Instruction Manual
Mobile Leeb Hardness Tester

SAUTER HMM
Version 1.6
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GB
Thank you for buying a digital SAUTER Shore hardness tester. We hope you are pleased with your high quality instrument and with its big functional range. If you have any queries, wishes or helpful suggestions, do not hesitate to call our service number.

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1 Introduction

1.1 Principle

The tester’s measuring principle is physically a rather simple one, it is a dynamic hardness tester.
An impact body with a hard metal test tip is propelled by a spring force against the surface of the test object. Surface deformation takes place, when the impact body hits the test object’s surface, which will result in loss of kinetic energy.

This energy loss is calculated by velocity measurements when the impact body is at a precise distance from the surface of both, the impact and rebound phase of the test. The permanent magnet in the impact body generates an induction voltage in the single coil of the impact device. The voltage of the signal is proportional to the velocity of the impact body, and signal processing by the electronics provides the hardness reading for display and storage.

1.2 Structure

Display Unit

Impact Device D type

1. Impact Body
2. Support Ring
3. Coil
4. Cable
5. Catch Chuck
6. Loading Tube
7. Release Button
1.3 Key pad

**Backlight button:**
To turn on/off the LCD backlight.

**Power button:**
Pressing and holding it can turn on/off power.

"Back/Print" button:
1. In measurement mode, press and hold it to erase the measured data. Or if the mini-printer is linked with the display unit, it will print out those data.
2. In other mode, press it to complete setup and save the parameters and return to the measurement mode.

**Press and hold it to delete current data in measurement mode or...**

**MEMORY button:**
Browse the memory data

**Date/Time button:**
Adjust date and time.

Press and hold it to delete current data in measurement mode or...

**Fig. 1-3**

1.4 Display

**Fig. 1-4**

1.5 Specifications

Display range: 0～999HLD

Accuracy: ±6 HL (at 800HLD)

Resolution: 1 (HL, HV, HB, HSD, MPa); 0.1 (HRC, HRB)

Impact energy: 11 Nmm

Mass of the impact body: 5.5g
Test tip- diameter: 3mm; material: tungsten carbide; hardness: ≥1600HV

Power: 3 x1.5V AAA Batteries

Operating temperature: 32 ~ 122°F, 5 % ~ 95%RH;
Storage temperature: 14 ~ 144°F, 5 % ~ 95%RH

Dimensions: 150mm x 80mm x 24 mm (Display unit)

Impact length: 147 mm (Type D)

Weight: Approx. 200 g (display unit); Impact device 75g (Type D)

Conform to following standards: ASTM A956 & DIN50156

2 Preparation for testing

- Instrument’s preparation
- Installation of batteries
- Connection of impact device
- Turn on the power
- To confirm the accuracy: Use the standard test block to check the tester and make sure it work well.

2.1 Preparation of the test object

Inappropriate specimen will bring erroneous measurement results. It should be the necessary processing and preparation according to the original conditions of specimen. The preparation of specimen should be according to the basic requirements of the following:

During the process of the test surface preparation, cold and heat processing on the specimen surface should be avoided. Testing surface should be flat with metallic luster, and no oxide skin and other dirt.

The roughness of test surface
The specimen must be of sufficient mass and rigidity. If insufficient, a displacement or move will be produced in the process of impact, which can cause large errors.
Generally, if the mass of the specimen is bigger than or equal to 5kg, tests can be carried out directly.

2.2 Thickness of specimen

The thickness of specimen and thickness of homogeneous layer (or a surface hardening layer) should be thick enough. If the test surface is not flat, the radius of test area should be larger than 30 mm (50 mm for type G). If this is not given, you should mount an appropriate support ring. The specimen should not be magnetic.

2.3 Testing procedure

Inappropriate specimen will bring the erroneous measurement results. It should always be the necessary processing and preparation according to the original conditions of specimen. The preparation of specimen should satisfy the basic requirements as follows:

- During test surface preparation it should be avoided cold or heat processing on the specimen’s surface.
- Test surface should be flat with metallic luster, and no oxide skin and other dirt.
- The roughness of test surface should be $Ra \leq 1.6$.
- The specimen must be of sufficient mass and rigidity to avoid the displacement or move in test.
- Generally, if the mass of the specimen is bigger than or equal to 5kg, tests can be carried out directly.
• The specimen of 2 ~ 5kg need to be clamped to become fixed, the specimen of 0.05 ~ 2kg should be coupled. If the mass is lighter than 0.05kg, it is not appropriate for Leeb testing.
• The thickness of specimen shall be not less than 5mm, and thickness of homogeneous layer (or surface hardening layer) may not be less than 0.8mm.
• If the test surface is not flat, the radius of the test area should be larger than 30mm and an appropriate support ring should be mounted.
• The specimen should not be magnetic.

2.3 Test procedure

2.3.1 Loading
Simply load the impact device by sliding the loading tube forward.

2.3.2 Locating
Then place and hold the impact device onto the surface of the test object at the desired test point. Impact indirection should be vertically.

2.3.3 Impacting (Measuring)
Trigger the impact by pressing the release button. The hardness value will be instantaneously be displayed.

2.3.4 Reading the test result
Read the test result from LCD at Fig. 2-2.

Note:
Generally, each measurement location of sample is conducted for five tests. The range (difference of maximum value and minimum value) values should be less than 15HL. The distance between any two impact point should be ≥3 mm; the distance between impact position and the edge of the sample should be≥3 mm.

2.4 Browse
The tester can save 9 hardness values, you can browse them after testing.
Press “ ” button to browse stored data and display the first data group in last nine test data,
including hardness value HLD, material, conversion values, impact direction, date and time etc.
Press “ ” or “ ” button to browse the next or previous data group. Press “ ” button to return to measurement mode.

2.5 Print test report
The tester can be linked to a wireless printer to print a report.
Place the printer near the tester (within 2 m), and turn the power on.
Press for about 2 seconds and a report will be printed.

**NOTE:**
The original data in memory will be erased automatically when printing is completed.

3 Setup

3.1 Material Code
In measurement mode, press “ ” button to select the material code you will impact. The material code is listed on the back label or see Appendix A-3.

**Note:**
It is necessary to select the material classification. In case if you don’t know the material type, you must consult the material handbook.
Default setting: 01(steel or cast steel)

3.2 Impact Direction
In measurement mode, press “ ” button to select the impact direction, the impact direction changes according to following sequence:

The tester can do some correction for test directions automatically.

3.3 Scale
The tester can convert HLD to the other hardness scales:
HRC→HRB→HB→HV→HSD or tensile strength (MPa) according to a particular material.
In measurement mode, press “ ” to convert to all common hardness scales or tensile strength (MPa);
Press the key continuously, the scale according to following sequence:

**Annotation:**
The conversion value is “---” indicated the conversion is out of range.
When you set the conversion from hardness scale to tensile strength or from tensile strength to hardness scale, you must reset material group. Conversion value only supplies the general reference, which may result in some offset. Precisely conversion generally needs related comparative tests. Default setting for the conversion is “HRC”.

4 Maintenance

4.1 Routine maintenance

General considerations

Please avoid collision. Put the instrument back into the case after use. The impact body should be in release state when being stored.

You should avoid working close to a strong magnetic field. Any of the components should become in contact with any kinds of oil or lubricant.

Clean the impact body

General every 1~2 thousands of times after test, the impact device tube and impact body should be cleaned.

Method: Rotate off the support ring, release and remove the impact body. Use the nylon brush to clean the tube and impact body.

Replacement impact ball

For long-term use, the impact ball may be worn, it should be replaced when the test precision seems to become affected.

5 Calibration

Calibration is used to calibrate the measured value (HLD, HRC, HRB, HB, HV and HSD) of the hardness tester, so as to farthest decrease the measuring error.

Before calibration, the scale should be converted into the scale needed. Such as to calibrate the HB, you should choose according to HB by button.

Press “” button for about 2 seconds until the number of impact time’s flicker that the impact time become to “0”. (Fig.4.1)

Test 5 times in test blocks to obtain the average value (can delete some error data in operation).

Press and hold button about 2 seconds to display the calibration mode. (Fig.4-2)

Enter the standard value of test block.
Press 🔄 or 🔄 to move digit.

Note:
If calibration in the other scale HRC, HRB, HB, HV or HSD, you must adjust to the scale needed in measurement mode first.

After step 3, hold 🔄 then press 🔄. Now the scale what you want to calibrate will be displayed (Fig.4-3)
In the other scale (HRC, HRB, HB, HV and HSD) calibration mode, the standard values input is different from calibration in Leeb hardness (HL).
25.0HRC, should be entered into "250" (HRB is the same).
85HB, should be entered into "085"(HV, HSD are the same).
If the input data exceeds the range, the calibration will not be performed.

Clock
THE Hardness Tester has built-in real-time clock system (Fig 4-4). It must be adjusted when you reinstall the batteries or other necessary case.
Press 🔄 to enter the clock adjustment mode.
Press 🔄 to change the value and press 🔄 or 🔄 to move item.
Press 🔄 to confirm the set and back to measurement mode.

System Reset
If the display unit isn’t working properly or halts, you should perform a system reset. Replace the batteries and remount them, then turn on the power.

6 Appendix
6.1 A-1 Scale Conversion Range

<table>
<thead>
<tr>
<th>Materials</th>
<th>HV</th>
<th>HB</th>
<th>HRC</th>
<th>HRB</th>
<th>HSD</th>
<th>Tensile strength (MPa)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Steel &amp; Cast Steel</td>
<td>81-955</td>
<td>81-654</td>
<td>20.0-68.4</td>
<td>38.4-99.5</td>
<td>32.5-99.5</td>
<td>375-2639</td>
</tr>
<tr>
<td>Alloy Tool Steel</td>
<td>80-898</td>
<td>20.4-67.1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stainless Steel</td>
<td>85-802</td>
<td>85-655</td>
<td>19.6-62.4</td>
<td>46.5-101.7</td>
<td></td>
<td>740-1725</td>
</tr>
<tr>
<td>Grey Cast Iron</td>
<td>63-336</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ductile Iron</td>
<td>140-387</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cast Aluminum</td>
<td>19-164</td>
<td>23.8-84.6</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
6.2 A-2 Material Code

<table>
<thead>
<tr>
<th>Cod</th>
<th>Material</th>
<th>Code</th>
<th>Material</th>
</tr>
</thead>
<tbody>
<tr>
<td>01</td>
<td>Steel &amp; Cast</td>
<td>11</td>
<td>Low Carbon Steel</td>
</tr>
<tr>
<td>02</td>
<td>Alloy Tool Steel</td>
<td>12</td>
<td>Hi Carbon Steel</td>
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<tr>
<td>03</td>
<td>Stainless Steel</td>
<td>13</td>
<td>Chrome Steel</td>
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<td>04</td>
<td>Grey Cast Iron</td>
<td>14</td>
<td>Cr-V Steel</td>
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<td>05</td>
<td>Ductile Iron</td>
<td>15</td>
<td>Cr-Ni Steel</td>
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<tr>
<td>06</td>
<td>Cast Aluminum</td>
<td>16</td>
<td>Cr-Mo Steel</td>
</tr>
<tr>
<td>07</td>
<td>Brass</td>
<td>17</td>
<td>Cr-Ni-Mo Steel</td>
</tr>
<tr>
<td>08</td>
<td>Bronze</td>
<td>18</td>
<td>Cr-Mn-Mo Steel</td>
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<tr>
<td>09</td>
<td>Copper</td>
<td>19</td>
<td>Cr-Mn-Si Steel</td>
</tr>
<tr>
<td>10</td>
<td>Forging Steel</td>
<td>20</td>
<td>Hi Strength Steel</td>
</tr>
</tbody>
</table>

6.3 A-3 Packing List

Annotation:
To have a look at the CE Declaration of Conformity, please click onto the following link: [https://www.kern-sohn.com/shop/de/DOWNLOADS/](https://www.kern-sohn.com/shop/de/DOWNLOADS/)