Mitutoyo

Mitutoyo Quality

Measuring Microscopes
MF/MF-U Series

Optical Measuring

Catalog No. E14003(4)

MF Series

Standard Measuring Microscopes

*Motor-Driven Z-axis

MF-U Series

Universal Measuring Microscopes

*Motor-Driven Z-axis

Lineup

Manual MF-A/B Models

Motor-Driven Z-axis MF-J Models

Motor-Driven X/Y/Z-axes MF-G Models

Manual MF-UA/UB/UC/UD Models

Motor-Driven Z-axis MF-UJ/UK Models

Motor-Driven X/Y/Z-axes MF-UE/UF/UG/UH Models

Mitutoyo

Attainment of Reduction in Measurement Time

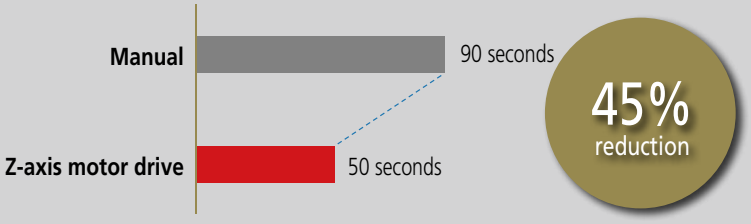
Z-axis Motor Drive & Vision Unit

Simple Focus Adjustment

Ultra-high Speed AF Function

The ultra-high speed AF function has been installed to allow focusing on a surface to be measured at a speed of about one second.
Freedom from burdensome focus adjustment even on a workpiece with many asperities allows the operator to perform stress-free measurement, drastically reducing operator's fatigue.

Application example: Cumulative total time of 3mm step-height measurement 10 times



* The amount of time saved is dependent on the particular workpiece and therefore this result is offered as an example but does not guarantee performance in all cases.

Simplified Measurement

One-click Tool

The concurrent use of the vision unit as a vision measurement system allows simplified measurement of an edge by merely one click. Moreover, since many data points can be obtained at a time with just one click, this will drastically speed up measurement and reduce data spread compared with the conventional method of "measuring data points one by one with cross hairs".

* Vision unit: Option

One-click circle tool

One-click box tool

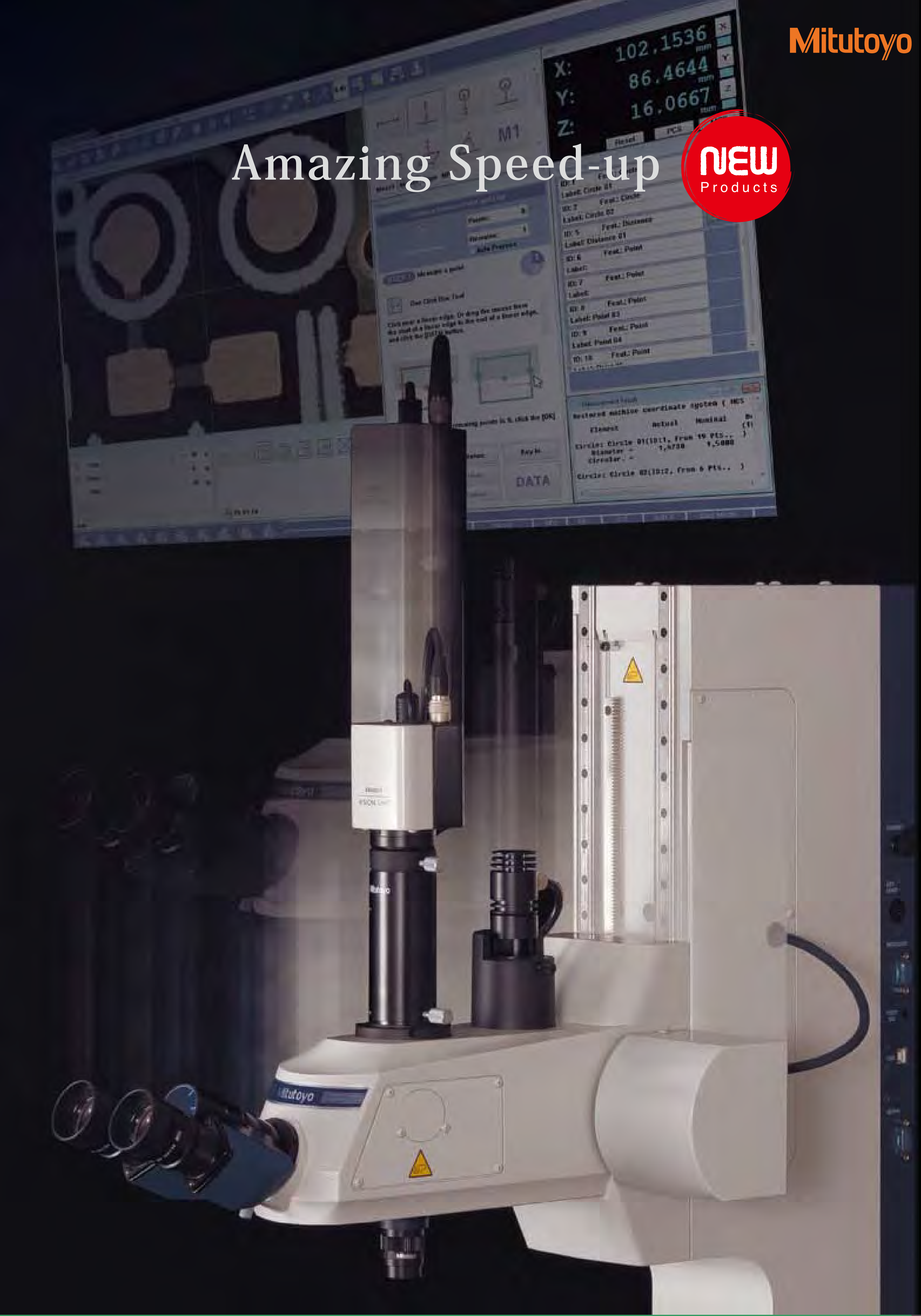
Easy Positioning

Quick Release Function

This series is equipped with a manual stage that provides intuitive positioning and has a quick release function that enables rapid movement between measuring points that are a large distance apart.

Mitutoyo

Amazing Speed-up



Mitutoyo

Feature

Excellent Observability and Operability

Ultra-wide View Field and High Magnification Observation

Field Number: 24

This measuring microscope series has achieved an industry-leading wide field of view of ø24mm (when using 1x objective).

A Camera Port on All Models

All models are equipped with a C-mount port as standard to which a compatible camera is attachable.
The port allows a vision measurement system or an observation-specific digital camera to be mounted.

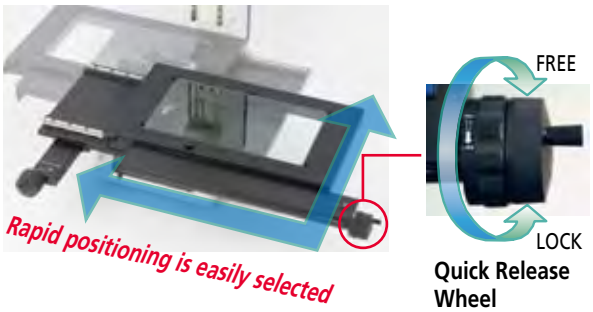
Lineup of a Wide Range of Objectives

The objectives available provide a choice of ultra-low magnification, for excellent flare suppression, to high magnification that approaches the resolution limit possible with optical wavelengths, allowing the customer to select an optimal magnification depending on the intended use.

Intuitive Operation

Quick Release Mechanism

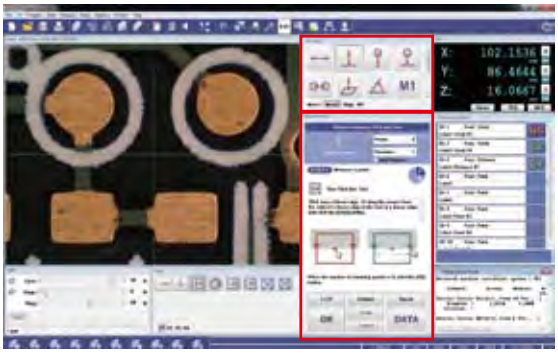
The manual stage provides intuitive positioning and can be easily moved rapidly between measuring positions on a workpiece by using the quick release function on each axis. Just free a Quick Release Wheel and move the stage by pushing and pulling. Lock the wheel to continue measurement with fine feed. Very effective for traversing between widely separated positions.



Quick Release Wheel

Vision Unit

The vision unit allows anyone to perform simplified measurement of an edge with just one click.
Also, using the vision unit eliminates the need for burdensome parallel alignment of a workpiece and data point detection with cross hairs, thus allowing quick inspection of dimensions.



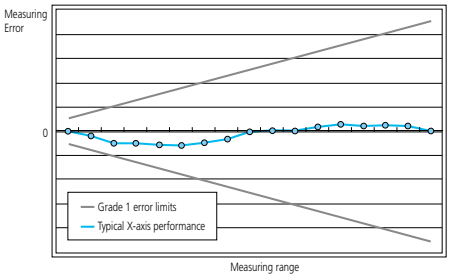
High-accuracy Measurement and Reliability

Best-in-Class Accuracy As of April, 2016

X/Y Axis: (2.2+0.02L) µm

All models have achieved best-in-class accuracy performance. Since the accuracy of the whole system is ensured by conformity to the inspection method of JIS B 7153, any model enables high-accuracy measurement.
Any measuring microscope that achieves this accuracy performance (close to JIS Class 0) will be a great asset to the customer's quality control improvement program.

Example



Reference) Measuring accuracy of each axis of a JIS B 7153 measuring microscope (at 20°C)
Grade 0: (2+0.01L)µm or less
Grade 1: (4+0.02L)µm or less
L: measured length (mm)

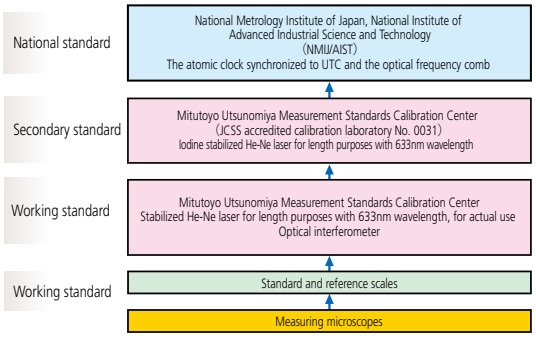
A Wide Choice of Stage Size

Precisely because measuring microscopes in this series are widely used in widely different industries, Mitutoyo offers a choice of stage size from 100x100mm to maximum-in-class 400x200mm. The customer can choose the optimal size for the application with accuracy performance guaranteed.

Extraordinary Reliability ~ Traceability to National Standards ~

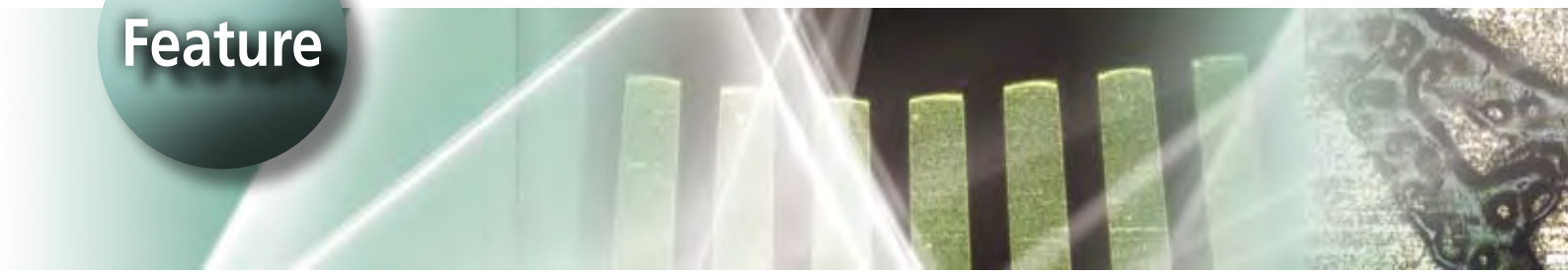
Use of Master Gages Traceable to National Standards

Measurement results obtained from these microscopes are traceable to national standards to guarantee compliance with quality control systems. This is achieved through ensuring that all Mitutoyo master calibration gages and facilities are themselves traceable to national standards.



Mitutoyo

Feature



MF Series – User-friendly Standard Model –

Reduction in Magnification Error due to Variation in Point of Focus

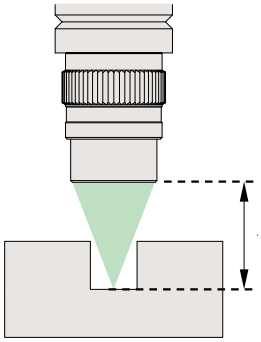
Telecentric Optical System

In order not to change the observing magnification even at low magnification (10x or less) where the objective's precise working distance is difficult to accurately reproduce because of a wide focal depth, this series has adopted the telecentric optical system that reduces the magnification error due to slight variation in working distance.
Also, the MF series objectives are manufactured with a more accurate magnification due to Mitutoyo's unique specification that surpasses JIS Standards. This optimizes comparative measurement with a reticle.

Safe Operation

Ultra-long Working Distance

An ultra-long working distance is ensured in the entire lineup of a wide variety of objectives between 1x and 100x. This practically eliminates any risk of collision with a workpiece even when surface asperities are present.



Working distance	Objective
61.0mm	ML1x
77.0mm	ML3x
61.0mm	ML5x
51.0mm	ML10x
20.0mm	ML20x
13.0mm	ML50x
6.0mm	ML100x

Easy Change of Magnification

Sliding Nosepiece

The MF series usually allows only a single objective to be mounted which needs to be replaced for every magnification change. The sliding nosepiece allows up to two objectives to be mounted.
In the case of measurement that needs frequent magnification change, this nosepiece design drastically improves workability.
(Refer to page 20 for details)

Manual (2- or 3-axis)

Camera Port | Counter
Zero-setting | Quick Release
FS Objective | Tilting
XY Motor | Z-axis Motor
Vision AF | Remote
LAF | Power Turret

Z-axis Motor Drive

Camera Port | Counter
Zero-setting | Quick Release
FS Objective | Tilting
XY Motor | Z-axis Motor
Vision AF | Remote
LAF | Power Turret

Motor Drive

Camera Port | Counter
Zero-setting | Quick Release
FS Objective | Tilting
XY Motor | Z-axis Motor
Vision AF | Remote
LAF | Power Turret

Camera Port Camera port for mounting a digital camera (standard equipment on all models)

Zero-setting Handy zero-set switch that minimizes the operator's hand motion

FS Objective Possible to mount an objective that enables various observation methods. (Only for the MF-U series)

XY Motor Motor-driven stage retains high accuracy

Vision AF Vision auto focus function that speeds up measurement by reducing the operator's focusing error

LAF Laser auto focus function enables excellent trackability

Counter Low-profile digital display possible to install on the left or right side and adjust tilt angle to suit the operator

Quick Release Quick-release mechanism that allows rapid stage positioning (Only for manual XY stage models)

Tilting Tilting optical tube that can adjust the eyepoint to suit to the operator's physique (Standard-equipped in the MF-U series)

Z-axis Motor Z-axis motor drive for fast Z-axis focusing

Remote Remote control box that enables handy operation

Power Turret Motor-powered turret enables faster operation when several objectives are required for measurement

Key	
	Standard-equipped function
	Not supported

Mitutoyo

Feature

MF-U Series – Universal Model Dealing with Diverse Observation Methods –

Clear Observation Image

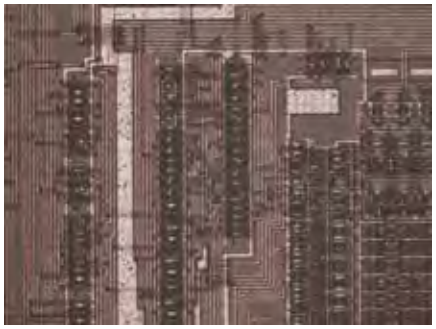
Apochromat Lenses

This series provides a clear observation image with excellent color quality, ultra-long working distance for high operability and apochromatic design that eliminates chromatic aberration.

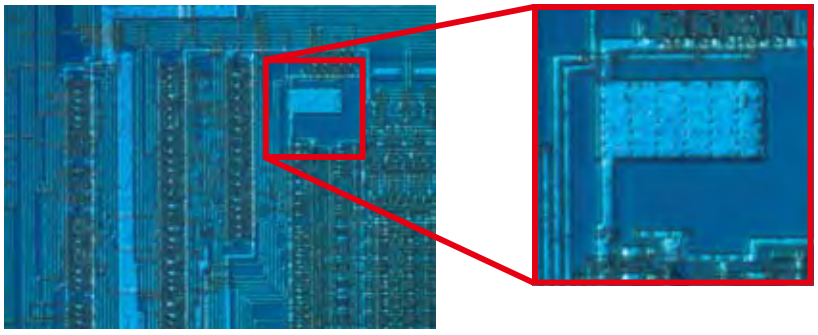
Detection of Microscopic Flaws and Asperities

Diverse Observation Methods

A choice of observation method such as dark-field observation, simple polarized observation and differential interference observation in addition to bright-field observation of magnified images are selectable depending on the intended use.



Ordinary observation (bright-field)



Differential interference : Allows observation of microscopic asperities hard to detect with ordinary bright-field observation.

Ordinary observation (bright-field)

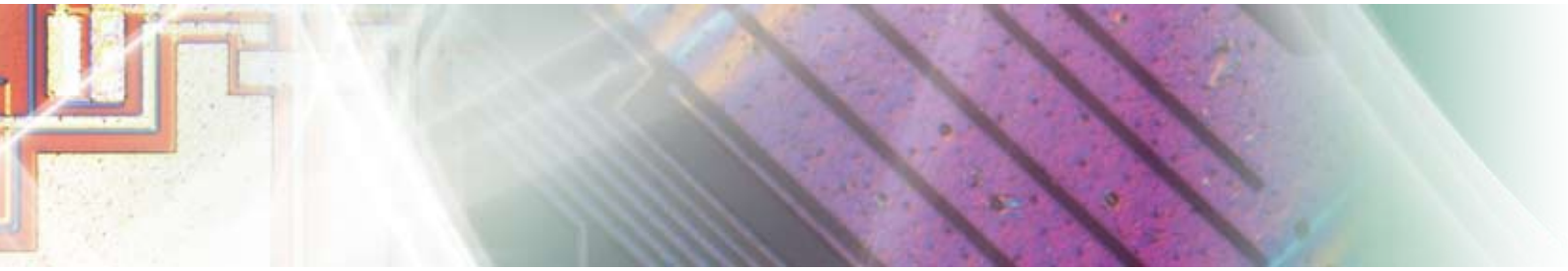
Dark-field: Allows highlighted observation of microscopic abnormalities such as flaws and contamination by using diffused light.

Polarization Unit

Used when performing simple polarized observation.
It is also recommended to use this unit for increasing image contrast during use of a low-magnification lens.

Differential Interference Unit

Used when performing differential interference observation.
This unit is used in combination with the polarization unit.



Manual (2- or 3-axis)

Camera Port | Counter
Zero-setting | Quick Release
FS Objective | Tilting
XY Motor | Z-axis Motor
Vision AF | Remote
LAF | Power Turret

Z-axis Motor Drive

Camera Port | Counter
Zero-setting | Quick Release
FS Objective | Tilting
XY Motor | Z-axis Motor
Vision AF | Remote
LAF | Power Turret

Motor Drive

Camera Port | Counter
Zero-setting | Quick Release
FS Objective | Tilting
XY Motor | Z-axis Motor
Vision AF | Remote
LAF | Power Turret

Camera Port Camera port for mounting a digital camera (standard equipment on all models)

Zero-setting Handy zero-set switch that minimizes the operator's hand motion

FS Objective Possible to mount an objective that enables various observation methods. (Only for the MF-U series)

XY Motor Motor-driven stage retains high accuracy

Vision AF Vision auto focus function that speeds up measurement by reducing the operator's focusing error

LAF Laser auto focus function enables excellent trackability

Counter Low-profile digital display possible to install on the left or right side and adjust tilt angle to suit the operator

Quick Release Quick-release mechanism that allows rapid stage positioning (Only for manual XY stage models)

Tilting Tilting optical tube that can adjust the eyepoint to suit the operator's physique (Standard-equipped in the MF-U series)

Z-axis Motor Z-axis motor drive for fast Z-axis focusing

Remote Remote control box that enables handy operation

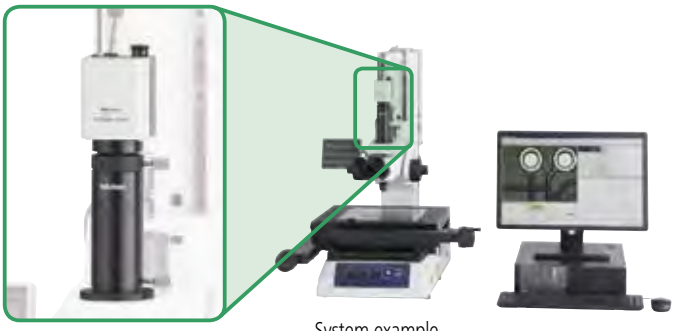
Power Turret Motor-powered turret enables faster operation when several objectives are required for measurement

View of icons	
	Standard-equipped function
	Not supported
	Selectable as an option

Optional Accessories

Camera/Images

Vision Unit

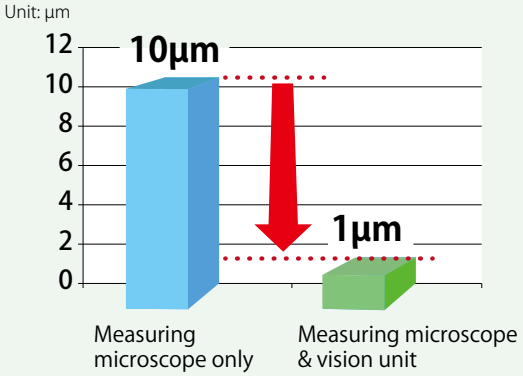


System example

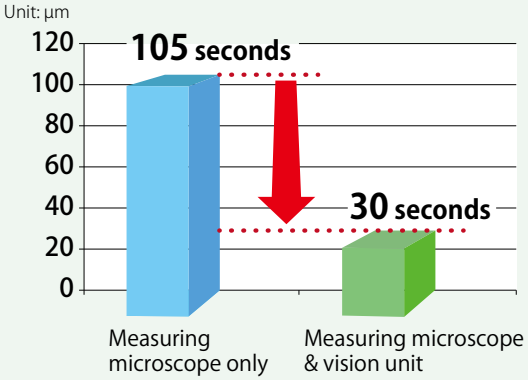
Reduction of Variation / Improvement in Efficiency

The vision unit allows anyone to perform simplified measurement of an edge with just one click.
Also, using the vision unit eliminates the need for burdensome workpiece orientating and data point detection with cross hairs, thus allowing quick inspection of dimensions.

About 90% reduction in variation



About 70% reduction in average measurement time



Measurement results and measurement times when measuring a width of about 20mm thrice (continuous reciprocation)
Measurement with the measuring microscope only

	Operator A	Operator B	Operator C		
Max. value (mm)	20.0863	20.0849	20.0811	Max. value (mm)	20.0863
Min. value (mm)	20.0846	20.0842	20.0837	Min. value (mm)	20.0837
Variation (mm)	0.0098	0.0047	0.0053	Variation (mm)	**0.0105**
Measurement time (sec)	76	150	89	Measurement time (sec)	**105**

Measurement with the measuring microscope & vision unit

	Operator A	Operator B	Operator B		
Max. value (mm)	20.0847	20.0849	20.0811	Max. value (mm)	20.0849
Min. value (mm)	20.0846	20.0842	20.0837	Min. value (mm)	20.0837
Variation (mm)	0.0001	0.0007	–0.0026	Variation (mm)	**0.0012**
Measurement time (sec)	36	23	25	Measurement time (sec)	**28**

Simplified Report/Storage Function

This series has the functions to perform tolerance verification of measurement/calculation results, various statistical processing for each item and image load/storage, enabling storage of measurement results and images at measured points.
Since measurement results can also be outputted in the CSV format, this allows smooth creation of inspection table.

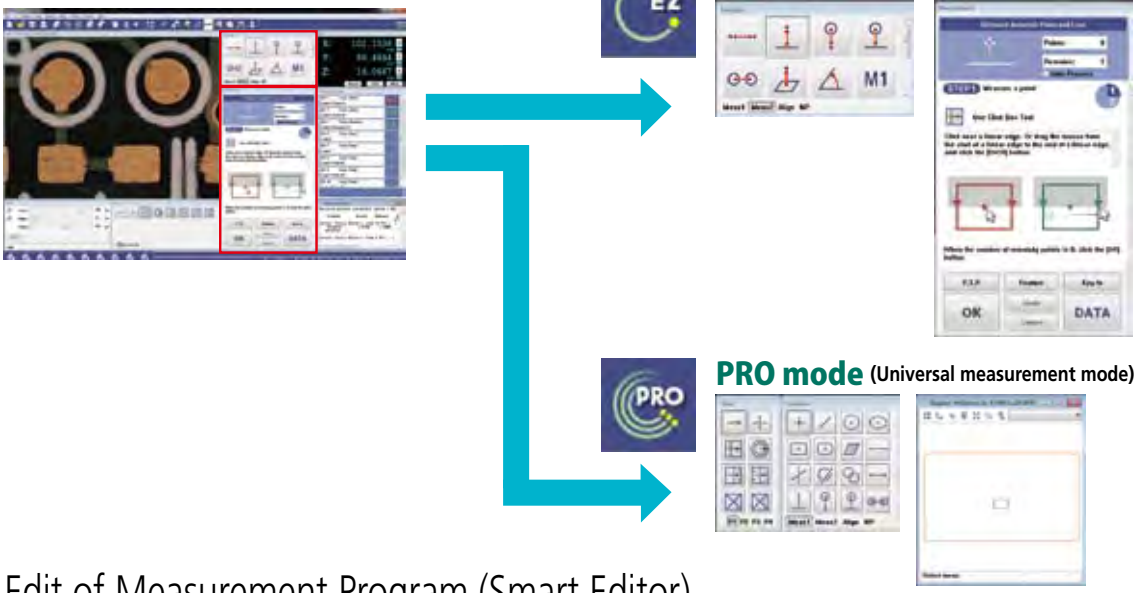
Optional Accessories

Camera/Images

Vision Unit
Dedicated Software - QSPAK -

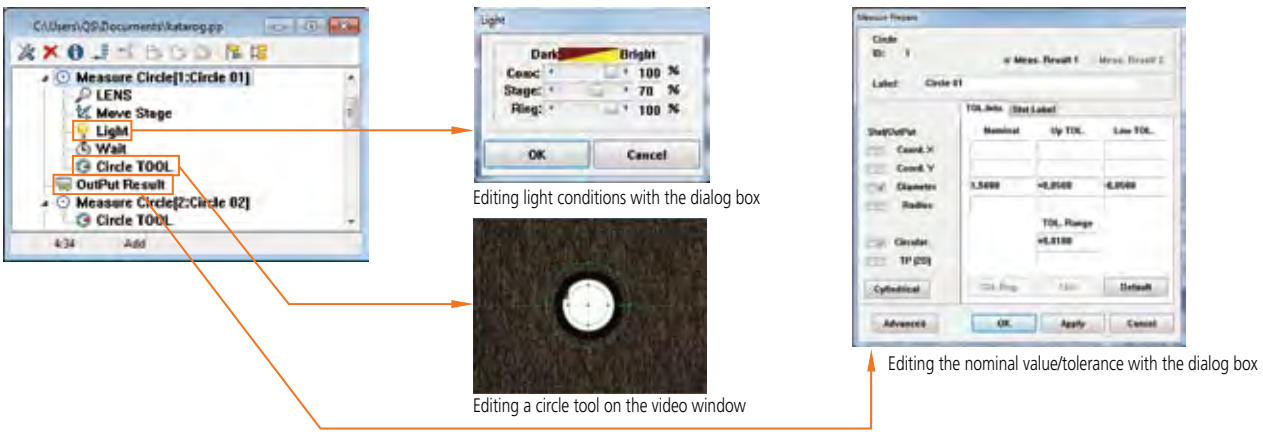
Simple/Universal Mode Switching (EZ/PRO)

In the EZ mode for Simple & Operation guidance display, this software allows even a beginner to perform measurement without any confusion using the easy-to-understand measurement icons and guidance function. Also, it supports the needs of more advanced measurement by the ability to switch to the PRO mode where the full functions of QSPAK are supported.



Simple Edit of Measurement Program (Smart Editor)

This function simply enables program correction/edit by only selecting an item you want to edit from among existing programs.



Editing light conditions with the dialog box

Editing a circle tool on the video window

Editing the nominal value/tolerance with the dialog box

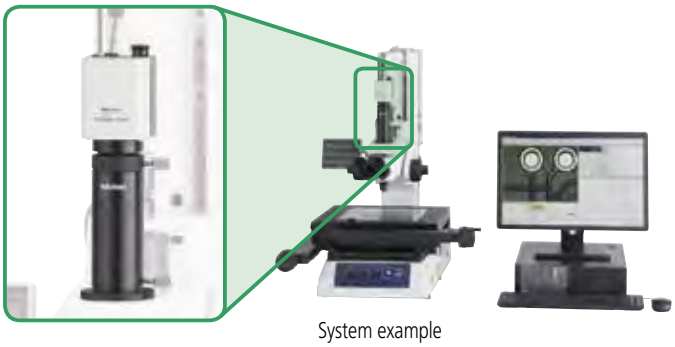
Edge Detection Functions

Outlier Removal Function ····· Removes outliers such as burrs and chips.
Dual-area Contrast Tool ····· Automatically adjusts the light intensity of two areas to the optimum.
Auto Trace Tool ····· Automatically detects contour data while predicting the next one.
To perform contour analysis and contour tolerancing, use 2-dimensional analysis software (FORMTRACEPAK-AP).

Optional Accessories

Camera/Images

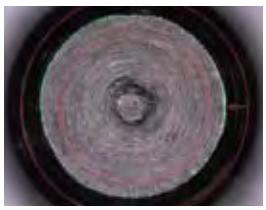
Vision Unit
Dedicated Software - QSPAK -



System example

Simplified Multi-point Measurement (One-click Tool)

A mere click on an edge allows correct measurement, avoiding the variation inherent in conventional multi-point measurement.
The function to remove outliers such as burrs and chips can be used concurrently.



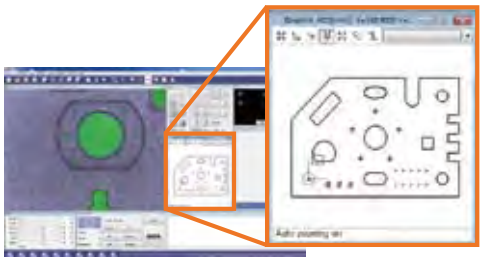
One-click circle tool

One-click box tool

Graphics Function

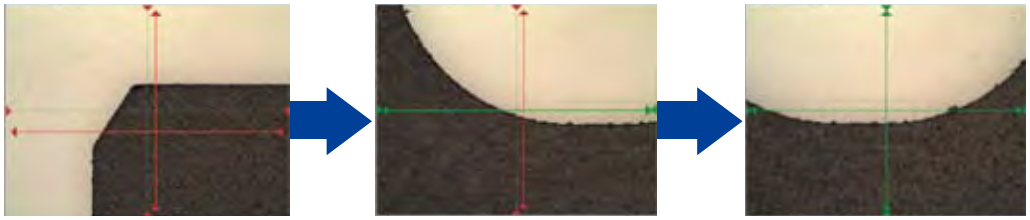
This function automatically displays the current position, coordinate system, measurement feature and measurement result on the graphics window to prevent an omission or error of measurement from occurring. It also enables you to grasp which portion of the whole workpiece is observed by importing 2-dimensional CAD data*.

* Optional software (For details refer to Page 15.)



Navigation Function (Quick Navigation)

Once a measurement program is created, anyone can measure a workpiece just as well as skilled personnel by merely following the navigation instructions at the next measuring point.



(1) The next measuring point is indicated with red cross hairs.

(2) Approaching the measuring point, the red cross hairs and green cross hairs come close to each other.

(3) When both cross hairs overlap one another while indicating the target point, press the Input button to complete the measurement.

Optional Accessories

Camera/Images

Optional Software

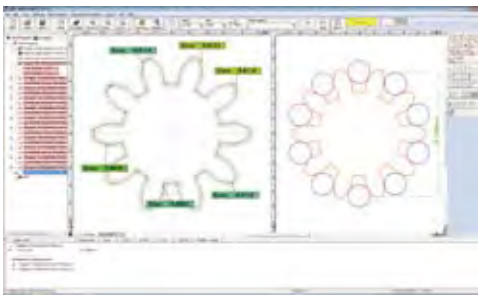
2-dimensional Analysis Software - **FORMTRACEPAK-AP** -

FORMTRACEPAK-AP allows contour analysis and comparative verification with the nominal value, making use of the point group data acquired with the auto trace tool.

Form analysis can be performed seamlessly from measured images with simple operations.

Example of form analysis

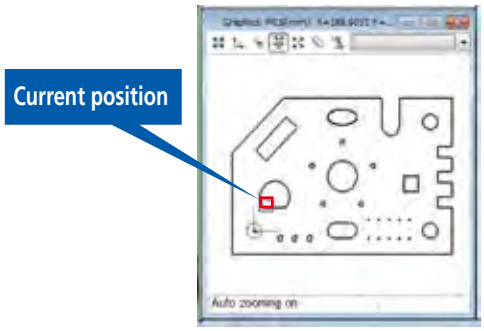
Contour tolerancing against the nominal value is also enabled. For example, the software allows over-pin diameter measurement by defining virtual circles with a given diameter around a gear.



Example of gear contour matching, and an over-pin diameter analysis

Effective use of CAD model - **QS-CAD I/F** -

2-D CAD model data (DXF-, or IGES-formatted) can be imported into QIPAK. Conversely, QIPAK measurement results can be converted into 2-D CAD model data. The design value for each measurement item is automatically entered. Since the graphics window makes the present location easy to identify, the operator can quickly move the stage a given point in the 2D CAD model.

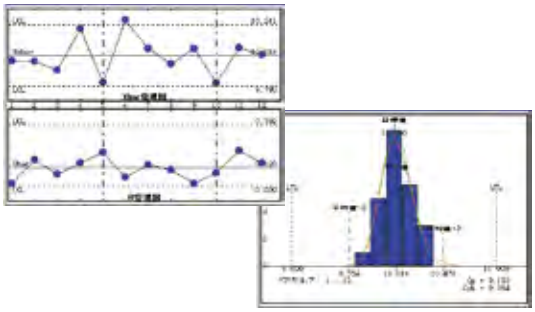


Early detection of process irregularities - **MeasurLink** -

Statistical data can be displayed in real-time, making early detection of process irregularities possible. Early identification of an out-of-control situation enables rapid remedial action to be taken when necessary.

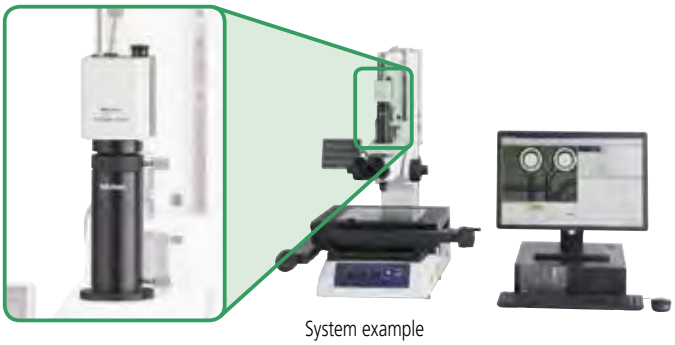
Examples of remedial action

- Mold repair or cycle-timing change
- Cutting tool adjustment or replacement.



Optional Accessories

Camera/Images



System example

Specifications

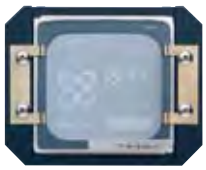
Vision Unit 10D	
Order No.	**359-763**
Magnification of optical system	0.5X: when a microscope is attached (0.5X: when using a TV adapter)
Image detection	High sensitivity 1/2-inch CMOS color camera with 300 million pixels
Resolution	0.1µm
Measuring accuracy for each axis (in a 20°C environment)	Depends on measuring microscope
Accuracy (in a 20°C environment)	Depends on measuring microscope Reference: when using a 3X ML objective (performing an inspection using our standard sample) Screen-internal measuring accuracy: ±2.5µm or less Screen-internal repeatability (2σ): ±1µm or less
PC system*	Windows 7
Software*	QSPAK Vision Unit
Applicable model	**MF D / MF-U D**

* Software (QSPAK) and calculation processor are required separately.

Calibration Chart

Calibration Chart
This chart is used for pixel-size correction of the CCD, and auto-focus accuracy and optical-axis offset corrections for each selected magnification.

* The function may be limited depending on the lens.
  For detailed information, contact a Mitutoyo sales office.



Order No. 02ATN695

Others

C-mount Adapter

This adapter is used to mount a C-mount compatible digital camera on the microscope main unit.

Order No. 970441

0.5x TV Adapter (including C-mount Adapter)

This adapter is used to mount a C-mount compatible digital CCD camera on the microscope main unit, thereby making an observation area on the monitor close to the real field of view through the objective.

Order No. 375-054

Optional Accessories

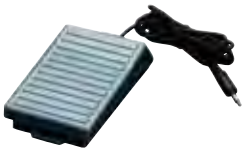
Camera/Images | Calculation processing

Data Processing Applications

2-dimesinal Data Processing Unit QM-Data200

Order No.: **264-155**
Application: QM-Data200 allows various data processing operations and creation of measurement programs without needing any other data processing unit.
Resolution: 0.1µm
Program function: Creation, execution and editing of measurement procedures
Statistical processing: Measurement items, number of data, maximum value, minimum value, mean value, standard deviation, range, histogram and statistics by measurement function (statistics by command)
Display: TFTLCD (with LED backlight)
Tilting mechanism: Installed

Foot Switch



Order No.: **12AAJ088**
Application: Foot switch for data transfer
A measurement result can be transferred to the data processing unit by stepping on the switch while holding the feed wheels.

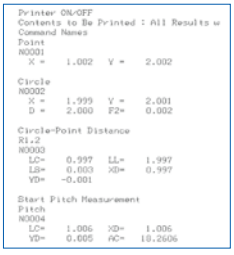
Thermal printer

DPU-414 Manufactured by SII

Specifications

Thermal Printer DPU-414		
Order No.	Connected to QM-Data 200	Please contact with your local Mitutoyo sales office.
	Counter display printing	Please contact with your local Mitutoyo sales office. Note: Combined use with footswitch No. **12AAJ088**
Printing method		Dot-matrix thermosensitive
Number of printing digits		40 digits (9 normal characters (7 dot matrix)
Printing speed		Maximum 52.5 normal characters/s
External dimensions		160mm(W)×170mm(D)×65.5mm(H) (printer)
Standard accessories		Printer cable, printing paper (1 roll), AC adapter (for 100V)
Spare goods	Printing paper (5 rolls)	**No. 908353** (5 rolls)

Printout example



Optional Accessories

Eyepieces/Optical Tubes

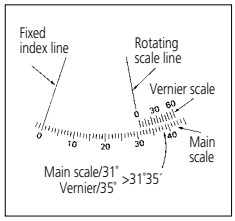
Eyepieces

Eyepieces

	WF10×/24	WF15×/16	WF20×/12
Order No. (1 piece)	**378-866-5**	**378-857-5**	**378-858-5**
Order No. (2 pieces)	**378-866**	**378-857**	**378-858**
Magnification	10×	15×	20×
Field number	24	16	12
Applicable model	**MF / MF-U**		

Eyepieces

Order No.375-043



The angle reading scale is built in, allowing angle measurement by simply rotating a scale line between the features to be measured.

Digital Protractor Eyepiece

Order No.176-313

An angle can be measured by merely rotating the cross hairs. (Digital display.)

Optical Tubes

Optional accessories required for MF

Monocular Tube

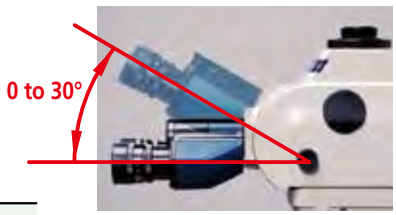
Order No.	**176-392**
Magnification	10×
Field number	24
Applicable model	Required for **MF**

Binocular Tube

Order No.	**176-393**
Magnification	10×
Field number	24
Applicable model	Required for **MF**

Standard-equipped Tilting Optical Tube (MF-U Dedicated Standard Option)

Tilting optical tube that can adjust the eyepoint to suit the operator's physique allows comfortable measurement.

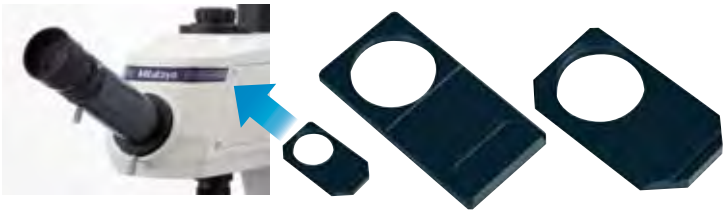


Focus Detector Unit Focus Pilot

Model No.	**FP-05**		**FP-05U**	
Order No.	**375-057** (Green)	**375-058** (Red)	**375-067** (Green)	**375-068** (Red)
Light source	Green LED or Red LED • Concentric circle pattern • Slit pattern · The focal point is the positon where the top and bottom of the pattern are aligned. · Pattern selection and brightness adjustment are enabled according to the surface status of a workpiece. · Observation with a wide field of view on a video monitor is available using 0.5x optical system (with a CCD camera mounted separately).			
Focusing reproducibility	Approximately 1.5µm (when using a 20x lens) * In-company measured reference value of a sample			
Applicable model	**MF**		**MF-U**	

Optional Accessories

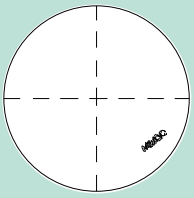
Eyepieces/Optical Tubes



For MF D　　For MF-U D

Reticles

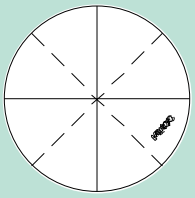
Chain line type



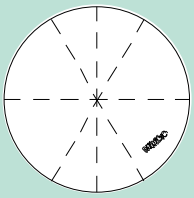
No.12AAG838 (MF D)
No.12AAG878 (MF-U D)
90° chain lines
Chain line pitch: 0.2 to 0.2
Line width: 7µm

No.12AAG836 (MF D)
No.12AAG877 (MF-U D)
90° chain line
Chain line pitch: 0.2 to 0.2
Line width: 5µm

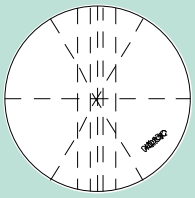
No.12AAG873 (MF D)
No.12AAG876 (MF-U D)
90° chain lines
Chain line pitch: 0.2 to 0.2
Line width: 3µm



No.12AAG839 (MF C / MF D)
No.12AAG879 (MF-U D)
90° solid lines, 45° chain lines
Chain line pitch: 0.2 to 0.2
Line width: 5µm

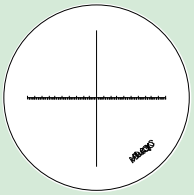


No.12AAG840 (MF C / MF D)
No.12AAG880 (MF-U D)
90° chain lines, 60° chain lines
Chain line pitch: 0.2 to 0.2
Line width: 5µm

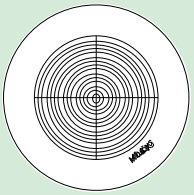


No.12AAG841 (MF C / MF D)
No.12AAG881 (MF-U D)
Zeiss type pattern
Chain line pitch: 0.2 to 0.2
Line width: 5µm

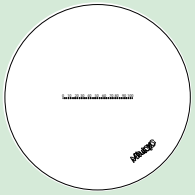
Graduation line type (Use these reticles with an eyepiece that has 10X magnification.)



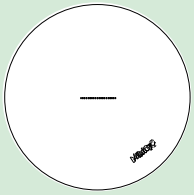
No.12AAG842 (MF D)*1
Cross haired graduation lines
0.1/20mm
Line width: 7µm



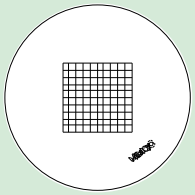
No.12AAG843 (MF D)*1
Concentric circles with graduation lines
ø1.2 to ø18
Line width: 7µm



No.12AAG844 (MF D)*1
Graduation lines
0.1/10mm
Line width: 10µm



No.12AAG845 (MF D)*1
Graduation lines
0.05/5mm
Line width: 10µm



No.12AAG846 (MF D)*1
Grid lines
□1mm　□10mm
Line width: 10µm

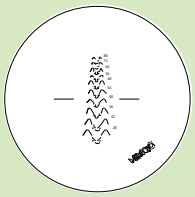
Comparison measuring type
(This is the comparison chart specific to a 3X ML objective. Use this with an eyepiece that has 10X magnification.)

No.12AAG847 (MF D)*2
Metric coarse screw thread
p = 0.25 to 1.0
Line width: 7µm

No.12AAG848 (MF D)*2
Metric coarse screw thread
p = 1.25 to 2.0
Line width: 7µm

No.12AAG849 (MF D)*2
Involute gear reference rack
m = 0.1 to 1.0, pressure angle: 14.5°
Line width: 7µm

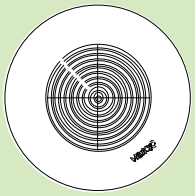
No.12AAG850 (MF D)*2
Involute gear reference rack
m = 0.1 to 1.0, pressure angle: 20°
Line width: 7µm



No.12AAG851 (MF D)*2
Unified coarse screw thread
80 to 28
Line width: 7µm

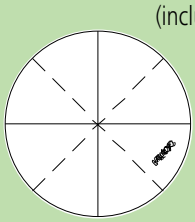
No.12AAG852 (MF D)*2
Unified coarse screw thread
24 to 14
Line width: 7µm

No.12AAG853 (MF D)*2
Unified coarse screw thread
13 to 10
Line width: 7µm



No.12AAG854 (MF D)*2
Concentric circles with cross hairs
0.01" to 0.20"
Line width: 7µm

Reticle for digital protractor eyepiece (included as standard)



90° solid lines, 45° chain lines
Chain line pitch: 0.2 to 0.2
Line width: 7µm

Each reticle includes an insertion unit. Since the insertion unit is specific to the model, select applicable reticles for your microscope.

Objectives for MF Series

ML Objectives

Model No.	Order No.	Magnification	Numerical Aperture (NA)	View field with eyepiece (mm)	View field with CCD camera (mm)*	Resolving Power (μm)	Working distance (mm)	Depth of Focus ±D.F. (μm)
ML 1×	**375-036-2**	1×	0.03	ø24	6.40×4.80	9.2	61.0	306
ML 3×	**375-037-1**	3×	0.09	ø8	2.10×1.60	3.06	77.0	34
ML 5×	**375-034-1**	5×	0.13	ø4.8	1.28×0.96	2.12	61.0	16.3
ML 10×	**375-039**	10×	0.21	ø2.4	0.64×0.48	1.31	51.0	6.2
ML 20×	**375-051**	20×	0.42	ø1.2	0.32×0.24	0.65	20.0	1.6
ML 50×	**375-052**	50×	0.55	ø0.48	0.13×0.10	0.5	13.0	0.9
ML 100×	**375-053**	100×	0.70	ø0.24	0.06×0.05	0.4	6.0	0.6

* View field with CCD camera is a view field when using Mitutoyo Vision Unit (P12-P16).

ML Objectives

Compatible observation method: Bright-field observation
Advantage: A measurement error is reduced with the correct magnification.
The telecentric optical system is adopted for a magnification of 10x or less to reduce measurement error due to an out-of-focus condition.

Sliding Nosepiece (Factory-set Option)

Two ML objectives can be mounted, allowing stress-free change of magnification.

- Parfocal Type (Order No. 176-370-1)
  Identical focal lengths of mounted objectives eliminates the need for refocusing after every objective change.
- Magnification Type (Order No. 176-370-2)
  The magnifications of both mounted objectives are guaranteed.
  This is the recommended nosepiece to use when a reticle is mounted in the optical tube.

Objectives for the MF-U Series

M Plan Apo Objectives

Compatible observation method: Bright-field observation, simple polarized observation, differential interference observation

Advantage: Plan apochromat lenses free of spherical aberration/chromatic aberration are adopted to obtain images with excellent color reproducibility without blur over the entire field of view.

G Plan Apo Objectives

Compatible observation method:
Observation through a cover glass

Advantage: Correction design is performed so as to obtain optimal observation images when observing through the glass.
(Corrected on the basis of BK7 and a cover glass thickness of 3.5mm. Custom order of other glass material and thickness is also available.)

BD Plan Apo Objectives

Compatible observation method: Bright-field observation, dark-field observation, simple polarized observation, differential interference observation

Advantage: Dark-field observation is also supported while maintaining the performance of the M Plan Apo objective series.

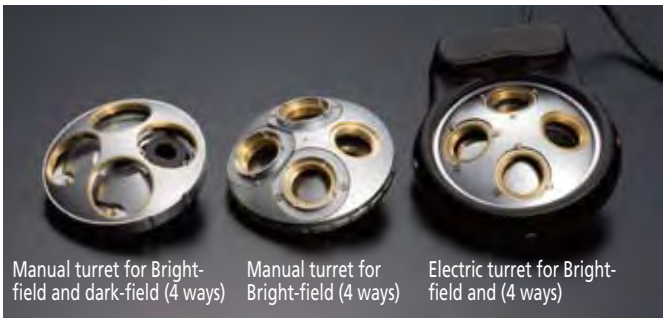
FS objectives

Model No.	Order No.	Magnification	Numerical Aperture (NA)	View field with eyepiece (mm)	View field with CCD camera (mm)	Resolving Power (μm)	Working distance (mm)	Depth of Focus ±D.F. (μm)
M Plan A po 1×	**378-800-3**	1×	0.025	ø24	6.40×4.80	11	11.0	200
M Plan A po 2×	**378-801-6**	2×	0.055	ø12	3.20×2.40	5	34.0	100
M Plan A po 5×	**378-802-6**	5×	0.14	ø4.8	1.28×0.96	2	34.0	40
M Plan A po 7.5×	**378-807-3**	7.5×	0.21	ø3.2	0.85×0.64	1.3	35.0	26.67
M Plan A po 10×	**378-803-3**	10×	0.28	ø2.4	0.64×0.48	1	34.0	20
M Plan A po 20×	**378-804-3**	20×	0.42	ø1.2	0.32×0.24	0.7	20.0	10
M Plan A po 50×	**378-805-3**	50×	0.55	ø0.48	0.13×0.10	0.5	13.0	4
M Plan A po 100×	**378-806-3**	100×	0.70	ø0.24	0.06×0.05	0.4	6.0	2
M Plan A po SL 20×	**378-810-3**	20×	0.28	ø1.2	0.32×0.24	1	30.5	10
M Plan A po SL 50×	**378-811-3**	50×	0.42	ø0.48	0.13×0.10	0.7	20.5	4
M Plan A po SL 80×	**378-812-3**	80×	0.55	ø0.3	0.08×0.06	0.6	15.0	2.5
M Plan A po SL 100×	**378-813-3**	100×	0.70	ø0.24	0.06×0.05	0.5	13.0	2
M Plan A po SL 200×	**378-816-3**	200×	0.62	ø0.12	0.03×0.02	0.4	13.0	1
M Plan A po HR 50×	**378-814-4**	50×	0.75	ø0.48	0.13×0.10	0.4	5.2	4
M Plan A po HR 100×	**378-815-4**	100×	0.90	ø0.24	0.06×0.05	0.3	1.3	2
G Plan A po 20× (t3.5)	**378-847**	20×	0.28	ø1.2	0.32×0.24	1	Air conversion29.42	10
G Plan A po 50× (t3.5)	**378-848-3**	50×	0.50	ø0.48	0.13×0.10	0.6	Air conversion13.89	4

Model No.	Order No.	Magnification	Numerical Aperture (NA)	View field with eyepiece (mm)	View field with CCD camera (mm)*	Resolving Power (μm)	Working distance (mm)	Depth of Focus ±D.F. (μm)
BD Plan Apo 2×	**378-831-7**	2×	0.055	ø12	3.20×2.40	5	34.0	100
BD Plan Apo 5×	**378-832-7**	5×	0.14	ø4.8	0.96×1.28	2	34.0	40
BD Plan Apo 7.5×	**378-830-7**	7.5×	0.21	ø3.2	0.85×0.64	1.3	34.0	26.7
BD Plan Apo 10×	**378-833-7**	10×	0.28	ø2.4	0.64×0.48	1	34.0	20
BD Plan Apo 20×	**378-834-7**	20×	0.42	ø1.2	0.32×0.24	0.7	20.0	10
BD Plan Apo 50×	**378-835-7**	50×	0.55	ø0.48	0.13×0.10	0.5	13.0	4
BD Plan Apo 100×	**378-836-7**	100×	0.70	ø0.24	0.06×0.05	0.4	6.0	2
BD Plan Apo SL 20×	**378-840-7**	20×	0.28	ø1.2	0.32×0.24	1	30.5	10
BD Plan Apo SL 50×	**378-841-7**	50×	0.42	ø0.48	0.13×0.10	0.7	20.0	4
BD Plan Apo SL 80×	**378-842-7**	80×	0.50	ø0.3	0.08×0.06	0.6	13.0	2.5
BD Plan Apo SL 100×	**378-843-7**	100×	0.55	ø0.48	0.13×0.10	0.4	13.0	2
BD Plan Apo HR 50×	**378-845-7**	50×	0.75	ø0.24	0.06× 0.05	0.3	5.2	4
BD Plan Apo HR 100×	**378-846-7**	100×	0.90				1.3	2

* SL: Super long working distance model HR: High Resolution model
* View field with CCD camera is a view field when using Mitutoyo Vision Unit (P12-P16).

Turret



Manual turret for Bright-field and dark-field (4 ways) | Manual turret for Bright-field (4 ways) | Electric turret for Bright-field and (4 ways)

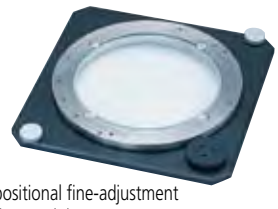
Supported observation		Bright field (M Plan Apo/G Plan Apo)			Bright and dark field (BD Plan Apo)	
Order No.	For normal model	**378-018**	**378-016**	**378-216**	**176-211**	**176-212**
	For LAF model	**176-410**			**176-412**	
Driving method		Manual	Electric		Manual	Electric
Number of ways		4	4	5	4	4

* When using the turret without parfocal mechanism and objectives, it is recommended to concurrently use "Parfocal Adjustment SIMM Set" (for bright-field observation: Order No. 378-089, for dark-field observation: Order No. 378-090).

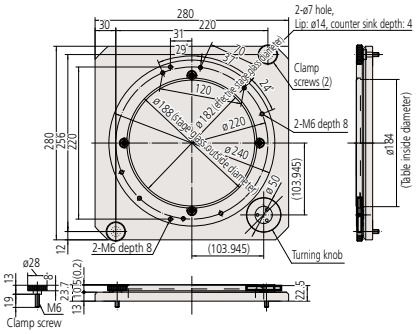
Optional Accessories

Rotary tables

Rotary table with Fine Wheel (A)

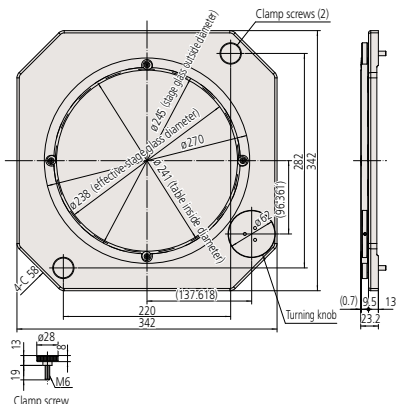


Order No.: **176-305**
Application: Workpiece orientating/positional fine-adjustment
External dimension: 280 (W)×280 (D)×23.7 (H)mm
Tabletop: ø240mm, 360° rotation, no angle scale
Mass: 5.5kg
Effective glass diameter (mm): ø182
Applicable model: Size 1010, 2010 (**MF/MF-U serie**s)
*Option: 172-197 Swivel Center Support
176-107 Holder with Clamp
172-378 V-block with Clamp



Rotary table with Fine Wheel (B)

Order No.: **176-306**
Application: Workpiece orientating/positional fine-adjustment
External dimension: 342 (W)×342 (D)×23.2 (H)mm
Tabletop: ø270mm, 360° rotation, no angle scale
Mass: 6.5kg
Effective glass diameter (mm): ø238
Applicable model: Size 2017, 3017, 4020 (**MF/MF-U series**)
*The V-block with Clamp, Swivel Center Support and Holder with Clamp can NOT be mounted on the table.

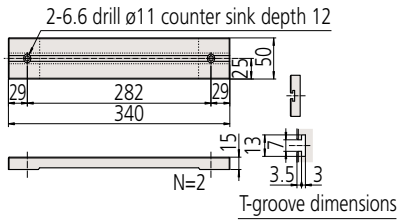


Stage Adapter

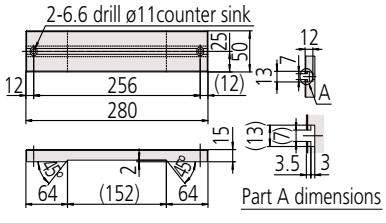
Order No.: Stage Adapter: **176-304**
Stage Adapter B: 176-310
Application: Used when setting the workpiece fixture on the stage.
External dimensions for one piece:
50 (W)×340 (D)×15 (H)mm
*Note) Adapter B is 280 (D)
Mass: Stage Adapter: 1.5kg
Stage Adapter B: 1.2kg

		Stage size		
		1010	2010	2017 3017 4020
176-304	Stage Adapter	—	Not applicable	Applicable
176-310	Stage Adapter B	—	Applicable	Not applicable

Note: Not required for model 1010.



176-304 Stage Adapter



176-310 Stage Adapter

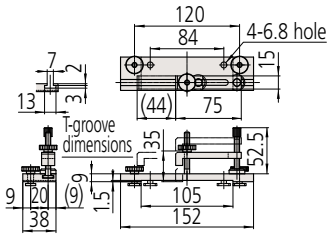
Optional Accessories

Others

Holder with Clamp

Order No.: **176-107**
Application: Used to clamp a thin workpiece such as a PCB or pressed part.
Maximum clamp length: 35mm
External dimensions: 62 (H)×152 (W)×38 (D)mm
Mass: 0.4kg

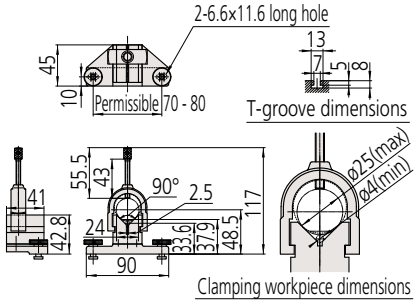
*Note: Size 2010 is used with stage adapter B. Sizes 2017, 3017, and 4020 are usable with stage adapter



V-block with Clamp

Order No.: **172-378**
Maximum clamping diameter: ø25mm
Height from the mounting surface to the center: 38-48mm
Application: Used to mount a cylindrical-form workpiece.
External dimensions: 117 (H)×90 (W)×45 (D)mm
Mass: 0.8kg

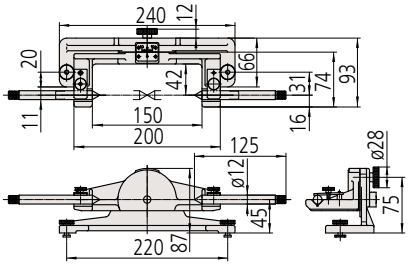
*Note: Size 2010 is used with stage adapter B. Sizes 2017, 3017, and 4020 are usable with stage adapter



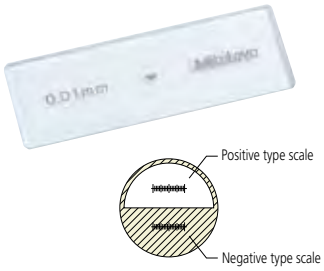
Swivel Center Support

Order No.: **172-197**
±10° for swivel position
Maximum angle index: 1°
Application: Used to mount a center-machined workpiece for measurement of screw pitch diameter, depth, etc.
Maximum horizontal clamping size: ø80×140mm
Maximum clamping size when inclined 10°: ø65×140mm
Mass: 2.5kg

*Note: Size 2010 is used with stage adapter B. Sizes 2017, 3017, and 4020 are usable with stage adapter



Stage Micrometer



Order No.: **375-056**
Scale length: 1mm
Minimum graduation: 0.01mm
Scale accuracy: 1+L(µm) L: length between any two lines (mm)
External dimensions: 76(W)×26(D)
Mass: 16g

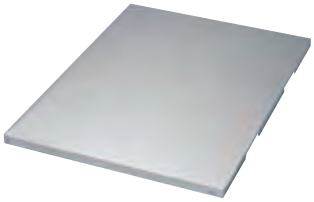
*Note: After purchasing the product, we perform calibration. For details, contact your neatest Mitutoyo Sales Office.

Mounting Stand (for Microscope)

Order No.: **176-309**
Application: Microscope main unit mounting stand
Maximum loading: 300kg
External dimensions: 1200 (W)×900 (D)×650 (H)
Mass: Approximately 50kg
Applicable model: **MF/MF-U**

*Note: When specifying a microscope with the Vision Unit, we recommend selecting the large mounting stand **No. 02ATE760**, which has external dimensions of 1,800 (W)×900 (D)×740 (H).

Vibration Damping Stand



Order No.: **176-308**
Application: Microscope vibration isolation table
Supporting method: Spring pad
Maximum loading: 200kg
External dimensions: 750 (W)×550 (D)×36 (H)
Mass: 36kg
Applicable model: **MF/MF-U**

Optional Accessories

Internal light source

LED Illumination Unit

The LED illumination unit has a longer operating life than a halogen bulb. This reduces running costs and saves the trouble of replacing the bulb. Also, a quick response to light control allows stress-free search for the illumination condition best suited to a workpiece.

For MF series: Transmitted/Reflected illumination Set **Order No. 176-445**
For MF-U series: Transmitted/Reflected illumination Set **Order No. 176-446**

Order No.176-445

Halogen Illumination Unit

Select this illumination unit when measuring a low-reflectivity workpiece rather than the standard LED illumination unit.

For MF series: Transmitted/Reflected illumination Set **Order No.176-447**
For MF-U series: Transmitted **Order No.176-448**
Reflected 100W (Standard) **Order No.176-315**
150W (High brightness) **Order No.176-316**

Order No.176-447

Order No.176-316

Illumination filter

Select the optimal filter depending on the intended use.
GIF filter: Emphasizes contrast in the image.
LB filter: Converts the warm-colored halogen light to a more natural color.
ND filter: Reduces illumination intensity without changing the observation condition (color temperature) in spite of the fact that halogen light becomes redder when darkened by decreasing the voltage.
ND2: Light intensity 1/2 (transmission factor 50%) ND8: Light intensity 1/8 (transmission factor 12.5%)

Light source	Applicable model	Order No.	Illumination method	GIF	LB80	ND2	ND8
LED illumination	MF	**176-445**	Transmitted/ reflected	12AAA645	—	—	—
	MF-U	**176-446**					
Halogen illumination	MF	**176-447**	Transmitted/ reflected	12AAA645	12AAA646	12AAA643	12AAA644
	MF-U	**176-448**	Transmitted				
		176-315	Reflected (100W)	12AAG806	12AAG807	—	—
		176-316	Reflected (150W)	—	—	—	—

Optional Accessories

External light source

LED Ring Light

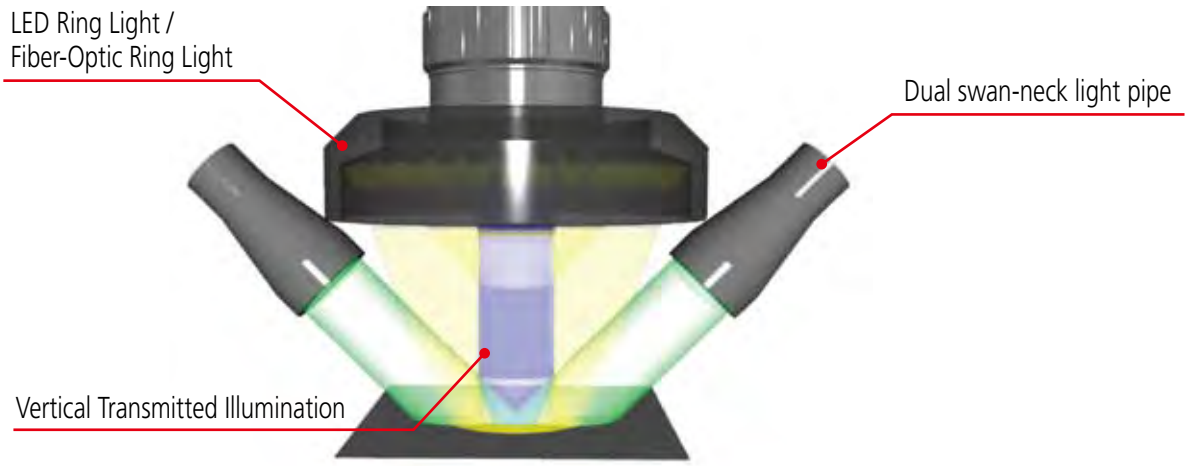
For MF series : **Order No.176-367-2** (Standard)
: **Order No.176-371** (Specific to Sliding Nosepiece)
For MF-U series : Please contact with your local Mitutoyo Sales Office.

This illumination unit provides a high image contrast for observation of deep-color resins, PCBs and small-diameter cylinders, thus providing optimal performance for vision measurement. Even if the brightness of illumination is changed, no color will change.

* The ring light illumination is compatible with ML objectives of 10x or less. If an objective with a magnification of more than 10x is used, there is a risk of difficulties in observation due to insufficient light intensity.

Mounted on MF series

Mounted on MF-U series

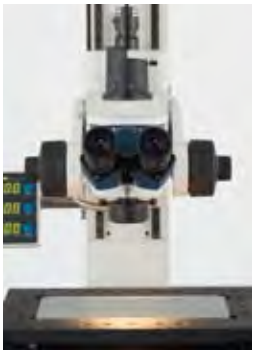


Fiber-Optic Ring Light

For MF series: **Order No. 176-366** (Standard)

The Fiber-Optic Ring Light is the best unit to use when a bright, shadowless image is required. This illumination is best suited to observation at high magnifications and vision measurement.

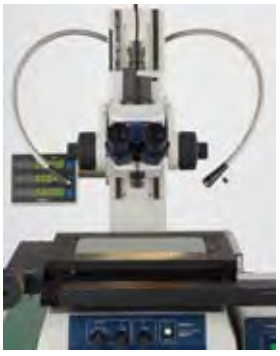
* The ring light illumination is compatible with ML objectives of 10x or less. If an objective with a magnification of more than 10x is used, there is a risk of difficulties in observation due to insufficient light intensity.



Dual swan-neck light pipe

For MF and MF-U series: **No. 176-343**

This illumination unit highlights the features of a workpiece surface by applying oblique light to it, forming shadows which aid viewing. High-brightness spot lighting is also available by the concurrent use of the standard-supplied condenser lens.



Mitutoyo

Specifications

MF Series

Main unit		Manual				
		1010	**2010**	**2017**	**3017**	**4020**
Without Z-axis scale		**MF-A1010D**	**MF-A2010D**	**MF-A2017D**	**MF-A3017D**	**MF-A4020D**
		176-861*1	**176-862***1	**176-863***1	**176-864***1	**176-865***1
With Z-axis scale		**MF-B1010D**	**MF-B2010D**	**MF-B2017D**	**MF-B3017D**	**MF-B4020D**
		176-866*1	**176-867***1	**176-868***1	**176-869***1	**176-870***1
Measuring accuracy*2 (X and Y axes, when not loaded)		(2.2+0.02L) µm L: measuring length (mm)				
Minimum reading		High accuracy digital scale is mounted 1/0.5/0.1µm switchable				
Observation	Optical tube	Monocular or binocular TV camera port for all models (observation/TV camera = 50/50)*4 is provided as standard Reticle (broken cross-hair, line width: 5µm) is provided as standard Various reticles are optional.				
	Incline angle	Angle of column: 25°				
	Observation image	Erect image				
	Observation method	Bright-field observation				
Eyepiece		10X (eyepiece field number: 24) is provided as standard 15X, 20X, Angle eyepieces 10X, Digital angle eyepieces 10X are optional.				
Objective		3X (working distance: 77mm) is provided as standard 1X, 5X, 20X, 50X, 100X, a pair of sliding nosepieces*5 are optional.				
Z axis	Feed mechanism	Coaxial coarse and fine feed, handles on both sides (coarse: 30mm/rotation, fine: 0.2mm/rotation)				
	Max. workpiece height	150mm		220mm		
Stage	Measurement range	100×100mm	200×100mm	200×170mm	300×170mm	400×200mm
	Max. table loading	10kg		20kg		15kg
	Feed mechanism	Manual and Quick-release mechanism (zero-set switch is incorporated)				
	Swiveling angle	—		±5°		±3°
Internal light source	• LED Illumination Unit	White LED (transmitted/vertical reflected), no step modulated light				
	• Halogen Illumination Unit	12V50W halogen (transmitted/vertical reflected), no step modulated light				
External light source		Ring light and dual swan-neck light pipe are optional.				
Dimensions (W×D×H)	Main unit	562×730×667mm	624×745×667mm	632×892×782mm	682×892×782mm	757×907×782mm
	Control unit	—				
	Control unit for illumination unit	114×360×96mm				
Output		RS-232C output, USB output for Vision Unit				
Mass		Approx. 70kg	Approx. 75kg	Approx. 150kg	Approx. 160kg	Approx. 165kg
Max. power consumption*3		LED: 45W Halogen: 160W AC power input connector: 100-240V				

• Required optional accessory
*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 are required for PSE.
*2 Measured in conformance with JIS B 7153
*3 Optional accessory is NOT target (Main unit and required optional illumination are target)
*4 C mount is required separately.
*5 A pair of Sliding Nosepieces are factory-installed option.

Main unit		Motor-Driven Z-axis Models			Motor-Driven X/Y/Z-axis Models		
		2017	**3017**	**4020**	**2017**	**3017**	**4020**
With Z-axis scale		**MF-J2017D**	**MF-J3017D**	**MF-J4020D**	**MF-G2017D**	**MF-G3017D**	**MF-G4020D**
		176-891*1	**176-892***1	**176-893***1	**176-781***1	**176-782***1	**176-783***1
Measuring accuracy*2 (X and Y axes, when not loaded)		(2.2+0.02L) µm L: measuring length (mm)					
Minimum reading		High accuracy digital scale is mounted 1/0.5/0.1µm switchable					
Observation	Optical tube	Monocular or binocular TV camera port for all models (observation/TV camera = 50/50)*4 is provided as standard Reticle (broken cross-hair, line width: 5µm) is provided as standard Various reticles are optional.					
	Incline angle	Angle of column: 25°					
	Observation image	Erect image					
	Observation method	Bright-field observation					
Eyepiece		10X (eyepiece field number: 24) is provided as standard 15X, 20X, Angle eyepieces 10X, Digital angle eyepieces 10X are optional.					
Objective		3X (working distance: 77mm) is provided as standard 1X, 5X, 20X, 50X, 100X, a pair of sliding nosepieces*5 are optional.					
Z axis	Feed mechanism	Motor drive (Maximum measuring speed: 20mm/s), lower limit setting (for collision avoidance with a workpiece)					
	Max. workpiece height	220mm					
Stage	Measurement range	200×170mm	300×170mm	400×200mm	200×170mm	300×170mm	400×200mm
	Max. table loading	20kg		15kg	20kg		15kg
	Feed mechanism	Manual and Quick-release mechanism (zero-set switch is incorporated)			Motor drive (Maximum measuring speed: 40mm/s)		
	Swiveling angle	±5°		±3°	±5°		±3°
Internal light source	• LED Illumination Unit	White LED (transmitted/vertical reflected), no step modulated light					
	• Halogen Illumination Unit	12V50W halogen (transmitted/vertical reflected), no step modulated light					
External light source		Ring light and dual swan-neck light pipe are optional.					
Dimensions (WxDxH)	Main unit	632×892×782mm	682×892×782mm	757×907×782mm	632×892×782mm	682×892×782mm	757×907×782mm
	Control unit	355×364×106.5mm					
	Control unit for illumination unit	114×360×96mm					
Output		RS-232C output, USB output for Vision Unit					
Mass		Approx. 160kg	Approx. 170kg	Approx. 175kg	Approx. 160kg	Approx. 170kg	Approx. 175kg
Max. power consumption*3		LED: 275W Halogen: 390W AC power input connector: 100-240V					

• Required optional accessory
*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 are required for PSE.
*2 Measured in conformance with JIS B 7153
*3 Optional accessory is NOT target (Main unit and required optional illumination are target)
*4 C mo unt is required separately.
*5 A pair of Sliding Nosepieces are factory-installed option.

Mitutoyo

Specifications

MF-U Series

Main unit		Manual				
		1010	**2010**	**2017**	**3017**	**4020**
BF (bright-field)	Without Z-axis scale	**MF-UA1010D**	**MF-UA2010D**	**MF-UA2017D**	**MF-UA3017D**	**MF-UA4020D**
		176-871[*1]	**176-872**[*1]	**176-873**[*1]	**176-874**[*1]	**176-875**[*1]
	With Z-axis scale	**MF-UB1010D**	**MF-UB2010D**	**MF-UB2017D**	**MF-UB3017D**	**MF-UB4020D**
		176-876[*1]	**176-877**[*1]	**176-878**[*1]	**176-879**[*1]	**176-880**[*1]
BD (bright-field/ dark-field)	Without Z-axis scale	**MF-UC1010D**	**MF-UC2010D**	**MF-UC2017D**	**MF-UC3017D**	**MF-UC4020D**
		176-881[*1]	**176-882**[*1]	**176-883**[*1]	**176-884**[*1]	**176-885**[*1]
	With Z-axis scale	**MF-UD1010D**	**MF-UD2010D**	**MF-UD2017D**	**MF-UD3017D**	**MF-UD4020D**
		176-886[*1]	**176-887**[*1]	**176-888**[*1]	**176-889**[*1]	**176-890**[*1]
Measuring accuracy[*2] (X and Y axes, when not loaded)		(2.2+0.02L) µm L: measuring length (mm)				
Minimum reading		High accuracy digital scale is mounted 1/0.5/0.1µm switchable				
Observation	Optical tube	Tilting optical tube is provided as standard TV camera port for all models (observation/TV camera = 50/50)[*4] is provided as standard Reticle (broken cross-hair, line width: 5µm) is provided as standard Various reticles are optional.				
	Incline angle	Angle of column: 0-30°				
	Observation image	Erect image				
	Observation method	Bright-field observation / dark-field observation (Only for MF-UC and MF-UD types) Simple polarization and differential interference are optional.				
Eyepiece		10X (eyepiece field number: 24) is provided as standard 15X, 20X are optional.				
Turret		Manual, motor drive				
Objective	Bright-field (BF)	M Plan Apo, G Plan Apo series				
	Bright-field/dark-field (BD)	BD Plan Apo series				
Z axis	Feed mechanism	Manual handles on both sides (coarse: 30mm/rotation, fine: 0.2mm/rotation)				
	Max. workpiece height	150mm		220mm		
Stage	Measurement range	100×100mm	200×100mm	200×170mm	300×170mm	400×200mm
	Max. table loading	10kg		20kg		15kg
	Feed mechanism	Manual and Quick-release mechanism (zero-set switch is incorporated)				
	Swiveling angle	—		±5°		±3°
Internal light source	• LED Illumination Unit	White LED (transmitted/vertical reflected), no step modulated light				
	• Halogen Illumination Unit	12V50W halogen (transmitted), no step modulated light 12V100W (vertical reflected), no step modulated light 15V150W (vertical reflected), no step modulated light are optional.				
External light source		Dual swan-neck light pipe are optional.				
Output		RS-232C output, USB output for Vision Unit				
Dimensions (W×D×H)	Main unit	562×730×667mm	624×745×667mm	632×892×782mm	682×892×782mm	757×907×782mm
	Control unit	—				
	Control unit for illumination unit	114×360×96mm				
Mass		Approx. 70kg	Approx. 75kg	Approx. 150kg	Approx. 160kg	Approx. 165kg
Max. power consumption[*3]		LED: 55W Halogen: 190W (vertical reflected 12V100W) and 240W (vertical reflected 15V150W) AC power input connector: 100-240V				

• Required optional accessory

*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 are required for PSE.

*2 Measured in conformance with JIS B 7153

*3 Optional accessory is NOT target (Main unit and required optional illumination are target)

*4 C mount is required separately.

Main unit		Motor-Driven Z-axis Models			Motor-Driven X/Y/Z-axis Models					
					Standard			Standard		
		2017	**3017**	**4020**	**2017**	**3017**	**4020**	**2017**	**3017**	**4020**
BF (bright-field)	With Z-axis scale	**MF-UJ2017D**	**MF-UJ3017D**	**MF-UJ4020D**	**MF-UG2017D**	**MF-UG3017D**	**MF-UG4020D**	**MF-UE2017D**	**MF-UE3017D**	**MF-UE4020D**
		176-792*1	**176-895***1	**176-896***1	**176-784***1	**176-785***1	**176-786***1	**176-790***1	**176-791***1	**176-792***1
BD (bright-field/ dark-field)	With Z-axis scale	**MF-UK2017D**	**MF-UK3017D**	**MF-UK4020D**	**MF-UH2017D**	**MF-UH3017D**	**MF-UH4020D**	**MF-UF2017D**	**MF-UF3017D**	**MF-UF4020D**
		176-897*1	**176-898***	**176-899***1	**176-787***1	**176-788***1	**176-789***1	**176-793***1	**176-794***1	**176-795***1
Measuring accuracy*2 (X and Y axes, when not loaded)		(2.2+0.02L) µm L: measuring length (mm)								
Minimum reading		High accuracy digital scale is mounted 1/0.5/0.1µm switchable								
Observation	Optical tube	Monocular or binocular TV camera port for all models (observation/TV camera = 50/50)*4 is provided as standard Reticle (broken cross-hair, line width: 5µm) is provided as standard Various reticles are optional.								
	Incline angle	Angle of column: 0-30°								
	Observation image	Erect image								
	Observation method	Bright-field observation / dark-field observation (Only for MF-UC and MF-UD types) Simple polarization and differential interference are optional.								
Eyepiece		10X (eyepiece field number: 24) is provided as standard 15X, 20X are optional.								
Turret		Manual, motor drive*5								
Objective	Bright-field (BF)	M Plan Apo, G Plan Apo series								
	Bright-field/dark-field (BD)	BD Plan Apo series								
Z axis	Feed mechanism	Motor drive (Maximum measuring speed: 20mm/s), lower limit setting (for collision avoidance with a workpiece)								
	Max. workpiece height	220mm								
Stage	Measurement range	200×170mm	300×170mm	400×200mm	200×170mm	300×170mm	400×200mm	200×170mm	300×170mm	400×200mm
	Max. table loading	20kg		15kg	20kg		15kg	20kg		15kg
	Feed mechanism	Manual and Quick-release mechanism (zero-set switch is incorporated)			Motor drive (Maximum measuring speed: 40mm/s)					
	Swiveling angle	±5°		±3°	±5°		±3°	±5°		±3°
Internal light source	LED Illumination Unit	White LED (transmitted/vertical reflected), no step modulated light								
	Halogen Illumination Unit	12V50W halogen (transmitted), no step modulated light 12V100W (vertical reflected), no step modulated light 15V150W(vertical reflected), no step modulated light are optional.								
External light source		Dual swan-neck light pipe are optional.								
Output		RS-232C output, USB output for Vision Unit								
Dimensions (W×D×H)	Main unit	632×892×782mm	682×892×782mm	757×907×782mm	632×892×782mm	682×892×782mm	757×907×782mm	608×790×846mm	658×790×846mm	733×790×846mm
	Control unit	355×364×106.5mm								
	Control unit for illumination unit	114×360×96mm								
Mass		Approx. 160kg	Approx. 170kg	Approx. 175kg	Approx. 160kg	Approx. 170kg	Approx. 175kg	Approx. 165kg	Approx. 175kg	Approx. 180kg
Max. power consumption*3		LED: 285W Halogen: 420W (vertical reflected 12V100W) and (vertical reflected 15V150W) AC power input connector: 100-240V								

• Required optional accessory

*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 are required for PSE.

*2 Measured in conformance with JIS B 7153

*3 Optional accessory is NOT target (Main unit, required optional illumination, and control unit are target)

*4 C mount is required separately.

*5 RS-232C cable (No. 12AAA807) is required when you select a motorized LAF model and a power turret .

Diagram

MF Series

External camera system

C mount
970441

0.5 x adapter unit
(with C mount)
375-054

Focus pilot FP-05
Green(375-057)/Red(375-058)

Camera / Images
P12 - 17

Reticle

Eyepiece
10x
2pcs.
378-866
1pc.
378-866-5

Eyepiece
15x
2pcs.
378-857
1pc.
378-857-5

Eyepiece
20x
2pcs.
378-858
1pc.
378-858-5

Digital protractor eyepiece
176-313

Protractor eyepiece
375-043

Monocular unit
176-392

Binocular unit
176-393

MF

Eyepiece / Optical tube
P21, 22

Rotary table / Others
P21, 22

Size 1010

Size 2010

Size 2017/3017/4020

Rotary table with fine feed wheel (A) 176-305

Stage adapter B
176-310

Stage adapter
176-304

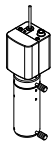
Rotary table with fine feed wheel (B) 176-306

V-block with clamp
172-378

Swivel center support
172-197

Holder with clamp
176-107

Vision unit 10DSet
•Vision unit
•Data processor
•Main software



Required option for Motor-Driven Z-axis models — Vision AF cable (12AAN358)

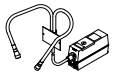
Required option — Calibration chart (02ATN695)
QS Calibration chart (02AKW001)
Foot switch (12AAJ088)

External control cable (12AAD128)

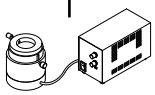
External control cable (12AAG888)

Filter
•GIF Filter (12AAG806)
•LB80 Filter (12AAG807)

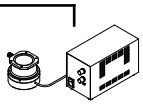
Fiber-Optic Ring (176-366)



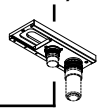
Dual swan-neck (176-343)



LED Ring (176-367-2)

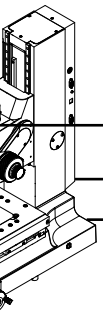


LED Ring (for FS Objectives) (176-371)



Sliding Nosepiece
•176-370-1
•176-370-2

Various ML objectives



Objectives P. 20

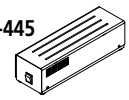
External light source P. 25

Internal light source P. 24

LED illumination unit 176-445

Transmitted

Reflected



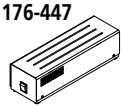
Control unit

Filter
•GIF Filter (12AAA645)

Halogen illumination unit 176-447

Transmitted

Reflected

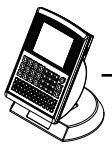


Control unit

Filter
•GIF Filter (12AAA645)
•LB80 Filter (12AAA646)
•ND2 Filter (12AAA643)
•ND8 Filter (12AAA644)

Data processing P. 17

RS-232C cable (12AAA807)



QM-Data200 (264-155)

External printer cable (12AAA804) — External printer

Thermal printer (12AAD032)

Foot switch (12AAJ088)

Mitutoyo

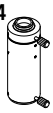
Diagram

MF-U Series

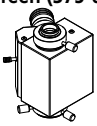
External camera system

C mount 970441

0.5 x adapter unit (with C mount) 375-054



Focus pilot FP-05 Green (375-067)/Red (375-068)



Camera / Images P. 11-16

Reticle

Eyepiece 10x 2pcs. 378-866

Eyepiece 15x 2pcs. 378-857

Eyepiece 20x 2pcs. 378-858

Eyepiece / Optical tube P. 17, 18

Bright-field (UA/UB/UE/UG/UJ)

Adjustable turret 4 holes 378-018 (For LAF: 176-410)

Aligning motor driver 5 holes 378-216

Dark-field (UC/UD/UF/UH/UK)

Motor turret 4 holes 176-212

Turret 4 holes 176-211 (For LAF: 176-412)

RS-232C cable (12AAA807)

Connect to Vision unit*

Objectives for bright-field

Objectives for bright-field/dark-field

Objectives P. 21

Differential interference unit

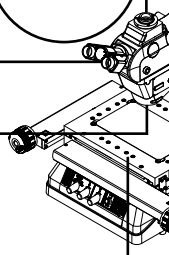
5X,10X (378-080)
20X (378-079)
50X,SL20X (378-078)
100X,SL80X,SL50X (378-076)

Polarization unit 378-092

Polarizer

Analyzer

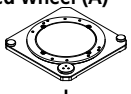
MF-U



Rotary table / Others P. 21, 22

Size 1010

Rotary table with fine feed wheel (A) 176-305



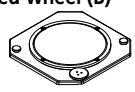
Size 2010

Stage adapter B 176-310

Size 2017/3017/4020

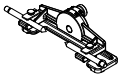
Stage adapter 176-304

Rotary table with fine feed wheel (B) 176-306



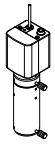
V-block with clamp 172-378

Swivel center support 172-197



Holder with clamp 176-107

*
Vision unit 10DSet
•Vision unit
•Data processor
•Main software



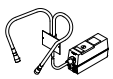
Required option for Motor-Driven Z-axis models — Vision AF cable (12AAN358)

Required option — Calibration chart (02ATN695)
QS Calibration chart (02AKW001)
Foot switch (12AAJ088)

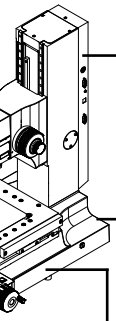
External control cable (12AAD128)

External control cable (12AAG888)

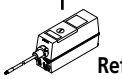
Filter
•GIF Filter (12AAG806)
•LB80 Filter (12AAG807)



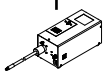
Dual swan-neck (176-343)



External light source P. 24



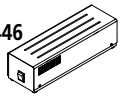
Reflected 100W fiber (176-315)



150W fiber (176-316)

Internal light source P. 23

LED illumination unit 176-446



Control unit

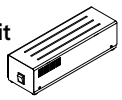
Filter
•GIF Filter (12AAA645)

Transmitted

Reflected

Halogen illumination unit 176-448

Transmitted



Control unit

Filter
•GIF Filter (12AAA645)
•LB80 Filter (12AAA646)
•ND2 Filter (12AAA643)
•ND8 Filter (12AAA644)

Data processing P. 16

RS-232C cable (12AAA807)

QM-Data200 (264-155)

External printer cable (12AAA804) — External printer
Thermal printer (12AAD032)
Foot switch (12AAJ088)

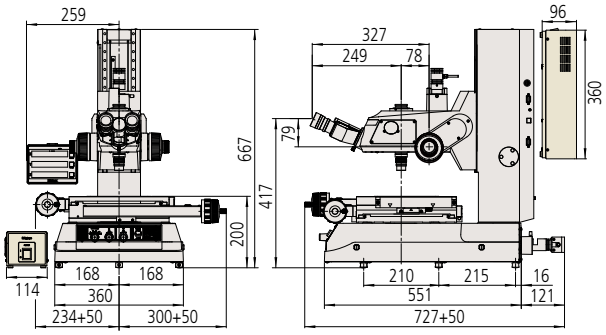
Dimensions

MF Series

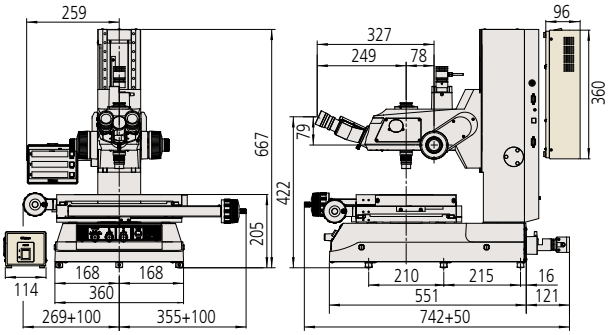
Manual Models *Common dimensions for MF-A and MF-B models.

Unit: mm

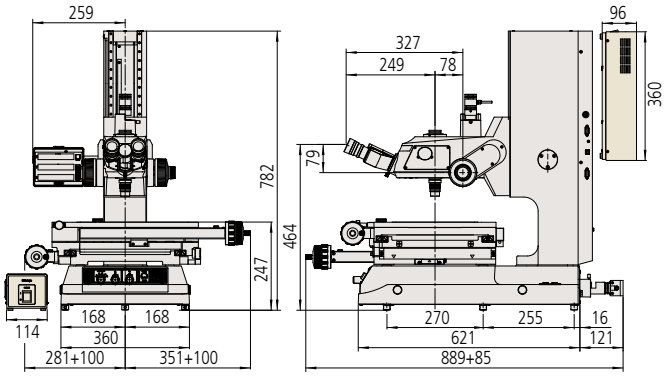
MF-B1010D



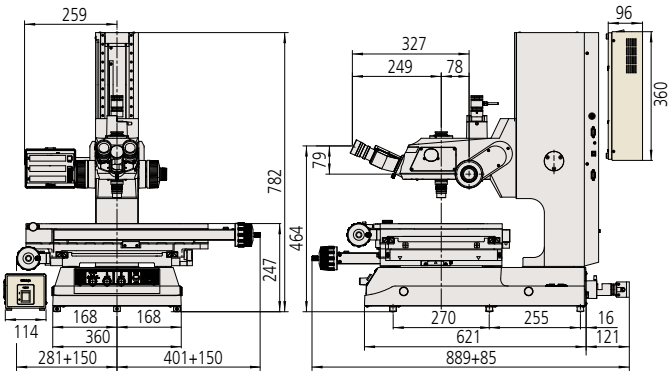
MF-B2010D



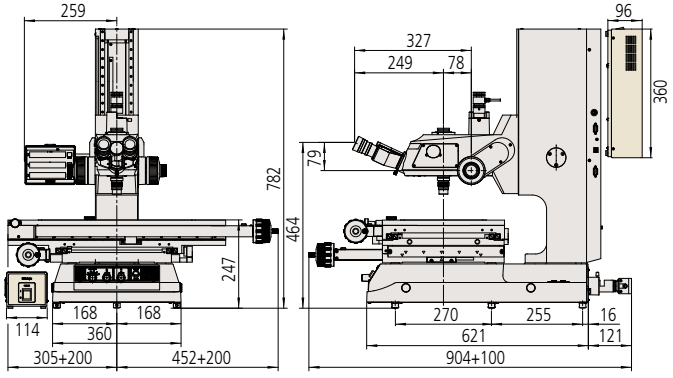
MF-B2017D



MF-B3017D



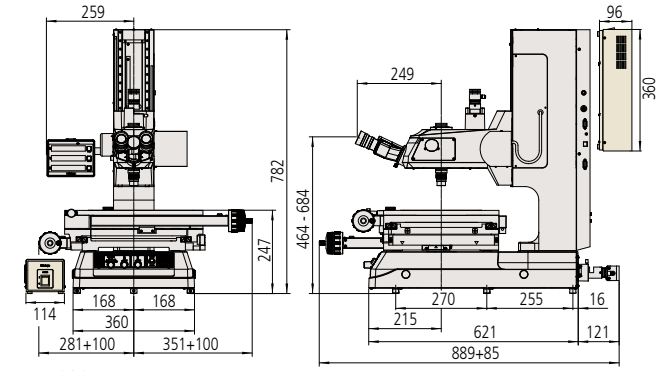
MF-B4020D



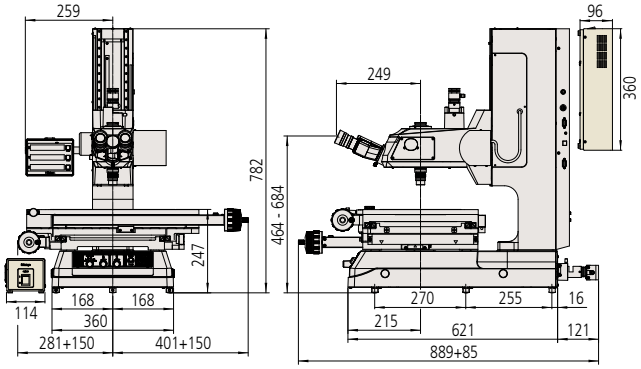
Motor-Driven Z-axis Models

Unit: mm

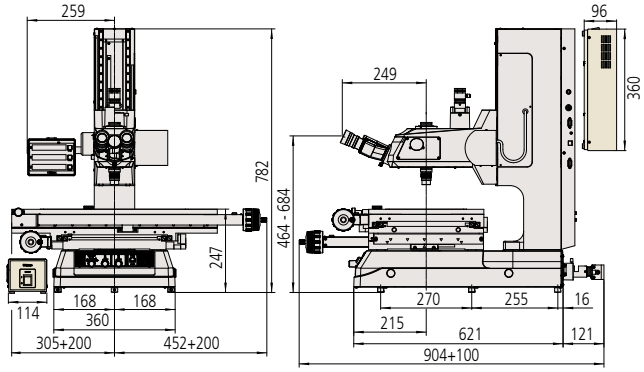
MF-J2017D



MF-J3017D



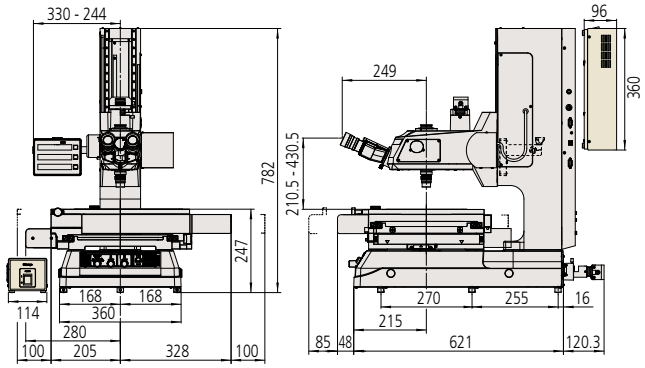
MF-J4020D



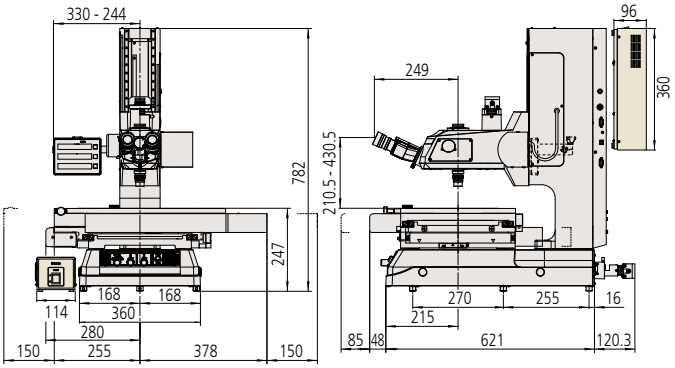
Motor-Driven X/Y/Z-axis Models

Unit: mm

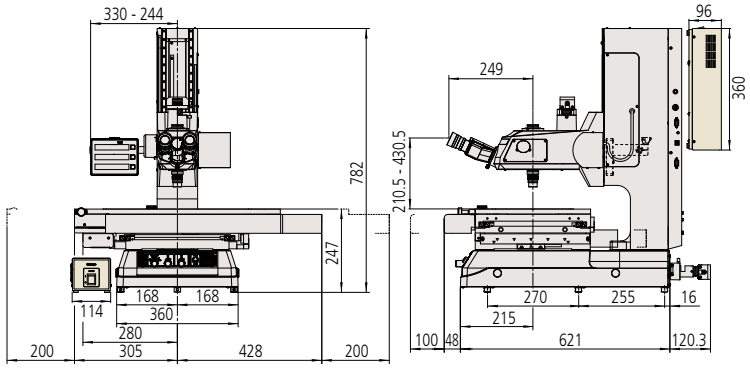
MF-G2017D



MF-G3017D



MF-G4020D



Mitutoyo

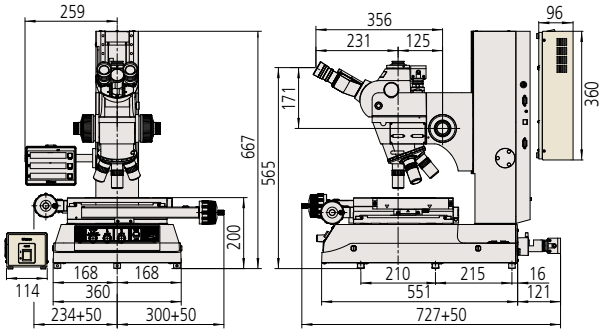
Dimensions

MF U Series

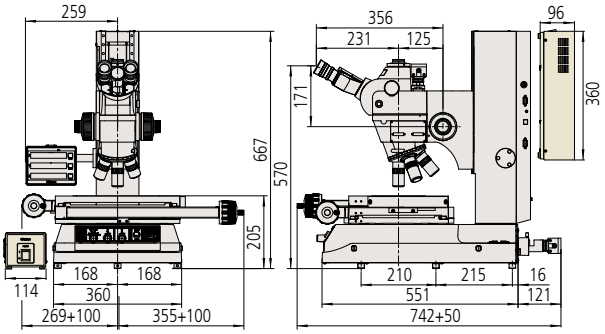
Manual Models *Common dimensions for MF-UA, MF-UB, MF-UC, and MF-UD models.

Unit: mm

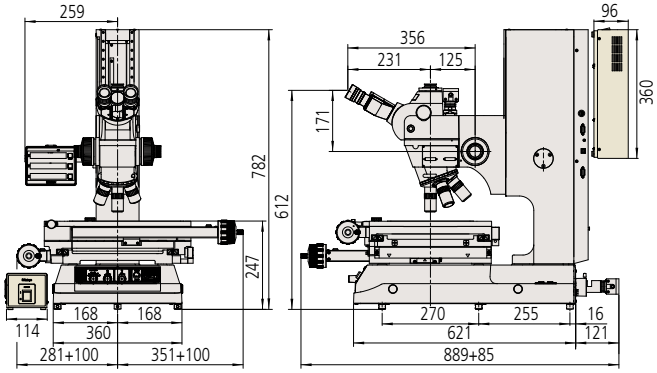
MF-UB1010D



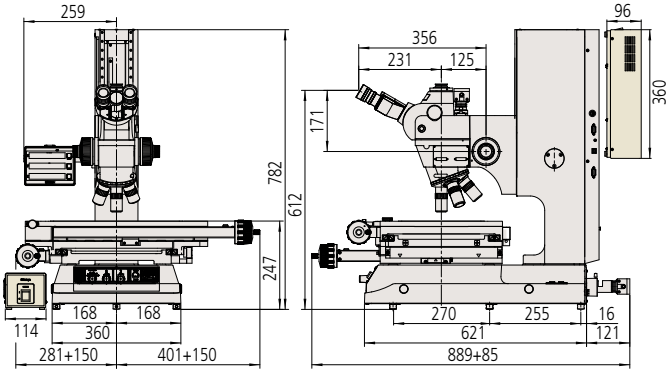
MF-UB2010D



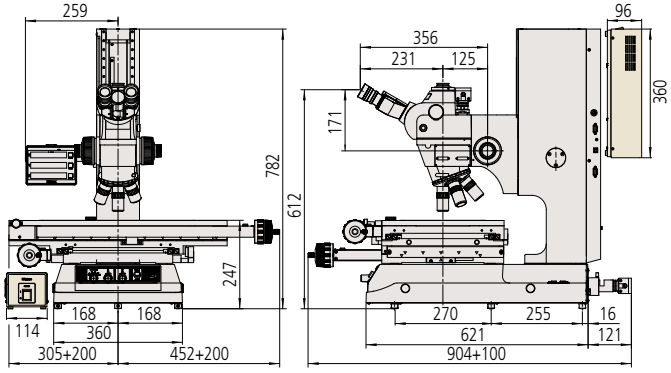
MF-UB2017D



MF-UB3017D



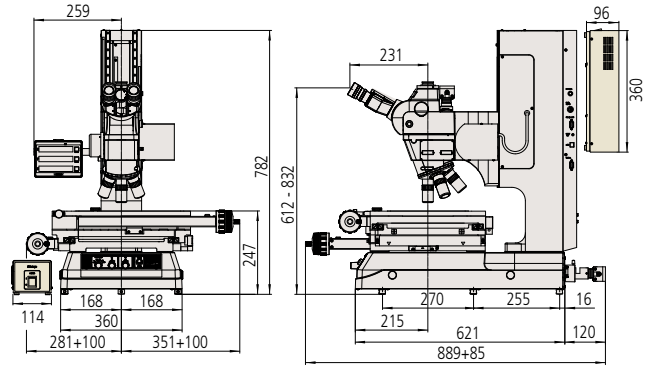
MF-UB4020D



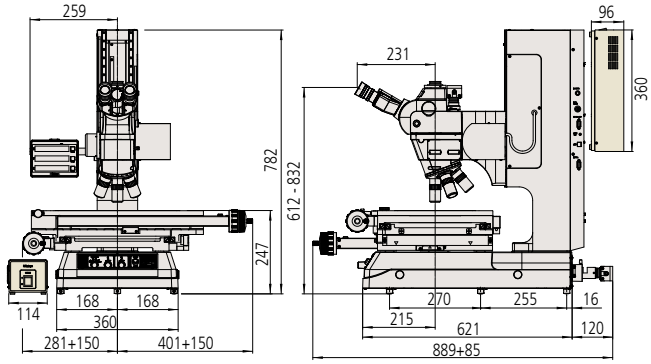
Motor-Driven Z-axis Models *Common dimensions for MF-UJ and MF-UK models.

Unit: mm

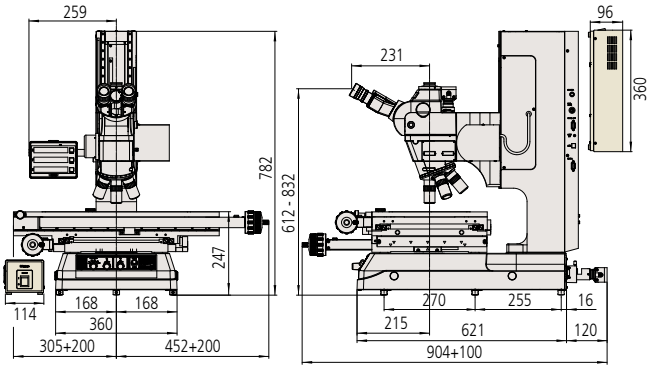
MF-UJ2017D



MF-UJ3017D



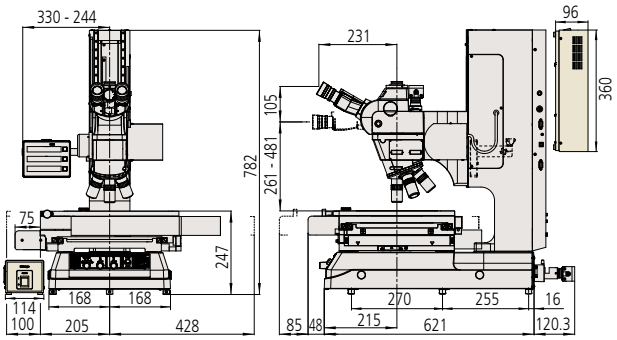
MF-UJ4020D



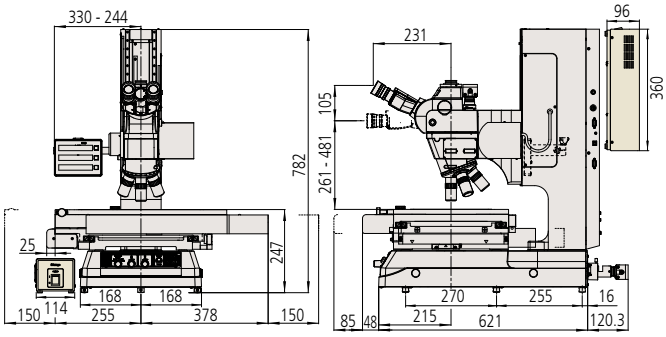
Motor-Driven X/Y/Z-axis Models (standard models) *Common dimensions for MF-UG and MF-UH models.

Unit: mm

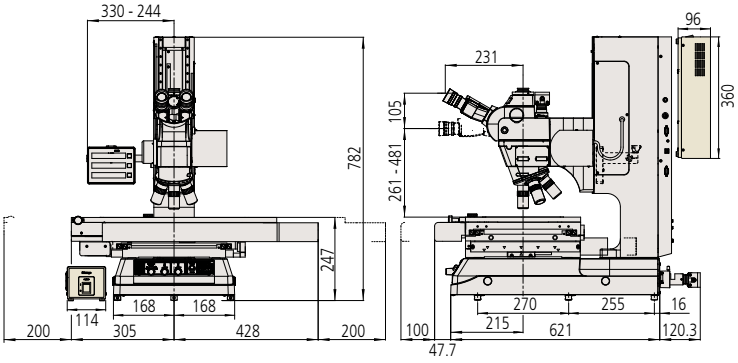
MF-UG2017D



MF-UG3017D



MF-UG4020D



Mitutoyo

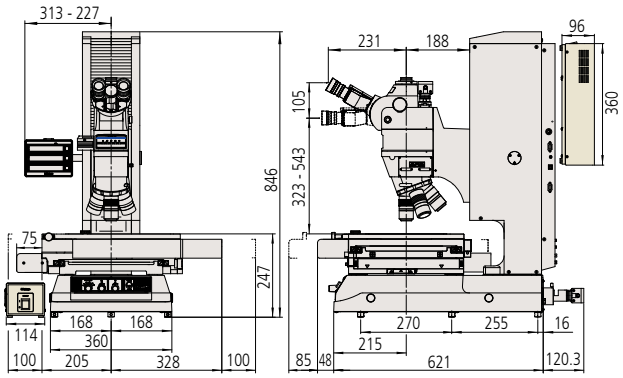
Dimensions

MF-U Series

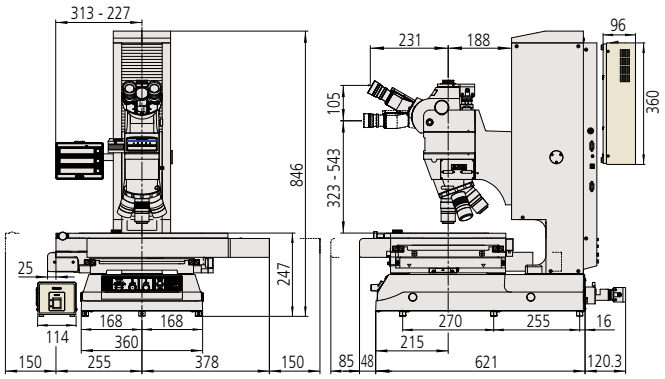
Motor-Driven X/Y/Z-axis Models (LAF models) *Common dimensions for MF-UA, MF-UB, MF-UC, and MF-UD models.

Unit: mm

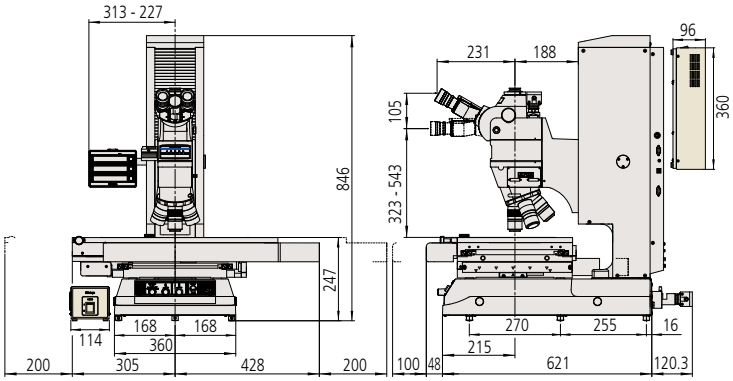
MF-UF2017D



MF-UF3017D



MF-UF4020D

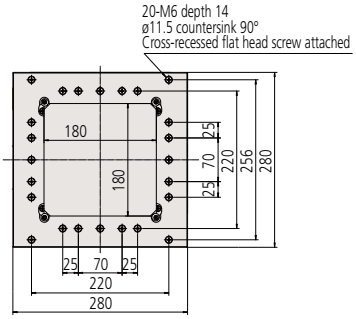


Dimensions

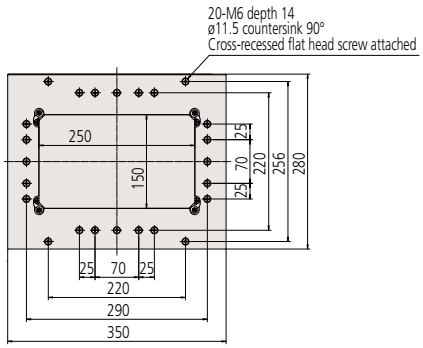
Stage Top View *Common dimensions for all models.

Unit: mm

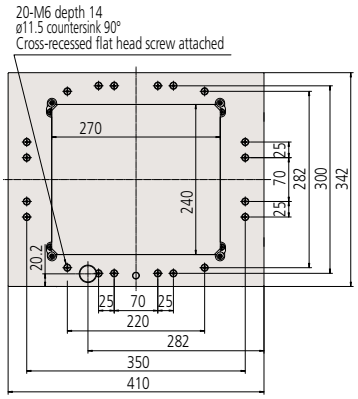
Size 1010
100x100mm



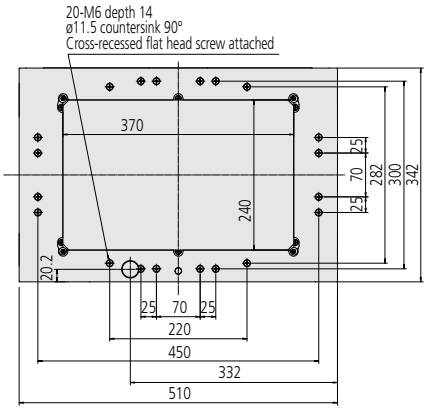
Size 2010
200x100mm



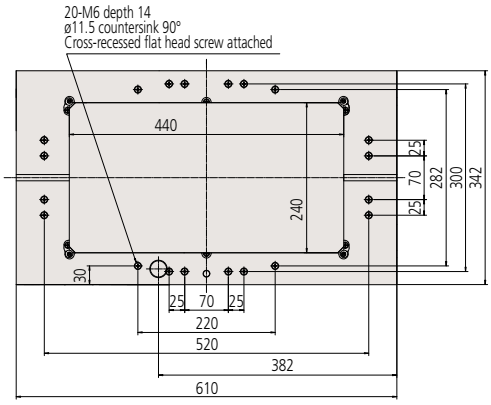
Size 2017
200x170mm



Size 3017
300x170mm



Size 4020
400x200mm



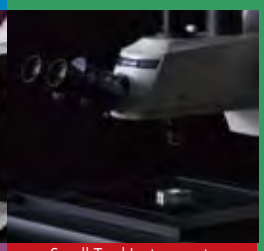
140 1702 (4) A-(CH)HS, Printed in Japan

Coordinate Measuring Machines

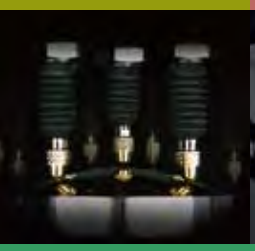
Vision Measuring Systems

Form Measurement

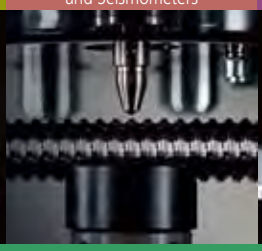
Optical Measuring



Sensor Systems



Test Equipment and Seismometers



Digital Scale and DRO Systems

Small Tool Instruments and Data Management

Whatever your challenges are, Mitutoyo supports you from start to finish.

Mitutoyo is not only a manufacturer of top quality measuring products but one that also offers qualified support for the lifetime of the equipment, backed up by comprehensive services that ensure your staff can make the very best use of the investment.

Apart from the basics of calibration and repair, Mitutoyo offers product and metrology training, as well as IT support for the sophisticated software used in modern measuring technology. We can also design, build, test and deliver bespoke measuring solutions and even, if deemed cost-effective, take your critical measurement challenges in-house on a sub-contract basis.

Find additional product literature and our product catalogue

http://www.mitutoyo.co.jp/global.html

Our products are classified as regulated items under Japanese Foreign Exchange and Foreign Trade Law. Please consult us in advance if you wish to export our products to any other country.
If the purchased product is exported, even though it is not a regulated item (Catch-All controls item), the customer service available for that product may be affected. If you have any questions, please consult your local Mitutoyo sales office.

Mitutoyo

Mitutoyo Corporation
20-1, Sakado 1-Chome,
Takatsu-ku, Kawasaki-shi,
Kanagawa 213-8533, Japan
T +81 (0) 44 813-8230
F +81 (0) 44 813-8231
http://www.mitutoyo.co.jp