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Indian Standard
CALIBRATION BLOCKS FOR USE IN ULTRASONIC NON-DESTRUCTIVE TESTING — SPECIFICATION
( Fourth Revision )

ICS 19.100
FOREWORD

This Indian Standard (Fourth Revision) was adopted by the Bureau of Indian Standards, after the draft finalized by Non-destructive Testing Sectional Committee had been approved by the Metallurgical Engineering Division Council.

This standard was first published in 1968 and subsequently revised in 1972, 1982 and 1990. The third revision issued in 1990, gave recommendations for the use of calibration blocks in ultrasonic flaw detection. As the application of blocks for calibrating various characteristic of flaw detection equipment is covered in details in IS 12666:1988 'Methods for performance assessment of ultrasonic flaw detection equipments', it has been decided to confine this fourth revision to specification for blocks only.

Ultrasonic flaw detection is widely used for assessing, non-destructively the homogeneity and internal soundness of metals and metal products. A wide variety of ultrasonic flaw detectors is now commercially available. The manufacture of ultrasonic flaw detectors with their associated probe system is, however, not governed by any recognized specification. Further, the performance of the instrument varies or changes with usage due to variations of changes in the characteristics of the electronic components employed in it. The performance of the probe system also undergoes changes or variations due to variations in crystal mounting or wear of the probes.

It is, therefore, necessary to maintain the sensitivity of an ultrasonic flaw detector and its probe system within narrow limits, if it is to be relied upon for quantitative results. Complicated electrical measurement might be used to ascertain the performance characteristics but the carrying out of such measurements are not easy for use in practice. The current trend has, therefore, been to use carefully selected blocks of metal of specified size and shape containing suitably located reflecting surfaces for the purpose of checking the instrument and probe characteristics and to calibrate, control and verify the adjustments involved during actual inspection so that consistent results may be obtained and these may be expressed on a common basis. Reference blocks of varying character, intended for such purposes, have been developed by individual organizations in different countries.

The purpose of this standard is essentially to provide a range of suitable blocks by which use singly or in combination the overall characteristics of ultrasonic flaw detection equipment can be calibrated and verified.

In this revision following modifications have been carried out:

a) Reference clause has been updated since IS 2853 ‘Methods of determining austenitic grain size in steel’ has been withdrawn and replaced with IS 4748:1988 ‘Method for estimating average grain size of metals (first revision)’.

b) Material clause has been modified.

c) Dimension clause has been modified.

d) Legends under Fig. 6 has been added.

For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with IS 2:1960 ‘Rules for rounding off numerical values (revised)’. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.
Indian Standard

CALIBRATION BLOCKS FOR USE IN ULTRASONIC NON-DESTRUCTIVE TESTING — SPECIFICATION

(Fourth Revision)

1 SCOPE

1.1 This standard (fourth revision) prescribes the material, dimensions and surface finish of steel blocks used for calibration of ultrasonic flaw detection equipment.

1.2 The blocks prescribed may be selected, as appropriate, for evaluation of various parameters of ultrasonic flaw detection equipment under either laboratory conditions or on site conditions (see IS 12666).

2 REFERENCES

The following standards contain provisions which through reference in this text, constitute provisions of this standard. At the time of publication, the editions indicated were valid. All standards are subject to revision and parties to agreements based on this standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below:

<table>
<thead>
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<td>4748:1988</td>
<td>Method for estimating average grain size of metals (first revision)</td>
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<tr>
<td>10719:1983</td>
<td>Method of indicating surface texture on technical drawings</td>
</tr>
<tr>
<td>12666:1988</td>
<td>Method for performance assessment of ultrasonic flaw detection equipment</td>
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3 MATERIAL

3.1 The material used for the manufacture of blocks shall be low or medium-carbon steel, fully killed, normalized to produce a fine grain structure having grain size corresponding to Mc Quaid Ehn No. 5 or finer when determined in accordance with IS 4748 and shall be homogeneous throughout. The test for grain size of material shall be carried out before making the blocks.

3.2 The blocks shall be made from wrought material free from internal flaws.

3.3 Final preparation of blocks shall be by light grinding. Burnishing of the surface and surface hardening shall not be permitted. The surface of the faces and edges shall generally be machined to R value not greater than 0.8 micron (see IS 10719).

3.4 The material used for making blocks shall be tested for ultrasonic attenuation after heat treatment. The local variations of attenuation shall not exceed ±1 dB (±0.02 dB/mm of block dimension) when tested with compressional waves in the frequency range 4 to 6 MHz.

3.5 The velocity of the compressional wave in the material of the block shall be specified by the manufacturer within the accuracy of ±1 m/s.

3.6 In V1 block, the equivalent thickness of the steel for the perspex insert shall be 50 ± 0.1 mm.

4 DIMENSIONS

4.1 The dimensions of the calibration blocks shall conform to those in Fig. 1 to 6. The opposing faces of the blocks shall be parallel within ± 0.10 mm and the adjacent faces shall be perpendicular within ± 5 mm of arc. Wherever possible, the limits on dimensions shall be held to ± 0.10 mm.

4.2 On blocks V1 and V2, the 0 (zero) marking for probe index shall be done on both the sides.

5 PACKAGING OF BLOCKS

5.1 Each block shall be packed in a strong case with an identification plate. The case shall be recessed in both the base and the lid in order to accommodate the block, and oiled felt shall be provided for both recesses to keep the test surfaces free from corrosion. Suitable means shall be provided for carrying the case.

5.2 If wood is used in the manufacture of the case, care shall be taken to ensure that the wood does not contain chemicals as it would have a deleterious effect on the block.
All dimensions in millimetres.

FIG. 1 BLOCK V1 DIMENSIONS
NOTE — The thickness may be either 12.5 mm or 20 mm and the target hole may have a diameter of either 1.5 mm or 5 mm. Blocks having a thickness of 20 mm and a target hole 1.5 mm diameter are generally preferred.

FIG. 2 BLOCK V2 DIMENSIONS

FIG. 3 BLOCK A5 DIMENSIONS, BEAM CALIBRATION BLOCK
All dimensions in millimetres.

**FIG. 4 BLOCK A6 DIMENSIONS**

All dimensions in millimetres.

**FIG. 5 BLOCK A7 DIMENSIONS, RESOLUTION BLOCK**
**Holes $H_1, H_2, H_3$**

* Diameter: $1.5 \pm 0.1$ mm each
* Depth: $6.0 \pm 0.2$ mm each

**Scale**

* Thickness: $2 \pm 0.5$ mm
* Width: $25 \pm 1.0$ mm

**Fixing Arrangements**: The scale shall slide easily over the block. It shall have provision to secure by fly nuts or any other device and any position parallel to edge $CD$.

**Fig. 6 Block A8 Dimensions, Surface Wave Block**
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This Indian Standard has been developed from Doc : No. MTD 21 (4612).

Amendments Issued Since Publication

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