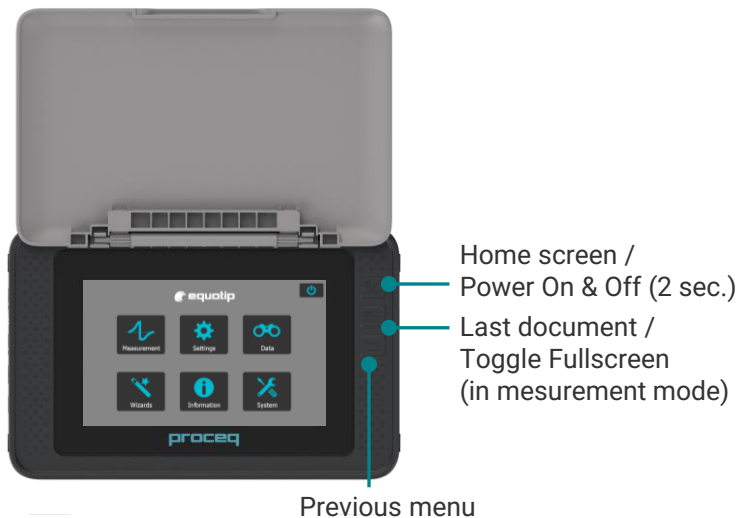




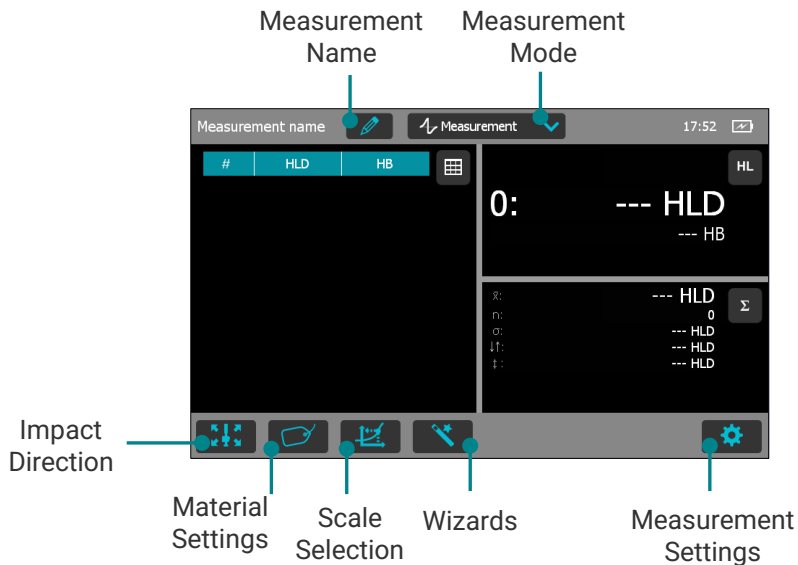
Conversion Curve - Technical Note



NOTE

Leeb D and Leeb DC probes only!

Measurement Screen



NOTE

Leeb D and Leeb DC probes only!

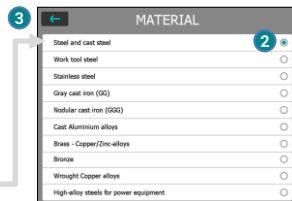
Conversion Unit & Material Selection

Leeb Probes

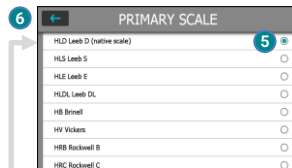
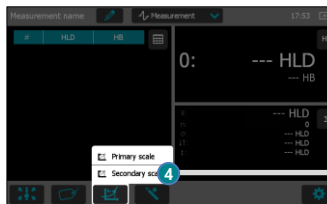
Method 1



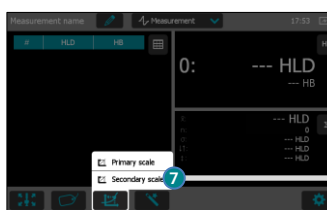
Set Material



Set Primary Scale



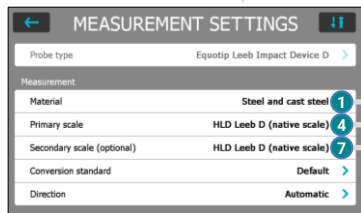
Set Secondary Scale



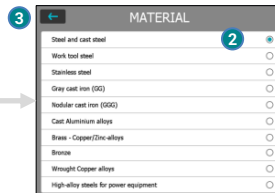
Conversion Unit & Material Selection

Leeb Probes

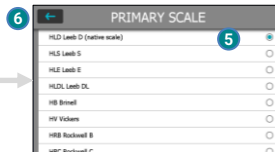
Method 2



Set Material



Set Primary Scale



Set Secondary Scale



Conversion Range - Datasheet

Leeb probes



Material Class	Method	Unit	Leeb Probes					
			D/DC	DL	S	E	G	C
Steel and Cast Steel	Vickers	HV	81-955	80-950	101-964	101-964	*	81-1012
	Brinell	HB	81-654	81-646	101-640	83-686	90-646	81-694
	Rockwell	HRB	38-100	37-100	*	*	48-100	*
		HRC	20-68	21-68	22-70	20-72	*	20-70
		HRA	*	*	61-88	61-88	*	*
	Shore	HS	30-99	31-97	28-104	29-103	*	30-102
	R _m σ ^{1a}	MPa	275-2194	275-2297	340-2194	283-2195	305-2194	275-2194
	R _m σ ^{2b}	MPa	616-1148	614-1485	615-1480	616-1480	618-1478	615-1479
	R _m σ ^{3c}	MPa	449-847	449-847	450-846	450-846	450-847	450-846
Work Tool Steel	Vickers	HV	80-900	80-905	102-924	82-1009	*	98-942
	Rockwell	HRC	21-67	21-67	22-68	23-70	*	20-67
Stainless Steel	Vickers	HV	85-802	*	119-934	88-668	*	*
	Brinell	HB	85-655	*	105-656	87-661	*	*
	Rockwell	HRB	46-102	*	70-104	49-102	*	*
		HRC	20-62	*	21-64	20-64	*	*
Grey Cast Iron (GG) Lamellar Graphite	Brinell	HB	90-664	*	*	*	*	*
	Vickers	HV	90-698	*	*	*	92-326	*
	Rockwell	HRC	21-59	*	*	*	*	*
Nodular Cast Iron (GGG)	Brinell	HB	95-686	*	*	*	127-364	*
	Vickers	HV	96-724	*	*	*	*	*
	Rockwell	HRC	21-60	*	*	*	19-37	*
Cast Aluminum Alloys	Brinell	HB	19-164	20-187	20-194	23-176	19-168	21-167
	Vickers	HV	22-193	21-191	22-196	22-198	*	*
	Rockwell	HRB	24-85	*	*	*	24-86	23-85
Brass Copper/Zinc Alloys	Brinell	HB	40-173	*	*	*	*	*
	Rockwell	HRB	14-95	*	*	*	*	*
Bronze CuAl/CuSn Alloys	Brinell	HB	60-290	*	*	*	*	*
Wrought Copper Alloys	Brinell	HB	124	*	*	*	*	*

NOTE The conversions are valid in the indicated range and scale for the respective probes and materials.

* No Conversion

σ^{1a} - Tensile strength for unalloyed or low-alloy steel

σ^{2b} - Tensile strength of quenching and tempering steels in the quenched tempered conditions

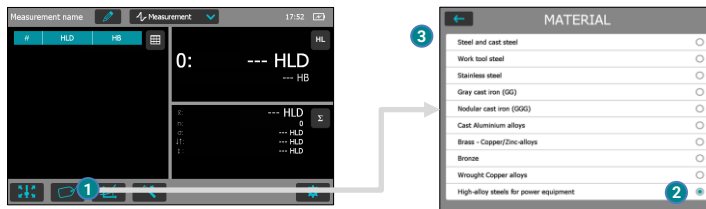
σ^{3c} - Tensile strength of quenching and tempering steels in the untreated, soft annealed or normalized conditions

Conversion Unit & Material Selection

Leeb Probes on High-Alloy Steels (DL/T 1845)

Set Material

Choose High-Alloy Steels for Power Equipment as Material Group



Measurement name: Measurement 17:52

0: --- HLD
--- HB

1

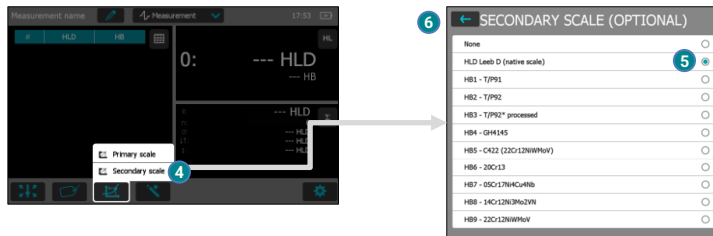
2

MATERIAL

- Steel and cast steel
- Work tool steel
- Stainless steel
- Gray cast iron (GG)
- Nodular cast iron (GGG)
- Cast Aluminium alloys
- Brass - Copper/Zinc-alloys
- Bronze
- Wrought Copper alloys
- High-alloy steels for power equipment

Set Secondary Scale

Choose Material HB1-HB9 as Secondary Scale to be Displayed in HBW Hardness Unit.



Measurement name: Measurement 17:53

0: --- HLD
--- HB

4

6

5

SECONDARY SCALE (OPTIONAL)

- None
- HLD Leeb D (native scale)
- HB1 - T/P91
- HB2 - T/P92
- HB3 - T/P92* processed
- HB4 - GH4145
- HB5 - C422 (22Cr12NiWMoV)
- HB6 - 20Cr13
- HB7 - 05Cr17Ni4Cu4Nb
- HB8 - 14Cr12Ni3Mo2VN
- HB9 - 22Cr12NiWMoV

NOTE

Leeb D and Leeb DC probes only!

Conversion Range – Datasheet

Leeb Probes on High-Alloy Steels (DL/T 1845)

← SECONDARY SCALE (OPTIONAL)

None	☐
HLD Leeb D (native scale)	☒
HB1 - T/P91	☐
HB2 - T/P92	☐
HB3 - T/P92* processed	☐
HB4 - GH4145	☐
HB5 - C422 (22Cr12NiWMoV)	☐
HB6 - 20Cr13	☐
HB7 - 05Cr17Ni4Cu4Nb	☐
HB8 - 14Cr12Ni3Mo2VN	☐
HB9 - 22Cr12NiWMoV	☐

Material Class	Method	Unit	Leeb Probes
			D/DC
High-alloy steels			
P/T91(10Cr9Mo1VNbN)			130-300
P/T92 (10Cr9moW2VNbBN)			130-281
P/T92 welded			140-330
GV4145	Brinell	HBW	280-390
C422 (22Cr12NiWMoV)			240-380
20Cr13			280-310
05Cr17Ni4Cu4Nb			265-333
14Cr12NiBmo2VN			280-403
22CR12NiWMoV			256-320

NOTE

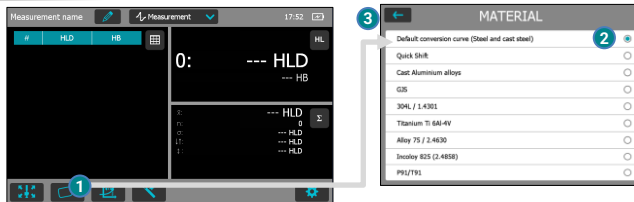
Leeb D and Leeb DC probes only!

Conversion Unit & Material Selection

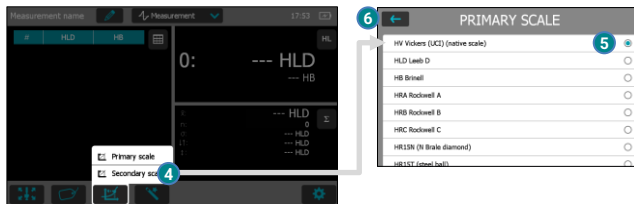
UCI

Method 1

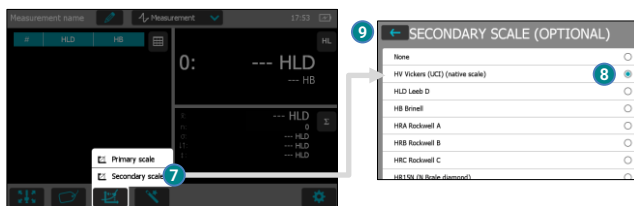
Set Material



Set Primary Scale



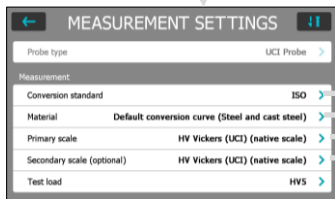
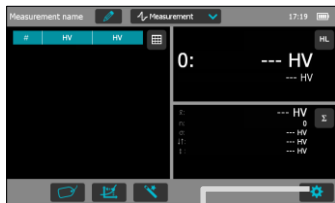
Set Secondary Scale



Conversion Unit & Material Selection

UCI

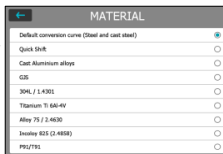
Method 2



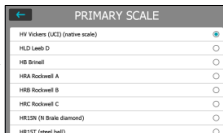
Set Standard



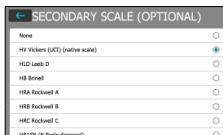
Set Material



Set Primary Scale



Set Secondary Scale



Conversion Range Datasheet – UCI



← MATERIAL

Default conversion curve (Steel and cast steel)	☒
Quick Shift	☐
Cast Aluminium alloys	☐
GJS	☐
304L / 1.4301	☐
Titanium Ti 6Al-4V	☐
Alloy 75 / 2.4630	☐
Incoloy 825 (2.4858)	☐
P91/T91	☐

Material Class	Method	Unit	Conversion Range	E Modulus GPa
Steel and cast Steel	Leeb	HLD	290-890	210
	Brinell	HB	66-737	
	Rockwell	HRC	37-85	
		HRA	59-99	
		HRB	20-70	
		HR15N	69-94	
		HR15T	78-96	
	Rm Nmm ⁻¹	MPa	220-2264	
Aluminium	Vickers	HV	24-225	75
	Brinell**	HB	24-199	
	Rockwell**	HRB	24-225	
1-point short conversion curves:				
Titanium Ti 6Al-4V		HV	263-406*	115
Cast Iron / GJS		HV	141-193*	160
Incoloy 825 / 2.4858	Vickers	HV	32-197*	195
304L / 1.4307		HV	170-244*	200
P91 / T91		HV	140-228*	218
Alloy 75 / 2.4630		HV	140-225*	221

NOTE

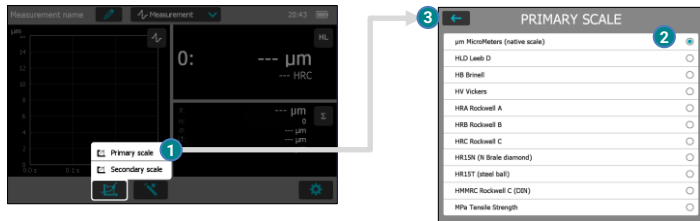
- * Recommended conversion range base on 1-point quick shift conversions. Measurements outside of this range may be prone to higher measurement errors.
- **Conversion based on ISO 18265

Conversion Unit & Material Selection

Portable Rockwell

Method 1

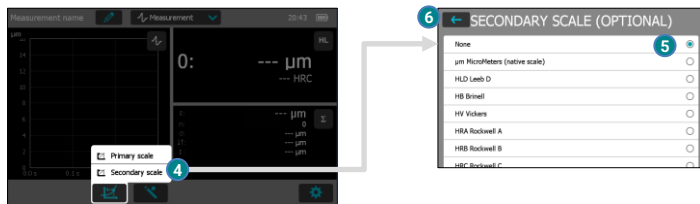
Set Primary Scale



The screenshot shows the 'PRIMARY SCALE' selection menu. A callout box labeled '1' points to the 'Primary scale' and 'Secondary scale' options in the bottom right of the main interface. A callout box labeled '2' points to the 'μm MicroMeters (native scale)' option in the list. A callout box labeled '3' points to the 'PRIMARY SCALE' title bar.

PRIMARY SCALE	
μm MicroMeters (native scale)	☒
HLD Leeb D	☐
HB Brinell	☐
HV Vickers	☐
HRA Rockwell A	☐
HRB Rockwell B	☐
HRC Rockwell C	☐
HRLSN (N Scale diamond)	☐
HRLST (steel ball)	☐
HMMRC Rockwell C (CDN)	☐
MPa Tensile Strength	☐

Set Secondary Scale



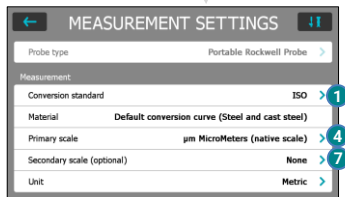
The screenshot shows the 'SECONDARY SCALE (OPTIONAL)' selection menu. A callout box labeled '4' points to the 'Primary scale' and 'Secondary scale' options in the bottom right of the main interface. A callout box labeled '5' points to the 'None' option in the list. A callout box labeled '6' points to the 'SECONDARY SCALE (OPTIONAL)' title bar.

SECONDARY SCALE (OPTIONAL)	
None	☒
μm MicroMeters (native scale)	☐
HLD Leeb D	☐
HB Brinell	☐
HV Vickers	☐
HRA Rockwell A	☐
HRB Rockwell B	☐
HRC Rockwell C	☐

Conversion Unit & Material Selection

Portable Rockwell

Method 2



MEASUREMENT SETTINGS

Probe type: Portable Rockwell Probe

Measurement:

- Conversion standard: ISO **1**
- Material: Default conversion curve (Steel and cast steel)
- Primary scale: μm MicroMeters (native scale) **4**
- Secondary scale (optional): None **7**
- Unit: Metric

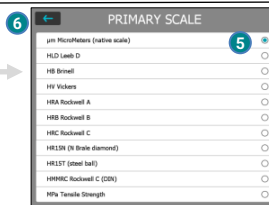
Set Standard



CONVERSION STANDARD

- ISO **2**
- ASTM

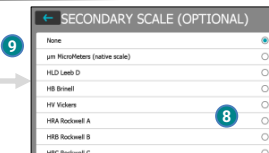
Set Primary Scale



PRIMARY SCALE

- μm MicroMeters (native scale) **5**
- HLD Leeb D
- HB Brinell
- HV Vickers
- HRA Rockwell A
- HRB Rockwell B
- HRC Rockwell C
- HR15N (N Brinell diamond)
- HR15T (steel ball)
- HMHR Rockwell C (CDN)
- MPa Tensile Strength

Set Secondary Scale



SECONDARY SCALE (OPTIONAL)

- None
- μm MicroMeters (native scale)
- HLD Leeb D
- HB Brinell
- HV Vickers
- HRA Rockwell A **8**
- HRB Rockwell B
- HRC Rockwell C

Conversion Range Datasheet

Portable Rockwell

←

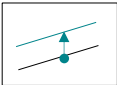
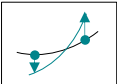
PRIMARY SCALE

µm MicroMeters (native scale)	☒
HLD Leeb D	☐
HB Brinell	☐
HV Vickers	☐
HRA Rockwell A	☐
HRB Rockwell B	☐
HRC Rockwell C	☐
HR15N (N Brale diamond)	☐
HR15T (steel ball)	☐
HMMRC Rockwell C (DIN)	☐
MPa Tensile Strength	☐

Material Class	Method	Unit	Portable Rockwell
			Conversion Range
Steel and cast Steel	Leeb	HLD	290-890
	Vickers	HV	30-1080
	Brinell	HB	76-618
	Rockwell	HRA	37-87
		HRB	55-100
		HRC	19-70
		HR15N	69-93
		HMMRC	19-70
	Rm Nmm ⁻²	MPa	255-2180

User-Defined Conversion Curves

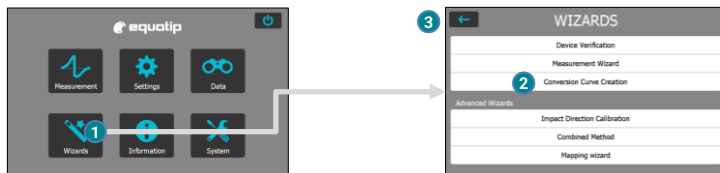
Curve Types

Type	Function		METHOD
One Point	Offset of the existing conversion Shifts the existing conversion to user-defined hardness value		LEEB, ROCKWELL, UCI
One Point	Import quick shift value (UCI only) Shifts the value in Vickers HV(UCI) to a new user-defined defined hardness value according to ASTM E140 and ISO 18265 standard		UCI
Two Points	Rotation of existing conversion Rotates the existing conversion curve with two user-defined hardness values		LEEB, ROCKWELL, UCI
Two Points	Definition of curve through coefficients Generates entire conversion curve from a polynomial equation by typing-in the equation coefficients		LEEB, ROCKWELL, UCI

User-Defined Custom Conversion

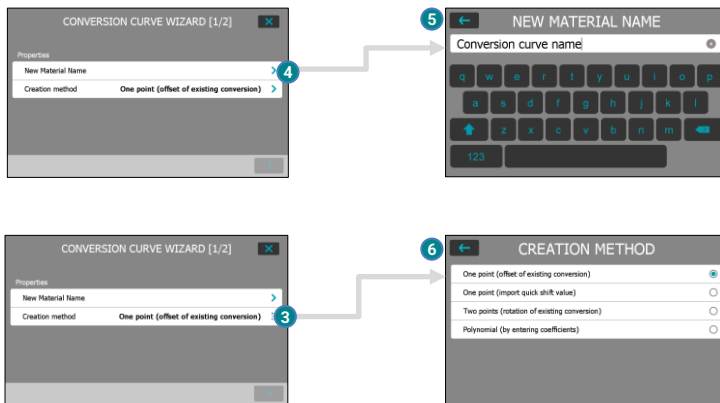
Conversion Curve Type Selection

Start Wizard



Create Method

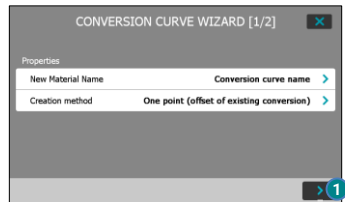
Type in the Name of Conversion Curve/Material



User-Defined Conversion Curves

One Point

Offset of Existing Conversion



Select point

Select one-point correction point



Enter values

Enter values from the measured reference sample



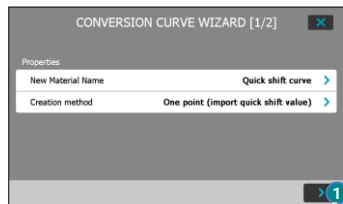
Save conversion



User-Defined Conversion Curves

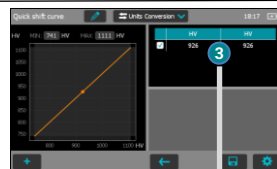
One Point

Import Quick Shift Value



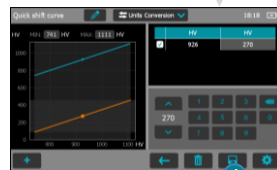
Select point

Select one-point correction point

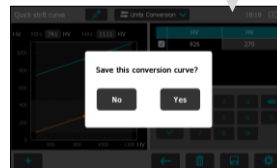


Enter values

Enter values from the measured reference sample



Save conversion



User-Defined Conversion Curves

Two Point Curve

Rotation of Existing Conversion

CONVERSION CURVE WIZARD [1/2]

Properties

New Material Name Two points curve >

Creation method Two points (rotation of existing conversion) >

> 1

CONVERSION CURVE WIZARD [2/2]

Select conversion

Probe Equotip Leeb Impact Device D >

Material Steel and cast steel >

Conversion standard Default >

Scale HB Brinell >

< > 2

Select point

Select first/second correction point



Enter values

Enter values for the first/second point from the measured reference samples



Save conversion



Conversion Curves: Polynomial

Definition of Curve by Entering Coefficients

CONVERSION CURVE WIZARD [1/2]

Properties

New Material Name: Polynomial curve

Creation method: Polynomial (by entering coefficients)

CONVERSION CURVE WIZARD [2/2]

Select conversion

Probe: Equotip Leeb Impact Device D

Conversion standard: Default

Scale: HB Brinell

Select point

Select the polynomial equation coefficients: **A0**, **A1**... **A5**

Enter values

Enter the polynomial equation coefficients: **A0**, **A1**... **A5**

Save conversion

Polynomial curve

Units Conversion

20.34

Polynomial curve

Units Conversion

09.17

Polynomial curve

Units Conversion

09.30

Save this conversion curve?

No Yes

Equation Format

$$\text{ScaleB (HLD)} = A0 + A1 \cdot \text{HLD}^1 + A2 \cdot \text{HLD}^2 + A3 \cdot \text{HLD}^3 + A4 \cdot \text{HLD}^4 + A5 \cdot \text{HLD}^5$$

Example

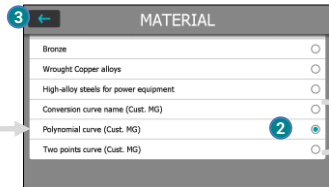
$$\text{HB(HLD)} = -2.7862\text{E}+02 - 2.3014\text{E}+00(\text{HLD})^1 + 7.8978\text{E}-03(\text{HLD})^2 - 9.5946\text{E}-06(\text{HLD})^3 + 5.0641\text{E}-09(\text{HLD})^4 + 0.00(\text{HLD})^5$$

Using the Custom Conversion Curves

Example: Polynomial Curve HB(HLD)

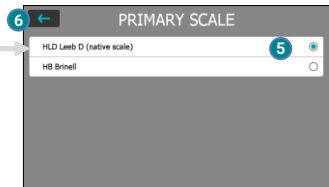
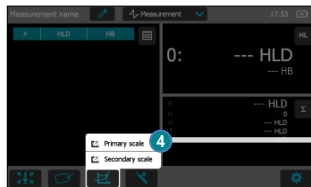
Set Material

User-defined conversion curves:
e.g. Polynomial curve (Cust. MG)

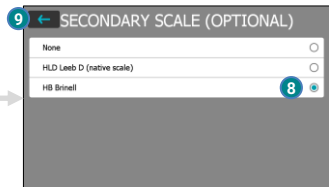
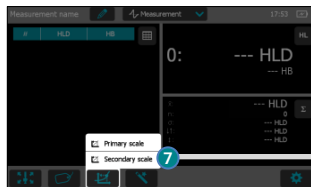


Custom
Material Groups

Set Primary Scale



Set Secondary Scale



SWISS  MADE

For more information on the use of the product,
please refer to product documentation.

It is available for download on



<https://www.screeningeagle.com/en/products/category/metal/equotip>

ASIA-PACIFIC

Proceq Asia Pte Ltd.
1 Fusionopolis Way
Connexis South Tower #20-02
Singapore 138632
T +65 6382 3966

CHINA

Proceq Trading Shanghai Co., Limited
Room 701, 7th Floor, Golden Block
407-1 Yishan Road, Xuhui District
200032 Shanghai | China
T +86 21 6317 7479

EUROPE

Proceq AG
Ringstrasse 2
8603 Schwerzenbach
Zurich | Switzerland
T +41 43 355 38 00

UK

Screening Eagle UK Limited
Bedford i-lab, Stannard Way
Priory Business Park
MK44 3RZ Bedford
London | United Kingdom
T +44 12 3483 4645

MIDDLE EAST AND AFRICA

Proceq Middle East and Africa
Sharjah Airport International
Free Zone | P.O.Box: 8365
United Arab Emirates
T +971 6 5578505

USA, CANADA & CENTRAL AMERICA

Screening Eagle USA Inc.
14205 N Mopac Expressway Suite 533
Austin, TX 78728 | United States

Screening Eagle USA Inc.
117 Corporation Drive
Aliquippa, PA 15001 | United States
T +1 724 512 0330

SOUTH AMERICA

Proceq SAO Equipamentos
de Medição Ltda.
Rua Paes Leme 136
Pinheiros, Sao Paulo
SP 05424-010 | Brasil
T +55 11 3083 3889