UDC 620.1.05 : 620.178.152.42

Ref. No. : ISO/R 1355-1970 (E)

ISO

INTERNATIONAL ORGANIZATION FOR STANDARDIZATION

ISO RECOMMENDATION

R 1355

CALIBRATION OF STANDARDIZED BLOCKS TO BE USED FOR ROCKWELL SUPERFICIAL N AND T SCALE HARDNESS TESTING MACHINES

1st EDITION

August 1970

Printed in Switzerland

Also issued in French and Russian. Copies to be obtained through the national standards organizations.

BRIEF HISTORY

The ISO Recommendation R 1355, *Calibration of standardized blocks to be used for Rockwell superficial N and T scale hardness testing machines*, was drawn up by Technical Committee ISO/TC 17, *Steel*, the Secretariat of which is held by the British Standards Institution (BSI).

Work on this question led to the adoption of Draft ISO Recommendation No. 1355, which was circulated to all the ISO Member Bodies for enquiry in June 1968. It was approved, subject to a few modifications of an editorial nature, by the following Member Bodies :

Australia	India	Romania
Belgium	Iran	South Africa, Rep. of
Brazil	Israel	Spain
Canada	Italy	Sweden
Czechoslovakia	Korea, Rep. of	Switzerland
Denmark	Netherlands	Thailand
France	New Zealand	Turkey
Germany	Norway	U.A.R.
Hungary	Peru	United Kingdom

The following Member Body opposed the approval of the Draft :

U.S.A.

This Draft ISO Recommendation was then submitted by correspondence to the ISO Council, which decided to accept it as an ISO RECOMMENDATION.

ISO Recommendation | R 1355 | August 1970

CALIBRATION OF STANDARDIZED BLOCKS TO BE USED FOR ROCKWELL SUPERFICIAL N AND T SCALE HARDNESS TESTING MACHINES

1. SCOPE

This ISO Recommendation applies to the calibration of standardized blocks for the indirect verification of hardness testing machines as described in ISO Recommendation R 1079, *Verification of Rockwell superficial N and T scale hardness testing machines.* It does not necessarily apply to the calibration of test blocks which are used in the routine checking of the testing machine by the user, but it is not intended to preclude the use of blocks calibrated in accordance with this ISO Recommendation for the routine checking of a machine.

NOTE. Standardized blocks which are used in routine checking of the testing machine may be calibrated using the load duration specified in clause 4.4 of ISO Recommendation R 1024, *Rockwell superficial hardness test (N and T scales) for steel.*

2. MANUFACTURE

2.1 Each metal block to be standardized should be of a thickness not less than 6 mm (1/4 in).

2.2 The block should be specially prepared and the attention of the manufacturer is drawn to the need to use a manufacturing process which will give the necessary homogeneity, stability of structure and uniformity of surface hardness. It is recommended that the fineness and regularity of grain and the uniformity of the metallurgical structure be verified by microscopical examination. A microscopical examination may also be made by the standardizing authority.

2.3 The standardized blocks should not be magnetized. It is recommended that the manufacturer should ensure that the blocks, if of steel, have been demagnetized.

2.4 The upper and lower surfaces of the standardized block should be flat within 0.005 mm and the parallelism should be such that the thickness does not vary by more than 0.010 mm per 50 mm.

2.5 The lower surface of the standardized block should have a fine ground finish.

2.6 The test surface (upper surface) should be polished and its surface roughness should not exceed 0.0003 mm (centre line average).

It should be noted that the surface of the standardized block is necessarily work-hardened by any machining and polishing process. It is necessary to ensure that the machining and final polishing processes are such that the work-hardening effects are uniform over the surface and do not penetrate to too great a depth.

2.7 To permit checking that no material is subsequently removed from the standardized block, its thickness at the time of standardization should be marked on it to the nearest 0.1 mm (0.004 in) or an official mark should be made on the test surface (see section 13).

3. STANDARDIZING PROCEDURE

The standardized blocks should be calibrated in a standardizing machine complying with the requirements of sections 4 to 8 at a temperature of 20 ± 2 °C in temperate climates and 27 ± 2 °C in tropical climates, using the general procedure described in ISO Recommendation R 1024.

4. STANDARDIZING MACHINE

The standardizing machine is one in which the load applied, the form of the indenter, and the measuring device can be verified by fundamental measurement. The load should be applied by means of weights giving true values of force.

5. LOADS

The loads should be correct within ± 0.1 %.

6. FORM OF INDENTER

6.1 N scale

6.1.1 The surface of the diamond should be highly polished and free from flaws.

6.1.2 The diamond cone should have an included angle of 120 ± 0.1° and should have its axis in line with the axis of the indenter within a tolerance of 0.3°. The tip of the cone should be spherical with a radius equal to 0.200 mm. The contour of the tip of the cone should not depart by more than 0.002 mm from the nominal contour. The surface of the cone should blend in a truly tangential manner with the surface of the spherical tip. The verification of the indenter should be made at not less than four sections.

NOTE. – The hardness values given by the testing machine do not depend only on the dimensions given in clause 6.1.2, but also on the roundness of sections perpendicular to the axis, the position of the crystallographic axes of the diamond, and the seating of the diamond in its holder.

For this reason, it is considered necessary to carry out a performance test in which the indenter should be compared, in a standardizing machine, with other indenters already accepted for standards work.

6.2 T scale

6.2.1 The diameter of the steel ball indenter should not vary from the nominal diameter by more than ± 0.001 mm (0.000 04 in).

6.2.2 The hardness of the steel ball should be not less than 850 HV 10 taking into account the curvature of the ball (see ISO Recommendation R 1079).

6.2.3 The ball should be polished and free from surface defects.

7. APPLICATION OF LOAD

7.1 The load should be applied and removed without shock.

NOTE. – External vibrations may affect the results of the calibration.

7.2 The mechanism which controls the application of the load should either

(*a*) employ a device, for example a spring, to reduce the velocity of penetration of the indenter during the period of penetration, or

(*b*) employ a device to maintain a constant velocity of penetration of the indenter.

7.3 In standard machines of the first type (see clause 7.2 (*a*)), the initial velocity (i.e. the velocity of the indenter prior to penetration of the test block) should be not greater than 1 mm/s. In machines of the second type (see clause 7.2 (*b*)), the initial velocity should be not less than 0.003 mm/s and not greater than 0.012 mm/s.

NOTE. – When making an indentation, the load-applying mechanism becomes clear of the load before the indenter has come to rest, so that the last stage in the indenting process is under the control of the load and the test block alone. It has been established experimentally that the depth of the indentation, and therefore the hardness value obtained, is dependent on the velocity of penetration and that variable hardness values are obtained if excessively slow velocities of penetration are used.

8. DURATION OF APPLICATION OF LOADS

The preliminary load should be applied for 10 to 20 seconds and the additional load for 30 to 35 seconds. The indexing of the pointer of the measuring apparatus, or the taking of the first reading, should be carried out as soon as possible after the 10 to 20 seconds duration of the preliminary load and the taking of the final reading should be made as soon as possible after the additional load has been removed.

9. NUMBER OF INDENTATIONS

On each block, five indentations should be made, randomly distributed over the entire test surface.

10. MEASURING APPARATUS

The measuring device should be capable of measuring vertical displacements within ± 0.2 of a scale unit.

11. REPEATABILITY

Let $e_1, e_2, \ldots e_5$ be the values in scale units of the measured increase in depth of indentation, arranged in increasing order of magnitude.

The repeatability of the block is defined as

$$e_5 - e_1$$

12. UNIFORMITY OF HARDNESS

Unless the repeatability is within 2 % (or less than 0.6 superficial hardness scale units if this is greater than 2 %) for the N scale or within 3 % (or less than 1.2 superficial hardness scale units if this is greater than 3 %) for the T scale, of the mean of the values (e) of the increase of depth of indentation, the block cannot be regarded as sufficiently uniform for hardness standardization purposes (see Appendix for examples).

13. MARKING

13.1 Each standardized block should be marked with the following :

(a) the arithmetic mean of the hardness values found in the standardizing tests;

(b) the name or mark of the supplier;

(c) the serial number;

(d) the name or mark of the standardizing authority;

(e) the thickness of the standardized block or an official mark on the test surface;

(f) the symbol of hardness.

13.2 At least one of the marks, or a special mark, should be on the test surface. Alternatively, the marking may be on the side of the standardized block, the marking being upright when the test surface is the upper face.