SU-400 Operation Manual

Version 1.0

Safety note:

- Please read the following safety instructions carefully before using the device and keep this manual in a safe place so that all users of this product can access it at any time.
- Please strictly follow the procedures in this section to prevent accidental damage to products and injury and users from misuse.
- The indenter on the ultrasonic probe is made of diamond and is very pointed. So be careful not to hurt yourself.
- The ultrasonic hardness tester is a precision measuring instrument. Avoid strong shock when using. Never drop the device!
- After use, store the device in a special tool box to prevent accidental dropping or damage.
- Do not disassemble the evaluation unit and the probe! Due to the compact design, self-decomposition leads to irreparable damage. In case of disassembly all warranty claims are lost!
- Do not use this product (including any electronic products) in a combustible gas environment to avoid fire or explosion.
- The built-in rechargeable battery is a special battery. Please only use this battery. In case of replacement, please only use an original replacement battery.
- To charge the battery, a normal power supply with USB output can be used.
- Do not put the battery in the water and avoid contact with water.
- If it turns out that the battery is deformed, do not use the device or the battery.

0. Preface

The ultrasonic hardness tester is ideally suited for mobile hardness testing where the focus is on fast and accurate results.

It is ideal for measuring small forgings, castings, spot welds, stamped parts, casting tools, ball bearings, sprockets, and for measuring the influence of heat or heat.

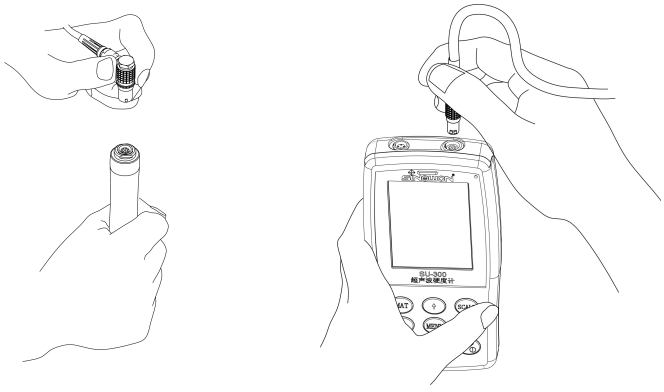
It can not only work with the manual probes, but also with the motorized probes, which are able to meet the different applications due to different surfaces.

It conforms the standard ASTM A1038-2005 and DIN standard DIN50159-1-2008.

- The main advantages of the ultrasonic hardness tester over other hardness testers:
- on-destructive testing due to smaller test force and therefore only microscopically small crater. (vs. Rockwell and Brinell)
- Can be done on-site, e.g. be measured on a permanently installed workpiece. The optical measurement is not required. (vs. Vickers)
- Low required weight (0.3 kg) of the test object. (vs. Leeb)

1. Correctly Connect Probe

Take out main unit and probe/impact device with its cable, then insert into the socket, impact device is 4 pin, UCI probe is 10 pin.



2.Interface Illustration and functions

2.1 Buttons Illustration

【MAT】: Start calibration in calibration interface; select calibration group in calibration selection interface; Short cut of calibration selection interface in main interface; as selected printing data in printing interface

【SCALE】: hardness standard etc.

【MENU】: For confirmation in main interface and calibration interface; In others interface, used as back to previous menu and quit.

【ETR】: Start measurement in main interface; used as confirmation in others interface

【⏻】【↓】【→】【←】: moving keys

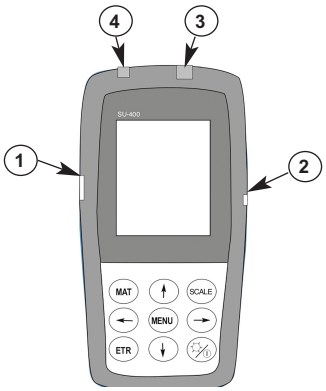
: Long press to enter sleep

1: Power switch

2: USB-C charge connector

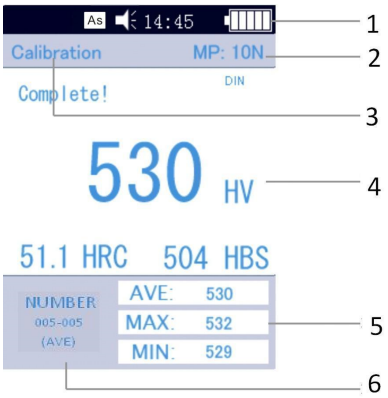
3: Connector for ultrasonic probe

4: Connector for Leeb probe



2.2 Interface Illustration

After connected probe, then power on by side switch, enter to main interface



1: status display
2: model information
3: the information of material calibration group
4: testing display
5: statistics of testing result,
6: Test number for average mode

Status display:

From left to right, model, Auto Save (As), Buzzer, System Time, Battery.

Probe:

Show probe type, MP:10N means motorized probe with test force 10N.

Calibration Information:

Show Calibration Group Name

Test Info:

Show test status “Loading…”、“Testing…”、“Unloading…”、“Ready!”、“Complete!”; upper right corner shows conversion standard ASTM/DIN; Middle part shows hardness value after each measurement and hardness conversion value, if shows ↑/↓ means the hardness value not in the valid range.

Test mod:

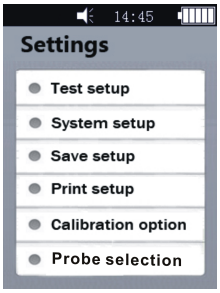
Average mode show as above picture, Times means test number, 005-000 means test five time then to calculate average value and save data. Single model does calculate average value, Below Times show Single.

Statistics of testing result:

For average mode only.

3. Main menu (Settings)

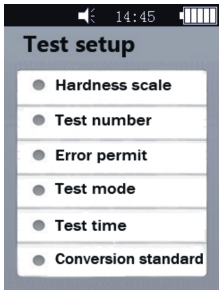
【↑】+【↓】: select, 【ETR】enter submenu



1. Test setup: setup measurement parameters
2. System setup: setup system parameters
3. Save setup: setup memory
4. Print set up: print connection and print function
5. Calibriation: probe calibration
6. Probe selection: probe selection

3.1 Test Setup

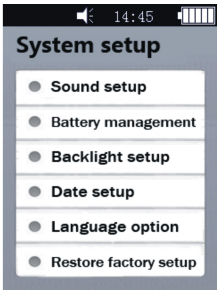
Press【↑】【↓】 switches to different submenu, press【ETR】 enter to submenu, press【MENU】 back to previous menu.



1. Hardness Scale: choose hardness scales
2. Test Number: test number of measurement (only for average mode)
3. Error Permit: set MAX and MIN value
4. Test Mode: select single mode or Average mode
5. Test Time: set test time (normal is 3 seconds)
6. Standard: ASTM/DIN/GB
7. Impact direction: for Leeb testing only, choose the direction
8. Material: for Leeb testing only

3.2 System Setup

Press【↑】【↓】 switches to different submenu, press【ETR】 enter to submenu, press【MENU】 back to previous menu.



1. Sound Setup: to ON/OFF voice
2. Battery Management: ON/OFF
3. Backlight Setup: to adjust contrast of screen
4. Date Setup: setup date time
5. Language option: to choose language (EN, DE, FR, IT, ES, CN)
6. Restore Factory Setup: enter password “888888”, press【MAT】 system restore factory setup.

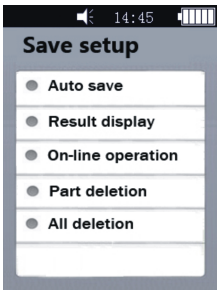
Battery Management:

in ON condition without any operation in 5 min, instrument will auto power off, same circumstance when in recharging, it is normal. If in OFF condition, the instrument will be always in standby time until use off the battery, we have to manually turn off. This mode is used in outer power supply.

3.3 Save Setup

Press【↑】【↓】 switches to different submenu, press【ETR】 enter to submenu, press【MENU】 back to previous menu.

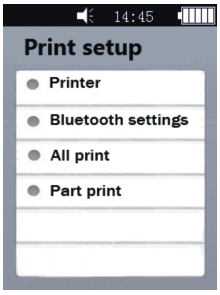
1. Auto Save: switch ON/OFF
2. Result Display: view measured value
3. On-line Operation: turn ON or OFF the connection to PC, The test results were sent to computer through hyper terminal.
4. Part Deletion: delete test results, press【ETR】 to select data, press【SCALE】to delete them.
5. All Deletion: Press【ETR】 enter printing page, system display dialog box, press【ETR】to delete all the test results.



3.4 Printing Setting

Press【↑】【↓】 switches to different submenu, press【ETR】enter to submenu, press【MENU】 back to previous menu.

1. Printer: select printing mode: Bluetooth or USB.
2. Bluetooth Settings: Power on wireless device, press 【ETR】to search Bluetooth,then shows Bluetooth device, select confirm, press again to connect.
3. All Print: Press 【ETR】enter printing interface, press send to print.
4. Part Print: Press【ETR】enter part print interface, then press【ETR】select data, press【SCALE】to print data.



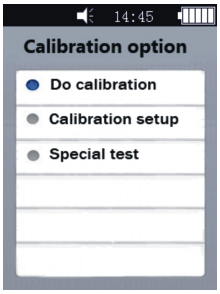
3.5 Celebration option

The probe must be set to motorized or manual probe!
This menu item is not for the Leeb probe.

1. measurement group: saved measurement group via 【MAT】 Select or clear via 【SCALE】.

2 Calibration: Set and edit the measurement group (see chapter 5)

3: Special Test: Setting the HZ value (Chapter 6)



3.6 Probe setup

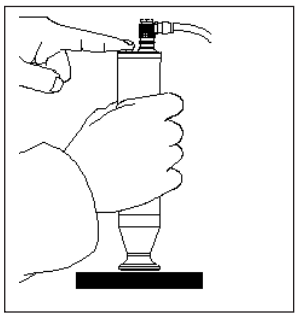
Select the type of connected probe

4. Operation Steps

Call up the main menu, make the desired settings via submenu "Test setup"; Select the type of probe to be used via the "Select probe" submenu. Then connect the probe to the device.

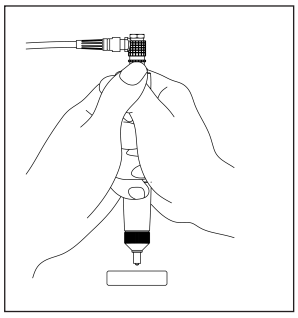
Button 【MAT】 can be used to select the correct measurement template.

4.1 Motorized Probe



Press button Menu - Test Setup - Probe Selection - choose electric probe, then connect with Motorized probe cable.
After connected well, put the probe on specimen, press the red button on the top of probe, the display will show “loading…”-“testing…”-“unloading…”, please do not move or shadow probe, otherwise will lead big error.

4.2 Manual Probe



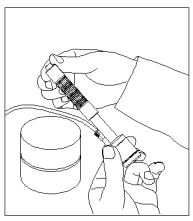
Press button Menu - Test Setup - Probe Selection - choose Manual probe, then connect with Motorized probe.
Hold the middle part of probe, keep the probe and specimen surface in vertical position, then evenly & downward press the probe vertically until the probe protective cap against the specimen, hold this movement around 2 seconds, then you will hear a “beep” sound, indicating that the probe and the measured object coupling end, and the measuring value shows on display.

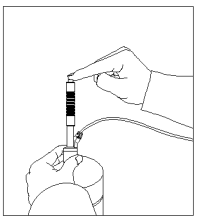
Attention!

When wrong operation and can not get correct value, it will show Error.
If result not in the measurement range, show ↓ or ↑.

4.3 Leeb Impact Device

Press button Menu - Test Setup - Probe Selection - choose Leeb, then connect impact device.
After connected well, see if impact device and impact direction is correct or not.
Press MAT to choose materials type.
Load impact device (Step 1), then release it (Step 2).





Attention!

When wrong operation and can not get correct value, it will show Error.
If result not in the measurement range, show ↓ or ↑.

5.1 UCI probe calibration

5.1 Calibration group

Press 【MAT】to select calibration group.

Press MAT to choose need calibration data, if need to delete one or more calibration data, move to there and press [SCALE] to delete.

The reason of calibration：

1. If in the process of the hardness tester verification on the reference hardness block the readings are stable but differ from the nominal value of the reference hardness block;
2. after long period of storage (more than 3 months);
3. After intensive operation (more than 200.000 measurements for ultrasonic probe;
4. In case of considerable change in the conditions of operation (ambient temperature, humidity etc).

5.2 UCI probe calibration

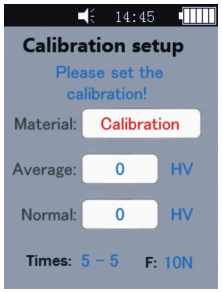
1. Calibration Preparation

Before calibration, firstly select probe type

MENU -> Probe (motorized or manual)

2. Calibration setup

Edit Calibration Name:



select Material (system default name is Calibration), red words means already selected, then press【ETR】enter edit page and edit calibration name.

Note: Calibration name is advised to edit according to probe type and testing material, which is convenient to identify calibration data, so you can test directly when you meet same material without calibration, significantly saving time.

Enter Normal Value:

press【SCALE】select scales, then press【↑】【↓】select Normal, then input Normal value according to hardness block. This value can be input before or after calibration action.

Note: Please input Normal Value after selecting scales, otherwise the value input will be delete when you select scales.

3. Calibration Step:

After setup above steps, if probe is connected, press【MAT】enter testing page (then it will show Please test 5-time to get a average value..), then you can calibrate by hardness block.

Please be sure to make probe vertically contact hardness block, motorized probe press red button/manual probe hold by hand to contact hardness block in constant speed, test 5 times in different position, test result shows in 【Average】. When you finish 5-time tests, system will give beep for two times and interface will show “Calibration Complete”, then goes to save steps.

Calibration Notice
When in calibration interface, first press [MAT], then vertically contact probe with standard block, if no reaction, take up probe and press [MAT] again, get 5 measurements. (please press red button again when using motorized probe).
If shows ↑, it means hardness value exceeds max value of this hardness scale; shows ↓, means hardness value lower than tested hardness scale. If you meet problems mentioned above, please see the 6th part in the manual to sole them.

Note: Don't press 【Scale】before saving calibration data. It’s used to switch testing scale in calibration setting, once pressed, unsaved data will be cleared. If you press it accidently, please select scale and calibrate according to steps mentioned above.

4. Save Calibration Data Setup

Before calibration, Material and Normal value have been filled, it will pop up box "Is it ok about calibration?", then press confirm to save.

If Normal Value is not input before calibration, after 5 tests, Normal Value will be automatically filled in same with Average value, and pop up box “then input the normal to finish the calibration”. Please press 【←】or【→】adjust to hardness block value, or press 【ETR】edit, then press 【MAT】to save, and you finish the calibration. This calibration data will be listed, and the following test will test according the calibration data.

5 Cancel Calibration

When end-user make calibration by himself, he should be accompanied with professional staff. Test the value of standard hardness block more than 5 times, test result should be within error range. If test result is out of error significantly, you have to cancel this calibration data and calibrate again.

HOW TO CANCEL:
press [MAT], system will pop up box “Exit Correction ?”, first confirm it then press [ETR], then canceled, and establish new calibration.

5.3 Calibration on specific material

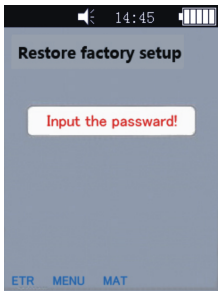
When you know the hardness value of the material, the calibration steps are the same when you calibrate by standard hardness block.

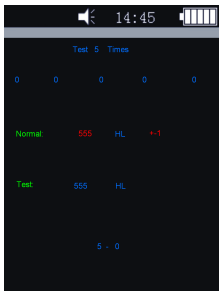
The different is here we use a kind of material which given hardness value by others bench hardness tester while not standard block. If you use the calibration data by hardness block, when you test aluminum, the value will have significant error. In order to test accurately, you have to calibrate the Ultrasonic Hardness Tester by the given hardness value of the material, which guarantee accuracy and stability. Special material will have significant deviation during testing.

calibration upon special material is same as common action.

5.4 Leeb Calibration

Before use Leeb calibration, please make sure probe selection is Leeb, and connect with leeb impact device.





Select menu “system setup” then submenu “Restore factory setup”.

Input password 123321, press MAT enter to menu “Leeb setup”.

Load impact device and test 5 times on same hardness block, Then system will calculate Normal and Test value.

Press SCALE can cancel the latest value.

The value of the standard still has to be the right value be adjusted.

Press 【←】 or 【→】 to decrease or increase the value of the normal by one correction step (1, 10 or 100).

The correction step (+/- 1, +/- 10, +/- 100) will be changed via 【↑】 and【↓】.

After input Normal value then press 【ETR】to save.

6. Special Test

In practical testing, Elastic Modulus differs among different materials, test result will exceed its original value by Ultrasonic Hardness Tester, please see example below to solve it flexiblely.

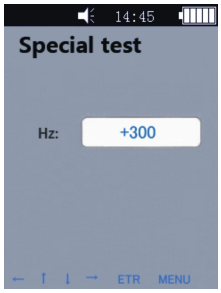
In der Praxis haben unterschiedliche Materiale unterschiedliche Elastizität und diese beeinflusst oft das Messergebnis von Härteprüfern nach der Ultraschall-Messmethode. Da der Ultraschall-Härteprüfer für Stahl ausgelegt ist, übersteigt das Messergebnis oft den ursprünglichen Wert bei z.B. Aluminium, Kupfer, Glas und Keramik.

Below is an example of how to properly set the device to solve the problem flexibly in such cases.

Menu: Special test

1. In Fig 6-1, press orientation button to adjust HZ value (default value is 0 HZ), or press [ETR] to edit.
   Note that you need to add “-”or“+”in front of your value number, otherwise you cannot enter the value, the system will indicate you”Error”

2. After enter the value, press 【MAT】to save it,
   The system goes back to [Calibration Option]-[Calibration Setup], create new calibration group, then we can test the hardness value.



Example: Aluminum with 200 HV

Take aluminum of 200HV for example, the test result may be around 910HV without calibration.

End-user can calibrate directly, however it will make test not stable, so you can consider special calibration.

It’s known to us, that the frequency value is smaller when it has high hardness value; The opposite is the same; So when test result is bigger than the original value, input +HV value, and if smaller, input –HV value. According the test above, test result is obviously larger than original value, so you can input +HV value to make the value display normal.

910HV is more than 700 HV larger than 200HV, normally we consider 2HV as 1 to adjust the HZ value to +350. Enter into calibration setting again, please calibrate it and then the Average value should display about 230HV, it’s much similar.

We calibrate it again and set the standard to 200 HV and save it as a measuring group z. Eg (ALU200).

A new special measuring group with HZ = 350 for aluminum with hardness of approx. 200 HV (ALU200) is thus created and can be used for aluminum with hardness around 200 HV.

When meeting other special material, do it flexibly mentioned above to solve it.

Note:

1. Do not make special calibration unless the material is really special, in case of unnecessary error.

2. If you need to calibrate another special material, please take the default calibration value to test the hardness value, input HZ value according to proportion HV:HZ =2:1, make another calibration.

3. Ultrasonic Hardness Tester has memory function, eternally save the last input HZ value, if you have to delete it, please restart the Ultrasonic Hardness Tester, or input HZ value as 0, then press [MAT] to save the setting.

7. Care instructions

Before and after the measurement, use a cloth moistened with alcohol to gently clean the head of the probe, and wipe the surface of the main unit and the probe with a clean cloth.

For first use and after a long period of non-use, please charge the device first before using it.

The diamond tip on the probe is hard and brittle, and can easily fall off with strong bumps. When not in use, attach the silicone protective cover of the probe and store the main unit and accessories in the appropriate tool box.

8 Technical specification

8.1 Main unit

Connection:	Ultrasonic probe (manual or motorized)
add. connection:	Leeb probe (optional)
Measuring range:	Rockwell: 20 - 68 HRC; 55 - 100 HRB; 60 - 85 HRA Brinell: 100 - 500 HBS Vickers: 100 - 1500 HV
Accuracy:	3% HV; ±1.5 HR; ±3% HB
Reading:	0,1 HR, 1 HV, 1 HB, 1 HLD,0,1 HS
Display:	Color LCD with back light
Data storage:	1000 mesured data + 20 groups
Menu language:	DE; EN; CHN; PRT; TUR
Working temperatur:	- 10°C - 50°C at humidity 30-80%
min. thickness specimen::	2 mm
min. weight specimen:	0.3 kg
Power:	chargeable lithium battery 4,2 V / 4800 mAh
Data output:	RS 232 / Bluetooth
Printer:	Bluetooth printer (optional)
Dimensions:	160 x 80 x 31 mm
Weight (without probe):	0.5 kg

8.2 ultrasonic probe

				Requirement of specimen		
Driver	Measuring force	Oszillation rod	Dimension (head)	Raughness	Min. weight	Min. thickness
manual	10 N	ø 2.4 mm	154 x ø 22, ø 5.5	Ra < 2.5 µm	0.3 kg	2 mm
manual	20 N	ø 2.4 mm	154 x ø 22, ø 5.5	Ra < 5 µm	0.3 kg	2 mm
manual	50 N	ø 3 mm	154 x ø 22, ø 5.5	Ra < 10 µm	0.3 kg	2 mm
manual	98 N	ø 3 mm	154 x ø 22, ø 5.5	Ra < 15 µm	0.3 kg	2 mm
motorized	3 N	ø 3.7 mm	197.5 x ø 46, ø 36	Ra < 1 µm	0.3 kg	2 mm
motorized	5 N	ø 3.7 mm	197.5 x ø 46, ø 36	Ra < 1.5 µm	0.3 kg	2 mm
motorized	8 N	ø 3.7 mm	197.5 x ø 46, ø 36	Ra < 2 µm	0.3 kg	2 mm
motorized	10 N	ø 3.7 mm	197.5 x ø 46, ø 36	Ra < 2.5 µm	0.3 kg	2 mm

9. Useful information

The ultrasonic hardness tester is very handy and provides a good measurement result with the right setting. It allows a non-destructive test directly at the location of the test specimen due to the small test load. The required minimum weight and minimum material thickness is also substantially smaller than e.g. at Leeb hardness tester.

Before you start measuring, you should know in advance about the material, the roughness and the hardness range of the specimen. From knowledge about material, roughness of the surface as well as the estimated hardness one can select the suitable probe and create a suitable measuring template.

The motorized probe is easy to use and provides a very accurate repeatability, even for inexperienced users. The manual probe requires manual skill and is designed more for trained users.

With the help of hardness comparison plates or a comparable test piece, which has been measured with stationary hardness testing machine, you can create special measurement templates, with which you can perform specific measurements.

The measuring accuracy of the ultrasonic hardness tester depends on the condition of the surface of the test object. Based on the roughness of the surface, you can choose a probe with a suitable measuring force. The smaller the measuring force, the smaller the trace left of the measurement.

10. Warranty

We quarantee the high precision of our products. Our accurate control service warrants high accuracy according to international standard. If in exceptional case, your measuring tool does not work correctly or is damaged between the warranty period please to not hesitate to return back together with the warranty certificate.

No warranty for demage of housing, Impact body, support ring, bond film, display, lithium battery.

11. Declaration of Conformity and confirmation of traceability of the values

We certify hereby that it was inspected at factory. We declare that this product is in conformity with standards and technical data as specified in our sales literature (instruction manuals, catalogue).

In addition, we certify that the measuring equipment used to checked this product refers to national standards. The traceability of the measured values is quaranteed by our Quality Assurance.

CE RoHS