Blade Micrometers
SERIES 422, 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 also available.
- Non-rotating spindle type.
- Equipped with Ratchet Stop for constant measuring force.

Digimatic (LCD)
422-230-30

122-101

Quickmike Type (LCD)
422-411

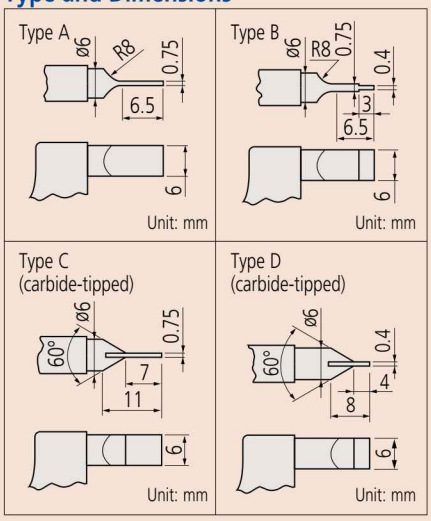
IP54

ABSOLUTE™

Technical Data

Parallelism
3µm for models up to 75mm
.00015" for models up to 3"
(3+R/100)µm for models over 75mm
.0002" for models over 3"
R = max. range (mm)
fraction rounded up

Type and Dimensions



Battery for series 422

SR44 (1 pc), 938882, for initial operational checks (standard accessory)
Battery life: Approx. 2.4 years under normal use (for series 422-2XX, 3XX)
Approx. 1 year under normal use (for series 422-4XX)
Length standard: Electromagnetic rotary sensor (for series 422-2XX, 3XX)
Electrostatic capacity absolute sensor (for series 422-4XX)
Standard accessories: Reference bar, 1 pc (except for measuring range 0-25mm/0-30mm (0-1"/0-1.2") models)
Spanner (301336), 1 pc (for series 122-1XX, 422-2XX, 3XX)

Optional accessories

Connecting cables for digital models
1m: **05CZA662**
2m: **05CZA663**
USB Input Tool Direct
USB-ITN-B (2m): **06ADV380B**
Connecting cables for **U-WAVE-T** (digital models)
02AZD790B (160mm)
For foot switch: **02AZE140B**
Connecting cables for Quickmike type
1m: **937387**
2m: **965013**
USB Input Tool Direct
USB-ITN-E (2m): **06ADV380E**
Connecting cables for **U-WAVE-T** (Quickmike type)
02AZD790E 160mm
For foot switch: **02AZE140E**
Refer to page B-68 for details.

SPECIFICATIONS

Metric

Order No.	Range	Resolution	Accuracy*	Remark
Digimatic (LCD)				
422-230-30	0 - 25mm	0.001mm	±3µm	Type A
422-231-30	25 - 50mm			
422-232-30	50 - 75mm			
422-233-30	75 - 100mm		±4µm	
422-260-30	0 - 25mm		±3µm	Type B
422-261-30	25 - 50mm			
422-270-30	0 - 25mm			Type C
422-271-30				Type D

* Excluding quantizing error

Metric Quickmike type

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

* Excluding quantizing error

Metric

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

Notes: 1) A heat shield is provided with Digimatic models and **422-230-30** as standard.

Inch/Metric

Order No.	Range	Resolution	Accuracy*	Remark
Digimatic (LCD)				
422-330-30	0 -1"	.0005"/ 0.001mm	±.00015"	Type A
422-331-30	1" -2"			
422-332-30	2" -3"			
422-333-30	3" -4"		±.0002"	
422-360-30	0 -1"		±.00015"	Type B
422-361-30	1" -2"			
422-370-30	0 -1"			Type C
422-371-30				Type D

* Excluding quantizing error

Inch/Metric Quickmike type

Order No.	Range	Resolution	Accuracy*	Remark
Digimatic (LCD)				
422-421	0 - 1.2"	.00005"/ 0.001mm	±.00015"	Type A

* Excluding quantizing error

Inch

Order No.	Range	Graduation	Accuracy	Remark
Analog				
122-125	0 - 1"	.0001"	±.00015"	Type A
122-126	1" - 2"			
122-127	2" - 3"			
122-128	3" - 4"		±.0002"	
122-135	0 - 1"		±.00015"	Type B
122-151				Type D

Mitutoyo

Micrometer

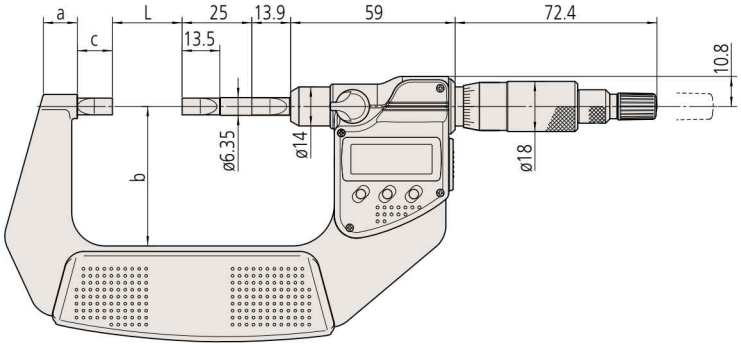
The origin of Mitutoyo's trustworthy brand of small tool instruments

B

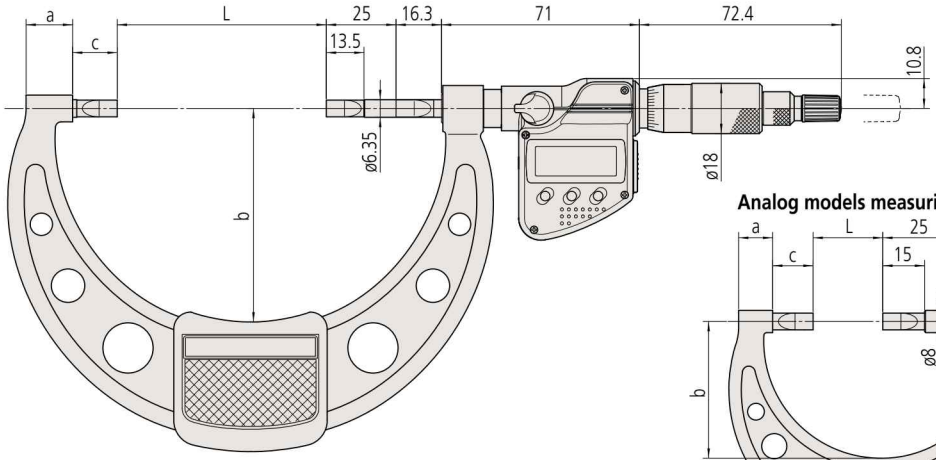
DIMENSIONS

Digital models up to 50mm measuring range

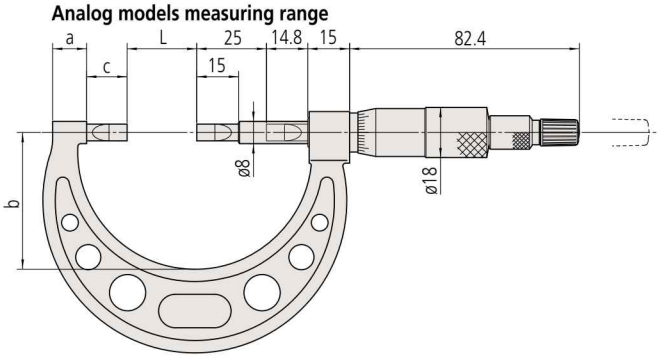
Unit: mm



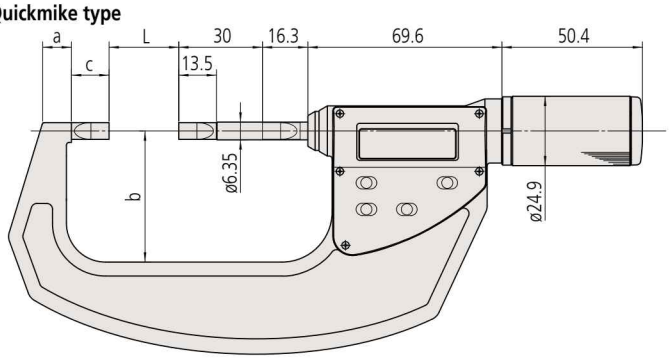
Digital models over 75mm measuring range

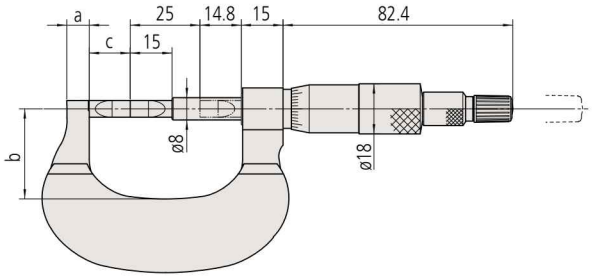


Analog models measuring range



Quickmike type





Order No.	L	a	b	C
422-230-30	0	11	31	12.5
422-231-30	25	12.2	50	12.6
422-232-30	50	14.6	57	13
422-233-30	75	16.7	76	16
422-260-30	0	11	31	12.5
422-261-30	25	12.2	50	12.6
422-270-30	0	11	31	12.5
422-271-30	0			
122-101	0	7.8	32	15
122-102	25	12.2	49	14.5
122-103	50	14.6	60	
122-104	75	17	79	17.5
122-105	100	19	94	17.9
122-106	125	20	106	18.3
122-107	150	19	118	18.5
122-108	175	17	130	18.9
122-109	200	18	143	17.7
122-110	225		156	18.7
122-115	250		169	
112-116	275		181	
422-411	0	8.5	36	13.5
422-412	25	10.3	47	

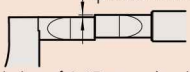
Quickmike

Provides a speedy spindle feed of 10mm per thimble rotation, which enables widely differently sized features to be measured quickly.

Deviation between the Anvil and Spindle in the Vertical Direction

within 0.15mm

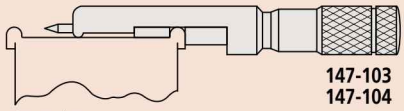
Deviation between the anvil and spindle in the vertical direction



Deviation of 0.15mm or less is guaranteed between the anvil and spindle in the vertical direction.

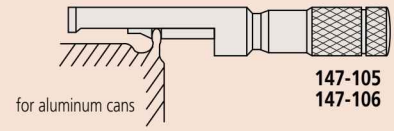
* When the measuring range is 0 - 25mm

Technical Data



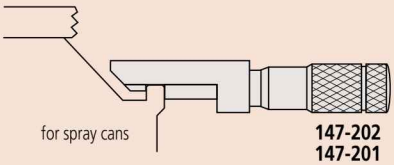
147-103
147-104

for steel cans
(for depth measurements up to 5mm)



147-105
147-106

for aluminum cans



for spray cans

147-202
147-201

Standard accessories: Spanner (200168), 1 pc
Spanner (202863), 1pc

Can Seam Micrometers
SERIES 147

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

147-103

B

SPECIFICATIONS

Metric

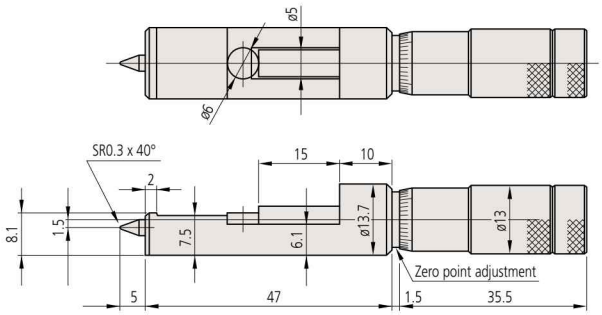
Order No.	Range	Graduation	Accuracy	Remarks
147-103	0 - 13mm	0.01mm	±3μm	for steel cans
147-105				for aluminum cans
147-202				for spray cans

Inch

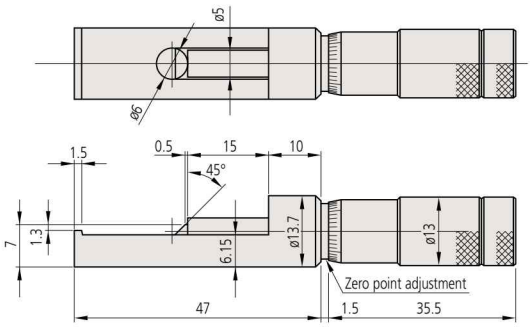
Order No.	Range	Graduation	Accuracy	Remarks
147-104	0 - .5"	.001"	±.00015"	for steel cans
147-106				for aluminum cans
147-201				for spray cans

DIMENSIONS

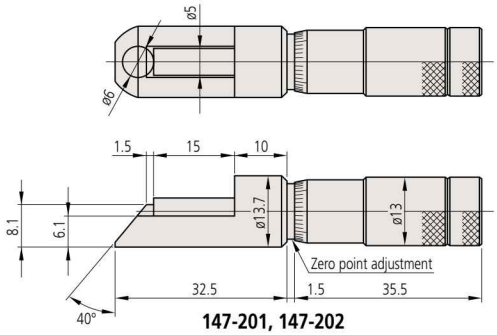
Unit: mm



147-103, 147-104



147-105, 147-106



147-201, 147-202

Mitutoyo

Micrometer

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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

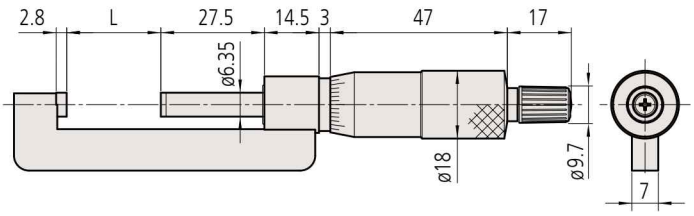
Metric

Order No.	Range	Graduation	Accuracy
147-301	0 - 25mm	0.01mm	±2µm
147-302	25 - 50mm		
147-303	50 - 75mm		
147-304	75 - 100mm		±3µm

Inch

Order No.	Range	Graduation	Accuracy
147-351	0 - 1"	.001"	±.0001"
147-352	1" - 2"		
147-353	2" - 3"		
147-354	3" - 4"		±.00015"

DIMENSIONS



Range	h1	h2	h3	H	L
0 - 25mm	6	8.5	13.5	17.5	0
25 - 50mm	6.5	11	14	20.5	25
50 - 75mm			13		50
75 - 100mm					75

Technical data

Flatness: 0.6µm/.000024"
Parallelism: (2+R/100)µm, R = max. range (mm)
[.00008"+.00004'(R/4)]" R = max. range (mm)
*fraction rounded up
Standard accessories: Reference bar, 1 pc
(except for measuring range 0-25mm (0-1") models)
Spanner (301336), 1 pc

Wire Micrometers Series 147

- Designed for measuring wire thickness.
- Measurable wire dia.: 10mm or less
- Measuring faces: Carbide
- Equipped with Ratchet Stop for constant measuring force.

147-401

SPECIFICATIONS

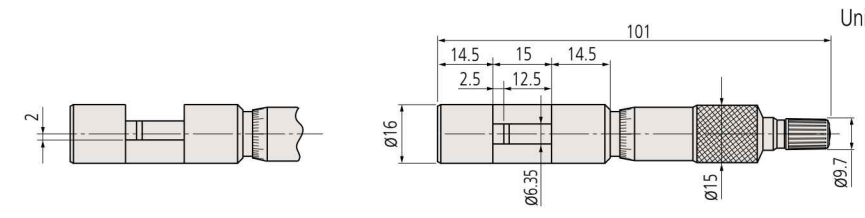
Metric

Order No.	Range	Graduation	Accuracy
147-401	0 - 10mm	0.01mm	±3µm

Inch

Order No.	Range	Graduation	Accuracy
147-402	0 - .4"	.0001"	±.00015"

DIMENSIONS



Technical Data

Flatness: 0.6µm/.000024"
Parallelism: 1.3µm/.00005"

Standard accessories: Spanner (200168), 1 pc
Spanner (202863), 1pc

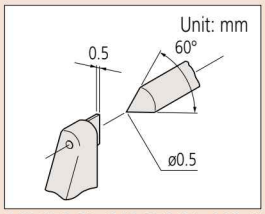
These marks indicate that a product has successfully passed IP65-level testing, which is carried out by the independent German certification organization TÜV Rheinland.

(Refer to page X for details.)

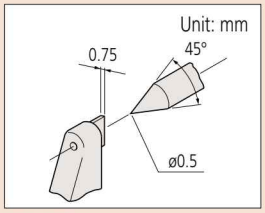
www.tuv.com
ID 0000040191

IP Codes (series 342-271-30, 342-371-30)

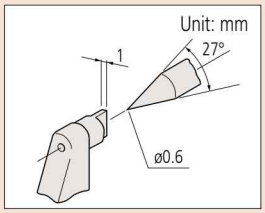
Level 6: Dust-proof.
No ingress of dust allowed.
Level 5: Protected against water jets.
Water projected in jets against the enclosure from any direction shall have no harmful effects.



342-271-30, 342-371-30, 112-401



342-451



142-402, 142-403

Battery for series 342

SR44 (1 pc), **938882**, for initial operational checks (standard accessory)
Battery life: Approx. 2.4 years under normal use (for series 342-271-30/342-371-30)
Approx. 3 years under normal use (for series 342-451)
Length standard: Electromagnetic rotary sensor (for series 342-271-30/342-371-30)
Electrostatic capacity absolute sensor (for series 342-451)
Standard accessories:
Spanner (301336), 1 pc (except for series 342-451)

Optional accessories

Connecting cables (digital model)
1m: **05CZA662**
2m: **05CZA663**
USB Input Tool Direct
USB-ITN-B (2m): **06ADV380B**
Connecting cables for **U-WAVE-T** (digital model)
02AZD790B (160mm)
For foot switch: **02AZE140B**
Connecting cables (Quickmike type)
1m: **937387**
2m: **965013**
USB Input Tool Direct
USB-ITN-E (2m): **06ADV380E**
Connecting cables for **U-WAVE-T** (Quickmike type)
02AZD790E 160mm
For foot switch: **02AZE140E**
Refer to page B-68 for details.

Crimp Height Micrometers Series 342,112,142

- Measures the height of crimp contacts.
- Equipped with Ratchet Stop for constant measuring force.
- IP65 water/dust protection (digital model).
- Model **342-451** is the Quickmike type, which provides a speedy spindle feed of 10mm per thimble rotation, which enables widely differently sized features to be measured quickly.

Digimatic (LCD)
342-271-30

Quickmike type (LCD)
342-451

ABSOLUTE™

112-401

SPECIFICATIONS

Metric

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

* Excluding quantizing error

Inch/Metric

Order No.	Range	Resolution	Accuracy*
Digimatic (LCD)			
342-371-30	0 - .8"	.00005"/ 0.001mm	±.00015"

* Excluding quantizing error

Metric

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

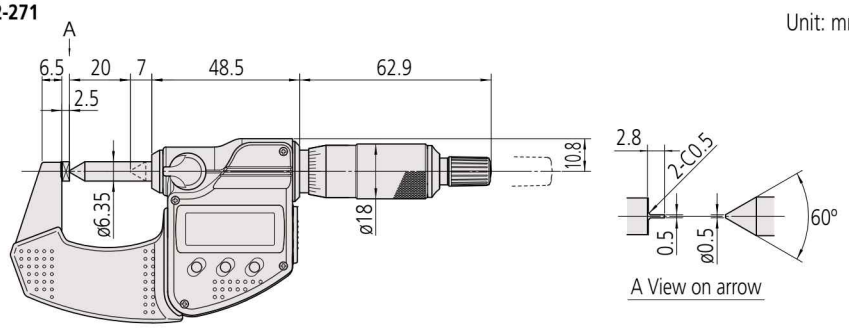
Metric

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

DIMENSIONS

No.342-271

Unit: mm



A View on arrow

Mitutoyo

Micrometer

The origin of Mitutoyo's trustworthy brand of small tool instruments

"Uni-Mike"
Series 317, 117 — Interchangeable Anvil Type

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

317-251-30

117-101

SPECIFICATIONS

Metric

Order No.	Range	Resolution	Accuracy*
Digimatic (LCD)			
317-251-30	0 - 25mm	0.001mm	±4μm
317-252-30	25 - 50mm		

* Excluding quantizing error

Inch/Metric

Order No.	Range	Resolution	Accuracy*
Digimatic (LCD)			
317-351-30	0 - 1"	.00005"/ 0.001mm	±.0002"
317-352-30	1" - 2"		

* Excluding quantizing error

Metric

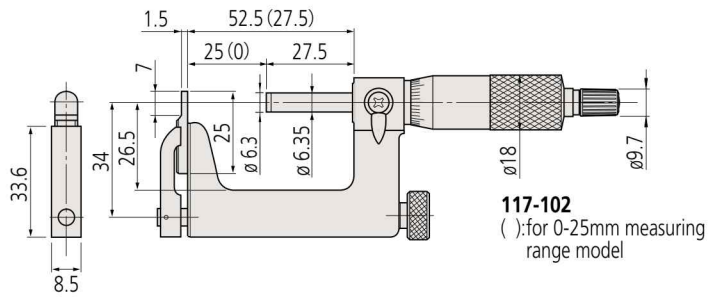
Order No.	Range	Graduation	Accuracy
Analog			
117-101	0 - 25mm	0.01mm	±4μm
117-102	25 - 50mm		

Inch

Order No.	Range	Graduation	Accuracy
Analog			
117-107	0 - 1"	.0001"	±.0002"
117-108	1" - 2"		

DIMENSIONS

Unit: mm



117-102
( ):for 0-25mm measuring range model

These marks indicate that a product has successfully passed IP65-level testing, which is carried out by the independent German certification organization TÜV Rheinland.

(Refer to page X for details.)

IP Codes (series 317)

Level 6: Dust-proof.
No ingress of dust allowed.
Level 5: Protected against water jets.
Water projected in jets against the enclosure from any direction shall have no harmful effects.

Technical data

Flatness: Spindle face 0.6μm
Anvil face 2μm
Parallelism: 3μm

Battery for series 317

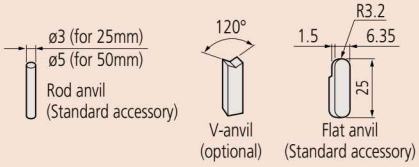
SR44 (1 pc), **938882**, for initial operational checks (standard accessory)
Battery life: Approx. 2.4 years under normal use (for series 317)
Length standard: Electromagnetic rotary sensor (for series 317)
Standard accessories: Reference bar, 1 pc
(except for measuring range 0-25mm (0-1") models)
Spanner (200877), 1pc (for series 117-XXX)
Spanner (301336), 1 pc (for series 317-XXX)

Optional accessories

Connecting cables (**series 317**)
1m: **05CZA662**
2m: **05CZA663**
USB Input Tool Direct
USB-ITN-B (2m): **06ADV380B**
Connecting cables for **U-WAVE-T**
02AZD790B 160mm
For foot switch: **02AZE140B**
Refer to page B-68 for details.

Accessories

Unit: mm



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	Base for 25mm (optional)

Limit Micrometers
SERIES 113

Technical Data

Standard accessories: Reference bar, 1 pc
(except for measuring range 0-25mm (0-1") models)
Spanner (200877), 1 pc

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

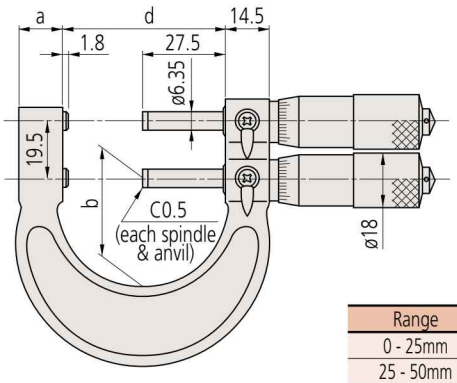
113-102

SPECIFICATIONS

Metric

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

Unit: mm



Range	a	b	d
0 - 25mm	15	23	29.3
25 - 50mm		37	54.3

Mitutoyo

Micrometer

The origin of Mitutoyo's trustworthy brand of small tool instruments

Indicating Micrometers
SERIES 510

- Suited to the measurement of low-volume manufactured parts.
- Easy to use when operating one-handed due to retractable anvil.
- In the 25mm 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 1µm.
- Water-proof to protection level IP54.
- Hard-coated crystal: enhanced oil and scratch resistance.
- Indicator scale is large and easy-to-read.
- The zero position and adjustable limit markers, for GO/±NG testing, are easily set.
- Measuring faces: Carbide

510-121

510-141

IP54 (Refer to page X for details.)

Technical Data

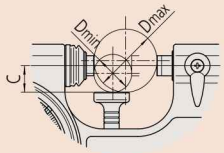
Flatness: 0.3µm/.000012"
Parallelism: 0.6µm/ .000024" for models up to 50mm/ 2"
1µm/ .00004" for models over 50mm/ 2"
Accuracy: ±2µm
Spindle feed error: 3µm/ .00015"
Dispersion of indication: 0.4µm/ .00002"
Dial indication accuracy: 1µm/ .00005"
Standard accessories: Reference bar, 1 pc
(except for measuring range 0-25mm (0-1") models)
Spanner (200154), 1 pc

Workpiece stop (optional)

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

Unit: mm

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



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

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

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

510-122 and **510-132**

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

510-123 and **510-133**

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

510-124 and **510-134**

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

SPECIFICATIONS

Metric

Order No.	Range	Indicating range	Graduation	Dial graduation	Measuring force	Anvil retraction button	Mass
510-121	0 - 25mm	±0.06mm	0.001mm	0.001mm	5 - 10N	Right side	520g
510-141						Left side	530g
510-122	25 - 50mm						670g
510-123	50 - 75mm						820g
510-124	75 - 100mm						970g

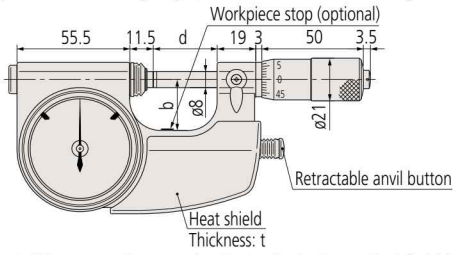
Inch

Order No.	Range	Indicating range	Graduation	Dial graduation	Measuring force	Anvil retraction button	Mass
510-131	0 - 1"	±.0023"	.0001"	.00005"	5 - 10N	Right side	520g
510-151						Left side	530g
510-132	1" - 2"						670g
510-133	2" - 3"						820g
510-134	3" - 4"						970g

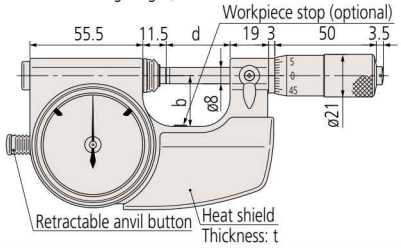
DIMENSIONS

Unit: mm

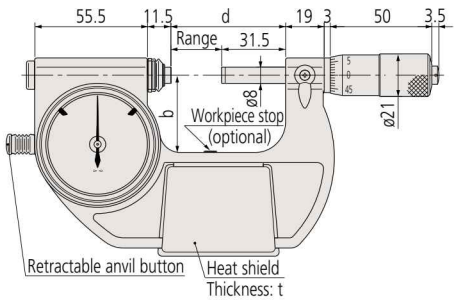
Up to 25mm measuring range (anvil-retraction button on the right side)



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



Over 50mm measuring range (anvil-retraction button on the left side)



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

IP54 (Refer to page X for details.)

Technical Data

Indicator
Indicating range: ±0.06mm/±.0023″
Repeatability of indication: 0.4μm/.00002″
Dial indication accuracy: 1μm/.00005″
Flatness: 0.3μm/.000012″
Parallelism: 0.6μm/.000024″ for models up to 50mm/2″ measuring range
1μm/.00004″ for models over 50mm/2″ measuring range

Dial Snap Meters
SERIES 523

- Suited to the measurement of mass-produced parts.
- Designed for measurement using a stand: realizes stable measurement.
- Greatly improved accuracy: indication error and graduation of 1μm.
- Water-proof to protection level IP54.
- Hard-coated crystal: enhanced oil and scratch resistance.
- Indicator scale is large and easy-to-read.
- Easily settable adjustable limit markers for GO/±NG testing.
- Equipped with an elevating workpiece stop as standard.
- Measuring faces: Carbide

523-121

SPECIFICATIONS

Metric

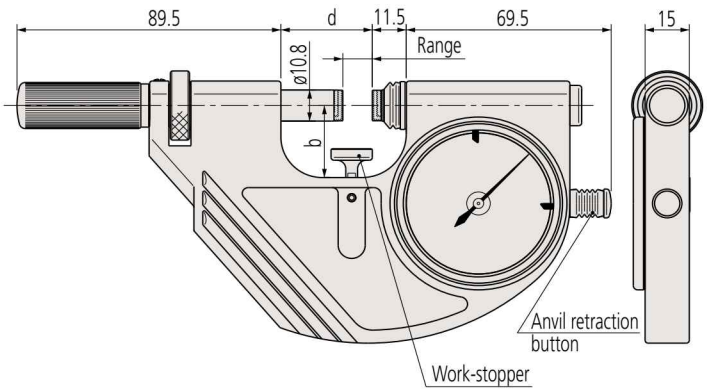
Order No.	Range	Dial graduation	Measuring force	Mass
523-121	0 - 25mm	0.001mm	5 - 10N	740g
523-122	25 - 50mm			840g
523-123	50 - 75mm			950g
523-124	75 - 100mm			1080g

Inch

Order No.	Range	Dial graduation	Measuring force	Mass
523-131	0 - 1"	.00005"	5 - 10N	740g
523-132	1" - 2"			840g
523-133	2" - 3"			950g
523-134	3" - 4"			1080g

DIMENSIONS

Unit: mm



Range	b	d
0 - 25mm	25	31
25 - 50mm	35	56
50 - 75mm	47	81
75 - 100mm	60	106

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Micrometer

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Snap Meters
SERIES 523

- Suited to the measurement of mass-produced parts.
- Various types of indicator can be selected according to the measurement application.
- Measuring faces: Carbide

523-141
(Indicator: optional)

SPECIFICATIONS

Metric

Order No.	Range	Anvil movement	Measuring force*	Mass
523-141	0 - 25mm	2mm	5 - 10N	710g
523-142	25 - 50mm			810g
523-143	50 - 75mm			920g
523-144	75 - 100mm			1050g

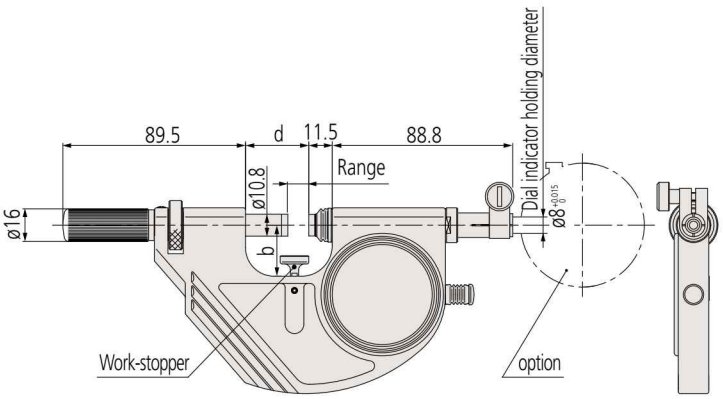
Inch

Order No.	Range	Anvil movement	Measuring force*	Mass
523-151	0 - 1"	.078"	5 - 10N	710g
523-152	1" - 2"			810g
523-153	2" - 3"			920g
523-154	3" - 4"			1050g

* Measured at the position where the anvil is retracted by 1mm from the free position without installing the indicator.

DIMENSIONS

Unit: mm



Range	b	d
0 - 25mm	25	31
25 - 50mm	35	56
50 - 75mm	47	81
75 - 100mm	60	106

Accuracy

Flatness: 0.3µm/.000012"
Parallelism: 0.6µm/.000024" for models up to 50mm/2"
1µm/.00004" for models over 50mm/2"
Repeatability of indication: 0.4µm/.00002"

Typical Indicators used with gage

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

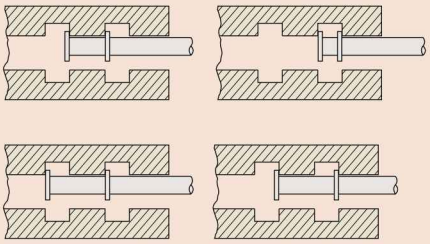
ABS Digimatic Indicator

Linear Gage and counter

Technical data

Parallelism: 10µm/.0004"

Standard accessories: Spanner (301336), 1 pc



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 - 25mm) measurement, a master gage is required for adjusting the reference point.

SPECIFICATIONS

Metric

Order No.	Range Outside	Range Inside	Graduation	Accuracy	Flange
Rotating spindle					
146-121	0 - 25mm	1.6 - 26.5mm	0.01mm	±10µm	ø6.35mm
146-122					ø12.7mm
146-123	25 - 50mm	26.5 - 51.5mm			
146-124	50 - 75mm	51.5 - 76.5mm			
146-125	75 - 100mm	76.5 - 101.5mm			

Metric

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

Inch

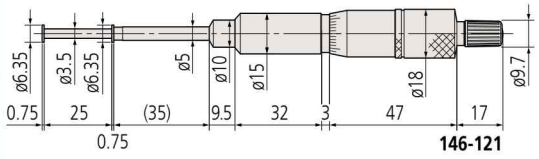
Order No.	Range Outside	Range Inside	Graduation	Accuracy	Flange
Rotating spindle					
146-131	0 - 1"	.055" - 1.05"	.001"	±.0004"	ø.25"
146-132					ø.5"
146-133	1" - 2"	1.05" - 2.05"			
146-134	2" - 3"	2.05" - 3.05"			
146-135	3" - 4"	3.05" - 4.05"			

Inch

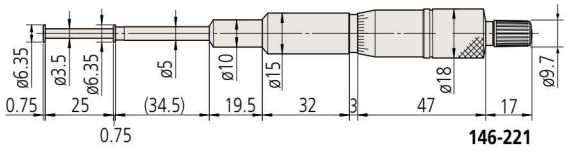
Order No.	Range Outside	Range Inside	Graduation	Accuracy	Flange
Non-rotating spindle					
146-231	0 - 1"	.055" - 1.05"	.001"	±.0004"	ø.25"
146-232					ø.5"
146-233	1" - 2"	1.05" - 2.05"			
146-234	2" - 3"	2.05" - 3.05"			
146-235	3" - 4"	3.05" - 4.05"			

DIMENSIONS

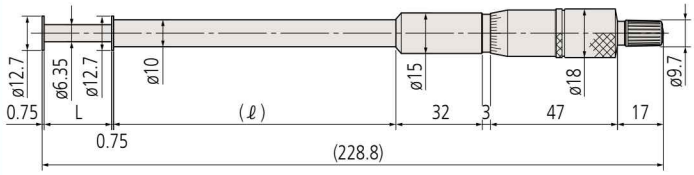
Unit: mm



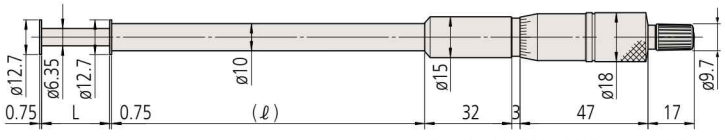
146-121



146-221



146-122, 146-123, 146-124, 146-125



146-222, 146-223, 146-224, 146-225

L	(ℓ)
25	(103.3)
50	(78.3)
75	(53.3)
100	(28.3)

L	(ℓ)
25	(115)
50	(90)
75	(65)
100	(40)

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Micrometer

The origin of Mitutoyo's trustworthy brand of small tool instruments

Quick-Mini
SERIES 700

- Lightweight and palm-sized.
- Highly suitable for quick dimensional inspection of small, thin and delicate objects.
- Functions: origin setting and zero-setting.

- Application examples
  Measurement of small objects:
  pearls, jewels, shims for engine tappets and screws.
  Measurement of thin objects:
  printing paper, polyethylene bags, sheet materials, foods including noodles, lenses for glasses, media substrates, foils, thin plates and medical products including filter cloths.
  Measurement of fine lines and bars:
  fishing lines, dental reamers, pasta, drills for PCB and hard wiring.

700-119-20

Technical Data

SR44 (1 pc), **938882**, for initial operational checks (standard accessory)

SPECIFICATIONS

Metric

Order No.	Range	Resolution	Accuracy*	Mass
700-119-20	0 - 12mm	0.01mm	±0.02	70 g

* Excluding quantizing error

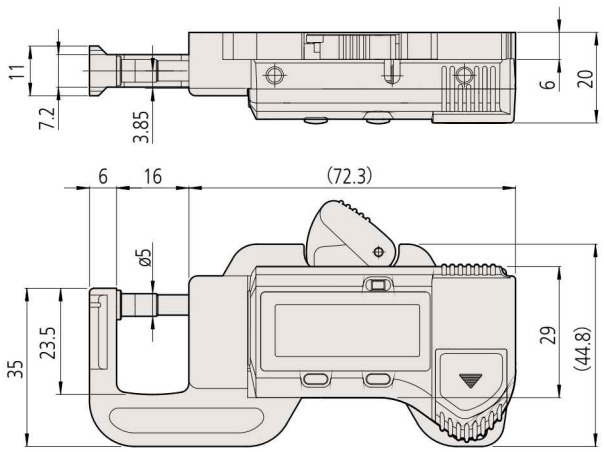
Inch/Metric

Order No.	Range	Resolution	Accuracy*	Mass
700-118-20	0" - 5" / 0 - 12mm	.0005"/0.01mm	±.001"	70 g

* Excluding quantizing error

DIMENSIONS

Unit: mm



700-119-20

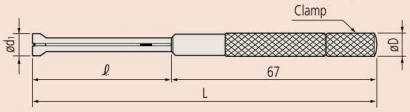
Small Hole Gage Set
SERIES 154

- Extra long for gaging deep and shallow holes, slots, and similar workpiece features.
- Two sprung leaves are fully expanded inside a feature so that its size can be measured with an outside micrometer after extraction.

154-902

DIMENSIONS

Unit: mm



Range	ød1	L	øD	ℓ
3 - 5mm	2.8 - 5.2	90	5.5	22.5
5 - 7.5mm	4.8 - 7.8	97.6		30
7.5 - 10mm	7.3 - 10.3	108	8.5	40
10 - 13mm	9.8 - 13.2			

SPECIFICATIONS

Metric

Order No.	Range
4-gage Set	
154-902	3 - 13mm
Gages included	
154-101	3 - 5mm
154-102	5 - 7.5mm
154-103	7.5 - 10mm
154-104	10 - 13mm

Inch

Order No.	Range
4-gage Set	
154-901	.125" - .5"
Gages included	
154-105	.125" - .2"
154-106	.2 - .3"
154-107	.3 - .4"
154-108	.4 - .5"

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

SPECIFICATIONS

Metric

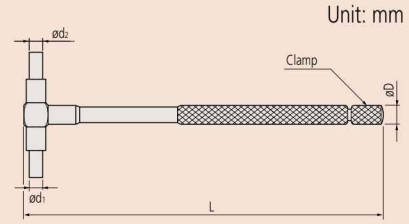
Order No.	Range
6-gage Set	
155-905	8 - 150mm
Gages included	
155-127	8 - 12.7mm
155-128	12.7 - 19mm
155-129	19 - 32mm
155-130	32 - 54mm
155-131	54 - 90mm
155-132	90 - 150mm

Inch

Order No.	Range
6-gage Set	
155-903	.313" - 6"
Gages included	
155-121	.313" - .5"
155-122	.5 - .75"
155-123	.75- 1.25"
155-124	1.25 - 2.125"
155-125	2.125 - 3.5"
155-126	3.5 - 6"

DIMENSIONS

Unit: mm



Range	L	øD	ød1	ød2
8 - 12.7mm	110	5	4	3
12.7 - 19mm		5.5	5	3.5
19 - 32mm				
32 - 54mm	150	8	7.5	6
54 - 90mm				
90 - 150mm				

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Micrometer

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Setting Standards for Outside Micrometers SERIES 167

• Used for adjusting the reference point of the outside micrometer.

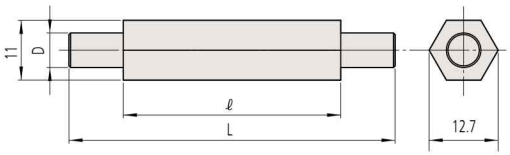
167-108

167-103

SPECIFICATIONS and DIMENSIONS

167-101 – 167-103
167-141 – 167-143

Unit: mm



Metric

Order No.	Length (L)	Tolerance	ℓ	Diameter (D)
167-101	25mm	±1.5μm	18	6.35mm
167-102	50mm	±2.0μm	40	
167-103	75mm	±2.5μm		

Inch

Order No.	Length (L)	Tolerance	ℓ	Diameter (D)
167-141	1"	±.00005"	18	.25"
167-142	2"	±.0001"	40	
167-143	3"	±.0001"		

167-104 – 167-107
167-144 – 167-147

Unit: mm

Metric

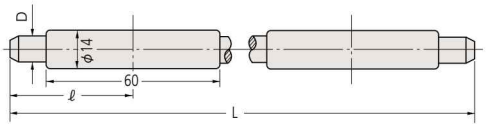
Order No.	Length (L)	Tolerance	Diameter (D)
167-104	100mm	±3μm	7.9mm
167-105	125mm	±3.5μm	
167-106	150mm	±4μm	
167-107	175mm	±4.5μm	

Inch

Order No.	Length (L)	Tolerance	Diameter (D)
167-144	4"	±.0001"	.31"
167-145	5"	±.00015"	
167-146	6"		
167-147	7"		

167-108 – 167-119
167-148 – 167-159

Unit: mm



Metric

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

Inch

Order No.	Length (L)	Tolerance	ℓ	Diameter (D)
167-148	8"	±.00015"	47	.37"
167-149	9"	±.0002"	47	
167-150	10"	±.0002"	52	
167-151	11"	±.0002"	57	
167-152	12"	±.00025 "	64	
167-153	13"	±.00025"	69	
167-154	14"	±.00025"	74	
167-155	15"	±.00025"	80	
167-156	16"	±.00025"	85	
167-157	17"	±.00025"	90	
167-158	18"	±.00025"	95	
167-159	19"	±.0003"	101	

Technical Data

Flatness: 0.3μm
Parallelism: 2μm

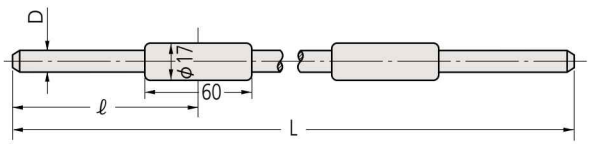
Micrometer Inspection Gauge Block

Refer to page E-11 for details.

516-152/153/154

Micro Checker (holder only)
516-607

167-120 – 167-404
167-160 – 167-180



Unit: mm

B

Metric

Order No.	Length (L)	Tolerance	ℓ	Diameter (D)
167-120	500mm	±11µm	106	
167-121	525mm	±11.5µm	112	
167-122	550mm	±12.0µm	117	
167-123	575mm	±12.5µm	122	
167-124	600mm	±13µm	128	
167-125	625mm	±13.5µm	133	
167-126	650mm	±14µm	138	
167-127	675mm	±14.5µm	142	
167-128	700mm	±15µm	147	
167-129	725mm	±15.5µm	153	
167-130	750mm	±16µm	158	
167-131	775mm	±16.5µm	164	
167-132	800mm	±17µm	170	
167-133	825mm	±17.5µm	175	
167-134	850mm	±18µm	180	
167-135	875mm	±18.5µm	185	
167-136	900mm	±19µm	191	
167-137	925mm	±19.5µm	196	
167-138	950mm	±20µm	201	
167-139	975mm	±20.5µm	207	
167-140	1000mm	±21µm	211	
167-365	1025mm	±21.5µm	217	
167-366	1050mm	±22µm	222	
167-367	1075mm	±22.5µm	227	
167-368	1100mm	±23µm	232	
167-369	1125mm	±23.5µm	238	
167-370	1150mm	±24µm	243	
167-371	1175mm	±24.5µm	248	
167-372	1200mm	±25µm	254	
167-373	1225mm	±25.5µm	259	
167-374	1250mm	±26µm	264	11.9mm
167-375	1275mm	±26.5µm	269	
167-376	1300mm	±27µm	275	
167-377	1325mm	±27.5µm	280	
167-378	1350mm	±28µm	285	
167-379	1375mm	±28.5µm	291	
167-380	1400mm	±29µm	296	
167-381	1425mm	±29.5µm	301	
167-382	1450mm	±30µm	306	
167-383	1475mm	±30.5µm	312	
167-384	1500mm	±31µm	317	
167-385	1525mm	±31.5µm	322	
167-386	1550mm	±32µm	328	
167-387	1575mm	±32.5µm	333	
167-388	1600mm	±33µm	338	
167-389	1625mm	±33.5µm	343	
167-390	1650mm	±34µm	349	
167-391	1675mm	±34.5µm	354	
167-392	1700mm	±35µm	359	
167-393	1725mm	±35.5µm	364	
167-394	1750mm	±36µm	370	
167-395	1775mm	±36.5µm	375	
167-396	1800mm	±37µm	380	
167-397	1825mm	±37.5µm	386	
167-398	1850mm	±38µm	391	
167-399	1875mm	±38.5µm	396	
167-400	1900mm	±39µm	401	
167-401	1925mm	±39.5µm	407	
167-402	1950mm	±40µm	412	
167-403	1975mm	±40.5µm	417	
167-404	2000mm	±41µm	423	

Inch

Order No.	Length (L)	Tolerance	ℓ	Diameter (D)
167-160	20"	±.0003"	106	
167-161	21"	±.0003"	112	
167-162	22"	±.0003"	117	
167-163	23"	±.0003"	122	
167-164	24"	±.0003"	128	
167-165	25"	±.00035"	133	
167-166	26"	±.00035"	138	
167-167	27"	±.00035"	142	
167-168	28"	±.00035"	147	
167-169	29"	±.00035"	153	
167-170	30"	±.00035"	158	.47"
167-171	31"	±.00035"	164	
167-172	32"	±.00035"	170	
167-173	33"	±.00035"	175	
167-174	34"	±.00035"	180	
167-175	35"	±.00035"	185	
167-176	36"	±.00035"	191	
167-177	37"	±.0004"	196	
167-178	38"	±.0004"	201	
167-179	39"	±.0004"	207	
167-180	40"	±.0004"	211	

Available up to 79"

Mitutoyo

Micrometer

The origin of Mitutoyo's trustworthy brand of small tool instruments

B

Setting Standards for Screw Thread Micrometers SERIES 167

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

167-264
(60° screw)

167-262
(60° screw)

Metric

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

Inch

Order No.	Length (L)	Accuracy
Metric (unified) θ = 60°		
167-294	1"	±.00015"
167-295	2"	±.0002"
167-296	3"	±.00025"
167-297	4"	±.0003"
167-298	5"	±.00035"
167-299	6"	±.0004"
Whitworth θ = 55°		
167-283	1"	±.00015"
167-284	2"	±.0002"
167-285	3"	±.00025"
167-286	4"	±.0003"
167-287	5"	±.00035"
167-288	6"	±.0004"

Setting Standards for V-Anvil Micrometers SERIES 167

• Specially designed for accurately setting of V-anvil micrometers.

167-329

Metric

Order No.	Length	Accuracy	Type
167-327	5mm	±2μm	Plug
167-328	10mm		
167-329	25mm		
167-330	40mm	±3μm	Ring
167-331	55mm		
167-332	70mm		
167-333	85mm		

Inch

Order No.	Length (L)	Accuracy	Type
167-337	.2"	±.0001"	Plug
167-338	.4"		
167-339	1"		
167-340	1.6"	±.00015"	Ring
167-341	2.2"		
167-342	2.8"		
167-343	3.4"		

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".
- 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	Sizes of parallels included in set	Diameter	Flatness	Parallelism	Remarks
157-903	0 - 25mm	12.00, 12.12, 12.25, 12.37mm	ø30	0.1µm	0.2µm	For 25mm
157-904	25 - 50mm	25.00, 25.12, 25.25, 13.37mm				For 50mm

Inch

Order No.	Range of micrometer to be checked	Sizes of parallels included in set	Diameter	Flatness	Parallelism	Remarks
157-901	0 - 1"	.5000",.5062", .5125", .5187"	ø30	0.1µm	0.2µm	For 25mm
157-902	1 - 2"	1.0000", 1.0062", 1.0125", 1.0187"				For 50mm

Optical Flats
SERIES 158

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

158-118

SPECIFICATIONS

Metric

Order No.	Thickness	Diameter	Flatness grade
158-117	12mm	ø45	0.2µm
158-118		ø45	0.1µm
158-119	15mm	ø60	0.2µm
158-120		ø60	0.1µm

Inch

Order No.	Thickness	Diameter	Flatness grade
158-122	.5"	1.8"	.000004"
158-124	.6"	2.4"	

Mitutoyo

Micrometer

The origin of Mitutoyo's trustworthy brand of small tool instruments

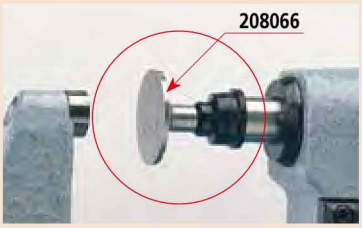
Spindle Attachment Tips

- Simple interchangeable tips attached to standard micrometer spindles enable measurement of contours otherwise unmeasurable (for 6.35 spindles only).
- Measuring range changes when a spindle attachment tip is mounted: the maximum measuring range is 10mm or less (accuracy is not guaranteed).

208062 **208063** **208064** **208065** **208066**

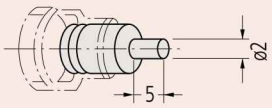
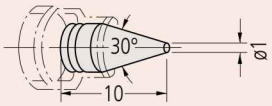
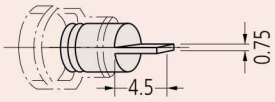
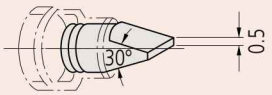
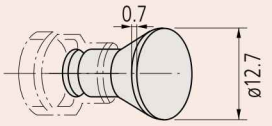
Technical Data

Tip length: 10mm ±5µm



Specifications and Dimensions

Unit: mm

Order No.	Tip type	Dimensions
208062	Spline	
208063	Comparator	
208064	Blade	
208065	Knife-edge	
208066	Disk-plate	

Micrometer Oil

- Special lubricant for micrometers.

207000
(Content: 30ml)

SPECIFICATIONS

Order No.	Product name	Remarks
207000	Micrometer oil	Grease (30ml)

Color-Coded Ratchet and Speeder Covers

- Ratchet and speeder covers in a choice of seven colors for use in instrument identification control schemes: red, blue, yellow, green, brown, black and gray.

SPECIFICATIONS

Ratchet and speeder covers

Standard outside micrometers

Ratchet

Speeder

Analog type: 0 - 300mm

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 type: 300 - 1000mm

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 - 300mm*

Order No.*		Color	Material
Ratchet	Speeder		
04GZA241	**04GAA260**	Gray	Plastic
—	**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

Ratchet thimble micrometers

QuantuMike

Color-coded speeder covers

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

Mitutoyo

Micrometer

The origin of Mitutoyo's trustworthy brand of small tool instruments

Micrometer Stands
SERIES 156

- Designed to allow benchtop use of hand micrometers or other gages which have frames suitable for gripping by the clamp.

156-105-10

156-101-10

156-102

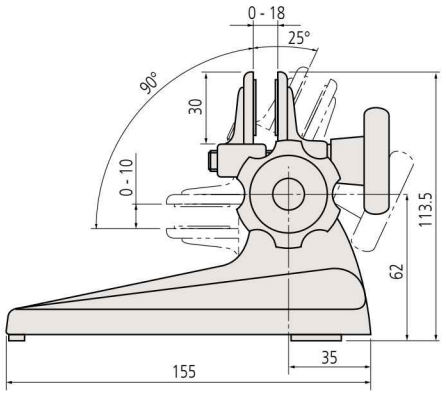
SPECIFICATIONS

Order No.	Micrometer ranges	Remarks
156-101-10	Up to 100mm (4")*	Adjustable angle type
156-105-10	0-25mm (0-1"), 25-50mm (1"-2")	Fixed angle type
156-102	125-300mm (5"-12")	Vertical type
156-103	300-1000mm (12"-40")	Vertical type

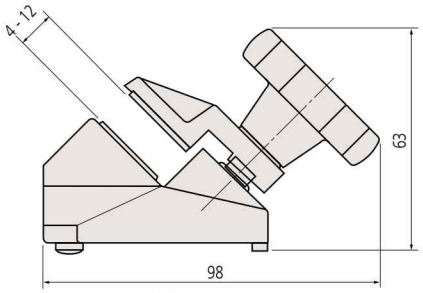
* Items that cannot be mounted on these stands
(**Order No. 406-253-30**, **323-253-30**, **331-254-30**, **342-254-30**, **342-264-30**, **369-253-30**, **422-232-30**, **422-233-30**, etc.)

DIMENSIONS

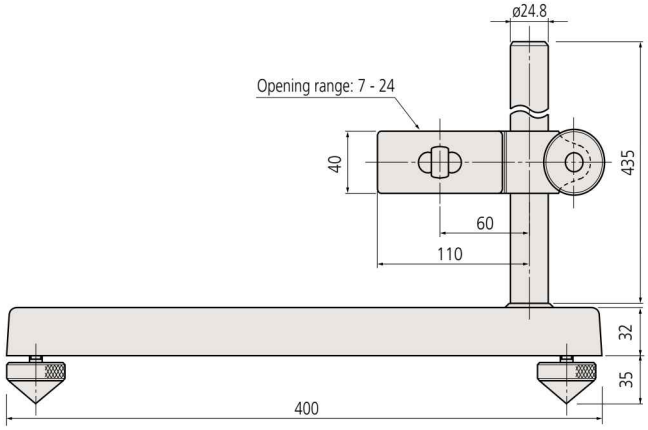
Unit: mm



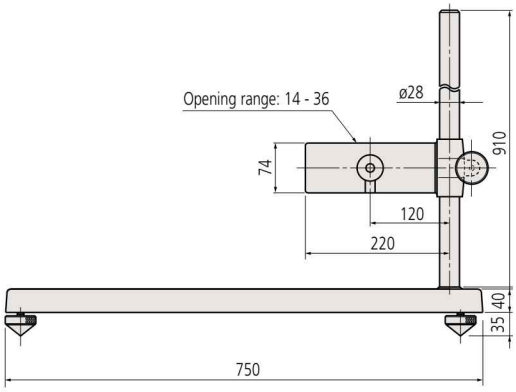
156-101-10



156-105-10



156-102



156-103

Introduction for Measurement data recording tools for Micrometers and Micrometer Heads (optional)

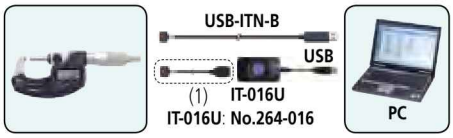
For Digimatic Micrometers other than Quick-mike type, and Digimatic Micrometer Heads series 350 (Connector type B)

■ Dedicated connecting cables (optional)

Interface for connecting to PC or PLC, and dedicated printer and its connecting cable.

● **PC connection** (wired system) ··· **USB Input Tool** (refer to page A-5/A-6)

USB-ITN-B (2m): **No.06ADV380B**

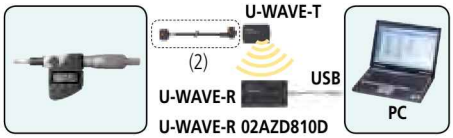


Dedicated cable for models with SPC data output

(1) 1m: **No.05CZA662**
2m: **No.05CZA663**

● **PC connection** (wireless system) ··· **U-WAVE** (refer to pageA-7)

U-WAVE-T (IP67): **No.02AZD730D**
U-WAVE-T (buzzer): **No.02AZD880D**



Dedicated cable for models with SPC data output

(2) For standard 160mm: **No.02AZD790B**
For footswitch: **No.02AZE140B**

● **Dedicated printer connection** (only for wired system) ··· **DP-1VR** (refer to page A-13)

Dedicated cable for models with SPC data output

(1) 1m: **No.05CZA662**
2m: **No.05CZA663**

● **Connecting to PC, PLC, etc. by RS-232C communication** (only for wired system) ··· **IT-007R** (refer to page A-6), **MUX-10F** (refer to page A-14)

Dedicated cable for models with SPC data output

(1) 1m: **No.05CZA662**
2m: **No.05CZA663**

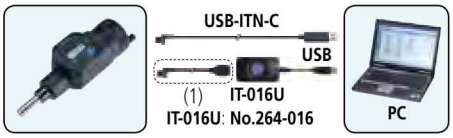
For Digimatic Micrometer Heads series 164 (Connector type C)

■ Dedicated connecting cables (optional)

Interface for connecting to PC or PLC, and dedicated printer and its connecting cable.

● **PC connection** (wired system) ··· **USB Input Tool** (refer to page A-5/A-6)

USB-ITN-C (2m): **No.06ADV380C**

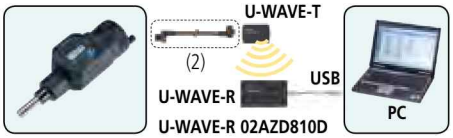


Dedicated cable for models with SPC data output

(1) 1m: **No.959149**
2m: **No.959150**

● **PC connection** (wireless system) ··· **U-WAVE** (refer to pageA-7)

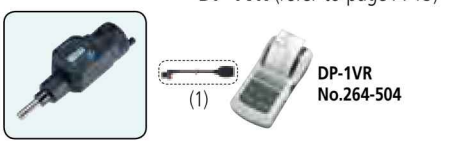
U-WAVE-T (IP67): **No.02AZD730D**
U-WAVE-T (buzzer): **No.02AZD880D**



Dedicated cable for models with SPC data output

(2) For standard 160mm: **No.02AZD790C**
For footswitch: **No.02AZE140C**

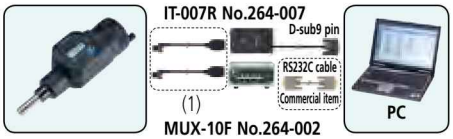
● **Dedicated printer connection** (only for wired system) ··· **DP-1VR** (refer to page A-13)



Dedicated cable for models with SPC data output

(1) 1m: **No.959149**
2m: **No.959150**

● **Connecting to PC, PLC, etc. by RS-232C communication** (only for wired system) ··· **IT-007R** (refer to page A-6), **MUX-10F** (refer to page A-14)



Dedicated cable for models with SPC data output

(1) 1m: **No.959149**
2m: **No.959150**

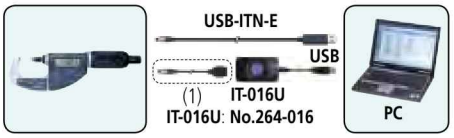
For Quickmike type (Connector type E)

■ Dedicated connecting cables (optional)

Interface for connecting to PC or PLC, and dedicated printer and its connecting cable.

● **PC connection** (wired system) ··· **USB Input Tool** (refer to page A-5/A-6)

USB-ITN-E (2m): **No.06ADV380E**

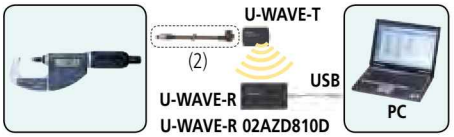


Dedicated cable for models with SPC data output

(1) 1m: **No.937387**
2m: **No.965013**

● **PC connection** (wireless system) ··· **U-WAVE** (refer to pageA-7)

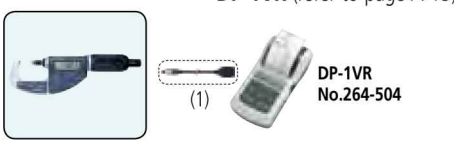
U-WAVE-T (IP67): **No.02AZD730D**
U-WAVE-T (buzzer): **No.02AZD880D**



Dedicated cable for models with SPC data output

(2) For standard 160mm: **No.02AZD790E**
For footswitch: **No.02AZE140E**

● **Dedicated printer connection** (only for wired system) ··· **DP-1VR** (refer to page A-13)



Dedicated cable for models with SPC data output

(1) 1m: **No.937387**
2m: **No.965013**

● **Connecting to PC, PLC, etc. by RS-232C communication** (only for wired system) ··· **IT-007R** (refer to page A-6), **MUX-10F** (refer to page A-14)

Dedicated cable for models with SPC data output

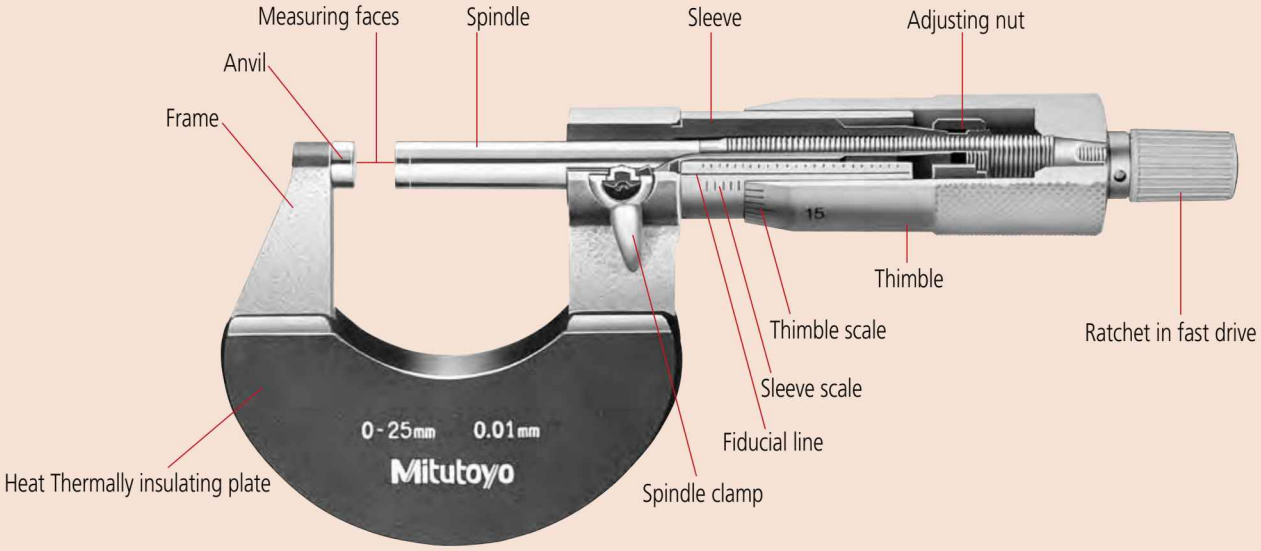
(1) 1m: **No.937387**
2m: **No.965013**

Mitutoyo

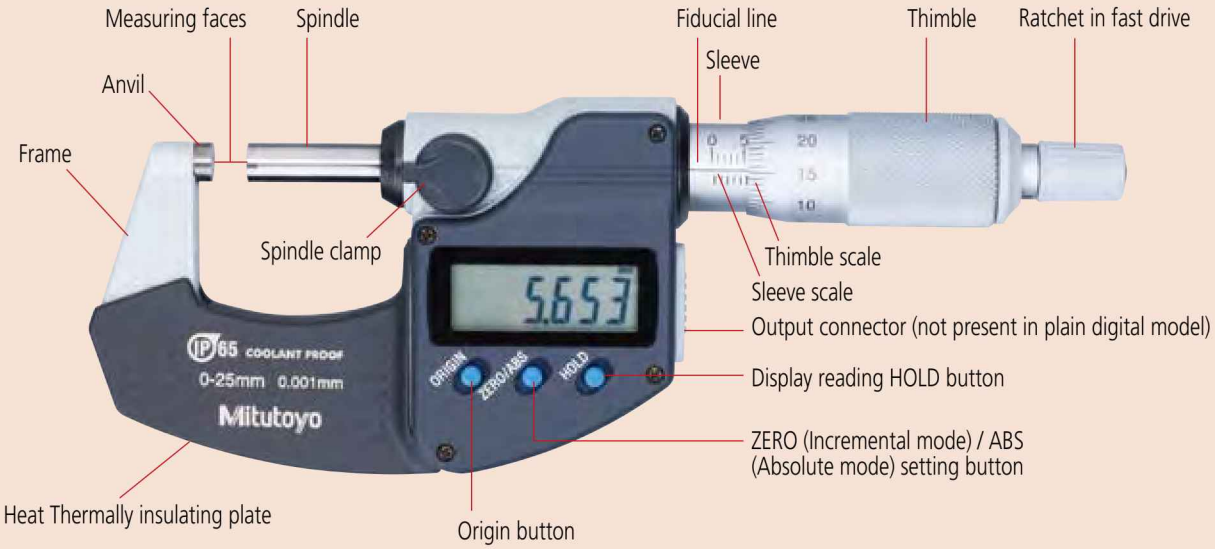
B

Nomenclature

Standard Analogue Outside Micrometer

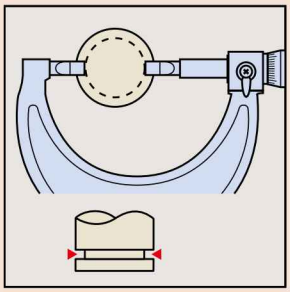


Digimatic Outside Micrometer



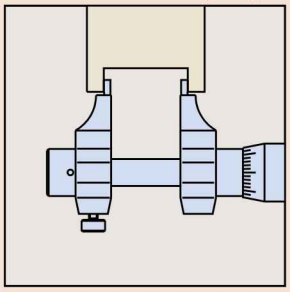
Special Purpose Micrometer Applications

Blade micrometer



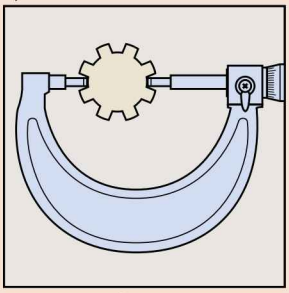
For diameter inside narrow groove measurement

Inside micrometer, caliper type



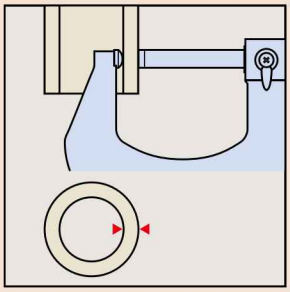
For small internal diameter, and groove width measurement

Spline micrometer



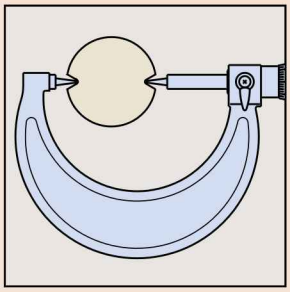
For splined shaft diameter measurement

Tube micrometer



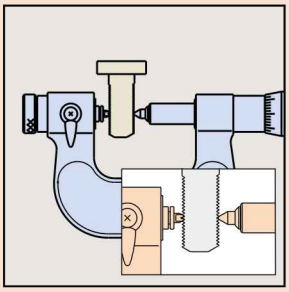
For pipe thickness measurement

Point micrometer



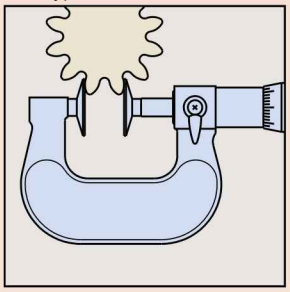
For root diameter measurement

Screw thread micrometer



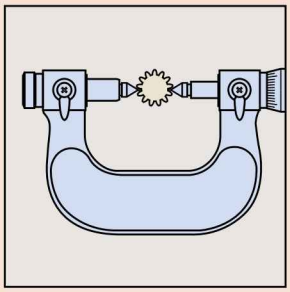
For effective thread diameter measurement

Disc type outside micrometer



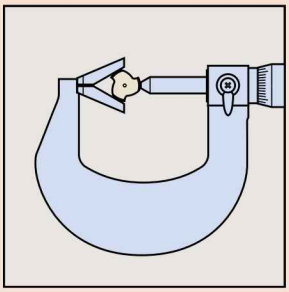
For root tangent measurement on spur gears and helical gears.

Ball tooth thickness micrometer



Measurement of gear over-pin diameter

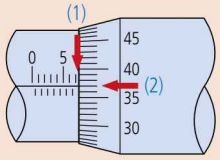
V-anvil micrometer



For measurement of 3- or 5-flute cutting tools

How to Read the Scale

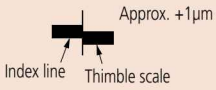
Micrometer with standard scale (graduation: 0.01mm)

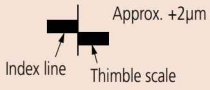


(1) Sleeve scale reading	7.mm
(2) Thimble scale reading +	0.37mm
Micrometer reading	7.37mm

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

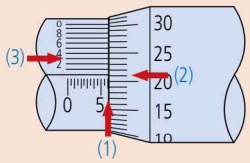
The thimble scale can be read directly to 0.01mm, as shown above, but may also be estimated to 0.001mm when the lines are nearly coincident because the line thickness is 1/5 of the spacing between them.





Micrometer with vernier scale (graduation: 0.001mm)

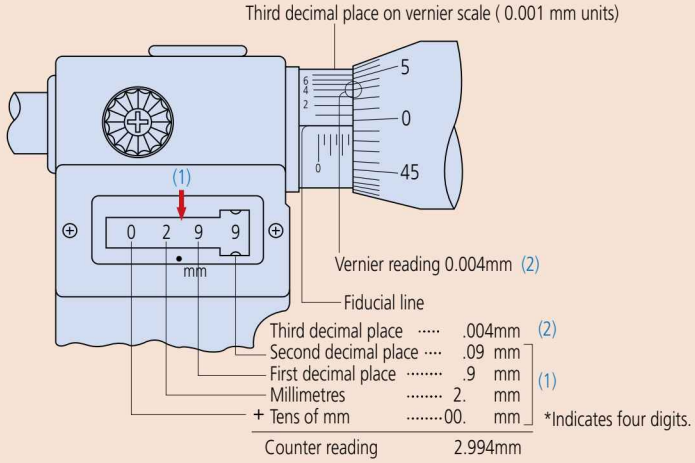
The vernier scale provided above the sleeve index line enables direct readings to be made to within 0.001mm.



(1) Sleeve scale reading	6.mm
(2) Thimble scale reading	.21mm
(3) Reading from the vernier scale marking and thimble graduation line +	.003mm
Micrometer reading	6.213mm

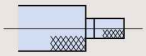
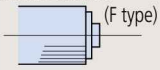
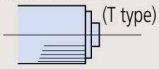
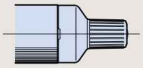
Note) 0.21 mm (2) is read at the position where the index line is between two graduations (21 and 22 in this case). 0.003 mm (3) is read at the position where one of the vernier graduations aligns with one of the thimble graduations.

Micrometer with mechanical-digit display (digital step: 0.001mm)

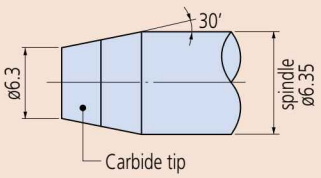


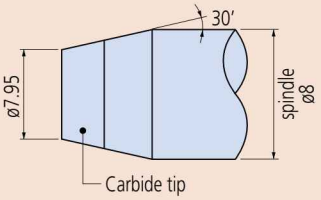
Note) 0.004 mm (2) is read at the position where a vernier graduation line corresponds with one of the thimble graduation lines.

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 (T type) 	Yes	Suitable	Audible operation provides confirmation of constant measuring force
Ratchet thimble 	Yes	Suitable	Audible operation provides confirmation of constant measuring force

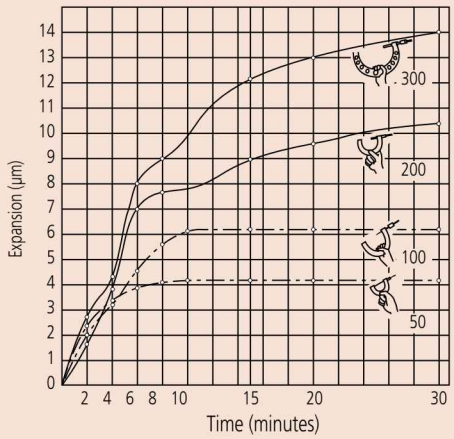
Measuring Face Detail





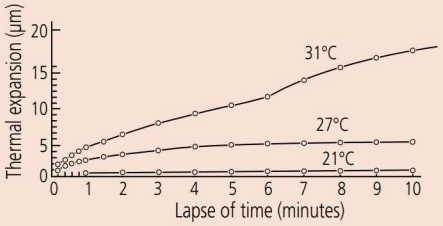
These drawings above are for illustration only and are not to scale

Micrometer Expansion due to Holding Frame with the Bare Hand



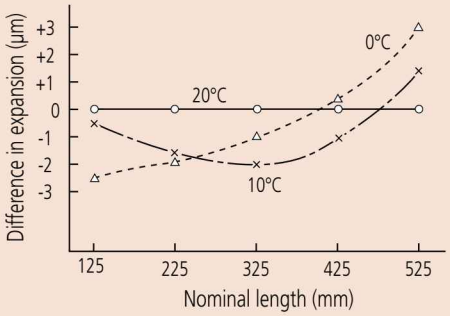
The above graph shows micrometer frame expansion due to heat transfer from hand to frame when the frame is held in the bare hand which, as can be seen, may result in a significant measurement error due to temperature-induced expansion. If the micrometer must be held by hand during measurement then try 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 200mm 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.)

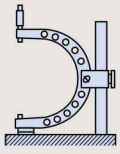
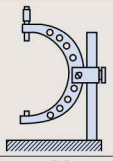
Difference in Thermal Expansion between Micrometer and Length Standard

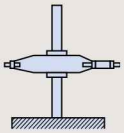
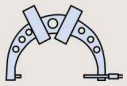


In the above experiment, after the micrometer and its standard were left at a room temperature of 20°C for about 24 hours for temperature stabilization, the start point was adjusted using the micrometer standard. Then, the micrometer with its standard were left at the temperatures of 0°C and 10°C for 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.)

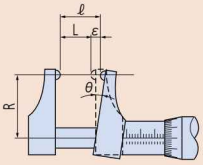
Effect of Changing Support Method and Orientation (Unit: µm)

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



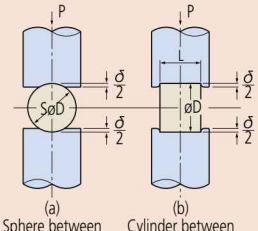
Abbe's principle states that "maximum accuracy is obtained when the scale and the measurement axes are common".
This is because any variation in the relative angle (θ) of the moving measuring jaw on an instrument, such as a caliper jaw micrometer, causes displacement that is not measured on the instrument's scale and this is an Abbe error ($\varepsilon = \ell - L$ 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 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
$\delta 1 = 0.82\sqrt[3]{P^2/D}$
b) Apparent reduction in diameter of cylinder
$\delta 2 = 0.094 \cdot P/L\sqrt[3]{1/D}$

Major measurement errors of the screw micrometer

Error cause	Maximum possible error	Precautions for eliminating errors	Error that might not be eliminated even with precautions
Micrometer feed error	3μm	1. Correct the micrometer before use.	±1μm
Anvil angle error	±5μm 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.	±3μm expected measurement error of half angle
Misaligned contact points	+10μm		+3μm
Influence of measuring force	±10μm	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.	+3μm
Angle error of thread gage	±10μm	1. Perform correction calculation (angle). 2. Correct the length error. 3. Adjust the micrometer using the same thread gage as the workpiece.	+3μm
Length error of thread gage	$\pm\left(3+\frac{L}{25}\right)$μm	1. Perform correction calculation. 2. Adjust the micrometer using the same thread gage as the workpiece.	±1μm
Workpiece thread angle error	JIS 2 grade error of half angle ±229 minutes -91μm +71μm	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.	±8μm assuming the error of half angle is ±23 minutes
Cumulative error	(±117+40)μm		+26μm -12μm

Screw pitch diameter measurement

● Three-wire method

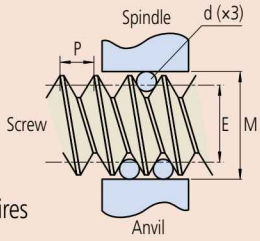
The screw pitch diameter can be measured with the three-wire method as shown in the figure.
Calculate the pitch diameter (E) with equations (1) and (2).

Metric thread or unified screw (60°)

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

Whitworth thread (55°)

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



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

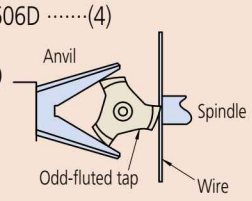
● One-wire method

The pitch diameter of odd-fluted tap can be measured using the V-anvil micrometer with the one-wire method. Obtain the measured value (M_1) and calculate M with equation (3) or (4).

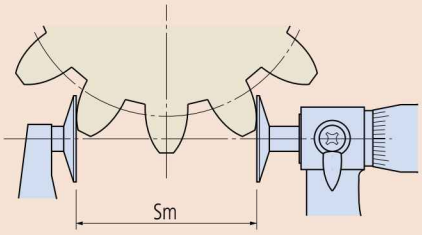
M_1 = Micrometer reading during one-wire measurement
D = Odd-fluted tap diameter

Tap with three flutes : $M = 3M_1 - 2D$ ·····(3)
Tap with five flutes : $M = 2.2360M_1 - 1.23606D$ ·····(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):

$$Sm = m\cos\alpha_0\{\pi(Zm - 0.5) + Z\,\mathrm{inv}\,\alpha_0\} + 2Xm\sin\alpha_0$$

Formula for calculating the number of teeth within the root tangent length (Zm):

$Zm' = Z \cdot K(f) + 0.5$ (Zm is the integer closest to Zm'.)

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

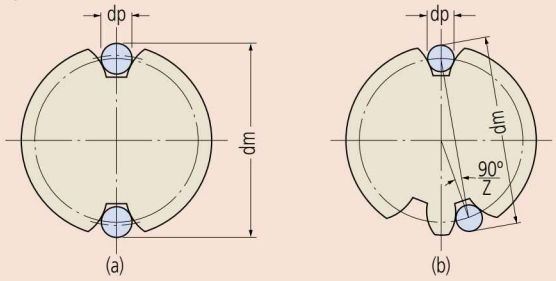
and, $f = \frac{X}{Z}$

inv 20° ≒ 0.014904
inv 14.5° ≒ 0.0055448

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

Gear measurement

Over-pin method



For a gear with an even number of teeth:

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

For a gear with an odd number of teeth:

$$dm = dp + \frac{dg}{\cos\varnothing}\cdot\cos\left(\frac{90°}{z}\right) = dp + \frac{z \cdot m \cdot \cos\alpha_0}{\cos\varnothing}\cdot\cos\left(\frac{90°}{z}\right)$$

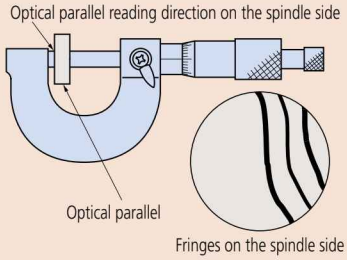
however,

$$\mathrm{inv}\varnothing = \frac{dp}{dg} - \frac{X}{2} = \frac{dp}{z \cdot m \cdot \cos\alpha_0} - \left(\frac{\pi}{2z} - \mathrm{inv}\alpha_0\right) + \frac{2\tan\alpha_0}{z}\cdot X$$

Obtain ø (invø) from the involute function table.

z : Number of teeth
α_0 : Pressure angle teeth
m : Module
X : Addendum modification coefficient

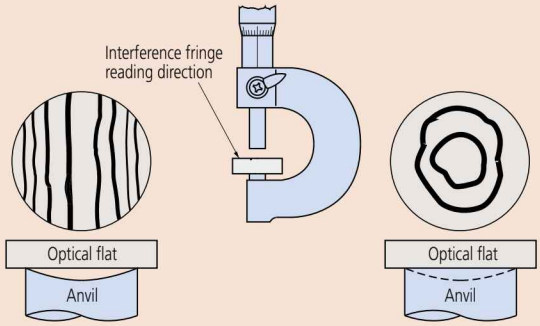
Testing Parallelism of Micrometer Measuring Faces



Parallelism can be estimated using an optical parallel held between the faces. Firstly, 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 (0.32µm for red fringes).
In the above figure a parallelism of approximately 1µm is obtained from 0.32µm x 3=0.96µm.

Testing Flatness of Micrometer Measuring Faces

Flatness can be estimated using an optical flat (or parallel) held against a face. Count the number of red interference fringes seen on the measuring face in white light. Each fringe represents a half wavelength difference in height (0.32µm for red).

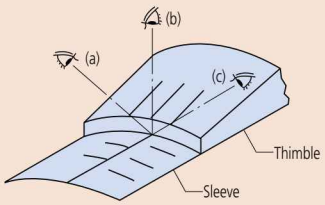


Measuring face is curved by approximately 1.3µm. (0.32µm x 4 paired red fringes.)

Measuring face is concave (or convex) approximately 0.6µm deep. (0.32µm x 2 continuous fringes)

General notes on using the micrometer

1. Carefully check the type, measuring range, accuracy, and other specifications to select the appropriate model for your application.
2. Leave the micrometer and workpiece at room temperature long enough for their temperatures to equalize before making a measurement.
3. 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.



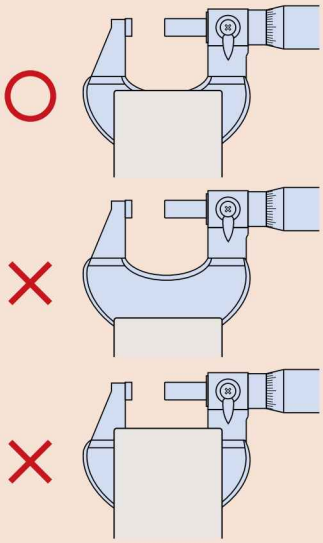
(a) From above the index line

(b) Looking directly at the index line

(c) From below the index line

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

5. 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.
6. Use the constant-force device correctly so that measurements are performed with the correct measuring force.
7. When attaching the micrometer onto a micrometer stand, the stand should clamp the center of the micrometer frame. Do not clamp it too tightly.



8. 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.
9. 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.
10. 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 mm between the measuring faces.
    Do not store the micrometer in a clamped state.

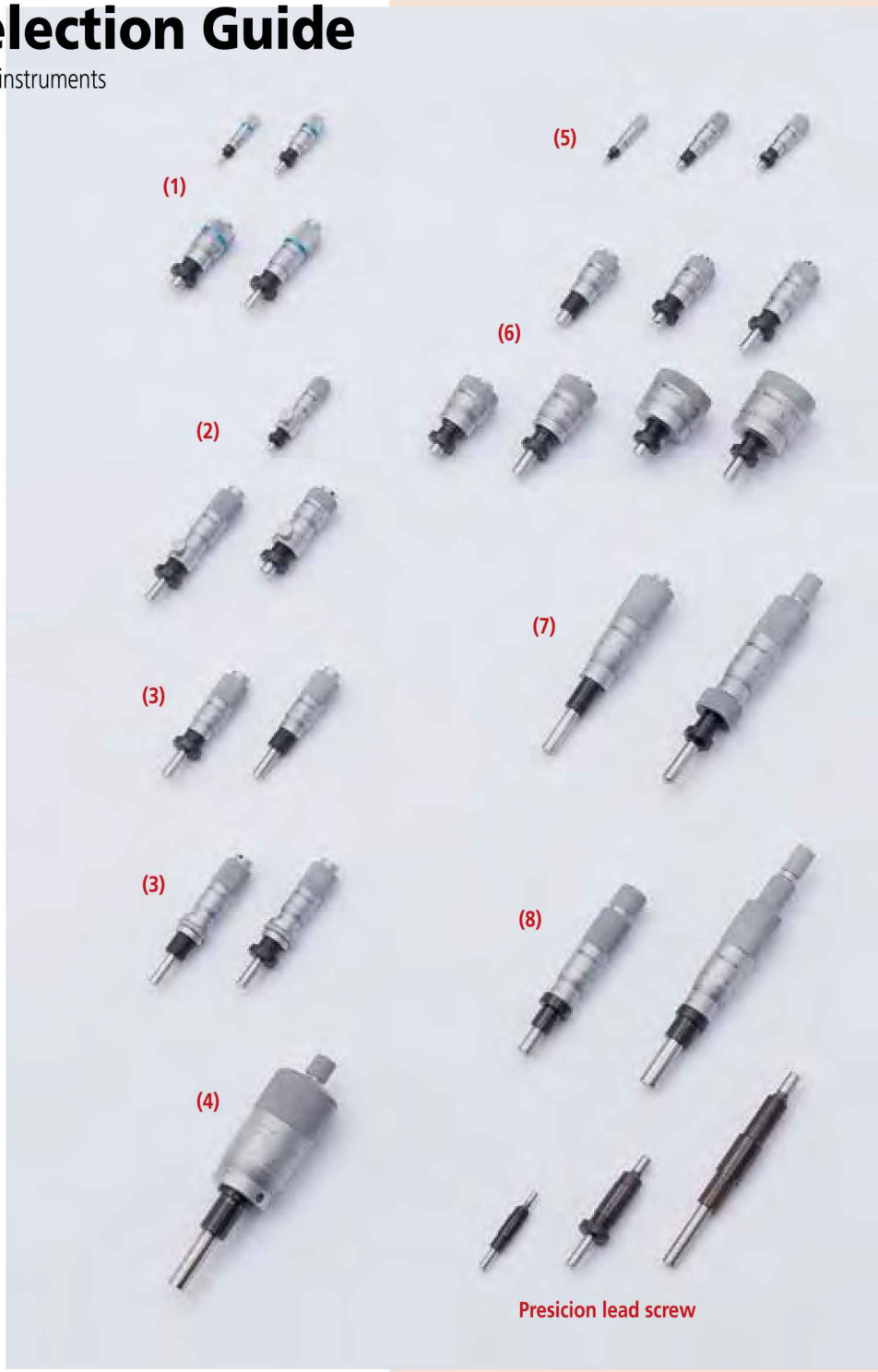
Mitutoyo

Micrometer Head Selection Guide

The origin of Mitutoyo's trustworthy brand of small tool instruments

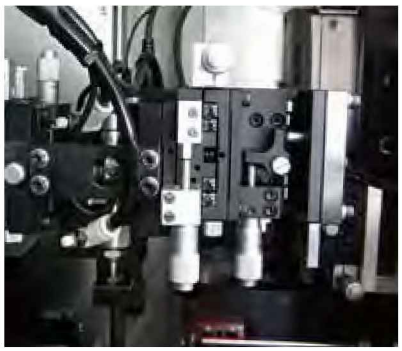
SELECTION TABLE

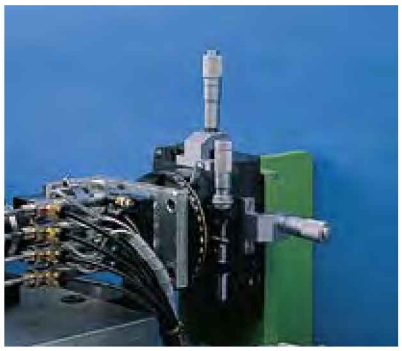
Mounted on measuring instruments and precision instruments, micrometer heads are used for various purposes including measurement, feeding and positioning. Recent developments in technology have seen the micrometer head widely utilized in precise feeding devices and cross-travel stages on laser instruments 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, 0.1mm spindle-pitch models (standard 0.5mm), 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.



Also refer to "Quick Guide to Precision Measuring Instruments" from page B-113.

Measuring range	Main feature of head			Series	Page
0 - 1mm/0- .02"	High-Function	Differential Screw Translator (Extra-Fine Feed) Type		110	B-104
0 - 2.5mm/0- .05"	High-Function	Differential Screw Translator (Extra-Fine Feed) Type	(11)		B-104
0 - 5mm/0- .2"	High-Function	Fine Spindle Feed of 0.1mm/rev	(1)	148	B-101, B-102
	Standard	Ultra-small / Small Type	(5)		B-80, B-81
0 - 6.5mm/0- .25"	Standard	Locking-screw Type	(2)		B-96 - B-98
	High-Function	Fine Spindle Feed of 0.1mm/rev	(1)		B-101, B-102
	High-Function	Fine Spindle Feed of 0.25mm/rev			B-103
	Standard	Ultra-small / Small Type	(5)		B-80, B-81
		Short Body with Choice of Thimble Diameter	(6)		B-82, B-83
0 - 10mm	High-Function	Large Thimble Type for Fine Feed	(13)	152	B-105, B-106
0 - 13mm/0- .5"	Standard	Locking-screw Type	(2)	148	B-96 - B-98
	High-Function	Fine Spindle Feed of 0.25mm/rev			B-103
		Differential Screw Translator (Extra-Fine Feed) Type	(11)	110	B-104
		Short Body with Choice of Thimble Diameter	(6)	148	B-82, B-83
	Standard	Small Standard Type	(3)		B-84, B-85
		Small Standard Type with Zero-adjustable Thimble	(10)		B-86, B-87





Measuring range	Main feature of head			Series	Page
0 - 15mm/0- .5"	High-Function	Non-rotating Spindle Type	(8)	153	B-99
	High-Function	Quick Spindle Feed of 1mm/rev	(4)	152	B-100
	Standard	Small Standard Type with Carbide-Tipped Spindle	(9)	149	B-88, B-89
0 - 25mm/0- 1"	Digimatic			350	B-77 - B-79
	High-Function	Non-rotating Spindle Type	(8)	153	B-99
		Quick Spindle Feed of 1mm/rev		152	B-100
		Large Thimble Type for Fine Feed			B-105, B-106
		XY-Stage type	(14)		B-107
		Fine Graduation and High Accuracy		153	B-108
		Digit Counter type		250	B-109
	Standard	Medium-sized Standard Type	(7)	150	B-90 - B-92
		Medium-sized Standard Type with 8mm diameter spindle		151	B-93 -B-95
0 - 50mm/0- 2"	Digimatic		(15)	164	B-77 -B-79
		Quick Spindle Feed of 1mm/rev		152	B-100
		Large Thimble Type for Fine Feed			B-105, B-106
		Non-rotating Spindle and Large Thimble		197	B-108
		Medium-sized Standard Type with 8mm diameter spindle	(12)	151	B-93 - B-95
60 - 75mm	Micro Jack			7	B-109

Micrometer Head

The origin of Mitutoyo's trustworthy brand of small tool instruments

Digimatic Micrometer Heads Series 164/350

- Equipped with digital display and output.
- series 350 IP65 models: the Digimatic output port enables inclusion in a statistical process control or networked measurement system. (Refer to page A-3 for details).

IP65

These marks indicate that a product has successfully passed IP65-level testing, which is carried out by the independent German certification organization TÜV Rheinland.

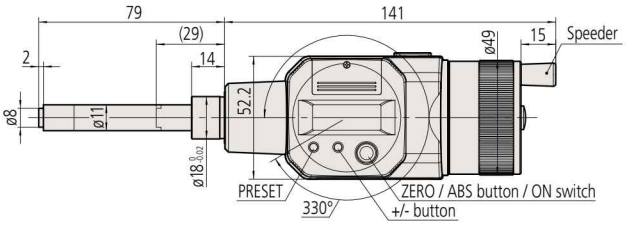
TÜVRheinland CERTIFIED
www.tuv.com ID 0000040191

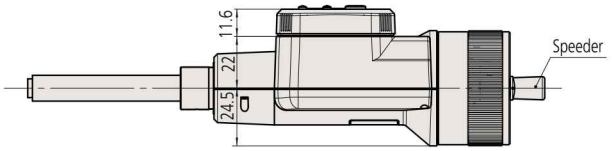
B

DIMENSIONS

Plain stem Unit: mm

Plain stem





164-163 Rotatable display Mass: 490g

( ): with spindle fully retracted

SPECIFICATIONS

Metric

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

* IP65 dust/water protection type
** Excluding quantizing error

Inch/Metric

Order No.	Range	Resolution	Accuracy**	Stem	Stem dia	Spindle end	Graduation features
164-164	0 - 2"	.00005"/ 0.001mm	±.00015"	Plain	0.709"	Flat (carbide tip)	—
350-351-30	0 - 1"		±.0001"	Plain	0.375"	Flat (carbide tip)	Standard
350-352-30				W/ clamp nut			
350-353-30				Plain		Spherical (SR4) (carbide tip)	
350-354-30				W/ clamp nut			
350-381-30*				Plain	0.5"	Flat (carbide tip)	
350-382-30*				W/ clamp nut			
350-383-30*				Plain		Spherical (SR4) (carbide tip)	
350-384-30*				W/ clamp nut			
350-361-30*				Plain		Flat	

* IP65 dust/water protection type
* Note: Stem diameter of IP65 type is 12mm.
** Excluding quantizing error

IP Codes (series 350)

Level 6: Dustproof
No ingress of dust allowed.
Level 5: Protected against water jets.
Water projected in jets against the enclosure from any direction shall have no harmful effects.
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 series 350-XXX)
Approx. 1.8 years under normal use (for series 164-163, 164)
Length standard: Electromagnetic rotary sensor
Standard accessories: Reference bar, 1 pc
Spanner (301336), 1 pc (for series 350-XXX)
Screwdriver (No.05CAA952), 1pc (for series 164-163, 164)

Functions (series 164/350)

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-voltage alarm annunciator appears well before the micrometer becomes unusable.

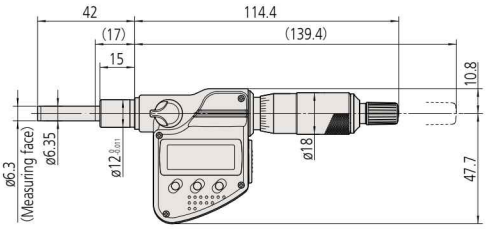
Optional accessories

Connecting cables for **series 164**
1m: **959149**
2m: **959150**
USB Input Tool Direct
USB-ITN-C (2m): **06ADV380C**
02AZD790C 160mm
For foot switch: **02AZE140C**
Connecting cables for **series 350**
1m: **05CZA662**
2m: **05CZA663**
USB Input Tool Direct
USB-ITN-B (2m): **06ADV380B**
Connecting cables for **U-WAVE-T**
02AZD790B 160mm
For foot switch: **02AZE140B**
Refer to page B-68 for details.

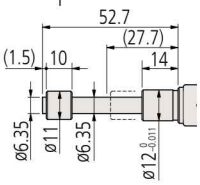
DIMENSIONS

Plain stem

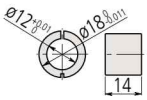
Unit: mm



350-281-30 (Stem dia. 12mm, waterproof type) Mass: 230g



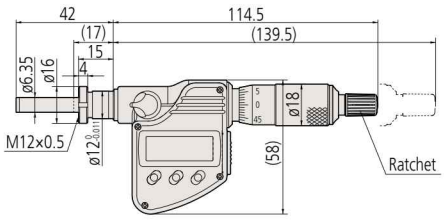
Equipped with a non-rotating device
350-261-30
(Stem dia. 12mm, waterproof type)
Mass: 235g

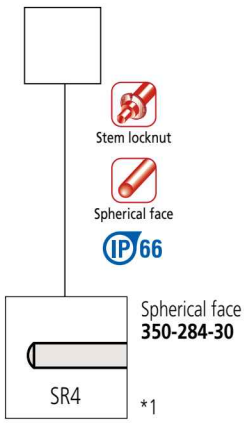


Bush (standard accessory)
350-261-30

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

Stem locknut





Fixture thickness: 11.5mm
350-282-30 (Stem dia. 12mm, equipped with locknut, waterproof type) Mass: 230g

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

Micrometer Head

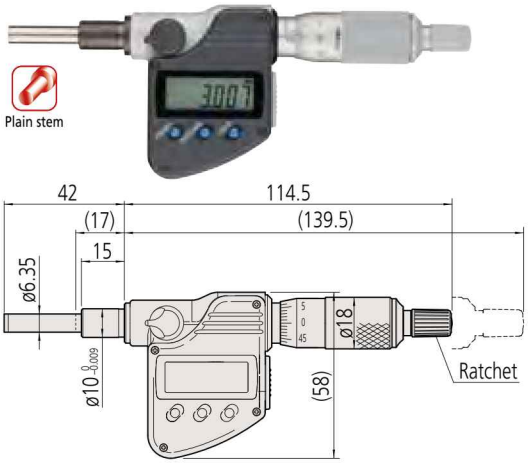
The origin of Mitutoyo's trustworthy brand of small tool instruments

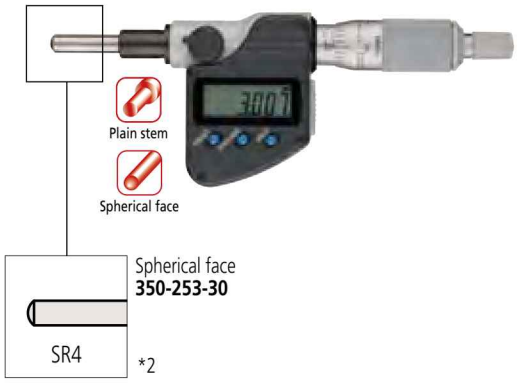
Digimatic Micrometer Heads
SERIES 164, 350

DIMENSIONS

Plain stem

Unit: mm

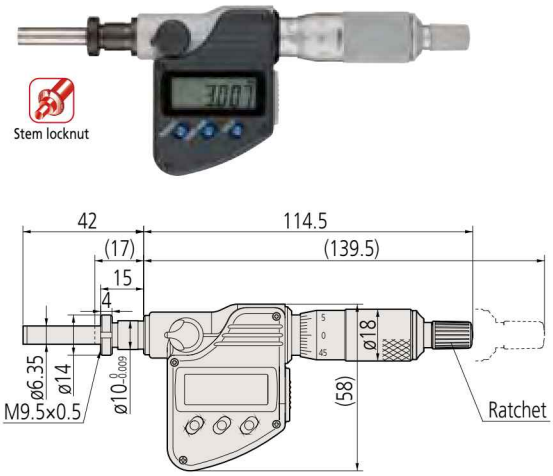


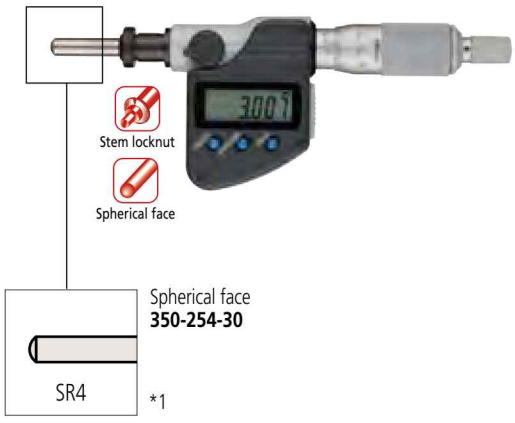


350-251-30
(Stem dia. 10mm, for general use) Mass: 230g

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

Stem locknut





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

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

Technical Data
Graduation: 0.02mm (**148-215**, **148-216**),
0.01mm or .001"

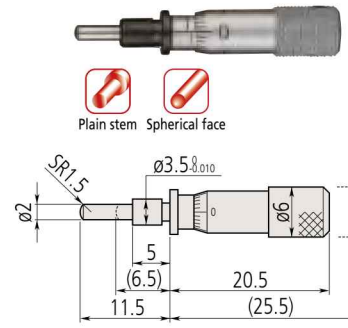
Micrometer Heads
SERIES 148 — Small/Ultra-small Type

• Miniature micrometer heads for ease of incorporating into machines.

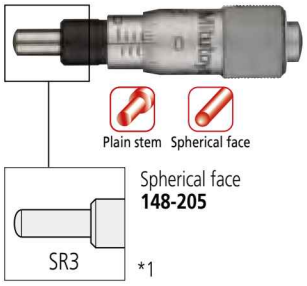
DIMENSIONS

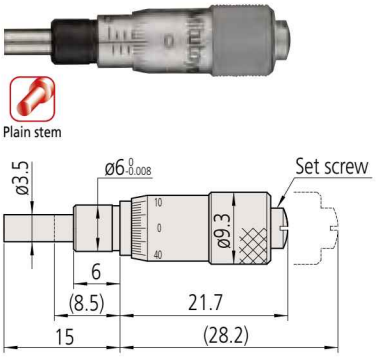
Unit: mm

Plain stem

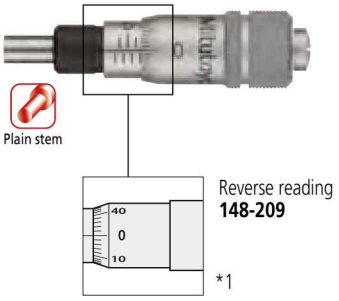


148-215 Mass: 4g





148-201 Mass: 10g



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

SPECIFICATIONS

Metric

Order No.	Range	Accuracy	Stem dia.	Stem	Spindle end	Graduation
148-215	0 - 5mm	±5µm	3.5mm	Plain	Spherical (SR1.5)	Standard
148-216				W/ clamp nut		
148-201	0 - 6.5mm		6mm	Plain	Flat	
148-203				W/ clamp nut		
148-205				Plain	Spherical (SR3)	
148-207				W/ clamp nut		
148-209				Plain	Flat	Reverse reading
148-211				W/ clamp nut		

Inch

Order No.	Range	Accuracy	Stem dia.	Stem	Spindle end	Graduation
148-217	0 - .2"	±.00025"	.156"	Plain	Spherical (SR1.5)	Standard
148-218				W/ clamp nut		
148-202	0 - .25"		.25"	Plain	Flat	
148-204				W/ clamp nut		
148-206				Plain	Spherical (SR3)	
148-208				W/ clamp nut		
148-210*				Plain	Flat	Reverse reading
148-212*				W/ clamp nut		

* made-to-order models

Mitutoyo

Micrometer Head

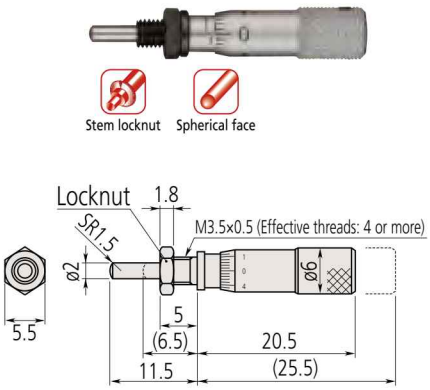
The origin of Mitutoyo's trustworthy brand of small tool instruments

Micrometer Heads
SERIES 148 — Small Standard Type

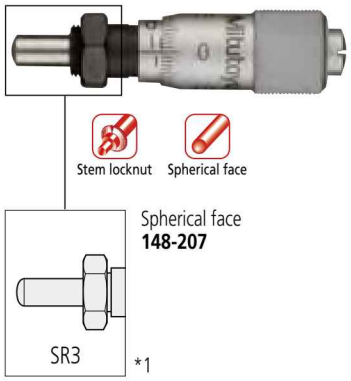
DIMENSIONS

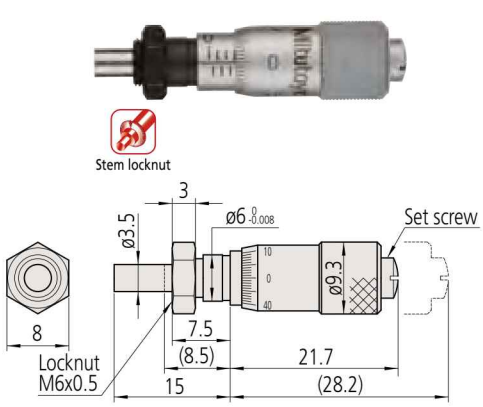
Stem locknut

Unit: mm

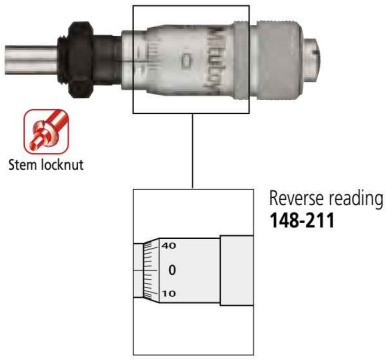


Fixture thickness: 3mm Mass: 4g
148-216





Fixture thickness: 4mm Mass: 10g
148-203



*1 Other dimensions are the same as **148-203**.
( ): with spindle fully retracted

Technical Data

Graduation: 0.01mm or .001"
Spindle pitch: 0.5mm or .025"

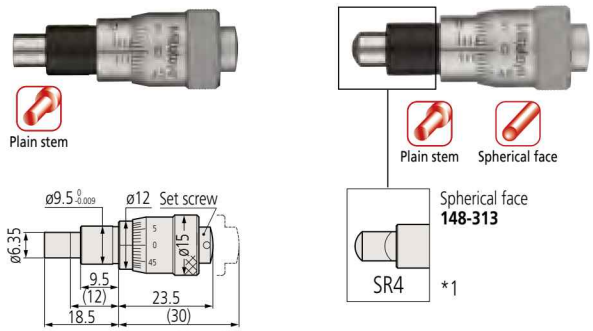
Micrometer Heads
SERIES 148 — Short Thimble with Choice of Diameter

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

DIMENSIONS

Unit: mm

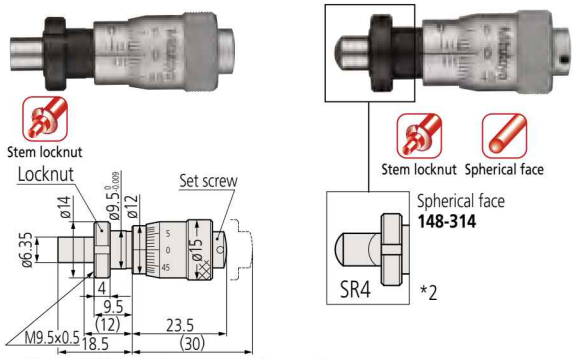
Plain stem



Mass: 26g
148-301 Thimble diameter: 15

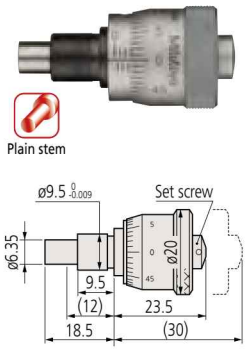
*1 Other dimensions are the same as **148-301**.

Stem locknut

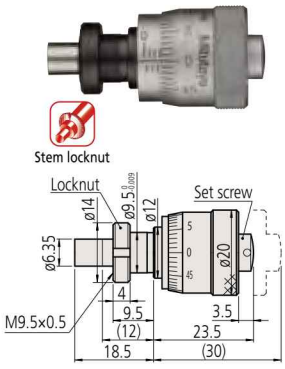


Fixture thickness : 6mm Mass: 26g
148-302 Thimble diameter: 15

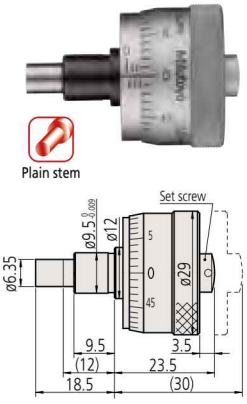
*2 Other dimensions are the same as **148-302**.



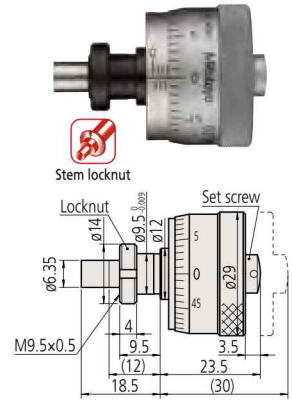
Mass: 39g
148-303 Thimble diameter: 20



Fixture thickness : 6mm Mass: 39g
148-304 Thimble diameter: 20



Mass: 71g
148-305 Thimble diameter: 29



Fixture thickness : 6mm Mass: 71g
148-306 Thimble diameter: 29

( ): with spindle fully retracted

Mitutoyo

Micrometer Head

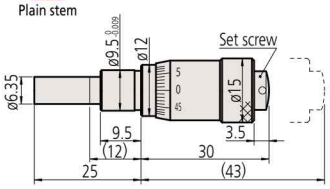
The origin of Mitutoyo's trustworthy brand of small tool instruments

Micrometer Heads
SERIES 148 — Short Thimble with Choice of Diameter

DIMENSIONS

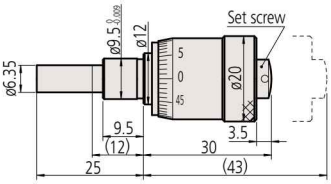
Unit: mm

Plain stem



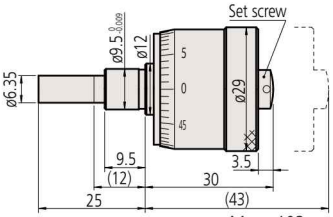
Mass: 35g

148-307 Thimble diameter: 15



Mass: 55g

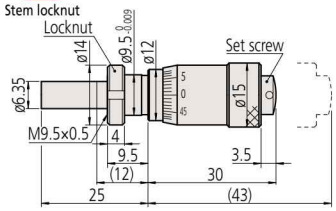
148-309 Thimble diameter: 20



Mass: 103g

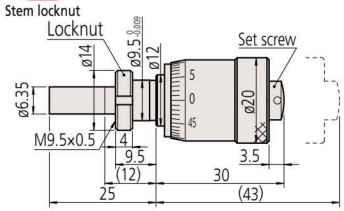
148-311 Thimble diameter: 29

Stem locknut



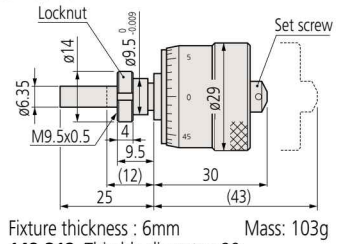
Fixture thickness : 6mm Mass: 35g

148-308 Thimble diameter: 15



Fixture thickness : 6mm Mass: 55g

148-310 Thimble diameter: 20



Fixture thickness : 6mm Mass: 103g

148-312 Thimble diameter: 29

( ): with spindle fully retracted

SPECIFICATIONS

Metric

Order No.	Range	Accuracy	Stem dia.	Stem	Spindle end	Special features
148-301	0 - 6.5mm	±2μm	9.5mm	Plain	Flat	15mm thimble dia.
148-302				W/ clamp nut		
148-303				Plain		20mm thimble dia.
148-304				W/ clamp nut		
148-305				Plain		29mm thimble dia.
148-306				W/ clamp nut		
148-313				Plain	Spherical (SR4)	15mm thimble dia.
148-314				W/ clamp nut		
148-307	0 - 13mm			Plain	Flat	15mm thimble dia.
148-308				W/ clamp nut		
148-309				Plain		20mm thimble dia.
148-310				W/ clamp nut		
148-311				Plain		29mm thimble dia.
148-312				W/ clamp nut		

Inch

Order No.	Range	Accuracy	Stem dia.	Stem	Spindle end	Special features
148-351	0 - .25"	±.0001"	.375"	Plain	Flat	.59" thimble dia.
148-352				W/ clamp nut		
148-353				Plain		.79" thimble dia.
148-354				W/ clamp nut		
148-355				Plain		1.14" thimble dia.
148-356				W/ clamp nut		
148-357	0 - .5"			Plain		.59" thimble dia.
148-358				W/ clamp nut		
148-359				Plain		.79" thimble dia.
148-360				W/ clamp nut		
148-361				Plain		1.14" thimble dia.
148-362				W/ clamp nut		

Technical Data

Graduation: 0.01mm or .001"
Spindle pitch: 0.5mm or .025"

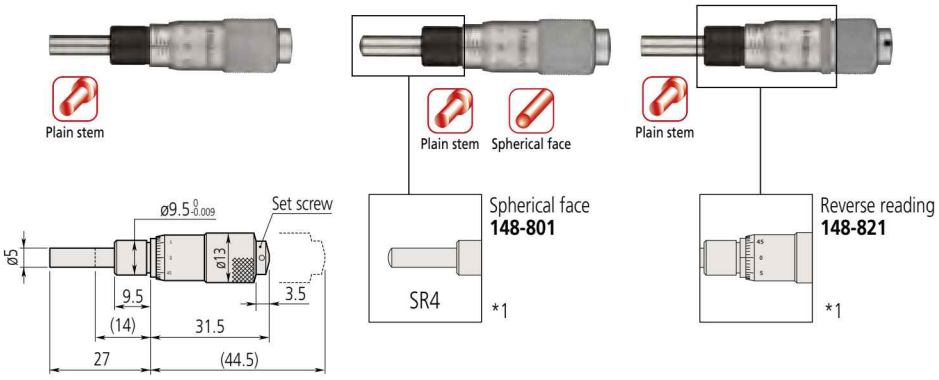
Micrometer Heads
SERIES 148 — Small Standard Type

• Measuring range of 13mm.

DIMENSIONS

Plain stem

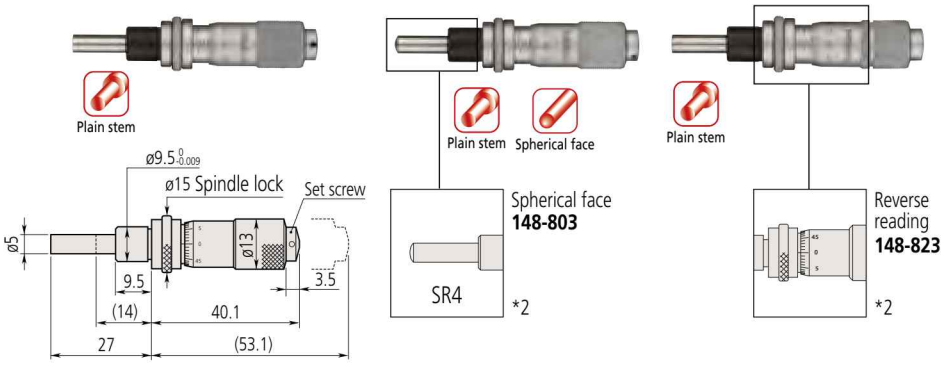
Unit: mm



148-104 Mass: 30g

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

Plain stem and spindle lock



148-121 Mass: 40g

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

SPECIFICATIONS

Metric

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

* with spindle lock

Inch

Order No.	Range	Accuracy	Stem dia.	Stem	Spindle end	Graduation features
148-112	0 - .5"	±.0001"	.375"	Plain	Flat	Standard
148-111**				W/ clamp nut		
148-123				Plain*		
148-122				W/ clamp nut*		
148-811				Plain	Spherical (SR4)	
148-812				W/ clamp nut		
148-813				Plain*		
148-814				W/ clamp nut*		
148-831				Plain	Flat	Reverse reading
148-832				W/ clamp nut		
148-833				Plain*		
148-834				W/ clamp nut*		

* with spindle lock
** made-to-order model

Mitutoyo

Micrometer Head

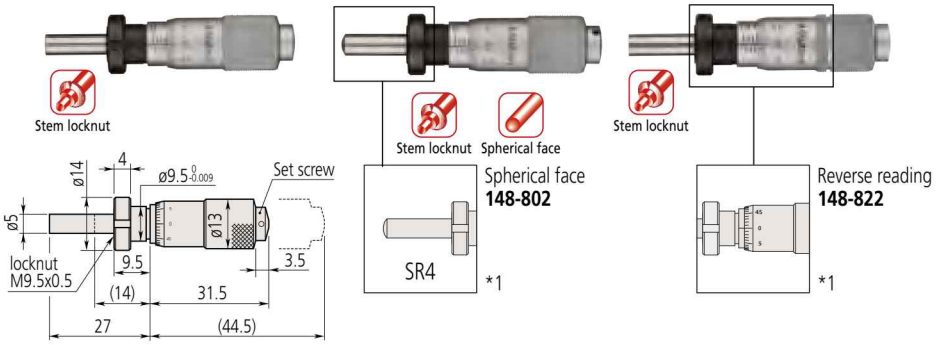
The origin of Mitutoyo's trustworthy brand of small tool instruments

Micrometer Heads
SERIES 148 — Small Standard Type

DIMENSIONS

Stem locknut Mass: 40g

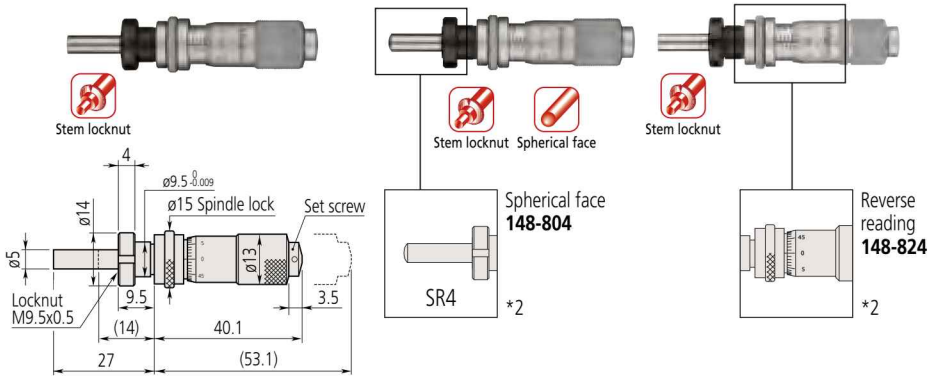
Unit: mm



Fixture thickness: 6mm
148-103

*1 Other dimensions are the same as **148-103**.

Stem locknut and spindle lock Mass: 40g



Fixture thickness: 6mm
148-120

*2 Other dimensions are the same as **148-120**.
( ): With spindle fully retracted.

Technical Data

Graduation: 0.01mm or .001"
Spindle pitch: 0.5mm or .025"

Micrometer Heads
SERIES 148 — Small Thimble Diameter Standard Type

- Measuring range of 13mm.
- The thimble can be set to zero at any position by loosening the setscrew.
- Stainless steel throughout: 148-513, 518, 511

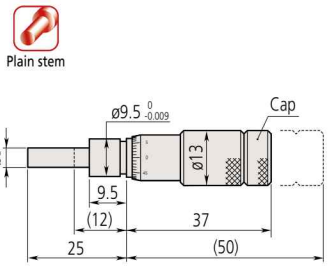
DIMENSIONS

Plain stem

Mass: 35g

Unit: mm

All stainless steel model

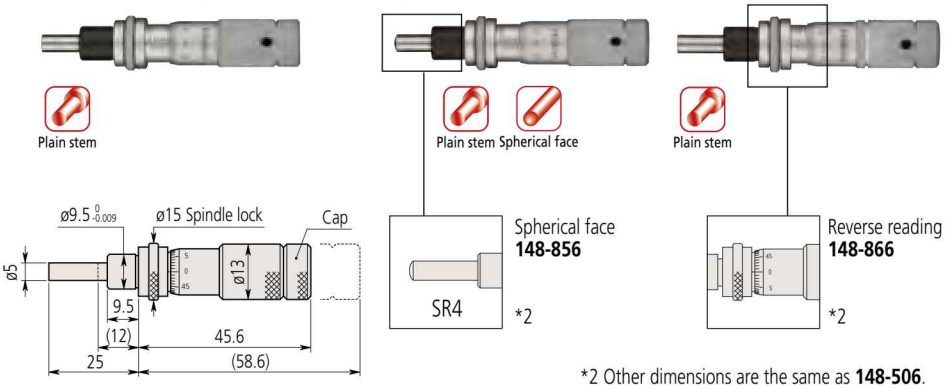


148-503 **148-513** All stainless steel model

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

Plain stem and spindle lock

Mass: 35g



148-506 MHA1-13L

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

SPECIFICATIONS

Metric

Order No.	Range	Accuracy	Stem dia.	Stem	Spindle end	Special features
148-503	0 - 13mm	±2µm	9.5mm	Plain	Flat	Standard
148-513						Stainless steel throughout
148-508				W/ clamp nut		Standard
148-506				Plain*		
148-504				W/ clamp nut*		
148-853				Plain	Spherical (SR4)	
148-854				W/ clamp nut*		
148-863				Plain	Flat	Reverse reading
148-864				W/ clamp nut*		
148-518**				W/ clamp nut		Stainless steel throughout
148-858**				W/ clamp nut	Spherical (SR4)	Standard
148-866**				Plain*	Flat	Reverse reading
148-856**				Plain*	Spherical (SR4)	Standard
148-868**				W/ clamp nut	Flat	Reverse reading

* with spindle lock ** made-to-order models

Inch

Order No.	Range	Accuracy	Stem dia.	Stem	Spindle end	Special features
148-501	0 - .5"	±.0001"	.375"	Plain	Flat	Standard
148-511**						Stainless steel throughout
148-507**				W/ clamp nut		Standard
148-505				Plain*		
148-502				W/ clamp nut*		
148-851				Plain	Spherical (SR4)	
148-852				W/ clamp nut*		
148-861				Plain	Flat	Reverse reading
148-862				W/ clamp nut*		

* with spindle lock ** made-to-order models

Mitutoyo

Micrometer Head

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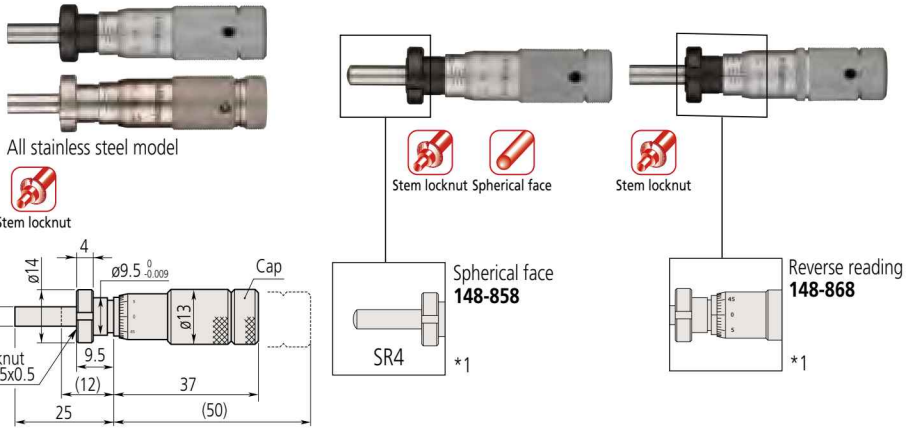
Micrometer Heads
SERIES 148 — Small Thimble Diameter Standard Type

DIMENSIONS

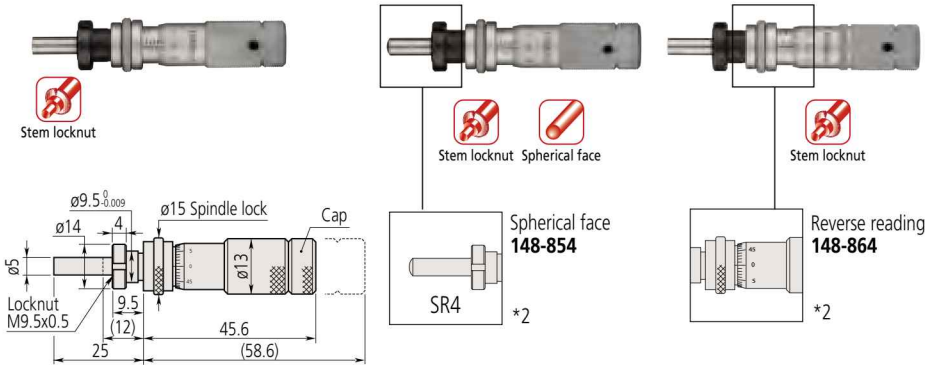
Stem locknut Unit: mm



Fixture thickness: 6mm
148-508 **148-518** All stainless steel model Mass: 40g

*1 Other dimensions are the same as **148-508**.

Stem locknut and spindle lock



Fixture thickness: 6mm
148-504
Mass: 40g

*2 Other dimensions are the same as **148-504**.
( ): With spindle fully retracted.

Technical Data

Graduation: 0.01mm or .001"
Spindle pitch: 0.5mm or .025"

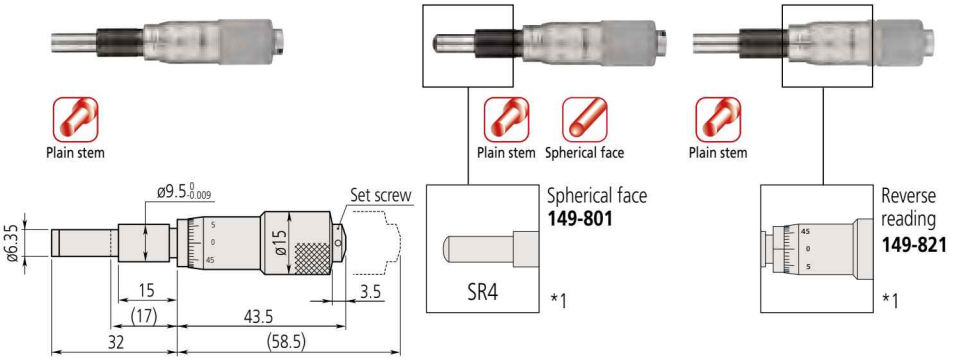
Micrometer Heads
SERIES 149 — Small Standard Type with Carbide-Tipped Spindle

• Carbide-tipped spindle provides high abrasion resistance.

DIMENSIONS

Plain stem

Unit: mm

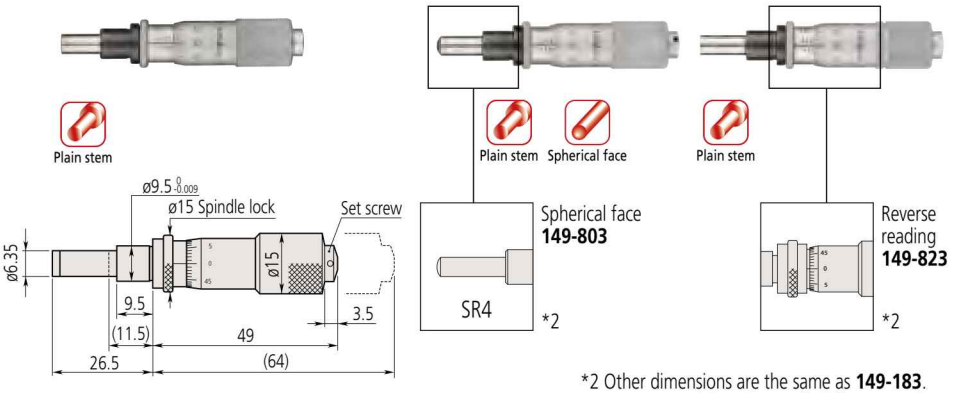


149-132 Mass: 55g

*1 Other dimensions are the same as **149-132**.

Plain stem and spindle lock

Mass: 55g



149-183

*2 Other dimensions are the same as **149-183**.
( ): With spindle fully retracted.

SPECIFICATIONS

Metric

Order No.	Range	Accuracy	Stem dia.	Stem	Spindle end	Graduation features
149-132	0 - 15mm	±2µm	9.5mm	Plain	Flat (carbide tip)	Standard
149-131				W/ clamp nut		
149-183				Plain*		
149-184				W/ clamp nut*		
149-801				Plain	Spherical (SR4) (carbide tip)	
149-802				W/ clamp nut		
149-821				Plain	Flat (carbide tip)	Reverse reading
149-822				W/ clamp nut		
149-803**				Plain*	Spherical (SR4) (carbide tip)	Standard
149-804**				W/ clamp nut*		
149-823**				Plain*	Flat (carbide tip)	Reverse reading
149-824**				W/ clamp nut*		

* with spindle lock ** made-to-order models

Inch

Order No.	Range	Accuracy	Stem dia.	Stem	Spindle end	Graduation features
149-148	0 - .5"	±.0001"	.375"	Plain	Flat (carbide tip)	Standard
149-147				W/ clamp nut		
149-185***				Plain*		
149-182				W/ clamp nut*		
149-811				Plain	Spherical (SR4) (carbide tip)	
149-812				W/ clamp nut		
149-831**				Plain	Flat (carbide tip)	Reverse reading
149-832**				W/ clamp nut		
149-181**				Plain*		Standard

* with spindle lock ** made-to-order model *** w/rachet (**149-181**) is available

Mitutoyo

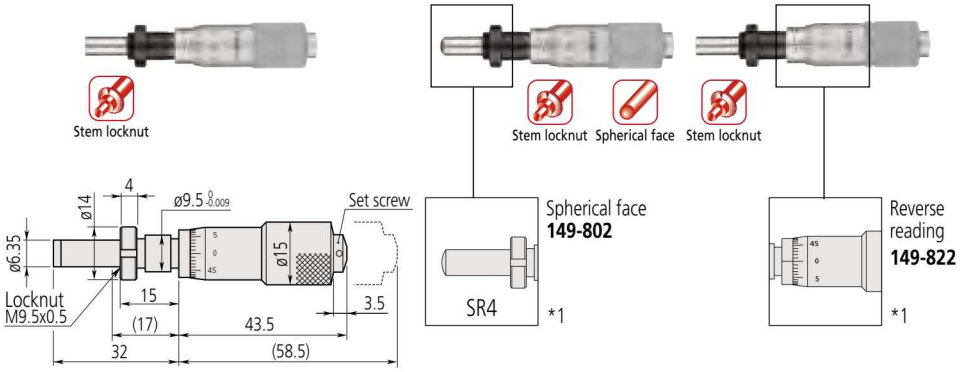
Micrometer Head

The origin of Mitutoyo's trustworthy brand of small tool instruments

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

DIMENSIONS

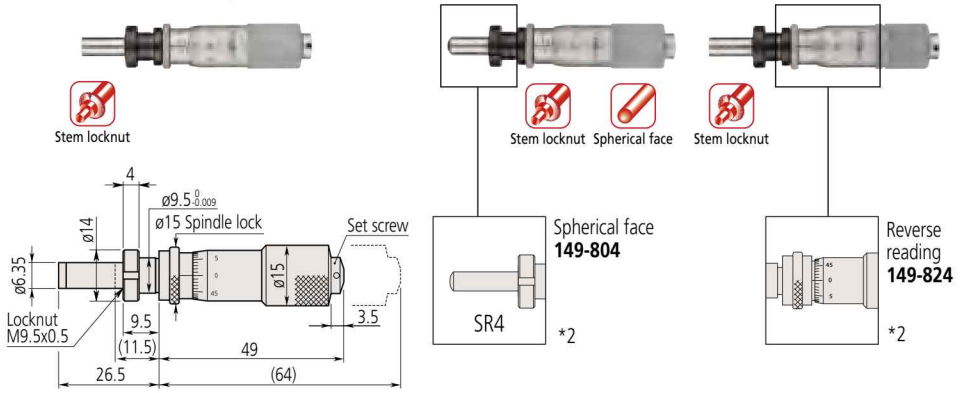
Stem locknut Unit: mm



Fixture thickness: 11.5mm
149-131 Mass: 60g

*1 Other dimensions are the same as **149-131**.

Stem locknut and spindle lock



Fixture thickness: 6mm
149-184 Mass: 60g

*2 Other dimensions are the same as **149-184**.
( ): With spindle fully retracted.

Technical Data

Graduation: 0.01mm, 0.001mm, .001" or .0001"
Spindle pitch: 0.5mm or .025"

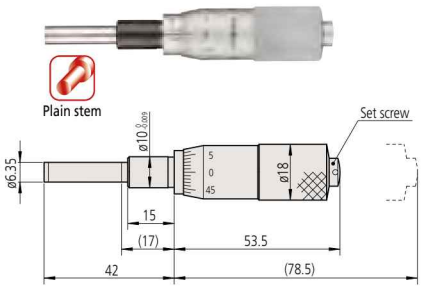
Micrometer Heads
SERIES 150 — Medium-sized Standard Type

• Measuring range of 25mm.

DIMENSIONS

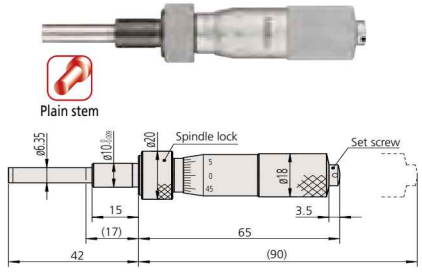
Unit: mm

Plain stem



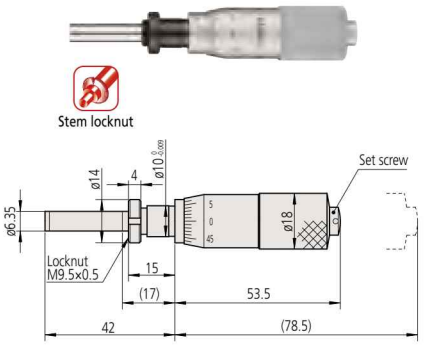
150-196 Mass: 95g

Plain stem and spindle lock



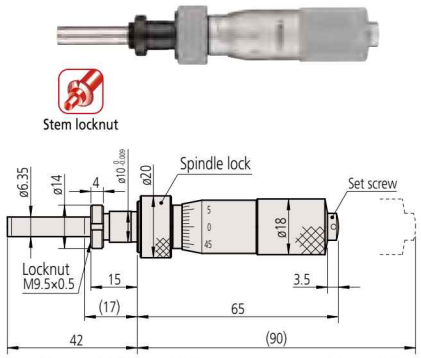
150-211 Mass: 115g

Stem locknut



Fixture thickness: 11.5mm Mass: 110g
150-195

Stem locknut and spindle lock



Fixture thickness: 11.5mm Mass: 115g
150-212

( ): With spindle fully retracted.

SPECIFICATIONS

Metric

Order No.	Range	Accuracy	Stem dia.	Stem	Spindle end	Special features
150-192	0 - 25mm	±2µm	10mm	Plain	Flat (carbide tip)	Standard
150-191				W/ clamp nut		
150-209				Plain*		
150-210				W/ clamp nut*		
150-801				Plain	Spherical (SR4) (carbide tip)	
150-802				W/ clamp nut		
150-821				Plain	Flat (carbide tip)	Reverse reading
150-822				W/ clamp nut		
150-190				Plain		W/vernier (0.001mm)
150-189				W/ clamp nut		
150-183**				Plain*		
150-184				W/ clamp nut*		
150-196				Plain		w/o ratchet stop
150-195				W/ clamp nut		
150-211				Plain*		
150-212				W/ clamp nut*		
150-219				Plain	Flat	Long spindle
150-220				W/ clamp nut		
150-803**				Plain*	Spherical (SR4) (carbide tip)	Standard
150-804**				W/ clamp nut*		
150-823**				Plain*	Flat (carbide tip)	Reverse reading
150-824**				W/ clamp nut*		
150-223**				Plain*	Flat	Long spindle
150-224**				W/ clamp nut*		

* with spindle lock ** made-to-order models

Inch

Order No.	Range	Accuracy	Stem dia.	Stem	Spindle end	Special features
150-208	0 - 1"	±.0001"	.375"	Plain	Flat (carbide tip)	Standard
150-207				W/ clamp nut		
150-213**				Plain*		
150-214**				W/ clamp nut*		
150-811				Plain	Spherical (SR4) (carbide tip)	
150-812				W/ clamp nut		
150-831				Plain	Flat (carbide tip)	Reverse graduation
150-832				W/ clamp nut		
150-206				Plain		W/vernier (.0001")
150-205**				W/ clamp nut		
150-215**				Plain*		
150-216**				W/ clamp nut*		
150-198				Plain		w/o ratchet stop
150-197				W/ clamp nut		
150-217**				Plain*		
150-218**				W/ clamp nut*		
150-221**				Plain	Flat	Long spindle
150-222**				W/ clamp nut		

* with spindle lock ** made-to-order models

Mitutoyo

Micrometer Head

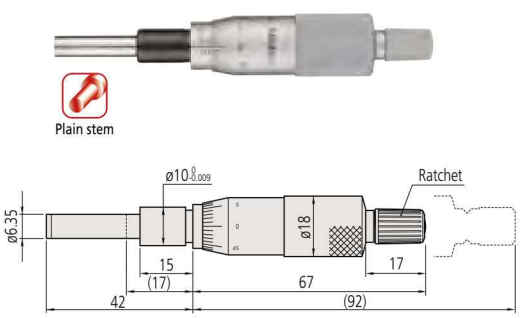
The origin of Mitutoyo's trustworthy brand of small tool instruments

Micrometer Heads
SERIES 150 — Medium-sized Standard Type

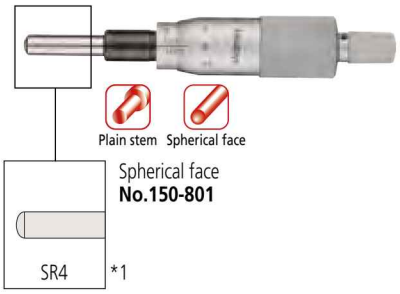
DIMENSIONS

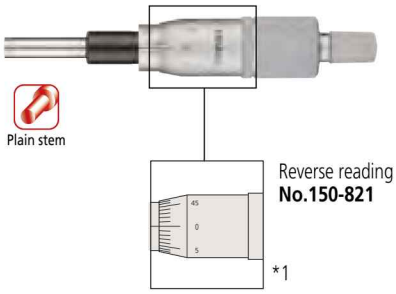
Plain stem

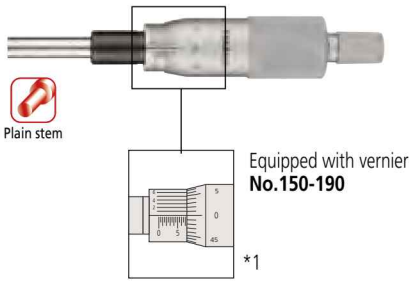
( ): With spindle fully retracted. Unit: mm

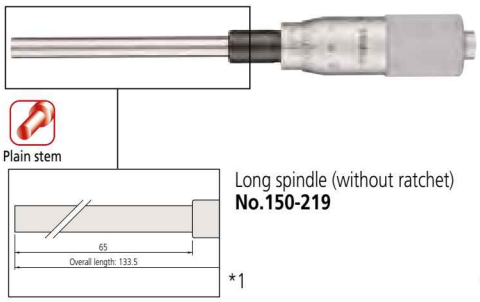


150-192 Mass: 95g



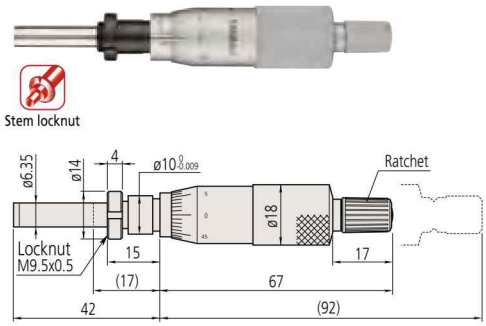




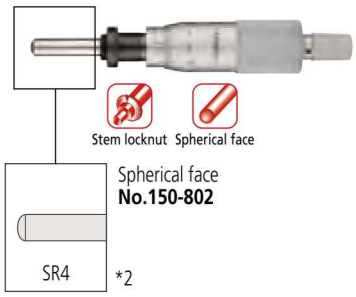


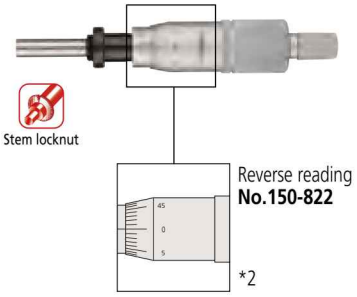
*1 Other dimensions are the same as **150-192**.

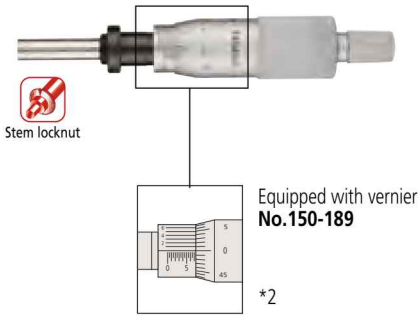
Stem locknut

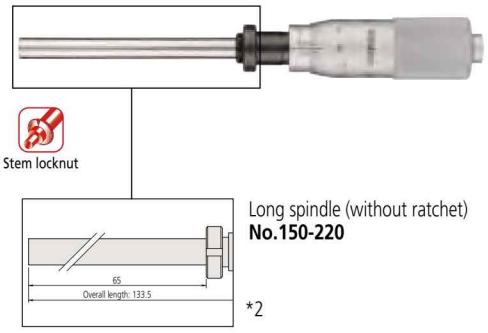


Fixture thickness: 11.5mm
150-191 Mass: 100g









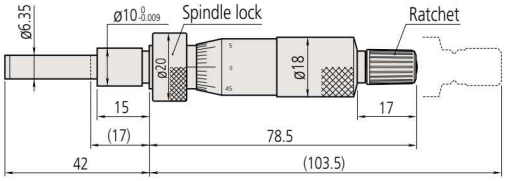
*2 Other dimensions are the same as **150-191**.

DIMENSIONS

( ): With spindle fully retracted. Unit: mm

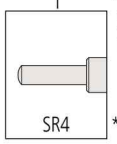
Plain stem and spindle lock

Mass: 110g

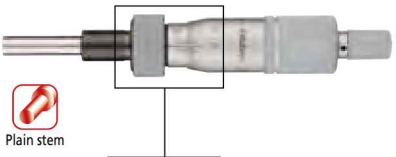


150-209

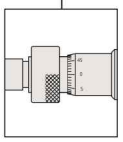
Spherical face
No.150-803



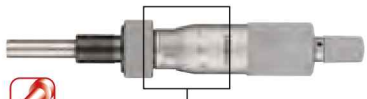
*1

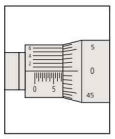


Reverse reading
No.150-823



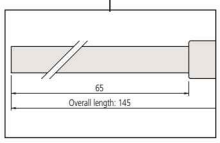
*1





Equipped with vernier
No.150-183

*1

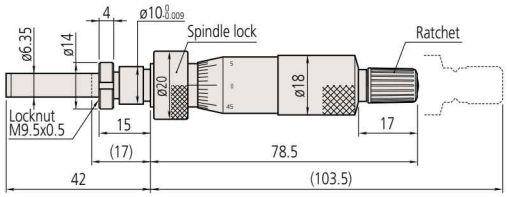


Long spindle (without ratchet)
No.150-223

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

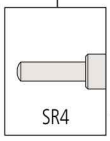
Stem locknut and spindle lock

Mass: 115g

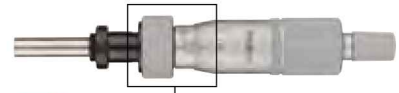


Fixture thickness: 11.5mm
150-210

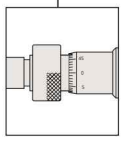
Spherical face
No.150-804



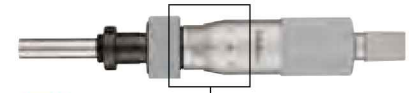
*2

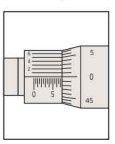


Reverse reading
No.150-824



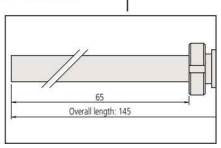
*2





Equipped with vernier
No.150-184

*2



Long spindle (without ratchet)
No.150-224

*2

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

Micrometer Head

The origin of Mitutoyo's trustworthy brand of small tool instruments

Micrometer Heads
SERIES 151 — Medium-sized Standard Type with 8mm diameter spindle

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

Technical Data

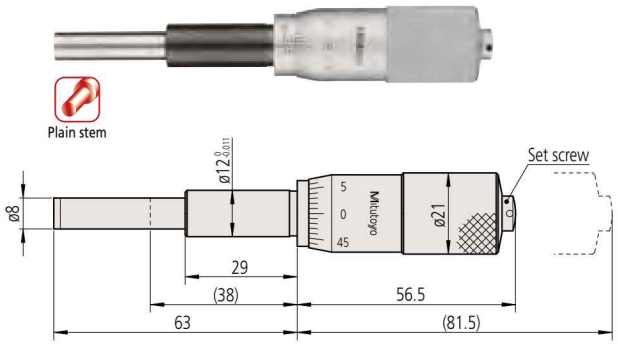
Graduation: 0.01mm, 0.001mm, .001" or .0001"
Spindle pitch: 0.5mm or .025"

B

DIMENSIONS

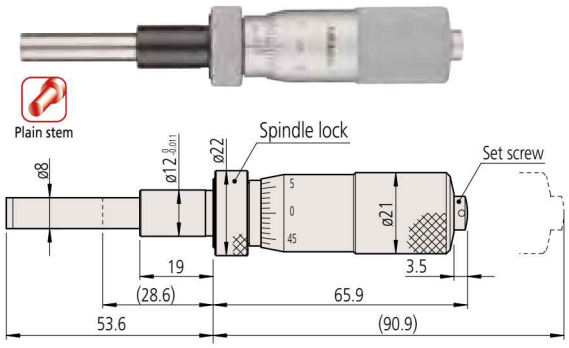
Unit: mm

Plain stem



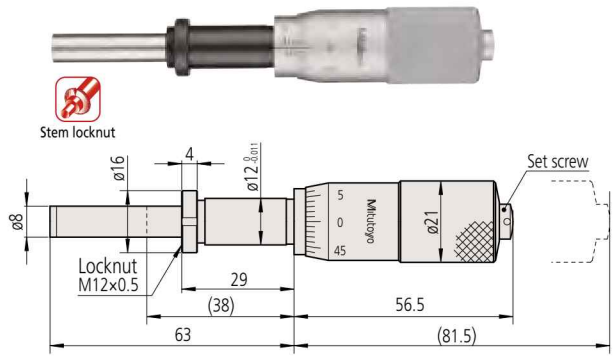
151-227 Mass: 150g

Plain stem and spindle lock



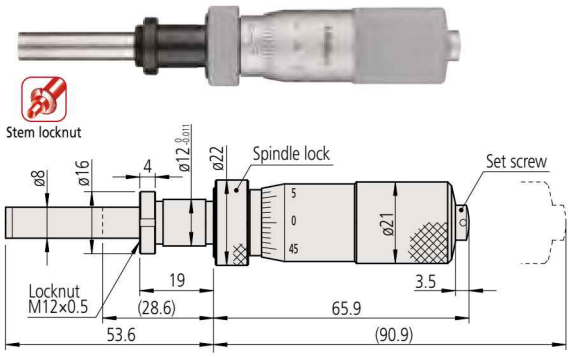
151-225 Mass: 165g

Stem locknut



Fixture thickness: 25.5mm
151-228 Mass: 155g

Stem locknut and spindle lock



Fixture thickness: 15.5mm
151-226 Mass: 165g

( ): With spindle fully retracted.

SPECIFICATIONS

Metric

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

* with spindle lock ** made-to-order models

Inch

Order No.	Range	Accuracy	Stem dia.	Stem	Spindle end	Special features
151-240	0 - .1"	±.0001"	.5"	Plain	Flat (carbide tip)	—
151-239				W/ clamp nut		
151-238				Plain		W/ vernier (.0001")
151-237				W/ clamp nut		
151-241**				Plain*		w/o ratchet stop
151-242**				W/ clamp nut*		
151-243**				Plain*		w/o ratchet stop (.0001")
151-244**				W/ clamp nut*		
151-272	0 - .2"	±.0002"		Plain		—
151-271				W/ clamp nut		

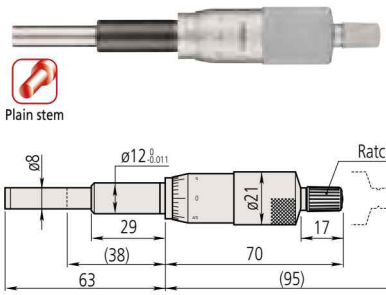
* with spindle lock ** made-to-order models

Micrometer Heads
SERIES 151 — Medium-sized Standard Type with 8mm diameter spindle

DIMENSIONS

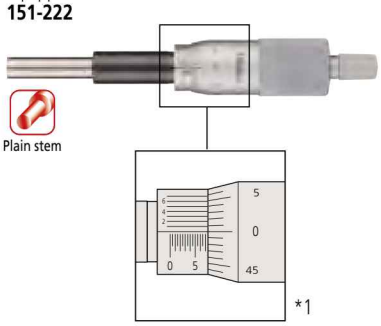
Unit: mm

Plain stem



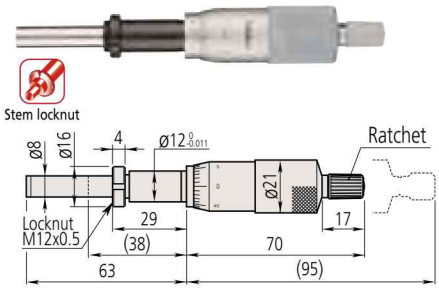
151-224 Mass: 150g

Equipped with vernier
151-222



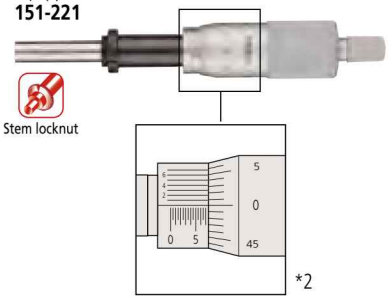
*1 Other dimensions are the same as **151-224**.

Stem locknut



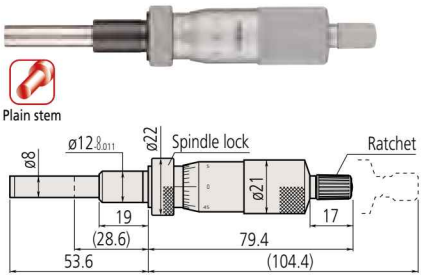
Fixture thickness: 25.5mm
151-223 Mass: 155g

Equipped with vernier
151-221



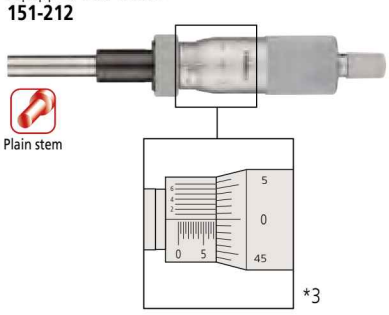
*2 Other dimensions are the same as **150-223**.

Plain stem and spindle lock



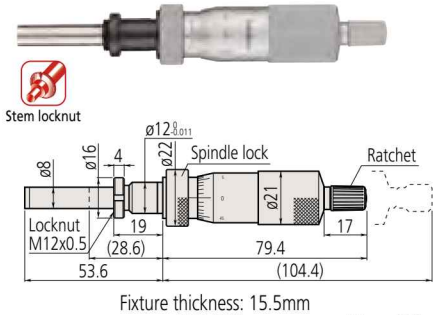
151-214 Mass: 160g

Equipped with vernier
151-212



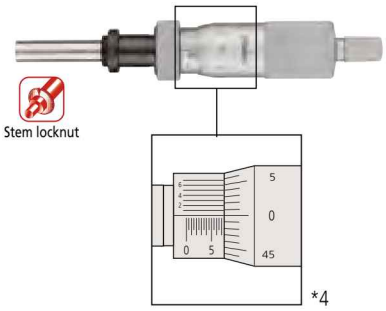
*3 Other dimensions are the same as **150-214**.

Stem locknut and spindle lock



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

Equipped with vernier
151-211



*4 Other dimensions are the same as **150-213**.
( ): With spindle fully retracted.

Mitutoyo

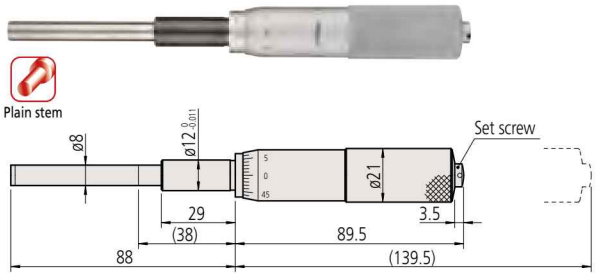
Micrometer Head

The origin of Mitutoyo's trustworthy brand of small tool instruments

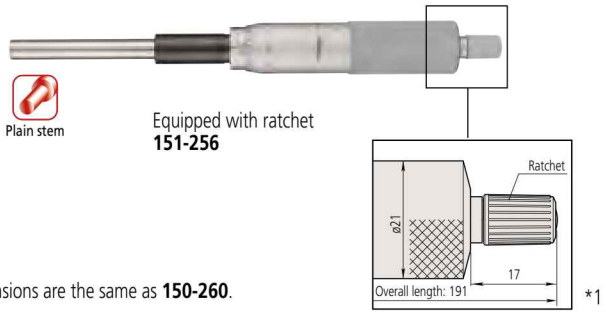
Micrometer Heads
SERIES 151 — Medium-sized Standard Type with 8mm diameter spindle

DIMENSIONS

Plain stem Unit: mm



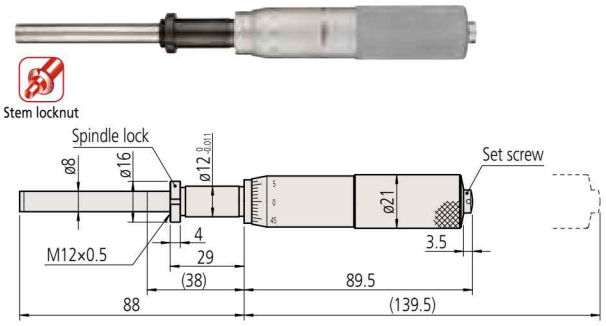
151-260 Mass: 240g



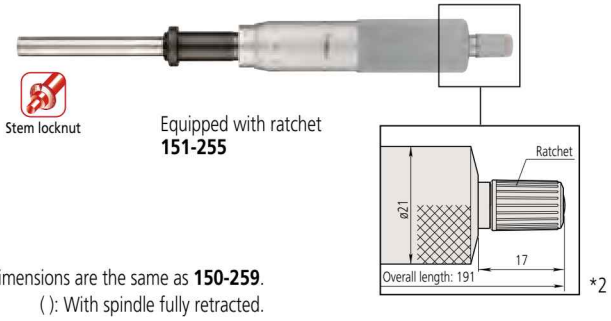
*1 Other dimensions are the same as **150-260**.

*1

Stem locknut



Fixture thickness: 25.5mm
151-259 Mass: 250g



*2 Other dimensions are the same as **150-259**.
( ): With spindle fully retracted.

*2

Secure spindle

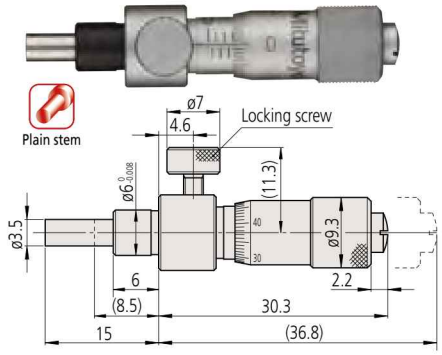
Micrometer Heads
SERIES 148 — Locking-screw Type

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

DIMENSIONS

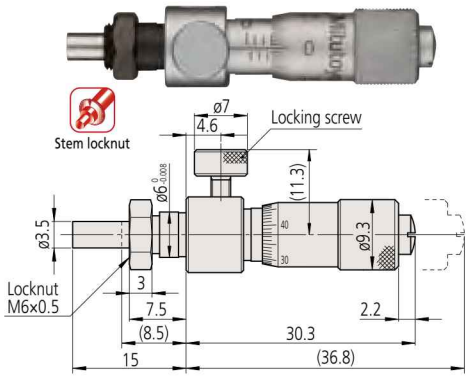
Unit: mm

Plain stem



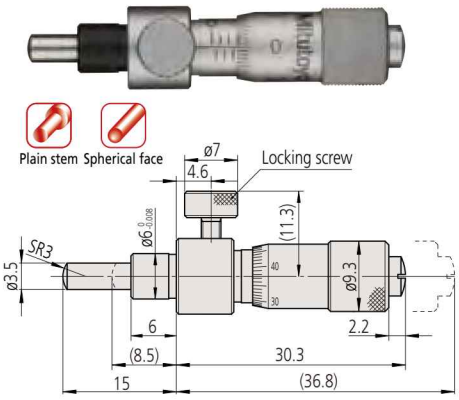
148-220 Mass: 16g

Stem locknut



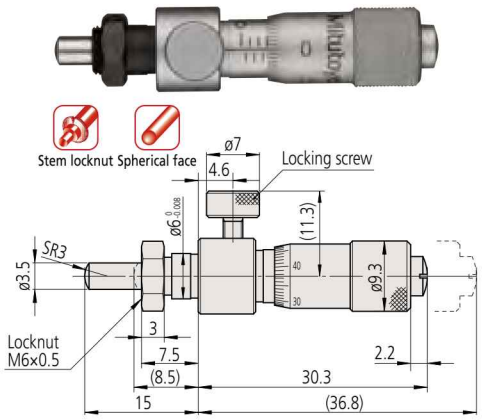
Fixture thickness: 4mm
148-221 Mass: 17g

Plain stem



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

Stem locknut



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

( ): With spindle fully retracted.

SPECIFICATIONS

Metric

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

Inch

Order No.	Range	Graduation	Accuracy	Stem dia.	Stem	Spindle end	Graduation features
148-230	0 - .25"	.001"	±.00025"	.25"	Plain	Flat	Standard
148-231					W/ clamp nut		
148-232					Plain	Spherical (SR3)	
148-233					W/ clamp nut		
148-160	0 - .5"		±.0001"	.375"	Plain	Flat	
148-161					W/ clamp nut		
148-162					Plain	Spherical (SR4)	
148-163					W/ clamp nut		
148-326	0 - .25"				Plain	Flat	
148-327					W/ clamp nut		
148-328					Plain	Spherical (SR4)	
148-329					W/ clamp nut		

Mitutoyo

Micrometer Head

The origin of Mitutoyo's trustworthy brand of small tool instruments

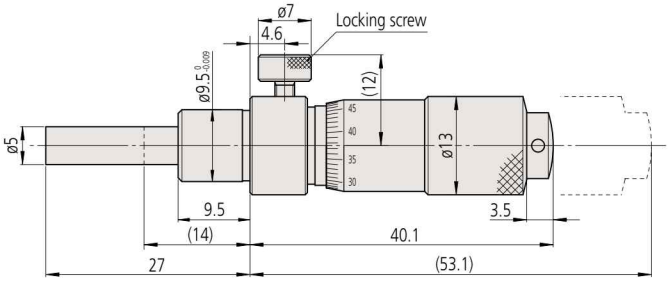
Micrometer Heads
SERIES 148 — Locking-screw Type

DIMENSIONS

Plain stem

Unit: mm

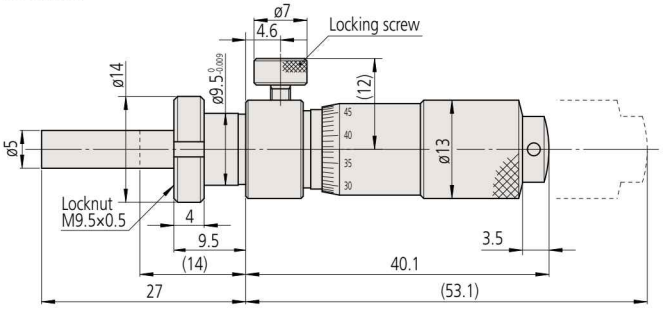
Plain stem



148-150 Mass: 40g

Stem locknut

Stem locknut

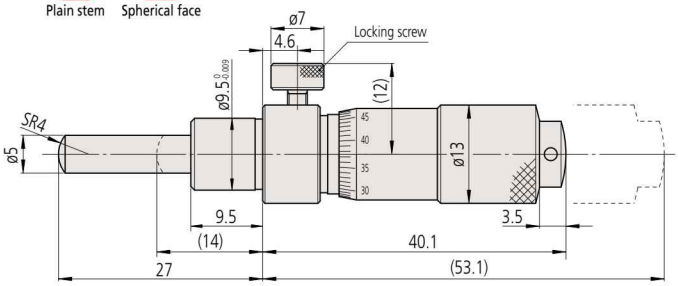


Fixture thickness: 6mm

148-151 Mass: 43g

Plain stem

Plain stem Spherical face

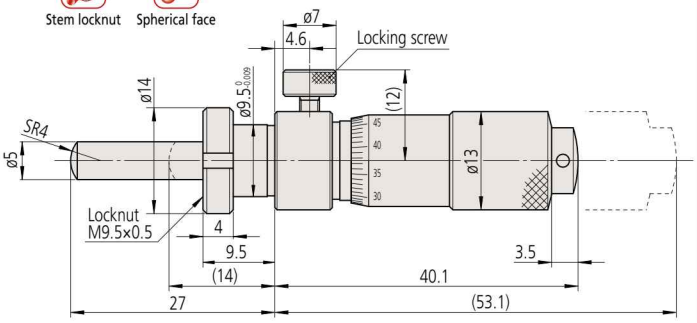


Spherical face (SR4)

148-152 Mass: 40g

Stem locknut

Stem locknut Spherical face



Spherical face (SR4) Fixture thickness: 6mm

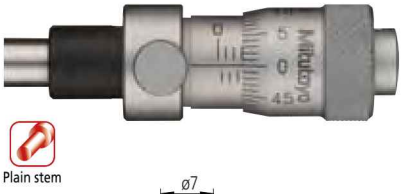
148-153 Mass: 43g

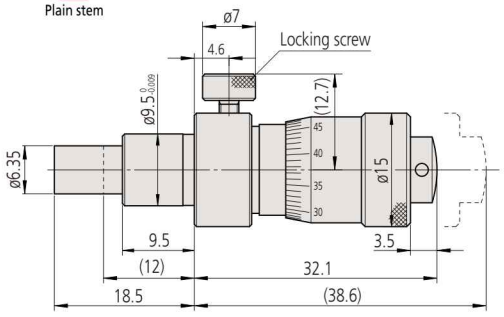
( ): With spindle fully retracted.

DIMENSIONS

Unit: mm

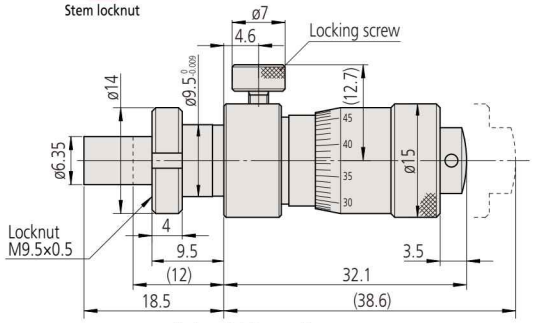
Plain stem





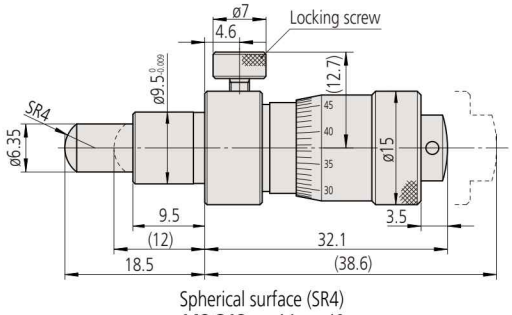
148-316 Mass: 40g

Stem locknut



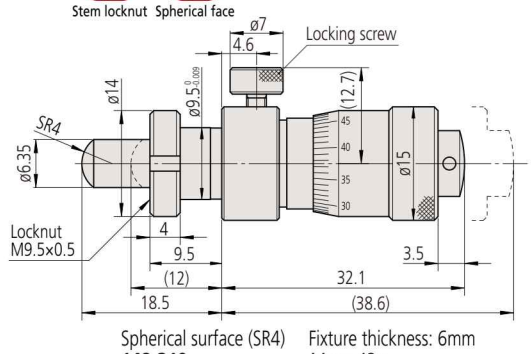
Fixture thickness: 6mm
148-317 Mass: 43g

Plain stem



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

Stem locknut



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

( ): With spindle fully retracted.

Mitutoyo

Micrometer Head

The origin of Mitutoyo's trustworthy brand of small tool instruments

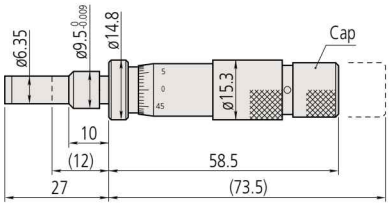
Micrometer Heads
SERIES 153 — Non-rotating Spindle Type

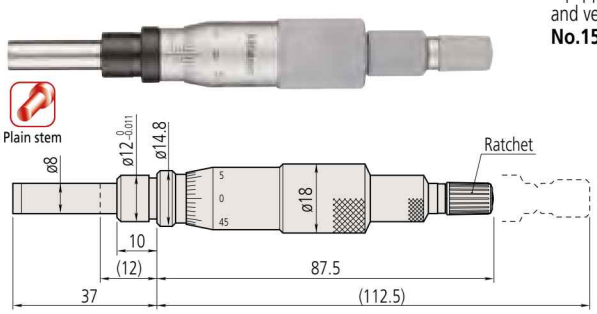
- The spindle translates without rotation.
- Torsion-free feed reduces workpiece deformation and wear.

DIMENSIONS

Unit: mm

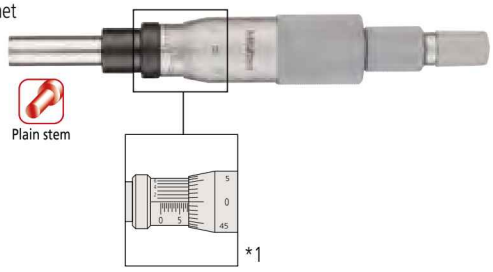
153-101 Mass: 70g



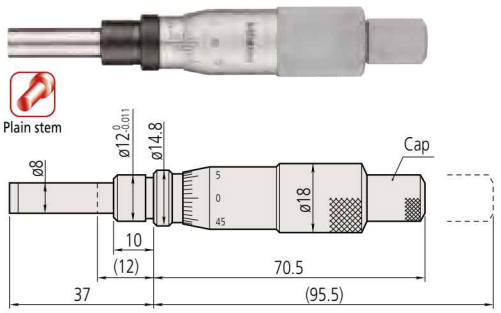


153-201 Mass: 125g

Equipped with ratchet and vernier ratchet
No.153-202

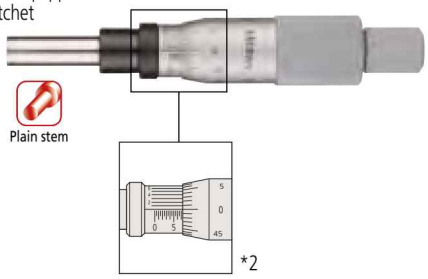


*1 Other dimensions are the same as **153-201**



153-203 Mass: 125g

Without ratchet/ Equipped with vernier ratchet
No.153-204



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

SPECIFICATIONS

Metric

Order No.	Range	Graduation	Accuracy	Stem dia.	Stem	Spindle end	Spindle pitch	Graduation features
153-101	0 - 15mm	0.01mm	±3μm	9.5mm	Plain	Flat (carbide tip)	0.5mm	Standard
153-201*	0 - 25mm	0.01mm	±3μm	12mm	Plain	Flat (carbide tip)	0.5mm	Standard
153-202*	0 - 25mm	0.001mm	±3μm	12mm	Plain	Flat (carbide tip)	0.5mm	w/ vernier (0.001mm)
153-203	0 - 25mm	0.01mm	±3μm	12mm	Plain	Flat (carbide tip)	0.5mm	Standard
153-204	0 - 25mm	0.001mm	±3μm	12mm	Plain	Flat (carbide tip)	0.5mm	w/ vernier (0.001mm)

Inch

Order No.	Range	Graduation	Accuracy	Stem dia.	Stem	Spindle end	Spindle pitch	Special features
153-108**	0 - .5"	.001"	±.00015"	.375"	Plain	Flat (carbide tip)	.025"	w/ vernier (.0001")
153-205*	0 - 1"	.001"	±.00015"	.5"	Plain	Flat (carbide tip)	.025"	Standard
153-206*	0 - 1"	.0001"	±.00015"	.5"	Plain	Flat (carbide tip)	.025"	w/ vernier (.0001")
153-207	0 - 1"	.001"	±.00015"	.5"	Plain	Flat (carbide tip)	.025"	Standard
153-208	0 - 1"	.0001"	±.00015"	.5"	Plain	Flat (carbide tip)	.025"	w/ vernier (.0001")

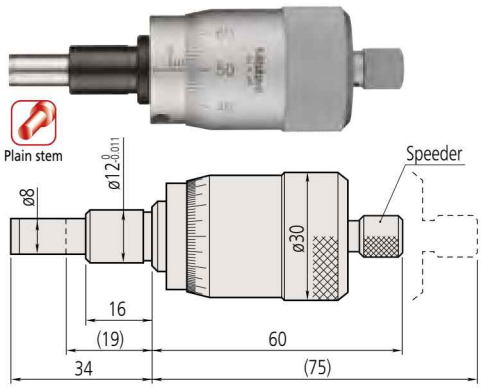
* with ratchet stop ** made-to-order model

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

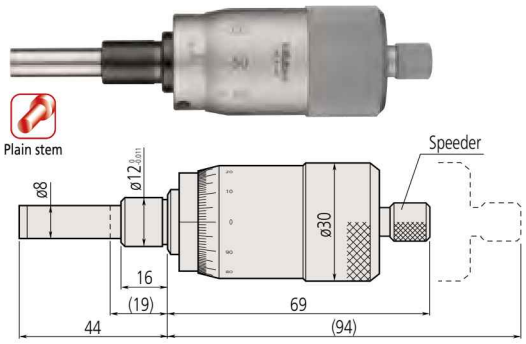
• Quick spindle feed of 1mm/rev.

DIMENSIONS

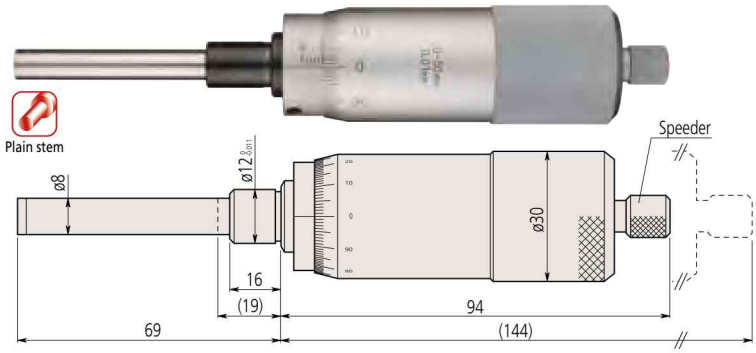
Unit: mm



152-101 Mass: 220g



152-102 Mass: 230g



152-103 Mass: 350g

( ): With spindle fully retracted.

SPECIFICATIONS

Metric

Order No.	Range	Graduation	Accuracy	Stem dia.	Stem	Spindle end	Spindle pitch
152-101	0 - 15mm	0.01mm	±2µm	12mm	Plain	Flat (carbide tip)	1mm
152-102	0 - 25mm						
152-103	0 - 50mm		±4µm				

Micrometer Head

The origin of Mitutoyo's trustworthy brand of small tool instruments

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

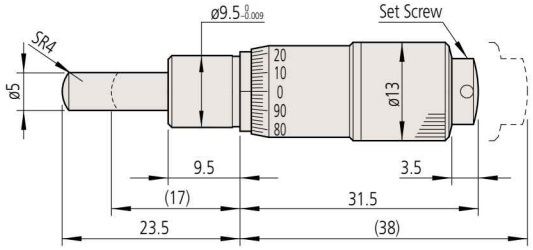
- Highly accurate 0.1mm pitch thread is only one-fifth of that used for a standard-pitch head (0.5mm).
- External dimensions are compatible with standard 0.5mm pitch heads.

DIMENSIONS

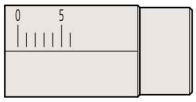
Plain stem

Unit: mm

Plain stem Spherical face



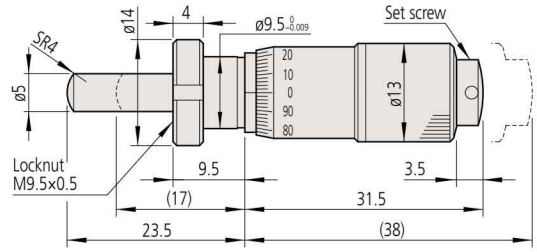
148-142 Mass: 31g



Sleeve marker

Stem locknut

Stem locknut Spherical face



Fixture thickness: 6mm
148-143 Spherical face Mass: 34g

( ): With spindle fully retracted.

SPECIFICATIONS

Metric

Order No.	Range	Graduation	Accuracy	Stem dia.	Stem	Spindle end	Spindle pitch	Special features
148-142	0 - 6.5mm	0.002mm	±2µm	9.5mm	Plain	Spherical (SR4)	0.1mm	—
148-143					w/ clamp nut			
148-342					Plain			Thicker & shorter thimble
148-343					w/ clamp nut			
148-242			±5µm	6mm	Plain	Spherical (SR3)		Small thimble diameter
148-243					w/ clamp nut			
148-244	0 - 5mm	0.004mm		3.5mm	Plain	Spherical (SR1.5)		
148-245					w/ clamp nut			

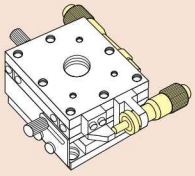
Spindle pitch

Pitch = 0.1mm

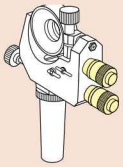
Pitch = 0.5mm

Applications

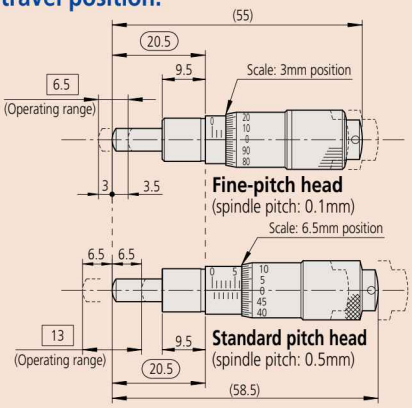
- Semiconductor-wafer positioning machinery and optical component alignment units, etc.
- Precision X-Y table positioning



- 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.



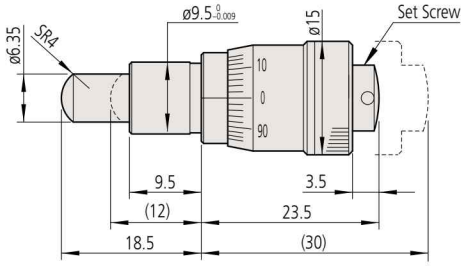
While the fine-pitch micrometer head has a measuring range of 6.5mm, the standard head has a larger range of 13mm.
When replacing a standard head, the fine-pitch type can use the common range in the middle of the spindle travel. The standard and compact types of fine-pitch head are otherwise completely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

DIMENSIONS

Unit: mm

Plain stem

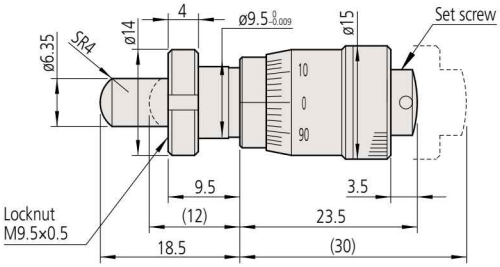
Plain stem Spherical face

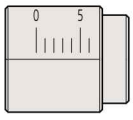


148-342 Mass: 29g

Stem locknut

Stem locknut Spherical face



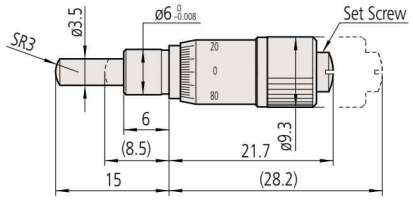


Sleeve marker

Fixture thickness: 6mm
148-343 Spherical face Mass: 31g

Plain stem

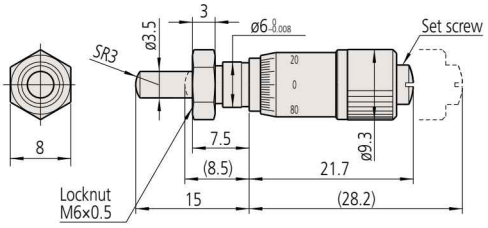
Plain stem Spherical face



148-242 Mass: 10g

Stem locknut

Stem locknut Spherical face

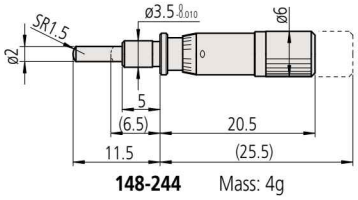


Sleeve marker

Fixture thickness: 4mm
148-243 Spherical face Mass: 10g

Plain stem

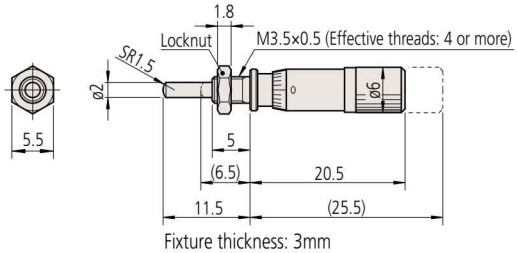
Plain stem Spherical face



148-244 Mass: 4g

Stem locknut

Stem locknut Spherical face



Sleeve marker

Fixture thickness: 3mm
148-245 Spherical face Mass: 5g

( ): With spindle fully retracted.

Micrometer Head

The origin of Mitutoyo's trustworthy brand of small tool instruments

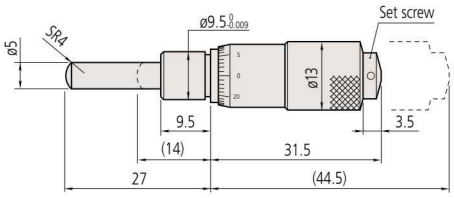
Micrometer Heads
SERIES 148 — Fine Spindle Feed of 0.25mm/rev

- Miniature micrometer heads for ease of incorporating into machines.

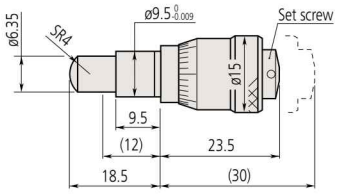
DIMENSIONS

Plain stem

Unit: mm

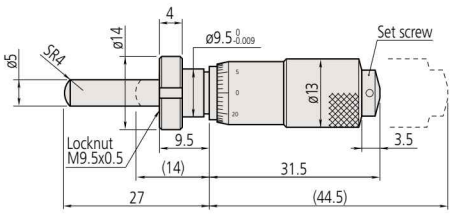


148-132 Mass: 30g

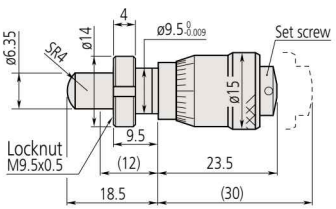


148-322 Mass: 30g

Stem locknut



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



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

( ): with spindle fully retracted

SPECIFICATIONS

Metric

Order No.	Range	Graduation	Accuracy	Stem dia.	Stem	Spindle end	Spindle pitch
148-132	0 - 13mm	0.01mm	±2µm	9.5mm	Plain	Spherical (SR4)	0.25mm
148-133					w/ clamp nut		
148-322	0 - 6.5mm				Plain		
148-323					w/ clamp nut		

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

• The differential movement of spindle threads and nuts allows ultra-fine feeding.

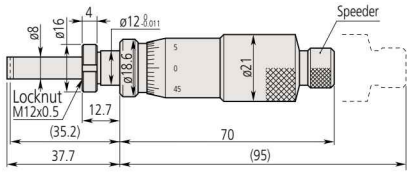
DIMENSIONS

Unit: mm

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

Equipped with vernier

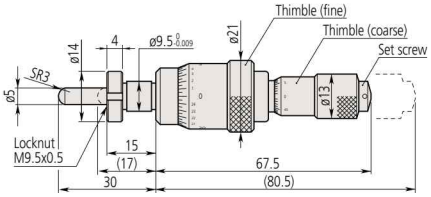
Stem locknut



Fixture thickness: 9.5mm
110-101, 110-102 Equipped with vernier Mass: 150g

Stem locknut

Spherical face

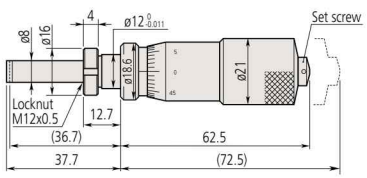


Fixture thickness: 11.5mm
110-502 Dual thimble Mass: 95g

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

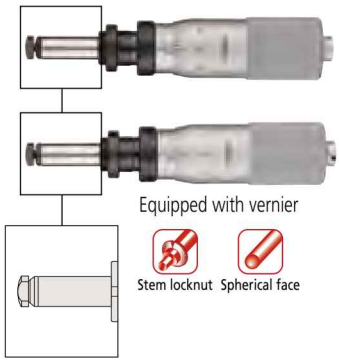
Equipped with vernier

Stem locknut



Fixture thickness: 9.5mm
110-105, 110-106 Equipped with vernier Mass: 150g

Spherical face



Equipped with vernier

Stem locknut

Spherical face

No.110-107
No.110-108 Equipped with vernier

( ): with spindle fully retracted

SPECIFICATIONS

Metric

Order No.	Range		Graduation		Accuracy**	Stem dia.	Stem	Spindle end	Graduation features
110-101	0 - 2.5mm		0.001mm		±5μm/±1.5μm	12mm	w/ clamp nut	Flat (carbide tip)	Standard
110-102			0.0001mm						Fine
110-105	0 - 1mm		0.001mm		±3μm/±1.5μm				Standard
110-106			0.0001mm						Fine
110-107			0.001mm					Spherical (SR10) (carbide tip)	Standard
110-108			0.0001mm						Fine
110-502	Thimble (fine)	0 - 0.2mm	Thimble (fine)	0.0005mm	±3μm/±1.5μm	9.5mm		Spherical (SR3)	Dual scales; 0.2mm fine-feed range
	Thimble (coarse)	0 - 13mm	Thimble (coarse)	0.01mm					

Inch

Order No.	Range		Graduation		Accuracy**	Stem dia.	Stem	Spindle end	Graduation features
110-111	0 - .05"		.00002"		±.00025"/±.00006"	.5"	w/ clamp nut	Flat (carbide tip)	Standard
110-112			.000005"						Fine
110-115*	0 - .02"		.00002"		±.00015"/±.00006"				Standard
110-116*			.000005"						Fine
110-117*			.00002"					Spherical (SR10) (carbide tip)	Standard
110-118*			.000005"						Fine
110-504	Thimble (fine)	0 - .006"	Thimble (fine)	.00002"	±.00015"/±.00006"	.375"		Spherical (SR3)	Dual scales; 0.2mm/.006" fine-feed range
	Thimble (coarse)	0 - .5"	Thimble (coarse)	.001"					

* made-to-order models
** Wide range / narrow range

Mitutoyo

Micrometer Head

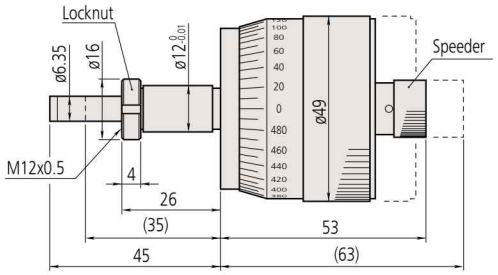
The origin of Mitutoyo's trustworthy brand of small tool instruments

Micrometer Heads
SERIES 152 — Large thimble type

- Large-diameter thimble for fine adjustment and positioning.

DIMENSIONS

Unit: mm



Fixture thickness: 22.5mm
152-283 Mass: 190g

( ): with spindle fully retracted

SPECIFICATIONS

Metric

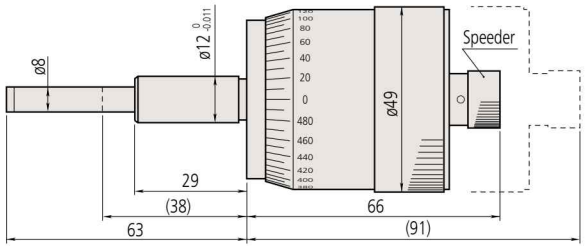
Order No.	Range	Graduation	Accuracy	Stem dia.	Stem	Spindle end	Spindle pitch	Graduation features
152-283	0 - 10mm	0.002mm	±2µm	12mm	w/ clamp nut	Flat (carbide tip)	0.5mm	Standard
152-332	0 - 25mm				Plain			
152-348								Bidirectional
152-380	0 - 50mm		±4µm					

Inch

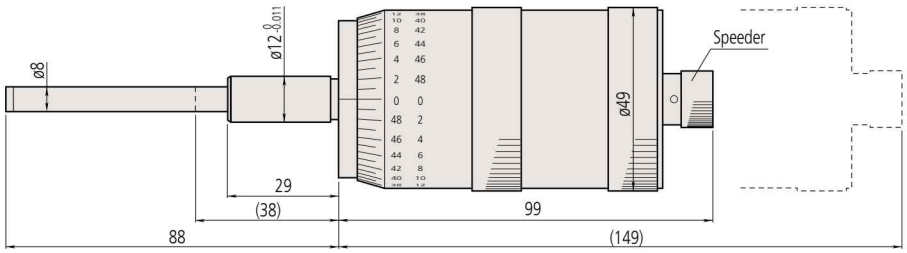
Order No.	Range	Graduation	Accuracy	Stem dia.	Stem	Spindle end	Spindle pitch	Graduation features
152-372	0 - 1"	.0001"	±.0001"	.5"	w/ clamp nut	Flat (carbide tip)	.025"	Bidirectional
152-388	0 - 2"							

DIMENSIONS

Unit: mm



152-332
152-348 Bidirectional Mass: 310g



152-380 Mass: 460g

( ): with spindle fully retracted

Mitutoyo

Micrometer Head

The origin of Mitutoyo's trustworthy brand of small tool instruments

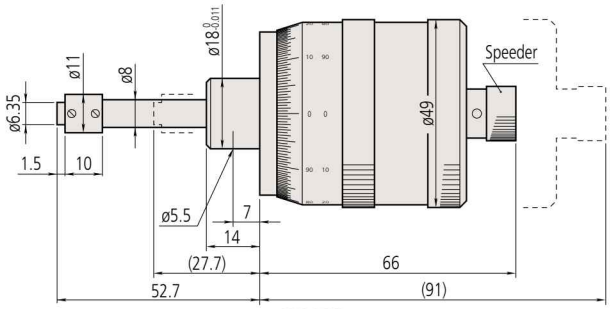
Micrometer Heads
SERIES 152 — XY-Stage type

- Micrometer heads especially designed for accurate cross-travel stage translation in X and Y.
- Spindle end: Flat form and hardened, or spherical with carbide tip (more than HRA90), lapped surface.

DIMENSIONS

Unit: mm

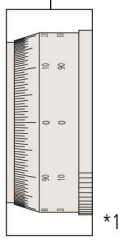
Plain stem



152-390 Mass: 270g

- The thimble can be rotated to a better reading position while maintaining the spindle position.

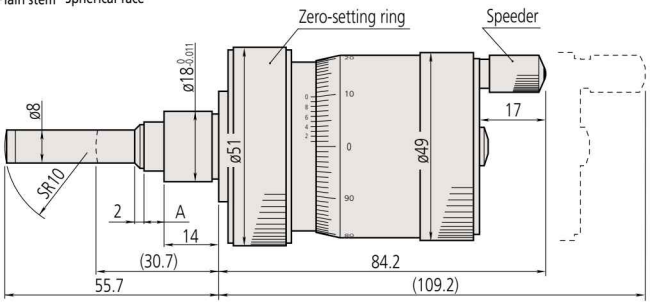
Plain stem



No.152-389

*1 Other dimensions are the same as **153-390**

Plain stem Spherical face

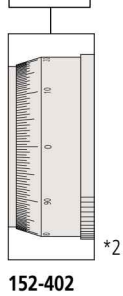


Length of A: 0 to 6 A = 6 in the drawing above.

152-402 Mass: 460g

- The zero-setting ring allows spindle movement without thimble position change for easy zero setting.

Plain stem Spherical face



152-402

*2 Other dimensions are the same as **152-402**

( ): With spindle fully retracted.

SPECIFICATIONS

Metric

Order No.	Range	Graduation	Accuracy	Stem dia.	Stem	Spindle pitch	Graduation features
152-390	0 - 25mm	0.005mm	±2µm	18mm	Plain	1mm	for X-axis, bidirectional
152-389							
152-402		0.001mm Vernier graduation					for X-axis, with Vernier
152-401							

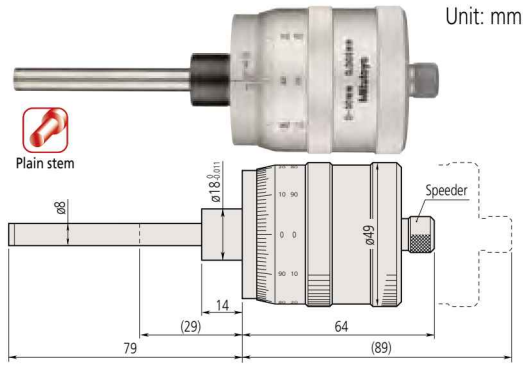
Inch

Order No.	Range	Graduation	Accuracy	Stem dia.	Stem	Spindle pitch	Graduation features
152-392	0 - 1"	.0001"	±.0001"	.709"	Plain	.025"	for X-axis, bidirectional
152-391							

Micrometer Heads
SERIES 197 — Long Stroke Non-rotating Spindle

DIMENSIONS

Unit: mm



197-101 Mass: 300g

( ): With spindle fully retracted.

- 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 1mm/rev (standard models: 0.5mm/rev).

SPECIFICATIONS

Metric

Order No.	Range	Graduation	Accuracy	Stem dia.	Stem	Spindle end	Spindle pitch	Graduation features
197-101	0 - 50mm	0.005mm	±5µm	18mm	Plain	Flat (carbide tip)	1mm	Bidirectional

Inch

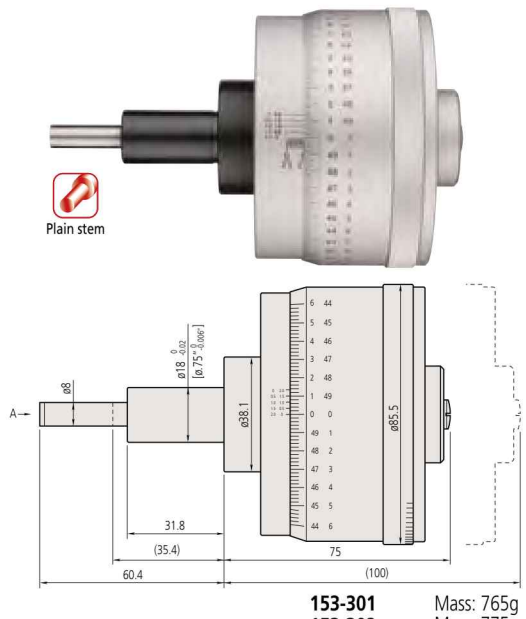
Order No.	Range	Graduation	Accuracy	Stem dia.	Stem	Spindle end	Spindle pitch	Graduation features
197-201	0 - 2"	.0002"	±.0001"	.709"	Plain	Flat (carbide tip)	.05"	Bidirectional

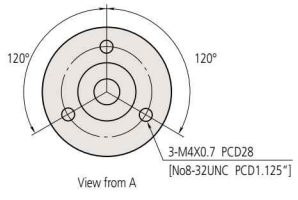
Micrometer Heads
SERIES 153 — High Accuracy and Resolution

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

DIMENSIONS

Unit: mm





153-301 Mass: 765g
153-302 Mass: 775g

[ ] : Order No.153-302
( ): With spindle fully retracted.

SPECIFICATIONS

Metric

Order No.	Range	Graduation	Accuracy*	Stem dia.	Stem	Spindle end	Spindle pitch	Graduation features
153-301	0 - 25mm	0.0005mm	±1/±0.5µm	18mm	Plain	Flat (carbide tip)	0.5mm	Bidirectional

Inch

Order No.	Range	Graduation	Accuracy*	Stem dia.	Stem	Spindle end	Spindle pitch	Graduation features
153-302	0 - 1"	.00001"	±.00005"/±.00003"	.75"	Plain	Flat (carbide tip)	.025"	Bidirectional

* Wide range / narrow range

Mitutoyo

Micrometer Head

The origin of Mitutoyo's trustworthy brand of small tool instruments

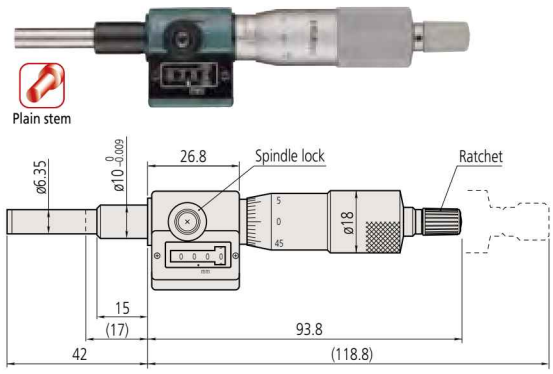
B

Micrometer Heads
SERIES 250 — Digit Counter type

- Digit counter for easy reading of spindle movement.
- Carbide measuring face.

DIMENSIONS

Unit: mm



250-301 Mass: 165g

( ): with spindle fully retracted

SPECIFICATIONS

Metric

Order No.	Range	Graduation	Accuracy	Stem dia.	Stem	Spindle end	Spindle pitch	Graduation features
250-301	0 - 25mm	0.01mm	±2µm	10mm	Plain	Flat (carbide tip)	0.5mm	—

Inch

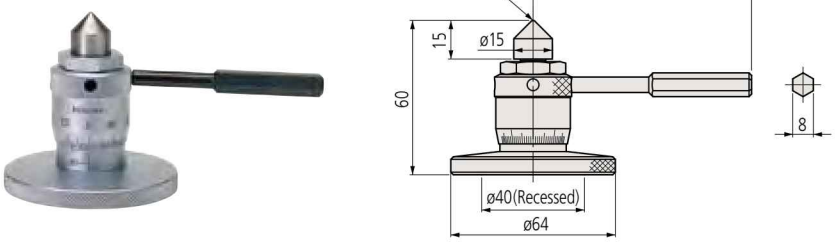
Order No.	Range	Graduation	Accuracy	Stem dia.	Stem	Spindle end	Spindle pitch	Graduation features
250-312	0 - 1"	.0001"	±.0001"	.375"	Plain	Flat (carbide tip)	.025"	Vernier scale

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.

DIMENSIONS

Unit: mm



SPECIFICATIONS

Metric

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

Micrometer Heads Mounting Fixtures

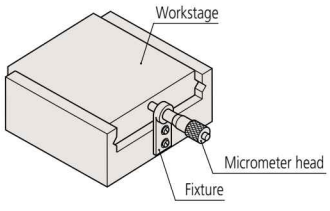
- Manufacturing brackets to mount micrometer heads for each particular application can be laborious and costly. Mitutoyo offers various types of fixtures for micrometer heads to meet a wide range of applications. These fixtures are made of nickel-plated cast iron.

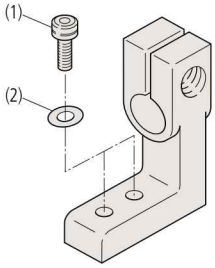
SPECIFICATIONS

Mounting hole size

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

* Supplied with a socket head screw (M3 x 0.5 x 12) for fixtures to be used with a micrometer head without stem locknut (plain stem type micrometer head).





SPECIFICATIONS

Recommended socket head screws for the fixtures

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

( ): with spindle fully retracted

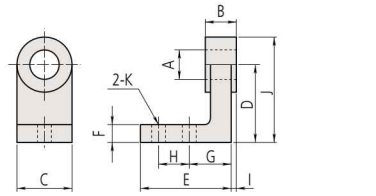
Mitutoyo

Micrometer Head

The origin of Mitutoyo's trustworthy brand of small tool instruments

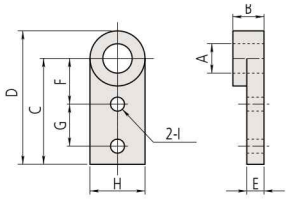
Micrometer Heads Mounting Fixtures

Fixtures for micrometer heads with stem locknut



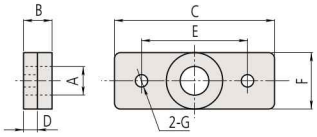
(Unit: mm)

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										



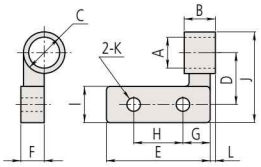
(Unit: mm)

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)

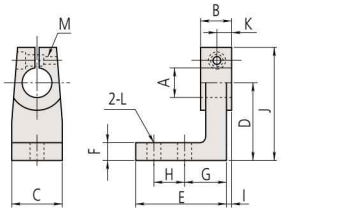
Order No.	A	B	C	D	E	F	G
303561	ø9.5	6	40	3.5	30	15	ø3.4
303570		11.5	60	5.5	40	20	ø4.5
303580	ø10						



(Unit: mm)

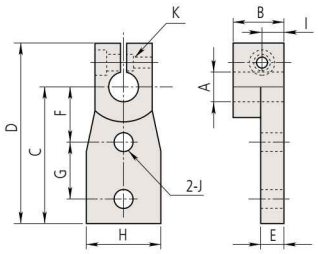
Order No.	A	B	C	D	E	F	G	H	I	J	K	L
303565	ø9.5	6	ø15	15	25	8.5	7.5	10	10	27.5	ø3.4	0.75
303574		11.5		20	40		10	20	15	35	ø4.5	1.25
303584	ø10											

Fixtures for plain stem type micrometer heads



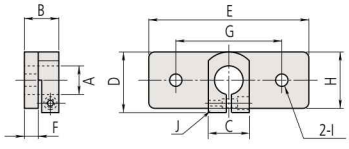
(Unit: mm)

Order No.	A	B	C	D	E	F	G	H	I	J	K	L	G
303560	ø9.5	9	15	20	23	5	11	8	1.5	3.25	4.5	ø3.4	M3×0.5
303569		14.5	20	30	35	7	16	12	3.25	4.25	7.25	ø4.5	
303579	ø10												



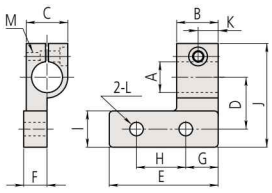
(Unit: mm)

Order No.	A	B	C	D	E	F	G	H	I	J	K
303564	ø9.5	9	30	4.25	4	15	10	15	4.5	ø3.4	M3×0.5
303573		14.5		5.25	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	15	20	40	3	30	15	ø3.4	M3×0.5
303571		14.5		22.5	60	5	40	20	ø4.5	
303581	ø10									

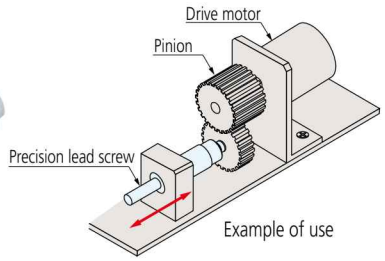


(Unit: mm)

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	M3×0.5
303575		14.5		20	40		10	20	15	40	7.25	ø4.5	
303585	ø10												

Precision Leadscrews

- Mitutoyo manufactures simple and less expensive precision leadscrews for precise positioning mechanisms and fine-feed mechanisms, in addition to standard micrometer heads.
- Mitutoyo also manufactures leadscrews with special specifications, such as 0.25mm pitch, as well as those with the standard 0.5mm feed pitch and with dimensions and forms that meet customer's requirements.
- Durability: 100-thousand operations are guaranteed (use condition: 4 kg load; 2 kg for **AS-6.5** and **BS-6.5**)
- Main applications:
  - · Precision feed stages
  - · Fine adjustment of optical elements (mirrors, prisms)
  - · Fiber optic centering devices
  - · Various assembly and adjustment jigs



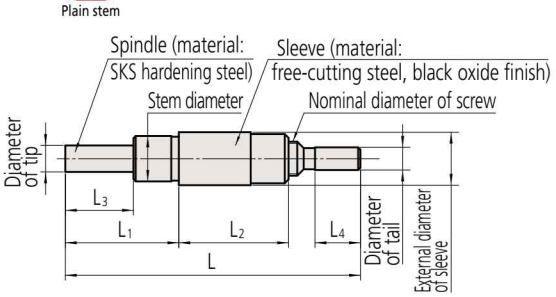
SPECIFICATIONS

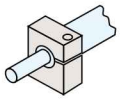
Order No.	Model	Stroke (mm)	Feed pitch (mm)	Feed accuracy (µm)	Stem diameter (mm)	Tip diameter (mm)	Tail diameter (mm)	Screw nominal diameter	Sleeve diameter (mm)	Measuring face	Mass	Others
04AZA160	AS-6.5	6.5	0.5	±5	ø6 $^{0}_{-0.008}$	ø3.5	ø3 $^{0}_{-0.01}$	M4.5 x 0.5	ø7	Hardened	10g	• AS type: Flat spindle tip without nut • BS type: Spherical spindle tip with nut
04AZA161	BS-6.5										11g	
04AZA162	AS-13	13		±2	ø9.5 $^{0}_{-0.009}$	ø5	ø5 $^{0}_{-0.012}$	M7.35 x 0.5	ø10.5		27g	
04AZA163	BS-13										30g	
04AZA164	AS-25	25			ø10 $^{0}_{-0.009}$	ø6.35	ø6 $^{0}_{-0.015}$		ø12	Carbide	61g	
04AZA165	BS-25										64g	

DIMENSIONS

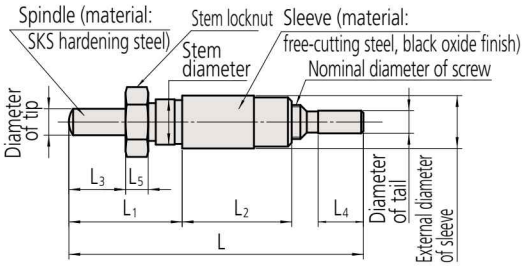
Type AS: Plain stem

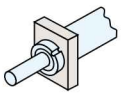
Unit: mm





Type BS: Stem with locknut





Order No.	L	L1	L2	L3	L4	L5
04AZA160	39	15	14.5	9	6	—
04AZA161				7.5		3
04AZA162	57.5	25	21.5	15.5	8	—
04AZA163						4
04AZA164	96.5	42	39.5	27	10	—
04AZA165						4

Mitutoyo

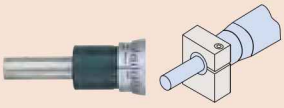
Micrometer Heads

Key Factors in Selection

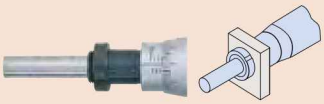
Key factors in selecting a micrometer head are the measuring range, spindle face, stem, graduations, thimble diameter, etc.

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 requires 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 both on the spindle and the face it contacts provides durability.

Figure A

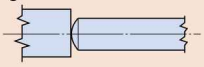


Figure B

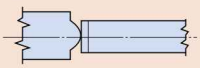
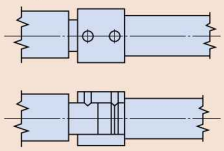


Figure C



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 0.5mm pitch.
- 1mm-pitch type: quicker to set than standard type and avoids the possibility of a 0.5mm reading error. Excellent load-bearing characteristics due to larger screw thread.
- 0.25mm or 0.1mm-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)

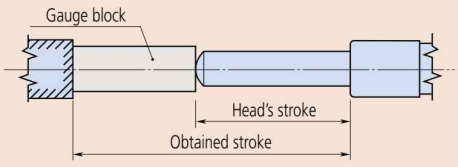
Spindle Lock

- 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 (Stroke)

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

Figure D



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

Ultra-fine Feed Applications

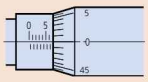
- Dedicated micrometer heads are available for manipulator applications, etc., which require ultra-fine feed or adjustment of spindle.

Thimble Diameter

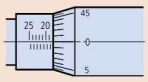
- The diameter of a thimble greatly affects its usability and the "fineness" of positioning. A small-diameter thimble allows quick positioning whereas a large-diameter thimble allows fine positioning and easy reading of the graduations. Some models combine the advantages of both features by mounting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

Graduation Styles

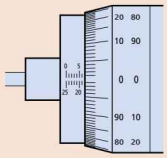
- Care is needed when taking a reading from a mechanical micrometer head, especially if the user is unfamiliar with the model.
- The "normal graduation" style, identical to that of an outside micrometer, is the standard. For this style the reading increases as the spindle retracts into the body.
- On 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.



Normal graduation style



Reverse graduation style

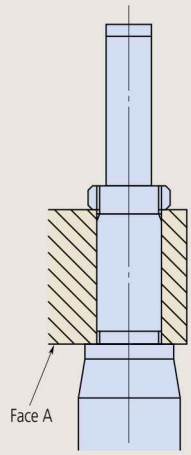
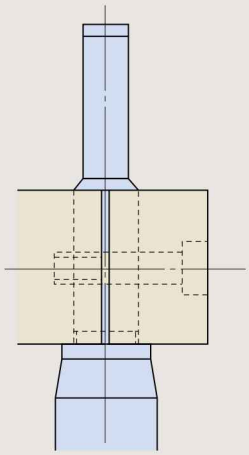
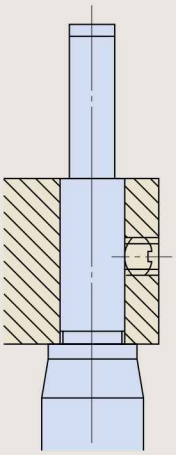


Bidirectional graduation style

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 / Points to keep in mind	(1) Clamp nut				(2) Split-body clamp				(3) Setscrew clamp			
	 Face A											
Stem diameter	ø9.5	ø10	ø12	ø18	ø9.5	ø10	ø12	ø18	ø9.5	ø10	ø12	ø18
Mounting hole 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. Use a brass plug under setscrew (if thickness of fixture allows) to avoid damaging stem.			

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.

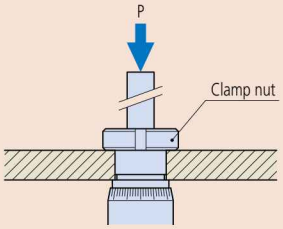
1. Recommended maximum loading limit

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

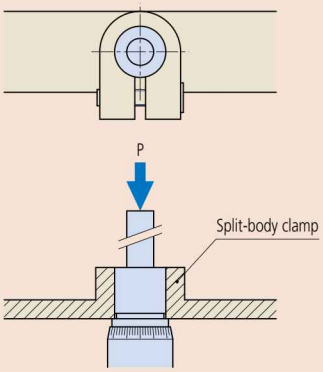
* Up to approx. 19.6N (2kgf) only for Ultra small models

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

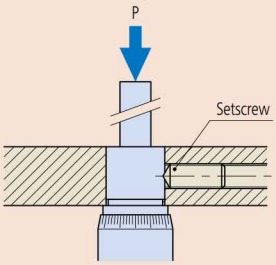
(1) Clamp nut



(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 9.8kN (880 to 1000kgf).
(2) Split-body clamp	The main unit will be pushed out of the fixture at 0.69 to 0.98kN (70 to 100kgf).
(3) Setscrew clamp	Damage to the setscrew will occur at 0.69 to 1.08kN (70 to 110kgf).

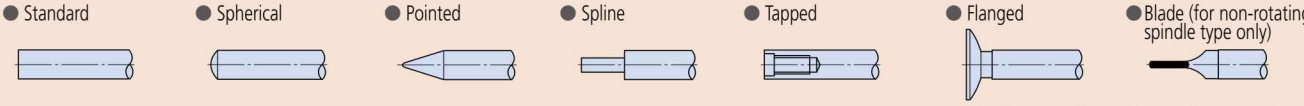
* These load values should only be used as an approximate guide.

Custom-built Products (Product Example Introductions)

Micrometer heads have applications in many fields of science and industry and Mitutoyo offers a wide range of standard models to meet customers' needs. However, in those cases where the standard product is not suitable, Mitutoyo can custom build a head incorporating features better suited to your special application. Please feel free to contact Mitutoyo about the possibilities - even if only one custom-manufactured piece is required.

1. Spindle-end types

● Standard ● Spherical ● Pointed ● Spline ● Tapped ● Flanged ● Blade (for non-rotating spindle type only)

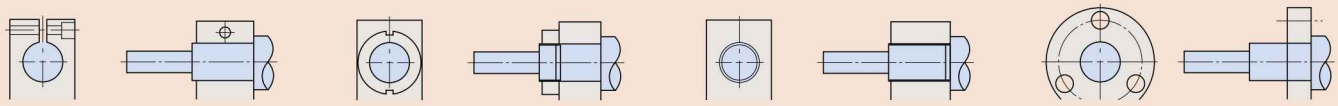


● Long spindle type is also available. Please consult Mitutoyo.

2. Stem types

A custom stem can be manufactured to suit the mounting fixture.

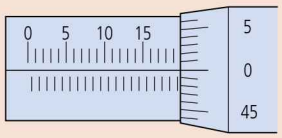
● Plain ● Clamp nut ● Threaded ● Flanged



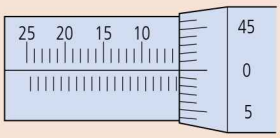
3. Scale graduation schemes

Various barrel and thimble scale graduation schemes, such as reverse and vertical, are available. Please consult Mitutoyo for ordering a custom scheme not shown here.

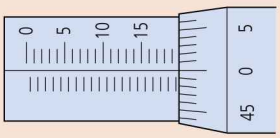
● Standard



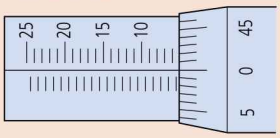
● Reverse



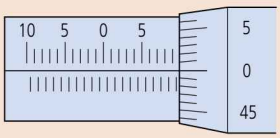
● Vertical



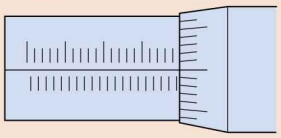
● Reverse vertical



● Offset zero



● Graduations only

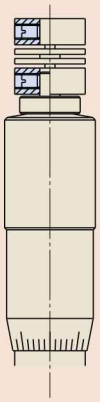


4. Logo engraving

A specific logo can be engraved as required.

5. Motor Coupling

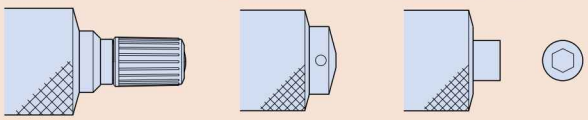
Couplings for providing motor drive to a head can be designed.



6. Thimble mounting

Thimble mounting methods including a ratchet, setscrew, and hex-socket head screw types are available.

● Ratchet ● Setscrew ● Hex-socket head screw



7. Spindle-thread pitch

Pitches of 1mm for fast-feed applications or 0.25mm for fine-feed can be supplied as alternatives to the standard 0.5mm. Inch pitches are also supported. Please consult Mitutoyo for details.

8. Lubricant for spindle threads

Lubrication arrangements can be specified by the customer.

9. All-stainless construction

All components of a head can be manufactured in stainless steel.

10. Simple packaging

Large-quantity orders of micrometer heads can be delivered in simple packaging for OEM purposes.

11. Spindle and nut (Precision lead screw)

The spindle can be used as a precision lead screw. The nut is machined in accordance with the specified dimensions.
For details, refer to "Precision Lead Screws" on page B-112.

12. Accuracy inspection certificate

An accuracy inspection certificate can be supplied at extra cost. For detailed information, contact the nearest Mitutoyo Sales Office.

Mitutoyo

New Products

Digimatic Holtest

Refer to pages C-3–C-6 for details.

Holtest

Refer to pages C-7–C-12 for details.

ABSOLUTE Borematic

Refer to pages C-13–C-16 for details.

Inside Micrometers (Caliper Type)

Refer to pages C-23–C-24 for details.

Bore Gages

Refer to pages C-33–C-36 for details.

Bore Gages for Blind Holes

Refer to pages C-41 - C-42 for details.

Holtest ABSOLUTE Boremati

Holtest·ABSOLUTE Boremati

Inside Micrometers

Inside Micrometers

Bore Gages

Bore Gages

INDEX

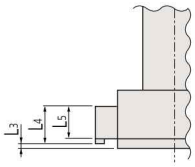
Holtest

For easy and accurate measurement of inside diameters

Digimatic Holtest
SERIES 468 — Three-point Internal Micrometers

- Three-point internal micrometer with large LCD readout. (Character height 7.4mm)
- Titanium-coated measuring pins provide excellent durability and impact resistance and allow the instrument to measure right to the bottom of a blind hole.
- One SR44 battery is required and battery life is approx. 1.2 years under normal use.
- ABSolute and INCremental measurement modes allow highly efficient operation.
- The IP65 protection rating allows the instrument to be used in the presence of splashing coolant.
- Measurements can be made close to the bottom of a blind hole.
- Deep holes can be measured by attaching an extension rod (optional).
- A function lock prevents accidental change of reference point.
- Measurement data output enables operation with Statistical Process Control (SPC) and measurement control systems. Refer to page A-3.
- An interface input tool is available for transferring measurement data, under keyboard control, directly to commercial spreadsheet software. Refer to page A-5.
- Interchangeable-Head Sets (interchangeable measuring heads type) covering an extended measuring range using multiple heads and Non-interchangeable-Head Sets are available.
- For Setting Rings, refer to page C-47.

Range (mm)	L_3 (mm)	L_4 (mm)	L_5 (mm)
6 - 12	2 or below	—	2.5
12 - 20	0.3 or below	5.6	3.5
20 - 30		8.3	5.2
30 - 50		13.0	10.0
50 - 100		17.0	14.0
100 - 300	12.4 or below	21.0	13.8



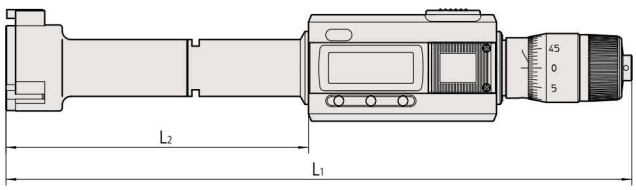
468-161

468-168

468-174

DIMENSIONS

Unit: mm



Range	L_2	L_1
6-8, 8-10, 10-12mm	59	175 - 177
12-16, 16-20mm	84	197.5 - 201.5
20-25, 25-30mm	93	206.9 - 211.9
30-40, 40-50mm	103.8	214.7 - 224.7
50-63, 62-75, 75-88, 87-100mm	105.4	219.6 - 232.6
100-125, 125-150, 150-175, 175-200, 200-225, 225-250, 250-275, 275-300mm	151.4	286.3 - 311.3

1) L_2 is maximum depth of measurement possible.
2) External view differs depending on measurement range.

These marks indicate that a product has successfully passed IP65-level testing, which is carried out by the independent German certification organization TÜV Rheinland.

(Refer to page X for details.)

An inspection certificate is supplied as standard. Refer to page X for details.

IP Codes

Level 6: Dust-proof.
Degree of protection against solid foreign objects.
No ingress of dust allowed.

Level 5: Protected against water jets.
Degree of protection against water.
Water projected in jets against the enclosure from any direction shall have no harmful effects.

Technical Data

Display: LCD
Battery: SR44 (1 pc), **938882**,
for initial operational checks (standard accessory)
Battery life: Approx. 1.2 years under normal use
Scale type: Electromagnetic induction-type rotary encoder

Functions

Zero-setting
Origin restoration
Data hold
2-point Preset
Function lock (see illustration of lock symbol below)

inch/mm readout (inch/mm models)
Automatic power ON/OFF
Error alarm
Data output

Optional accessories

Refer to page A-21 for details.
- USB Input Tool Direct (2m): **06ADV380B**
- Connecting cables for **U-WAVE-T**
  For standard (160mm): **02AZD790B**
  For foot switch: **02AZE140B**

Optional accessories

Mounting bracket
No.04AZB157

For details of Special-order Products, refer to page C-49.

SPECIFICATIONS

Metric

Order No.	Range	Resolution	Accuracy*1	Optional Accessories*2	
				Extension rod	SPC cable
468-161	6 - 8mm	0.001mm	±2µm (within 2µm)	**952322** (100mm)	**05CZA662** (1m) **05CZA663** (2m)
468-162	8 - 10mm				
468-163	10 - 12mm				
468-164	12 - 16mm			**952621** (150mm)	
468-165	16 - 20mm				
468-166	20 - 25mm		±3µm (within 3µm)	**952622** (150mm)	
468-167	25 - 30mm				
468-168	30 - 40mm				
468-169	40 - 50mm				
468-170	50 - 63mm			**952623** (150mm)	
468-171	62 - 75mm				
468-172	75 - 88mm				
468-173	87 - 100mm				
468-174	100 - 125mm		±5µm (within 5µm)		
468-175	125 - 150mm				
468-176	150 - 175mm				
468-177	175 - 200mm				
468-178	200 - 225mm				
468-179	225 - 250mm				
468-180	250 - 275mm				
468-181	275 - 300mm				

*1 Excluding quantizing error.
Accuracy: values measured with the entire measuring face.
Maximum difference: differences between the maximum and minimum values.
*2 Setting ring and extension rod: optional.
* It is not advisable to use measuring heads other than as supplied as a standard accessory, or widen a measuring range by using any other multiple sub-measuring heads. (The measuring accuracy in such cases is not guaranteed.)

Inch/Metric

Order No.	Range	Resolution	Accuracy*1	Optional Accessories*2	
				Extension rod	SPC cable
468-261	.275" - .35"	.00005"/ 0.001mm	±.0001" (within .0001")	**952322** (100mm)	**05CZA662** (1m) **05CZA663** (2m)
468-262	.35" - .425"				
468-263	.425" - .5"				
468-264	.5" - .65"			**952621** (150mm)	
468-265	.65" - .8"				
468-266	.8" - 1"		±.00015" (within .00015")	**952622** (150mm)	
468-267	1" - 1.2"				
468-268	1.2" - 1.6"				
468-269	1.6" - 2"				
468-270	2" - 2.5"			**952623** (150mm)	
468-271	2.5" - 3"				
468-272	3" - 3.5"				
468-273	3.5" - 4"				
468-274	4" - 5"	.0001"/ 0.001mm	±.00025" (within .00025")		
468-275	5" - 6"				
468-276	6" - 7"				
468-277	7" - 8"				
468-278	8" - 9"				
468-279	9" - 10"				
468-280	10" - 11"				
468-281	11" - 12"				

*1 Excluding quantizing error.
Accuracy: values measured across the entire measuring face.
Maximum difference: differences between the maximum and minimum values.
*2 Setting ring and extension rod: optional.
* It is not advisable to use measuring heads other than as supplied as a standard accessory, or widen a measuring range by using any other multiple sub-measuring heads. (The measuring accuracy in such cases is not guaranteed.)

Interchangeable-Head Sets (interchangeable measuring heads type)
* For details, refer to page C-5.

Non-interchangeable-Head Sets
** For details, refer to page C-6.

C

Mitutoyo

Holtest

For easy and accurate measurement of inside diameters

Interchangeable-Head Sets

Metric

Set Order No.	Range*	Content of set	Accessories (optional)
468-971	6 - 12mm	Display unit 6 - 12mm 1 pc Measuring head 6 - 8mm 1 pc 8 - 10mm 1 pc 10 - 12mm 1 pc Setting ring (ø8, ø10) 1 pc each Extension rod (100mm) 1 pc Spanner 2 pcs Hex wrench 1 pc Phillips screw driver 1 pc	SPC cable with data switch **05CZA662** (1m) **05CZA663** (2m)
468-972	12 - 20mm	Display unit 12 - 20mm 1 pc Measuring head 12 - 16mm 1 pc 16 - 20mm 1 pc Setting ring (ø16) 1 pc Extension rod (150mm) 1 pc Spanner 2 pcs Hex wrench 1 pc Phillips screw driver 1 pc	
468-973	20 - 50mm	Display unit 20 - 50mm 1 pc Measuring head 20 - 25mm 1 pc 25 - 30mm 1 pc 30 - 40mm 1 pc 40 - 50mm 1 pc Setting ring (ø25, ø40) 1 pc each Extension rod (150mm) 1 pc Spanner 2 pcs Hex wrench 1 pc Phillips screw driver 1 pc	
468-974	50 - 100mm	Display unit 50 - 100mm 1 pc Measuring head 50 - 63mm 1 pc 62 - 75mm 1 pc 75 - 88mm 1 pc 87 - 100mm 1 pc Setting ring (ø62, ø87) 1 pc each Extension rod (150mm) 1 pc Spanner 2 pcs Hex wrench 1 pc Phillips screw driver 1 pc	
468-975	100 - 200mm	Display unit 100 - 200mm 1 pc Measuring head 100 - 125mm 1 pc 125 - 150mm 1 pc 150 - 175mm 1 pc 175 - 200mm 1 pc Setting ring (ø125, ø175) 1 pc each Extension rod (150mm) 1 pc Spanner 2 pcs Hex wrench 1 pc Phillips screw driver 1 pc	

Inch/Metric

Set Order No.	Range*	Content of set	Accessories (optional)
468-976	.275-.5"	Display unit .275-.5" 1 pc Measuring head .275-.35" 1 pc .35-.425" 1 pc .425-.5" 1 pc Setting ring 1 pc each (.35"DIA., .425"DIA.) Extension rod (100mm) 1 pc Spanner 2 pcs Hex wrench 1 pc Phillips screw driver 1 pc	SPC cable with data switch **05CZA662** (1m) **05CZA663** (2m)
468-977	.5-.8"	Display unit .5-.8" 1 pc Measuring head .5-.65" 1 pc .65-.8" 1 pc Setting ring (.65"DIA.) 1 pc Extension rod (150mm) 1 pc Spanner 2 pcs Hex wrench 1 pc Phillips screw driver 1 pc	
468-978	.8-2"	Display unit .8-2" 1 pc Measuring head .8-1" 1 pc 1-1.2" 1 pc 1.2-1.6" 1 pc 1.6-2" 1 pc Setting ring 1 pc each (1"DIA., 1.6"DIA.) Extension rod (150mm) 1 pc Spanner 2 pcs Hex wrench 1 pc Phillips screw driver 1 pc	
468-979	2-4"	Display unit 2-4" 1 pc Measuring head 2-2.5" 1 pc 2.5-3" 1 pc 3-3.5" 1 pc 3.5-4" 1 pc Setting ring 1 pc each (2.5"DIA., 3.5"DIA.) Extension rod (150mm) 1 pc Spanner 2 pcs Hex wrench 1 pc Phillips screw driver 1 pc	
468-980	4-8"	Display unit 4-8" 1 pc Measuring head 4-5" 1 pc 5-6" 1 pc 6-7" 1 pc 7-8" 1 pc Setting ring (5"DIA., 7"DIA.) 1 pc each Extension rod (150mm) 1 pc Spanner 2 pcs Hex wrench 1 pc Phillips screw driver 1 pc	

* It is not advisable to use measuring heads other than as supplied as a standard accessory, or widen a measuring range by using any other multiple sub-measuring heads. (The measuring accuracy in such cases is not guaranteed.)

468-971

468-972

468-973

468-974

Standard accessory
(packed separately)
Setting Rings (ø125, ø175)
468-975

Optional accessories

Refer to page A-21 for details.
USB Input Tool Direct (2m): **06ADV380B**
Connecting cables for **U-WAVE-T**
For standard (160mm): **02AZD790B**
For foot switch: **02AZE140B**

Non-Interchangeable-Head Sets

Metric

Set Order No.	Range*2	Content of set	Accessories (optional)	
			Extension rod	SPC cable
468-981	6 - 12mm	Display unit 6 - 8mm 1 pc 8 - 10mm 1 pc 10 - 12mm 1 pc Setting ring (ø8, ø10) 1 pc each Spanner 2 pcs Hex wrench 1 pc Phillips screw driver 1 pc	100mm 1 pc	SPC cable with data switch **05CZA662** (1m) **05CZA663** (2m)
468-982	12 - 25mm	Display unit 12 - 16mm 1 pc 16 - 20mm 1 pc 20 - 25mm 1 pc Setting ring (ø16, ø20) 1 pc each Spanner 2 pcs Hex wrench 1 pc Phillips screw driver 1 pc	150mm 2 pcs*1	
468-983	25 - 50mm	Display unit 25 - 30mm 1 pc 30 - 40mm 1 pc 40 - 50mm 1 pc Setting ring (ø30, ø40) 1 pc each Spanner 1 pc Hex wrench 1 pc Phillips screw driver 1 pc	150mm 1 pc	
468-984	50 - 75mm	Display unit 50 - 63mm 1 pc 62 - 75mm 1 pc Setting ring (ø62) 1 pc Spanner 1 pc Hex wrench 1 pc Phillips screw driver 1 pc	150mm 1 pc	
468-985	75 - 100mm	Display unit 75 - 88mm 1 pc 87 - 100mm 1 pc Setting ring (ø87) 1 pc Spanner 1 pc Hex wrench 1 pc Phillips screw driver 1 pc	150mm 1 pc	

Inch/Metric

Set Order No.	Range*2	Content of set	Accessories (optional)	
			Extension rod	SPC cable
468-986	.275"-.5"	Display unit .275-.35" 1 pc .35-.425" 1 pc .425-.5" 1 pc Setting ring (.35"DIA., .425"DIA) 1 pc each Spanner 2 pcs Hex wrench 1 pc Phillips screw driver 1 pc	100mm 1 pc	SPC cable with data switch **05CZA662** (1m) **05CZA663** (2m)
468-987	.5"-1"	Display unit .5-.65" 1 pc .65-.8" 1 pc .8-1" 1 pc Setting ring (.65"DIA., .8"DIA) 1 pc each Spanner 2 pcs Hex wrench 1 pc Phillips screw driver 1 pc	150mm 2 pcs*1	
468-988	1"-2"	Display unit 1-1.2" 1 pc 1.2-1.6" 1 pc 1.6-2" 1 pc Setting ring (1.2"DIA., 1.6"DIA) 1 pc each Spanner 1 pc Hex wrench 1 pc Phillips screw driver 1 pc	150mm 1 pc	
468-989	2"-3"	Display unit 2-2.5" 1 pc 2.5-3" 1 pc Setting ring (2.5" DIA) 1 pc Spanner 1 pc Hex wrench 1 pc Phillips screw driver 1 pc	150mm 1 pc	
468-990	3"-4"	Display unit 3-3.5" 1 pc 3.5-4" 1 pc Setting ring (3.5" DIA) 1 pc Spanner 1 pc Hex wrench 1 pc Phillips screw driver 1 pc	150mm 1 pc	

*1 Total 2 pcs of extension rods: 1 pcs of Part **No. 952621** (for measuring range 12 to 16mm, 16 to 20mm) and Part **No. 952622** (for measuring range 20 to 25mm). Two extension rods cannot be connected due to the different mounting positions.

*2 It is not advisable to use measuring heads other than as supplied as a standard accessory, or widen a measuring range by using any other multiple sub-measuring heads. (The measurement accuracy in such cases is not guaranteed.)

468-981

468-982

468-983

468-984

468-985

Optional accessories

Refer to page A-21 for details.
USB Input Tool Direct (2m): **06ADV380B**
Connecting cables for **U-WAVE-T**
For standard (160mm): **02AZD790B**
For foot switch: **02AZE140B**

Holtest

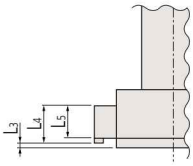
For easy and accurate measurement of inside diameters

An inspection certificate is supplied as standard.
Refer to page X for details.

Holtest
SERIES 368 — Three-point/Two-point Internal Micrometers

- Titanium-coated measuring pins on the three-point type (over 6mm range models) provide excellent durability and impact resistance and allow the instrument to measure right to the bottom of a blind hole.
- Three-point bore micrometer with measuring range 6mm or longer allows stable measurement through automatic centering.
- Can measure deep holes using an Extension rod (optional) which is available on models over 6mm (.275") measuring range.
- Ratchet Stop ensures constant-force, repeatable measurement.
- Setting Rings for accurately setting the instrument are optional. Refer to page C-47 for details.

Range (mm)	L3 (mm)	L4 (mm)	L5 (mm)
2 - 6	—	—	2
6 - 12	2 or below	—	2.5
12 - 20	0.3 or below	5.6	3.5
20 - 30		8.3	5.2
30 - 50		13.0	10.0
50 - 100		17.0	14.0
100 - 300	12.4 or below	21.0	13.8



368-001
(Two-point contact model)

368-168

368-170

368-174

Application using an extension rod

For details of Special-order Products, refer to page C-49.

SPECIFICATIONS

Metric

Order No.	Range	Graduation	Accuracy*1	Extension Rod (optional)
(Two-point)				
368-001	2 - 2.5mm			—
368-002	2.5 - 3mm			
368-003	3 - 4mm			
368-004	4 - 5mm			
368-005	5 - 6mm	0.001mm	±2µm (within 2µm)	
(Three-point)				
368-161	6 - 8mm			**952322** (100mm)
368-162	8 - 10mm			
368-163	10 - 12mm			
368-164	12 - 16mm			**952621** (150mm)
368-165	16 - 20mm			
368-166	20 - 25mm			
368-167	25 - 30mm			**952622** (150mm)
368-168	30 - 40mm			
368-169	40 - 50mm		±3µm (within 3µm)	
368-170	50 - 63mm			
368-171	62 - 75mm			
368-172	75 - 88mm			
368-173	87 - 100mm	0.005mm		
368-174	100 - 125mm			**952623** (150mm)
368-175	125 - 150mm			
368-176	150 - 175mm			
368-177	175 - 200mm			
368-178	200 - 225mm		±5µm (within 5µm)	
368-179	225 - 250mm			
368-180	250 - 275mm			
368-181	275 - 300mm			

Inch

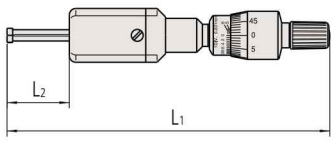
Order No.	Range	Graduation	Accuracy*1	Extension Rod (optional)
(Two-point)				
368-021	.08" - .1"			—
368-022	.1" - .12"			
368-023	.12" - .16"			
368-024	.16" - .2"			
368-025	.2" - .24"	.0001"		
368-026	.24" - .28"		±.0001" (within .0001")	
(Three-point)				
368-261	.275" - .35"			**952322** (100mm)
368-262	.35" - .425"			
368-263	.425" - .5"			
368-264	.5" - .65"			**952621** (150mm)
368-265	.65" - .8"			
368-266	.8" - 1"			
368-267	1" - 1.2"			**952622** (150mm)
368-268	1.2" - 1.6"			
368-269	1.6" - 2"		±.00015" (within .00015")	
368-270	2" - 2.5"			
368-271	2.5" - 3"			
368-272	3" - 3.5"			
368-273	3.5" - 4"	.0002"		
368-274	4" - 5"			**952623** (150mm)
368-275	5" - 6"			
368-276	6" - 7"			
368-277	7" - 8"			
368-278	8" - 9"		±.00025" (within .00025")	
368-279	9" - 10"			
368-280	10" - 11"			
368-281	11" - 12"			

*1 Excluding quantizing error.
Accuracy: values measured across the entire measuring face.
Maximum difference: differences between the maximum and minimum values.

* Setting ring and extension rod: optional.
* It is not advisable to use measuring heads other than as supplied as a standard accessory, or widen a measuring range by using any other multiple sub-measuring heads. (The measuring accuracy in such cases is not guaranteed.)

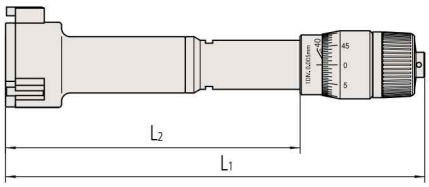
DIMENSIONS

Unit: mm



Range	L2	L1
2 - 2.5, 2.5 - 3mm	12	103.5 - 104
3 - 4, 4 - 5, 5 - 6mm	22	113 - 114

External appearance differs depending on the measuring range.



Range	L2	L1
6 - 8, 8 - 10, 10 - 12mm	59	102 - 104
12 - 16, 16 - 20mm	82	126 - 130
20 - 25, 25 - 30mm	94	137 - 142
30 - 40, 40 - 50mm	102	145 - 155
50 - 63, 62 - 75, 75 - 88, 87 - 100mm	105	150 - 163
100 - 125, 125 - 150, 150 - 175, 175 - 200, 200 - 225, 225 - 250, 250 - 275, 275 - 300mm	161	227 - 252

External appearance differs depending on the measuring range.

C

Holtest

For easy and accurate measurement of inside diameters

An inspection certificate is supplied as standard.
Refer to page X for details.

Holtest
SERIES 368 — Three-point/Two-point Internal Micrometers

Non-Interchangeable-Head Sets

Metric

Set Order No.	Range*	Graduation	Content of Set
(Two-point) **368-906**	2 - 3mm	0.001mm	Micrometer head unit 2 - 2.5mm 1 pc 2.5 - 3mm 1 pc Setting ring (ø2.5) 1 pc Hex wrench 1 pc
368-907	3 - 6mm		Micrometer head unit 3 - 4mm 1 pc 4 - 5mm 1 pc 5 - 6mm 1 pc Setting ring (ø4, ø5) 1pc each Hex wrench 1 pc
(Three-point) **368-911**	6 - 12mm		Micrometer head unit 6 - 8mm 1 pc 8 - 10mm 1 pc 10 - 12mm 1 pc Setting ring (ø8, ø10) 1pc each Extension rod (100mm) 1 pc Spanner 2 pcs Hex wrench 1 pc
368-912	12 - 20mm	0.005mm	Micrometer head unit 12 - 16mm 1 pc 16 - 20mm 1 pc Setting ring (ø16) 1 pc Extension rod (150mm) 1 pc Spanner 2 pcs Hex wrench 1 pc
368-913	20 - 50mm		Micrometer head unit 20 - 25mm 1 pc 25 - 30mm 1 pc 30 - 40mm 1 pc 40 - 50mm 1 pc Setting ring (ø25, ø40) 1pc each Extension rod (150mm) 1 pc Spanner 2 pcs Hex wrench 1 pc
368-914	50 - 100mm		Micrometer head unit 50 - 63mm 1 pc 62 - 75mm 1 pc 75 - 88mm 1 pc 87 - 100mm 1 pc Setting ring (ø62, ø87) 1pc each Extension rod (150mm) 1 pc Spanner 2 pcs Hex wrench 1 pc
368-915	100 - 200mm		Micrometer head unit 100 - 125mm 1 pc 125 - 150mm 1 pc 150 - 175mm 1 pc 175 - 200mm 1 pc Setting ring (ø125, ø175) 1pc each Extension rod (150mm) 1 pc Spanner 2 pcs Hex wrench 1 pc

Inch

Set Order No.	Range*	Graduation	Content of Set
(Two-point) **368-926**	.08" - .12"	.0001"	Micrometer head unit .08-1" 1 pc .1-.12" 1 pc Setting ring (.1" DIA) 1 pc Hex wrench 1 pc
368-927	.12" - .28"		Micrometer head unit .12-.16" 1 pc .16-.2" 1 pc .2-.24" 1 pc .24-.28" 1 pc Setting ring 1pc each (.16" DIA., .24" DIA) Hex wrench 1 pc
(Three-point) **368-916**	.275" - .5"		Micrometer head unit .275-.35" 1 pc .35-.425" 1 pc .425-.5" 1 pc Setting ring 1pc each (.35" DIA., .5" DIA) Extension rod (100mm) 1 pc Spanner 2 pcs Hex wrench 1 pc
368-917	.5" - .8"	.0002"	Micrometer head unit .5-.65" 1 pc .65-.8" 1 pc Setting ring (.65" DIA) 1 pc Extension rod (150mm) 1 pc Spanner 2 pcs Hex wrench 1 pc
368-918	.8" - 2"		Micrometer head unit .8-1" 1 pc 1-1.2" 1 pc 1.2-1.6" 1 pc 1.6-2" 1 pc Setting ring 1pc each (1" DIA., 1.6" DIA) Extension rod (150mm) 1 pc Spanner 2 pcs Hex wrench 1 pc
368-919	2" - 4"		Micrometer head unit 2-2.5" 1 pc 2.5-3" 1 pc 3-3.5" 1 pc 3.5-4" 1 pc Setting ring 1pc each (2.5" DIA., 3.5" DIA) Extension rod (150mm) 1 pc Spanner 2 pcs Hex wrench 1 pc
368-920	4" - 8"		Micrometer head unit 4-5" 1 pc 5-6" 1 pc 6-7" 1 pc 7-8" 1 pc Setting ring 1pc each (5" DIA., 7" DIA) Extension rod (150mm) 1 pc Spanner 2 pcs Hex wrench 1 pc

* It is not advisable to use measuring heads other than as supplied as a standard accessory, or widen a measuring range by using any other multiple sub-measuring heads.
(The measuring accuracy in such cases is not guaranteed.)

368-906

368-907

368-911

368-912

368-913

368-914

Setting rings supplied as standard
(ø125, ø175) (Packed separately)
368-915

Mitutoyo

Holtest

For easy and accurate measurement of inside diameters

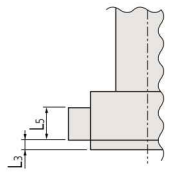
An inspection certificate is supplied as standard.
Refer to page X for details.

Holtest (Type II)
SERIES 368 — Three-point Internal Micrometers

For details of Special-order Products, refer to page C-49.

- Hardened tool-steel anvils (instead of titanium-coated carbide) for a more economically priced tool.
- Same accuracy as the titanium-coated Holtest models.
- For details of setting rings, refer to page C-47.
- Constant-force device allows repeatable measurement.

Range (mm)	L_3 (mm)	L_5 (mm)
12 - 20	2.6 or below	3.5
20 - 30	3.4 or below	5.2
30 - 50		10
50 - 100		14
100 - 300	19.6 or below	13.8



- Can measure deep holes using an Extension Rod (optional).

368-769

368-770

368-774

SPECIFICATIONS

Metric individual

Order No.	Range	Graduation	Accuracy*1	Extension Rod (optional)
368-764	12 - 16mm	0.005mm	±2μm (within 2μm)	**952621** (150mm)
368-765	16 - 20mm			
368-766	20 - 25mm		±3μm (within 3μm)	**952622** (150mm)
368-767	25 - 30mm			
368-768	30 - 40mm			
368-769	40 - 50mm			
368-770	50 - 63mm			**952623** (150mm)
368-771	62 - 75mm			
368-772	75 - 88mm			
368-773	87 - 100mm			
368-774	100 - 125mm		±5μm (within 5μm)	
368-775	125 - 150mm			
368-776	150 - 175mm			
368-777	175 - 200mm			
368-778	200 - 225mm			
368-779	225 - 250mm			
368-780	250 - 275mm			
368-781	275 - 300mm			

Inch individual

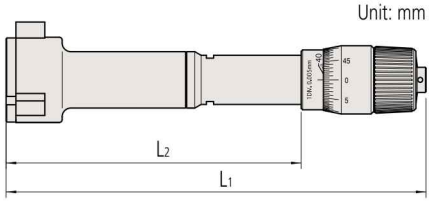
Order No.	Range	Graduation	Accuracy*1	Extension Rod (optional)
368-864	.5" - .65"	.0002"	±.0001" (within .0001")	**952621** (150mm)
368-865	.65" - .8"			
368-866	.8" - 1"		±.00015" (within .00015")	**952622** (150mm)
368-867	1" - 1.2"			
368-868	1.2" - 1.6"			
368-869	1.6" - 2"			
368-870	2" - 2.5"			**952623** (150mm)
368-871	2.5" - 3"			
368-872	3" - 3.5"			
368-873	3.5" - 4"			
368-874	4" - 5"		±.00025" (within .00025")	
368-875	5" - 6"			
368-876	6" - 7"			
368-877	7" - 8"			
368-878	8" - 9"			
368-879	9" - 10"			
368-880	10" - 11"			
368-881	11" - 12"			

*1 Excluding quantizing error.
Accuracy: values measured across the entire measuring face.
Maximum difference: differences between the maximum and minimum values.

* Setting ring and extension rod: optional.
* It is not advisable to use measuring heads other than as supplied as a standard accessory, or widen a measuring range by using any other multiple sub-measuring heads. (The measuring accuracy in such cases is not guaranteed.)

DIMENSIONS

Unit: mm



Range	L2	L1
12 - 16, 16 - 20	82	126 - 130
20 - 25, 25 - 30	94	137 - 142
30 - 40, 40 - 50	102	145 - 155
50 - 63, 62 - 75, 75 - 88, 87 - 100	105	150 - 163
100 - 125, 125 - 150, 150 - 175, 175 - 200 200 - 225, 225 - 250, 250 - 275, 275 - 300	161	227 - 252

External appearance differs depending on the measuring range.

Non-Interchangeable-Head Sets

Metric

Order No.	Range*	Graduation	Content of Set
368-991	12 - 20mm	0.005mm	Micrometer head unit 12 - 16mm 1 pc 16 - 20mm 1 pc Setting ring (ø16) 1 pc Extension rod (150mm) 1 pc Spanner 2 pcs Hex wrench 1 pc
368-992	20 - 50mm		Micrometer head unit 20 - 25mm 1 pc 25 - 30mm 1 pc 30 - 40mm 1 pc 40 - 50mm 1 pc Setting ring (ø25, ø40) 1 pc each Extension rod (150mm) 1 pc Spanner 2 pcs Hex wrench 1 pc
368-993	50 - 100mm		Micrometer head unit 50 - 63mm 1 pc 62 - 75mm 1 pc 75 - 88mm 1 pc 87 - 100mm 1 pc Setting ring (ø62, ø87) 1 pc each Extension rod (150mm) 1 pc Spanner 2 pcs Hex wrench 1 pc
368-994	100 - 200mm		Micrometer head unit 100 - 125mm 1 pc 125 - 150mm 1 pc 150 - 175mm 1 pc 175 - 200mm 1 pc Setting ring(ø125, ø175) 1 pc each Extension rod (150mm) 1 pc Spanner 2 pcs Hex wrench 1 pc

Inch

Order No.	Range*	Graduation	Content of Set
368-995	.5" - .8"	.0002"	Micrometer head unit .5-.65" 1 pc .65-.8" 1 pc Setting ring (.65" DIA.) 1 pc Extension rod (150mm) 1 pc Spanner 2 pcs Hex wrench 1 pc
368-996	.8" - 2"		Micrometer head unit .8-1" 1 pc 1-1.2" 1 pc 1.2-1.6" 1 pc 1.6-2" 1 pc Setting ring (1" DIA., 1.6" DIA.) 1 pc each Extension rod (150mm) 1 pc Spanner 2 pcs Hex wrench 1 pc
368-997	2" - 4"		Micrometer head unit 2-2.5" 1 pc 2.5-3" 1 pc 3-3.5" 1 pc 3.5-4" 1 pc Setting ring (2.5" DIA., 3.5" DIA.) 1 pc each Extension rod (150mm) 1 pc Spanner 2 pcs Hex wrench 1 pc
368-998	4" - 8"		Micrometer head unit 4-5" 1 pc 5-6" 1 pc 6-7" 1 pc 7-8" 1 pc Setting ring (5" DIA., 7" DIA.) 1 pc each Extension rod (150mm) 1 pc Spanner 2 pcs Hex wrench 1 pc

* It is not advisable to use measuring heads other than as supplied as a standard accessory, or widen a measuring range by using any other multiple sub-measuring heads.
(The measuring accuracy in such cases is not guaranteed.)

368-991

368-992

368-993

Setting rings are supplied as standard
(ø125, ø175) (Packed separately)

368-994

Mitutoyo

Holtest

For easy and accurate measurement of inside diameters

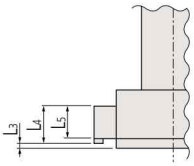
ABSOLUTE Borematic
SERIES 568 — ABSOLUTE Digimatic Snap-Open Bore Gages

- A snap-type digital display, inside-diameter measuring instrument allows quick and easy measurement with lever operation.
- Titanium-coated measuring pins provide excellent durability and impact resistance and allow the instrument to measure right to the bottom of a blind hole.
- Three-Point contact measuring head enables highly repeatable measurement data to be obtained.
- The ABSOLUTE linear encoder eliminates overspeed errors.

568-364 568-368

- GO/NO-GO judgment function.
- Dual HOLD function buttons, optimally located, enable high operability.
- 330-degree rotatable display unit for easy reading at any angle.
- Measurement can be made close to the bottom of a blind hole.

Range (mm)	L3 (mm)	L4 (mm)	L5 (mm)
6 - 12	2 or below	—	2.5
12 - 20	0.3 or below	5.6	3.5
20 - 30		8.3	5.2
30 - 50		13.0	10
50 - 125		17.0	14



- Can measure deep holes by attaching an optional extension rod.

Extension rod (optional)

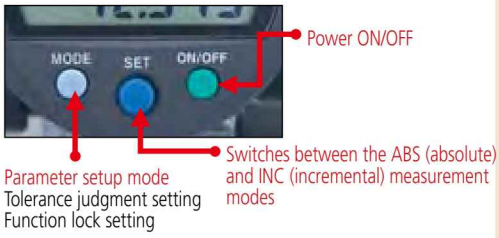
- Digimatic output port enables inclusion in a statistical process control or networked measurement system. (Refer to page A-3 for details.)
- Interface Input Tools are available that enable the conversion of measurement data to keyboard signals that are then directly input to cells in off-the-shelf spreadsheet software such as Excel. (Refer to page A-5 for details.)
- Interchangeable-Head Bore Gages are available in part sets and full sets.
- For details of Setting rings, refer to page C-47.

• Large LCD

Character height of 11mm (1.5 times the character area of conventional 8.5mm products)

• Three large buttons

The three large-button design employed by **ID-N/ID-B**, the ABSOLUTE coolant proof Digimatic indicators, enables easier and simpler operation.



• Function locking

Ensures reliability of measurement by locking the settings to prevent preset function settings from being changed by mistake.

An inspection certificate is supplied as standard.
Refer to page X for details.

ABSOLUTE™ (Refer to page X for details.)

Technical Data

Resolution: 0.001mm or .00005"/0.001mm
Display: LCD
Response speed: Infinite
Battery: SR44 (1 pc), **938882**,
for initial operational checks (standard accessory)
Battery life: Approx. 5,000 hours in continuous use
Scale type: Electrostatic capacitance type absolute encoder

Functions

GO/NO-GO judgment
GO/NO-GO judgment zoom
2-Point Preset
Zero-setting
Data hold, Error alarm
Low battery voltage alert
Data output
Function Lock
330° rotary display
inch/mm conversion (inch/mm models)

For details of Custom-ordered Products, refer to page C-49.

Optional accessories

Refer to page A-21 for details
USB Input Tool Direct (2m): **06ADV380F**
Connecting cables for **U-WAVE-T**
For standard (160mm): **02AZD790F**
For foot switch: **02AZE140F**

SPECIFICATIONS

Metric individual

Order No.	Range*2	Accuracy*1	Mass	Accessories (optional)*2	
				Extension Rod	SPC cable
568-361	6 - 8mm	±5µm (within 5µm)	480g	**952322** (100mm)	**905338** (1mm)
568-362	8 - 10mm		485g		
568-363	10 - 12mm				
568-364	12 - 16mm		475g	**952621** (150mm)	
568-365	16 - 20mm		480g		
568-366	20 - 25mm	±6µm (within 6µm)	540g	**952622** (150mm)	**905409** (2mm)
568-367	25 - 30mm		555g		
568-368	30 - 40mm		565g		
568-369	40 - 50mm		610g		
568-370	50 - 63mm		730g	**952623** (150mm)	
568-371	62 - 75mm		740g		
568-372	75 - 88mm		790g		
568-373	87 - 100mm		800g		
568-374	100 - 113mm		900g		
568-375	112 - 125mm		910g		

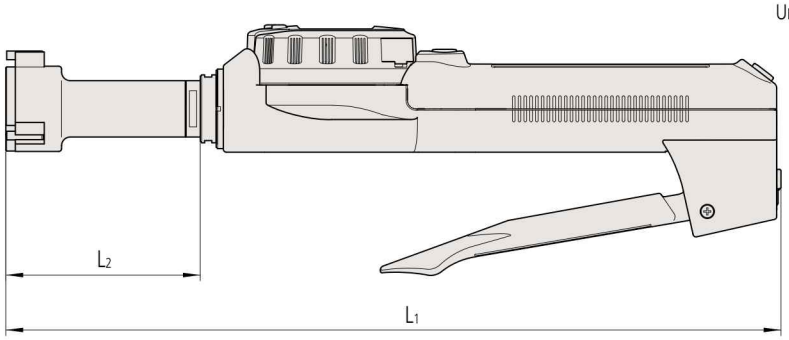
Inch/Metric individual

Order No.	Range*2	Accuracy*1	Mass	Extension Rod (optional)*2	
				Extension Rod	SPC cable
568-461	.275"- .35"	±.00025" (within .00025")	480g	**952322** (100mm)	**905338** (1mm)
568-462	.35"- .425"		485g		
568-463	.425"- .5"				
568-464	.5"- .65"		475g	**952621** (150mm)	
568-465	.65"- .8"		480g		
568-466	.8"- 1"	±.0003" (within .0003")	540g	**952622** (150mm)	**905409** (2mm)
568-467	1"- 1.2"		555g		
568-468	1.2"- 1.6"		565g		
568-469	1.6"- 2"		610g		
568-470	2"- 2.5"		730g	**952623** (150mm)	
568-471	2.5"- 3"		740g		
568-472	3"- 3.5"		790g		
568-473	3.5"- 4"		800g		
568-474	4"- 4.5"		900g		
568-475	4.5"- 5"		910g		

*1 Excluding quantizing error
Instrumental error excluding quantizing error (maximum error)
*2 The measurement range cannot be enlarged by measuring heads that are not standard-supplied (the accuracy is not guaranteed).
Note: Setting rings are optional.

DIMENSIONS

Unit: mm



Range	L2	L1
6 - 8, 8 - 10, 10 - 12 mm	83	284
12 - 16, 16 - 20 mm	53	255
20 - 25, 25 - 30mm	59	261
30 - 40, 40 - 50mm	67	269
50 - 63, 62 - 75, 75 - 88, 87 - 100, 100 - 113, 112 - 125mm	75	277

External appearance differs depending on the measuring range.

C

Holtest

For easy and accurate measurement of inside diameters

An inspection certificate is supplied as standard.
Refer to page X for details.

ABSOLUTE Borematic
SERIES 568 — ABSOLUTE Digimatic Snap-Open Bore Gages

Interchangeable-Head Bore Gage Sets

Each set includes one display unit with interchangeable measuring heads of the sizes specified.

Metric

Order No.	Range	Content of Set	
568-924	6 - 12mm	Display unit	1 pc
		Measuring head	
		6 - 8mm	1 pc
		8 - 10mm	1 pc
		10 - 12mm	1 pc
		Attachment	1 pc
		Setting ring (ø8, ø10)	1 pc each
		Spanner	3 pcs
568-925	12 - 25mm	Display unit	1 pc
		Measuring head	
		12 - 16mm	1 pc
		16 - 20mm	1 pc
		20 - 25mm	1 pc
		Attachment	2 pcs
		Setting ring (ø16, ø20)	1 pc each
		Spanner	2 pcs
568-926	25 - 50mm	Display unit	1 pc
		Measuring head	
		25 - 30mm	1 pc
		30 - 40mm	1 pc
		40 - 50mm	1 pc
		Attachment	1 pc
		Setting ring (ø30, ø40)	1 pc each
		Spanner	2 pss
568-927	50 - 100mm	Display unit	1 pc
		Measuring head	
		50 - 63mm	1 pc
		62 - 75mm	1 pc
		75 - 88mm	1 pc
		87 - 100mm	1 pc
		Attachment	1 pc
		Setting ring (ø62, ø87)	1 pc each
		Spanner	2 pcs

Inch/Metric

Order No.	Range	Content of Set	
568-928	.275" - .5"	Display unit	1 pc
		Measuring head	
		.275-.35"	1 pc
		.35-.425"	1 pc
		.425-.5"	1 pc
		Attachment	1 pc
		Setting ring (.35" DIA, .425" DIA)	1 pc each
		Spanner	3 pcs
568-929	.5" - 1"	Display unit	1 pc
		Measuring head	
		.5-.65"	1 pc
		.65-.8"	1 pc
		.8-1"	1 pc
		Attachment	2 pcs
		Setting ring (.65" DIA, .8" DIA)	1 pc each
		Spanner	2 pcs
568-930	1" - 2"	Display unit	1 pc
		Measuring head	
		1-1.2"	1 pc
		1.2-1.6"	1 pc
		1.6-2"	1 pc
		Attachment	1 pc
		Setting ring (1.2" DIA, 1.6" DIA)	1 pc each
		Spanner	2 pss
568-936	2" - 4"	Display unit	1 pc
		Measuring head	
		2-2.5"	1 pc
		2.5-3"	1 pc
		3-3.5"	1 pc
		3.5-4"	1 pc
		Attachment	1 pc
		Setting ring (2.5" DIA, 3.5" DIA)	1 pc each
		Spanner	2 pcs

Non-Interchangeable-Head Snap-Open Bore Gage Sets

Each set includes complete gages (display units and measuring heads for each size).

Metric

Order No.	Range	Content of Set	
568-955	6 - 12mm	Display unit	
		6 - 8mm	1 pc
		8 - 10mm	1 pc
		10 - 12mm	1 pc
		Setting ring (ø8, ø10)	1 pc each
		Spanner	3 pcs
568-956	12 - 25mm	Display unit	
		12 - 16mm	1 pc
		16 - 20mm	1 pc
		20 - 25mm	1 pc
		Setting ring (ø16, ø20)	1 pc each
		Spanner	2 pcs
568-957	25 - 50mm	Display unit	
		25 - 30mm	1 pc
		30 - 40mm	1 pc
		40 - 50mm	1 pc
		Setting ring (ø30, ø40)	1 pc each
		Spanner	2 pcs
568-958	50 - 75mm	Display unit	
		50 - 63mm	1 pc
		62 - 75mm	1 pc
		Setting ring (ø62)	1 pc
		Spanner	2 pcs
568-959	75 - 100mm	Display unit	
		75 - 88mm	1 pc
		87 - 100mm	1 pc
		Setting ring (ø87)	1 pc
		Spanner	2 pcs

Inch/Metric

Order No.	Range	Content of Set	
568-965	.275" - .5"	Display unit	
		.275-.35"	1 pc
		.35-.425"	1 pc
		.425-.5"	1 pc
		Setting ring (.35" DIA, .425" DIA)	1 pc each
		Spanner	3 pcs
568-966	.5" - 1"	Display unit	
		.5-.65"	1 pc
		.65-.8"	1 pc
		.8-1"	1 pc
		Setting ring (.65" DIA, .8" DIA)	1 pc each
		Spanner	2 pcs
568-967	1" - 2"	Display unit	
		1-1.2"	1 pc
		1.2-1.6"	1 pc
		1.6-2"	1 pc
		Setting ring (1.2" DIA, 1.6" DIA)	1 pc each
		Spanner	2 pcs
568-968	2" - 3"	Display unit	
		2-2.5"	1 pc
		2.5-3"	1 pc
		Setting ring (2.5" DIA)	1 pc
		Spanner	2 pcs
568-969	3" - 4"	Display unit	
		3-3.5"	1 pc
		3.5-4"	1 pc
		Setting ring (3.5" DIA)	1 pc
		Spanner	2 pcs

568-924

568-926

568-955

568-957

568-959

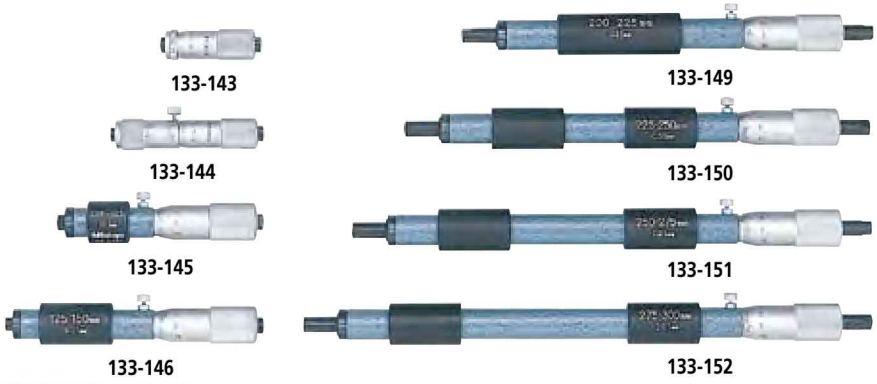
Mitutoyo

Inside Micrometers

For easy and accurate measurement of inside diameters

Tubular Inside Micrometers
SERIES 133 — Single Rod Type

- Standard single rod type inside micrometer.
- Carbide measuring faces.
- The sleeve is rotated to adjust the index line position when setting to a length standard.
- Setting ring (nominal size below 300mm), CERA Inside Micro Checker, and Gauge Block accessory set are provided as a reference gage for datum adjustment (refer to page C-47, C-26, and E-17 - E20 for details).



133-143
133-144
133-145
133-146
133-147
133-148
133-149
133-150
133-151
133-152

Optional Accessory

SPECIFICATIONS

Metric Individual

Order No.	Range	Graduation	Accuracy
133-143	50 - 75mm	0.01mm	±3µm
133-144	75 - 100mm		±4µm
133-145	100 - 125mm		±5µm
133-146	125 - 150mm		
133-147	150 - 175mm		
133-148	175 - 200mm		
133-149	200 - 225mm		
133-150	225 - 250mm		±6µm
133-151	250 - 275mm		
133-152	275 - 300mm		
133-153	300 - 325mm		±7µm
133-154	325 - 350mm		
133-155	350 - 375mm		
133-156	375 - 400mm		±8µm
133-157	400 - 425mm		
133-158	425 - 450mm		
133-159	450 - 475mm		±9µm
133-160	475 - 500mm		
133-161	500 - 525mm		
133-162	525 - 550mm		±10µm
133-163	550 - 575mm		
133-164	575 - 600mm		
133-165	600 - 625mm		±11µm
133-166	625 - 650mm		
133-167	650 - 675mm		
133-168	675 - 700mm		±12µm
133-169	700 - 725mm		
133-170	725 - 750mm		
133-171	750 - 775mm		±13µm
133-172	775 - 800mm		
133-173	800 - 825mm		
133-174	825 - 850mm		±14µm
133-175	850 - 875mm		
133-176	875 - 900mm		
133-177	900 - 925mm		±15µm
133-178	925 - 950mm		
133-179	950 - 975mm		
133-180	975 - 1000mm		±16µm

Inch Individual

Order No.	Range	Graduation	Accuracy
133-223	2" - 3"	.001"	±.00015"
133-224	3" - 4"		±.0002"
133-225	4" - 5"		±.00025"
133-226	5" - 6"		
133-227	6" - 7		
133-228	7" - 8"		
133-229	8" - 9"		
133-230	9" - 10"		±.0003"
133-231	10" - 11"		
133-232	11" - 12"		

Single Rod Type Inside Micrometer Set

133-902

Metric Micrometer set

Order No.	Range	Models included
133-901	50 - 150mm (4 heads/set)	133-143 133-144 133-145 133-146 with fitted case
133-902	50 - 300mm (10 heads/set)	133-143 133-144 133-145 133-146 133-147 133-148 133-149 133-150 133-151 133-152 with fitted case

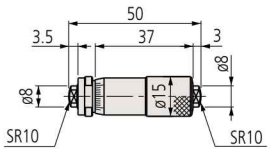
Inch Micrometer set

Order No.	Range	Models included
133-903	2" - 6" (4 heads/set)	133-223 133-224 133-225 133-226 with fitted case
133-904	2" - 12" (10 heads/set)	133-223 133-224 133-225 133-226 133-227 133-228 133-229 133-230 133-231 133-232 with fitted case

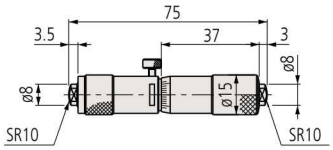
C

DIMENSIONS

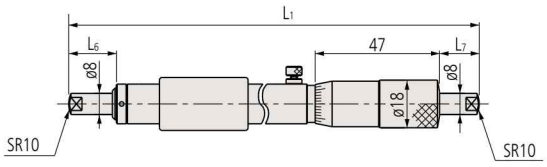
Unit: mm



133-143



133-144



Order No.	L1	L6	L7
133-145	100	5	3
133-146	125	5	3
133-147	150	18	15
133-148	175	18	15
133-149	200	18	15
⋮	⋮	⋮	⋮
133-180	975	18	15

Mitutoyo

Inside Micrometers

For easy and accurate measurement of inside diameters

Tubular Inside Micrometers
SERIES 137, 337 — Extension Rod Type

- Wide range of inside measurements possible by combining extension rods and anvils with the micrometer head.
- Two types of measuring faces are available; with or without carbide tip. (No. 337-101/301/302/102/303/304 only available with carbide tip.)
- The sleeve is rotated to adjust the index line position when setting to a length standard.
- An inside length standard is required for accurately setting the micrometer.
- Order No. 337-101/301/302/102/303/304 features:
  - IP65 (water-proof) protection level that enables use in the presence of cutting fluid.
  - A large-character LCD display.
  - Storage of 2 preset values for use when setting to an inside length standard.
  - A function lock that prevents accidental changing of the reference setting during measurement.
  - An output port for measurement data that enables inclusion in a statistical process control or networked measurement system. Refer to page A-3 for details.
  - Ability to use Interface Input Tools that enable 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.

337-301

137-205

These marks indicate that a product has successfully passed IP65-level testing, which is carried out by the independent German certification organization TÜV Rheinland.

(Refer to page X for details.)

IP Codes

Level 6: Dust-proof.
No ingress of dust allowed.
Level 5: Protected against water jets.
Water projected in jets against the enclosure from any direction shall have no harmful effects.

Technical Data

Accuracy
±(3 + number of rods + maximum measurement length/50) µm (fraction rounded up)
Excluding quantizing error (only for Digimatic)

Functions (for 337-101/301/302/102/303/304)

Zero-setting
Origin restoration
Data hold
2-point Preset
Function lock
Automatic power ON/OFF
Error alarm
Data output

Battery and scale type (for 337-101/301/302/102/303/304)

SR44 (1 pc), **938882**, for initial operational checks (standard accessory)
Battery life: Approx. 1.2 years under normal use
Scale type: Electromagnetic induction-type rotary encoder

Optional accessories

Refer to page A-21 for details.
Connecting cables with **IT/DP/MUX**, etc.
1m: **05CZA662**
2m: **05CZA663**
USB Input Tool Direct (2m): **06ADV380B**
Connecting cables for **U-WAVE-T**
For standard (160mm): **02AZD790B**
For foot switch: **02AZE140B**

SPECIFICATIONS

Metric

Order No.	Range	Resolution	Micrometer head stroke	Extension rods Qty	Extension rods Size	Display unit
Digimatic (LCD)						
337-101	200 - 225mm	0.001mm	25mm	—	—	200 - 225mm
337-301	200 - 1000mm			6	25,50,100 (2pcs),200,300mm	
337-302	200 - 1500mm			7	25, 50, 100, 200, 300 (3pcs) mm	

Inch/Metric

Order No.	Range	Resolution	Micrometer head stroke	Extension rods Qty	Extension rods Size (inch)	Display unit
Digimatic (LCD)						
337-102	8" - 9"	.0001"/ 0.001mm	1"	—	—	8 - 9"
337-303	8" - 40"			6	1", 2", 4" (2 pcs.), 8", 12"	
337-304	8" - 60"			7	1", 2", 4", 8", 12" (3 pcs.)	

Metric

Order No.	Range	Graduation	Micrometer head stroke	Extension rods Qty	Extension rods Size	Main unit
Analog						
137-201	50 - 150mm	0.01mm	13mm	3	13, 25, 50mm	50 - 63mm
137-202	50 - 300mm			5	13, 25, 50 (2 pcs.), 100mm	
137-203	50 - 500mm			6	13, 25, 50 (2 pcs.), 100, 200mm	
137-204	50 - 1000mm			8	13, 25, 50 (2 pcs.), 100, 200 (2 pcs.), 300 mm	
137-205	50 - 1500mm			10	13, 25, 50 (2 pcs.), 100, 200 (3 pcs.), 300 (2 pcs.)mm	
Annalog (With carbide measuring face)						
137-206	50 - 150mm			3	13, 25, 50mm	
137-207	50 - 300mm			5	13, 25, 50 (2 pcs.), 100mm	
137-208	50 - 500mm			6	13, 25, 50 (2 pcs.), 100, 200mm	
137-209	50 - 1000mm			8	13, 25, 50 (2 pcs.), 100, 200 (2 pcs.), 300 mm	
137-210	50 - 1500mm			10	13, 25, 50 (2 pcs.), 100, 200 (3 pcs.), 300 (2 pcs.)mm	

Inch

Order No.	Range	Graduation	Micrometer head stroke	Extension rods Qty	Extension rods Size (inch)	Main unit
Analog						
137-211	2" - 6"	.001"	.5"	3	.5", 1", 2"	2 - 2.5"
137-212	2" - 12"			5	.5", 1", 2" (2 pcs.), 4"	
137-213	2" - 20"			6	.5", 1", 2" (2 pcs.), 4", 8"	
137-214	2" - 40"			8	.5", 1", 2" (2 pcs.), 4", 8" (2 pcs.), 12"	
137-215	2" - 60"			10	.5", 1", 2" (2 pcs.), 4", 8" (3 pcs.), 12" (2 pcs.)	
Annalog (With carbide measuring face)						
137-216	2" - 6"			3	.5", 1", 2"	
137-217	2" - 12"			5	.5", 1", 2" (2 pcs.), 4"	
137-218	2" - 20"			6	.5", 1", 2" (2 pcs.), 4", 8"	
137-219	2" - 40"			8	.5", 1", 2" (2 pcs.), 4", 8" (2 pcs.), 12"	
137-220	2" - 60"			10	.5", 1", 2" (2 pcs.), 4", 8" (3 pcs.), 12" (2 pcs.)	

Tubular Inside Micrometers
SERIES 137 — Extension Rod Type (main unit)

- Micrometer head for Extension Rod Type inside micrometer.
- The sleeve is rotated to adjust the index line position when setting to a length standard.
- Setting ring and Gauge Block accessory set are provided as a reference gage for datum adjustment (refer to page C-47 and E-17 - E20 for details).

137-011

SPECIFICATIONS

Metric

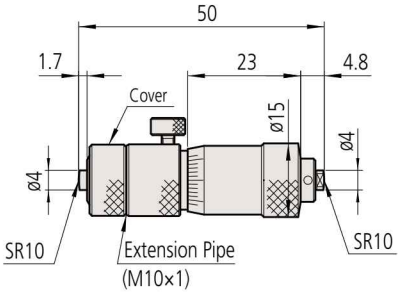
Order No.	Range	Graduation	Accuracy	Micrometer head stroke
137-011 Carbide-tipped **137-013**	50 - 63mm	0.01mm	±3µm	13mm

Inch

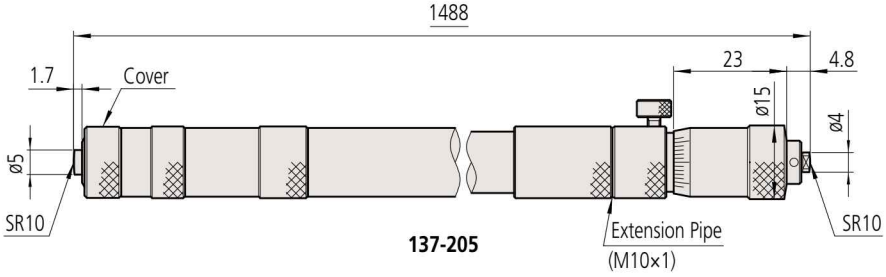
Order No.	Range	Graduation	Accuracy	Micrometer head stroke
137-012 Carbide-tipped **137-014**	2" - 2.5"	.001"	±.00015"	.5"

DIMENSIONS

Unit: mm



137-011



137-205

Mitutoyo

Inside Micrometers

For easy and accurate measurement of inside diameters

Tubular Inside Micrometers
SERIES 139, 339, 140 — Extension Pipe Type

- Wide range of inside diameter measurements possible by combining extension pipes and anvils with the micrometer head.
- Carbide measuring faces are available.
- The sleeve is rotated to adjust the index line position when setting to a length standard.
- An inside length standard is required for accurately setting the micrometer.
- Order No. 339-101/301/302/102/303/304 features:
  - IP65 (water-proof) protection level that enables use in the presence of cutting fluid.
  - A large-character LCD display.
  - Storage of 2 preset values for use when setting to an inside length standard.
  - A function lock that prevents accidental changing of the reference setting during measurement.
  - An output port for measurement data that enables inclusion in a statistical process control or networked measurement system. Refer to page A-3 for details.
  - Ability to use Interface Input Tools that enable 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.

339-301

139-177

140-158

These marks indicate that a product has successfully passed IP65-level testing, which is carried out by the independent German certification organization TÜV Rheinland.

(Refer to page X for details.)

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ID 0000021605

IP Codes

Level 6: Dust-proof.
No ingress of dust allowed.
Level 5: Protected against water jets.
Water projected in jets against the enclosure from any direction shall have no harmful effects.

Technical Data

Accuracy
339 series
±(3 + number of pipes + maximum measurement length/50)µm (fraction rounded up)
139 series
±(3 + number of pipes + maximum measurement length/50)µm (fraction rounded up)
140 series
±(7 + number of pipes + maximum measurement length/50)µm (fraction rounded up)
Excluding quantizing error (only for Digimatic)

Functions (for 339-101/301/302/102/303/304)

Zero-setting
Origin restoration
Data hold
Function lock
Automatic power ON/OFF
2-point Preset
Error alarm
Data output

Battery and scale type (for 339-101/301/302/102/303/304)

SR44 (1 pc), **938882**, for initial operational checks (standard accessory)
Battery life: Approx. 1.2 years under normal use
Scale type: Electromagnetic induction-type rotary encoder

Optional accessories

Refer to page A-21 for details
Connecting cables with **IT/DP/MUX**, etc.
1m: **05CZA662**
2m: **05CZA663**
USB Input Tool Direct (2m): **06ADV380B**
Connecting cables for **U-WAVE-T**
For standard (160mm): **02AZD790B**
For foot switch: **02AZE140B**

SPECIFICATIONS

Metric

Order No.	Range	Resolution	Micrometer head stroke	Extension pipes Qty	Extension pipes Size	Display unit
Digimatic (LCD)						
339-101	200 - 225mm	0.001mm	25mm	—	—	200 - 225mm
339-301	200 - 1000mm			5	25,50,100,200,400mm	
339-302	200 - 2000mm			8	25,50,100,200 (2pcs),400 (3pcs)mm	

Inch/Metric

Order No.	Range	Resolution	Micrometer head stroke	Extension pipes Qty	Extension pipes Size	Display unit
Digimatic (LCD)						
339-102	8" - 9"	.0001"/ 0.001mm	1"		—	8" - 9"
339-303	8" - 40"			5	1", 2", 4", 8", 16"	
339-304	8" - 80"			8	1", 2", 4", 8" (2 pcs.), 16" (3 pcs.)	

Metric

Order No.	Range	Graduation	Micrometer head stroke	Extension pipes Qty	Extension pipes Size	Main unit
Analog						
139-173	100 - 500mm	0.01mm	25mm	4	25, 50, 100, 200mm	100 - 125mm
139-174	100 - 900mm			5	25, 50, 100, 200, 400mm	
139-175	100 - 1300mm			6	25, 50, 100, 200, 400mm (2 pcs.)	
139-176	100 - 1700mm			7	25, 50, 100, 200, 400mm (3 pcs.)	
139-177	100 - 2100mm			8	25, 50, 100, 200, 400mm (4 pcs.)	
140-157	1000 - 2000mm		50mm	5	50, 100 (2 pcs.), 200, 500mm	1000 - 1050mm
140-158	1000 - 3000mm			6	50, 100 (2 pcs.), 200, 500, 1000mm	
140-159	1000 - 4000mm			7	50, 100 (2 pcs.), 200, 500, 1000mm (2 pcs.)	
140-160	1000 - 5000mm			8	50, 100 (2 pcs.), 200, 500, 1000mm (3 pcs.)	

Inch

Order No.	Range	Graduation	Micrometer head stroke	Extension pipes Qty	Extension pipes Size	Main unit
Analog						
139-178	4" - 20"	.001"	1"	4	1", 2", 4", 8"	4" - 5"
139-179	4" - 36"			5	1", 2", 4", 8", 16"	
139-180	4" - 52"			6	1", 2", 4", 8", 16" (2 pcs.)	
139-181	4" - 68"			7	1", 2", 4", 8", 16" (3 pcs.)	
139-182	4" - 84"			8	1", 2", 4", 8", 16" (4 pcs.)	
140-161	40" - 80"		2"	5	2", 4" (2 pcs.), 8", 20"	40" - 42"
140-162	40" - 120"			6	2", 4" (2 pcs.), 8", 20", 40"	
140-163	40" - 160"			7	2", 4" (2 pcs.), 8", 20", 40" (2 pcs.)	
140-164	40" - 200"			8	2", 4" (2 pcs.), 8", 20", 40" (3 pcs.)	

Tubular Inside Micrometers
SERIES 139 — Extension Pipe Type (main unit)

- Micrometer head for Extension Pipe Type inside micrometer.
- The sleeve is rotated to adjust the index line position when setting to a length standard
- Setting ring, CERA Inside Micro Checker, and Gauge Block accessory set are provided as a reference gage for datum adjustment (refer to page C-47, C-26, and E-17 - E20 for details).

139-001

SPECIFICATIONS

Metric

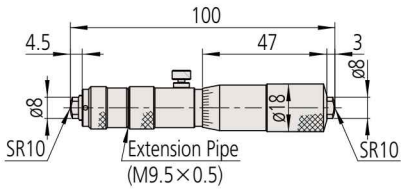
Order No.	Range	Graduation	Accuracy	Micrometer head stroke
139-001	100 - 125mm	0.01mm	±3μm	25mm

Inch

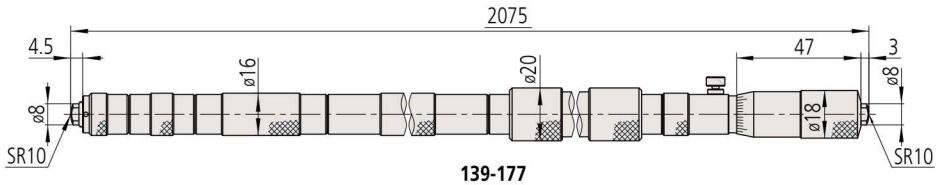
Order No.	Range	Graduation	Accuracy	Micrometer head stroke
139-002	4" - 5"	.001"	±.00015"	1"

DIMENSIONS

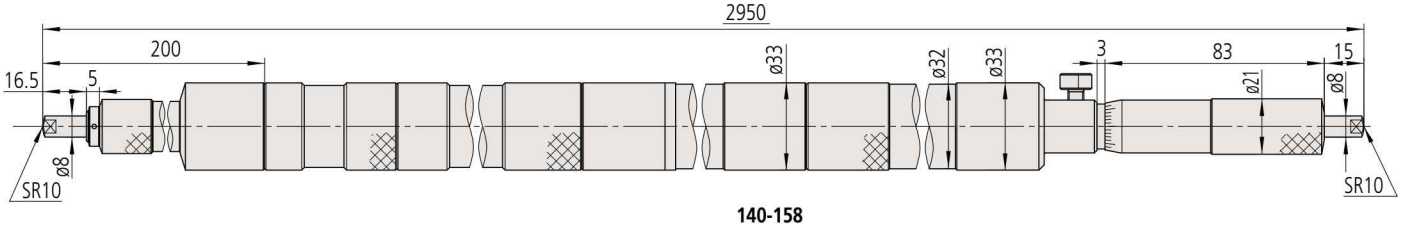
Unit: mm



139-001



139-177



140-158

Mitutoyo

Inside Micrometers

For easy and accurate measurement of inside diameters

Inside Micrometers
SERIES 345, 145 — Caliper Type

- Carbide measuring faces.
- Equipped with a constant measuring-force device.
- Setting ring (nominal size below 300mm), CERA Inside Micro Checker (more than 50mm), and Gauge Block accessory set are provided as a reference gage for datum adjustment (refer to page C-47, C-26, and E-17 - E20 for details).

345-250-30

145-185

145-187

Accessories for 145-185/186/193/194 (optional)

Cap (**No.300401**) Holder (**No.300400**)

* This instrument requires the cap and the holder for mounting on a micrometer stand.

SPECIFICATIONS

Metric

Order No.	Range	Resolution	Accuracy*	Mass
Digimatic (LCD)				
345-250-30	5 - 30mm	0.001mm	±5µm	320g
345-251-30	25 - 50mm		±6µm	325g

* Excluding quantizing error

Inch/Metric

Order No.	Range	Resolution	Accuracy*	Mass
Digimatic (LCD)				
345-350-30	.2" - 1.2"	.00005"/	±.00025"	320g
345-351-30	1" - 2"	0.001mm	±.0003"	325g

* Excluding quantizing error

Metric

Order No.	Range	Graduaton	Accuracy	Mass
Analog				
145-185	5 - 30mm	0.01mm	±5µm	130g
145-186	25 - 50mm		±6µm	140g
145-187	50 - 75mm		±7µm	160g
145-188	75 - 100mm		±8µm	180g
145-189	100 - 125mm		±9µm	210g
145-190	125 - 150mm			230g
145-191	150 - 175mm		±10µm	250g
145-192	175 - 200mm			270g
145-217	200 - 225mm		±11µm	310g
145-218	225 - 250mm			330g
145-219	250 - 275mm		±12µm	350g
145-220	275 - 300mm			370g

Inch

Order No.	Range	Graduaton	Accuracy	Mass
Analog				
145-193	.2" - 1.2"	.001"	±.00025"	130g
145-194	1" - 2"		±.0003"	140g
145-195	2" - 3"		±.00035"	160g
145-196	3" - 4"		±.0004"	180g

Battery and scale type (for 345-250-30/251-30/350-30/351-30)

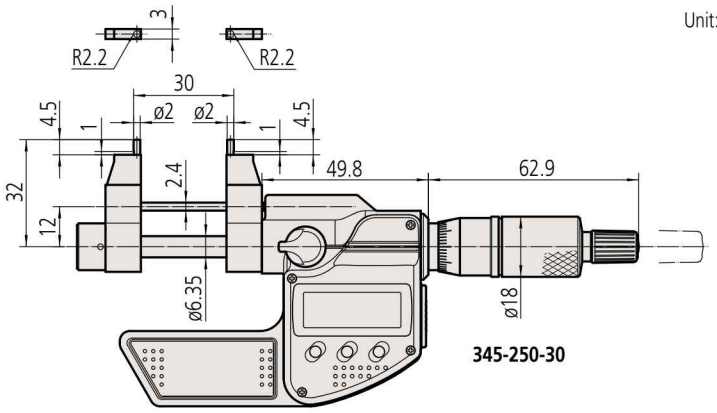
SR44 (1 pc), **938882**, for initial operational checks (standard accessory)
Battery life: Approx. 2.4 years under normal use
Scale type: Electromagnetic induction-type rotary encoder

Optional accessories

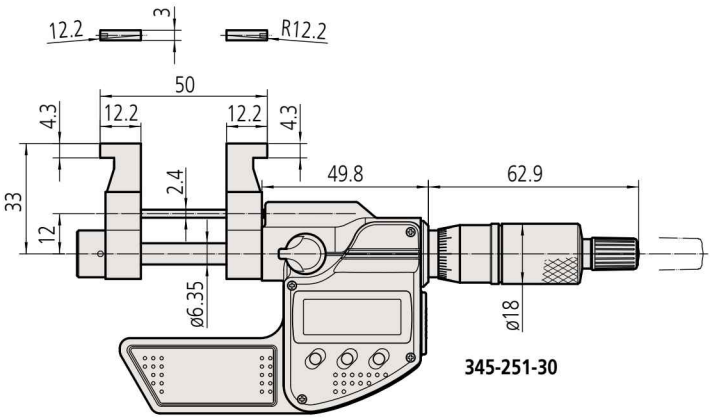
Refer to page A-21 for details
Connecting cables for Input Tool/ Digimatic Mini-Processor, etc.
1m: **05CZA662**
2m: **05CZA663**
USB Input Tool Direct (2m): **06ADV380B**
Connecting cables for **U-WAVE-T**
For standard (160mm): **02AZD790B**
For foot switch: **02AZE140B**

DIMENSIONS

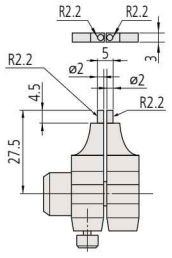
Unit: mm



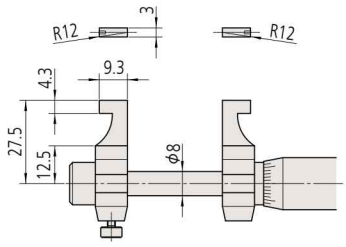
345-250-30



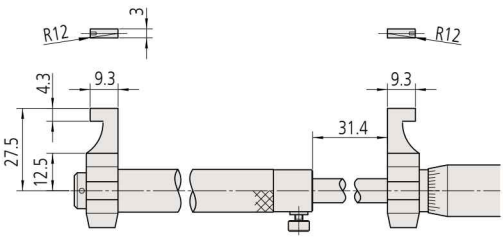
345-251-30



145-185



145-186



50mm or more

C

Inside Micrometers

For easy and accurate measurement of inside diameters

Inside Micrometers
SERIES 141 — Interchangeable Rod Type

- Wide range of inside diameter measurements possible by combining one or more interchangeable rods.
- Each interchangeable rod is marked with its measuring range.
- For models supplied with more than one interchangeable rod, the full measuring range is achieved by combining spacing collars with the rods.
- Both micrometer head and rods are satin-chrome finished throughout.
- The sleeve is rotated to adjust the index line position when setting to a length standard.
- Setting ring (nominal size below 300mm), CERA Inside Micro Checker, and Gauge Block accessory set are provided as a reference gage for datum adjustment (refer to page C-47, C-26, and E-17 - E20 for details).

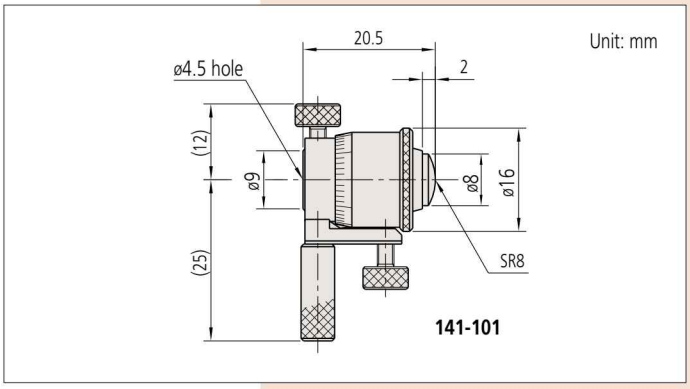
When using one of the extension rods supplied
(Measuring range 43 to 50mm)

141-101
When using one of the extension rods supplied
(Measuring range 25 to 32mm)

Technical Data

Accuracy
±(6+maximum measurement length/50)µm
(fraction rounded up)

DIMENSIONS



SPECIFICATIONS

Metric

Order No.	Range	Graduation	Micrometer head stroke	Remarks
141-001 / 141-003*	25 - 32mm	0.01mm	7mm	—
141-101 / 141-103*	25 - 50mm			with 2 rods
141-025 / 141-027*	50 - 63mm		13mm	—
141-205 / 141-211*	50 - 200mm			with 3 rods
141-206 / 141-212*	50 - 300mm			with 5 rods
141-009 / 141-011*	200 - 225mm		25mm	—
141-117	200 - 500mm			with 3 rods
141-118	200 - 1000mm			with 8 rods

* with carbide measuring face

Inch

Order No.	Range	Graduation	Micrometer head stroke	Remarks
141-002 / 141-004*	1″ - 1.25″	.001″	.25″	—
141-102 / 141-104*	1″ - 2″			with 2 rods
141-026 / 141-028*	2″ - 2.5″		.5″	—
141-208 / 141-214*	2″ - 8″			with 3 rods
141-233 / 141-215*	2″ - 12″			with 5 rods
141-010 / 141-012*	8″ - 9″		1″	—
141-121	8″ - 20″			with 3 rods
141-122	8″ - 40″			with 8 rods

* with carbide measuring face

An inspection certificate is supplied as standard.
Refer to page X for details.

Application

– The two auxiliary gauge blocks are held against the appropriate measuring blocks by the support clamps, which also provide accurate location for the inside micrometer by means of the V-grooved extensions.

Optional accessories

• Wooden box
For 515-585: 602160
For 515-586: 602163

Inside Micro Checker SERIES 515

• The Inside Micro Checker is designed to act as a setting standard for inside micrometers.

• Each measuring block is made of zirconia-based ceramic and it is free from deterioration and dimensional changes over time.

515-585

Standard accessory set

Support clamps	**940286***	Pair
Auxiliary block 10mm		2pcs.
Collar	**602195**	2pcs.
Clamp screwdriver	**600324**	1pc.

* Order No. is equivalent to a pair (2pcs.)

SPECIFICATIONS

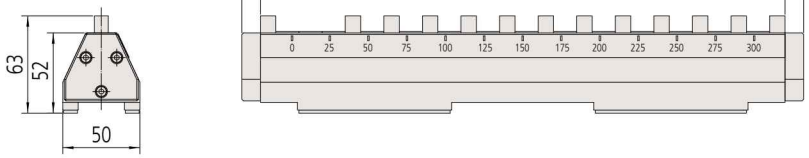
Order No.	Length to check	Block pitch accuracy
515-585	25-300mm	±(1+L/150) µm L: Length to check (mm)
515-586	25-600mm	

Please note that the bottom surface and the contact faces are not perpendicular to each other.

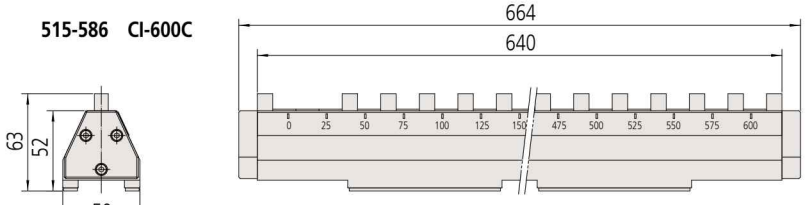
DIMENSIONS

Unit: mm

515-585 CI-300C



515-586 CI-600C



C

Bore Gages

For easy and accurate measurement of inside diameters

Bore Gages
SERIES 526 — for Extra Small Holes

- These gages are designed to measure the diameters of very small holes. The radial displacement of the split-ball anvil is converted to axial displacement of the measuring rod, which is shown on the dial indicator.
- Alternative indicators may be used in place of those recommended*.
  * Some indicators and protection covers cannot be used with these bore gages. Contact a Mitutoyo sales office if considering the use of dial or digimatic indicators other than the recommended models.
- An optional stand (**215-120-10**) is available for efficient measurement of multiple small holes. Refer to page C-30 for details.

526-170

* The dial indicator and the protection cover are optional.

SPECIFICATIONS

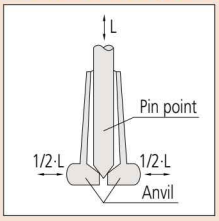
Metric

Order No.	Range	Content of set						Probing depth
		Bore gage	Dial indicator	Dial protection cover	Anvil	Pin point	Setting ring	
526-170	0.95-1.55mm	**526-170**	Not supplied	Not supplied	5 pcs.	1 pc.	5 pcs.	11.5mm
526-160	1.50-4.00mm	**526-160**			9 pcs.	2 pcs.	9 pcs.	17.5, 22.5mm
526-150	3.70-7.30mm	**526-150**			7 pcs.	1 pc.	7 pcs.	32.0mm
526-172	0.95-1.55mm	**526-170**	**2109SB-10** (Graduation 0.001mm)	**21DZA000**	5 pcs.	1 pc.	5 pcs.	11.5mm
526-162	1.50-4.00mm	**526-160**			9 pcs.	2 pcs.	9 pcs.	17.5, 22.5mm
526-152	3.70-7.30mm	**526-150**			7 pcs.	1 pc.	7 pcs.	32.0mm
526-173	0.95-1.55mm	**526-170**	**2046SB** (Graduation: 0.01mm)	**21DZA000**	5 pcs.	1 pc.	5 pcs.	11.5mm
526-163	1.50-4.00mm	**526-160**			9 pcs.	2 pcs.	9 pcs.	17.5, 22.5mm
526-153	3.70-7.30mm	**526-150**			7 pcs.	1 pc.	7 pcs.	32.0mm

Inch

Order No.	Range	Content of set						Probing depth
		Bore gage	Dial indicator	Dial protection cover	Anvil	Pin point	Setting ring	
526-175	.037-.061"	**526-175**	Not supplied	Not supplied	5 pcs.	1 pc.	5 pcs.	.45"
526-165	.06-.157"	**526-165**			9 pcs.	2 pcs.	9 pcs.	.68,.88"
526-155	.145-.29"	**526-155**			7 pcs.	1 pc.	7 pcs.	1.25"
526-176	.037-.061"	**526-175**	**2923SB-10** (Graduation: .0001")	**21DZA000**	5 pcs.	1 pc.	5 pcs.	.45"
526-166	.06-.157"	**526-165**			9 pcs.	2 pcs.	9 pcs.	.68,.88"
526-156	.145-.29"	**526-155**			7 pcs.	1 pc.	7 pcs.	1.25"

Measurement principle



Technical Data

Accuracy
Metric models: 4µm
Inch models: .00016"
Repeatability
Metric models: 2µm
Inch models: .00008"

Optional Accessories

– : Dial indicator (See Chapter F)
21DZA000: Dial protection cover
215-120-10: Stand for small holes

Recommended dial indicators (see Chapter F)

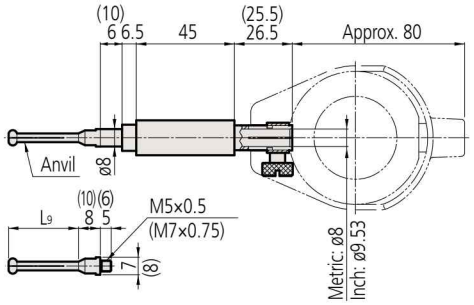
Metric models: **2046SB** (0.01mm)
2972TB (0.01mm - One-revolution type)
2109SB-10 (0.001mm)
2900SB-10 (0.001mm - One-revolution type)
Inch models: **2922SB** (.0005")
2977TB (.0005" - One-revolution type)
2923SB-10 (.0001")
2910SB-10 (.0001" - One-revolution type)

Recommended digimatic indicators (see Chapter F)

Metric models: **543-310B** (ID-C112GXB: 0.001mm)
Inch models: **543-312B** (ID-C112GEXB: 0.001mm/.00005")
* Indicators equipped with rubber bellows, such as water-proof types, cannot be used.

DIMENSIONS

Unit: mm

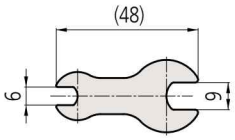


( ): **3.7 - 7.3mm / .145 - .29 range model**

STANDARD ACCESSORIES

Bore gage (Main body)	Anvil				Pin point	Setting ring	Spanner
	Marked No.	Parts No.	Measuring range	L9		mm/inch	Parts No.
526-170 526-175	1.0	**201414**	0.95-1.15mm/.037-.045"	11.5mm/.45"	**201435**	1.0mm/.04"	**210188**
	1.1	**201415**	1.07-1.25mm/.042-.049"			1.1mm/.045"	
	1.2	**201416**	1.17-1.35mm/.046-.053"			1.2mm/.05"	
	1.3	**201417**	1.27-1.45mm/.050-.057"			1.3mm/.055"	
	1.4	**201418**	1.37-1.55mm/.054-.061"			1.4mm/.06"	
526-160 526-165	1.75	**201419**	1.50-1.90mm/.060-.075"	17.5mm/.68"	**201436**	1.75mm/.07"	**210188**
	2.00	**201420**	1.80-2.20mm/.070-.085"			2.00mm/.08"	
	2.25	**201421**	2.05-2.45mm/.080-.095"			2.25mm/.09"	
	2.50	**201422**	2.25-2.75mm/.090-.105"			2.50mm/.10"	
	2.75	**201423**	2.50-3.00mm/.100-.115"	22.5mm/.88"	**201437**	2.75mm/.11"	
	3.00	**201424**	2.75-3.25mm/.110-.125"			3.00mm/.12"	
	3.25	**201425**	3.00-3.50mm/.120-.135"			3.25mm/.13"	
	3.50	**201426**	3.25-3.75mm/.130-.145"			3.50mm/.14"	
	3.75	**201427**	3.50-4.00mm/.140-.157"			3.75mm/.15"	
526-150 526-155	4.0	**201428**	3.70-4.30mm/.145-.170"	32.0mm/1.25"	**201438**	4.0mm/.16"	**210188**
	4.5	**201429**	4.20-4.80mm/.165-.190"			4.5mm/.18"	
	5.0	**201430**	4.70-5.30mm/.185-.210"			5.0mm/.20"	
	5.5	**201431**	5.20-5.80mm/.205-.230"			5.5mm/.22"	
	6.0	**201432**	5.70-6.30mm/.225-.250"			6.0mm/.24"	
	6.5	**201433**	6.20-6.80mm/.245-.270"			6.5mm/.26"	
	7.0	**201434**	6.70-7.30mm/.265-.290"			7.0mm/.28"	

Spanner
No.210188



Thickness: 1.5

C

Mitutoyo

Bore Gages

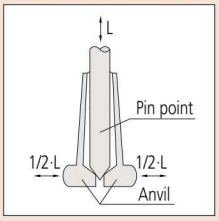
For easy and accurate measurement of inside diameters

Bore Gages
SERIES 526 — for Extra Small Holes

526-101

* The dial indicator and the protection cover are optional.

Measurement principle



Technical Data

Accuracy
Metric models: 7-10mm, 4µm / 10-18mm, 6µm
Inch models: .3-.4", .00016" / .4-.7", .00024"
Repeatability
Metric models: 2µm
Inch models: .00008"

Optional accessories

–: Dial indicator (See Chapter F)
21DZA000: Dial protection cover
–: Setting ring (See page C-47)
215-120-10: Stand for small holes

Recommended dial indicators (see Chapter F)

Metric models: **2046SB** (0.01mm)
2972TB (0.01mm - One-revolution type)
2109SB-10 (0.001mm)
2900SB-10 (0.001mm - One-revolution type)
Inch models: **2922SB** (.0005")
2977TB (.0005" - One-revolution type)
2923SB-10 (.0001")
2910SB-10 (.0001" - One-revolution type)

Recommended digimatic indicators (see Chapter F)

Metric models: **543-310B** (ID-C112GXB, 0.001mm)
Inch models: **543-312B** (ID-C112GEXB, 0.001mm/.00005")
* Indicators equipped with rubber bellows, such as water-proof types, cannot be used.

SPECIFICATIONS

Metric

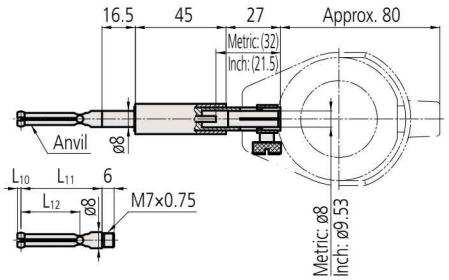
Order No.	Range	Content of set				Probing depth
		Bore gage	Dial indicator	Dial protection cover	Anvil	
526-101	7-10mm	**526-101**	Not supplied	Not supplied	6 pcs.	32mm
526-102	10-18mm	**526-102**			8 pcs.	62mm
526-124	7-10mm	**526-101**	**2109SB-10** (Graduation: 0.001mm)	**21DZA000**	6 pcs.	32mm
526-125	10-18mm	**526-102**			8 pcs.	62mm
526-126	7-10mm	**526-101**	**2046SB** (Graduation: 0.01mm)	**21DZA000**	6 pcs.	32mm
526-127	10-18mm	**526-102**			8 pcs.	62mm

Inch

Order No.	Range	Content of set				Probing depth
		Bore gage	Dial indicator	Dial protection cover	Anvil	
526-103	.3-.4"	**526-103**	Not supplied	Not supplied	6 pcs.	1.25"
526-104	.4-.7"	**526-104**			8 pcs.	2.42"
526-122	.3-.4"	**526-103**	**2923SB-10** (Graduation: .0001")	**21DZA000**	6 pcs.	1.25"
526-123	.4-.7"	**526-104**			8 pcs.	2.42"
526-119	.3-.4"	**526-103**	**2922SB** (Graduation: .0005")	**21DZA000**	6 pcs.	1.25"
526-120	.4-.7"	**526-104**			8 pcs.	2.42"

DIMENSIONS

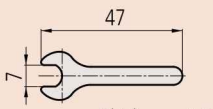
Unit: mm



STANDARD ACCESSORIES

Bore gage (Main body)	Anvil						Spanner
	Marked No.	Parts No.	Measuring range	L_{10}	L_{11}	L_{12}	Parts No.
526-101 **526-103**	1	**102469**	7.0 - 7.5mm/.28 - .30"	1.8mm/.07"	40mm/1.57"	29.2mm/1.15"	**102148**
	2	**102470**	7.5 - 8.0mm/.30 - .32"				
	3	**102471**	8.0 - 8.5mm/.32 - .34"				
	4	**102472**	8.5 - 9.0mm/.34 - .36"				
	5	**102473**	9.0 - 9.5mm/.36 - .38"				
	6	**102474**	9.5 - 10.0mm/.38 - .40"				
526-102 **526-104**	1	**102454**	10 - 11mm/.40 - .44"	2.1mm/.08"	46mm/1.81"	38mm/1.50"	**102148**
	2	**102455**	11 - 12mm/.44 - .48"	2.7mm/.11"			
	3	**102456**	12 - 13mm/.48 - .52"				
	4	**102457**	13 - 14mm/.52 - .56"				
	5	**102458**	14 - 15mm/.56 - .60"				
	6	**102459**	15 - 16mm/.60 - .64"				
	7	**102460**	16 - 17mm/.64 - .68"				
	8	**102461**	17 - 18mm/.68 - .72"				

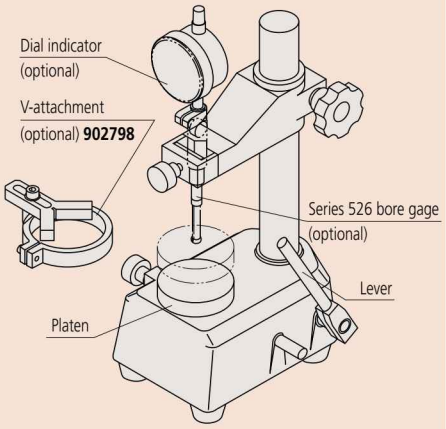
Spanner
No.102148



Thickness: 1.5

Operating method

Pulling the lever forwards moves the platen upwards and the instrument goes into measurement mode.
The V-attachment aids positioning the workpiece on the platen and is useful when measuring a large number of the same size of workpiece.



Bore Gage Stand
SERIES 215

- Optimal for efficient measurement of multiple small holes with a bore gage (series 526).
- V-attachment (**902798**) is available for centering a large number of workpieces quickly (option).
- With platen (60mm).

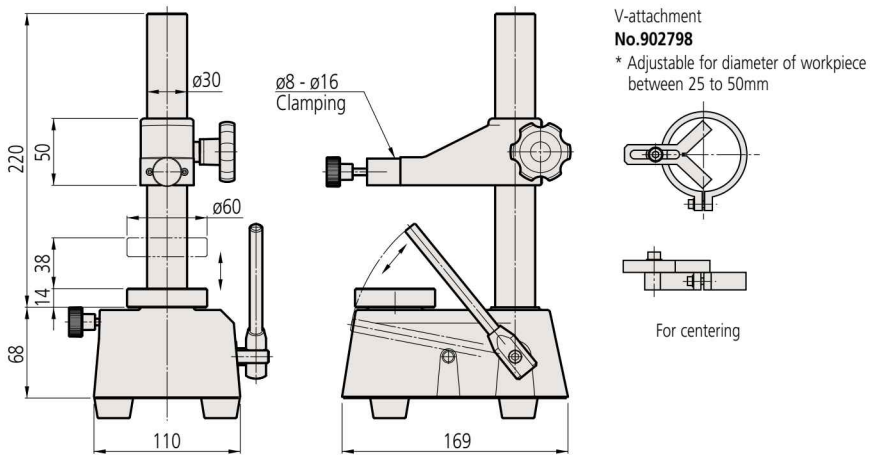
215-120-10

SPECIFICATIONS

Order No.	Measuring table displacement	Measuring table
215-120-10	38 mm	Flat measuring table (ø60mm)

DIMENSIONS

Unit: mm



C

Bore Gages

For easy and accurate measurement of inside diameters

Bore Gages
SERIES 511 — for Small Holes

- Alternative indicators may be used in place of those recommended*.
  * Some indicators and protection covers cannot be used with these bore gages. Contact a Mitutoyo sales office if considering the use of dial or digimatic indicators other than the recommended models.
- Setting Rings are available to aid in accurately setting a gage before making a measurement. (For details, refer to page C-47)

511-201

The dial indicator and protection cover are optional.

Close-up view of anvils and contact points

Technical Data

Accuracy: Metric models: 5µm
Inch models: .0002"
Repeatability: Metric modes: 2µm
Inch models: .00008"
Adjacent error: Metric modes: 2µm
Inch models: .00008"

Optional Accessories

– : Dial indicator (See Chapter F)
21DZA000: Dial protection cover

Recommended digimatic indicators (see Chapter F)

Metric models: **2046SB** (0.01mm)
2972TB (0.01mm - One-revolution type)
2109SB-10 (0.001mm)
2900SB-10 (0.001mm - One-revolution type)
Inch models: **2922SB** (.0005")
2977TB (.0005" - One-revolution type)
2923SB-10 (.0001")
2910SB-10 (.0001" - One-revolution type)

Recommended digimatic indicators (see Chapter F)

Metric models: **543-310B** (ID-C112GXB: 0.001mm)
Inch models: **543-312B** (ID-C112GEXB: 0.001mm/.00005")
* Indicators equipped with rubber bellows, such as water-proof types, cannot be used.

SPECIFICATIONS

Metric

Order No.	Range	Stroke of contact point	Measuring force	Guide force	Content of set					Probing depth
					Bore gage	Dial indicator	Dial protection cover	Anvil	Interchangeable Washer	
511-209	6-10mm	0.5mm	2N or less	—	**511-209**	Not supplied	Not supplied	9 pcs.	Not supplied	50mm
511-201	10-18.5mm	0.6mm		6N or less	**511-201**				1 pc.	100mm
511-210	6-10mm	0.5mm	2N or less	—	**511-209**	**2109SB-10** (Graduation: 0.001mm)	**21DZA000**	9 pcs.	Not supplied	50mm
511-203	10-18.5mm	0.6mm		6N or less	**511-201**				1 pc.	100mm
511-211	6-10mm	0.5mm	2N or less	—	**511-209**	**2046SB** (Graduation: 0.01mm)	**21DZA000**	9 pcs.	Not supplied	50mm
511-204	10-18.5mm	0.6mm		6N or less	**511-201**				1 pcs.	100mm

Inch

Order No.	Range	Stroke of contact point	Measuring force	Guide force	Content of set					Probing depth
					Bore gage	Dial indicator	Dial protection cover	Anvil	Interchangeable Washer	
511-214	.24-.4"	.020"	2N or less	—	**511-214**	Not supplied	Not supplied	9 pcs.	Not supplied	2"
511-205	.4-.74"	.024"		6N or less	**511-205**				1 pc.	4"
511-212	.24-.4"	.020"	2N or less	—	**511-214**	**2923SB-10** (Graduation: .0001")	**21DZA000**	9 pcs.	Not supplied	2"
511-206	.4-.74"	.024"		6N or less	**511-205**				1 pc.	4"
511-213	.24-.4"	.020"	2N or less	—	**511-214**	**2922SB** (Graduation: .0005")	**21DZA000**	9 pcs.	Not supplied	2"
511-207	.4-.74"	.024"		6N or less	**511-205**				1 pc.	4"