QM-Data200 and Vision Unit

Extending the Capabilities of 2D Optical Measuring Instruments

Catalog No. E14008
Powerful support for measurement and QA

Amid the constant advancement of today’s industrial world, the importance of an optical measuring machine that allows the non-contact measurement of workpiece dimensions is increasing, along with the growth of processing technology. At the same time, as more rationalization and less manpower are required on the shop floor, the factors of efficiency, speed, and reliability are becoming more and more important with respect to measurement. Mitutoyo’s optical measurement data-processing systems, the “QM-Data200”, and “Vision Measurement Unit” answer these needs as well as supporting the all-important Quality Assurance function. Simply choose the one that best suits your requirements.
QA

No need for parallelism adjustment of a workpiece on the stage
Merely setting a part coordinate system on a workpiece allows you to start measurement without extra operations.
There is no need to make a parallelism adjustment of the workpiece using a rotary table.

Easy transfer of counter display values and measurement result to a PC
The user can transfer counter display values to spreadsheet software on the PC, output a calculation result with the data processing system to the PC to create an inspection certificate and maintain measurement history records.
2-D Data Processing Unit
QM-Data200

FEATURES
• High contrast color graphic displays on the large LCD screen with LCD back light.
• One-key operation for combined measurements that are often used (circle-circle distance, etc.)
• Equipped with the measurement procedure teaching function and the measuring position navigation in Repeat mode.
• Easy measurement possible in combination with visual cross-hair alignment and automatic edge detection (Optoeye positioning function installed on a profile projector)
• The AI measurement function (automatic identification of measuring item) eliminates switching between the measurement command keys.
• The user menu function allows user to store measurement commands or part programs to create a customized menu.
• Tolerance zone measurement of data processing result and various statistical processing for each item are possible.
• Measurement result output to “MS-Excel®” in spreadsheet (CSV) format*
• The measurement procedure and measurement result can be saved, using the USB memory.**
• Two models are available: a stand-alone type with tilt system and a flexible arm type that can be mounted on a Profile Projector.***
• Easy measurement possible even during printout
* MS-Excel® is a registered trademark of Microsoft Corporation.
** Operation is not assured for all commercial USB memories. For detailed information, refer to page 9.
*** For information about applicable models, refer to Specifications on page 9.

Experience measurement with the QM-Data 200

The comprehensive key panels of the QM-Data 200 make it easy for any operator to use. Measurements of combined elements such as circle-to-circle distance, etc., can be measured via one-touch operation. Furthermore, the measurement procedure navigation display, which indicates the next data entry position during a measurement, makes it possible even for a beginner to see where the next measuring position is at a glance.

Measure the distance between the centers of round holes A and B.

1. Select the “circle-circle distance” measurement key from the pattern-measurement keys.
2. Measure each position (a1, a2, a3) of round hole A, following the measurement procedure navigation on the LCD.
3. Next, the measurement procedure navigation for round hole B will be displayed. Measure each position (b1, b2, b3) in the same manner as in step (2).
4. The measurement result is displayed.
When using the Repeat function to execute a measurement procedure (part program) created with the teaching function, the Repeat function guides the operator to the next measuring point. This point is reached when the cross-hairs located at the center of the navigation display are placed over the other cross-hairs, which indicate the next measuring point. The operator can also be guided to the next measuring point by moving the stage to a position where the digital counter reading approaches zero.

In a measurement using the coordinate entry format, the coordinates calculated from the measurement data (coordinates of the center of a circle, etc.) are applied to data entry as one measuring point. For example, measurement of the pitch of a rectangular hole can be executed simply by selecting the [PITCH MEASUREMENT] key and [RECTANGULAR HOLE CENTER] in the coordinate entry format.

Teaching function
When measuring more than one workpiece of the same form, the series of key operations performed in the measurement of the first workpiece can be stored as a part program.

The coordinate entry format function
In a measurement using the coordinate entry format, the coordinates calculated from the measurement data (coordinates of the center of a circle, etc.) are applied to data entry as one measuring point. For example, measurement of the pitch of a rectangular hole can be executed simply by selecting the [PITCH MEASUREMENT] key and [RECTANGULAR HOLE CENTER] in the coordinate entry format.

Measurement of a pitch circle whose circumference intersects with the three hole centers

2. Press [COORDINATE ENTRY FORMAT].
3. Measure circle C1 (entry of four points). Likewise, measure circles C2 and C3.
4. Select the center of each circle (entry of four points).
5. The diameter of the pitch circle (C4) can now be found.
**AI MEASUREMENT FUNCTION**

With the AI measurement function (Automatic Element-Identification function), elements can be automatically identified based on data input from the measuring points. This function allows the continuous measurement of different elements, eliminating key entry for each element.

**Continuous measurement of inside diameter (A) and angle (B)**

1. Select the [AI MEASUREMENT] key.
2. Input data from the three measuring points on inside diameter (A).
3. End the measurement. (Press F5)
4. The measurement result for the inside diameter is displayed.

**USER MENU**

The user can customize the QM-Data200 to best suit their needs by registering frequently used measurement commands and necessary functions such as part programs, etc., to create an original menu (up to 3 menus).

**Example of user menu registration**

- [USER MENU] key
- Measurement command
- User macro
- Part program

Note: A user macro is a measurement command created by the user, and is a combination of several measurement commands. Up to three user menus, from [USER1] to [USER3], can be registered. A maximum of nine icons can be registered for one menu.

**Elements that can be identified using the AI function**

In the following, one of the following has to be selected:
- [Line and distance]
- [Ellipse and rectangular hole]
- [Ellipse and slotted hole]

**Counter function**

The QM-Data200 can be used as a counter when it is directly connected to a linear scale. Features zero-set and 1/2 display functions.

**Tolerance zone measurement function**

With this function, when nominal value and tolerance limits (upper and lower limits) are given, the difference between the measured value and the nominal value is compared with the tolerance zone.
A variety of measurement commands for all basic measurements

Creating the coordinate system

- Coordinate system pattern 1: The line that passes through the measuring point is the X axis, and the line that passes through another measuring point and intersects the X axis making a 90-degree angle is the Y axis.
- Coordinate system pattern 2: The line that passes through the measuring point is the X axis, and its midpoint is the origin.
- Coordinate system pattern 3: The line that passes through the measuring point is the X axis, and the intersection with another line is the origin.
- Coordinate system pattern 4: The measuring point is the origin, and the line that passes through another measuring point is the X axis.
- Coordinate system handling: Save, recall and reset the coordinate system.

Origin setting
- Translate the coordinates horizontally until the measuring point is positioned as the origin. The displacement value can be entered directly.
- Rotate the coordinate system until the measuring point comes to the specified position. (The origin is not transferred.)
- Rotate the X axis coordinate in such a way that it becomes parallel to the specified line. (The origin is not transferred.)
- Rotate the coordinate system in such a way that it becomes parallel to the measured line. (The origin is not transferred.)
- Rotate the coordinate system system until the measuring point is positioned as the origin. (The origin is not transferred.)

Determining axis by point
- Rotate the X axis coordinate in such a way that it passes through the measuring point. (The origin is not transferred.)
- Rotate the coordinate system in such a way that it becomes parallel to the specified line. (The origin is not transferred.)
- Rotate the coordinate system until the measuring point comes to the specified position. (The origin is not transferred.)

Compensation of offset axis
- Compensate for offset axis.
- The rotation angle can be entered directly.
- point. (The origin is not transferred.)
- Rotate the X axis coordinate in such a way that it passes through the measuring point. (The origin is not transferred.)
- Rotate the coordinate system in such a way that it becomes parallel to the specified line. (The origin is not transferred.)

Compensation of plane
- Reduce the error caused by the inclination of the workpiece setting (effectively used by measuring machines with a Z axis.).
- Reduce the error caused by the inclination of the workpiece setting (effectively used by measuring machines with a Z axis.).

Basic element measurement key

- Point: Coordinates (Multi-point processing for a maximum of 100 points)
- Circle: Center coordinates, diameter, roundness (Multi-point processing for a maximum of 100 points)
- Rectangular hole: Center coordinates, length, width
- Line: Angle and perpendicularly with the X axis. (Multi-point processing for a maximum of 100 points)
- Slotted hole: Center coordinates, length, width, radius of slotted hole
- Intersection point and intersecting angle: Intersection coordinates, intersecting angle, supplementary angle
- Ellipse: Center coordinates, major-axis diameter, minor-axis diameter, angle with the X axis. (Departure from the X axis (Multipoint processing for a maximum of 100 points))

Pattern measurement key

- Pitch: Point-point distance, difference between coordinates, angle, cumulative distance, cumulative angle
- Line-circle intersection: Coordinates of intersection
- Center line between line-circle: Angle with the X axis
- Perpendicularity: Perpendicularity
- Parallelism: Perpendicularity
- Circle-circle distance: Center-center distance, longest distance, shortest distance, difference between coordinates
- Circle-circle tangent line: Angle with the X axis
- Line-circle distance: Perpendicular (shortest) distance
- Intersection of circles: Coordinates of intersection
- Line-circle intersection: Coordinates of circle
- Midpoint between circles: Coordinates of midpoint
- Midpoint between line and point: Coordinates of midpoint
- Circle-point distance: Center-center distance, longest distance, shortest distance, difference between coordinates
- Circle-circle tangent line: Angle with the X axis
- Midpoint between points: Coordinates of midpoint
- Line-point distance: Point
- Projected point: Coordinates of the point projected on a line
- Plane-plane distance: Distance between plane and point
- Point-circle tangent point: Coordinates of tangent point
- Circle-circle distance: Center-center distance, longest distance, shortest distance, difference between coordinates
- Circle-circle tangent line: Angle with the X axis
- Circle-circle tangent point: Coordinates of tangent point
- Corner: Diameter, radius of corner circle, center coordinates
- Height: Height (distance between steps in the Z axis direction)
- Plane-plane distance: Distance between plane and plane (point)

Optional accessories

Thermal printer
- Used to print out measurement results.
- * Contact your local Mitutoyo sales office for Order No. of this printer.

Printer control code system: ESC/P, MS-DOS 24 pins

Printing method: Thermal serial dot

Printing digits: 40 digits

Maximum print speed: 52 Sps (normal characters)

Dimensions (WxDxH): 160mmx170mmx65.5mm (printer body)

Standard accessories: Printer cable, recording paper (1 roll), AC adapter (100V)

Optional Accessories

Order No. 908353 Recording paper for printer (5 rolls/lot)

* Supports external printer (color or black & white) for ESP/C

Printer control code system: ESC/P, MS-DOS 24 pins
### QM-Data200 Specifications

<table>
<thead>
<tr>
<th>Code</th>
<th>Order No.</th>
<th>Stand-mount type (Including Optoeye built-in type)</th>
<th>Arm-mount type (Order No. 264-155)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Display</td>
<td>Japanese, English, German, French, Italian, Portuguese, Spanish, Dutch, Hungarian, Chinese, Japanese, Russian, Turkish, Polish, Dutch, Hungarian</td>
<td>Stand-mount type (Order No. 264-155)</td>
<td>Arm-mount type (Order No. 264-156)</td>
</tr>
<tr>
<td>languages</td>
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<td>- Stand-mount type</td>
<td>- Arm-mount type</td>
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<tr>
<td>Resolution</td>
<td>0.1µm</td>
<td>- Stand-mount type</td>
<td>- Arm-mount type</td>
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<td>Program functions</td>
<td>Part program creation, execution, editing</td>
<td>- Stand-mount type</td>
<td>- Arm-mount type</td>
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<tr>
<td>Statistical processing</td>
<td>Number of data, maximum value, minimum value, standard deviation, range, histogram, statistics on a measuring function basis (by command)</td>
<td>- Stand-mount type</td>
<td>- Arm-mount type</td>
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<tr>
<td>Display system</td>
<td>COLOR TFT LCD (with LED backlight)</td>
<td>- Stand-mount type</td>
<td>- Arm-mount type</td>
</tr>
<tr>
<td>ABS (Absolute origin)</td>
<td>Supported (automatic travel)</td>
<td>- Stand-mount type</td>
<td>- Arm-mount type</td>
</tr>
<tr>
<td>LAF (Laser Aiming)</td>
<td>Supported</td>
<td>- Stand-mount type</td>
<td>- Arm-mount type</td>
</tr>
</tbody>
</table>

**Input/Output**

- RS-232C 1: For connecting to external PC
- RS-232C 2: For connecting to external device (Supported for USB-FD connection)
- For OPTOEYE edge signal input
- USB-MEMORY: For connecting to USB memory
- For RS-232C output (2)

**Measurement result file output**

- RS-232C output (CSV format, MUX-10 format)

**Power**

- AC 100 to 240V

**Maximum power consumption**

- 17W (does not include optional accessories)

**External dimensions (WxDxH)**

- Stand-mount type: Approximately 260x242x310 mm (including the stand)
- Arm-mount type: Approximately 318x242x310 mm (including the stand)

**Mass**

- Stand-mount type: Approximately 2.9 kg
- Arm-mount type: Approximately 2.8 kg

**Applicable models**

- Stand-mount type: PJ-2500/PJ-3000 series
- Arm-mount type: PJ-2500/PJ-3000 series

**Standard accessories**

- AC adapter, power cable, Easy Operation guide

**Note1:** To denote your AC line voltage add the following suffixes (e.g. 264-155A) A for 120V, C for 110V, D for 220V, E for 240V. No suffix is required for 100V.

**Note2:** Mitutoyo does not guarantee the operation of all commercial USB memories except for the following: SanDisk Corporation or IO DATA DEVICE, INC. and that meet the following requirements.

- Those that are not compliant with USB 3.0
- Those that have no security function such as encryption and fingerprint authentication

**Dimensions**

### Stand-mount type (Order No. 264-155)

<table>
<thead>
<tr>
<th>Measurement</th>
<th>Value</th>
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<tr>
<td>Width</td>
<td>196 (7.72&quot;)</td>
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<tr>
<td>Depth</td>
<td>260 (10.24&quot;)</td>
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<tr>
<td>Height</td>
<td>64 (2.52&quot;)</td>
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</table>

### Arm-mount type (Order No. 264-156)

<table>
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<th>Measurement</th>
<th>Value</th>
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</thead>
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<tr>
<td>Depth</td>
<td>242 (9.53&quot;)</td>
</tr>
<tr>
<td>Height</td>
<td>70 (2.76&quot;)</td>
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</table>
Vision System Retrofit for Microscopes
Vision Unit

FEATURES
- Efficient, manual vision measurement with a high-resolution camera (multi-megapixel class)
- The automatic edge-detection tools and various macro icons allow measurement in one easy step.
- Measurement results are output to MS-Excel®. This lets the user generate an inspection table on the same computer.
- Allows the tolerance zone measurement of measurement results and various types of statistical processing for each item.
- The auto-brightness control function faithfully reproduces the type and degree of illumination used. (This function is limited to the MF/MF-U series.)
- Combined use with the focus pilot provides high accuracy in height measurements.
- A series of measuring operations can be performed using just one screen display.
- Digital zoom function (2X, 4X)
- High-resolution vision storage function by adjusting white balance
- Adoption of large LCD monitor
* MS-Excel® is a registered trademark of Microsoft Corporation.

More user-friendly manual measurement environments available

Wide-field measurement
Upsizing of the image sensor has made the field of view approximately 40% wider than conventional for both X and Y directions, thus allowing concurrent observation of the circumference of a measurement point.

Digital zoom function
A normal 1X display image can be magnified to a 2X or 4X image by merely clicking the corresponding menu icon. The image can be measured to fine detail using the digital zoom display.

* An actual image using objective lens ML1X plus LED ring light
Edge detection support tools

**One-click tools** [Patent registered (application country: Japan)]

Each tool has the function of automatically discriminating operations from self tool setup to edge detection/calculation by merely single-clicking the vicinity of a measurement point edge with the mouse. If measurement is performed in one tool window, these tools drastically reduce measurement time thanks to no need for stage travel.

![One-click circle tool](image1)

![One-click box tool](image2)

**Smart tool** [Patent registered (application country: Japan)]

This tool provides the function of automatically detecting the sharpest edge close to the center of the cross hairs. An edge is detected by just enclosing the location of a measurement point with a small circle. This method allows quicker edge detection compared with edge alignment using the cross hairs directly.

![Smart tool](image3)

**Template tools**

**Basic templates**
The tool provides 3 types of templates corresponding to the reticles of a measuring microscope.

![Cross hairs](image4)

![Grid](image5)

![Concentric circles](image6)

**Extended templates**
This tool allows free setting of values such as diameter, distance and angle through key entry on a profile projector. Four types of templates: cross hairs, circle, rectangle and angle are available.

![Circle template](image7)

![Angle template](image8)

**Manual pattern matching**
This tool creates a pattern that matches a workpiece feature exactly so that tolerance zone judgement can be performed visually. The nominal profile line is defined, and then upper and lower limits are keyed in to construct the zone limit lines. With these lines displayed, a workpiece feature can be evaluated for conformance at a glance.

![Manual pattern matching](image9)

**CAD convert template**
This tool allows generation of an original user pattern template from CAD data (line/circle/arc) imported through CAD data conversion processing.

*To import CAD data, optional software "CAD Import & Export" is required separately.

**Coordinate system creation key**

**Coordinate system**

![Coordinate system](image10)

**Creation key**

![Creation key](image11)
Functions for Faster, More Accurate Measurement

Quick Navigation [Patent pending (application country: Japan)]

The measurement navigation function can be used to check the selected measurement command or current measurement status. It tells the operator “what is being measured,” “what is the next measuring position,” and so on.

Measurement navigation

The measurement navigation function can be used to check the selected measurement command or current measurement status. It tells the operator “what is being measured,” “what is the next measuring position,” and so on.

Abnormal point exclusion

This function automatically excludes any abnormal point having a burr or chip. The degree of abnormality to which the exclusion applies can be set as desired.

Smart Editor [Patent registered (application country: Japan)]

During a part program list display, the target position of XY stage travel, coordinate system creation, measuring item command, and edge detection tool are displayed independently as icons or on labels, to facilitate part program editing.

Graphics window

The real-time graphic display of measurement result and element provides a visual image of the measuring point. Also, the graphic display of measuring elements facilitates the selection of a measuring element, making for a quicker measurement process.

Counter window

Displays the center of the video window. It is easy to switch between the machine coordinate system (MCS) and the workpiece coordinate system (PCS). The vision unit can be used like a conventional measuring microscope, simply by setting the counter to zero.

Icon Editor

Using the Icon Editor, the layout of icons such as the measurement key icon, tool icon, etc., can be freely arranged. The layout setting can be freely determined. For example, frequently used icons can be laid out on just one page.
The result of measurement using a part program, either before or after focusing, can be output in CSV format. This means the measurement result can be output to a commercial spreadsheet program such as MS-Excel®, so that an inspection table can be generated in the original format.

### Auto-brightness control function (exclusive to MF/MF-U series)

The brightness of transmitted and reflected illumination used on a microscope can be controlled via the software on the PC. It is not necessary to adjust the illumination during a repeat measurement, since the level is faithfully reproduced according to the setting selected during the creation of the part program. Even in the measurement of a workpiece that requires variations in illumination, consistently accurate edge detection is ensured. This enhances the efficiency of repeated measurements.

### Contrast level [Patent pending (application country: Japan)]

The contrast around the center of the video window is indicated by a level meter. The peak that is indicated on the level meter is the focal point. This will improve the focal point reproducibility of a manual-type measuring microscope.

### Video image scale display

The scale display, which is proportionate to the real field of view, on the video window lets the operator quickly grasp the approximate size of a test piece. The image can be saved along with the scale display.

### Support from inspection table generation to measurement control

#### Saving image files

The color image on the video window can be saved as a BMP-format file for easy attachment to the image record or inspection table for the workpiece.

#### Measurement result output [Patent pending (application country: Japan)]

The result of measurement using a part program, either before or after focusing, can be output in CSV format. This means the measurement result can be output to a commercial spreadsheet program such as MS-Excel®, so that an inspection table can be generated in the original format.

#### Image text display

Measurement results and comments can be added to the color image on the video window via the keyboard, and printed out or saved in a file.

#### Security function

Access to the results can be limited, according to requirements, simply by setting a password.
Functions dedicated to Measuring Microscope MF/MF-U series power models

By installing this Vision Unit on a power-operated model in the measuring microscope MF/MF-U series, a wide choice of functions becomes available.

• Image-contrast detection is the basis of the image AF (auto focus) function. *1
• The installation of a power turret in the MF-U power model or MF-U LAF type allows the objective lens magnification to be changed on the QS-PAK screen.

The objective lens in use is recognized automatically and displayed on the QS-PAK screen. *2

*1: AF cable (No.12AAN358) required separately.
*2: RS-232C cable (No.12AAA807) required separately.

<table>
<thead>
<tr>
<th>Vision Unit 10D compatible models</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Optical system</th>
<th>AF type</th>
<th>Observation method</th>
<th>Model</th>
<th>Power turret compatible</th>
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<tbody>
<tr>
<td>Finite system</td>
<td>Image AF</td>
<td>Bright field</td>
<td>MF-G2017D</td>
<td>✓</td>
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<td></td>
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<td></td>
<td>MF-G3017D</td>
<td>✓</td>
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<tr>
<td></td>
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<td>MF-G4020D</td>
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<tr>
<td>Infinity system</td>
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<td>Bright field</td>
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<td>MF-UG3017D</td>
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<td>MF-UG4020D</td>
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</tr>
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<td>Image AF·LAF</td>
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<td>MF-UH4020D</td>
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<td>✓</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>MF-UH4020D</td>
<td>✓</td>
</tr>
</tbody>
</table>

FORMPAK-QV (Optional software)

FORMPAK-QV allows contour analysis and contour tolerancing against the nominal value, from the data acquired using QSPAK.

• Contour tolerancing function
• Fine contour analysis function
• Report generation function

CAD Import & Export (Optional software)

Operability has been greatly improved, and the time required to create a part program has been greatly reduced, by importing the CAD data (DXF, IGES), as generated at the product-design stage, to QSPAK. The measurement result from QSPAK can be converted to CAD data.

FEATURES

• The nominal value of each measuring item is entered automatically.
• The graphics window can be used to calculate elements.
• Graphics data can be output in a specified CAD data format.
**SYSTEM CONFIGURATION**

- **Vision AF cable**
  - No.12AA358
  *(AF function is only available in the MF DMF-UD series.)*
- **Focus Pilot*1**
- **Camera for Vision Unit**
- **Foot switch** *(Option) No.12AA088*
- **Counter cable** *(Case1 : RS-232C cable (2 pcs.) (Except for MF DMF-UD series))
  *(Case2 : USB Cable (Only for MF DMF-UD series))*
- **Measuring microscopes**
  - **MF B/MF-UB series**
  - **MF C/MF-UC series**
  - **MF D/MF-UD series**
  - **Hyper MF/MF-U**
  *(For Vision Unit)*
- **Software:** QSPAK
- **Common optional accessories**
  - **0.5xTV Adapter**
  - **Ring fiber illumination system** *(No.176-366)*
  - **Halogen illumination source (100W)** *(No.176-315)*
  - **LED ring illumination system** *(No.176-367)*
  - **Halogen illumination source (150W)** *(No.176-316)*
  - **External light control cable** *(For the MF-A/MF-UA series and later)*
  *(No.12AAD128)*
  *(For the MF-A/MF-UA series and later)*
  *(No.12AAG888)*
  *(External light control cable)*
  *(For the MF-A/MF-UA series and later)*
  *(No.12AA0128)*
  *(External light control cable)*
  *(For the MF-A/MF-UA series and later)*
  *(No.12AA9888)*
- **Calibration chart** *(with holder)*

### Specifications

<table>
<thead>
<tr>
<th>Component</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Image detection camera</td>
<td>Image sensor 1/2-inch color CMOS with 3 mega pixels</td>
</tr>
<tr>
<td></td>
<td>External dimensions / Mass (camera only) 56 (W) x 54 (D) x 78 (H) mm / 0.4 kg</td>
</tr>
<tr>
<td></td>
<td>Optical system magnification 0.5X (0.5X TV adapter supplied standard)</td>
</tr>
<tr>
<td>PC</td>
<td>OS Windows7</td>
</tr>
<tr>
<td>Software</td>
<td>QSPAK Vision Unit</td>
</tr>
<tr>
<td>Resolution</td>
<td>0.1µm (0.01µm if connecting to Hyper MF/MF-U)</td>
</tr>
</tbody>
</table>

*1: Focus pilot is dependent on the Focus Detection Unit. The unit can detect a focus position at high accuracy and high repeatability.
*2: Compatible only with the microscope main unit with a built-in image-forming lens (1X fixed).
*3: Order No. depends on the destination.
*4: Specific to each model for other company’s microscopes.
*5: This measuring accuracy means a difference between an actual measurement value in vision measurement and a true value.
*6: Repeatability on one screen means the dispersion in measurement values when different positions within the same screen are measured repeatedly.
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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