MarSurf Engineered

Overview of Solutions

October 2017

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Mahr

EXACTLY

Measuring Stations According to Applications

pump body	valve body	flange	cylinder head	cylinder block
001.000 - LD130 1000.000-LD130	1000.000-LD130 1101.000-LD130	003.000-GD120 1000.000-LD130	002.000 - GD120/PCV 003.000-GD120 2000.000-GD25 2000.002-GD25 2020.000-GD25 2040.000-GD25	MD 001.000 002.000 - GD120/PCV 003.000-GD120 2000.000-GD25 2000.002-GD25 2020.000-GD25 2040.000-GD25

nozzle body	injection nozzle	injection body	crank shaft	gear wheels
1000.000-LD130 1101.000-LD130	501.000 - LD130 1101.000-LD130	1000.000-LD130 1101.000-LD130	002.000 - GD120/PCV 004.000-PCV 004.200-GD120 3000.000-LD130 3100.000-LD130	001.000 - LD130 503.000 - LD130 2000.002-GD25

steering rod	cam tubes	cam pieces	camshaft	valve housing
001.000 - LD130	001.000 - LD130	001.000 - LD130 1000.000-LD130 1201.000-LD130	006.000 506.000-GD120 3000.000-LD130 3100.000-LD130 9000.000-GD120	001.000 - LD130

general injection components	brake discs	ring gear	hollow shaft	truck axle components
1000.000-LD130 1101.000-LD130	001.000 - LD130		503.000 - LD130	003.000-GD120

shaft	transmission components	steering	automatic transmission gearbox
004.000-PCV 004.200-GD120 006.000 506.000-GD120	006.000 2000.002-GD25	1101.000-LD130	1000.000-LD130

- **mobile devices (MD)**

MD 001.000 - cylinder inspector for large engines

NEW

Type:	manual		
Measuring Task:	roughness	last update:	19.10.2017

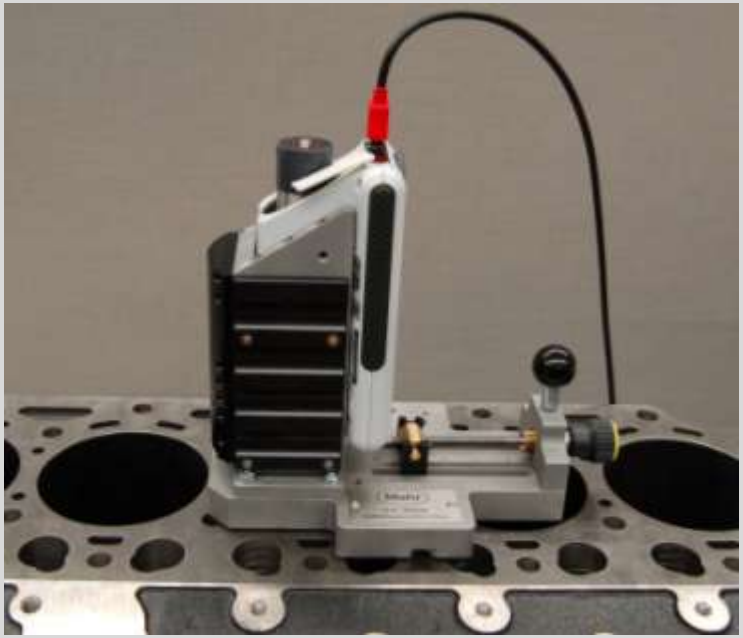
Description of Measuring Station:

This is a mobile roughness measuring device based on SD26 / M400 for measuring of cylinder bores, especially in large engine blocks.
Premise is a horizontal attachment of the measurement gage to the workpiece. In consequence V-motorblocks or W-motorblocks needs to be tilted correspondently.

The diameter can be adjusted variable in the range of 50mm to 102mm. The depth of measuring can be adjusted by changing the probe or by using individual manufactured plates in the range of 5mm to 30mm.

The equipment comes with a station for calibration, which is similar to a cylinderbore with an included roughness standard. The gage is packed in a case that it can be easily and secure transported.

Application Description:	roughness measurement on cylinder bore holes of large motorblocks cylinder bore hole diameters 50mm - 102 mm
Workpiece Dimensions:	unlimited
Workpiece Weight:	unlimited
Drive Unit:	SD26
Axis:	-
Reference	21114313A
Additional Documents:	-



- **manual measuring stations**

001.000 - LD130 - manual universal measuring station

Type:	manual		
Measuring Task:	roughness and contour	last update:	19.10.2017

Description of Measuring Station:

This measuring station with manual positioning axes placed on a standard measuring station (with large granite plate) is particularly suitable for small workpieces with oblique holes. It can also be used with larger workpieces (30 kg, edge length up to 300 mm), where the range of movement of the CT300 is no longer adequate.

The standard range of functions now includes longer displacement paths and 360° rotation in TC. Workpiece positioning is supported by digital displays on all axes.

The measuring station can also be fitted optional with one or two swivel axes (TA or TA/TB) with a standard "clamping ball unit" quick-change interface, so even awkward orientations can be positioned easily, without a special workpiece holder.
Measuring positions can be aligned individually by means of a fine positioning mechanism.

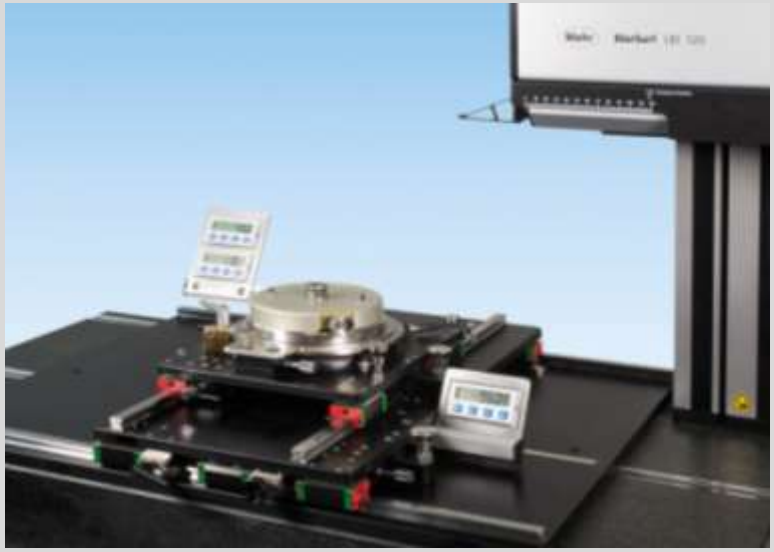
The positioning system can be combined with all available software packages and suitable drive units (XC, XR, XCR, XP).

The measuring station concept is characterized by:
• Fast measurements of complex small parts in the measuring room.
• Ability to position larger workpieces which the CT300 struggles to handle.

Please note:
• Operators must have a good understanding of metrology.
• For complex measuring programs comprising numerous sequential features or for 100% series measurements we recommend using an automatic measuring station.

Application Description:	• complex small parts • heavier workpieces • periodic measurement tasks
Workpiece Dimensions:	80x80x80 mm
Workpiece Weight:	up to 30 kgs
Drive Unit:	UD120 / UD131 - PCV - GD120 - GD25
Axis:	1 Rotational axis: TC 360° optional up to 2 Rotational axes TA, TB Linear axes: TX approx. 360 mm, TY approx. 260 mm

Reference	#1
Additional Documents:	ME News #1 -manual universal measuring station



002.000 - GD120/PCV - measuring station with air cushioned positioning table

Type:	manual		
Measuring Task:	roughness and contour	last update:	19.10.2017

Description of Measuring Station:

Measuring station with air-cushioned positioning table for comfortable positioning of large workpieces, such as cylinder head or cylinder block.
This measurement station is made for workpiece up to 130 kg (on request even more).
Integrated guidance enables the user to position heavy workpieces easily and precisely .
The workpiece positioning directions are TX, TY and TC. Each axis can be separately adjusted using coarse and fine adjustment and blocked with a locking brake.
The round table (Ø 600 mm) is delivered with standard thread M6, 50 mm rod (Witte system), so that special mounting devices can be designed and realized either locally or by the customer.

The measuring station can be combined with all available drive units and standard software packages. In connection with a switch box, more than one drive unit can be used. The drive unit not beeing applied can be stored at the laterally arranged storage station. If only one drive unit is required the storage station can be disassembled.

The measuring station concep is characterized by:
• Easy and comfortable positioning of large workpieces using air-cushioned shifting and positioning carriage
• Combinable with numerous different types of drive units
• Each single axis can be blocked separately

Please note:
• Recommendation: Software package "operator guidance MarSurf QE"
• Manual measuring station – requires 100% operator involvement
• It is also possible to upgrade existing standard surface systems, however the entire basic system (granit plate, ground table and positioning system) must be replaced

Application Description:	• cylinder head and block • crankshaft • gearbox
Workpiece Dimensions:	n.s.
Workpiece Weight:	approx. 130 kgs
Drive Unit:	various
Axis:	TX TY TC 360°

Reference	21077997A
Additional Documents:	>ME News #4 - air-cushioned positioning table > Flyer Measuring_station_manual_ air-cushioned_ positioning_table > Video air-cushioned_positioning_table

003.000-GD120 - measuring station with air-bearing column

Type:	manual		
Measuring Task:	roughness	last update:	19.10.2017

Description of Measuring Station:

This measuring station is suitable for the measurement of larger and heavier workpieces, e.g. cylinder block, cylinder head, crankshaft, transmission housing, or similar. For this purpose, the workpiece is placed on the granite block. The measuring column can then be positioned flexibly, freely in all axis directions. Positioning is performed via an air bearing plate, which is located below the measuring column. The plate supplied with air for displacement. For measuring, the air bearing plate is deactivated so that a stable measurement of the measuring stand on the granite is ensured.
The measuring station has a border on all sides. This ensures that there is no danger of the very easily movable column falling from the measuring station when the air bearing plate is activated. There are two grooves on one side of the granite, so that stops or other aids can be attached if required to support the respective measuring task. The size of the working surface is 2.0m x 1.0m.
The measuring station can basically be configured in any combination of drive units for roughness and / or contour measurement according to the packages offered by Mahr.

The measuring station concept is characterized by:
• high flexibility
• Easy positioning for the measuring task, even on large workpieces

Please note:
• The measuring station does not have any possibilities for fine positioning in the axes HX, HY or HC.
• Individual axes cannot be fixed
• If the points listed under "please note" are desired, we recommend the model 002.000

Application Description:	Larger and heavier workpieces, e.g. cylinder block, cylinder head, crankshaft, gearbox
Workpiece Dimensions:	n.s.
Workpiece Weight:	any
Drive Unit:	GD120 - other configurations possible
Axis:	HZ - 750mm free moving column

Reference	06094406
Additional Documents:	-

004.000-PCV - manual measuring station for crankshafts

Type:	manual		
Measuring Task:	roughness and contour	last update:	19.10.2017

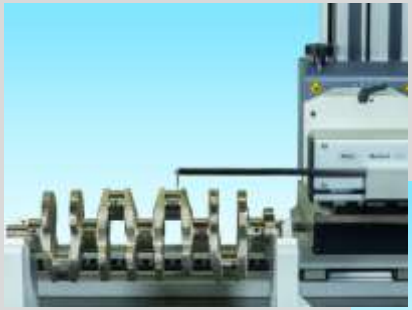
Description of Measuring Station:

This measuring station has been designed for contour measurement – and optionally also roughness measurement – on large turned parts or crankshafts.
The workpiece is loaded and positioned manually. Then the measuring point is approached by manually moving the measuring column parallel to the workpiece axis.
The integrated HY-axis at right angles to the workpiece axis is used for fine adjustment of the zenith search.
Measuring programs are created using MarWin XC, XR or XCR packages.

The measuring station concept is characterized by:
• User-friendly, flexible measurement of large workpieces
• Programming via standard MarWin packages

Please note:
• This measuring station is also available with other drive units, such as the GD120 or LD130.
• If required, several different drive units can also be used in combination, and changed by means of a change mount.
• The measuring station must be operated by trained personnel.
• The measuring station can also be combined with the columns ST500/750 or ST500/750 CNC, if required (available from Mahr).

Application Description:	larger turned parts, crankshaft
Workpiece Dimensions:	max. diameter 300 mm, max. length 1400 mm
Workpiece Weight:	n.s.
Drive Unit:	PCV / GD120 / LD130
Axis:	linear axes: HX 1240 mm HY 80 mm
Reference	21095480A
Additional Documents:	>ME News #06 - Newsletter_manual crank shaft measuring system



004.200-GD120 - roughness measurement on truck crankshafts

NEW

Type:	manual		
Measuring Task:	roughness	last update:	19.10.2017

Description of Measuring Station:

This measuring station is designed to measure big crankshafts (truck) or similar sized axially symmetric workpieces up to a length of 1.600mm. Bigger workpieces can be realized on request.

The measuring station is to measure roughness on the main and crank bearings as well as the transition zone of the radii to a certain grade. Also the convexity / straightness on the bearings can be measured.

The workpiece is lifted via crane to the measurement station and settled to prisms. The supporting face of the prism is made out of POM. The drive unit can be moved manually on a HX-axis which is aligned parallel to the workpiece axis. The position of the axis is shown on a display. Afterwards a zenith search can be done by using the HY-axis. This axis comes with a fine adjustment and as well a display showing the position. Afterwards the measurement can be performed. Additionally, the crankshaft can be turned with in the POM-support manually. This enables maximum accessibility to the features needs to be measured, especially to the surface of the crank bearings. As an option also supports for positioning the crankshaft into fixed pre-defined positions are available / can be made on request.

We recommend to combine this measuring station with the software package " OPERATOR GUIDANCE " which helps to build a structured measurement process and which gives afterwards a guidance to the user, what he has to do. (see also Engineered catalog / Id.No.: 9058181)

Application Description:	• roughness measurement on main and crank bearings • straightness
Workpiece Dimensions:	Length up to 1600 mm
Workpiece Weight:	up to 180kg
Drive Unit:	GD120
Axis:	HX 1740 mm HY 110 mm

Reference	21089151A
Additional Documents:	-

006.000 - manual measuring station for shaft measurement

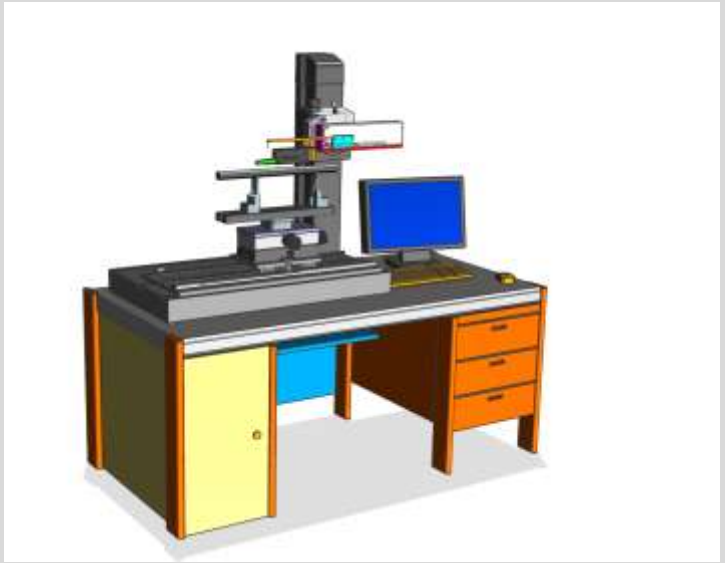
Type:	manual		
Measuring Task:	roughness and contour	last update:	19.10.2017

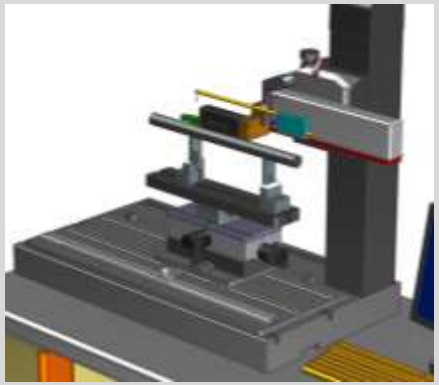
Description of Measuring Station:

The basis of this measuring station is a standard XCR20 measuring station with a large base plate (1000 mm x 550 mm). A manual TX axis with a positioning range of 600mm is installed on the base plate. A coarse positioning of the workpiece in the X-direction can be performed by this axis and an attached metallic measuring tape. Afterwards the fine positioning of the workpiece takes place via the CT300-xy-table mounted on the slide.
A pair of prisms to support the workpiece is arranged onto the CT300, which is designed to be displaceable and clampable at a distance in the X-direction, as well as individually adjustable in the height (Z-direction).
Therefore it is possible to measure cylindrical workpiece of different diameter (up to Ø35 mm) and lengths (up to 550 mm).
The combination of a contour- (PCV) and a roughness-drive unit (GD25) enables the measurement of a high variety of features on a single measuring station, which makes the work in the measuring room more effective.
The measurement task is carried out according to the handling of a standard XCR measuring station.
Additionally, the measuring station is designed for a wide range of workpiece fixture due to the universal clamping system.

Application Description:	transmission shaft
Workpiece Dimensions:	Length 550 mm and Ø35 mm
Workpiece Weight:	up to 30kg
Drive Unit:	PCV GD25
Axis:	TX 600mm

Reference	21112612A
Additional Documents:	-





- **semi-automatic measuring stations**

501.000 - LD130 - measuring station for nozzle bodies

Type:	semi-automatic		
Measuring Task:	roughness and contour	last update:	19.10.2017

Description of Measuring Station:

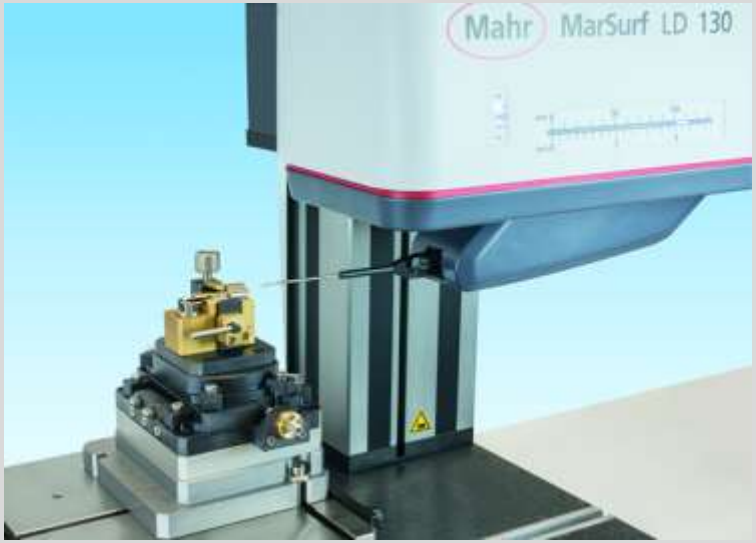
The measuring system is based on a standard MarSurf LD 130 measuring station and is suitable for the fully automatic measurement of different nozzle body types. Each nozzle body type requires its own holder, which is manually placed on an XY table. Each workpiece holder must be manually aligned to the probe arm. The fully automated measurement of the nozzle can then be performed. The entire cone of the nozzle seat can be measured, from the blind hole to the guide diameter.
The particularly small probe tip (0.45 mm total height) is moved into a blind hole diameter of about 0.6 mm and then the measurement of the entire inner contour is started.
A special software routine was written for this purpose in which the blind bore is approached in several increments. Roughness can be measured on the valve seat angle, half angle of the valve seat, in the guide bore and other contours can be measured in the nozzle.

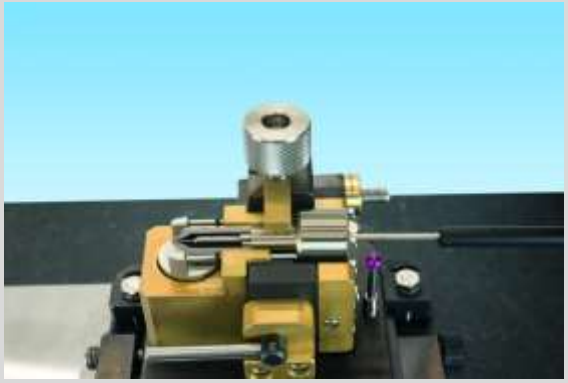
The measuring station concept is characterized by:
- Almost complete measurement of roughness and contour features in the nozzle
- Possibility to perform fast serial measurement after measuring station has been setup according to the device used.
- Devices support the set-up and alignment
- Measurement of roughness on valve seat with GRR<10% can be realized
- Trouble-free service and support, since based on MarSurf LD130 standard measuring station

Please note:
- Sensitive probe arm required, since measuring task is in Ø 0.6mm bore
- If the probe arm breaks, all workpiece fixtures must be set up again
- An installation site with low concentration of dirt is recommended
- The operator should be aware of sensitive measurements

Application Description:	Nozzle Body and workpieces with small bores
Workpiece Dimensions:	50x50x50 mm
Workpiece Weight:	0
Drive Unit:	LD130
Axis:	1 Linear axis: CT200mot / TY

Reference	21019124A
Additional Documents:	ME News #3 - measuring station for nozzle bodies





503.000 - LD130 - measuring station for measurement on tooth flanks

Type:	semi-automatic		
Measuring Task:	roughness	last update:	19.10.2017

Description of Measuring Station:

This measuring station enables partly automated measurement of roughness on tooth flanks. Optionally, a probe arm with double tip allows also a simplified evaluation of two tooth profiles in one tooth gap. (Probe height must be observed)
Measurements can be carried out on external and internal teeth as well as on helical teeth.
Internal teeth can be measured by means of a cranked probe. The limits lie in the crank of the probe arm as well as the helix angle of the teeth.
First step of the measurement sequence is a manually performed adjusting/searching for the tooth gap by means of the probearm so as to set the starting point for the measurement. Subsequently, the measuring program associated with the gear wheel is started, which includes the positioning of the automated axis in the Y direction. A corresponding Quick & Easy program can be programmed by the user and defines the measuring sequence.
In a program specifically created for the measuring station, only the number of teeth as well as the angle of the helical teeth must be entered.
After starting the program, the TA axis is adjusted to the helical teeth, the operator manually sets the starting point and starts the Quick & Easy program. In accordance with the tooth pitch of the gear, the automated TB axis is automatically cycled to the next tooth.

The measuring station concept is characterized by:
• Easy programming with Quick & Easy
• Easy handling
• Measuring room suitability

Please note:
• The measuring station is semi-automatic. Manual search of the tooth gap is required.
• Collision prevention with the probe arm when setting the TX axis is in the hands of the user.

Application Description:	tooth flanks
Workpiece Dimensions:	Hollow shaft clamping Ø 70mmx500mm, Double gear approx. 180x200mm
Workpiece Weight:	up to 11 kgs
Drive Unit:	LD130
Axis:	TX, TY, TA, TB, TC

Reference	21134818A
Additional Documents:	> ME News #08 - Measuring station for tooth flanks

506.000-GD120 - measuring station for roughness measurement on balance shafts

NEW

Type:	semi automatic		
Measuring Task:	roughness	last update:	19.10.2017

Description of Measuring Station:

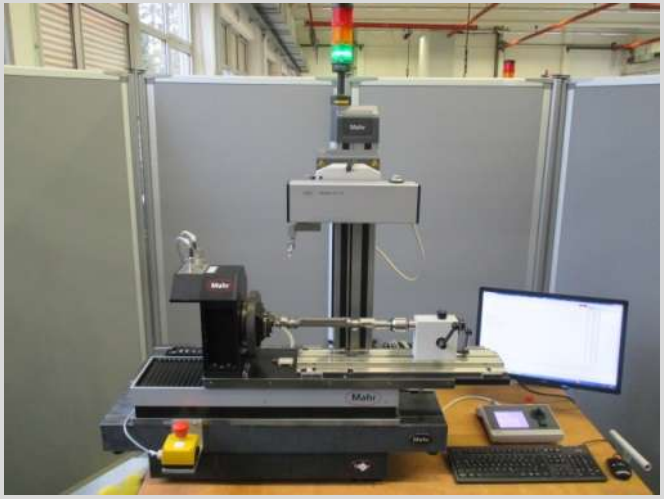
Measuring station for roughness measurement and straightness measurement at various bearing positions of a shaft - here specifically for a balance shaft.
The configuration are two semiautomatic axis to positioning the workpiece and a tailstock which is variable adjustable. The automatic axis enable the turning of the shaft and a linear movement of the workpiece to position the different measurement features along the workpiece. To clamp different shafts in terms of length, the tailstock can be positioned free up to the length of the shafts of 400mm.

First step of the measurement procedure is to position full automatic the first feature. It is possible to measure the maximal length of the cylindrical share of the bearing surface. Therefore a measurement is performed from one side chamfer of the bearing to the other side chamfer. Automatically, the roughness will be evaluated between those chamfers. Every bearing can be also measured in different angels while using the automated turning axis. Afterwards, the measurement of the next bearing can be performed by moving the workpiece via linear axis. The measurement procedure is individual programmed by using MarWin Quick&Easy's. In consequence it can be easily modified only by having basic MarWin knowledge. It is recommended to use this measuring station with the Software package "user guidance MarWin QE" SW#1.

special features are:
- automatic measurement of roughness and straightness of different measuring locations on a shaft
- enables reliable and easy serial measurement
- in combination with Software package "user guidance MarWin QE" the user will be guided completely through pre-defined quality control plans

Application Description:	• roughness and straightness measurement on balance shafts • roughness and straightness measurement on camshafts
Workpiece Dimensions:	400 mm
Workpiece Weight:	n.s.
Drive Unit:	GD120
Axis:	TX 400 mm TA

Reference	21141072A
Additional Documents:	-



- **fully automatic measuring stations**

1000.000-LD130- fully automatic CNC measuring station

Type:	fully automatic		
Measuring Task:	roughness and contour	last update:	19.10.2017

Description of Measuring Station:

This measuring station concept for a fully automated measurement 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 position of the workpiece is achieved by two fast, precision axial axes and rotational axes. Therefore a process reliable and reproducible positioning of the workpieces is achieved (e.g. measurment locations inside bores with diameters less than 1 mm).
Roughness and contour evaluations are carried out in one measurement with the MarSurf LD130. In addition to the advantages of the measuring station, you also get the advantages of the drive unit, such as easily variable measuring force that is constant over the entire measuring range.
The fully automatic measuring sequence positions the workpiece in different positions and performs measurements that are difficult to adjust manually. In combination with the automatic probe arm changer (TWE) the user influence on the measurement results is minimized. Additionally, the fully automatic measuring sequence reduces the time which the users need at the machine and therefore raises efficiency.
At the end, all results are automatically clearly displayed on the screen, printed out as a measuring record and saves the data for further statistics.
The measuring station stands for a high degree of efficiency and flexibility for your production area or measuring room.

The measuring station concept is characterized by:
• Full automatic operation without any user interference
• Reproducible clamping of different workpiece fixtures due to pneumatic zero point clamping system
• Proximity to production, that means time-savings through short distances.
• "One-touch operation" guarantees ease of use and measurement reliability
• Time savings, because no set-up time is required for each measurement
• Statistical evaluation of each characteristic ensuring the control of the manufacturing process

Please note:
• High, one-time programing expenditure
• High initial Investment
• Comes with software package CNCPlus (see section software)

Application Description:	• pump housing • pump housing (CP4) • cam parts • Injection cylinder head (CP4)
Workpiece Dimensions:	100x100x100 mm
Workpiece Weight:	up to 10 kgs
Drive Unit:	LD130
Axis:	2 rotational axes: TA ±360° , TB +159° up to -183° resp. ±170°. 2 linear axes: TX ±200mm, TY ±200mm

Reference	Angebotsvorlage 1000.000
Additional Documents:	ME News #02 - Measuring station CNC Type01 A

1101.000-LD130 - fully automatic measuring station for small workpieces

NEW

Type:	fully automatic CNCPlus		
Measuring Task:	roughness and contour	last update:	19.10.2017

Description of Measuring Station:

This measuring station with up to six individual workpiece fixtures is especially designed for a full automatic and high precision measurement of roughness and contour on small workpieces. Realized applications are diverse components of fuel injection systems such as nozzles, valve-bodies, valve-needles, etc. as well as applications with little bigger components like spindles of steering rods or steering nuts.
The concepts allows to use up to six fixtures for different workpieces at the same time. The fixtures can either be screwed onto the turning table or can be exchanged reproducible with a universal clamping plate and clamping ball unit (asymmetrical alignment of register pins). This enables many different measuring tasks with the same machine.
In combination with the automatic probe arm changer (TWE), it is possible to exchange up to ten different probe arms depending of the chosen measuring program. Therefore the degree of automation and consequently the efficiency can be raised. Additionally, a full automatic measuring sequence without further user action is possible.
Due to the automatic alignment and positioning of workpieces – no manual set-up of the workpiece fixtures necessary, a fast serial measurement is possible without extensive set-up time of the measuring station.
By means of the option “workpiece recognition“, the degree of automation can be configured arbitrarily up to the completely user-independent design. The “pallet measurement“-option also allows the measurement of several identical workpieces without operator intervention.
In combination with the corresponding Software package "CNCPlus" (see section software), the probe arms and workpiece fixtures are set up into a coordinate system, i.e. no further set-up of the measuring station is required during operation. In service case, e.g. exchange of probe arms, the measuring station is completely available again after a few minutes.

Highlights are:
- measuring tasks with small tolerances
- roughness and contour features within nozzles
- fast series measurement without efforts in terms of setup-time
- automatic alignment and positioning of workpieces - no manual setup of clamping devices
- measurement of roughness on valve seat with a very high grade of repeatability
- statistics on every feature to control the production process
- minimal risk of probe defect as consequence of probe check routine and offset-calculation
- no influence of user to the measurement
- designed to be operated by production staff
- easy and quick to maintain

Application Description:	nozzle body, valve needles, armatures, etc.
Workpiece Dimensions:	50mm x 50mm x 50mm
Workpiece Weight:	up to 5 kgs
Drive Unit:	LD130
Axis:	TX 200mm TC 340° TY 200mm HZ 500mm

Reference	130695700
Additional Documents:	• Flyer Control 2017 • Flyer • Video Control 2017

1201.000-LD130 - fully automatic measuring station for cam pieces

NEW

Type:	fully automatic CNCPlus		
Measuring Task:	roughness and contour	last update:	19.10.2017

Description of Measuring Station:

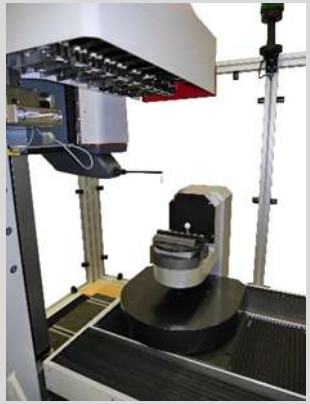
This measurement station enables a full-automatic measuring with maximum degree of freedom due to five automatic workpiece positioning axis being used. The design is made preferable for small workpieces with a weight up to 5kg and a volume of 2 liters (including workpiece clamping devices), e.g. nozzles, needles, etc. and similar injection system parts.
Using an universal clamping plate with a clamping ball unit (asymmetrical alignment of register pins) creates the possibility to reproducible set up many different workpiece fixture for a high variety of measuring tasks with the same machine.
During the full-automatic operation the workpiece will be automatically positioned to perform all measuring tasks in highest repeatability.Therefore there is no influence of the user on the measuring result anymore and consequently difficult reachable measuring locations can be measured reliable.
In combination with the automatic probe arm changer (TWE), it is possible to exchange up to ten different probe arms depending of the chosen measuring program. Therefore the degree of automation and consequently the efficiency can be raised. Additionally, a full automatic measuring sequence without further user action is possible.
Roughness and Contour measurement is performed combined by using the LD130 drive unit and therefore roughness and contour features can be measured and evaluated on the same machine
At the end of each measurement cycle all results will be displayed clearly arranged at the screen, can be printed or stored electronically and send to any server. In addition the data can be provided for further statistical evaluations.
Due to the full-automatic operation this measurement station serves maximum economic efficiency and flexibility.
This measurement concept can be provided in a layout suitable for measurement rooms as well for production areas.

Highlights:
- user friendly and maximum repeatability
- minimum time in case of service
- statistic evaluation for all measurement features to control the production process
- full-automatic operation without any interruption due to automatic probe arm exchange device

Please note:
- quite high initial amount of programming

Application Description:	cam pieces in long and short design
Workpiece Dimensions:	cylinder Ø 150 H=150
Workpiece Weight:	up to 5 kgs
Drive Unit:	LD130
Axis:	3 rotational axis: TA ±360° , TB +166° up to -165°, TC 0° up to 90°. 2 linear axis: TX 200mm, TY 200mm

Reference	#X
Additional Documents:	• Flyer Control 2017 • Video Control 2017



2000.000-GD25 - CNC measuring station for larger workpieces

Type:	fully automatic CNCPlus		
Measuring Task:	roughness	last update:	19.10.2017

Description of Measuring Station:

This measuring station is designed for full automatic roughness measurement on large workpieces such as cylinder blocks and cylinder heads. The positioning of the workpiece is done during operation ofthe program sequence via two CNC-linear axis and one rotary axis. Furthermore, the measurement station is capable to rotate the drive unit in addition to the two common linear positioning axis. This arrangement of full automatic axis allows high flexibility and accessibility of measuring points is ensured as well as an proceeding without any interference by user.

Position changes of the probe tip are compensated. This makes it possible to program according to drawing data. Possible deviations in the real positioning are corrected automatically. In addition, it is ensured that measurement programs between identical measuring stations are interchangeable without reprogramming.

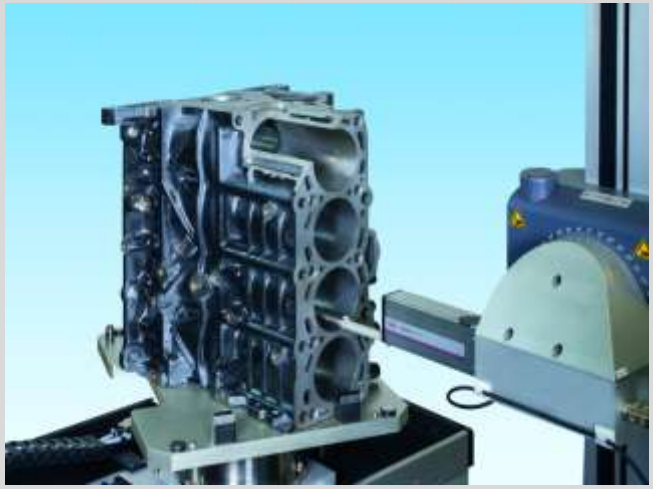
Required operator intervention within the measurement process can be supported by images and texts. This may be, for example, a probe arm or workpiece change. Customer-specific workpiece clamping systems can be integrated.
Measurement processes are performed in a time-optimized manner depending on the selected features pertaining to the probe arm and workpiece holder.
For the test sequences, pre-alignment functions can be stored that optimize the measurement process quality and time.

The measuring station concept is characterized by:
• Good accessibility of measuring points due to the rotary axis around the probe (HA)
• The software CNCPlus offers many custom advantages - see also "CNCPlus" in the chapter "Software"
• Production-related application and usability by employees from the workshop
• Complex and diverse measuring tasks can easily be performed without influence of operating personnel on measurement results
• Small drive unit for complete immersion in larger and deep bores

Please note:
• In case of a combination with contour measurement tasks, the system can optionally be carried out with the drive unit LD130. It should be noted that this eliminates the HA axis due to technical reasons.

Application Description:	large workpieces such as cylinder head and block (3-cylinder, 4-cylinder, 6-cylinder to a limited extent)
Workpiece Dimensions:	up to 500x550x550mm
Workpiece Weight:	max. 150kgs incl. mounts
Drive Unit:	GD25
Axis:	- TX 600mm - HZ 750mm - TY 600mm - HB +/- 45° - TC 360° - HA 340°

Reference	#7
Additional Documents:	> ME News #07--CNC Measuring station for lager workieces



2000.002-GD25 - CNC measuring station for roughness measurement on gears

NEW

Type:	fully automatic		
Measuring Task:	roughness	last update:	19.10.2017

Description of Measuring Station:

This measuring station is mechanically identical to the measuring station model 2000.000-GD25. It differs by the software package Family Program Gear Measurement.
The measuring station 2000.000-GD25 is suitable for roughness measurement on large workpieces, e.g. cylinder blocks, cylinder heads. Positioning of the workpiece and the program run take place fully automatically. Through the rotation of the measuring unit in two axis directions, a high flexibility and reachability of measuring points is achieved. Position changes of the probe tip are compensated. This enables programming according to drawing data. Any deviations in the real positioning are automatically corrected. In addition It is ensured that measurement programs can be interchanged between identical measuring stations without program adaptation. Any necessary intervention by the operator within the measuring sequence can be supported by pictures and texts. These can be, for example, probe arm changes or workpiece changes. Customized workpiece clamping systems can be integrated. Depending on the selected characteristics, measuring sequences are performed in a time-optimized manner with in regards to the probe arms and workpiece mounts. For the measurement sequences, preconditioning functions can be stored, which optimize the measurement process both qualitatively and temporally.

The measuring station concept is characterized by:
- Good accessibility of measuring points, due to rotating axis around the probe (HA)
- The software CNC+ offers many individual programming advantages, see also flyer CNC+
- Production-oriented application and usability by the workshop employees
- Complex and diverse measuring tasks can be easily carried out without the influence of the operator on the results of the measurement

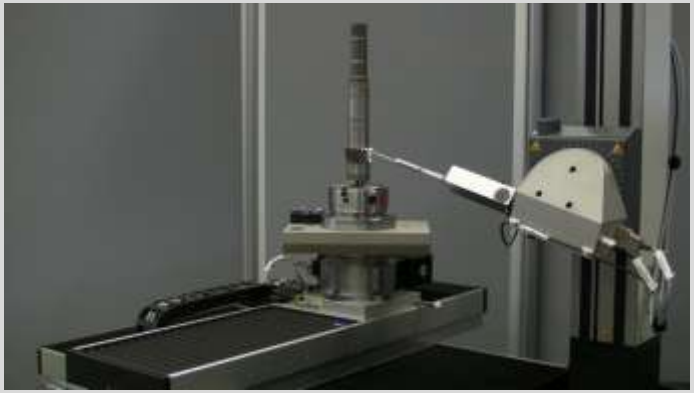
Please note:
In the case of a combination with contour measurement tasks, the system can optionally be executed with the LD 130 drive unit. It should be noted that for technical reasons, the HA axis must be omitted. With the aid of the family program, the measuring station is capable of a very simple and user-friendly roughness measurement on tooth flanks of external teeth. Typical workpieces are spline shafts, gear shafts and toothed wheels. Through the use of the family program, the measuring station can be used for the measurement of the most varied tooth systems and requires no measuring or specific knowledge of the measuring station as well as no programming skills for measuring sequences. The following can be measured:
- External toothing of straight or helical gears
- Right and left tooth flanks
- Different positions of teeth on the workpiece
- Different diameters (15 mm to 400 mm)
- Different number of teeth and modules (1 to 6)

The workpiece geometry, the tooth geometry and the measuring task are interrogated by means of a user-guided mask. If the workpiece has already been entered and the associated data record has been stored, it can be called up again and the measurement can be started immediately. The subsequent measuring sequence is fully automatic without any further user intervention:
- Automatic tooth gap search (start position of the measuring sequence)
- Several previously freely selectable measuring traces on a tooth flank
- Freely configurable measuring distances as well as evaluation parameters
- Freely configurable number of tooth flanks to be measured and their angular position (for example four teeth, which are at an angle of 90° to one another)
- No reclamping of workpiece
- No changing of probe arms

Optionally, the measuring station can be equipped with topographic software, which makes it possible to visualize the grinding structure of the tooth flank.

Application Description:	• Spline shafts, gear shafts as well as gears • straight and helical gears • Right and left tooth flanks • Different heights and positions of the toothing • Different diameters (15 mm to 400 mm) • Different number of teeth and module (1 to 6)
Workpiece Dimensions:	up to 400 mm
Workpiece Weight:	max. 150kgs incl. mounts
Drive Unit:	GD25
Axis:	- TX 600mm - HZ 750mm - TY 600mm - HB +/- 45° - TC 360° - HA 340°

Reference	21148651A
Additional Documents:	-



2020.000-GD25 - CNC measuring station for larger workieces

Type:	fully automatic CNCPlus		
Measuring Task:	roughness	last update:	19.10.2017

Description of Measuring Station:

This measuring station is based on the model 2000.000 and is supplemented by a pneumatically actuated swivel-unit (TB axis) that is integrated and controlled in the automatic sequence. The workpiece can then be swiveled in two positions: 0° and 90°. Intermediate positions of the pivots are not possible in this model.

It should be noted that the model 2000.000 and related models cannot be retrofit with the swivel, since the positioning of the workpiece positioner on the granite is different, and the granite block and the base frame are also larger.

Application Description:	• cylinder block • cylinder head (Center of gravity 3-cylinder, 4-cylinder)
Workpiece Dimensions:	up to 500x550x550mm
Workpiece Weight:	max. 150kgs incl. mounts
Drive Unit:	GD25
Axis:	- TX 600mm - TY 600 mm - TC 340° - TB 0 und 90° (pneum.) - HB +/- 45° - HA 360°

Reference	21174011A
Additional Documents:	• Flyer Control 2017 • Video

2040.000-GD25 - roughness measurement on cylinder block and cylinder head

NEW

Type:	fully automatic CNCPlus		
Measuring Task:	roughness	last update:	19.10.2017

Description of Measuring Station:

This measurement station is based on the series 2000.000 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°.

Please be aware that series 2000.000 and similar solutions can not be upgraded with the swiveling unit due to different position of the workpiece positioning system on the granite. Also the granite and base frame differs in size.

Application Description:	• cylinder head • cylinder block (3-cylinder, 4-cylinder)
Workpiece Dimensions:	up to 500x550x550mm
Workpiece Weight:	max. 150kgs incl. mounts
Drive Unit:	GD25
Axis:	- TX 600mm - HB +/- 45° - TY 600 mm - HA 360° - TC 340° - HZ 750mm - TB -90° bis +90°

Reference	21185254A
Additional Documents:	-

3000.000-LD130 - fully automatic measuring station for crankshafts

Type:	fully automatic		
Measuring Task:	roughness, contour and symmetry	last update:	19.10.2017

Description of Measuring Station:

This measuring station has been specifically designed for the fully automatic measurement of roughness and contour features on crankshafts. This includes, among other things, the measurement of the crowning of the surfaces of the main and hub bearings in one measurement sequence, the measurement of the undercuts at the ends of the bearing points, the measurement of the double radii at the ends of the bearing points (production technology grinding), axial bearings and various other measurement tasks.
The measuring station is suitable for use in the measuring room as well as in production. The fully automated process allows reliable and reproducible results of complex and demanding measuring tasks without any user influence. This property allows the daily handling of the measuring station by trained but not technically educated personnel.
The measuring point is ergonomically designed in such a way that crankshafts (3- and 4-cylinder engines) can be inserted manually. For this purpose, attention was paid, among other things, to the smallest working depth and, therefore, to the lowest possible physical stress on the operator. In addition, the loading process has been decoupled from the clamping process, making the corresponding steps easy to handle.

The measuring station concept is characterized by:
• Very high degree of automation
• Measuring without operator influence
• Very easy handling in daily use

Please note:
• Manual probe arm exchange may be necessary (depending on the respective measuring task)

Application Description:	crankshaft of car engines (3 and 4-cylinder)
Workpiece Dimensions:	n.s.
Workpiece Weight:	n.s.
Drive Unit:	LD130
Axis:	TA ±720° TC ±720° HZ 750mm HB ±45° HX 600mm HY 110mm

Reference	3000.000-LD130
Additional Documents:	-

3100.000-LD130 - automatic CNC measuring station for crankshafts

Type:	fully automatic		
Measuring Task:	roughness and contour	last update:	19.10.2017

Description of Measuring Station:

This measuring station has been specially designed for the fully automatic measurement of roughness and contour features on crankshafts and camshafts. The measuring station is suitable for use in production. The fully automated process allows reliable and reproducible results of complex and demanding measuring tasks without any user influence. This allows for the daily handling of the measuring station by trained but not technically educated personnel.
The 45° position of the crankshaft in combination with the possibility of tilting the drive unit +/- 45° allows for operation with a minimized number of different clamping positions.

The measuring station is ergonomically designed in such a way that crankshafts (3- and 4-cylinder engines) can be inserted manually. For this purpose, attention was paid, among other things, to the smallest working depth and, therefore, to the lowest possible physical stress on the staff. In addition, the insertion process was decoupled from the clamping process so that the corresponding work can be carried out in a practical and reliable manner.

The measurement tasks for crankshaft typically performed on this measuring station are:
- Roughness and contour on main and hub bearings
- Roughness on cheeks
- Contour and roughness of undercuts or radii on the main and hub bearings
- Centering bore on the front face
- and more

Application Description:	crankshaft of car engines (3 and 4-cylinder) camshaft
Workpiece Dimensions:	n.s.
Workpiece Weight:	n.s.
Drive Unit:	LD130
Axis:	HY HX TA HB

Reference	21119278A
Additional Documents:	• Flyer Control 2017 • Video

9000.000-GD120 - measuring station for laser-marking on camshafts

NEW

Type:	fully automatic		
Measuring Task:	roughness	last update:	19.10.2017

Description of Measuring Station:

This measurement station is a very special solution designed to check circular laser mark on a camshaft. It is designed to be placed at a shop floor. For the measurement task a GD120 and the roughness software is used

The laser mark consists of 11 segments which are circular lasered. Each mark is filled with an "X". Each segment is 3mm brough and 9mm in length.

To perform the measurement the starting position has to be found manually. Via Software-checkboxes the user decides which of those 11 segments should be measured. Afterwards the measurement will be done full automatically.

Application Description:	laser marking on camshaft
Workpiece Dimensions:	Ø 35 x 400
Workpiece Weight:	approx. 3 kgs
Drive Unit:	GD120
Axis:	T1S+R and T1S-L

Reference	21104847A
Additional Documents:	-

- **software**

9058181 - software operator guidance MarSurf QE

NEW

Type:	manual		
Measuring Task:	roughness and contour	last update:	19.10.2017

Description of Measuring Station:

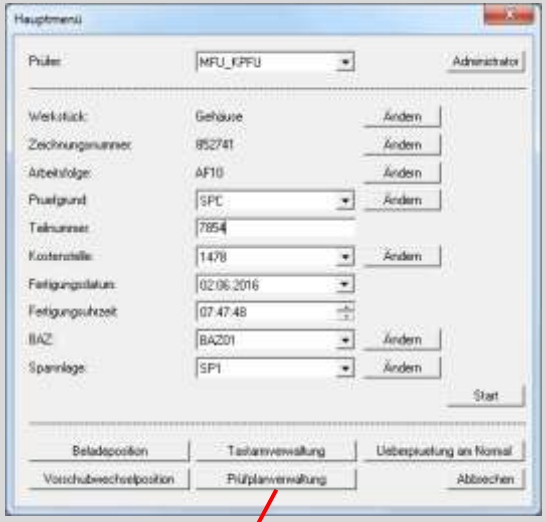
The „user guidance" is an software option extending the functions of the MarWin MarSurf XCR / XC / XR Software. The software option enables reasonable sequencing of single Quick & Easy measurement programs to one measurement procedure. A typical example are quality control plans. By means of the data structure given by the customer a specific input-mask will be created. Using this mask the user can simply choose afterwards the measurement procedures needs to be applied. Having started the measurement procedure the user will be guided by means of pictures and description to each measurement location and even if necessary different clamping position.
Furthermore the user guidance can perform additional handling functions. Examples are a probearm management data base or standard probe check functions. The input and modification of this data base can be done completely by user dialog. Therefore no specific capabilities regarding programming are necessary. For documentation reasons all input-data at the main input-mask can be transferred to the protocol generated by the MarSurf XCR Software and e.g. exported via QSSTAT interface.
The choice of the quality plan or input-data can be also given by using a scanner (e.g. DMC-scanner). Using this technology input of required information can be partly or completely automated realized to avoid any failures.

typical application:
- series measurement of a defined spectrum of workpieces
- typical in combination with hardware: manual, semiautomatic measurement stations
- data export is applicable in combination with QS-StatPlus
- overall information like name of user, production line, operation step, etc. are beeing entered only once and are available afterwards for all QE's, protocol, export, etc.
- can be used in combination with all measurement stations

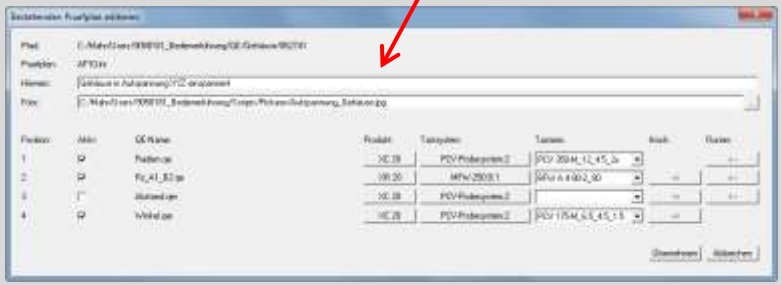
Highlights:
- regular repeating measurement procedures can be started only using a few clicks
- intuitive user concept to create measurement proceedures by combining Quick & Easy sequences – No special capabilities in terms of programming neccessary
- extents the functions of the standard MarWin MarSurf XCR Software

Software-Option to MarWin Standard package

Application Description:



editing of a measuring sequence



Reference	SW #1
Additional Documents:	-

MarSurf CNCPlus software

NEW

Type:	fully automatic CNCPlus		
Measuring Task:	roughness and contour	last update:	19.10.2017

Description of Measuring Station:

CNCPlus software package is an option (partially tied) for full-automatic operated measurement stations. This software option allows combining maximum of user comfortability and highest grade of automation with maximum of individualism and easy service.

Highlights:
- Due to a customer specific user interface an adoption to special needs is easily.
- No qualified employees are necessary for operate the measurement station.
- Automatic workpiece recognition by using RFID or DataMatrixCode. Failures by user are avoided.
- Individual configuration of the measurement sequence by simply choosing features to be measured by check-boxes. The measurement sequence will be automatically optimized e.g. in terms of minimum number of probearm exchanges.
- Favorite measurement sequences can be simply created and saved.
- Probe arms are calibrated and the corresponding data are stored in a data base. The internal offset of the probe arms in the database permit an exchange of programs between identical machines.
- The probe arm data base enables an easy probe arm exchange in case of defects.
- Several machines can use central stored measurement programs. Therefore it can be assured that all the time the current version of programs being used.
- Calibration of spare probe arms without any programming and immediate use, even in critical measurement tasks.
- Program sequences can be interrupted and started again without any losses of data or positioning.
- All common surface characteristics (e.g. Ra, Rmax, Rz, Pt) and characteristic curves can be evaluated and documented.
- In combination with the MarWin platform protocols can be exported by any customer specific needs. Also pictures, logos or other graphics can be included into the measuring protocol.

Application Description:	full automatic operation of CNC measurement stations

Reference	SW #2
Additional Documents:	-