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## HARDNESS TESTING OF METALS (LEEB)

Determining the hardness of metals is of particular significance during the preparation and use of metallic materials. Usually, hardness is determined using test machines in accordance with Vickers, Rockwell or Brinell.

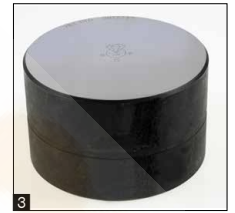
For mobile measurements, the rebound method according to Dietmar Leeb, which was first used in 1978, has prevailed. To do this, a standardised impact body (such as SAUTER AHMO D01) is shot against the item to be tested. The rebound of the impact body leads to a deformation of the upper surface, which results in a loss of kinetic energy. This loss of energy is determined by measuring the speed and herefrom the Leeb hardness value (HL) is calculated.

These measuring devices can be used in any location. Usually they are equipped with a large internal data memory, which allows to record the measurements at goods receipt or in production.

Our range is equipped with compact measuring devices of the so-called "Pen Type" shape (HN-D) or measuring devices with external sensors connected by cables.

### Quick-Finder

Readout	Measuring range	Sensor	Model	Page
[d] HL	[Max] HL		<b>SAUTER</b>	
1	960	D	<b>HN-D</b>	66
1	960	D	<b>HMM-NP</b>	65
1	960	D	<b>HMM</b>	65
1	960	D	<b>HK-D</b>	64
1	960	D	<b>HK-DB</b>	64
1	960	D	<b>HMO</b>	67



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## Premium Leeb hardness tester – also with hardness comparison block included

### Features

- External impact sensor standard (Type D)
- Mobility: In comparison with stationary table-top devices and testing devices with an internal sensor, using the SAUTER HK-D offers the highest level of mobility and flexibility
- All measurement directions possible (360°) thanks to an automatic compensation function
- **1** SAUTER HK-DB: Hardness comparison block, hardness approx. 800 HLD, included in delivery
- Measurement value display: Rockwell (Type A, B, C), Vickers (HV), Shore (HS), Leeb (HL), Brinell (HB)
- Internal memory for up to 600 data groups, with up to 32 values per group forming the average value of the group
- Mini statistics function: displays the measured result, the average value, the impact direction, date and time
- Automatic unit conversion: The measuring result is automatically converted into all specified hardness units

- Measuring with tolerance range and programmable limit values. The process is supported by an audible and visual signal
- Matrix display: Backlit multi-function display
- Robust metal housing
- **2** Delivered in a robust carrying case

### Technical data

- Precision: ± 1 % at 800 HLD
- Minimum sample radius (concave/convex): 50 mm (with support ring: 10 mm)
- Thinnest measurable material thickness: 2 mm, with coupling on fixed base
- The lowest weight of the test item on solid support unit: 2 kg with fixed coupling
- Battery operation, 2×1.5 V AA standard, operating time up to 200 h
- Permissible ambient temperature -10 °C/40 °C
- Overall dimensions W×D×H 132×82×31 mm

### Accessories

- Plug-In for data transfer of measuring data from the measuring instrument and transfer to a PC, e.g. in Microsoft Excel®, SAUTER AFI-2.0, see internet
- BalanceConnection software for flexible measured value recording or transmission, compatible with Microsoft® Excel, Access and other applications, scope of delivery: 1 CD, 1 license, KERN SCD-4.0
- Support rings for bended test objects, SAUTER AHMR 01
- Impact body Type D, net weight approx. 0,05 kg, hardness ≥ 1600 HV, tungsten carbide, impact ball ø 3 mm, in accordance with standard ASTM A956-02, SAUTER AHMO D01
- External impact sensor Type C. Low energy sensor: requires only 25 % impact energy compared to type D, for testing tiny or light objects or the surface of hardened layer, SAUTER AHMR C
- External impact sensor Type D, SAUTER AHMR D
- External impact sensor Type D+15. Slim front section for holes, grooves or re-entrant surfaces, SAUTER AHMR D+15
- External impact sensor Type DL, for very narrow surfaces (ø 4,5 mm), SAUTER AHMR DL
- External impact sensor Type G. High energy sensor: 900 % impact energy compared to type D, SAUTER AHMR G
- Connection cable impact sensor, SAUTER HMO-A04
- **3** Test block Type D/DC, ø 90 mm (± 1 mm), net weight < 3 kg, hardness range 790 ± 40 HL, SAUTER AHMO D02 630 ± 40 HL, SAUTER AHMO D03 530 ± 40 HL, SAUTER AHMO D04
- Factory calibration certificates for SAUTER AHMO D02, AHMO D03, AHMO D04, SAUTER 961-132

#### STANDARD



#### OPTION



Model	Sensor	Measuring range	Readout	Test block	Net weight	Option
						<b>Factory calibration certificate</b>
<b>SAUTER</b>		HL	[d] HL	Typ D/DC approx. 800 HL	approx. kg	KERN
<b>HK-D</b>	D	170 - 960	1	not standard	0,45	961-131
<b>HK-DB</b>	D	170 - 960	1	standard	0,45	961-131



## Advanced features for demanding applications

### Features

- **1** Impact (rebound) sensor: The bounce module is accelerated by a spring against the item being tested. Depending on how hard the object is, the kinetic energy of the module will be absorbed. The speed reduction will be measured and converted to Leeb hardness values
- External impact sensor (Type D) included
- High levels of mobility and flexibility in comparison with stationary table-top devices and hardness testing devices with internal sensors
- All measurement directions possible (360°) thanks to an automatic compensation function
- **2** Hardness test block for calibration included (790 ± 40 HL)
- Internal memory for up to 9 measurement values
- Mini statistics function: displays the measured result, the average value, the impact direction, date and time
- SAUTER HMM: Infrared printer for direct output of the measuring results is included with delivery

- SAUTER HMM-NP: identical product features as the SAUTER HMM model, but comes without the printer
- Measurement value display: (B & C), Vickers (HV), Brinell (HB), Shore (HSD), Leeb (HL), tensile strength (MPa)
- Automatic unit conversion: The measuring result is automatically converted into all specified hardness units
- **3** Delivered in a robust carrying case

### Technical data

- Precision: ± 1 % at 800 HLD (± 6 HLD)
- Measuring range tensile strength: 375–2639 MPa (steel)
- Minimum sample weight on a solid and stable support: 2 kg with fixed coupling
- Minimum sample material thickness: 3 mm with coupling on fixed base
- Minimum sample radius (concave/convex): 50 mm (with support ring: 10 mm)
- Batteries included, 3×1.5 V AAA, operating time up to 30 h, AUTO-OFF function to preserve the battery
- SAUTER HMM: External mains adapter for printer, as standard
- Overall dimensions W×D×H 150×80×30 mm

### Accessories

- External impact sensor Type D, as standard, can be reordered, SAUTER AHMO D
- Connection cable, without impact sensor, SAUTER HMM-A02
- **5** Support rings for bended test objects, SAUTER AHMR 01
- **4** Impact body Type D, net weight approx. 0,05 kg, hardness ≥ 1600 HV, tungsten carbide, impact ball Ø 3 mm, in accordance with standard ASTM A956-02, SAUTER AHMO D01
- Test block Type D/DC, Ø 90 mm (± 1 mm), net weight < 3 kg, hardness range 790 ± 40 HL, SAUTER AHMO D02 630 ± 40 HL, SAUTER AHMO D03 530 ± 40 HL, SAUTER AHMO D04
- Factory calibration certificates for SAUTER AHMO D02, AHMO D03, AHMO D04, SAUTER 961-132
- Paper roll, 1 piece, SAUTER ATU-US11

STANDARD							OPTION
HMM							

Model	Sensor	Measuring range	Readout	Net weight	Option
					Factory calibration certificate
SAUTER		HL	[d] HL	approx. kg	KERN
HMM	D	170 – 960	1	0,25	961-131
HMM-NP	D	170 – 960	1	0,25	961-131



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## “Pen type“ Leeb hardness tester for mobile hardness testing of metals

### Features

- User-friendly operation: The compact version enables the product to be used in a significantly wider range of applications compared with traditional devices
- The measuring device has been designed for one-hand operation and this allows the user to work more quickly and flexibly
- Modern LCD display: Optimised for industrial applications: increased luminosity and backlight can be switched on, that way the display can be read from any angle
- All measurement directions possible (360°) thanks to an automatic compensation function
- Internal impact sensor included (Type D)
- Measurement value display: (B & C), Vickers (HV), Brinell (HB), Leeb (HL)
- Standard block for calibration not included in scope of delivery
- Internal data memory for up to 500 measurements with date and time
- Data interface USB, including USB interface cable
- **1** Delivered in a robust carrying case

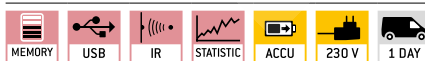
### Technical data

- Measurement uncertainty  $\pm 4$  HLD
- Minimum sample weight on a solid and stable support: 2 kg with fixed coupling
- Thinnest measurable material thickness: 3 mm, with coupling on fixed base
- Rechargeable battery pack integrated, as standard, operating time up to 16 h without backlight, charging time approx. 3 h
- Mains adapter external, standard
- Overall dimensions W×D×H 22×35×147 mm
- Net weight approx. 0,20 kg

### Accessories

- Plug-In for data transfer of measuring data from the measuring instrument and transfer to a PC, e.g. in Microsoft Excel®, SAUTER AFI-2.0, see *internet*
- Impact body Type D, net weight approx. 0,05 kg, hardness  $\geq 1600$  HV, tungsten carbide, impact ball  $\varnothing 3$  mm, in accordance with standard ASTM A956-02, SAUTER AHMO D01
- **2** Test block Type D/DC,  $\varnothing 90$  mm ( $\pm 1$  mm), net weight  $< 3$  kg, hardness range 790  $\pm 40$  HL, SAUTER AHMO D02 630  $\pm 40$  HL, SAUTER AHMO D03 530  $\pm 40$  HL, SAUTER AHMO D04
- Factory calibration certificates for SAUTER AHMO D02, AHMO D03, AHMO D04, SAUTER 961-132

#### STANDARD



#### OPTION



Model	Sensor	Measuring range	Readout	Option
				Factory calibration certificate
SAUTER		HL	[d] HL	KERN
HN-D	D	170 – 960	1	961-131





## Advanced features for professional applications

Features	Technical data	Accessories
<ul style="list-style-type: none"> <li>LCD touchscreen</li> <li>Automatic recognition of the impact (rebound) sensor connected to the SAUTER HMO</li> <li>Mobility: In comparison with stationary table-top devices and testing devices with an internal sensor, using the SAUTER HMO offers the highest level of mobility and flexibility</li> <li>All measurement directions possible (360°) by defining the direction of impact on the device</li> <li>USB socket for connection to the printer and charging the batteries</li> <li><b>1</b> Hardness test block for calibration included</li> <li>Internal data memory for up to 500 values</li> <li>Mini statistics function: Displays the measure value, the average value, the difference between the maximum and minimum values, date and time</li> <li>Measurement value display: (B &amp; C), Vickers (HV), Brinell (HB), Leeb (HL), tensile strength (MPa)</li> <li>Automatic unit conversion: The measuring result is automatically converted into all specified hardness units</li> <li><b>2</b> Delivered in a robust carrying case</li> </ul>	<ul style="list-style-type: none"> <li>Precision: <math>\pm 1\%</math> at 800 HLD (<math>\pm 6</math> HLD)</li> <li>Measuring range tensile strength: 375–2639 MPa (steel)</li> <li>Minimum sample weight on a solid and stable support: Sensor D + DC: 2 kg with fixed coupling</li> <li>Minimum sample material thickness: Sensor D + DC: 3 mm with coupling on fixed base</li> <li>Minimum sample radius (concave/convex): 50 mm (with support ring: 10 mm)</li> <li>Internal rechargeable battery pack, operating time up to 50 h without backlight, charging time approx. 8 h, standard</li> <li>Mains adapter included</li> <li>Overall dimensions WxDxH 24×83×135 mm</li> <li>Net weight approx. 4,6 kg</li> </ul>	<ul style="list-style-type: none"> <li>External impact sensor Type D, as standard, can be reordered, SAUTER AHMO D</li> <li><b>3</b> External impact sensor Type DC. Short impact sensor for tests in holes or hollowed objects, SAUTER AHMO DC</li> <li>on request: Support rings for bended test objects, SAUTER AHMR 01</li> <li><b>4</b> Impact body Type D, net weight approx. 0,05 kg, hardness <math>\geq 1600</math> HV, tungsten carbide, impact ball <math>\varnothing 3</math> mm, in accordance with standard ASTM A956-02, SAUTER AHMO D01</li> <li>Connection cable impact sensor, SAUTER HMO-A04</li> <li>Test block Type D/DC, <math>\varnothing 90</math> mm (<math>\pm 1</math> mm), net weight <math>&lt; 3</math> kg, hardness range 790 <math>\pm 40</math> HL, SAUTER AHMO D02 630 <math>\pm 40</math> HL, SAUTER AHMO D03 530 <math>\pm 40</math> HL, SAUTER AHMO D04</li> <li>Factory calibration certificates for SAUTER AHMO D02, AHMO D03, AHMO D04, SAUTER 961-132</li> <li>Paper roll, 1 piece, SAUTER ATU-US11</li> </ul>

STANDARD

CALBLOCK MEMORY IR STATISTIC PRINT TOL ACCU 230 V 1 DAY

OPTION

ISO +4 DAYS

Model	Sensor	Measuring range	Readout	Option
SAUTER HMO	D	HL 170 – 960	[d] HL 1	Factory calibration certificate KERN 961-131



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