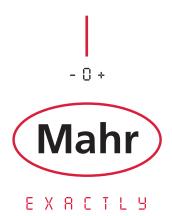
MarShaft



MarShaft SCOPE 600 plus 3D

Optical and Tactile Shaft Measuring Machine for Camshafts



MarShaft SCOPE 600 plus 3D



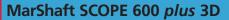
Every year, over 100 million camshafts are produced worldwide. The cams control the inlet and outlet valves in every combustion engine. Camshafts are always evolving, for example to reduce fuel consumption, pollution and noise emissions.

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.

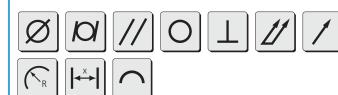
Mahr specializes in camshaft applications, and their new **MarShaft SCOPE 600** *plus* **3D** measuring station offers a completely new measuring technique: The combination of optical and tactile sensors enables 3D functionality for the first time and thus the complete inspection of camshafts in one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

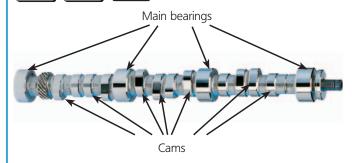
To this end, Mahr has also enhanced its already very successful **MarShaft SCOPE 750** *plus* measuring station. It now has a new 2D probe system, a motorized tailstock and a special calibration for the linear axes (Z-X-Y). The matrix camera optically measures features such as diameters, lengths, radii, 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

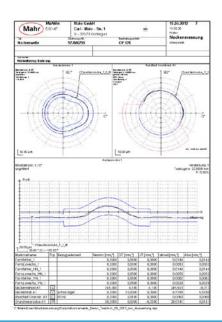
Cams

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

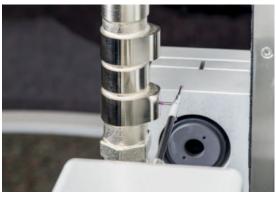
Lengths

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)

Weight

Measuring range (Z) Workpiece weight

Workpiece dimensions

max. length max. diameter

Measurement resolution

Lengths/diameters

Angle

Error limit MPE_{E1}

Length Diameter

Repeatability 4 s for 50 measurements

Length Diameter

Drives

Travel speed Z Travel speed X Travel speed Y Rotational speed C

Optics

Camera

CMOS matrix with USB port Full frame mode

Subframe mode (16 rows)

Tactile probe

Measuring range Measuring force

Measuring computer

Ambient conditions

Operating temperature Recommended working temperature Storing/transport temperature

Permitted humidity

Temporal temperature gradient Spatial temperature gradient

Air pressure

Perm. ambient sound pressure

Electrical Connection

Supply voltage Mains frequency Power consumption

Sound level

Permissible ground vibrations

0.5 Hz...20 Hz range Range >20 Hz 690 mm x 1230 mm x 760 mm

approx. 140 kg 760 mm max. 15 kg

600 mm 120 mm Adjustable

0.01 mm...0.0001 mm; 0.001 inch...0.0001 inch

0.01...0.0001 degrees (decimal) or degrees, minutes, seconds

 \leq (2.0 + l/125) $\mu m;$ l in mm \leq (1.0 + l/125) $\mu m;$ l in mm surfaces

1.5 µm

1.0 μ m, with clean, ground workpiece Valid in temperature range 20°C \pm 2 K

max. 200 mm/s max. 100 mm/s max. 50 mm/s max. 1.0 1/s

Telecentric precision lens;

Red lighting with high light output in flash mode

1280 x 1024 pixels 15 images/s

approx. 400 images/s

Filter algorithm to exclude dirt particles during the edge calculation

2-coordinate probe +/- 300 µm

at 100 μ m deflection = 0.2 - 0.3 mN 19" industrial PC; WIN 7 x 64 bit

+10°C...+40°C +15°C...+35°C -10°C...+50°C

max. 90%; non-condensing

< 2 K/h

< 1 K/m ceiling height 1000 hPa \pm 200 hPa

 $< 75 \, dB(A)$

100 V_{AC} to 240 V_{AC} +10 %/-15 %

50/60 Hz max. 1000 VA < 75 dB(A)

 $2\,\text{mm/s}^2$ to $50\,\text{mm/s}^2$ linear gradient

50 mm/s²

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