

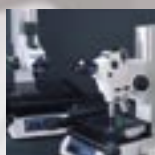
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Profile Projectors



Microscopes



New Products

PV-5110



MF



MF-U



PJ-A3000

SERIES 302 — Profile Projectors

FEATURES

- The PJ-A3000 Series profile projectors are medium-size models that feature high versatility and easy operation.
- Easy-to-read digital XY counter is located near the projection screen to minimize eye movement.
- Digital readout protractor screen facilitates angle measurement.



PJ-A3010F-200



PJ-A3005D-50
PJ-A3005D-50E
PJ-A3005R-50



PJ-A3010F-100
PJ-A3010F-100E



PJ-A3005F-150
PJ-A3005F-150E



PJ-A3010F-200
PJ-A3010F-200E

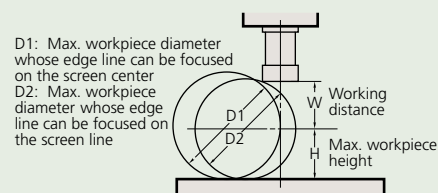


PJ-A3000

Technical Data

Projected image:	Inverted image
Protractor screen	
• Effective diameter:	315mm (12.4")
• Screen material:	Fine ground glass
• Screen rotation:	±360°, fine feed and clamp
• Angle reading:	Digital counter (LED)
	Resolution: 1' or 0.01° (switchable)
	Range: ±370°
	ABS/INC mode switching, Zero Set
• Reference line:	Cross hair line
Projection lens:	10X (172-202)
	Optional: 20X, 50X, 100X
Magnification accuracy	
• Contour illumination:	±0.1% or less
• Surface illumination:	±0.15% or less
Maximum workpiece height:	Refer to the projection capacity (H) below.
Contour illumination	
• Light source:	Halogen bulb (24V, 150W)
• Optical system:	Telecentric system
• Functions:	2-step (High/Low) brightness switch, Heat-absorbing filter, Cooling fan
Surface illumination	
• Light source:	Halogen bulb (24V, 150W)
• Optical system:	Vertical illumination with adjustable condenser lens
	Heat-absorbing filter, Cooling fan
• Functions:	Manual focus
Focusing:	Manual focus
Resolution:	0.001mm or .0001"/0.001mm
	(.00005"/0.001mm: digital head)
Power supply:	100 - 240V AC, 50/60Hz
Mass:	105kg - 140kg

Projection Capacity



Unit: mm

	Magnification			
	10X	20X	50X	100X
View field	ø31.5	ø15.7	ø6.3	ø3.1
W	66 (20)	32.5 (2)	12.6	5
H -50 models*	123.5	123.5	123.5	123.5
-100 models	91	91	91	91
-150 models	103.5	103.5	103.5	103.5
200 models	92.5	92.5	92.5	92.5
D1 -50 models*	224 (198)	87 (61)	27	10
-100 models	182	87 (61)	27	10
-150 models	207 (198)	87 (61)	27	10
200 models	185	87 (61)	27	10
D2	69 (23)	69 (23)	25	10

(): When using surface illumination
*Including PJ-A3000

Optional Accessory

172-203:	20X projection lens set
172-204:	50X projection lens
172-207:	100X projection lens
172-229:	Oblique illumination mirror for 10X lens
172-230:	Oblique illumination mirror for 20X lens
172-116:	Standard scale (50mm)
172-117:	Standard scale (2")
172-118:	Reading scale (200mm)
172-161:	Reading scale (300mm)
172-119:	Reading scale (8")
172-162:	Reading scale (12")
932105:	Overlay chart set
172-160-2:	Green filter (for PJ-A3000, -50 models)
172-160-3:	Green filter (for -100, -150, -200 models)
512305:	Halogen bulb (24V, 150W)
965012:	SPC cable (2m) for angle display output

Fixture and Stage accessory

176-106:	Rotary table (Effective diameter: 66mm)
172-196:	Rotary table (Effective diameter: 100mm)
172-198:	Rotary table with fine feed wheel (Effective diameter: 100mm)
176-105:	Swivel center support (Max. workpiece dia.: 70mm)
172-197:	Swivel center support (Max. workpiece dia.: 80mm)
176-107:	Holder with clamp
172-378:	V-block with clamp (Max. workpiece dia.: 25mm)
999678:	Fixture mount adapter

Availability	PJ-A3000 PJ-A3005R-50 PJ-A3005D-50/E	PJ-A3005F-150/E PJ-A3010F-100/E PJ-A3010F-200/E
176-106	✓	—
172-196	—	✓*
172-198	—	✓*
176-105	✓	✓*
172-197	—	✓*
176-107	✓	✓*
176-378	✓	✓*

* Fixture mount adapter (**999678**) is required for PJ-A3010F-200/E



QM-Data200
2-D data processing unit.
(Refer to the page 384 for more details.)



Optoeye
Edge detection system for QM-Data 200
(Refer to the page 385 for more details.)

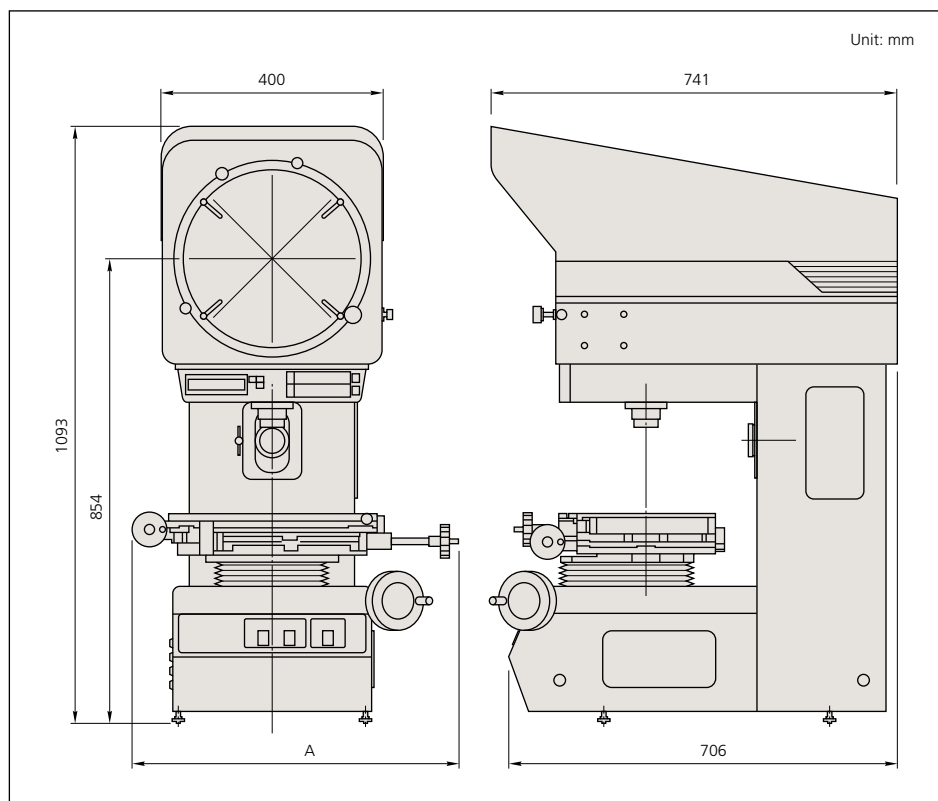
SPECIFICATIONS

Model No.	PJ-A3005R-50	PJ-A3005D-50	PJ-A3005R-50E	PJ-A3010F-100	PJ-A3010F-100E
Order No. (metric)	302-709*	302-704*	302-708*	302-703*	302-707*
Order No. (inch/metric)	302-719*	302-714*	302-718*	302-713*	—
XY stage travel range	50 x 50mm	50 x 50mm	50 x 50mm	100 x 100mm	100 x 100mm
Measurement method	Analog head	Rotary encoder	Rotary encoder	Linear encoder	Linear encoder
Floating function	—	—	—	X and Y axes	X and Y axes
XY stage table top size	152 x 152mm	152 x 152mm	152 x 152mm	250 x 250mm	250 x 250mm
XY stage effective area	82 x 82mm	82 x 82mm	82 x 82mm	142 x 142mm	142 x 142mm
Stage glass No.	380405	380405	380405	12BAE041	12BAE041
Swiveling function	—	—	—	—	—
Max workpiece loading	8kg	8kg	8kg	10kg	10kg
Remarks	w/o digital counter	—	w/o angle counter	—	w/o angle counter

Model No.	PJ-A3005F-150	PJ-A3005F-150E	PJ-A3010F-200	PJ-A3010F-200E	PJ-A3000
Order No. (metric)	302-702*	302-706*	302-701*	302-703*	302-707*
Order No. (inch/metric)	302-712*	—	302-711*	—	—
XY stage travel range	150 x 50mm	150 x 50mm	200 x 100mm	200 x 100mm	Fixed
Measurement method	Linear encoder	Linear encoder	Linear encoder	Linear encoder	—
Floating function	X and Y axes	X and Y axes	X and Y axes	X and Y axes	—
XY stage table top size	280 x 152mm	280 x 152mm	380 x 250mm	380 x 250mm	160 x 145mm
XY stage effective area	185 x 84mm	185 x 84mm	266 x 170mm	266 x 170mm	ø70mm
Stage glass No.	381349	381349	382762	382762	200673
Swiveling function	—	—	±3°	±3°	—
Max workpiece loading	10kg	10kg	15kg	15kg	8kg
Remarks	—	w/o angle counter	—	w/o angle counter	w/o angle counter

* To denote your AC line voltage add the following suffixes to the order No. (e.g.: **302-700A**):
A for UL/CSA, D for CEE, E for BS, DC for China, K for EK, No suffix is required for JIS/100V

DIMENSION



PJ-H30

SERIES 303 — Profile Projectors

By separating axial motion, and stabilizing the XY measuring table in the vertical direction, high measuring accuracy of $(3+0.02L)\mu\text{m}$ has been achieved on the PJ-H30 Series Profile Projectors. Focusing is accomplished by moving the screen head itself up & down with the hand wheel or motorized unit. The power focusing (PJ-H30D type) provides higher performance.



Adjustable / oblique switchable surface illumination



Vertical illumination



Oblique illumination



PJ-H30A3017B

XY stage travel range: 300 x 170mm

Selection of XY stage



PJ-H30A505B

XY stage travel range: 50 x 50mm



PJ-H30A1010B

XY stage travel range: 100 x 100mm



PJ-H30A2010B

XY stage travel range: 200 x 100mm



PJ-H30A2017B

XY stage travel range: 200 x 170mm

Selection of machine type

	PJ-H30E type	PJ-H30A type	PJ-H30B type	PJ-H30D type
Type of screen	Fixed screen	Protractor screen	Protractor screen	Protractor screen
Focus operation	Manual	Manual	Manual	Power drive
Edge detection system	—	—	OPTOEYE (built-in)	OPTOEYE (built-in)

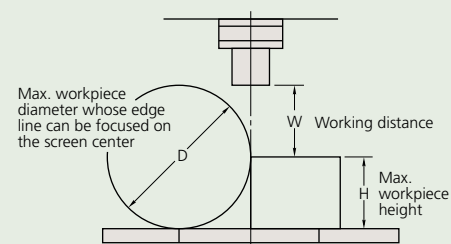
FEATURES

- Newly designed optical system with high NA lenses provide drastically brighter and clearer screen images during surface illumination.
- The three-lens mounting turret includes a 10X lens as standard. Four types of projection lenses (5X, 20X, 50X, 100X) are available.

Technical Data

Projected image:	Erect image
Protractor screen	<ul style="list-style-type: none"> • Effective diameter: 306mm (12") • Screen material: Fine ground glass • Screen rotation: $\pm 360^\circ$, fine feed and clamp • Angle display: Digital counter (LED)
Resolution:	1' or 0.01° (switchable)
Range:	$\pm 370^\circ$
Reference line:	ABS/INC mode switching, Zero Set
Projection lens:	Cross hair line
Lens mount:	10X (172-472)
Magnification accuracy:	Optional: 2X, 20X, 50X, 100X
Contour illumination:	3-lens mounting turret
• Contour illumination:	$\pm 0.1\%$ or less
• Surface illumination:	$\pm 0.15\%$ or less
Maximum workpiece height:	105mm
Contour illumination	
• Light source:	Halogen bulb (24V, 150W)
• Optical system:	Zoom Telecentric system
• Functions:	Brightness adjustment, Heat-absorbing filter, Cooling fan
Surface illumination	
• Light source:	Halogen bulb (24V, 150W)
• Optical system:	Vertical / oblique illumination with an adjustable condenser lens
• Functions:	Non-stepped brightness adjustment, Heat-absorbing filter, Cooling fan
Manual focus or Power drive	
Resolution:	0.001mm or .0001"/0.001mm
Power supply:	100 - 240V AC, 50/60Hz
Mass:	176kg - 212kg

Projection Capacity



Unit: mm

	Magnification				
	5X	10X	20X	50X	100X
View field	$\phi 61.2$	$\phi 30.6$	$\phi 15.3$	$\phi 6.12$	$\phi 3.06$
H	100	100	100	100	100
W	66	70.5	56.5	50	50
D	148	197	167	114	123

Optional Accessory

172-271:	5X projection lens
172-473:	20X projection lens
172-474:	50X projection lens
172-475:	100X projection lens
172-555:	Oblique illumination adapter
172-116:	Standard scale (50mm)
172-117:	Standard scale (2")
172-118:	Reading scale (200mm)
172-161:	Reading scale (300mm)
172-119:	Reading scale (8")
172-162:	Reading scale (12")
932105:	Overlay chart set
12AAG981:	Green filter
172-259:	Polarizing unit
965014:	SPC cable (2m)
12AAD196:	QM-Data 200 connecting kit (for Type T4 only)
990744:	Hood (lager type)
172-269:	Machine stand
990600:	External counter zero switch
515530:	Halogen bulb (24V, 150W)

Fixture and Stage accessory

172-198:	Rotary table (Effective diameter: 84mm)
176-305:	Rotary table (Effective diameter: 183mm)
176-306:	Rotary table (Effective diameter: 240mm)
176-105:	Swivel center support (Max. workpiece dia.: 70mm)
172-197:	Swivel center support (Max. workpiece dia.: 80mm)
176-107:	Holder with clamp
172-378:	V-block with clamp (Max. workpiece dia.: 25mm)
176-317:	Fixture mount adapter
176-304:	Fixture mount adapter

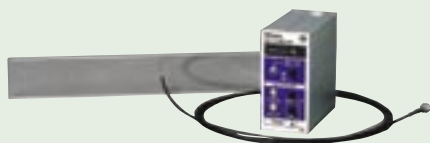
Availability	Size of XY stage		
	505 1010	505 1010 2010	2017 3017
172-198	✓	✓**	✓***
176-305	—	✓**	—
176-306	—	—	✓
176-105	✓*	✓**	✓***
172-197	✓*	✓**	✓***
176-107	✓*	✓**	✓***
176-378	✓*	✓**	✓***

* Need to use with Rotary table **172-198**.
 ** Fixture mount adapter (**176-317**) is required.
 *** Fixture mount adapter (**176-304**) is required.



QM-Data200

2-D data processing unit
 (Refer to the page 384 for more details.)



Optoeye

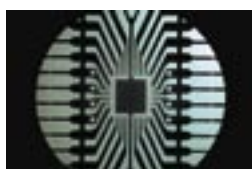
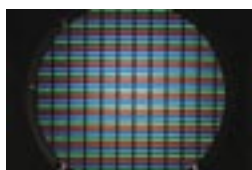
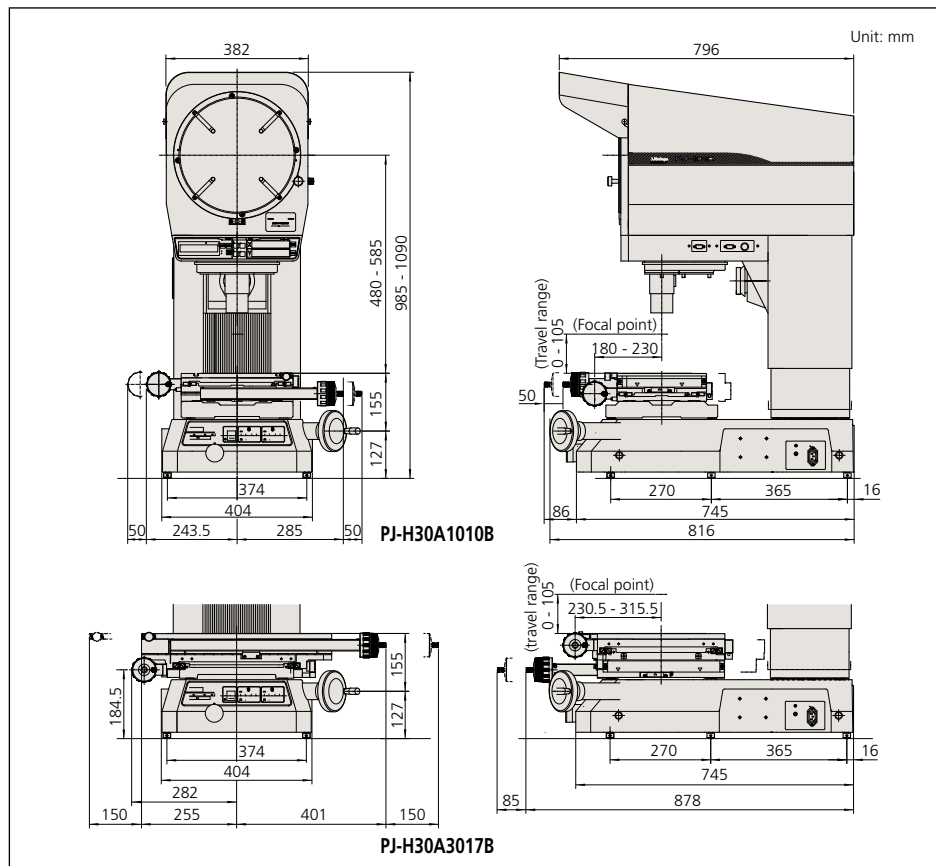
Edge detection system for QM-Data 200
 (Refer to the page 385 for more details.)

SPECIFICATIONS

Model No.	PJ-H30_505B	PJ-H30_1010B	PJ-H30_2010B	PJ-H30_2017B	PJ-H30_3017B
Order No.	PJ-H30E type	303-701*	303-702*	303-703*	303-705*
	PJ-H30A type	303-711*	303-712*	303-713*	303-715*
	PJ-H30B type	303-721*	303-722*	303-723*	303-725*
	PJ-H30D type	303-731*	303-732*	303-733*	303-735*
XY stage travel range	50 x 50mm	100 x 100mm	200 x 100mm	200 x 170mm	300 x 170mm
Accuracy (at 20°C)	(3+0.02L)μm, L = Measured length (mm)				
Measurement method	Linear encoder	Linear encoder	Linear encoder	Linear encoder	Linear encoder
Floating function	X and Y axes	X and Y axes	X and Y axes	X and Y axes	X and Y axes
XY stage table top size	300 x 240mm	300 x 240mm	350 x 280mm	410 x 342mm	510 x 342mm
XY stage effective area	180 x 150mm	180 x 150mm	250 x 150mm	270 x 240mm	370 x 240mm
Stage glass No.	384111	381952	381952	381952	384261
Swiveling function	±3°	±3°	±3°	±5°	±5°
Max workpiece loading	10kg	10kg	10kg	15kg	15kg
Remarks	E-type: with fixed screen A-type: with protractor screen B-type: with protractor screen and built-in Optoeye edge sensor D-type: with protractor screen, built-in Optoeye edge sensor and Power focus				

* To denote your AC line voltage add the following suffixes to the order No. (e.g.: **302-701A**):
A for UL/CSA, **D** for CEE, **E** for BS, **DC** for China, **K** for EK, **No suffix** is required for JIS/100V

DIMENSION



PJ-500

SERIES 303 — Profile Projectors

FEATURES

- Large-diameter (508mm) screen with staggered cross hairs minimizes errors in aligning the image of a workpiece.
- Digital readout protractor and built-in XY counter for efficient measurement.
- Motor-controlled XY table for speedy measurement.
- Three-lens mount turret includes 10X and 20X projection lens as standard.
- Projection lens has a long working distance for efficient inspection.
- Provided with SPC data output ports.



PJ-500



PJ-500

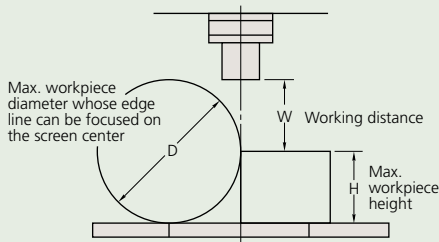


PJ-500L

Technical Data

- Projected image: Inverted image
 Protractor screen
- Effective diameter: 508mm (20")
 - Screen material: Fine ground glass
 - Screen rotation: $\pm 360^\circ$, fine feed and clamp
 - Angle reading: Digital counter (LED)
 Resolution: 1' or 0.01° (switchable)
 Range: $\pm 370^\circ$
 ABS/INC mode switching, Zero Set
 Cross hair line
 - Reference line: Cross hair line
- Projection lens: 10X (**172-281**), 20X (**172-282**)
 Optional: 5X, 50X, 100X
- Magnification accuracy
- Contour illumination: $\pm 0.1\%$ or less
 - Surface illumination: $\pm 0.15\%$ or less
- Maximum workpiece height: 205mm (98.2mm: for 5X lens)
- Contour illumination
- Light source: Halogen bulb (24V, 150W)
 - Optical system: Zoom Telecentric system
 - Functions: 2-step (High/Low) brightness switch, Heat-absorbing filter, Cooling fan
- Surface illumination
- Light source: Halogen bulb (24V, 150W)
 - Optical system: Vertical illumination
 - Functions: Heat-absorbing filter, Cooling fan
- Focusing: Power drive
 Resolution: 0.001mm or .0001"/0.001mm
 Power supply: 100 - 240V AC, 50/60Hz
 Mass: 660kg (PJ-500), 700kg (PJ-500L)

Projection Capacity



Unit: mm

	Magnification				
	5X	10X	20X	50X	100X
View field	ø101.6	ø50.8	ø25.4	ø10.16	ø5.08
H	156.8	101	90	82	69
W	98.2	205	205	205	205
D	196.4	287	308	260	193

Optional Accessory

172-280:	5X projection lens
172-283:	50X projection lens
172-284:	100X projection lens
172-287:	Oblique surface illumination unit
172-116:	Standard scale (50mm)
172-117:	Standard scale (2")
172-118:	Reading scale (200mm)
172-161:	Reading scale (300mm)
172-119:	Reading scale (8")
172-162:	Reading scale (12")
172-286:	Green filter
965014:	SPC cable (2m)
172-285:	Polaroid Photographic Attachment
172-288:	Controller stand
515530:	Halogen bulb (24V, 150W)

Fixture and Stage accessory

172-196:	Rotary table (Effective diameter: 100mm)
172-289:	Rotary table (Effective diameter: 200mm)
172-197:	Swivel center support (Max. workpiece dia.: 80mm)
176-107:	Holder with clamp
172-378:	V-block with clamp (Max. workpiece dia.: 25mm)
999678:	Fixture mount adapter for PJ-500
999904:	Fixture mount adapter for PJ-500L

Availability	PJ-500	PJ-500L
172-196	✓*	—
172-289	✓	✓**
172-197	✓*	—
176-107	✓*	—
176-378	✓*	—

*Fixture mount adapter (**999678**) is required.
Fixture mount adapter (999904**) is required.



QM-Data200

2-D data processing unit.
(Refer to the page 384 for more details.)



Optoeye

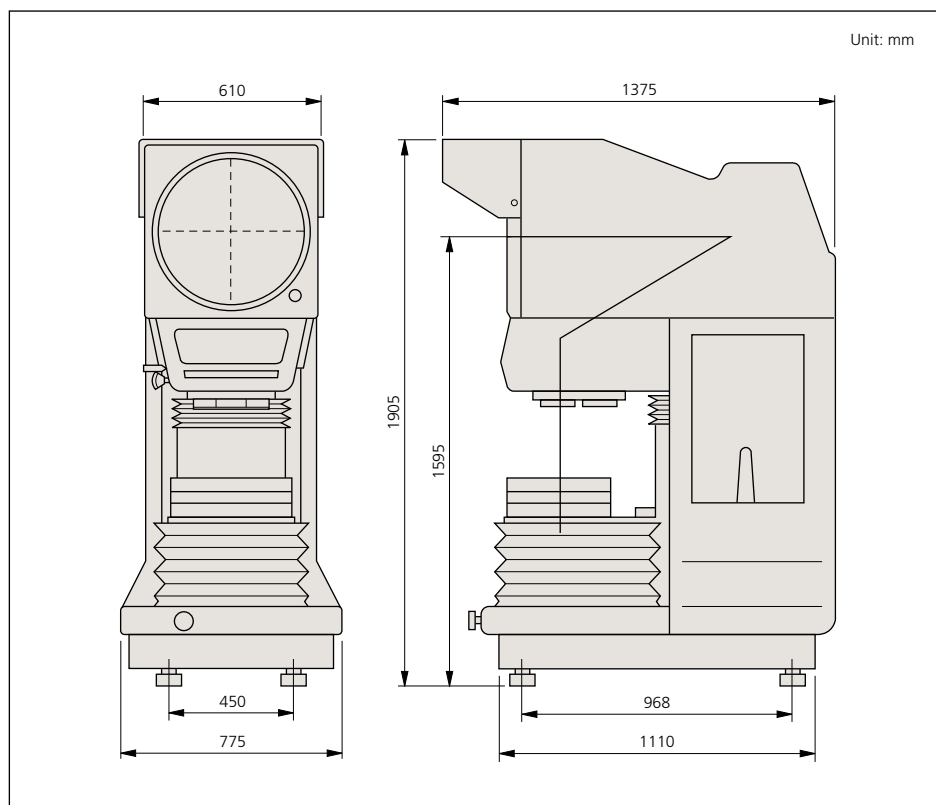
Edge detection system for QM-Data 200
(Refer to the page 385 for more details.)

SPECIFICATIONS

Model No.	PJ-500	PJ-500L
Order No. (metric)	303-801*	303-802*
Order No. (inch/metric)	303-811*	—
XY stage travel range	200 x 100mm	350 x 200mm
Accuracy (at 20°C)	(3+0.04L)μm, L = Measured length (mm)	
Measurement method	Linear encoder	Linear encoder
XY stage table top size	430 x 254mm	620 x 420mm
XY stage effective area	270 x 170mm	470 x 320mm
Stage glass No.	381952	382255
Swiveling function	±3°	±3°
Max workpiece loading	20kg	10kg
Remarks	Joystick control	Joystick control

* To denote your AC line voltage add the following suffixes to the order No. (e.g.: **302-700A**):
A for UL/CSA, **D** for CEE, **E** for BS, **DC** for China, **K** for EK, **No suffix** is required for JIS/100V

DIMENSION



PV-5110

SERIES 304 — Profile Projectors

FEATURES

- Floor model that uses a downward illumination system.
- Digital readout protractor screen (including zero-setting, ABS/INC coordinate switching functions) for easy and error-free angle measurement.
- Angled screen allows projected images

- to be easily traced or compared with a template.
- The optional oblique surface illumination unit (172-418) provides clear and bright images, allowing easy inspection of non-reflection workpieces such as plastic parts or printed materials.



PV-5110
with optional KA counter

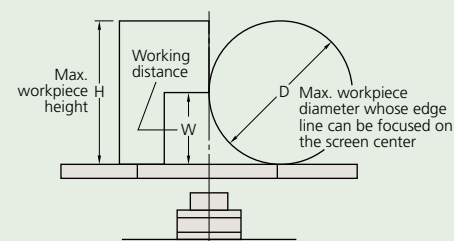


PV-5110

Technical Data

- Projected image: Inverted image
Protractor screen
- Effective diameter: 508mm (20")
 - Screen material: Fine ground glass
 - Screen rotation: $\pm 360^\circ$, fine feed and clamp
 - Angle reading: Digital counter (LED)
Resolution: $1'$ or 0.01° (switchable)
Range: $\pm 370^\circ$
ABS/INC mode switching, Zero Set
Cross hair line
 - Reference line: 10X (172-402)
Optional: 5X, 20X, 50X, 100X
- Magnification accuracy
- Contour illumination: $\pm 0.1\%$ or less
 - Surface illumination: $\pm 0.15\%$ or less
- Maximum workpiece height: Refer to the projection capacity (H) below.
- Contour illumination
- Light source: Halogen bulb (24V, 150W)
 - Optical system: Zoom Telecentric system
 - Functions: 2-step (High/Low) brightness switch, Heat-absorbing filter, Cooling fan
- Surface illumination
- Light source: Halogen bulb (24V, 150W)
 - Optical system: Vertical illumination
 - Functions: Adjustable condenser lens, Oblique illumination (for 5X, 10X and 20X), Heat-absorbing filter, Cooling fan
- Focusing: Manual focus
Resolution: 0.001mm or $0.0001"/0.001\text{mm}$ (using optional KA counter)
Power supply: 100 - 240V AC, 50/60Hz
Mass: 210kg

Projection Capacity



Unit: mm

	Magnification				
	5X	10X	20X	50X	100X
View field	$\phi 101.6$	$\phi 50.8$	$\phi 25.4$	$\phi 10.16$	$\phi 5.08$
H	125	181	206	87	87
W	60 (27)	60	60	32.4	22.5
D	120	120	120	64.8	45

() : When using surface illumination

Optional Accessory

- 172-280:** 5X projection lens
- 172-401:** 5X projection lens set
- 172-402:** 10X projection lens set
- 172-403:** 20X projection lens set
- 172-404:** 50X projection lens set
- 172-405:** 100X projection lens set
- 172-418:** Surface illumination unit
- 172-116:** Standard scale (50mm)
- 172-330:** Standard scale (80mm)
- 172-117:** Standard scale (2")
- 172-161:** Reading scale (300mm)
- 172-329:** Reading scale (600mm)
- 172-162:** Reading scale (12")
- 512089:** Digital counter stand
- 172-160-2:** Green filter
- 172-319:** Canopy
- 965014:** SPC cable (2m)
- 515530:** Halogen bulb (24V, 150W)

Fixture and Stage accessory

- 172-196:** Rotary table*
(Effective diameter: 100mm)
- 172-198:** Rotary table with fine feed wheel*
(Effective diameter: 100mm)
- 172-197:** Swivel center support*
(Max. workpiece dia.: 80mm)
- 176-107:** Holder with clamp*
- 172-378:** V-block with clamp*
(Max. workpiece dia.: 25mm)

*Fixture mount adapter (**999678**) is required.



KA Counter

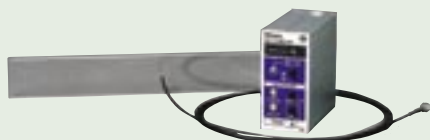
(Refer to the page 354 for more details.)

12AAF182: Counter stand



QM-Data200

2-D data processing unit.
(Refer to the page 384 for more details.)



Optoeye

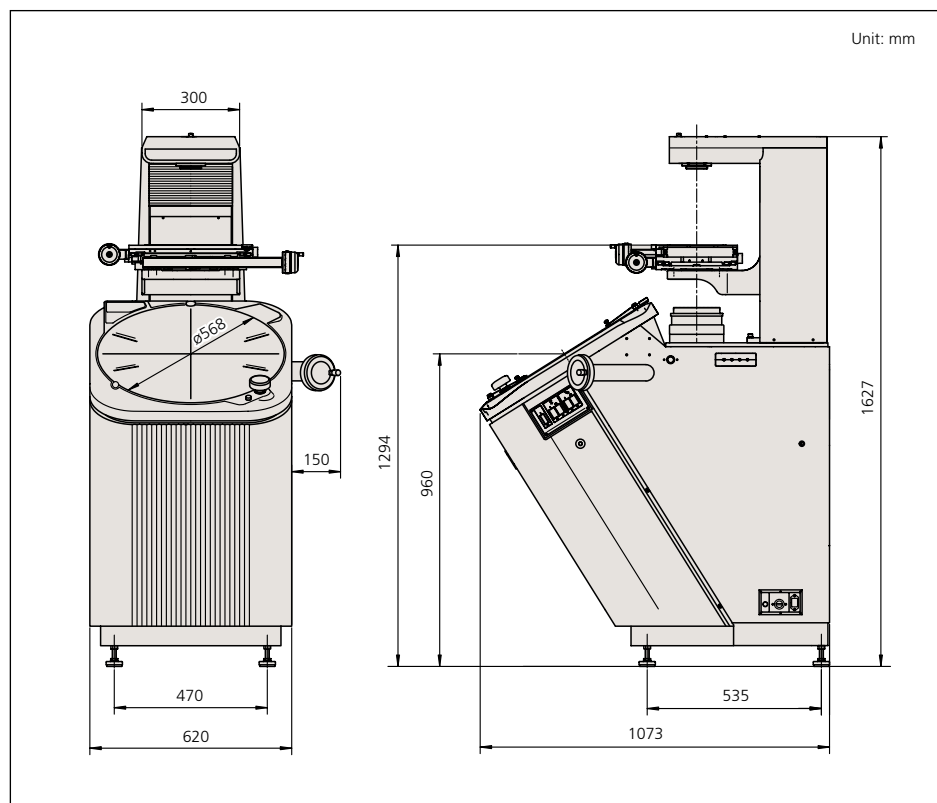
Edge detection system for QM-Data 200
(Refer to the page 385 for more details.)

SPECIFICATIONS

Model No.	PV-5110
Order No.	304-909*
XY stage travel range	200 x 100mm
Floating function	X and Y axes
Measurement method	Linear encoder
XY stage table top size	380 x 250mm
XY stage effective area	266 x 170mm
Stage glass No.	382762
Swiveling function	±3°
Max workpiece loading	15kg
Remarks	—

* To denote your AC line voltage add the following suffixes to the order No. (e.g.: **302-700A**):
A for UL/CSA, **D** for CEE, **E** for BS, **DC** for China, **K** for EK, **No suffix** is required for JIS/100V

DIMENSION



PV-600A

SERIES 305 — Profile Projector

FEATURES

- Floor model that uses a downward illumination system.
- Large diameter (600mm) screen for efficient inspection.
- Angled screen allows projected images to be easily traced or compared with a template.
- The optional oblique surface illumination unit (**172-418**) provides clear and bright images, allowing easy inspection of non-reflection workpieces such as plastic parts or printed materials.



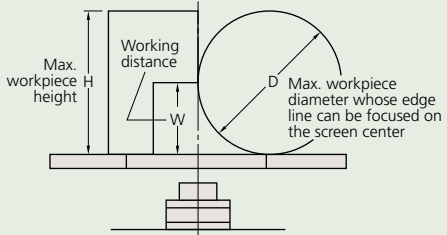
PV-600A with optional accessories (projection screen, projection lens, XY stage and counter)

PV-600A
Order No.: 305-103*
 * To denote your AC line voltage add the following suffixes to the order No. (e.g.: **305-103A**):
A for UL/CSA, **D** for CEE, **E** for BS, **DC** for China, **K** for EK, **No suffix** is required for JIS/100V

Technical Data

- Projected image: Inverted image
- Protractor screen (optional)
 - Effective diameter: 600mm (23.6")
 - Screen material: Fine ground glass
 - Screen rotation: $\pm 360^\circ$, fine feed and clamp
 - Angle reading: Vernier (graduation: 1')
 - Reference line: Cross hair line
- Projection lens (optional): 5X, 10X, 20X, 50X, 100X
- Magnification accuracy
 - Contour illumination: $\pm 0.1\%$ or less
 - Surface illumination: $\pm 0.15\%$ or less
- Maximum workpiece height: Refer to the projection capacity (H) below.
- Contour illumination (optional)
 - Light source: Halogen bulb (24V, 150W)
 - Optical system: Telecentric system
 - Functions: 2-step (High/Low) brightness switch, Heat-absorbing filter, Cooling fan
- Surface illumination (optional)
 - Light source: Halogen bulb (24V, 150W)
 - Optical system: Vertical illumination
 - Functions: Adjustable condenser lens, Oblique illumination (5X, 10X, 20X), 2-step (High/Low) brightness switch, Heat-absorbing filter, Cooling fan
- Focusing: Manual focus
- Resolution: 0.001mm or .0001"/0.001mm (using optional KA counter)
- Power supply: 100 - 240V AC, 50/60Hz
- Mass: 250kg

Projection Capacity



Unit: mm

	Magnification				
	5X	10X	20X	50X	100X
View field	120	60	30	12	6
H	37 (12)	37 (37)	37 (37)	—	—
W	140	182	257	76	76
D	94	94	94	14	6

() : When using surface illumination

Optional Accessory

- 172-308:** Protractor screen
(Effective diameter: 600mm)
- 172-371:** 5X projection lens set
- 172-384:** 10X projection lens set
- 172-385:** 20X projection lens set
- 172-372:** 50X projection lens set
- 172-373:** 100X projection lens set
- 172-330:** Standard scale (80mm)
- 172-117:** Standard scale (2")
- 172-329:** Reading scale (600mm)
- 172-162:** Reading scale (12")
- 172-160-2:** Green filter
- 512305:** Halogen bulb (24V, 150W)
- 172-319:** Canopy

Fixture and Stage accessory

- 172-196:** Rotary table*
(Effective diameter: 100mm)
- 172-197:** Swivel center support*
(Max. workpiece dia.: 80mm)
- 176-107:** Rotary table*
- 172-378:** V-block with clamp*
(Max. workpiece dia.: 25mm)

*Fixture mount adapter (**999678**) is required.

Optional Surface Illumination Unit

Order No.: 172-418

Method: Twin-bulb type oblique illumination

Light source: Halogen bulbs (24V, 150W)

Note: Vertical illumination when using 50X, 100X magnifications.



KA Counter

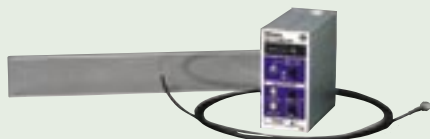
(Refer to the page 354 for more details.)

12AAF182: Counter stand



QM-Data200

2-D data processing unit.
(Refer to the page 384 for more details.)



Optoeye

Edge detection system for QM-Data 200
(Refer to the page 385 for more details.)

Optional XY Stage

Order No.: 319-225-1

XY travel range: 200 x 100mm

Measurement method: Linear encoder

Floating function: X and Y axes

Table top size: 380 x 250mm

Effective area: 266 x 170mm

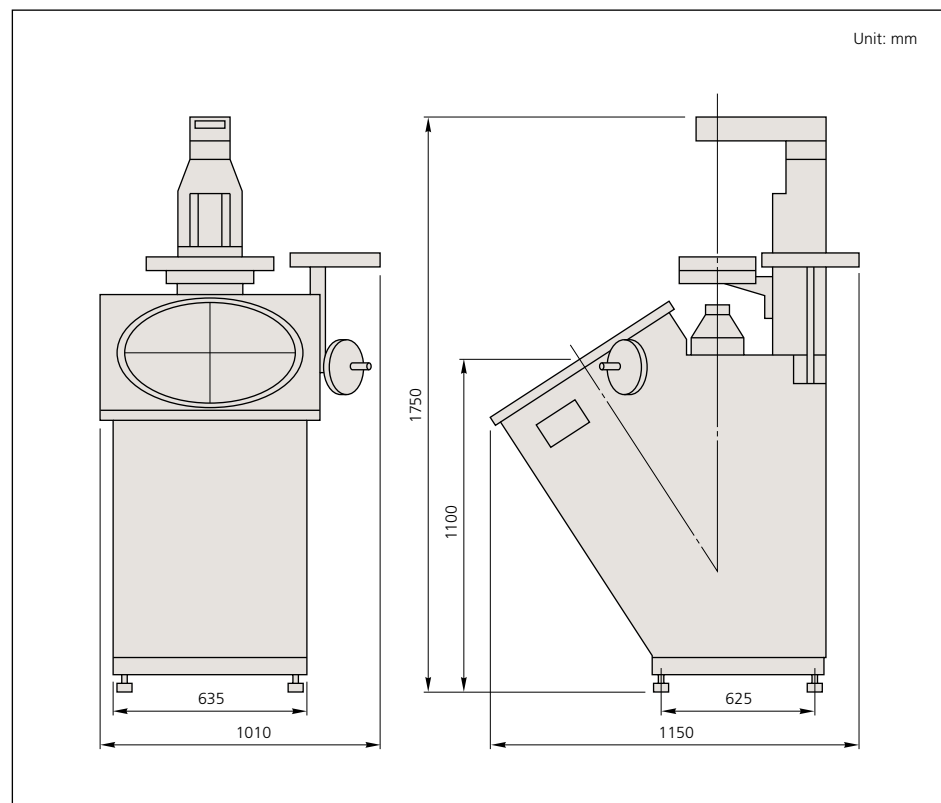
Stage glass No.: 382762

Swiveling function: $\pm 3^\circ$

Max workpiece loading: 5kg



DIMENSION



PH-3515F, PH-14A

SERIES 172 — Profile Projector

FEATURES

- Bench-top model that uses horizontal optical system.
- Suitable for thread pitch measurements—blurred or distorted images will not be produced when workpiece is angled.
- Erect image* on the day-bright screen (*inverted image: PH-14A).
- 356mm diameter protractor screen with cross-hairs and staggered lines for easy alignment.
- Digital angle measurement to 1' or 0.01° (PH-3515F).
- Heavy-duty workpiece table incorporates linear scales for fast, accurate measurement.
- Built-in XY counter (PH-3515F).



PH-3515F

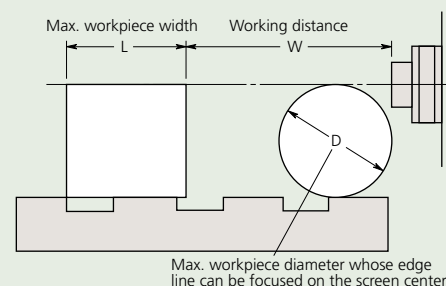


PH-14A

Technical Data

Projected image:	Erect image (inverted image: PH-14A)
Protractor screen (optional)	
• Effective diameter:	356mm (14")
• Screen material:	Fine ground glass
• Screen rotation:	±360°, fine feed and clamp
• Angle reading:	Digital counter (LED)* Resolution: 1' or 0.01° (switchable) Range: ±370° ABS/INC mode switching, Zero Set [*Vernier (graduation: 1'): PH-14A]
• Reference line:	Cross hair line
Projection lens:	10X (172-184) (172-011: PH-14A) Optional: 5X, 20X, 50X, 100X (20X, 50X, 100X: PH-14A)
Magnification accuracy	
• Contour illumination:	±0.1% or less
• Surface illumination:	±0.15% or less
Maximum workpiece height:	Refer to the projection capacity (H) below.
Contour illumination	
• Light source:	Halogen bulb (24V, 150W)
• Optical system:	Telecentric system
• Functions:	2-step (High/Low) brightness switch, Heat-absorbing filter, Cooling fan
Surface illumination	
• Light source:	Halogen bulb (24V, 150W) (24V, 150W: PH-14A)
• Optical system:	Vertical illumination
• Functions:	Adjustable condenser lens, 2-step (High/Low) brightness switch, Heat-absorbing filter, Cooling fan
Focusing:	Manual focus
Resolution:	0.001mm or .0001"/0.001mm (using optional KA counter: PH-14A)
Power supply:	100 - 240V AC, 50/60Hz
Mass:	152kg (140kg: PH-14A)

Projection Capacity



PH-3515F

Unit: mm

	Magnification				
	5X	10X	20X	50X	100X
View field	70.6	35.3	17.65	7.06	3.5
L	175	235	235	80	109
W	160 (64)	93 (35)	40	14.6	9.5
D	152.4	152.4	116	30.4	19

() : When using surface illumination

PH-14A

Unit: mm

	Magnification			
	10X	20X	50X	100X
View field	70.6	17.3	7.12	3.56
L	235	235	80	109
W	93	40	14.6	11
D	105	105	30.4	19

Optional Accessory

- 172-145:** 5X projection lens set*
- 172-173:** 20X projection lens set*
- 172-165:** 50X projection lens set*
- 172-166:** 100X projection lens set*
- 12AAB988:** Half mirror for 100X projection lens*
- 172-012:** 20X projection lens set**
- 172-013:** 50X projection lens set**
- 172-014:** 100X projection lens set**
- 172-133:** Vertical surface illumination unit
- 172-116:** Standard scale (50mm)
- 172-117:** Standard scale (2")
- 172-118:** Reading scale (200mm)
- 172-161:** Reading scale (300mm)
- 172-119:** Reading scale (8")
- 172-162:** Reading scale (12")
- 932105:** Overlay chart set
- 172-286:** Green filter
- 512305:** Halogen bulb (24V, 150W)
- 12BAA637:** Halogen bulb (24V, 200W)*
- 172-269:** Machine stand*
- 172-108:** Machine stand**

Fixture and Stage accessory

- 172-142:** Center support
- 172-143:** Center support riser
- 172-144:** Rotary vise (Max. workpiece dia.: 60mm)
- 172-234:** V-block with clamp (Max. workpiece dia.: 50mm)
- 172-132:** Vertical holder
- 172-001:** Tipped-saw support stand
- 172-002:** Cutter support stand

*only for PH-3515F

**only for PH-14A



KA Counter

(Refer to the page 354 for more details.)

12AAF182: Counter stand



QM-Data200

2-D data processing unit.
(Refer to the page 384 for more details.)



Optoeye

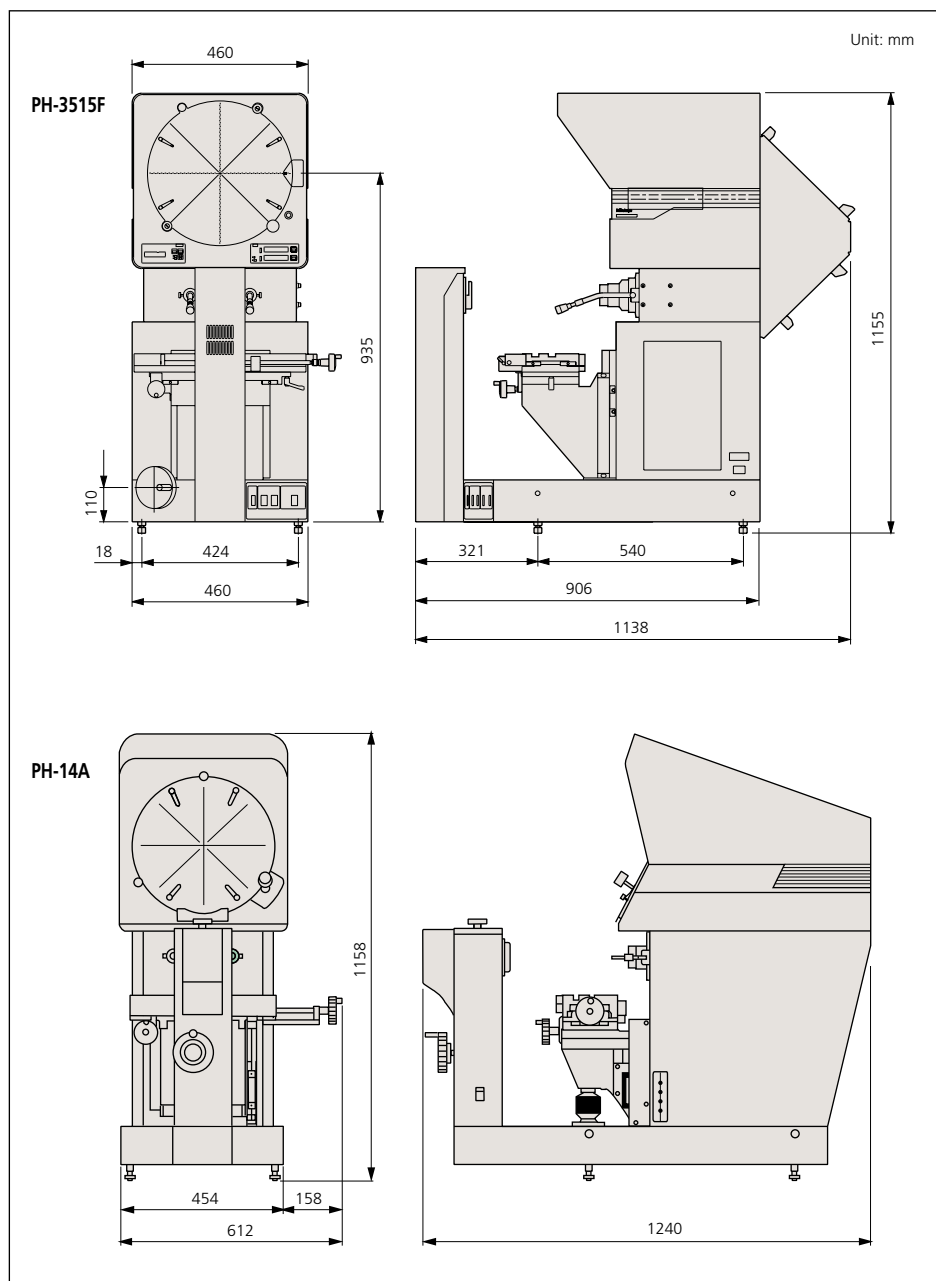
Edge detection system for QM-Data 200
(Refer to the page 385 for more details.)

SPECIFICATIONS

Model No.	PH-3515F	PH-14A
Order No.	172-847*	172-810*
XY stage travel range	254 x 152mm	200 x 100mm
Measurement method	Linear encoder	Linear encoder
Floating function	X axis	—
XY stage table top size	450 x 146mm	407 x 153mm
Swiveling function	±10°	±10°
Max workpiece loading	45kg	45kg
Remarks	—	—

*To denote your AC line voltage add the following suffixes to the order No. (e.g.: **302-700A**):
A for UL/CSA, **D** for CEE, **E** for BS, **DC** for China, **K** for EK, **No suffix** is required for JIS/100V

DIMENSION



Accessories for Profile Projectors

SERIES 172 — Profile Projector

Standard Scales



172-116

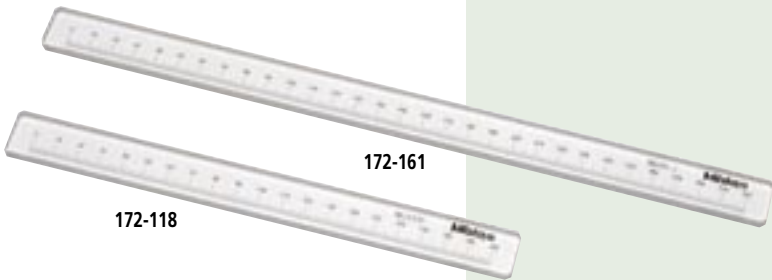
- Used for checking magnification accuracy.

SPECIFICATIONS

Metric			
Graduation	Range	Order No.	Accuracy (20°C)*
0.1mm	50mm	172-116	(3+15L/1000)µm
0.1mm	80mm	172-330	(3+15L/1000)µm

*L = Measured length (mm)

Reading Scales



172-118

172-161

- Specially designed for inspecting the magnified image of a standard scale on the projection screen.

SPECIFICATIONS

Metric			
Graduation	Range	Order No.	Accuracy
0.5mm	200mm	172-118	18µm
0.5mm	300mm	172-161	19.5µm
0.5mm	600mm	172-329	24µm

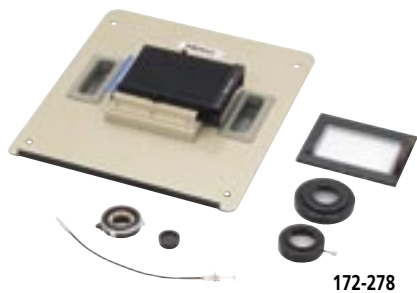
Inch			
Graduation	Range	Order No.	Accuracy (20°C)
.01"	2"	172-117	.00013"

Inch			
Graduation	Range	Order No.	Accuracy
.02"	8"	172-119	.00071"
.02"	2"	172-162	.00077"

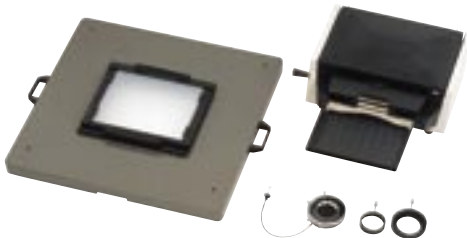
Polaroid Photographic Attachments

FEATURES

- The Polaroid film eliminates the need for developing in a dark room. By using this unit, the workpiece's surface image projected on the screen can be recorded easily.
- The focus can be adjusted after loading the film.



172-278

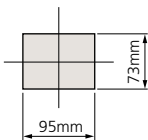


172-285

SPECIFICATIONS

Order No.	Applicable model	Applicable film
172-278	PJ-H3000 series	Polaroid #669 (color), #665 (monochrome)
172-285	PJ-500 series	Polaroid #809 (color), #804 (monochrome)

Photography area

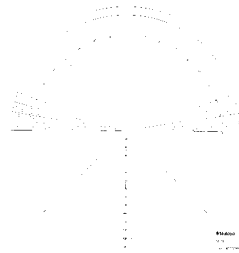


Overlay Chart Set

FEATURES

- Makes inspection of projected images an easy process.
- Twelve different patterns are available in set.
- Designed for use with profile projectors whose screen diameter is 300mm or larger.

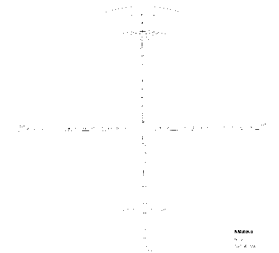
Overlay chart set (12 sheets)
Order No.: 932105



512066
Protractor (1°-grad. radial index) and radius (1mm-radius increment concentric semicircles)



512067
Radius (0.1cm-reading scales and 5mm-radius increment concentric circles)



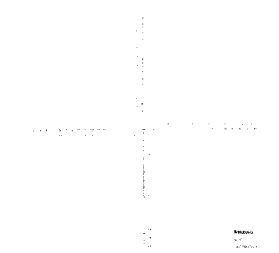
512068
Radius (1X, 10X, 20X, 50X)



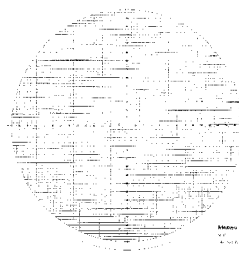
512069
1mm-reading scales (20X, 50X)



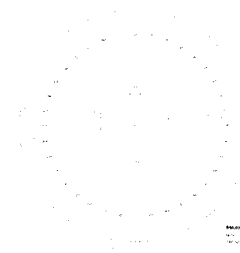
512070
10x10mm sections



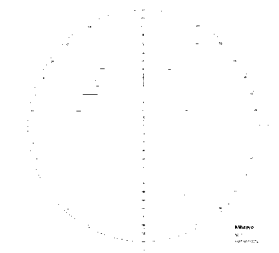
512071
0.5mm-reading scales



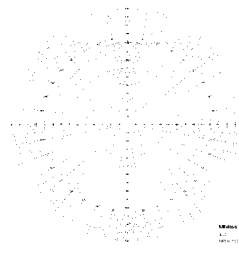
512072
1x1mm sections



512073
Protractor (1°-grad. diametrical index)



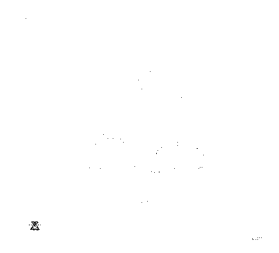
512074
1mm-reading vertical scale



512075
Protractor (1°-grad. diametrical index) and radius (1mm-radius increment concentric circles)



512076
Metric, Unified, and Whitworth screw threads (20X)



512077
Metric screw thread (100X) and 20° and 14.5° gear teeth (20X)

Micrometer Heads

for Profile Projectors and Toolmaker's Microscopes

Micrometer Heads for XY Stage

FEATURES

- Non-rotating device is provided.
- The thimble reading can be zero-set at any spindle position.
- Black and red figures of the bidirectional graduation allow easy reading in both directions.
- Clamping stem diameter: 18mm

Adjustable Micrometer Heads for XY Stages

FEATURES

- The adjustable spindle can be fed under the thimble clamped at any reading, allowing easy reference point setting.
- The spherical measuring face is carbide-tipped.
- Clamping stem diameter: 18mm



152-390

SPECIFICATIONS

Metric					
Graduation	Range	Order No.	Accuracy	Remarks	
0.005mm	25mm	152-390	±2μm	for X-axis	
0.005mm	25mm	152-389	±2μm	for Y-axis	

Inch					
Graduation	Range	Order No.	Accuracy	Remarks	
.0001"	1"	152-391	±.0001"	for X-axis	
.0001"	1"	152-392	±.0001"	for Y-axis	

SPECIFICATIONS

Metric					
Graduation	Range	Order No.	Accuracy	Remarks	
0.001mm*	25mm	152-402	±2μm	for X-axis	
0.001mm*	25mm	152-401	±2μm	for Y-axis	

*Obtained by using vernier.

Digimatic Micrometer Heads

FEATURES

- Large LCD digits for error-free reading.
- The display rotates 330° for easy viewing.
- The spindle does not rotate.
- With SPC data output.



164-161

SPECIFICATIONS

Metric			
Resolution	Range	Order No.	Accuracy
0.001mm	50mm	164-161	±3μm

Inch/Metric			
Resolution	Range	Order No.	Accuracy
.00005"/0.001mm	2" (50mm)	164-162	±.00015"

Technical Data

Graduations: 0.005mm, 0.001mm* or .0001"

*vernier reading

Spindle pitch: 1mm

Spindle face: Flat (hardened) or spherical with carbide tip (more than HRA90), lapped surface

Scale surface: White anodized aluminum



Technical Data

Resolution: 0.001mm or .00005"/0.001mm

Display: LCD

Battery: SR44 (1 pc./2 pcs.*), 938882

Battery life: Approx. 3 years under normal use (1.8 years: 164-161 and 164-162, 1.2 years: 164-171 and 164-172)

Dust/Water protection level: IP65 (series 350**)

* 164-161 and 164-162

** 350-271, 350-273, 350-261, 350-381, 350-382, 350-383, 350-384, 350-361

Function

Zero-setting, Data hold, Data output (series 164), Preset, inch/mm conversion (inch/mm models)

Alarm: Low voltage, Counting value composition error

Optional Accessory

05CZA662: SPC cable with data switch (1m)*

05CZA663: SPC cable with data switch (2m)*

937387: SPC cable for series 164 (1m)

965013: SPC cable for series 164 (2m)

*for series 350

Workpiece Fixtures

for Profile Projectors and Measuring Microscopes

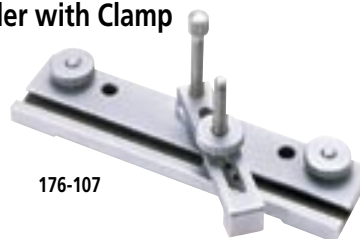
Rotary Tables



Order No.	176-106	172-198	172-289
Effective glass dia.	66mm	100mm	200mm
Angle reading	6'	2' (w/ fine adjustment)	—
Mass	1.7kg	2.5kg	14kg

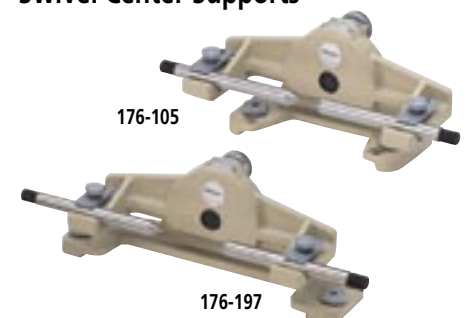
Note: Holder with clamp (176-107) can be mounted.

Holder with Clamp



Order No.	176-107
Max. workpiece height	35mm
Mass	0.42kg

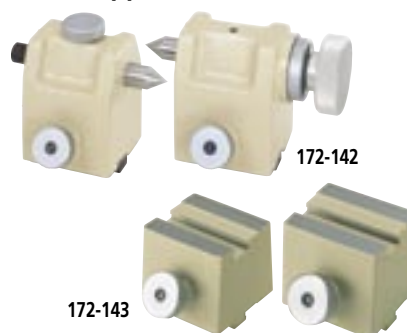
Swivel Center Supports



Order No.	176-105	172-197
Max. workpiece dia.	70mm (45mm)*	80mm(65mm)*
Max. workpiece length	140mm	140mm
Swivel range	±10°	±10°
Mass	2.4kg	2.5kg

*When swiveled 10°

Center Support

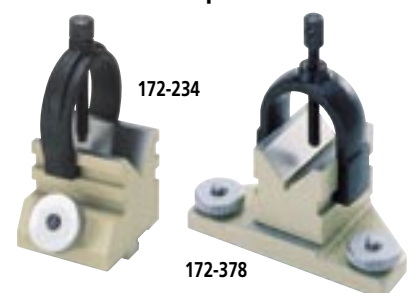


SPECIFICATIONS

Order No.	172-142
Max. workpiece height	120mm (240mm)*
Mass	3.3kg

*When using a center support riser (172-143)

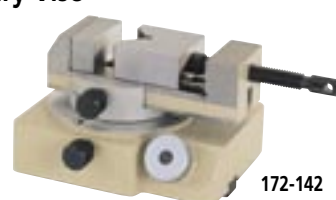
V-Block with Clamp



SPECIFICATIONS

Order No.	172-234	172-378
Max. workpiece dia.	50mm	25mm
Width of block	60mm	41mm
Mass	1.24kg	0.8kg

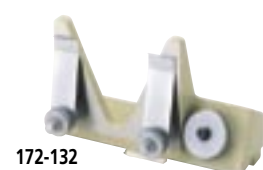
Rotary Vise



SPECIFICATIONS

Order No.	172-144
Max. workpiece height	60mm
Width of jaw	40mm
Angle reading	5°
Mass	2.5kg

Vertical Holder



SPECIFICATIONS

Order No.	172-132
Mass	1.3kg

TM-500

SERIES 176 — Toolmaker's Microscopes

The Mitutoyo TM Series is a toolmaker's microscope well suited for measuring dimensions and angles of machined metals. It can also be used to check the shape of screws and gears by attaching an optional reticle. The compact body makes it ideal for use on shop-floors with limited space.

FEATURES

- Angle measurement is performed easily by turning the angle scale disc to align the cross-hair reticle with the workpiece image.
- Illumination intensity can be adjusted.



TM-505



TM-510

Technical Data

Observation image:	Erect image
Optical tube:	Monocular (diopter adjustable) Depression angle: 30° Reticle: 90° broken cross-hair (176-126)
Angle reading:	Range: 360° Minimum reading: 6' (by vernier)
Eyepiece:	15X (176-116), View field dia.: 13mm Optional: 10X, 20X
Objective:	2X (176-138), Working distance: 67mm Optional: 5X, 10X, 30X
Total magnification:	
Contour illumination	
• Light source:	Tungsten bulb (24V, 2W)
• Functions:	With green filter, Light intensity adjustable
Surface illumination:	
• Light source:	Tungsten bulb (24V, 2W)
• Functions:	Light intensity adjustable
Power supply:	100/110/120/220/240V AC, 50/60Hz
Mass	13.5g (14.5kg: TM-510)

Angle reading



Optional Accessory

- 172-145:** 5X projection lens set*
176-115: 10X eyepiece (view field dia.: 13mm)
176-117: 20X eyepiece (view field dia.: 10mm)
176-139: Objective, 5X (W.D.: 33mm, N.A.: 0.10)
176-137: Objective, 10X (W.D.: 14mm, N.A.: 0.14)
164-161: Digimatic micrometer head
 (range: 50mm, reading: 0.001mm)
164-162: Digimatic micrometer head
 (range: 2"/50mm, reading: .0005"/0.001mm)
152-390: Micrometer head for X-axis
 (range: 50mm, reading: 0.005mm)
152-389: Micrometer head for Y-axis
 (range: 50mm, reading: 0.005mm)
152-391: Micrometer head for X-axis
 (range: 2", reading: .0001")
152-392: Micrometer head for Y-axis
 (range: 2", reading: .0001")
611635-041: Rectangular gauge block (25mm)
611675-041: Rectangular gauge block (50mm)
611201-241: Rectangular gauge block (1")
611202-241: Rectangular gauge block (2")
383038: Halogen bulb (24V, 2W)
175-204: Dial indicator attachment for Z-axis measurement
965013: SPC cable (2m) for Digimatic micrometer head

Fixture and Stage accessory

- 990561:** Workpiece clip (2pcs./set)
176-106: Rotary table for TM-505 (effective dia.: 66mm)
172-196: Rotary table for TM-510 (effective dia.: 100mm)
176-105: Swivel center support for TM-505
 (max. workpiece dia.: 70mm)
172-197: Swivel center support for TM-510
 (max. workpiece dia.: 80mm)
172-378: V-block with clamp
 (max. workpiece dia.: 25mm)
176-107: Holder with clamp

Illumination unit

- 377-090-1:** Fiber-optic ring light
176-203: Twin-bulb reflected illumination unit
176-343: Bifurcated fiber illuminator

Reticle

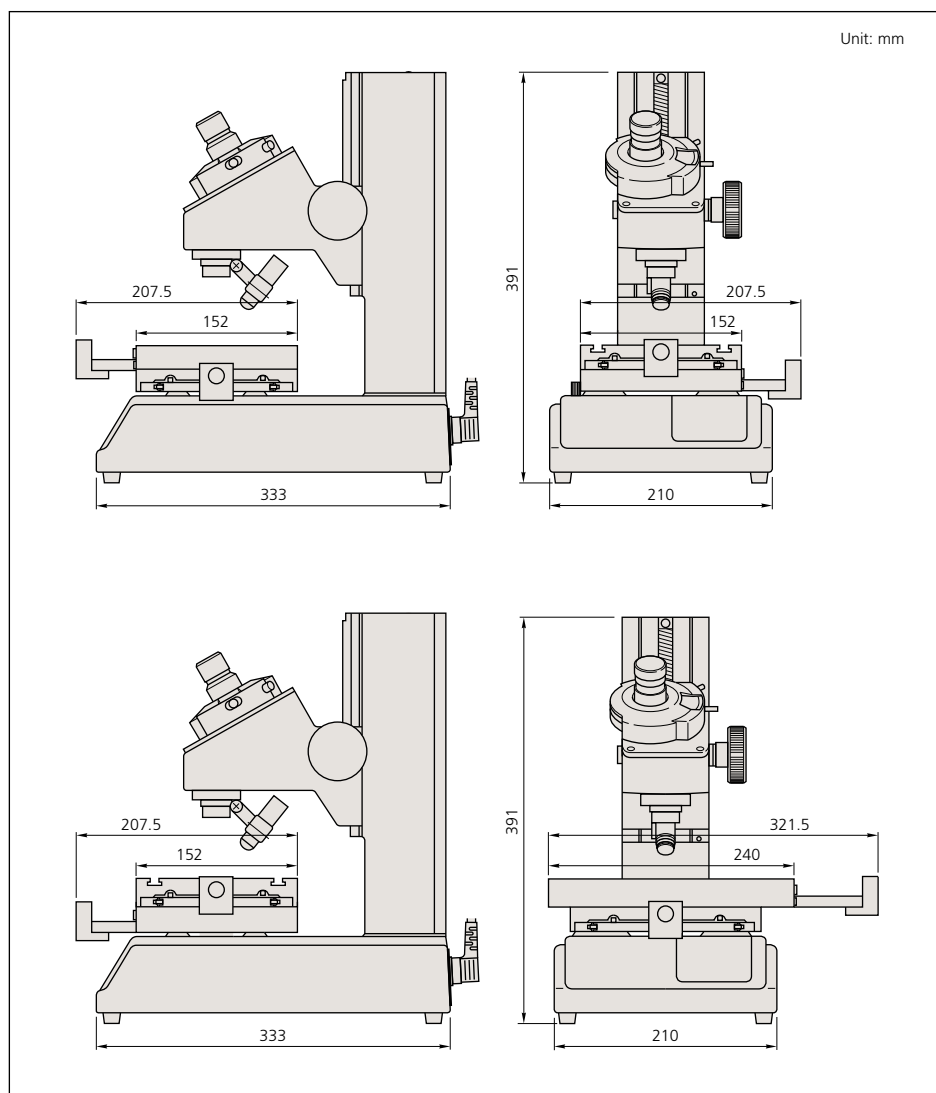
- 176-111:** Concentric circles
 (up to $\phi 4$ mm, 0.05mm increment)
176-135: Concentric circle
 (up to $\phi .2$ ", .01" increment)
176-113: 55° angle
176-114: 60° angle
176-109: Metric screw threads (pitch = 0.25 - 1mm)
176-110: Metric screw threads (pitch = 1.25 - 2mm)
176-140: ISO metric screw threads
 (pitch = 0.075 - 0.7mm)
176-141: ISO metric screw threads
 (pitch = 0.75 - 2mm)
176-142: ISO unified screw threads (80 - 28TPI)
176-143: ISO unified screw threads (24 - 14TPI)
176-144: ISO unified screw threads (13 - 10TPI)
176-123: Unified screw threads (80 - 28TPI)
176-124: Unified screw threads (24 - 14TPI)
176-125: Unified screw threads (13 - 10TPI)
176-120: Whitworth screw threads (60 - 26TPI)
176-121: Whitworth screw threads (24 - 18TPI)
176-122: Whitworth screw threads (16 - 11TPI)
176-127: NF screw threads (80 - 28TPI)
176-128: NF screw threads (24 - 14TPI)
176-129: NF screw threads (13 - 10TPI)
176-130: 14.5° involute gear teeth (normal rack type)
176-112: 20° involute gear teeth (normal rack type)

SPECIFICATIONS

Model No.	TM-505	TM-510
Order No.	176-811*	176-812*
XY stage travel range	50 x 50mm	100 x 50mm
Measurement method	Micrometer head (optional)	Micrometer head (optional)
Floating function	—	—
XY stage table top size	152 x 152mm	240 x 152mm
Effective area of table	96 x 96mm	154 x 96mm
Max. workpiece height	115mm	107mm
Max. workpiece weight	5kg	5kg
Remarks	—	—

*To denote your AC line voltage add the following suffixes to the order No. (e.g.: **176-811A**):
A for UL/CSA, **D** for CEE, **E** for BS, **DC** for China, **K** for EK, **No suffix** is required for JIS/100V

DIMENSION



MF

SERIES 176 — Measuring Microscopes

The MF measuring microscopes' expandability, such as when used in combination with Mitutoyo's vision unit to boost its performance or data management on a PC, promises further improved measuring efficiency.

FEATURES

- Bright field observation, clear and flare less erect image, wide field of view.
- Long working distance objectives, up to 100x magnification (total: 2000x).

- Aperture diaphragms in the transmitted illumination and reflected illumination system as standard feature.
- The quick-release system, which is especially useful in long-stroke measurements.
- Focus and measure using the fine/coarse movement handle with the large-size grips on both sides of the column.
- Zero-set switches (X- and Y-axis) are also located near the stage feed handles.
- Available with the Vision Unit for upgrading to a vision measuring system.



Using optional slide type nosepiece with 2-lens mount (factory set option)

MF-B2017B
XY stage travel range: 200 x 170mm
(w/ optional binocular tube)

Selection of XY stage (travel range)

MF-B505B: 50 x 50mm



MF-B1010B: 100 x 100mm



MF-B2010B: 200 x 100mm



MF-B3017B: 300 x 170mm



MF-B4020B: 400 x 200mm



Technical Data

Observation image:	Erect image
Optical tube (optional):	Monocular or binocular tube (depression: 25°), Reticle projection method, w/ TV mount, Optical path ratio (eyepiece/TV mount: 50/50)
Eyepiece lens (optional):	10X, 15X, 20X
Objective:	3X (375-037), W.D.: 72.5mm Optional: 1X, 5X 10X, 20X, 50X, 100X
Contour illumination	
• Light source:	Halogen bulb (12V, 50W)
• Optical system:	Telecentric illumination with adjustable aperture diaphragms
• Functions:	Light intensity adjustable, Non-stepped brightness adjustment
Surface illumination	
• Light source:	Halogen bulb (12V, 100W or 12V, 150W)
• Optical system:	Koehler illumination with adjustable aperture diaphragms
• Functions:	Light intensity adjustable, Non-stepped brightness adjustment
Display unit:	
• No. of axis:	2 axes (MF-A type) or 3 axes (MF-B type)
• Resolution:	0.001 mm / 0.0005 mm / 0.0001 mm / .0001" / .00005" / .00001"
• Functions:	Zero-setting, Direction switching, Data output (via RS-232C interface)
Power supply:	100/110/120/220/240V AC, 50/60Hz
Mass	65.5kg (MF- 505B, MF- 1010B), 69.5kg (MF- 2010B), 130kg (MF- 2017B), 138kg (MF- 3017B), 144kg (MF- 4020B)

Optional Reticles for 3X Eyepiece

12AAG838 (12AAG878): Cross-hair (7μm width)
12AAG836 (12AAG877): Cross-hair (5μm width)
12AAG873 (12AAG876): Cross-hair (3μm width)
12AAG839 (12AAG879): Broken cross-hair
12AAG840 (12AAG880): Broken cross-hair and 60° angle
12AAG841 (12AAG881): Zeiss type chart
12AAG842*: 20mm scale (0.1mm reading)
12AAG843*: Concentric circle (ø1.2 - ø18mm)
12AAG844*: 10mm scale (0.1mm reading)
12AAG845*: 5mm scale (0.05mm reading)
12AAG846*: 10x10mm section (1mm min.)
12AAG847*: Metric screw thread (P = 0.25-1.0)
12AAG848*: Metric screw thread (P = 1.25-2.0)
12AAG849*: Involute gear tooth (14.5°, module = 0.1 - 1.0)
12AAG850*: Involute gear tooth (20°, module = 0.1 - 1.0)
12AAG851*: Unified screw thread (80 - 28TPI)
12AAG852*: Unified screw thread (24 - 14TPI)
12AAG853*: Unified screw thread (13 - 10TPI)
12AAG854*: Concentric circle (ø.01" - ø.2")
 () : for MF-UB models, * : MF-B / MF-UB compatible
 Reticle mount is provided.

Reticle mount
(standard accessory)

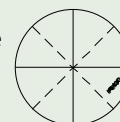


for MF-UB models



for MF-B models

Cross-hair and 45° angle
(standard accessory)



12AAG840

Optional Accessory

- 176-302:** Monocular tube with 10X eyepiece
176-303-1: Binocular tube with 10X eyepiece set
378-856: 10X eyepiece set (view field dia.: 24mm)
378-857: 15X eyepiece set (view field dia.: 16mm)
378-858: 20X eyepiece set (view field dia.: 12mm)
375-043: Protractor eyepiece (10X)
176-313: Digital protractor eyepiece (10X)
375-036-1: 1X objective (W.D.: 61mm, N.A.: 0.03)
375-034-1: 5X objective (W.D.: 61mm, N.A.: 0.13)
375-039: 10X objective (W.D.: 51mm, N.A.: 0.21)
375-051: 20X objective (W.D.: 20mm, N.A.: 0.42)
375-052: 50X objective (W.D.: 13mm, N.A.: 0.55)
375-053: 100X objective (W.D.: 6mm, N.A.: 0.7)
176-314: Slide type nosepiece with 2-lens mount
12AAA643: ND2 color filter (contour / surface)
12AAA644: ND8 color filter (contour / surface)
12AAA645: GIF filter (contour / surface)
12AAA646: LB80 color filter (contour / surface)
375-054: 0.5X camera adapter (w/ C-mount adapter)
970441: C-mount adapter
513667: Halogen bulb (24V, 50W)
12BAB345: Halogen bulb (long life type, 24V, 50W)
176-308: Vibration damping stand
176-309: Mounting stand
375-056: Stage micrometer
12AAA165: Lens cleaning kit
12AAA846: Foot switch

Illumination unit

- 176-351-6:** Oblique surface illumination unit
176-367-1: LED ring illuminator
176-343: Twin fiber optics illuminator
176-366: Ring fiber optics illuminator
12AAG806: GIF color filter (for fiber optics illuminator)
12AAG807: LB80 color filter (for fiber optics illuminator)

Fixture and Stage accessory

- 176-107:** Holder with clamp*
172-378: V-block with clamp*
(max. workpiece dia.: 25mm)
172-197: Swivel center support*
(max. workpiece dia.: 80mm)
176-305: Rotary stage with fine feed knob for 505/1010/2010 models
176-306: Rotary stage with fine feed knob for 2017/3017/4020 models

*Fixture mount adapter (**176-310**) is required for 2010 models.
 Fixture mount adapter (**176-304**) is required for 2017/3017/4020 models.



QM-Data200

2-D data processing unit
 (Refer to the page 384 for more details.)

12AAA807: Connecting cable set



Focus pilot FP-05

Focus assisting system
 (Refer to the page 382 for more details.)



Vision Unit

PC base vision measuring system
 (Refer to the page 386 for more details.)

SPECIFICATIONS

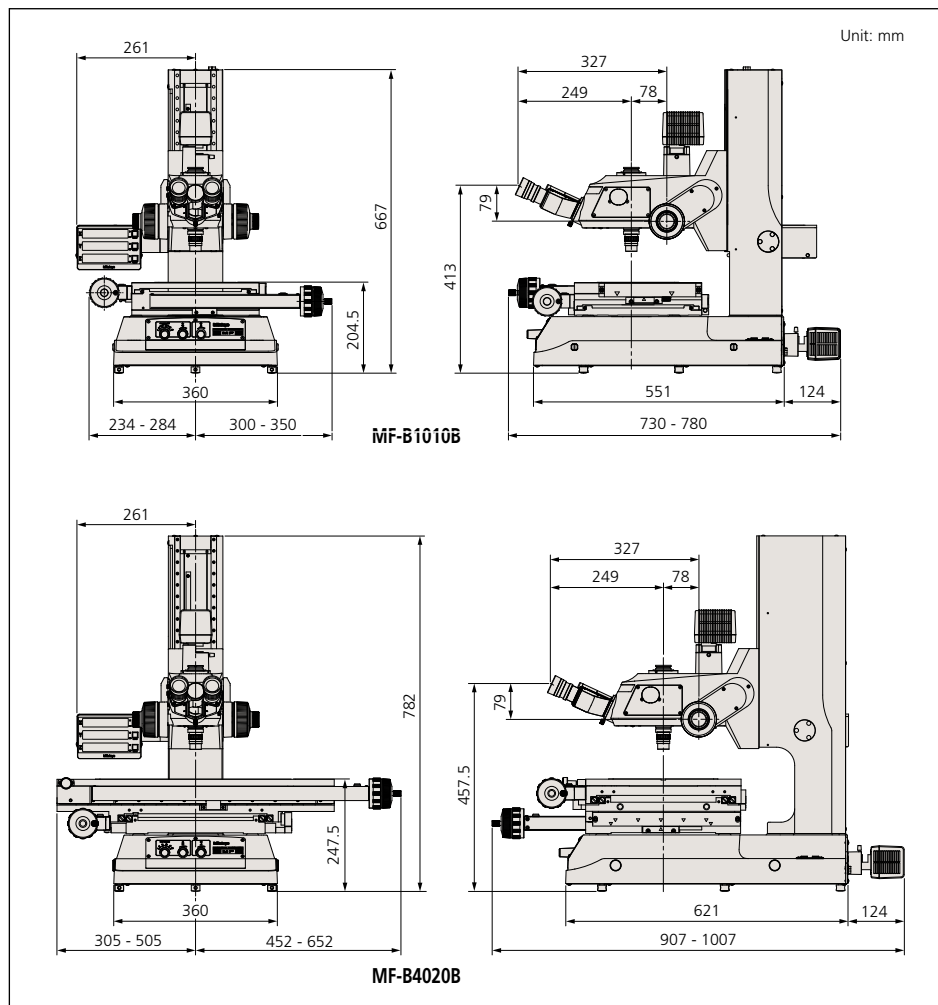
Model No.		MF_ 505B	MF_ 1010B	MF_ 2010B	MF_ 2017B	MF_ 3017B	MF_ 4020B
Order No.	MF-A type	176-561*	176-562*	176-563*	176-564*	176-565*	176-566*
	MF-B type	176-581*	176-582*	176-583*	176-584*	176-585*	176-586*
XY stage travel range		50 x 50mm	100 x 100mm	200 x 100mm	200 x 170mm	300 x 170mm	400 x 200mm
Z-axis travel range		150mm	150mm	150mm	220mm	220mm	220mm
Focusing method		Manual focusing (coarse focusing: 10mm/rev., fine focusing: 0.1mm/rev.)					
Measurement method		Linear encoder (2-axis model: X / Y-axis, 3-axis model: X / Y / Z-axis)					
Resolution (switchable)		0.001mm / 0.0005mm / 0.0001mm / .0001" / .00005" / .00001"					
Measuring accuracy (at20°C)		XY-axes: (2.5+0.02L)μm, L = Measuring length (mm) when not loaded, JIS B 7153					
Indication accuracy (at20°C)		Z-axis: (5+0.04L)μm, L = Measuring length (mm)					
Floating function		X and Y axes with Quick-release mechanism					
XY stage top size		280 x 280mm	280 x 280mm	350 x 280mm	410 x 342mm	510 x 342mm	610 x 342mm
Effective glass size		180 x 180mm	180 x 180mm	250 x 150mm	270 x 240mm	370 x 240mm	440 x 240mm
Swiveling function		—	—	—	±5° (left)	±5° (left)	±3° (left)
Max. workpiece weight		10kg	10kg	10kg	20kg	20kg	15kg
Max. workpiece height		150mm	150mm	150mm	220mm	220mm	220mm

*To denote your AC line voltage add the following suffixes to the order No. (e.g.: **176-561A**):
A for UL/CSA, **D** for CEE, **E** for BS, **DC** for China, **K** for EK, **No suffix** is required for JIS/100V

Machine type

	MF-A type	MF-B type
Measurement system	X and Y-axis (2-axes type)	X, Y and Z-axis (3-axis type)

DIMENSION

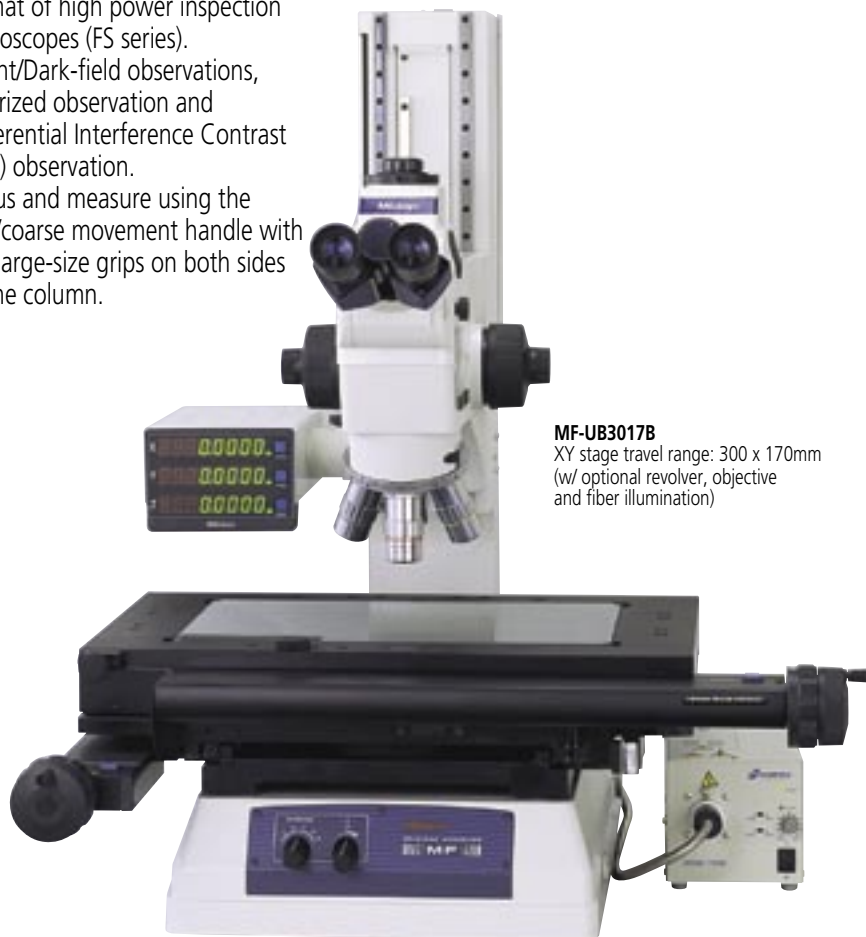


MF-U

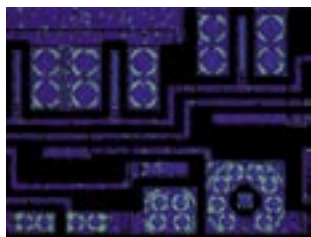
SERIES 176 — High-power Multi-function Measuring Microscopes

FEATURES

- Clear and flare less erect image, wide field of view.
- Long working distance objectives, up to 20X magnification (total: 4000X).
- Infinity-correction optical system same as that of high power inspection microscopes (FS series).
- Bright/Dark-field observations, Polarized observation and Differential Interference Contrast (DIC) observation.
- Focus and measure using the fine/coarse movement handle with the large-size grips on both sides of the column.
- Zero-set switches (X- and Y-axis) are also located near the stage feed handles.
- Inward type revolver with 4 lens mount.
- Improved eye level lens for fatigue free use.



MF-UB3017B
XY stage travel range: 300 x 170mm
(w/ optional revolver, objective and fiber illumination)



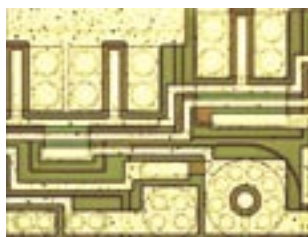
Polarized light observation:
Observing only the filtered light that vibrates in one direction. Used for observing materials with special optical characteristics, such as mineral and liquid crystal.



Dark field (DF) observation:
Observing only the scattered light by shutting down the direct light to the objectives. The scratches and dust that cannot be viewed in the bright view field can be observed by a high-contrast.



Differential interference contrast (DIC) observation:
Effective in detecting fine scratches and steps on the surface of metal, liquid crystal, and semiconductors.



Bright field (BF) observation:
Most common method of observation. Observing directly the light reflected on the surface of workpiece.

Technical Data

Observation image:	Erect image
Optical tube:	Siedentoph type (pupil distance adjustment: 51 - 76mm), 1X tube lens, Binocular tube (depression: 30°), Reticle projection method, w/ TV mount, Optical path ratio (eyepiece/TV mount: 50/50)
Eyepiece lens:	10X (field No.: 24mm), Optional: 15X, 20X
Revolver (optional):	Manual or power turret
Objective (optional):	M / BD Plan Apo objective from 1X to 100X (Refer to the page 394 for more details.)
Contour illumination	
• Light source:	Halogen bulb (12V, 50W)
• Optical system:	Telecentric illumination with adjustable aperture diaphragms
• Functions:	Light intensity adjustable, Non-stepped brightness adjustment
Surface illumination	
• Light source:	Optional halogen illumination unit (fiber optic cold light illumination)
• Optical system:	Koehler illumination with adjustable aperture diaphragms
• Functions:	Light intensity adjustable, Non-stepped brightness adjustment
Display unit:	
• No. of axis:	2 axes or 3 axes
• Resolution:	0.001mm / 0.0005mm / 0.0001mm / .0001" / .00005" / .00001"
• Functions:	Zero-setting, Direction switching, Data output (via RS-232C interface)
Power supply:	100/110/120/220/240V AC, 50/60Hz
Mass	65.5kg (MF-U_505B, MF-U_1010B), 69.5kg (MF-U_2010B), 130kg (MF-U_2017B), 138kg (MF-U_3017B), 144kg (MF-U_4020B)

Selection of XY stage (travel range)



MF-UB505B: 50 x 50mm



MF-UB1010B: 100 x 100mm



MF-UB2010B: 200 x 100mm



MF-UB2017B: 200 x 170mm



MF-UB4020B: 400 x 200mm

Optional Accessory

378-857:	15X eyepiece set (view field dia.: 16mm)
378-858:	20X eyepiece set (view field dia.: 12mm)
(See page 394.)	Objective
378-018:	Adjustable manual BF revolver
378-116:	Adjustable power BF revolver
176-211:	Adjustable manual BF/DF revolver
378-210:	Adjustable power BF/DF revolver
(See page 376.)	Reticles
178-092:	Polarization unit
378-076:	DIC unit for 100X, SL80X, SL50X objective
378-078:	DIC unit for 50X, SL20X objective
378-079:	DIC unit for 20X objective
378-080:	DIC unit for 10X, 5X objective
12AAA643:	ND2 color filter
12AAA644:	ND8 color filter
12AAA645:	GIF filter
12AAA646:	LB80 color filter
375-054:	0.5X camera adapter (w/ C-mount adapter)
970441:	C-mount adapter
513667:	Halogen bulb (24V, 50W)
12BAB345:	Halogen bulb (long life type, 24V, 50W)
517181:	Halogen bulb (24V, 100W)
12BAD602:	Halogen bulb (high intensity type, 24V, 100W)
176-308:	Vibration damping stand
176-309:	Mounting stand
375-056:	Stage micrometer
12AAA165:	Lens cleaning kit
12AAA846:	Foot switch

Illumination unit

176-315:	Halogen illumination unit (12V, 100W)
176-316:	Halogen illumination unit (12V, 150W)
176-343:	Twin fiber optics illuminator
12AAG806:	GIF color filter (for 176-315)
12AAG807:	LB80 color filter (for 176-315)

Fixture and Stage accessory

176-107:	Holder with clamp*
172-378:	V-block with clamp* (max. workpiece dia.: 25mm)
172-197:	Swivel center support* (max. workpiece dia.: 80mm)
176-305:	Rotary stage with fine feed knob for 505/1010/1020 models
176-306:	Rotary stage with fine feed knob for 1720/1730 models

*Fixture mount adapter (**176-310**) is required for 1020 models.
Fixture mount adapter (**176-304**) is required for 1720/1730 models.



QM-Data200

2-D data processing unit
(Refer to the page 384 for more details.)

12AAA807: Connecting cable set

Focus pilot FP-05

Focus assisting system
(Refer to the page 382 for more details.)



Vision Unit

PC base vision measuring system
(Refer to the page 386 for more details.)



SPECIFICATIONS

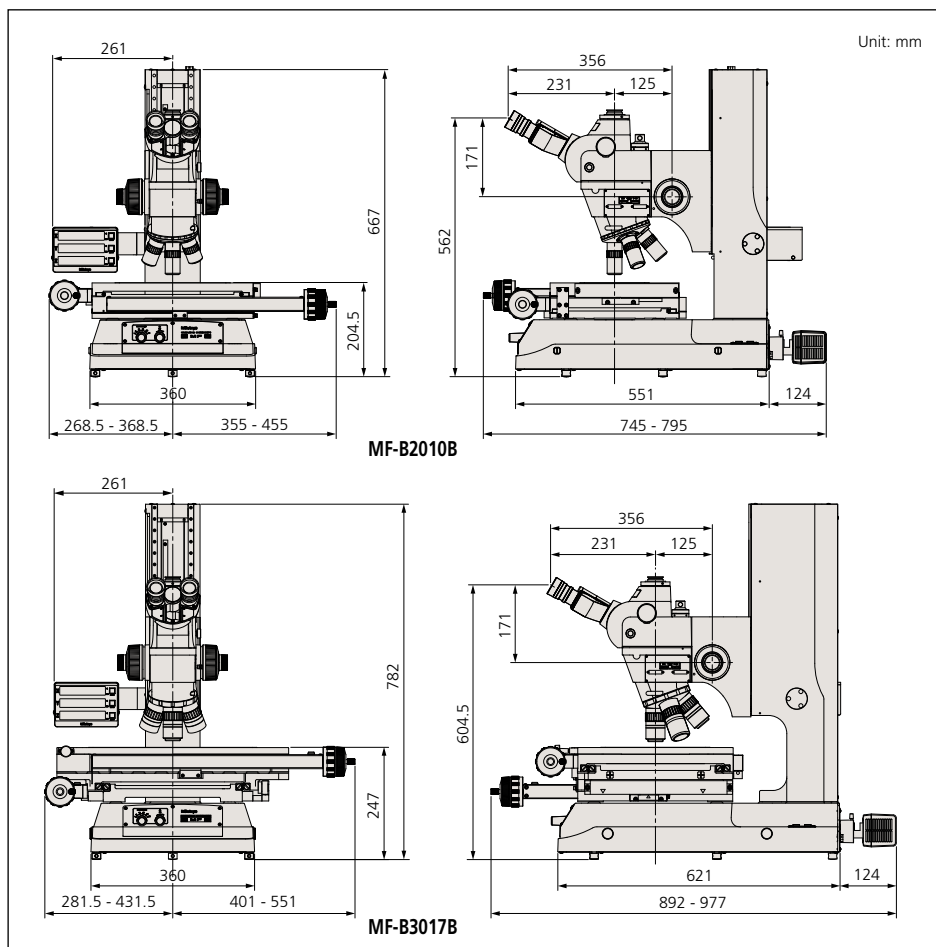
Model No.		MF-U_505B	MF-U_1010B	MF-U_2010B	MF-U_2017B	MF-U_3017B	MF-U_4020B
Order No.	MF-A type	176-567*	176-568*	176-569*	176-570*	176-571*	176-572*
	MF-B type	176-587*	176-588*	176-589*	176-590*	176-591*	176-592*
	MF-C type	176-573*	176-574*	176-575*	176-576*	176-577*	176-578*
	MF-D type	176-593*	176-594*	176-595*	176-596*	176-597*	176-598*
XY stage travel range		50 x 50mm	100 x 100mm	200 x 100mm	200 x 170mm	300 x 170mm	400 x 200mm
Z-axis travel range		150mm	150mm	150mm	220mm	220mm	220mm
Focusing method		Manual focusing (coarse focusing: 10mm/rev., fine focusing: 0.1mm/rev.)					
Measurement method		Linear encoder (2-axis model: X / Y-axis, 3-axis model: X / Y / Z-axis)					
Resolution (switchable)		0.001mm / 0.0005mm / 0.0001mm / .0001" / .00005" / .00001"					
Measuring accuracy (at20°C)		XY-axis: (2.5+0.02L)μm, L = Measuring length (mm) when not loaded, JIS B 7153					
Indication accuracy (at20°C)		Z-axis: (5+0.04L)μm, L = Measuring length (mm)					
Floating function		X and Y axes with Quick-release mechanism					
XY stage top size		280 x 280mm	280 x 280mm	350 x 280mm	410 x 342mm	510 x 342mm	610 x 342mm
Effective glass size		180 x 180mm	180 x 180mm	250 x 150mm	270 x 240mm	370 x 240mm	440 x 240mm
Swiveling function		—	—	—	±5° (left)	±5° (left)	±3° (left)
Max. workpiece weight		10kg	10kg	10kg	20kg	20kg	15kg
Max. workpiece height		150mm	150mm	150mm	220mm	220mm	220mm

*To denote your AC line voltage add the following suffixes to the order No. (e.g.: **176-567A**):
A for UL/CSA, **D** for CEE, **E** for BS, **DC** for China, **K** for EK, **No suffix** is required for JIS/100V

Machine type

	MF-A type	MF-B type	MF-C type	MF-D type
Observation type	Bright field (BF)	Bright field (BF)	Bright / Dark field (BF/DF)	Bright / Dark field (BF/DF)
Measurement system	X and Y-axis (2 axes)	X, Y and Z-axis (3 axes)	X and Y-axis (2 axes)	X, Y and Z-axis (3 axes)

DIMENSION



Hyper MF / MF-U

SERIES 176 — High-Accuracy Measuring Microscopes

FEATURES

- The world highest accuracy XY measuring accuracy of $(0.9+3L/1000)\mu\text{m}$
 - Selectable LAF function
 - High operatability and repeatability
 - Three axes motorized control
- Power-drive auto focus unit is a standard feature.

Hyper MF-U
(w/ optional optical tube, revolver
and objective)



SPECIFICATIONS

Model No.	Hyper MF	Hyper MF-U
Order No. (mm)	176-401*	176-402*
Observation type	BF	BF or BF/BD
Digital counter	—	—
XY stage travel range	250 x 150mm	250 x 150mm
Measuring unit	Linear encoder	Linear encoder
Resolution	0.01 μm	0.01 μm
Measuring accuracy (at 20°C)	$\pm(0.9+3L/1000)\mu\text{m}$, L = XY axis measuring length (mm) when not loaded	
Drive system (X, Y, Z-axis)	Motor-driver control with the joystick	
XY stage top size	460 x 350mm	460 x 350mm
Effective glass size	300 x 200mm	300 x 200mm
Swiveling function	$\pm 3^\circ$	$\pm 3^\circ$
Max. workpiece weight	30kg	30kg
Max. workpiece height	150mm	150mm

* To denote your AC line voltage add the following suffixes to the order No. (e.g.: **176-401A**):
A for UL/CSA, **D** for CEE, **E** for BS, **DC** for China, **K** for EK, **No suffix** is required for JIS/100V

Technical Data: Hyper MF

Observation image:	Erect image
Optical tube:	Monocular or binocular tube (optional, depression: 25°), Reticle projection method, w/ TV mount, Optical path ratio (eyepiece/TV mount: 50/50)
Eyepiece lens (optional):	10X, 15X, 20X
Objective:	3X (375-037), W.D.: 72.5mm Optional: 1X, 5X 10X, 20X, 50X, 100X
Contour illumination	
• Light source:	Halogen bulb (12V, 100W) (fiber optic cold light illumination)
• Optical system:	Telecentric illumination with adjustable aperture diaphragms
• Functions:	Light intensity adjustable, 100 steps brightness adjustment
Surface illumination	
• Light source:	Halogen bulb (12V, 50W)
• Optical system:	Koehler illumination with adjustable aperture diaphragms
• Functions:	Light intensity adjustable, 100 steps brightness adjustment
Data output	Via RS-232C interface
Power supply:	100/110/120/220/240V AC, 50/60Hz
Mass	250kg (main unit), 14kg (power unit)

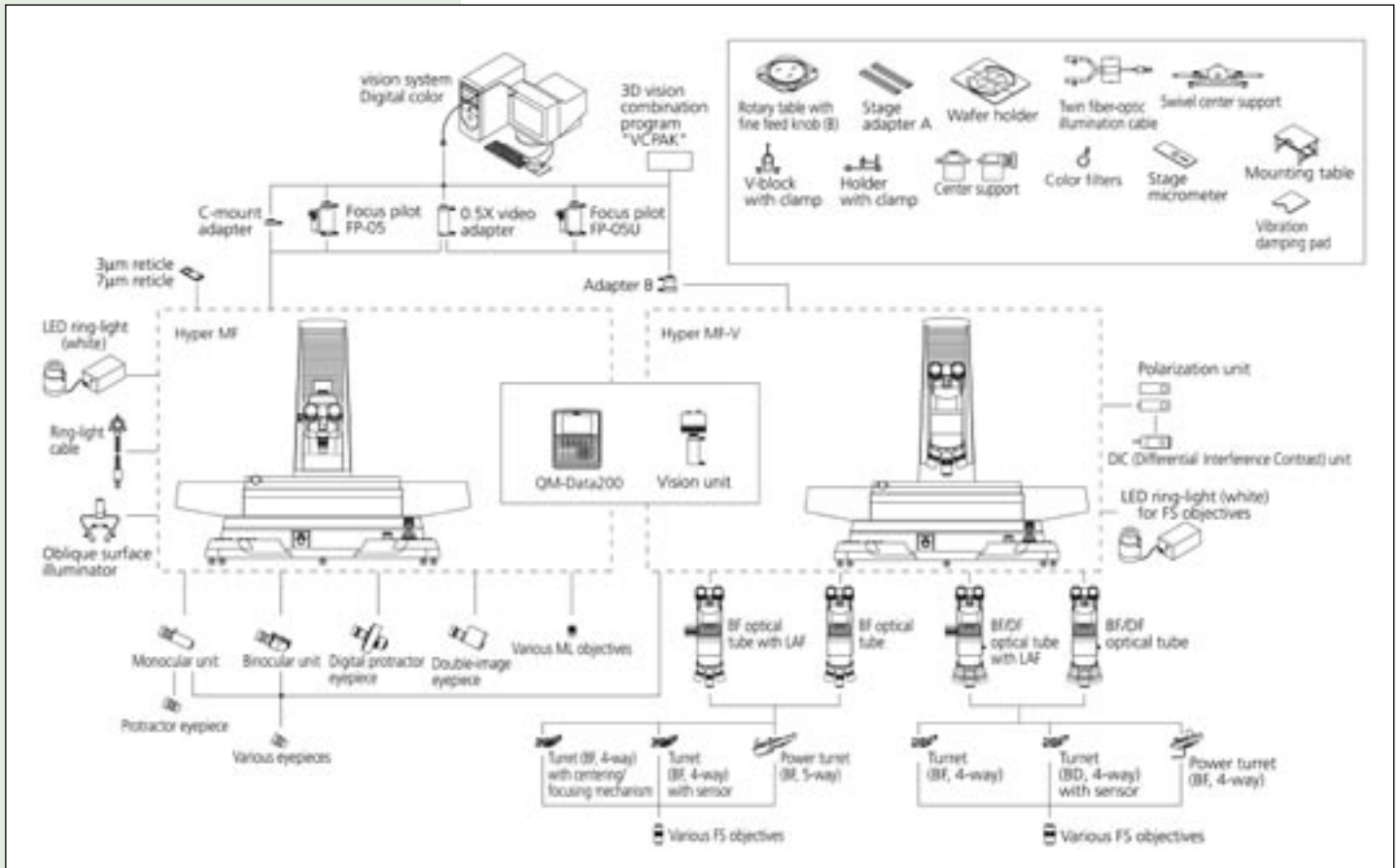
Technical Data: Hyper MF-U

Observation image:	Erect image
Optical tube:	Siedentoph type (pupil distance adjustment: 51 - 76mm), 1X tube lens, Binocular tube (depression: 25°), Reticle projection method, w/ TV mount, Optical path ratio (eyepiece/TV mount: 50/50)
Eyepiece lens:	10X (field No.: 24mm), Optional: 15X, 20X
Revolver (optional):	Power revolver
Objective (optional):	M / BD Plan Apo objective from 1X to 100X (Refer to the page 394 for more details.)
Contour illumination	
• Light source:	Halogen bulb (12V, 100W)
• Optical system:	Telecentric illumination with adjustable aperture diaphragms
• Functions:	Light intensity adjustable, 100 steps brightness adjustment
Surface illumination	
• Light source:	Halogen bulb (12V, 50W)
• Optical system:	Koehler illumination with adjustable aperture diaphragms
• Functions:	Light intensity adjustable, 100 steps brightness adjustment
Data output	Via RS-232C interface
Power supply:	100/110/120/220/240V AC, 50/60Hz
Mass	255kg (main unit), 14kg (power unit)

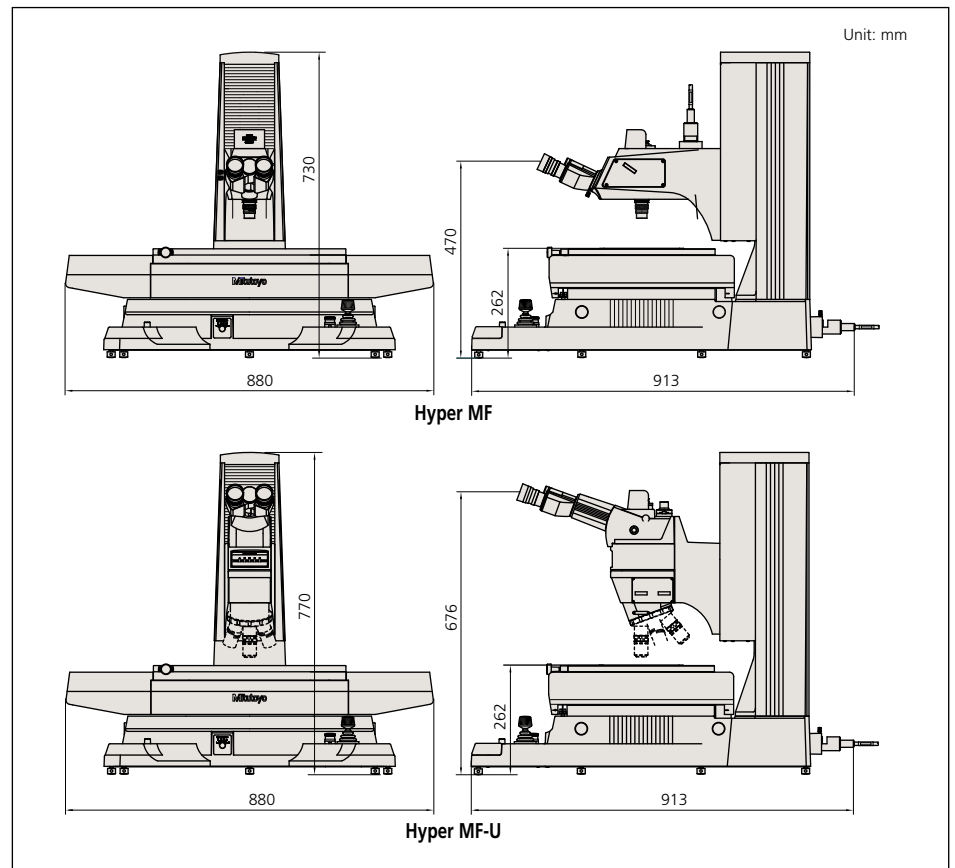


Refer to the Hyper MF / MF-U leaflet (E4267) for more details.

SYSTEM DIAGRAM



DIMENSION



Accessory for Measuring Microscope

Focus Pilot FP-05

FEATURES

- By installing this system on the camera mount of an MF series measuring microscope and projecting the focusing chart on the workpiece surface, the focal point can be detected with high-accuracy and high-repeatability.
- Two types of chart patterns are available. Select the pattern in accordance with the type of the workpiece surface texture.

- The brightness of the chart can be adjusted.
- A wide view field observation on the monitor is made possible with the use of a CCD camera (C-mount adapter is included.)



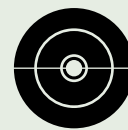
SPECIFICATIONS

Order No.	375-055*	375-065*
Applicable microscopes	MF models	MF-U models
Magnification	0.5X, Accuracy: 0.1%**	
Camera adapter	C-mount (provided)	
Applicable CCD camera	Up to 2/3-inch	
Mass	1.8kg	1.8kg

* To denote your AC line voltage add the following suffixes to the order No. (e.g.: **375-055A**):
A for UL/CSA, **D** for CEE, **E** for BS, **DC** for China, **K** for EK, **No** suffix is required for JIS/100V

**within 2/3 area from the center of view field

Focusing charts



375-055: Concentric circle



375-065: Slit

Stage Micrometer



SPECIFICATIONS

Order No.	375-056
Range	1mm
Graduations	0.01mm
Accuracy (at 20°C)	(1+L)μm, L = Measuring length (mm)
Dimensions (WxD)	76 x 26 x mm
Mass	16g

Power Focus Unit



SPECIFICATIONS

Order No.	378-307*
Applicable microscopes	MF-A models, MF-UA models
Resolution	0.4μm
Drive speed	3.2mm/s
Power supply	100 - 240V AC, 50/60Hz
Dimensions (WxDxH)	Control box: 108 x 72 x 193mm

* To denote your AC line voltage add the following suffixes to the order No. (e.g.: **378-307A**):
A for UL/CSA, **D** for CEE, **E** for BS, **DC** for China, **K** for EK, **No** suffix is required for JIS/100V

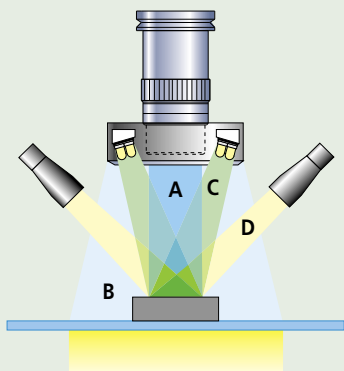
Power Turret



SPECIFICATIONS

Order No.	378-016*	378-210*
Observation type	BF	BF/DF
Applicable microscopes	MF-UB models	
No. of objective mounts	5-mount	4-mount
View field adjustment range	±0.5mm	
Power supply	100 - 240V AC, 50/60Hz	
Dimensions (W x D x H)	Control box: 108 x 72 x 193mm	

* To denote your AC line voltage add the following suffixes to the order No. (e.g.: **378-016A**):
A for UL/CSA, **D** for CEE, **E** for BS, **DC** for China, **K** for EK, **No** suffix is required for JIS/100V



A: Vertical surface illumination (Halogen)



PCB



HDD suspension



IC circuit

B: Ring fiber optics illumination



Flexible PCB



PCB



Electric parts

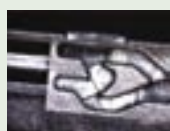
C: LED ring illumination



HDD suspension



PCB



Black resin molded parts

D: Twin fiber optics illumination



IC package



Garnet



PCB

Twin fiber optics illuminator



SPECIFICATIONS

Order No.	176-343*
Applicable microscopes	MF-B, MF-UB models
Length of fiber cable	1800mm
Light source	Halogen bulb (12V, 100W) (517181: halogen bulb)
Dimensions (W x D x H)	Light unit: 235 x 76 x 120mm

Color filters (GIF: **12AAG806**, LB80: **12AAG807**) are available.

*To denote your AC line voltage add the following suffixes to the order No. (e.g.: **176-343A**):

A for UL/CSA, **D** for CEE, **E** for BS, **DC** for China, **K** for EK, **No suffix** is required for JIS/100V

Ring fiber optics illuminator



SPECIFICATIONS

Order No.	176-366*
Applicable microscopes	MF-B models
Length of fiber cable	1000mm
Light source	Halogen bulb (12V, 100W) (517181: halogen bulb)
Dimensions (W x D x H)	Light unit: 235 x 76 x 120mm

Color filters (GIF: **12AAG806**, LB80: **12AAG807**) are available.

*To denote your AC line voltage add the following suffixes to the order No. (e.g.: **176-366A**):

A for UL/CSA, **D** for CEE, **E** for BS, **DC** for China, **K** for EK, **No suffix** is required for JIS/100V

LED ring illuminator



SPECIFICATIONS

Order No.	176-367-1*
Applicable microscopes	MF-B models with 1X/3X/5X objective
Light source	White LED (12V, 100W)
Length of LED cable	1500mm

Color filters (ND2: **12AAA643**, ND8: **12AAA644**, GIF: **12AAA645**, LB80: **12AAA646**) are available.

*To denote your AC line voltage add the following suffixes to the order No. (e.g.: **176-367-1A**):

A for UL/CSA, **D** for CEE, **E** for BS, **DC** for China, **K** for EK, **No suffix** is required for JIS/100V

Oblique surface illumination unit



SPECIFICATIONS

Order No.	176-351-6*
Applicable microscopes	MF-B models with 1X/3X/5X objective
Light source	Supplied from microscope (surface illumination)

Color filters (ND2: **12AAA643**, ND8: **12AAA644**, GIF: **12AAA645**, LB80: **12AAA646**) are available.

*To denote your AC line voltage add the following suffixes to the order No. (e.g.: **176-351-6A**):

A for UL/CSA, **D** for CEE, **E** for BS, **DC** for China, **K** for EK, **No suffix** is required for JIS/100V

QM-Data200

SERIES 264 — 2-D Data Processing Unit

The QM-Data200 is a geometric readouts/analysis unit for optical instruments like a profile projectors. This features powerful 2-D coordinate measurement capabilities with unmatched simple key operation. The QM-Data200 improves operator productivity, minimizes errors and save a total measurement time and production cost.

FEATURES

- Various graphic displays on the large LCD screen for easy measurement operations.
- One-key operation for combined measurements that are often used (circle-circle distance, etc.)
- The AI measurement function (automatic identification of measuring item) eliminates switching between the measurement command keys.

- Equipped with the measurement procedure teaching function and the measuring position navigation in Repeat mode.
- The user menu function allows user to register measurement commands or part programs to create his/her own menu.
- Tolerance zone measurement of data processing result and various statistical processing for each item are available.
- Measurement result output to "MS-Excel" in spreadsheet (CSV) format.
- The measurement procedure and measurement result can be saved, using the optional floppy disk drive unit.
- Two models are available: a stand-alone type with tilt system and a flexible arm type that can be mounted on a Profile Projector.

QM-Data200

Order No.: 264-145* (stand-mount type)

Order No.: 264-146* (arm-mount type)

Order No.: 264-149* (for Hyper MF/MF-U)

*To denote your AC line voltage add the following suffixes to the order No. (e.g.:

264-140A):

A for UL/CSA, **D** for CEE, **E** for BS, **DC** for China, **K** for EK, **No suffix** is required for JIS/100V



QM-Data 200
Stand-mount type

• Graphic display

Measurement information and data are visualized on the back-lit LCD display with graphical interfaces. The geometric feature that you selected is displayed with the probing navigator. The measurements map and blink indication show you the probing points and sequences. Simply probe points and click by following the blink indicator the measurement can be easily completed even a beginner. This improves operation accuracy and reduces errors and time.



Technical Data

Resolution:	0.0001mm
Program functions:	Part program creation, execution, editing
Statistical processing:	Number of data, maximum value, minimum value, mean value, standard deviation, range, histogram
Element memory:	Maximum of 1000 elements
Element recall:	Point, line, circle, distance, ellipse, rectangular hole, slotted hole, intersection and intersecting angle
Element key-in:	Point, line, circle
Display system:	Monographic LCD (320 x 240 dots, with back light)
Measurement result file output:	RS-232C output (CSV format, MUX-10F format)
Display language:	Japanese/English/German/French/Italian/Spanish/Portuguese
Data input:	RS-232C, X/Y/Z-axis signal, Footswitch
Data output:	RS-232C, Printer, Floppy disk drive unit
Power supply:	100V AC to 240V AC
Mass:	2.2kg (stand-mount type) 2.1kg (arm-mount type)

• Intuitive panel design

The QM-Data200 employs the Geometry Keys" to accelerate the measurement process. The probing routine of standard geometric features and combinations are designed with Geometry Keys on the front panel. Click of a key that you need and capture features you can complete the measurement quickly and accurately. This improves operator productivity, reduce errors and save operation time and cost.



Optional Accessory

- 12AAH035:** Floppy disk drive unit (USB type)
12AAH034: Stick memory (512MB, USB type)
12AAD033: Receipt printer (for 230V)
12AAD034: Receipt printer (for 120V)
908353: Printer paper for receipt printer
12AAA804: Printer cable (2m)
937179T: Foot switch
172-270: Adjustable stand
12AAD193: Connection cable B
12AAD194: Connection cable C
12AAD195: Connection cable D
12AAD196: Connection cable E
12AAA807: RS-232C cable (2m)
12AAA920: RS-232C cable (3m)

Technical Data

Image detection

- Directivity: Non-direction
- Min. diameter: $\phi 2\text{mm}$ on the screen
- Min. width: 1mm on the screen
- Max. moving speed: 1000mm/s

Applicable illumination

- Type: Surface / Contour illumination
- Range: 30Lx to 1500Lx on the screen

Repeatability:

Function: 1 μm in contour illumination
Error in detection of illumination change
Supporting a contour illumination
brightness selector switch of projector

Optional Accessory

12AAE671:

Detector attachment (A)

PJ-A3000, PJ-H30, PH-3515, PH-A14 series
(Adaptation diameter of a screen: $\phi 250$ to $\phi 350\text{mm}$)

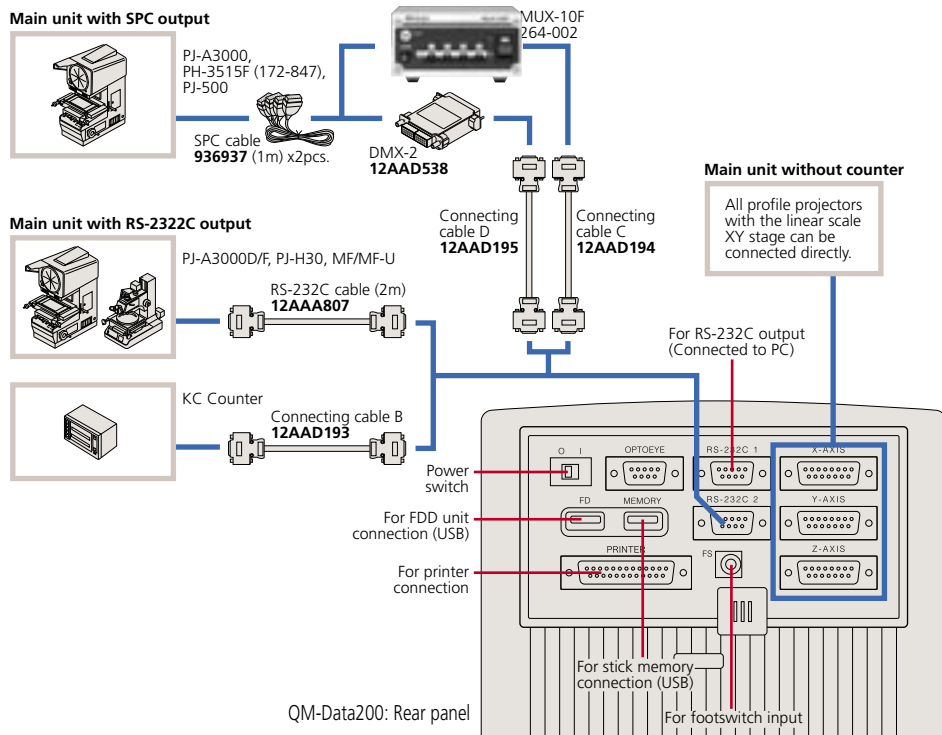
12AAE672:

Detector attachment (B)

PJ-500, PV-5110, PV-600A series
(Adaptation diameter of a screen: $\phi 500$ to $\phi 600\text{mm}$)



SYSTEM DIAGRAM



OPTOEYE-200

The OPTOEYE-200 Image Edge Sensor eliminates human errors which may be involved in visual alignment, ensuring speedy, accurate, and consistent measurements, regardless of operator's skill.

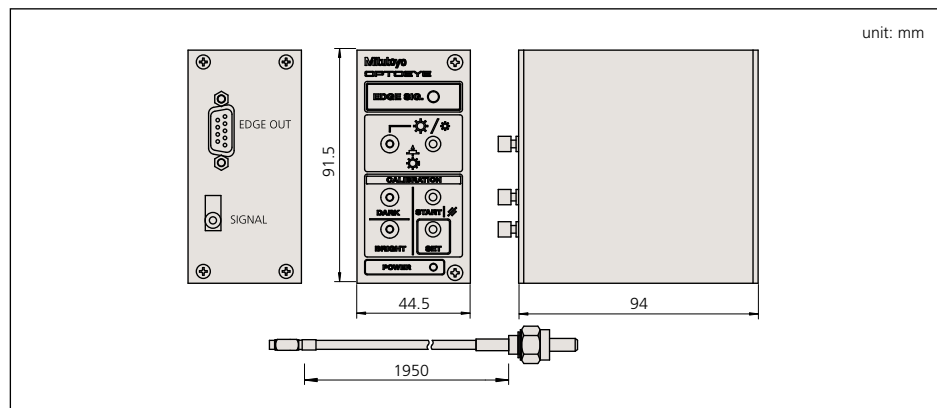
FEATURES

- OPTOEYE-200 adopts a thin fiber-optic cable for detector connection to offer easy set-up and smart operation without obstructing your vies.

- Bright and dark buttons allow easy calibration.
- OPTOEYE can be powered by QM-Data200 via the connecting cable. It means that no AC adapter is required. type of the workpiece surface texture.
- The brightness of the chart can be adjusted.



DIMENSION



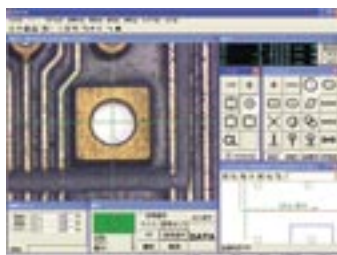
Vision Unit

SERIES 359 — Vision System Retrofit for Microscopes

FEATURES

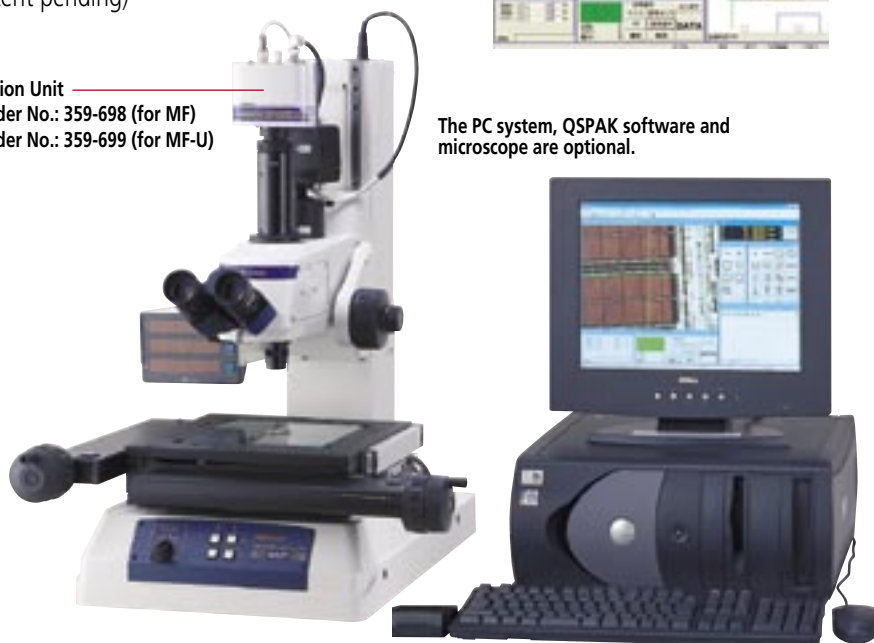
- The automatic edge-detection tools and various macro icons allow measurement in one easy step.
- The graphics and measurement navigation functions facilitate operation.
- Image data input/storage function.
- Measurement results are output to MS-Excel®. This lets the user generate an inspection table on the same computer.
- Allows the tolerance zone measurement of measurement results and various types of statistical processing for each item.
- Combined use with the focus pilot provides high-accuracy in height measurements. (patent pending)
- A series of measuring operation can be performed using just one screen display.
- The auto-brightness control function faithfully reproduces the type and degree of illumination used. (This function is limited to the MF/MF-U series.)

QSPAK Measurement Window

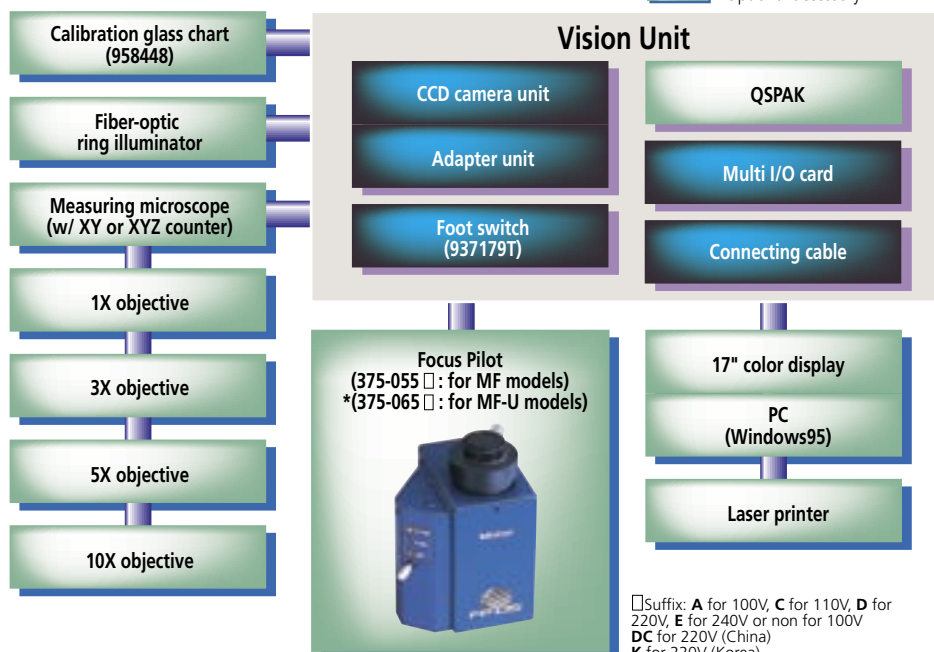


Vision Unit
Order No.: 359-698 (for MF)
Order No.: 359-699 (for MF-U)

The PC system, QSPAK software and microscope are optional.



 : Optional accessory



□ Suffix: **A** for 100V, **C** for 110V, **D** for 220V, **E** for 240V or non for 100V
DC for 220V (China)
K for 220V (Korea)

Technical Data

Projected image:	Inverted image
CCD camera unit	
• Image sensor:	1/3" color CCD camera
• Resolution:	0.0001mm
• Dimensions:	100 x 58 x 89mm (W x D x H)
• Mass:	0.4kg
Adapter unit	
• Operating software:	QSPAK (optional)
• Dimensions:	45 x 123mm
• Magnification:	0.5X
• Mass:	0.3kg
Magnifications:	21X - 210X on 17" monitor
Standard accessory:	Foot switch (937179T)

QSPAK, optional software

For observation/comparison of a form

- Template matching function
- Manual pattern matching function

For simple measurement

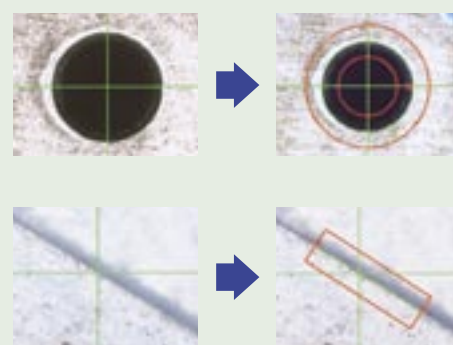
- One-click edge detection tool function
- Smart tool function
- User macro function

For repeated measurement/auto-measurement

- Quick navigation function
- Playback function
- Graphic function
- External data output function
- Statistical calculation function

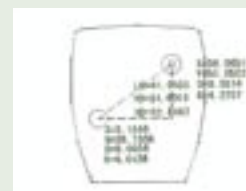
One-click Edge Detection

Just by clicking the mouse near the edge of a workpiece, QSPak automatically scans the edge and detects it, showing its coordinates. This function also works with the point tool, box tool, circle tool and auto-focus tool.



Graphic Window

The measurement results and measured elements are plotted in the graphic window in real-time. By using this function the user can check the current measuring position at a glance. The graphic window can be used for geometrical calculation.



Ball Endmill Measuring Unit

SERIES 359 — Checking R-contour of ball endmill

From setting a reference point to measuring R-contour, the operation is made simple

All you have to do to carry out the entire measurement procedure is to simply enter measuring conditions in the menu of the ball endmill measuring program.



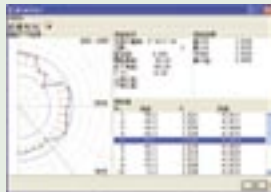
Digital rotary heads providing high-accuracy indexing

Equipped with digital micrometer heads that can switch displays between 0.1 and 1 degrees, thus providing high-accuracy indexing of angles.



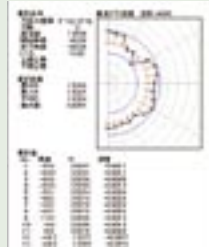
Allows graphic display of R-contour measurement result

Measurement result of R-contour is graphically displayed to allow the assessment of contour accuracy at a glance.



Report generation function for easily generating reports

Measurement result can be easily made into a report, which can later be used as a shopfloor setting data sheet after re-grinding or an abrasion status data sheet.



Saving image files

Images of the tool edge conditions, such as the state of finish and wear, can be saved in digital file.



R-contour measurement with high-accuracy by the use of image processing

A CCD camera is used in image processing for position detection, in order to avoid focus error and to thereby ensure high-accuracy R-contour measurements. This also increases measuring efficiency and helps reduce labor.



Setting a reference point on shank

Measuring R-contour of blade edge

Measuring R-contour at a different position

FEATURES

With the Ball Endmill measuring unit the operator can check for abrasion wear while checking the R-contour after re-grinding or during grinding the ball-end. Periodically checking for abrasion wears in the ball endmill's R-contour helps the user forecast when to replace or re-grind the ball-end, thus ensuring a stable processing accuracy. This also helps to reduce the running cost of the ball endmill while increasing work efficiency.

- Periodically check R-contour, in order to improve processing accuracy
- Access the condition of R-contour after re-grinding the tool end
- Generate a report of the R-contour measurement result
- Save clear images of the tool end in file
- Increase accuracy better than you normally do with use of profile projector

The PC system, microscope and vision unit are optional.



QSPAK and ball endmill extension program

System configuration

- Ball endmill measuring unit (359-655*)
- Digital rotary head
- Ball endmill extension program
- *Suffix: **A** for 100V, **D** for 220V, **E** for 240V
- MF series measuring microscope
- Vision Unit
- QSPAK (measuring program)
- Collet chuck set
- Set A (12AAG241):
ø2.5 to ø5.0mm 5 pcs./set
- Set B (12AAG242):
ø5.5 to ø10.0mm 5 pcs./set
- Set C (12AAG243):
ø10.5 to ø15.0mm 5 pcs./set
- Set D (12AAG244):
ø15.5 to ø20.0mm 5 pcs./set



Digital rotary head



Collet chuck

FS-110

SERIES 378 — Metallurgical Microscope

The FS-110 is designed for inspecting micro-components such as IC chips and video head parts. The optical system features ultra-long working distance objectives, wide view field eye-pieces, and independent correction for lateral chromatic aberration.

FEATURES

- The complete system of FS-110 can be composed of a variety of parts for meeting diverse applications.
- Available without or a transmitted illuminator.
- Ultra-long working distance objectives provide easy manipulation of workpieces.
- Easy switching between the bright-field illumination and the dark-field illumination.
- Optional accessories widen the range of applications.

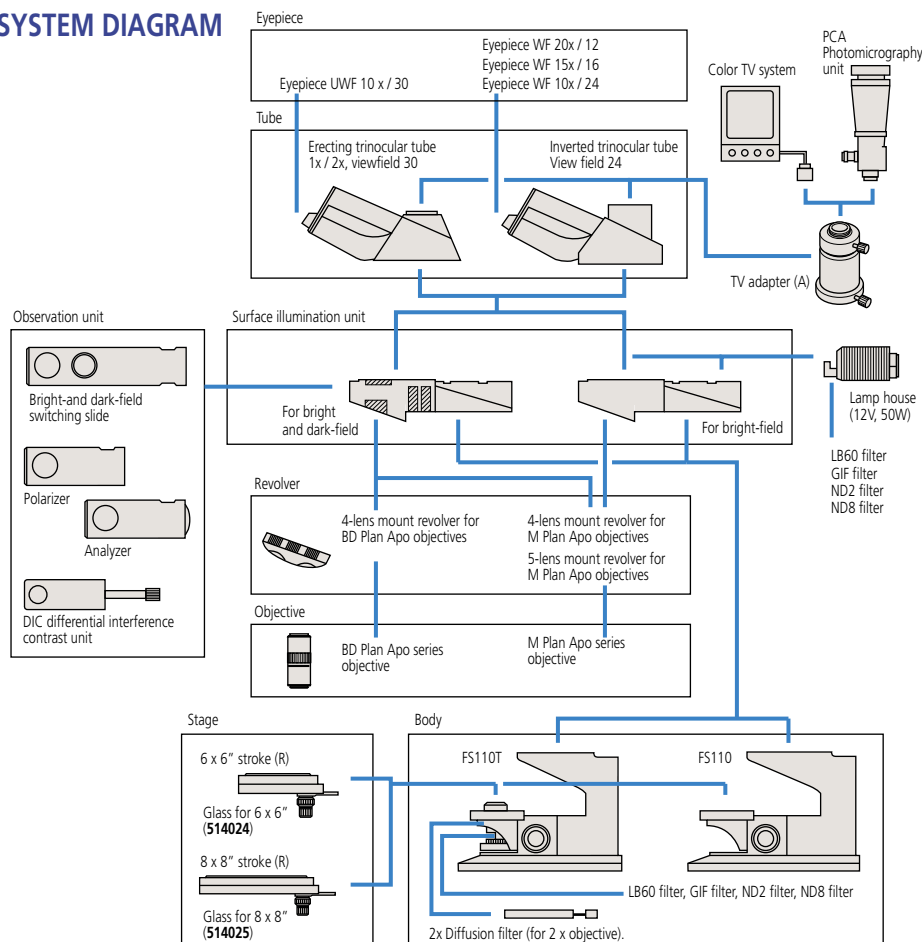


FS-110T with optional accessories



FS-110IR with optional accessories

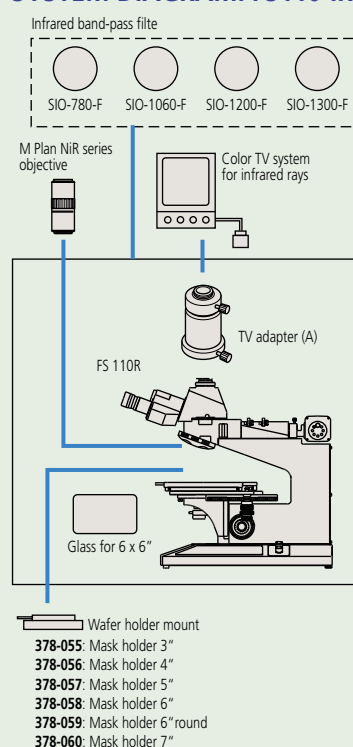
SYSTEM DIAGRAM



Optional Accessory

- 378-856:** 10X eyepiece (Field number: 24), 2 pcs. /set
378-857: 15X eyepiece (Field number: 16), 2 pcs. /set
378-858: 20X eyepiece (Field number: 12), 2 pcs. /set
378-851: Extra-wide 10X eyepiece (Field number: 30)*
378-003: Trinocular tube, 1X (Erect image)
378-004: Trinocular tube, 1X (Inverted image)
378-001: Trinocular tube, 1X / 2X switchable (Erect image)
12AAA646: Color filter (LB80)
12AAA643: Color filter (ND2)
12AAA646: Color filter (ND8)
12AAA645: Color filter (Green)
378-031: Reflected illumination unit (Bright/dark field)
378-032: Reflected illumination unit (Bright field)
378-085: Light source unit**
378-013: Revolving nosepiece w/ 4 lens mounts (B/D field)
378-014: Revolving nosepiece w/ 4 lens mounts (Bright field)
378-015: Revolving nosepiece w/ 5 lens mounts (Bright field)
378-074: Polarizing unit
378-075: Bright/dark field switching unit
378-021: Workstage (6" x 6"), Right-handed type
378-022: Workstage (6" x 6"), Left-handed type
378-023: Workstage (8" x 8"), Right-handed type
378-024: Workstage (6" x 6"), Left-handed type
514024: Stage glass for 6" x 6" workstage
514025: Stage glass for 8" x 8" workstage
378-051: Wafer holder (3" DIA. - 6" DIA.)
378-055: Mask holder (3" x 3")
378-056: Mask holder (4" x 4")
378-057: Mask holder (5" x 5")
378-058: Mask holder (6" x 6")
378-059: Mask holder (7" x 7")
378-060: Mask holder (6" DIA.)
378-076: Differential interference contrast unit (100X, SL80, SL50X)
378-078: Differential interference contrast unit (50X, SL20X)
378-079: Differential interference contrast unit (20X)
378-080: Differential interference contrast unit (10X, 5X)
378-041: CCD camera mount adapter
(See page 394.) Objectives
 *Can be used with the special trinocular tube (378-001).
 **Light source: Halogen bulb (12V, 50W)

SYSTEM DIAGRAM: FS110-IR

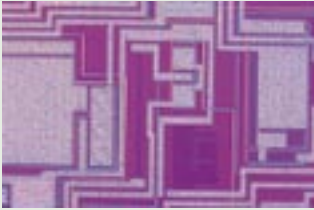


FS-300

SERIES 378 — High Power Inspection Microscope



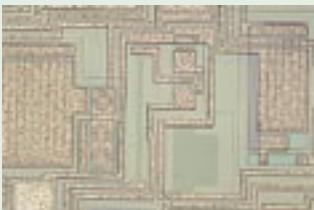
Polarized light observation:
Observing only the filtered light that vibrates in one direction. Used for observing materials with special optical characteristics, such as mineral and liquid crystal.



Differential interference observation:
Effective in detecting fine scratches and steps on the surface of metal, liquid crystal, and semiconductors.



Dark field observation:
Observing only the scattered light by shutting down the direct light to the objectives. The scratches and dust that cannot be viewed in the bright view field can be observed by a high-contrast.



Bright field observation:
Most common method of observation. Observing directly the light reflected on the surface of workpiece.



Refer to the FS-300 leaflet (E4197) for more details.

The FS-300 is designed for inspecting micro-components such as IC chips and video head parts. The optical system features ultra-long working distance objectives, wide view field eyepieces, and independent correction for lateral chromatic aberration.

FEATURES

- The complete system of FS-300 can be composed of a variety of parts for meeting diverse applications.
- Available with or without a transmitted illuminator.
- Ultra-long working distance objectives provide easy manipulation of workpieces.
- Easy switching between the bright-field illumination and the dark-field illumination.
- Optional accessories widen the range of applications.



FS-300 with optional accessories

SPECIFICATIONS

Main unit	Observation system	Bright field (BF): 378-320, 378-322, 378-324, 378-326 Bright/dark field (BF/DF): 378-321, 378-323, 378-325, 378-327
	Reflected illumination	Koehler illumination With aperture diaphragm (centering mechanism) and field stop 12V/100W halogen lamp (non-stepped brightness adjustment) With filter mounting slot (2-slot) With BF/DF switching slide (378-321, 378-323, 378-325, 378-327 only)
	Transmitted illumination	12V/100W fiber illumination (non-stepped brightness adjustment) With aperture diaphragm (378-321, 378-323, 378-325, 378-327 only)
	Focus adjustment	With concentric coarse and fine focusing wheels (right and left) Fine adjustment: 0.1mm/rev. for 32mm travel range Coarse adjustment: 3.8mm/rev. for 32mm travel range
Power revolver		Inward type with 4 lens mounts
Workstage		Travel stroke: 356 x 306mm with X-/Y-axis fine feed knobs and coarse travel handle
Optical tube	Type	Trinocular tube (erect image)
	Field number	24
	Depression angle	Fixed 20°: 378-320, 378-321, 378-322, 378-323 Adjustable 0° to 20°: 378-324, 378-325, 378-326, 378-327
	Intermediate image mag.	1X
	Optical pass ratio	Siedentopf type, adjustment range: 51 - 76mm
	Pupil distance	Siedentopf type, adjustment range: 51 - 76mm
Eyepiece	Field of view	10X/ø30: 378-320, 378-321, 378-322, 378-323 10X/ø24: 378-324, 378-325, 378-326, 378-327
Applicable objective (optional)		M Plan Apo, M Plan Apo SL, G Plan Apo: 378-320, 378-322, 378-324, 378-326 BD Plan Apo, BD Plan Apo SL: 378-321, 378-323, 378-325, 378-327
Dimensions	Main unit	360 x 803 x 568.5mm
	Workstage	700 x 400mm
Power supply		100 to 240VAC, 50/60Hz
Power consumption		Approx. 150W: 378-320, 378-321, 378-324, 378-325 Approx. 300W: 378-322, 378-323, 378-326, 378-327
Mass		Approx. 50kg including workstage

FS-70

SERIES 378 — Microscope Unit for Semiconductor Inspection

FEATURES

- The optical system that has originally developed for the best seller FS 60 models was further enhanced for the FS70 models. It is ideal as a microscope unit of a prober station for semiconductors. (All models CE marked.)
- The FS70L supports three types of YAG laser wavelength ranges (1064nm, 532nm and 355nm), while the FS70L4 supports two types of wavelength ranges (532nm and 266nm), thus expanding a scope of laser applications, allowing laser-cutting of thin-films used in semiconductors and liquid crystal substrates. However, Mitutoyo assumes no responsibility whatsoever for the performance and/or safety of the laser system used with Mitutoyo microscopes. a careful examination is recommended in selecting a laser-emission unit.
- Bright field, Differential Interference Contrast (DIC) and polarized observations are standard with the FS70Z. The FS70L and FS70L4 do not support the DIC method.
- By employing an inward revolver, the long working distance objectives provide excellent operatability.
- An ergonomic design with superb operatability: the FS70 employs the erect-image optical system (the image in the field of view has the same orientation as the specimen) and enlarged fine focus adjustment wheel with rubber grip coarse adjustment knob.



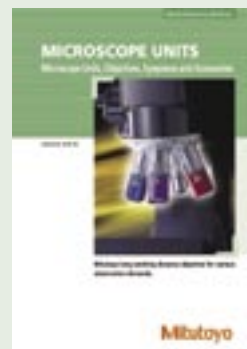
SPECIFICATIONS

Model No. Order No.	FS70 378-184-1	FS70-TH 378-184-3	FS70Z 378-185-1	FS70Z-TH 378-185-3	FS70L 378-186-1	FS70L-TH 378-186-3	FS70L4 378-187-1	FS70L4-TH 378-187-3
Short base model No. Order No.	FS70-S 378-184-2	FS70-THS 378-184-4	FS70Z-S 378-185-2	FS70Z-THS 378-185-4	FS70L-S 378-186-2	FS70L-THS 378-186-4	FS70L4-S 378-187-2	FS70L4-THS 378-187-4
Focus adjustment	50mm travel range with concentric coarse (3.8mm/rev) and fine (0.1mm/rev) focusing wheels (right / left)							
Image	Erect image							
Pupil distance	Siedentopf type, adjustment range: 51 - 76mm							
Field number	24							
Tilt angle	—	0° - 20°	—	0° - 20°	—	0° - 20°	—	0° - 20°
Optical pass ratio	50/50	100/0 or 0/100	50/50	100/0 or 0/100	100/0 or 0/100		100/0 or 0/100	
Protective filter	—		—		Built-in laser beam filter		Built-in laser beam filter	
Tube lens	1X		1X - 2X zoom		1X		1X	
Applicable laser	—		—		1064/532/355nm		532/355nm	
Camera mount	C-mount (using optional adapter B)				Use a laser with TV port.		C-mount receptacle (with green filter switch)	
Illumination system, optional	Reflective illumination for bright field (Koehler illumination, with aperture diaphragm) 12V 100W fiber optics, non-stepped adjustment, light guide length: 1.5m, power consumption 150W							
Objective, optional (for observation)	M Plan Apo, M Plan Apo SL, G Plan Apo							
Objective, optional (for laser-cutting)	—				M/LCD Plan NIR, M/LCD Plan NUV		M Plan UV	
Loading weight*	14.5kg	13.6kg	14.1kg	13.2kg	14.5kg	13.6kg	14.1kg	13.2kg
Mass (main unit)	6.1kg	7.1kg	6.6kg	7.5kg	6.1kg	7.1kg	6.6kg	7.5kg

*Loading weight on optical tube excluding weight of objective lenses and eyepieces

Technical Data

Focus adjustment	
• Method:	With concentric coarse and fine focusing wheels (right and left)
• Range:	50mm travel range 0.1mm/rev. for fine adjustment, 3.8mm/rev. for coarse adjustment
Trinocular tube Image:	Erect image
Pupil distance:	Siedentopf type, adjustment range: 51 - 76mm
Field number:	24
Tilt angle:	0° - 20° (only -TH, -THS models)
Illumination system:	Reflective illumination for bright field (Koehler illumination, with aperture diaphragm)
Light source:	12V100W fiber optics, non-stepped adjustment), light guide length 1.5m, power consumption 150W
Objectives (optional):	M Plan Apo-4, M Plan Apo SL, G Plan Apo



Refer to the Microscope Units leaflet (E4191) for more details.

VM-ZOOM40

SERIES 378 — Assembly Type Microscope Unit

The VM-ZOOM40 is an assembly type microscope unit that has drastically improved operability and the quality of visual images by combining the main unit, which has a high-magnification zooming system, with a newly developed high-resolution objective, which has a long working distance. If the VM-ZOOM40 is used with an analysis probe and various other laser repair equipment, it will greatly aid in development, manufacturing, and inspection of semiconductors and LCD panels.



SPECIFICATIONS

Total magnification	100X - 4,000X (when using 1/2-inch CCD camera and 14-inch monitor)
Magnification of tube	0.25X - 10X (Zoom ratio 1:40)
Objective	M Plan Apo HR 10X
Field of view	<ul style="list-style-type: none"> 1/2-inch CCD camera (optional): 2.56x1.92mm - 0.064x0.048mm Binocular: ø3.2mm - ø0.08mm
Reflected illumination	<ul style="list-style-type: none"> Koehler system (with aperture stop) Fiber-optic illuminator (378-088) is required for the manual zoom type.
Light source	Halogen bulb (21V, 150W)
Focusing unit	Concentric coarse and fine wheels
Power supply	20Lx (min.) on the screen
Mass	Main unit: Approx. 7kg Binocular unit: 1kg Remote controller unit: Approx. 7kg

FEATURES

- High-ratio 40X zoom with excellent operability.
- High-resolution objective (10X) supplied as standard.
- Various optional bright-field objectives attachable.
- The slide type lens mount allows quick change between the monitoring and laser beam cutting objectives.
- Three wavelength (near infrared, visible, near ultraviolet, ultraviolet) lasers supported.
- C-mount attached as standard.
- The manual or power type system selectable according to the purpose.

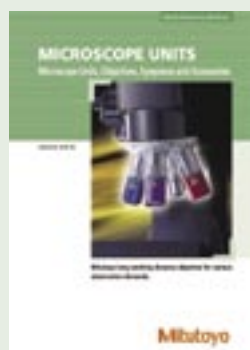
Selection Guide of System Configuration

Order No. (Depends on each system configuration)	378-171*	378-172*	378-173*	378-174*	378-175*	378-176*	378-177*	378-178*	378-181*	378-182*	Remarks
Manual zoom function	●	●	●	●							
Power zoom function					●	●	●	●	●	●	Fiber-optic illumination controller is also provided.
Single-objective mount	●				●						
Double-objective mount		●	●	●		●	●	●	●	●	The objective can be switched due to the sliding mechanism.
Binocular unit		●	●	●		●		●		●	10X eyepieces (378-856) are provided.
YAG laser (1064/532/355nm) mount			●	●			●	●			
YAG laser (532/266nm) mount									●	●	
Focusing unit	●	●	●	●	●	●	●	●	●	●	
CCD camera mount	●	●	●	●	●	●	●	●	●	●	
M Plan Apo HR 10X Objective	●	●	●	●	●	●	●	●	●	●	

●: Included in the set.

* To denote your AC line voltage add the following suffixes to the order No. (e.g.: **378-171A**):

A for UL/CSA, **D** for CEE, **E** for BS, **DC** for China, **K** for EK, **No suffix** is required for JIS/100V



Refer to the Microscope Units leaflet (E4191) for more details.

VMU

SERIES 378 — Video Microscope Unit

The VMU is a compact, light-weight, and easy-to-install microscope unit for CCD camera monitoring in semiconductor fabrications.

FEATURES

- The optical system features ultra-long working distance objectives and correction for the wide range of radiation.
- The fiber-optic reflected illumination keeps the workpiece free from thermal expansion caused by heat. The fiber-optic illuminator is required for the light source.
- Also available with a laser mount or revolving nosepiece (objective mount).



SPECIFICATIONS

Magnification of tube	1X
Applicable wavelength	378-505, 378-506
	378-507
	378-508
Objective	(Optional)
Reflected illumination	• Teracentric system with aperture stop system • Fiber-optic illuminator (optional) is required.
Light source	Halogen bulb (21V, 150W) (optional)
Mass	378-505: 570g 378-506: 590g 378-507: 980g 378-508: 1010g

Selection Guide of System Configuration

Order No. (Depends on each system configuration)	378-505	378-506	378-507	378-508
Vertical CCD camera mount	●	●	●	●
Horizontal CCD camera mount		●		
YAG laser mount			●	●
Fiber-optic illumination unit			●	●
M Plan Apo, M Plan Apo SL, G Plan Apo objectives for bright field observation	▲	▲	▲	▲
M Plan Apo NIR, LCD Plan Apo NIR, M Plan Apo NUV and LCD Plan Apo NUV objectives for laser cutting			▲	
M Plan UV objectives for laser machining				▲

●: Provided, ▲: Available as optional accessory



Refer to the Microscope Units leaflet (E4191) for more details.

Eyepiece

SERIES 378

FEATURES

- The field of view is extra wide.
- Optional reticles are available.

Reticles (optional)

- 516848:** Cross-hair
516576: Broken cross hair (90° and 60°)
516578: Concentric circle
 (Diametric increment: 1.2mm)
516577: 20mm scale
 (Minimum reading: 0.1mm) with cross hair
516849: 10mm scale (Minimum reading: 0.1mm)
516850: 5mm scale (Minimum reading: 0.05mm)
516851: 10x10mm section
 (Minimum section: 1x1mm)



SPECIFICATIONS

Order No. (2pcs. set)	Magnifi- cation	Field number	Mass	Individual order No.
378-856	10X	24	85g	378-856-5
378-857	15X	16	40g	378-857-5
378-858	20X	12	55g	378-858-8

Objectives

SERIES 378

The Mitutoyo 378 Series objectives have the world's longest working distance and an infinity correction optical system. These objectives provide flexible observation at high magnifications and independent correction of chromatic aberration.

FEATURES

- The long working distance type objectives provide a wide space between the lens surface and the workpiece surface in focus, making it possible to observe workpieces which are usually hard-to-focus because of their projections like a step.

- The metallurgical plan apochromatic (M Plan Apo) objective is an excellent optical system. This objective provides a flat, chromatic aberration free image throughout the field of view, making it is suitable for any type of microscope.
- Specially designed objectives are also available with correction for near-infrared radiation, near-ultraviolet radiation, and ultraviolet radiation, or various thickness of LCD screen glasses.
- The mounting screw threads of objectives are designed to conform to JIS B-7141-1988.



M Plan Apo and M Plan Apo SL objectives for bright field observation



BD Plan Apo and BD Plan Apo SL objectives for bright/dark field observation



Near-infrared radiation corrected M Plan Apo NIR objective



Near-ultraviolet radiation corrected M Plan Apo NUV objectives



Ultraviolet radiation corrected M Plan UV objectives



Refer to the Microscope Units leaflet (E4191) for more details.

M Plan Apo for Bright Field Observation

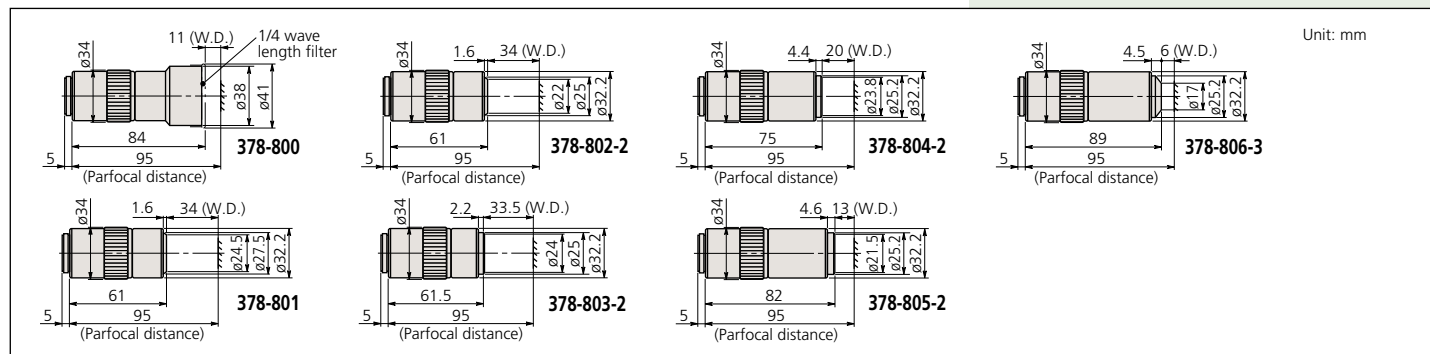
Order No.	Mag.	N.A.	W.D.	f	R	D.F.	View field 1	View field 2	Mass
378-800	1X	0.025	11.0mm	200mm	11.0μm	440μm	ø24mm	4.8x6.4mm	300g
378-801	2X	0.055	34.0mm	100mm	5.0μm	91μm	ø12mm	2.4x3.2mm	220g
378-802-2	5X	0.14	34.0mm	40mm	2.0μm	14.0μm	ø4.8mm	0.96x1.28mm	230g
378-803-2	10X	0.28	33.5mm	20mm	1.0μm	3.5μm	ø2.4mm	0.48x0.64mm	230g
378-804-2	20X	0.42	20.0mm	10mm	0.7μm	1.6μm	ø1.2mm	0.24x0.32mm	270g
378-805-2	50X	0.55	13.0mm	4mm	0.5μm	0.9μm	ø0.48mm	0.10x0.13mm	290g
378-806-3	100X	0.70	6.0mm	2mm	0.4μm	0.6μm	ø0.24mm	0.05x0.06mm	320g

Note:

Polarizing unit (378-074) is required when using 1X objective.

Mag.: Magnification
 N.A.: Numerical aperture
 W.D.: Working distance
 f: Focal distance
 R: Resolving power
 D.F.: Focal depth
 View field 1: Field of view when using ø24mm eyepiece
 View field 2: Field of view when using 1/2" CCD camera

DIMENSION



M Plan Apo SLfor Bright Field Observation

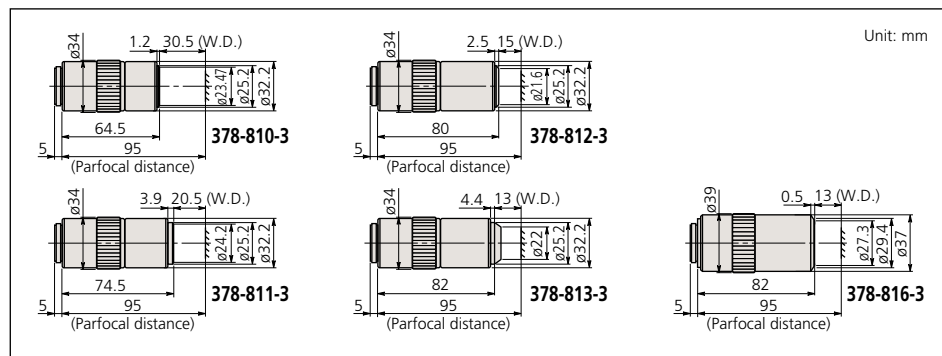
Order No.	Mag.	N.A.	W.D.	f	R	D.F.	View field 1	View field 2	Mass
378-810-3	20X	0.28	30.5mm	10mm	1.0μm	3.5μm	ø1.2mm	0.24x0.32mm	240g
378-811-3	50X	0.42	20.5mm	4mm	0.7μm	1.6μm	ø0.48mm	0.10x0.13mm	280g
378-812-3	80X	0.50	15.0mm	2.5mm	0.6μm	1.1μm	ø0.3mm	0.06x0.08mm	280g
378-813-3	100X	0.55	13.0mm	2mm	0.5μm	0.9μm	ø0.24mm	0.05x0.06mm	290g
378-816-3	200X	0.62	13.0mm	1mm	0.4μm	0.7μm	ø0.12mm	0.025x0.03mm	490g

Note:

These objectives offer extra-long working distance.

Mag.: Magnification
 N.A.: Numerical aperture
 W.D.: Working distance
 f: Focal distance
 R: Resolving power
 D.F.: Focal depth
 View field 1: Field of view when using ø24mm eyepiece
 View field 2: Field of view when using 1/2" CCD camera

DIMENSION



M Plan Apo HR for Bright Field Observation

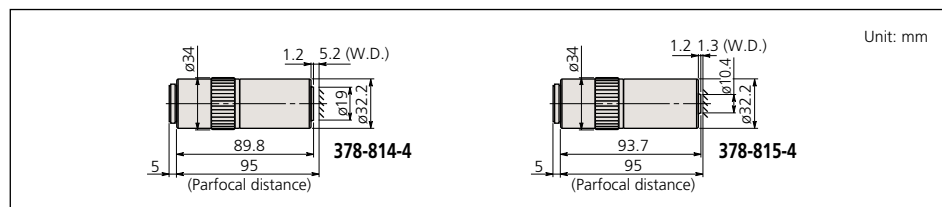
Order No.	Mag.	N.A.	W.D.	f	R	D.F.	View field 1	View field 2	Mass
378-788-4	10X	0.42	15mm	20mm	0.8μm	1.1.55μm	ø1.2mm	0.24x0.32mm	240g
378-814-4	50X	0.75	5.2mm	4mm	0.4μm	0.48μm	ø0.48mm	0.10x0.13mm	275g
378-815-4	100X	0.90	1.3mm	2mm	0.3μm	0.34μm	ø0.24mm	0.05x0.06mm	275g

Note:

These objectives offer extra-high resolving power.

Mag.: Magnification
 N.A.: Numerical aperture
 W.D.: Working distance
 f: Focal distance
 R: Resolving power
 D.F.: Focal depth
 View field 1: Field of view when using ø24mm eyepiece
 View field 2: Field of view when using 1/2" CCD camera

DIMENSION



Note:
The LCD Plan Apo Series are designed for observing a workpiece through LCD glass (thickness = 3.5mm).

Mag.: Magnification
N.A.: Numerical aperture
W.D.: Working distance
f: Focal distance
R: Resolving power
D.F.: Focal depth
View field 1: Field of view when using ø24mm eyepiece
View field 2: Field of view when using 1/2" CCD camera

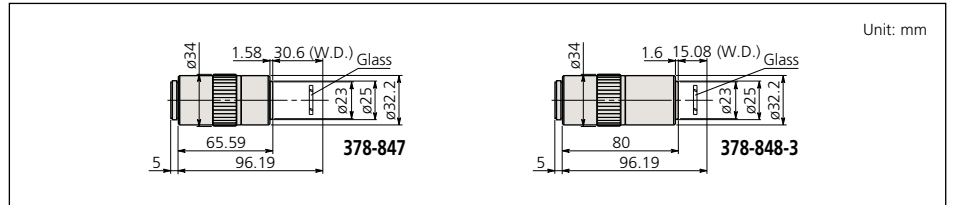
Mag.: Magnification
N.A.: Numerical aperture
W.D.: Working distance
f: Focal distance
R: Resolving power
D.F.: Focal depth
View field 1: Field of view when using ø24mm eyepiece
View field 2: Field of view when using 1/2" CCD camera

Glass Thickness (t = 3.5mm) Corrected G Plan Apo for Bright Field Observation

Order No.	Mag.	N.A.	W.D.	f	R	D.F.	View field 1	View field 2	Mass
378-847	20X	0.28	29.42mm*	10mm	1.0μm	3.5μm	ø1.2mm	0.24x0.32mm	270g
378-848-3	50X	0.50	13.89mm*	4mm	0.6μm	1.1μm	ø0.48mm	0.10x0.13mm	320g

*In air

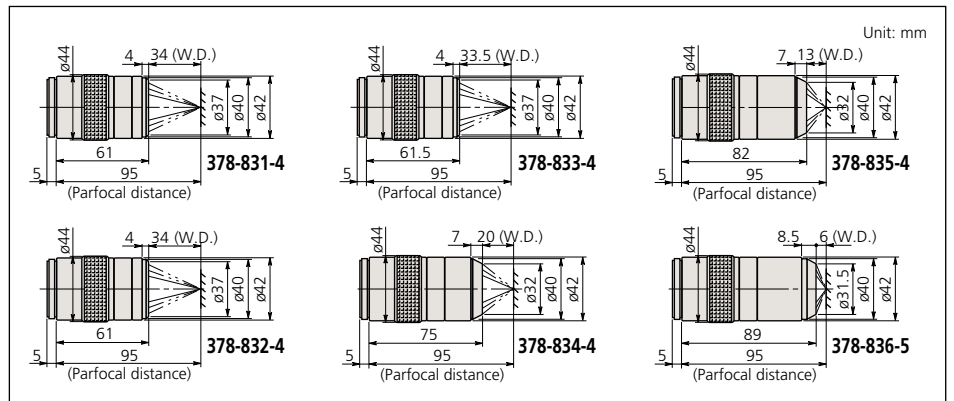
DIMENSION



BD Plan Apo for Bright / Dark Field Observation

Order No.	Mag.	N.A.	W.D.	f	R	D.F.	View field 1	View field 2	Mass
378-831-4	2X	0.055	34.0mm	100mm	5.0μm	91μm	ø12mm	2.4x3.2mm	230g
378-832-4	5X	0.14	34.0mm	40mm	2.0μm	14.0μm	ø4.8mm	0.96x1.28mm	240g
378-833-4	10X	0.28	33.5mm	20mm	1.0μm	3.5μm	ø2.4mm	0.48x0.64mm	240g
378-788-4	20X	0.42	20.0mm	10mm	0.7μm	1.6μm	ø1.2mm	0.24x0.32mm	300g
378-814-4	50X	0.55	13.0mm	4mm	0.5μm	0.9μm	ø0.48mm	0.10x0.13mm	320g
378-815-4	100X	0.70	6.0mm	2mm	0.4μm	0.6μm	ø0.24mm	0.05x0.06mm	320g

DIMENSION



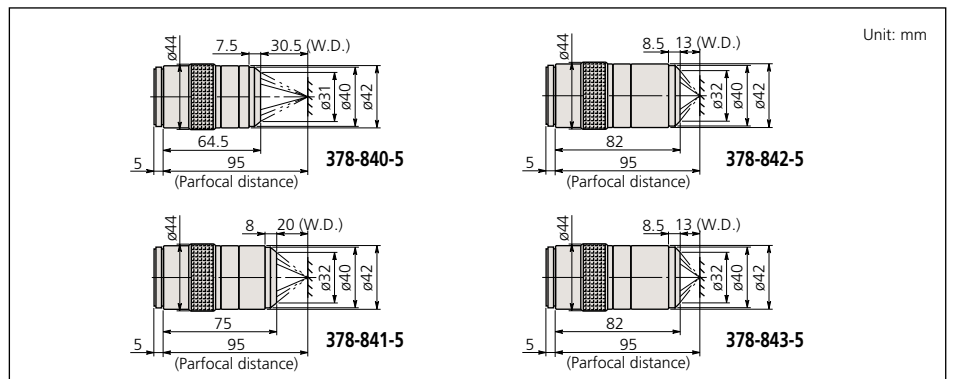
Note:
These objectives offer extra-long working distance.

Mag.: Magnification
N.A.: Numerical aperture
W.D.: Working distance
f: Focal distance
R: Resolving power
D.F.: Focal depth
View field 1: Field of view when using ø24mm eyepiece
View field 2: Field of view when using 1/2" CCD camera

BD Plan Apo SL for Bright / Dark Field Observation

Order No.	Mag.	N.A.	W.D.	f	R	D.F.	View field 1	View field 2	Mass
378-840-5	20X	0.28	30.5mm	10mm	1.0μm	3.5μm	ø1.2mm	0.24x0.32mm	240g
378-841-5	50X	0.42	20.0mm	4mm	0.7μm	1.6μm	ø0.48mm	0.10x0.13mm	310g
378-842-5	80X	0.50	15.0mm	2mm	0.6μm	1.1μm	ø0.3mm	0.06x0.08mm	320g
378-843-5	100X	0.55	13.0mm	2mm	0.5μm	0.9μm	ø0.24mm	0.05x0.06mm	320g

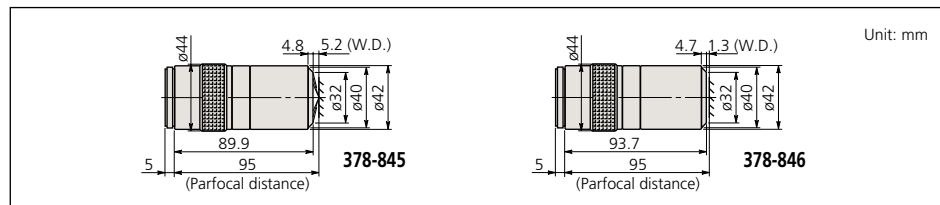
DIMENSION



BD Plan Apo HR for Bright / Dark Field Observation

Order No.	Mag.	N.A.	W.D.	f	R	D.F.	View field 1	View field 2	Mass
378-845	50X	0.75	5.2mm	4mm	0.4 μ m	0.48 μ m	ø0.48mm	0.10x0.13mm	420g
378-846	100X	0.90	1.3mm	2mm	0.3 μ m	0.24 μ m	ø0.24mm	0.05x0.06mm	435g

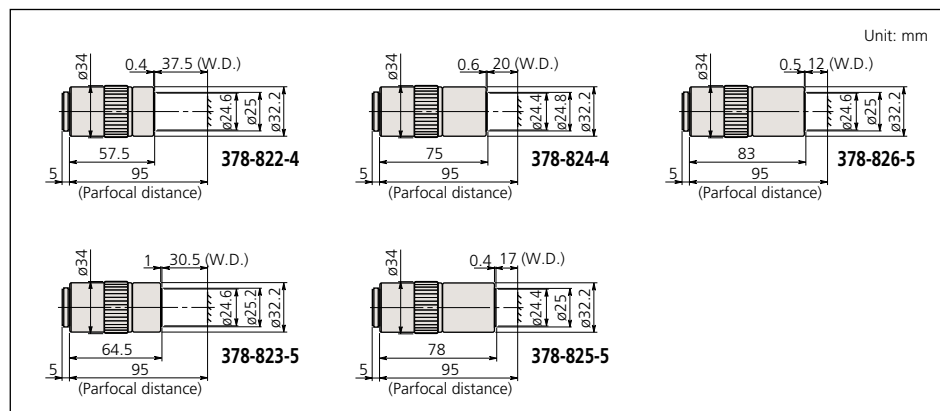
DIMENSION



Near-infrared Radiation Corrected M Plan Apo NIR for Bright Field Observation

Order No.	Mag.	N.A.	W.D.	f	R	D.F.	View field 1	View field 2	Mass
378-822-4	5X	0.14	37.5mm	40mm	2.0 μ m	14.0 μ m	ø4.8mm	0.96x1.28mm	220g
378-823-5	10X	0.26	30.5mm	20mm	1.1 μ m	4.1 μ m	ø2.4mm	0.48x0.64mm	250g
378-824-4	20X	0.40	20.0mm	10mm	0.7 μ m	1.7 μ m	ø1.2mm	0.24x0.32mm	300g
378-825-5	50X	0.42	17.0mm	4mm	0.7 μ m	1.6 μ m	ø0.48mm	0.10x0.13mm	315g
378-826-5	100X	0.50	12.0mm	2mm	0.6 μ m	1.1 μ m	ø0.24mm	0.05x0.06mm	335g
378-863-5	50X	0.65	10mm	4mm	0.42 μ m	0.65 μ m	ø0.48mm	0.10x0.17mm	450g
378-864-5	100X	0.70	10mm	2mm	0.74 μ m	0.56 μ m	ø0.24mm	0.05x0.06mm	450g

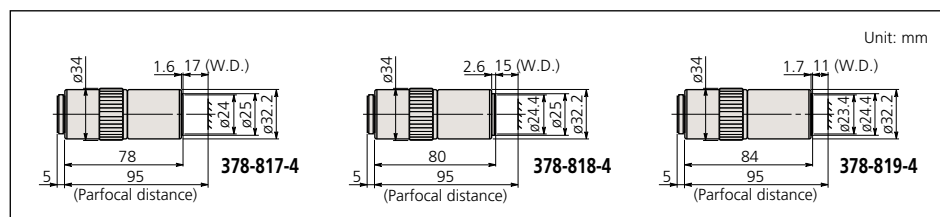
DIMENSION



Near-infrared Radiation Corrected M Plan Apo NIR for Bright Field Observation

Order No.	Mag.	N.A.	W.D.	f	R	D.F.	View field 1	View field 2	Mass
378-817-4	20X	0.40	17.0mm	10mm	0.7 μ m	1.7 μ m	ø1.2mm	0.24x0.32mm	340g
378-818-4	50X	0.42	15.0mm	4mm	0.7 μ m	1.6 μ m	ø0.48mm	0.10x0.13mm	350g
378-819-4	100X	0.50	11.0mm	2mm	0.6 μ m	1.1 μ m	ø0.24mm	0.05x0.06mm	380g

DIMENSION



Note:

These objectives offer extra-high resolving power.

Mag.: Magnification
N.A.: Numerical aperture
W.D.: Working distance
f: Focal distance
R: Resolving power
D.F.: Focal depth
View field 1: Field of view when using ø24mm eyepiece
View field 2: Field of view when using 1/2" CCD camera

Note:

These objectives are designed that a workpiece's image can be focused within the focal depth even when the wavelength used is changed anywhere from the visible range ($\lambda = 480\text{nm}$) up to near-infrared range ($\lambda = 1800\text{nm}$). Therefore the M Plan NIR Series are suitable for laser repair. However, when the wavelength used exceeds 1100nm, the focussing position may slightly deviate from that in the visible light range due to changes in the glass dispersion and the refractive index.

Mag.: Magnification
N.A.: Numerical aperture
W.D.: Working distance
f: Focal distance
R: Resolving power
D.F.: Focal depth
View field 1: Field of view when using ø24mm eyepiece
View field 2: Field of view when using 1/2" CCD camera

Note:

These objectives are designed that a workpiece's image can be focused within the focal depth even the wavelength used is changed anywhere from the visible range ($\lambda = 620\text{nm}$) to the near-ultraviolet range ($\lambda = 355\text{nm}$). Therefore The M Plan NUV Series are suitable for laser repair using high frequency laser beam.

Mag.: Magnification
N.A.: Numerical aperture
W.D.: Working distance
f: Focal distance
R: Resolving power
D.F.: Focal depth
View field 1: Field of view when using ø24mm eyepiece
View field 2: Field of view when using 1/2" CCD camera

Note:
These near-infrared ($\lambda = 1800\text{nm}$) corrected objectives are designed for observing a workpiece through LCD glass (thickness = 1.1mm (378-827-4, 378-828-5) or 0.7mm (378-829-5, 378-754-5)) and for laser repair.

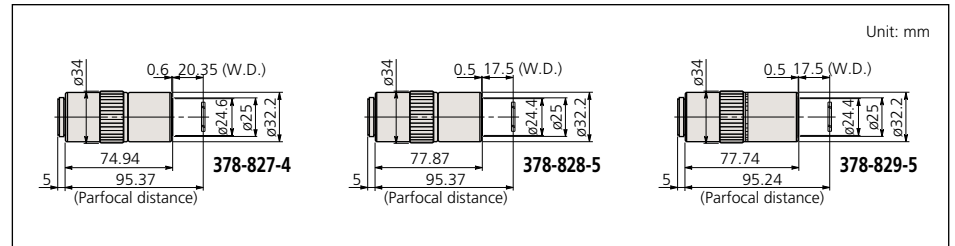
Mag.: Magnification
N.A.: Numerical aperture
W.D.: Working distance
f: Focal distance
R: Resolving power
D.F.: Focal depth
View field 1: Field of view when using $\phi 24\text{mm}$ eyepiece
View field 2: Field of view when using 1/2" CCD camera

Near-Infrared Radiation and LCD Glass Thickness ($t = 1.1\text{mm}$ or 0.7mm) Corrected LCD Plan Apo NIR for Bright Field Observation

Order No.	Mag.	N.A.	W.D.	f	R	D.F.	View field 1	View field 2	Mass
378-827-4	20X	0.40	19.98mm*	10mm	$0.7\mu\text{m}$	$1.7\mu\text{m}$	$\phi 1.2\text{mm}$	$0.24 \times 0.32\text{mm}$	305g
378-828-5	50X	0.42	17.13mm*	3.9mm	$0.7\mu\text{m}$	$1.6\mu\text{m}$	$\phi 0.48\text{mm}$	$0.10 \times 0.13\text{mm}$	320g
378-829-5	50X	0.42	17.26mm*	3.9mm	$0.7\mu\text{m}$	$1.6\mu\text{m}$	$\phi 0.48\text{mm}$	$0.10 \times 0.13\text{mm}$	320g
378-752-5	100X	0.50	12.13mm*	2mm	$0.6\mu\text{m}$	$1.1\mu\text{m}$	$\phi 0.24\text{mm}$	$0.05 \times 0.06\text{mm}$	335g
378-754-5	100X	0.50	11.76mm*	2mm	$0.6\mu\text{m}$	$1.1\mu\text{m}$	$\phi 0.24\text{mm}$	$0.05 \times 0.06\text{mm}$	335g

*In air

DIMENSION



Note:
These near-infrared ($\lambda = 1800\text{nm}$) corrected objectives are designed for observing a workpiece through LCD glass (thickness = 1.1mm (378-827-4, 378-828-5) or 0.7mm (378-829-5, 378-754-5)) and for laser repair.

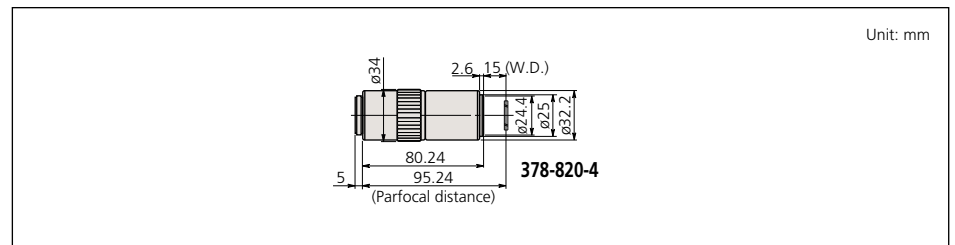
Mag.: Magnification
N.A.: Numerical aperture
W.D.: Working distance
f: Focal distance
R: Resolving power
D.F.: Focal depth
View field 1: Field of view when using $\phi 24\text{mm}$ eyepiece
View field 2: Field of view when using 1/2" CCD camera

Near-ultraviolet Radiation and LCD Glass Thickness ($t = 0.7\text{mm}$) Corrected LCD Plan NUV for Bright Field Observation

Order No.	Mag.	N.A.	W.D.	f	R	D.F.	View field 1	View field 2	Mass
378-820-4	50X	0.42	14.76mm*	4mm	$0.7\mu\text{m}$	$1.6\mu\text{m}$	$\phi 0.48\text{mm}$	$0.10 \times 0.13\text{mm}$	310g
378-753-4	50X	0.42	14.53mm	4mm	$0.7\mu\text{m}$	$1.6\mu\text{m}$	$\phi 0.48\text{mm}$	$0.10 \times 0.13\text{mm}$	310g
378-751-4	100X	0.50	11.03mm	2mm	$0.6\mu\text{m}$	$1.1\mu\text{m}$	$\phi 0.24\text{mm}$	$0.05 \times 0.06\text{mm}$	380g

*In air

DIMENSION



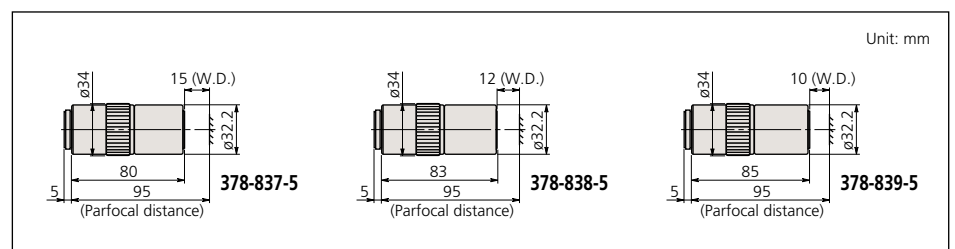
Note:
These ultraviolet corrected objectives are designed that a workpiece's image can be focused within the focal depth even when the wavelength used is changed anywhere from the visible range ($\lambda = 550\text{nm}$) to the ultraviolet range ($\lambda = 266\text{nm}$). Therefore The M Plan UV Series are suitable for laser repair using high frequency laser beam.

Mag.: Magnification
N.A.: Numerical aperture
W.D.: Working distance
f: Focal distance
R: Resolving power
D.F.: Focal depth
View field 1: Field of view when using $\phi 24\text{mm}$ eyepiece
View field 2: Field of view when using 1/2" CCD camera

Ultraviolet Radiation Corrected M Plan UV for Bright Field Observation

Order No.	Mag.	N.A.	W.D.	f	R	D.F.	View field 1	View field 2	Mass
378-837-5	20X	0.36	15.0mm	10mm	$0.8\mu\text{m}$	$2.1\mu\text{m}$	$\phi 1.2\text{mm}$	$0.24 \times 0.32\text{mm}$	330g
378-838-5	50X	0.40	12.0mm	4mm	$0.7\mu\text{m}$	$1.7\mu\text{m}$	$\phi 0.48\text{mm}$	$0.10 \times 0.13\text{mm}$	400g
378-839-5	80X	0.55	10.0mm	2.5mm	$0.5\mu\text{m}$	$0.9\mu\text{m}$	$\phi 0.3\text{mm}$	$0.06 \times 0.08\text{mm}$	380g

DIMENSION



MSM-400

SERIES 377 — Stereo Microscopes

FEATURES

- Bright, sharp images with real depth are recreated with high resolution and excellent faithfulness to color, thus minimizing eye fatigue while increasing inspection efficiency and productivity.
- The MSM series provides a full range of advanced functions at an affordable price.
- User-friendly turret types (MSM-412, MSM-465) and a zoom type (MSM-Z414) are available.
- Continuous zooming, a standard feature, allows you to enlarge the object by 10 to 40 times in total magnification.
- MSM series can be connected to a digital camera or CCD camera to save captured images of the object or for simultaneous observation through different media.
- The extended depth of focus, long working distance and wide field of view increase work efficiency. The system is ideal for inspecting various objects such as electronic components, metal components, plants, mineral compositions and biological cells.
- Various attachments expand applications and use. Extended MSM units can be used for appearance inspections, on processing lines, inside inspection systems or in teaching environments.



MSM-412



MSM-Z414



MSM-465

SPECIFICATIONS

Model No.	MSM-412	MSM-Z414	MSM-465
Order No.	377-925*	377-945*	375-065*
Optical system	Greenough's type		Galilean type
Total magnification	10X, 20X	10X to 40X	6X, 12X, 25X, 50X
Optical tub	Binocular	Binocular	Binocular
Pupil distance	54 - 76mm (adjustable)	54 - 76mm (adjustable)	54 - 76mm (adjustable)
Eyepiece	WF10X, WF5X, WF15X, WF20X	WF10X, WF5X, WF15X, WF20X	WF10X, WF5X, WF15X, WF20X
Objective	1X, 2X	1X to 4X	1.2X, 2.5X, 5X
Working distance of objective	95mm	80mm	89mm
Focusing travel	44mm	44mm	50mm
Maximum workpiece height	93mm	95mm	95mm*
Workstage size	ø95mm	ø95mm	ø95mm
Dimensions	151x285x343mm	151x285x343mm	151x285x343mm
Mass	4.9kg (377-925B) 4.7kg	5.3kg (377-945B) 5.1kg	4.8kg (377-965B) 6.3kg

* To denote your AC line voltage add the following suffixes to the order No. (e.g.: **377-925A**):
A for UL/CSA, **D** for CEE, **E** for BS, **DC** for China, **K** for EK, **No suffix** is required for JIS/100V

OPTIONAL LENSES

For MSM-412, Z414



5X eyepiece:
377-026



15X eyepiece:
377-028



20X eyepiece:
377-029



0.5X Auxiliary
objective
377-045



0.75X Auxiliary
objective
377-046



1.5X Auxiliary
objective
377-047

For MSM-465



6.25X eyepiece:
377-066



15X eyepiece:
377-067



20X eyepiece:
377-068



32X eyepiece:
377-069



0.5X Auxiliary
objective
377-076

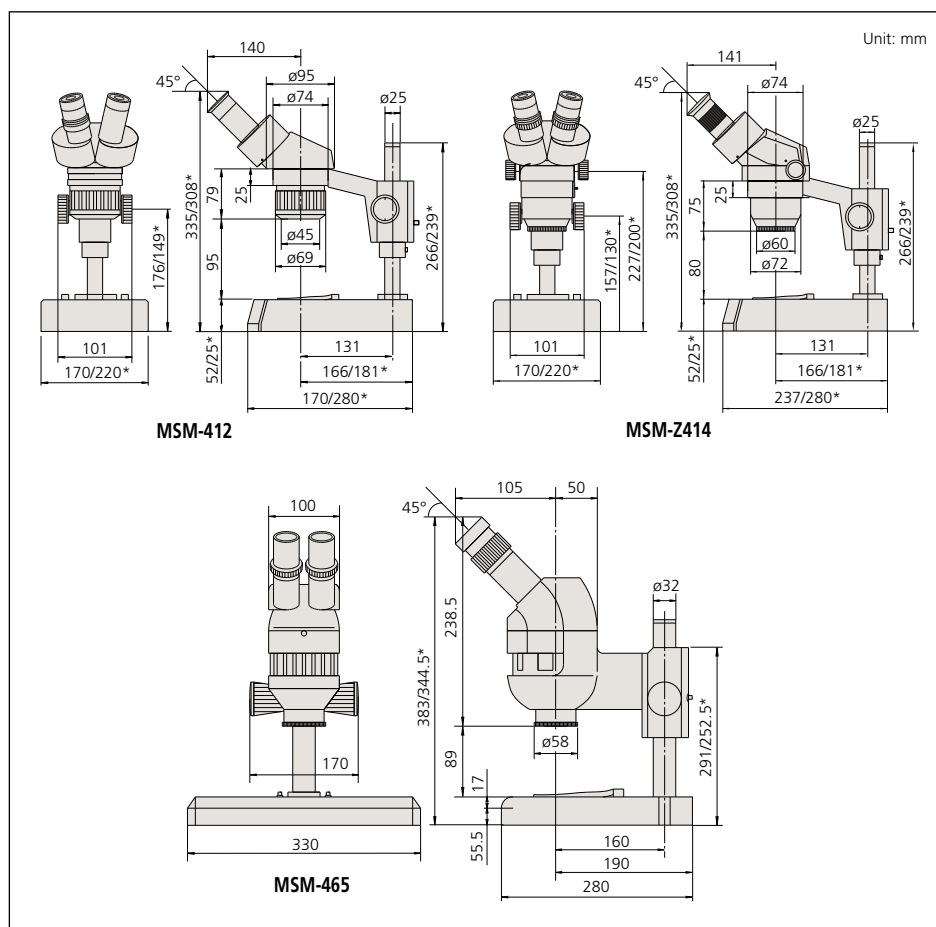


1.5X Auxiliary
objective
377-077



2X Auxiliary
objective
377-078

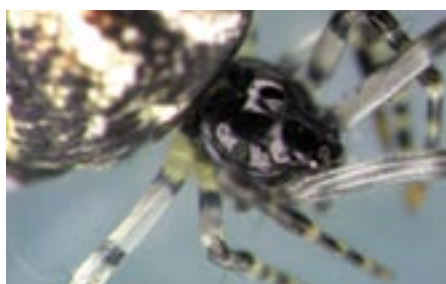
DIMENSION



MSM-465



MSM-Z414



Pocket Magnifiers

SERIES 183

FEATURES

- Suitable for inspecting metal surfaces.

SPECIFICATIONS

Magnification	Order No.	Remarks
25X	183-201	Pen type
	283-202	With stand
50X	183-203	With stand



Pocket Comparators

SERIES 183

FEATURES

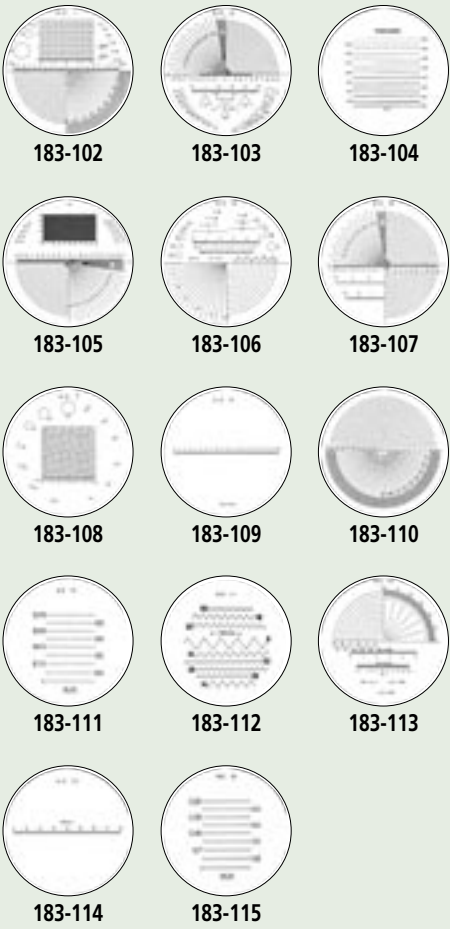
- By replacing optional reticles, dimensional, angle, and other types of measurements can be performed.
- Illuminator (950757) is available.

SPECIFICATIONS

Magnification	Order No.	Remarks
8X	183-101	Optional recides available
9X	183-102	Optional recides available
10X	183-131	Optional recides available



Optional Reticles for pocket comparators

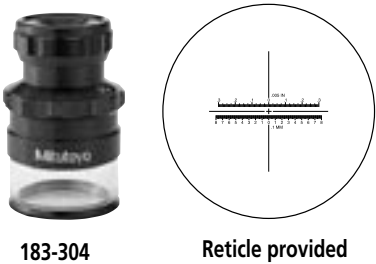


Zoom loupe

SERIES 183

FEATURES

- Allows the user 8X - 16X zoom observation.
- Magnification indicator is provided for 8X, 10X, 12X, 14X, and 16X observation.
- Metric and inch scales are provided for measuring.
- Comes with a carrying case.



SPECIFICATIONS

Magnification	Order No.	Remarks
8X	183-304	With recide (Scale graduation: 0.1mm, .0005"

Clear Loupe

SERIES 183



SPECIFICATIONS

Magnification	Order No.	Remarks
7X	183-301	Drawtube removable
10X	183-302	Drawtube removable
15X	183-303	Drawtube removable