The Pocket Surf portable roughness gage is one of the easiest to use and most popular surface roughness gages ever made. The Pocket Surf performs traceable surface roughness measurements on a wide variety of surfaces therefore it can be confidently used in production, on the shop floor or in inspection labor.
### Important Definitions and Surface Parameters

**Pocket Surf®**

Technical Data

Probes

Applications and Accessories

---

**Pocket Surf®. Portable Surface Roughness Gage**

- M1 & M2 Data
Important Definitions and Surface Parameters

Real surface separates a body from the surrounding medium. (DIN EN ISO 4287)

Stylus instrument enables two-dimensional tracing of a surface. The stylus is traversed normal to the surface at constant speed. (DIN EN ISO 3274)

Traced Profile is the enveloping profile of the real surface acquired by means of a stylus instrument.

Parameters usually are defined over the sampling length. An average parameter estimate is calculated by taking the arithmetic mean of the parameter estimates from all the individual sampling lengths. For roughness profile parameters the standard number of sampling lengths is five.

$Ra$  Mean roughness  DIN EN ISO 4287, ASME B46.1

Roughness average $R_a$ is the arithmetic average of the absolute values of the roughness profile ordinates

$$R_a = \frac{1}{L} \int_{L} |Z(x)| \, dx$$

$Z(x)$ = profile ordinates of the roughness profile.

$R_a$ is also called AA and CLA.

$R_s, R_{max}$ Roughness depth  DIN ISO 4287, ASME B46.1

Single roughness depth $R_s$ is the vertical distance between the highest peak and the deepest valley within a sampling length.

Mean roughness depth $R_z$ is the arithmetic mean of the single roughness depths $R_{zi}$ of consecutive sampling lengths:

$$R_z = \frac{1}{5} (R_{z1} + R_{z2} + \ldots + R_{z5})$$

The $R_z$ definition is identical to the definition in DIN4768: 1990. The ten point height $R_z$ as well as the parameter symbol $R_y$ of ISO 4287:1984 has been canceled.

Maximum roughness depth $R_{max}$ is the largest single roughness depth with the evaluation length. (DIN EN ISO 4288; $R_{max}$ is also called $R_{z1max}$).

Selection of cutoff according to DIN EN ISO 4287, ASME B46.1

<table>
<thead>
<tr>
<th>Periodic profile</th>
<th>Non-periodic profile</th>
<th>Cutoff</th>
<th>Sample/ Evaluation length</th>
</tr>
</thead>
<tbody>
<tr>
<td>$R_{Sm}$ (mm/in)</td>
<td>$R_z$ (µm/µin)</td>
<td>$R_a$ (µm/µin)</td>
<td>$R_{zr}$ (mm/in)</td>
</tr>
<tr>
<td>&gt; 0.13 to 0.4/.005 to .016</td>
<td>&gt; 0.5 to 10/20 to 400</td>
<td>&gt; 0.1 to 2/4 to 80</td>
<td>0.8/.030</td>
</tr>
</tbody>
</table>
**Pocket Surf**, the portable surface roughness gage

*US-patent no. 4,776,212*

**Features**

- Pocket-sized economically priced, completely portable instrument which performs traceable surface roughness measurements on a wide variety of surfaces; can be used confidently in production, on the shop floor and in the laboratory.
- Solidly built, with a durable cast aluminum housing, to provide years of accurate, reliable surface finish gaging.
- Can be used to measure any one of four, switch-selectable, parameters: $R_a$, $R_{\text{mean}}$, $R_y$, $R_z$.
- Selectable traverse length 1, 3 or 5 cut-offs of 0.8 mm/.030”
- Operates in any position – horizontal, vertical, and upside down
- Four switchable probe positions – axial (folded) or at 90°, 180° or 270°
- Even difficult-to-reach surfaces such as inside and outside diameters are accessible.
- Integrated data output for SPC-processing units that is compatible with the most common data processing systems.
- Easy-to-read LCD readout presents the measured roughness value, in microinches or micrometers, within half a second after the surface is traversed.
- Out-of-range (high or low) and “battery low” signals are also displayed.

**Technical Data**

- **Dimensions** 140 mm x 76 mm x 25 mm / 5.5” x 3” x 1”
- **Weight** 435 g / 14 oz
- **Measuring Ranges**
  - $R_a$: 0.03 µm to 6.35 µm / 1 µinch to 250 µinch
  - $R'_{\text{mean}}$: 0.2 µm to 25.3 µm / 8 µinch to 999 µinch
  - $R_y$: 0.2 µm to 25.3 µm / 8 µinch to 999 µinch
  - $R_z$: 0.2 µm to 25.3 µm / 8 µinch to 999 µinch
- **Display Resolution** 0.01 µm / 1 µin
- **Measurement Accuracy** Meets ASME-B46.1, ISO, DIN standards and MIL specifications
- **Digital Readout** LCD; with; “Battery low” signal; “H” and “L” (measured values out-of-range)

Optional Accessory: Statistics Printer MSP 2, see page 11-4 for more details.
Pocket Surf

Technical Data

Probing and Traverse Lengths

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Traverse Length (Nominal)</th>
<th>Evaluation Length</th>
<th>Number of Cutoffs/ Switch Position</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ra/Ry</td>
<td>2.0 mm/.075”</td>
<td>0.8 mm/.030”</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>3.5 mm/.135”</td>
<td>2.4 mm/.090”</td>
<td>3</td>
</tr>
<tr>
<td>Ra/Rz/Rmax</td>
<td>5.0 mm/.195”</td>
<td>4.0 mm/.150”</td>
<td>5</td>
</tr>
</tbody>
</table>

- Traverse Speed: 5.08 mm/.2” per second
- Cutoff: 0.8 mm/.030” ASME 2 RC-filter
- Probe Type: Piezoelectric
- Maximum Stylus Force: 15.0 mN / 1500 mfg
- Power: consumer-type alkaline battery, 9 Volt
- Battery Capacity: Approx. 2500 measurements, depending on frequency of use and output option
- Operating Temperature: 10° to 45°C / 50° to 113° F
- Storage Temperature: -20° to 65°C / -4° to 149° F

Pocket Surf Sets

Order no.

<table>
<thead>
<tr>
<th>EMD-1500-311</th>
<th>EGH-1019</th>
<th>Probe, 90°, 10 µm radius, PMD-90101 Certified Specimen, incl. Test Certificate</th>
</tr>
</thead>
<tbody>
<tr>
<td>EMD-1500-312</td>
<td>EGH-1019</td>
<td>Probe, 90°, 10 µm radius, EMD-90010 Precision Specimen</td>
</tr>
<tr>
<td>EMD-1500-321</td>
<td>EGH-1026</td>
<td>Probe, 90°, 5 µm radius, PMD-90101, Certified Specimen, incl. Test Certificate</td>
</tr>
<tr>
<td>EMD-1500-322</td>
<td>EGH-1026</td>
<td>Probe, 90°, 5 µm radius, EMD-90010 Precision Specimen</td>
</tr>
</tbody>
</table>

A Pocket Surf kit is furnished complete in a fitted case, and includes a Pocket Surf unit with a General Purpose Probe** and a 3.2 µm/125 µinch (nominal) Reference Specimen**.

** Part Numbers listed in table above.

Accessories

Order no.

<table>
<thead>
<tr>
<th>EBY-1014</th>
<th>9 Volt Alkaline Battery</th>
</tr>
</thead>
<tbody>
<tr>
<td>EPL-1681</td>
<td>Riser Plate, for calibrating the gage with the Reference Specimen</td>
</tr>
<tr>
<td></td>
<td>Statistic Printer MSP 2 and Data cable see chapter 11</td>
</tr>
</tbody>
</table>
## Probes

### General Purpose Probes

**EGH-1019/EGH-1026**  
For most surface roughness applications.  
**EGH-1026**  
With a 90° conical diamond stylus, 5 µm/.0002" radius*.  
**EGH-1019**  
With a 90° conical diamond stylus, 10 µm/.0004" radius.

### Transverse Chisel Probe

**EGH-1020-W1**  
For gaging sharp edges or small O.D.’s where probe is aligned with (in 180° or closed position) to axis of traverse. 90° sapphire chisel, 10 µm/.0004" radius.

### Parallel Chisel Probe

**EGH-1020-W2**  
For gaging sharp edges or small O.D.’s where probe is perpendicular (in 90°- oder 270° position) to axis of traverse. Also for O.D.’s smaller than 6,35 mm/.25” staged on EAS-2421 (Order no. 2008023). Vee fixture 90° sapphire chisel, 10 µm/.0004" radius.

### Small Bore Probe

**EGH-1021/EGH-1027**  
For gaging small bores (3,2 mm/.125” minimum I.D.) up to a depth of 19 mm/.75”.  
**EGH-1027**  
With a 90° conical diamond stylus, 5 µm/.0002" radius.*  
**EGH-1021**  
With a 90° conical diamond stylus, 10 µm/.0004" radius.

### Groove Bottom Probe

**EGH-1028**  
For measuring the bottom of grooves, recesses and small holes to depths of 6,35 mm/.25”. Also used for short lands and shoulders. With 90° conical diamond stylus, 10 µm/.0004" radius.

**NOTE:** Small Bore and Groove Bottom Probes can only be used in 180° position with the Pocket Surf unit supported in a height stand or other fixture.

* Yellow dot at connector end signifies 5 µm/.0002" radius.

---

*Using the Groove Bottom Probe to check an “O” ring groove.*
Applications and Accessories

Height Stand EAS-2496

a compact, convenient fixture with a bracket to hold the Pocket Surf gage. Designed for making measurements on a granite surface plate or on any suitable, flat working surface.

Order no. EAS-2496

Bore Adapter Kit EAS-2839

for time saving hand-held measurement of bores without having to fix the workpiece. Accommodates all inside diameters from 25 mm/ 1" to 150 mm/ 6"; depths from 25 mm/ 1" to 60 mm/ 2.4".

Order no. EAS-2839

Vee-Adapter Kit EAS-2739

attaches to bottom of Pocket Surf unit, permitting convenient, hand-held measurements of hard-to-reach cylindrical surfaces, such as crankshaft journals without having to fix the workpiece. Suitable for parts with diameters from 5.0 mm/ .19" to 125 mm/ 5".

Order no. EAS-2739

Universal Stand EAS-2426

a heavy duty stand equipped with an adjustable bracket to hold the Pocket Surf for measuring of workpieces, up to 213 mm / 8.375 in tall.

Order no. EAS-2426
Applications and Accessories

Portable vee fixture EAS-2421
for measuring small parts with outside diameters from 3.1 mm/ .125" to 25 mm/ 1" for lengths of 25 mm/ 1" minimum - includes PS-145 setting pin.
Order no. EAS-2421

Bottom Plate EAS-2584
for measuring cylindrical workpieces too short (less than 89 mm/3.5" long) for the “closed” probe position; for workpieces with short O.D.’s from 6.35 mm/ .25" (minimum 38 mm/ 1.5” long).
Order no. EAS-2584

EAS-3048 Mounting Bracket for use with height gages
for mounting the Pocket Surf to most standard height gages. The bracket includes a rectangular bar that is 11.5 mm x 6.35 mm (0.45” x 0.25”) to fit the holder of the height gage. A swivel feature is included to permit the Pocket Surf to be set anywhere within a 360° rotation.
Order no. EAS-3048

Height Stand with Swivel
... a compact, convenient fixture with an adjustable bracket to hold the Pocket Surf, anywhere within a 360° rotation, for making measurements on a surface plate or on any suitable, flat working surface.
Order no. 2236687
Wherever surface structures influence the function, processing or appearance of components or products, careful testing is essential. But how can surfaces be tested? At the start of the 20th Century, experts still had to test by eye and touch. A practiced eye can detect features in the μm range, and even the much maligned thumbnail test delivered perfectly acceptable results. Now however, we live in an age of exchangeable parts, fits and internationalization, where subjective tests like this are no longer adequate. Today, computer-aided measuring instruments provide objective data. Measurement and evaluation have become considerably easier. For decades, Mahr has been a worldwide pioneer in this area, as demonstrated by the company’s numerous innovations and patented solutions in the field of roughness metrology. The interplay between the stylus, drive and measuring setup plays a key role in influencing the quality of surface measurement tasks. This is where Mahr’s core expertise comes in, as demonstrated by the company’s numerous innovations and patented solutions. Over this time, we have succeeded in perfecting the stylus method which is now widespread throughout the world. We can meet even the most demanding requirements for non-contact measurement, e.g. where extremely soft materials or ultra-short measuring times are involved, thanks to the range of optical sensors offered by MarSurf. Developed with Mahr quality, expertise and know-how, MarSurf is the solution for all your surface metrology needs.
# MarSurf. Surface Measurement

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MarSurf. Handy and precise for on-site roughness measurements

MOBILE ROUGHNESS MEASUREMENT DEVICES

Mahr has played a key role in ensuring the success of mobile roughness measurement devices. As early as the 1980s, Mahr was setting new standards with the M4P. The products have developed in line with changing production monitoring requirements. Today’s devices meet the highest international standards. Mobile roughness measurement devices from Mahr are lightweight with a handy shape, flexible handling, high-precision measurement in different positions and easy positioning using V-blocks.
Perthometer M1. The Basic Model for Roughness Measurements

Entry-level roughness measurement

Description

This instrument serves for determining and documenting the most common parameters as per DIN EN ISO/AMSE/prEN 10049 (Ra, Rz, Rmax, and RPC) and according to the JIS Japanese standard (Rz, Ra).

With a minimum of keys, the Perthometer M1 is characterized by a multitude of functions. An automatic function enables periodic and aperiodic profiles to be identified and the cutoff to be set according to standards without any previous test measurement, such that unintentional non-standard measurements are excluded.

In mobile use, the measuring record can be output on the built-in thermal printer automatically or simply by pressing a key. Stationary operation offers the possibility of connecting the Perthometer directly to a PC via the serial interface.

Delivery as a set in a handy carrying case,
Perthometer M1 set Order No. 6910134
Traceable calibration Order No. 9963102

Features

- Measuring range of up to 150 μm (6,000 μin)
- Units μm/μin selectable
- Standards: DIN/ISO/JIS
- Traversing lengths 1.75 mm, 5.6 mm, 17.5 mm (.7 in, .22 in, .7 in)
- Cutoff 0.25 mm/0.80 mm/2.5 mm (0.010 in/.032 in/.100 in)
- Short cutoff selectable
- Number of sampling lengths selectable from 1 to 5
- Automatic selection of filter and traversing length conforming to standards
- Phase-correct profile filter as per DIN EN ISO 11562
- Parameters as per DIN/ISO/JIS: Ra, Rz, Rmax, RPC and JIS: Ra, Rz
- Automatic scaling according to the profile amplitude
- Printing of roughness profile and measuring record
- Dynamic pick-up calibration
- Blocking of instrument settings for preventing unintentional modifications
Perthometer M2. The Universal Standard Instrument ...

Highly mobile, high-performance unit

Description

The operation of this instrument is based on the well-proved catalog of functions which enables instrument settings such as measuring conditions, language and record contents to be selected very easily. The Perthometer M2 thus offers a maximum of comfort and flexibility.

Compared with the Perthometer M1, this instrument not only meets the requirements for determination and documentation of selected parameters, but also makes most of the parameters and characteristic curves stipulated in DIN/ISO/JIS available for the evaluation of the profile assessed.

Moreover, the Perthometer M2 offers an integrated memory for the results of up to 200 measurements and enables, among other things, tolerance monitoring, vertical scale selection and the setting of unsymmetric intersection lines for peak count calculation.

Delivery as a set in a handy carrying case,

Perthometer M2 set Order No. 6910135
Traceable calibration Order No. 9963102

Features

- Measuring range of up to 150 μm (6000 μin)
- Units μm/μin selectable
- Standards: DIN/ISO/JIS and CNOMO (Motif) selectable
- Traversing lengths as per DIN EN ISO 4288/ASME B461: 1.75 mm, 5.6 mm, 17.5 mm (0.07 in, .22 in, .7 in); as per EN ISO 12085: 1 mm, 2 mm, 4 mm, 8 mm, 12 mm, 16 mm
- Number of sampling lengths selectable from 1 to 5
- Automatic selection of filter and traversing length conforming to standards
- Phase-correct profile filter as per DIN EN ISO 11562
- Cutoff 0.25 mm/0.80 mm/2.50 mm (.010 in/.032 in/.100 in)
- Short cutoff selectable
- Parameters as per DIN/ISO/SEP: Ra, Rz, Rmax, Rp, Rq, Rt, R3z, Rk, Rvk, Rpk, Mr1, Mr, Sm, Rpk; as per JIS: Ra, Rz, Ry, Sm, S, tp; Motif parameters: R, Rx, Ar, W, CR, CF, CL (three-zone measurement)
- Tolerance monitoring in display and measuring record
- Automatic or adjustable scaling
- Printing of R-profile (ISO/JIS), P-profile (MOTIF), material ratio curve, measuring record
- Output of date and/or time of the measurements
- Integrated memory for the results of up to 200 measurements
- Dynamic pick-up calibration
- Blocking of instrument settings for preventing unintentional modifications plus possibility of password protection
**Mobile Roughness Measurements. Technical Data**

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<tr>
<th>Measuring principle</th>
<th>M1</th>
<th>M2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Traversing speed</td>
<td>0.5 mm/s</td>
<td>•</td>
</tr>
<tr>
<td>Measuring ranges</td>
<td>100 μm (4,000 μin)</td>
<td>•</td>
</tr>
<tr>
<td></td>
<td>150 μm (6,000 μin)</td>
<td>•</td>
</tr>
<tr>
<td>Profile resolution</td>
<td>12 nm</td>
<td>•</td>
</tr>
<tr>
<td>Filter</td>
<td>Gaussian</td>
<td>•</td>
</tr>
<tr>
<td>Cutoffs</td>
<td>0.25/0.8/2.5 mm (0.010/0.032/0.100 in)</td>
<td>0.25/0.8/2.5 mm (0.010/0.032/0.100 in)</td>
</tr>
<tr>
<td>Short cutoff</td>
<td>1.75/5.6/175* mm (0.07/0.22/0.70* in)</td>
<td>1.75/5.6/175* mm (0.07/0.22/0.70* in)</td>
</tr>
<tr>
<td>as per DIN/ISO</td>
<td>1/2/4/8<em>12</em>/16* mm (0.010/0.032/0.100 in)</td>
<td>1/2/4/8<em>12</em>/16* mm (0.010/0.032/0.100 in)</td>
</tr>
<tr>
<td>Evaluation lengths</td>
<td>1.25/4/12.5* mm (0.05/0.16/0.5* in)</td>
<td>1.25/4/12.5* mm (0.05/0.16/0.5* in)</td>
</tr>
<tr>
<td>Number of sampling lengths</td>
<td>selectable from 1 to 5</td>
<td>•</td>
</tr>
<tr>
<td>Standards</td>
<td>DIN/ISO/JIS/ASME</td>
<td>DIN/ISO/JIS/ASME</td>
</tr>
<tr>
<td>Parameters</td>
<td>Ra, Rz, Rmax, Rp, Rq, Rpk, Mr1, Mr2, RPC, Mr, RSm</td>
<td>Ra, Rz, Rmax, Rp, Rq, Rpk, Mr1, Mr2, RPC, Mr, RSm</td>
</tr>
</tbody>
</table>

**Vertical scale**
- automatic
- dep. on cutoff
- R-profile,
- results

**Horizontal scale**
- dep. on cutoff
- R-profile, MRC,
- P-profile (MOTIF), results

**Record contents**
- R-profile, MRC,
- R-profile (MOTIF), results

**Printing**
- automatic/manual record with time
- automatic/selectable

**Calibration function**
- dynamic (Rz value)
- integrated memory for results of up to 200 measurements

**Language**
- selectable
- selectable: English, German, French, Italian, Spanish, Portuguese, Dutch, Swedish, Czech, Polish, Russian, Japanese, Chinese, Korean

**Purposefully designed with graphics area**
- thermal printer, 384 points/horizontal line, 20 characters/line
- approx. 6 lines/second corresponds to approx. 25 mm/s (1 in/s)
- dia. 40.0 mm - 1.0 mm (1.575 in - .0394 in), externally coated
- width 575 mm ± 0.5 mm (2.263 in ± .0197 in)

**Interface**
- RS 232 C

**Power supply**
- NiMH battery, capacity: approx. 1,000 measurements (dep. on number and length of record printouts), plug-in power pack with three mains plugs, for input voltages from 90 V to 264 V
- drive unit, RS 232 C, power pack
- IP 50

**Temperature range for**
- storage
- operation
- relative humidity
- dimensions (L x W x H)
- mass

* only with PFM drive unit
### Workstation MarSurf XR 20 for M-units

**Archiving and documenting made easy**

### Description

The **MarSurf XR 20** workstation is based on the PC measuring system software. The software enables the measuring result to be archived and documented very easily. Here, the M-unit is controlled by a PC, i.e. the measuring conditions are set on the PC or laptop.

Clear icons and a comprehensive online help make using this powerful software very easy. Decades of surface metrology experience in industry are combined with state-of-the-art and future-focused technologies.

The workstation supports WINDOWS 2000 and WINDOWS XP. Data transmission is performed via an RS 232 cable between M-unit and PC. For accessing the software, a USB dongle and a license file are required.

### Features

- Over 65 parameters may be selected for R, P and W profiles as per ISO / JIS or MOTIF
- Tolerance monitoring and statistics for all parameters
- Fast creation of Quick & Easy measuring programs using Teach-In mode
- Comprehensive logging
- Simulation mode to help users familiarize themselves with the system quickly
- Numerous measuring station configurations for customized applications
- Different user levels can be set up
- Printout of an A4 form via a PC printer
- Archiving of the measured profiles on PC or laptop

### Accessories

- Software MarSurf XR 20
- USB dongle
- Floppy disk 3,5” with license file
- RS 232 cable (2 m)

**Order no. 6299009**
Application Aids

Efficient application aids for manufacturing

MarSurf BF-1

MarSurf TF-1

MarSurf DR-1

MarSurf CB-2

Description

Tough manufacturing environments require quick and easy roughness measurement. The shop floor is particularly demanding on measuring instruments. Application aids from Mahr are the perfect solution.

Features

- Special design allows precise, easy positioning of measuring instrument
- Easy to use even without specialist metrological knowledge
- Device for protecting drive unit from environmental influences that might disrupt the measurement
- Pick-up protection, i.e. pick-up is only extended during measurement
- Surface protection material ensures measurement leaves no marks on the workpiece

Our application aids work with evaluation instruments in the M1 or M2 series. A calibration or storage station is included in the scope of delivery. Calibration standards are available, with a Calibration Certificate if required.

Applications

Engine blocks:
- Crankshaft bore sensor hole
- Dipstick hole
- Crankshaft bores (1st and last journal only)
- Water pump bore
- Freeze plug bore

Crankshafts:
- Pilot bore on the end of crankshaft

Connecting rods:
- Pin bores
- Crank bores

Cylinder heads:
- Camshaft bores (1st and last journal only)
MarSurf BF-1

Miscellaneous bore fixtures for the shop floor

Features

The MarSurf BF-1 is designed for measurements on the shop floor. The centuring device adapted to the specific measuring task enables the pick-up to be positioned directly to the measuring position.

- Tooling can be designed to measure openings from 12.7 mm to 150 mm
- Adjustable measuring depth of 10 mm through 75 mm
- Automatic pick-up protection means the pick-up is only exposed during the measuring cycle
- Calibration stand included in the scope of delivery
- The fixture can be used with M1 or M2 units

Accessories

- The tooling is always order-related, i.e. designed for a special measuring task
- Optional: The MarSurf BF-1 can also be supplied without adjustable measuring depth, i.e. it is designed for just one measuring task

MarSurf TF-1

Crankshaft thrust face measurement fixture

Features

The MarSurf TF-1 is designed for measurements in the shop floor, i.e. for measuring crankshaft thrust faces. The special design enables easy handling, i.e. the pick-up automatically positioned to the measuring position.

- Tooling can be designed to measure crankshafts from 17.5 mm to 44.5 mm
- Non marring material leaves no traces on the workpiece
- Automatic pick-up protection means the pick-up is only exposed during the measuring cycle
- Calibration stand included in the scope of delivery
- The fixture can be used with M1 or M2 units
MarSurf CB-2

Cylinder bore surface finish fixture

Description
The MarSurf CB-2 is designed for the measurement of cylinder walls, sleeves or any bores requiring surface roughness measurements. High clamping force supported by air pressure for stable measurements inside bores from 77 mm through 106 mm.

Features
• Auto sizing feature for bores from 77 mm through 106 mm
• Mechanical stop with depth indicator
• Automatic probe protection means the pick-up is only exposed during the measurement cycle
• MarSurf CB-2 utilizes a pneumatically activated clamping mechanism
• Measurement depth capability of 25 mm through 225 mm
• The fixture can be used with M1 or M2 units

Accessories
• MarSurf CB-2 bore fixture Order No. 2190856 (for bores from 77 mm through 81 mm), including air connection hose 3.65 m and bore expansion plate for bores ranging from 81 mm through 89 mm, from 89 mm through 87 mm and from 97 mm through 106 mm in diameter
• The system require a shop floor air pressure of 0.45 N/mm² to 0.83 N/mm² (65 psi to 120 psi; 4.5 bar to 8 bar)
• Air supply to be clean and free from oil with a maximum of 25% humidity

MarSurf DR-1

Deck face measurement fixture

Description
The MarSurf DR-1 is designed for stable surface finish measurement on flat surfaces without the need for positional adjustment of the pick-up. Equipment with a magnetic base, the MarSurf DR-1 is ideal when measuring overhead or non-horizontal surfaces.

Features
• Wide range of application
• Magnetic base provides for non-level mounting on ferrous surfaces
• The fixture can be used with M1 or M2 units
Pick-ups for Mobile Roughness Measuring Instruments

Pick-ups for multiple measuring tasks for the use with PFM/PFM 2

The pick-ups of type N are characterized by special construction features:

- Stylus tip geometry as per EN ISO 3274, standard 2 μm/90° (80 μin/90°)
- Measuring force of approx. 0.7 mN (1.95 mOz) (as per EN ISO 3274)
- Reliable inductive converter
- Rugged, rigid housing
- Self-aligning, elastic bearings
- Reliable plug and socket connections

The standard NHT 6 pick-up for example, adapts to various surfaces to be traced due to the special design of its tracing arm and skid. Further pick-ups such as the NHT 11 are suited for recessed measuring points and grooves.

NHT 6-100 pick-up

Type: single-skid pick-up with spherical skid
Skid radius: 25 mm (0.984 in) in traversing direction, 2.9 mm (0.114 in) at right angles
Contact point: 0.8 mm (0.0315 in) in front of the stylus
Measuring range: 100 μm (0.00394 in)
Specification:
- for plane surfaces, bores with a dia. larger than 6 mm, (0.236 in) and a max. depth of 17 mm (0.669 in), grooves with a width larger than 3 mm (0.118 in);
- min. workpiece length = traversing length + 1 mm (0.0394 in)

NHT 6-150 pick-up

Type: single-skid pick-up with spherical skid
Skid radius: 25 mm (0.984 in) in traversing direction, 2.9 mm (0.114 in) at right angles
Contact point: 0.8 mm (0.0315 in) in front of the stylus
Measuring range: 150 μm (0.00591 in)
Specification:
- for plane surfaces, bores with a dia. larger than 6 mm (0.236 in) and a max. depth of 17 mm (0.669 in), grooves with a width larger than 3 mm (0.118 in);
- min. workpiece length = traversing length + 1 mm (0.0394 in)

NHT 11-100 pick-up

Type: single-skid pick-up with spherical skid
Skid radius: 25 mm (0.984 in) in traversing direction, 2.9 mm (0.114 in) at right angles
Contact point: 0.8 mm (0.0315 in) in front of the stylus
Measuring range: 100 μm (0.00394 in)
Specification:
- for plane surfaces, bores with a dia. larger than 11 mm (0.433 in) and a max. depth of 14 mm (0.551 in), grooves with a width larger than 2.5 mm (0.0984 in) and a max. depth of 7.5 mm (0.295 in)

NHT pick-up extension (80 mm/3.15 in), Order No. 6850530 (for pick-ups of the "N-series")
**Pick-ups for Mobile Roughness Measuring Instruments**

**NHTR-100 pick-up**  
Order No. 6111508  
Single-skid pick-up with lateral, spherical skid, radius 0.3 mm in traversing direction, stylus radius 5 μm (200 μin), 90° suitable to measure inner radii in circumferential direction with a diameter larger than 12 mm (0.472 in) (without figure).

**NHT 3-100 pick-up**  
Order No. 6111502  
Type single-skid pick-up with spherical skid  
Skid radius 25 mm (0.984 in) in traversing direction, 1.45 mm (0.0571 in) at right angles  
Contact point 0.9 mm (0.0354 in) in front of the stylus  
Measuring range 100 μm (0.00394 in)  
Specification for bores with a dia. larger than 3 mm (0.118 in) and a max. depth of 17 mm (0.669 in); min. workpiece length = traversing length + 1 mm (0.0394 in)

**NHTF 0.5-100 pick-up**  
Order No. 6111503  
Type single-skid pick-up with spherical skid  
Skid radius 25 mm (0.984 in) in traversing direction, 1.45 mm (0.0571 in) at right angles  
Contact point 0.6 mm (0.0236 in) beside the stylus  
Measuring range 100 μm (0.00394 in)  
Specification e.g. for gear tooth flanks with a modulus larger than 0.8

**The NHTF 0.5 for gear tooth flanks**  
enables roughness measurements even at hardly accessible points.
## Drive Units for Mobile Roughness Measuring Instruments

**PFM drive unit**

**PFM 2 drive unit**

### Description

The **PFM drive unit** can be connected to the Perthometers M1 and M2. It forms part of the Perthometer sets.

The drive unit can be used with the well-proved NHT skidded pick-ups.

For special measuring tasks, e.g. on crankshafts, the **PFM 2 drive unit** with transverse tracing is available. This is connected as the standard **PFM** drive unit. If both drive units are used, the range of applications of the mobile Perthometers M1 and M2 is considerably raised.

### Technical Data

#### PFM drive unit

<table>
<thead>
<tr>
<th>Description</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Traversing direction</td>
<td>longitudinal</td>
</tr>
<tr>
<td>Traversing lengths as per DIN/ISO</td>
<td>1.75 mm, 5.6 mm, 175 mm (.07 in, .22 in, 7 in)</td>
</tr>
<tr>
<td>as per EN ISO</td>
<td>1 mm, 2 mm, 4 mm, 8 mm, 12 mm, 16 mm (.0394 in, .0787 in, .315 in, .472 in, .63 in)</td>
</tr>
<tr>
<td>Traversing speed</td>
<td>0.5 mm/s (.0197 in/s)</td>
</tr>
<tr>
<td>Dimensions (w/o pick-up protection)</td>
<td>dia. 24 mm (.945 in), L = 112 mm (4.41 in)</td>
</tr>
</tbody>
</table>

**Order No. 6720907**

#### PFM 2 drive unit

<table>
<thead>
<tr>
<th>Description</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Traversing direction</td>
<td>transverse</td>
</tr>
<tr>
<td>Traversing lengths as per DIN/ISO</td>
<td>1 mm, 2 mm, 4 mm, 8 mm, 12 mm, 16 mm (.0394 in, .0787 in, .315 in, .472 in, .63 in)</td>
</tr>
<tr>
<td>as per EN ISO</td>
<td>1 mm, 2 mm, 4 mm, 8 mm, 12 mm, 16 mm (.0394 in, .0787 in, .315 in, .472 in, .63 in)</td>
</tr>
<tr>
<td>Traversing speed</td>
<td>0.5 mm/s (.0197 in/s)</td>
</tr>
<tr>
<td>Dimensions (w/o pick-up protection)</td>
<td>dia. 24 mm (.945 in), L = 112 mm (4.41 in)</td>
</tr>
</tbody>
</table>

**Order No. 6720909**

**PFM 2 set**

**Order No. 6720909**

- **PFM drive unit**
- **Vee pick-up protection**
- **Pick-up protection**
- **Screwdriver**
## Applications with PFM Drive Units

### Drive unit for shop floor applications

### Description

The robust PFM drive unit with its slim, cylindrical form is suited for measuring even complex workpieces. It is easily attached to mounting devices for stationary operation, while for manual operation, the hand-held support with its multiple contact surfaces offers various application possibilities. The optionally available PFM 2 drive unit is suited for transverse tracing, e.g., between lateral shoulders on crankshafts.

Exchangeable front-mounting devices protect the pick-up and enable correct positioning on the workpiece. The vee pick-up protection, which is used when working without the hand-held support, is used for cylindrical workpieces. Prismatic contact surfaces at the bottom and the end faces of the hand-held support also support the drive unit on cylindrical workpieces. For large workpieces, the drive unit is placed onto the surface to be traced.

For small workpieces, the hand-held support is placed upside down, thus serving as workholding device. The multiple contact surfaces, the vertical adjusters and the possibility of shifting and turning the drive unit within the hand-held support, make the PFM a simple, but complete measuring station of so far unequalled flexibility.

Roughness measurements on workpieces which are still being manufactured require particular devices for solving the measuring task (e.g., transverse tracing on crankshafts or camshafts). With the Percometer M1 or M2, the PFM 2 drive unit for transverse tracing, a shaft whipper and the vee pick-up protection, it is possible to perform such measurements on site and with high precision.
**Accessories**

**PP vee-block**
Order No. 6710401
with four different prisms for mounting axis-symmetrical workpieces with diameters from 1 mm to 160 mm (.0394 in to 6.30 in). Dimensions (L x W x H) 100 mm x 80 mm x 40 mm (3.91 in x 3.15 in x 1.58 in). Weight 1.5 kg (3.31 lb). Including clamping springs for holding light workpieces in the prism.

**XY table CT 120**
Order No. 6710529
for mounting and aligning workpieces. Can be adjusted in two coordinates by 15 mm (.591 in). Table surface 120 mm x 120 mm (4.728 in x 4.728 in) with two brackets.

**PPS parallel vice**
Order No. 6710604
for mounting rectangular and cylindrical workpieces.
Jaw width 70 mm (2.76 in), jaw height 25 mm (0.984 in), span 40 mm (1.58 in), total height 58 mm (2.28 in). Weight 2 kg (4.41 lb).

**Shaft whippers for PFM 2**
for diameters from 5 mm to 80 mm (100 mm) (.197 in to 3.15 in/3.94 in)
Order No. 6850738
Roughness measurements on workpieces which are still being manufactured require particular devices for solving the measuring task (e.g. transverse tracing on crankshafts or camshafts).

Mahr or DKD calibration certificates are available on request.

**PRN 10 roughness standard**
Order No. 6820420
with Mahr calibration certificate. Roughness standard with turned profile, chromed. Profile depth approx. 10 μm (.394 μin). For checking the roughness measuring station.

**PGN 3 geometric standard**
Order No. 6820601
(without figure) Surface roughness standard with a sinusoidal groove profile.
Profile depth approx. 3 μm (120 μin), groove spacing approx. 0.12 mm (0.00472 in). For checking the roughness measuring station.
## Accessories

### Measuring Stands

| Measuring stand ST-D | Height adjustment | Order No. 6710803  
<table>
<thead>
<tr>
<th></th>
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<th></th>
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</thead>
<tbody>
<tr>
<td>of PFM mounting device</td>
<td>0 mm to 300 mm (0 in to 11.81 in),</td>
<td>by means of a handwheel</td>
</tr>
<tr>
<td>Triangular foot</td>
<td>175 mm x 190 mm x 385 mm (6.89 in x 7.48 in x 15.16 in)</td>
<td>approx. 3 kg (6.61 lb)</td>
</tr>
<tr>
<td>Dimensions (L x W x H)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Weight</td>
<td></td>
<td></td>
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<tr>
<td></td>
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<td></td>
</tr>
</tbody>
</table>

| Measuring stand ST-F | Height adjustment | Order No. 6710806  
<table>
<thead>
<tr>
<th></th>
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</thead>
<tbody>
<tr>
<td>of PFM mounting device</td>
<td>0 mm to 300 mm (0 in to 11.81 in),</td>
<td>by means of a handwheel</td>
</tr>
<tr>
<td>Table surface</td>
<td>400 mm x 250 mm (15.75 in x 9.84 in), granite</td>
<td></td>
</tr>
<tr>
<td>400 mm x 250 mm x 422 mm (15.75 in x 9.84 in x 16.61 in)</td>
<td>approx. 24 kg (52.91 lb)</td>
<td></td>
</tr>
<tr>
<td>Dimensions (L x W x H)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Weight</td>
<td></td>
<td></td>
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</table>

| Measuring stand ST-G | Height adjustment | Order No. 6710807  
<table>
<thead>
<tr>
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</thead>
<tbody>
<tr>
<td>of PFM mounting device</td>
<td>0 mm to 300 mm (0 in to 11.81 in),</td>
<td>by means of a handwheel</td>
</tr>
<tr>
<td>Granite plate with an 10 mm (.39 in) T-slot for mounting workholding devices, Handwheel height adjustment for simply and exactly adjusting the drive unit to the required measuring height.</td>
<td>500 mm x 300 mm x 415 mm (19.69 in x 11.81 in x 16.34 in)</td>
<td>approx. 35 kg (77.16 lb)</td>
</tr>
<tr>
<td>Dimensions (L x W x H)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Weight</td>
<td></td>
<td></td>
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</tbody>
</table>

### Measuring Stand Accessories

<table>
<thead>
<tr>
<th>Measuring stand accessories (not included in the scope of delivery of the measuring stands):</th>
</tr>
</thead>
</table>
| PFM/PFM 2 mounting device | Order No. 6851304  
| The drive unit can be swiveled and aligned in a range of ± 15° by means of this mounting device. |
| M1/M2 support plate | Order No. 6851332  
| with shoulder strap, for mobile use and for fixing the Perhometer to an ST-F, ST-D or ST-G measuring stand by means of the mounting device (Order No. 6851333). |
| M1/M2 mounting device | Order No. 6851333  
| for fixing the Perhometer to an ST-F, ST-D or ST-G measuring stand by means of the support plate (Order No. 6851332). |

### Software

<table>
<thead>
<tr>
<th>Software</th>
</tr>
</thead>
</table>
| MarSurf XR 20 evaluation software | Order No. 6299009  
| Control of the M-unit via the RS 232 COM port |
| Software access via a USB dongle, usable with Windows 2000 and Windows XP |
The Perthometer Sets for Mobile Operation

The Perthometer set

Perthometer M1 set  Order No. 6910134
Perthometer M2 set  Order No. 6910135
Calibration of M-unit  Order No. 9963102

The Perthometers of the M series are delivered as a set in a handy carrying case. The instrument is thus safely packed for transport. The components included in the set can easily and quickly be assembled to form a complete measuring station.

Scope of delivery
The illustrated accessories form part of the Perthometer sets.

In addition, the following accessories (that are not including in the standard scope of delivery) can be placed into the carrying case:
• a second NHT pick-up
• support plate for M1/M2 with shoulder strap Order No. 6851332
• a PRN 10 roughness standard Order No. 6820420

1 hand-held support Order No. 6850736
1 PFM drive unit Order No. 6720907

1 carrying case Order No. 7025343
1 screwdriver Order No. 3903456

1 NHT 6-100 pick-up Order No. 6111501
1 vee pick-up protection for PFM Order No. 6850715
1 pair of vertical adjusters Order No. 6850720
1 power pack with 3 mains plugs Order No. 6840712
1 chart paper roll Order No. 5450105