



PORTABLE HARDNESS TESTER

- Wide measuring range
- Hardness reading in split seconds
- For all metallic materials
- Measures in any direction
- Data transfer to PC/printer
- High accuracy $\pm 4HL$ (0.5% at 800 HL)
- Instant digital display of hardness value

Application Range - Primary Industries

- Good for all metals
- 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
- 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



Standardized according to ASTM A956-96

EQUOTIP Units all you need for quick, precise hardness measurements!



Standard Equipment D
Art. Nr. 350 01 000

Impact device D with 1.5 m cable and electronic indicating device, standard test block D, coupling paste, carrying case 325x295x105 mm, weight 4.8 kg.

In addition to universal unit D, the following units are assembled from accessory combinations.



Standard Equipment G
Art. Nr. 350 92 000

Impact device G with 1.5 m cable and electronic indicating device, standard test block G (seperate), 6.1 kg carrying case 325x295x105 mm, weight 8.1 kg (6.1 kg + 2.0 kg)

This variant version is recommended for the exclusive measurement of solid and heavy components in the Brinell range. Unit G places low demands on measuring location surface finish. Typical applications: forgings or solid castings



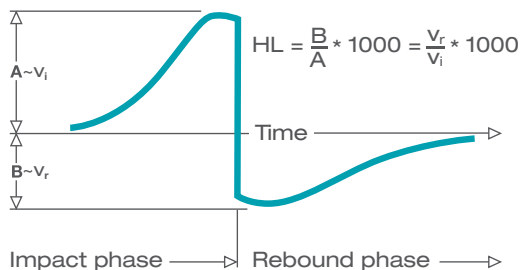
Standard Equipment E
Art. Nr. 350 93 000

Impact device E with 1.5 m cable and electronic indicating device, standard test block E, coupling paste and carrying case 325x295x105 mm, weight 4.8 kg.

Comprises impact device E with diamond test tip for an extremely long life. Recommended where the predominant hardness values to be measured are in excess of 50HRC, respectively 650HV, or for extra hard components.

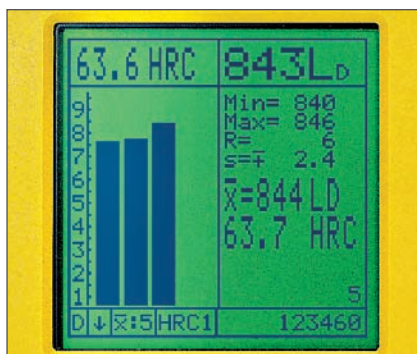
Other units are available: **Standard Equipment C, Art. Nr. 350 95 001**
Standard Equipment DL, Art. Nr. 350 91 310
Standard Equipment S, Art. Nr. 350 91 410

EQUOTIP Measuring Principle



When the test is carried out, an impact body with a tungsten carbide test tip is impelled by spring force against a test surface from which it rebounds. Impact and rebound velocities are measured by fallowing method: a permanent magnet integrated into the impact body passes through a coil and induces an electric voltage during its forward and return travel. These voltages are proportional to the velocities and are processed and displayed as the hardness value L on the indicating device.

The Hardness Value "L"



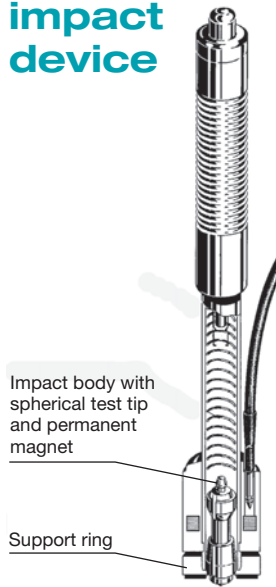
This term, 1978 introduced by Proceq into measuring technology, is the quotient for the impact body's rebound and impact velocity, multiplied by 1000. Harder materials produce higher rebound velocity than those which are less hard.

With reference to a particular material group (e.g. steel, aluminium etc.) the L-value represents a direct hardness measurement and is used as such. Comparison curves with standard static hardness values have been established (Brinell, Vickers, Rockwell C) for the most prevalent materials, enabling the L-values to be converted into the relevant values for these procedures.

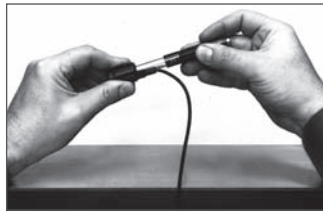
With EQUOTIP 2, such hardness values can be directly displayed in the hardness scales HRC, HB, HV and HS.

Additionally, the user can input up to 20 "plant internal" conversion tables.

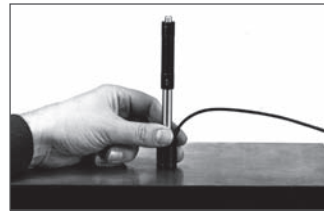
EQUOTIP impact device



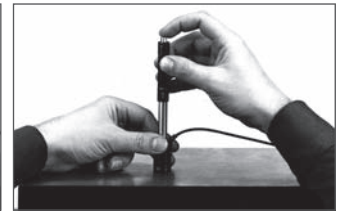
Performing of Hardness Test



1. Load



2. Place



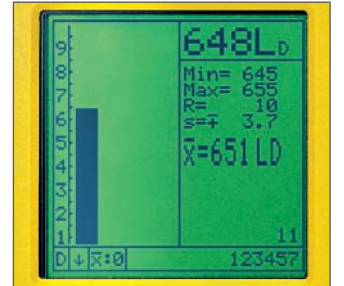
3. Measure

Simple-few operating elements. Accurate measurements possible even by occasional users. Absolutely no settings required.

Reliable, ultra-modern electronics, battery state indicator and automatic reading cancellation in the event of low battery. LCD display for low power consumption. Simple, instantaneous function check.

No subjective measuring errors are possible. Readings are available for automatic processing of printout.

Read off the hardness value L.



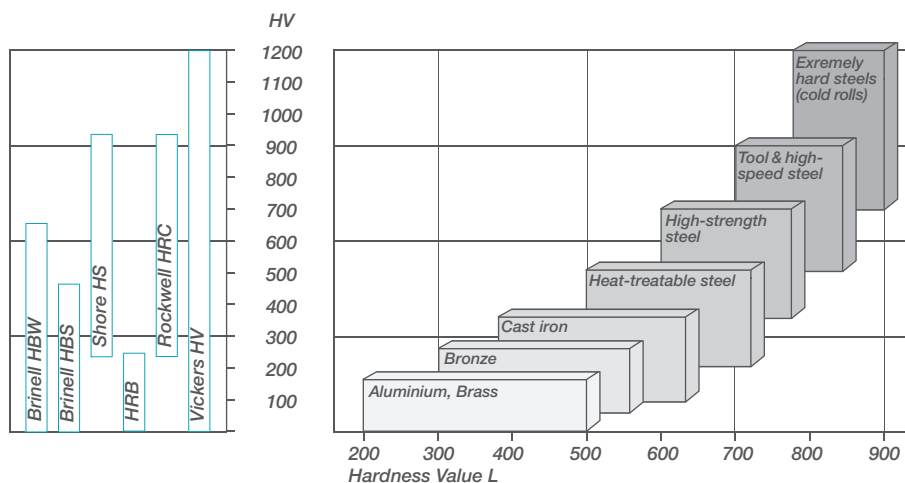
The instrument is immediately ready for the next impact which will erase the L-value displayed.

Technical Data Unit D

Material Group*	Vickers	Brinell	Rockwell		Shore	Tensile strength
	HV	HB	HRC	HRB	HS	N/mm ²
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	95-687	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				

* Specific acceptable materials for each group available on request

Measuring ranges of the most important hardness measuring procedures in comparison to the hardness of different metals



EQUOTIP Impact Devices

The EQUOTIP unit is fitted with universal impact device D. Special impact devices are available for use in extremely confined spaces, with special component geometry or surface finish. These significantly extend the possibilities of application for the EQUOTIP procedure. Each special impact device is compatible with unit D indicating device and is supplied as accessory.

Impact Device D Art. No. 350 71 001

Application: For the majority of your hardness testing assignments
Weight: 75g



Impact Device DC Art. No. 350 71 002

Application: Use in very confined spaces, e.g. in holes, cylinders or for internal measurements on assembled machines.
Weight: 50g



Impact Device DL Art. No. 350 71 310

Application: For measurements in extremely confined spaces or at the base of grooves.
Weight: 100g



Impact Device G Art. No. 350 72 001

Application: Solid components. e.g. heavy castings and forgings.
Weight: 250g



Impact Device C Art. No. 350 75 001

Application: Surface hardened components, coatings, thin walled or impact sensitive components (small measuring indentation).
Weight: 75g



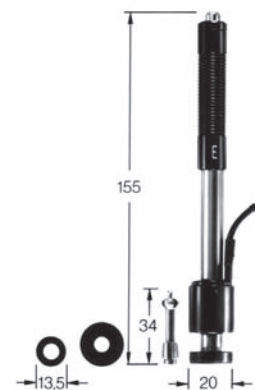
Impact Device S Art. No. 350 71 410

Application: big, heavy and massive materials - extremely hard test pieces - rolls in the upper hardness range
Weight: 80g

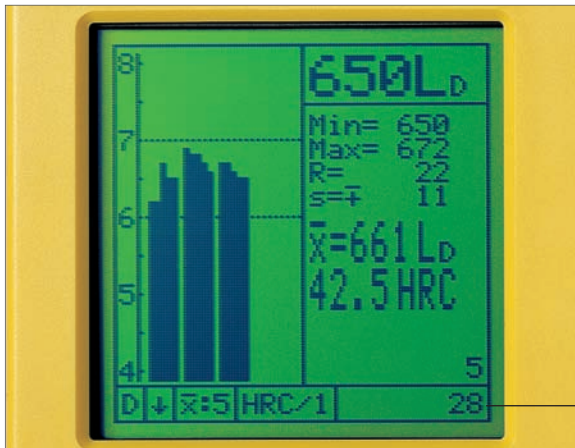
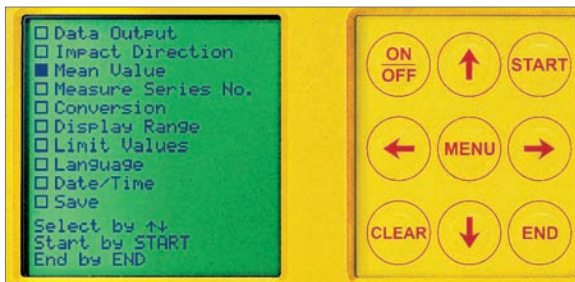


Impact Device E Art. No. 350 73 001

Application: For measurements in the extremely high hardness range (always in excess of 50 HRC/650 HV); Tool steels with high carbide content inclusions.
Weight: 80g



Operator - friendly



At a glance the large LCD monitor provides information on:

- Hardness value L (measured value)
- Lowest value (min)
- Highest value (max.)
- Range (R)
- Standard deviation (s)
- Mean value (\bar{x})
- Converted mean value
- Impact no.

Shown in the information line are the current basic settings.

In the example:

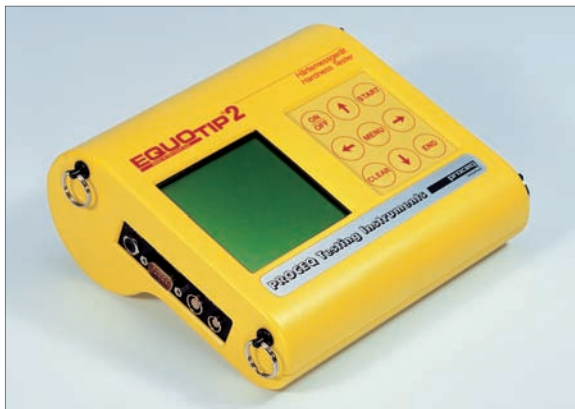
- Impact device D
- Impact direction downwards
- Mean value automatically formed after 5 individual measurements
- Conversion to HRC
- Consecutive measuring series no.

Visual representation of the last measuring series provides an immediate survey of hardness level and regularity.

Freely selectable setpoints limits.

The user can set up the EQUOTIP device to his specific requirements with a few keys.

EQUOTIP indicating device



- Supplied by 6 Nos. 1.5V Mignon cells, operating life with one set of batteries approximately 60 hours at 20° C
- Connection for standard mains supply 9V DC, 0.2A
- Permissible temperature range 0° C to + 50° C
- RS 232C interface
- Dimensions: 180 x 175 x 80 mm / 800 g

Communications

The measured data can be transmitted via interface RS 232C to an external printer in on-line-mode. The stored data (capacity of memory approx. 5000 values) can be transferred by means of EQUOLINK-Software via RS 232C to a computer.

Preparation of the surface	Impact devices		
	D, DC, DL, E, S	C	G
Roughness class ISO	N7	N5	N9
Max. roughness depth Rt	10 µm	2.5 µm	30 µm
Centre line average CLA, AA, Ra	2 µm	0.4 µm	7 µm

Min. weight of samples	D, DC, DL, E, S	C	G
of compact shape	5 kg	1.5 kg	15 kg
on solid support	2 kg	0.5 kg	5 kg
coupled on plate	0.1 kg	0.02 kg	0.5 kg

Min. thickness of sample	D, DC, DL, E, S	C	G
uncoupled	25 mm	15 mm	70 mm
coupled	3 mm	1 mm	10 mm
surface layer thickness	0.8 mm	0.2 mm	

Max. hardness of samples

Indentation size on test surface

with 300 HV, 30 HRC*			
diameter	0.54 mm	0.38 mm	1.03 mm
depth	24 µm	12 µm	53 µm
with 600 HV, 55 HRC*			
diameter	0.45 mm	0.32 mm	0.90 mm
depth	17 µm	8 µm	41 µm
with 800 HV, 63 HRC*			
diameter	0.35 mm	0.30 mm	
depth	10 µm	7 µm	

* approximate hardness conversion for steel

Support rings



On curved surfaces having a radius less than 30mm, effective positioning on the testpiece is facilitated by the use of support rings (set of 12). The appropriate support ring is screwed on to the front of the impact device. The set includes support rings for cylindrical, hollow-cylindrical, spherical or hollow-spherical surfaces with a radius of 11 mm. Special support rings can be manufactured for geometrically complex surfaces.

Application criteria

valid for impact bodies D, DC, DL, E, S

As is standard practice for hardness measurements, the measuring location surface should be bright and smoothly ground. It does not have to be polished. Damage to the test piece surface after testing with EQUOTIP will be minimal. At least 2 to 3 test impacts should be made at each measuring location, and then in all cases the average should determine for the individual readings. A surface of 10x10mm is sufficient for measurement purposes. The device can also be used without special preparation using the EQUOTIP unit D. Slim workpieces and those weighing between 2 and 5 kg must be placed on a solid baseplate for testing in such manner that the force of the impact neither shifts them nor causes them to flex, since otherwise the readings could be falsified.

Compact miniature parts with plane measuring surfaces can also be tested, but must be "coupled" for the purpose with rigid base. "Coupling" is effected by lightly coating the workpiece with coupling paste and "sticking" it firmly to a baseplate of adequate weight.

Subject to change without notice

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