

# MeasumaX **MX**



**INSTRUCTION MANUAL**

**HARDNESS TESTER**

**Model Q520**



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## 1 OVERVIEW

### 1.1 Advantages

- **Wide measuring range.** Based on the principle of Leeb hardness testing theory. It can measure the Leeb hardness of all metallic materials.
- **Large LCD screen:** Showing all functions and parameters. With EL background light.
- **Seven impact devices:** A range of seven attachments are available for special application. The Q520 will automatically identify the type of impact devices when attached.
- **Test at any angle;** Tests can be taken at any angle, even upside down.
- **Direct display Scales:** Hardness scales HRB, HRC, HV, HB, HS, HL are directly displayed
- **Large memory:** The large memory capacity can store up to 100 groups of information including single measured value, mean value, impact direction, impact times, material and hardness scale etc.
- **Battery information:** Screen showing the capacity of the battery.
- **User calibration function.**
- **Software:** Software to connect to PC via RS232 port. Micro printer support.
- **Compact plastic case:** Case suitable for use under poor working conditions.
- **Continuous working:** Continuous working period of no less than 100 hours with two alkaline batteries(AA size). Auto power off to save energy.
- **Outline dimensions:** 150mm×74mm×32 mm
- **Weight:** 245g

### 1.2 Main Application & Testing Range

#### 1.2.1 Main Application

- Die cavity of molds.
- Bearings and other parts.
- Failure analysis of pressure vessels, steam generators and other equipment.
- Heavy work pieces.
- Installed machinery and permanently assembled parts.
- Testing surfaces of a small hollow spaces.
- Material identification in the warehouse of metallic materials.
- Rapid testing in large range and multi-measuring areas for large-scale work piece.

#### 1.2.2 Testing Range

Testing range refer to Table 1 and Table 2 in the Appendix.

### 1.3 Technical Specifications

- For error and repeatability of displayed value see Table1-1 below.

No.	Type of impact device	Hardness value of Leeb standard hardness block.	Error of displayed value.	Repeatability
1	D	760±30HLD 530±40HLD	±6 HLD ±10 HLD	6 HLD 10 HLD
2	DC	760±30HLDC 530±40HLDC	±6 HLDC ±10 HLDC	6 HLD 10 HLD
3	DL	878±30HLDL 736±40HLDL	±12 HLDL	12 HLDL
4	D+15	766±30HLD+15 544±40HLD+15	±12 HLD+15	12 HLD+15
5	G	590±40HLG 500±40HLG	±12 HLG	12 HLG
6	E	725±30HLE 508±40HLE	±12 HLE	12 HLE
7	C	822±30HLC 590±40HLC	±12 HLC	12 HLC

- **Measuring range:** HLD (170-960) HLD
- **Measuring direction:** 0°~360°
- **Hardness Scale:** HL, HB, HRB, HRC, HRA, HV, HS
- **Display:** LCD segment
- **Data memory:** max. 100 groups (relative to number of impact times)
- **Working power:** 3V (2 AA size alkaline batteries)
- **Continuous working period:** About 100 hours (With back light off)
- **Communication interface:** RS232

### 1.4 Configuration

Table 1-2

	No.	Item.	Qty	Remarks.
Standard Configuration	1	Main unit	1	
	2	D type impact device	1	With cable
	3	Standard test block	1	
	4	Cleaning brush (I)	1	
	5	Small support ring	1	
	6	Alkaline battery	2	AA size
	7	Manual	1	
	8	Instrument package case	1	
	9			
Optional Configuration	11	Cleaning brush (II)	1	For use with G type impact device.
	12	Other type of impact devices and support rings		Refer to Table 3 and Table 4 in the appendix.
	13	DataPro software	1	
	14	Communication cable	1	
	15	Micro Printer	1	
	16	Print cable	1	

### 1.5 Working Conditions

Working temperature: 0- +40°C

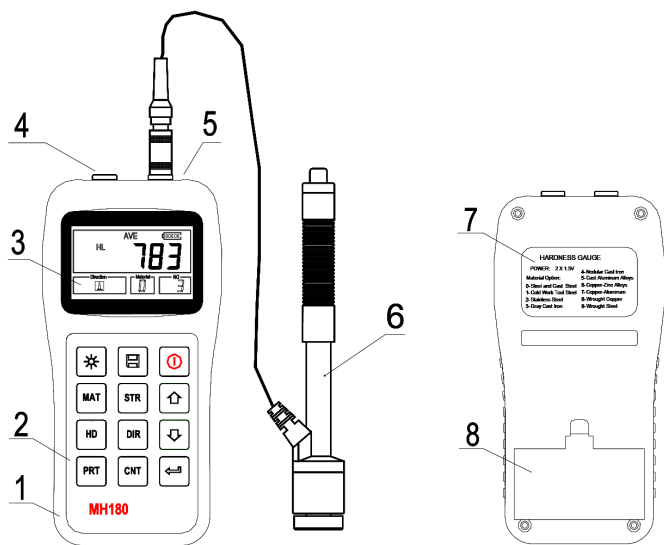
Storage temperature: -30°C - +60°C

Relative humidity: ≤ 90%

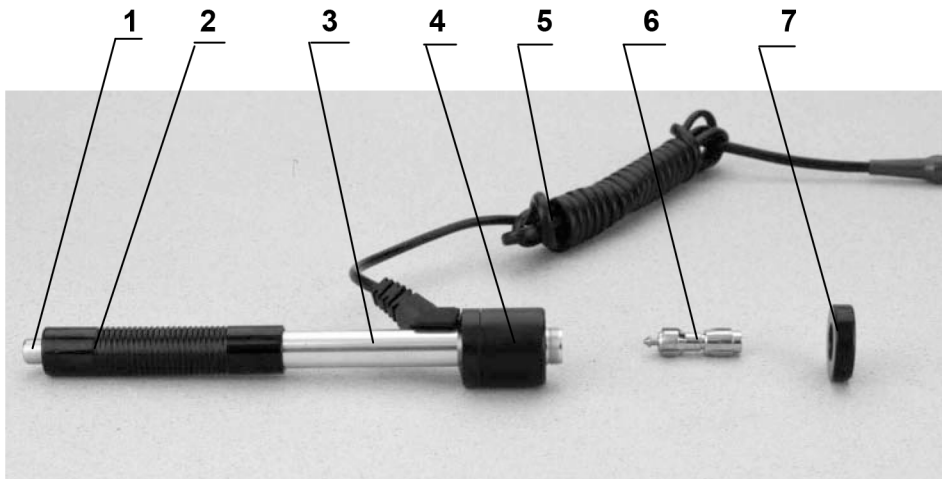
The surrounding environment should be avoided if vibration, strong magnetic field, corrosive medium and heavy dust are on the workpiece.

### 2.1 Structure Feature

1. Main unit
2. Keypad
3. LCD display
4. Socket of RS232
5. Socket of impact device
6. Impact device
7. Label
8. Battery cover

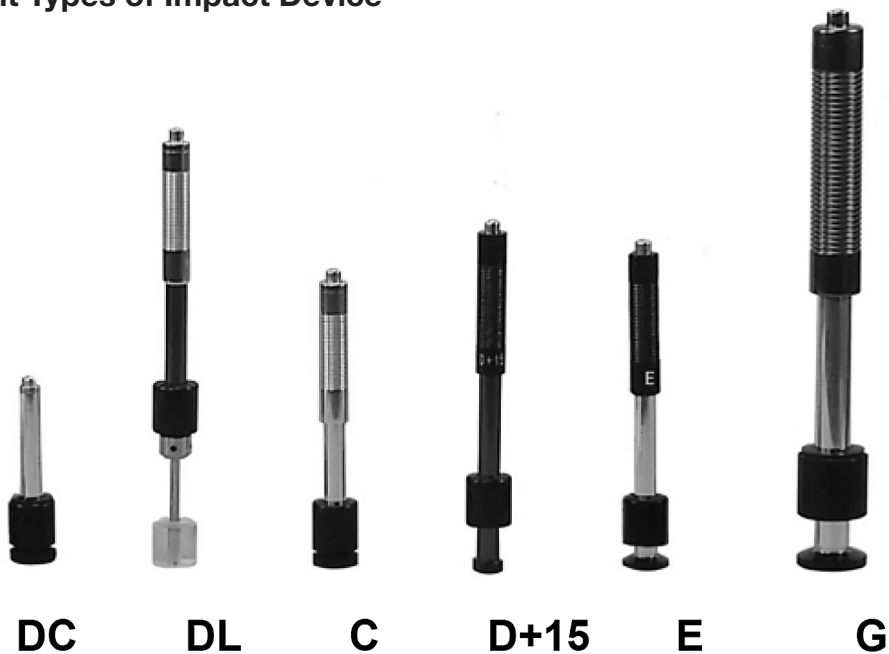


**2.1.1 D Type Impact Device**



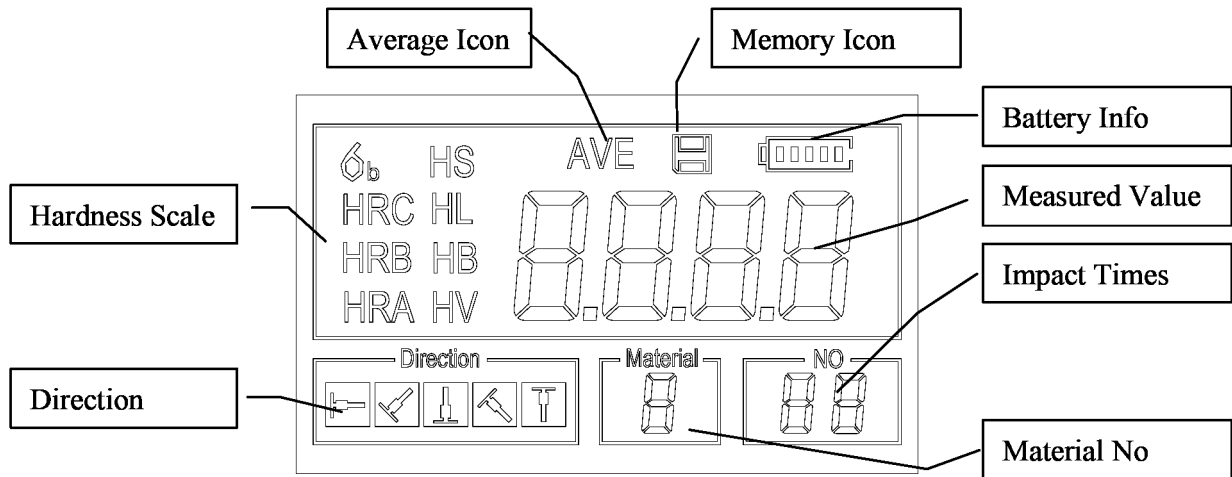
- |   |                  |   |              |   |              |   |           |
|---|------------------|---|--------------|---|--------------|---|-----------|
| 1 | Release button   | 2 | Loading tube | 3 | Guide tube   | 4 | Coil unit |
| 5 | Connection cable | 6 | Impact body  | 7 | Support ring |   |           |

**2.1.2 Different Types of Impact Device**



## 2.2 Main Screen

Below is the main display screen:





























### Instruction of the Main Display Screen:

- Material:** The material to be tested. (See table 5-1)
- Impact direction:** The impact direction.
- Hardness scale:** Hardness scale of the measured value.
- Battery information:** Showing the capacity of the battery.
- Measured value:** Display each single time measured value (without showing average icon) or display the mean value of the tests taken (with average icon prompting). “ -HI- ” means over conversion value or measure range. “ -LO- ” means lower than conversion value or measure range.
- Impact times:** Number of times that the current test has been taken.
- Average Icon:** Will appear when showing the average value of the test after reaching the preset number of impacts.
- Memory Icon:** It appears when operating the instrument memory.

## 2.3 Keypad Definitions

Table 2-1

	Turn on/off the EL backlight		Data Save or Data Delete		Turn the instrument on/off
	Material Selection		Hardness/Strength switch		Plus or Up
	Hardness Scale Selection		Direction change		Minus or Down
	Print data		Impact Times set		Data logging or Enter

- Press key  to store present groups of measured values into the memory. This operation is only valid after displaying the average value.
- Press key  and  to display a single measured value.
- Press key  to switch on or off the back light of the LCD.
- Press key  to set the impact direction.
- Press key  to change the number of impacts in one group. The impact times item will flash when first pressing the  key, and then the impact times value will plus or minus when pressing the  or  key. Press  key finally to exit from changing the impact time process.
- Press key  to change the hardness scale.
- Press key  to change the material. Presetting hardness scale recovers to HL automatically after material presetting changed.
- Press key  to switch between hardness test and strength test. Only D and DC type of impact device has the function of strength testing. So hardness testing is the only selection if the impact device is not D or DC type.
- Press key  to print out the measured values after measurement.

## 2.4 Leeb Hardness Testing Principle

The basic principle is to use an impact body of certain weight impacts against the testing surface under certain test force, then measure the impacting velocity and the rebounding velocity of the impact body respectively when the spherically test tip is located 1mm above the testing surface.

The calculation formula is as follows:

$$HL=1000 \times VB / VA$$

Where, HL — Leeb hardness value.

VB — Rebounding velocity of the impact body.

VA — Impacting velocity of the impact body.

### 3 PREPARATION

#### 3.1 Instrument Preparation and Inspection

Verification of the instrument is by using a standard test block with a known hardness. The error and repeatability of displayed value should be within the regulation of Appendix table 2. The instrument and impact device must be calibrated using a standard hardness block before used at the first time, or having not been used for a long time, or having reset the instrument system.

**To calibrate the unit follow the steps found under 4.1 Calibrating The Machine on page 10**

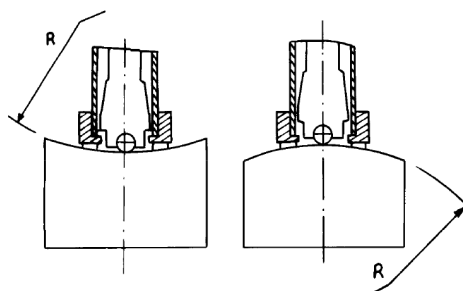
#### 3.2 Impact Device Selection

Refer to Appendix Table 1 and Table 3 for selection of impact device.

#### 3.3 Preparation of the Sample Surface

Preparation for sample surface should conform to the relative requirement in Appendix Table 3.

- In the preparation processing for sample surface, the hardness effect of being heated or cold processing on the surface of sample should be avoided.
- Too big roughness of the being measured surface could cause error. So, the surface of the sample to be measured must appear metallic luster, smoothing and polish, without oil stain.
- Support of test sample. Support is no necessary for heavy sample. Medium-weight parts must be set on the smoothing and stable plane. The sample must set absolutely equability and without any wobble.
- Curved surface: The best testing surface of sample is flat. When the curvature radius  $R$  of the surface to be tested is smaller than 30mm (D, DC, D+15,C, E and DL type of impact device) and smaller than 50mm (G type of impact device), the small support ring or the shaped support rings should be chosen.
- The sample should have enough thickness, min. thickness of sample should conform to Table 3.
- For the sample with hardened layer on surface, the depth of hardened layer should conform to Table 3.



- **Coupling.** Light-weight sample must be firmly coupled with a heavy base plate. Both coupled surface must be flat and smooth, and there is no redundant coupling agent existing. The impact direction must be vertical onto the coupled surface. When the sample is a big plate, long rod or bending piece, it can be deformed and become unstable, even though its weight and thickness is big enough, and accordingly, the test value may not be accurate. So the sample should be reinforced or supported at its back.
- Magnetism of the sample itself should be avoided.

## 4. TESTING



Before taking a test, it is best to calibrate the testing unit to insure it's accuracy .

### 4.1 Calibrating The Machine

To calibrate the unit press the “Start” and “Enter” on the keyboard at the same time

This puts the unit into Calibration Mode.

Using the calibration block, take 5 measurements, making sure that each measurement is at least 3mm apart and at least 5mm from the edge of the block.

The unit will give an average of the 5 measurements you have taken. Using the   arrows set the reading to 790.

Press Enter.

The unit is now calibrated to 790 Leeb Hardness. You do NOT have to calibrate each time you use the device.

### Hardness Test Scales

HRB, HRC	Rockwell Hardness
HV	Vickers Hardness
HB	Brinell Hardness
HS	Shore Hardness
HL	Leeb Hardness




## 4.2 Operation Modes

Set the Direction.

Set the direction of the test using the button marked “DIR”. You can set the tester to horizontal, vertical, 45 degrees or upside down as the anvil is spring actuated.

### Hardness or Strength Tests


Press the button marked “STR” 

Strength Test mode is denoted by the symbol “Öb” in the top left hand corner of the screen

Hardness Test mode is denoted by the letters “HL” in the centre left of the screen.

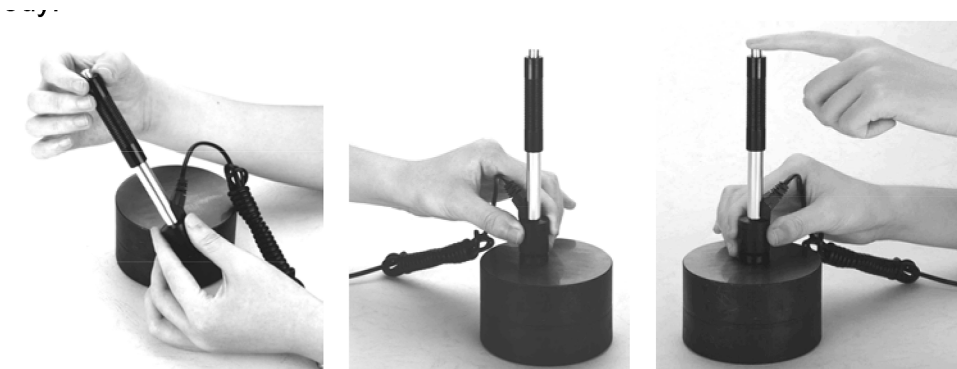
**NB: You will only get test results on a material selection in an applicable scale. For Example; In Hardness Test mode with a material selection of 1 will offer a Vickers Hardness test result (HV). Material selection 7 will not offer a HV result as the hardness result is off the Vickers scale. The same rule applies in Strength Test mode.**

## 4.3 Start-Up

- Insert the plug of the impact device into the socket on the top of the tester.
- Press the  key to switch the power on. The instrument now is in working mode.

## 4.4 Loading the Impact Device

Pushing the loading-tube downwards until contact is felt. Then allow it to slowly return to the starting position. This locks the impact body ready for use.



Press the impact device supporting ring firmly on the surface of the sample, the impact direction should be square to the testing surface.

### 4.5 Testing

- When the sample, the impact device and the operator are stable, press the release button on the top of the impact device to test. The action direction should be the same as the direction selected on the LCD screen.
- Each measurement of the sample usually needs 3 to 5 times of testing. The result data should not more than mean value  $\pm 15HL$ .
- The distance between any two impact points or from the center of any impact point to the edge of testing sample should conform to the regulation in Table 4-1.

TABLE 4-1

Type of Impact Device	Distance of center of the two indentations	Distance of center of the indentation to sample edge
	Not less than (mm)	Not less than (mm)
D, DC	3	5
DL	3	5
D+15	3	5
G	4	8
E	3	5
C	2	4

### 4.6 Read Measured Value

After each impact operation, the LCD will display the current measured value, the number of impact times plus one, the buzzer would alert a long howl if the measured value is not within the valid range.


When reaching the number of presetting impact times, the buzzer will emit a long howl. After 2 seconds, the buzzer will emit a short howl, and the average measured value will be displayed.

### 4.7 Notification

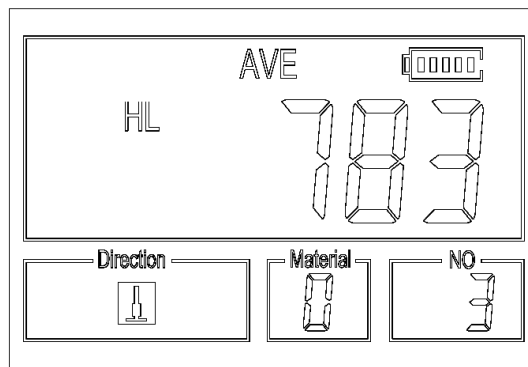
- Replacing the impact device must be done during Power off. The main body can not identify the type of the impact device if already powered up. It can also damage the circuit board of the main body.
- The current test value can not be saved if the number of impact time is less than the presetting times value.
- Only type D and type DC impact devices have the the strength test option function. You can not change the setting to strength testing when using other types of impact devices. The setting would be set to hardness testing automatically after replacing the impact device whether the setting is hardness testing.
- Not all materials could convert to all hardness scale value. The hardness scale is reset to HL automatically after changing the material. **So select material firstly before changing the hardness scale.**

## 5 OPERATION DETAIL

### 5.1 Power On/Off

Press  to power on the instrument. Be sure to plug in the impact device before powering on. The system will automatically detect the type of the impact device during power up, and will display this information on the screen. Users should pay attention to the probe type displayed on the screen.

After pausing for several second, the screen will exit and enter the main display screen as following:



The tester unit can be turned off by pressing the key while it is working. The tool has a special memory that retains all of its settings even when the power is off.

### 5.2 Material Setting

Press key to change the material to the one you want to preset.

Hardness scale recovers to HL automatically after material presetting changed. Please select material firstly, then select hardness scale.

In hardness testing, you can select the material among the following materials:

Steel and Cast Steel, Cold Work Tool Steel, Stainless Steel, Gray Cast Iron  
 Nodular Cast Iron, Cast Aluminum Alloys, Copper-Zinc Alloys  
 Copper-Aluminum Alloys, Wrought Copper and Wrought Steel.

The relationship between the material number displayed on the instrument screen and the material is as follows:

TABLE 5-1

Material No.	Material	Material No.	Material
0	Steel and Cast Steel	5	Cast Aluminium Alloys
1	Cold Work Tool Steel	6	Copper-Zinc Alloys
2	Stainless Steel	7	Copper-Aluminium Alloys
3	Grey Cast Iron	8	Wrought Copper
4	Nodular Cast Iron	9	Wrought Steel

### 5.2 Material Setting Cont.

In strength testing, the following materials are selectable:

Mild Steel, High-Carbon Steel, Cr Steel, Cr-V Steel, Cr-Ni Steel, Cr-Mo Steel, Cr-Ni-Mo Steel, Cr-Mn-Si Steel, Super Strength Steel and Stainless Steel.

The relationship between the material number displayed on the instrument screen and the material is as follows:

TABLE 5-2

Material No.	Material	Material No.	Material
0	Mild Steel	5	Cr-Mo Steel
1	High Carbon Steel	6	Cr-Ni-Mo Steel
2	CR Steel	7	Cr-Mn-Si Steel
3	CR-V Steel	8	Super Strength Steel
4	CR-Ni Steel	9	Stainless Steel

### 5.3 Hardness/Strength Testing

Press **STR** key to switch between hardness testing and strength testing (6b) .

**Note: Only D and DC type of impact device has the function of strength testing. So hardness testing is the only selection if the impact device is not D or DC type.**

In hardness testing, Press **HD** key to change the hardness scale. The supported hardness scales includes: HL, HV, HB, HRC, HS, HRB and HRA.

Note:

- Here only displays the valid hardness scale for the present selected impact device and material. It will not display the hardness scale which is not valid.
- **Please select material firstly, then select hardness scale.**
- Presetting hardness scale recovers to HL automatically after presetting material is changed.

### 5.4 Impact Direction Setting


Press the **DIR** key to move to the impact direction that is being performed.

### 5.5 Setting The Number of Impacts

You could set the number of times within the range of 1 to 32 as following:








- 1) Press **CNT** key in testing state. The impact times item will begin to flash;
- 2) Press **↑** or **↓** key to set the average times to the number you want.
- 3) Press **CNT** key finally to exit from the operation.

## 5.6 Data Logging

At most one hundred files (F00-F99, one group as one file) can be stored inside the gauge. By simply pressing the  key after a new measurement finishes-and the screen shows the “AVE” icon, the measured hardness/strength group values will be saved to memory. The new saved file is listed as the last file of the memory. This function provides the user with the ability to view/delete a file/group previously saved in memory.






### 5.6.1 Viewing stored file/Group

To view the memory data, follow the steps:

- 1) Press the  key to activate the data logging function. The memory icon will appear. It will display the current file name, the test parameter of the group data and the mean value of the group. If there is no data in the memory, it will display: <E04>, which means no memory data, and then return back.
- 2) Use the  key and the  key to select the desired file to view.
- 3) Press the  key to see details of that group data.
- 4) Use the  key and the  key to view each single measured data in that group while viewing details.
- 5) Press the  key to return to previous screen at any time during data logging.

### 5.6.2 Deleting Selected File/Group

The user may require deleting a file from the instrument memory. The procedure is outlined in the following steps.

- 1) Press the  key to activate the data logging function. The memory icon will appear. It will display the current file name, the test parameter of the group data and the mean value of the group. If there is no data in the memory, it will display: <E04>, which means no memory data, and then return back.
- 2) Use the  key and the  key to scroll to the file that will be deleted.
- 3) Press the  key on the desired file. It will automatically delete the file, and display “-DEL”.
- 4) Press the  key, at any time, to exit the data logging function and return to measurement mode.






**Note: Do not shut down the instrument while deleting data. It could lead to unpredicted consequence if shutting down while deleting.**

## 5.7 Print Report


At the end of the inspection process, or end of the day, the user may require the readings be printed. This function is only available with a mini-printer.

## 5.7 Print Report Cont.


Before printing, please insert one connection plug of the print cable (Optional parts) into the socket on the up-left of the main body, and insert the other plug into the communication socket of the mini-printer. You can print out the measurement result immediately after each testing process, by easily pressing the key. If you want to print the data stored in the instrument memory, then following is the steps:

1. Press the  key to activate the data logging function. The memory icon will appear.
2. Use the  key and the  key to select the desired file.
3. Press the  key to print the selected file. This operation will send all the data in current file to the mini printer via RS232 port and print them out.
4. Press the  key to exit the data logging functions and return to measurement mode.


## 5.8 System Reset

Press down the  key while powering on the instrument will restore factory defaults. The only time this might possibly helpful is if the parameter in the gauge was somehow corrupted.

## 5.9 EL Backlight



With the EL background light, it is convenient to work in the dark condition. Press  key to switch on or switch off the background light at any moment as you need after power on. Since the EL light will consume much power, turn on it only when necessary.

## 5.10 Auto Power Off

The instrument features an auto power off function designed to conserve battery life. If the tool is idle (neither measuring nor any key operation) for 5 minutes, it will turn itself off. Before powering off, the LCD display of the instrument will continue flashing for 20 seconds. Except key , press any key could stop the twinkle of LCD screen and stop the operation of power off at the moment.

While the voltage of the battery is too low, the display will show <E00>, then power off automatically.

## 5.11 Battery Replacement

Two AA size alkaline batteries are needed as the power source. After several hours' usage of the batteries, the battery symbol on the screen will be shown as . The more of dark part indicates the more close to fill. When the battery capacity runs out, the battery symbol will be shown as  and will begin to flash. When this occurs, the batteries should be replaced by a new pair.

**Note: Pay attention to the polarity of the batteries! Please take out the batteries when not working during a long period of time.**

**5.12 Connecting To A Computer**

The Instrument is equipped with a RS232 serial port. Using the accessory cable (The cable and following referred software are optional parts), the gauge has the ability to connect to a computer, or external storage device.

Measurement data stored in the memory of the gauge can be transferred to the computer through the RS232 port. Detailed information of the communication software and its usage refer to the software manual.

**5.13 Error Code Reference**

Error Code	Explanation	Error Code	Explanation
E00	Battery Flat	E05	Can Not Print
E01	Value Out Of Range	E06	
E02	Measurement not finished	E07	
E03	Data Already Saved	E08	
E04	No Memory Data	E09	

**6 MAINTENANCE & SERVICING**

**6.1 Impact Device Maintenance**

- After the impact device has been used for 1000--2000 times, please use the nylon brush provided to clean the guide tube and impact body. When cleaning the guide tube, unscrew the support ring first, then take out the impact body, spiral the nylon brush in counter-clock direction into the bottom of guide tube and take it out for 5 times, and then install the impact body and support ring again.
- Release the impact body after use.
- Any lubricant is absolutely prohibited inside the impact device.

**6.2 Instrument Maintenance Program**

- When using standard Rockwell hardness block to testing, if all the error is bigger than 2 HRC, it may be the invalidation of impacted ball top caused by abrasion. Changing the spherical test tip or impact object should be considered.
- When the hardness tester appears some other abnormal phenomena, please do not dismantle or adjust any fixedly assembled parts. Fill in and present the warranty card to us. The warranty service can be carried on.

**6.3 Fault Analysis & Evacuation**

Fault Appearance	Fault Analysis	Handling Method
Failure Power On	Battery Flat	Replace The Batteries
No Measure Value	Impact Device Cable Failure	Replace The cable

## APPENDIX

**Table 1**

Material	Method	Impact device					
		D/DC	D+15	C	G	E	DL
Steel and cast steel	HRC	20 ~ 68.5	19.3 ~ 67.9	20.0 ~ 69.5		22.4 ~ 70.7	20.6 ~ 68.2
	HRB	38.4 ~ 99.6			47.7 ~ 99.9		37.0 ~ 99.9
	HRA	59.1 ~ 85.8				61.7 ~ 88.0	
	HB	127 ~ 651	80 ~ 638	80 ~ 683	90 ~ 646	83 ~ 663	81 ~ 646
	HV	83 ~ 976	80 ~ 937	80 ~ 996		84 ~ 1042	80 ~ 950
	HS	32.2 ~ 99.5	33.3 ~ 99.3	31.8 ~ 102.1		35.8 ~ 102.6	30.6 ~ 96.8
Cold work tool steel	HRC	20.4 ~ 67.1	19.8 ~ 68.2	20.7 ~ 68.2		22.6 ~ 70.2	
	HV	80 ~ 898	80 ~ 935	100 ~ 941		82 ~ 1009	
Stainless steel	HRB	46.5 ~ 101.7					
	HB	85 ~ 655					
	HV	85 ~ 802					
Grey cast iron	HRC						
	HB	93 ~ 334			92 ~ 326		
	HV						
Nodular cast iron	HRC						
	HB	131 ~ 387			127 ~ 364		
	HV						
Cast aluminum alloys	HB	19 ~ 164		23 ~ 210	32 ~ 168		
	HRB	23.8 ~ 84.6		22.7 ~ 85.0	23.8 ~ 85.5		
BRASS(copper-zinc alloys)	HB	40 ~ 173					
	HRB	13.5 ~ 95.3					
BRONZE(copper-aluminum/tin alloys)	HB	60 ~ 290					
Wrought copper alloys	HB	45 ~ 315					

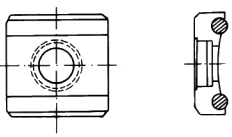
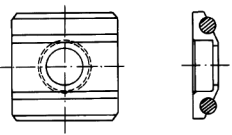
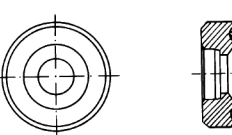
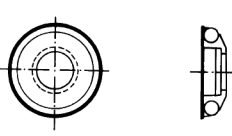
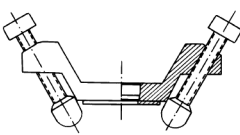
**Table 2**

No.	Material	HLD	Strength $\sigma_b$ (MPa)
1	Mild steel	350 ~ 522	374 ~ 780
2	High-Carbon steel	500 ~ 710	737 ~ 1670
3	Cr steel	500 ~ 730	707 ~ 1829
4	Cr-V steel	500 ~ 750	704 ~ 1980
5	Cr-Ni steel	500 ~ 750	763 ~ 2007
6	Cr-Mo steel	500 ~ 738	721 ~ 1875
7	Cr-Ni-Mo steel	540 ~ 738	844 ~ 1933
8	Cr-Mn-Si steel	500 ~ 750	755 ~ 1993
9	Super strength steel	630 ~ 800	1180 ~ 2652
10	Stainless steel	500 ~ 710	703 ~ 1676

**Table 3**

Type of impact device	DC(D)/DL	D+15	C	G	E	
Impacting energy	11mJ	11mJ	2.7mJ	90mJ	11mJ	
Mass of impact body	5.5g/7.2g	7.8g	3.0g	20.0g	5.5g	
Test tip hardness: Dia. Test tip: Material of test tip:	1600HV 3mm Tungsten carbide	1600HV 3mm Tungsten carbide	1600HV 3mm Tungsten carbide	1600HV 5mm Tungsten carbide	5000HV 3mm synthetic diamond	
Impact device diameter: Impact device length: Impact device weight:	20mm 86(147)/ 75mm 50g	20mm 162mm 80g	20mm 141mm 75g	30mm 254mm 250g	20mm 155mm 80g	
Max. hardness of sample	940HV	940HV	1000HV	650HB	1200HV	
Mean roughness value of sample surface Ra:	1.6μ m	1.6μ m	0.4μ m	6.3μ m	1.6μ m	
Min. weight of sample: Measure directly Need support firmly Need coupling tightly	>5kg 2 ~ 5kg 0.05 ~ 2kg	>5kg 2 ~ 5kg 0.05 ~ 2kg	>1.5kg 0.5 ~ 1.5kg 0.02 ~ 0.5kg	>15kg 5 ~ 15kg 0.5 ~ 5kg	>5kg 2 ~ 5kg 0.05 ~ 2kg	
Min. thickness of sample Coupling tightly Min. layer thickness for surface hardening	5mm ≥ 0.8mm	5mm ≥ 0.8mm	1mm ≥ 0.2mm	10mm ≥ 1.2mm	5mm ≥ 0.8mm	
Size of tip indentation						
Hardness 300HV	Indentation diameter Depth of indentation	0.54mm 24μ m	0.54mm 24μ m	0.38mm 12μ m	1.03mm 53μ m	0.54mm 24μ m
Hardness 600HV	Indentation diameter Depth of indentation	0.54mm 17μ m	0.54mm 17μ m	0.32mm 8μ m	0.90mm 41μ m	0.54mm 17μ m
Hardness 800HV	Indentation diameter Depth of indentation	0.35mm 10μ m	0.35mm 10μ m	0.35mm 7μ m	-- --	0.35mm 10μ m
Available type of impact device	DC: Test hole or hollow cylindrical; DL: Test slender narrow groove or hole	D+15: Test groove or reentrant surface	C: Test small, light, thin parts and surface of hardened layer	G: Test large, thick, heavy and rough surface steel	E: Test super high hardness material	

**Table 4**

No.	Type	Sketch of non-conventional Supporting ring	Remarks
1	Z10-15		For testing cylindrical outside surface R10 ~ R15
2	Z14.5-30		For testing cylindrical outside surface R14.5 ~ R30
3	Z25-50		For testing cylindrical outside surface R25 ~ R50
4	HZ11-13		For testing cylindrical inside surface R11 ~ R13
5	HZ12.5-17		For testing cylindrical inside surface R12.5 ~ R17
6	HZ16.5-30		For testing cylindrical inside surface R16.5 ~ R30
7	K10-15		For testing spherical outside surface SR10 ~ SR15
8	K14.5-30		For testing spherical outside surface SR14.5 ~ SR30
9	HK11-13		For testing spherical inside surface SR11 ~ SR13
10	HK12.5-17		For testing spherical inside surface SR12.5 ~ SR17
11	HK16.5-30		For testing spherical inside surface SR16.5 ~ SR30
12	UN		For testing cylindrical outside surface, radius adjustable R10 ~ ∞



#### **ENVIRONMENT PROTECTION**

Recycle unwanted materials instead of disposing of them as waste. All tools, accessories and packaging should be sorted, taken to a recycling centre and disposed of in a manner which is compatible with the environment. When the product becomes completely unserviceable and requires disposal, drain any fluids (if applicable) into approved containers and dispose of the product and fluids according to local regulations.

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