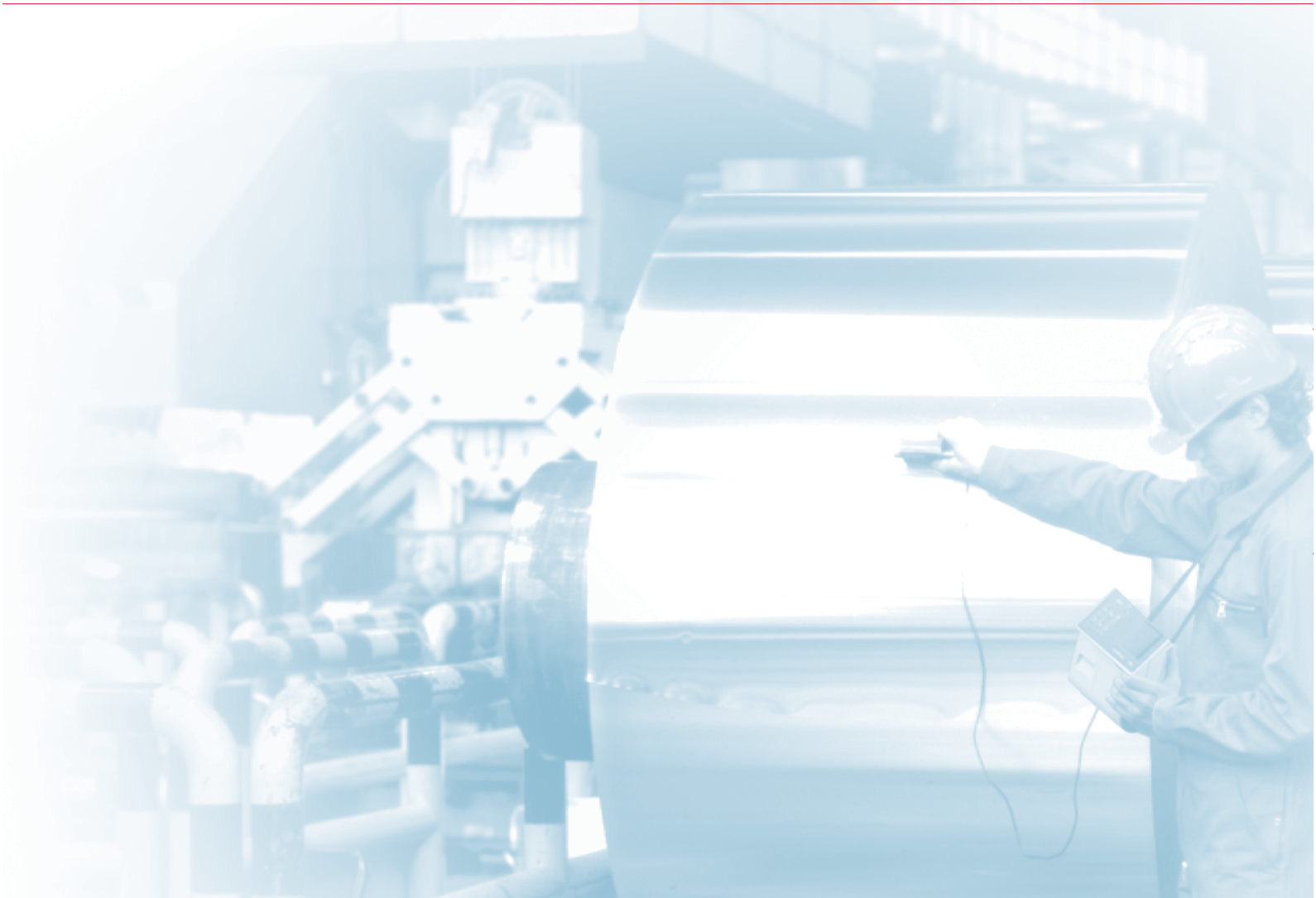
MARSURF I MOBILE ROUGHNESS MEASUREMENT DEVICES

Mahr FEDERAL

EXACTLY

PRODUCTION-RELATED ROUGHNESS MEASURING.

MOBILE WITH MARSURF



► | 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

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 etimates from all the individual sampling lenghts. For roughness profile parameters the standard number of sampling lengths is five.

Traversing length l_t is the overall length traveled by the stylus when acquiring the traced profile. It is the sum of the pre-travel, evaluation length l_n and post-travel.

Cutoff λ_c of a profile filter determines which wavelengths belong to roughness and which ones to waviness.

Sampling length l_r is the reference for roughness evaluation. Its length is equal to the cutoff wavelength λ_c.

Evaluation length l_n is that part of the traversing length l_t over which the values of surface parameters are determined. The standard roughness evaluation length comprises five consecutive sampling lengths.

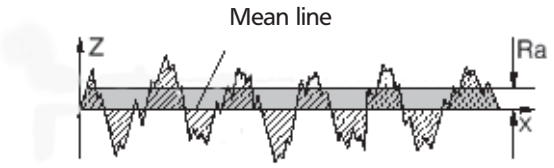
Pre-travel is the first part of the traversing length l_t.
Post-travel is the last part of the traversing length l_t.

R_a 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

$$R_a = \frac{1}{L}\int_0^L |Z(x)|\, dx$$

Z(x) = profile ordinates of the roughness profile.
R_a is also called AA and CLA,



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

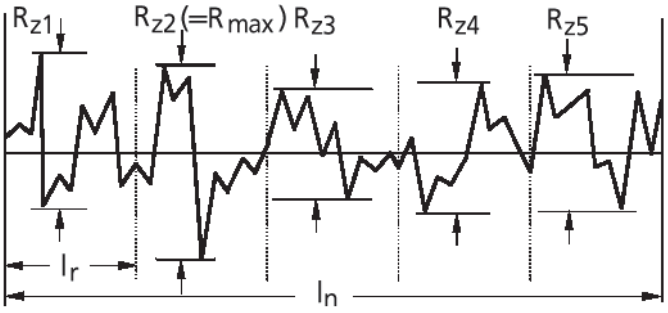
Single roughness depth R_{zi} is the vertical distance between the highest peak and the deepest valley within a sampling length

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

$$Rz = \frac{1}{5}\,(R_{z1} + R_{z2} + ... + R_{z5})$$

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



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

Periodic profile	Non-periodic profile		Cutoff	Sample/ Evalution length
R_{Sm} (mm/in)	R_z (µm/µin)	R_a (µm/µin)	R_λ (mm/in)	l_r / l_n (mm/in)
> 0.13 to 0.4/.005 to.016	> 0.5 to10/20 to 400	> 0.1 to 2/4 to 80	0.8/.030	0.8/4.0 ; .030/.150

Pocket Surf®* the portable surface roughness gage

* *US-patent no. 4.776.212*

Optional Accessory:
Statistics Printer MSP 2.
Order No. 4102040

Requires connection cable
Order No. 4102046

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_{max}/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_y 0.2 µm to 25.3 µm / ***8 µinch to 999 µinch*** R_{max} 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)

Pocket Surf

Technical Data

Probing and Traverse Lengths

Parameters	Traverse Length (Nominal)	Evaluation Length	Number of Cutoffs/ Switch Position
R_a/R_y	2.0 mm/ ***.075"*** 3.5 mm/ ***.135"***	0.8 mm/ ***.030"*** 2.4 mm/ ***.090"***	1 3
$R_a/R_z/R_{max}$	5.0 mm/ ***.195"***	4.0 mm/ ***.150"***	5

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.		
EMD-1500-311	EGH-1019	Probe, 90°, 10 µm radius, PMD-90101 Certified Specimen, incl. Test Certificate
EMD-1500-312	EGH-1019	Probe, 90°, 10 µm radius, EMD-90010 Precision Specimen
EMD-1500-321	EGH-1026	Probe , 90°, 5 µm radius, PMD-90101, Certified Specimen, incl. Test Certificate
EMD-1500-322	EGH-1026	Probe, 90°, 5 µm radius, EMD-90010 Precision Specimen

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.*

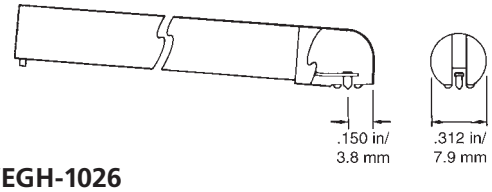
Accessories

Order no.	
EBY-1014	9 Volt Alkaline Battery
EPL-1681	Riser Plate, for calibrating the gage with the Reference Specimen
	Statistic Printer MSP 2 and Data cable see chapter 11

Probes

General Purpose Probes

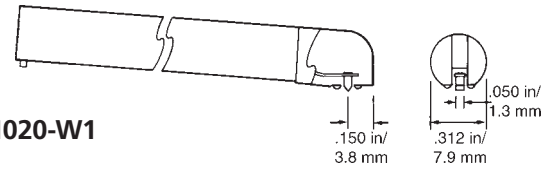
EGH-1019/EGH-1026
For most surface roughness applications.
EGH-1026
With a 90° conical diamond stylus, 5 µm/ .0002" radius*.
EGH-1019
With a 90° conical diamond stylus, 10 µm/ .0004" radius.



EGH-1019/EGH-1026

Transverse Chisel Probe

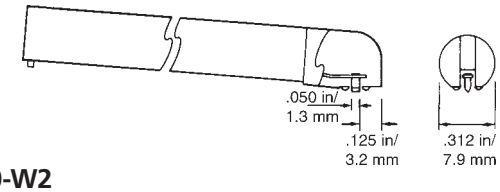
EGH-1020-W1
For gaging sharp edges or small O.D.'s where probe is alligned with (in 180° or closed position) to axis of traverse. 90° sapphire chisel, 10 µm./ .0004" radius.



EGH-1020-W1

Parallel Chisel Probe

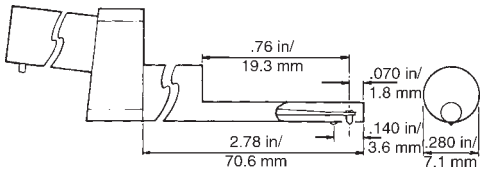
EGH-1020-W2
For gaging sharp edges or small O.D.'s where probe is perpendicular (in 90°- oder 270° position). to axis of traverse Also for O.D.'s smaller than 6,35 mm,/ .25" staged on EAS-2421 (Order no. 2008023). Vee fixture 90° sapphire chisel, 10 µm./ .0004" radius.



EGH-1020-W2

Small Bore Probe

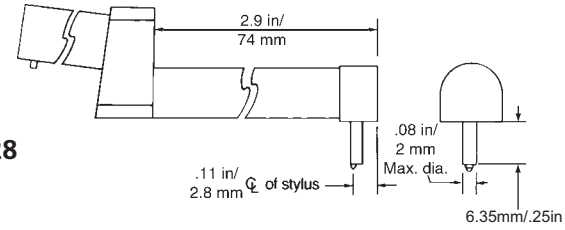
EGH-1021/EGH-1027
For gaging small bores (3,2 mm/ .125" minimum I.D.) up to a depth of 19 mm/ .75".
EGH-1027
With a 90° conical diamond stylus, 5 µm/ .0002" radius.*.
EGH-1021
With a 90° conical diamond stylus, 10 µm/ .0004" radius.



EGH-1021/EGH-1027

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.



EGH-1028

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**

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 prerious 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**

Perthometer M1 set with 2008143 Roughness Master
Order No. 2190827

- 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, 0.7 in)
- Cutoff 0.25 mm/0.80 mm/2.5 mm (.010 in/.032 in/.100 in)
- Short cutoff selecatable
- 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/SEP: 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**

Perthometer M2 set with 2008143 Roughness Master
Order No. 2190828

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 (.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, Mr2, Mr, Sm, RPc; 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

	M1	M2
Measuring principle	stylus method	•
Traversing speed	0.5 mm/s	•
Measuring ranges	100 µm (4,000 µin)	•
	150 µm (6,000 µin)	•
Profile resolution	12 nm	•
Filter	Gaussian	•
Cutoffs	0.25/0.8/2.5 mm	0.25/0.8/2.5 mm
	(0.010/0.032/0.100 in)	(0.010/0.032/0.100 in)
Short cutoff	•	•
Traversing lengths as per DIN/ISO	1.75/5.6/17.5* mm	1.75/5.6/17.5* mm
	(0.07/0.22/0.70* in)	(0.07/0.22/0.70* in)
as per EN ISO 12085	1/2/4/8*/12*/16* mm	1/2/4/8*/12*/16* mm
Evaluation lengths	1.25/4/12.5* mm	1.25/4/12.5* mm
	(0.05/0.16/0.5* in)	(0.05/0.16/0.5* in)
Number of sampling lengths	selectable from 1 to 5	•
Standards	DIN/ISO/JIS/ASME	DIN/ISO/JIS/ASME
Parameters	DIN/ISO/ASME:	DIN/ISO/ASME: Ra, Rz,
	Ra, Rz, Rmax, RPc	Rmax, Rp, Rq, Rt,
	JIS: Ra, Rz	R3z, Rk, Rvk,
		Rpk, Mr1, Mr2, RPc, Mr, RSm.
		JIS: Ra, Rz, Ry, Sm, S, tp
		MOTIF: R, Ar, Rx, W, CR, CL, CF
Vertical scale	automatic	automatic/selectable
Horizontal scale	dep. on cutoff	dep. on cutoff
Record contents	R-profile,	R-profile, MRC,
	results	P-profile (MOTIF),
		results
Printing	automatic/manual	automatic/manual
		record with time
Calibration function	dynamic (Rz value)	•
Memory	–	integrated memory
		for results of up to
		200 measurements
Units µm/µinch	selectable	selectable
Languages	selectable: English, German, French, Italian, Spanish, Portuguese., Dutch, Swedish,	
Russ., Pol., Czech., Jap.,	Czech, Polish, Russian, Japanese, Chinese, Korean	
Blocking for instrum. settings	•	•
Password protection	–	•
Membrane keypad	•	•
LCD	purposefully designed with graphics area	
Printer	thermal printer, 384 points/horizontal line, 20 characters/line	
Printing speed	approx. 6 lines/second corresponds to approx. 25 mm/s (1 in/s)	
Thermal paper	dia. 40.0 mm - 1.0 mm (1.575 in - .0394 in),	
	width 57.5 mm ± 0.5 mm (2.263 in ± .0197 in), externally coated	
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	
Power management	•	•
Connections	drive unit, RS 232 C, power pack	
System of protection	IP 50	•
Temperature range for		
– storage	–15 °C to +55 °C (5 °F to 131 °F)	•
– operation	+5 °C to +40 °C (41 °F to 104 °F)	•
Relative humidity	30 % to 85 %	•
Dimensions (L x W x H)	190 mm x 170 mm x 75 mm	•
	(7.48 in x 6.69 in x 2.95 in)	•
Mass	approx. 900 g (1.984 lb)	•

* 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 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

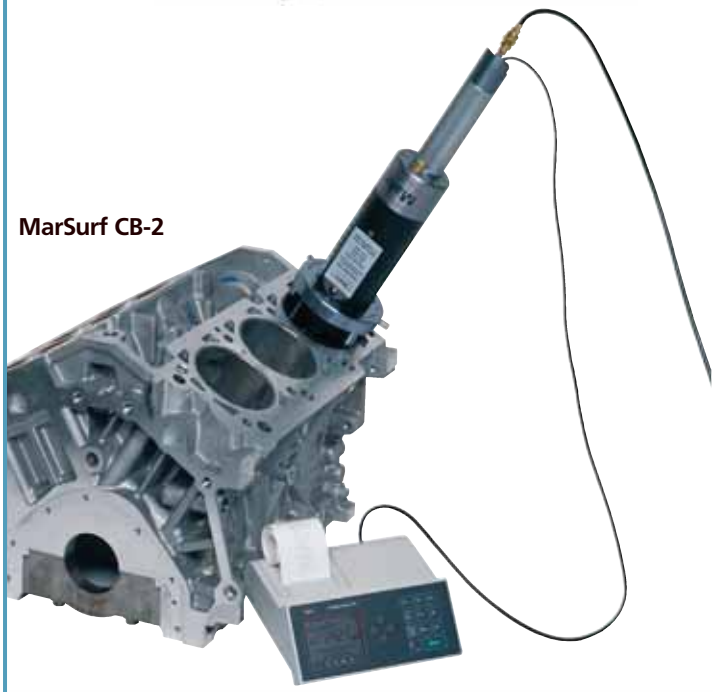
Application Aids

Efficient application aids for manufacturing

MarSurf BF-1

MarSurf TF-1

MarSurf CB-2



MarSurf DR-1

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

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.

- 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

Other Applications for use with the M1/M2 Surface Finish Measurement Systems

MarSurf CS 1 **2190922**
Measurement system for main and pin journals, oil seal and rod end surfaces on crankshafts. Designed to accommodate journals of 25mm through 125mm with a minimum width of .82" (20.8mm). Features include pneumatic clamping on the journal to be measured for stable measurements prior to data acquisition.

MarSurf DW 1 **2190974**
Waviness Fixture: Designed to protect and mount the GD-25/PGK-20 drive unit for surface roughness/waviness measurements. Features include probe protection, carrying handle, cable strain relief, stable base for use on areas with small surface area and calibration stand.

MarSurf CR 1
Camshaft/Crankshaft bore surface finish measurement system. Designed to measure all crankshaft/camshaft bores in an engine block. Designed to order and dedicated in size to a minimum bore size of 47mm. Features include pneumatic clamping within the bore for stable measurements and prior to data acquisition.

MarSurf VG 1
Valve Guide surface finish measurement system. Designed to measure surface finish of valve guides from the spring side of cylinder heads. Provides stable measurement without operator setup in harsh environments for in process inspection. 6mm minimum valve bore insert.

Applications not limited to those described. Please call your local Mahr representative for your surface finish measurement challenges.

MarSurf BF-1

Miscellaneous bore fixtures for the shop floor

Description

The **MarSurf BF 1** is designed for the measurement of bores on the shop floor. The fixture utilizes bore specific tooling which automatically positions the measurment probe relataive to the surface to be measured. No operator setup is required.

Features

- Tooling can be designed to measure openings from 14.00mm to 150.00mm.
- 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.
- Used with M1 or M2 units.

Accessories

- The tooling is design-specific for the 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

Description

The MarSurf TF 1 measurement system is designed to perform surface finish measurements of thrust wall surfaces on crankshafts. The tooling is applied to the thrust wall area and the measurement probe is automatically positioned over the surface to be measured. There is no need for operator setup.

Features

- Tooling can be designed to measure crankshaft journal widths of 17.5mm to 44.5mm
- Non-marring material leaves no traces on the workpiece
- Automatic pick-up protection means the pick-up is only exposedduring the measuring cycle
- Calibration stand included in the scope of delivery
- Used with M1or M2 units

MarSurf CB-2

Cylinder bore surface finish fixture

Description

MarSurf CB 2 **Order No. 2190856**
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 77mm through105mm.

Features

- Auto sizing feature for bores from 77mm through 105 mm
- Mechanical stop with depth indicator
- Automatic probe protection means the pick-up is only explosed during the measurement cycle
- MarSurf CB-2 utilizes a pneumatically activated clamping mechanism
- Measurement depth capability of 25mm through 225mm
- Used with M1 or M2 units

Accessories and Options

The following Accessories/Options are available:
Expansion pads for bores available for 105mm through133mm

Options:
MarSurf CB 3 **Order No. 2190910**
for bores ranging from **74mm** through 105mm

MarSurf CB 4 **Order No. 2191022**
for bores ranging from 77mm through 105mm (for skid type measurements with model S2/PZK surface finish evaluation system).

MarSurf DR-1

Deck face measurement fixture

Description

MarSurf DR 1 Fixture **Order No. 2190873**
The **MarSurf DR 1** is designed for stable surface finish measurement on flat surfaces without the need for positional adjustment of the pick-up. Equipped with a magnetic base, the Marsurf DR 1 is ideal when measuring overhead or non-horizontal surfaces.

Features

- Wide range of applications
- Magnetic base provides for non-level mounting on ferrous surfaces
- Used with M1or M2 units

Pick-ups for Mobile Roughness Measuring Instruments

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

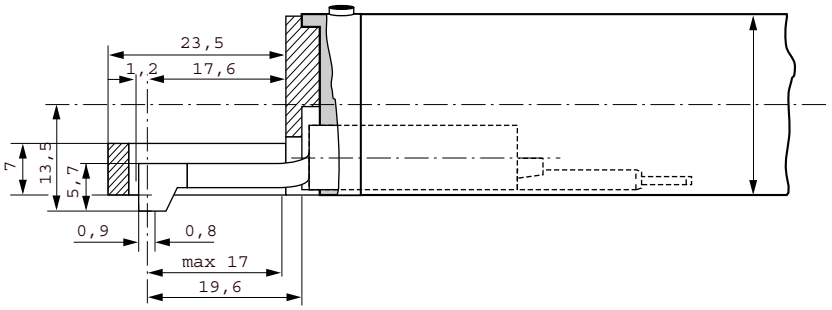
The pick-ups of type N are characterized by special construction features:

- Stylus tip geometry as per EN ISO 3274, standard 2 µm/90° (80 µin/90°)
- Measuring force of approx. 0.7 mN (1.95 mozf) (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.

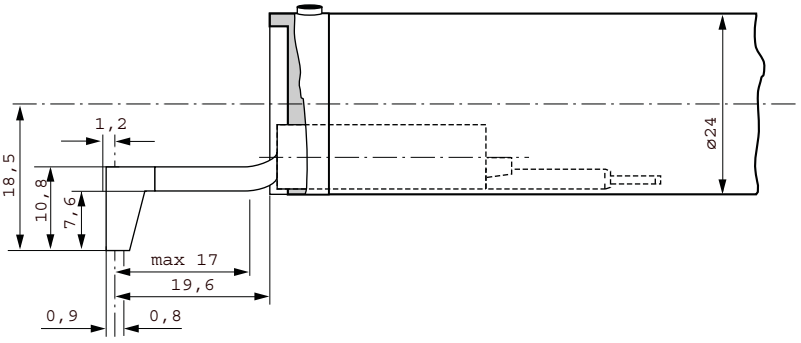
NHT 6-100 pick-up — **Order No. 6111501**

Type	single-skid pick-up with spherical skid
Skid radius	25 mm (.984 in) in traversing direction, 2.9 mm (.114 in) at right angles
Contact point	0.8 mm (.0315 in) in front of the stylus
Measuring range	100 µm (.00394 in)
Specification	for plane surfaces, bores with a dia. larger than 6 mm, (.236 in) and a max. depth of 17 mm (.669 in), grooves with a width larger than 3 mm (.118 in); min. workpiece length = traversing length + 1 mm (.0394 in)



NHT 6-150 pick-up — **Order No. 6111504**

Type	single-skid pick-up with spherical skid
Skid radius	25 mm (.984 in) in traversing direction, 2.9 mm (.114 in) at right angles
Contact point	0.8 mm (.0315 in) in front of the stylus
Measuring range	150 µm (.00591 in)
Specification	for plane surfaces, bores with a dia. larger than 6 mm (.236in) and a max. depth of 17 mm (.669 in), grooves with a width larger than 3 mm (.118 in); min. workpiece length = traversing length + 1 mm (.0394 in)



NHT 11-100 pick-up — **Order No. 6111505**

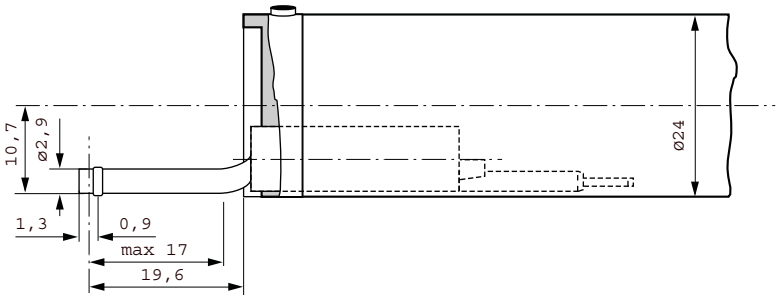
Type	single-skid pick-up with spherical skid
Skid radius	25 mm (.984 in) in traversing direction, 2.9 mm (.114 in) at right angles
Contact point	0.8 mm (.0315 in) in front of the stylus
Measuring range	100 µm (.00394 in)
Specification	for plane surfaces, bores with a dia. larger than 11 mm (.433 in) and a max. depth of 14 mm (.551 in), grooves with a width larger than 2.5 mm (.0984 in) and a max. depth of 7.5 mm (.295 in)

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

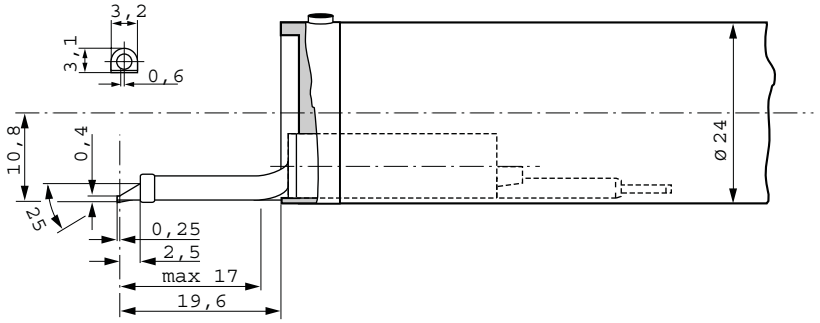
Pick-ups for Mobile Roughness Measuring Instruments

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 (.472 in) (without figure).



NHT 3-100 pick-up	**Order No. 6111502**
Type	single-skid pick-up with spherical skid
Skid radius	25 mm (.984 in) in traversing direction, 1.45 mm (.0571 in) at right angles
Contact point	0.9 mm (.0354 in) in front of the stylus
Measuring range	100 µm (.00394 in)
Specification	for bores with a dia. larger than 3 mm (.118 in) and a max. depth of 17 mm (.669 in); min. workpiece length = traversing length + 1 mm (.0394 in)



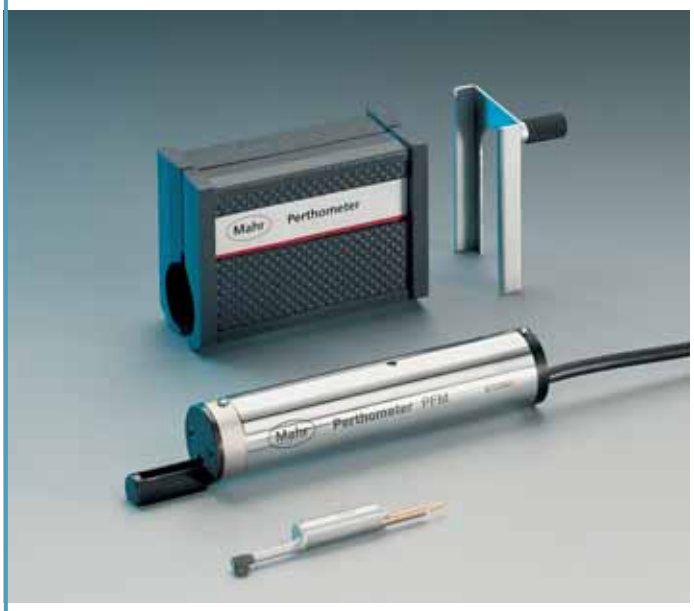
The NHTF 0.5 for gear tooth flanks

enables roughness measurements even at hardly accessible points.

NHTF 0.5-100 pick-up	**Order No. 6111503**
Type	single-skid pick-up with spherical skid
Skid radius	25 mm (.984 in) in traversing direction, 1.45 mm (.0571 in) at right angles
Contact point	0.6 mm (.0236 in) beside the stylus
Measuring range	100 µm (.00394 in)
Specification	e.g. for gear tooth flanks with a modulus larger than 0.8

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.
For the scope of delivery of the Perthometer sets, practical examp-

Technical Data

PFM drive unit	**Order No. 6720907**
Traversing direction	longitudinal
Traversing lengths	set on the Perthometer
as per DIN/ISO	1.75 mm, 5.6 mm, 17.5 mm (.07 in, .22 in, .7 in)
as per EN ISO	1 mm, 2 mm, 4 mm, 8 mm, 12 mm, 16 mm (.0394 in, .0787 in, .157 in, .315 in, .472 in, .63 in)
Traversing speed	0.5 mm/s (.0197 in/s)
Dimensions (w/o pick-up protection)	dia. 24 mm (.945 in), L = 112 mm (4.41 in)

Technical Data

PFM 2 drive unit

Traversing direction	transverse
Traversing lengths	set on the Perthometer
as per DIN/ISO	1.75 mm, 5.6 mm (.07 in, .22 in)
as per EN ISO 12085	1 mm, 2 mm, 4 mm (.0394 in, .0787 in, .157 in)
Traversing speed	0.5 mm/s (.0197 in/s)
Dimensions (w/o pick-up protection)	dia. 24 mm (.945 in), L = 112 mm (4.41 in)

PFM 2 set **Order No. 6720909**
consisting of:

PFM 2 drive unit
Vee pick-up protection
Pick-up protection
Screwdriver

Applications with PFM Drive Units

Drive unit for shop floor applications

Description

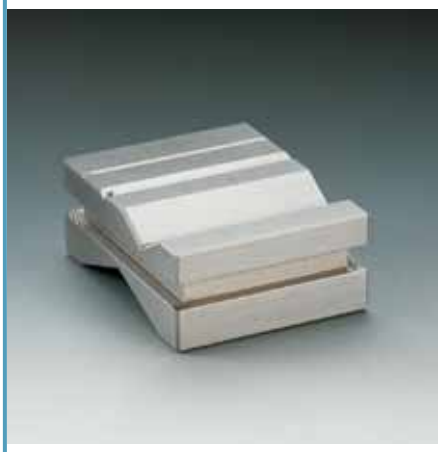
The robust **PFM drive unit** with its slim, cylindrical form is suited for measuring even complex workpieces. It is easily attached to mounting devices for stationary operation, while for manual operation, the hand-held support with its multiple contact surfaces offers various application possibilities. 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.

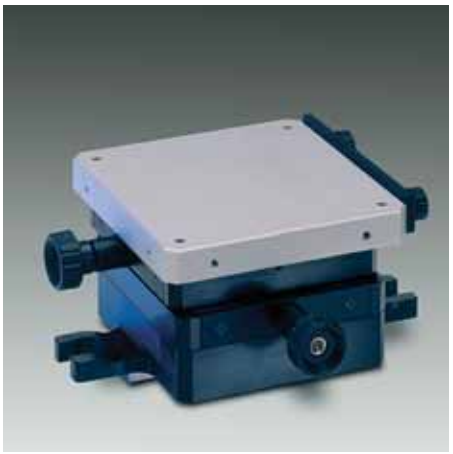
For small workpieces, the hand-held support is placed upside down, thus serving as workholding device.
The multiple contact surfaces, the vertical adjusters and the possibility of shifting and turning the drive unit within the hand-held support, make the PFM a simple, but complete measuring station of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

PRN 10 roughness standard
Order No. 6820420

with DKD calibration certificate. Roughness standard with turned profile, chromed. Profile depth approx. 10 µm (.394 µin). For checking the roughness measuring station.

PPS parallel vice
Order No. 6710604

for mounting rectangular and cylindrical workpieces. Jaw width 70 mm (2.76 in), jaw height 25 mm (.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).

PGN 3 geometric standard
Order No. 6820601

(not shown) Surface roughness standard with a sinusoidal groove profile. Profile depth approx. 3 µm (120 µin), groove spacing approx. 0.12 mm (.00472 in). For checking the roughness measuring station.

NIST or DKD calibration certificates are available on request.

Single Roughness Master
Order No. 2008143

(not shown) Surface roughness standard with a sinusoidal waveform. Made of electroformed nickel with hardened surface layer. Certified for R_z=9.75 µm/384 µin; R_a=3.0 µm/118 µin and R_{max}=9.8µm/386 µin, tracable to NIST.

Dual Roughness Master
Order No. 2238983

(not shown) Surface roughness standard with two areas: sinusoidal for calibration, similar to order **No. 2008143**, and traingular for stylus check for R_a=0.4 µm/16 µin.

Accessories

Measuring Stands

Measuring stand ST-D **Order No. 6710803**

Height adjustment of PFM mounting device	0 mm to 300 mm (0 in to 11.81 in), by means of a handwheel
Triangular foot Dimensions (L x W x H)	175 mm x 190 mm x 385 mm (6.89 in x 7.48 in x 15.16 in)
Weight	approx. 3 kg (6.61 lb)

Measuring stand ST-F **Order No. 2190832**

Height adjustment of PFM mounting device	0 mm to 300 mm (0 in to 11.81 in), by means of a handwheel
Table surface	400 mm x 250 mm (15.75 in x 9.84 in), granite
Dimensions (L x W x H)	400 mm x 250 mm x 422 mm (15.75 in x 9.84 in x 16.61 in)
Weight	approx. 24 kg (52.91 lb)

Measuring stand ST-G **Order No. 6710807**

Granite plate with an 10 mm (.39 in) T-slot for mounting work-holding devices. Handwheel height adjustment for simply and exactly adjusting the drive unit to the required measuring height.

Height adjustment of PFM mounting device	0 mm to 300 mm (0 in to 11.81 in), by means of a handwheel
Dimensions (L x W x H)	500 mm x 300 mm x 415 mm (19.69 in x 11.81 in x 16.34 in)
Weight	approx. 35 kg (77.16 lb)

Measuring Stand Accessories

Measuring stand accessories (not included in the scope of delivery of the measurings stands):

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 Perthometer 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 Perthometer to an ST-F, ST-D or ST-G measuring stand by means of the support plate (Order No. 6851332).

Software

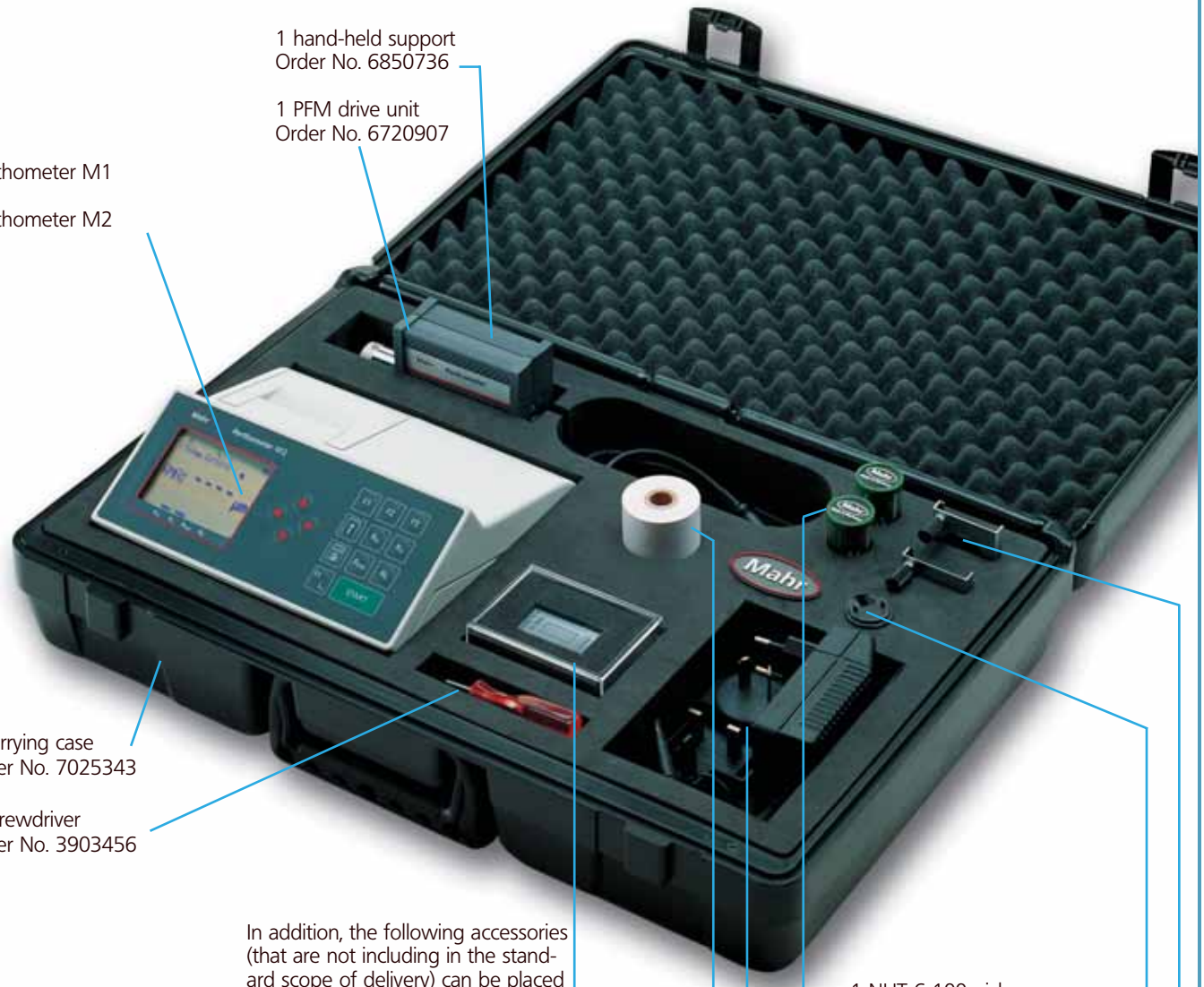
MarSurf XR 20 evaluation software **Order No. 6299009**
Control of the M-unit via the RS 232 COM port
Software access via a USB dongle, usable with Windows 2000 and Windows XP

The Perthometer Sets for Mobile Operation

Perthometer M1 set	**Order No. 6910134**
Perthometer M1 set with 2008143 Roughness Master	**Order No. 2190827**
Perthometer M2 set	**Order No. 6910135**
Perthometer M2 set with 2008143 Patch Roughness Master	**Order No. 2190828**

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.



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