OPERATION MANUAL

HARTIP 3000+

PORTABLE HARDNESS TESTER

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1 Leeb Hardness Test (definition)

An impact body with a spherical test tip made of tungsten carbide is propelled against the sample surface by a spring force and then rebounds back. At a distance of 1mm from the sample surface, the impact and rebound velocities of the impact body are measured by the following method: when passing through the coil in its coil holder, a permanent magnet embedded in the impact body induces in the coil an electric voltage proportional to the velocity of the magnet. Leeb hardness (HL) is expressed by

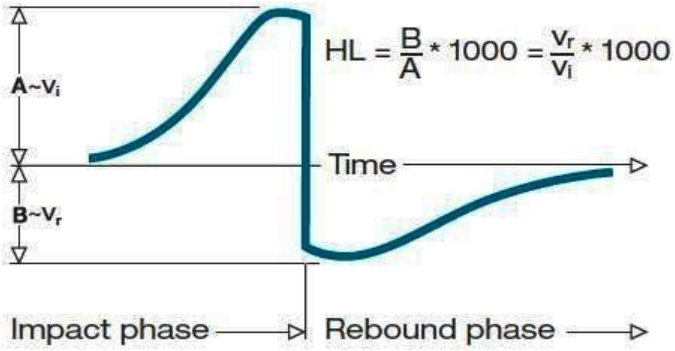
$$HL = \frac{Vr}{Vi} * 1000$$

Where HL = Leeb Hardness

V_r = rebound velocity of the impact body

V_i = impact velocity of the impact body

The output voltage of the coil when the impact body passes through the induction coil is illustrated in the following figure:



A Leeb's Hardness Tester measures the hardness of sample material in terms of Hardness Leeb (HL), which can be readily converted into other Hardness units (Rockwell B and C, Vickers, Brinell and Shore D, etc.)

Notation of Leeb's Hardness

When measuring the hardness of a sample material using the traditional static hardness testing method, a change of applied pressure will result in a change in the hardness reading. This will also happen during a Leeb's Hardness test when one changes the impact device. In hardness measurement of the same test sample with different impact devices, the Leeb's hardness values obtained will vary.

For example: 720HLD≠720HLC

Because different converting curves are obtained from different impact devices, when converting hardness HL into another hardness values, the notation for the converted hardness value should include the impact device used.

For example:

Hardness HV converted from hardness HL using impact device D+15 should be written as 22, 8 HV LD+15.

Where: 22=Hardness value HL

8=Hardness value HV

L=Leeb's Method

D+15=Impact device

Hardness HRC converted from hardness L using impact device D should be written as 35, 9 HRCLD.

Where: 35=Hardness value HL

9=Hardness value HRC

L=Leeb's Method

D=Impact device

2 Specifications, Features and Applications

2.1 Introduction

HARTIP 3000+ is a new generation of Leeb hardness tester with more advanced technology and features. The tester applies our new patent dual-coil sensor technology which makes the tester more accurate than old previous model. All impact devices (probes) do not need to set up impact direction. HARTIP 3000+ can work with both analogy impact device and wireless RF probe.
The measuring values can be downloaded to PC and printer by wireless or by cable.
The HARTIP 3000+ also can be powered by USB power supply without battery via PC cable.

2.2 Specifications

Principle	Leeb hardness measurement
Accuracy	±0.3% @ HL=800
Repeatability	±2HL
Display resolution	1HL, 0.1HRC
Display	2.8" 320 x 240 TFT color LCD - suitable under sunshine
Hardness scale	HL/HRC/HRB/HB/HV/HS/HRA/ MPa
Measuring range	HL100-960 / HRC0.9-79.2 / HRB1.0-140 / HB1-1878 / HV1-1698 / HS0.5-1370 / HRA1.0-88.5 / MPa(rm)1-6599N/mm^2
Impact device	standard cable probe D DC / DL / D+15 / G / C / E
Materials and curves	12 common metal materials
Indicator	Upper limit / Lower limit / low battery / buzzer warning / date and time
Communication interface	USB / RS232
Continuous working time	>40 hours
Power supply	1.5V AA alkaline battery x 4 / 1.2V nickel-hydrogen rechargeable battery x 4 / 3.7V Li-ion rechargeable battery x 4 / USB power supply
Working environment	-10°C ~ + 45°C
Dimension	195x84x38mm
Weight	550g (battery not included)
Standard	Conforming to ASTM A956, DIN 50156, GB/T 17394-1998

2.3 Features

- ✓ No need to setup different impact direction
- ✓ Higher accuracy with dual-coil technology
- ✓ TFT large color LCD with pixel 320 x 240
- ✓ Multi-color style – suitable under sunshine
- ✓ Real date and time
- ✓ Calibration by user

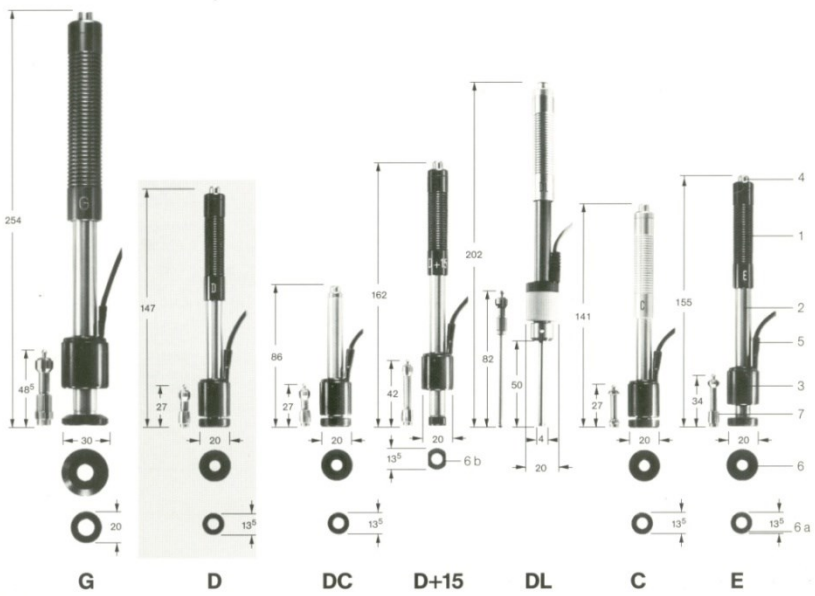
2.4 Applications

- ✓ Hardness tests on installed machines or steel structures: heavy and large work-pieces or permanently installed system parts.
- ✓ Rapid testing of multiple measuring areas for examination of hardness variations over larger regions.
- ✓ Hardness measurements for produced parts on production line.
- ✓ Identifying metallic material stored in warehouse.
- ✓ Ineffectiveness analysis of permanent parts, pressure -vessels, turbo generators, etc.

3 Hardness Tester Parts Names

3.1 Main body

3.2 Types of Impact Devices



1 Loading tube
2 Guiding tube
3 Coil holder with coil
4 Release button
5 Connecting cable leading to the indicating device with coil plug
6 Large supporting ring
7 Impact body

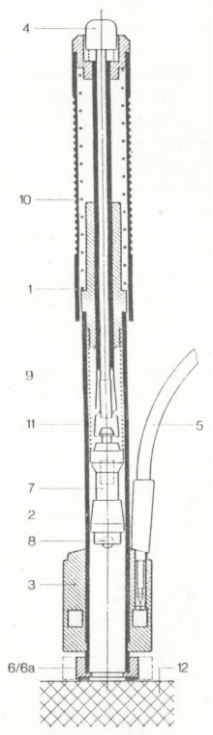
3.3 Special Features of Impact Devices

Type	Brief description	
D	Universal standard unit for majority of hardness testing assignments.	
DC	Extremely short impact device, other specs identical with type D.	
	Application:	- highly confined spaces - holes and cylinders - internal measurements on assembled machines
D+15	Slim front section	
	Application:	- grooves and recessed surfaces.
DL	Extremely slim front section	
	Application:	- extremely confined spaces - base of grooves
C	Reduced impact energy (compared with type D).	
	Application:	- surface hardened components, coatings - minimum layer thickness: 0.2mm. - thin walled or impact sensitive components (small measuring indentation).
E	Synthetic diamond test tip (approx.5000 HV).	
	Application:	- extremely high hardness measurement such as high carbon steel up to 1200 HV
G	Increased impact energy(approx. 9 times that of type D)	
	Application:	- Brinell hardness range only - heavy cast and forged parts with lower demands on surface finish.

3.4 Internal Structure of Impact Devices

Status: impact spring stressed

1 Loading tube
2 Guiding tube
3 Coil with holder
4 Release button
5 Connection cable (3-pole)
6 Large support ring
6a Small support ring
7 Impact body
8 Spherical test tip
9 Impact spring
10 Loading spring
11 Catch chuck
12 Material under test



Impact device model DC is not equipped with a loading tube; since it is loaded by means of a separate stick.
Impact devices should not be disassembled; otherwise misalignments in the spring system and the transmitter will occur.

4 Symbols and Illustrations

4.1 Meaning of Various Symbols

Symbol	Meaning
LD	Leeb hardness value obtained with impact device D
LDC	Leeb hardness value obtained with impact device DC
LG	Leeb hardness value obtained with impact device G
LC	Leeb hardness value obtained with impact device C
LD15	Leeb hardness value obtained with impact device D+15
LE	Leeb hardness value obtained with impact device E
LDL	Leeb hardness value obtained with impact device DL

Symbol	Meaning
HL	Leeb hardness value
HRC	Rockwell C hardness value
HRB	Rockwell B hardness value
HB	Brinell hardness value
HV	Vickers hardness value
HS	Shore hardness value
HRA	Rockwell A hardness value
MPa	Intensity of tension

4.2 Measurement and Conversion Table

Range for measurement and conversion:

PROBE D/DC			HLD: 100-960				
MATERIALS	HRC	HRB	HB	HV	HS	HRA	MPa(N/mm^2)
STEEL/CAST STEEL	1-74.7	1.2-140	28-1027	45-1230	4.0-112	7-88.5	118-3315
ALLOY TOOL STEEL	0.9-78.7	*	15-1878	32-1698	5.5-128	*	79-6599
STAINLESS STEEL	3.7-62.4	8.3-101.7	85-655	36-802	6-131	*	108-1725
LAMELLAR IRON	21-59	24-100	35-570	90-698	6-83	*	*
NODULAR IRON	21-60	24-100	62-857	96-724	8-90	*	*
CAST ALUMINUM	1-48	24-85	19-445	22-193	3-64	*	129-2618
BRASS	1-53	1.5-99.6	32-477	29-495	5-65	32-76	258-4146
BRONZE	1-56	14-100	15-505	11-535	2-68	29-76	190-1860
WROUGHT COPPER	1-54	14-100	39-569	38-590	6-73	*	*
FORGING STEEL	1-72	*	50-1060	48-1110	7-103	*	200-3750
ROLLING STEEL	1-72	*	82-1380	83-1440	14-117.8	*	310-4860

PROBE DL	DL: 100-980						
MATERIALS	HRC	HRB	HB	HV	HS	HRA	MPa(N/mm^2)
STEEL/CAST STEEL	1-73	1.5-109.5	1-1026	1-1167	0.5-100	*	24-3517
ALLOY TOOL STEEL	2.4-79.2	*	5-1489	2.0-1556	1-122	*	38-5063
STAINLESS STEEL	*	*	*	*	*	*	*
LAMELLAR IRON	*	*	*	*	*	*	*
NODULAR IRON	13-78.4	38-110	50-1271	5-1160	1.5-102	*	*
CAST ALUMINUM	1-57	1.6-120	3-736	12-645	2.5-74	*	*
BRASS	*	*	*	*	*	*	*
BRONZE	*	*	*	*	*	*	*
WROUGHT COPPER	*	*	*	*	*	*	*
FORGING STEEL	*	*	*	*	*	*	*
ROLLING STEEL	*	*	*	*	*	*	*

PROBE E	HLE: 100-960						
MATERIALS	HRC	HRB	HB	HV	HS	HRA	MPa(N/mm^2)
STEEL/CAST STEEL	6.3-78.5	3-140	24-1144	24-1369	3.6-121	1-88	54-3800
ALLOY TOOL STEEL	10.5-83.2	*	8-1840	24-1659	10-1370	*	1-1460
STAINLESS STEEL	*	*	*	*	*	*	*
LAMELLAR IRON	*	*	*	*	*	*	*
NODULAR IRON	*	*	*	*	*	*	*
CAST ALUMINUM	*	*	*	*	*	*	*
BRASS	*	*	*	*	*	*	*
BRONZE	*	*	*	*	*	*	*
WROUGHT COPPER	*	*	*	*	*	*	*
FORGING STEEL	*	*	*	*		*	*
ROLLING STEEL	1.4-81	*	98-1529	68-1541	16-124	*	262-5274

PROBE G	HLG: 100-900						
MATERIALS	HRC	HRB	HB	HV	HS	HRA	MPa(N/mm^2)
STEEL/CAST STEEL	*	1-133	10-946	*	*	*	*
ALLOY TOOL STEEL	*	*	19-804	*	*	*	*
STAINLESS STEEL	*	*	10-844	*	*	*	*
LAMELLAR IRON	*	*	5-804	*	*	*	*
NODULAR IRON	*	*	5-998	*	*	*	*
CAST ALUMINUM	*	1-120	8-635	*	*	*	*
BRASS	*	*	*	*	*	*	*
BRONZE	*	*	*	*	*	*	*
WROUGHT COPPER	*	*	*	*	*	*	*
FORGING STEEL	*	*	*	*	*	*	*
ROLLING STEEL	*	*	*	*	*	*	*

PROBE C	HLC: 100-960						
MATERIALS	HRC	HRB	HB	HV	HS	HRA	MPa(N/mm²)
STEEL/CAST STEEL	5-72.5	*	23-953	23-1125	5-111	*	*
ALLOY TOOL STEEL	4-77.2	*	*	43-1566	*	*	*
STAINLESS STEEL	*	*	*	*	*	*	*
LAMELLAR IRON	*	*	*	*	*	*	*
NODULAR IRON	*	*	*	*	*	*	*
CAST ALUMINUM	*	*	*	*	*	*	*
BRASS	*	*	*	*	*	*	*
BRONZE	*	*	*	*	*	*	*
WROUGHT COPPER	*	*	*	*	*	*	*
FORGING STEEL	*	*	*	*	*	*	*
ROLLING STEEL	*	*	*	*	*	*	*

PROBE D+15	HLD+15: 100-960						
MATERIALS	HRC	HRB	HB	HV	HS	HRA	MPa(N/mm²)
STEEL/CAST STEEL	1-69.8	*	12-999	12-1221	2-112	*	*
ALLOY TOOL STEEL	1.3-78	*	*	2.0-1485	*	*	*
STAINLESS STEEL	*	*	*	*	*	*	*
LAMELLAR IRON	*	*	*	*	*	*	*
NODULAR IRON	*	*	*	*	*	*	*
CAST ALUMINUM	*	*	*	*	*	*	*
BRASS	*	*	*	*	*	*	*
BRONZE	*	*	*	*	*	*	*
WROUGHT COPPER	*	*	*	*	*	*	*
FORGING STEEL	*	*	*	*	*	*	*
ROLLING STEEL	*	*	*	*	*	*	*

5 Preparation before Measuring

5.1 Requirements to the sample

Surface temperature of the sample should be lower than 120 °C.
The sample must feature a metallic smooth and ground surface, in order to eliminate erroneous measurements caused by coarse grinding or lathe scoring. Roughness of the finished surface should not exceed values shown in following table:

Types of impact devices	Max surface roughness of sample Ra
D/ DC, D+15,DL,E	2μm
G	7μm
C	0.4μm

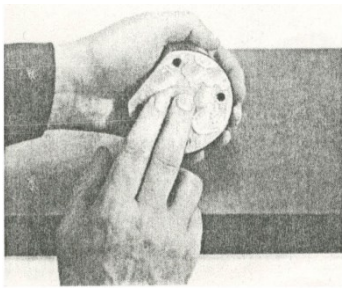
5.2 Requirements related to sample weight

For samples weighing over 5 kg and of compact shape, no support is needed.
Samples weighing between 2-5 kg, and also for heavier samples with protruding parts or thin walls, should be placed on a solid support in such a manner that they do not bend or move by the impact force.
Samples weighing less than 2 kg should be firmly coupled with a stable support weighing over 5 kg.
For coupling purposes,

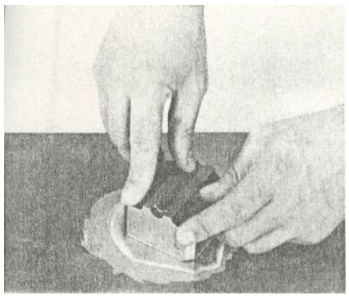
The coupling surface between the sample and base plate should be flat, plane parallel and ground.
A proper thin layer of coupling paste is to be applied to the contact surface of the sample.
The sample should be firmly pressed against the base plate surface by moving it with a circular motion.
The direction of impact should be perpendicular to the coupling surface.
For the coupling operation, the following prerequisites must be fulfilled:
Contact surface between the sample and the base plate must be flat, plane parallel and ground.
The direction of the test impact must be perpendicular to the coupled surface.
Minimum thickness of the sample for coupling under various impact devices are shown in following table:

Types of impact devices	**Minimum thickness**
D/DC,D+15,DL,E	3mm
G	10mm
C	1mm

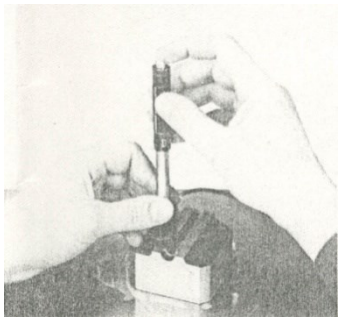
Proper Coupling:
Proper coupling requires a little experience. Insufficiently coupled samples produce large variation among measurements and abnormally low L-values while the operation is characterized by a rattling noise upon impact of the test tip.
Examples for coupling a test piece with a base plate:



Application of the coupling paste
(As thin as possible).



Mutual rubbing of both parts while firmly press the sample against the base plate.



A particular advanced of coupling is the possibility of obtaining a very uniform, rigid connection between the sample and the support, totally eliminating stresses at the sample surface. The resulting variation in measured values is very low.

Requirement on the surface-hardened layer of the sample

Surface-hardened steels, especially case-hardened steels, produce L-values which are too low when case-hardening depth is small because of their soft core .When measuring with impact devices D, DC, D+15, DL or E,

depth of the hardened layer should be no less than 0.8 mm. When measuring with impact device C, the depth of the hardened layer should be no less than 0.2 mm.

Types of impact devices	Min. layer thickness for surface hardening
D/DC, D+15,DL,E	0.8mm
C	0.2mm
G	1.8mm

The test sample should not be magnetic.

For test sample of curving surface, where the radius of curvature R is less than 30mm, a small support ring should be applied.

Requirement on sample weight using various impact devices

Types of impact devices	Classification of samples		
	Heavy-weight	medium-weight	light-weight
D/DC, D+15,DL,E	>5kg	2 - 5kg	0.05 – 2kg
G	>15 kg	5 - 15kg	0.5 – 5kg
C	>1.5kg	0.5 - 1.5kg	0.02 - 0.5kg

When measuring hardness with HARTIP 3000+, the following has to be noticed: Despite the low mass of the impact body and low impact energy, a relatively large impact force within short duration is generated when the impact body hits the measuring surface.

Types of impact devices	D/DC, D+15, DL, E	G	C
Max. impact force	900N	2500N	500N

No particular precautions are necessary for heavy-weight samples with compact shape.

Smaller and lighter samples or workpieces may yield or flex under this force, producing too-low L-values with excessively large variation. Even with big or heavy workpieces, it is possible for thin-wall regions or thinner protruding parts to yield upon impact. Depending on the frequency of the resilient yielding action, the measured L-value may be abnormally low or high. Under many situation, potential problems can be checked in the following manner:

a) Medium-weight samples and also heavier samples with protruding parts or thin walls should be placed on a solid support in such a manner that they do not move or bend during the test impact.

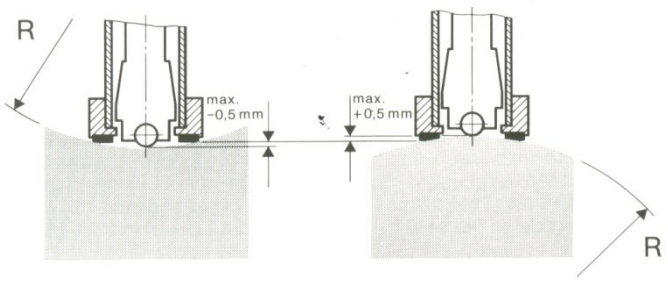
b) Light-weight samples should be rigidly “coupled” with a non-yielding support such as a heavy base plate. Clamping in a vice is of no value, since the samples become exposed to stress, and complete rigidity can never be attained. Consequently, measured L-values would be too small and show excessive variations.

Samples with Curved Surfaces

Impact testers only work properly if the impact body has a certain position in the guiding tube at the moment of impact. In the normal position when testing flat and convex-cylindrical samples (such as round samples), the spherical test tip is located exactly at the end of the guiding tube.

However, when testing spherically or cylindrically shaped concave surfaces, the impact body remains further within the guide tube or protrudes further therefore. Thus, with such types of curved surfaces, it should be observed that the radius of curvature R is larger than the values indicated in the following Figure.

Curved surfaces should always be tested with the small support ring.



Impact device types D/DC, D+15, C and E Rmin=30mm

Impact device type G Rmin=50mm

For impact devices D, DC, D+15, C and E, special support rings are available to accommodate smaller radii on convex or concave surface.

Types of impact devices	Support Ring	Radius for Curved Surface (mm)
D/DC, D+15,C,E	Standard support ring	>60
	Small support ring	60-30
C	Standard support ring	>100
	Small support ring	100-50

6 Operation

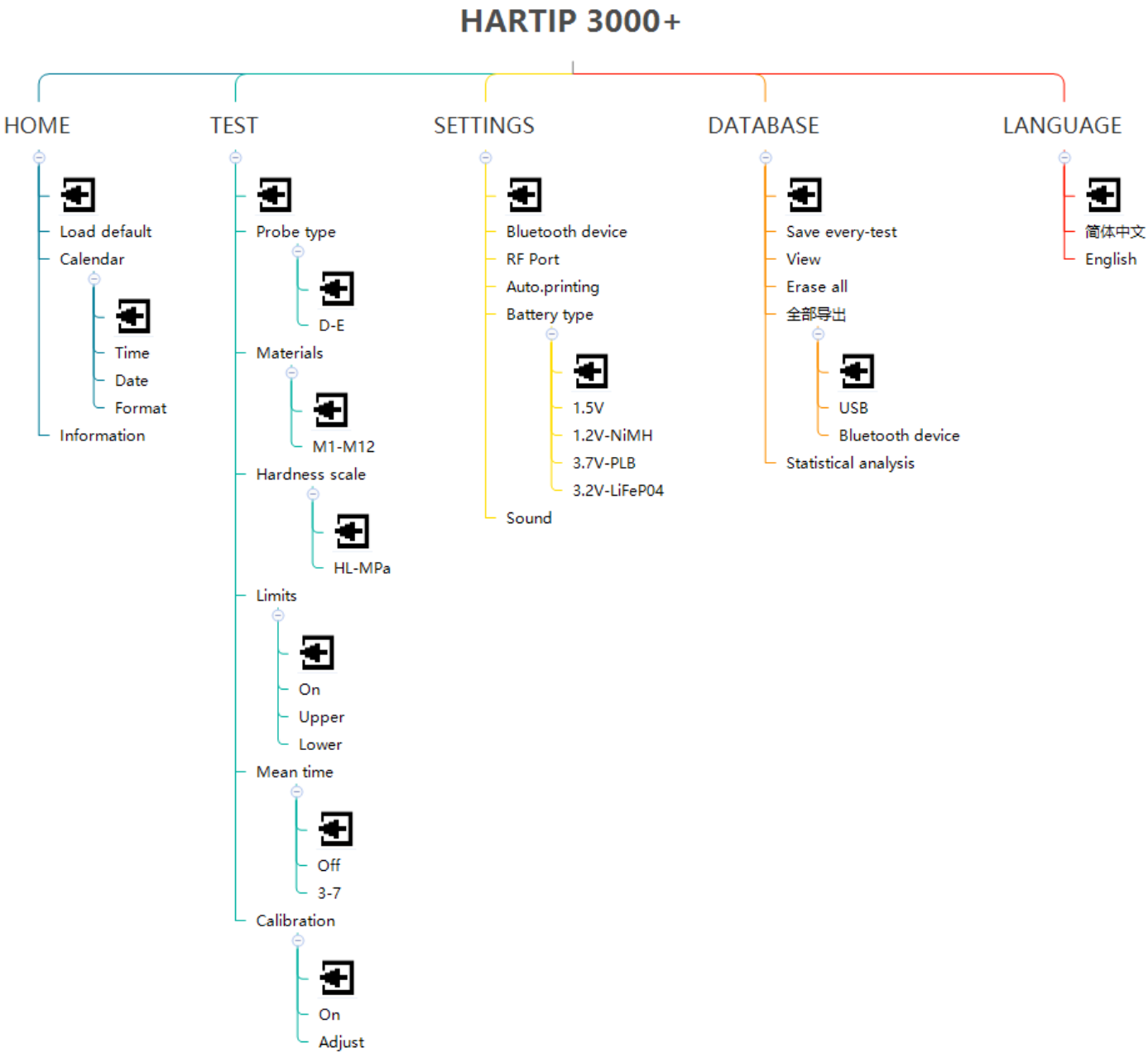
6.1 Function of Key and operation diagram

6.1.1 Function of Key

	Power	Press it shortly: to switch the tester on. Press and hold it: to switch the tester off.
	Bluetooth	Press it shortly: to enable Bluetooth function (Optional)
	Lightness	Press it shortly: to adjust the lightness
	Data Review	Press it shortly: to enter data review mode
	Display	Press it shortly: to switch measuring modes

	Test Menu	Press it shortly: to enter test menu
	Upward Increase	Press it shortly: to move the cursor up Press it shortly: to increase current number
	Downward Decrease	Press it shortly: to move the cursor down. Press it shortly: to decrease current number
	Leftward	Press it shortly: to move the cursor left
	Rightward	Press it shortly: to move the cursor right
	Delete Back to measuring mode	Press it shortly: to delete data Press it shortly: to go back to measuring mode
	Enter Back to measuring mode	Press it shortly: to confirm. Press it shortly: to go back to measuring mode

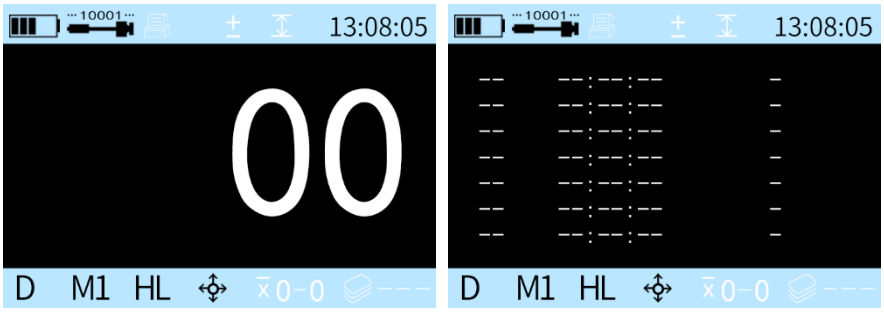
7 Operation Diagram



7.1 Turn On/Off the Instrument

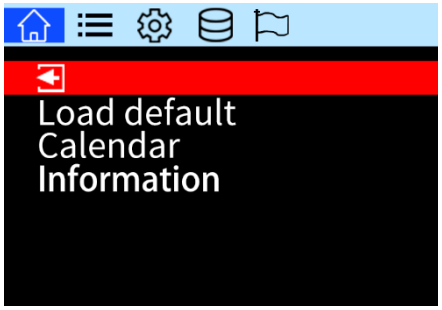
Press  shortly to turn on the instrument, then the tester will enter measuring mode, Press and hold  to turn off the tester.

Press  to switch different measuring modes.



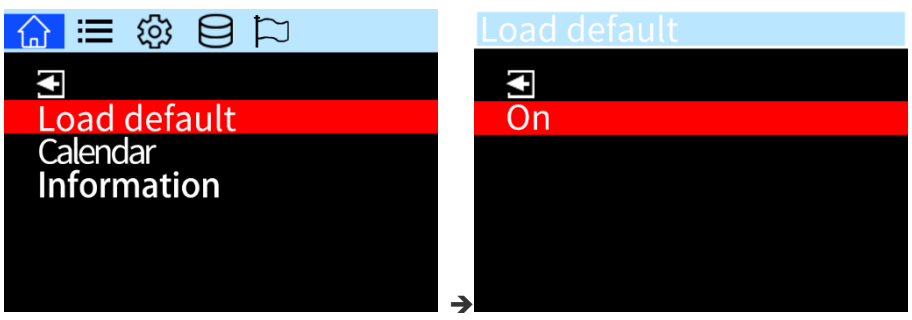
7.2 Home Menu

Press  to enter test menu and then press  to enter home menu. Press  or  to select different items. Press  to enter. After adjustment, press  to confirm. Press  or  to return to Measuring screen.



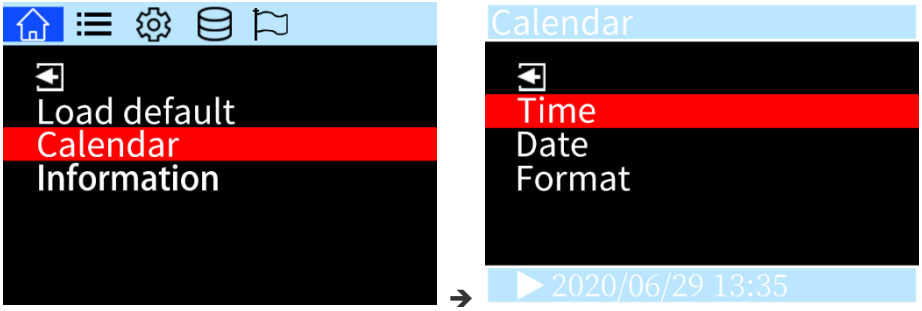
7.3 Load Default

Press  to enter test menu and then press  to enter home menu. Press  or  to select Load Default. Press  to enter. Select “ON” and then press  to load default setting. Press  to go back to Home menu, or press  to return to Measuring screen.



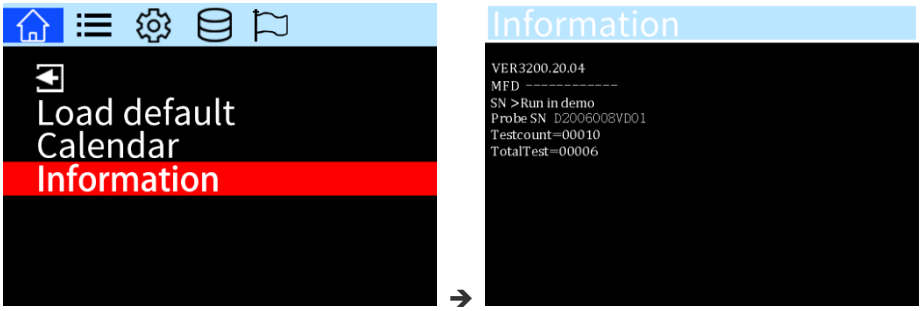
7.4 Calendar

Press  to enter test menu and then press  to enter home menu. Press  or  to select Calendar. Press  to enter. Select Time / Date / Format and press  to adjust. Press  to go back to Home menu, or press  to return to Measuring screen.



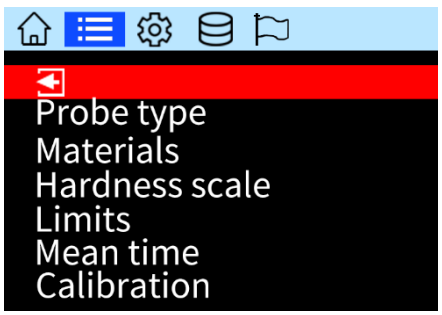
7.5 Information

Press  to enter test menu and then press  to enter home menu. Press  or  to select Information. Press  to show information page. Press  to go back to Home menu, or press  to return to Measuring screen.



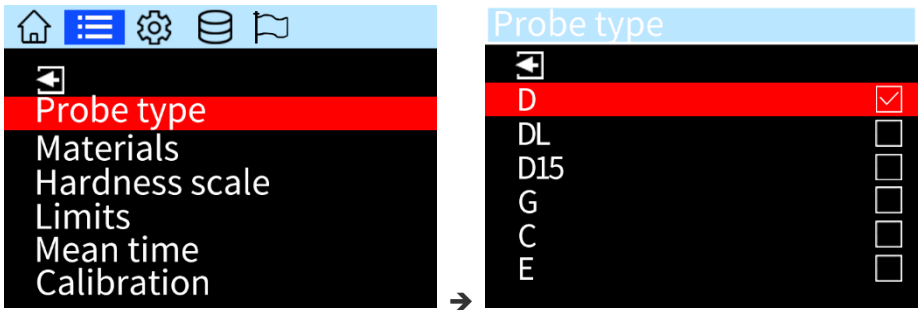
7.6 Test Menu

After starting, press  to enter test menu. Press  or  to select the item. Press  to enter selected item. After adjustment, press  to confirm. Press  to go back to Test menu, or press  to return to Measuring screen.



7.7 Probe Type

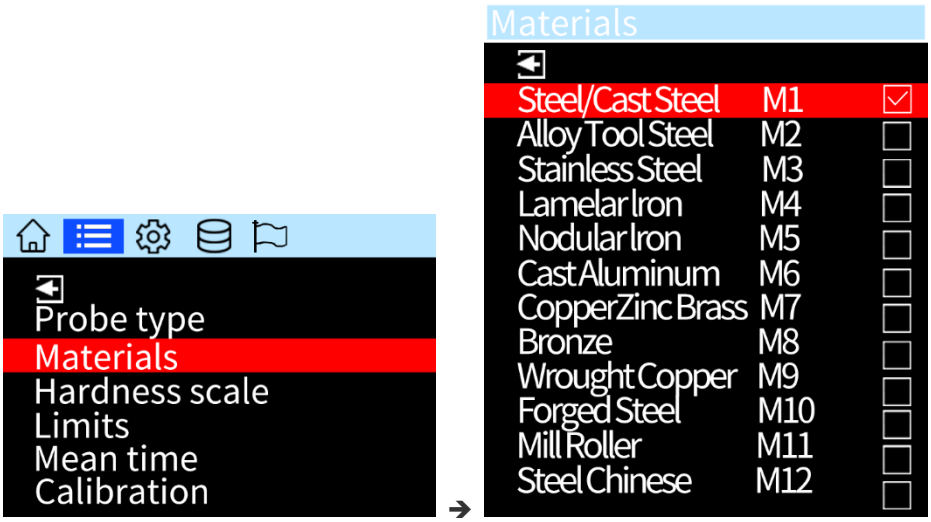
Press  to enter test menu. Press  or  to select Probe type, then press  to enter. Press  or  to select suitable Probe type, press  to confirm. You may select "D→DL→D15→G→C→E" probe. Press  to go back to Test menu, or press  to return to Measuring screen.



Note: Please select D if you use DC probe.

7.8 Materials

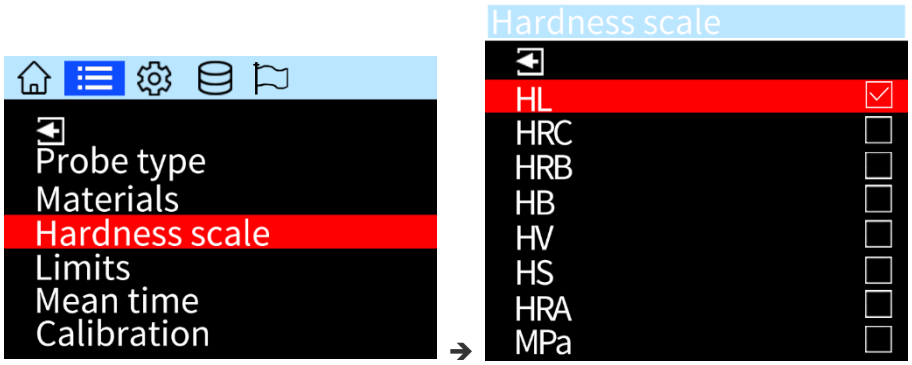
Press  to enter test menu. Press  or  to select Materials, then press  to enter. Press  or  to select suitable Material, there are 12 types of material, press  to confirm selection. Press  to go back to Test menu, or press  to return to Measuring screen.



Note: M1, M10, M12 are all steel, and the difference between them: the conversion of M1 Hardness Unit follows the corresponding international standard; the conversion of M10 Hardness Unit follows the corresponding state standard (forged steel); the conversion of M12 Hardness Unit follows the corresponding state standard (steel rolling). There are some numerical differences between the three standards. The user should select the proper one.

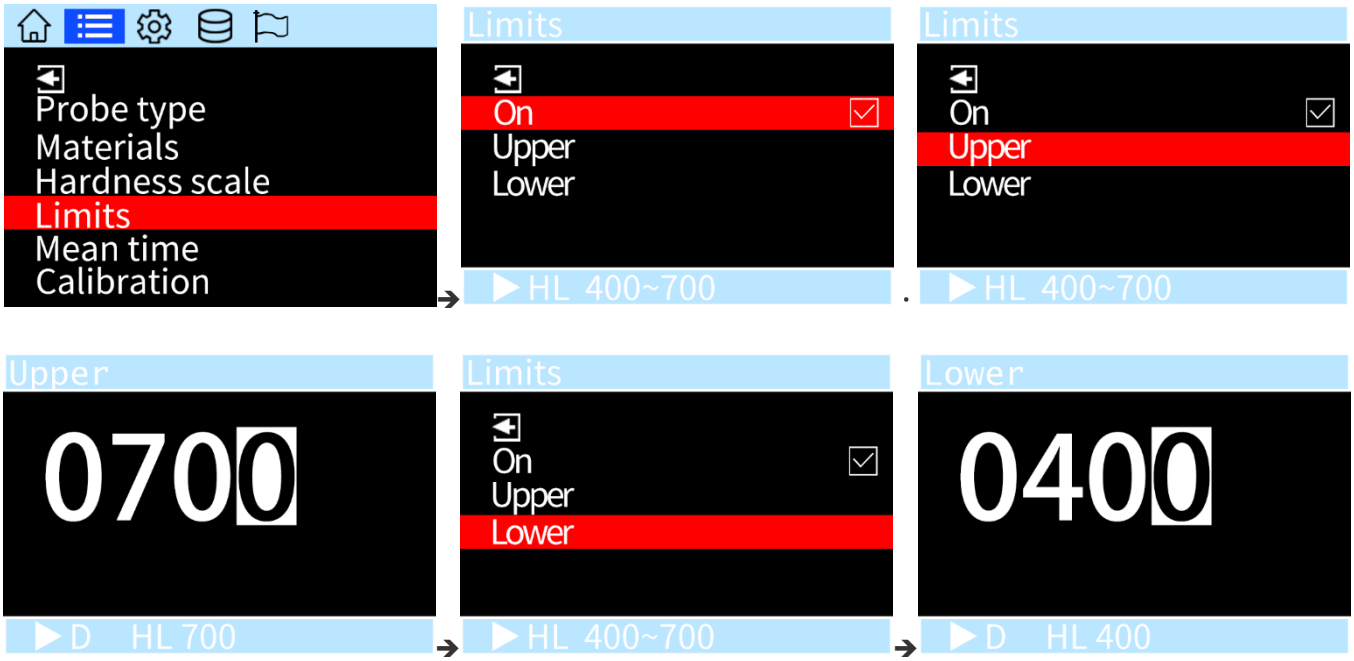
7.9 Hardness Scale

Press  to enter test menu. Press  or  to select Hardness Scales, then press  to enter. Press  or  to select suitable Hardness Scale, press  to confirm selection. Press  to go back to Test menu, or press  to return to Measuring screen.



7.10 Upper/Lower Limits

Press  to enter test menu. Press  or  to select Limits, then press  to enter. Press  to go back to Test menu, or press  to return to Measuring screen.

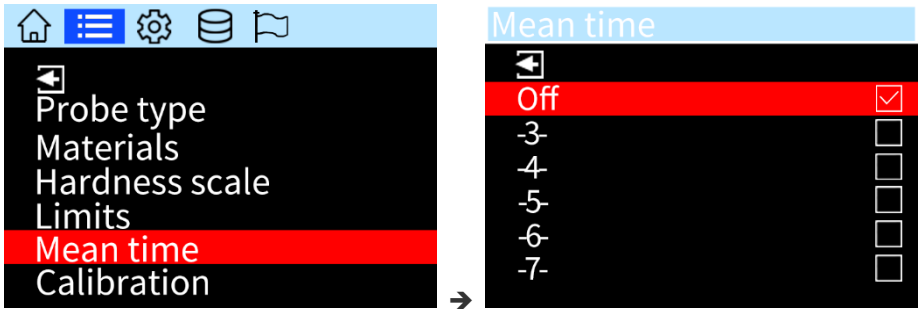


Select “On” to enable pre-set Upper/Lower Limit, and display “ ” in Measure screen. After enabling, the Voice Prompt is enabled by default. After overrun, prompt three sounds. If the measurement is above the Upper Limit, “△” displays next to the readings. If the measurement is under the Lower Limit, “▽”displays next to the readings. Select “Off” to disable Upper/Lower Limit prompt. Select “Upper” or “Lower” to adjust.
The Upper Limit must be higher than the Lower Limit, otherwise, the settings are invalid.

The settings of Upper/Lower Limit will impact the statistics of the qualified rate. Any value overrun is deemed as disqualified, otherwise, it is deemed as qualified.

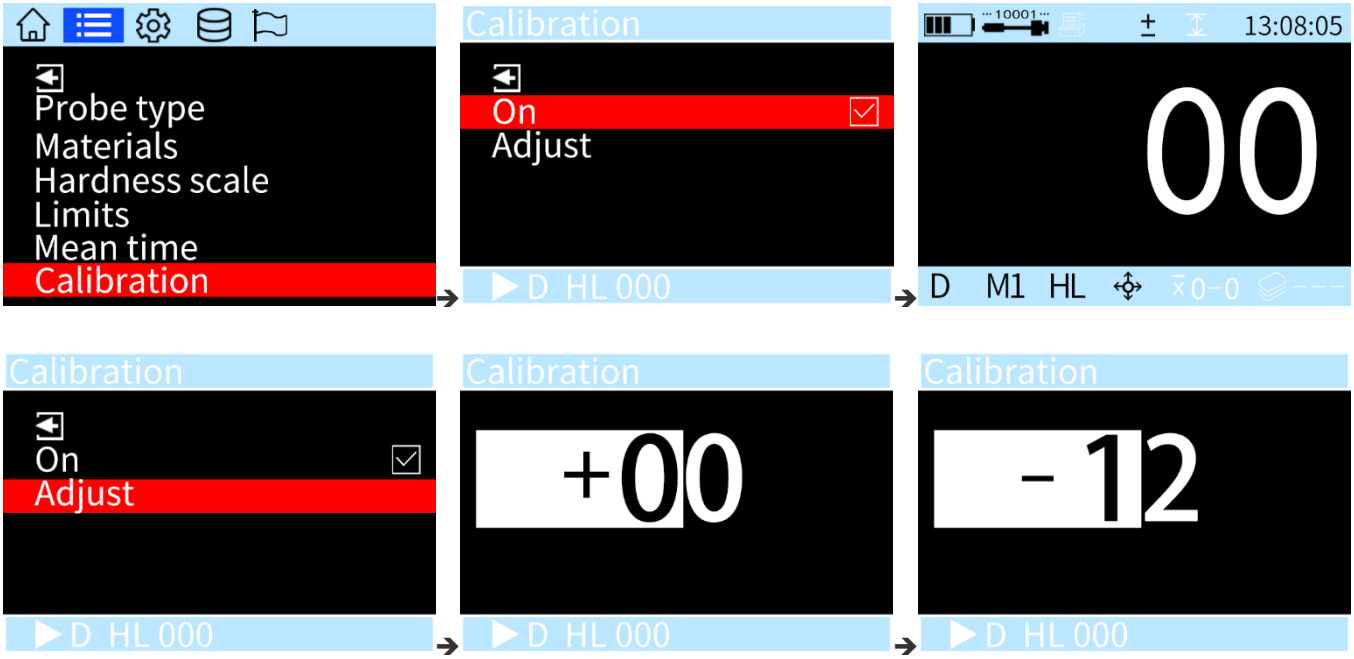
7.11 Mean Time

Press  to enter test menu. Press  or  to select Mean Time, then press  to enter. Press  or  to select suitable times, then press  to confirm. Press  to go back to Test menu, or press  to return to Measuring screen.



7.12 Calibration

Press  to enter test menu. Press  or  to select Calibration, then press  to enter. Select "ON" to enable Calibration mode, then select "Adjust" to enter adjustment page. Press  or  to adjust the value. After adjustment, press  to confirm. Press  to go back to Test menu, or press  to return to Measuring screen.



On: To enable / disable the calibration.

Before calibration, please load factory default settings first (refer to 7.3 Load Default), then select calibration menu, then adjust value according to the accuracy, finally press ↵ to accept changes. After Calibration is done, the symbol ± will be displayed at the top line of the screen.

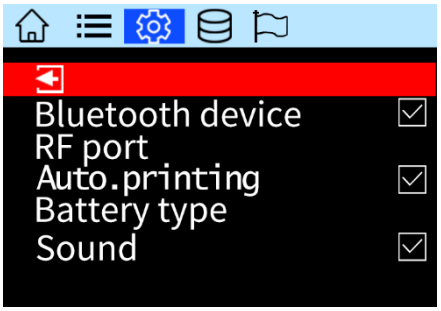
Note: before formal measuring using the instrument, check if the calibration is correct.

Note: if the calibration value is set to 0, the Calibration cannot be enabled.

Note: Calibration is only a temporary way to ensure measurement accuracy. It is not recommended conduct calibration frequently to ensure accuracy of the instrument. For permanent calibration, please contact the manufacturer.

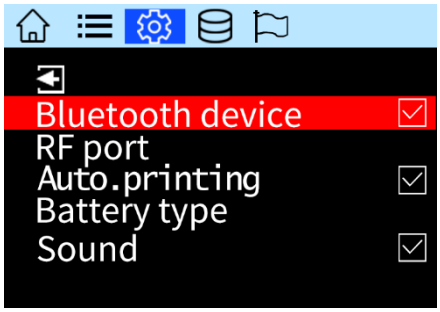
7.13 Configuration Menu

Press ⚙ to enter test menu and then press ▶ to enter Configuration menu. Press ▲ or ▼ to select different items. Press ↵ to enter. Press ◀ to go back to Configuration menu, or press 🗑 to return to Measuring screen.



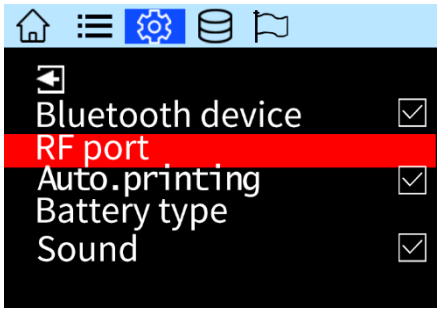
7.14 Bluetooth Device (Optional)

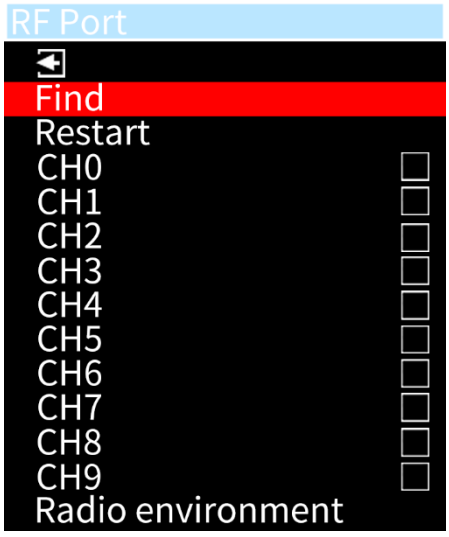
Press  to enter test menu and then press  to enter Configuration menu. Press  or  to select Bluetooth device. Press  to enable / disable Bluetooth function. After selection, press  or  to go back to Measuring screen.



7.15 RF port (Optional)

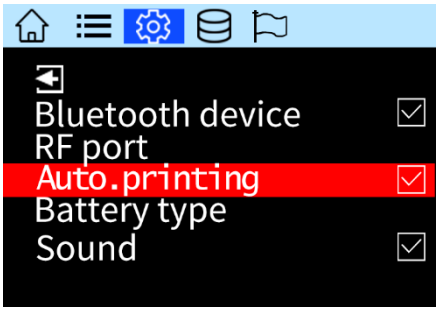
Press  to enter test menu and then press  to enter Configuration menu. Press  or  to select RF port, then press  to enter. After selection, press  to go back to Configuration menu, or press  to return to Measuring screen.





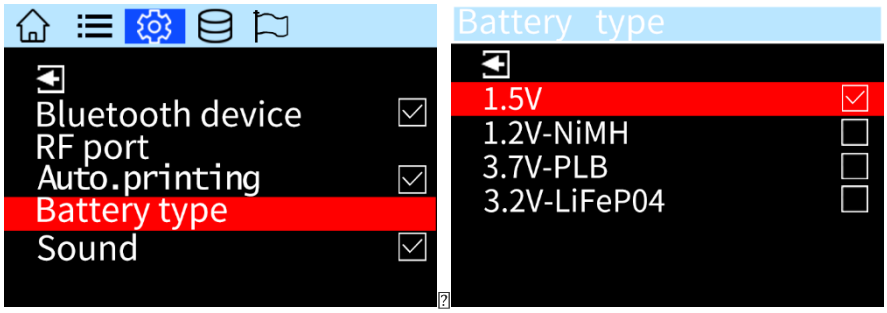
7.16 Auto. Printing

Press  to enter test menu and then press  to enter Configuration menu. Press  or  to select Auto. Printing. Press  to enable / disable Auto. Printing. After selection, press  or  to go back to Test menu, press  to go back to Measuring screen.



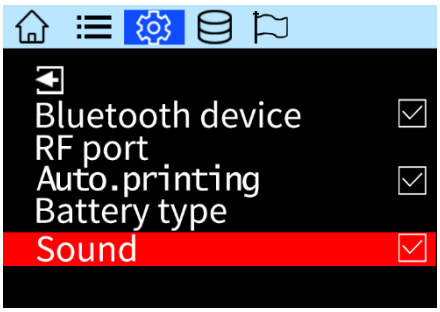
7.17 Battery Type

Press  to enter test menu and then press  to enter Configuration menu. Press  or  to select Battery Types then press  to confirm. After selection, press  to go back to Configuration menu, press  to go back to Measuring screen.



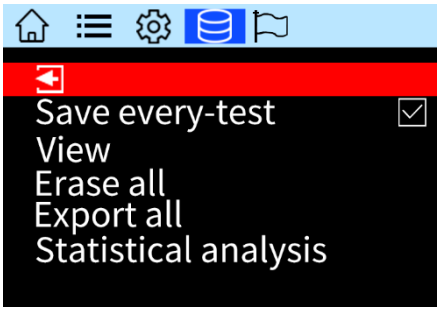
7.18 Sound

Press  to enter test menu and then press  to enter Configuration menu. Press  or  to select Sound then press  to enable / disable sound indicator. After selection, press  or  to go back to Test menu, press  to go back to Measuring screen.



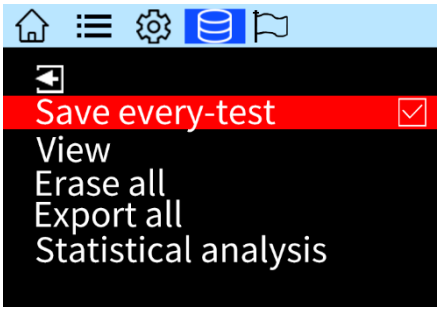
7.19 Database

Press  to enter test menu and then press  to enter database menu. Press  or  to select different items. Press  to confirm. Press  to go back to Database menu, or press  to return to Measuring screen.



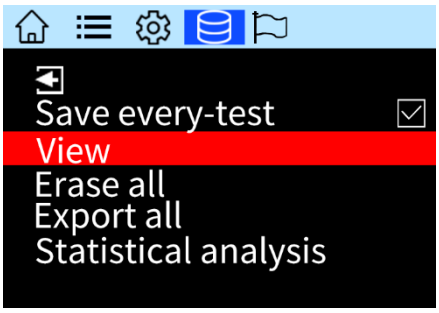
7.20 Save every-test

Press  to enter test menu and then press  to enter Database menu. Press  or  to select Save every-test, then press  to enable / disable this function. After selection, press  or  to go back to Measuring screen.



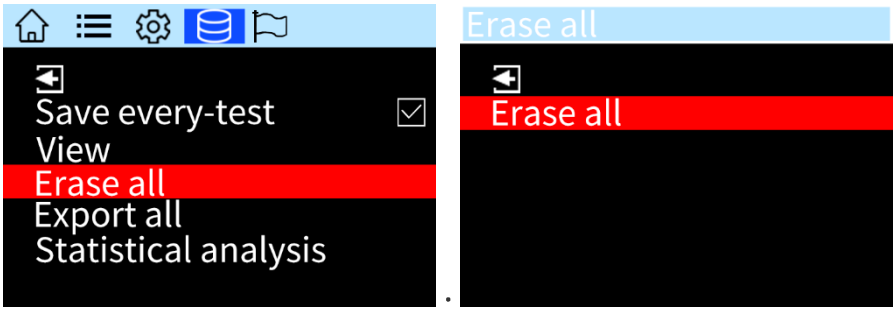
7.21 View

Press  to enter test menu and then press  to enter Database menu. Press  or  to select View, then press  to enter view page. After selection, press  to go back to Database menu or press  to go back to Measuring screen.



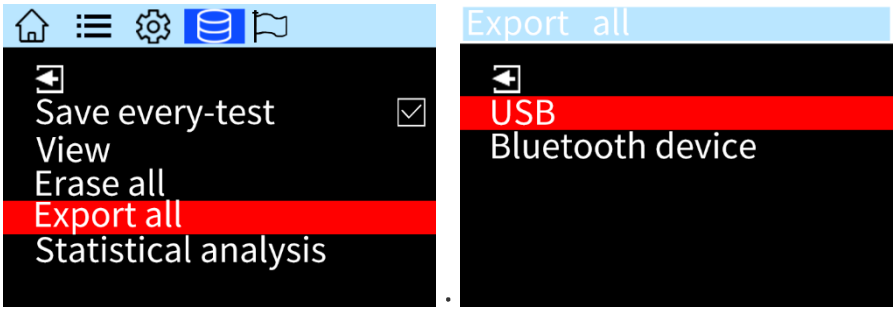
7.22 Erase All

Press  to enter test menu and then press  to enter Database menu. Press  or  to select Erase All, then press  to enter Erase all page. Press  or  to go back to Database menu.



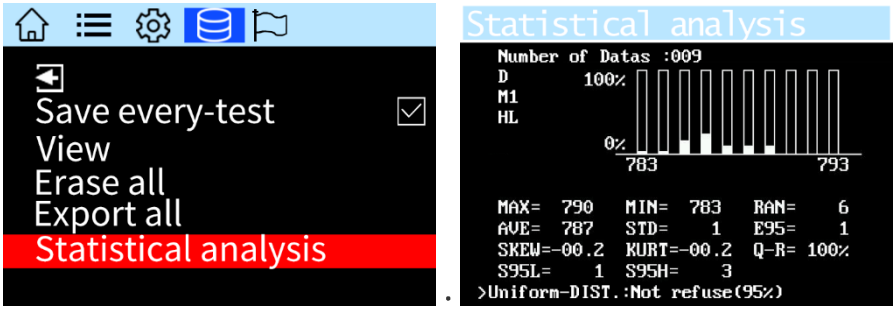
7.23 Export All

Press [⚙] to enter test menu and then press [▶] to enter Database menu. Press [▲] or [▼] to select Export All, then press [↵] to enter Export all page. Press [←] or [🗑] to go back to Database menu.



7.24 Statistical analysis

Press [⚙] to enter test menu and then press [▶] to enter Database menu. Press [▲] or [▼] to select Statistical analysis, then press [↵] to enter Statistical analysis page. Press [←] or [🗑] to go back to Database menu.



Statistical analysis was used to analyses the test results of a batch of tested materials in order to find the characteristics.

To perform statistics analysis, the data amount shall be 4 at least, otherwise, displaying “The data amount is less than 4”.

For statistics analysis, the data type of the two groups shall be consistent for calculation, otherwise, displaying “Data in FILE are different types”. Consistent data type covers the sensor, materials and unit.

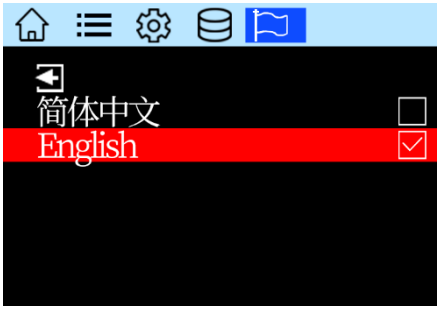
FILE A: Group A

NUM: Data amount in current group

D M1 HL: Probe, Materials, Hardness Unit
RAN (?): Range
AVE: Average value
STD (?): Standard Deviation
E95 (?): Mean 95% Confidence Intervals (Standard Deviation)
SKEW (?): Skewness
KUPT: Kurtosis
S95H (?): Standard Deviation, 95% Confidence Intervals Upper Limit, S95L: Standard Deviation 95% Confidence Intervals Lower Limit
Uniform-DIST.: Not refuse (95%) (?): Uniform distribution: Not refuse (95%)
Normal or Uniform: Not refuse (95%): normal distribution or uniform distribution: Not refuse (95%)
Normal-DIST.: Not refuse (95%): normal distribution: Not refuse (95%)
Neither Uniform nor Normal DIST: Neither normal distribution nor uniform distribution.

7.25 Language Menu

Press  to enter test menu and then press  to enter Language menu. Press  or  to select different languages. Press  to confirm. Press  or  to return to Measuring screen.

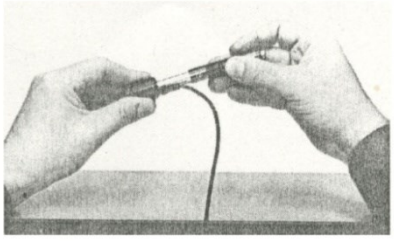


7.26 Measuring Procedure

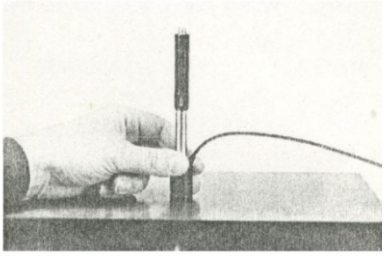
7.26.1 Turn on the tester

Press  shortly to turn on the instrument, then the tester will enter measuring mode, Press and hold  to turn off the tester. Before turning on the tester, please make sure to put suitable batteries and connect probe well.

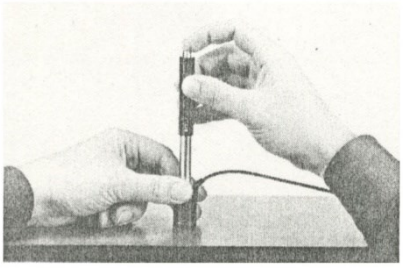
Measuring with cable probe



Loading: Press down the loading tube to lock the impact body inside the impact device.



Placing: Place and press the support ring beneath the impact device on the surface of work-piece under test. Distance between two test points should be no less than 3mm.

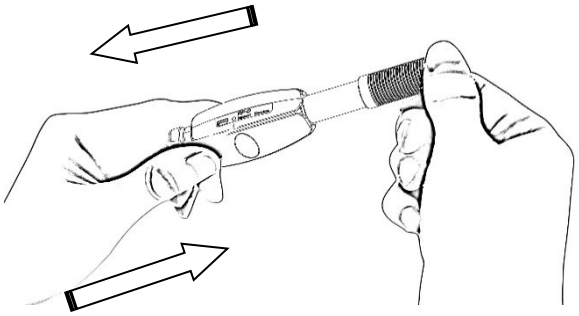


Starting: Press the button on top of the impact device to release the locked impact body to complete the measurement.

When one measurement is finished, the measured hardness value and related parameters will show on LCD. During the testing process, the probe, work-piece and body must be stable.

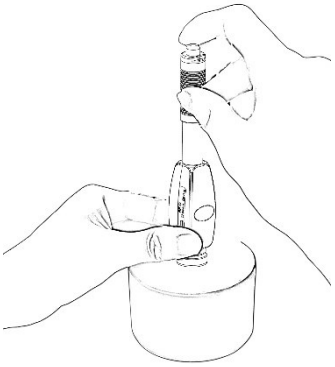
7.26.2 Measuring with wireless probe (Optional)

Loading the wireless probe



Hold the impact device with left hand while push the loading tube with right hand toward to the end. Then loose the force and let the loading tube back to original position.

Release



Place the impact device against the object to be measured. Then press the release button on top of the impact device with finger of right hand. The measuring value will be displayed on LCD.

When the tester is switched on, the tester will enter into measuring mode, and the wireless probe will start working after loading.

8 Maintenance and Repair

Do your best to avoid shock, heavy dust, damp, strong magnetic field, and oil stain.

8.1 Maintenance of Impact Devices

Impact devices do not require any particular care other than periodic cleaning of the impact body and the guiding tube after performing approximately 1000-2000 tests. During cleaning, the following procedures should be observed:

Unscrew support ring and remove impact body from the guiding tube.

Remove any dirt and metallic dust from the impact body and the spherical test tip.

Clean the guiding tube with the special brush provided.

Do not apply oil to any parts of the impact device.

8.1.1 Change Battery

Batteries can be changed at any time. When AA alkaline batteries are used, please take the batteries out from battery compartment if the tester is not be used for a long time.

8.2 Introduction of PC software

Data communication software is designed for reading and processing the data of hardness tester. It can read the data from the memory of hardness tester, export the data to the computer and print the data from the computer printer.

System requirement: A PC with USB port

Windows 8 / Windows 10

8.2.1 Connect PC and hardness tester

Connect PC and hardness tester by a PC connection cable, switch on the tester, then press  →  →  to select “RS232 Protocol”, then press  to enter RS232 page. Select “COMPUTER” and press  to enable PC connection.

8.2.2 Driver installation

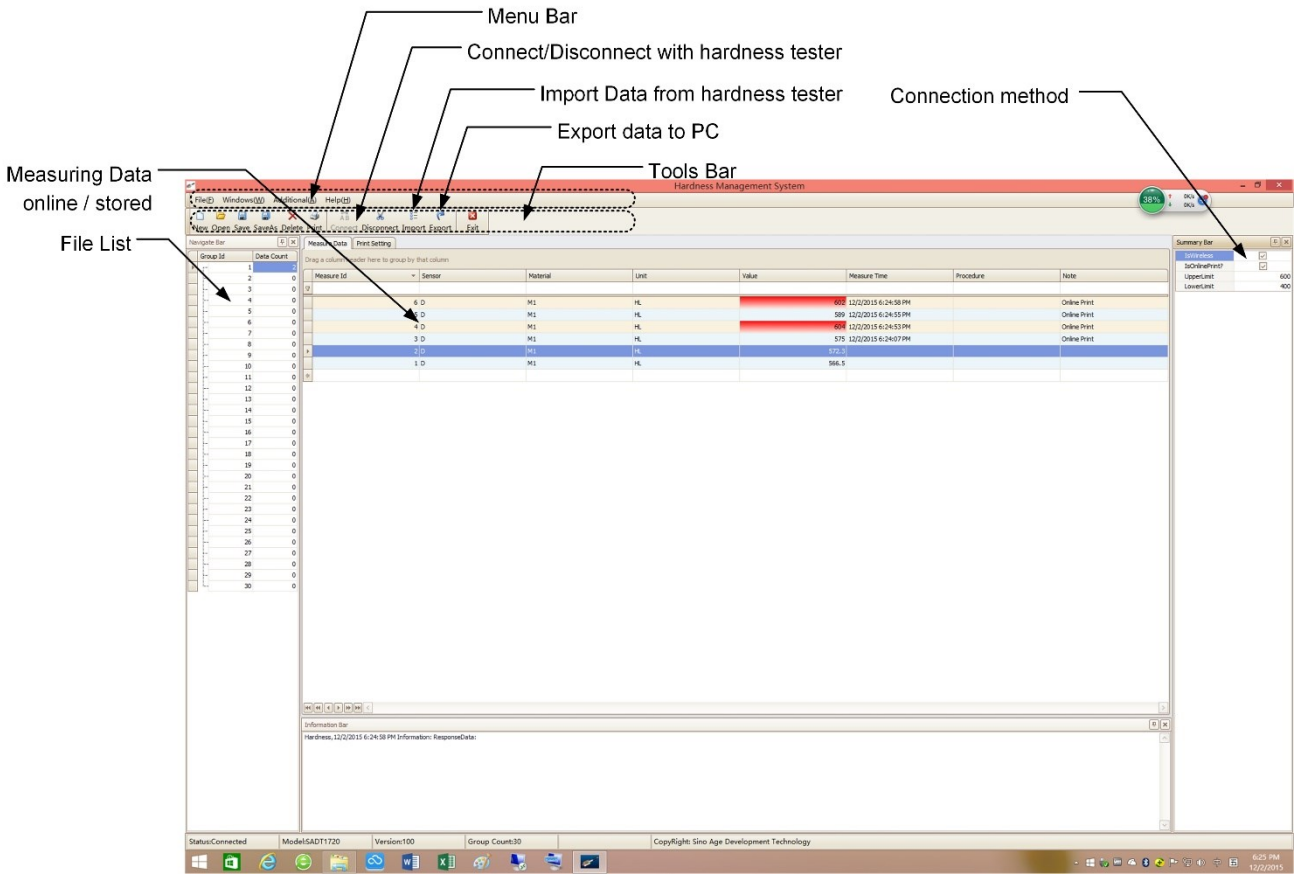
Computer will prompt "Found new hardware" while the hardness tester is connected to the computer first time, please install the driver located in X:\Drivers folder. (X: means CDROM drive letter).

8.2.3 Software Installation

Double click “setup.exe" to install the PC software. Please follow the installation wizard to finish it.

8.2.4 Start PC software

After the data communication software is installed, a shortcut will be created on the desktop automatically. Double click the shortcut to run the program.

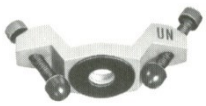
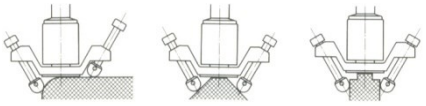


The main interface of the software is a standard windows form, containing the title bar, menu bar and toolbar.

Please note: After running the software, click the "Connect" from the toolbar to create connection between PC and tester. If it is connected by 2.4G/Bluetooth, please click "Is Wireless" option in the right Summary Bar first, then click "Connect" button to connect wireless connection. Bluetooth pairing code is 1234.

9 Optional Accessories

Support Rings for Impact Device D

Part designation and dimensions:		Suitable for the following test surfaces	
D6 	Φ 19.5×5.5mm	R≥60mm	plane cylindrical hollow-cylindrical spherical hollow-spherical
D6a 	Φ 13.5×5.5mm	R≥30mm	plane cylindrical hollow -cylindrical spherical hollow-spherical
Z 10-15 Z 14.5-30 Z 25-50 	20×20×7.5mm 20×20×6.5mm 20×20×6.5mm	R 10mm-15mm R 14.5mm-30mm R 25mm-50mm R<10mm not possible R≥30mm D6/D6a	cylindrical
HZ 11-13 HZ 12.5-17 HZ 16.5-30 	20×18×5mm 20×20×5mm 20×20×5mm	R 11mm-13mm R 12.5mm-17mm R 16.5mm-30mm R<11mm not possible R≥30mm D6a	hollow-cylindrical
K 10-15 K 14.5-30 	Φ 20×7.7mm Φ 20×6.7mm	R 10mm-13mm R 14.5mm-30mm R<10mm not possible R≥30mm D6/D6a	spherical
HK 11-13 HK 12.5-17 HK 16.5-30 	Φ 17×5mm Φ 18×5mm Φ 20×5mm	R 11mm-13mm R 12.5mm-17mm R 16.5mm-30mm R<11mm not possible R≥30mm D6a	hollow-spherical
UN 	Φ 52×20×16mm		

9.1.1 Micro printer

9.1.1.1 Power on

Press the power switch (left button) and hold down for 3 seconds, then the power is on. The status indicator flashes.

9.1.1.2 Power off

Press the power switch (left button) and hold down for 3 seconds, then the power is off. The status indicator light turns off.

9.1.1.3 Feeding Paper

Press the paper feed button (right button), the printer start feeding paper. If release the button, then stop feeding paper.

9.1.1.4 Self-test

In the power-off state, press the paper feed button (right panel), do not release, and then power on. The printer will print self-test

9.1.1.5 Working Status Indication

Printer head overheating, lacking paper, roll cover open: work status indicator flashes, the flashing period is 4 seconds (bright for 2 seconds)

Communication Status Indicator: When the printer is in stand-by station, the working status indicator light period is 4 seconds (bright for 50 milliseconds).

9.1.1.6 Power Status Indication

In the printer working process, the remaining capacity is more than 50%, three-color power indicator, green light keep bright; when the battery power 50% ~ 30%, three-color power indicator, the yellow light keep bright; when the battery is less than 30%, three-color power indicator, the red light keep bright; When the battery power is too low to support normal printing, the printer will automatically shut down

In the process of charging, the charger-color indicator light shows red. When charging is completed, three-color indicator light turns green.

9.1.1.7 Precautions

Operate the printer correctly; avoid any damage to the printer;

If jams occur, be sure to power off and wait for 10 seconds until the head is cooled down. Then remove the paper jam;

Do not place this product in wet or dusty environments; no pressing, stack forbidden;

Only use qualified paper roll (with axis);

Do not use paper roll with the end adhesive to the axis, otherwise the printer cannot measure the paper roll end correctly, or cause damage to the printer. Do not print data for long time