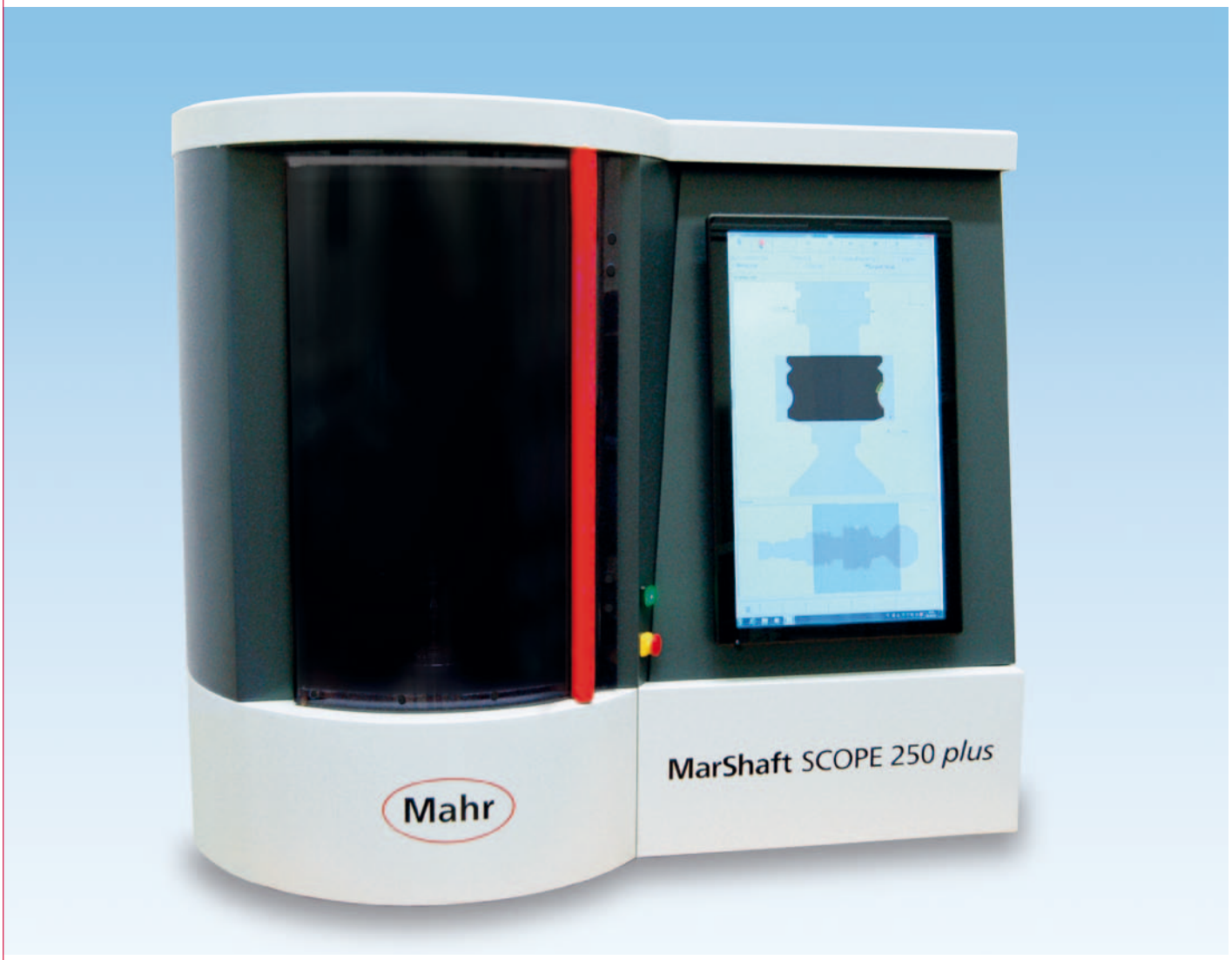
MarShaft



MarShaft SCOPE 250 *plus*

Mahr

EXACTLY

Flexible shaft measuring machine for measuring small, rotationally symmetrical workpieces such as turned parts

- Use in production
- Fast and easy operation
- Maximum measuring accuracy in harsh manufacturing environments
- New matrix camera with 40 mm x 24 mm image field

MarShaft SCOPE 250 *plus*

Mahr offers measuring systems for factories of the future

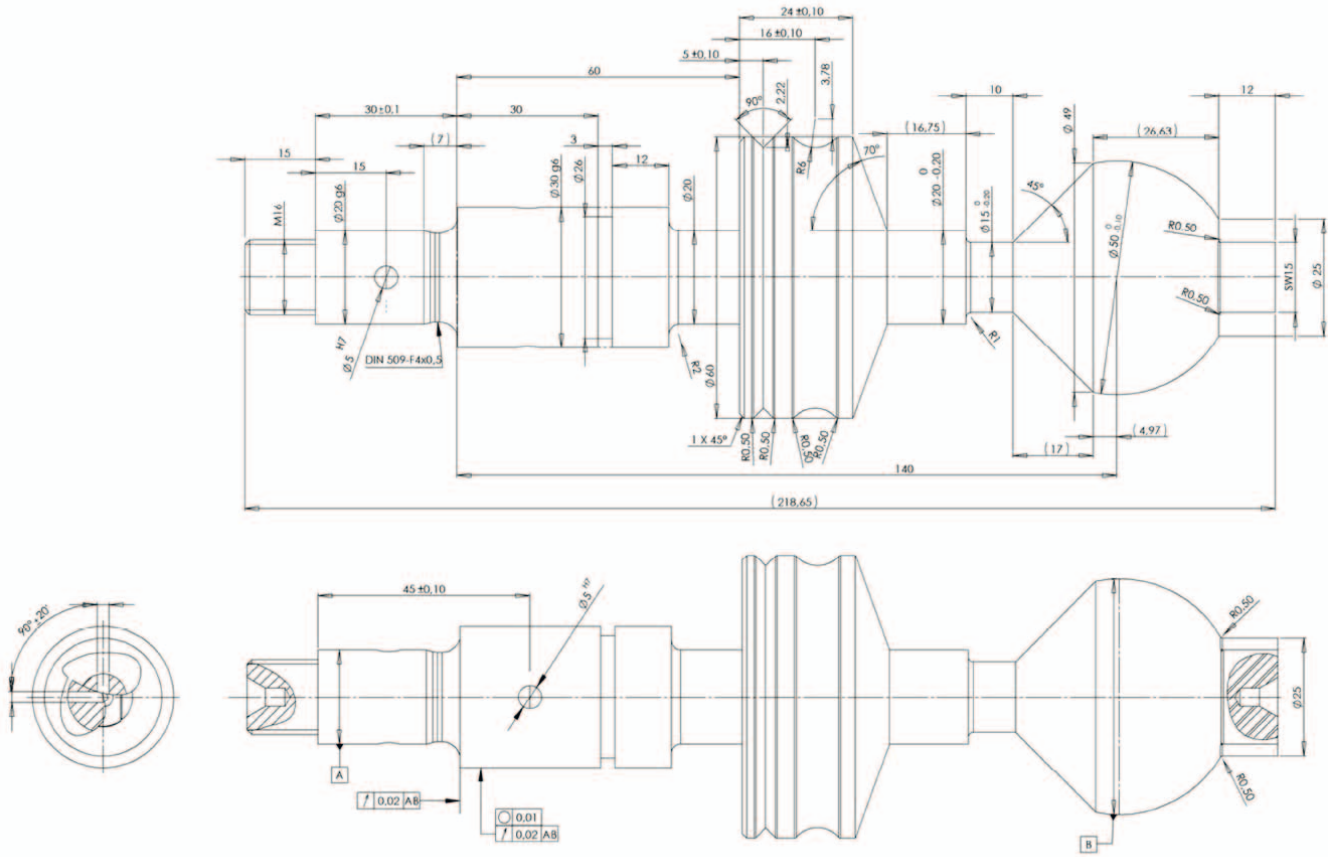
The role of dimensional metrology is expanding at a dramatic rate, in parallel with innovations in manufacturing processes. Given the ever more stringent accuracy requirements and falling cycle times in production (turning, milling, grinding, etc.), rapid measurement directly at the manufacturing machine is absolutely essential. So, measurement at the point of origin of the product, with rapid feedback to the manufacturing process to avoid waste is the problem you need to get solved. Mahr's flexible MarShaft SCOPE 250 *plus* shaft measuring machine offers the right measuring solution for the fast, precise and fully automatic measurement of rotationally symmetrical workpieces in production.

The MarShaft SCOPE 250 *plus* has a high precision roundness measuring axis (C) and a vertical measuring axis (Z) with a measuring range of 250 mm. The jewel in the crown is the state-of-the-art, high resolution CMOS matrix camera (providing the live image) with an image field of 40 mm x 24 mm. The extremely high image acquisition rate of over 120 images per second keeps measuring times to a minimum. Zoom functions allow the smallest details to be measured, which are difficult, and in some cases even impossible, to test with conventional measuring methods.

MarShaft SCOPE 250 *plus*

The main measurable features

- Length
- Diameter
- Form and position tolerances
- Offsets
- Recess width
- Bevel width
- Intersection points
- Position of intersection points
- Angles of rotation
- Radii
- Position of radii
- Taper lengths
- Hole contours
- Angles
- Pitches
- Widths across flats
- Outer threads



MarShaft SCOPE 250 *plus* / Versions

MarShaft SCOPE 250 *plus* with C-axis and tailstock
Order no. 5361802

Model with C-axis and tailstock for the static and dynamic measuring of workpieces clamped between centers.
2 centering tips with a cone of 60° for centering bore diameters of 2 mm to 15 mm (order no. 5361112) are included in package.

MarShaft SCOPE 250 *plus* with high-precision C-axis and tailstock
Order no. 5361803

Model with high-precision C-axis and tailstock for the static and dynamic measuring of workpieces clamped between centers.
2 centering tips with a cone of 60° for centering bore diameters of 2 mm to 15 mm (order no. 5361112) are included in package.

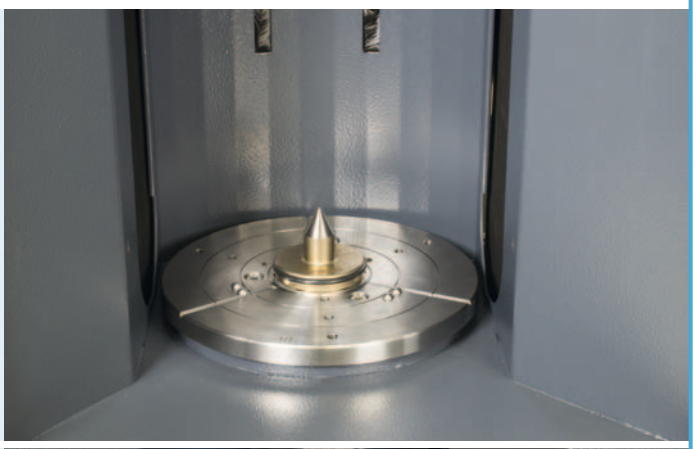
Performance features at a glance:

- New, high-resolution CMOS matrix camera with a large 40 mm x 24 mm live image field allows fast scanning with over 120 images per second
- High precision when measuring diameters and lengths
- Extremely fast measuring times thanks to high measuring speeds of up to 200 mm / s
- By using Mahr's MarWin software platform, you can benefit from our decades of experience in length, shape, position and contour measurement
- Excellent entry level price into the small optical shaft measuring machine segment

MarShaft SCOPE 250 *plus* / Components and accessories

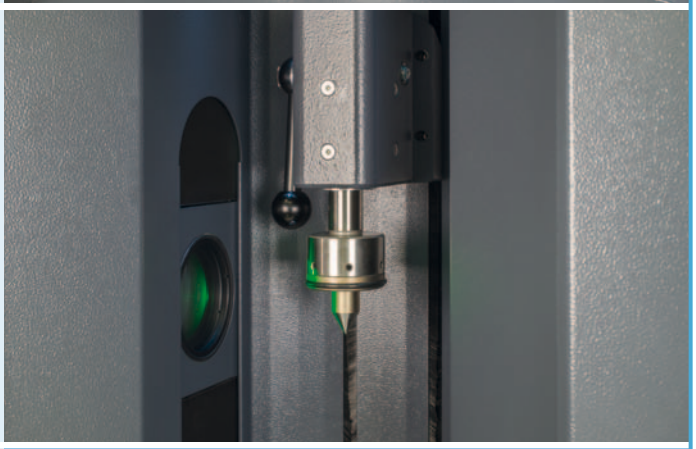
Precision measuring spindle (C-axis) with table plate

High-precision measuring spindle (C-axis) for dynamic measurements such as roundness, radial runout, coaxiality, cylindricity or diameter. The C-axis features the Mahr standard table plate and holds centering tips and other clamps that can be used for many types of workpiece.



Tailstock

The tailstock serves as the top workpiece holder bearing. The tailstock is equipped with an eccentric clamping mechanism for clamping at any Z-height. This mechanism is tightened and loosened by a clamping lever. The spindle is spring-loaded and automatically exercises the clamping force. Operating the tailstock with one hand allows you to change testpieces safely and easily. For dynamic (i. e. rotational) measurements, the spindle is situated in a high-precision ball bearing.



Centering tip with 60° cone for bore Ø 2 mm to 15 mm

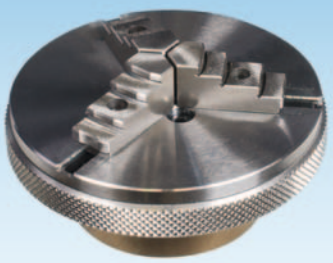
Interchangeable standard tip for clamping various workpieces between centers.

2 centering tips with a cone of 60° for centering bore diameter of 2 mm to 15 mm are included in the MarShaft SCOPE 250 *plus* with tailstock package.

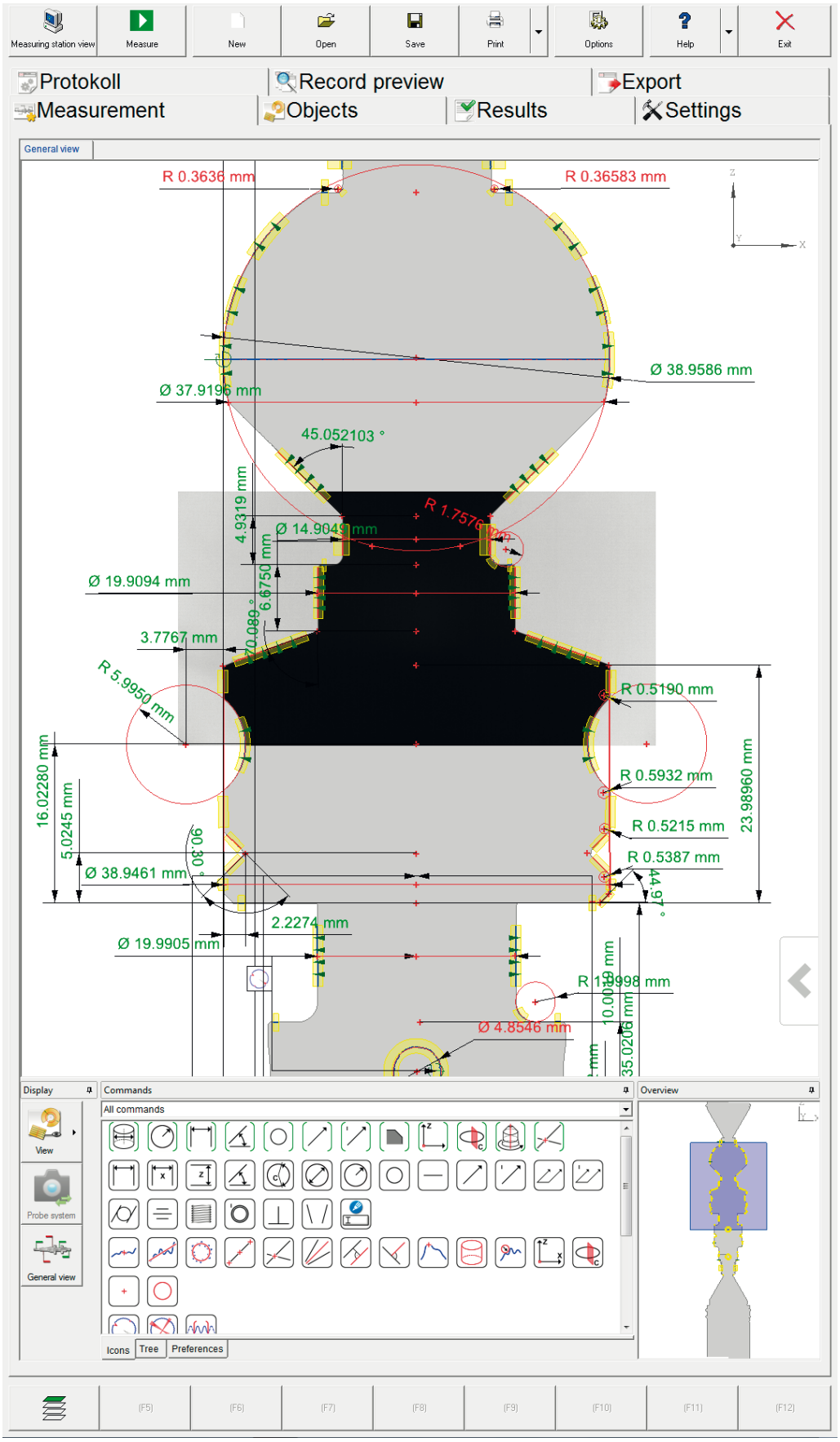
Order no. 5361112

Rim chuck with three jaws and Ø 70 mm with adaptor for the MarShaft SCOPE 250 *plus*
Outer clamping range 1 mm to 70 mm
Included in MarShaft SCOPE 250 *plus* basic package.

Order no. 5361080



MarShaft SCOPE 250 *plus* / MarWin EasyShaft



MarShaft SCOPE 250 *plus* / MarWin EasyShaft Software V. 8.0

MarWin EasyShaft software is the measuring, control and evaluation program for the MarShaft SCOPE *plus* series. It enables the precision measurement of diameters, lengths, contour features and form and position tolerances in accordance with standards, and offers many new evaluation and documentation options, all with a well-laid-out, intuitive user interface. The software runs entirely under the familiar Windows® operating system. The user interface is compatible with other Windows® applications, reducing the familiarization time substantially. All Windows®-compatible printers can be used for record output.

Performance features at a glance:

- The familiar Windows® user interface makes for a short learning curve
- The EasyShaft user interface is in line with the standard user interface across all Mahr products (cf. EasyForm or Contour 1)
- Clear, windows-based layout
- User-friendly, 100% touchscreen functionality
- Predefined macros for easy programming (e.g. diameter measurement at the touch of a single button)
- Many functions can be selected directly via obvious icons
- Touchscreen-controllable machine axes
- The live image from the matrix camera is continuously displayed during measurement, i.e. direct visual assessment of the workpiece surface (e.g. soiling) even during measurement
- For individual and series measurements: the ideal operating strategy for every task
- User-friendly, state-of-the-art measuring program management
- Time-optimized measuring program sequence, thus minimal measuring times
- Clear measuring records – in black-and-white or color – output to all Windows® printers
- Future-proof investment, runs under Windows® 7 Ultimate
- Optional data export to statistics programs extends the range of functions of the EasyShaft software

EasyShaft program window

The EasyShaft software gives you full control of the MarShaft SCOPE 250 *plus*. The touchscreen gives you direct access to positioning, programming, measurement and documentation. The clear, simple user interface helps you keep track of everything you need to know. Many functions, e.g. loading measuring results or adding feature measurements, can be activated simply by clicking on obvious icons.

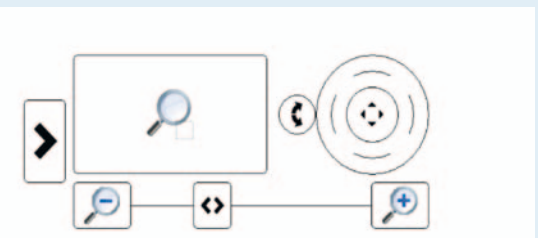
EasyShaft commands

The command bar contains a summary overview of all of the commands required for measuring and evaluating features:

- Macros (composed sequences of evaluation actions, e.g. diameter, radius, distance or angle)
- Features which can be calculated (e.g. direct distance, distance in X and Z, angle, angle sector, radius, roundness, straightness, radial run-out, axial run-out, cylindricity, symmetry etc.)
- Substitute elements which can be calculated (e.g. point, line, circle, point on straight line, intersection point, symmetry straight line, parallel straight line, extreme point, C-reference etc.).

Display palette (touchscreen control of machine axes)

- Used to show or hide the display palette
- Used to select the zoom range
- May be joystick for the C-axis depending on device version
- May be joystick for the Z-axis depending on device version
- Zoom in or out incrementally
- Zoom in or out continuously

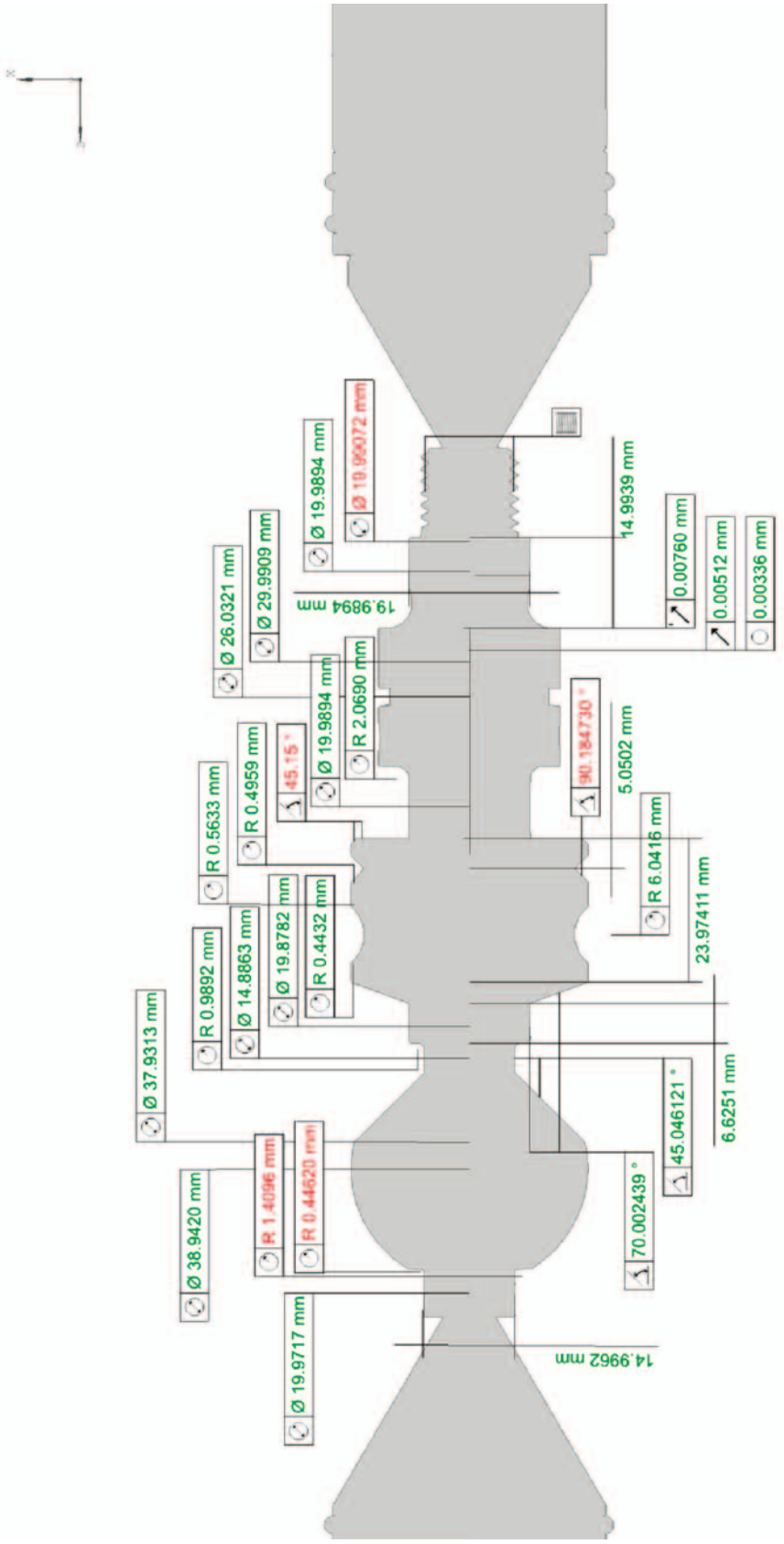


MarShaft SCOPE 250 *plus* / MarWin EasyShaft / Sample result record

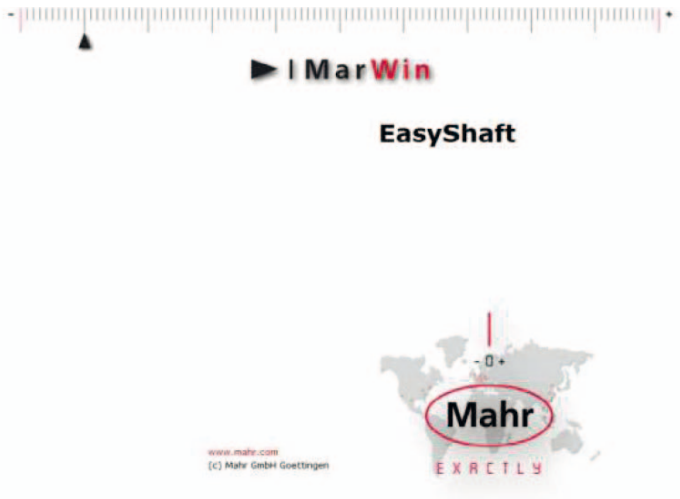
Mahr MarWin 8.00-07	**QE Shaft measurement** **Task: "Scope"**	**20.05.2015** 1 16:59:42 Inspector: **Administrator** Signature:
Part:	Drawing n°:	Machining operation:
Comment:		

N°	Feature	Nominal size	LT	UT	Actual size	Dev. from TL	Dev. from TC	Deviation	Exceeding
1	M16 (Steigung) mm	2.0000	-0.0050	0.0050	1.9985		-0.0015	-0.0015	
1	M16 (Partial profile angle 1) °	30.0000	-0.1667	0.1667	29.8455		-0.1545	-0.1545	
1	M16 (Partial profile angle 2) °	30.0000	-0.1667	0.1667	29.5967		-0.4033	-0.4033	-0.2367
1	M16 (Flankendurchmesser) mm	14.5830	-0.0800	0.0800	14.5662		-0.0168	-0.0168	
1	M16 (Kerndurchmesser) mm	13.3895	-0.1185	0.1185	13.3155		-0.0740	-0.0740	
1	M16 (Aussendurchmesser) mm	15.8220	-0.1400	0.1400	15.9081		0.0861	0.0861	
2	distance_4 mm	15.0000	-0.1000	0.1000	14.9595		-0.0405	-0.0405	
3	diameter_1 mm	5.0000	-0.1000	0.1000	4.9005		-0.0995	-0.0995	
4	diameter_2 mm	20.0000	-0.1000	0.1000	19.9913		-0.0087	-0.0087	
5	distance_5 mm	7.0000	-0.1000	0.1000	6.6656		-0.3344	-0.3344	-0.2344
6	distance_6 mm	15.0000	-0.1000	0.1000	15.0113		0.0113	0.0113	
7	distance_7 mm	4.0000	-0.1000	0.1000	4.0493		0.0493	0.0493	
8	diameter_3 mm	30.0000	-0.1000	0.1000	29.9940		-0.0060	-0.0060	
9	diameter_4 mm	26.0000	-0.1000	0.1000	26.0332		0.0332	0.0332	
10	distance_9 mm	10.0000	-0.1000	0.1000	10.0597		0.0597	0.0597	
11	distance_10 mm	3.0000	-0.1000	0.1000	2.9662		-0.0338	-0.0338	
12	distance_11 mm	10.0000	-0.1000	0.1000	10.0019		0.0019	0.0019	
13	diameter_5 mm	20.0000	-0.1000	0.1000	19.9905		-0.0095	-0.0095	
14	radius_2 mm	2.0000	-0.1000	0.1000	1.9998		-0.0002	-0.0002	
15	diameter_6 mm	39.0000	-0.1000	0.1000	38.9461		-0.0539	-0.0539	
16	distance_12 mm	35.0000	-0.1000	0.1000	35.0206		0.0206	0.0206	
17	angle_1 °	45.00	-1.00	1.00	44.97		-0.03	-0.03	
18	angle_2 °	90.00	-1.00	1.00	90.30		0.30	0.30	
19	distance_13 mm	5.0000	-0.1000	0.1000	5.0245		0.0245	0.0245	
20	radius_3 mm	6.0000	-0.1000	0.1000	5.9950		-0.0050	-0.0050	
21	distance_15 mm	15.97975	-0.10000	0.10000	16.02280		0.04305	0.04305	
22	distance_16 mm	2.2200	-0.1000	0.1000	2.2274		0.0074	0.0074	
23	distance_17 mm	3.7800	-0.1000	0.1000	3.7767		-0.0033	-0.0033	
24	distance_18 mm	23.90976	-0.10000	0.10000	23.98960		0.07984	0.07984	
25	diameter_7 mm	20.0000	-0.2000	0.0000	19.9094		0.0094	-0.0906	
26	angle_5 °	70.000	-1.000	1.000	70.089		0.089	0.089	
27	diameter_8 mm	15.0000	-0.2000	0.0000	14.9049		0.0049	-0.0951	
28	distance_22 mm	6.6500	-0.1000	0.1000	6.6750		0.0250	0.0250	
29	distance_23 mm	5.0000	-0.1000	0.1000	4.9319		-0.0681	-0.0681	
30	angle_6 °	45.000000	-0.100000	0.100000	45.052103		0.052103	0.052103	
31	radius_4 mm	0.5000	-0.1000	0.1000	0.5215		0.0215	0.0215	
32	radius_5 mm	0.5000	-0.1000	0.1000	0.5387		0.0387	0.0387	
33	radius_6 mm	0.5000	-0.1000	0.1000	0.5190		0.0190	0.0190	
:	:	:	:	:	:	:	:	:	:

MarShaft SCOPE 250 *plus* / MarWin EasyShaft / Sample result record



MarShaft Scope *plus* / Marwin Software EasyShaft V. 8.0



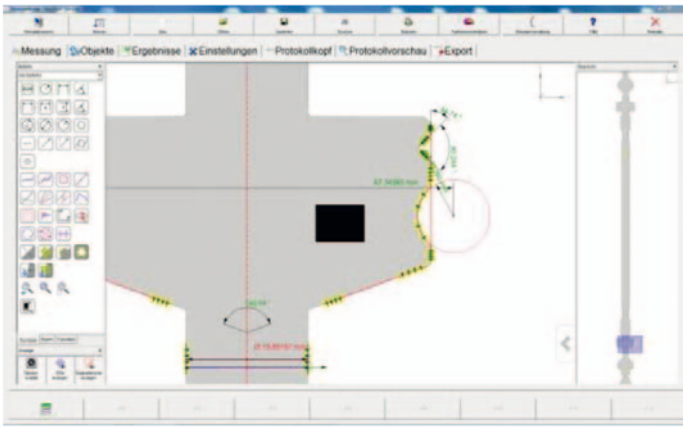
MarWin EasyShaft Software V8.0

MarWin EasyShaft Software V8.0
Order no. 5361580

The MarWin EasyShaft software is the measuring, control and evaluation program for the MarShaft SCOPE *plus* series. It enables the precision measurement of diameters, lengths, contour features and form and position tolerances in accordance with standards, and offers many new evaluation and documentation options, all with a well-laid-out, intuitive user interface.

Country package with Windows 7® Ultimate operating system, with optional language versions
- German
- English / International
- French
- Other languages on request

Included in the scope of delivery of the machine version



MarWin EasyShaft Offline Programming Software Option

Offline programming option for EasyShaft V8.0
Order no. 536158

Creating measuring programs in offline mode. The testpiece contours can either be created by a fully automatic form scan with a MarShaft SCOPE 250 *plus* or loaded from a STEP file (from a CAD system).

MarWin ProfessionalShaft Software

ProfessionalShaft V8.0 software option
Order no. 5361581

Free programming with MarWin MarScript for implementing customer-specific applications such as measuring symmetry in keyways.

MarShaft SCOPE 250 *plus*

Technical Data

Dimensions (basic unit) W/H/D	1054 mm x 952 mm x 592 mm
Equipment table height for optimal operation	800 mm x 900 mm
Weight	approx. 120 kg
Measuring range (Z)	250 mm
Workpiece weight	max. 5 kg
Workpiece dimensions	
Max. length in centers	250 mm
Max. length in chuck	150 mm
Max. measurable diameter	40 mm
Max. swivel diameter in centers	100 mm
Max. swivel diameter in chuck	50 mm
Measurement resolution	adjustable
Lengths/diameters	0.01 mm ... 0.0001 mm 0.001 inch ... 0.0001 inch
Angle	0.01 ... 0.0001 degrees (decimal) or degrees, minutes, seconds
Repeatability 4 σ for 50 measurements	
Length	2.0 µm
Diameter	(0.4 + D/80) µm; D in mm for clean, ground workpiece surfaces
Error limit MPE_{E1}	
Length	≤ (3.0 + l/125) µm; l in mm
Diameter	≤ (1.5 + l/40) µm; l in mm valid in temperature range 20°C ± 2 K
Drives	
Travel speed Z	max. 200 mm/s
Rotational speed C	max. 1.0 1/s
Optics	
Telecentric precision lens; lighting with high light output in flash mode	
Camera	
CMOS matrix camera with USB 3.0 interface	40 mm x 24 mm
Full frame mode	120 images/s
Subframe mode (16 rows)	approx. 1000 images/s
Filter algorithm to exclude dirt particles during the edge calculation.	

MarShaft SCOPE 250 *plus*

Technical Data

Measuring computer	SFF-PC; WIN 7 x 64; Intel CPU; DVD-RW
Ambient conditions	
Operating temperature	+10 °C ... +35 °C
Recommended working temperature	+15 °C ... +35 °C
Storing/transport temperature	-10 °C ... +50 °C
Permitted humidity	max. 90%; non-condensing!
Temporal temperature gradient	< 2 K/h
Spatial temperature gradient	< 1 K/m ceiling height
Air pressure	1000 hPa ± 200 hPa
Perm. ambient sound pressure	< 75 dB(A)
Electrical connection	
Supply voltage U~	100 V ... 240 V +10 %/-15 %
Mains frequency	50/60 Hz
Power consumption	max. 500 VA
Protection class	I
Protection rating	IP32
Sound level	
Emitted sound level	< 70 dB(A)
Perm. ground vibrations	
Range 0.5 Hz ... 20 Hz	2 mm/s to 50 mm/s linear gradient
Range >20 Hz	50 mm/s

Subject to change without notice.

- 0 +

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Mahr GmbH Göttingen

Carl-Mahr-Str. 1, 37073 Goettingen, Germany
Phone: +49 (0)551-7073-800, Fax: +49 (0)551 7073-888
info@mahr.com, www.mahr.com

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