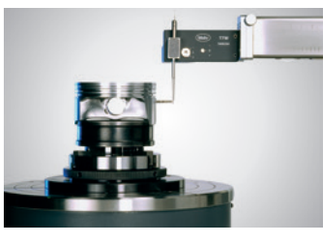
MarForm | Form measuring instruments

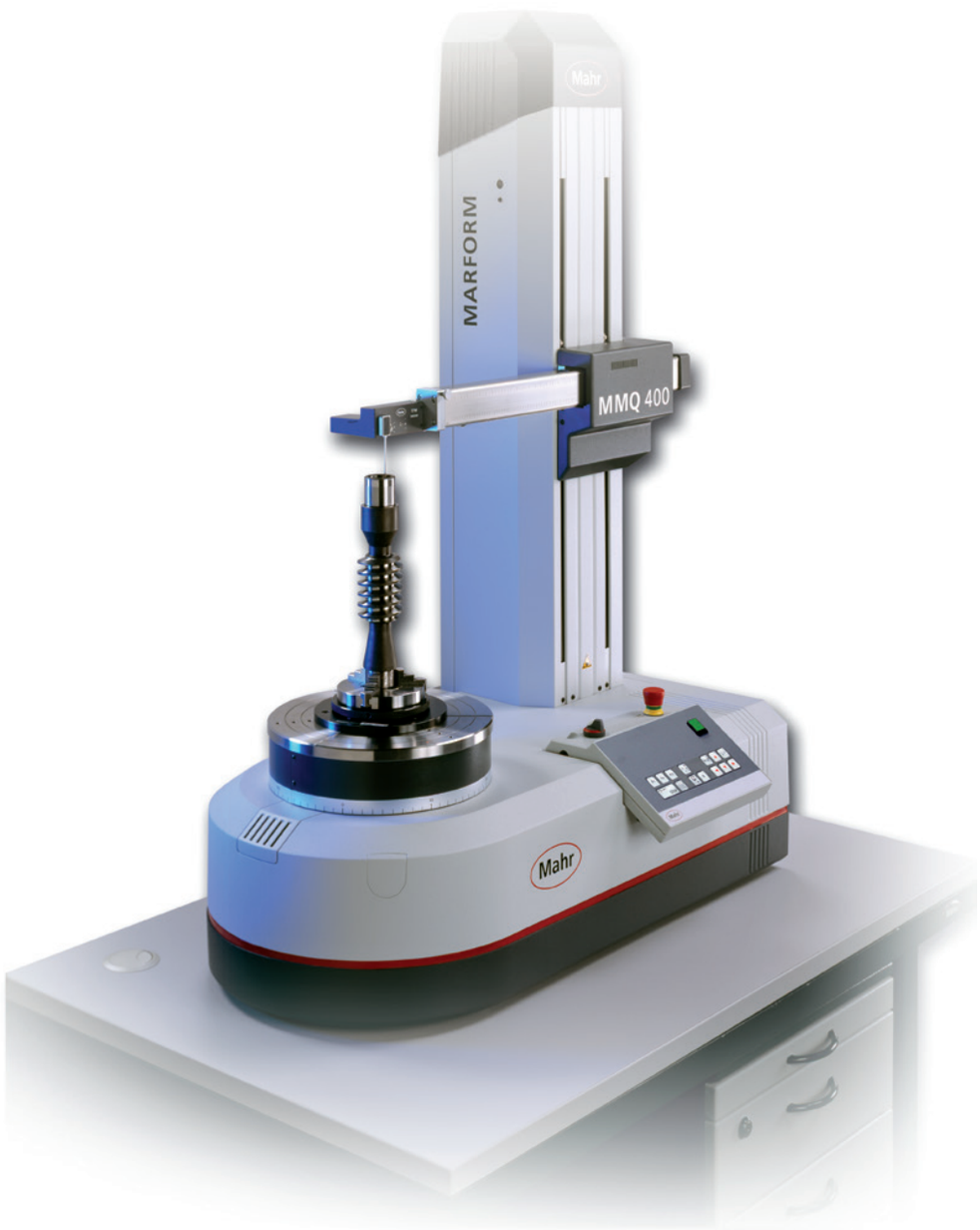
The error-free functioning and durability of a workpiece is determined not only by its dimensions but above all by its form. Especially in the case of rotationally symmetrical workpieces requirements are rising all the time, whether in terms of roundness, flatness, straightness, coaxiality or runout. MarForm helps you to cut process costs without driving up testing costs – by stable, innovative devices with a maximum of automation, flexibility and accuracy.

MarForm. Form tester for a wide variety of applications

Form Measuring Instruments for Workbenches or Measuring Rooms

In many aspects of our daily lives, we put our faith in the reliable operation of technical components. From the ABS brakes, fuel injection system and gearbox in our car to our PC hard drive, from the compressor in the air conditioning system to the blades on our razor, not to mention the landing flaps on airplanes. The smooth interaction between moving parts is critical to their error-free function and durability. To guarantee this level of performance, rotationally symmetrical workpieces are manufactured under strict specifications for the permissible deviation from the ideal form. These tolerances can only be reliably tested with high precision, specially optimized form testers. MarForm helps you to cut process costs without driving up testing costs.

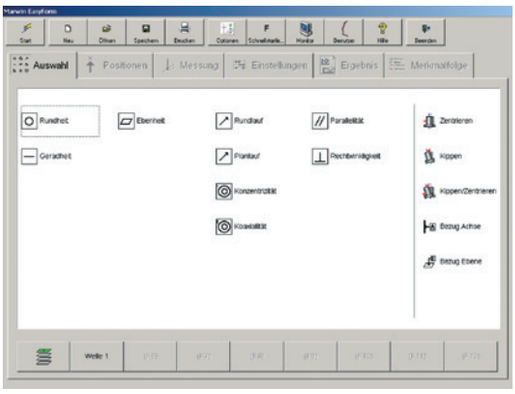


MarForm MMQ 100

Compact Form Measuring Machine

FEATURES

- The MarForm MMQ 100 form tester is the ideal solution for simple yet precise measuring tasks
- Fast and accurate measuring results
- Mechanical bearings for reliability
- Large measuring volume
- Low weight and compact size for greater mobility
- Fast, computer aided workpiece alignment
- Centering and tilting knobs for coarse and fine adjustment
- Universal and reliable
- Workshop compatible, no compressed air connection required
- Touchscreen design eliminates the need for a keyboard or mouse
- Digital encoders in Z and X transfer the measuring position directly to the software



OPTIONS:

- AdvancedForm
- Mahr QE QS-STAT data export

VERSIONS

- **MMQ 100 with EasyForm** is a powerful PC based evaluation system running under Windows® 10. It offers meaningful color reports with user-friendly software for evaluating form and position tolerances (DIN ISO 1101): roundness, roundness within sections, radial runout, axial runout, concentricity, coaxiality, flatness[(1)], straightness[(1)], parallelism[(1)], perpendicularity[(1)].

[(1)] from one circular track

The **MMQ 100 measuring station with EasyForm** comes as a complete system. The MMQ 100 consists of the following:

- MarForm MMQ 100
- Digital encoders in X/Z
- T20W probe
- MarWin® EasyForm Software
- MarWin PC with WIN 10 operating system
- 24" TFT monitor
- Touch sensitive touch screen monitor (optional)

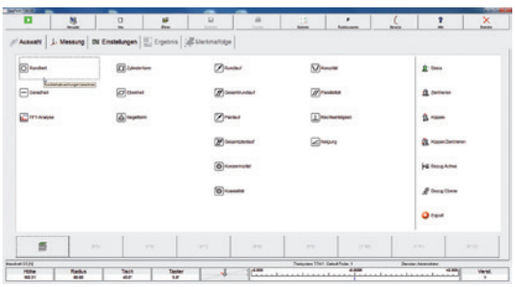
For more information, please visit our website: www.mahr.com

MarForm MMQ 150

Compact Form Measuring Machine

FEATURES

- MarForm MMQ 150 - The entry into the world of cylindricity metrology, the MMQ 150 is an automatic measuring machine for the testing of form and location tolerances.
- Use in production or measuring room
- Fast and easy operation
- Measuring accuracy, optimized for cylindricity tolerances
- Reduces number of rejected parts, saves time, lowers production costs
- Maintenance free, high precision mechanical bearings



OPTIONS:

- Rim chuck Ø 100 mm
- Various additional clamps
- Commutator analysis
- Vibrational velocity analysis
- Upgrade to MarWin AdvancedForm
- 22" touch screen instead of 24" monitor
- Probe arms of various lengths and with various stylus ball geometries
- Various double probe arms
- Various calibration standards
- Various equipment tables, some with vibration compensation

VERSIONS

- The MMQ 150 measuring station consists of the following components:
- MarForm MMQ 150 form tester
- T20W length measuring probe with probe arm
- EasyForm Software for measuring and operating
- MarWin PC, Windows 10 operating system
- 24" monitor

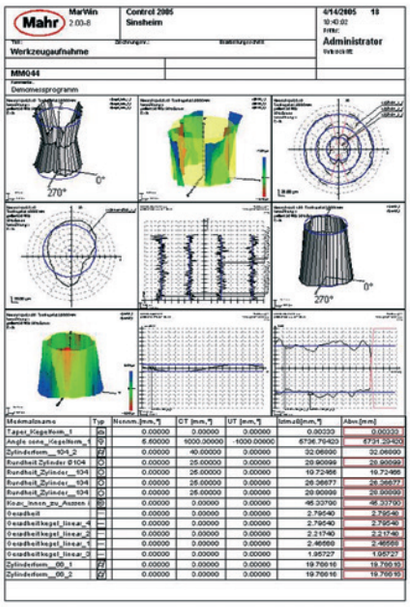
For more information, please visit our website: www.mahr.com

MarForm MMQ 200

Compact Form Measuring Machine

FEATURES

- Compact form measuring machine for manufacturing workshops and inspection rooms
- Proof of form and position deviations as per DIN/ISO 1101
- Fully automatic measuring sequences
- Precision roundness measuring axis (C)
- Motorized vertical measuring axis (Z)
- Motorized horizontal positioning axis (X)
- Manual centering and tilting table
- T20W manual length measuring probe or
- T7W motorized probe
- Ergonomic control panel, can also be used to start select measuring programs (P1, P2, P3)



OPTIONS:

- 22" touchscreen TFT monitor instead of the 24" standard TFT
- Roughness measurement and evaluation with MMQ 200/T7W
- MarWin Software, diameter evaluation
- Various clamps
- Probe arms of various lengths and with various stylus ball geometries
- Various double probe arms
- Various calibration standards

VERSIONS

- The MarForm **MMQ 200** is available in two versions: As a measuring station with the universal measuring probe **T20W** and as a measuring station with the motorized measuring probe **T7W**, which takes automation another step forward with its unique motorization.
- The **MMQ 200** is operated with the **EasyForm** Software. It is controlled by means of touchscreen technology, which also makes operation with the mouse exceptionally easy.

Form measuring station with T20W
- MarForm MMQ 200 form tester
- T20W length measuring probe, manual, with probe arm
- EasyForm measuring and operating software
- Intel-class PC, Windows 10
- 24" TFT monitor
- Rim chuck Ø 100 mm

Form measuring station with T7W
- MarForm MMQ 200 form tester
- T7W length measuring probe with probe arm
- EasyForm measuring and operating software
- Intel-class PC, Windows 10
- 24" TFT monitor
- Rim chuck Ø 100 mm

For more information, please visit our website: www.mahr.com

MarForm MMQ 400

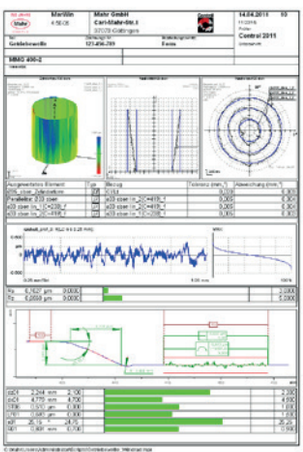
Universal Form Measuring Machine

DESCRIPTION

- MarForm MMQ 400 is suitable for universal use for extensive workpiece evaluation according to DIN ISO 1101
- High precision measuring axes in Z and X make every form measuring task possible. MarForm MMQ 400 is available in different versions for:
- High precision workpieces
- Unusually long workpieces
- Large and heavy workpieces
- Use in production or in the precision measuring room
- Different modules are available with which the MarForm MMQ 400 can optimally be prepared for your requirements:
- Motorized or manual centering and tilting table
- Vertical axis (Z) with 900 mm, 500 mm or 350 mm measuring length
- Horizontal axis (X) with 180 mm or 280 mm measuring length and with digital linear scales in the X and Z axes; high probe position accuracy for measurements requiring high reproducibility
- Manual or fully automatic probe with short measuring circuit, high linearity, low measuring force
- Path control for fast measuring of a nominal contour

OPTIONS:

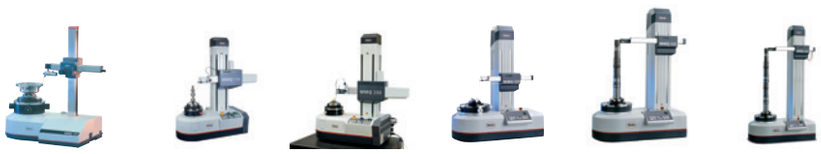
- Roughness measurement
- Switch between form probe with ruby ball and roughness probe PHT 6–350
- Piston testing with MarWin Evaluation Software
- Shaft twist testing and analysis with MarWin
- Cam profile testing
- Bar to bar variation analysis at commutators
- Contour measurement and evaluation
- Path control (MCPC)
- Shape evaluation
- Vibrational velocity analysis
- Dominant roundness waviness (MBN 10455)



For more information, please visit our website: www.mahr.com

MarForm MMQ 100 / MMQ 150 / MMQ 200 / MMQ 400

Compact Form Measuring Machine



Formtester	MMQ 100	MMQ 150	MMQ 200	MMQ 400–2 Z = 350 mm X = 180 mm	MMQ 400–2 Z = 500 mm X = 280 mm	MMQ 400–2 Z = 900 mm X = 280 mm
Roundness measuring unit, C-axis						
Roundness deviation (µm+µm/mm measuring height) **	0.05 + 0.0006	0.03 + 0.0006	0.03 + 0.0006	0.02 + 0.0005	0.02 + 0.0005	0.02 + 0.0005
Roundness deviation (µm+µm/mm measuring height) *	0.025 + 0.0003	0.015 + 0.0003	0.015 + 0.0003	0.01 + 0.00025	0.01 + 0.00025	0.01 + 0.00025
Axial runout deviation (µm+µm/mm measuring radius) **	0.04 + 0.0006	0.4 + 0.0006	0.04 + 0.0006	0.04 + 0.0002	0.04 + 0.0002	0.04 + 0.0002
Axial runout deviation (µm+µm/mm measuring radius) *	0.02 + 0.0003	0.02 + 0.0001	0.02 + 0.0001	0.02 + 0.0001	0.02 + 0.0001	0.02 + 0.0001
Centering and tilting table						
Centering and tilting table	manual	manual	manual	manual / auto-matic	manual / auto-matic	automatic
Table diameter	160	160	160	285	285	285
Table load capacity, centered (N)	200	200	200	600	600	400
Speed (rpm) 50 Hz / 60 Hz	5 / 6	1–6	0.2–15	0.2–15	0.2–15	0.2–15
Vertical straightness measuring untit, Z-axis						
Positioning path (mm), Z axis	300, manual	-	-	-	-	-
Z axis positioning	manual	-	-	-	-	-
Measuring path, motorized Z (mm)	-	250	250	350	500	900
Straightness deviation / 100 mm measuring path (µm)**, Z axis	-	0.4	0.15	0.15	0.15	0.15
Straightness deviation / total measuring path (µm)**, Z axis	-	1	0.3	0.3	0.4	0.9
Parallelism deviation Z-/C axis in tracing direction, measuring path (µm)	-	1	0.5	0.5	0.8	2
Measuring speed (mm/s), Z axis	-	0.5–30	0.5–30	0.1–30	0.1–30	0.1–30
Positioning speed (mm/s), Z axis	-	0.5–50	0.5–100	0.5 –100	0.5 –100	0.5 –100
Horizontal straightness measuring unit, X-axis						
Positioning path (mm), X axis	180, manual	150, motorized	150, motorized	-	-	-
Measuring path, motorized X (mm)	-	-	-	180	280	280
Straightness deviation / 100 mm measuring path (µm)**, X-axis	-	-	-	0.4	0.5	0.5
Straightness deviation / total measuring path (µm)**, X axis	-	-	-	0.8	1.5	1.5
Perpendicularity X/C axis, measuring path (µm)	-	-	-	1	2	2
Positioning speed (mm/s), X axis	-	0.5–30	0.5–30	0.5–30	0.5–30	0.5–30
Measuring speed (mm/s), X axis	-	-	-	0.5–10	0.5–10	0.5–10

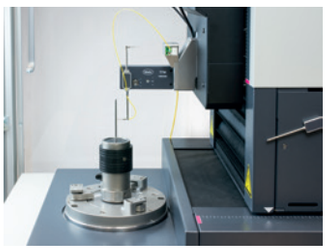
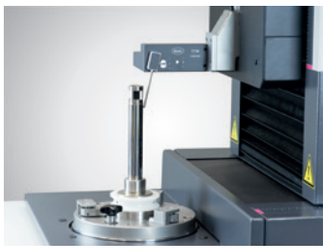
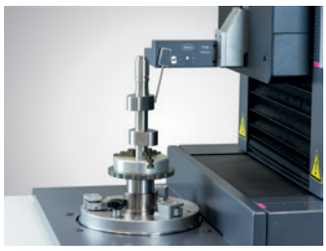
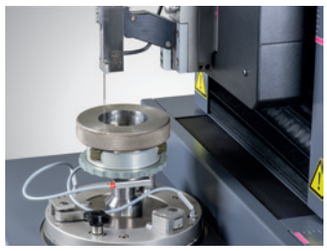
* Values as maximum deviation from LSC reference circle, filter 15 undulations/revolution.
** All values in accordance with DIN ISO 1101 at 20°C ±1°C in a vibration-neutral environment, filter 15 undulations/revolution LSC or 2.5 mm LSS, 5 rpm or 5 mm/s and standard probe arm with ball diameter 3 mm. Proof at the standard using error separation techniques. Given the number of different options available, only a few machines are described here by way of example. Technical data for "your" MMQ is available from Mahr on request.

For more information, please visit our website: www.mahr.com

MarForm. Reference Machines for Form and Position Tolerances

Our most accurate Form Measuring Machines

Precision form measurement cuts costs! MarForm is our ultra accurate form measuring system. These systems are used wherever information is required about the geometry of workpieces with very strict tolerances. ISO 1101 describes roundness, cylindricity, straightness, parallelism, etc., as form and position deviations. These features are monitored by form testers. The high accuracy of form measuring instruments can save you money, because you can maintain the necessary tolerance margins for your production. MarForm is a precision roundness and concentricity measuring machine.

MarForm MFU 100

Reference Form Measuring Station

DESCRIPTION

- Reference form measuring station in a new dimension.
- The journey from high precision measuring axes to competent measurements is often a long one that the **MFU 100** has mastered completely. Only the MFU 100 has integrated reference elements for the real-time spatial compensation of geometric deviations, recording all profiles as high precision 3D coordinates.
- For decades, **MarForm** measuring machines have been recognized for their accuracy and stability. The new **MarForm MFU 100** was developed with the claims of testing the shape and position features of product parts in a one liter measuring volume close to the production area and at a reasonable cost. In doing so, it has taken our long experience into a new dimension.
- **MarForm MFU 100** is a precision reference form measuring center. Its exceptionally low measurement uncertainty increases the tolerance margin for your production processes, thereby lowering production costs.
- Circular roundness measuring axis (C)
- Motorized centering and tilting table (X, Y, A, B)
- Vertical straightness measuring axis (Z)
- Horizontal straightness measuring axis (X)
- Tangential multifunction axis (Y)
- Motorized length measuring probe T7W
- MarWin Evaluation Software for form and position features
- All axes are coordinated to ensure maximum measuring reliability. The horizontal X axis extends beyond the center of the workpiece, allowing 'true parallelism' to be checked free from other measuring influences. The tangential Y axis is an innovative new feature. This additional motorized axis, which is new to conventional form testers, helps to locate the zenith of miniature workpiece geometries without operator influence. The actual precision measurement can then be started in exactly the right place. This significantly increases process accuracy.
- The Y axis is used together with the vertical Z axis and the horizontal X axis to determine the workpiece diameter. This allows tolerances to be checked in the sub-nanometer range by the maximum material principle, in accordance with standards, for the very first time and at a very reasonable price.
- High resolution digital scales in conjunction with the machine electronics provide a level of positioning accuracy which allows even miniature part geometries to be tested. MarForm MFU 100 is also suitable for error-free scanning of surfaces.
- The MarWin Software package offers the full range of functions of a modern measuring and evaluating application including user friendly records and electronic documentation in the company network.
- The rigorous separation of control and evaluation functions ensures that **MarForm MFU 100** is future proof and expandable. New language versions, special evaluations and new standards are easy to incorporate. The **MFU 100** is also ready for the addition of future sensor systems.
- In short: **MarForm MFU 100** brings form measuring machines for inspection rooms and production areas into a new dimension.
- **MarForm MFU 110** with optional optical sensor which is interchangeable with T7W (motorized).

APPLICATIONS

- Checking product parts for form and position features
- Recording of all profiles as high-precision 3D coordinates with real-time spatial compensation of geometric deviations
- Scanning of surfaces, roughness evaluation
- Scanning and evaluation of contours and shapes

For more information, please visit our website: www.mahr.com

MarForm MFK 500

Reference Form Measuring Station

DESCRIPTION

- Reference form measuring center for laboratory and measuring room, with a large measuring volume for heavy workpieces
- The benchmark form measuring centers for laboratories and measuring rooms.
- **MFK form measuring center for comprehensive workpiece assessment. MFK form tester -** ideal for testing engine blocks, cylinder heads, gear cases, hydraulic elements, crankshafts and camshafts. Generously sized, optimized design for high measuring accuracy throughout the machine. Long measuring and travel paths for easy, safe workpiece changing.
- **MarForm MFK 600** or **MFK 500**, built from individual coordinated components, offer flexibility and adaptability for a range of measuring tasks.
- The form tester is based on a non-warping granite base, which is set up so it is isolated from vibrations. Its high precision horizontal surface forms the datum plane for the measuring setup. The CNC table supports and guides heavy workpieces by means of air bearings on the granite surface.
- Universal form measuring station with a large measuring volume for heavy workpieces
- **MFK 600** with 5 measuring and set up axes for measuring form elements and determining positions
- **MFK 500** with 3 measuring and 4 set up axes for measuring form elements
- Rotating measuring probes and automatic workpiece positioning make it easy to use and quick to set up
- Air bearings for low maintenance and continuous loading
- Collision protected probe systems for diverse measuring tasks
- Large workpiece holder surface for large individual workpieces or workpiece pallets
- Roundness measuring device with automatic adjustment to the workpiece diameter, even with eccentric positioning
- Straightness measurements in 3 main coordinate directions
- Workpiece assessment as per ISO 1101
- Testing in machine and workpiece coordinates in accordance with production specifications
- Full evaluation of form and position features as well as diameter and position values
- Extensive accessories and choice of measuring probes for optimized performance of all measuring tasks
- Ready for use and easily expandable with additional movement axes for turning workpieces during a program sequence. In this way the most complex measuring tasks on V-engine blocks for example can be carried out without operator intervention. MarWin Software enables a customized and intuitive operation for every application. With the help of user-friendly family programs, created in the MarEdit operating mode, you parameterize your measuring program without any programming knowledge thanks to clear masks. Then you measure your part-families and automatically document the measurement results.

OPTIONS:

- Additional movement axes for turning workpieces during a program sequence

APPLICATIONS

- Checking of form and position features as well as diameter:
- Engine blocks
- Cylinder heads
- Gear cases
- Hydraulic elements
- Crankshafts and camshafts

For more information, please visit our website: www.mahr.com

MarForm Software MarWin

DESCRIPTION

- **MarWin** AdvancedForm for MarForm gives you full control over your form measuring station. You can position, align, measure and document at the click of a mouse – and the graphical user interface keeps you fully informed at all times.
- Functions can be selected with the mouse from pull-down menus in menu bars, just as in other Windows® applications.
- **MarWin** lets you stay in control of the form measuring station at all times. You can track the profile shape while it is being measured, and intervene if you wish. The controls can be adapted to individual requirements. Whether you are carrying out a quick individual measurement, starting a program sequence on a series component or converting a complex measuring task into a measuring program: **MarWin** offers the ideal operating strategy for every task. As tasks can differ so greatly, there is no one operating strategy that is perfect for every application.

That is why MarWin offers a variety of operating strategies:
- **EasyForm:** Easy to learn and shortest way to achieve a meaningful measuring record
- **Favorite measuring runs** for measurement using an existing measuring program

Quick&Easy (AdvancedForm)
- for fast measurement; obtain a measuring result quickly, with minimal effort

Teach-in programming (AdvancedForm)
- for creating, modifying and running a measuring program, with lots of different options
- The powerful **teach-in programming** feature of **AdvancedForm** allows you to create measuring programs for frequently measured workpieces. It can also be used to create measuring runs containing special positioning movements, measurements, evaluations and displays.
- In teach-in programming, simply use the mouse to click on an icon – e.g. for measuring and evaluating a run – and a window opens in which you can describe the feature in more detail (e.g. radial or axial run-out, datum, code name, tolerance, etc.). The number and type of measurements (true measurement or reevaluation of already measured profiles) are also specified in this window. Separate windows can be opened for editing measuring, evaluation and display parameters. In many cases, however, this is unnecessary, as default values are already entered which can be used for many measuring tasks. If different settings are required for specific measuring tasks, then the clear window layout will quickly take you to the right place, allowing you to optimize the settings in a flash.
- Measuring programs for frequently measured series components can be saved and then opened and started as a measuring run (see above) at any time.
- Meaningful graphical profile displays, with several profiles in one graphic if required, displayed in different colors and in various ways, are immediately available on the generously sized color screen. If you are interested in exact numerical values, you can choose to display the results as a table.

For more information, please visit our website: www.mahr.com

MarForm MMQ 500

High precise universal form measuring machine

FEATURES

Due to the variety of precise measurement options, the new MarForm MMQ 500 is the best option for tabletop form testers. Thanks to its optimized engineering design it can be implemented universally and guarantees maximum utilization.

- Can be used universally for small workpieces of just a few millimeters right through to
- heavy workpieces of up to 80 kg
- Intuitive software
- Highest axis accuracy even as the tolerances become smaller
- Best repeatability even for difficult measuring task
- Measurement of form, position, roughness, contour, and lead in one measuring sequence

TECHNICAL DATA

Order no.	5440901
Diameter max.* [mm]	530
Measuring path Z (mm)	470
Type	MMQ 500
Roundness deviation (µm+µm/mm measuring height) **	0,02 + 0,0005
Roundness deviation (µm+µm/mm measuring height) *	0,01 + 0,00025
Axial runout deviation (µm+µm/mm measuring radius) **	0,04 + 0,0002
Axial runout deviation (µm+µm/mm measuring radius) *	0,02 + 0,0001
Centering and tilting table	automatic
Table diameter	300
Table load capacity, centered (N)	800
Straightness deviation / total measuring path (µm)**, Z axis	0,3
Parallelism deviation Z-/C axis in tracing direction, measuring path (µm)	0,6
Measuring speed (mm/s), Z axis	100

Values as maximum deviation from LSC reference circle, filter 15 undulations/revolution.
** All values in accordance with DIN ISO 1101 at 20°C ±1°C in a vibration-neutral environment, filter 15 undulations/revolution LSC or 2.5 mm LSS, 5 rpm or 5 mm/s and standard probe arm with ball diameter 3 mm. Proof at the standard using error separation techniques. Given the number of different options available, only a few machines are described here by way of example. Technical data for "your" MMQ is available from Mahr on request.