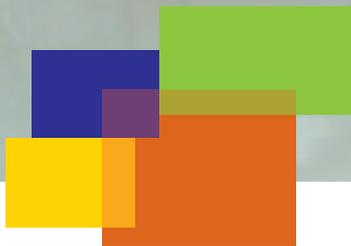


TR Series

Surface Roughness Tester
for workshop and laboratory



Portable, rugged and instant operation
on metallic and ceramic surfaces

Surface roughness measurement – the basics

Application

Surface roughness testers are used when visual and feel comparisons are just not sufficient. The user-friendly instruments belonging to the TR series determine reliable and quantitative roughness parameters.

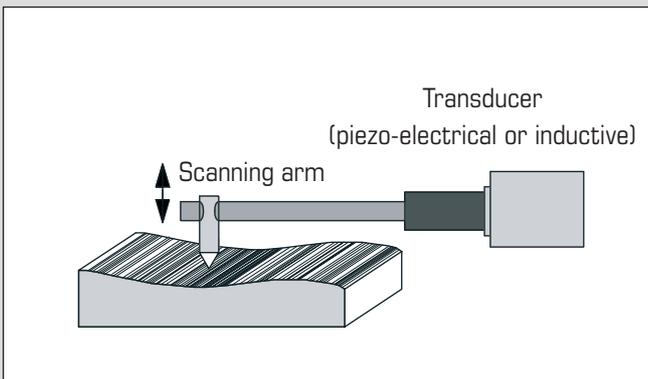
Some typical inspection applications are

- shot-blasted surfaces,
- machined components (e.g. turning, milling or grinding).

In addition to this, a roughness measurement enables conclusions to be made about slip resistance, e.g. of ceramic tiles.

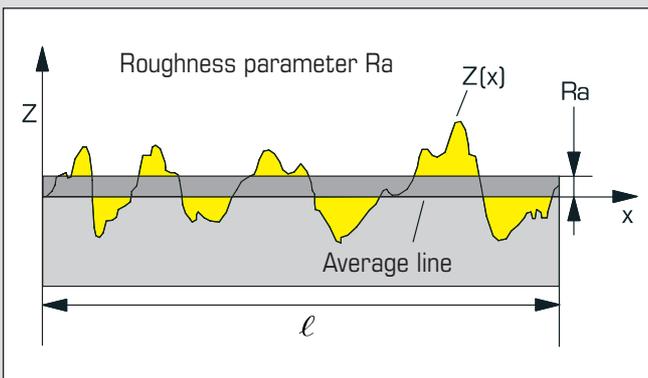
Background: roughness parameters Ra and Rz

The roughness parameters Ra and Rz are the most widely used throughout the world for roughness inspection (refer to DIN EN ISO 4287). Determination of both parameters is recommended for reliable evaluation of a roughness profile. Ra and Rz cannot be converted into each other: each value must be individually acquired and calculated by the tester. More comfortable instruments do this in only one measurement sequence; otherwise two consecutive measurement sequences are needed.



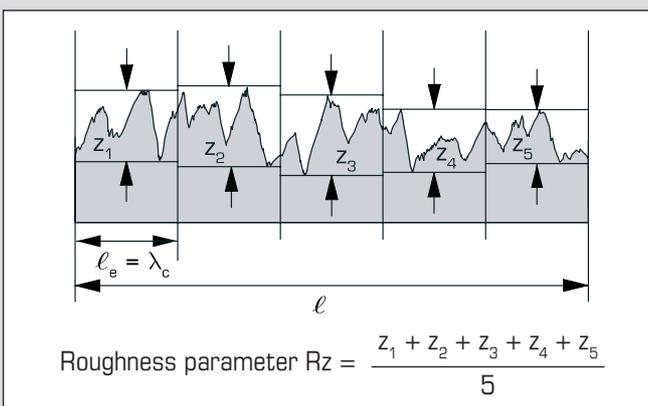
Mechanical determination of roughness parameters

The figure on the left shows the principle for scanning the surface profile. The piezo-electrical transducer is used for simpler tasks and the inductive transducer for more demanding ones.



Ra – the mathematical average value for roughness

Ra is the generally recognized parameter and the one mostly used internationally. The average roughness value is the mathematical average of the absolute profile deviations within the scanning path. Ra is preferably used in order to evaluate gradual surface changes. For example, this is the case with grinding when the grinder becomes less effective. However, different profile forms cannot be detected using the Ra value. The measured numerical value for Ra is always smaller than that of the Rz value determined on the same roughness profile due to the calculation formula.



Rz – the determined roughness

The determined roughness depth Rz is the mathematical average from the largest individual roughness depths z_n from a number of individual measurement paths $l_e = \lambda_c$. Averaging of the largest roughness depths of measurement paths directly adjacent to each other weakens the influence of individual peaks and ridges. The complete path l is the sum of the individual measurement paths.

The TR series – universal Surface Roughness Testers

One series – three versions

The three versions TR-100, TR-110 and TR-200 are precision Surface Roughness Testers developed for workshop and laboratory. They are especially ideal for mobile operation due to their compact, sturdy design.

The instruments **TR-100** and **TR-110** are sufficient for simple test tasks. Both are designed for the quick acquisition of roughness parameters Ra and Rz. They are preferably used in workshops and for mobile operations, therefore both these instruments do not have interfaces for data transfer to a PC.

The **TR-200** is the instrument suitable for more demanding test tasks due to its extensive range of functions. In addition to the basic functions, the TR-200 enables testing of many critical applications.

With its high accuracy, more measurement parameters and the RS232 data interface, it meets the highest demands for workshops and laboratories.

The basic instrument and the version with more built-in operational ease

The Surface Roughness Testers TR-100 and TR-110 use a piezo-electrical transducer with a diamond tip. This automatically scans the roughness profile of the surface. The deflection of the diamond tip generates a voltage in the piezo-electrical transducer. The instrument then digitizes this voltage and converts it into the roughness parameters Ra and Rz.



Surface Roughness Tester TR-100

TR-100 – the basic instrument

The portable Surface Roughness Tester **TR-100** was designed for practical use in the workshop. This instrument determines roughness parameters Ra and Rz.

Before testing you select the parameters, either Ra or Rz, and set the cut-off length. The instrument is then positioned and the measurement started. A double tone sounds after a few seconds and the measurement value (Ra or Rz) is displayed. Any calibration which may be necessary is simply made using the keypad. The corresponding roughness standard is included in the standard delivery package.



Surface Roughness Tester TR-110

TR-110 – more operational ease

The latest state of the art portable Surface Roughness Tester **TR-110** operates similar to the TR-100. However, in order to determine both parameters (Ra and Rz) it is only necessary to scan the surface once.

An integrated sleeve can be slid over the sensor tip in order to protect it during periods of non-use. In addition to this, an automatic 1.5 minute cut-off function protects the lithium-ion battery against unnecessary discharge.

TR-200 – the top instrument version with graphics display

The **TR-200** works with an inductive transducer having a diamond tip, similar to the pick-up of a record player. Voltages are generated when the sensor is deflected and are converted into the different roughness parameters by the instrument electronic system as well as being used for profile presentation.

The Surface Roughness Tester TR-200 is designed for practical use in the workshop as well as for universal measurement tasks in the laboratory.

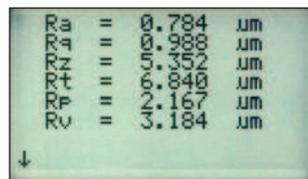
It enables measurement of nearly all roughness characteristics. The measured surface profile can be presented on the display in addition to the 13 different characteristics. The RS232 interface on the instrument enables transfer of all characteristics and surface profile to the printer **TA-220** (option)



Surface Roughness Tester TR-200



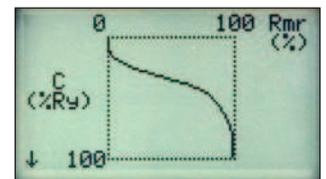
Display with Ra indication



Display showing all roughness parameters



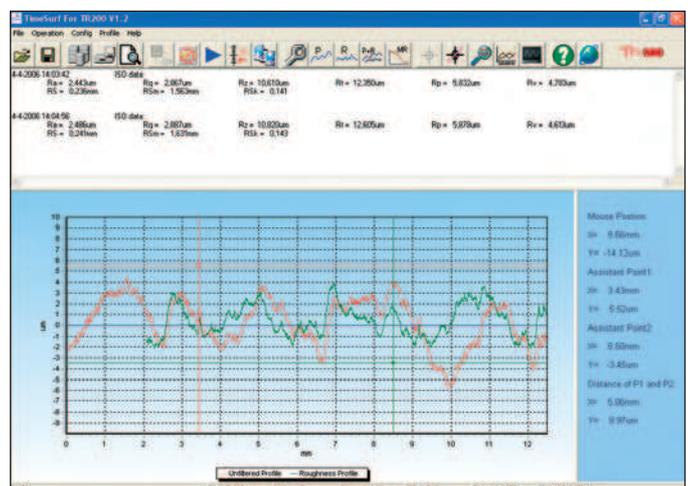
Profile display



Material ratio curve

Characteristics and profile presentation can be documented on a PC using the data evaluation program **TimeSurf**. This program is a practical accessory especially for monitoring and documentation of series products. The user-friendly operation can be either made by menu prompting on the instrument or with TimeSurf on a PC.

If the measurement data can be directly allocated to the components you will then be able to quickly print and attach them.



Profile display with roughness parameters in the program TimeSurf

Surface Roughness Tester TR-200 with extensive range of accessories



Standard (spare) measurement sensor



50 mm extension for measuring sensor



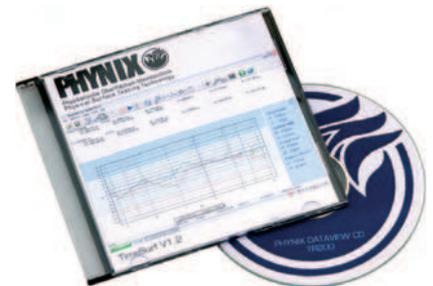
Ra/Rz reference plate with DKD certificate



Portable printer TA-220



Interface cable for PC/printer



TimeSurf software for data transfer and management



Measurement support, including holder, for stationary measurements with the TR-200, base plate made of granite



Sturdy transport and storage case with TR-200 and standard accessories

Technical specifications TR-100/TR-110

Roughness parameters	Ra and Rz
Units of measure	$\mu\text{m}/\mu\text{inch}$, switchable
Measurement range*	Ra: 0.05 to 15.0 μm Rz: 0.1 to 50 μm
Cut-off length	0.25 mm, 0.8 mm or 2.5 mm, switchable
Filter	RC
Functions	signal tone (Start/Test/Ready) additionally on TR-110: protection sleeve for sensor tip, automatic switch-off after 1.5 minutes, backlight
Calibration	with keyboard and attached roughness standard
Scan path	6 mm
Scan speed	1 mm/s
Measurement tolerance	Class 3 according to DIN 4772
Measurement principle	piezo electrical scanning system
Sensor tip	diamond, radius 5 μm
Ambient temperature	0 to 40 °C
Voltage supply	TR-100: 3.6 V NiMH battery TR-110: 3 V Li-Ion battery, charge indicator
Battery charger	220 VAC/9 VDC, it is possible to charge and carry out measurements at the same time
Dimensions	TR-100: 125 mm \times 73 mm \times 26 mm TR-110: 102 mm \times 70 mm \times 22 mm
Weight	TR-100: 200 g TR-110: 180 g

* According to DIN EN ISO 4288, the cut-off length of 2.5 mm is only recommended for surfaces whose Ra value does not exceed 10 μm .

Standard delivery package TR-100/TR-110

Surface Roughness Tester TR-100 or TR-110, each with integrated sensor, roughness standard (Ra), battery charger 220 V 50 Hz, transport and storage case, operating manual, manufacturer's certificate

Optional accessories

Ra/Rz reference plate with DKD certificate (ca. Ra = 5 μm , ca. Rz = 21 μm)

Standard delivery package TR-200

Surface Roughness Tester TR-200, sensor, protection for sensor, roughness standard (Ra), adapter for stepped measurements, charger 220 V 50 Hz, screwdriver, transport and storage case, operating manual, manufacturer's certificate

Optional accessories

Standard (spare) sensor, 50 mm sensor extension dia. 10 mm, Ra/Rz reference plate with DKD certificate (ca. Ra = 5 μm , ca. Rz = 21 μm), portable printer TA-220, interface cable for PC/printer, TimeSurf software for data transfer and management, measurement support including holder for stationary measurements with base plate made of granite (70 mm \times 400 mm \times 250 mm)

Technical specifications TR-200

Roughness parameters	Ra, Rz, Rq, Rt, Rp, Rmax, Rm, R3z, S, Sm, Sk, Tp, Pc
Profile	unfiltered primary file (P-profile) roughness profile (R-profile) material ratio curve (Tp-curve)
Profile enlargement	Vv: 200 times to 20.000 times Vh: 20 times, 50 times
Standards	according to ISO, DIN, JIS, ANSI (selected in the menu)
Class of accuracy	Class 2 according to DIN 4772
Units of measure	$\mu\text{m}/\mu\text{inch}$, switchable
Measurement resolution	0.001 $\mu\text{m}/0.04 \mu\text{inch}$
Display	50 mm \times 30 mm, 128 \times 64 dot matrix with backlight
Display features	display of sensor tip position, battery charge level, roughness parameters and profiles, LCD brightness (adjustable)
Functions	printout (parameters are configurable), automatic switch-off (Auto-Off) after 5 minutes with data storage, calibration via software for each cut-off length
Display languages	English, German, French, Italian, Spanish, Dutch
Output interface	RS232, direct connection to printer TA-220 or PC
Measurement range	Ra, Rq: 0.01 μm to 16 μm Rz, Rp, Rt, R3z: 0.02 μm to 160 μm ** Sm, S: 2 μm to 4000 μm Tp: 1 % to 100 % (% Ry) ** maximum deflection of the sensor tip
Cut-off length	0.25 mm, 0.8 mm or 2,5 mm, switchable
Evaluation length l_n	1 to 5 cut-off lengths
Scan length	1 to 5 cut-off lengths + 2 cut-off lengths
Digital filter	RC, PC-RC, Gauss, D-P
Sensor/ measurement principle	standard version TS-100, inductive, diamond tip, radius 5 μm
Bores holes	from 6.0 mm, depth 15 mm (TS-100)
Voltage supply	Li-Ion battery, 1000 mAh (for > 3000 measurements)
Battery charger	220 V, 50 Hz
Ambient temperature	5 °C to 40 °C
Dimensions	141 mm \times 56 mm \times 48 mm (without sensor)
Weight	440 g



Physikalische Oberflächen-Messtechnik
Physical Surface Testing Technology

PHYNIX GmbH & Co. KG
Alexe-Altenkirch-Strasse 3
50739 Köln • Germany
Phone: +49 (0)2 21/1 7964-30
Fax: +49 (0)2 21/1 7964-35
info@phynix.de
www.phynix.de