FLEXIBLE SHAFT MEASURING MACHINE FOR MEASURING SMALL, ROTATIONALLY SYMMETRICAL WORKPIECES

- Highest measuring accuracy in the rough production environment
- Extremely short measuring times due to high measuring speeds of up to 200 mm/s

That is what EXACTLY means to us.
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 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
- 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 a Glance:

• New, high-resolution CMOS matrix camera with a large 40 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
Mar Shaft 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
Order no. 5361112

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 Mar Shaft SCOPE 250 plus package.

Rim chuck with three jaws and Ø 70 mm
Order no. 5361080

with adaptor for the Mar Shaft SCOPE 250 plus
Outer clamping range 1 mm to 70 mm
MarShaft SCOPE 250 plus
Software MarWin EasyShaft
MarShaft SCOPE 250 plus
Software MarWin EasyShaft

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
Software MarWin EasyShaft. Sample Result Record
MarShaft SCOPE 250 plus
Software MarWin EasyShaft. Sample Result Record
Software MarWin EasyShaft

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

Offline Programming Option for MarWin EasyShaft

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).

ProfessionalShaft Software Option

Free programming with MarWin MarScript for implementing customer-specific applications such as measuring symmetry in keyways.
# MarShaft SCOPE 250 plus

## Technical Data

<table>
<thead>
<tr>
<th>MarShaft SCOPE 250 plus</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Dimensions (basic unit) W/H/D</strong></td>
<td>1054 mm x 952 mm x 592 mm</td>
</tr>
<tr>
<td><strong>Equipment table height for optimal operation</strong></td>
<td>800 mm - 900 mm</td>
</tr>
<tr>
<td><strong>Weight</strong></td>
<td>approx. 120 kg</td>
</tr>
<tr>
<td><strong>Measuring range (Z)</strong></td>
<td>250 mm</td>
</tr>
<tr>
<td><strong>Workpiece weight</strong></td>
<td>max. 5 kg</td>
</tr>
<tr>
<td><strong>Workpiece dimensions</strong></td>
<td></td>
</tr>
<tr>
<td>Max. length in centers</td>
<td>250 mm</td>
</tr>
<tr>
<td>Max. length in chuck</td>
<td>150 mm</td>
</tr>
<tr>
<td>Max. measurable diameter</td>
<td>40 mm</td>
</tr>
<tr>
<td>Max. swivel diameter in centers</td>
<td>100 mm</td>
</tr>
<tr>
<td>Max. swivel diameter in chuck</td>
<td>50 mm</td>
</tr>
<tr>
<td><strong>Measurement resolution</strong></td>
<td>Adjustable</td>
</tr>
</tbody>
</table>
| 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 4σ for 50 measurements** |  |
| Length | 2.0 μm |
| Diameter | (0.4 + D/80) μm; D in mm  
for clean, ground workpiece surfaces |
| **Error limit MPEE1** |  |
| Length | ≤ (1.5 + l/40) μm; l in mm |
| Diameter | ≤ (3.0 + l/125) 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 x 24 mm |
| Full frame mode | 120 images/s |
| Subframe mode (16 rows) | approx. 1000 images/s |
## MarShaft SCOPE 250 plus

### Technical Data

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

Subject to change without notice.