Flexible Measuring Gage

QM-Measure

How many kinds of gages are necessary for accurate inspection?

CATALOG No. E4188-198
Put QM-Measure on your shop-floor . . .

Simple and easy, but limited

Hand tools are certainly a common part of product inspections. They have certain benefits, of course, including simple operation. Each of these tools, however, can only measure a single axis within a single dimension: outside/inside diameter, height, depth, etc. This means a variety of different tools is required for complete measurement. Overall, it’s a costly and time-consuming way of doing things.
Ordinarily, a solid backgrounding in geometry is required for 3-D measurement using a coordinate measuring machine. But Mitutoyo offers an easy, automated solution. With QM-Measure you can complete the 3-D measurement process simply by following the messages displayed onscreen. A special Gage-like measurement menu makes it fast and accurate . . . and you won’t need a math degree to it.

QM-Measure adapts to varying temperature conditions, too, with an optional Temperature Compensation System that lets you evaluate workpiece dimensions at 20°C (68°F) in an ambient shop-floor temperature ranging from 15°C (59°F) to 30°C (86°F).

“Gage-like” operation and Flexibility
Accuracy in measurement
The QM-Measure system delivers accuracy of $E = (3.0 + 4L/1000) \mu m$. This means you can measure 300mm volumetric length with an indication error of less than 4.2\,\mu m.

Open-space design
The QM-Measure's unique "open-space" structure makes it easy to load and unload your workpieces. Moreover, it lets the shop operator approach the workpiece free of obstruction by the machine column.

Rigid air bearings
Optimized machine balance and air bearings on all guideways ensure smooth, worry-free probing for 3-D measurement. Operating fatigue is minimized, too!

With Linear Scale
A glass linear encoder is employed as a length standard of all axes. Featuring high resistance to rust and corrosion, it offers a long service life and remarkable reliability.

Air regulator
The QM-measure is supplied with a standard air regulator, which monitors the condition of the air supply* and removes any remaining mist or oil.

* An additional air dryer and mist separator may be required, as per conditions of use.
Optimized machine rigidity
In choosing an open-space structure for the QM-Measure system, Mitutoyo optimized the body design through FEM (finite-element method) analysis, thus minimizing machine deformation and related concerns during the probing.

Temperature compensation
The useful Temperature Compensation function lets you evaluate workpiece dimension at as little as 20°C (68°F), even when shop or workpiece temperatures are not at 20°C (68°F).
In fact, QM-Measure works within a temperature range of 15°C to 30°C (59°F to 86°F) with no effect on accuracy.

Convenient key operation
The QM-Data 300 (data processing unit) can change the mounting position and angle in response to measurement conditions. Key operation makes it easy!

Enhanced volumetric accuracy
Deformation of the X-axis guide due to movement of the X-axis slider is compensated as follows:

This chart presents simulated stress distribution when the X-axis slider is moved to the stroke end and 20kg load is applied to it. Even then, stress does not produce an accuracy deterioration over prolonged use.

An optional-temperature compensation system—featuring two temperature sensor units—is available for automatic detection of temperature.

This chart indicates volumetric measuring accuracy under various environmental temperatures (20°C - 15°C - 20°C - 30°C - 20°C), each with guaranteed measurement result.

QM-Data 300
A gage-like measurement menu
The coordinate system setup is indispensable when a conventional CMM is used. However, this can lead to the impression that “CMM operation is difficult.” But QM-Data 300 provides a gage-like measurement menu that frees you from such concerns. Simply touch the features of the workpiece with a touch trigger probe, following the interactive graphic display. The measured geometry is immediately calculated and displayed. It’s so easy, even a beginner can perform volumetric measurement.

Gage-like measurement menu 1/5
A menu that’s as easy as a hand tool.

- F1: Plane (for alignment)
- F2: Height
- F3: Inner width
- F4: Outer width
- F5: Inside diameter
- F6: Outside diameter
- F7: Distance between two circles
- F8: Intersecting angle of two side planes

Gage-like measurement menu 2/5
For standard measurement.

- F1: Height between two parallel planes
- F2: Width of recess formed by two planes
- F3: Width of projection formed by two planes
- F4: Angle formed by two planes
- F5: Inside diameter of hole
- F6: Outside diameter of shaft
- F7: Angle formed by plane and cylinder
- F8: Angle formed by two planes
- F9: Diameter of cylinder

Gage-like measurement menu 3/5
For standard measurement.

- F1: Center position of hole
- F2: Center-to-center distance between two holes
- F3: Angle formed by three holes
- F4: Circle formed by three holes
- F5: Slotted hole
- F6: Rectangular hole
- F7: Distance between two grooves
- F8: V-groove
- F9: Circle formed by cone and plane

Gage-like measurement menu 4/5
For advanced measurement.

- F1: Straightness
- F2: Diameter of sphere
- F3: Taper on cylinder
- F4: Side length
- F5: Flatness
- F6: Cone angle
- F7: Angle formed by two cylinders
- F8: Corner circle
- F9: Circularity

Gage-like measurement menu 5/5
For advanced measurement.

- F1: Perpendicularity of two planes
- F2: Perpendicularity of plane and cylinder
- F3: Perpendicularity of two cylinders
- F4: Coaxiality
- F5: Parallelism of two planes
- F6: Parallelism of plane and cylinder
- F7: Parallelism of two cylinders
- F8: Concentricity of two holes
- F9: Radial runout
Mitutoyo’s “AI” Function

Mitutoyo’s exclusive “AI” function even frees you from the need to select geometric features (step 1 right). Based on input data, the QM-Data 300 identifies which geometric features is measured, then shows the appropriate graphic display and calculates the dimensions automatically. This lets the operator continue the process without interruption using simple keystrokes.

The following geometric features are supported;
- Point
- Line
- Plane
- Circle
- Cylinder
- Cone
- Sphere

How does the AI function simplify key operation?
Example: Parallelism between two cylinders

**Step 1**
Probe the workpiece to measure the first cylinder, then press the key to complete the measurement.

The QM-Data 300 automatically identifies “Cylinder” from the input data.
Then press the key to move to the next measurement.

**Step 2**
Probe the workpiece to measure the second cylinder, then press the key to complete the measurement.

**Step 3**
Press the key three times to begin the parallelism calculation.

**Step 4**
Press the key to show the calculation result of parallelism.

*: The key is not required when using the Timer function or a foot switch.

How easily can you measure the features of a workpiece?
Example: Center position of hole

**Step 1**
Show the gage-like measurement menu 2/3, then press the F9 key to select Center Position of Hole measurement.

**Step 2**
Probe the workpiece to measure the hole, following interactive graphic display.

**Step 3**
The measured feature is immediately calculated and displayed on the LCD.
Multiple language support
Several operating languages are available: English, Japanese, German, French, Italian, Spanish and Portuguese.
For Advanced Measurement
In addition to gage-like measurement menus, the QM-Data 300 provides the experienced operator with a host of advanced functions equal to those of standard CMM software.

Optional programs
• QMFit – creating the best fit coordinate system –
The QMFit can translate and rotate the part coordinate system so that the measurement results of workpiece features most closely match their nominal values using the “least square” method algorithm. This is very suitable for measuring parts having low dimensional accuracy, such as press and injection-molding components.

• QMGraph – visualizing measurement results –
The QMGraph shows the calculation results of geometrical deviations and tolerance assessments with easy-to-understand drawings.
  • Geometrical deviation: Straightness, flatness, circularity
  • Tolerance assessment: Positional deviation, XYZ coordinate value

• QMScan – digitizing 3-D contour –
The QMScan uses a hard probe to scan and digitize workpiece contours. The contour-point clouds thus obtained can then be transferred to an external contour modeling system via floppy disk or the RS-232C interface.

• QMStat – evaluating SPC parameters –
The QMStat features a comprehensive selection of SPC parameters:
  • Average, Max., Min., Sigma, Cp/Cpk
  • Histogram
  • X-Rs control chart
  • Run chart
Optional accessories

- Machine stand (table top H=750mm) 06AAY484
- Machine stand (table top H=650mm) 06AAX288
- Sub-plate for QM-Measure 333 06ABF364
- Sub-plate for QM-Measure 353 06ABF366
- Granite sub-plate for QM-Measure 333 06AAX763
- Granite sub-plate for QM-Measure 353 06AAX917
- Fine feeding device (10mm/ .4” stroke) 06AAY251
- Ceramic master ball 06AAV498
- Foot switch 937179F
- Printer 06AAX263
- Printer (120V) 06AAX265
- Printer (230V) 06AAX266
- Printer paper (10 rolls) 06AAX290
- Floppy disk drive 06AAX917
- Foot switch 937179F
- Fine feeding device 06AAY251
Technical Data

Dimensions

![Diagram of QM-Measure 333 and QM-Measure 353](Diagram.png)

Dimensions

**QM-Measure**
- A: Fine feeding device
- B: Temperature compensation unit
- C: Sub-plate
- D: Machine stand

**QM-Data 300**
- Dimensions
  - W: 280 (11.02"
  - D: 850 (33.46"
  - H: 190 (7.48"

Specifications

- **QM-Measure 333**
  - Measuring range:
    - X-axis: 300mm (12"
    - Y-axis: 300mm (12"
    - Z-axis: 300mm (12"
  - Length standard: Precision linear encoder
  - Resolution: 0.0005mm (.00002"
  - Accuracy (20°C±1°C)*: E = (3.0+4L/1000)µm, R = 4.0µm (.00016"
  - Guide method: Air bearing for each axis
  - Clamping method: Clamping screw
  - Fine feeding device: Optional (10mm/.4" stroke)
  - Z-axis balance: Counterweight
  - Measuring table: Optional (aluminum or granite sub-plate)
  - Workpiece loading:
    - Maximum height: 410mm (16.14"
    - Maximum mass: 30kg (66 lbs.
  - Air pressure: 0.35MPa or 51PSI
  - Air consumption: 50L/min. (in normal state) or 1.8CFM
  - Dimensions:
    - W: 825mm (32.48"
    - D: 690mm (27.17"
    - H: 1345mm (52.95"
  - Mass**:
    - QM-Measure: 130kg (286 lbs.
    - QM-Data 300: 1.2kg (2.6 lbs.

- **QM-Measure 353**
  - Measuring range:
    - X-axis: 300mm (12"
    - Y-axis: 500mm (20"
    - Z-axis: 300mm (12"
  - Length standard: Precision linear encoder
  - Resolution: 0.0005mm (.00002"
  - Accuracy (20°C±1°C)*: E = (3.0+4L/1000)µm, R = 4.0µm (.00016"
  - Guide method: Air bearing for each axis
  - Clamping method: Clamping screw
  - Fine feeding device: Optional (10mm/.4" stroke)
  - Z-axis balance: Counterweight
  - Measuring table: Optional (aluminum or granite sub-plate)
  - Workpiece loading:
    - Maximum height: 410mm (16.14"
    - Maximum mass: 30kg (66 lbs.
  - Air pressure: 0.35MPa or 51PSI
  - Air consumption: 50L/min. (in normal state) or 1.8CFM
  - Dimensions:
    - W: 825mm (32.48"
    - D: 890mm (35.04"
    - H: 1360mm (53.54"
  - Mass**:
    - QM-Measure: 170kg (374 lbs.
    - QM-Data 300: 1.2kg (2.6 lbs.

Data output function

For expanded system capability, the QM-Data 300 can output the following data to a PC (via RS-232C) or an optional floppy disk drive:

> Part program for external storage
> Digitized XYZ point data for a 3-D surface program
> SPC calculation results (average, max./min. sigma and CP/CPK) for MeasureLink program
> Measurement data in normal ASCII or CSV format
> Tolerance-assessment results in normal ASCII or CSV format

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* ISO 10360-2
* E: Error of indication of volumetric length measurement
* L: Measuring length (mm)
* R: Probing error (with TP2 touch signal probe)
** Excludes optional machine stand.
Linear Height for 1D/2D measurement

Note: All information regarding our products, and in particular the illustrations, drawings, dimensional and performance data contained in this pamphlet, as well as other technical data are to be regarded as approximate average values. We therefore reserve the right to make changes to the corresponding designs, dimensions and weights. The stated standards, similar technical regulations, descriptions and illustrations of the products were valid at the time of printing. In addition, the latest applicable version of our General Trading Conditions will apply. Only quotations submitted by ourselves may be regarded as definitive.