iSurfa-360 Surface Roughness Tester

Instruction Manual

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1.Roughness Tester Overview

The surface roughness measuring instrument is a hand-held instrument suitable for the production site environment and mobile measurement needs. It can measure the surface roughness of various machined parts. It can calculate the corresponding parameters according to the selected measurement conditions and display them on the display. All measured parameters and profile graphics are displayed on the screen. The instrument is easy to operate, comprehensive in function, fast in measurement, stable in accuracy, easy to carry, and can measure the main parameters of the latest international standards. This instrument fully and strictly implements international standards. The measurement parameters conform to the national standard of GB/T 3505 "Technical Specifications for Product Geometry, Surface Structure, Profile Method, Terms, Definitions and Parameters of Surface Structure" and are compatible with the standards of the United States, Germany, Japan, the United Kingdom and other countries. It is suitable for testing in workshop verification stations, laboratories, measurement rooms and other environments.

1.1Features of Instrument

▲Electromechanical integration design, small size, light weight, easy to operation

▲DSP chip control and data processing, high speed, low power consumption

▲14 parameters: Ra、Rq、Rz、Rt、Rp、Rv、R3z、R3y、RzJIS、Rs、Rsk、Rku、Rsm、Rmr

▲160μm large measurement range

▲240*320 TFT color 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

1.Roughness Tester Overview

▲Can work more than 20 hours while the power is enough

▲Large capacity data storage, can store 100 item of raw data and waveform

▲Real-time clock setting and display for easy data recording and storage

▲With automatic sleep, automatic shutdown power-saving features

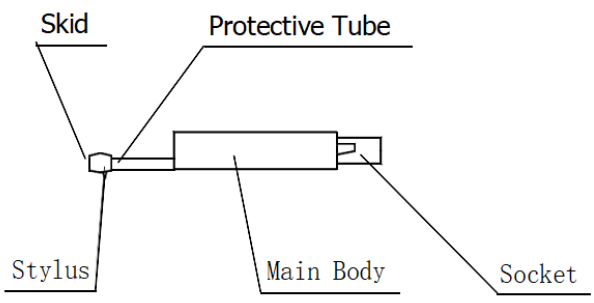
▲Reliable circuit and software design of prevent the motor stuck

▲Instrument can display a variety of information tips and instructions. For example Measurement result display, the menu prompts and error messages

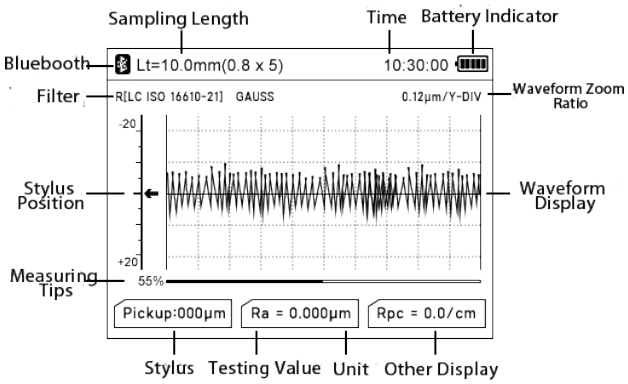
1.2Measurement Principle

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 data collection system after amplification and level conversion. After that, those collected data are processed 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.

1.3Name of Each part

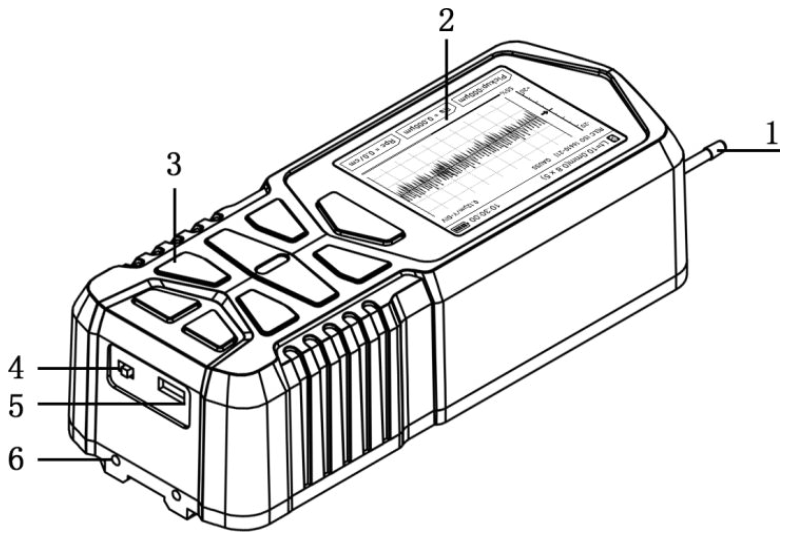


Sensor



Display Interface

1.Roughness Tester Overview



1.Sensor	4.Power Switch
2.Display	5.USB Charging port
3.Key Area	6.Installation Hole M3(Distance 20mm)

Power switch is a total power switch on the instrument. Turned off when not in use for a long time.

1.4Buttons Define

Power key: Press and hold 2 seconds On/Off tester

Stylus position keys: For switching between stylus position display

Parameter selection Key: Used to view various parameters

Up Arrow key: To select items for the switch

Down arrow keys: Select the item for switching

Menu / Enter key: To enter the menu settings

ESC Cancel / Exit key: Used to exit the menu and unset

Record storage key/ print key: For storing and print the record results

1.Roughness Tester Overview

1.5Battery Charging

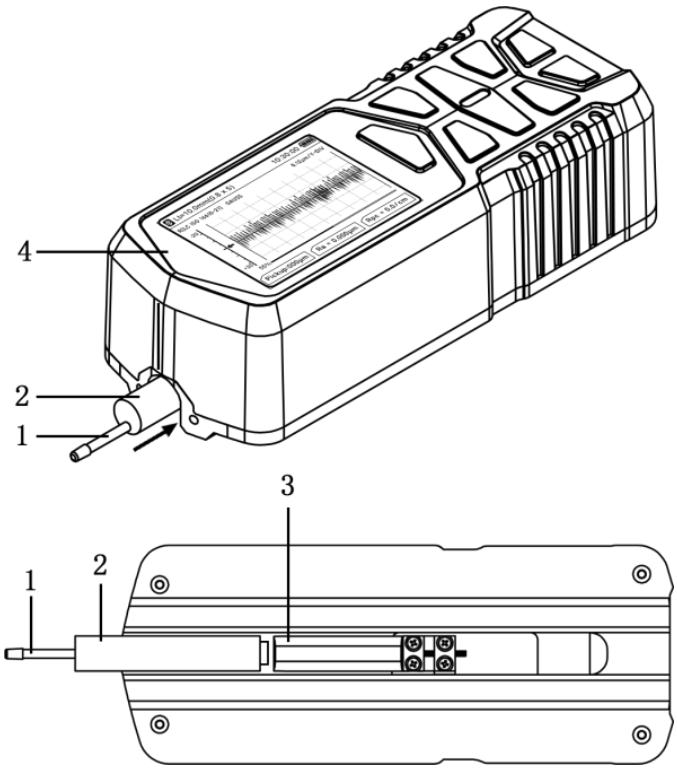
When battery voltage is too low (that is, battery voltage symbol display ▭ on screen to prompt low voltage), the instrument should be charged as soon as possible. USB port of the instrument for charging. You can use the built-in power adapter for charging, you can also use computer's USB port for charging. 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.

When charging, ensure that the instrument side of the power switch is in the ON position

1.6Connection Method of Sensor and Main Unit



1 Protective tube 2 Sensor body 3 Sensor socket 4 Main body

1.Roughness Tester Overview

Installation and Removing of sensor

For installation, hold the main body of sensor 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.

★ 1.Stylus of pickup is key part of this tester and great attention.should be paid to it.

2.During installation and unloading, the stylus should not be touched in order.

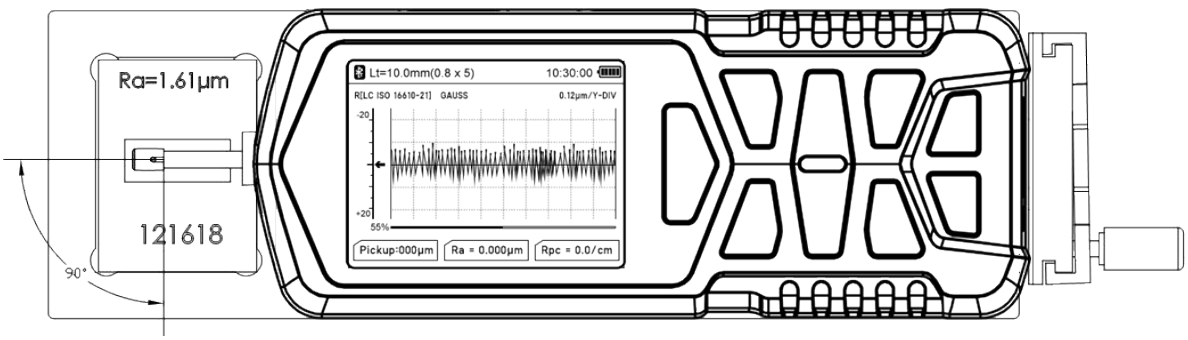
to avoid damage and affecting measurement.

3.Connection of sensor should be reliable during installation.

2.Measuring Operation

2.1Preparation 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.

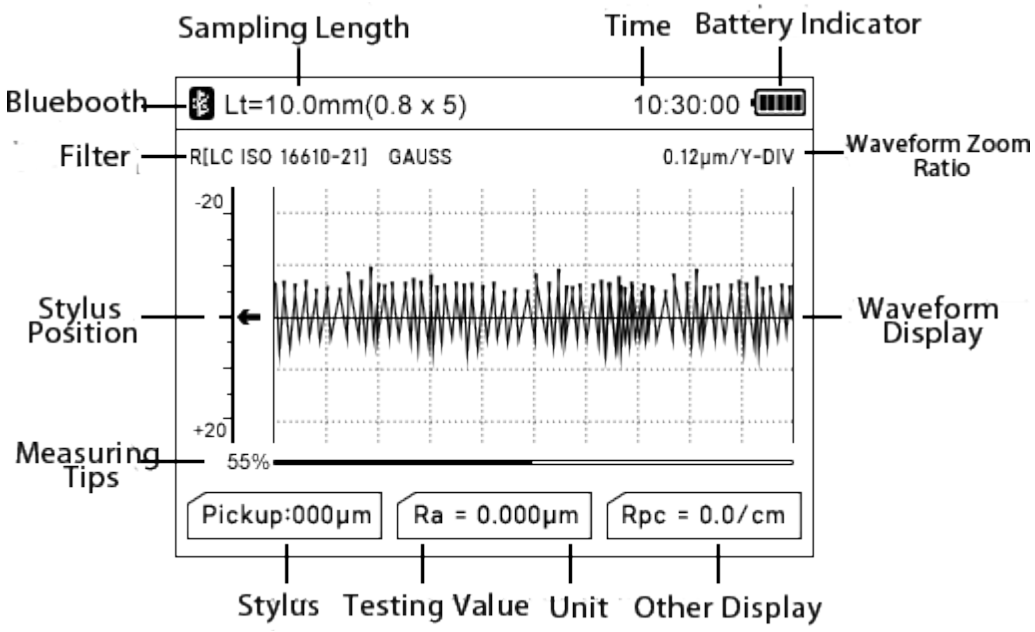


Correct and standard operation is the premise for accurate measurement result, please make sure to follow it.

2.Measuring Operation

2.2Turning 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, as shown.



Introductions:

1.The next boot will be displayed when the last shutdown set content

2.Startup and shutdown, press and hold the key for about 2 seconds to open the instrument will perform the appropriate action

3.Long time not to use, the instrument should be on the side of the power switch turned off

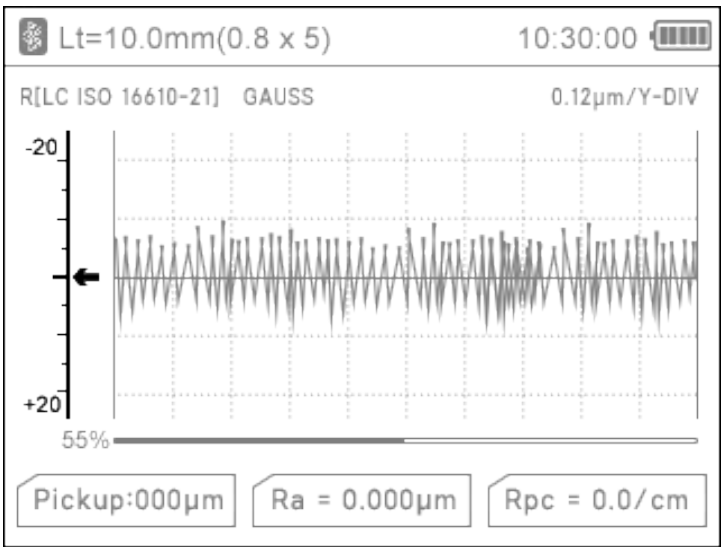
4.Start measuring sensor is installed, please refer to the stylus position, try to adjust the stylus cursor position to the best position "0"

2.3Stylus Position

First, use the stylus position to determine the location of the sensor. The stylus as measured in the middle position.

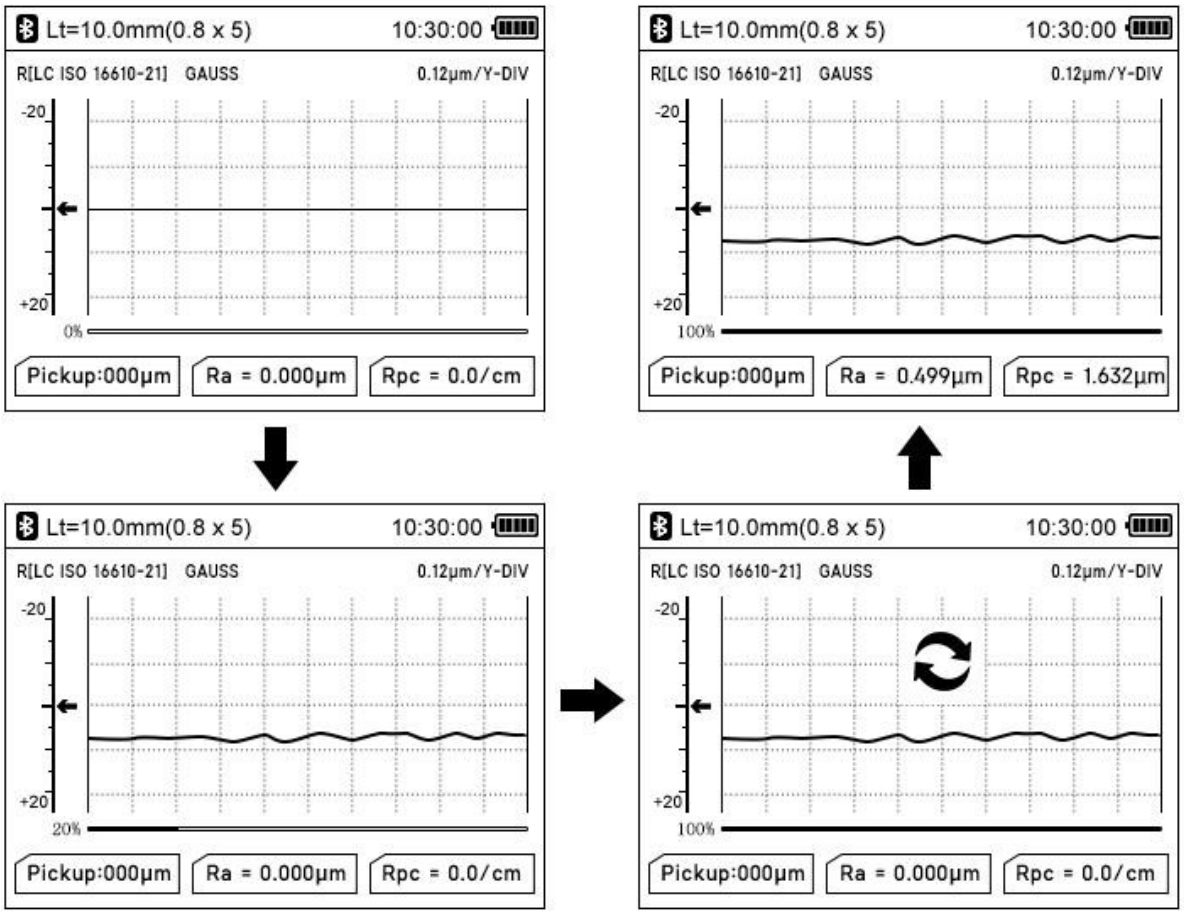
2.Measuring Operation

In the main interface mode, press the stylus position key switches stylus position display screen and the main display screen.



2.4Start Measurement

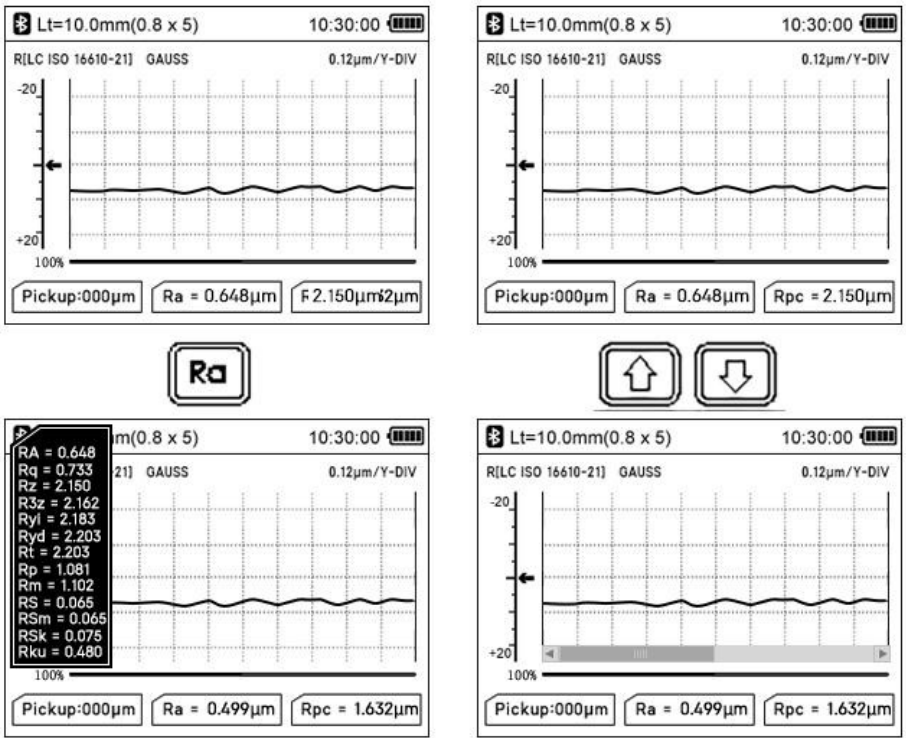
In the main interface mode, press the Start button to start measuring



2.Measuring Operation

2.5Measurement Result Display

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



2.6Print Measurement Results

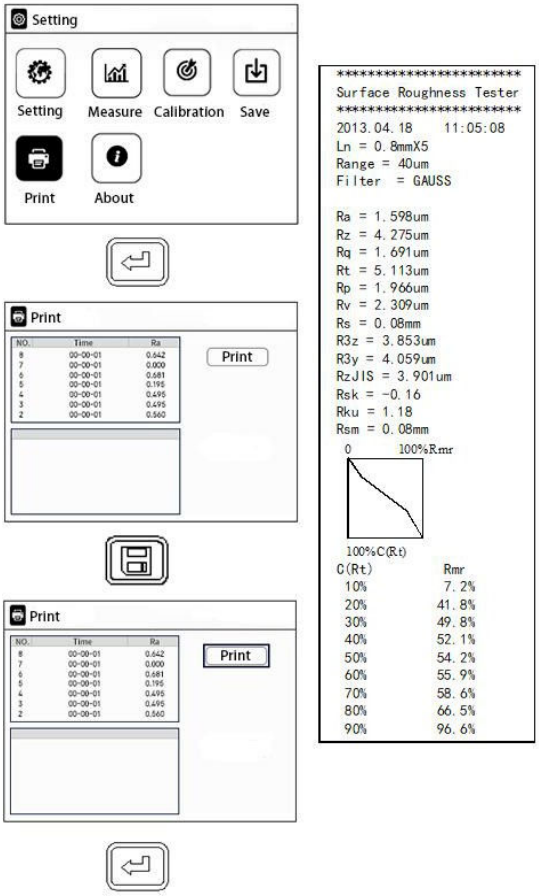
The instrument can be connected to the printer.

The measurement results will be printed.

After measurement, Press key to display the measurement results.

Press key to print the measured data to a serial printer. At this point,key is a print key to use.

The instrument can be tested according to the actual requirements of arbitrary parameters choose to print or print all the parameters, how to set the parameters, refer to "Print Settings."

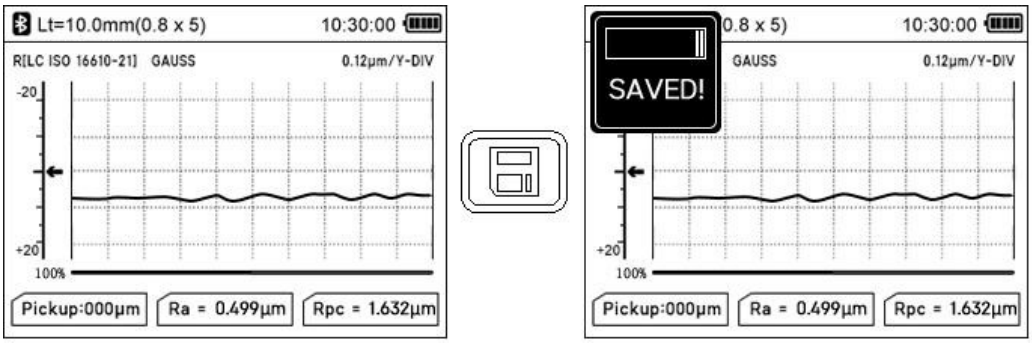


2.Measuring Operation

2.7Storage Measurement Results

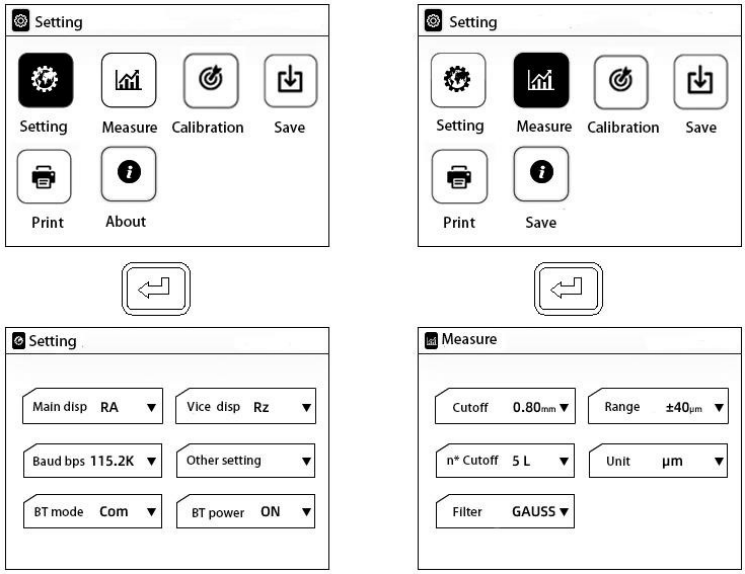
In the main display interface mode, press the key to save the measurement results stored in the instrument memory. Instrument built-in large capacity memory, can store 100 groups of raw data and waveform data.

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.



2.8Measuring Parameter Settings

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



2.Measuring Operation

The required parameters should be set before measurement, and the sampling length, evaluation length, range selection, and filter should be set according to the specific conditions of the workpiece.

Selection principle：

1.Refer to 6.3 Introduction for the recommended sampling length value table

2.The evaluation length first selects the standard recommended value, ln=5l, that is, the evaluation length includes 5 sampling lengths. When the size space of the surface to be measured of the workpiece is less than 7 sampling lengths (2 sampling lengths are used for calculation and filtering), less than 5 sampling lengths can be selected, but it should be noted that the fewer the number of sampling lengths selected, the The worse the repeatability of the indication

3.For range selection, it is recommended to start with the minimum range. When an over-range alarm occurs, increase the range.

4.There are 4 filtering methods in this instrument：

RC:traditional filter,Commonly seen on older analog instruments, now often implemented with digital filtering. The characteristic is that the shape of the contour after filtering is distorted, which has little effect on the Ra parameter value, but has different degrees of influence on other parameters.

PC-RC: The RC is phase corrected, and the shape of the contour is basically unchanged after filtering. Its amplitude transfer characteristics are the same as RC.

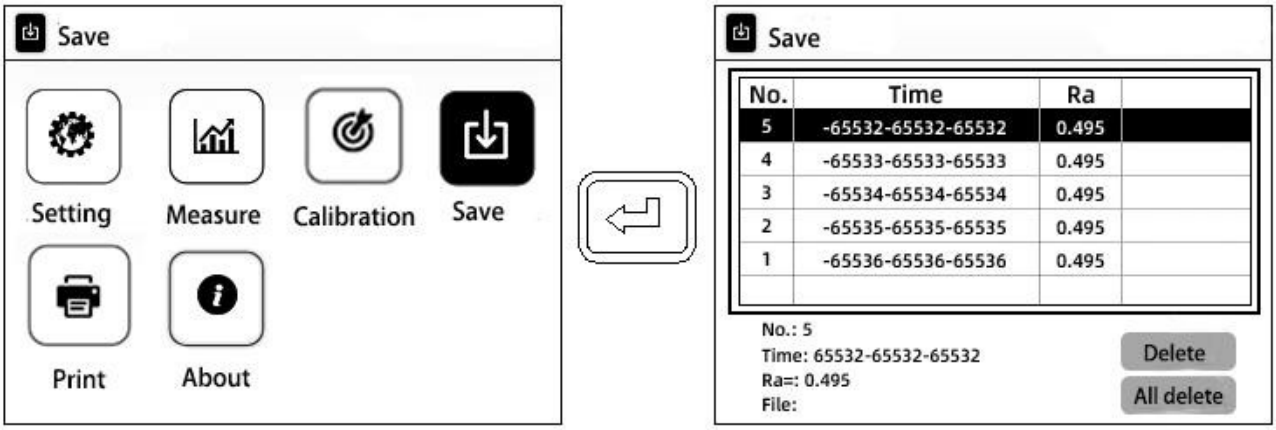
Gauss:new standard filter,Will replace RC. The characteristic is that the shape of the contour after filtering is basically unchanged.

D-P: Take least squares median line only for unfiltered contours.

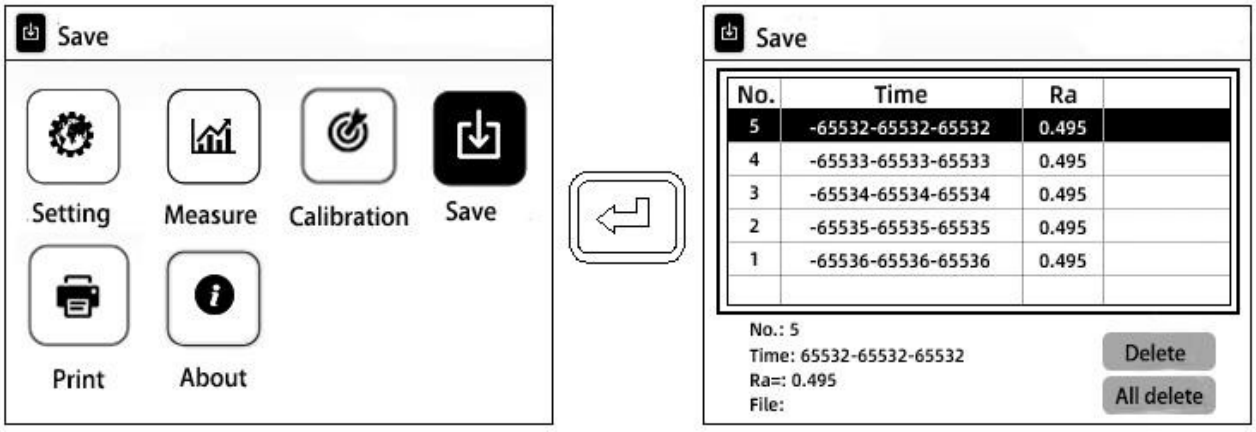
2.Measuring Operation

2.9Storage Management

In the basic measurement mode, press the key to enter the menu operation state, Press the keys to select "Save" function, Press the key to enter management projects.



2.9.1View Record



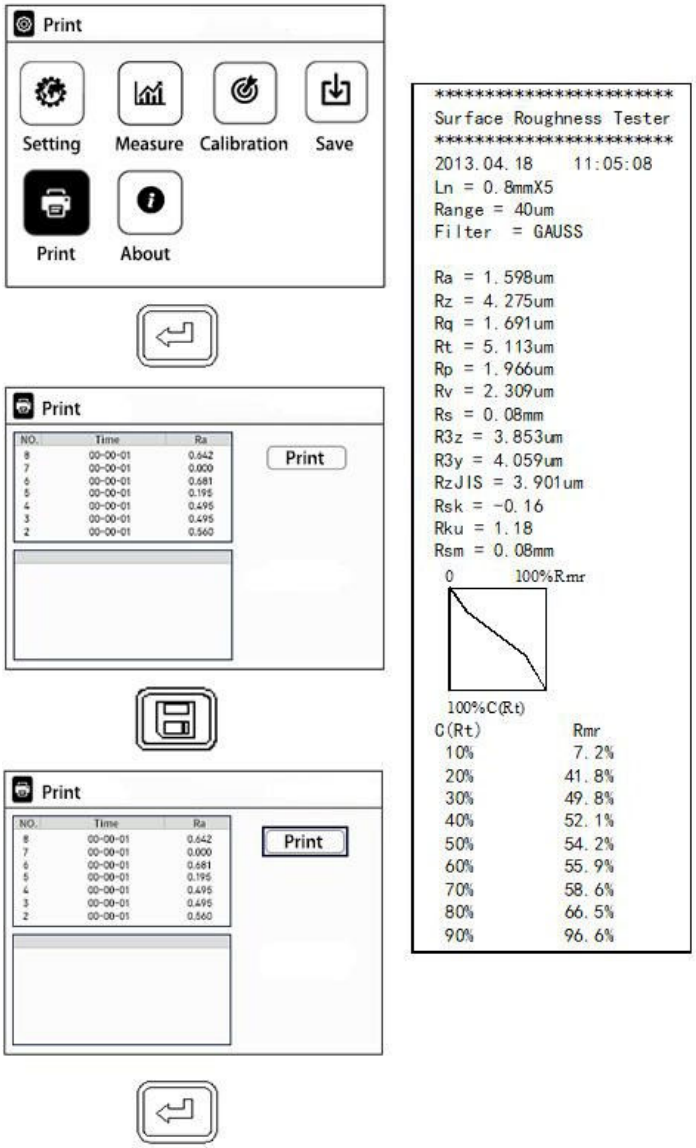
Item Up Page Down

Item Down

elect the appropriate records, press View log content

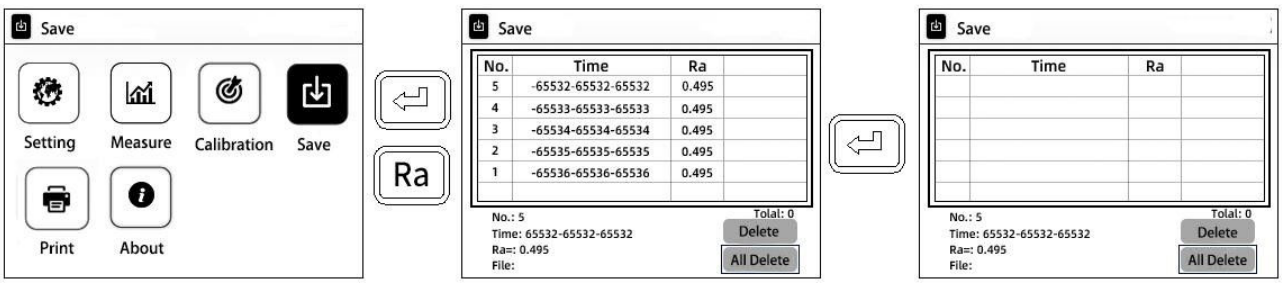
In view records content, data can be printed according to the specified printer, operate the following figure.

2.Measuring Operation



2.9.2 Format

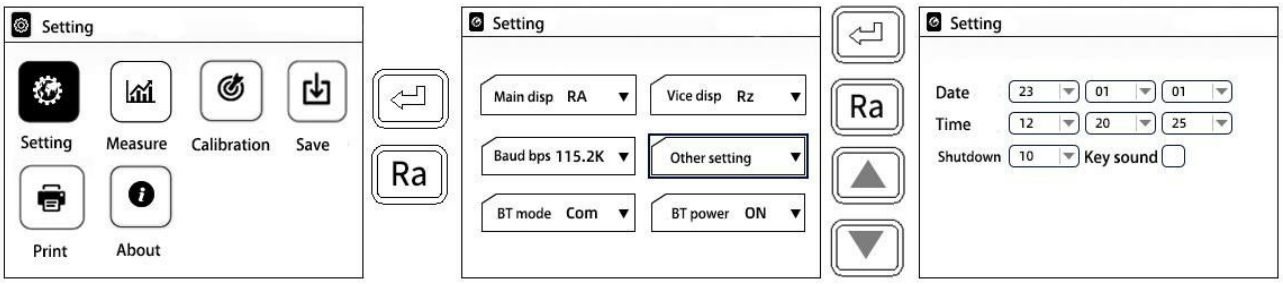
Data format is the deletion of data records, once formatted and all data will be cleared. In the data before formatting instrument has confirmation prompt information, user data will not be restored after confirmation.



2.Measuring Operation

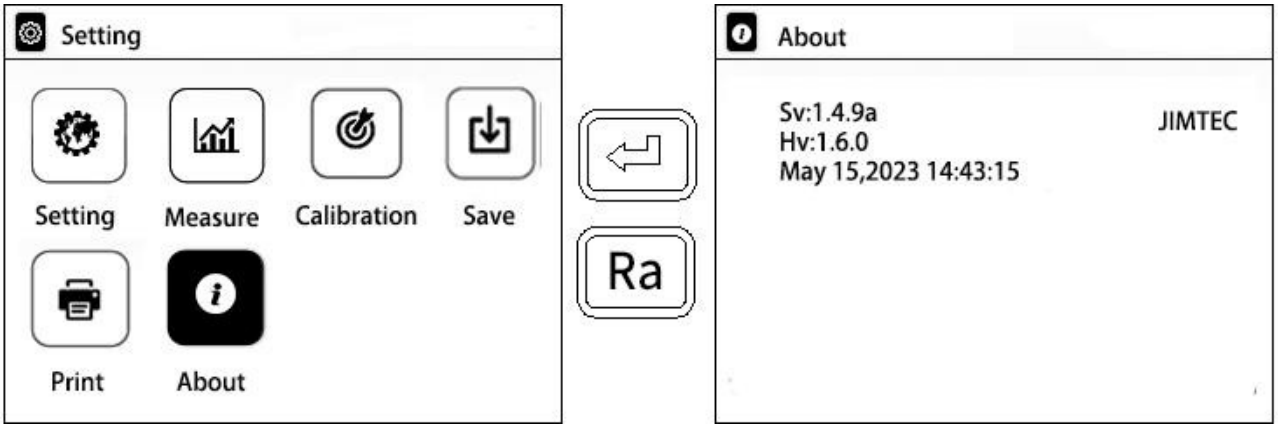
2.10Date Settings

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



2.11Software 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.



2.12Parameter 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

2.Measuring Operation

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.

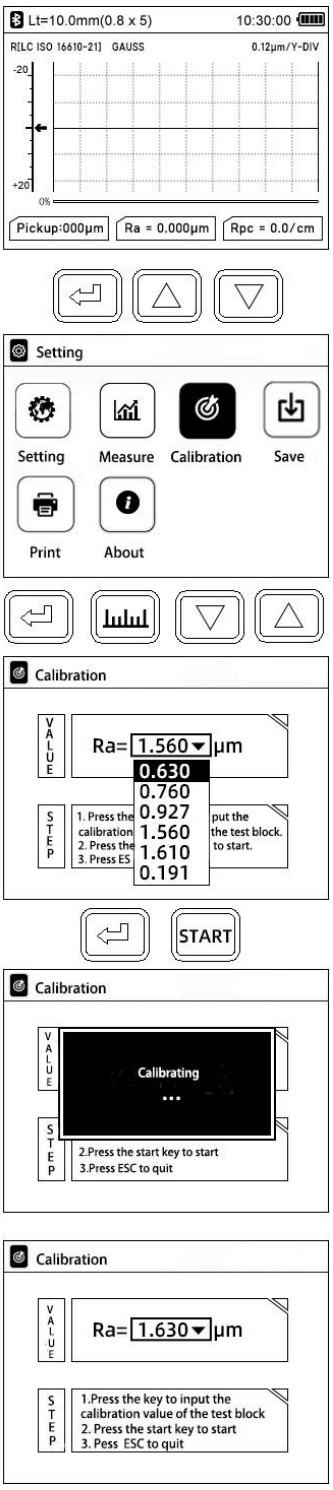
Illustration is based on a model calibrated 1.63 μ m steps to calibrate the model for the actual calibration of the nominal value of the set value.

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 "START" 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.

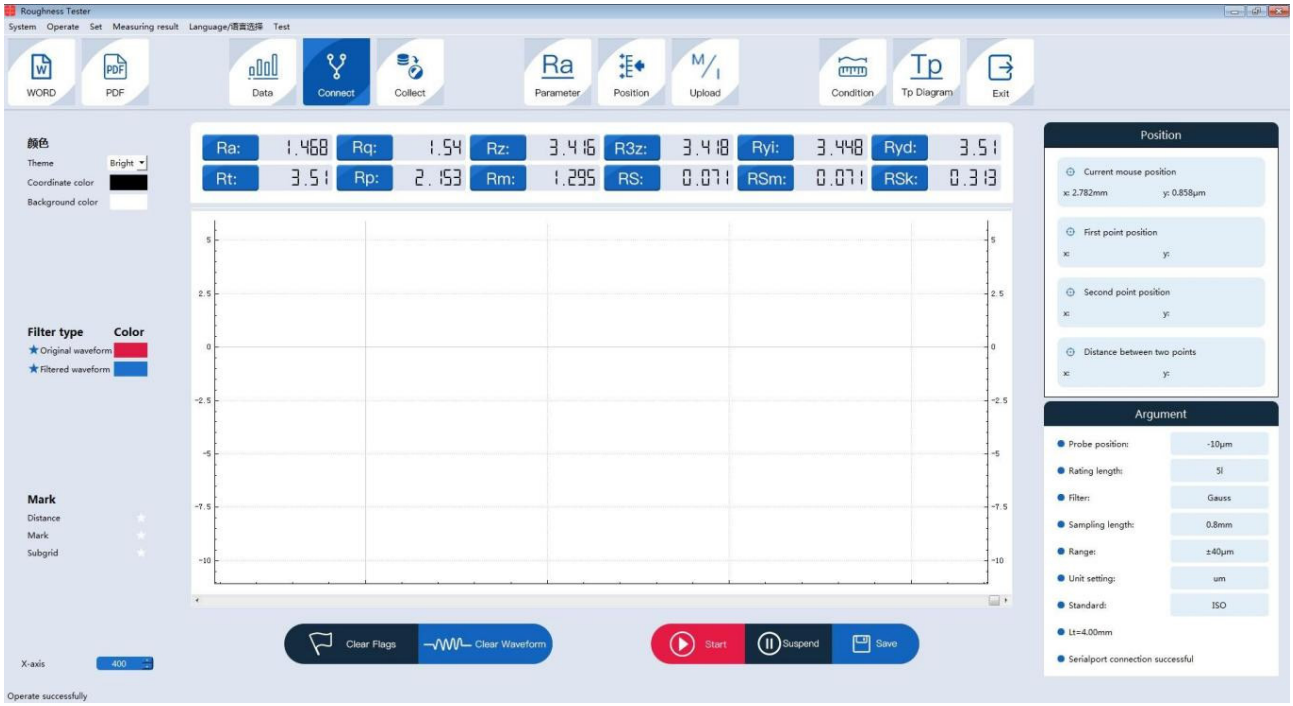
4.Press "ESC"key to return the menu without saving calibration results.

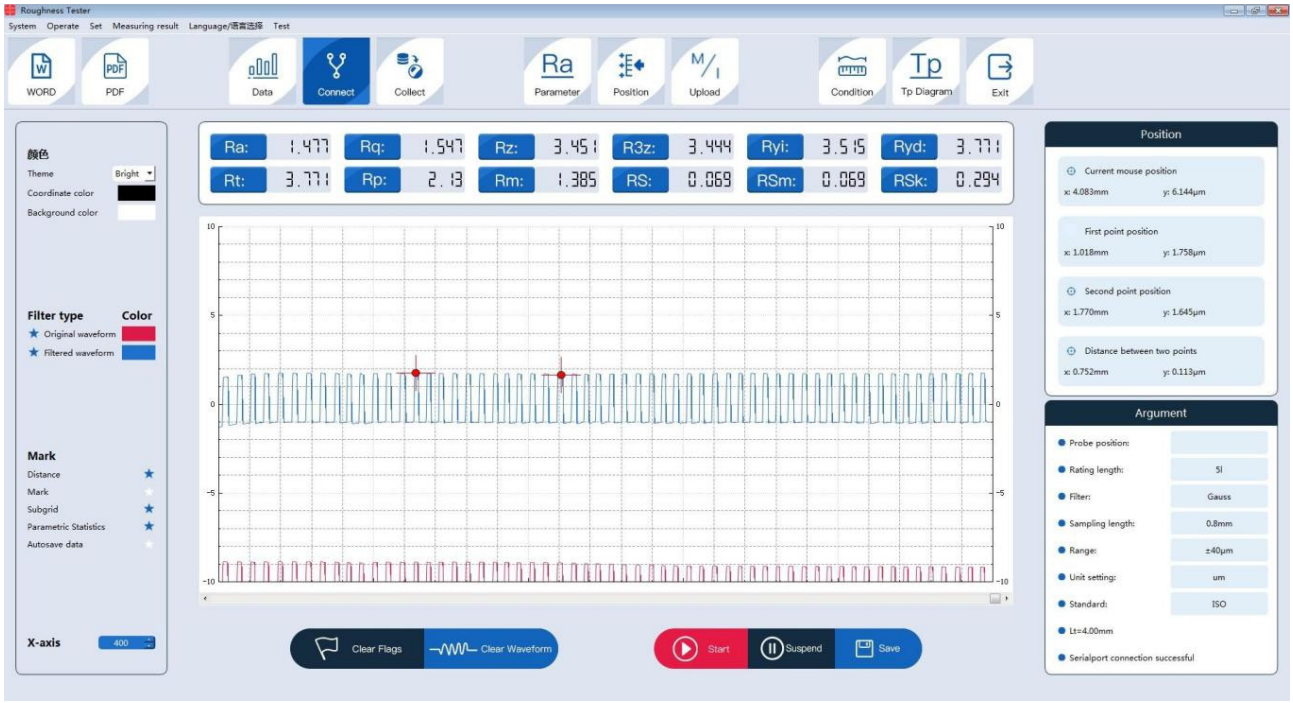


2.Measuring Operation

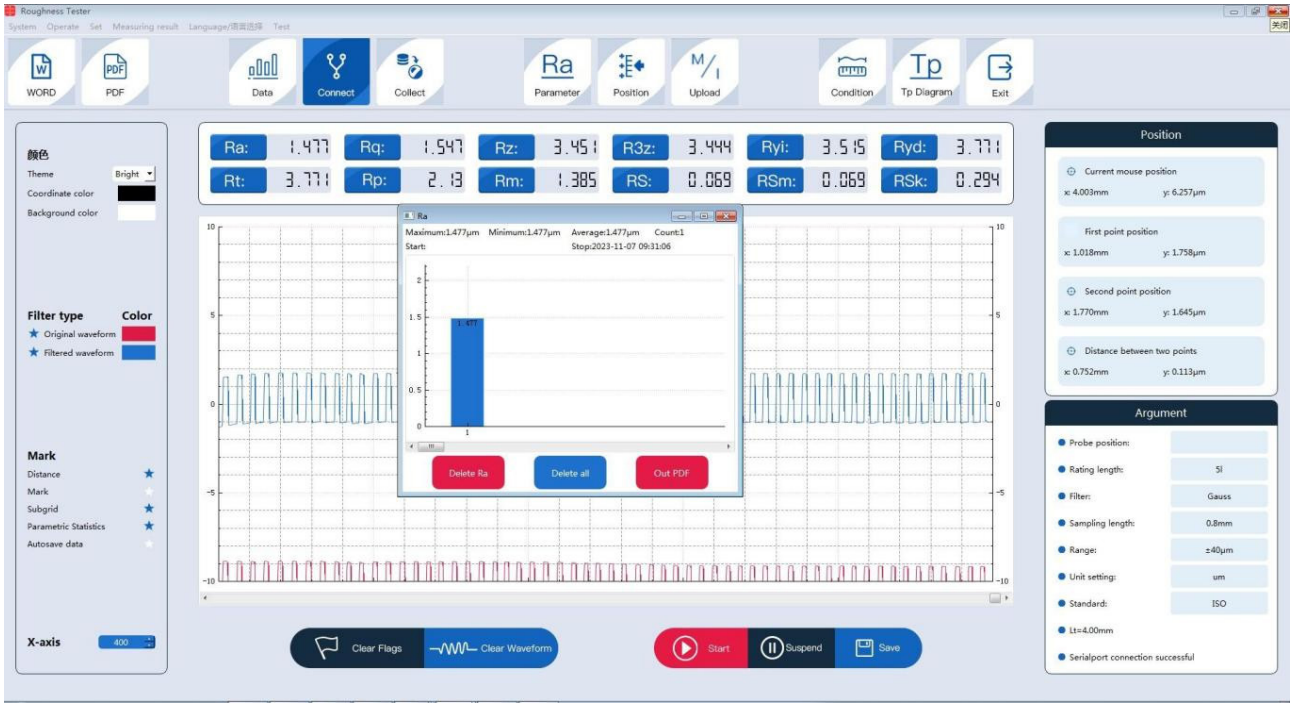
2.13Dataview of software

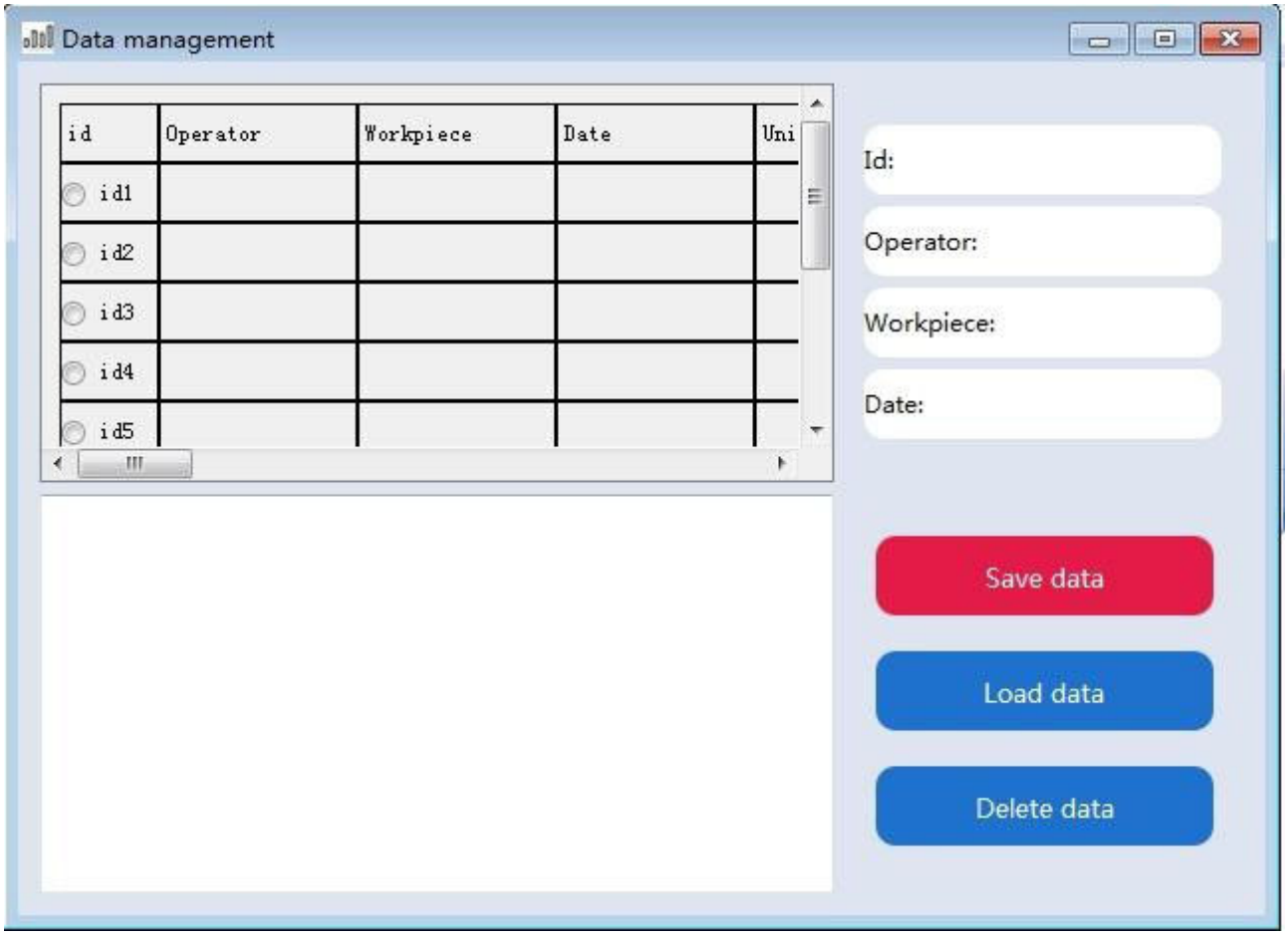
Dataview of software can easily be waveform analysis and print measurement results uploaded to the PC machine.





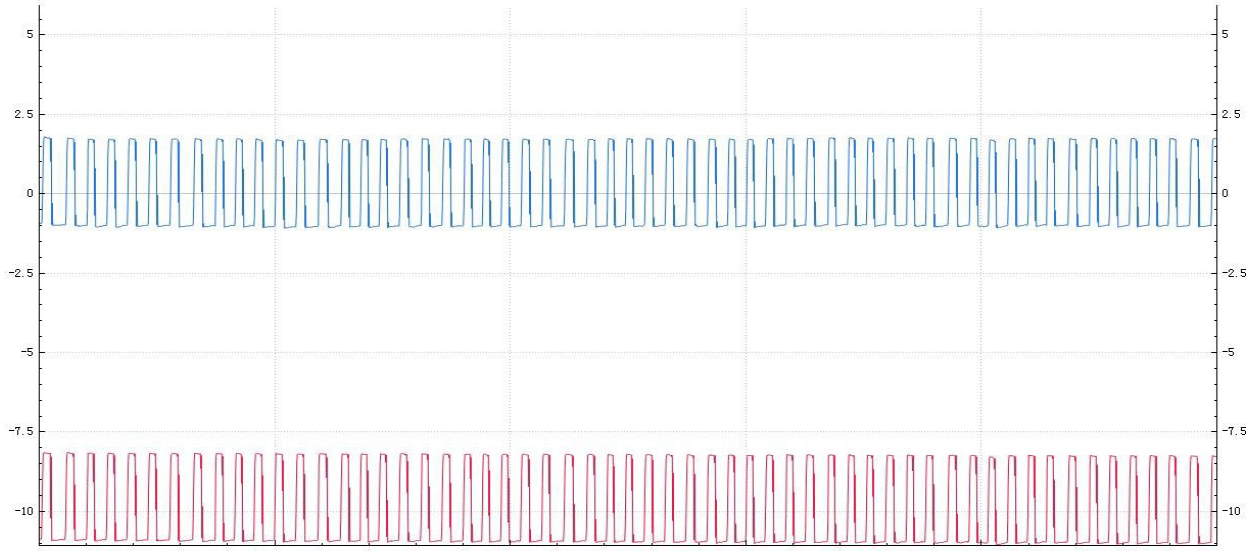
2.Measuring Operation

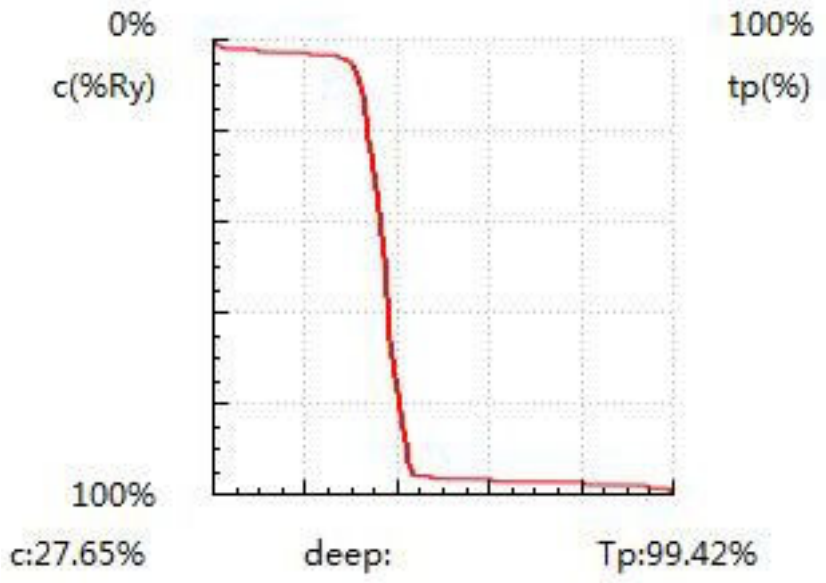




2.Measuring Operation

Surface Roughness Instrument Measurement Data Report					
Ra=1.466μm	Rq=1.538μm	Rz=3.412μm	R3z=3.412μm	Ryi=3.448μm	Ryd=3.486μm
Rt=3.510μm	Rp=2.146μm	Rm=1.302μm	RS=0.070mm	RSm=0.070mm	Rku=0.313



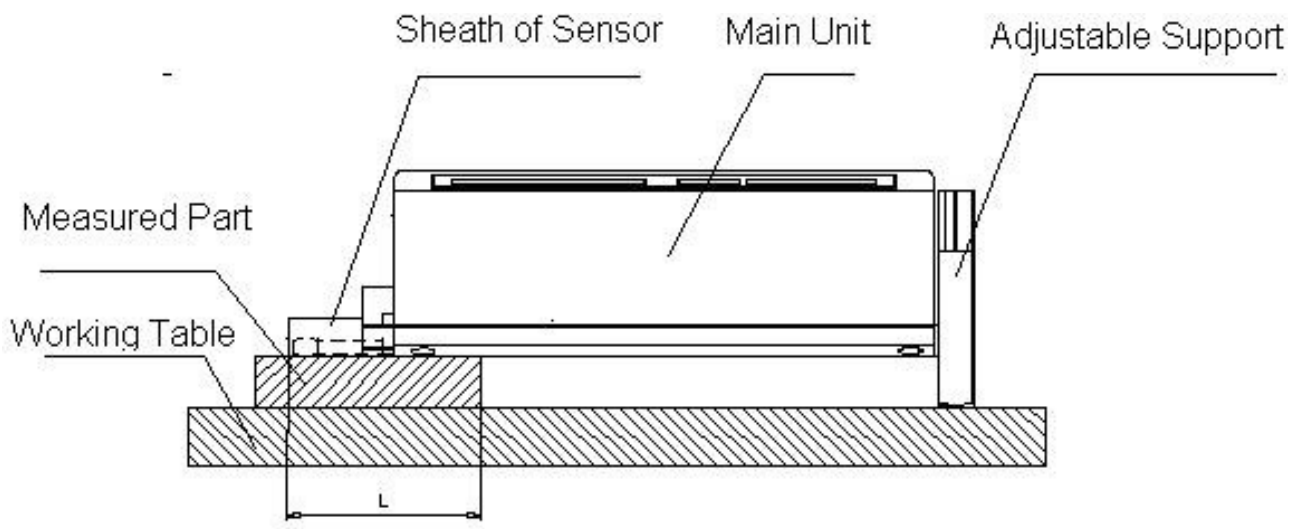


Unit setting:um	Sampling length:0.8mm	Rating length:5l
Standard:ISO	Range:±40μm	Filter:Gauss
Operator:1	Workpiece:1	Date:11.6

3.Options and Usage

3.1Adjustable 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.Sensor 2. Main Unit 3. Adjustable Support

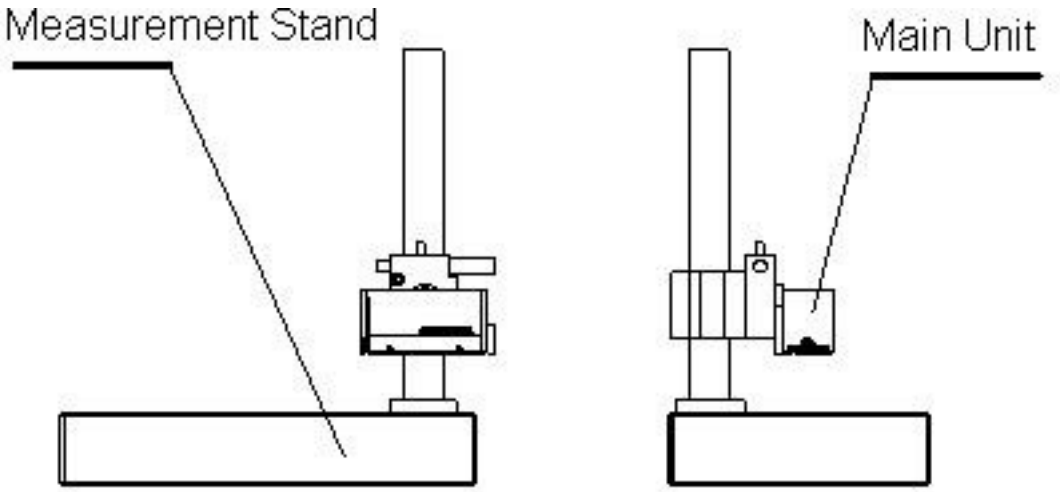
▲1.the value L above shall not be shorter than driving stroke of this measurement to prevent pickup from dropping out of part during measurement.

2.Locking of adjustable supporter shall be reliable.

3.2Measurement Stand

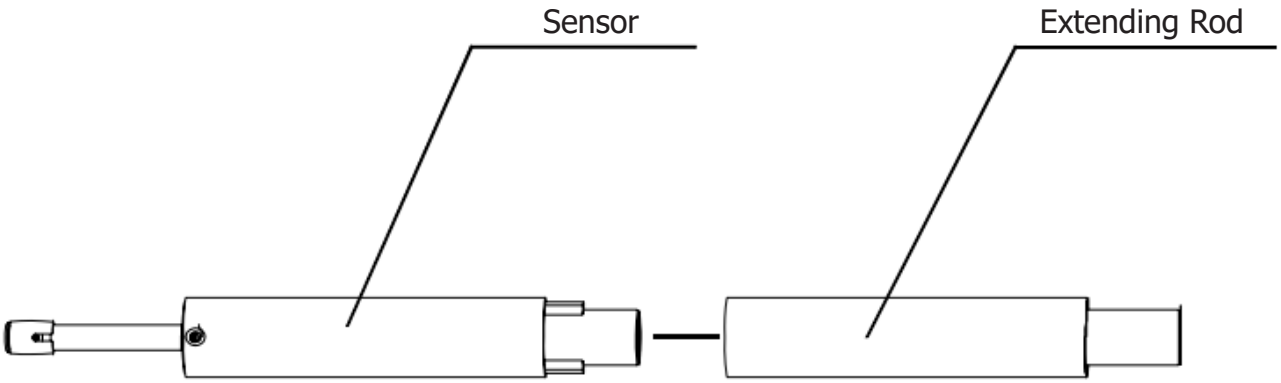
Measurement Stand can adjust the positions between tester and measured part conveniently with flexible and stable operation and wider application range. Roughness of complex shapes can also be measured. Measurement stand enable the adjustment of the position of stylus to be more precise and measurement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

3.Options and Usage



3.3Extending Rod

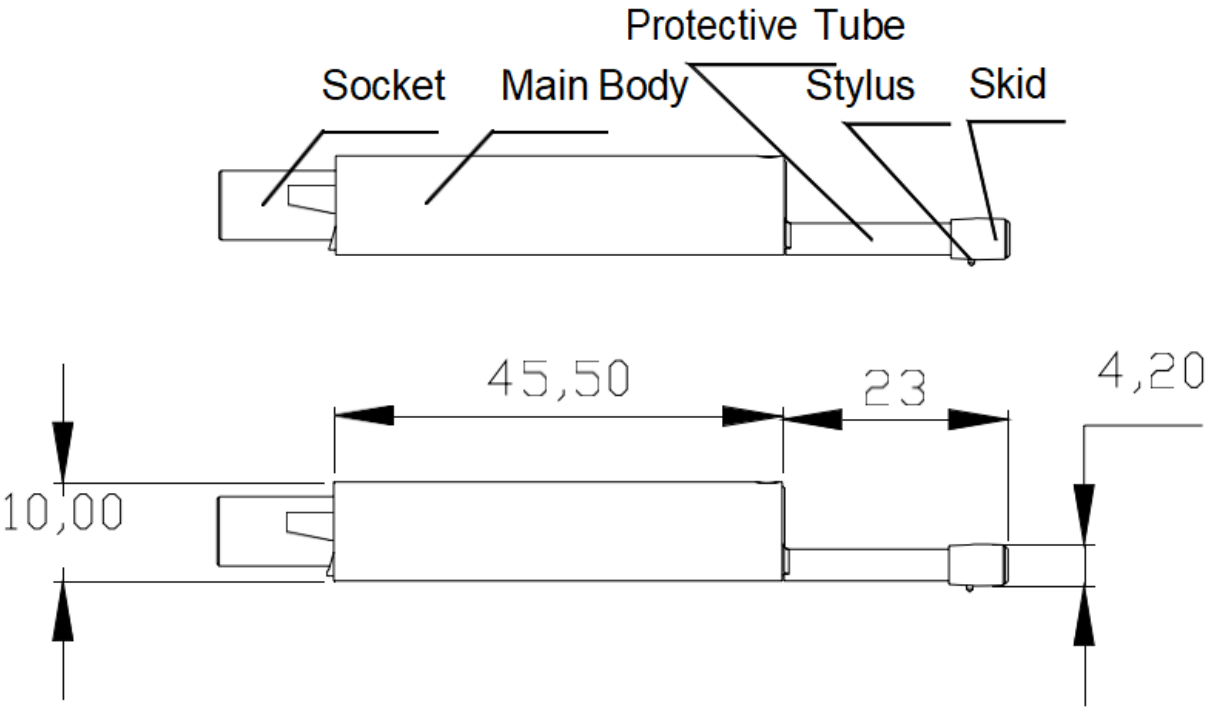
Extending rod increases the depth for pickup to enter the part. Length of extending rod is 50mm.



3.4Standard Sensor

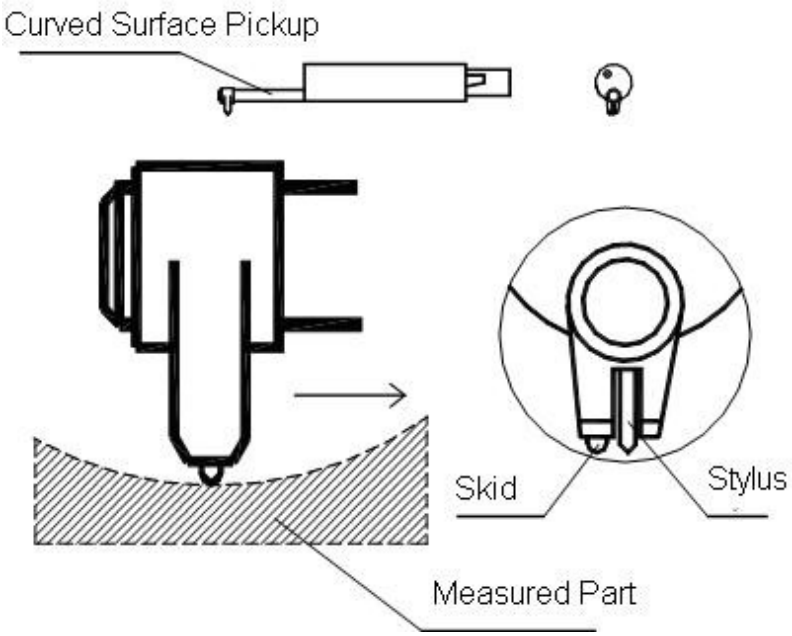
Most of the standard sensor sensor, it can measure most of the plane, inclined plane, cone surface, inner hole, groove and other surface roughness, can be hand-held measurement, in addition to the standard sensor, other special sensors are needed to measure the measuring platform.

3.Options and Usage



3.5Curved Surface Sensor

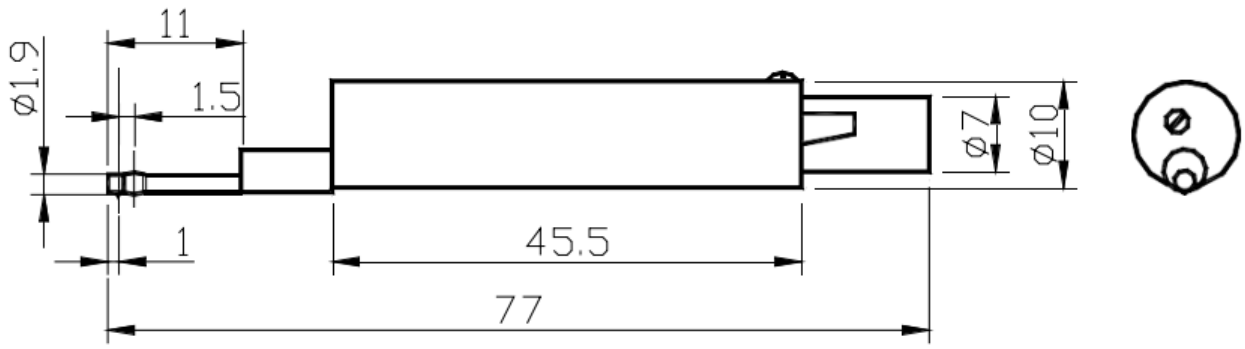
Curved surface sensor is mainly used for measuring radius is larger than the smooth cylindrical 3mm surface roughness, for the larger radius smooth spherical surface and other surface also can obtain good approximation, the radius of curvature, the surface is smooth, the better the effect of measurement.



3.Options and Usage

3.6 Pinhole Sensor

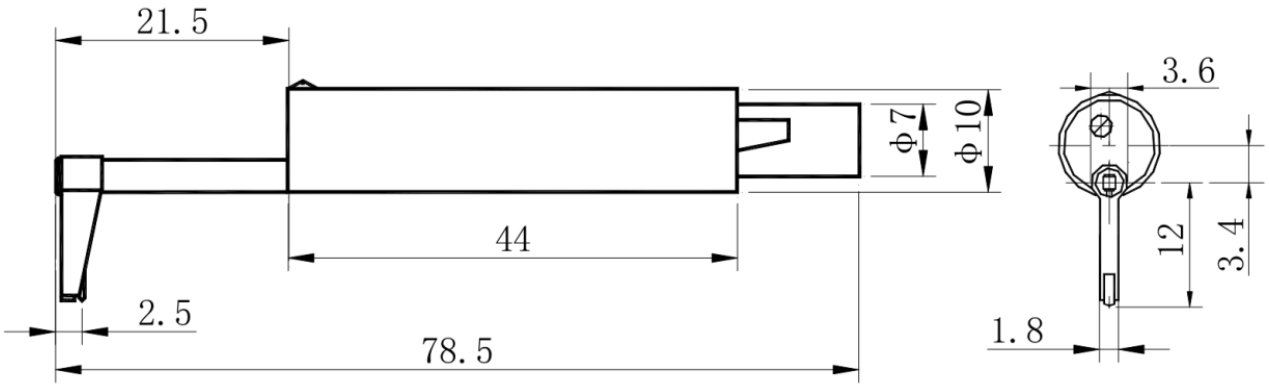
Using Pinhole pickup, the inner surfaces of holes with radius more than 2mm can be measured.Refer to the following Figure for detailed dimension.



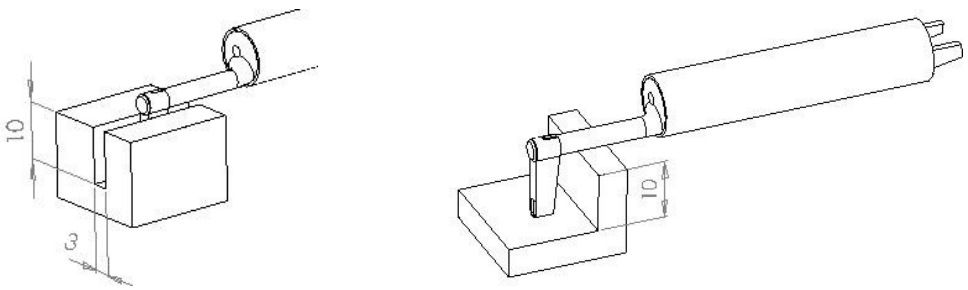
Pinhole pickup

3.7Deep Groove Sensor

With deep groove sensor, 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.



Deep groove sensor



4.Technical Parameter and Features

4.1Technical Parameter

Name	Content
Measurement Parameter	Ra,Rz,Ry,Rq,Rt, Rp,Rv,Rmax, R3z, Rsk, Rs, Rsm,Rmr
Measuring Range	Ra:0.005-16um
Display Range	Ra,Rq:0.005-16um
	Rz,Rt,Ry,Rp, Rv,Rmax,R3z:0.02-160um
Error Correction Range	One click measurement correction
Resolution	0.001um
Filter	RC,PC-RC,Gauss,D-P
The sampling length(lr)	0.25,0.8,2.5mm
Assessment length(ln)	Ln= lr×n n=1~5
Drive stroke	1.25-17.5mm
Indication Error	No more than±10%
Repeatability	No more than 6%
Supporting Artifacts	Flat surface, curved surface, and other special workpieces
Display	LCD
Power supply	Rechargeable lithium battery
Standard accessories	Host, standard sensor, standard template, height adjustment bracket, power adapter,sensor protection sleeve
Accessories optional	Marble platform, cast iron platform, small hole/curved surface/deep groove sensor, sensor extension rod
Outline dimension L*W*H	157*62.6*45mm
Weight	About 456.8g

4.2Measuring Range

Parameter	Measuring range
Ra Rq	0.005μm~16μm
Rz R3z Ry Rt Rp Rm	0.02μm~160μm
RSk	0~100%
RS RSm	1mm
tp	0 ~ 100%

5.General Maintenance

5.1Sensor

1.Any time swap sensors 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 sensor guide head bracket roots (the front of the body) plug.

2.To complete the measurement work, please timely sensor into the box;

3.Please pay attention to protect the needle part measuring sensor.

4.The sensor's precision components, any knock, touch, fall off phenomenon may damage the sensor, should try to avoid such situations.

5.The sensor 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 sensor used for emergency.

5.2Main Unit

1.Pay attention to maintaining the Main Unit surface clean, often with a soft dry cloth to clean its surface.

2.The instrument is a precision measuring instrument, should always be handled with care, to avoid the shock.

5.3Battery

1.Always observe the battery prompt, when the low voltage, please charge.

2.The charging time is 3 hours, try not to long time charge.

5.4Standard Sample Plate

1.The surface of a standard sample plate must be kept clean.

2.To avoid scratches on the surface of sample area.

5.General Maintenance

5.5Troubleshooting

When the tester breaks down, handle the troubles according to measures described on Fault Information. If troubles still exist, please return the instrument to JIMTEC 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 stylus position	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

6.References

6.1 Terms

The instrument calculat 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."

6.1.1Terms

Filtered profile: profile signal after primary profile is filtered to remove waviness.

D-P (direct-profile): adopt central line of Least Square Algorithm.

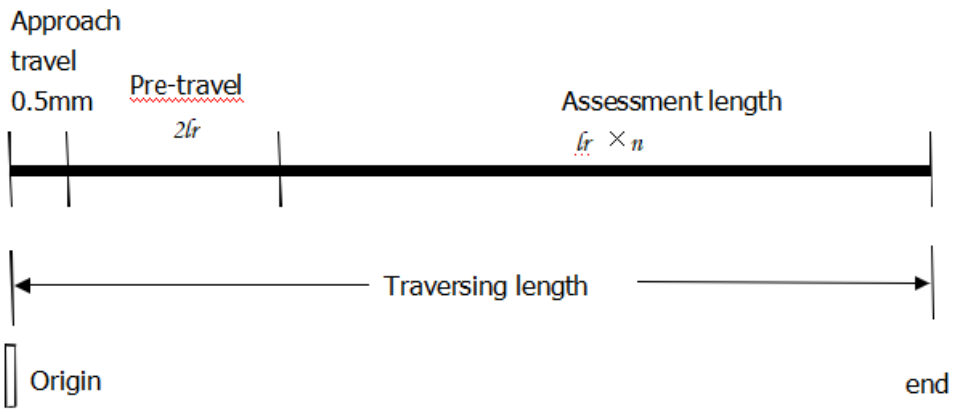
RC filter: analogue 2RC filter with phase difference.

PC-RC filter: RC filter with phase-correction.

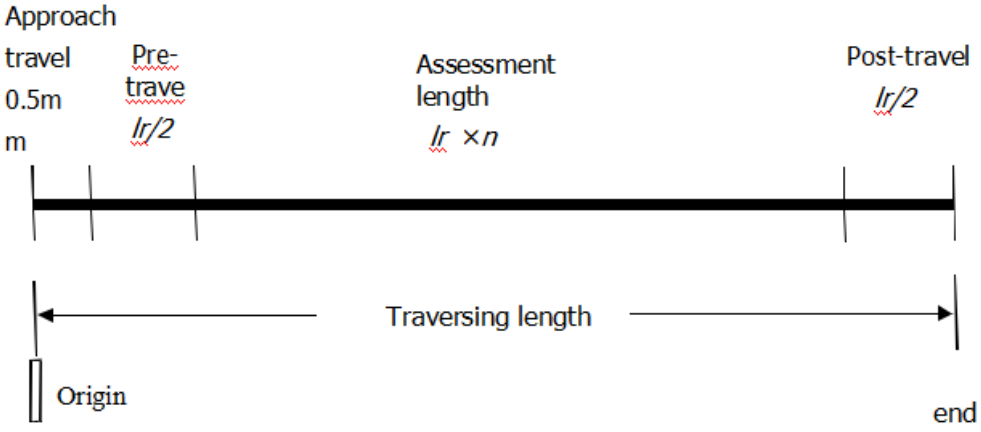
Gauss filter: ISO11562.

6.1.2Traversing Length

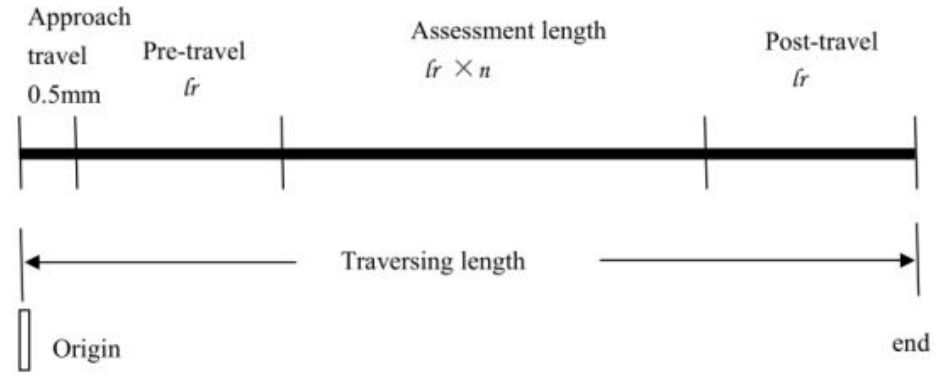
- RC Filter



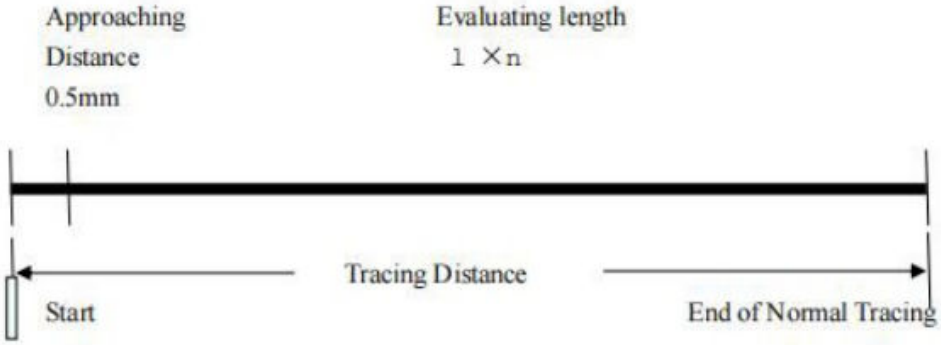
- GAUSS Filter



● PCRC Filter



● D-P direct profile

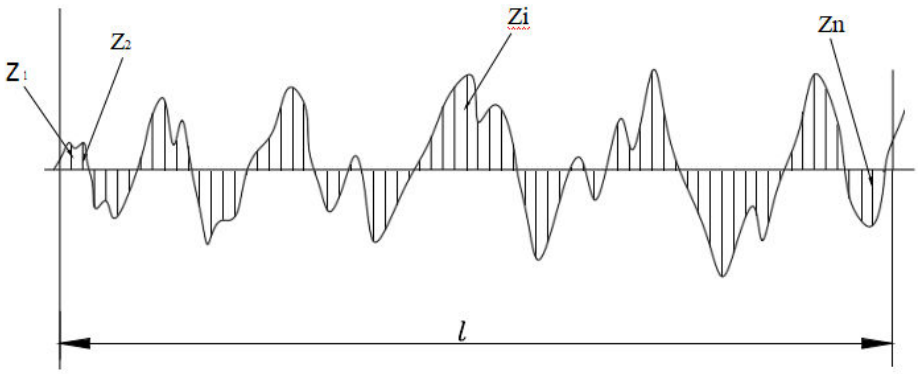


6.2Parameters Definitions

6.2.1Arithmetical Mean Deviation of Profile Ra

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

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



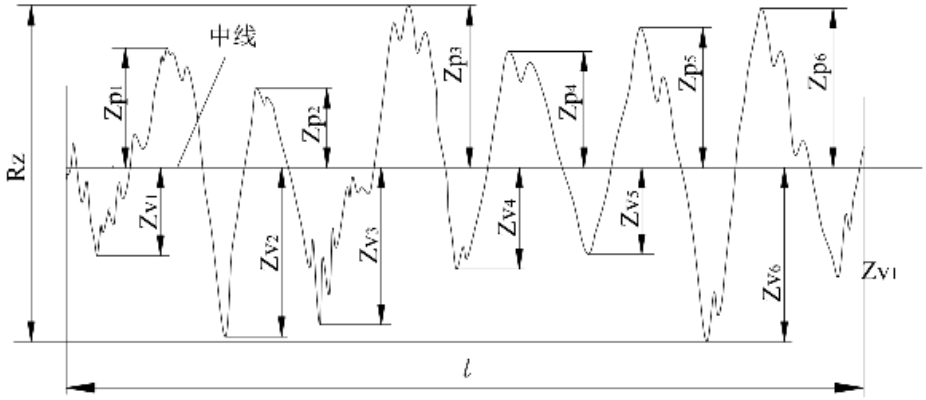
6.2.2Root-mean-square Deviation of Profile Rq

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

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

6.2.3Maximum 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

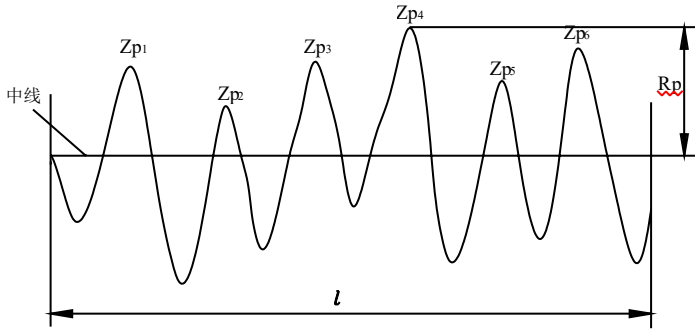


6.2.4Total Peak-to-valley Height Rt

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

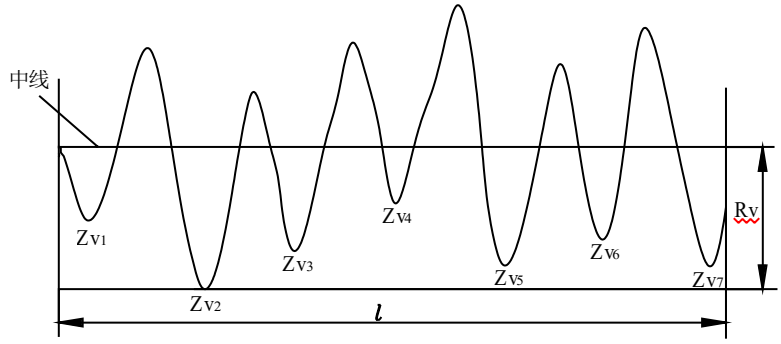
6.2.5Maximum height of Profile Peak Rp

Rp is the height from the highest profile peak line to mean line within sampling length



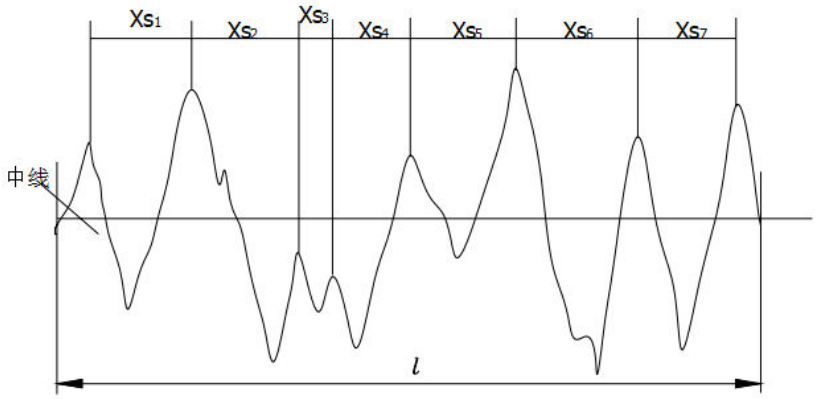
6.2.6Maximum Depth of Profile Valley Rv

Rv is the depth from the deepest profile valley line to mean line within sampling length



6.2.7Mean Spacing of Local Peaks of Profile RS

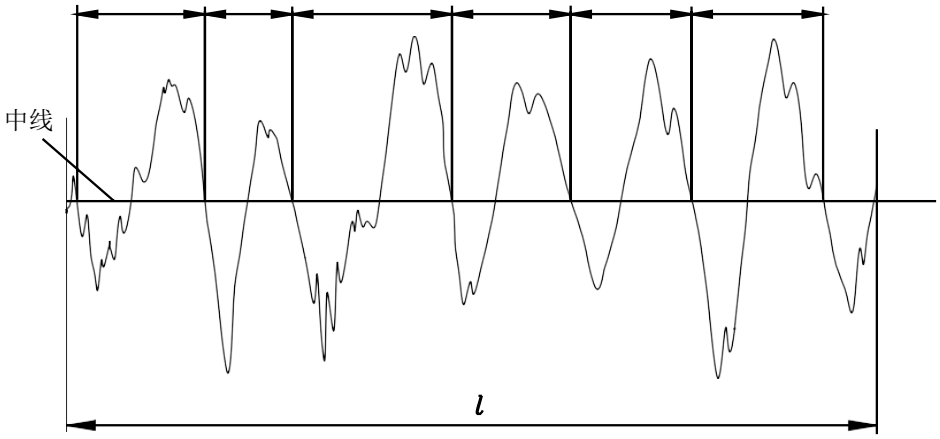
RS is the mean spacing of adjacent local peaks of the profile within sampling length.



6.2.8Mean Spacing of Profile elements RSm

RSm is the mean spacing between profile peaks at the mean line within sampling length.

$$RSm = \frac{1}{n}\sum_{i=1}^{m} XSi$$



6.2.9Ten Point Height of Irregularities RzJIS

The sum of the mean height of the five highest profile peaks and the mean depth of the five deepest profile valley from mean within the sampling length.

$$RzJIS = \frac{1}{5}\sum_{i=1}^{5} Yp_i + \frac{1}{5}\sum_{i=1}^{5} Yv_i$$

6.2.10Maximum Height of Profile RyJIS

The same to 6.2.3 Rz.

6.2.11Skewness of the profile RSk

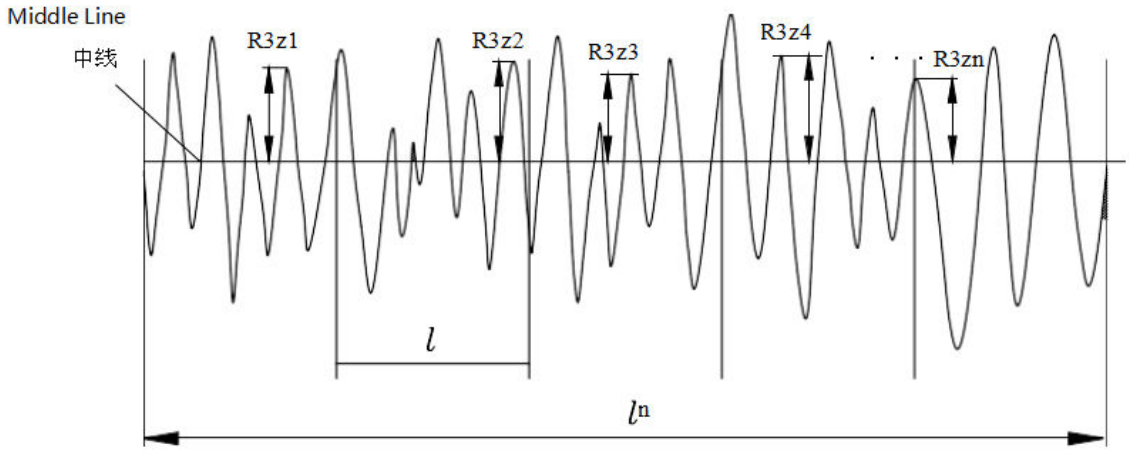
RSk is the quotient of the mean cube value of the profile deviation (Yi) and the cube of Rq within sampling length.

$$Rsk = \frac{1}{Rq^3}\left[\frac{1}{lr}\int_0^{lr} Z^3(x)dx\right]$$

6.2.12Third Maximum Peak-to-valley Height R3z

R3z is the mean of the sum of the third profile peak height and the third profile valley depth of each sampling length over evaluation length.

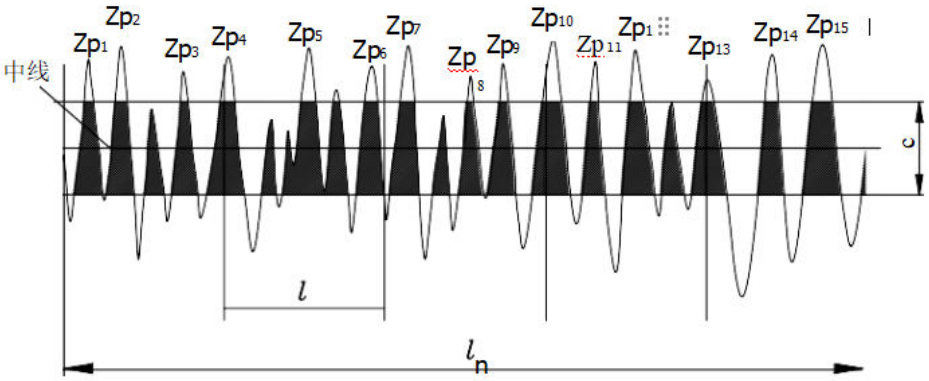
$$R3z = \sum_{i=1}^{i=n} R3zi$$



6.2.13Rmax

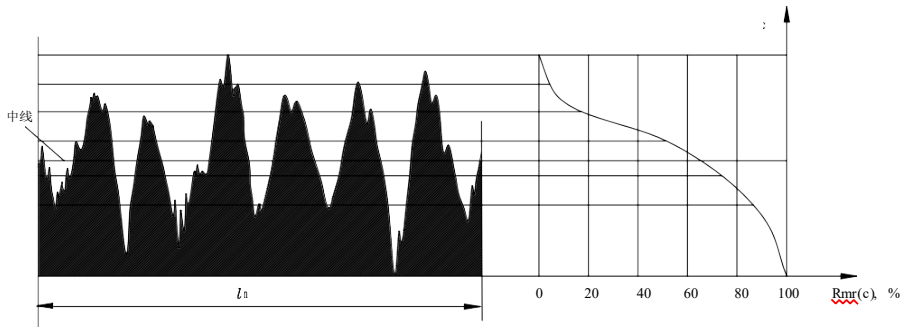
The same to 6.2.4 Rt.

6.2.14Peak count Rpc



6.2.15Material ratio curve of profile Rmr

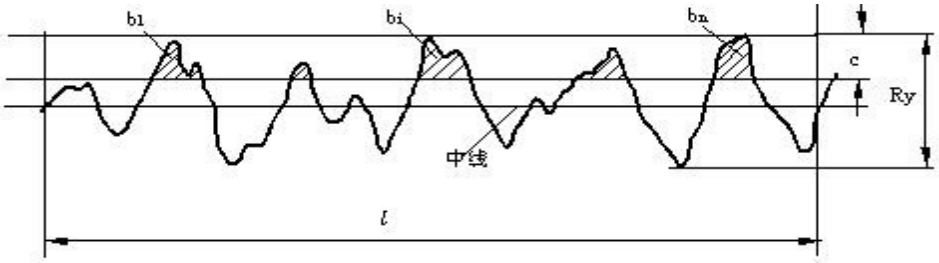
The material ratio of change with horizontal position and the relationship between the curve.



6.2.16Material length ratio Rmr(c)

Horizontal position in a given contour C on the physical materials and the assessment length of the length ratio.

$$Rmr(c) = \frac{\text{Material length (c)}}{\text{Evaluation length}}$$



6.References

Recommended table of the sampling length

Ra (μm)	Rz (μm)	Sample length λc(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 ＞0.16～0.20	＞1.0～1.25 ＞0.8～1.0	
＞0.125～0.16 ＞0.1～0.125 ＞0.08～0.1	＞0.63～0.8 ＞0.5～0.63 ＞0.4～0.5	
＞0.063～0.08 ＞0.05～0.063 ＞0.04～0.05	＞0.32～0.4 ＞0.25～0.32 ＞0.2～0.25	
＞0.032～0.04 ＞0.025～0.032 ＞0.02～0.025	＞0.16～0.2 ＞0.125～0.16 ＞0.1～0.125	

The configuration list of Instrument

Number	Name	Quantity	Remarks
1	Main Unit	1	
2	Sensor	1	Precision parts
3	Adjustable Support	1	
4	Calibration Block	1	
5	Block Bracket	1	
6	Charger	1	
7	USB Charging cable	1	
8	Operating manual	1	
9	Certificate	1	
10	Guarantee Card	1	
11	Instrument Container	1	
12	Software	1	

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