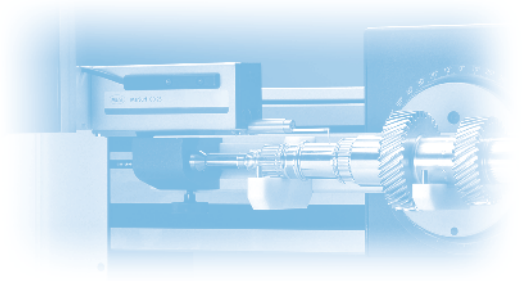
MARSURF I CNC *premium*



FULLY AUTOMATED MEASURING STATIONS

Mahr

EXACTLY

STANDARD MEASURING TECHNOLOGY COMBINED WITH SPECIALISED TECHNOLOGY
PRECISION FOR YOUR SERIES WORKPIECES

► | Nowadays, roughness and contours have to be measured as close to production as possible. Quality trends and data need to be available at virtually the same time as the manufactured products so that effective action can be taken. Moving the measuring instrument from the measuring room to production, and the associated ambient conditions, place much more strenuous demands on the measuring station. When it comes to surface measuring technology in particular, where measurements reach into the µm range, environmental influences such as temperature, vibrations, acoustics and humidity can all have a major effect on the measurement. Vibration isolation systems and measurement enclosures play a crucial role in mitigating these influences. This equipment is usually operated by production staff, who expect the measuring station to be as sturdy and user-friendly as possible.

From a wide-ranging product portfolio, three application-oriented types of standardized measuring station have been identified based on the component size, measuring volume and the measuring task as well as the measuring positions. For example, the probe arm changer can change up to 10 different probe arms from the LD 130 / LD 260 drive unit line in automatic sequence. This is unique in surface measuring technology and saves a lot of time as the program sequences do not have to be interrupted.

The measuring stations described below feature Mahr's new measuring instrument concept, whereby the entire surface quality of your products is calculated in automatic or semi-automatic mode. This requires high-precision linear and rotational axes so that even complex components can be measured in one sequence without having to reclamp the workpiece.

User-independent measurements require: simple operation, high measuring certainty, universal software standards across all products, allowance for ambient conditions. In addition, Mahr offers its customers throughout the world a highly competent service team to help with commissioning, training, calibration and maintenance. These are our strengths that you, the customer, can benefit from worldwide.

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► | Mahr. Fully automated measuring stations

MarSurf CNC *premium* type 01-A

Description

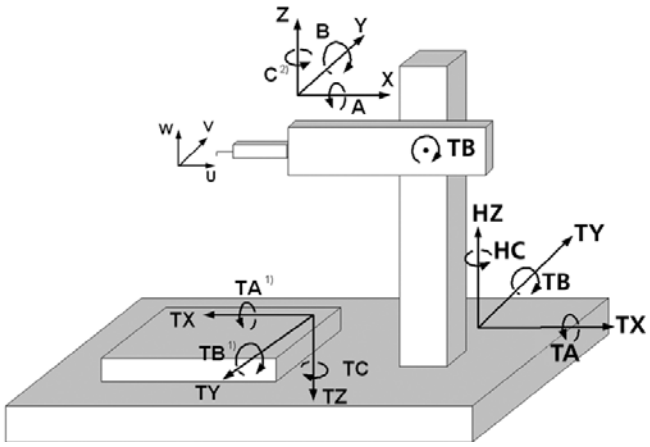
This measuring station concept with five positioning axes is particularly recommended for **complex workpieces with awkward measuring points and a volume of up to 1 litre**, such as **injection system components, pump bodies** or **components from automatic control gears**.

During the fully automated measuring routine the workpiece is moved to the various positions required to complete the measuring task. Any measuring positions that are difficult to set manually are reliably reached.

Advantages of the measuring station concept

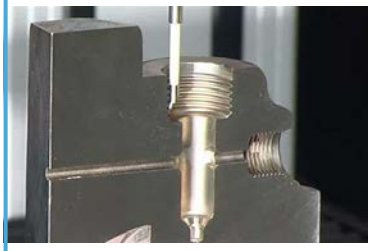
The measuring station concept offers:

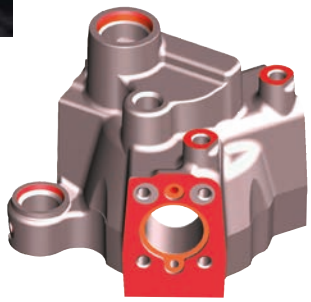
- Close-to-production measuring, i.e. saves time thanks to shorter distances
- Reliability thanks to user-independence
- Cost savings thanks to maximum measuring speed
- Statistical analysis of every feature to ensure control over the manufacturing process



Technical Data

Measuring station	Type 01-A LD130
Measuring task	Roughness and contour
Workpiece dimensions	approx. 100 mm x 100 mm x 100 mm
Workpiece weight	up to 10 kg
Drive unit	LD 130
Measuring stroke	13 mm / 26 mm
Measuring length	130 mm
Installation area	approx. 3400 mm x 2700 mm





Technical data of axes

Axis	Paths / angles	Vmax
Traverse path TX	400 mm	120 mm/s
Traverse path TY	400 mm	120 mm/s
Traverse path HZ	750 mm	30 mm/s
Angle of twist TA	340°	80°/s
Angle of twist TB	270°	20°/s

MarSurf CNC *premium* type 01-A

Standard components

Probe arm changer (TWE)
The probe arm changer can automatically change the probe arms required for the measuring task.

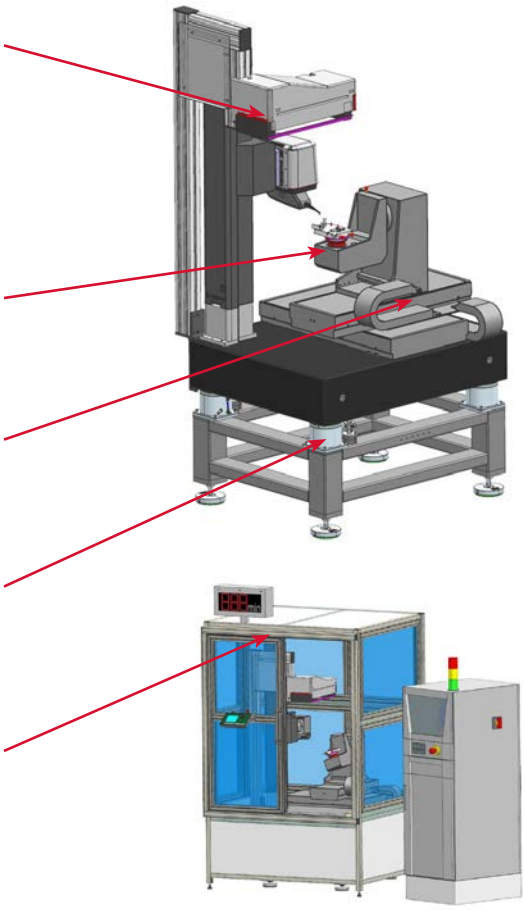
- Maximum number: 10 probe arms
- Changeover time: approx. 30 sec

Pneumatic zero point clamping system and holder for calibration standards
The clamping system has a ball chuck which allows different workpiece holders to be used reliably and reproducibly. In addition, there is an interchangeable holder for calibration standards that is used to calibrate the measuring station.

Workpiece positioning system
The four axes of the workpiece positioning system allow access to awkward measuring points, which would require considerable effort to reach manually.

Vibration isolation system
The granite plate system on diaphragm air springs and a base frame isolates the measuring setup from most ground vibrations.

Measuring enclosure
The measuring enclosure provides external protection, and automatic positioning movements can only be performed when the door is closed for the safety of the operator.



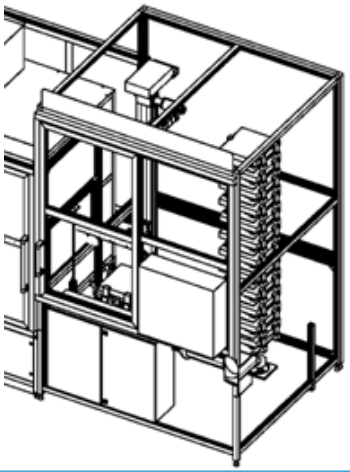
Optional components

Traffic light system and display unit
The status of the measurement can be read off in an instant thanks to the traffic light system. In addition, the remaining measuring time can be viewed even from afar on the display unit.

Identifying workpieces
If you want to automatically measure different workpieces, you can set the corresponding program sequence by RFID or data matrix code scanner, or even by camera.

Automatic workpiece feed
You can set up an automatic workpiece feed for fully automated measurements.

One way of doing this is using a workpiece magazine. This can be loaded manually, and automatically supplies the measuring machine with the parts to be measured one after the other. This allows the measuring machine to be used to full capacity independently of the user.
(Implementation is checked on a case-by-case basis.)



MarSurf CNC *premium* type 04-A

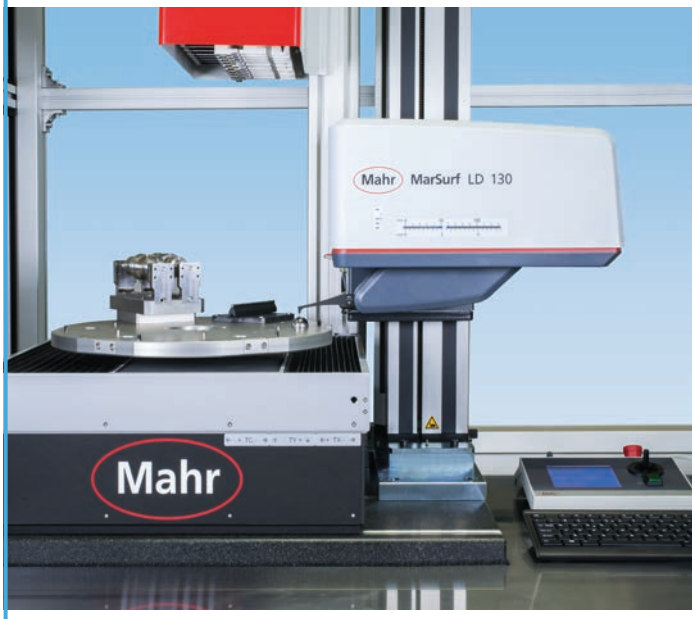
Description

This measuring station concept for **small parts** with multiple special individual fittings that can be positioned using a turntable, is particularly recommended for high-precision measurements on **small parts**, such as **nozzle bodies, valve needles, racks** or **steering nuts**.
The individual fittings guarantee easy positioning and minimal vibration. Up to six different individual fittings can be fixed to a turntable at any one time. Interchangeable fittings mean that more measuring tasks can be carried out at each measuring station.

Advantages of the measuring station concept

The measuring station concept offers:

- A solution to measurement tasks with very low tolerances
- Reliability, as no operator is required
- A solution to diverse measuring tasks on many different workpieces.
- Automatic alignment and positioning of high-precision workpieces with the help of CNC plus software
- Statistical analysis of every feature to ensure control over the manufacturing process
- Faster and easier changeover of probe arms
- Easy changeover of probe arms for servicing



Technical Data

Measuring station	Type 04-A UD 130	Type 04-A LD 130
Measuring task	Roughness and contour	
Workpiece dimensions	approx. 50 mm x 50 mm x 50 mm; with 6 holder positions	
Drive unit	UD 130	LD 130
Measuring stroke	10 mm / 20 mm	13 mm / 26 mm
Measuring length	130 mm	130 mm
Installation area	approx. 1800 mm x 1800 mm	

Technical data of axes

(Axis definition: see type 01-A)

Axis	Paths / angles	Vmax
Traverse path TX	200 mm	30 mm/s
Traverse path TY	200 mm	30 mm/s
Traverse path HZ	750 mm	30 mm/s
Angle of twist TC	340°	80°/s

MarSurf CNC *premium* type 04-A

Standard components

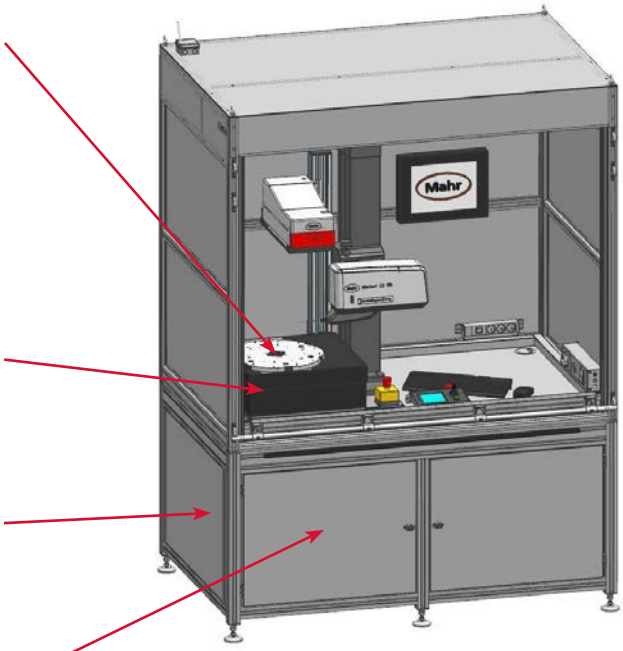
Round plate
The round plate holds six individual fittings at the same time, which means that more measuring tasks can be carried out at each measuring station.

Clamping devices
Universal clamps allow the measuring station to be used for a wide range of measuring tasks. Devices with a vise, vee-blocks or chucks are used to quickly insert and complete general and/or new measuring tasks.

Workpiece positioning system
The three axes of the workpiece positioning system allow access to awkward measuring points, which would require considerable effort to access manually.

Vibration isolation system
The granite plate system on diaphragm air springs and a base frame isolates the measuring setup from most ground vibrations.

Measuring Cabinet
The measuring cabinet protects against the environment on the one hand, and also serves as a workstation for the operator as all the operating elements, such as the manual control panel, are inside the cabinet.



Optional components

Probe arm changer (TWE)
can automatically change the probe arms required for the measuring task.

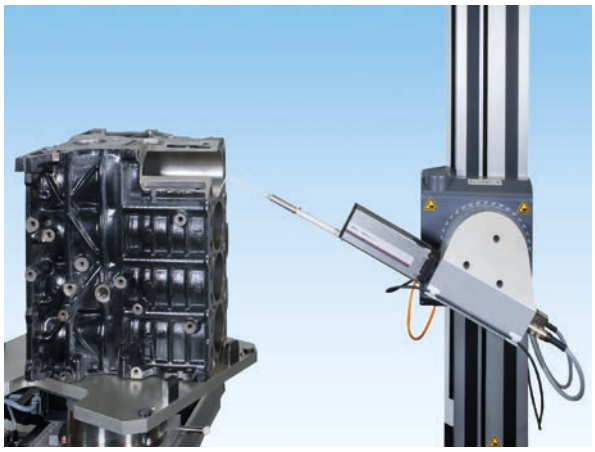
- Maximum number: 10 probe arms
- Changeover time: approx. 30 sec

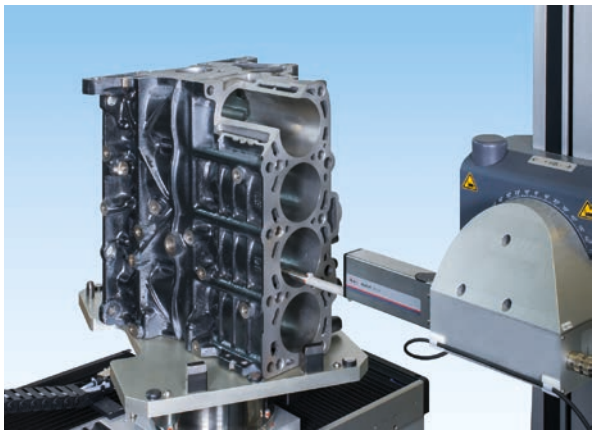
Universal clamping plate for table plate with "clamping ball unit"
Thanks to the quick-clamp mechanism consisting of the top coupler and the lock unit, the workpiece and standard holders can be swapped quickly and flexibly without having to realign the system.

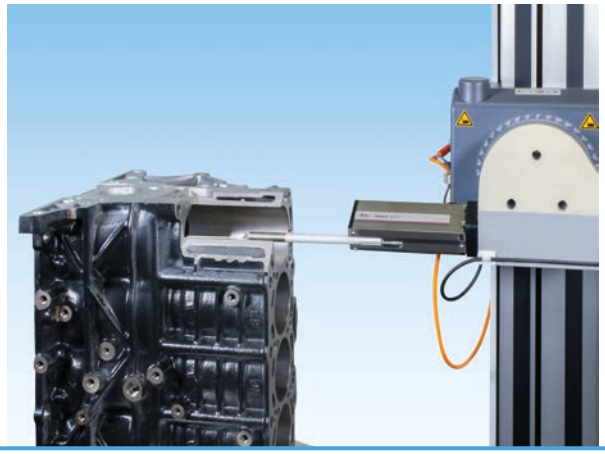
Traffic light system and display unit
The status of the measurement can be read off in an instant thanks to the traffic light system. In addition, the remaining time for the measurement can be displayed on the display unit.

Identifying workpieces
If you want to automatically measure different workpieces, you can set the corresponding program sequence by RFID or data matrix code scanner.

MarSurf CNC *premium* type 09-A & type 09-B







Description

This measuring station concept can be used to measure contour depth and roughness depth on **large** and **heavy components**. It can also calculate angles, for example in valve seats, and check chamfers. Typical workpieces include **crankcases, transmission housing** and **cylinder heads.**

There are two versions available: One has the MarSurf LD 130 drive unit (type 09-A) and the other has the MarSurf GD 25 drive unit (type 09-B). The workpiece is positioned using two linear axes and one rotation axis. Type 09-B also comes with a motorized rotational axis for drive unit GD 25.

Advantages of the measuring station concept

The measuring station concept offers:

- The use of heavy duty axes which allow the high-precision positioning of heavy workpieces
- A high-precision rotation table axis (TC) and two high-precision linear table axes (TX, TY)
- Time savings thanks to no setup and automatic measuring routine
- Statistical analysis of every feature to ensure control over the manufacturing process

Technical Data

Measuring station	**Type 09-A LD 130**	**Type 09-B GD 25**
Measuring task	Roughness and contour	Roughness
Workpiece dimensions	approx. 500 mm x 500 mm x 500 mm	
Workpiece weight	up to 120 kg	
Drive unit	LD 130	GD 25
Measuring stroke	13 mm / 26 mm	250 µm / 500 µm
Measuring length	130 mm	25 mm
Installation area	approx. 3300 mm x 3200 mm	

Technical data of axes

(Axis definition: see type 01-A)

Axis	**Paths / angles**	**Vmax**
Traverse path TX	600 mm	30 mm/s
Traverse path TY	600 mm	30 mm/s
Angle of twist TC	340°	80°/s
Traverse path HZ	750 mm	30 mm/s
Angle of twist HA (only type 09-B GD 25)	340°	20°/s
Angle of twist HB	100°	10°/s

MarSurf CNC *premium* type 09-A & type 09-B

Standard components

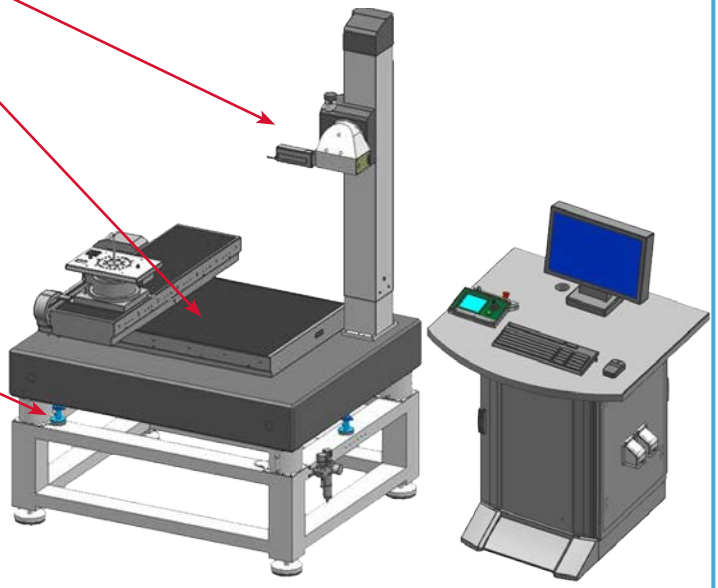
Accessibility of measuring points using GD 25 (type 09-B)
The motorized rotation of the HA and HB axes means that awkward features can be measured without having to reclamp the workpiece. This keeps setup times to a minimum.

Workpiece positioning system
One rotation table axis (TC) and two linear table axes (TX, TY) position even big and heavy workpieces with a high degree of accuracy.

Loading
The measuring table can be moved right up close to the user for loading. This ensures maximum ergonomic comfort when working.

Vibration isolation system
The granite plate system on diaphragm air springs and a base frame isolates the measuring setup from most ground vibrations.

Flexible measuring enclosure
The enclosure system can be adapted for loading by crane or forklift. The measuring enclosure protects against environmental influences, and automatic positioning movements can only be performed when the light grid authorizes the measurement for the safety of the operator.

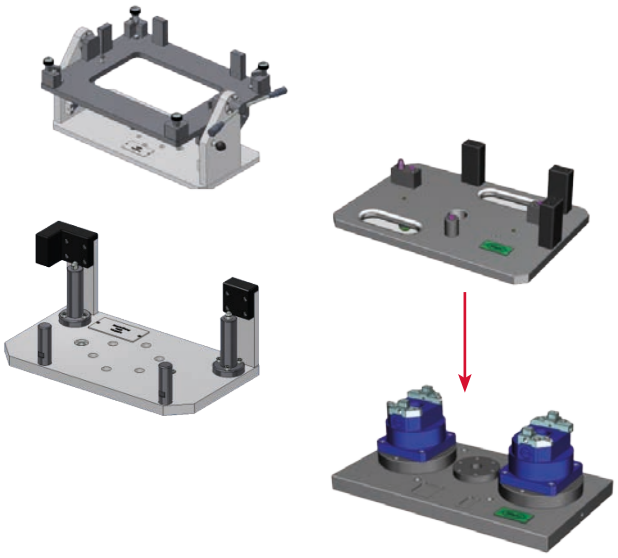


Optional components

Identifying workpieces
If you want to automatically measure different workpieces, you can set the corresponding program sequence by RFID or data matrix code scanner.

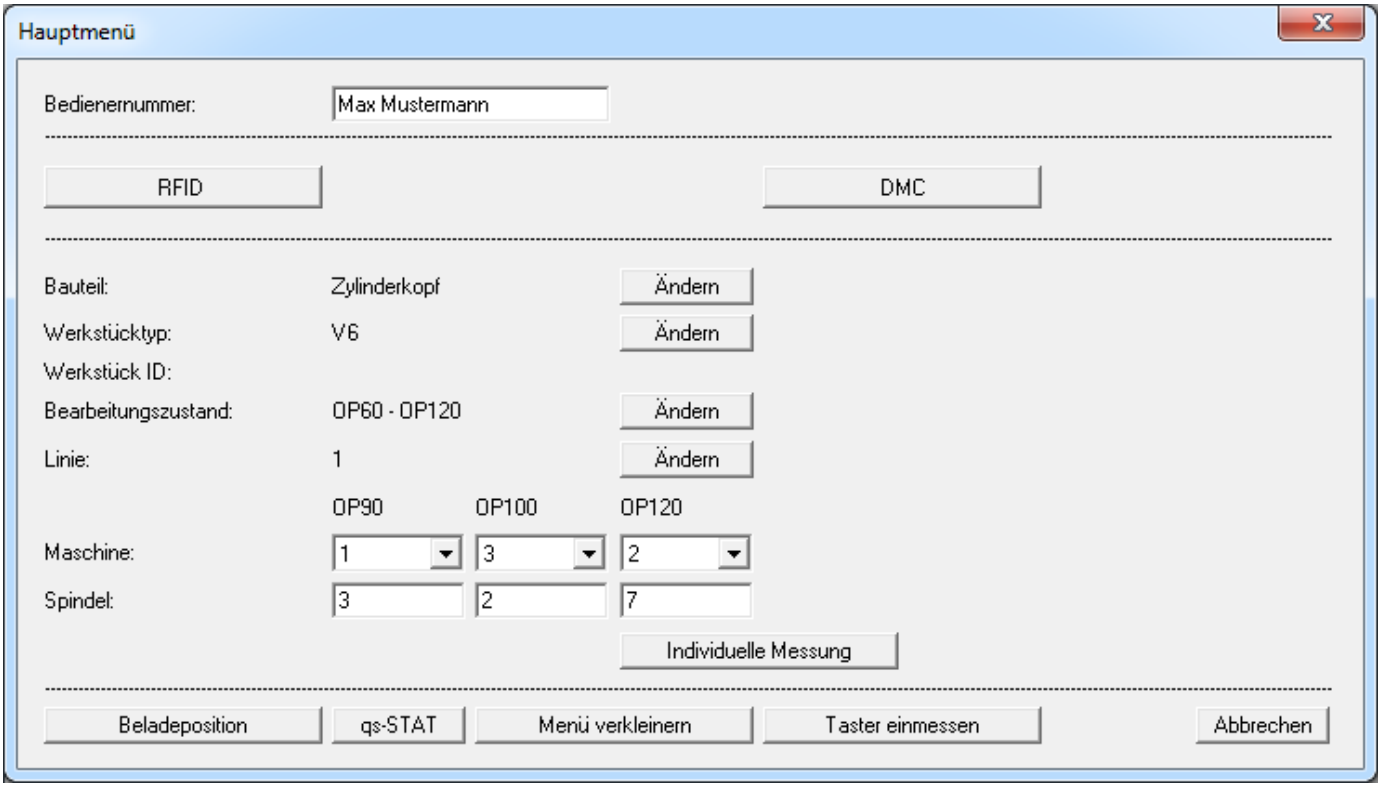
Special holders for awkward and complex workpieces
The workpiece holders are individually customized to your measuring task. The integrated changeover interface on the machine's base plate means that holders can be clamped reproducibly. The clamping systems can hold workpieces and production adapters with a joint weight of up to 150 kg.

Even individual clamping systems by other manufacturers can be integrated following testing.

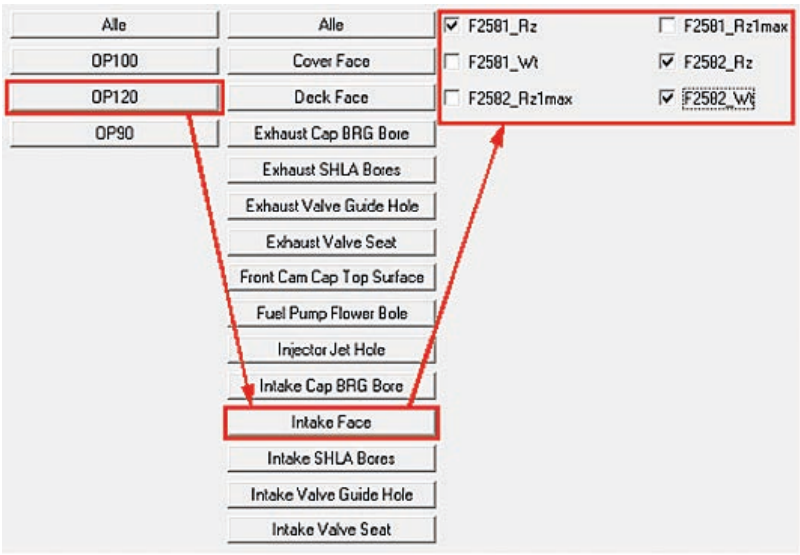


MarSurf CNC *plus* software

Customer-specific user interface: Measuring position and workpiece management



The customer-specific user interface means that your special requirements can be easily catered for. The measuring machine does not, therefore, need to be operated by trained measuring staff. The respective measuring program sequence can be selected automatically by reader using the RFID and data matrix code on the workpieces. This prevents allocation errors by the user.



Feature-oriented programs

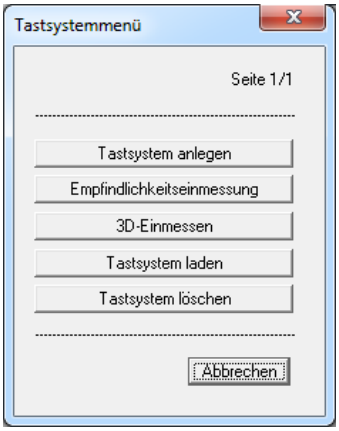
The respective program sequence can be individually created by selecting from a list of measurable features. The measuring program is optimized by keeping the number of probe arm changeovers to a minimum. It is also possible to create favorites programs.
This keeps user influence/effort to a minimum in recurring measuring tasks.

MarSurf CNC *plus* software

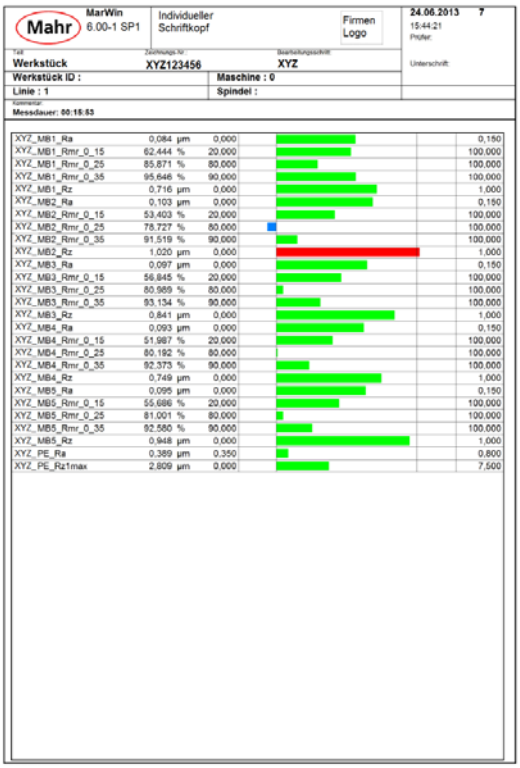
Probe arm management

The probe arms are calibrated and the relevant data is saved. As the individual probe arms are calculated, the programs are interchangeable amongst identical machines.

Replacement probe arms can be calibrated and used immediately without programming, even for critical measuring tasks.



Evaluating and exporting data



Pause option

The program sequence can be paused and continued without losing any data or your position.

All the conventional surface parameters (such as Ra, Rmax, Rz, Pt) and characteristic curves can be analysed and documented. Mahr's **MarWin** software platform, which can be used across all products, means that measuring records can be exported according to customized specifications. Photos, company logos and other images can be incorporated in the measuring record.

Advantages

- **Interchangeable measuring programs**
  Measuring programs created one machine can be easily copied to identical machines without requiring any further programming. Multiple machines can even access and use a measuring program stored centrally. This ensures that the most up-to-date version of the measuring program is always used.
- **Probe arm database** enables easy replacements in the event of faulty probe arms.
- **Customer-specific user screen**
  Measuring programs can be configured or selected according to the machining condition / production status (initial sample or online production test of the critical areas during series production).
- **Individual measuring programs**
  The machine operator can create individual process-optimized measuring programs from the features already programmed without any prior knowledge of programming.

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