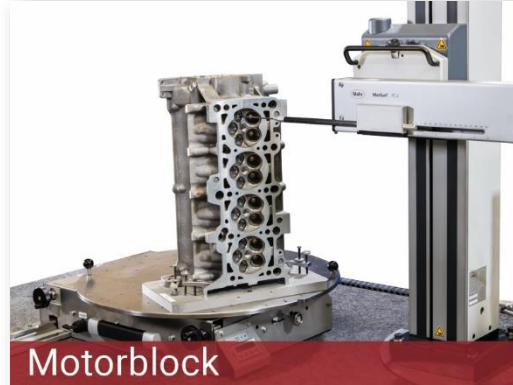
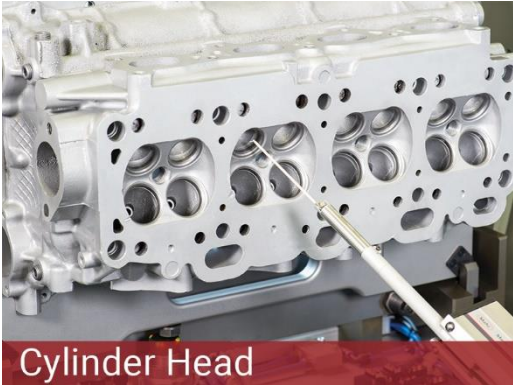


Engineered Solutions

Application Automotiv



Mahr | Application Cylinder Head

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Product Line MarSolution

Based on Millimar Programm



Typical Measurement Tasks



SPC-Measuring Table for Cylinder Head

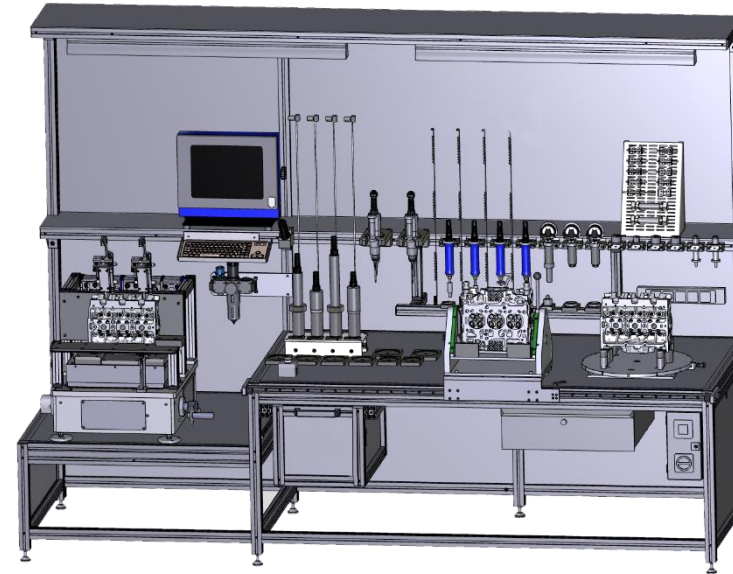
Measurement Task

- Diameter
- Distances (e.g. depth of valve guide after pressing)
- Go/NoGo-Inspection
- Surface (optional)

The Solution

Measuring table with various hand-held measuring devices (pneumatic and tactile), multi-point measuring device for the depth of the valve guide and (optional) surface measurement. The measuring table is designed for direct use in production for quality control during production.

The measuring table can be designed and equipped individually according to customer specifications.



Automation:	manual
Main application:	cylinder head
Reference No:	79



Measuring Station for Dynamic Cam Angle Determination

Measurement Task

- Determination of the cam angle of drive and output camshaft in relation to the integrated Hall sensors
- Dynamic measurement of the cam angle in the cylinder head cover
- Evaluation of the cam angle as "best fit"
- Graphic representation of the cam shape / result

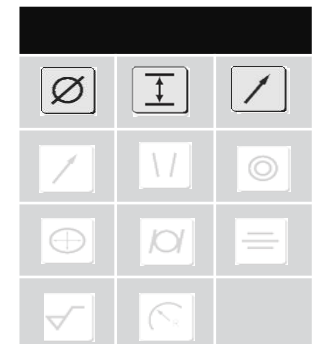
The Solution

This measuring station is designed for 100% end-of-line measurement of cylinder head covers and the camshafts already mounted in them. The station is integrated into the production line. Loading and unloading is done by a robot. After loading the actual measuring cell, the measurement is carried out. Depending on the design and cycle time requirements, the station is equipped with several measuring cells that can be loaded in parallel.

The evaluation of the cam angle is carried out as a "best-fit" similar to a form tester with graphic display of the result.



Automation:	inline
Main application:	camshaft, cylinderhead
Reference No:	83



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Typical Measurement Tasks



Measuring Station with Aircushioned Positioning Table

Measurement Task

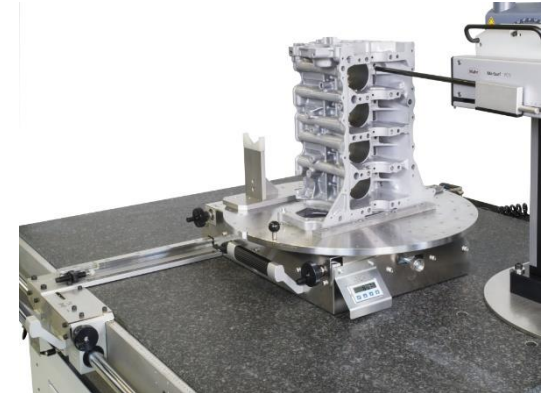
- Roughness and contour measurement
- Depending on the measuring task, all drive units from the Mahr can be applied
- Combination of several different drive units are possible
- Workpiece weight up to 250 kg

The Solution

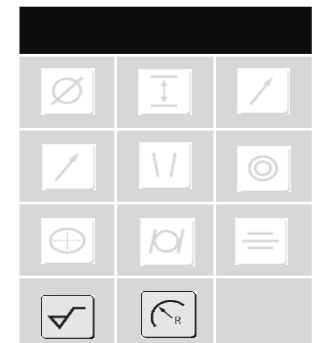
Measuring station with air-bearing positioning table for comfortable and precise positioning of large workpieces.

The guided axes allow positioning of the workpieces in TX, TY and TC direction. Each axis can be adjusted separately by simple and fast pre-positioning and subsequent fine adjustment. Each axis can be locked separately with a parking brake.

The mounting plate (Ø 600 mm) has a hole pattern with M6 threads at 50 mm intervals (Witte system). This allows the user to flexibly realise workpiece supports on site.



Automation:	manual
Main application:	motorblock; crankshaft; gearbox
Reference No:	23



Flexible Roughness and Contour Measurement on Large Workpieces

Measurement Task

typical applications are for example:
 turbin blades, cylinder block, cylinder head, crankshaft, housing, et al.

Depending on drive unit applied roughness and contour features can be measured

The Solution

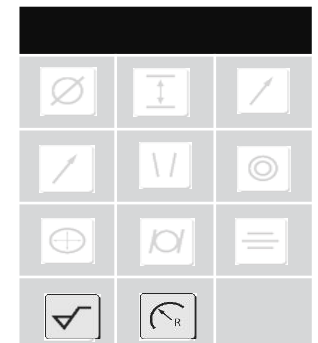
This measuring station is designed for measurement tasks on large and heavy workpieces. The workpiece is placed on the granite block. Afterwards the measuring column with drive unit can be positioned flexibly, freely in all directions. The positioning is performed via an air bearing plate, which is located below the measuring column. During proceeding of measurements the air-supply is switched off and the column is placed stable on the granite. An all-round limit prevents the easily movable column from falling down. The granite is designed with a T-slot for attaching accessories. The size of the granite is 2.0m x 1.0m.

The measuring station concept is characterized by:

- High flexibility
- Easy positioning to the measuring task, even on large workpieces



Automation:	manual
Main application:	aerospace
Reference No:	85



CNC Measuring Station for Larger Workpieces - 2000.000-GD25

Measurement Task

This measuring station is designed for full automatic roughness measurement on large workpieces such as cylinder blocks and cylinder heads.

Complex and diverse measuring tasks can easily be performed without influence of operating personnel on measurement results and avoids any labour time during performance of the measurement.

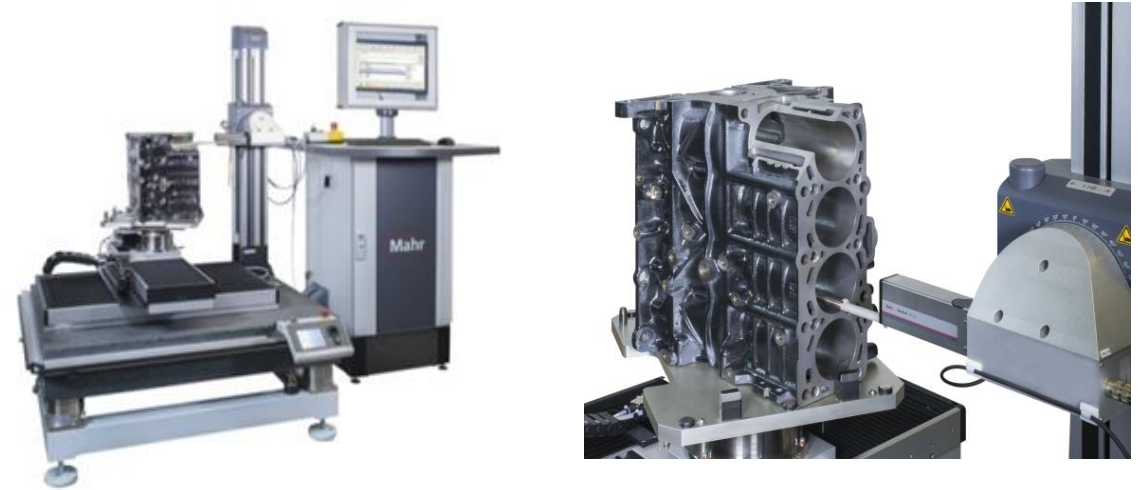
The Solution

This station comes with a positioning system of the workpiece of two CNC-linear axis and one TC rotary axis. Furthermore, the measurement station is capable to rotate the drive unit (HA) in addition to the HZ and HB-axis of the column. This arrangement of full automatic axis allows high flexibility and accessibility of measuring points and ensures an proceeding without any interference by user.

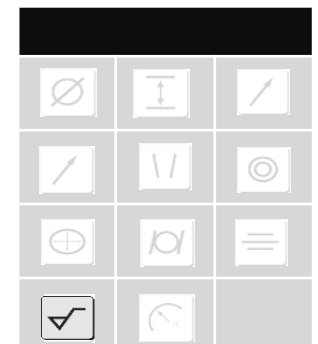
The workpiece is clamped by a customer-specific clamping device.

The measuring station concept is characterized by:

- Good accessibility of a broad variety of measuring points
- The software CNCPlus supports full-automatic processing
- Usability by employees from the workshop
- Small drive unit for complete immersion in larger and deep bores



Automation:	full-automatic
Main application:	motorblock; cylinderhead
Reference No:	7



CNC Measuring Station for Cylinderblock and -Head

Measurement Task

The drive unit GD25 enables high grade access to any roughness feature to be measured. The concept is full automatic processing, which means the station can be operated by non-metrology specialised personell and does not require any ressources during the measurement process.

- Full automatic roughness measurement
- Suits 3-cylinder and 4-cylinder engines

The Solution

This measurement station is based on the series 2000 design. Additionally, there is a electronic controlled swivelling unit (TB-axis) on top of the workpiece positioning system which is fully integrated in the automatic run of the machine. It enables the measurement station to swivel the workpiece in any position between -90° till +90°.

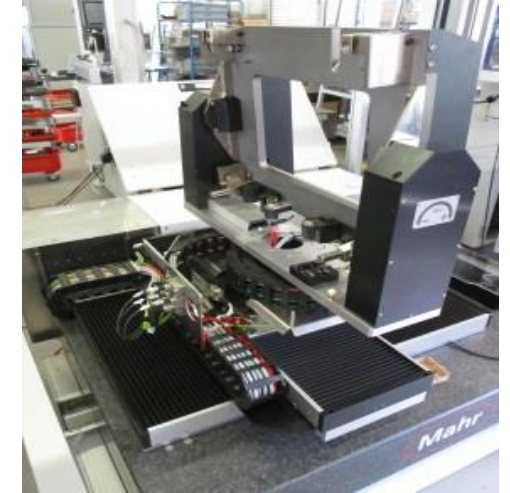
Axis beeing realised:

- TX - 600mm
- TY - 600 mm
- TC - 340°
- TB -90° bis +90°
- HB - +/- 45°
- HA - 360°
- HZ - 750mm

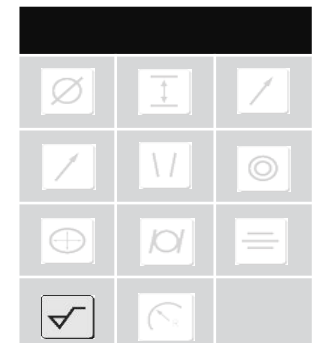
Drive unit: GD25

Workpiece weight: up to 150kg

Workpiece dimensions: 500 mm x 550 mm x 550 mm



Automation:	full-automatic
Main application:	cylinderhead, cylinderblock
Reference No:	8



CNC Measuring Station for Large Workpieces - Series 2010

Measurement Task

Roughness and contour measurement

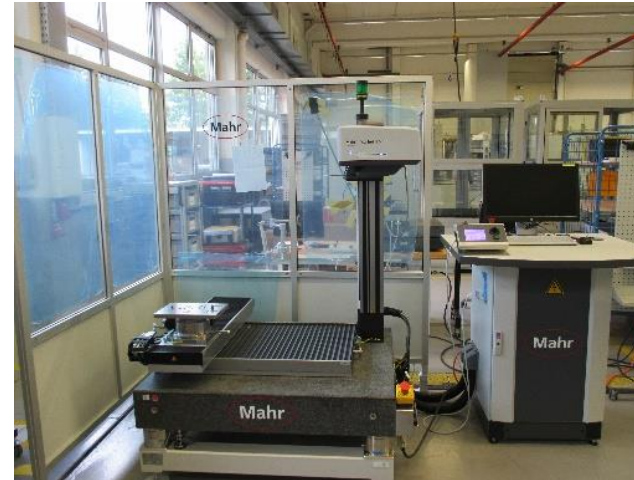
Typical measurement tasks are:

- Roughness on sealing surfaces
- Roughness on bearing surfaces
- Contour and roughness of valve seats
- etc.

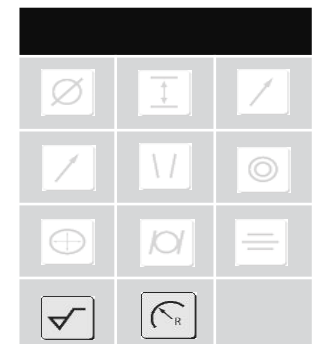
The Solution

This measuring station is designed for fully automatic contour and roughness measurement on large workpieces. The workpiece is positioned during the automatic program sequence via two CNC linear axes and one rotary axis. This arrangement of the axes allows a high flexibility with regard to measuring tasks and the accessibility of the corresponding measuring locations. Customer-specific workpiece clamping systems can be integrated.

The measuring station is designed for use in production. The programs, control and processes are designed in such a way that no specific expert knowledge is required for operation and the measuring station can be operated by workshop personnel.



Automation:	full-automatic
Main application:	cylinderblock, cylinderhead
Reference No:	52



A solid red vertical bar is positioned on the left side of the slide.

Mahr | Application Motorblock

Engineered Solutions

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Product Line MarSolution

Based on Millimar Programm



Typical Measurement Tasks



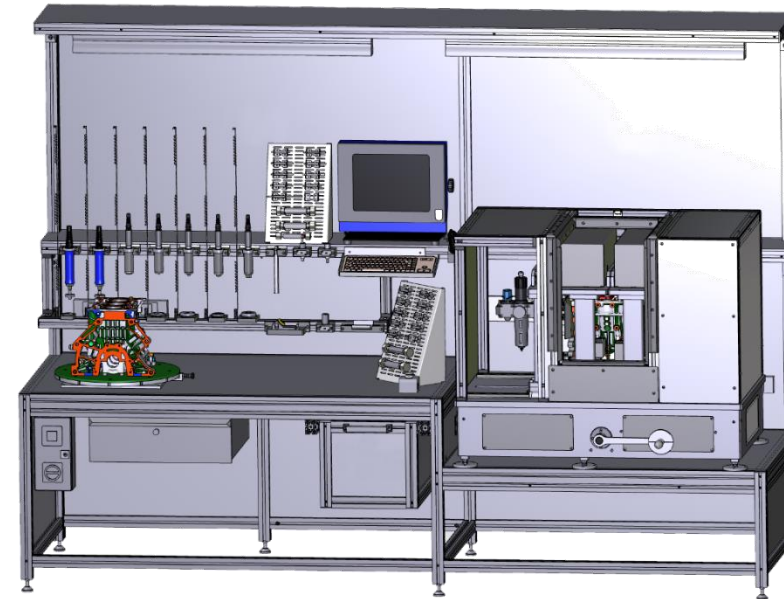
Measuring Table for Cylinder Block

Measurement Task

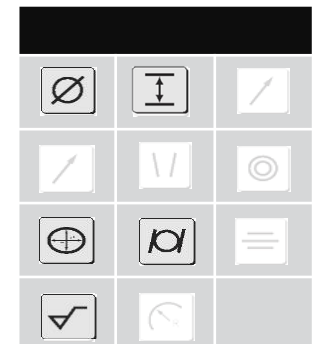
- Diameter
- Roundness
- Cylindricity
- Distances
- Go/ NoGo-Inspection
- Surface (optional)

The Solution

Measuring table with different hand gages (pneumatic and tactile), multipoint measuring fixture for different distances and (optional) surface measurement unit. Measuring tables are equipped and manufactured to customer specifications.



Automation:	manual
Main application:	motor block
Reference No:	80



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Typical Measurement Tasks



Measuring Station with Aircushioned Positioning Table

Measurement Task

- Roughness and contour measurement
- Depending on the measuring task, all drive units from the Mahr can be applied
- Combination of several different drive units are possible
- Workpiece weight up to 250 kg

The Solution

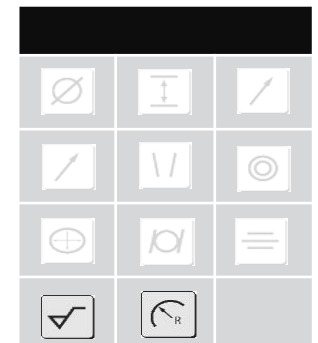
Measuring station with air-bearing positioning table for comfortable and precise positioning of large workpieces.

The guided axes allow positioning of the workpieces in TX, TY and TC direction. Each axis can be adjusted separately by simple and fast pre-positioning and subsequent fine adjustment. Each axis can be locked separately with a parking brake.

The mounting plate (Ø 600 mm) has a hole pattern with M6 threads at 50 mm intervals (Witte system). This allows the user to flexibly realise workpiece supports on site.



Automation:	manual
Main application:	motorblock; crankshaft; gearbox
Reference No:	23



Flexible Roughness and Contour Measurement on Large Workpieces

Measurement Task

typical applications are for example:
 turbin blades, cylinder block, cylinder head, crankshaft, housing, et al.

Depending on drive unit applied roughness and contour features can be measured

The Solution

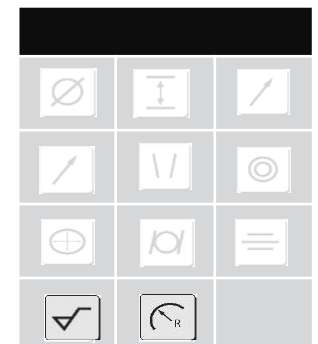
This measuring station is designed for measurement tasks on large and heavy workpieces. The workpiece is placed on the granite block. Afterwards the measuring column with drive unit can be positioned flexibly, freely in all directions. The positioning is performed via an air bearing plate, which is located below the measuring column. During proceeding of measurements the air-supply is switched off and the column is placed stable on the granite. An all-round limit prevents the easily movable column from falling down. The granite is designed with a T-slot for attaching accessories. The size of the granite is 2.0m x 1.0m.

The measuring station concept is characterized by:

- High flexibility
- Easy positioning to the measuring task, even on large workpieces



Automation:	manual
Main application:	aerospace
Reference No:	85



CNC Measuring Station for Larger Workpieces - 2000.000-GD25

Measurement Task

This measuring station is designed for full automatic roughness measurement on large workpieces such as cylinder blocks and cylinder heads.

Complex and diverse measuring tasks can easily be performed without influence of operating personnel on measurement results and avoids any labour time during performance of the measurement.

The Solution

This station comes with a positioning system of the workpiece of two CNC-linear axis and one TC rotary axis. Furthermore, the measurement station is capable to rotate the drive unit (HA) in addition to the HZ and HB-axis of the column. This arrangement of full automatic axis allows high flexibility and accessibility of measuring points and ensures an proceeding without any interference by user.

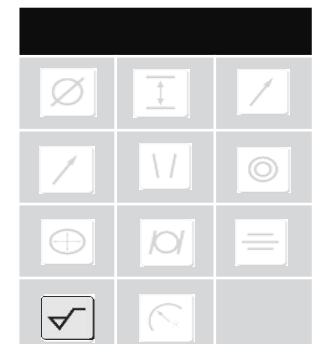
The workpiece is clamped by a customer-specific clamping device.

The measuring station concept is characterized by:

- Good accessibility of a broad variety of measuring points
- The software CNCPlus supports full-automatic processing
- Usability by employees from the workshop
- Small drive unit for complete immersion in larger and deep bores



Automation:	full-automatic
Main application:	motorblock; cylinderhead
Reference No:	7



CNC Measuring Station for Cylinderblock and -Head

Measurement Task

The drive unit GD25 enables high grade access to any roughness feature to be measured. The concept is full automatic processing, which means the station can be operated by non-metrology specialised personell and does not require any ressources during the measurement process.

- Full automatic roughness measurement
- Suits 3-cylinder and 4-cylinder engines

The Solution

This measurement station is based on the series 2000 design. Additionally, there is a electronic controlled swivelling unit (TB-axis) on top of the workpiece positioning system which is fully integrated in the automatic run of the machine. It enables the measurement station to swivel the workpiece in any position between -90° till +90°.

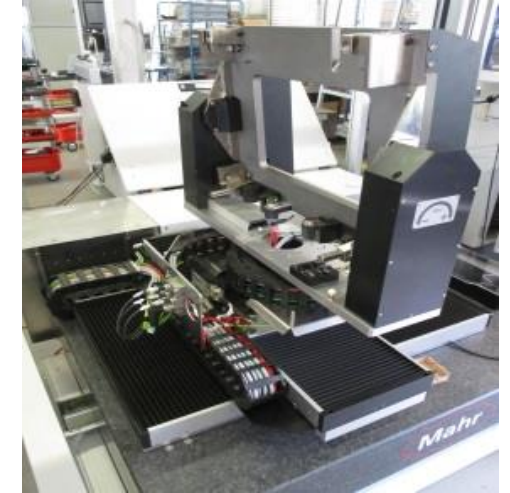
Axis being realised:

- TX - 600mm
- TY - 600 mm
- TC - 340°
- TB -90° bis +90°
- HB - +/- 45°
- HA - 360°
- HZ - 750mm

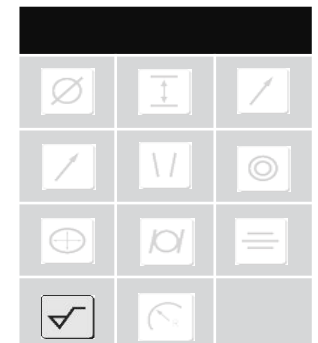
Drive unit: GD25

Workpiece weight: up to 150kg

Workpiece dimensions: 500 mm x 550 mm x 550 mm



Automation:	full-automatic
Main application:	cylinderhead, cylinderblock
Reference No:	8



CNC Measuring Station for Large Workpieces - Series 2010

Measurement Task

Roughness and contour measurement

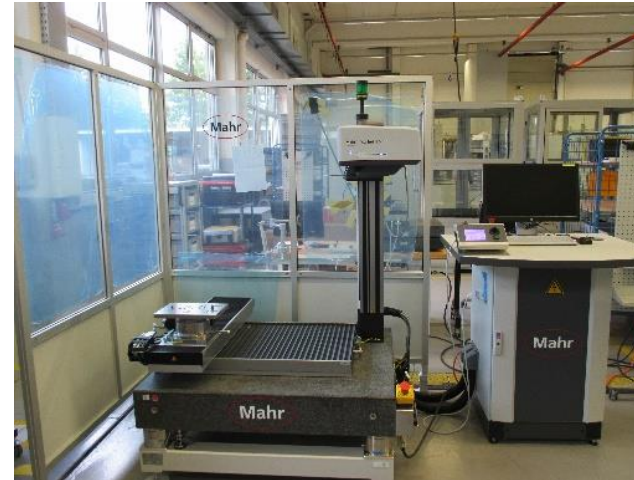
Typical measurement tasks are:

- Roughness on sealing surfaces
- Roughness on bearing surfaces
- Contour and roughness of valve seats
- etc.

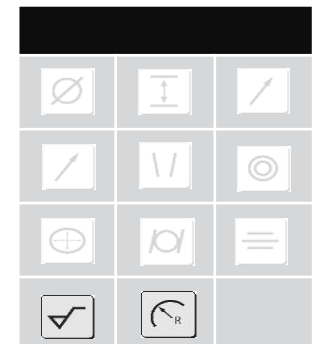
The Solution

This measuring station is designed for fully automatic contour and roughness measurement on large workpieces. The workpiece is positioned during the automatic program sequence via two CNC linear axes and one rotary axis. This arrangement of the axes allows a high flexibility with regard to measuring tasks and the accessibility of the corresponding measuring locations. Customer-specific workpiece clamping systems can be integrated.

The measuring station is designed for use in production. The programs, control and processes are designed in such a way that no specific expert knowledge is required for operation and the measuring station can be operated by workshop personnel.



Automation:	full-automatic
Main application:	cylinderblock, cylinderhead
Reference No:	52



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Typical Measurement Tasks



Manual Universal Measuring Station - Series 001

Measurement Task

Measurement of roughness and contour features depending on the drive unit applied

- Complex small parts
- Heavier workpieces
- Periodic measurement tasks

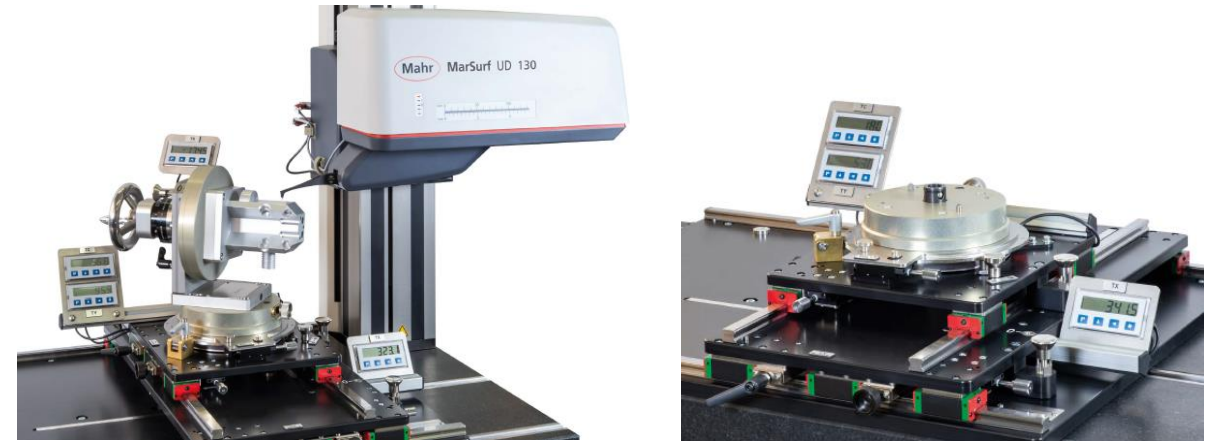
The Solution

This measuring station simplifies daily measuring tasks by using manual positioning axes placed on a standard measuring station (with a large granite plate).

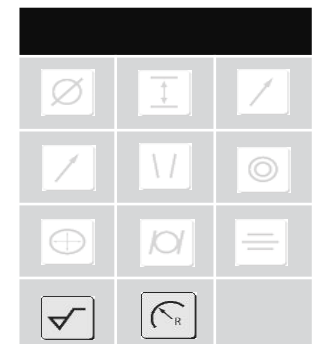
It is suitable for workpieces up to 30 kg and an edge length of up to 300 mm.

The basic axis comprises two linear axes TX and TY and a rotary axis TC which can be freely rotated through 360°. The axes are all equipped with digital position indicators. In addition, a fine positioning mechanism on each axis enables the sensitive alignment of the workpiece.

As an option, the measuring station can also be expanded with one or two additional swivel axes (TA or TA/TB) by means of a standard quick-change interface.



Automation:	manual
Main application:	gear; camshaft
Reference No:	22



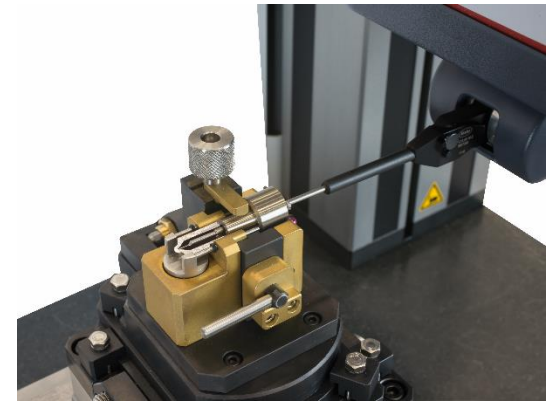
Measuring Station for Nozzle Bodies

Measurement Task

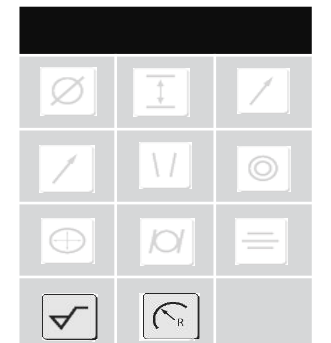
- Nozzle Body and workpieces with small bores
- Complete measurement of roughness and contour features within the nozzle (cone, seat, seat angle, blind hole, half-angle, guide diameter)

The Solution

The measuring system is based on a standard MarSurf LD 130 measuring station and is suitable for the fully automatic measurement of nozzle bodies. For each nozzle body type, an auxiliary fixture is manually set up once with an XY table integrated into the fixture. Once this has been done, the fully automatic measurement of the nozzle can be performed. Different fixtures, once aligned, can be changed at any time without further set-up. The particularly small probe tip (0.45 mm total height) is designed to be inserted into a blind hole with a diameter of approx. 0.6 mm. Afterwards the measurement of the complete inner contour is carried out. A special software routine ensures that the blind hole is approached automatically in several steps. This solution is used for fast series measurement, as further set-up work is not necessary.



Automation:	semi-automatic
Main application:	injection system
Reference No:	77



Flexible Fully Automatic CNC Measuring Station - Series 1000

Measurement Task

Roughness and high precision contour measurement on:

- Injection parts like: pump housing, nozzle needle, injection cylinder head
- Cams
- Centrifugal pump housing
- Break discs

The Solution

This fully automated measuring station with 5 positioning axes (three linear and two rotational axes) is particularly suitable for small workpieces weighing up to 10 kg and a volume of up to 1 liter, e.g. nozzle body or valve needles.

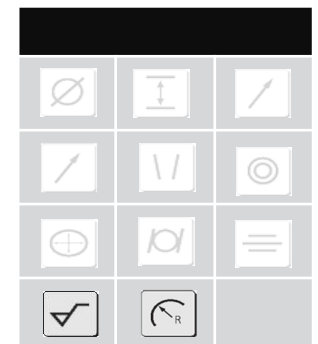
The measuring station stands for a high degree of efficiency and flexibility for the production or measuring room.

The measuring station concept is characterized by:

- Full automatic operation without any user interference
- Reproducible clamping of different workpiece fixtures
- Proximity to production - time-savings due to short distances
- "One-touch operation" - easy to use and reliable results
- Time savings - no set-up time is required for each measurement
- Statistic evaluation of each characteristic



Automation:	full-automatic
Main application:	injection system; camshaft
Reference No:	6



Measuring Station for Small Workpieces - S1100

Measurement Task

- Fully automatic roughness measurement
- Fully automatic, high-precision contour measurement
- Inner and outer geometries
- Typical workpieces: injector body, nozzle, valve seat, needle
- Fast serial measurement

The Solution

This measuring station enables fully automatic measurements combined with maximum flexibility. The measuring station allows the simultaneous use of up to six different clamping devices for different workpieces. Thus, a large number of different measuring tasks and workpieces can be carried out without loss of time due to set-up, recalibration, etc.

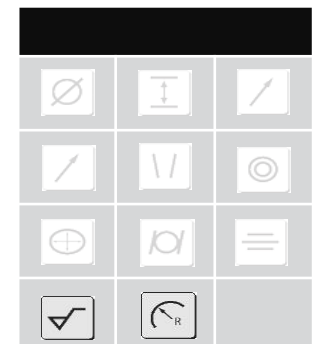
Due to the high degree of automation in combination with an automatic probe arm changer, a fully automatic measuring sequence is realised without any user interaction. The operator interface is designed in such a way that the measuring station can be operated by workshop personnel in daily use.

The measuring station layout is available for use in the measuring room or also for direct use in the production area.



Automation:	full-automatic
Main application:	injection system

Reference No:	17
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Fully Automatic Measuring Station for Injection Parts - Series 1200

Measurement Task

- Fully automatic roughness measurement
- Fully automatic, high-precision contour measurement
- Inner and outer geometries
- Typical workpieces: injector body, nozzle, valve seat, needle
- Workpieces weighing up to 5 kg and with a volume of 2 litres (including workpiece clamping devices)

The Solution

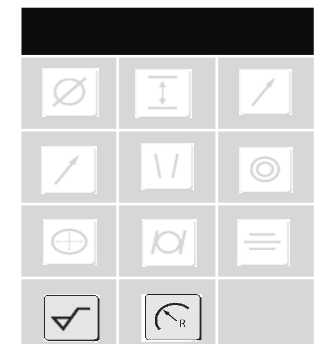
This measuring station enables fully automatic measurements with maximum flexibility due to five automatic workpiece positioning axes. The workpiece holder is designed with a clamping ball adapter, so that any number of different workpiece fixtures for a wide range of measuring tasks can be easily and reproducibly applied.

Due to the high degree of automation in combination with an automatic probe arm changer, a fully automatic measuring sequence is realised without any user interaction. The operator interface is designed in such a way that the measuring station can be operated by workshop personnel in daily use.

The measuring station layout is available for use in the measuring room or also for direct use in the production area.



Automation:	full-automatic
Main application:	injection system
Reference No:	76



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Product Line MarSolution

Based on Millimar Programm



Typical Measurement Tasks



Measuring Device for Crankshaft

Measurement Task

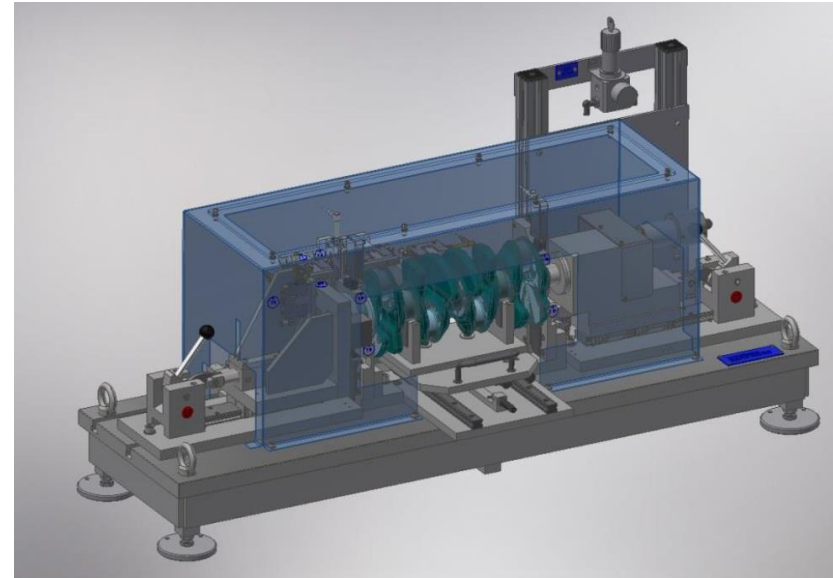
- Main Bearing: Diameters , Roundness, Runout, Width
- Flange: Diameter, Runout

The Solution

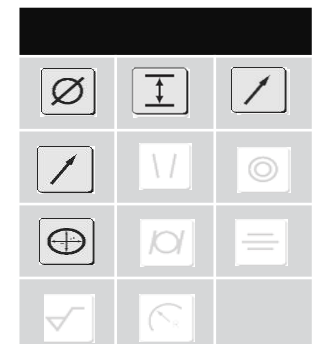
This measuring station is designed for manual loading by workshop personnel. The workpiece is placed on a slide in pre-storage prisms. The workpiece is then transported into the device. In this position the workpiece is lifted out of the prisms and clamped between centres. The measurement is started. All static and dynamic measuring tasks are performed automatically.

Finally, the results are displayed and transferred to a QA database. The workpiece is moved out of the measuring device by means of the loading slide and can be removed.

The measuring station concept can generally be adapted to different measuring tasks and shaft types.



Automation:	semi-automatic
Main application:	crankshaft; shaft
Reference No:	81



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Typical Measurement Tasks



Manual Measuring Station for Shafts

Measurement Task

This measuring station is available with different configurations regarding drive units, such as the PCV, GD120 (side-cranked) or LD130. Depending on the drive unit applied the station enables contour and/or roughness measurement.

The design is to measure flexible features like radii, straightness, roughness on bearing surfaces etc.. of larger turned parts e.g. crankshafts.

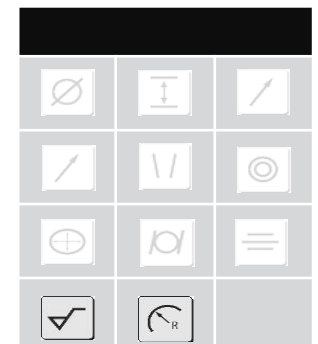
The Solution

This measuring station has been designed for measurement of large shafts up to 1.600mm (larger versions are available on request).

The workpiece is loaded and positioned manually. The measuring position is approached by manually moving the measuring column. The column is mounted on a manual HX-axis aligned parallel to the work piece axis. A additional HY-axis at right angle aligned to the workpiece axis is used for fine adjustment and zenith search. The crankshaft can be turned within the POM-coated supports manually. This enables maximum accessibility to the features which needs to be measured, especially to the surface of crank bearings.



Automation:	manual
Main application:	shaft; crankshaft
Reference No:	5



Measuring Station with Aircushioned Positioning Table

Measurement Task

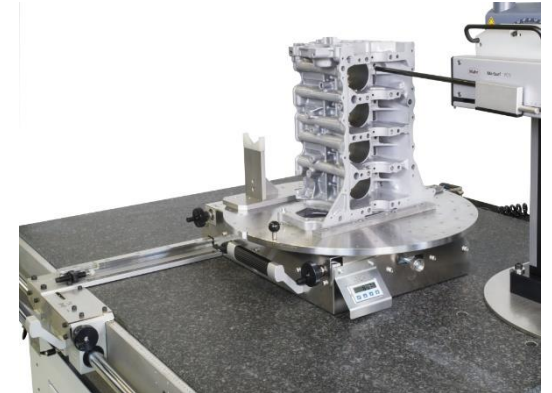
- Roughness and contour measurement
- Depending on the measuring task, all drive units from the Mahr can be applied
- Combination of several different drive units are possible
- Workpiece weight up to 250 kg

The Solution

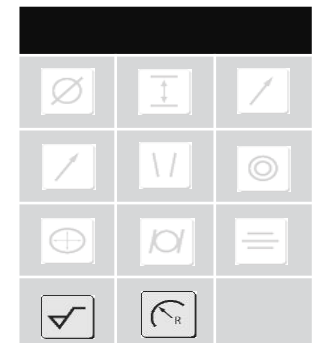
Measuring station with air-bearing positioning table for comfortable and precise positioning of large workpieces.

The guided axes allow positioning of the workpieces in TX, TY and TC direction. Each axis can be adjusted separately by simple and fast pre-positioning and subsequent fine adjustment. Each axis can be locked separately with a parking brake.

The mounting plate (Ø 600 mm) has a hole pattern with M6 threads at 50 mm intervals (Witte system). This allows the user to flexibly realise workpiece supports on site.



Automation:	manual
Main application:	motorblock; crankshaft; gearbox
Reference No:	23



Flexible Manual Measurement Station

Measurement Task

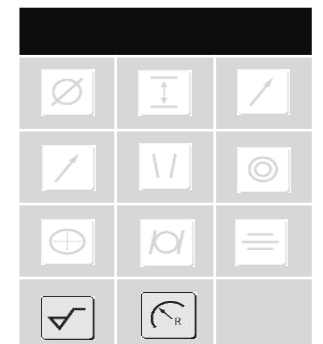
- General contour and roughness measurement tasks
- Roughness measurement on main and journal bearings
- Radii at bearing joints

The Solution

Basic setup of this measurement station is a standard XCR20 LD260 measurement station in combination with a 1500mm x 1000mm granite. The HZ-column is fixed at the granite. The workpiec support system is carried by an air plate to enable easy movement of quite heavy workpieces. On top of the airplate system a fixture with a mechanical TB swivelling axis is installed. Therefore the granite has been surrounded by a safety boundry.



Automation:	manual
Main application:	shaft, crankshaft
Reference No:	26



Automatic Measuring Station for Crank- and Camshaft

Measurement Task

- Roughness and contour measurement on big camshafts and Crankshafts e.g. truck industry
- Measurement of main and pin bearings
- Roughness of the cheeks
- Contour and roughness of undercuts or radii on main and pin bearings
- Center hole on the front sides

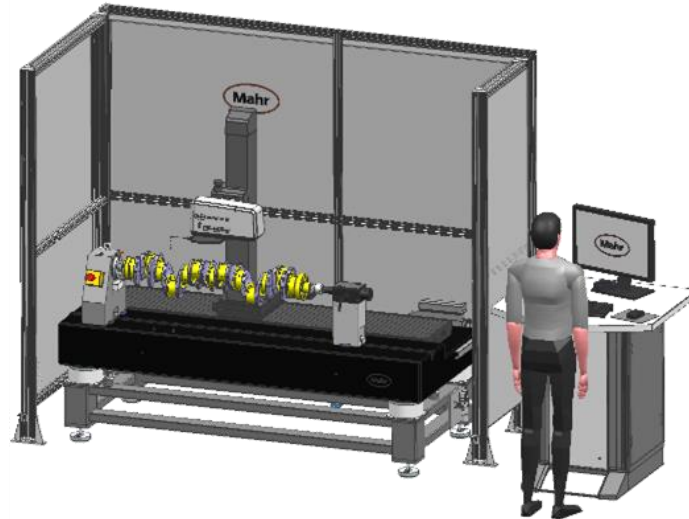
The Solution

This measuring station is specially designed for the full automatic measurement of roughness and contour features on crankshafts and camshafts. The full automatic process enables reliable and reproducible measurement results of complex and demanding measuring tasks without any operator influence. Thus the daily use of the measuring station by trained but not metrologically trained personnel is possible.

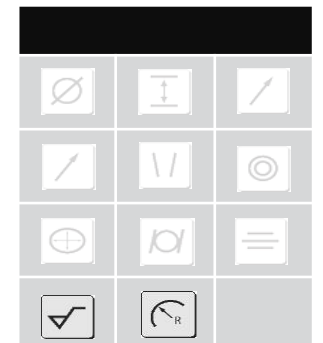
The possibility of swiveling the drive unit +/- 45 ° enables operation with a minimized number of different clamping positions.

The 2 storage prisms are axially displaceable. Means, the workpieces can be inserted and then stretched between tips. Typically measuring tasks are:

- Roughness and contour on main and pin bearings
- Roughness of the cheeks
- Contour and roughness of undercuts or radii on main and pin bearings
- Center hole on the front sides



Automation:	full-automatic
Main application:	shaft, crankshaft, camshaft
Reference No:	50



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Product Line MarSolution

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Typical Measurement Tasks



WMV - Modularized Shaft Measuring Device

Measurement Task

- Diameter and length measurement on shafts in the production environment
- Dimensional inspection of workpieces, gears, concentricity in the tooth flank
- Repeatability +/- 0.001 mm

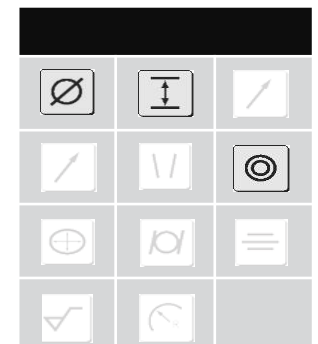
The Solution

Workpiece is clamped by center-tips. Workpiece can be shifted by pulling to right or left direction into two measuring positions.

- Modularized design of the measuring device enables quick conversion for other work piece types and measurement tasks
- Work piece size: max. Ø 150 x 400 mm
- Measuring visualization: measuring computer, Millimar display column, Millimar dial gage



Automation:	manual
Main application:	shaft, camshaft, gear
Reference No:	60



Measuring Device for Camshaft

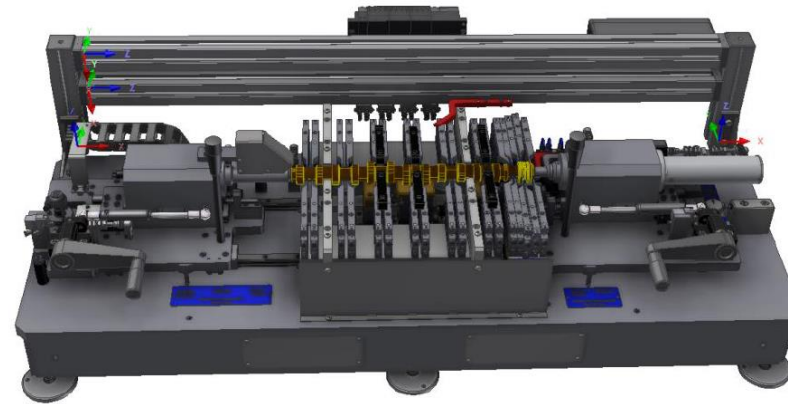
Measurement Task

- Diameter
- Roundness
- Runout
- Cylindricity
- Distances

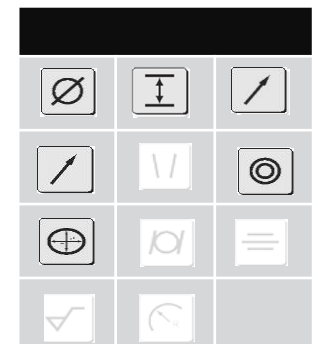
The Solution

This measuring station is designed for manual loading by workshop personnel. For this purpose, the workpiece is placed in pre-storage prisms. After loading, the workpiece is picked up between centres by means of manual operated tail-stocks on both sides and the measurement is started. All static and dynamic measuring tasks are performed automatically. Finally, the results are displayed and transferred to a QA database.

The measuring station concept can generally be adapted to different measuring tasks and shaft types.



Automation:	semi-automatic
Main application:	camshaft; shaft
Reference No:	82



Measuring Station for Dynamic Cam Angle Determination

Measurement Task

- Determination of the cam angle of drive and output camshaft in relation to the integrated Hall sensors
- Dynamic measurement of the cam angle in the cylinder head cover
- Evaluation of the cam angle as "best fit"
- Graphic representation of the cam shape / result

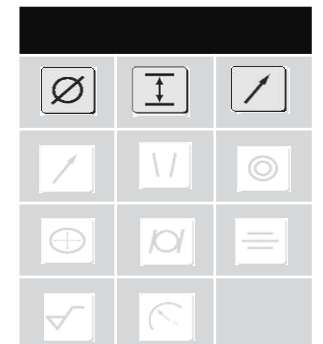
The Solution

This measuring station is designed for 100% end-of-line measurement of cylinder head covers and the camshafts already mounted in them. The station is integrated into the production line. Loading and unloading is done by a robot. After loading the actual measuring cell, the measurement is carried out. Depending on the design and cycle time requirements, the station is equipped with several measuring cells that can be loaded in parallel.

The evaluation of the cam angle is carried out as a "best-fit" similar to a form tester with graphic display of the result.



Automation:	inline
Main application:	camshaft, cylinderhead
Reference No:	83



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Typical Measurement Tasks



Manual Universal Measuring Station - Series 001

Measurement Task

Measurement of roughness and contour features depending on the drive unit applied

- Complex small parts
- Heavier workpieces
- Periodic measurement tasks

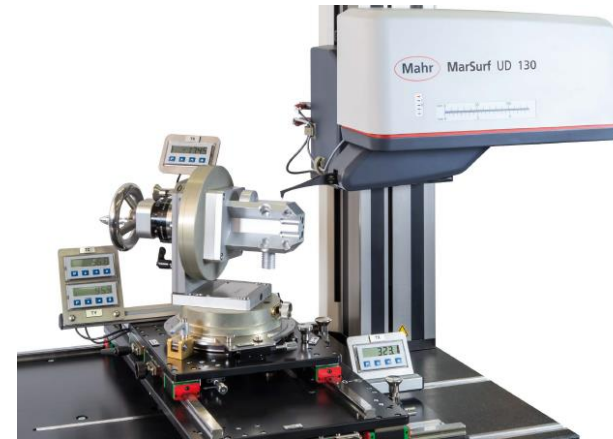
The Solution

This measuring station simplifies daily measuring tasks by using manual positioning axes placed on a standard measuring station (with a large granite plate).

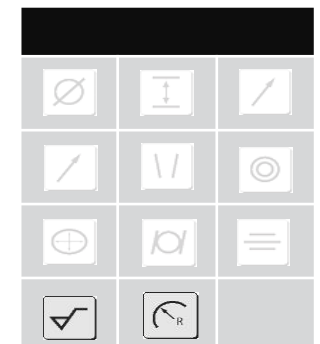
It is suitable for workpieces up to 30 kg and an edge length of up to 300 mm.

The basic axis comprises two linear axes TX and TY and a rotary axis TC which can be freely rotated through 360°. The axes are all equipped with digital position indicators. In addition, a fine positioning mechanism on each axis enables the sensitive alignment of the workpiece.

As an option, the measuring station can also be expanded with one or two additional swivel axes (TA or TA/TB) by means of a standard quick-change interface.



Automation:	manual
Main application:	gear; camshaft
Reference No:	22



Measuring Station with Aircushioned Positioning Table

Measurement Task

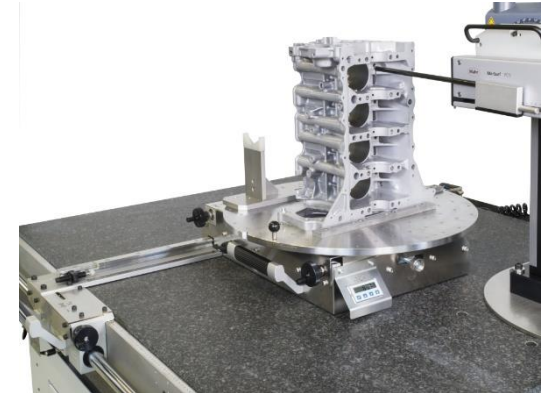
- Roughness and contour measurement
- Depending on the measuring task, all drive units from the Mahr can be applied
- Combination of several different drive units are possible
- Workpiece weight up to 250 kg

The Solution

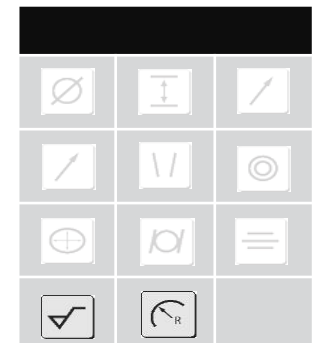
Measuring station with air-bearing positioning table for comfortable and precise positioning of large workpieces.

The guided axes allow positioning of the workpieces in TX, TY and TC direction. Each axis can be adjusted separately by simple and fast pre-positioning and subsequent fine adjustment. Each axis can be locked separately with a parking brake.

The mounting plate (Ø 600 mm) has a hole pattern with M6 threads at 50 mm intervals (Witte system). This allows the user to flexibly realise workpiece supports on site.



Automation:	manual
Main application:	motorblock; crankshaft; gearbox
Reference No:	23



Flexible Fully Automatic CNC Measuring Station - Series 1000

Measurement Task

Roughness and high precision contour measurement on:

- Injection parts like: pump housing, nozzle needle, injection cylinder head
- Cams
- Centrifugal pump housing
- Break discs

The Solution

This fully automated measuring station with 5 positioning axes (three linear and two rotational axes) is particularly suitable for small workpieces weighing up to 10 kg and a volume of up to 1 liter, e.g. nozzle body or valve needles.

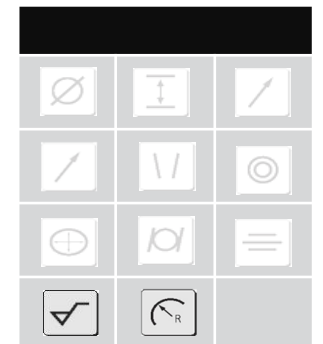
The measuring station stands for a high degree of efficiency and flexibility for the production or measuring room.

The measuring station concept is characterized by:

- Full automatic operation without any user interference
- Reproducible clamping of different workpiece fixtures
- Proximity to production - time-savings due to short distances
- "One-touch operation" - easy to use and reliable results
- Time savings - no set-up time is required for each measurement
- Statistic evaluation of each characteristic



Automation:	full-automatic
Main application:	injection system; camshaft
Reference No:	6



Full Automatic Measuring Station for Cam Pieces - Series 1201

Measurement Task

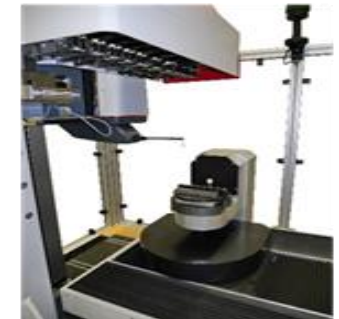
- Roughness and contour
- Cam pieces in long and short version
- Workpieces with a weight of up to 5 kg and a volume of approx. 2 litres (including workpiece clamping devices)

The Solution

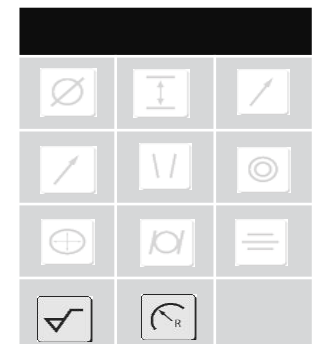
This measuring station enables fully automatic measurements with maximum flexibility due to five automatic workpiece positioning axes. The workpiece holder is designed with a clamping ball adapter, so that any number of different workpiece fixtures for a wide range of measuring tasks can be easily and reproducibly applied.

Due to the high degree of automation in combination with an automatic probe arm changer, a fully automatic measuring sequence is realised without any user interaction. The operator interface is designed in such a way that the measuring station can be operated by workshop personnel in daily use.

The measuring station layout is available for use in the measuring room or also for direct use in the production area.



Automation:	full-automatic
Main application:	cam parts, shaft
Reference No:	21



Automatic Measuring Station for Crank- and Camshaft

Measurement Task

- Roughness and contour measurement on big camshafts and Crankshafts e.g. truck industry
- Measurement of main and pin bearings
- Roughness of the cheeks
- Contour and roughness of undercuts or radii on main and pin bearings
- Center hole on the front sides

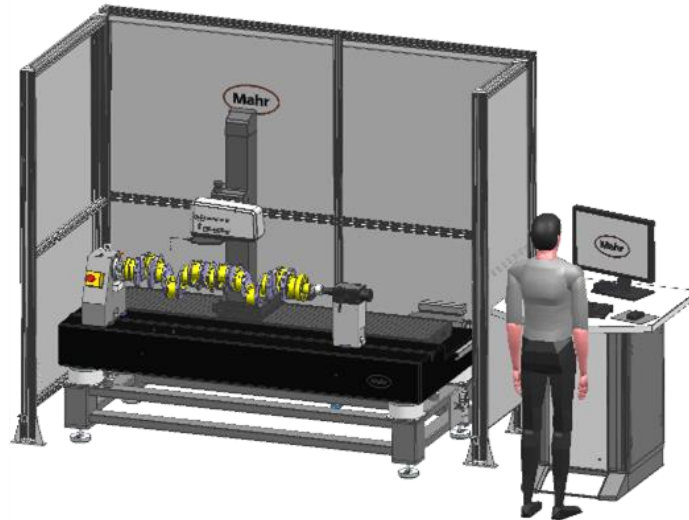
The Solution

This measuring station is specially designed for the full automatic measurement of roughness and contour features on crankshafts and camshafts. The full automatic process enables reliable and reproducible measurement results of complex and demanding measuring tasks without any operator influence. Thus the daily use of the measuring station by trained but not metrologically trained personnel is possible.

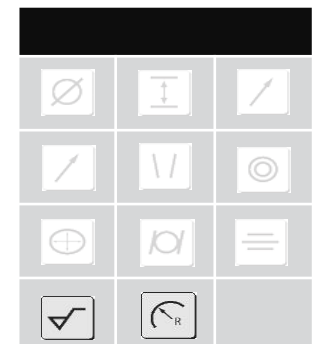
The possibility of swiveling the drive unit +/- 45 ° enables operation with a minimized number of different clamping positions.

The 2 storage prisms are axially displaceable. Means, the workpieces can be inserted and then stretched between tips. Typically measuring tasks are:

- Roughness and contour on main and pin bearings
- Roughness of the cheeks
- Contour and roughness of undercuts or radii on main and pin bearings
- Center hole on the front sides



Automation:	full-automatic
Main application:	shaft, crankshaft, camshaft
Reference No:	50



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Product Line MarSolution

Based on Millimar Programm



Typical Measurement Tasks



Air Gaging on Gear Housings

Measurement Task

- Diameter measurement
- Set of 12 air gages to measure different dimensional features on gearbox housings

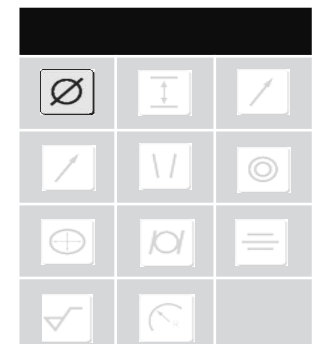
The Solution

Applying the different plugs different diameters can be measured. Applying air gaging technology the system is very robust and the measurement results are very reliable even applied straight at the shop floor. High-precision measurements can be carried out by personnel not trained in metrology.

The software-based user guidance guides the operator through the various measuring tasks.



Automation:	manual
Main application:	gearbox
Reference No:	12



Diamar nk - Universal Measuring Unit for Shop Floor

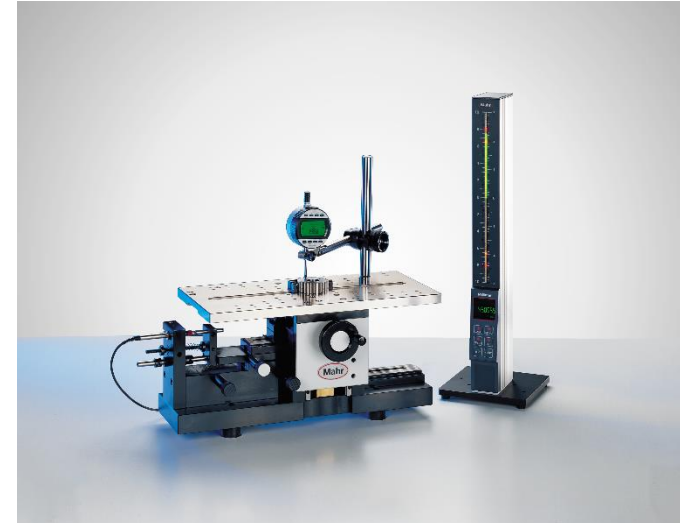
Measurement Task

- Outside and inner diameters
- Testing the dimension over balls on internal and external gears
- Heights

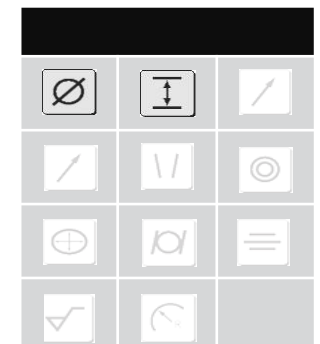
The Solution

- Base with table top 350 mm x 180 mm (13.78 in x 7.09 in) and location holes for mounting accessories
- 1 mounting device for holding the fixed probe arm
- 1 spring-loaded retraction unit for holding the moveable probe arm
- Retraction range 25 mm (.9843 in), can be limited
- 1 probe holder/dial indicator holder
- 1 height adjustment facility for the table top, adjustment range 50 mm (1.969 in)

Part-specific accessories, such as stop rail, support plate, locating pin, measuring systems, etc., are available on request. Suitable evaluation units are all Millimar instruments with probes, also indicators and test indicators.



Automation:	manual
Main application:	gear, ring
Reference No:	54



Diamar 280 - Universal Measuring Unit for Shop Floor

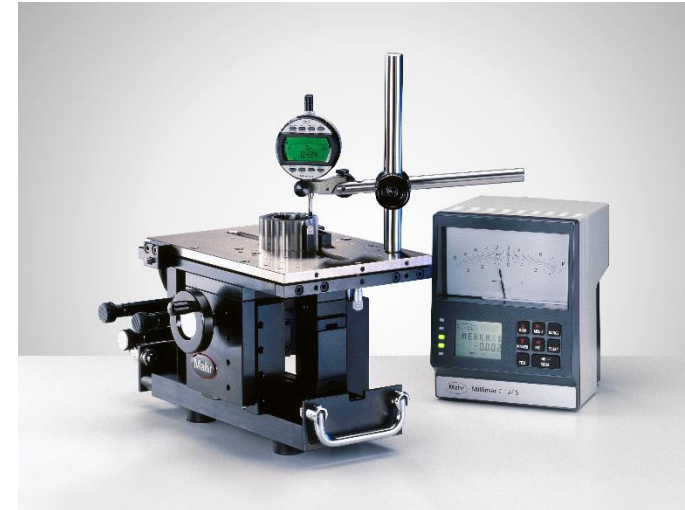
Measurement Task

- Outside and inner diameters
- Testing the dimension over balls on internal and external gears
- Heights

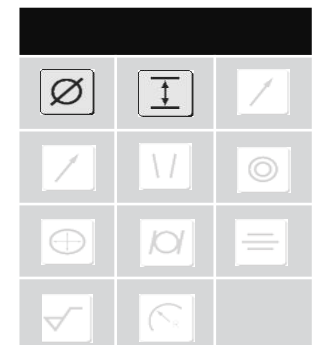
The Solution

- Base with table top 255 mm x 180 mm (10 in x 7.1 in) and location holes for mounting accessories
- 1 mounting device for holding the fixed probe arm
- 1 spring-loaded retraction unit for holding the moveable probe arm
- Retraction range 20 mm (.8 in), can be limited at will
- 1 probe holder/dial indicator holder
- 1 height adjustment facility for the table top, adjustment range 45 mm (1.77 in)
- Adjustable inclination of the table

Part-specific accessories, such as stop rail, support plate, locating pin, measuring systems, etc., are available on request. Suitable evaluation units are all Millimar instruments with probes, also indicators and test indicators.



Automation:	manual
Main application:	gear, bearing, rings
Reference No:	55



KMR - Gear Measuring Device Using Dimension Over Balls

Measurement Task

For the measurement of diameters and concentricity in the manufacturing environment

- Dimensional testing of gears
- Dimension over balls, measurement of diameter and run-outs - repeatability: +/- 0.001 mm
- Allows for immediate reaction to and identification of faulty parts

The Solution

Workpiece is located in the center of the device. When workpiece is setup on the right hand side a probe will be moved manually operated by a lever to measurement position.

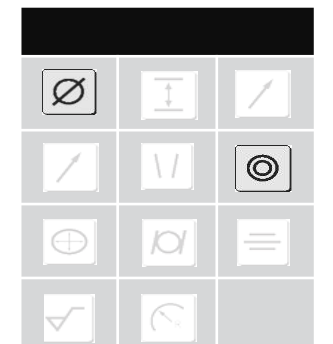
The actual measurement can be triggered by the computer applied or by foot-switch.

Measurement evaluation can be done by products out of the Millimar programm suitable for operation with two probes.

- The flexible design of the measuring device enables a quick changeover to other types of workpieces
- 6 versions of the KMR gage enable the choice of the best possible configuration for the measurement
- Design is suitable for measurement directly at the processing machine



Automation:	manual
Main application:	gear
Reference No:	56



KMW - Modularized Shaft Measuring Device

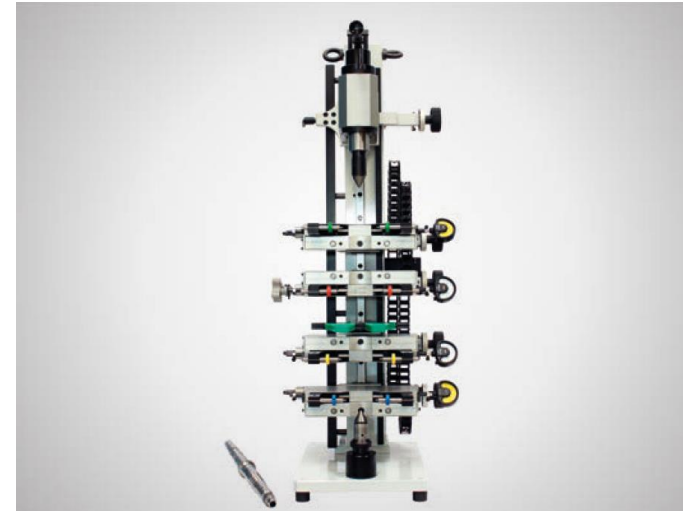
Measurement Task

- Measurement of diameter and runout in production environment
- Dimensional testing of shafts
- Using dimension over balls, measurement of diameter and runouts repeatability: +/- 0.001 mm
- Allows immediate reaction and identification of faulty parts

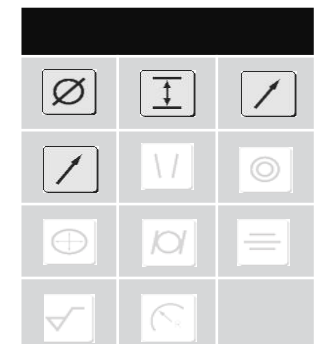
The Solution

The workpiece is clamped with centering tips. Optionally, the probes can be applied pneumatically to protect the tips from wear. Then the measurement takes place. The measurement results can be displayed by reading out the dial gauges or, if probes are used, on an evaluation computer.

The fixture is suitable for use directly in production. The modular design of the fixture allows quick and easy changeover to other workpiece types and measuring tasks. Workpieces up to max. Ø 120 mm and a length of 600 mm can be measured. Other dimensions are available on request.



Automation:	manual
Main application:	shaft, gear
Reference No:	57



RLV - Runout Measuring Device

Measurement Task

This measuring device is especially suited for run-out measurement on the tooth flank of gears in the production environment.

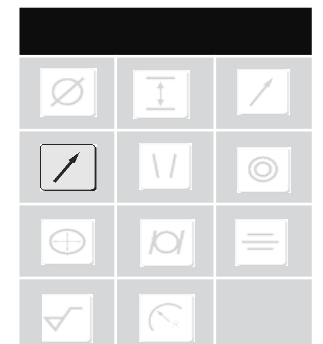
- Dimensional testing of workpieces, gears, run-outs on the tooth flank
- Repeatability +/- 0.001 mm

The Solution

- Workpiece size: max. Ø 200 mm
- Measuring visualization: measuring computer, Millimar display column, Millimar dial gage
- The ergonomic handling allows operators who are not versed in metrology to provide reliable measuring results
- A individual solution for production in order to measure workpieces directly at the processing machine
- Allows for immediate reaction and identification of faulty parts
- The flexible construction of the measuring device enables quick conversion for other workpiece types (different diameters).



Automation:	manual
Main application:	gear
Reference No:	58



UKTP - Universal Control Device Transmission Run-Out

Measurement Task

Dimensional testing of gears. For the measuring of axial and radial run-out as well as lengths in the production environment.

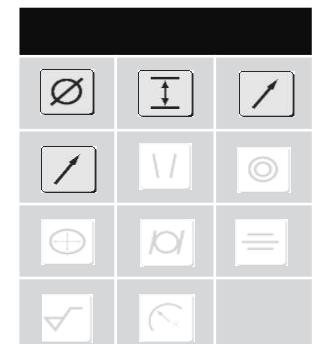
- Axial and radial run-out
- Lengths and heels on gears +/- 0.001 mm

The Solution

- Workpiece measurement directly at the processing machine
- Allows immediate identification and reaction to faulty parts
- The flexible design of the measuring device enables quick conversion for other workpiece types (different diameters)
- Workpiece size: max. Ø 100 mm
- Measuring visualization: measuring computer, Millimar display column or Millimar dial gage



Automation:	manual
Main application:	gear
Reference No:	59



Diameter Measurement and Misalignment of Diameters

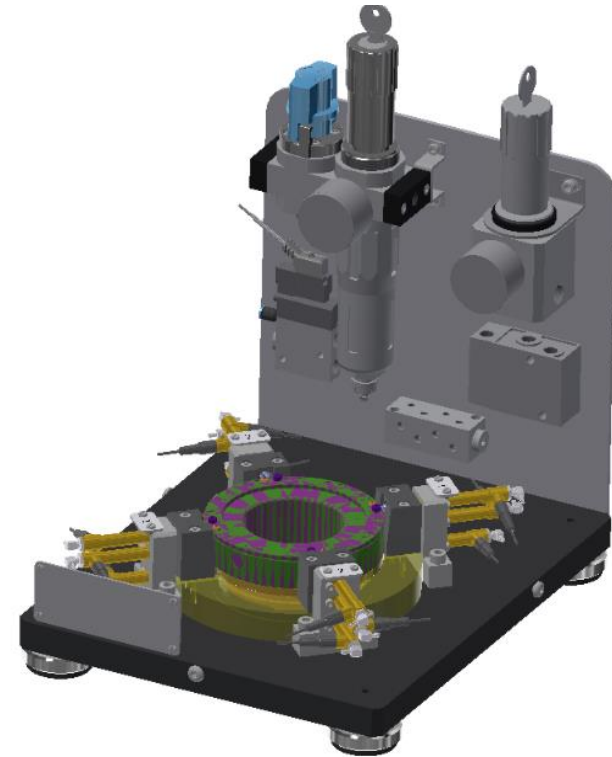
Measurement Task

- Static measurement of two diameters
- Diameters are measured every 90°
- Misalignment of two related diameters

The Solution

Solution is designed to measure planet-wheel carrier of a gear drive. Part is loaded manually. Afterwards probes are being automatically attached, measurement is performed, probes are being withdrawn and measurement result is displayed together with information that measurement is finalized.

The design fits work-shop surroundings.



Automation:	manual
Main application:	gear
Reference No:	65



Measurement of Gear Tooth Alignment

Measurement Task

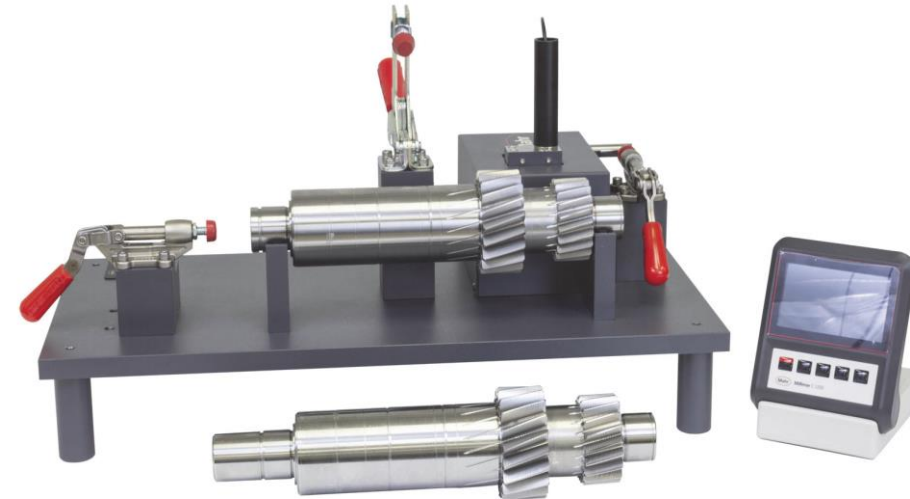
- Measurement of gear tooth alignment / true position of shaft, in relation to specific Datum
- Contact points are set for specific location on the part
- 0.076 mm true position WRT Datum A-B-C and reference face C, along the AB axis

The Solution

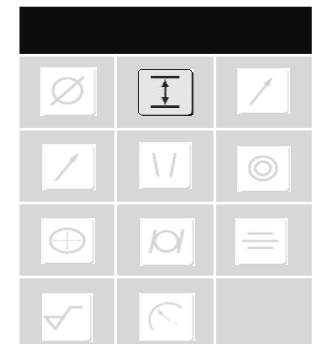
Bench fixture, with a small footprint, designed with V-mounts, two part clamps, measuring gage head lock, and amplifier readout. The workpiece will be loaded on V-blocks and is afterwards fixed by a holder utilized by a lever. Applying a second lever the workpiece will be fixed precisely into the V-blocks. The clamp is used to hold the part securely for the measurement but without affecting the measurement adversely or distort the part. The pantograph assembly insures that the measurements are accurate and repeatable with even applied gaging force.

The gage includes a precision fixture using one inductive probe and a C 1200 amplifier readout.

Optionally, there is a layout available with adjustable clamping system for the different part length.



Automation:	manual
Main application:	gear
Reference No:	14



Measuring Station for Double Clutch Components

Measurement Task

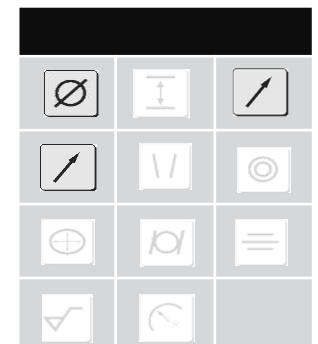
For measuring distances, diameters, axial and radial runout and concentricity in production environment. Dimensional check of double-clutch assemblies after the welding process. Repeatability: ± 0.02 . The real-time measurement results allow an immediate impact on rejects or rework results on the production.

The Solution

Semiautomatic measuring station for different assemblies of a double clutch. The workpieces are placed manually on a mandrel. A manual QR scanner captures the ID number of each statistical data control point. After closing the protective hood and pressing the start button, a dynamic measuring process for various features is carried out. The evaluation of the measurement results takes place via an integrated measuring software. A touch screen is used to visualize control and measurement results. The automatic recognition recognizes different workpiece types and loads the associated control and measuring programs. The desing is suitable for a 100% measurement directly on the processing machine. Due to the compact and mobile construction, a quick change of the site is possible. The cycle time is between 15 and 60 seconds, depending on the quantity and type of measurement characteristics.



Automation:	semi-automatic
Main application:	gear
Reference No:	61



Measurement of Disc Carrier for Automatic Gear

Measurement Task

- Radial run-out
- Axial run-out
- Teeth to teeth run-out
- Two-ball diameter
- Concentricity

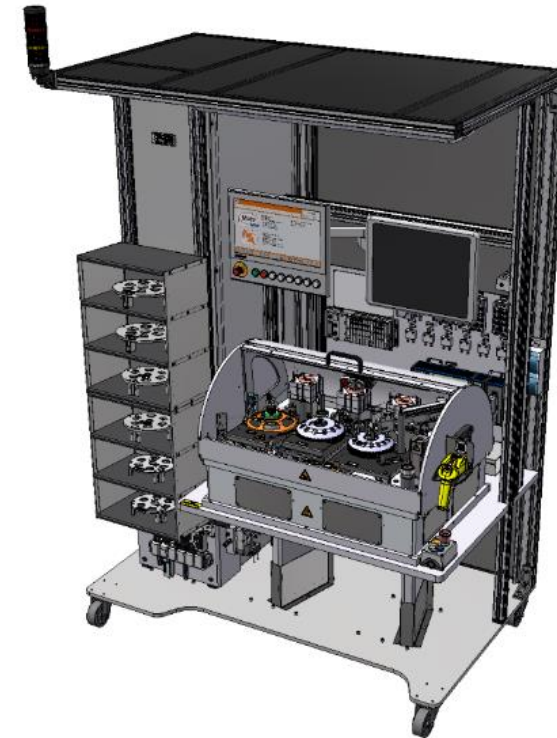
The Solution

Parts are recognized via Barcode-Scanner. The corresponding measuring programm is automatically been loaded.

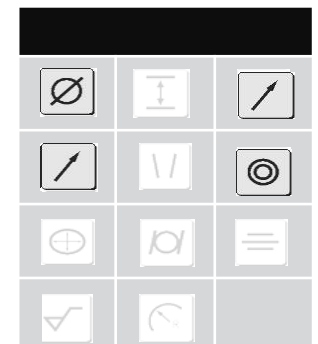
The work piece is loaded manually to the measurement station. After closing the housing, the dynamic, full-automatic measurement is been performed.

On the left hand side master workpieces are beeing stored for regular calibration of the station.

The working desk is optimized for ergonomics and full ajustable in flexible heights.



Automation:	semi-automatic
Main application:	gear
Reference No:	67



Inline Shaft Measurement

Measurement Task

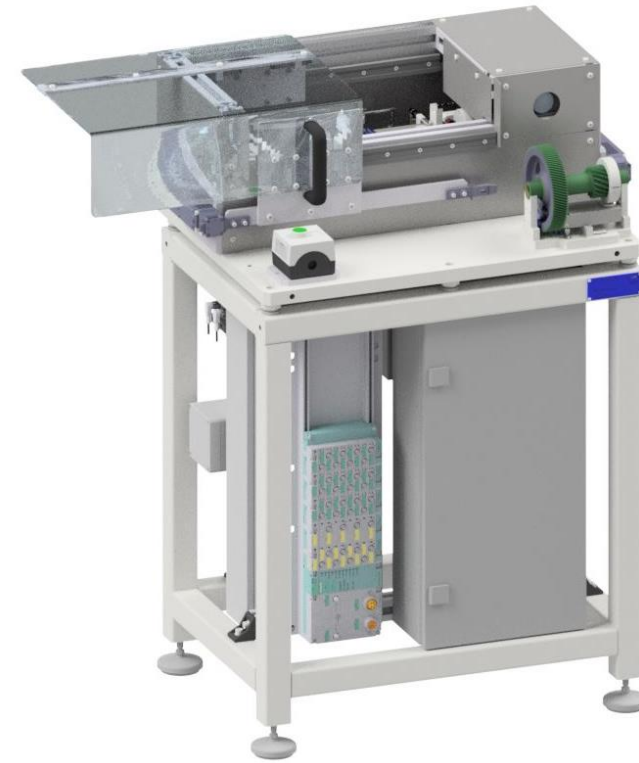
- Diameter on bearing carrier
- Axial runout on shaft

The Solution

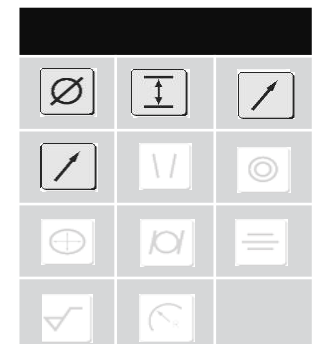
This measurement station is designed for both manual and automatic loading by applying a robot.

After loading the workpiece a housing will close the station automatically. Center tips will close to fix the workpiece. Static and dynamic measurements are being performed fully automatic.

Afterwards results being displayed and transferred to QS-Data-Base of the customer and housing is opened for unloading and loading of next workpiece.



Automation:	full-automatic
Main application:	shaft; gear
Reference No:	66



Measurement of Diameters on Gear-Shaft

Measurement Task

Measurement of different diameters on different sections statically.

Cycle time realized is 30 sec..

The Solution

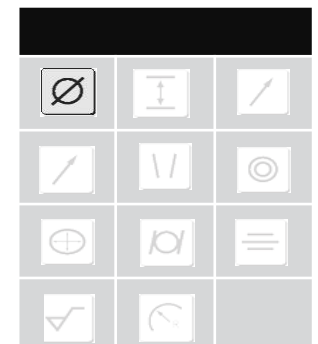
This automatic gage is for 100% measurement of diameter of gear secondary axis. The station is integrated in the production line. The procedure of measurement is:

- Auto loading
- Part type detection (data-matrix-camera)
- Removal on Vé + referencing
- Includes pneumatic measurement
- Auto unloading

The machine is design to measure different type of parts (flex plant approach). The adjustment of probes to serve the different geometries is done automatically depending on the information of data matrix information.



Automation:	inline
Main application:	shaft, gear
Reference No:	47



Inline Measurement of Differential Housing

Measurement Task

High precision measurement of different inner diameters and length of a differential gearbox

The Solution

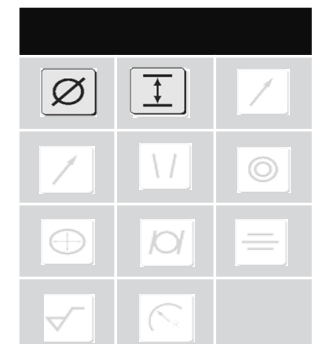
This solution is designed for full automatic inline operation. The parts are positioned to the measuring station by robot loading. During loading the measurement head is covered safely underneath a metal sheet housing. After loading process is finished the measurement head moves automatically axial into the workpiece. The measurement head is build as an mechanical bore gauge.

The special feature of this solution is the high accuracy of the measurement with a repeatability of 1 micron.

Cycle time realised is 10 s.



Automation:	inline
Main application:	gear
Reference No:	89



Engineered Solutions

Product Line MarSurf Engineered

Based on MarSurf Sensors



Typical Measurement Tasks



Roughness Measurement of Gap Between Tooth and Tooth Flank

Measurement Task

This measurement station is to measure roughness and contour partly-automated on tooth flanks and inbetween gap of tooth.

Applicable are external teeth - including helical gearing - and internal teeth.

Applying additional optional rotation axis with tail stock bearing e.g. surfaces on shafts can be also measured in axial direction.

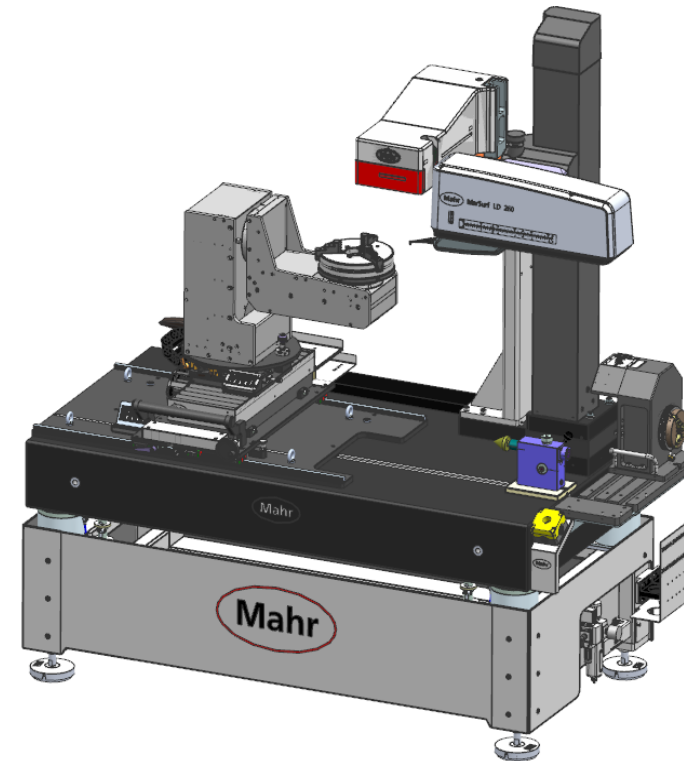
The Solution

The station is designed to serve to measurement tasks:

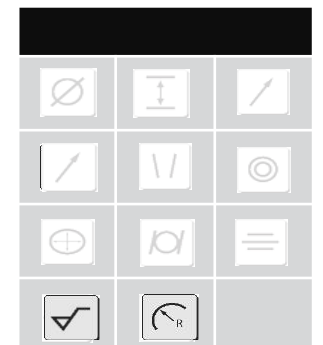
1) Tooth measurement - the measurement procedure starts with manual alignment in respect to the tooth gap. Afterwards the corresponding measurement program is started which includes the full-automatic operation of all axis and proceeding of all measurement tasks programmed in one step incl. automatic onward proceeding to all teeth selected to be measured.

The design allows long shafts as well which can be plunged thru the rim-chuck clamping device.

2) Standard measurement tasks - Set-up of full automatic axis can be moved to a storing position. Due to the space available in consequence the station can be used as a standard LD measurement station by applying e.g. CT300 or CNC-Modular rotation axis



Automation:	semi-automatic
Main application:	gear
Reference No:	70



Drive Shaft Measuring Station

Measurement Task

- Roughness
- Micro-contour like radii, distances, angles, etc.
- Serves a number of different operation steps during production process

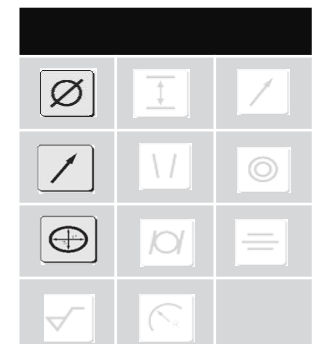
The Solution

This measuring station consists of a LD130 drive unit in combination with a Mahr Modular axis system. The CNC axis system allows automatic positioning of the workpiece, so that a number of measuring tasks can be processed without operator intervention.

The measuring station is also equipped with a larger granite and a customer-specific cabin. A height-adjustable monitor, keyboard and mouse are also available. When not in use, the measuring station can be closed by means of a rolling door. All in all, the measuring station is designed for use directly in production.



Automation:	semi-automatic
Main application:	shaft
Reference No:	91



Output Shaft Measuring Station

Measurement Task

- Roughness
- Micro-contour like radii, distances, angles, etc.
- Bevels / edge break
- Serves a number of different operation steps during production process

The Solution

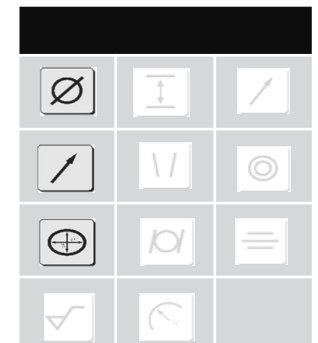
This measuring station consists of a UD130 drive unit in combination with a Mahr Modular axis system. The CNC axis system allows automatic positioning of the workpiece, so that a number of measuring tasks can be processed without operator intervention.

The Y-axis is used to search the zenith of the output shaft. Bores that are eccentrically positioned can also be approached and measured using this axis. The workpiece is tilted into various positions by means of the TB axis of rotation. Rotations of up to 180° are possible. This saves reclamping operations and ensures an uninterrupted, fully automatic process.

When not in use, the measuring station can be closed by means of a roller door. All in all, the measuring station is designed for use directly in production.



Automation:	semi-automatic
Main application:	shaft, gearbox
Reference No:	92



Fully Automatic Measuring Station for Gear Boxes - Series 2200

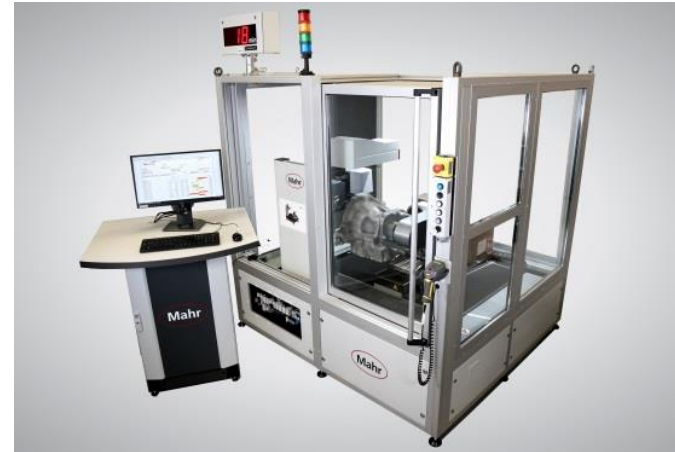
Measurement Task

- Full automatic roughness and contour measurement based on drive unit LD260
- Typically, high numbers of features and/or complex measurement tasks

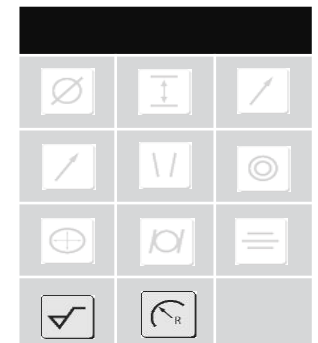
The Solution

This measuring station is designed to handle large components and measure contour and roughnesses on those fully automatically. High flexibility is granted due to six full automatic axis positioning the workpiece to the required position. Thanks to the user-friendly CNCplus software, the operator can operate the measuring station after only a brief introduction to the system.

The safety concept enables fast positioning and short testing times. Thanks to the active vibration damping system, the CNC measuring station can also be integrated directly into the production area. Thus, short distances and fast test results are achieved.



Automation:	full-automatic
Main application:	gear, motorblock, steering
Reference No:	49



Automatic Measuring of Transmission Plates - Series 9020

Measurement Task

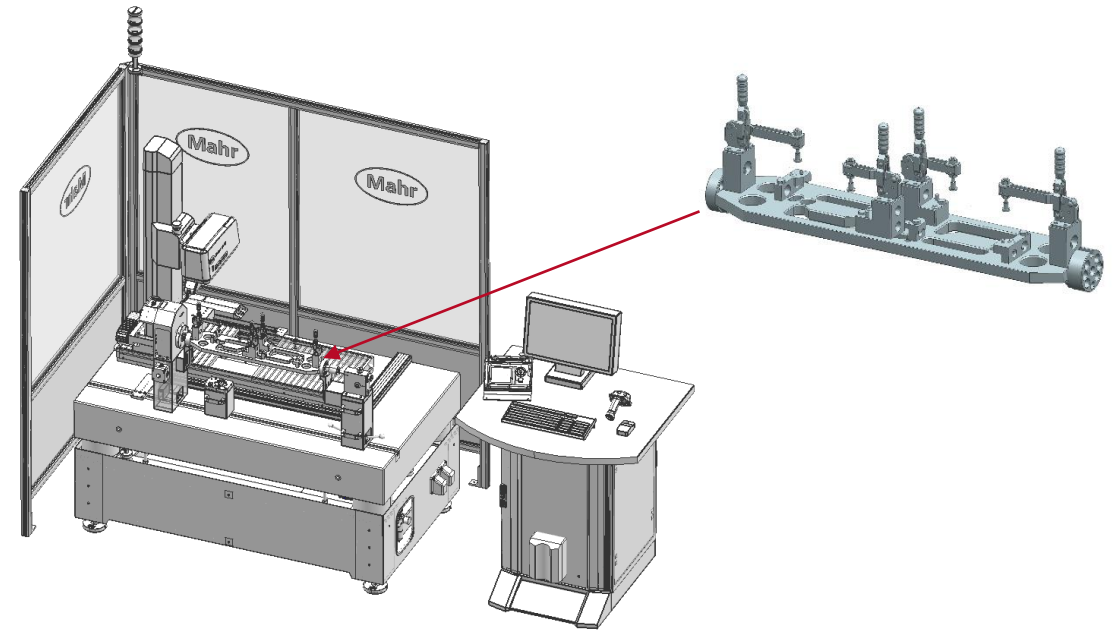
Contour and roughness measurement of transmission plates and rotationally symmetric parts e.g. shafts. Also further cubic geometries can be applied.

The Solution

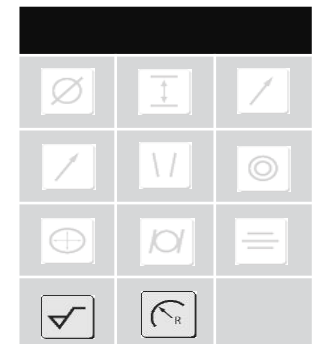
This measuring station is designed for the full automatic measurement of roughness and contour characteristics. The measuring direction is transverse to the workpiece axis. The clamping of the workpiece is either directly between tips (shafts) or clamping devices supporting cubic workpieces are been clamped between tips.

The measuring station concept is characterised by its outstanding features:

- Individual clamping options
- Very high degree of automation
- Measurement without influence even of non-trained operator
- Very easy handling even on complex and demanding measuring tasks



Automation:	full-automatic
Main application:	gear; shaft
Reference No:	51



Full-Automatic Roughness Measurement for Gear Flanks

Measurement Task

Skidless roughness measurement on gear wheel and gear shaft

- External toothing of straight or helical gears
- Different positions of teeth on the workpiece in one run
- Right and left tooth flanks
- Different number of teeth and modules (1 to 6)
- Freely configurable measuring tasks

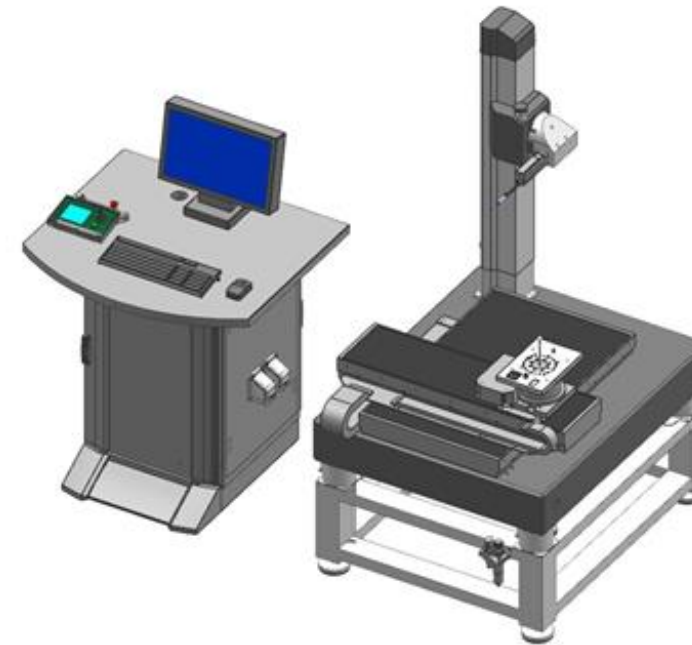
The Solution

This measuring station is build for roughness measurement on large gear wheels and gear shafts (Ø 15 mm - 400 mm). In contrast to all competitive systems this station comes with a skidless system, which allows very high precise and reliable measurements in respect to metrology standards.

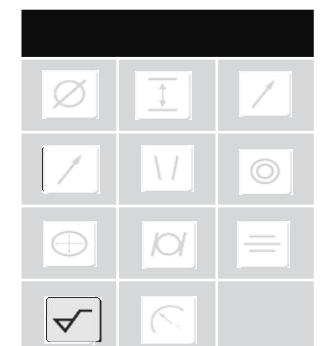
The station comes with a family program "Gear Measurement". Therefore it requires no specific measuring knowledge as well as no programming skills for operation the stations. Only gear parameter like modul, root diameter, etc. needs to be entered and measurement tasks needs to be selected by means of a user-guided mask.

The measuring sequence is without any further user intervention:

- Automatic tooth gap search
- No reclamping of workpiece
- No change of probe arms



Automation:	full-automatic
Main application:	gear
Reference No:	71



Full Automatic Measuring Station Including Workpiece Feeding

Measurement Task

- Roughness and contour
- Channels, bore holes and sealing surfaces on transmission plate of automatic gear
- Suitable also for other work pieces e.g. brake disc, injection components, etc.

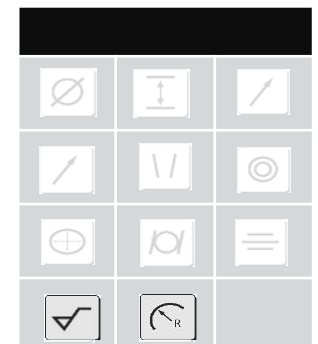
The Solution

This fully automated measuring station enables complex measurement processes without any user interference. To allow maximum flexibility it comes with 5 CNC positioning axes and a probe arm changer.

Attached to the measurement system there is a workpiece storage and feeding system. Up to 15 work pieces can be stored and in consequence measured in one automatic cycle. This allows a maximum degree of utilization of the station in combination with minimal efforts in resources and impact on results by staff.



Automation:	full-automatic
Main application:	gear
Reference No:	84



Flexible Roughness and Contour on Medium Sized Workpieces

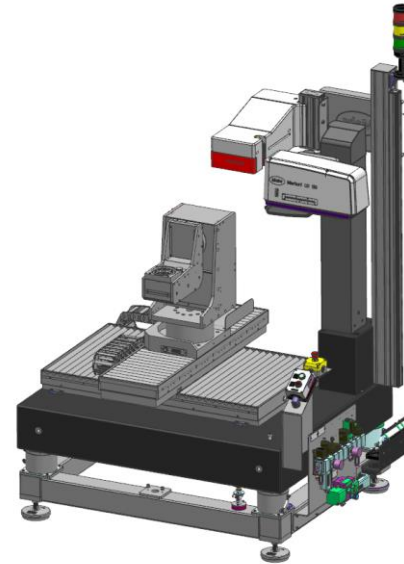
Measurement Task

Measurement of roughness and contour on shafts and for e drive shafts, complex workpiece geometries such as pump housings, etc. up to \varnothing 300mmx225mm and 15 kg.

Optionally family program "Gear" is available for high accuracy measurement of surface roughness. This allows measurement on the most complex gear geometries without special programming knowledge.

The Solution

This roughness and contour measuring station with LD130 is characterized by 6 axes of motion and an automatic probearm changer. This allows a very flexible and fully automatic measuring of workpieces. Due to the 3 linear and 3 rotary axes, the workpieces can even be measured from all 6 sides depending on the clamping. The system was designed for the measurement of drive shafts of electric drives, but can be used universally for workpieces of medium size. The machine is protected by a two-sided housing and is operated from the front side.



Automation:	full-automatic
Main application:	gear
Reference No:	87

