face: Material/Carbide tip (110-502-10/504-10 are alloy tool steel), Hardness/90 HRA or more (Only 110-502-10/504-10 are 60 HRC or more), Lapped
 - Scale finishing: Satin-chrome plated
 - *1 Made-to-order models
 - *2 Wide range/narrow range
- Note: Refer to page B-129 for details of the recommended maximum loading limit.

DIMENSIONS

Unit: mm

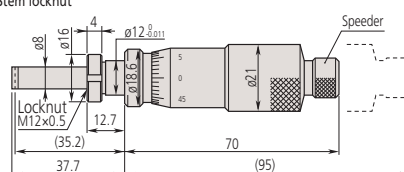
- Differential movement mechanism with double spindle.
- Non-rotating spindle.
- Fixture thickness: 9.5 mm



Equipped with vernier scale



Stem locknut



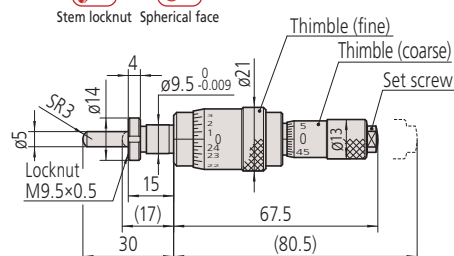
110-101

110-102 Equipped with vernier scale

- Dual thimble
- Fixture thickness: 11.5 mm



Stem locknut Spherical face



110-502-10 Mass: 95 g

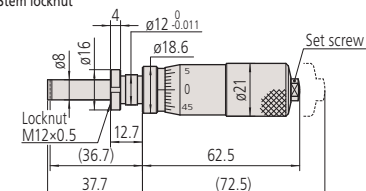
- Differential movement mechanism with double spindle.
- Non-rotating spindle.
- Fixture thickness: 9.5 mm



Equipped with vernier scale



Stem locknut



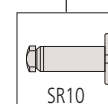
110-105-10

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

Spherical face



Equipped with vernier scale



Stem locknut Spherical face

110-107-10

110-108-10 Equipped with vernier scale

(): with spindle fully retracted.

Micrometer Head

Micrometer Heads
SERIES 152 — Large Thimble Type

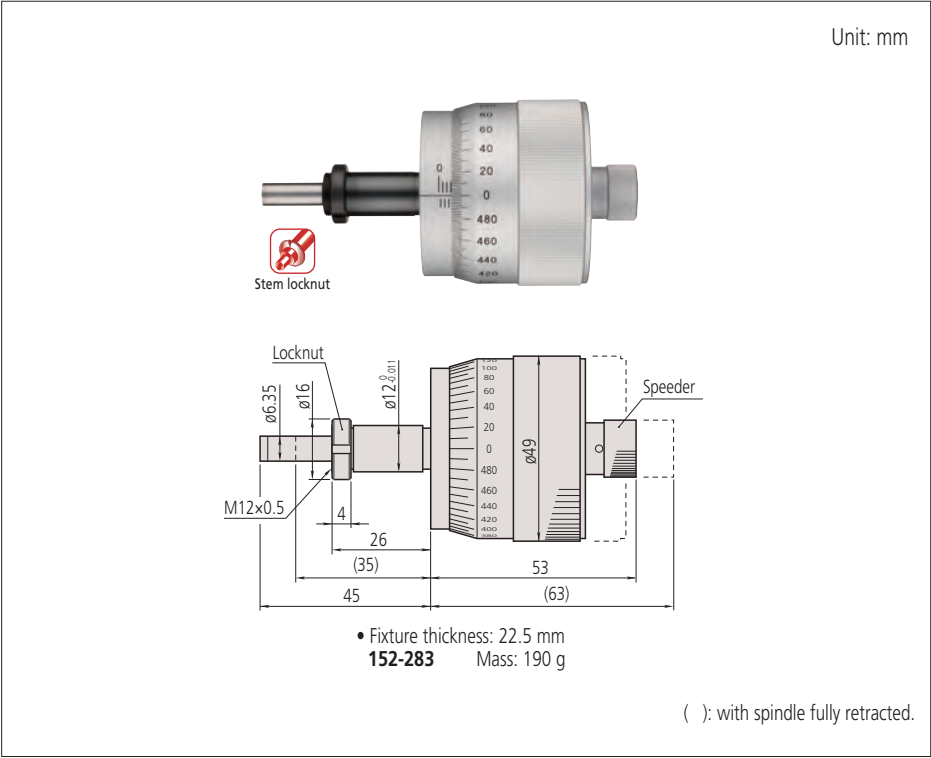
- Large-diameter thimble for fine adjustment and positioning.

SPECIFICATIONS

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

- Measuring face: Material/ Carbide tip, Hardness/90 HRA or more, Lapped
 - Scale finishing: White anodized aluminum
- Note: Refer to page B-129 for details of the recommended maximum loading limit.

DIMENSIONS

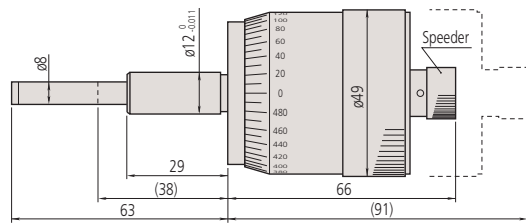


DIMENSIONS

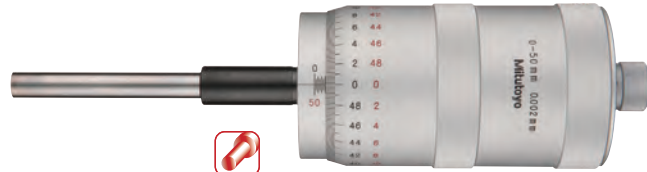
Unit: mm



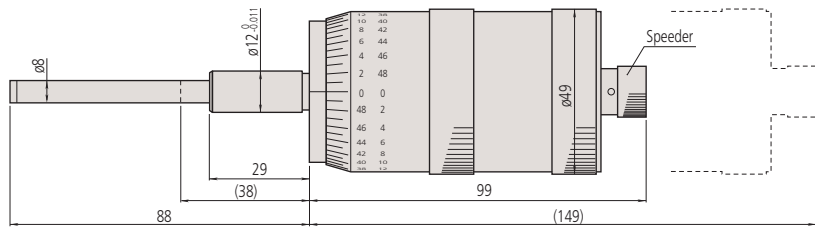
Plain stem



152-332 Mass: 310 g



Plain stem



152-380 Mass: 460 g

(): with spindle fully retracted.

B

Micrometer Head

Micrometer Heads
SERIES 152 — XY-Stage Type

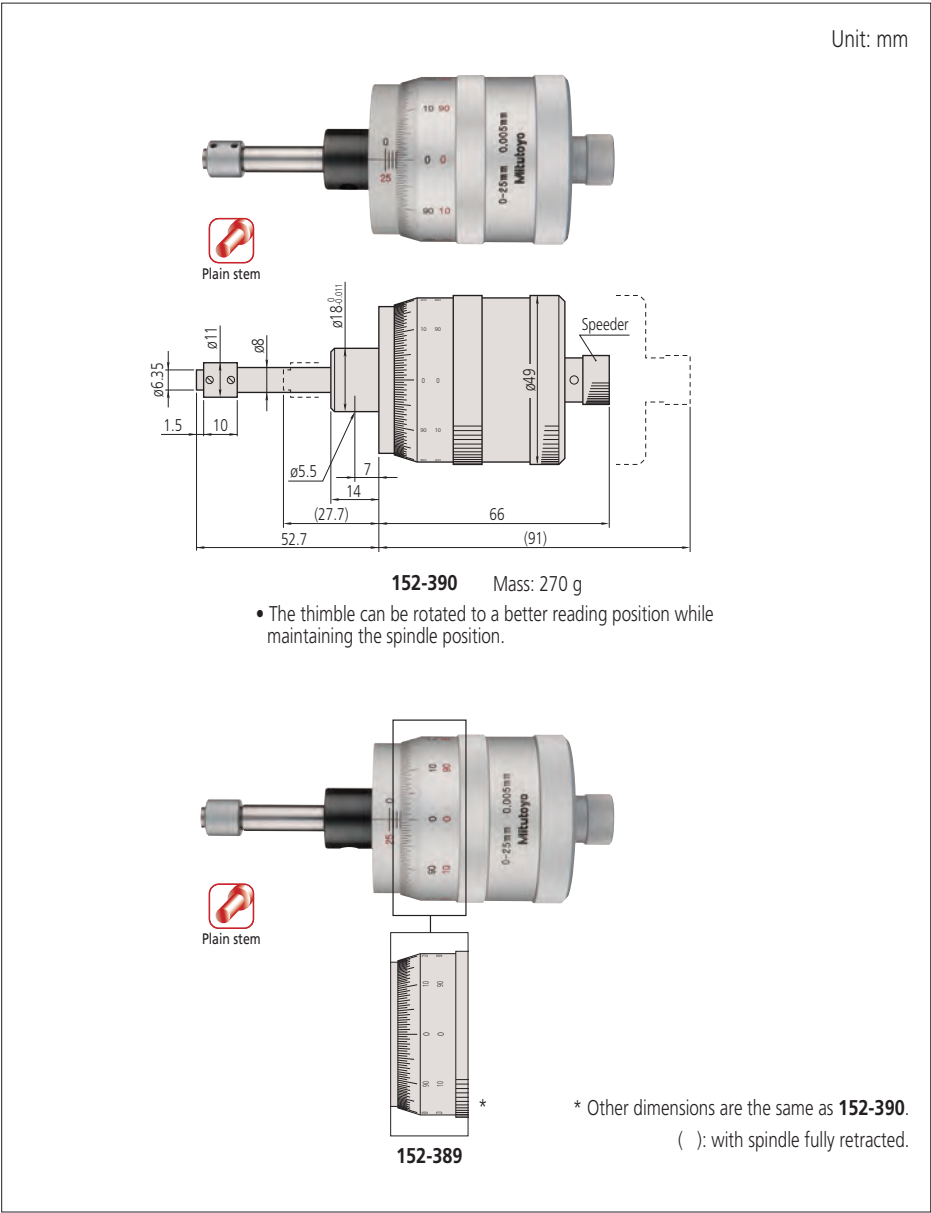
- Micrometer heads especially designed for accurate cross-travel stage control in X and Y axes.

SPECIFICATIONS

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

- Measuring face: Material/Carbide tip (152-389/390 are alloy tool steel), Hardness/90 HRA or more (152-389/390 are 60 HRC or more), Lapped
 - Scale finishing: White anodized aluminum
- Note: Refer to page B-129 for details of the recommended maximum loading limit.

DIMENSIONS



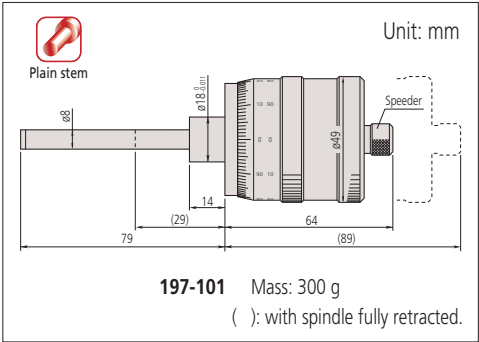
Micrometer Heads
SERIES 197 — Long Stroke Non-rotating Spindle

- Large thimble micrometer head with non-rotating spindle.
- Floating thimble allows easy zero setting at any spindle position.
- Dual-spindle mechanism for quick feed of 1 mm/rev (standard models: 0.5 mm/rev).



197-101

DIMENSIONS



SPECIFICATIONS

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

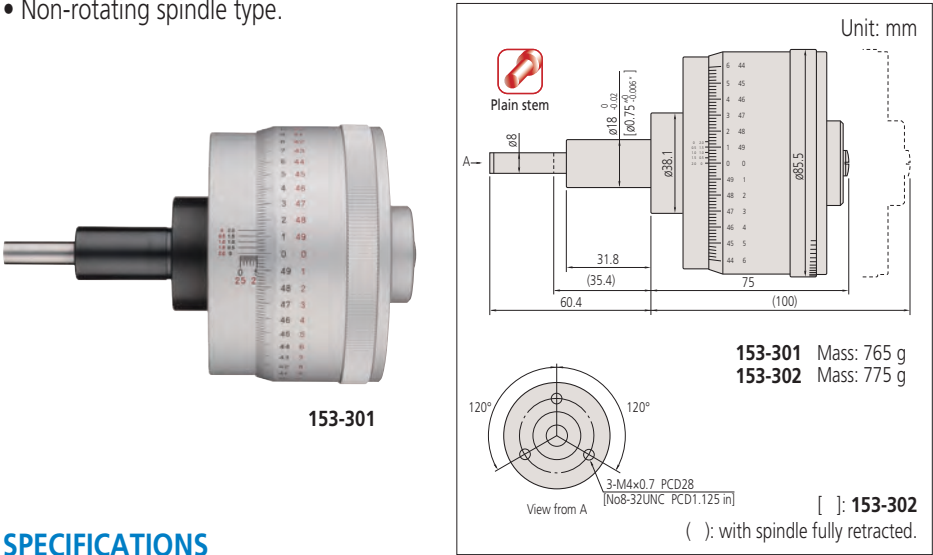
Inch									
Order No.	Range	Graduation	Graduation features	Stem dia.	Stem	Spindle end	Spindle pitch	Maximum permissible error J_{MPE}	
197-201	0 - 2 in	0.0002 in	Bidirectional	0.709 in	Plain	Flat (carbide tip)	0.05 in	± 0.0001 in	

- Measuring face: Material/Carbide tip, Hardness/90 HRA or more, Lapped
 - Scale finishing: White anodized aluminum
- Note: Refer to page B-129 for details of the recommended maximum loading limit.

Micrometer Heads
SERIES 153 — High Accuracy and Resolution

- Fine graduation and high resolution model.
- Non-rotating spindle type.

DIMENSIONS



SPECIFICATIONS

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

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

- Measuring face: Material/Carbide tip, Hardness/90 HRA or more, Lapped
 - Scale finishing: White anodized aluminum
- * Wide range/narrow range
- Note: Refer to page B-129 for details of the recommended maximum loading limit.

Micrometer Head

Micrometer Heads
SERIES 250 — Digit Counter Type

- Digit counter for easy reading of spindle movement.

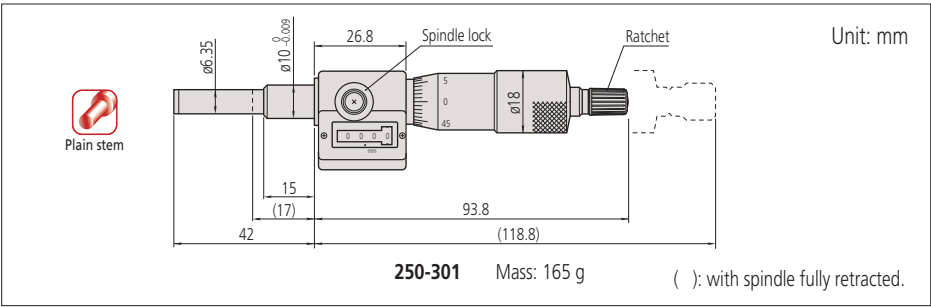


SPECIFICATIONS

Metric								
Order No.	Range (mm)	Graduation (mm)	Stem dia. (mm)	Stem	Spindle end	Spindle pitch (mm)	Graduation features	Maximum permissible error <i>J_{MPE}</i> (μm)
250-301	0 - 25	0.01	10	Plain	Flat (carbide tip)	0.5	—	±2
Inch								
Order No.	Range (in)	Graduation (in)	Stem dia. (in)	Stem	Spindle end	Spindle pitch (in)	Graduation features	Maximum permissible error <i>J_{MPE}</i> (in)
250-312	0 - 1	0.0001	0.375	Plain	Flat (carbide tip)	0.025	Vernier scale	±.0001

- Measuring face: Material/Carbide tip, Hardness/90 HRA or more, Lapped
 - Scale finishing: Satin-chrome plated
- Note: Refer to page B-129 for details of the recommended maximum loading limit.

DIMENSIONS



Micro Jack
SERIES 7

- Used for accurate leveling of machines, surface plates, and other precision instruments.
- Zero-setting is possible at any position.
- Easy adjustment under heavy load.

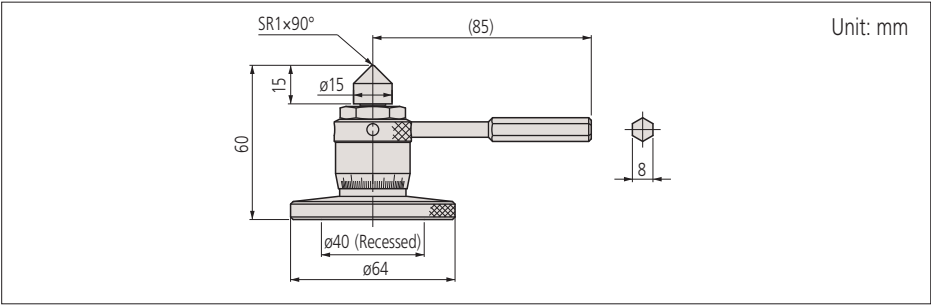


SPECIFICATIONS

Metric				
Order No.	Range (mm)	Graduation (mm)	Remarks (kg)	Handle power at the max. loading (N)
7850	60 - 75	0.01	Max. load: 400	90

- Measuring face: Material/Alloy tool steel, Hardness/60 HRC or more, Lapped
 - Scale finishing: Satin-chrome plated
- Note: Refer to page B-129 for details of the recommended maximum loading limit.

DIMENSIONS



Measurement example



Micrometer Head Mounting Fixtures

- Manufacturing brackets to mount micrometer heads for each particular application can be laborious and costly. Mitutoyo offers various types of fixtures for micrometer heads to meet a wide range of applications. These fixtures are made of nickel-plated cast iron.

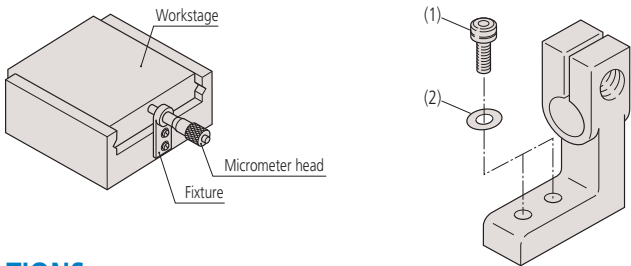


B

SPECIFICATIONS

Micrometer Head	Fixtures (Order No.)	Mounting hole size
148 Series	303560, 303562, 303564, 303566 303559, 303561, 303563, 303565	ø9.5×9.5 long for plain stem or stem locknut type micrometer heads
149 Series	303569, 303571, 303573, 303575 303568, 303570, 303572, 303574	ø9.5×15 long for plain stem or stem locknut type micrometer heads
150 Series	303579, 303581, 303583, 303585 303578, 303580, 303582, 303584	ø10×15 long for plain stem or stem locknut type micrometer heads

Note 1: Supplied with a socket head screw (M3×0.5×12) for fixtures to be used with a micrometer head without stem locknut (plain stem type micrometer head).
Note 2: Refer to page B-129 for details of the recommended maximum loading limit.



SPECIFICATIONS

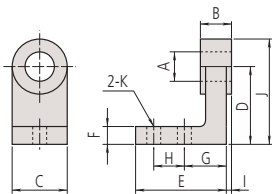
Fixtures (Order No.)	Socket head screw (1)	Washer (2)
303559, 303560, 303561, 303562, 303563, 303564 303565, 303566	M3×0.5×8 M3×0.5×12	Small, Nominal dia.: 3 Small, Nominal dia.: 3
303568, 303569, 303570, 303571, 303572, 303573 303578, 303579, 303580, 303581, 303582, 303583	M4×0.7×10	Small, Nominal dia.: 4
303574, 303575 303584, 303585	M4×0.7×12	Small, Nominal dia.: 4

Note: Refer to page B-129 for details of the recommended maximum loading limit.

Micrometer Head

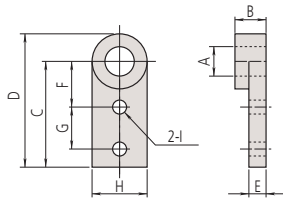
Micrometer Heads
Mounting Fixtures

Fixtures for micrometer heads with stem locknut



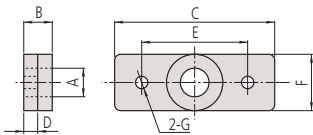
(Unit: mm)

Order No.	A	B	C	D	E	F	G	H	I	J	K
303559	ø9.5	6	15	20	24	5	11	8	0.5	27.5	ø3.4
303568		11.5	20	30	35	7	16	12	1.75	40	ø4.5
303578	ø10										



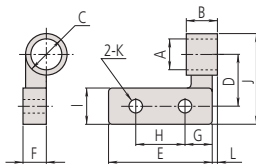
(Unit: mm)

Order No.	A	B	C	D	E	F	G	H	I
303563	ø9.5	6	30	37.5	4.5	15	10	15	ø3.4
303572		11.5	40	50	6.5	18	15	20	ø4.5
303582	ø10								



(Unit: mm)

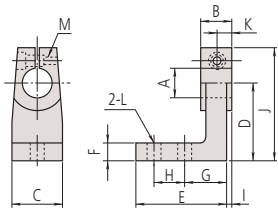
Order No.	A	B	C	D	E	F	G
303561	ø9.5	6	40	3.5	30	15	ø3.4
303570		11.5	60	5.5	40	20	ø4.5
303580	ø10						



(Unit: mm)

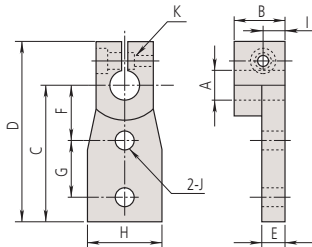
Order No.	A	B	C	D	E	F	G	H	I	J	K	L
303565	ø9.5	6		15	25		7.5	10	10	27.5	ø3.4	0.75
303574		11.5	ø15	20	40	8.5	10	20	15	35	ø4.5	1.25
303584	ø10											

Fixtures for plain stem type micrometer heads



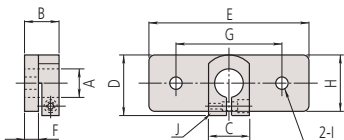
(Unit: mm)

Order No.	A	B	C	D	E	F	G	H	I	J	K	L	M
303560	ø9.5	9	15	20	23	5	11	8	1.5	3.25	4.5	ø3.4	M3x 0.5
303569		14.5	20	30	35	7	16	12	3.25	4.25	7.25	ø4.5	
303579	ø10												



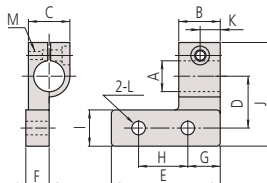
(Unit: mm)

Order No.	A	B	C	D	E	F	G	H	I	J	K
303564	ø9.5	9	30	42.5	4	15	10	15	4.5	ø3.4	M3x 0.5
303573		14.5	40	52.5	6	18	15	20	7.25	ø4.5	
303583	ø10										



(Unit: mm)

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



(Unit: mm)

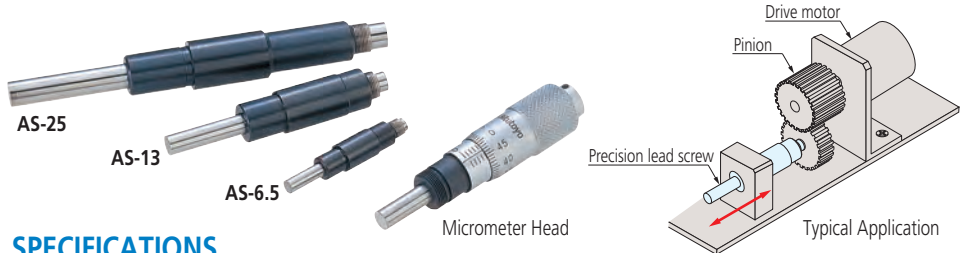
Order No.	A	B	C	D	E	F	G	H	I	J	K	L	M
303566	ø9.5	9	15	15	25	8.5	7.5	10	10	32.5	4.5	ø3.4	M3x 0.5
303575		14.5		20	40		10	20	15	40	7.25	ø4.5	
303585	ø10												

Main applications:

- Precision feed stages
- Fine adjustment of optical elements (mirrors, prisms)
- Fiber optic centering devices
- Various assembly and adjustment jigs

Precision Leadscrews

- Mitutoyo manufacture simple and less expensive precision leadscrews for precise positioning mechanisms and fine-feed mechanisms, in addition to standard micrometer heads.
- Mitutoyo also manufacture leadscrews with special specifications, such as 0.25 mm pitch, as well as those with the standard 0.5 mm feed pitch and with dimensions and forms that meet customer requirements.



SPECIFICATIONS

Order No.	Model*	Range (mm)	Feed pitch (mm)	Feed accuracy (μm)	Stem diameter (mm)	Tip diameter (mm)	Tail diameter (mm)	Screw nominal diameter	Sleeve diameter (mm)	Measuring face	Mass (g)
04AZA160	AS-6.5	0 - 6.5	0.5	±5	ø6 ⁰ _{-0.008}	ø3.5	ø3 ⁰ _{-0.01}	M4.5×0.5	ø7	Hardened	10
04AZA161	BS-6.5										11
04AZA162	AS-13	0 - 13		±2	ø9.5 ⁰ _{-0.009}	ø5	ø5 ⁰ _{-0.012}	M7.35×0.5	ø10.5		27
04AZA163	BS-13										30
04AZA164	AS-25	0 - 25			ø10 ⁰ _{-0.009}	ø6.35	ø6 ⁰ _{-0.015}	ø12	Carbide tip	61	
04AZA165	BS-25									64	

- Measuring face: Material/Alloy tool steel (**AS-25** and **BS-25** are Carbide tip), Hardness/60 HRC or more (**AS-25** and **BS-25** are 90 HRA or more), Lapped
- Durability: 100,000 operations are guaranteed (use condition: 4 kg load; 2 kg for **AS-6.5** and **BS-6.5**)
- * AS type: Flat spindle tip without nut, BS type: Spherical spindle tip with nut
- Note: Refer to page B-129 for details of the recommended maximum loading limit.

DIMENSIONS

Type AS: Plain Stem

Unit: mm

Plain stem

Spindle (material: SKS hardened steel)

Sleeve (material: free-cutting steel, black oxide finish)

Stem diameter

Nominal diameter of screw

Diameter of tip

L₃

L₁

L₂

L₄

L

Diameter of tail

External diameter of sleeve

Type BS: Stem with Locknut

Stem locknut

Spherical face

Spindle (material: SKS hardened steel)

Stem locknut

Sleeve (material: free-cutting steel, black oxide finish)

Stem diameter

Nominal diameter of screw

Diameter of tip

L₃

L₅

L₁

L₂

L₄

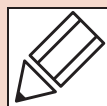
L

Diameter of tail

External diameter of sleeve

Order No.	L	L ₁	L ₂	L ₃	L ₄	L ₅
04AZA160	39	15	14.5	9	6	—
04AZA161	—	—	—	7.5	—	3
04AZA162	57.5	25	21.5	15.5	8	—
04AZA163	—	—	—	—	4	—
04AZA164	96.5	42	39.5	27	10	—
04AZA165	—	—	—	—	—	4

Quick Guide to Precision Measuring Instruments



Micrometer Heads

Mounted on measuring instruments and precision instruments, micrometer heads are used for various purposes including measurement, feeding and positioning. Recent developments in technology have seen the micrometer head widely utilized in precise feeding devices and cross-travel stages on laser instruments and manipulators, in addition to the usual duties on measurement jigs. In parallel with the application expansion, the customer's needs have increased. To meet customer demands, Mitutoyo provides standard micrometer heads with different measuring ranges, stem type and body size. Furthermore, high-performance types of Digimatic Micrometer Head, 0.1 mm spindle-pitch models (standard 0.5 mm), etc., are now available for the new applications. Mitutoyo also provides customization services for special applications. Micrometer heads with customized spindle tips and precision leadscrews manufactured to customer specification can be offered, even in one-off quantities.

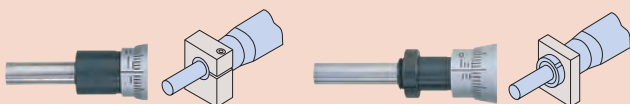
Key Factors in Selection

Key factors in selecting a micrometer head are the measuring range, spindle face, stem, graduations, thimble diameter.

Stem

Plain stem

Stem locknut type



- The stem used to mount a micrometer head is classified as a "plain type" or "clamp nut type" as illustrated above. The stem diameter is manufactured to a nominal Metric or Imperial size with an h6 tolerance.
- The clamp nut stem allows fast and secure clamping of the micrometer head. The plain stem has the advantage of wider application and slight positional adjustment in the axial direction on final installation, although it does require a split-fixture clamping arrangement or adhesive fixing.
- General-purpose mounting fixtures are available as optional accessories.

Measuring Face



Flat face

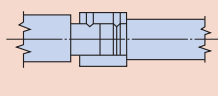
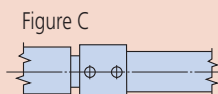
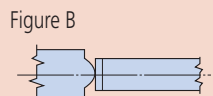
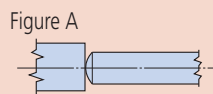


Spherical face



Anti-rotation device

- A flat measuring face is often specified where a micrometer head is used in measurement applications.
- When a micrometer head is used as a feed device, a spherical face can minimize errors due to misalignment (Figure A). Alternatively, a flat face on the spindle can bear against a sphere, such as a carbide ball (Figure B).
- A non-rotating spindle type micrometer head or one fitted with an anti-rotation device on the spindle (Figure C) can be used if a twisting action on the workpiece must be avoided.
- If a micrometer head is used as a stop, then a flat face on both the spindle and the face it contacts provides durability.



Non-Rotating Spindle

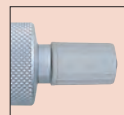
- A non-rotating spindle type head does not exert a twisting action on a workpiece, which may be an important factor in some applications.

Spindle Thread Pitch

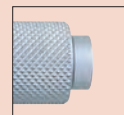
- The standard type head has 0.5 mm pitch.
- 1 mm-pitch type: quicker to set than standard type and avoids the possibility of a 0.5 mm reading error. Excellent load-bearing characteristics due to larger screw thread.
- 0.25 mm or 0.1 mm-pitch type
This type is the best for fine-feed or fine-positioning applications.

Constant-force Device

- A micrometer head fitted with a constant-force device (ratchet or friction thimble) is recommended for measurement applications.
- If using a micrometer head as a stop, or where saving space is a priority, a head without a ratchet is probably the best choice.



Micrometer head with constant-force device



Micrometer head without constant-force device (no ratchet)

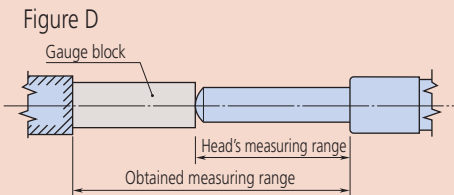
Spindle Lock

- If a micrometer head is used as a stop, it is desirable to use a head fitted with a spindle lock so that the setting will not change even under repeated shock loading.



Measuring Range

- When choosing a measuring range for a micrometer head, allow an adequate margin in consideration of the expected measuring range. Six measuring ranges, 5 mm to 50 mm, are available for standard micrometer heads.
- Even if the expected measuring range is small, such as 2 mm to 3 mm, it will be cost effective to choose a 25 mm-stroke model as long as there is enough space for installation.
- If a long measuring range of over 50 mm is required, the concurrent use of a gauge block can extend the effective measuring range. (Figure D)



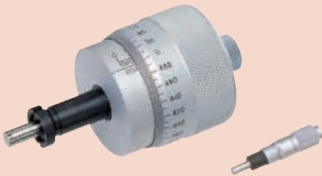
- In this guide, the range (or stroke end) of the thimble is indicated by a dashed line. For stroke ends, consider the thimble as moving to the position indicated by the line when designing the jig.

Ultra-fine Feed Applications

- Dedicated micrometer heads are available for manipulator applications, etc., which require ultra-fine feed or adjustment of spindle.

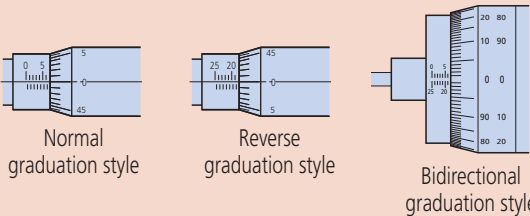
Thimble Diameter

- The diameter of a thimble greatly affects its usability and the "fineness" of positioning. A small-diameter thimble allows quick positioning whereas a large-diameter thimble allows fine positioning and easy reading of the graduations. Some models combine the advantages of both features by mounting a coarse-feed thimble (speeder) on the large-diameter thimble.



Graduation Styles

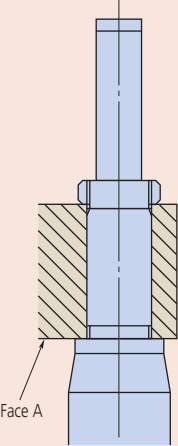
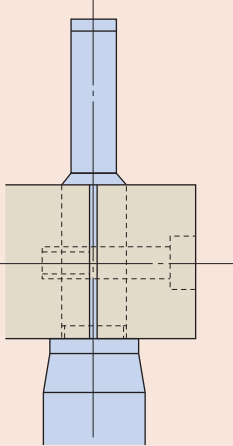
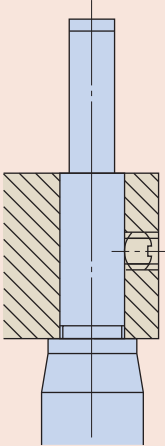
- Care is needed when taking a reading from a mechanical micrometer head, especially if the user is unfamiliar with the model.
- The "normal graduation" style, identical to that of an outside micrometer, is the standard. For this style, the reading increases as the spindle retracts into the body.
- On the contrary, in the "reverse graduation" style, the reading increases as the spindle advances out of the body.
- The "bidirectional graduation" style is intended to facilitate measurement in either direction by using black numerals for normal, and red numerals for reverse operation.
- Micrometer heads with a mechanical or electronic digital display, which allow direct reading of a measurement value, are also available. These types are free from misreading errors. A further advantage is that the electronic digital display type can enable computer-based storage and statistical processing of measurement data.



Guidelines for Self-made Fixtures

A micrometer head should be mounted by the stem in an accurately machined hole using a clamping method that does not exert excessive force on the stem. There are three common mounting methods as shown below. Method (3) is not recommended. Adopt methods (1) or (2) wherever possible.

(Unit: mm)

Mounting method	(1) Clamp nut				(2) Split-body clamp				(3) Setscrew clamp			
												
Points to keep in mind												
Stem diameter	ø9.5	ø10	ø12	ø18	ø9.5	ø10	ø12	ø18	ø9.5	ø10	ø12	ø18
Mounting hole Fitting tolerance	G7 +0.005 to +0.020		G7 +0.006 to +0.024		G7 +0.005 to +0.020		G7 +0.006 to +0.024		H5 0 to +0.006		H5 0 to +0.008	
Precautions	Care should be taken to make Face A square to the mounting hole. The stem can be clamped without any problem at squareness within 0.16/6.5.				Remove burrs generated on the wall of the mounting hole by the slitting operation.				M3x0.5 or M4x0.7 is an appropriate size for the setscrew. Limit countersinking into stem to 90°x0.5 and be careful not to damage the stem in the process.			

Maximum Loading Capacity of Micrometer Heads

The maximum loading capacity of a micrometer head depends mainly on the method of mounting and whether the loading is static or dynamic (used as a stop, for example). Therefore the maximum loading capacity of each model cannot be definitely specified. The loading limits recommended by Mitutoyo (at less than 100,000 revolutions if used for measuring within the guaranteed accuracy range) and the results of static load tests using a small micrometer head are given below.

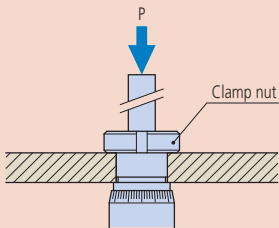
1. Recommended maximum loading limit

		Maximum loading limit
Standard type	Spindle pitch: 0.5 mm	Up to approx. 39.2 N (4 kgf)*
	Spindle pitch: 0.1 mm/0.25 mm	Up to approx. 19.6 N (2 kgf)
High function type	Spindle pitch: 0.5 mm	Up to approx. 39.2 N (4 kgf)
	Spindle pitch: 1.0 mm	Up to approx. 58.8 N (6 kgf)
	Non-rotating spindle	Up to approx. 19.6 N (2 kgf)
	Series 110 micro-fine feed type (with a differential mechanism)	Up to approx. 19.6 N (2 kgf)

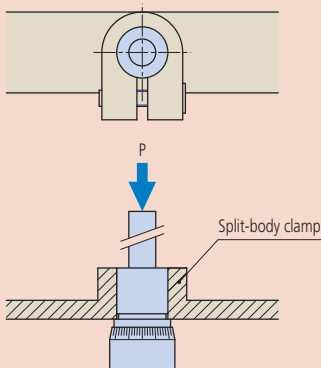
* Up to approx. 19.6 N (2 kgf) only for Ultra small models

2. Static load test for micrometer heads (using 148-104 / 148-103 for this test)

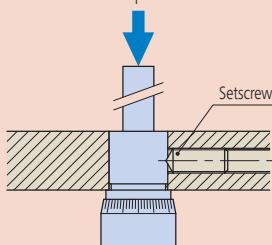
(1) Clamp nut



(2) Split-body clamp



(3) Setscrew clamp



Test method
Micrometer heads were set up as shown and the force at which the head was damaged or pushed out of the fixture when a static load was applied, in direction P, was measured. (In the tests no account was taken of the guaranteed accuracy range.)

Mounting method	Damaging/dislodging load
(1) Clamp nut	Damage to the main unit will occur at 8.63 to 9.8 kN (880 to 1000 kgf).
(2) Split-body clamp	The main unit will be pushed out of the fixture at 0.69 to 0.98 kN (70 to 100 kgf).
(3) Setscrew clamp	Damage to the setscrew will occur at 0.69 to 1.08 kN (70 to 110 kgf).

Note: These load values should only be used as an approximate guide.