MeasurLink ENABLED
Data Management Software by Mitutoyo

Products equipped with the measurement data output function can be connected to the measurement data network system MeasurLink (refer to page A-5 for details).

Microscopes

Microscope lineups that systemize observation, measurement and processing

MF
SERIES 176 — Measuring Microscopes

MeasurLink® ENABLED
Data Management Software by Mitutoyo

- An easy-to-operate standard measuring microscope using specially designed long working distance ML objective lenses.
- Measuring accuracy is the highest in its class (and conforms to JIS B 7153).
- Illumination can be selected from an LED unit, which has a longer life, or a powerful halogen unit for high-magnification applications.
- Excellent usability, a high-NA and long working distance objectives enable effective observation.

Manual type

- Stages range in size from 100×100 mm to 400×200 mm.
- The XY stage is equipped with a quick-release mechanism that enables switching between coarse and fine feed to provide swift and precise stage movement, even over a large distance.

MF-B2017D
The binocular tube (eyepiece) and illumination unit are optional accessories.

SPECIFICATIONS

Without Z-axis scale	Model No.	**MF-A1010D**	**MF-A2010D**	**MF-A2017D**	**MF-A3017D**	**MF-A4020D**
	Order No.	**176-861***1	**176-862***1	**176-863***1	**176-864***1	**176-865***1
With Z-axis scale	Model No.	**MF-B1010D**	**MF-B2010D**	**MF-B2017D**	**MF-B3017D**	**MF-B4020D**
	Order No.	**176-866***1	**176-867***1	**176-868***1	**176-869***1	**176-870***1
Observation image		BF (Bright-field)/Erect image				
Eyepiece (optional) with diopter adjustment		10X (eyepiece field number: 24), 15X, 20X Note: Monocular - one 10X eyepiece provided as standard; Binocular - two 10X eyepieces provided as standard				
Objective (optional)		ML objective 3X (provided as standard), 1X, 5X, 10X, 20X, 50X, 100X				
Illumination unit (One of the two options must be selected.)	LED illumination unit	Transmitted illumination: Telecentric system, Built-in aperture diaphragm, White LED light source, stepless light intensity control with cooling fan Reflected illumination: Koehler illumination, Variable aperture diaphragm mechanism, White LED light source, stepless light intensity control Control unit: Power ON/OFF switch (main switch), 100 to 240 V AC power input connector				
	Halogen illumination unit	Transmitted illumination: Telecentric system, Built-in aperture diaphragm, Halogen bulb (12 V, 50 W), stepless light intensity control, With cooling fan Reflected illumination: Koehler illumination, Variable aperture diaphragm mechanism, Halogen bulb (12 V, 50 W), stepless light intensity control, With cooling fan Control unit: Power ON/OFF switch (main switch), 100 to 240 V AC power input connector				
Stage	Measurement range	100×100 mm	200×100 mm	200×170 mm	300×170 mm	400×200 mm
	Quick-release mechanism	Provided as standard for the X and Y axes				
	Zero-set button	Provided as standard for the X and Y axes (and for the Z axis only for the MF-B type)				
Z axis	Max. workpiece height	150 mm		220 mm		
	Feed mechanism	Coaxial coarse and fine feed, handles on both sides (coarse: 30 mm/rotation, fine: 0.2 mm/rotation)				
Measuring accuracy*2 (X and Y axes, when not loaded)		(2.2+0.02L)μm L: measuring length (mm)				
Digital display	Resolution	1/0.5/0.1 μm 0.0001/0.00005/0.00001 in switchable				
	Display axes	X and Y (or X, Y, and Z only for the MF-B type)				
	Functions	Zero-setting, direction switching, RS232C output, USB output (specific to QSPAK)				

*1: The following suffixes are added to the order No.to specify the User Manual's language:
-10 for English; -11 for Simplified Chinese; No suffix for Japanese.
*2: Measuring method complies with JIS B7153.

Bulb replacement for transmitted/ reflected illumination	Standard: Halogen bulb (12 V, 50 W) (**513667**)
	Bulb life: 50 hours

Motor-Driven Z-axis

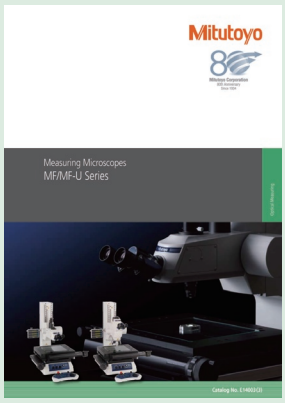
- Usability of the MF series has been improved by motorizing. The Z-axis of the newly introduced MF-J is motorized to enable easier focus adjustment and measurement on heavy workpieces.
- Using the Vision Unit (optional) enables the image AF function.

MF-J2017D
The binocular tube (eyepiece) and illumination unit are optional accessories.

Specifications for Motor-Driven Z-axis MF models

Model No.		**MF-J2017D**	**MF-J3017D**	**MF-J4020D**
Order No.		**176-891***1	**176-892***1	**176-893***1
Vision AF*2		Yes		
Stage	Quick release mechanism	Fitted to X and Y axes		
	Zero set switch	Fitted to X and Y axes		
Z axis	Max. workpiece height	220 mm		
	Feed mechanism	Motordrive (Maximum measuring speed: 20 mm/s)		

*1: To denote your AC power cable add the following suffixes to the order No.: A for UL/CSA, D for CEE, DC for CCC, E for BS, K for KC, C and No suffix is required for PSE.
*2: Vision Unit and an image AF cable are separately required.
The specification other than the above is subject to the MF series.



Refer to the MF/MF-U series Catalog (No. E14003) for more details.

Mitutoyo

Microscopes

Microscope lineups that systemize observation, measurement and processing

MeasurLink ENABLED
Data Management Software by Mitutoyo

Products equipped with the measurement data output function can be connected to the measurement data network system MeasurLink (refer to page A-5 for details).

MF-U
SERIES 176 — Universal Measuring Microscopes

MeasurLink® ENABLED
Data Management Software by Mitutoyo

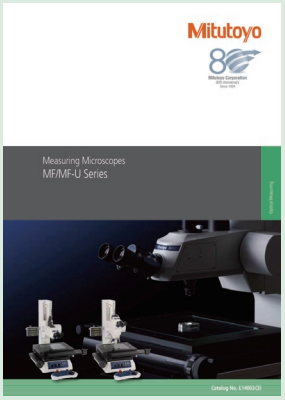
- Integration of metallurgical and measurement microscope functions provides high-resolution observation and a high-accuracy measurement solution.

MF-UB2017D
The turret, objectives and illumination unit are optional accessories.

- Measuring accuracy is the highest in its class (and conforms to JIS B 7153).
- Illumination can be selected from an LED unit, which has a longer life, or a powerful halogen unit for high-magnification applications.
- Excellent usability, a high-NA and long working distance objectives enable effective observation.

Manual type

- Stages range in size from 100×100 mm to 400×200 mm.
- The XY stage is equipped with a quick-release mechanism that enables switching between coarse and fine feed to provide swift and precise stage movement, even over a large distance.



Refer to the MF/MF-U series Catalog (No. E14003) for more details.

SPECIFICATIONS

BF (bright-field)	Without Z-axis scale	Model No.	**MF-UA1010D**	**MF-UA2010D**	**MF-UA2017D**	**MF-UA3017D**	**MF-UA4020D**
		Order No.	**176-871***1	**176-872***1	**176-873***1	**176-874***1	**176-875***1
	With Z-axis scale	Model No.	**MF-UB1010D**	**MF-UB2010D**	**MF-UB2017D**	**MF-UB3017D**	**MF-UB4020D**
		Order No.	**176-876***1	**176-877***1	**176-878***1	**176-879***1	**176-880***1
BD (bright-field/ dark-field)	Without Z-axis scale	Model No.	**MF-UC1010D**	**MF-UC2010D**	**MF-UC2017D**	**MF-UC3017D**	**MF-UC4020D**
		Order No.	**176-881***1	**176-882***1	**176-883***1	**176-884***1	**176-885***1
	With Z-axis scale	Model No.	**MF-UD1010D**	**MF-UD2010D**	**MF-UD2017D**	**MF-UD3017D**	**MF-UD4020D**
		Order No.	**176-886***1	**176-887***1	**176-888***1	**176-889***1	**176-890***1
Observation image			BF (Bright-field), DF (Dark-field) (MF-UC and MF-UD models only), Polarization, Differential Interference Contrast (DIC) / Erect image				
Eyepiece (optional) with diopter adjustment			10X (eyepiece field number: 24, two eyepieces provided as standard), 15X, 20X				
Turret (required)	Bright-field (BF)		Manual / Motor (select either one)				
	Bright-field/dark-field (BD)						
Objective (optional)	Bright-field (BF)		M Plan Apo, M Plan Apo SL, G Plan Apo series				
	Bright-field/dark-field (BD)		BD Plan Apo, BD Plan Apo SL series				
Illumination unit (One of the two options must be selected.)	LED illumination unit		Transmitted illumination: Telecentric system, Built-in aperture diaphragm, White LED light source, stepless light intensity control, With cooling fan Reflected illumination: Koehler illumination, Variable aperture diaphragm mechanism, White LED light source, stepless light intensity control Control unit: Power ON/OFF switch (main switch), 100 to 240 V AC power input connector				
	Halogen illumination unit		Transmitted illumination: Telecentric system, Built-in aperture diaphragm, Halogen bulb (12 V, 50 W), stepless light intensity control, With cooling fan Reflected: BF/BD Kohler illumination with adjustable aperture diaphragm, 12 V, 100 W or 12 V, 15 W halogen lamp (selectable), external fiber-optic illumination, stepless brightness adjustment Control unit: Power ON/OFF switch (main switch), 100 to 240 V AC power input connector				
Stage	Measuring range		100×100 mm	200×100 mm	200×170 mm	300×170 mm	400×200 mm
	Quick-release mechanism		Provided as standard for the X and Y axes				
	Zero-set button		Provided as standard for the X and Y axes (and for the Z axis only for the MF-UB and -UD types)				
Z axis	Max. workpiece height		150 mm		220 mm		
	Feed mechanism		Coaxial coarse and fine feed, handles on both sides (coarse: 10 mm/rotation, fine: 0.1 mm/rotation)				
Measuring accuracy *2 (X and Y axes, when not loaded)			(2.2+0.02L)μm L: measuring length (mm)				
Digital display	Resolution		1/0.5/0.1 μm 0.0001/0.00005/0.00001 in switchable				
	Display axes		X and Y (or X, Y, and Z only for the MF-UB and -UD types)				
	Functions		Zero-setting, direction switching, RS232C output, USB output (specific to QSPAK)				

*1: The following suffixes are added to the order No.to specify the User Manual's language: -10 for English; -11 for Simplified Chinese; No suffix for Japanese.
*2: Measuring method complies with JIS B7153.

Bulb replacement for transmitted/reflected illumination	Standard: Halogen bulb (12 V, 50 W) (**513667**)
	Bulb life: 50 hours
For replacement for reflected illumination (from separate light source) *3	Standard: Halogen bulb (12 V, 100 W) (**517181**)
	High-intensity bulb (12 V, 100 W) (**12BAD602**)

*3: At the time of purchase, a standard bulb and a high-intensity bulb are provided. (Only for the Reflected illumination models.)

Motor-Driven Z-axis

- Usability of the MF-U series has been improved by motorizing. The Z-axis of the newly introduced MF-UJ/UK is motorized to enable easier focus adjustment and measurement on heavy workpieces.
- Using Vision Unit (optional) enables the image AF function.

MF-UJ2017D
The turret, objectives and illumination unit are optional accessories.

J

Specifications for Motor-Driven Z-axis MF-U models

BF (Bright-field)		Model No.	**MF-UJ2017D**	**MF-UJ3017D**	**MF-UJ4020D**
		Order No.	**176-894**[*1]	**176-895**[*1]	**176-896**[*1]
BD (Bright-field/dark-field)		Model No.	**MF-UK2017D**	**MF-UK3017D**	**MF-UK4020D**
		Order No.	**176-897**[*1]	**176-898**[*1]	**176-899**[*1]
Eyepiece (optional) with diopter adjustment			10X (eyepiece field number: 24, two eyepieces provided as standard), 15X, 20X		
Objective (optional)	Bright-field (BF)		M Plan Apo, M Plan Apo SL, G Plan Apo series		
	Bright-field/dark-field (BD)		BD Plan Apo, BD Plan Apo SL series		
Vision AF [*2]			Yes		
Stage	Measuring range		200×170 mm	300×170 mm	400×200 mm
	Quick release mechanism		Fitted to X and Y axes		
	Zero set switch		Fitted to X and Y axes		
Z axis	Max. workpiece height		220 mm		
	Feed mechanism		Motor drive (measuring speed: max. 20 mm/s)		
Measuring accuracy [*3] (X and Y axes, when not loaded)			(2.2 + 0.02L)µm L: measuring length (mm)		
Digital display	Resolution		1/0.5/0.1 µm 0.0001/0.00005/0.00001 in switchable		
	Display axes		X, Y and Z		
	Functions		Zero-setting, direction switching		

*1: To denote your AC power cable add the following suffixes to the order No.: A for UL/CSA, D for CEE, DC for CCC, E for BS, K for KC, C and No suffix is required for PSE.
*2: Vision Unit and an image AF cable are separately required.
*3: Measuring method complies with JIS B7153.
Note: For all specifications not included above see page J-7.

Microscopes

Microscope lineups that systemize observation, measurement and processing

MeasurLink ENABLED
Data Management Software by Mitutoyo

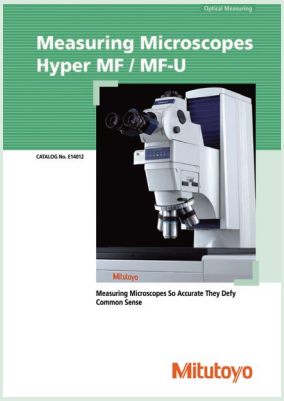
Products equipped with the measurement data output function can be connected to the measurement data network system MeasurLink (refer to page A-5 for details).

Hyper MF/MF-U
SERIES 176 — High-Accuracy Measuring Microscopes

MeasurLink® ENABLED
Data Management Software by Mitutoyo

- This is the ultimate measuring microscope achieving the world's highest accuracy (1.5+10L/1000µm), with 0.01µm resolution.
- Three-axis motorized front operation joystick control, which makes a refreshing change from conventional microscope operation, allows fine positioning even during fast movement.
- Large workstage with stroke of 250×150 mm provides enough margin for the measurement of larger workpieces.
- The best-selling data processing unit, **QM-Data200**, and the Vision Unit can be integrated to provide an effective and stable measurement environment.

Hyper MF-U
The optical tube, turret, and objective lens are optional.



Refer to the Hyper MF/MF-U Catalog (No. E14012) for more details.

SPECIFICATIONS

Model No.		HyperMF-B2515B	HyperMF-UB2515B	HyperMF-UD2515B	HyperMF-UE2515B	HyperMF-UF2515B
Order No.		176-430*1	176-431*1	176-432*1	176-433*1	176-434*1
Optical tube		Finite correction optical system BF (Bright-field)	Infinity-correction optical system BF (Bright-field)	Infinity-correction optical system BD (Bright/Dark-field)	Infinity-correction optical system BF (Bright-field) with the LAF function	Infinity-correction optical system BD (Bright/Dark-field) with the LAF function
	Standard reticle (Built-in)	90° broken-cross line (line width 5 µm)				
	Pupil distance adjustment	Siedentopf type Adjustment range: 51 to 76 mm				
	Optical path switching ratio	Observation/TV-photomicrography = 50/50				
	Vertical tilt angle	25°	Tilting			
	TV port	Provided as standard				
Observation image		Erect image				
Eyepiece	Magnification	10X, 15X, 20X				
Objective lens (optional)		Selectable from the monocular unit (equipped with one eyepiece) or binocular tube (equipped with two eyepieces)	Equipped with two 10X eyepieces			
	ML series objective lens	1X, 3X, 5X, 10X, 20X, 50X, 100X	—			
	BF (Bright-field)	—	M Plan Apo, M plan Apo SL, G plan Apo			
	BD (Bright/Dark-field)	—	BD Plan Apo, BD Plan Apo SL			
Turret (optional)	BF (Bright-field)	—	(Equipped with a four-hole manual turret/ motorized five-hole turret *2)			
	BD (Bright/Dark-field)	—	(Equipped with a four-hole manual turret/ motorized four-hole turret *3)			
Focusing section	Maximum height of workpiece	150 mm				
	Measuring accuracy	(1.5+0.01L)µm L: Measuring length (mm)				
	Drive method	Motorized control using a joystick				
Illumination unit	Transmitted illumination device	Telecentric system, Built-in aperture diaphragm, Halogen bulb (12 V, 50 W), 100-step light intensity control, Fiber-optic cable cold light illumination				
	Reflected illumination unit	Koehler illumination, Variable aperture diaphragm mechanism, Halogen bulb (12 V, 100 W), 100-step light intensity control, Fiber-optic cable cold light illumination				
Workstage	Measuring range (X×Y)	250×150 mm				
	Measuring accuracy*4 (When no load is put on the X- or Y-axis)	(0.9+0.003L)µm L: Measuring length (mm)				
	Dimensions of the top plane	460×350 mm				
	Usable dimensions of the stage glass	300×200 mm				
	Swiveling angle	±3°				
	Maximum loading mass	30 kg				
	Drive method	Motorized control using a joystick				
Detector		High precision digital scale (Patented)				
Digital display	Resolution	0.01 µm				
	Axes to be displayed	X, Y, Z				
	Data processing unit	QM-Data200 or Vision Unit (required)				
Operation section	LAF (just focus)	—	—		Available	
	LAF (tracking focus)	—	—		Available	

*1: To denote your AC power cable add the following suffixes to the order No.: A for UL/CSA, D for CEE, DC for CCC, E for BS, K for KC, C and No suffix is required for PSE.
*2 and *3 are factory-installed options.
*4: Measurement accuracy complies with JIS B7153.

Bulb replacement for transmitted/reflected illumination	Standard: Halogen bulb (12 V, 50 W) (**02APA527**)

For replacement for reflected illumination (from separate light source)	Standard: Halogen bulb (12 V, 100 W) (**517181**)
	High-intensity bulb (12 V, 100 W) (**12BAD602**)

MeasurLink ENABLED
Data Management Software by Mitutoyo

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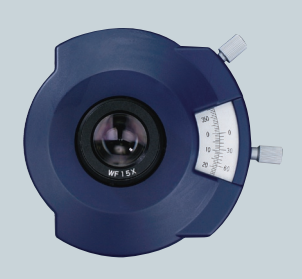
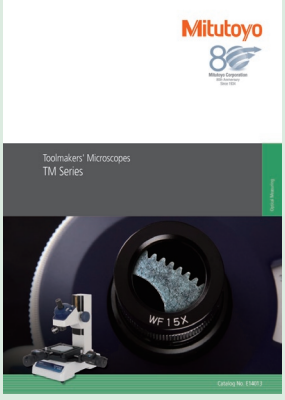
Angle Index (Standard Accessory)





Refer to the TM Series Catalog (No. E14013) for more details.

TM
SERIES 176 — Toolmakers' Microscopes

MeasurLink® ENABLED
Data Management Software by Mitutoyo

- Compact universal toolmakers' microscope that can be installed on any site.
- Newly designed LED illuminators provide enhanced observation for higher accuracy and resolution.
- Optional LED circular illuminator available for applications requiring all-round lighting.
- Achieves a maximum measuring height of 115 mm despite the compact size.
- Installation of digimatic micrometer heads (MHD-50MB, option) makes measurement easy and precise.
- A vernier scale (Angle Index) built into the eyepiece mount enables accurate angular measurements.
- Overall magnification is 30X using the standard accessory lenses but can be changed to lie within the 20-200X range by using optional objectives and/or eyepieces.

TM-505B

TM-1005B

Micrometer heads are optional.

SPECIFICATIONS

Model No.		TM-505B	TM-1005B
Order No.		**176-818***1	**176-819***1
Optical tube		Monocular type (Vertical tilt angle: 30°)	
Observation image		Erect	
Eyepiece protractor		Resolution (graduation) : 1°, Rotation angle: 360°, Resolution (angle): 6', Adjustable zero point	
Eyepiece		Standard accessory: 15X (field number: 13), Options: 10X, 20X	
Objective lens		Standard accessory: 2X, Options: 5X, 10X	
Microscope head	Maximum height of workpiece	115 mm	107 mm
	Focusing method	Manual (Coarse feed)	
Illumination unit	Transmitted illumination	Stepless brightness adjustment, White LED light source with green filter	
	Surface illumination	Oblique single-source type, Stepless brightness adjustment, White LED light source	
Cross-travel stage	Measuring range	50×50 mm	100×50 mm (An optional 50 mm gauge block is required to cover full range. A CERA block is recommended.)
	Table size	152×152 mm	240×152 mm
	Usable area of the stage glass	96×96 mm	154×96 mm
	Maximum stage glass loading	5 kg	
Linear measurement method		Micrometer head*2	
Resolution		Depends on the micrometer head specifications*2 (for **MHD-50MB** (**164-163**): 0.001 mm)	
Micrometer head travel range		for **MHD-50MB** (**164-163**): 50 mm	
Power supply		AC 100 to 240 V 50/60 Hz Maximum power consumption: 4.2 W	
Main unit mass		14 kg	15 kg

Note: The main unit with digimatic micrometer head (MHD-2″MB) is provided in the TM-500 series.
TM-A505B (176-820A)
TM-A1005B (176-821A)
Other specifications are the same as the other TM-500 Series.
*1: The main unit is compatible with CE. To denote your AC power cable add the following suffixes to the order No.: A for UL/CSA, D for CEE, E for BS, DC for CCC, K for KC, C and No suffix is required for PSE.
*2: Micrometer heads are optional for **TM-505B** and **TM-1005B**.

J

Microscopes

Microscope lineups that systemize observation, measurement and processing

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Vision Unit
SERIES 359 — Vision System Retrofit for Microscopes

MeasurLink® ENABLED
Data Management Software by Mitutoyo

- The measurement tools and various macro icons allow measurement in one easy step.
- The graphics and measurement navigation functions facilitate operation.
- The image saving function and the data output function to the spreadsheet software are standard.
- Combined use with the MF/MF-U Series (Motor-Driven Z-axis/Motor-Driven) achieves the image AF (auto focus) function.

MF-J2017D plus Vision Unit

Foot switch
12AAJ088

SPECIFICATIONS

	Vision Unit
Magnification of the optical system	When installed on the microscope 0.5X (using the 0.5X TV adapter)
Image detection	High-sensitivity 1/2 in color CMOS camera 3 million pixels
Resolution	0.1 µm
Accuracy (Measurement environment: 20°C)	Depends on the accuracy specification of the Mitutoyo measuring microscope to which the unit is fitted. For reference: When using an ML series 3X objective lens (In an inspection using a sample workpiece based on the Mitutoyo standards) Measurement accuracy in the screen: Within ±2.5 µm Repetitive accuracy in the screen (±2σ): Within ±1 µm
Software (option)	QSPAK Vision Unit Edition

Note: QSPAK and a data processor are required separately.

Applicable Models

- Mitutoyo **MF series, MF-U series** (Connection to the **MF-H series** is not available.)
  Hyper MF series, Hyper MF-U series

Refer to the QM-Data200 and Vision Unit Catalog (No. E14008) for more details.

MeasurLink ENABLED
Data Management Software by Mitutoyo

Products equipped with the measurement data output function can be connected to the measurement data network system MeasurLink (refer to page A-5 for details).

QM-Data200
SERIES 264 — 2D Data Processing Unit

MeasurLink® ENABLED
Data Management Software by Mitutoyo

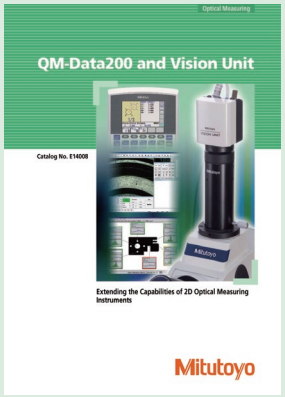
- 2D Data Processor designed to perform arithmetic processing of XY coordinate data acquired from projectors and measuring microscopes for local display or output to a printer.
- Informative color-graphic displays on the large LCD screen make for easy measurement operations.
- The AI measurement function (automatic identification of measuring item) eliminates switching between the measurement command keys.
- Equipped with a measurement procedure teaching function and measuring position navigation in Repeat mode.
- The user menu function allows users to register measurement commands or part programs to create their own menus.
- Measurement result output to (CSV) format in spreadsheet software.
- Part programs and calculation results can be saved on a USB-compatible memory device.

QM-Data200
(stand type)

SPECIFICATIONS

Model No.	QM-Data200		
Order No.	Standard type **264-155***1	Flexible arm type **264-156***1	Standard type **264-159***1
Applicable models (Conventional models)*2	**PJ-A3000 series** **PJ-H30 series** **PV-5110** **PH-3515F** **PH-A14** **MF series** **MF-U series**	**PJ-A3000 series** **PJ-H30 series** **PV-5110** **PH-3515F** **PH-A14**	**HyperMF/MF-U**
Unit of measurement	Length: mm Angle: Switchable between decimal degree and sexagesimal notation		
Resolution	0.1 µm		0.01 µm
Program function	Creating, performing, and editing of measurement procedures		
Statistical processing	Number of data, maximum value, minimum value, mean value, standard deviation, range, histogram Statistics classified by each measurement function (Statistics classified by each command)		
Display unit	Color graphic LCD (equipped with a backlight)		
ABS point	—		Available (Automatic movement)
LAF (Laser AF)	—		Available
Edge sensor position correction	Available (Profile Projectors with OPTOEYE)		—
Input/output	XYZ: Data input from linear scales (Maximum number of axes: 3) RS-232C 1: Connection to an external PC RS-232C 2: Connection to a measuring unit counter OPTOEYE: Connection to an OPTOEYE edge signal (OPTOEYE 200) FS: For the connection to the foot switch PRINTER: For the connection to an external printer USB-MEMORY: For the connection to a USB memory		
Measurement result file output	RS-232C output (CSV format, MUX-10 format)		
Display language	16 languages (Japanese, English, German, French, Italian, Spanish, Portuguese, Cheskey, Chinese (simplified/traditional), Korean, Turkish, Swedish, Polish, Dutch, Hungarian)		
Power supply	AC 100 to 240 V 50/60 Hz		
Maximum power consumption	17 W (excluding optional accessories)		
External dimensions (W×H×D)	260×242×310 mm (including the stand section)	318×153×275 mm (when the arm is horizontal)	260×242×310 mm (including the stand section)
Mass	Approx. 2.9 kg	Approx. 2.8 kg	Approx. 2.9 kg
Standard Accessories	AC adapter, Power cable, Quick Operation Guide		

*1: To denote your AC power cable add the following suffixes to the order No.: A for UL/CSA, D for CEE, E for BS, K for KC, C and No suffix is required for PSE, and 00 for power cord other than A, D, E, K, C, No suffix.
*2: Please contact Mitutoyo office with respect to the models that are applicable to the models other than mentioned above.



Refer to the QM-Data200 and Vision Unit Catalog (No. E14008) for more details.

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Mitutoyo

Microscopes

Microscope lineups that systemize observation, measurement and processing

FS-70
SERIES 378 — Microscope Unit for Semiconductor Inspection

- Compact microscope unit equipped with an eyepiece observation section.
- A versatile microscope head typically used as an OEM product suitable for fitting to specialist machines, such as those designed for inspection and repair of semiconductor wafers using YAG (near-infrared, visible, near-ultraviolet, or ultraviolet) lasers*.

* The performance and safety of laser-equipped system products is not guaranteed.

- Usable in infrared optical systems*. Applications: internal observation of silicon systems; spectral characteristics analysis using infrared.

* An infrared source and infrared camera are necessary.

- Models supporting BF (Bright-field), DF (Dark-field), Polarization, and Differential Interference Contrast (DIC) are available.
- The inward-facing turret and long working distance objective lenses maintain the high operability of the microscope.

FS70Z

FS70L

FS70L4

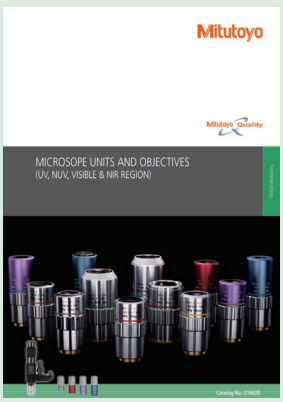
The parfocal manual turret, eyepieces and objective lenses are optional.

SPECIFICATIONS

Model No.	FS70	FS70-TH	FS70Z	FS70Z-TH	FS70L	FS70L-TH	FS70L4	FS70L4-TH
Order No.	**378-184-1**	**378-184-3**	**378-185-1**	**378-185-3**	**378-186-1**	**378-186-3**	**378-187-1**	**378-187-3**
Short base model No.	FS70-S	FS70-THS	FS70Z-S	FS70Z-THS	FS70L-S	FS70L-THS	FS70L4-S	FS70L4-THS
Order No.	**378-184-2**	**378-184-4**	**378-185-2**	**378-185-4**	**378-186-2**	**378-186-4**	**378-187-2**	**378-187-4**
Focus adjustment	50 mm travel range with concentric coarse (3.8mm/rev) and fine (0.1 mm/rev) focusing wheels (right / left)							
Image	Erect image							
Optical tube type	Siedentopf, adjustable interpupillary distance range: 51 - 76 mm							
Field number	24mm							
Tilt angle	—	0° - 20°	—	0° - 20°	—	0° - 20°	—	0° - 20°
Optical pass ratio	Fixed type (Eyepiece/TV = 50/50)	Switchable type (Eyepiece/Tube = 100/0: 0/100)	Fixed type (Eyepiece/TV = 50/50)	Switchable type (Eyepiece/Tube = 100/0: 0/100)				
Protective filter	—				Built-in laser beam filter			
Tube lens	1X		1X - 2X zoom		1X			
Applicable laser	—				1064/532/355 nm		532/266 nm	
Camera mount	C-mount (using optional adapter B*1)				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) 12 V, 100 W fiber-optics, stepless adjustment, light guide length: 1.5 m							
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 *2	14.5 kg	13.6 kg	14.1 kg	13.2 kg	14.2 kg	13.5 kg	13.9 kg	13.1 kg
Mass (main unit)	6.1 kg	7.1 kg	6.6 kg	7.5 kg	6.4 kg	7.2 kg	6.7 kg	7.5 kg

*1: Installation is optional.
*2: Loading on optical tube excluding weight of objective lenses and eyepieces

Bulb replacement	Standard: Halogen bulb (12 V, 100 W) (**No.517181**)
	For the fiber-optic cable illumination unit (12 V, 100 W) (**No.378-700**)



Refer to the Microscope Units and Objectives Catalog (No. E14020) for more details.

VMU
SERIES 378 — Video Microscope Unit

- Compact and lightweight microscope designed to be built in for camera observation
- A versatile microscope head typically used as an OEM product suitable for fitting to specialist machines, such as those designed for inspection and repair of semiconductor wafers using YAG (near-infrared, visible, near-ultraviolet, or ultraviolet) laser *1.

*1 The performance and safety of laser-equipped system products is not guaranteed.

- For VMU-LB and VMU-L4B, the rigidity and general performance of the microscope main unit have been enhanced compared with previous models.
- Applications *2: internal observation of silicon systems, spectral characteristics analysis using infrared, etc.

*2 An infrared source and infrared camera are necessary.

- Telecentric system equipped with an aperture diaphragm is standard on the reflected illumination optical system.
- Best suited to process images for which uniform illumination is required.
- Design and manufacture are flexible to meet your demands such as double camera mounting or double (low/high) magnification.


VMU-V


VMU-H

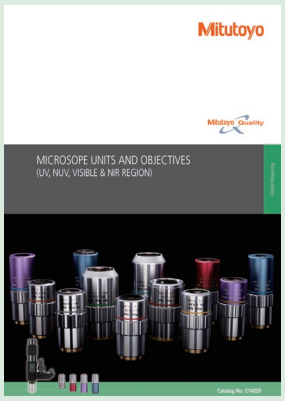

VMU-LB


VMU-L4B

SPECIFICATIONS

Model No.		VMU-V	VMU-H	VMU-LB	VMU-L4B
Order No.		378-505	378-506	378-513	378-514
Camera mounting direction		Vertical	Horizontal	Vertical	
Observation		Bright-field/Erect image	Bright-field/Inverted image	Bright-field/Erect image	
Optical tube	TV adapter	Equipped with a C-mount		Equipped with a C-mount (Equipped with a green filter switching mechanism)	
	Image forming (tube) lens	Built-in 1X (visible/near-infrared calibration)		Built-in 1X (near-infrared/visible/ near-ultraviolet calibration)	Built-in 1X (visible/ultraviolet)
	Available for lasers	—		YAG laser source (Fundamental, Second/Third harmonic) mountable	YAG laser source (Second/Third/Fourth harmonic) mountable
Objective lens (required option)	For observation	M Plan Apo series, M Plan Apo HR series, M Plan Apo SL series, G Plan Apo series			
	For laser processing	—		M/LCD Plan Apo NIR series M/LCD Plan Apo NUV series Note: Selected depending on the wavelength of the laser source	M/LCD Plan Apo NIR series M/LCD Plan Apo NUV series M Plan UV series Note: Selected depending on the wavelength of the laser source
Applicable camera(s)		2/3 type or less cameras (C-mount type)			
Reflected illumination optical system		Telecentric system equipped with an aperture diaphragm			
Illumination unit (optional)		Fiber-optic cable illumination unit (12 V, 100 W) (**378-700***)/ (15 V, 150 W) (**176-316***)			
Main unit weight		650 g	750 g	1270 g	1300 g

Note1: Besides the models shown above, products equipped with a compact Koehler illumination system intended for general observation are also available.
Note2: The **M Plan Apo 1X** objective lens is used with the polarization unit (**378-710** or **378-715**).
* Order numbers differ depending on the power supply cord.



Refer to the Microscope Units and Objectives Catalog (No. E14020) for more details.

WIDE VMU
SERIES 378 — Wide-field Video Microscope Unit

- Wide-FOV video microscope unit for Bright/Dark-field observation.
- Incorporates a wide-field image sensor (APS-C format or smaller size) providing seven times greater viewing area than the VMU Series for greatly enhanced inspection efficiency.
- In addition to normal bright-field observation, this series supports dark-field observation for scratch inspection, etc., and polarized light observation for increased contrast when viewing certain specimens.
- Bulk inspections covering a wide area can be performed with multiple units in a high-density configuration.


WIDE VMU-V


WIDE VMU-H

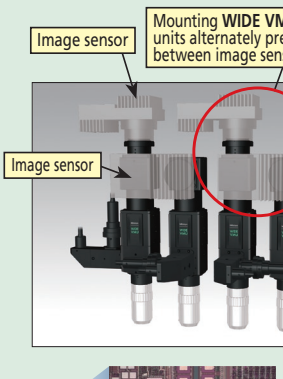

WIDE VMU-BDV

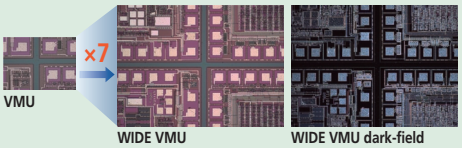

WIDE VMU-BDH

SPECIFICATIONS

		For Bright-field Observation		For Bright/Dark-field Observation	
Model		WIDE VMU-V	WIDE VMU-H	WIDE VMU-BDV	WIDE VMU-BDH
Order No.		378-515	378-516	378-517	378-518
Camera mounting orientation		Vertical	Horizontal	Vertical	Horizontal
Observation		Bright-field/ Erect image	Bright-field/ Inverted image	Bright/Dark-field/ Erect image	Bright/Dark-field/ Inverted image
Optical tube	Optical system	Magnification: 1X Visible light			
	Camera Mount	F-Mount, C-Mount (with aligning and parfocal adjustment mechanism)			
	Imaging forming (tube) lens	Built-in 1X tube lens (Correcting wavelength range: 436 to 656 nm)			
	Image field	ø30			
	Polarized unit*	Mountable			
Objective lens (required option)		M Plan Apo, M Plan Apo HR, M Plan Apo SL, G Plan Apo		BD Plan Apo, BD Plan Apo HR, BD Plan Apo SL	
Applicable camera		APS-C format or smaller size			
Reflected illumination optical system		Telecentric illumination, Bright-field illumination optical tube (Single-port fiber-optic illumination)		Telecentric illumination, Bright/Dark-field illumination optical tube (Dual-port fiber-optic illumination) Bright/Dark-field switching with light source on-off	
Illumination unit (optional)		Fiber-optic illumination unit (12 V, 100 W) (**378-700**)/ (12 V, 150 W) (**176-316**)			
Main unit mass		1800 g	1950 g	2000 g	2150 g

*Polarized observation by Bright-field illumination





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Microscopes

Microscope lineups that systemize observation, measurement and processing

FS objective lenses
SERIES 378 — Ultra-long working distance objective lens

- **M/BD Plan Apo** (M Plan Apochromat Bright/Dark-field) objectives feature the image evenness over the entire view field needed to achieve high color reproducibility.
- The following objective lenses support a wide range of wavelength including near infrared, visible, and ultraviolet lasers. Specialty LCD laser objectives are available: **M/LCD Plan NIR (-HR) series** (Near-infrared lenses for laser processing featuring ultra-long working distances), **M/LCD Plan NUV series** (Near-ultraviolet lenses), **M Plan UV series** (Ultraviolet lenses), and **G Plan Apo series** (Cover Glass corrected lenses that allow focusing through a window for vacuum and high temperature applications).
- Uses environment-friendly glass (no lead or arsenic) for the lens material (of the specified models).

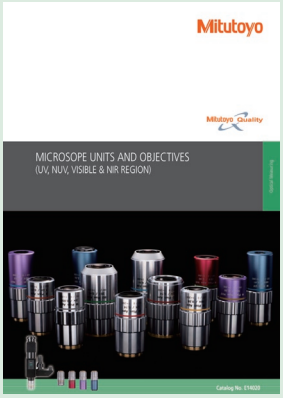
BF (Bright-field) for observation/measurement

BD (Bright/Dark-field) for observation/measurement

For near-infrared calibration (NIR)

For near-ultraviolet calibration (NUV)

For the ultraviolet calibration (UV)



Refer to the Microscope Units and Objectives Catalog (No. E14020) for more details.

Variable Focal Length Lens
TAGLENS

- Without changing the required magnification, ultra-high speed variable focal length enables obtaining perfectly focused images in real-time with stress-free operation.
- The time required for auto-focusing is drastically reduced, and the optical system focus range is extended without the expense of a mechanical drive.

TAGLENS-T1

TAGLENS main unit + Controller + Software

SPECIFICATIONS

Operating principle	Variable refraction index
Focal length variable frequency	70 kHz
Max. opening width	ø11 mm
Transmittance	90% (λ400 to 700 nm)

Video Microscope Unit VMU-T1

Video microscope for TAGLENS-T1 (Above TAGLENS-T1 is required)

SPECIFICATIONS

Compatible TAGLENS	TAGLENS-T1
Imaging lens magnification	1X
Imaging area	ø11 mm
Applicable objective lens	M Plan Apo Series
Options	Common functions in VMU-LB/L4B series: turret, motorized turret, polarization unit, focusing unit, XY stage, simplified stand

M Plan Apo Series

Objective lens	1X	2X	5X	7.5X	10X	20X	50X
Depth of focus ×2	0.88 mm	0.18 mm	0.028 mm	0.012 mm	0.007 mm	0.003 mm	0.0018 mm
Total scanning width	16 mm	4.0 mm	0.64 mm	0.28 mm	0.16 mm	0.040 mm	0.007 mm
Ratio: Total scanning width / (Depth of focus ×2)	18X	22X	23X	23X	23X	13X	3.8X