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GB/T 17394.1-2025

Metallic materials - Leeb hardness test - Part 1: Test method

金属材料 里氏硬度试验 第1部分：试验方法

(English Translation)

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1 Scope

This Part of GB/T 17394 specifies the test principle, test instruments, specimen, test procedure, measurement uncertainty of test results, test report for determining the Leeb hardness of metallic materials by using hardness testers equipped with D, DC, S, E, D+15, DL, C and G impact devices.

This Part applies to Leeb hardness testers equipped with D, DC, S, E, D+15, DL, C and G impact devices; see Table 1.

2 Normative References

The following documents are essential to the application of this Document. For the dated documents, only the versions with the dates indicated are applicable to this Document; for the undated documents, only the latest version (including all the amendments) is applicable to this document.

GB/T 17394.2 Metallic materials - Leeb hardness test - Part 2: Verification and calibration of hardness testers GB/T 17394.3 Metallic materials - Leeb hardness test - Part 3: Calibration of reference blocks GB/T 17394.4 Metallic materials - Leeb hardness test - Part 4: Tables of hardness values conversation the reading. In particular, the underside of the support ring needs to be visually inspected and sediment and dirt shall be removed. Replace the

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support ring with a new one after the rubber coating is worn, except for the DL type impact device (this type has no rubber coating)

6.1 Surface shape

6.1.1

The support ring shall match the surface profile of the test location. The impact velocity vector shall be perpendicular to the local surface area to be tested.

NOTE: It may require selection of an appropriate instrument or specimen fixture.

6.1.2

The test can be carried out on the surface of the curved-surface specimen (concave or convex), but a support ring matching the curved surface must be used. For G-type impact devices, the radius of curvature of the test location shall be no less than 50mm; for other types of impact devices, the radius of curvature shall be no less than 30mm.

6.2 Thickness and mass

It should select the hardness tester with the type of impact device suitable for it according to the stiffness of the test piece (usually determined by the local thickness) and the quality of the test piece. When the mass of the test piece is less than the minimum allowable mass of the test, or the mass of the test piece is large enough but the local thickness is less than the minimum allowable thickness of the test (see Table 2) can affect the test results, it is necessary to rigidly support the test piece according to the instrument instruction manual and (or) coupled to a firm support for testing.

NOTE 1: If adequate support and coupling cannot be provided, incorrect test results will occur.

NOTE 2: Coupling refers to such a way: the test piece is firmly connected to the heavier support, and the test piece does not appear stress or strain. For example, an adhesive film can be applied between the surface of the test piece and the heavy support. This combination provides greater mass to stop the impactor from being struck.

NOTE 3: For some test pieces with special geometric shapes, such as sheet or pipe surface, when the thickness of the test piece is less than the minimum thickness given in Table 2, it is necessary to provide additional support for the test location for testing. On pipes, for example, the requirement for support can be expressed as the ratio between the diameter D of the pipe and the wall thickness s of the pipe, as a measure of the stiffness of the specimen. If the support cannot be applied, the correction factor of the measured value shall be determined according to D/s.

Table 2 -- Quality and Thickness Requirements of Samples

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6.3 Surface treatment

The test surface needs to be carefully prepared to avoid appearing the following conditions, such as changes in hardness due to heating during grinding, or due to work hardening during machining. Any coating, scale, dirt or other surface irregularities need to be completely removed. There must be no lubricant on the surface. For different impact devices, the maximum value of the surface roughness parameter Ra of the test piece test position shall comply with the provisions in Table 3.

Table 3 -- Recommended Test Surface Roughness Parameters Ra

7.1 Before the first test every day, it is necessary to carry out daily inspection on the used

hardness tester according to Appendix B.

7.2 The ambient temperature during the test should be within the range of 10°C to 35°C; if it is beyond this range, it shall be indicated in the test report.

NOTE: If the temperature difference between the tested material and the hardness tester is too large, it may affect the test results; so it should be ensured that the temperature difference between the two will not have an adverse effect on the hardness test results.

7.3 The magnetic field or electromagnetic field appearing in the test position of the test piece will affect the result of the Leeb hardness test, and the magnetic field or electromagnetic field in the test position shall be avoided.

7.4 There shall be no relative movement between the test piece and the impact device during

the test. Properly designed fixtures shall be used when necessary. The test surface and Type of impact device Minimum mass Minimum thickness (uncoupling) Minimum thickness (coupling) Type of hardness tester impact device Maximum allowable value of the test surface roughness parameter Ra

NOTE: If test surface is too rough, incorrect test result shall appear. Test surface should be processed and polished to meet requirement of Tabele3 20HL, the number of tests shall be increased and the arithmetic mean shall be calculated.

8 Measurement Uncertainty of Test Results

The measurement uncertainty of a test result depends on various sources of uncertainty. These uncertainties can be divided into two categories:

--- Source: Leeb hardness tester (including the measurement uncertainty introduced during direct inspection) and hardness uniformity of standard hardness blocks;

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--- Source: changes in test methods and test conditions.

Use the hardness tester given in Table 3 and the allowable error in Table 5 of GB/T 17394.2 to estimate the uncertainty of the hardness measurement.

NOTE: Sometimes it is not possible to quantify each source of measurement uncertainty. However, through the data analysis of the measured values of multiple test pieces, the estimated value of the uncertainty of the measured values can be obtained.

See Appendix C for an example of evaluating the measurement uncertainty of Leeb hardness measurements.

9 Test Report

The test report shall at least include the following:

a) The standard number implementing this Part, namely GB/T 17394.1-2014;

b) Detailed description related to the specimen;

c) The type of impact device;

d) Test results and individual basic readings;

e) Important test details, such as: coupling method, test position on the specimen, impact direction relative to the direction of gravity, etc.;

f) Any circumstances that affect the test results;

g) If not the test temperature within the range of 10°C to 35°C.

Metrology Transmission C.2 General procedures this procedure uses the method of residual sum of squares (RSS) to synthesize uc, (see Table C.1 for each uncertainty sub-item). The expanded uncertainty U is the product of uc and the inclusion factor k (usually k=2). Table C.1 gives all symbols and definitions.

C.3 Deviation of hardness tester the deviation b of the hardness tester originates from the difference between the following two parts:

- the average value of the five hardness indentations of the calibrated hardness tester;

- Calibrate the standard value of the standard hardness block.

Uncertainty can be determined in different ways.

C.4 Procedure for calculating uncertainty: Hardness measurements

NOTE: CRM (Certified Reference Material) is a standard hardness block calibrated by a standard hardness tester.

C.4.1 The method for considering the maximum permissible error of the hardness tester

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