

MarShaft



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OPTICAL AND TACTILE SHAFT MEASURING MACHINE FOR CAMSHAFTS

- Measurements are much faster and more process-reliable
- Complete acquisition of all features
- Automated measurement directly in production

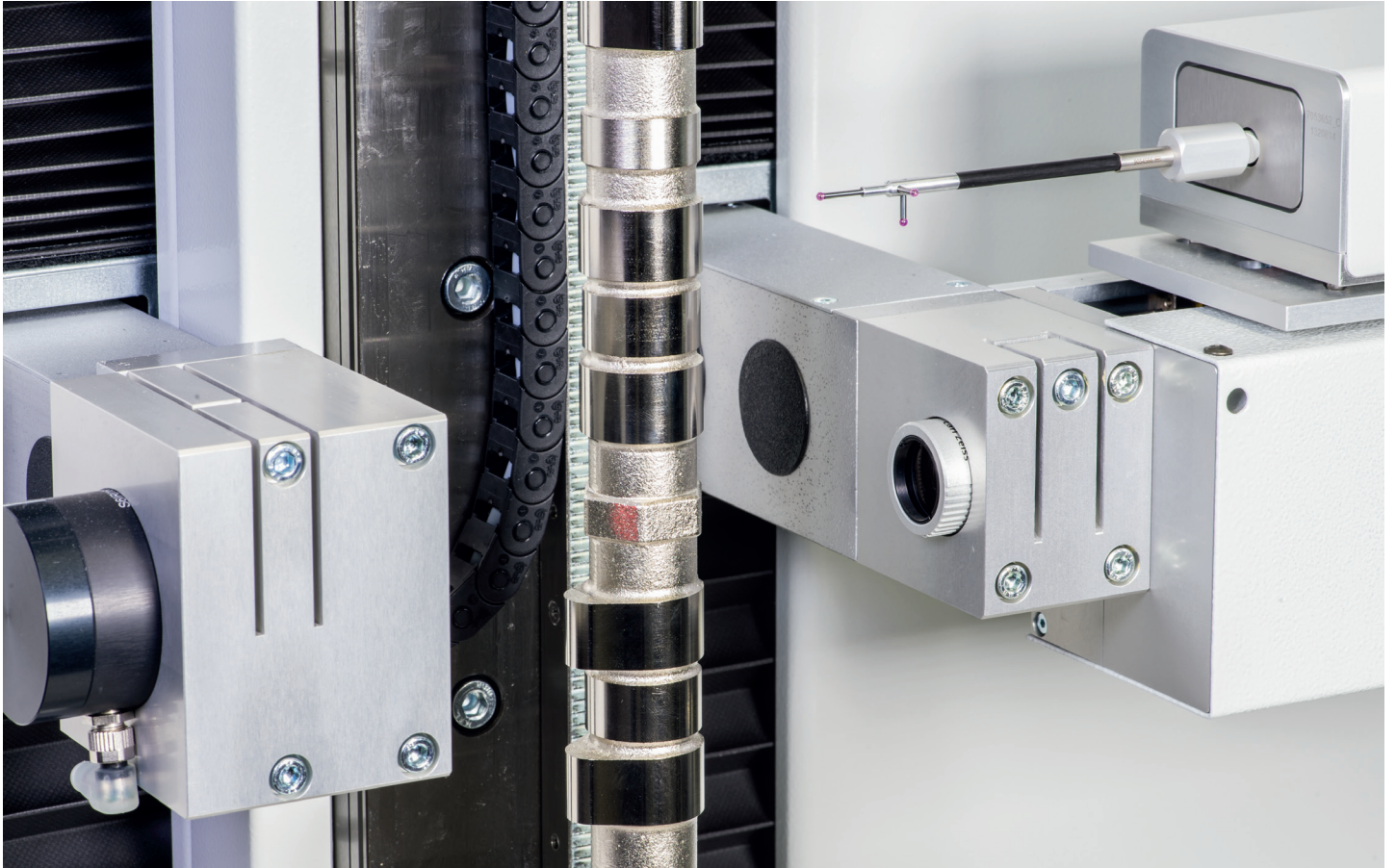
This is what we mean by **EXACTLY.**

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EXACTLY

MarShaft SCOPE 600 *plus* 3D



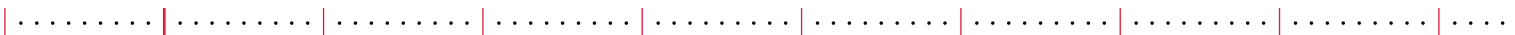
Every year, over 100 million camshafts are produced worldwide. The cams control the inlet and outlet valves in every combustion engine. Camshafts are always evolving, for example to reduce fuel consumption, pollution and noise emissions.

The precise quality testing of workpieces is becoming increasingly important because whenever tolerances are exceeded without detection, entire assemblies often break down. Manufacturers of camshafts are, therefore, increasingly being advised to perform a 100 percent geometry check.

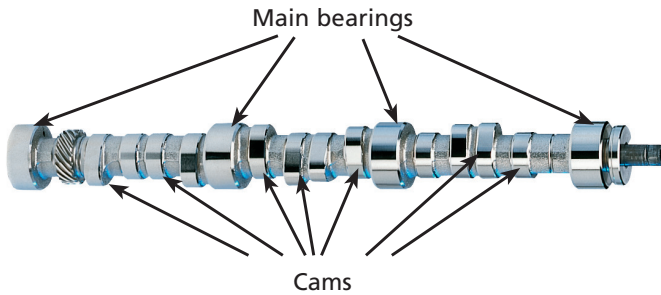
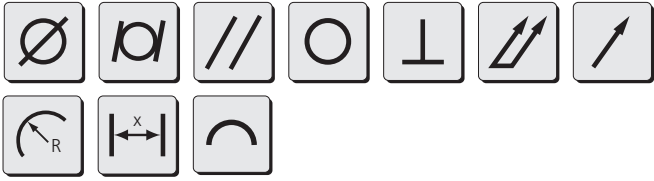
Mahr specializes in camshaft applications, and their new MarShaft SCOPE 600 *plus* 3D measuring station offers a completely new measuring technique: The combination of optical and tactile sensors enables 3D functionality for the first time and thus the complete inspection of camshafts in one clamping operation.

To this end, Mahr has also enhanced its already very successful **MarShaft SCOPE 750 *plus*** measuring station. It now has a new 2D probe system, a motorized tailstock and a special calibration for the linear axes (Z-X-Y). The matrix camera optically measures features such as diameters, lengths, radii, form, position features, cam angles and the cam pitch in just a few seconds. The additional 2D probe records features that cannot be measured optically: concave cam profile, axial runouts, reference elements in an axial direction as well as axial holes. The tactile and optical system are calibrated in one coordinate system. The measuring station uses the MarWin software platform to deliver complete 3D functionality.

Users benefit from several advantages of the new measuring solution **MarShaft SCOPE 600 *plus* 3D**. The automated measuring procedure is much faster and much more reliable. While conventional coordinate measuring technology takes approximately 30 to 40 minutes per workpiece, the Mahr measuring station can measure a four-cylinder camshaft in just five minutes. Furthermore, the measuring station can be used directly in production at the machine tool for the respective machining operation. The motorized tailstock ensures that the workpieces are always clamped with the same clamping force and thereby eliminate operator influence.



CAMSHAFT MEASUREMENT WITH MARWIN PROFESSIONALSHAFT



Evaluates the following properties:

Bearings

- Roundness
- Diameter
- Radial run-out
- Cylindricity
- Coaxiality
- Straightness
- Conicity

- Form deviation of pre-cam
- Sector deviation of pre-cam
- Sector position of pre-cam
- Form deviation of post-cam
- Sector deviation of post-cam
- Sector position of post-cam
- Base circle roundness
- Base circle diameter
- Base circle radial runout
- Acceleration evaluation
- Speed evaluation
- Nominal/actual comparison of cam profile

Cams

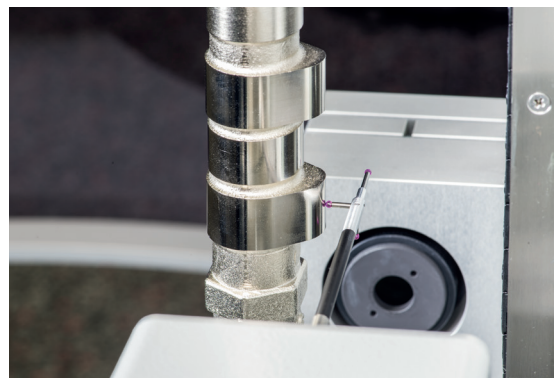
- Cam angle
- Ref. angle
- Cam pitch
- Form deviation
- Sector deviation
- Sector position

Lengths

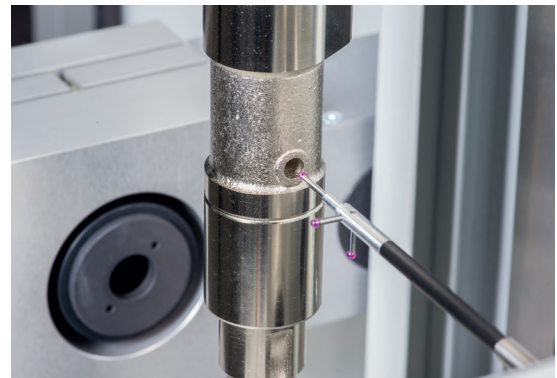
- Length measurements



New 2D probe system



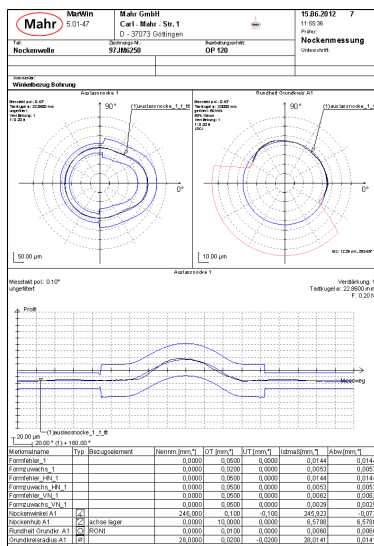
Measuring the cam profile



Measuring the blind hole



Groove measurement



MarShaft SCOPE 600 *plus* 3D

TECHNICAL DATA

Dimensions (basic unit) (w/H/D)	690 mm x 1230 mm x 760 mm
Weight	approx. 140 kg
Measuring range (Z)	760 mm
Workpiece weight	max. 15 kg
Workpiece dimensions	
max. length	600 mm
max. diameter	120 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
Error limit MPE _{E1}	
Length	≤ (2.0 + l/125) μm; l in mm
Diameter	≤ (1.0 + l/125) μm; l in mm surfaces
Repeatability 4 s for 50 measurements	
Length	1.5 μm
Diameter	1.0 μm, with clean, ground workpiece Valid in temperature range 20°C ± 2 K
Drives	
Travel speed Z	max. 200 mm/s
Travel speed X	max. 100 mm/s
Travel speed Y	max. 50 mm/s
Rotational speed C	max. 1.0 1/s
Optics	Telecentric precision lens; red lighting with high light output in flash mode

Camera	
CMOS matrix with USB port	1280 x 1024 pixels
Full frame mode	15 images/s
Subframe mode (16 rows)	approx. 400 images/s Filter algorithm to exclude dirt particles during the edge calculation
Tactile probe	2-coordinate probe
Measuring range	+/- 300 μm
Measuring force	at 100 μm deflection = 0.04 N
Measuring computer	
	19" industrial PC; WIN 7 x 64 bit
Ambient conditions	
Operating temperature	+10°C...+40°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	100 VAC to 240 VAC +10 %/-15 %
Mains frequency	50/60 Hz
Power consumption	max. 1000 VA < 75 dB(A)
Sound level	
Permissible ground vibrations	
0.5 Hz...20 Hz range	2 mm/s ² to 50 mm/s ² linear gradient
Range >20 Hz	50 mm/s ²



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