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# Instruction Manual

## Mobile Leeb Hardness Tester

### SAUTER HMM

Version 1.6  
01/2018  
GB



PROFESSIONAL MEASURING

HMM-BA-e-1816



# SAUTER HMM

Version 1.6 01/2018

## Instruction Manual

### Mobile Leeb Hardness Tester

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.

Summarize:

<b>1</b>	<b>Introduction</b> .....	<b>3</b>
1.1	Principle .....	3
1.2	Structure.....	3
1.3	Key pad.....	4
1.4	Display .....	4
1.5	Specifications .....	4
<b>2</b>	<b>Preparation for testing</b> .....	<b>5</b>
2.1	Preparation of the test object.....	5
2.2	Thickness of specimen .....	6
2.3	Testing procedure .....	6
2.3	Test procedure.....	7
2.3.1	Loading .....	7
2.3.2	Locating .....	7
2.3.3	Impacting (Measuring).....	7
2.3.4	Reading the test result.....	7
2.4	Browse.....	7
2.5	Print test report.....	8
<b>3</b>	<b>Setup</b> .....	<b>8</b>
3.1	Material Code .....	8
3.2	Impact Direction .....	8
3.3	Scale .....	8
<b>4</b>	<b>Maintenance</b> .....	<b>9</b>
4.1	Routine maintenance .....	9
<b>5</b>	<b>Calibration</b> .....	<b>9</b>
<b>6</b>	<b>Appendix</b> .....	<b>10</b>
6.1	A-1 Scale Conversion Range .....	10
6.2	A-2 Material Code .....	11
6.3	A-3 Packing List.....	11

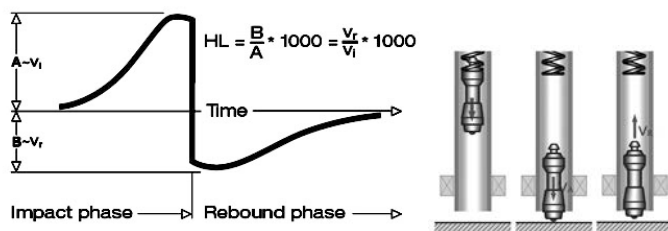
# 1 Introduction

## 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

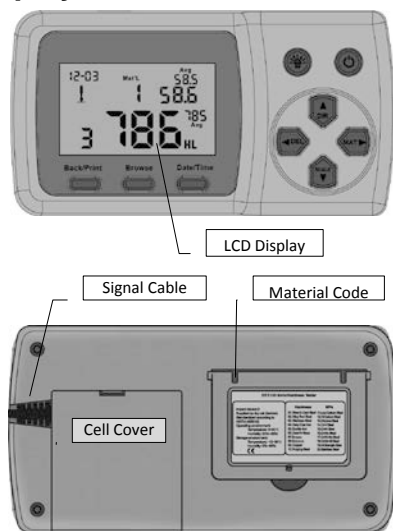


Fig.1-1 Display Unit

### Impact Device D type

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

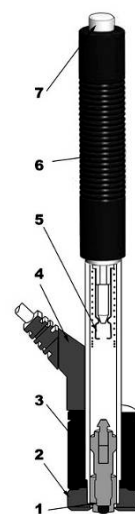


Fig2.1-

### 1.3 Key pad

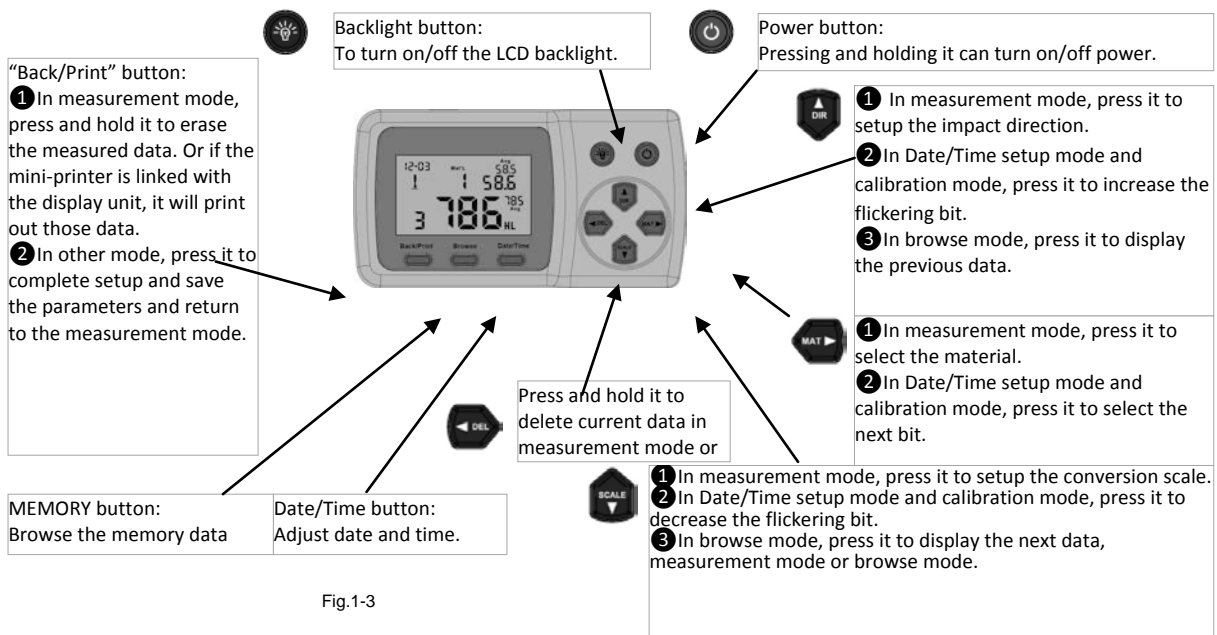


Fig.1-3

### 1.4 Display

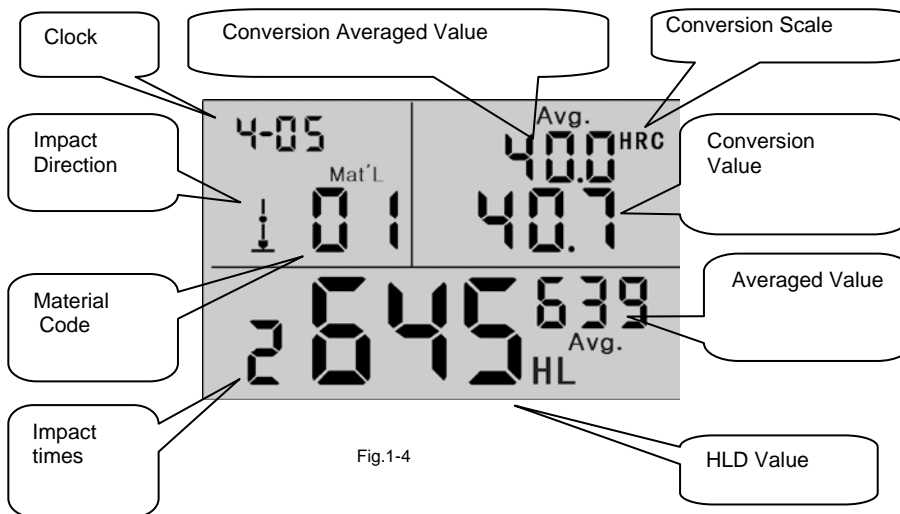


Fig.1-4

### 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:  $\geq 1600\text{HV}$

Power: 3 x 1.5V 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)

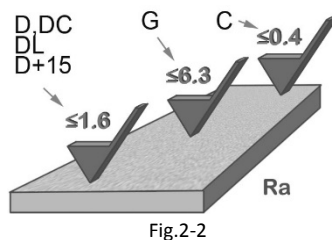
Conform to following standards: ASTM A956 & DIN50156

## 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.

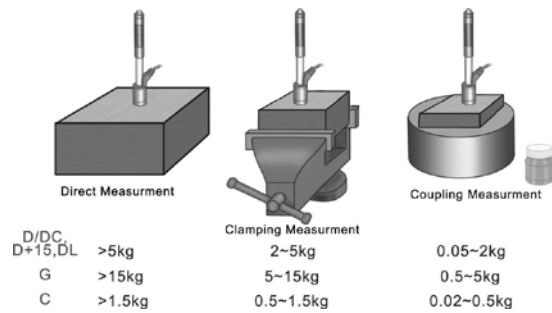


Fig.2-3

## 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.

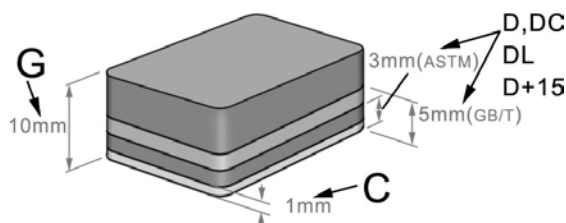


Fig.2-4

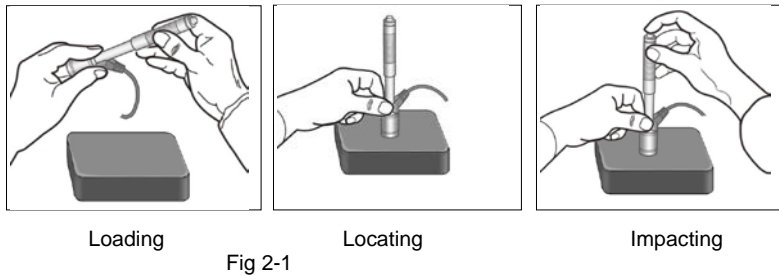
## 2.3 Testing procedure

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  $R_a \leq 1.6$ .
- 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.

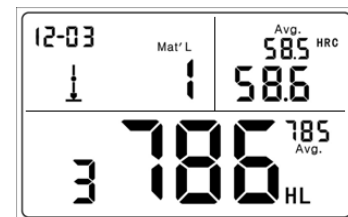
**Note:**

**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  $\geq 3$  mm; the distance between impact position and the edge of the sample should be  $\geq 3$  mm.**

## 2.4 Browse

The tester can save 9 hardness values, you can browse them after testing.

Press “Browse” button to browse stored data and display the first data group in last nine test data,



Hardness value: 786HLD;  
The third measurement point;  
Mean value: 785HLD  
Conversions to HRC: 58.6HRC  
Mean value of HRC: 58.5HRC

Fig 2-2


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.






Test Report			
Impact Unit Type: D			
Material : Steel&Caststeel			
1	808 HLD		61.2 HRC
Date: 06/07/31 Time:18:21:27			
2	808 HLD		61.2 HRC
Date: 06/07/31 Time:18:21:27			
3	805 HLD		60.8 HRC
Date: 06/07/31 Time:18:21:27			
4	808 HLD		61.2 HRC
Date: 06/07/31 Time:18:21:27			
5	805 HLD		60.8 HRC
Date: 06/07/31 Time:18:21:27			
-----			
s = 3	HLD		00.4 HRC
$\bar{x}$ =	806 HLD		61.0 HRC
Printed: 06/07/31 18:21:27			


Fig.2-3

#### 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**.

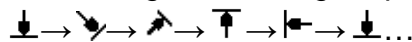
#### Note:

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:

HRC→ HRB→ HB→ HV→ HSD→ MPa→ HRC...

#### 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.

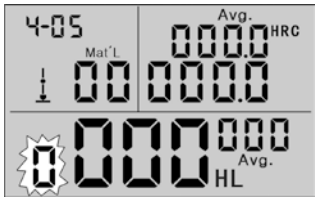


Fig.4-1

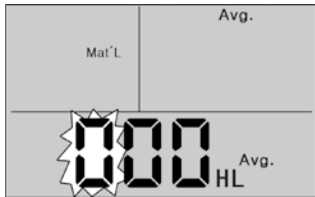


Fig.4-2

Press to change the value and 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.



Fig.4-3

### 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.



Fig.4-4

### 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

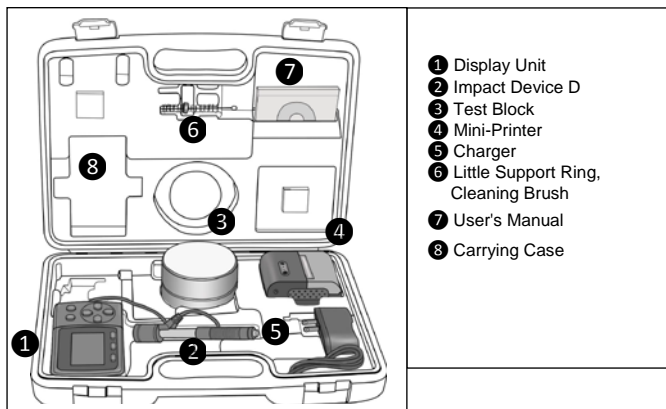
Materials	HV	HB	HRC	HRB	HSD	Tensile strength (MPa)
Steel & Cast Steel	81-955	81-654	20.0-68.4	38.4-99.5	32.5-99.5	375-2639
Alloy Tool Steel	80-898		20.4-67.1			375-2639
Stainless Steel	85-802	85-655	19.6-62.4	46.5-101.7		740-1725
Grey Cast Iron		63-336				
Ductile Iron		140-387				
Cast Aluminum		19-164		23.8-84.6		

Alloys						
Brass		40-173		13.5-95.3		
Bronze		60-290				
Copper		45-315				
Forging Steel	83-976	142-651	19.8-68.5	59.6-99.6	26.4-99.5	

## 6.2 A-2 Material Code

Hardness		Tensile Strength	
Cod	Material	Code	Material
01	Steel & Cast	11	Low Carbon Steel
02	Alloy Tool Steel	12	Hi Carbon Steel
03	Stainless Steel	13	Chrome Steel
04	Grey Cast Iron	14	Cr-V Steel
05	Ductile Iron	15	Cr-Ni Steel
06	Cast Aluminum	16	Cr-Mo Steel
07	Brass	17	Cr-Ni-Mo Steel
08	Bronze	18	Cr-Mn-Mo Steel
09	Copper	19	Cr-Mn-Si Steel
10	Forging Steel	20	Hi Strength Steel

## 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/>