



Testing & Measuring Equipments

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equotip



Technical Information

Support Rings & Impact Device

Leeb hardness testers provide accurate measurements if the impact body has a certain position in the guiding tube at the moment of its impact onto the test surface. When testing flat samples with standard support rings, the spherical test tip is located precisely at the end of the guiding tube. However, when testing curved samples with the Equotip standard support rings, this may not always be the case. To ensure accurate measurements in all cases, Proceq offers a range of special support rings designed for measurements on curved sample surfaces.

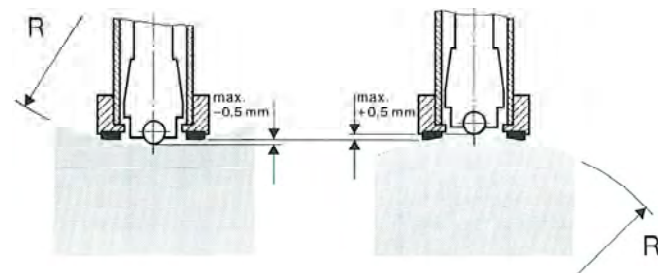
Most Common Test Situations:

Equotip Impact Devices D/DC, C, E, S and G with Standard Support Rings

With each Equotip impact device D/DC, C, E, S or G, respectively, Proceq delivers two support rings. The 13.5 mm outer diameter (OD) support ring – named “D6a” – provides accurate results if the test surface curvature is larger than $R = 30$ mm. The 19.5mm OD support ring D6 can be used down to a minimum test surface curvature of $R = 60$ mm. Equotip impact devices G sell with two support rings with 19.5 mm (G6a) and 29.5 mm OD (G6), respectively. These provide accurate measurements as long as the surface curvature of the sample is less than $R = 50$ mm and $R = 100$ mm, respectively.



For test surfaces that do not comply with these standard situations, Proceq’s special support rings offer apt solutions for impact devices of types D/DC, C, E and S.



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Testing on Cylindrical Test Surfaces (e.g. boilers and pipes)

Cylindrical test objects can be tested with the support rings Z10–15 (R = 10 to 15 mm cylinder radius), Z14.5–30 (R = 14.5 to 30 mm), and Z25–50 (R = 25 to 50 mm cylinder radius). The support rings HZ11–13, HZ12.5–17, and HZ16.5–30 are well suited for Equotip hardness measurements on hollow-cylindrical surfaces, such as the inside of pipes and boilers of R = 11 to 13 mm, R = 12.5 to 17 mm, and R = 16.5 to 30 mm cylinder radii, respectively.

For convenience particularly when used with Proceq's advanced Equotip 3 impact devices, these support rings can be rotated by 360° around the longitudinal axis of the impact device. By means of a grub screw, the user can freely align the rectangular support ring to match the orientation of the impact device handle and to find the optimal position with respect to the sample.

Testing on Spherical Test Surfaces (e.g.)

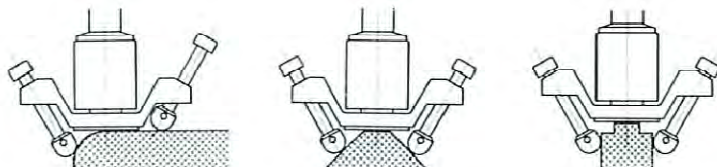
For spherical test situations, Proceq offers the support rings K10–15 (10 to 15 mm spherical radius) and K14.5–30 (R = 14.5 to 30 mm spherical radius). Accordingly, hollow-spherical surfaces can be tested with the support rings HK11–13 (R = 11 to 13 mm spherical radius), HK12.5–17 (R = 12.5 to 17 mm spherical radius), and HK16.5–30 (R = 16.5 to 30 mm spherical radius). The support rings for spherical test requirements are symmetrical around the guide tube, eliminating the need of alignment of the support ring.

Testing in Recesses

For hardness tests inside recesses such as the bases between the teeth of gears, the support rings of the above-mentioned impact devices do not fit. For these situations, Proceq offers the DL long tip system. This is a special impact body and support ring combination, which can reach into many such recesses.

Universal Support Ring

The most versatile support ring is called UN. This ring embraces the need to test even more complex geometries. Examples can be seen below.



If none of these solutions apply to your sample geometry, please contact your local Proceq representative or visit <http://www.proceq.com> and <http://www.equotip.com/>.



FAQ – Frequently Asked Questions

Q: What are the differences between Equotip 3 impact devices of the advanced design and the traditional design?

A: The advanced Equotip 3 impact devices have a more ergonomic design to hold the impact device more comfortably and to intuitively prompt the user how to use the instrument to achieve the best results. In addition, the electronic components in the impact devices have been modernized to ensure long-term supply to customers without disruption.

Q: What are the differences between the various impact devices?

A: Please check the table below for a detailed list of the various impact devices.

| Type | Application | Impact energy | Ball indenter |
|--------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|----------------|
| D | Universal unit. For the majority of your hardness testing requirements. | 11 Nmm | WC, 3 mm |
| G | Increased impact energy. For solid components, e.g. heavy castings and forgings. | 90 Nmm | WC, 5 mm |
| DL | Slim front section. For measurements in confined spaces, at the base of grooves or on recessed surfaces. Note: The impact device DL can only be used with manual correction for impact direction. | 11 Nmm | WC, 2.8 mm |
| E | Diamond ball indenter. For measurements especially in the very high hardness range (in excess of 50 HRC / 650 HV): Tool steels with high carbide content inclusions. | 11 Nmm | diamond, 3 mm |
| S | Ceramic ball indenter. For measurements in the very high hardness range (always in excess of 50 HRC / 650 HV): Tool steels with high carbide content inclusions. | 11 Nmm | ceramics, 3 mm |
| C | Reduced impact energy. Surface hardened components, coatings, thin walled or impact sensitive components (small measuring indentation). | 3 Nmm | WC, 3 mm |
| DC | Short device. For use in very confined spaces, e.g. in holes, cylinders or for internal measurements on assembled machines. | 11 Nmm | WC, 3 mm |
| SVP 40 | Wedge seating tester. Semi-automatic device for the fast evaluation of the wedging (seating and regularity) of stator windings. | 28 Nmm | WC, 3 mm |

Q: What can I test with the advanced Equotip 3 impact devices?

A: Testing can be done on the same variety of geometries as with the previous design.

- The instruments are ideally suited for all metal parts over 5 kg and thicker than 25 mm (device C: 1.5 kg / 15 mm, device G: 15 kg / 70 mm).
- Parts below these limits can be tested on solid supports. For parts below 2 kg the Equotip coupling paste shall be used (device C: 0.5 kg, device G: 5 kg).
- For parts lighter than 0.05 kg and thinner than 3 mm (device C: 0.02 kg / 1 mm, device G: 0.5 kg / 10 mm), measuring with Equotip can yield useful information, but adjustments to the displayed hardness value may be required (to be found through comparative testing).

Q: Can I test on an 'as-produced' surface?

A: Accuracy of the Equotip 3, like all hardness tests, depends on a good clean surface. Any surface contamination like dirt, oil, rust, scale etc. will affect the accuracy of the test. Guidelines with respect to surface preparation can be found in the Equotip literature or testing guidelines, respectively.

Q: Can I use the advanced Equotip 3 impact devices on curved sample surfaces?

A: The advanced Equotip 3 impact devices can be used to test on all sorts of curved parts with radii down to 10 mm. Particularly useful for these conditions are the special Equotip support rings, which are offered in a wide range by Proceq.

Q: Are the support rings that were used with Equotip 1, Equotip 2 and Equotip 3 impact devices also compatible with the advanced Equotip 3 impact devices?

A: Yes, they are, with one exception: the Equotip support ring UN has been modified to fit on the advanced Equotip 3 impact devices as well as prior versions of impact devices. And the support rings for cylindrical surfaces have a new design, which was developed to align the support ring with the new coil housing.

Q: Can I test at an odd inclination angle / in a direction which deviates from vertically down?

A: The angle between impact device and sample surface must be 90°, i.e. no odd inclination angles to the surface are possible. Once this is ensured, the impact direction can be vertically down, up, horizontal, and any direction in between. Equotip 3 with advanced impact devices automatically compensate for testing at different angles when 'automatic' is selected, with the following exceptions:

- For devices DL, Proceq chose to disable automatic correction to avoid more frequent erroneous measurements. The manual setting can be used reliably though.
- For devices C, impact directions between vertically down and horizontal can be used.
- For Equotip 2 impact devices (3-pole connector), that are used with special cables, allow only the usage of the manual direction setting.

For all impact devices, the angle may also be set manually using the "F1" key of Equotip 3.

Q: What do I need to do if I wish to switch from the traditional to the advanced impact devices?

A: Please ensure that the latest Equotip 3 operating system (OS version > 1.1.5) and instrument firmware (FW version > 1.5.2) are installed on your Equotip 3 indicating device. You can use Equolink 3 to update your firmware via your internet connection. The OS and FW are backwards-compatible, i.e., you may still also use the traditional impact devices even with the latest versions.

Q: Can I use Equotip 2 impact devices with Equotip 3 indicating devices, or Equotip 3 impact devices with Equotip 2 indicating devices, respectively?

A: Indeed you can.

Q: How do I service advanced Equotip 3 impact devices?

A: The maintenance and servicing of your advanced Equotip 3 impact devices is no different from what you have done to keep your traditional Equotip impact devices in good order.

- Use the test blocks to check your equipment before use. For this, Proceq has recently launched an unrivaled range of Leeb test blocks.
- In case the hardness reading deviates from the set-point value on the test block, use the cleaning brush (supplied with each new impact device) to clean the guide tube of the impact device. Also, use acetone / isopropanol and a soft cloth to clean the indenter ball of the impact body.

