

# MANUAL TR-200

Surface roughness tester



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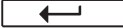

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Start key	
Parameter key	
Esc key	
Menu key	
Scroll key	 
"Enter" key	
Power key	

## 1. OVERVIEW

TR-200 hand-held roughness tester is a new product . This tester applies to production site and can be used to measure surface roughness of various machinery-processed parts, calculate parameters according to selected measuring conditions and clearly display all measurement parameters and profile graphs on LCD.

Feature:

- Multi-parameter measuring: Ra, Rz, Ry, Rq, Rp, Rm, Rt, R3z, Rmax, Sk, S, Sm, tp;
- High accuracy inductance pickup;
- Four filtering methods of RC, PC-RC, GAUSS and D-P;
- Compatible with four standards of ISO, DIN, ANSI and JIS;
- 128×64 dot matrix LCD displays all parameters and graphs;
- DSP chip is used to control and process data with high speed and low power consumption;
- Built-in lithium ion chargeable battery and control circuit have high capacity, without memory effect. Consecutive work time is longer than 20 hours;
- Design of mechanical and electrical integration is adopted to achieve small bulk, light weight and easy usage;
- Can be connected to TA-220s printer to print all parameters and graphs;
- Built-in standard RS232 interface enables communication with PC;
- Automatic switch off, memory and various prompt instructions;
- Accessories of curved surface pickup, measurement stand, sheath of pickup, adjustable supporter and extending rod are available.

### 1.1 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 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 LCD, printed through printer and communicated with PC.

## 1.2 STANDARD CONFIGURATION

Table 1-1 Standard Configuration List

- Standard sensor
- Main processor
- Standard sample plate
- Power adapter
- RS232 communication cable
- Sheath of pickup
- Adjustable supporter

## 1.3 NAMES OF EACH PART OF THE INSTRUMENT

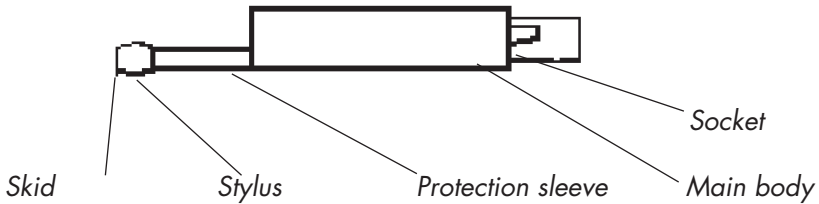


Figure 1-1-1 Pick up

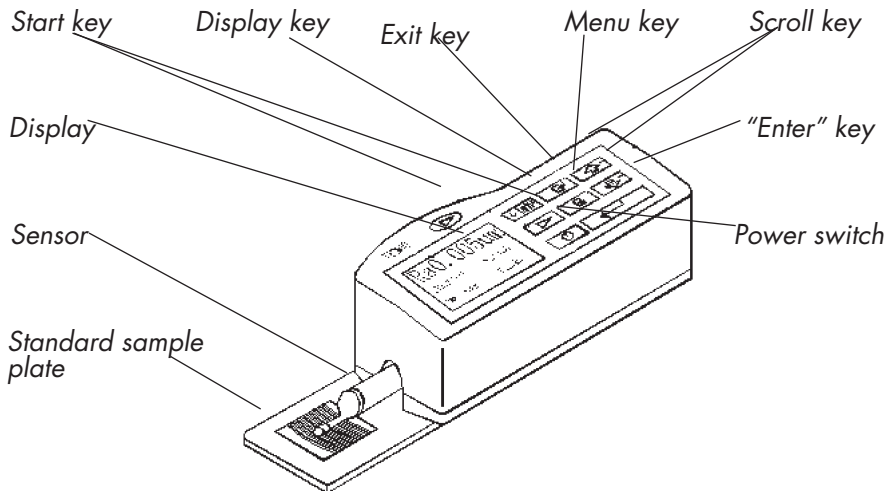


Figure 1-1-2 Front view of instrument

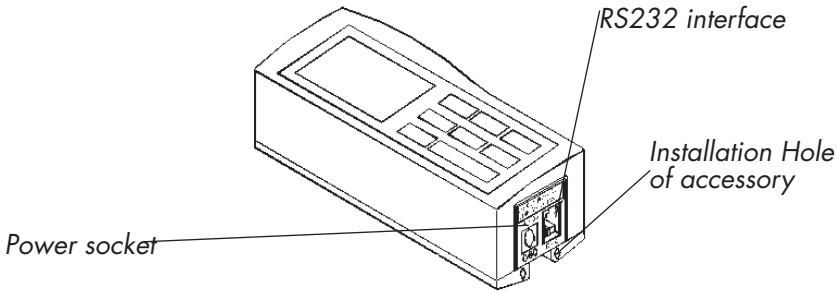


Figure 1-1-3 Side view of instrument

## 1.4 BASIC CONNECTION METHOD

### 1.4.1 Installation and removing of pickup

For installation, hold the main part of pickup with hand, push it into connection sheath at the bottom of the instrument as shown in Figure 1-2 and then slightly pushed it to the end of the sheath. To remove, hold the main part of pickup or the root of protective sheath with hand and slowly pull it out.

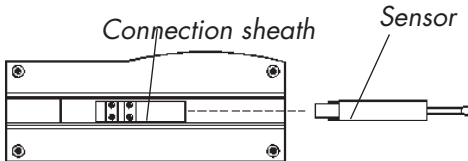


Figure 1-2 Installation and removing of pickup

**Tip:**

1. **The 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 pickup should be reliable during installation.**



### 1.4.2 Power adapter and charging of battery

When battery voltage is too low (that is, battery voltage symbol flashes on screen to prompt low voltage), the instrument should be charged as soon as possible. As shown in Figure 1-3, the plug of power adapter should be plugged into power socket of the instrument. Power adapter could be connected to power of 220V 50Hz .then charging will begin. Input voltage for power adapter is AC 220V with DC 6V of output, about 500mA of maximum charge current, 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.

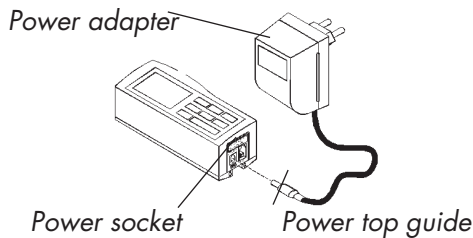






Figure 1-3 Connection of power adapter

**Tip:**

1. **Layout of connection lines shall not affect measuring part under charging state.**
2. **Meanings of battery voltage prompts are:**
  -  indicates normal voltage and measurement can be carried out; the black part inside prompt shows capacity of battery;
  -  indicates too-low voltage and battery should be charged as soon as possible;
  -  indicates that battery is being charged;
  -  indicates that battery is full and charging power should be cut off as soon as possible;
3. **Relative high noises of power source may affect measurement of weak signal to some extent when battery is being charged;**
4. **The instrument needs to monitor the process of charging so it is not necessary to turn it off. The instrument will turn on automatically even it's turned off.**
5. **Keep the battery switch on unless the TR-200 will not be used for a long period of time (more than 2 to 3 weeks). If the battery switch is off, the measurement results will be lost.**
6. **When the TR-200 is delivered the battery switch is off, User should set the switch on firstly before use it.**

## 2 MEASURING OPERATION

### 2.1 PREPARATION FOR MEASUREMENT

- a. Switch-on to check if battery voltage is normal;
- b. Clear the surface of part to be measured;
- c. Refer to Figure 2-1 and Figure 2-2 to place the instrument correctly, stably and reliably on the surface to be measured;

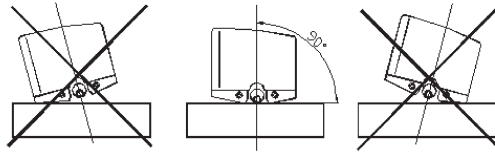


Figure 2-1 Front view

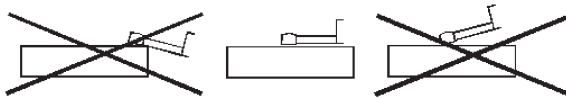


Figure 2-2 Side view

- d. Refer to Figure 2-3, trace of the pickup must be vertical to the direction of process line of the measured surface.

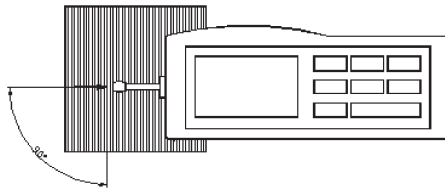


Figure 2-3 Measuring direction

**Instruction:**

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

## 2.2 BASIC MEASUREMENT STATUS

Press and release Power key to switch on. The instrument automatically displays model, name and information of manufacturer, and then enters basic measurement status, as shown in Figure 2-4.

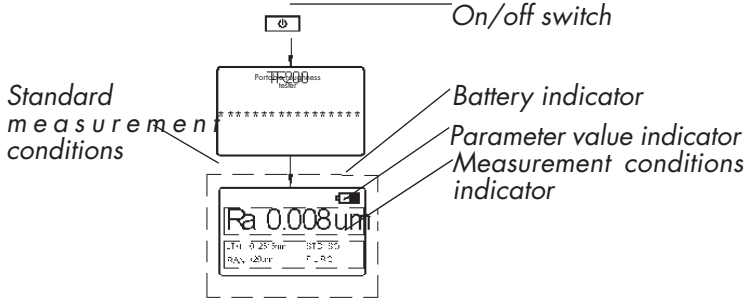


Figure 2-4 Switch-on process

### Instruction:

**Contents of basic measurement status entered in the first switch-on are default settings of this instrument. Settings and data of last switch-off will be displayed in the next switch-on. Basic measurement status will be entered automatically for each switch-on (as shown in Figure 2-4).**

Please don't keep pressing for a long time to switch on the instrument.

In basic measurement status, the follows can be perform:

- Measurement  
Press Start key to start measurement, as shown in Figure 2-5.

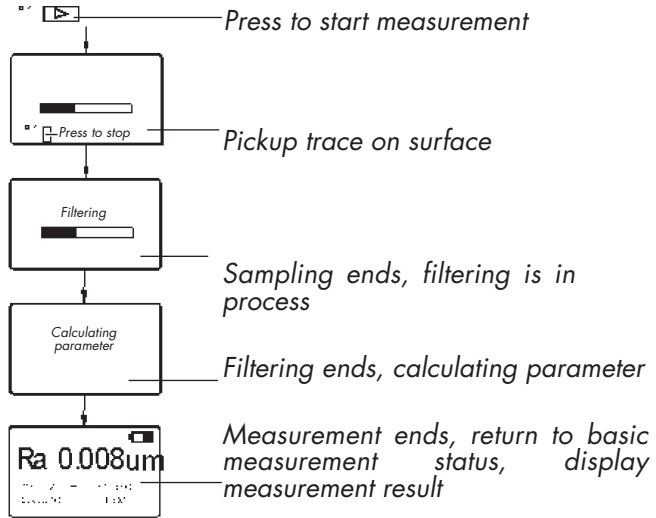


Figure 2-5 Measurement process

- Enter menu operation status  
Press Menu key to enter menu operation status. For detailed operation, see descriptions in corresponding chapters and sections later.
- Display measurement parameters  
Press Parameter key first to shows all parameter values of this measurement.  
Press Scroll key to scroll pages; secondly, press Parameter key to displays profile graphs of this measurement. Press Scroll key to roll profile graphs with other sampling lengths; thirdly, press Parameter key to displays tp curve and tp value of this measurement; Press the keys again will repeat above descriptions. Press Esc key in each status to return basic measurement status (as shown in figure below).

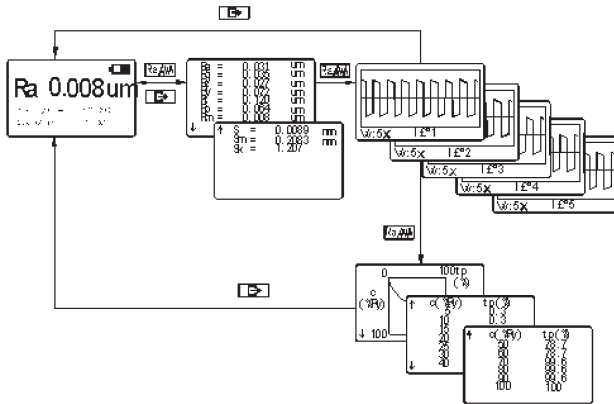


Figure 2-6 Display of parameters

- Display position of stylus  
Press Enter key to show the position of stylus in shortcut mode, which is easy to use in practical measurement.

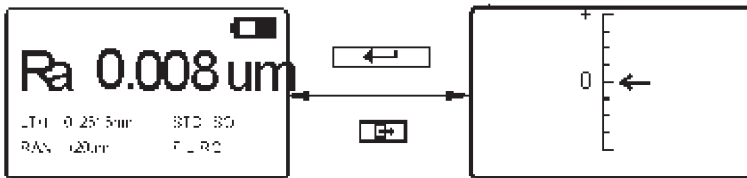


Figure 2-7 Position of stylus

**Instruction:**

1. Tester automatically stores results and conditions of last measurement before it is turned off, and will automatically enter this status while it is turned on again.
2. After entering basic measurement status, press Start key to measure, if measuring conditions are not needed to be changed.
3. If position of stylus is close to the limit of range or beyond it, adjust the position of pickup slightly. Note to keep in line with instructions in 2.1 Preparation for Measurement (adjustment is not needed generally).

## 2.3 MODIFYING CONDITIONS OF MEASUREMENT

Under basic measurement status, press Menu key to enter menu operation status.

Press Scroll key to select setting function of measured conditions, and then press Enter key to enter Set Measurement Conditions status. In this status, all measurement conditions can be modified (as shown in Figure 2-8).



Figure 2-8 Select set measurement conditions status

### 2.3.1 Sampling length

After entered setting status, press Scroll key to select Set Sampling Length. Press Enter key to cycle with 0.8 mm . 2.5mm . auto . 0.25mm (as shown in Figure 2-8). Stop at the value you want and press Scroll key to modify others.

### 2.3.2 Evaluation length press menu key

to enter menu operation status and press Scroll key to select Set Measurement Conditions. Press Enter key to enter Set Measurement and press Scroll key to select Set n\*cutoff. Press Enter to cycle with 1.2.3.4.5 (as shown in Figure 2-9) Stop at the value you want and press Scroll key to modify others.



Figure 2-9 Modifying Evaluation Length

#### Instruction:

**When sampling length is set to be automatic, evaluation length will automatically display value 5 to match. This value can not be modified.**

### 2.3.3 Standard press menu key

to enter menu operation status and press Scroll key to select Set Measurement Condition. Press Enter key for measurement setting and press Scroll key to select Set Standard. Press Enter key to cycle with ISO. DIN. JIS . ANSI.



Figure 2-10 Modifying standard

Table 2 standard code and name

Code	Standard name
ISO 4287	International standard
DIN 4768	German standard
JIS B601	Japanese industrial standard
ANSI B46.1	American standard

### 2.3.4 Range press menu key

to enter menu operation status and press Scroll key to select Set Measurement Conditions. Press Enter key for measurement setting and press Scroll key to select Set Range. Press Enter key to cycle with ±20µm.±40µm .±80µm .auto.



Figure 2-11 Modifying range

### 2.3.5 Filter

Press menu key to enter menu operation status and press Scroll key to select Set Measurement Conditions. Press Enter key for measurement setting and press Scroll key to select Set Filter. Press Enter key to cycle with RC.PC-RC.Gauss.D-P.



Figure 2-12 Modifying filter

### 2.3.6 Parameter

Press menu key to enter menu operation status and press Scroll key to select Set Measurement Conditions. Press Enter key for measurement setting and press Scroll key to select Parameter. Press Enter key to cycle with Ra..Rz.Ry.Rq (of which: five parameters of Ra.Rz.Ry.Rmax .Rq are available for ANSI[American Standard] and DIN[German Standard]). After confirmation, parameters selected will be displayed in basic measurement status.



Figure 2-13 Modifying parameters to display

## 2.4 SYSTEM SETUP

Press Menu key to enter menu operation status and press Scroll key to select System Setup. Press Enter key for system setting. In System Setup (as shown in Figure 2-14), modify contents of system settings.



Figure 2-14 Select system setup function



### 2.4.1 Language

Press menu key to enter menu operation status and press Scroll key to select System Setup. Press Enter key for system setting and press Scroll key to select Language. Press Enter key for language selection and press to select the language you want. Press Enter key to confirm.

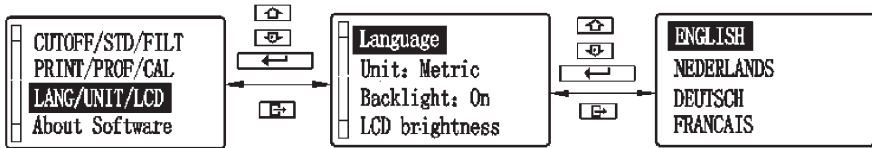


Figure 2-15 Language selection function

### 2.4.2 Unit

Press menu key to enter menu operation status and press Scroll key to select System Setup. Press Enter key for system setting and press Scroll key to choose Unit. Press Enter key to switch between metric system and British system.



Figure 2-16 Metric/British system switching function

### 2.4.3 Display

- a. LCD Back-light Press Menu key to enter menu operation status and press Scroll key to select System Setup. Press Enter key for system setting and press Scroll key to select LCD Back-light On/Off. Press Enter key to switch between On and Off.



Figure 2-17 Back-light On/Off Function

**Tip:**  
**press after turn on the TR-200 for back-light.**

- b. LCD Brightness Press Menu key to enter menu operation status and press Scroll key to select System Setup. Press Enter key for system setting and press Scroll key for LCD Brightness Adjustment. Press Enter key to enter LCD Brightness Adjustment and press Scroll key to adjust the brightness to satisfactory degree.

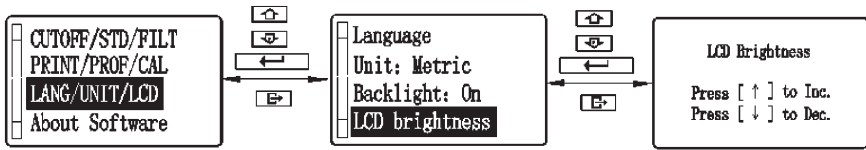


Figure 2-18 LCD Brightness Adjustment Function

## 2.5 FUNCTION SELECTION

Press Menu key to enter menu operation status and press Scroll key to select Function Selection. Press Enter key to enter Function Selection status. After that, select appropriate functions you want.



Figure 2-19 Choose function selection

## 2.5.1 Printing

Before printing, connect the tester to the printer with the communication cable as shown in Figure 2-20, and set the printer to On-line status.

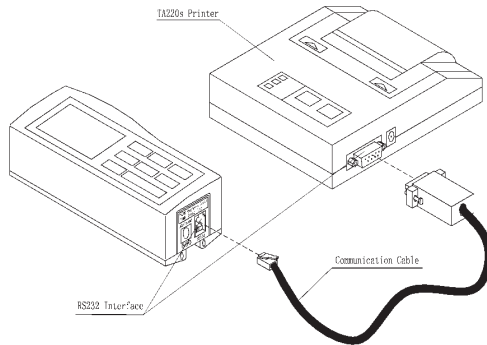


Figure 2-20 Connect printer instruction:

This tester is used with TA-series printers only. TA-210 only prints values of parameters. TA-220s prints values of parameters, profile graph and tp curve.

- a. **Print Parameters** Press Menu key to enter menu operation status and press Scroll key to choose Function Selection. Press Enter key to enter Function Selection status and press Scroll key to select Print Parameter. Press Enter key to print all measurement parameters (as shown in Figure 2-19).

### Instruction:

**Under basic measurement status, press key to print all parameter values.**

- b. **Print Parameter and Profile** Press Menu key to enter menu operation status and press Scroll key to choose Function Selection. Press Enter key to enter Function Selection status and press Scroll key to select Print Parameter and Profile. Press Enter key to start printing. The contents to print include all measurement parameters, profile figures after filtering and tp figure.



Figure 2-21 Choose print parameter and profile function

### 2.5.2 Primary profile

Press Menu key to enter menu operation status and press Scroll key to choose Function Selection. Press Enter key to enter Function Selection status and press Scroll key to select Primary Profile. Press Enter key to display Primary Profile (i.e. Direct Profile or Original Profile) in this measurement on LCD.

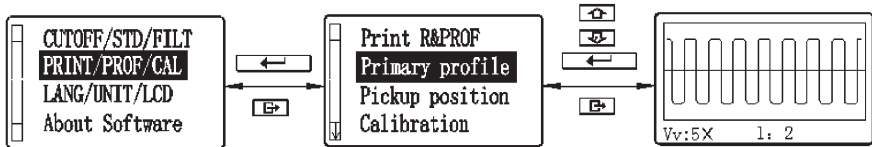


Figure 2-22 Select primary profile function

### 2.5.3 Stylus position press menu key

to enter menu operation status and press Scroll key to choose Function Selection. Press Enter key to enter Function Selection status and press Scroll key to select Stylus Position. Press Enter key to display the Stylus position.

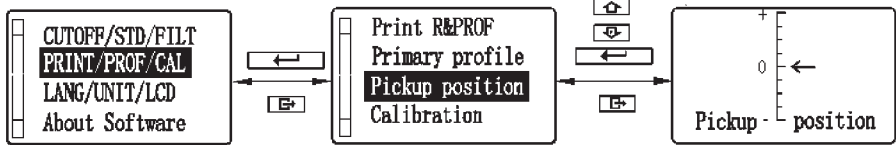


Figure 2-23 Select display stylus position function

### 2.5.4 Calibration

Press menu key to enter menu operation status and press Scroll key to choose Function Selection. Press Enter key to enter Function Selection status and press Scroll key to select Display Value Calibration function. Press Enter key to enter Calibration status and press Scroll key to change calibration coefficients. Press Enter key to move cursor.

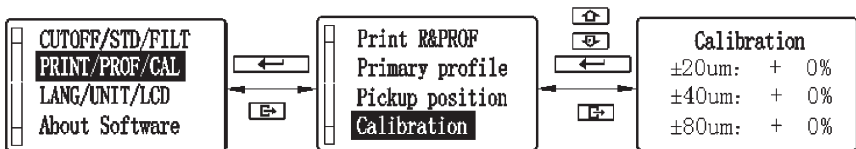


Figure 2-24 Select display value calibration function

**Instruction:**

1. **While using correct measuring method to test random sampling plate, if measured value exceeds  $\pm 10\%$  of the value of sampling plate, use Display Value Calibration function to calibrate according to the percentage of real deviation with calibration range within  $\pm 20\%$ .**
2. **Generally, instrument has been strictly tested before delivery so as to ensure display value error to be much less than  $\pm 10\%$ . In this case, user is suggested not to frequently use Display Value Calibration function.**

## **2.6 COMMUNICATION WITH PC**

Before communicating with PC, connect the instrument to serial interface of PC with communication cable attached to the instrument as shown in Figure 2-25, and enter private operation software Data View on PC.

*Figure 2-25 Connect PC instruction: to establish the communication between this instrument and PC, use Data View private software. Please refer to the Software Instruction for operation.*

### 3. OPTIONS AND USAGE

#### 3.1 ADJUSTABLE SUPPORTER AND SHEATH OF PICKUP

When measured surface of part is smaller than the bottom surface of the instrument, sheath of pickup and adjustable supporter of TR-200 options can be used for auxiliary support to complete the measurement (as shown in Figure 3-1 and 3-2).

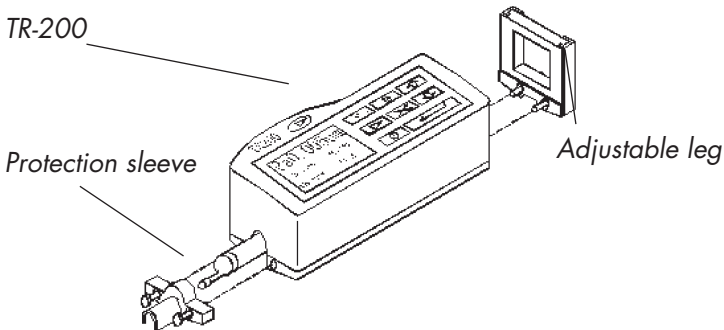


Figure 3-1 Connections of adjustable supporter and sheath of pickup

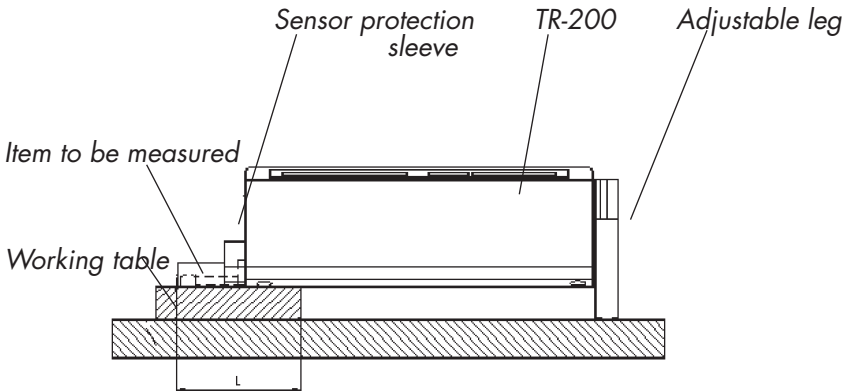


Figure 3-2 Usage of adjustable supporter and sheath of pickup

**Tip:**

1. **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.**

### 3.2 MEASUREMENT STAND

TA series 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. TA series 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.

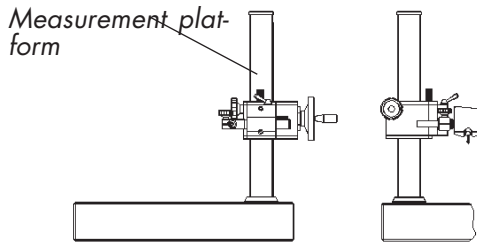


Figure 3-3 Measurement platform

### 3.3 EXTENDING ROD

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

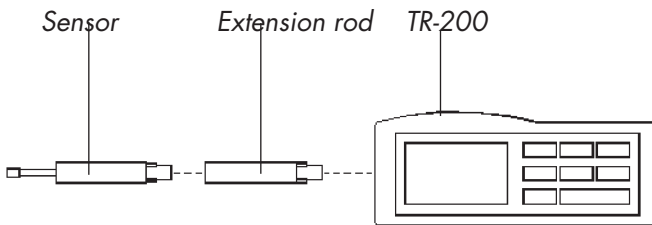


Figure 3-4 Extending Rod

### 3.4 CONNECTION ROD OF MAGNETIC GAUGE BASE

Connection rod connects the tester with magnetic gauge base so as to measure various surfaces of parts flexibly and easily as shown in figure 3-5. It's particularly suitable for production sites.

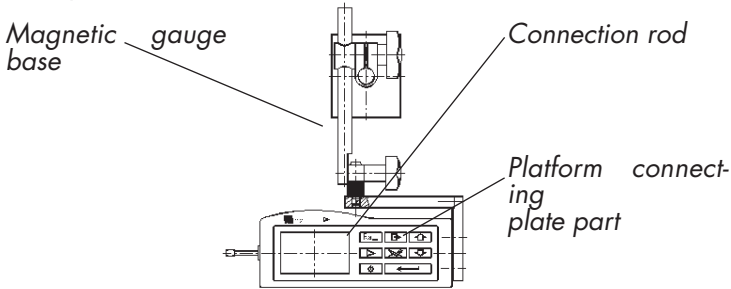


Figure 3-5 Connect the tester with magnetic gauge base

### 3.5 CURVED SURFACE PICKUP

Curved surface pickup can measure convex or concave surfaces of parts, as shown in the figure below.

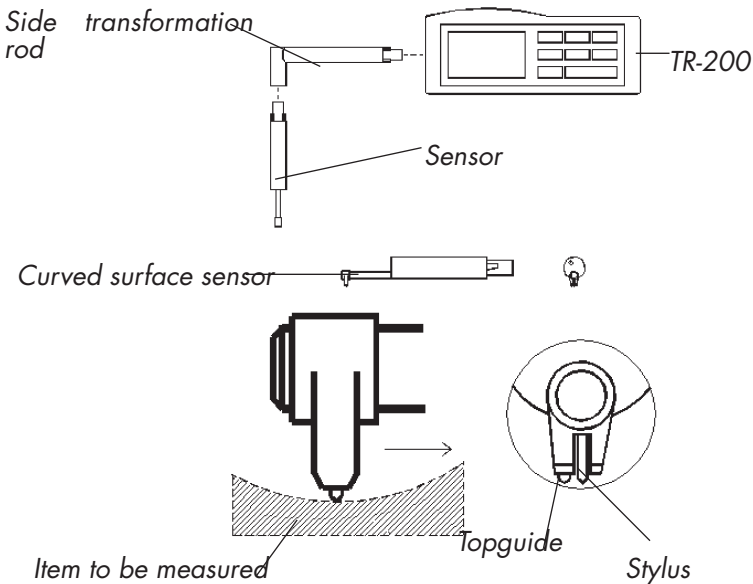


Figure 3-7 Curved Surface Pickup



## 4 TECHNICAL PARAMETER AND FEATURES

- Pickup
- Test principle Inductance type
- Measurement range 160 $\mu$ m
- Stylus tip radius 5 $\mu$ m
- Stylus tip material Diamond
- Measuring force 4mN (0.4gf)
- Stylus tip angle 90°
- Radius of skid curvature 45mm
- Maximum drive range: 17.5mm
- Traversing speed: measuring sampling length = 0.25mm  
 Vt=0.135mm/s  
 sampling length = 0.8mm Vt=0.5mm/s  
 sampling length = 2.5mm Vt=1mm/s  
 returning V=1mm/s
- Accuracy Less than or equal to  $\pm 10\%$
- Repeatability of displayed value Less than or equal to 6%
- Display content
  - Menu modify measurement conditions, calibration display value and select communication with PC or printing.
  - Parameter parameters of roughness compatible with four standards of ISO, DIN, ANSI and JIS.
  - Graph Primary profile, filtered profile and tp curve.
  - Prompt information measurement, menu prompt, errors, battery capacity and switch-off prompt information.
- Profile and filter
  - Filtered Profile RC
  - Filtered Profile PC-RC
  - Filtered Profile Gauss
  - Non-Filtered Profile D-P
- Sampling length /cut-off length Automatic, 0.25mm,0.8mm,2.5mm
- Evaluation length (1~ 5) \*sampling length

- Roughness parameter and display range
 

Parameter	Display range
Ra	0.005 $\mu$ m ~ 16 $\mu$ m
Rq	0.005 $\mu$ m ~ 16 $\mu$ m
Rz	
R3z	
Ry	
Rt	
Rp	
Rm	0.02 $\mu$ m ~ 160 $\mu$ m
Sk	0 ~ 100%
S	
Sm	1mm
tp	0 ~ 100%
- Measuring rang and resolution
 

Automatic	0.01 $\mu$ m ~0.04 $\mu$ m
$\pm$ 20 $\mu$ m	0.01 $\mu$ m
$\pm$ 40 $\mu$ m	0.02 $\mu$ m
$\pm$ 80 $\mu$ m	0.04 $\mu$ m
- Power supply
  - AC adapter Rating 6V, 500mA
  - Supply voltage: 220V
  - Built-in battery(Lithium ion battery):
  - Charging time: 2.5 hours
  - Consecutive work time per charge: more than 20 hours
  - Auto-sleep function: display turns off if not operated for 5 minutes
- Temperature
  - Working environment 0 $^{\circ}$ C~ 40 $^{\circ}$ C
- Humidity:
  - < 90% RH
- Store and transportation:
  - Temperature: - 40 $^{\circ}$ C ~ 60 $^{\circ}$ C
  - Humidity: < 90% RH
- Dimensions
  - LxWxH: 141x56x48mm
- Weight
  - Mass: approximately 430g
- Connect with PC
  - Standard RS-232 serial interface
- Connect to printer
  - Connect with TA series printers only.
  - TA-210 printer only prints parameters.
  - TA-220s can print parameters as well as profile figures.

## **5. GENERAL MAINTENANCE**

- Avoid crash, intensive vibration, heavy dust, humidity, grease stain and strong magnetic field;
- Pickup is a precise part and should be protected carefully. Put it back in the package box after operation of each time;
- Protect standard sample plate provided with tester carefully so as to avoid calibration fault caused by scratching.

### **5.1 TROUBLESHOOTING**

When the tester breaks down, handle the troubles according to measures described in next section 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 warranty card and sample plate attached. Phenomenon of problem should be explained.

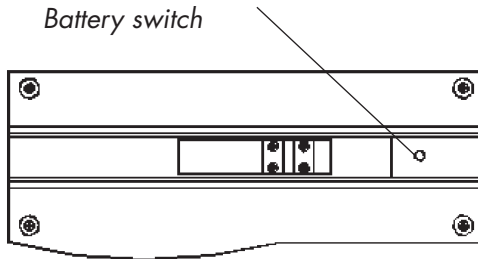
## 5.2 FAULT INFORMATION

Table 6

Display content	Cause	Solutions
Out of Range	Maximum value of measured signal exceeds measuring range; 3. Measure again.	1. Press Esc key to return; 2. Enter menu setting status, increase measuring range, press Esc key to return;
No data	Wrong operation results in failed measuring;	1. Press Esc key to return; 2. Check if preparation for measuring is correct; 3. Switch on and measure again.
A/D failure	Hardware circuit fault;	Scheme 1: Switch off and switch on again; Scheme 2: Press Reset key; Scheme 3: Return to factory to repair.
Motor failure	Mechanical fault;	Scheme 1: Switch off and switch on again; Scheme 2: Press Reset key; Scheme 3: Return to factory to repair.
Pickup failure	Pickup is in automatic return process	1. Press Esc key to return and wait till pickup returns to the start position; 2. Measure again.
Working abnormally		1. Turnoff and then restart 2. switch the battery off, then switch the battery on 10 seconds later.

## 6. BATTERY SWITCH

The battery switch is at the bottom of the instrument.



*Figure 6-1 Battery Switch*

When the TR-200 is delivered the battery switch is off, User should set the switch on before use it. If TR-200 don't start up after the battery switch is turned on, press ON/OFF button. Keep the battery switch on unless the TR-200 will not be used for a long period of time. If the battery switch is off, the measurement results will be lost.

## 7. REFERENCES

### 7.1 PROFILE AND FILTER

#### 7.1.1 Profile

- a. Primary profile:  
non-filtered profile signal obtained by pickup from measured surface.
- b. Filtered profile:  
profile signal after primary profile is filtered to remove waviness.

#### 7.1.2 Filter

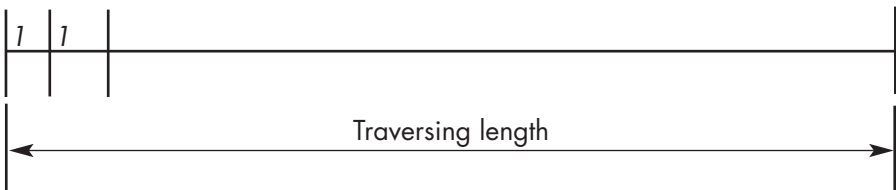
- a. RC filter:  
analogue 2RC filter with phase difference;
- b. PC-RC filter:  
RC filter with phase-correction;
- c. Gauss filter:  
DIN4777
- d. D-P (direct-profile):  
adopt central line of Least Square Algorithm.

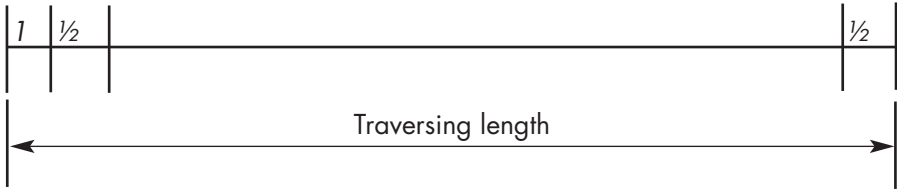
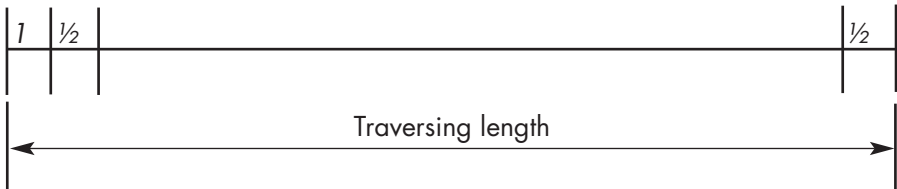
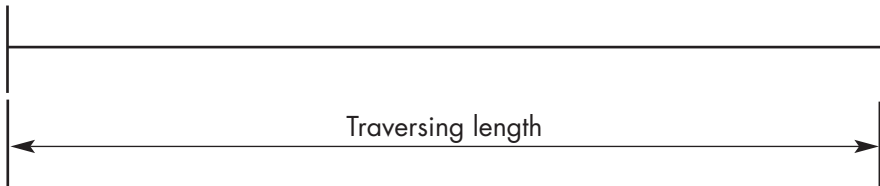
### 7.2 CENTRAL LINE

TR-200 adopts central line of Least Square Algorithm.

### 7.3 TRAVERSING LENGTH

#### 7.3.1 RC Filter



**7.3.2 PC-RC filter****7.3.3 Gauss filter****7.3.4 D-P Direct profile**

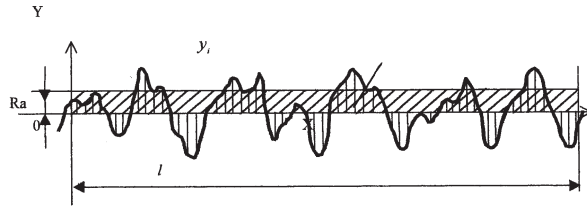
## 7.4 DEFINITIONS OF TR-200 ROUGHNESS PARAMETERS

This section gives definitions of TR-200 measurement parameters.

### 7.4.1 Arithmetical mean deviation of profile

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

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



### 7.4.2 Rq root-mean-square deviation of profile

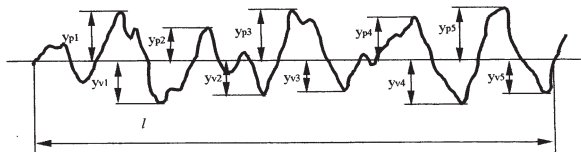
Rq is the square root of the arithmetic mean of the squares of profile deviation ( $Y_i$ ) from mean within sampling length.

$$Rq = \left( \frac{1}{n} \sum_{i=1}^n y_i^2 \right)^{\frac{1}{2}}$$

### 7.4.3 Rz ten point height of irregularities

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.

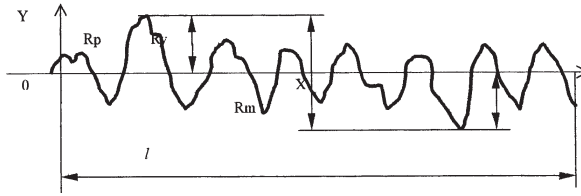
$$Rz = \frac{\sum_{i=1}^5 y_{pi} + \sum_{i=1}^5 y_{vi}}{5}$$





### 7.4.4 Ry (ISO) maximum height of profile

Ry is The sum of height Rp of the highest profile peak from the mean line and depth Rv of the deepest profile valley from the mean line within sampling length.



### 7.4.5 Ry (DIN) maximum height of profile

To get Ry (DIN) value: firstly calculate Ryi in each sampling length, the maximum of which is the Ry (DIN) for the evaluation length.

### 7.4.6 Rt Total peak-to-valley height

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

### 7.4.7 Rp maximum depth of profile peak

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

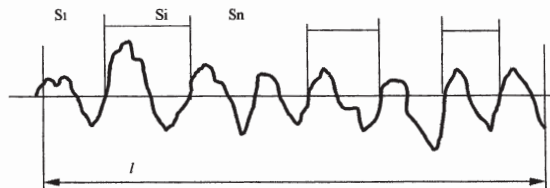
### 7.4.8 Rm maximum depth of profile valley

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

### 7.4.9 Sm mean spacing of profile elements

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

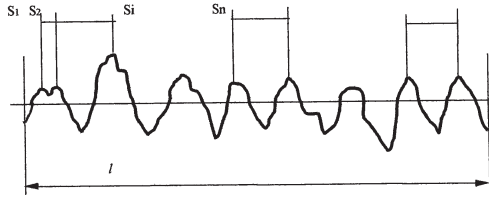
$$RSm = \frac{1}{n} \sum_{i=1}^{i=n} Si$$



**7.4.10 S Mean spacing of local peaks of profile**

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

$$RS = \frac{1}{n} \sum_{i=1}^{i=n} S_i$$

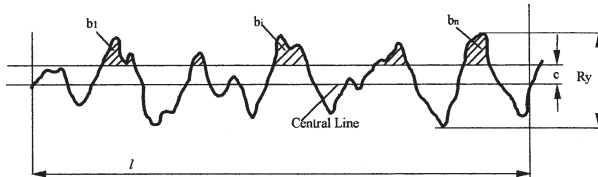


**7.4.11 tp Profile bearing length ratio**

The bearing ratio tp is the length of bearing profile, at a depth c below the highest peak. Tp(%) is the ratio at the depth c.

$$tp = \frac{\eta_p}{l}$$

$$\eta_p = b_1 + \Lambda \Lambda + b_i + \Lambda \Lambda + b_n$$



**7.4.12 Sk Skewness of the profile**

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

$$RS_k = \frac{1}{R_q^3} \times \frac{1}{n} \sum_{i=1}^n (y_i)^3$$

**7.4.13 R3z third maximum peak-to-valley height**

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.

## EC-DECLARATION OF CONFORMITY

This certifies that the following designated product  
**TR-200 (Surface roughness tester)**  
complies with the essential protection requirements of  
Council Directive 89/336/EEG approximation of the laws of the  
Member States relating to electromagnetic compatibility.

This declaration applies to all specimens manufactured  
in accordance with the manufacturing drawings  
which form part of this declaration.

Assessment of compliance of the product with the requirements relating  
to the compatibility was based on the following standards:  
EN55022, EN60555-2, EN60555-3, EN50082-1

This declaration is the responsibility of the manufacturer/importer:

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Telephone / Telefax: +31-43-3520060 / +31-43-3631168  
Name of the subscriber: Nicole Paulissen-Schiffer  
Position: General Manager

Maastricht



**City**

**Authorised representative signature**

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