SURFACE ROUGHNESS TESTER
AR-132A

This Surface Roughness Tester is small in size, light in weight, easy to carry. Although complex and advanced, it is convenient to use and operate. Its ruggedness will allow many years of use if proper operating techniques are followed. Please read the following instructions carefully and always keep this manual within easy reach.

8.6Cutoff Length Recommended

Ra (μm)	Rz (μm)	Cutoff length (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	

2. Specifications

Display: LCD, with blue backlight
Parameters: Ra, Rz
Display Range:
Ra: 0.05~10μm/1.000~400.0μinch
Rz: 0.020~100.0μm/0.780~4000μinch
Accuracy: Not more than ±10%
Fluctuation of display value: Not more than 6%
Sensor :
Test Principle: Inductance type
Radius of Probe Pin: 10μm
Material of Probe Pin: Diamond
Measurement Force of Probe: 16mN(1.6gf)
Probe Angle: 90°
Vertical Radius of Guiding Head: 48mm
Maximum driving stroke: 17.5mm/0.7inch
Cutoff length (l): 0.25mm / 0.8mm / 2.5mm
Driving speed:
sampling length = 0.25mm Vt=0.135mm/s
Measuring range ≤1
sampling length = 0.8mm Vt=0.5mm/s
Measuring range ≤2.5
sampling length = 2.5mm Vt=1mm/s
Measuring range =1
returning Vt=1mm/s
Resolution : 0.001μm if reading < 10μm
0.01μm if 10μm ≤ reading < 100μm
0.1μm if reading ≥100μ
Evaluation length: 1~5L optional
Operating conditions: Temp. 0~50°C (32~122°F)
Humidity <80%RH
Power supply: Li-ion battery (rechargeable)
Size: 140x57x48mm (5.5x2.2x1.9inch)
Weight: 420g (14.82oz)

1.Features

This instrument is compatible with four standards of ISO, DIN, ANSI and JIS and is widely used in production site to measure surface roughness of various machinery-processed parts, calculate corresponding parameters according to selected measuring conditions and clearly display all measurement parameters. When measuring the roughness of a surface, the sensor is placed on the surface and then uniformly slides along the surface by driving the mechanism inside the tester. The sensor gets the surface roughness by the sharp built-in probe. This roughness causes displacement of the probe which results in change of inductive amount of induction coils so as to generate analogue signal, which is in proportion to the surface roughness at output end of phase-sensitive rectifier. The exclusive DSP processes and calculates and then outputs the measurement results on LCD.

* Multiple parameter measurement: Ra, Rz,
* Built-in lithium ion rechargeable battery and control circuit with high capacity
* Can communicate with PC computer for statistics, printing and analysing by the optional cable and the software for USB interface.
*Manual or automatic shut down. The tester can be switched off by pressing the Power key at any time. On the other hand, the tester will power itself off about 5 minutes after the last key operation.
*Metric /Imperial Conversion

Standard Accessories:

Main unit
Standard sensor
Standard sample plate
Adjustable leg
Sheath of sensor
Screwdriver
Power adapter
Carrying case
Operation manual

Optional accessories:

Groove stylus
Curvature probe
Small Hole probe
Extension rod
Measurement stand
USB Cable & software
Bluetooth adapter & software

3.Front Panel Descriptions And Names Of Each Parts

3.1Key descriptions

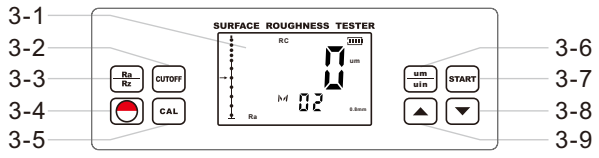


Fig. 3-1

3-1 Display
3-2 Cutoff
3-3 Parameter
3-4 Power
3-5 Calibration key
3-6 um/uinch conversion key
3-7 Start
3-8 Down
3-9 Up

8.3.2 Rz ten point height of irregularities

The average of the sum of five maximum profile peaks and the average of five maximum profile valleys withinthe sampling length.

$$Rz = \frac{\sum_{i=1}^{5} \frac{1}{2_i} + \sum_{i=1}^{5} y_V}{5}$$

8.4Fault Information

Err1 no data stored for browsing.
Err2 the Ra value of the standard sample is too small to be uses for calibration.
Err3 the value is too small to continue to decrease.

8.5Code Standard Name

ISO4287	International Standard
DIN4786	German Standard
JISB601	Japanese Industrial Standard
ANSIB46.1	American Standard

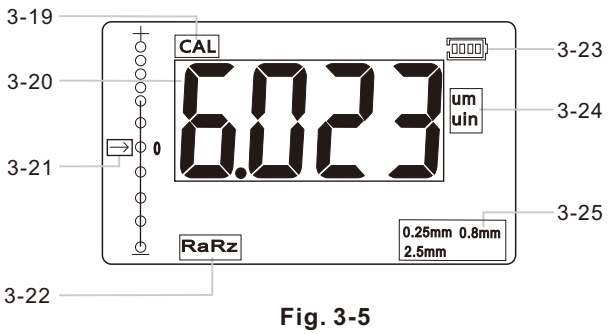


Fig. 3-5

3-19 Calibration
3-20 Measurement
3-21 Position pointer
3-22 Parameters
3-23 Battery
3-24 Unit
3-25 Cutoff

3.3installation and unloading of sensor

To install, hold the main part of the sensor by hand,push it into connection sheath at the bottom of the instrument as shown in Figure 3-4 and then slightly push to the end of sheath. To unload, hold the main partof sensor or the root of protective sheath and slowlypull it out.

A.The probe of the sensor is the main part of this instrument and requires close attention.

B.During installation and unloading , the probe should not be touched in order to avoid damage which can affect measurement results.

C.Connection of the sensor should be reliable during installation.

5.How to calibrate the tester

5.1To enter the calibration state, just depressing the key (CAL) , The calibration state is marked by'CAL'.
5.2Take a measurement based on the Standard sample plate. Contrast the measuring value with the value of standard sample plate based on the same parameter.
5.3Depress the key (SAVE) or(READ)to adjust the reading to the standard value.
5.4Just repeat 6.2 to 6.3 till the accuracy is ok.
5.5To quit, just press any key other than START key.
5.6 The instrument has been thoroughly tested before delivery to ensure that the display value error is less than 10%. The user is recommended not to use the Calibration function too often.

6.How to calibrate the tester

6.1 When measuring on the standard wafer, if the measurement result is compared with the standard wafer and the deviation is greater than 10%, the factory Settings should be restored.

7.How to restore the factory settings

7.1Press the (DEL MENU) key and hold until "FAC" appears on the display. After 3 seconds, the number that keeps jumping appears. After 30 seconds, press any key except the power button to exit.

A. Layout of connection lines should not affect measuring Part while charging.
B. The meanings of battery indicators are:
If battery voltage is normal, measurement can be carried out.
The black part inside prompt shows capacity of Battery; (0000) Indicates too-low voltage and battery should be charged as soon as possible; (▮▮▮▮) indicates that battery is full.
C. Relative high noises of the power source can affect measurement to weak signal to some extent when battery is being charged;
D. The back light of LCD will be on when charging even if the tester is still in the state of power off.
The tester can monitor the process of charging itself.

4.Measuring Procedures

4.1 Preparations for measurement

A. Switch on to test if the battery voltage is normal.
B. The instrument automatically restores conditions of the last measurement before it is turned off since these conditions are automatically stored. Meanwhile, the second line of 2 digits on displayshows the groups stored in the memory. Before takingmeasurement, preparations have to be made and checked.
C. To check if the cutoff length selected is right. if not,Depress the (CUTOFF) to select. For the recommended cutoff length, please see the table in 10.7on page 13.
D. To check if the measurement unit selected is right. If not, depress the key (in/mm) to switch between the metric system and the British system.

F. To check if the parameter selected is right. If not,depress the key (RaRz) to select. This step is very important.
G.To clear the surface of the part to be measured;
H. Refer to Figure 4-1 and Figure 4-2 to place the instrument correctly, stably and reliably on the surface to be measured.
I. Refer to Figure 4-2 , the sliding trail of the sensor must be vertical to the direction of process line of themeasured surface.
J. Adjustable leg and sheath of sensor When the measured surface of the part is smaller than the measured surface of the part is smaller than the bottom surface of the instrument , the sheath of sensor and adjustable leg can be used for auxiliary support to complete measurement.
(as shown in Figure 4-3)

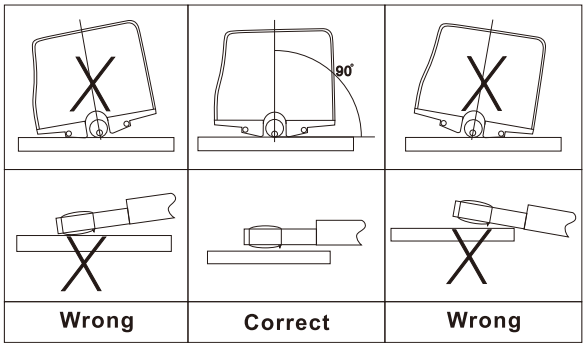


Fig.4-1

8.References

8.1Central Line

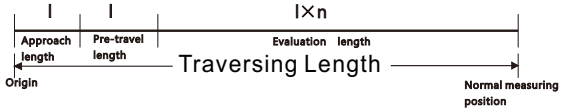
This tester adopts minimum central line of least square algorithm.

8.2Traversing Length

l=sampling lenght

n=number of sampling lenght

lxn=evaluation lenght

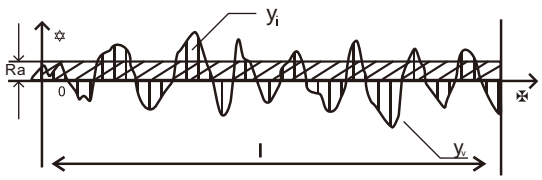


8.3 Definition of roughness parameter

8.3.1 Ra arithmetical mean deciation of profile

Arithmetic value of mean deciation of profile within sampling length.

$$Ra = \frac{1}{n}\sum_{i=1}^{n}\left|y_i\right|$$



3.2Names of each parts

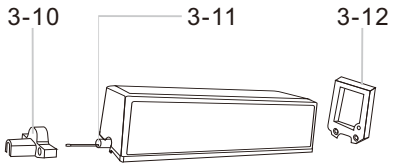


Fig. 3-2

3-10 Sheath of probe
3-11 Probe
3-12 Adjustable leg

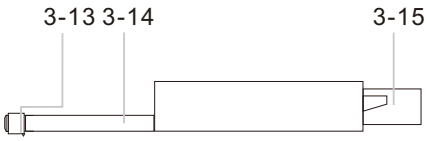


Fig. 3-3

3-13 Stylus
3-14 Protection sleeve
3-15 Socket

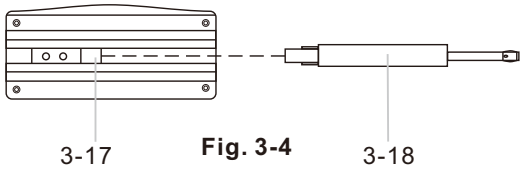


Fig. 3-4

3-17 Connection sheath
3-18 probe

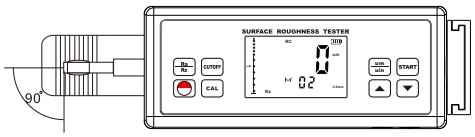


Fig.4-2

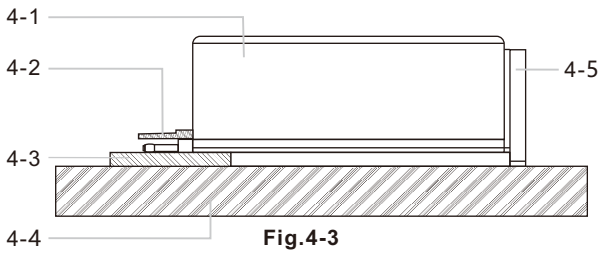


Fig.4-3

4-1 Roughness tester
4-2 Sheath of probe
4-3 Item to be measured
4-4 Working table
4-5 Adjustable leg

4.2 Measuring

After preparations is done , just press Start key to measure if measuring conditions are not to be changed. Firstly, you will see the'___' on the display and the probe is moving forward and sampling. Then you will see the probe stop sliding and move backward . The measurement result shows on the display after the probe stop moving.

3.3Power adapter and charging of battery

When the battery voltage is too low (which is indicated by the battery symbol on the screen), the instrument should be charged as soon as possible. Follow the indications shown in Figure 3-6. the power adapter should be plugged into the power socket of the instrument. The power adapter should be connected to 100~220V 50Hz and charging of the battery will begin. Input voltage for power adapter is AC 100~220V with DC 5~7 V of output, about 300mA of charging current, charging time of up to 5.0 hours. This instrument uses a lithium ion chargeable battery. Charging can be fulfilled at any time without affecting the normal operation of the instrument.

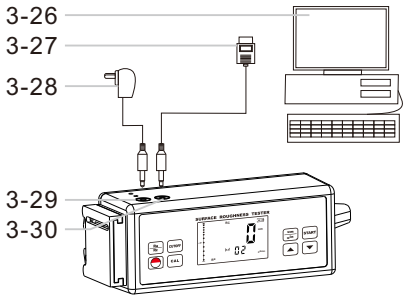


Fig.3-6 Connection of Power Adapter and USB

3-26 Computer
3-27 USB port to PC COM
3-28 Power adapter
3-29 DC power socket
3-30 Data cable socket

NOTES: See next page