English

User Manual

PCE-RT 2300 Roughness Tester

User manuals in various languages (français, italiano, español, português, nederlands, türk, polski, русский, 中文) can be found by using our product search on: www.pce-instruments.com

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v1.2

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Contents

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1 Safety notes

Please read this manual carefully and completely before you use the device for the first time. The device may only be used by qualified personnel and repaired by PCE Instruments personnel. Damage or injuries caused by non-observance of the manual are excluded from our liability and not covered by our warranty.

- The device must only be used as described in this instruction manual. If used otherwise, this can cause dangerous situations for the user and damage to the meter.
- The instrument may only be used if the environmental conditions (temperature, relative humidity, …) are within the ranges stated in the technical specifications. Do not expose the device to extreme temperatures, direct sunlight, extreme humidity or moisture.
- Do not expose the device to shocks or strong vibrations.
- The case should only be opened by qualified PCE Instruments personnel.
- Never use the instrument when your hands are wet.
- You must not make any technical changes to the device.
- The appliance should only be cleaned with a damp cloth. Use only pH-neutral cleaner, no abrasives or solvents.
- The device must only be used with accessories from PCE Instruments or equivalent.
- Before each use, inspect the case for visible damage. If any damage is visible, do not use the device.
- Do not use the instrument in explosive atmospheres.
- The measurement range as stated in the specifications must not be exceeded under any circumstances.
- Non-observance of the safety notes can cause damage to the device and injuries to the user.
- Turn off the meter when not in use.
- Do not use the full measurement range.
- If the meter no longer works flawlessly, do not use it.

We do not assume liability for printing errors or any other mistakes in this manual.

We expressly point to our general guarantee terms which can be found in our general terms of business.

2 Delivery contents

1 x Roughness tester PCE-RT 2300
1 x Microprobe
1 x Removable motorized sensor
2 x Connection cable for motor unit
1 x Charger
1 x Interface cable
1 x Transport case
1 x Manual

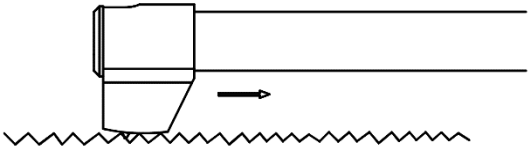
3 Specifications

Measuring range	320 µm
Accuracy	± 10%
Repeatability	± 7%
Resolution	± 20 µm: 0.01 µm ± 40 µm: 0.02 µm ± 80 µm: 0.04 µm
Measurement Parameters	Ra, Rz, Rq, Rt, Rc, Rp, Rv, R3z, R3y, Rz (JIS), Ry, Rs, Rsk, Rku, Rmax, Rsm, Rmr, RPc, Rk, Rpk, Rvk, Mr1, Mr2
Measurement Standards	ISO4287, ANSI b46.1, DIN4768, JISb601
Graphic	Primary profile (roughness + waviness) Roughness profile (roughness) Loading curves
Measuring filter	RC, PC-RC, Gaus, DP
Measuring section (Cut Off)	0.25 mm, 0.8 mm, 2.5 mm
Measuring length	1 ... 5* measuring path Max. 17.5 mm (including pre- and post-run)
Sensor	Diamond probe tip 90° 5 µm
Contact force sensor	<4 mN
Feed rate	0.25 mm: 0.135 mm / s 0.8 mm: 0.5 mm / s 2.5 mm: 1 mm / s
Display	3.5" LCD screen
Power supply	3.7V Li-Ion Battery 5V / 800-mA USB Power Adapter
Operating time	50 h
Operating conditions	-20 ... 40°C / -4 ... 104°F, max. 90% RH
Storage conditions	-40 ... 60°C / -40 ... 140°F, max. 90% RH
Dimensions	Main unit: 158 x 55 x 52 mm / 6.2 x 2.2 x 2 in Motor unit: 115 x 23 x 27 mm / 4.5 x 1 x 1.1 in
Weight	About 500 g / 1.1 lbs

3.1 Measurement ranges by parameter

Parameter	Measurement range
Ra Rq	0.005 … 32 µm
Rz R3z Ry Rt Rp Rm	0.02 … 320 µm
Sk	0 … 100 %
S Sm	0.02 … 1000 µm
tp	0 … 100 %

4 Measuring principle

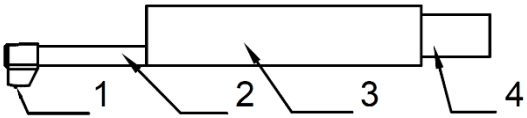


If you wish to measure the roughness of the surface, place the meter on the surface to be measured. The meter will move the sensor over the surface to capture its structure. Through displacement of the measuring needle, an induction coil in the sensor will be changed. The resulting analogue signal will directly be amplified. These amplified signals will be collected by the meter and then filtered and converted by the DSP chip. The converted readings can then be viewed on the LCD and processed.

5 Device description

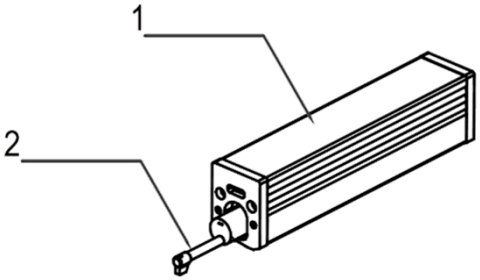
Sensor

1. Diamond probe tip
2. Sensor tube
3. Sensor body
4. Sensor socket



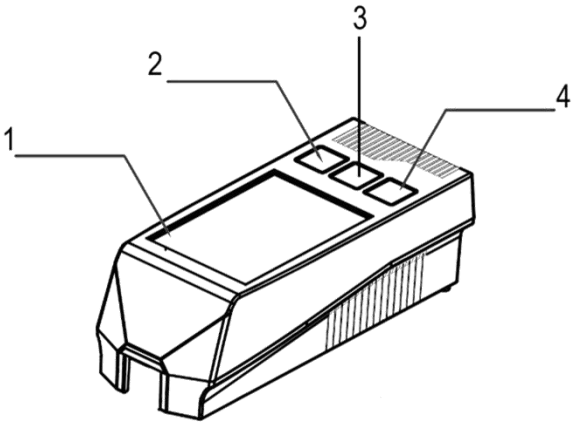
Drive unit

1- Removable motor
2- Sensor



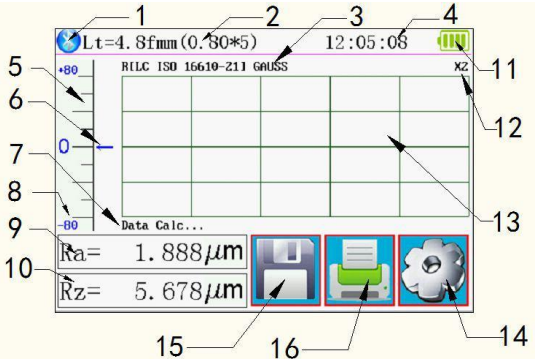
Main device

1. Touch screen
2. ESC/selection key
3. Start/on/off key
4. Enter/selection key



5.1 Display description

1. Bluetooth active
2. Length assessment
3. Filter
4. Activity time
5. Start measurement
6. Sensor position
7. Status information
8. Sensor position range
9. 1st reading (Master)
10. 2nd reading (Slave)
11. Battery level indicator
12. Profile scale
13. Profile display area
14. Menu key
15. Save button
16. Print button

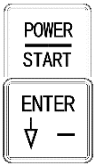


5.2 Key description

ESC/selection key: With this key, you can increase a value or select a different function.
Back function: You can go back to the previous function by pressing this key.

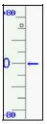
Start/on/off key: Press and hold this key to switch the meter on/off.
Starting a measurement: To start a measurement, short-press the key.

Enter/selection key: With this key, you can decrease a vale or select a different function.
Enter function: Press this key to confirm an entry.

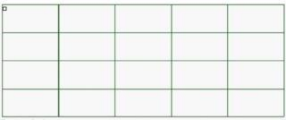


5.3 Hidden buttons on the touch screen

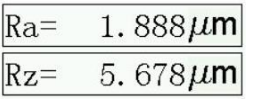
There are three hidden buttons on the touch screen. They have the following functions:



Start measurement



Profile zoom



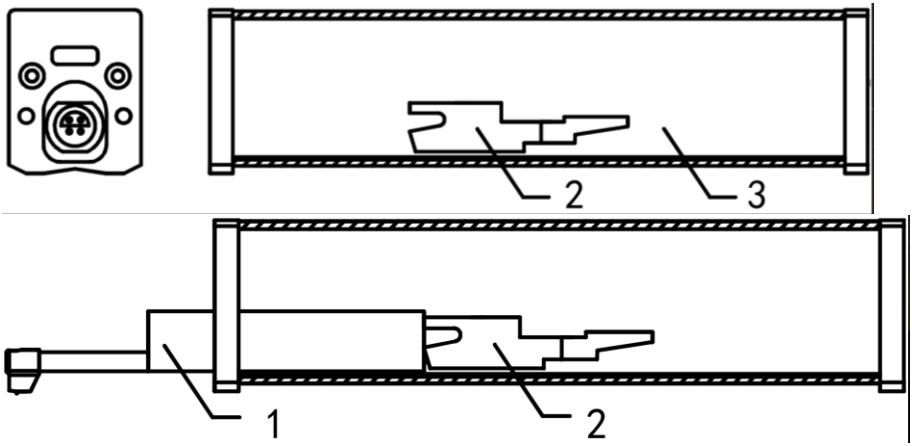
Display all measuring functions

5.4 Recharging the battery

As soon as the display shows a flat battery icon, the battery is discharged and should be recharged as soon as possible. To charge the meter, you can use the included charger or you can charge it directly via your computer. If you want to use a different charger, it should fulfil the following specifications:
Output: 5 V / 1000 mA
After connecting the charger, a charging animation will be displayed. The battery is fully charged when the animation stops. Charging takes approx. 5 hours.
Important:
The battery is only charged if the ON/OFF switch is “ON“.

5.5 Connecting the sensor to the drive unit

Before connecting the sensor to the drive unit or removing it, make sure the meter is turned off.



1. Sensor
2. Motorised sensor bracket
3. Drive unit

To connect the sensor to the drive unit, hold the sensor body and move it into the drive unit as described in the picture. To release the sensor, hold the sensor body tightly and pull it back out.

Important:
The sensor is the main part of the measuring system and needs special care. Do not touch the probe tip. The sensor must only be used when it is installed in the meter. When no measurement is made, place the sensor back in its packaging to avoid damage. If you want to use a new sensor, the sensor must be adjusted to the meter.

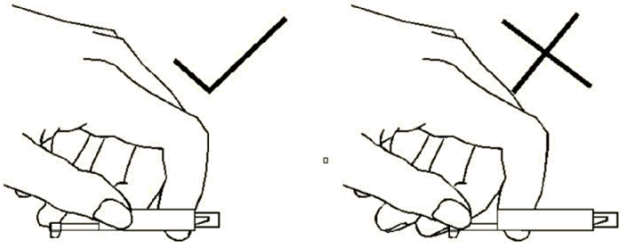


Fig. 1: Handling the sensor

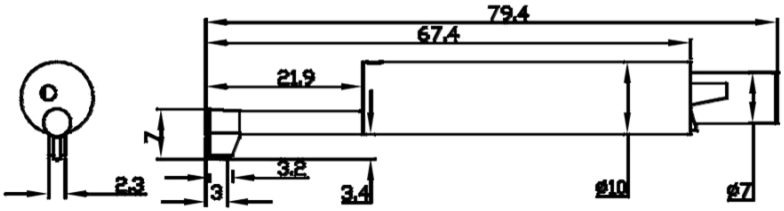
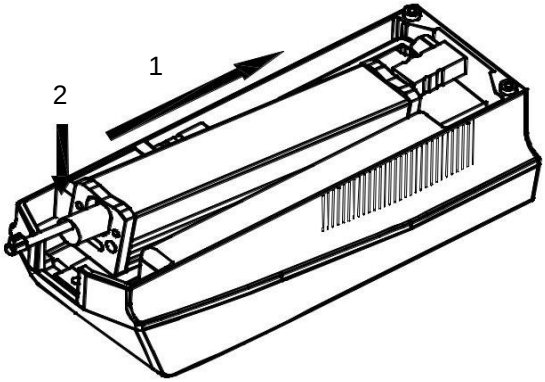


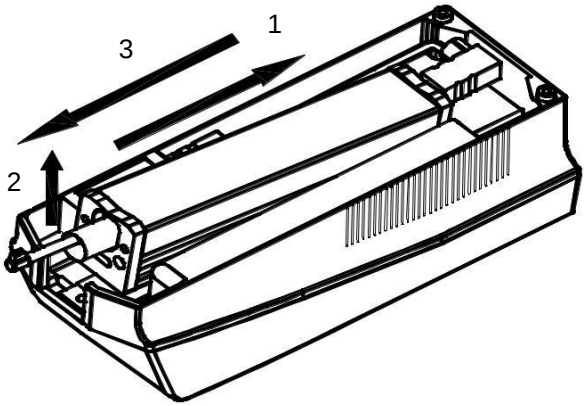
Fig. 2: Sensor dimensions in mm

5.6 Connecting the drive unit to the main device



1. Insert the drive unit into the main device according to the picture until it is attached firmly onto the pin on the inside.
2. Now push down the drive unit so that it can snap into place.

5.7 Removing the drive unit from the main device

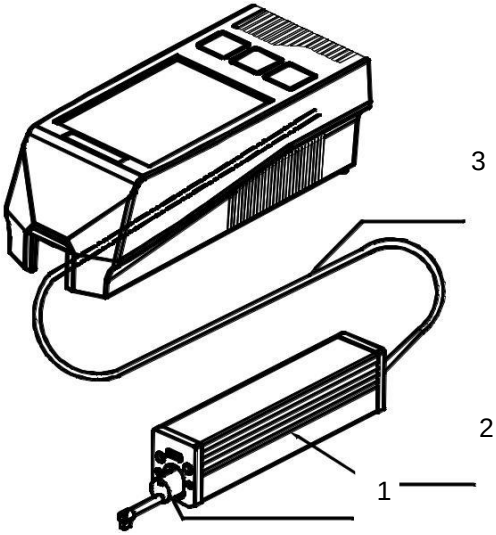


1. To remove the drive unit from the main device, first unsnap the drive unit.
2. Then lift the tip of the drive unit.
3. Pull out the drive unit.

5.8 Using the extension cable

When the drive unit is not connected to the display, use the included extension cable as shown in the picture.

1. Sensor
2. Drive unit
3. Extension cable



6 Measurement

6.1 On/off

To power the meter on/off, press and hold the On/off key for two seconds. The meter will go directly to measurement on when turned on.

6.2 Preparing the meter

Turn on the meter and check whether the battery voltage is sufficient. Then clean the surface of your sample. Now place the meter firmly and evenly on the surface to be measured. The grooves on the sample must be vertical to the probe.

Important:
To ensure the most accurate results, make sure to exactly follow all steps described in the manual.

6.3 Changing the language

To change the menu language, press and hold the Enter key for about 7 seconds. You can select either Chinese or English.

6.4 Sensor position

In measurement mode, there is a scale on the left-hand side. The arrow shows the current sensor position and should be as central as possible. The arrow can move within the scale without affecting the measurement. If it is outside the scale, the measurement can be affected.

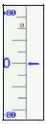


Fig. 3:Sensor scale

6.5 Starting a measurement

To start a measurement, press the “Start“ key or touch the scale on the left-hand side of the touch screen. To interrupt the measurement, press the “ESC“ key. The measurement will be interrupted and the sensor stops. To return the sensor to its normal position, restart the meter or start a new measurement.

6.6 Readings

To access all measuring functions involving a conversion, touch the part where the readings are displayed (1). To zoom into the graphics, touch the graphics part (2) on the touch screen. 4 different zoom levels are possible: 1x, 2x, 4x and 8x. You can start the measurement via the scale (3).

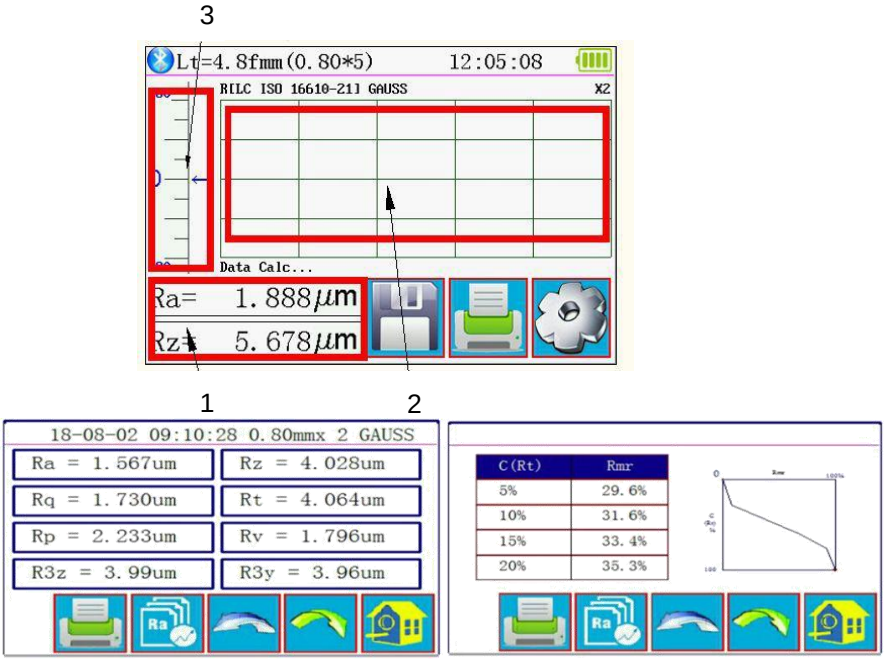


Fig. 4: Complete readings displayed

6.7 Printing the readings

The meter can be connected to a serial printer via Bluetooth. When the printer is connected, you can print the measuring data by pressing the button on the touch screen. In the menu “Print Settings“, you can select the parameters of a measurement you wish to print.

6.8 Saving the measurement

To save the current reading, press the icon on the touch screen. You can save 100 groups of raw data and profile data to this meter. The file name will be generated automatically from the date and time. All saved readings can now be viewed via the “Record“ menu. The reading last saved will always start with “001“. All other readings will be numbered consecutively.

7 Menu

To enter the menu, press the  button on the touch screen. You can leave the menu by pressing “ESC“ or ”Return HomePage“.

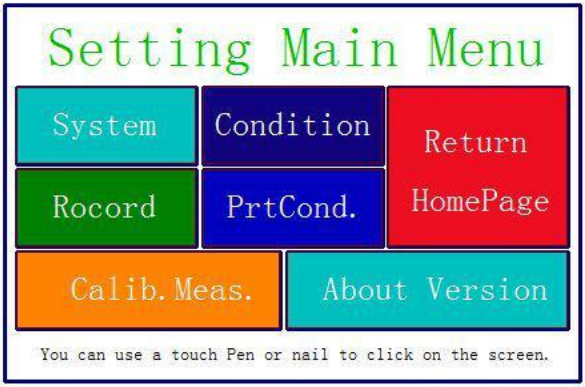


Fig. 5: Main menu

7.1 System

The menu item “System“ has two pages. You can switch between them by pressing “System Setting X/2“ on the touch screen.

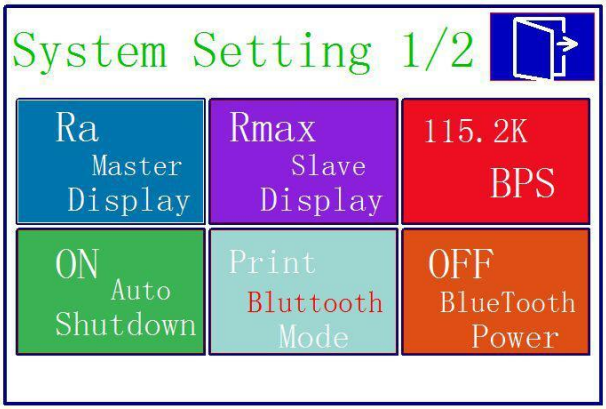


Fig. 6: System setting page 1

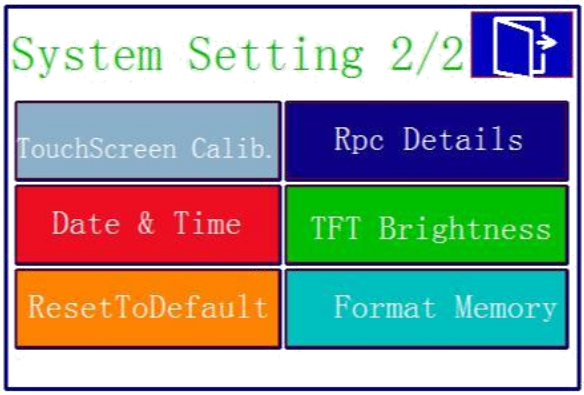


Fig. 7: System setting page 2

7.1.1 Display Master/Slave

Under “Master Display“ and “Slave Display“, you can select the measuring unit you wish to see on the measuring display. Via “Master Display“, you can set the first tab and “Slave Display“ is used to set the second tab.

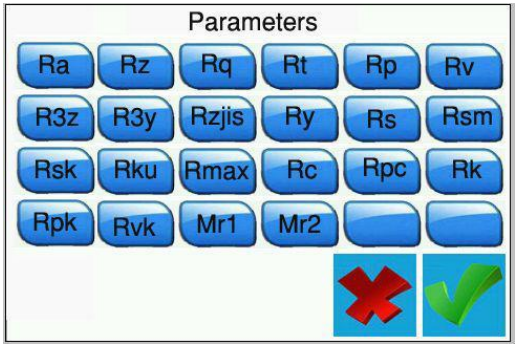


Fig. 8: Possible units of measurement

7.1.2 BPS

Via BPS (Bits per second), you can set the baud rate for the Bluetooth connection with a terminal device. Possible settings: 921.600, 230.400, 115.200 und 38.400 bps. The standard setting is 115.200 bps.

7.1.3 Automatic Power Off

If this function is activated, the meter will turn off automatically after 10 minutes of inactivity. If this function is disabled, the meter will operate continuously.

7.1.4 Bluetooth mode

There are two Bluetooth functions which can be set via the menu ”Bluetooth Mode“. If you want to connect a printer to the meter, the “Print“ function must be used. If you wish to connect the meter to an app, select the “Ctrl“ function. Before selecting one of these functions, disable the device’s Bluetooth.

7.1.5 Enable/disable Bluetooth

Via the menu “Bluetooth Power“, you can enable or disable Bluetooth. When Bluetooth is activated, the battery will discharge much more quickly. When you turn off the meter, the Bluetooth connection will be discontinued automatically which means that you will have to enable the Bluetooth function manually after a restart.

7.1.6 Touch screen

To adjust the touch screen, go to ”Touch Calib.“ in the menu. Now use a touch pen to touch the crosses displayed in the corners as accurately as possible. You will re-enter the menu as soon as the crosses have been touched.
Note: If it is not possible to get back to the menu due to incorrect adjustment, you can press and hold the “ESC“ key for several seconds in measuring mode to adjust the touch screen.

7.1.7 Counting function Rpc

In the menu item “Rpc Details“ you can set the counting function of the meter. You can set the minimum value to be counted as a peak. First choose whether you want the meter to count according to the overall roughness or according to the percentage. To make a selection, touch “µm“ or “%“ directly. Then set the value.

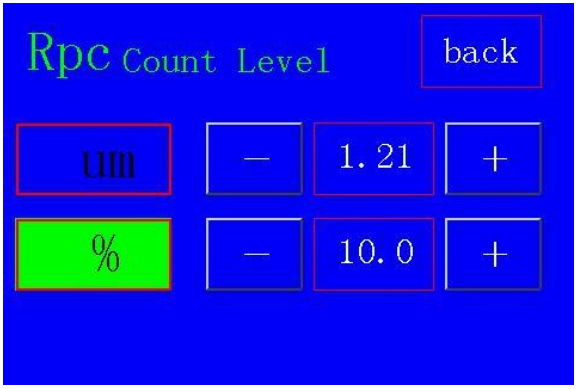


Fig. 9: Setting the limit value

7.1.8 Setting date and time

To set the date and time, go to “Date & Time“ in the menu. To be able to set the date and time, the current time must first be stopped by touching ”STOP“. Now use the plus and minus buttons on the touch screen to set the date and time. The format is YYYY/MM/DD. Touch “ESC“ to leave the menu without saving the settings or touch “SAVE“ to save the settings and leave the settings. Touch “START“ to start the clock again. If you leave the menu without starting the clock, it will start automatically.

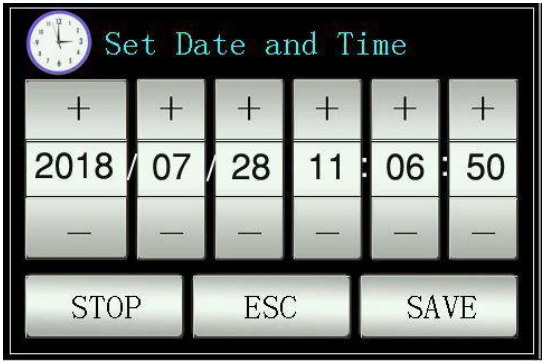


Fig. 10: Setting the date and time

7.1.9 Setting the LCD brightness

To set the display brightness, go to the menu “TFT Brightness“. Use the plus and minus buttons to set the display brightness. Touch “Return“ to confirm the values and get back to the menu. With the “Default“ button, you can reset the value to 80 %.

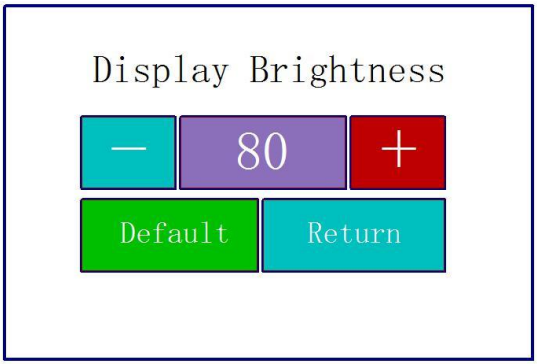


Fig 11: Setting the brightness

7.1.10 Reset to default

To reset all settings to their default settings, go to the menu “ResetToDefault“ and confirm via the green checkmark.

Fig. 12: Reset of settings

7.1.11 Deleting all measured data

To delete all saved measuring data, go to the menu “Format Memory“. The memory will be formatted as soon as you confirm via the green checkmark. This takes approx. 1 minute. Do not turn off the meter during formatting.

7.2 Setting the measuring parameters

To set the measuring parameters, go to the menu “Condition“ and set all measuring parameters.

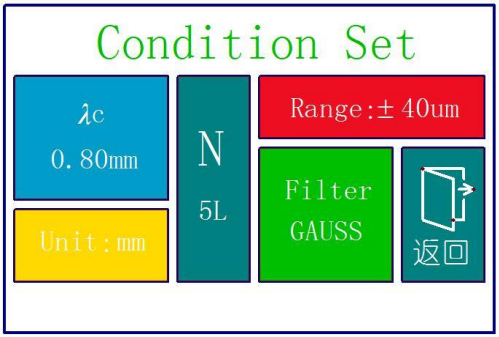


Fig. 13: Setting the measuring parameters

Cut-off length λc	0.25 mm; 0.80 mm; 2.50 mm
No. of measurements per measuring process (L)	1 … 5
Range	±20 µm; ±40 µm; ±80 µm; ±160 µm
Unit	inch, mm
Filter	RC; PC-RC; GAUSS; D-P

7.3 Recorded data

To view the recorded data, go to the menu “Record“ where you can view and also print and delete all measuring data.

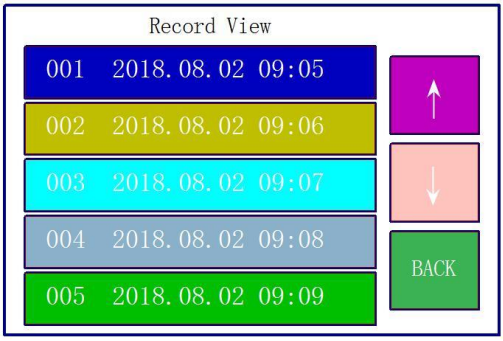


Fig. 14: Data memory

7.4 Device information

To view the device information, go to the menu “About Version“ where you can find some information on the battery and the software version. Touch the touch screen to leave this view.

7.5 Calibration and adjustment

Before making a measurement, a calibration should be carried out with the included reference to make sure the meter works within the specified parameters. If it does not, the meter must be adjusted. To do so, go to the menu “Calib. Meas.“ and use the plus and minus buttons to enter the value of your reference. After setting the value, place the meter on the reference. Then press Start. A measurement will now be made. After completion of the measurement, you can save the adjustment and leave the menu via “Save&Exit“. To leave the adjustment screen without saving, touch “Exit“.

Note: The meter has an accuracy of ±10 %. To set the value or to start a measurement, you can also use the keys.

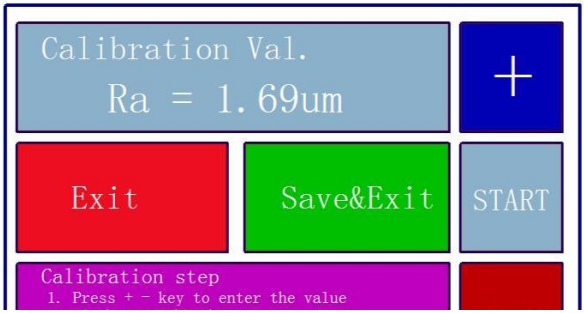


Fig. 15: Calibration

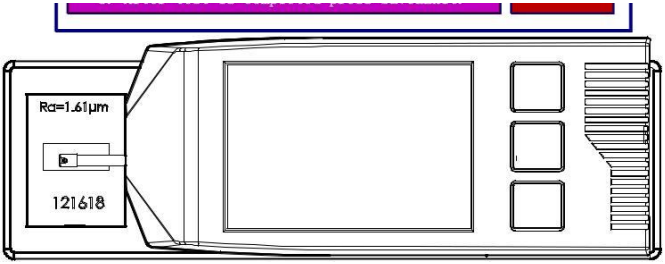


Fig. 16: Placing the meter on the reference

7.6 Printer settings

To make some printer settings, go to the menu “PrintCond.“ where you can decide what information you want your printer to include in the printout.

Logo	“Surface Roughness Tester“ is displayed in the head line. The wording cannot be changed.
Date	Date and time will be included on the printout.
Meas. Cond.	Shows the measuring settings.
Tp.	Prints the Tp curve.
Prof.	Prints graphical view of surface structure.
Result	Prints the desired units of measurement.

Note: Printing graphs is not possible with all printers.

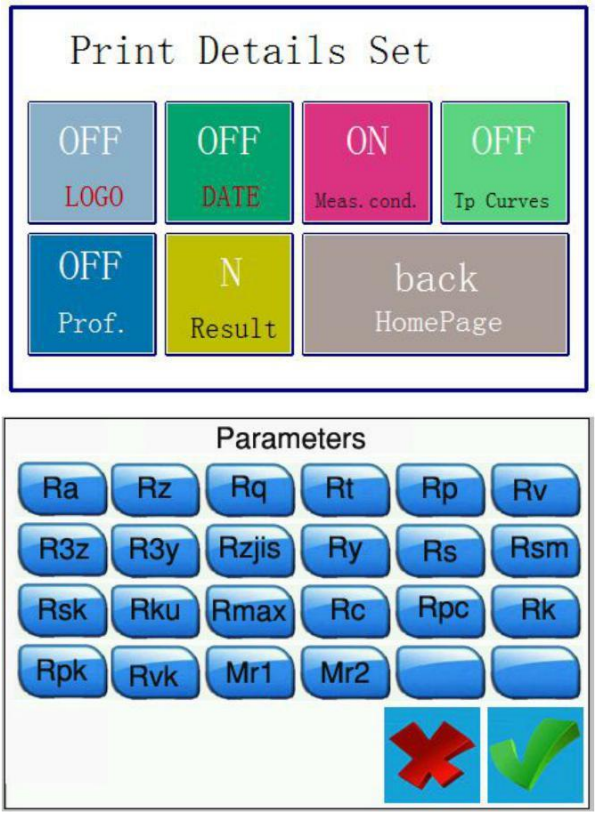


Fig. 17: Printer settings

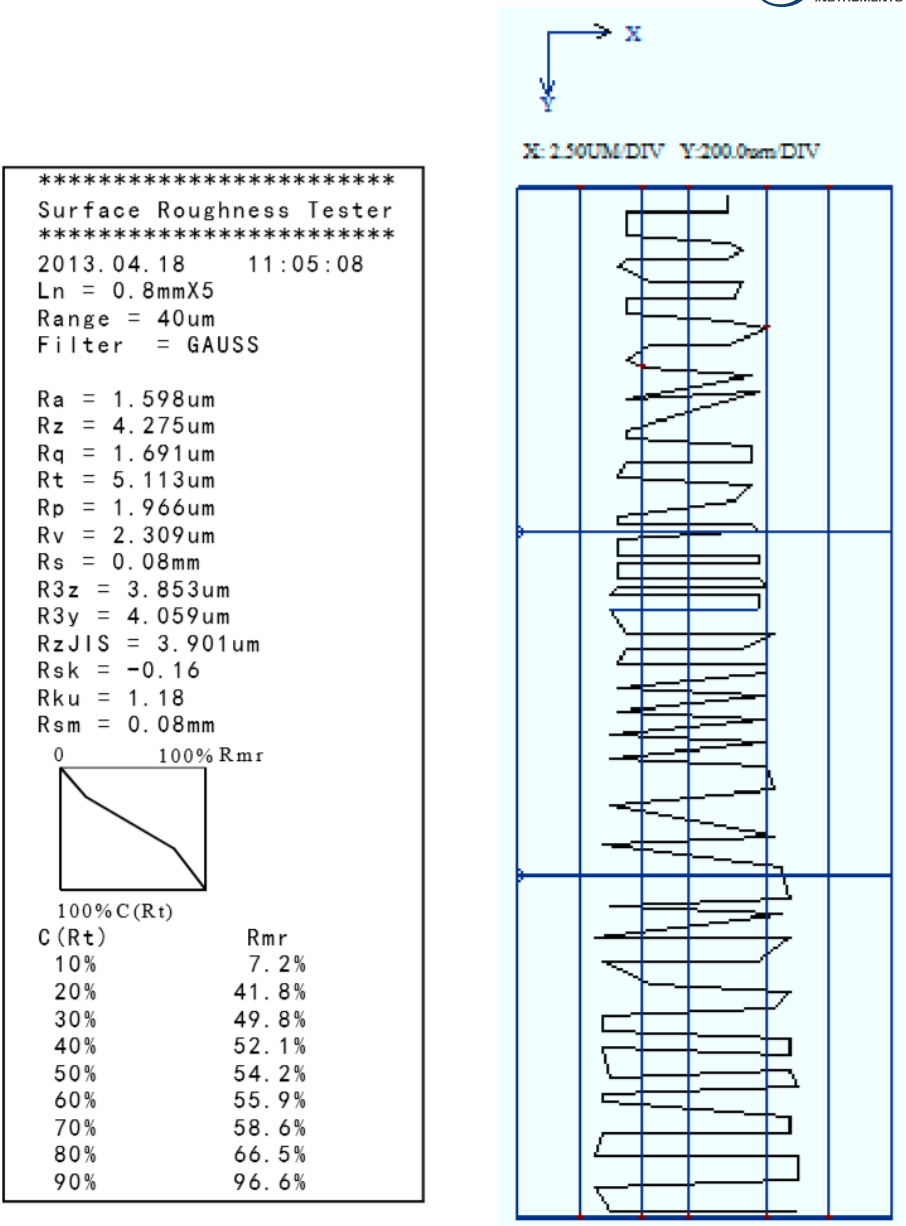


Fig. 18: Example printout

7.7 Connection to a PC

The software does not come with the meter but can be downloaded here:

https://www.pce-instruments.com/deutsch/download-win_4.htm
To connect the meter to the PC, first install the software and the driver. Now make the following settings in the meter:

BPS: 921.6
Bluetooth: Print
Bluetooth off

This can be set in the menu ”PrntCond.“.

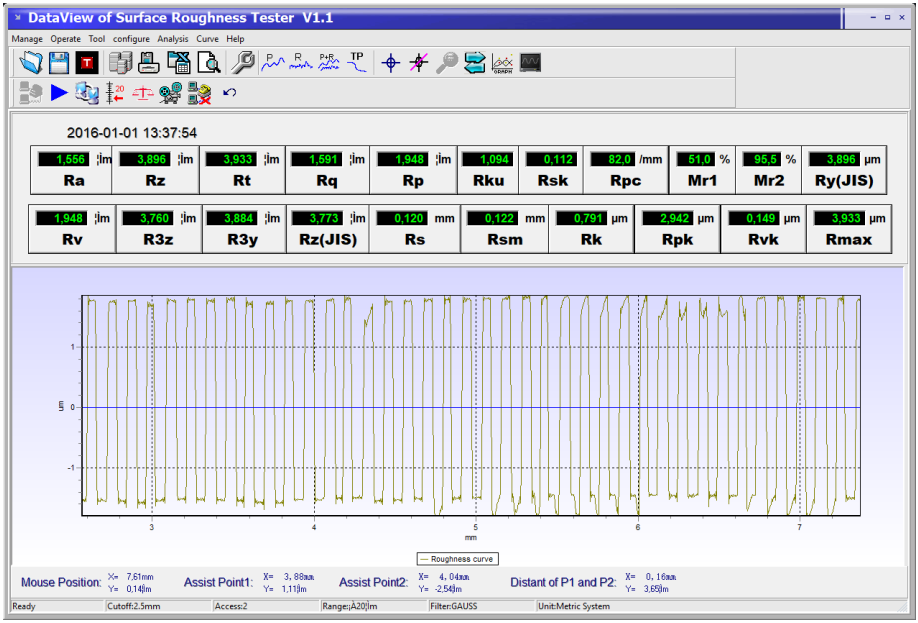


Fig. 19: Example view

Manage	Manage data records
Operate	Connect meter, start measurement, show sensor position
Tool	Show/hide toolbar icon
Configure	Configure meter
Analysis	Export all data from the database in the software as a csv file
Curve	Set graphical views
Help	Show all information about the software
	Open raw data
	Save raw data
	Save raw data in txt format
	View all measurements saved in the software
	Save last measurement
	Export all data from the software as a csv file
	View and print the test report of the displayed measurement
	Configure the measuring procedure
	View course of profile
	View course of roughness
	View course of profile and of roughness at the same time
	View TP course
	Enable assisting lines which appear in the graph and can be moved to help assess the measuring procedure
	Disable assisting lines
	Zoom into graph by highlighting the desired field
	Disable zoom function
	Reset graphical view
	Optimises the scale of the graph
	Connect to the meter
	Start measurement
	Loads last measurement from the meter to the software
	Shows the position of the probe tip in real time
	Adjust the meter
	Transfer the measuring data saved in the meter to the PC

	Disconnect meter from the PC
	Reset display of the meter

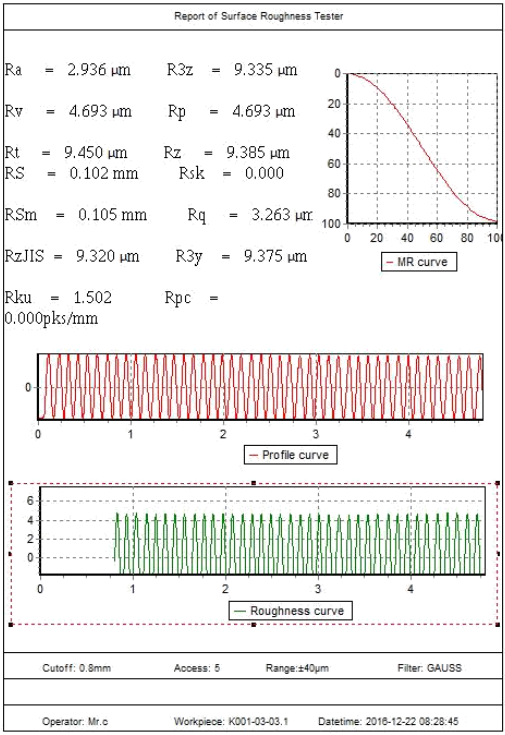


Fig. 20: Example test report

7.8 Accessories

The meter comes with a tripod for clamping in the motor unit.
For example, when the contact area is too small for placing the complete meter on it, you can detach the motor unit, clamp it into the tripod and position it as required for your test object.

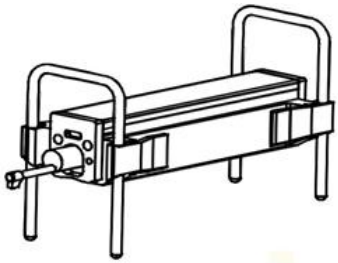


Fig. 21: Tripod for motor unit

8 General information about the sensor

1. When changing the sensor, do not touch the sensor head or probe tip as these are very sensitive parts.
2. After completing the measurement, place the sensor back into its transportation box. Do not carry the sensor when connected to the motor unit.
3. Protect the probe tip.
4. The sensor is a sensitive part. Any impact can damage it. Make sure to prevent such situations.
5. The sensor is excluded from the warranty. To avoid failure, it is recommended to have a replacement sensor ready.

9 General information about the meter

1. Keep the touch screen clean. Only clean it with a dry cloth.
2. The PCE-RT 2300 is a highly accurate meter and must be treated with special care.
3. Always make sure the battery is sufficiently charged.
4. Do not keep the battery attached to the charger for more than 3 hours.

10 General information about the reference

1. The surface of the reference must be clean at any time. Measurements on a dirty surface are not possible.
2. Avoid scratches on the reference surface.

11 Troubleshooting

Error message	Reason	Solution
After starting the meter, nothing is displayed for approx. 1 minute.	Cables not connected correctly or damaged	Disconnect and connect cables again or replace cables.
The motor unit does not show any reaction.		
Touch screen does not work	Touch screen parameters incorrect	Refer to 7.1.6 in the manual.
Motor error	Motor stuck	Restart the meter.
Probe tip outside scale	Incorrect scale used	Try a different scale. Refer to 7.2 in the manual.
	Sensor placed incorrectly	Realign the complete measuring system.
No readings	No readings displayed after turning on the meter	Make a measurement.
Readings outside tolerance	Incorrect settings	Make an adjustment. Refer to 7.5 in the manual.

12 Chart for recommended “cut-offs“

Ra (µm)	Rz (µm)	Measurement distance
＞5～10	＞20～40	2.5
＞2.5～5	＞10～20	
＞1.25～2.5	＞6.3～10	0.8
＞0.63～1.25	＞3.2～6.3	
＞0.32～0.63	＞1.6～3.2	
＞0.25～0.32	＞1.25～1.6	0.25
＞0.20～0.25	＞1.0～1.25	
＞0.16～0.20	＞0.8～1.0	
＞0.125～0.16	＞0.63～0.8	
＞0.1～0.125	＞0.5～0.63	
＞0.08～0.1	＞0.4～0.5	
＞0.063～0.08	＞0.32～0.4	
＞0.05～0.063	＞0.25～0.32	
＞0.04～0.05	＞0.2～0.25	
＞0.032～0.04	＞0.16～0.2	
＞0.025～0.032	＞0.125～0.16	
＞0.02～0.02	＞0.1～0.125	

13 Contact

If you have any questions, suggestions or technical problems, please do not hesitate to contact us. You will find the relevant contact information at the end of this user manual.

14 Disposal

For the disposal of batteries in the EU, the 2006/66/EC directive of the European Parliament applies. Due to the contained pollutants, batteries must not be disposed of as household waste. They must be given to collection points designed for that purpose.

In order to comply with the EU directive 2012/19/EU we take our devices back. We either re-use them or give them to a recycling company which disposes of the devices in line with law.

For countries outside the EU, batteries and devices should be disposed of in accordance with your local waste regulations.

If you have any questions, please contact PCE Instruments.

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