www.insize.com

ISR-C002
ROUGHNESS TESTER
OPERATION MANUAL

PLEASE SCAN QR CODE TO WATCH THE OPERATION VIDEO OF PRODUCTS.

VIDEO

Introduction

The surfaces roughness tester is suitable for shop floor use and mobile measure to need of a small handheld instrument, it operation simple, function overall, measure fast, accuracy stability, take convenience. This tester applies to production site and can be used to measure surface roughness of various machinery-processed parts. This tester is capable of evaluating surface textures with a variety of parameters according to various national standards and international standard. The measurement results are displayed digital/graphically on the OLED, and output to the printer.

Features:

- Electromechanical integration design, small size, light weight, easy to operation;
- DSP chip control and data processing, high speed, low power consumption;
- Support Bluetooth printing and mobile APP wireless operation.
- Large measurement range; 21 parameters: Ra, Rz, Rq, Rv, Rp, RS, R3z, R3y, Rt, Rz(JIS), Rk, Rku, Rsm, Rpc, Rpk, Rvk, Rsk, Mr1, Mr2, Ry (JIS), Rmax
- 128 × 64 OLED dot matrix display, digital or graphic highlight display; no viewing angle;
- Display full information, intuitive and graphical displays all parameters;
- Compatible with ISO, DIN, ANSI, JIS multiple national standards;
- Built-in lithium-ion rechargeable battery and control circuit, high capacity, no memory effect;
- There are remaining charge indicator, charging hint;
- Tester has charging instructions, the operator can readily understand the level of charge
- Can work more than 20 hours while the power is enough;
- Large capacity data storage, can store 100 item of raw data and waveforms;
- Real-time clock setting and display for easy data recording and storage;
- With automatic sleep, automatic shutdown power-saving features;
- Reliable circuit and software design of prevent the motor stuck;

- Instrument can display a variety of information tips and instructions. For example measurement result display, the menu prompts and error messages;
- Metal case design, rugged, compact, portable, high reliability;
- Can connected to the computer and printer;
- All parameters can be printed or print any of the parameters which set by the user;
- Optional curved surface pickup probe, holes probes,measurement stand, Sheath of probe, extension rod, printer and analysis software.

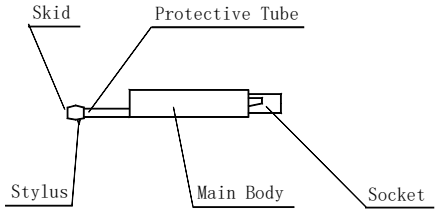
❶ Measurement principle

When measuring roughness of part surface, the pickup is placed on the surface of the part and then tracing the surface at constant rate. The pickup acquires the surface roughness by the sharp stylus in pickup. The roughness causes displacement of pickup which results in change of inductive value of induction coils thus generate analogue signal which is in proportion to surface roughness at output end of phase-sensitive rectifier. This signal enters conversion. After that, those collected data are processed data collection system after amplification and level with digital filtering and parameter calculation by DSP chip and the measuring result can be read on OLED, printed through printer and communicated with PC.

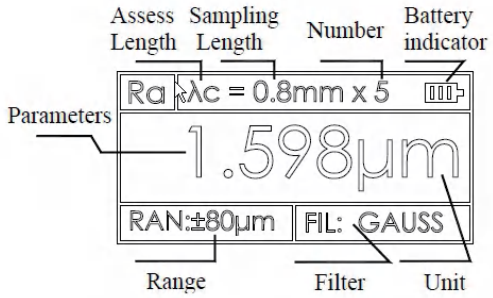
❷ Standard Delivery

Item	Quantity
Main unit	1pc
Standard probe	1pc
Calibration block and support	1pc of each
Adjustable stand	1pc
Probe cover	1pc
Software and USB cable	1pc
AC/DC adapter	1pc

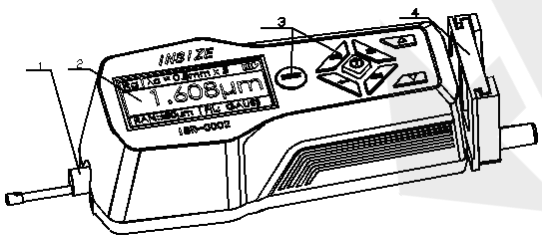
❸ Name of each part



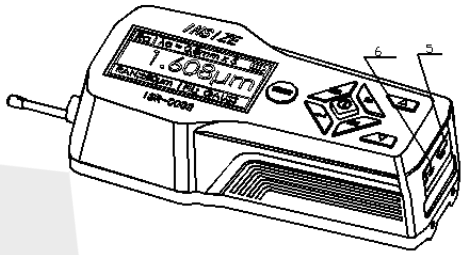
probe



display interface



1.probe 2.display 3.key area 4.adjustable support



5.USB charge 6.power switch

❹ Buttons define

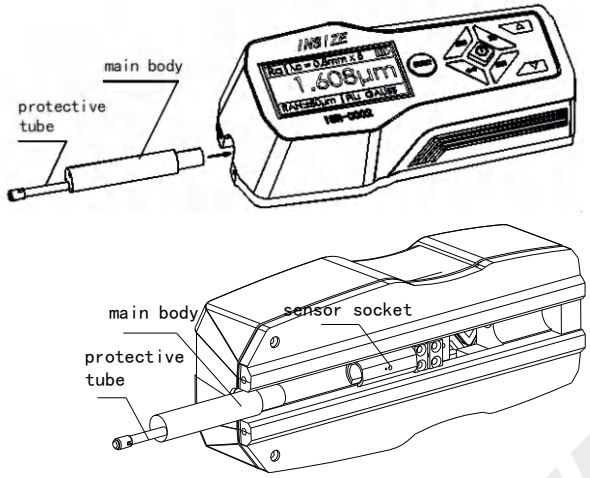
- Power key: Press and hold 2 seconds On/Off tester
- Stylus position keys: For switching between stylus position display
- START Start measurement key: Start the instrument to measuring mode
- Parameter selection Key: Used to view various parameters
- △ Up Arrow key& Record storage key: For storing record
- ▽ Down arrow keys & print key: Select the item for switching results
- Menu / Enter key: To enter the menu settings
- ESC Cancel / Exit key: Used to exit the menu and unset

❺ Battery Charging

When measuring roughness of part surface, the pickup is placed on the surface of When battery voltage is too low (that is, battery voltage symbol display on screen to prompt low voltage), the instrument should be charged as soon as possible. USB port of the instrument for charging. You can use the built-in power adapter for charging, you can also use computer's USB port for charging. If use the other power adapter for charging, the output voltage should be 5V DC, the current should be greater than 800mA.

Instrument displays charging animation when charging after full animation ends, the display is full of symbols. Charging time of 2.5 hours.
This instrument adopts lithium ion chargeable battery without memory effect and charging can be fulfilled at any time without affecting normal operation of the instrument.

❻ Connection method of probe and main unit



Installation and Removing of probe

For installation, hold the main body of probe with hand, push it into connection adapter at the bottom of the instrument as shown in figure and then slightly pushed it to the end of the sheath. To remove, hold the main body of pickup or the root of protective sheath with hand and slowly pull it out.

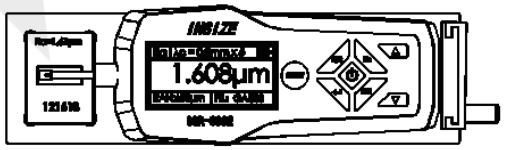
Note:

- Stylus of pickup is key part of this tester and great attention. should be paid to it.
- During installation and unloading, the stylus should not be touched in order to avoid damage and affecting measurement.
- Connection of probe should be reliable during installation.

Measuring Operation

❶ Preparation for Measurement

Switch-on to check if battery voltage is normal;
Clear the surface of part to be measured;
Place the instrument correctly, stably and reliably on the surface to be measured;
Trace of the pickup must be vertical to the direction of process line of the measured surface.

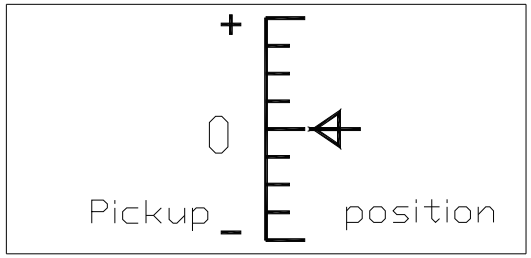


❷ Turning On/Off

Press the key ⏻ to hold 2 seconds after the instrument will automatically boot, boot will display equipment type, name and manufacturer information, and then enter the basic measurement status main display interface.

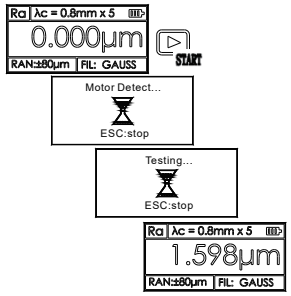
❸ Stylus Position

First, use the stylus position to determine the location of the probe. The stylus as measured in the middle position. In the main interface mode, press the stylus position key Probe switches stylus position display screen and the main display screen.



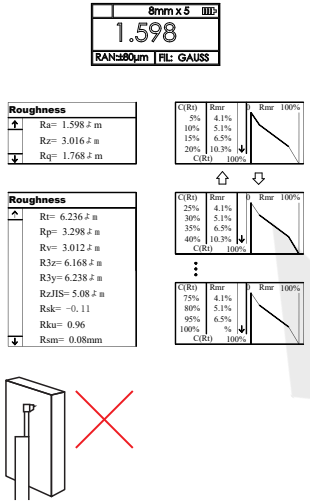
❹ Start measurement

In the main interface mode, press the Start button to start measuring.



❺ Measurement result display

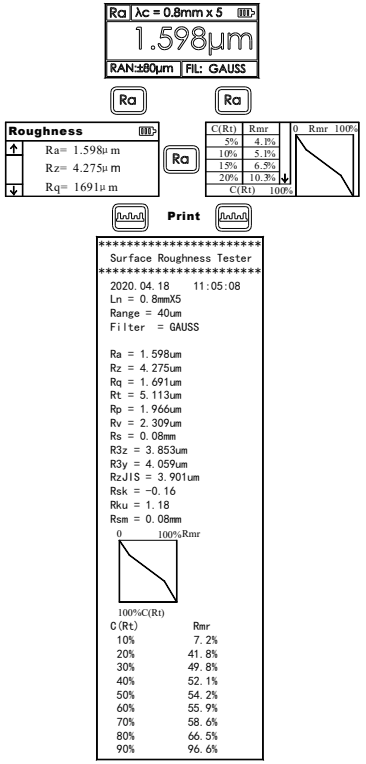
After the measurement, can be observed in Figure shows the results of all measurements.



⚠ Attention: Don't use the roughness tester in the vertical direction

❻ Print measurement results

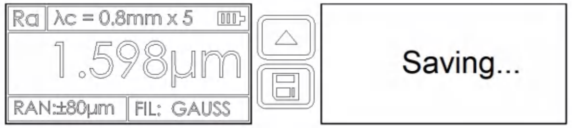
The instrument can be equipped with a printer, wired or Bluetooth connection, long press the Ra key until you enter the BPS setting interface, use the up and downkeys to switch the BPS to 115.2K. When you need to perform bluetooth printing, please set to print mode and turn on the bluetooth switch, the instrument will automatically connect to the printer. After the measurement is completed, if you need to print the measurement results, press the Ra key to enter the measurement result display and then press the key to print the data to the designated serial printer. This instrument can select and print any parameters or print all parameters according to the actual test requirements of the user. For how to set the parameter selection, please refer to "Print Settings".



❼ **Storage measurement results**

In the main display interface mode, press the [key]+[save] key to save the measurement results stored in the instrument memory. Instrument built-in large capacity memory, can store 100 groups of raw data and waveform data.

Data storage recording date and time the file name automatically generated according to the last data record is always stored the most recent recording time, the last data record stored recording record number will be 001.



❽ **Measuring parameter Settings**

In the basic measurement mode, press the [enter] key to enter the menu operation state, press the [up] [down] keys to select "Preferences" function, then press the [enter] key to enter the parameter setting mode. In the parameter setting mode, you can modify all the measurement conditions.

Menu
▷ 1.Parameter
2.Recoder
3.Date

Parameter		Content
▷ λc	0.8mm	0. 25mm; 0. 8mm; 2.5mm
N× λc	5	1-5
RANGE	±40 μm	±20; ±40; ±80 μm
FILTER	GAUSS	RC; PC-RC; GAUSS; D-P
DISPLAY	Ra	Ra Rz Rt Rq
UNIT	μm	μm μin
LANGUAGE	ENG	ENG CHS

◆ **Bluetooth Mode**

There are 2 mode to operate Bluetooth module, print mode and ctrl (data transmission) mode. Set it to print when Bluetooth printing is needed and to ctrl when communicating with mobile APP. Bluetooth switch can only be operated when Bluetooth power is off.

◆ **Bluetooth Power**

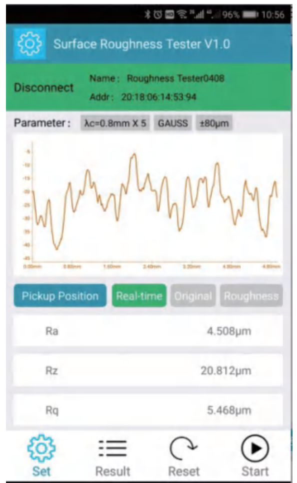
Please set the Bluetooth mode first, then turn ON the Bluetooth power, the instrument will automatically set the Bluetooth module as required.

Because of the unnecessary battery capacity loss caused by the long-term opening of the Bluetooth function, the instrument will turn off the Bluetooth power after each boot. If you need to use Bluetooth function, please open it yourself.

◆ **Mobile APP**

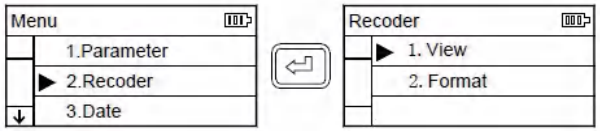
This instrument supports the wireless Bluetooth function, such as in the high altitude or pipeline operation is inconvenient to directly operate the instrument keys, Bluetooth remote operation function can be used. This mobile phone APP currently supports Android version 6 or more.

Use mobile phone APP to control the instrument, please set the Bluetooth mode to Ctrl, and turn ON the Bluetooth power and BPS 115.2k.



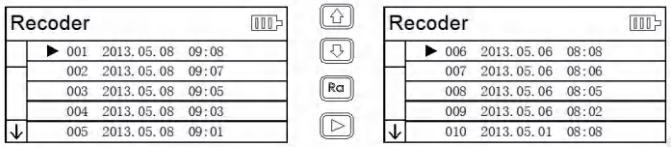
9 Storage Management

In the basic measurement mode, press the [↵] key to enter the menu operation state, Press the [△] [▽] keys to select "Recoder" function, Press the [↵] key to enter management projects.



Recoder management by the two project components, 1 view 2 format. Selected item and press the Enter key to enter.

◆ View Record



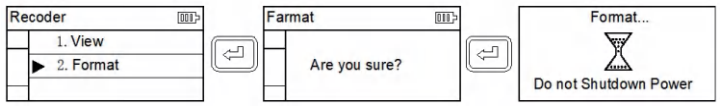
Item Up　　Page Up

Item Down　　Page Down

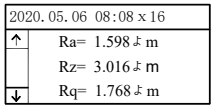
Select the appropriate records, press [↵] view log content.In view records content, [⎙] key can be printed according to the specified printer, operate the right figure.

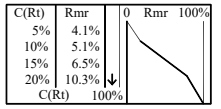
◆ Format

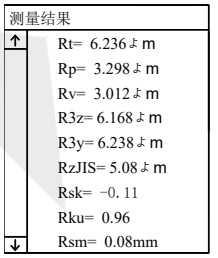
Data format is the deletion of data records, once formatted and all data will be cleared. In the data before formatting instrument has confirmation prompt information, user data will not be restored after confirmation.

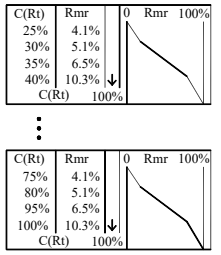


"





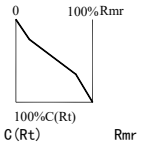




Print

Surface Roughness Tester
****
2020.04.18 11:05:08
Ln = 0.8mmX5
Range = 40um
Filter = GAUSS

Ra = 1.598um
Rz = 4.275um
Rq = 1.691um
Rt = 5.113um
Rp = 1.966um
Rv = 2.309um
Rs = 0.08mm
R3z = 3.853um
R3y = 4.059um
RzJIS = 3.901um
Rsk = -0.16
Rku = 1.18
Rsm = 0.08mm

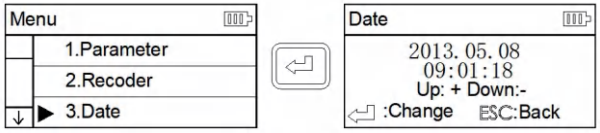


C(Rt)	Rmr
10%	7.2%
20%	41.8%
30%	49.8%
40%	52.1%
50%	54.2%
60%	55.9%
70%	58.6%
80%	66.5%
90%	96.6%

View Record

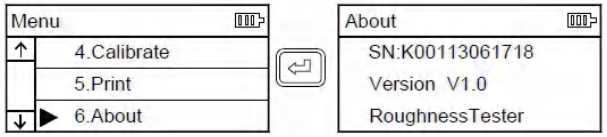
⑩ Date Settings

Built-in real time clock calendar instrument used to record information about the test of time to adjust date and time as follows.



⑪ Software Information

Instruments software and hardware information can help users easily upgrade and maintain the product, unique serial number of the instrument software information items are displayed.

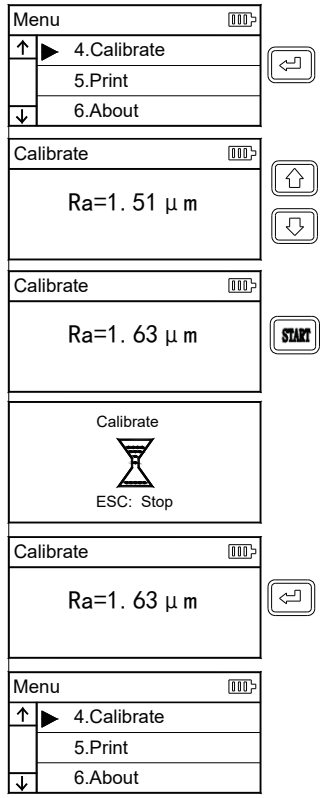


⑫ Parameter calibration

Before measuring instrument, usually required calibration use standard calibration. Block. The instrument is configured with a standard calibration block, before measurement, instruments to test the block. Under normal circumstances, when the measured value and the block value of the difference in the acceptable range, the measurement value is valid, can be measured directly.

If the measured value and the block value of the difference is greater than a accuracy error range of the instrument, or the user require high accuracy, can be used to correct the indication calibration function and improve measurement accuracy. Showing the value of the calibration procedure as shown.

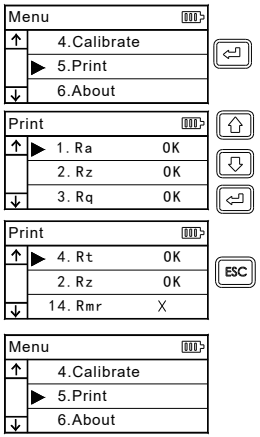
Illustration is based on a model calibrated 1.63μm steps to calibrate the model for the actual calibration of the nominal value of the set value.



- 1. Under normal circumstances, the instrument in the factory have been rigorously tested, showing error is much less than ± 10%, in this case, the user is not showing the value of the calibration frequently used functions.
- 2. After setting the calibration value, you must press the ▷ key for a full measurement, instrument calibration to be valid.
- 3. New parameters after calibration must be carried out once a complete measurement and press the ▷ key is stored in the instrument.
- 4. Press "ESC" key to return the menu without saving calibration results

⓭ Print setup

The instrument can be tested according to the actual requirements of any parameter selection Print or Print All, the steps shown in Figure.



⓮ Rpc setting

According to user's demand, Rpc-parameter's calculation can be selected from "μm" and "%". Enter menu "Parameter Set", select item in "Rpc BW sel", input relevant value in "Rpc BW Set".

⓯ Dataview of software

Dataview of software can easily be waveform analysis and print measurement results uploaded to the PC machine.Use USB cable to connect computer data processing software to set the tester baud rate 921.6 k.

⓰ Data output to Excel

It can be connected to a computer via bluetooth (need to buy a bluetooth receiver) to output the readings to Excel or Word, etc.

1. The roughness meter is set to print mode, the baud rate is set to 115.2K, bluetooth is turned on, and connect the bluetooth receiver to the computer.
2. When the bluetooth receiver shows that the green light flashes twice at an interval, it means the pairing is successful. Open Excel and press down key to transfer data to Excel.Or connect to a computer via a wired method (data transmission cable is required) to output the readings to Excel or Word, etc.

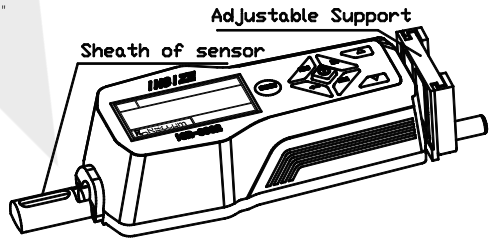
1. The roughness meter is set to print mode, and the baud rate is set to 115.2K.
2. Open Excel directly and press the down key to transfer the data to Excel.

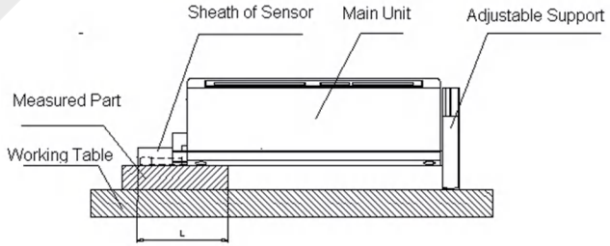
Note: please note that the parameters of "result" is selected in "print details set", otherwise there will be no data output to Excel

Options and Usage

❶ Adjustable support

When measured surface of part is smaller than the bottom surface of the instrument, sheath of pickup and adjustable supporter of instrument options can be used for auxiliary support to complete the measurement (as shown in Figure).

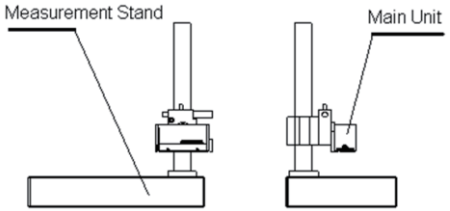




1. The value L above shall not be shorter than driving stroke of this measurement to prevent pickup from dropping out of part during measurement.
2. Locking of adjustable supporter shall be reliable.

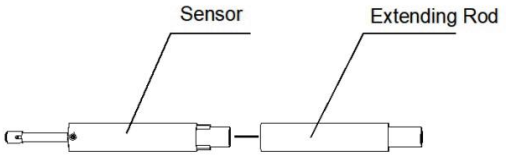
❷ Measurement Stand

Measurement Stand can adjust the positions between tester and measured part conveniently with flexible and stable operation and wider application range. Roughness of complex shapes can also be measured. Measurement stand enable the adjustment of the position of stylus to be more precise and measurement to be more stable. If Ra value of measured surface is relatively low, Using measurement platform is recommended.



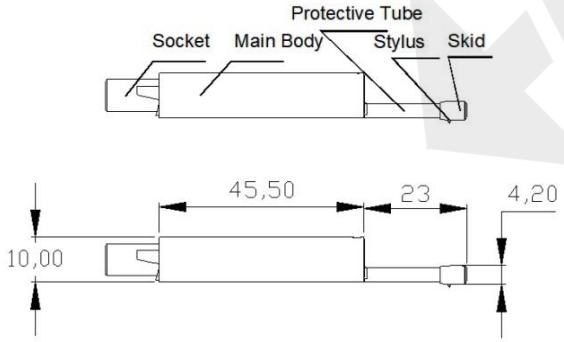
❸ Extending Rod

Extending rod increases the depth for pickup to enter the part. Length of extending rod is 50mm.



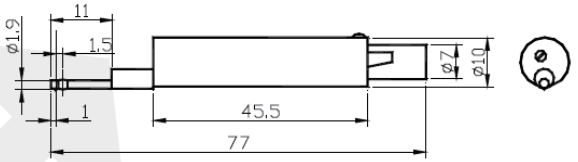
❹ Standard probe

Most of the standard probe, it can measure most of the plane, inclined plane, cone surface, inner hole, groove and other surface roughness, can be hand-held measurement, in addition to the standard probe, other special probes are needed to measure the measuring platform.



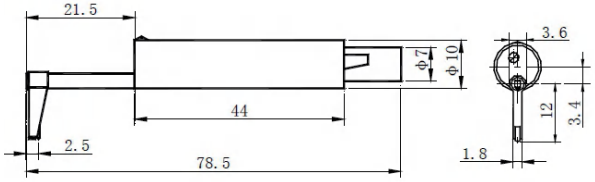
❺ Small hole probe

Using Small hole probe pickup, the inner surfaces of holes with radius more than 2mm can be measured. Refer to the following Figure for detailed dimension.



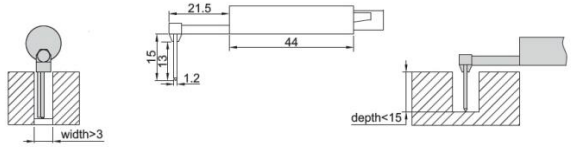
❻ Deep Groove probe

With deep groove probe, it is possible to measure groove with width wider than 3mm and depth deeper than 10mm, or the surface roughness of step with height less than 10mm, Also can used to measure the planar, cylindrical used with platform. please see figure for detailed dimension.



❼ Deep Groove probe

With deep groove probe, it is possible to measure groove with width wider than 3mm and depth deeper than 15mm, or the surface roughness of step with height less than 15mm, please see figure for detailed dimension.



❽ Miniature thermal printer

The printer is a Bluetooth interface, and the BT indicator lights up when the roughness instrument is connected successfully.

Technical Parameter and Features

❶ Technical Parameter

Name		Content	
Measurement Range	TheZaxis (vertical)	320μm	
	TheZaxis (horizontal)	17.5mm/0.69"	
Resolution ratio	TheZaxis (vertical)	0.002μm/±20μm	0.004μm/±40μm
		0.008μm/±80μm	0.020μm/±160μm
Measurement item	Parameter	Ra Rz Rq Rt Rmax Rp Rv R3z R3y Rz(JIS) RS Rsk Rku Rsm Ry(JIS) RPc Rk Rpk Rvk Mr1 Mr2	
	Standard	ISO4287 ANSI B46.1 DIN4768 JIS B601	
	Graphic	Material ratio curve of the profile	
Filter		RC,PC-RC,Gauss,D-P	
The sampling length(lr)		0.25,0.8,2.5mm	
Assessment lengthLn		Ln= lr×n n=1~5	
Sensor	Principle	The displacement differential inductance	
	Stylus	Natural Diamond, 90 cone angle, 5μm tip radius	
	Force	<4mN	
	Skid	RubyLongitudinal radius 40mm	
	Traversing speed	lr=0.25, Vt=0 .135mm/s	
		lr=0.8, Vt=0 . 5mm/s	
		lr=2.5 , Vt= 1mm/s	
		Return Vt= 1mm/s	
Accuracy		±(5nm+0.1A) A: Ra of calibration test block	
Repeatability		No more than 6%	
Residual profile		No more than 0.010μm	
Power supply		Builtin 3.7VLithium ionbatteryCharger:DC5V,800mA/3hour	
Working Time		More than 20 hours	
Outline dimension L×W×H		146×61×42 mm	
Weight		About 400g	
Working Environment		Temperature- 20 ~ 40 Humidity< 90% RH	
Store and Transportation		Temperature- 40~60 Humidity< 90% RH	

❷ Measuring Range

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

General Maintenance

❶ Probe

- 1. Any time swap probes are to be especially careful, careful not to touch the guide head and a stylus, because this is a key part of the whole instrument, to try to hold the probe guide head bracket roots (the front of the body) plug.
- 2. To complete the measurement work, please timely probe into the box;
- 3. Please pay attention to protect the needle part measuring probe.
- 4. The probe's precision components, any knock, touch, fall off phenomenon may damage the probe, should try to avoid such situations.
- 5. The probe is a damageable parts, do not belong to the scope of warranty parts, only provide repair. In order not to affect the measurement work, users are advised to buy backup probe used for emergency.

❷ Main Unit

- ◆ Pay attention to maintaining the Main Unit surface clean, often with a soft dry cloth to clean its surface.
- ◆ The instrument is a precision measuring instrument, should always be handled with care, to avoid the shock.
- ◆ Pay attention to add oil to maintain regularly every year to prevent internal wear.

❸ Battery

- ◆ Always observe the battery prompt, when the low voltage, please charge.
- ◆ The charging time is 3 hours, try not to long time charge.

❹ Standard Sample Plate

- ◆ The surface of a standard sample plate must be kept clean.
- ◆ To avoid scratches on the surface of sample area.

❺ Troubleshooting

When the tester breaks down, handle the troubles according to measures described on Fault Information. If troubles still exist, please return the instrument to factory for repair. Users should not dismantle and repair the device by themselves. Returned instrument should be accompanied with sample plate attached. Phenomenon of problem should be explained.

Error message	Cause	Solutions method
Motor error	Motor stuck	Reboot
Out of Range	1. The measured surface signal exceeding the measurement range 2. Placed away from the center of the stylusposition	Increase Measuring range Adjust the Stylus position
No test data	After the boot does not measure.	The actual measurement: one time
Measurement Accuracy Out of Range	Set the parameter error Calibration data error	Set the parameter measurement Calibrate the tester

References

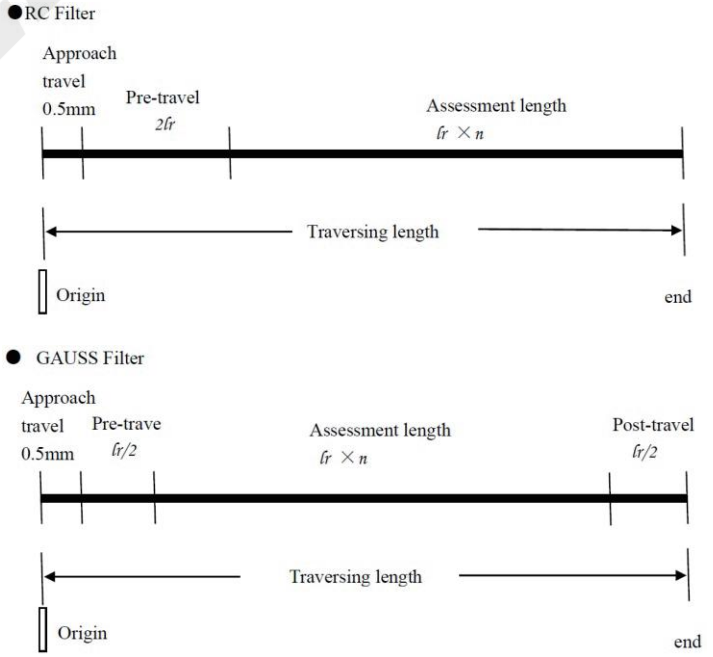
❶ Terms

The instrument calculate parameters on the filter profile and the direct profile , all calculated in line with the GB/T 3505-2000 "Geometrical Product Specification(GPS) —— Surface texture: Profile method——Term,definitions and surface texture parameters."

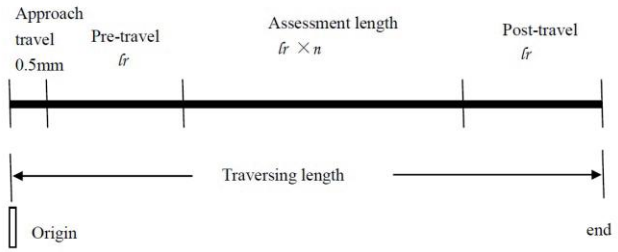
◆ Terms

Filtered profile: profile signal after primary profile is filtered to remove waviness.D-P (direct-profile): adopt central line of Least Square Algorithm.RC filter: analogue 2RC filter with phase difference.PC-RC filter: RC filter with phase-correction.Gauss filter: ISO11562.

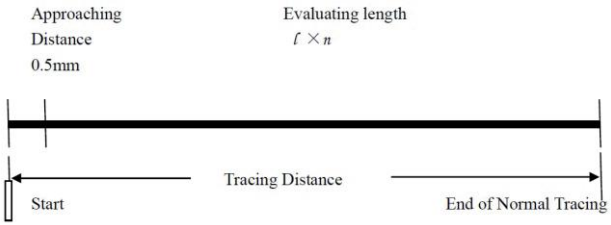
◆ Traversing Length



● PCRC Filter



● D-P direct profile

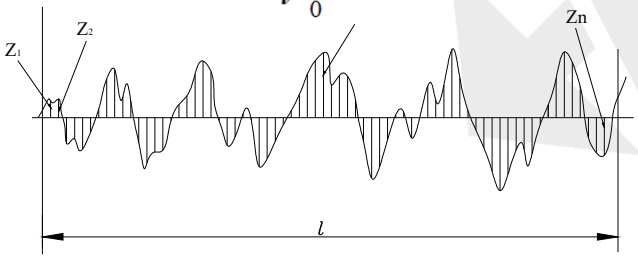


❷ **Parameters Definitions**

◆ Arithmetical Mean Deviation of Profile Ra

Ra is arithmetic mean of the absolute values of profile deviation Z(x) from mean within sampling length.

$$Ra = \frac{1}{l}\int_0^l |Z(x)|dx$$



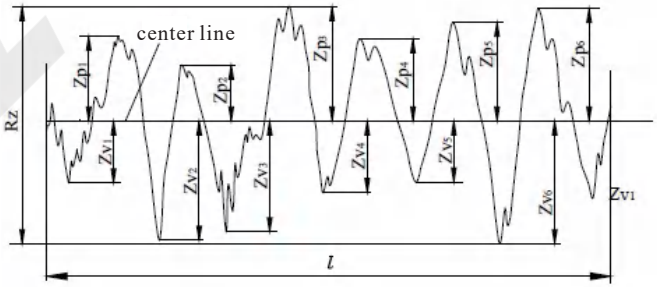
◆ Root-mean-square Deviation of Profile Rq

Rq is the square root of the arithmetic mean of the squares of profile deviation Z(x) from mean within sampling length.

$$Rq = \sqrt{\frac{1}{l}\int_0^l Z^2(x)dx}$$

◆ Maximum Height of Profile Rz

Rz is The sum of height Zp of the highest profile peak from the mean line and depth Zv of the deepest profile valley from the mean line within sampling length.



◆ Total Peak-to-valley Height Rt

Rt is the sum of the height of the highest peak Zp and the depth of the deepest valley Zv over the evaluation length.

❸ **Recommended table of the sampling length**

Ra (μm)	Rz (μm)	Sample length λ c(mm)
>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	
>0.02~0.025	>0.1~0.125	

Standard Delivery

Main unit	1 pc
Standard probe	1 pc
Calibration block and support	1 pc of each
Adjustable stand	1 pc
Probe cover	1 pc
Software and USB cable	1 pc
AC/DC adapter	1 pc

Optional Accessory

Extension rod	**ISR-C002-ER**
Transverse rod	**ISR-C002-TR**
Tiny hole probe	**ISR-C002-SBP**
Deep groove probe	**ISR-C002-DGP**
Deep groove probe	**ISR-C002-DGP1**
Light duty test stand	**ISR-C002-STAND1**
Heavy duty test stand	**ISR-C002-STAND**
Bluetooth printer	**ISR-C002-PRINTER**
Reveiver	**ISR-C300-RECEIVER**
SPC cable	**ISR-C300-SPC**