equotip® piccolo

PORTABLE HARDNESS TESTER

The most advanced integrated tester

- Revolutionary impact device with single motion load & release mechanism
- Highly accurate in any impact direction - automatically!
- Converts to all common hardness scales (HV, HB, HRC, HRB, HS, Rm)
- Custom conversions for uncommon alloys
- Statistics (average, standard deviation, min/max, range)
- Internal, non volatile data storage of fully tagged readings
- Instant reading from large, high-contrast LCD,
- Intelligent self diagnostics
- Virtually unlimited impacts per battery charge cycle
- Smart recharging of built in Li-Ion batteries while USB connected
- USB: data and software transfer with versatile PC application
- Ready for automatic testing

Patents pending - Standardized according to ASTM A956 + DIN 50156
A High Quality Swiss Product

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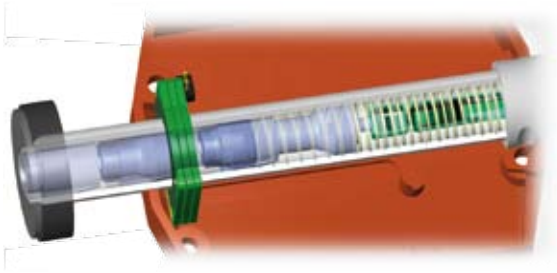
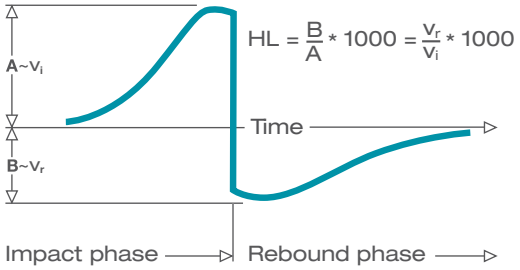
Application Range - Primary Industries

- Good for all materials
- Ideal for production level testing
- Best suited for on-site testing of heavy, big or already installed parts
- Handy for difficult to access or confined test locations
- Automatic sensing and compensation for impact direction
- Excellent for material selection and acceptance tests
- Easy to use and accurate on curved test surfaces (R > 10 mm)
- Metal production & processing
- Automotive & transportation
- Machinery & power plants
- Petro-chemical, refineries
- Aerospace & shipyard
- Metal constructions
- Testing services & laboratories

The EQUOTIP measuring principle

The EQUOTIP measuring principle is physically a rather simple, dynamic hardness test. An impact body with a hard metal test tip is propelled by spring force against the surface of the test piece. Surface deformation takes place when the impact body hits the test 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 for 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 (see signal below). 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.





The EQUOTIP hardness scale “HL”

The hardness value HL was first introduced into measuring technology in 1975, when the method and the instrument were presented by its inventors Leeb and Brandestini (Swiss Patent 596550). The ratio between rebound velocity v_r and impact veolocity v_i multiplied by 1000 is taken to calculate the hardness value HL (HL = hardness in LEEB units). Method and instrument are named EQUOTIP derived from **E**nergy **QUO**tient recalling the principle of energy measurement. The PICCOLO is the latest tester in the tradition of the EQUOTIP System.

Hence, HL is a direct, standardized (ASTM A956) measurement of hardness. In contrast to static hardness testing, dynamic hardness test results contain additional information on reactive behavior of materials, e.g. on elastic properties of the material. Correlations to other hardness scales like Rockwell C (HRC) or Brinell (HB) are available and programmed as a standard feature in the PICCOLO. Converted values can be directly displayed on the large LCD. As conversions between different hardness scales are always material dependent and affected by some loss in accuracy, an extensive set of material specific conversions are available. With the PICCOLO the user can easily program his “company’s own” conversions for those alloys and materials not included in the standard list by using industry accepted empirical tests.

	Vickers	Brinell	Rockwell		Shore	Tensile strength
Material Group	HV	HB	HRC	HRB	HS	N/mm²
1 steel and cast steel	81-955	81-654	20-68	38-100	30-100	274-2193
2 cold work tool steel	80-900		21-67			
3 stainless steel	85-802	85-655	20-62	47-102		
4 cast iron lamellar graphite GG	90-698	90-664	21-59			
5 cast iron nodular graphite GGG	96-724	95-678	21-61			
6 cast aluminum alloys	22-193	19-180		24-85		
7 copper/zinc alloys (brass)		40-173		14-95		
8 CuAl/CuSn alloys (bronze)		60-290				
9 wrought copper alloys, low alloyed		45-315				

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Testing with EQUOTIP PICCOLO - Easy as 1-2-3

1. Place

2. Load

3. Measure

1. Place the PICCOLO on the surface point to be tested, perpendicular to the surface.
   Recommendation: grasp the PICCOLO between the housing and the support ring and press firmly against the surface.
2. Loading the impact device – slide the actuator towards the housing. The catch chuck grasps the impact body and draws it against the energy spring to a defined force. This motion "wakes up" the electronics and the display shows the current test settings.
3. Measuring is accomplished by again sliding the actuator towards the housing. This releases the impact body from the catch chuck and propels it towards the test surface within the defined energy. Results are immediately displayed in the selected scale. No separate trigger action is necessary – loading and release is accomplished in the same motion.
   Recommendation: space the impacts 3 mm to 5 mm apart, and average 3 to 5 single values for each data point.

Suitable test specimens are primarily large, massive parts. Owing to the dynamic mode of action, it should be ensured that the specimen does not move or oscillate during the measurement. Parts which are too thin or thinly coated need special effort to assure reliable results. The measured surface must be clean and dry. Surface roughness should be better than ISO N7. Excessive scattering of test result indicates poor surface preparation.

Preparation of the surface	
Roughness class ISO	N7
Max. roughness depth Rt	10 µm
Centre line average CLA, AA, Ra	2 µm
Min. weight of samples	
of compact shape	5 kg
on solid support	2 kg
coupled on plate	0.1 kg
Min. thickness of sample	
uncoupled	25 mm
coupled	3 mm
surface layer thickness	0.8 mm

Max. hardness of samples
890 HLd (955 HV, 68 HRC)*

Indentation size on test surface	
with 570 HLd (300 HV, 30 HRC)*	
diameter	0.54 mm
depth	24 µm
with 760 HLd (600 HV, 55 HRC)*	
diameter	0.45 mm
depth	17 µm
with 840 HLd (800 HV, 63 HRC)*	
diameter	0.35 mm
depth	10 µm

* approximate hardness conversion for steel

Configuring the EQUOTIP PICCOLO

The display output of your test results (scale and material) can be configured individually by the 3 button on-board control system or via the PC interface program. Basic statistic option, <cancel> for last test value and check of hardware features make the PICCOLO ready for maximum ease of customized use. Sensing and compensation for impact direction is default, but can also be switched off.

EQUOTIP PICCOLO full bi-directional communication

The PICCOLO is supplied with special interface software to facilitate communication with Windows®-based computers. This easy to use software assists in managing the stored data for further evaluation. Data can be assessed within the software, or exported for use in other data evaluation programs. The software can also be used to fully manage the set-up of the PICCOLO via the USB port. The firmware of the PICCOLO can be easily updated from the Proceq web-site to the latest version through this software.

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Technical Information

DIMENSIONS: 147.5 x 44 x 20 mm

WEIGHT: 110 g

IMPACT ENERGY: 11 mJ (11 Nmm)

IMPACT BODY D: 5.5 g

SPHERICAL TEST TIP: Ø 3 mm, Tungsten Carbide (ca. 1500 HV)

MEASUREMENT RANGE: 150 - 950 HL

CONVERSIONS: 81-955 HV, 81-678 HB, 20-70 HRC, 38-102 HRB, 30-100 HS, 274-2193 N/mm²

RESOLUTION: 1 HL, 1 HV, 1 HB, 0.1 HRC, 0.1 HRB, 1 HS, 1 N/mm²

IMPACT DIRECTION: Automatic sensing and compensation (fine angular resolution)

MEASUREMENT ACCURACY: ±4 HL (0.5% at 800 HL)

OPERATING ENVIRONMENT: -10 to +60 °C, 90% max. humidity

CONSTRUCTION: Scratch proofed anodized aluminum

DISPLAY: Large, high contrast LCD

BATTERY: Li-Ion, charges from USB port

BATTERY LIFE: over 20,000 impacts on a full charge

ON/OFF: automatic, using intelligent wake-up/sleep mode

INTERNAL MEMORY: 2,000 readings, non volatile memory (optional extension of memory capacity)

COMMUNICATIONS: USB, bi-directional with PC interface software

OPERATOR LOCK: Programmable from PC interface software

Ordering Information

UNIT KITS:

351 10 001 Includes:	EQUOTIP PICCOLO hardness tester, unit D PICCOLO hardness test device with impact body D, small D6a and large D6 support ring, cleaning brush, charger and USB cable, neck/wrist strap (lanyard), USB-memory stick with Software, device box, operating instructions, quick reference guide, product certificate
351 10 002 Includes:	EQUOTIP PICCOLO hardness tester, unit D with Proceq test block 351 10 001, test block D with Proceq calibration, large carrying case
351 10 003 Includes:	EQUOTIP PICCOLO hardness tester, unit D with MPA certificate 351 10 001, test block D with MPA calibration and certificate, large carrying case

OPTIONAL ACCESSORIES

350 01 140	Test block D with Proceq calibration
350 01 139	Test block D with MPA calibration and certificate
351 90 001	Large carrying case with space for test block and major accessories
350 01 015	Coupling paste (can)
350 03 000	Set of support rings (12 pcs.)
351 90 003	AC charger/power supply (110-220 V)
820 351 01	Operating instructions
820 351 02	Quick reference guide

REPLACEMENT PARTS

351 01 001 PICCOLO hardness test device, with impact body and support ring D6

351 90 021 PICCOLO hardness test device (exchange), with support ring D6, without impact body

350 01 004 Impact body D*

350 01 009 Support ring D6* (19,5 x 5,5 mm)

350 01 010 Support ring D6a* (13,5 x 5,5 mm)

351 90 019 Device box

351 90 016 Neck/Wrist strap (Lanyard)

351 90 018 USB cable, 1.8 m

351 90 017 Cover for USB receptacle

350 01 008 Cleaning brush

341 80 112 USB charger

* wear and tear items

Subject to change without notice

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