भारतीय मानक

Indian Standard

IS 18738 (Part 2) : 2024
ISO 15792-2 : 2020

वेल्डिंग उपभोग्य — परीक्षण के तरीके

भाग 2 इस्पात में सिंगल-रन और टू-रन तकनीक परीक्षण खंड और नमूनों की तैयारी

Welding Consumables — Methods of Test

Part 2 Preparation of Single-Run and Two-Run Technique Test Pieces and Specimens in Steel

ICS 25.160.20

भारतीय मानक ब्यूरो
BUREAU OF INDIAN STANDARDS
मानक भवन, 9 बहादुर शाह ज़फर मार्ग, नई दिल्ली - 110002
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI - 110002
www.bis.gov.in www.standardsbis.in

May 2024 **Price Group 6**

Welding General and its Applications Sectional Committee, MTD 11

NATIONAL FOREWORD

This Indian Standard (Part 2) which is identical to ISO 15792-2 : 2020 'Welding consumables — Test methods — Part 2: Preparation of single-run and two-run technique test pieces and specimens in steel' issued by the International Organization for Standardization (ISO), was adopted by the Bureau of Indian Standards on the recommendation of the Welding General and its Applications Sectional Committee and approval of the Metallurgical Engineering Division Council.

The test pieces and specimens are used to determine the strength and impact properties of welded joints when testing welding consumables with single-run and two-run techniques. This standard specifies the preparation of butt weld test pieces and specimens.

The committee decided to adopt ISO 15792-2 : 2020 standard under dual numbering system.

This Indian Standard is published in three parts. The other parts in this series are:

Part 1	Preparation of all-weld metal test pieces and specimens in steel, nickel and nickel alloys
Part 3	Classification testing of positional capacity and root penetration of welding consumables in a fillet weld

The text of ISO standard has been approved as suitable for publication as an Indian Standard without deviations. Certain terminologies and conventions are, however, not identical with those used in Indian Standard. Attention is especially drawn to the following:

a) Wherever the words 'International Standard' appear referring to this standard, it should be read as 'Indian Standard'; and

b) Comma (,) has been used as a decimal marker, while in Indian Standards, the current practice is to use a point (.) as the decimal marker.

In this adopted standard, reference appears to certain International Standards for which Indian Standards also exist. The corresponding Indian Standards which are to be substituted in their place is given below along with their degree of equivalence for the edition indicated:

International Standard	*Corresponding Indian Standard*	*Degree of Equivalence*
ISO 5178 Destructive tests on welds in metallic materials — Longitudinal tensile test on weld metal in fusion welded joints	IS 3600 (Part 4) : 2024/ISO 5178 : 2019 Fusion welded joints and weld metal in steel — Method of test: Part 4 Destructive tests on welds in metallic materials — Longitudinal tensile test on weld metal in fusion welded joints (*third revision*)	Identical

The Committee responsible for the preparation of this standard has reviewed the provisions of following International Standards referred in these adopted standards and decided their acceptability for use in conjunction with this standard.

International Standard	*Title*
ISO 4136 : 2012	Destructive tests on welds in metallic materials — Transverse tensile test

(*Continued on third cover*)

Contents

Page

Introduction

Consumables for both submerged arc welding and metal arc welding with tubular cored electrodes can be suitable for welding by the single- or two-run technique and the methods for testing and classification are specified. When a welding consumable is offered for use by these techniques, it should be noted that all-weld metal test pieces may not be required by the consumable classification standard.

Test conditions prescribed and results required should not be considered to be requirements or expectations for a procedure qualification.

Indian Standard

WELDING CONSUMABLES — METHODS OF TEST

PART 2 PREPARATION OF SINGLE-RUN AND TWO-RUN TECHNIQUE TEST PIECES AND SPECIMENS IN STEEL

1 Scope

This document specifies the preparation of butt weld test pieces and specimens.

The test pieces and specimens are used to determine the strength and impact properties of welded joints when testing welding consumables with single-run and two-run techniques.

This document is applicable to welding consumables for arc welding of steel.

This document is not suitable for electro-slag or electro-gas welding.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 4136:2012, *Destructive tests on welds in metallic materials — Transverse tensile test*

ISO 5178, *Destructive tests on welds in metallic materials — Longitudinal tensile test on weld metal in fusion welded joints*

ISO 9016:2012, *Destructive tests on welds in metallic materials — Impact tests — Test specimen location, notch orientation and examination*

3 Terms and definitions

No terms and definitions are listed in this document.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at http://www.electropedia.org/

4 General requirements

Welding consumables to be tested shall be representative of the manufacturer's products to be classified or tested. Test pieces shall be prepared as described below.

5 Test plate material

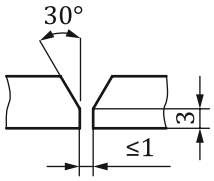
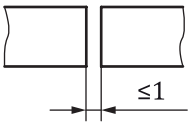
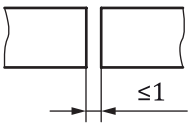
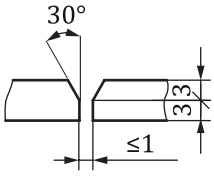
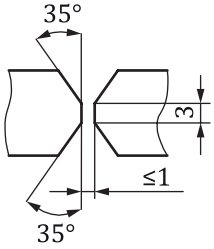
The material to be used shall be in accordance with the appropriate consumable classification standard.

6 Preparation of the test piece

The plates of the test piece shall be preset or restrained in such a way that a sufficiently flat test piece is produced for extraction of specimens. The welded test piece shall not be straightened. A suitable backing system for single-run technique may be used. Run-on and run-off plates may be used (see Table 1).

Table 1 — Butt weld test piece for single-run or two-run technique

Dimensions in millimetres

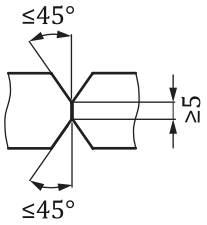
Type	Plate thickness	Preparation[a]	Diameter of wire electrode for submerged arc welding	Diameter of tubular cored electrode[b]
2.1	12	single-run technique 	4	—
2.2	12	two-run technique 	4	—
2.3	6	single-run technique 	—	See welding consumable classification standard
2.4	6	single-run technique 	—	1,6[c]
2.5	20	two-run technique 	5[b]	—

[a] The bevel angle is the same for both sides of the joint. Tolerance is ±2,5 for 2.1, 2.4 and 2.5.

[b] Other diameters may be used for tests other than classification tests.

[c] Or largest diameter offered by the welding consumable manufacturer for single run technique.

Table 1 *(continued)*

Type	Plate thickness	Preparation[a]	Diameter of wire electrode for submerged arc welding	Diameter of tubular cored electrode[b]
2.6	12	two-run technique 	4 [b]	—

[a] The bevel angle is the same for both sides of the joint. Tolerance is ±2,5 for 2.1, 2.4 and 2.5.

[b] Other diameters may be used for tests other than classification tests.

[c] Or largest diameter offered by the welding consumable manufacturer for single run technique.

7 Welding conditions

The test piece shall be welded in the flat position. Welding shall start at room temperature or after application of any preheating required by the welding consumable standard. The interpass temperature shall be in accordance with the welding consumable standard.

The preheating and interpass temperatures shall be measured using temperature indicator crayons, surface thermometers or thermocouples, for example in accordance with ISO 13916.

The welding conditions used, such as current, voltage, travel speed, weld bead size, shall be:

— within the range recommended by the welding consumable manufacturer; and

— where the test is performed for classification purposes, in accordance with the limits specified in the relevant consumable standard.

8 Heat treatment

All heat treatments required for the butt weld, except hydrogen removal treatment shall be carried out on the completed test piece, or on sections thereof with a machining allowance.

The heat treatments are specified in standards relating to welding consumables.

Hydrogen removal treatment may be carried out on the test piece for tensile testing before or after final machining. The test piece may be held at a temperature not exceeding 250 °C for up to 16 h.

9 Position of specimens, specimen dimensions and testing

Figure 1 and Figure 2 show the position of the notched impact specimens, the transverse tensile test specimens and the all weld metal tensile test specimens as appropriate. The test piece shall be divided by cutting (machining) or by thermal cutting. In the case of thermal cutting, machining allowances of 10 mm at least on either side shall be provided for subsequent machining of the specimens.

When applicable, the specimens for the impact test (see Figure 1 and Figure 2) and testing shall be in accordance with ISO 9016. The impact specimen shall be in accordance with ISO 9016:2012, designation VWT 0/*b*. The position of the impact specimens shall be at the midline of the plate thickness for types 2.1, 2.2 and 2.6, and from the last welded run as shown in Figure 2 for type 2.5. Impact specimens are not applicable for type 2.3 and 2.4.

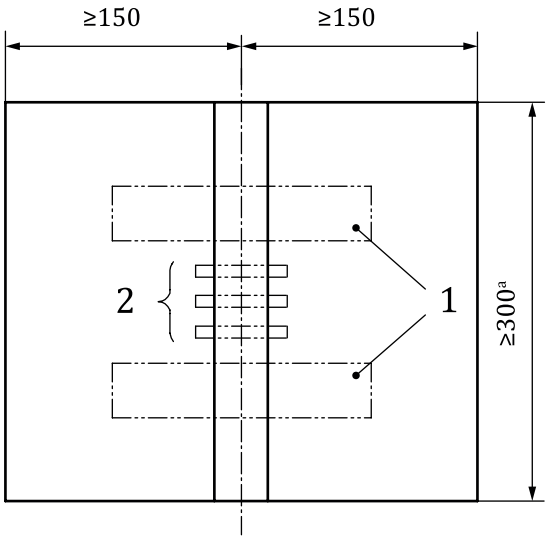
The size of impact specimens shall be 10 mm x 10 mm. If impact testing is required for types 2.3 and 2.4, subsize specimens 5 mm x 10 mm shall be used.

The specimens for transverse tensile tests [see Figure 1a)] and testing shall be in accordance with ISO 4136. The specimen dimensions shall be in accordance with ISO 4136:2012, Table 2.

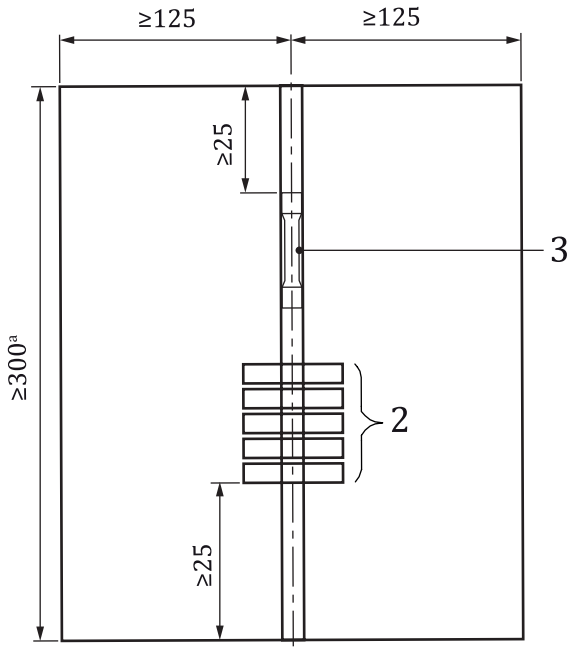
For type 2.6, the all weld tensile test specimen [see Figure 1b)] shall be in accordance with ISO 5178 and shall a nominal diameter of 6,0 mm. The reduced section of the longitudinal tensile specimen shall be located entirely within the weld.

Prior to the preparation of test specimens, it is recommended that the prepared and etched surface of the test piece be subjected to radiographic and/or macrographic examination to ascertain if there are any defects in the weld

Dimensions in millimetres



a) Location of transverse tensile specimens and impact specimens (single pass classifications)



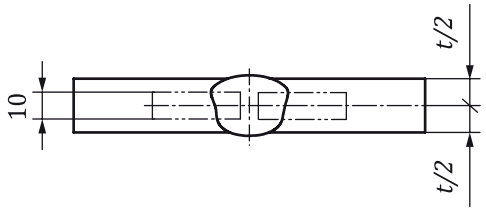
b) Location of impact specimens and all weld metal tension specimen locations (two pass classifications)

Key

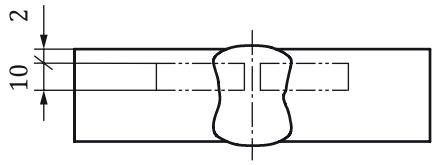
1 transverse tensile specimens
2 impact specimens
3 all weld metal tension specimen
[a] Effective weld length.

Figure 1 — Position of specimens

Dimensions in millimetres



a) Types 2.1, 2.2, and 2.6



b) Type 2.5 only

Figure 2 — Position of impact specimens

Bibliography

[1] ISO 13916, *Welding — Measurement of preheating temperature, interpass temperature and preheat maintenance temperature*

(*Continued from second cover*)

International Standard	*Title*
ISO 9016 : 2012	Destructive tests on welds in metallic materials — Impact tests — Test specimen location, notch orientation and examination

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 : 2022 ‘Rules for rounding off numerical values (*second revision*)’. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

Bureau of Indian Standards

BIS is a statutory institution established under the *Bureau of Indian Standards Act*, 2016 to promote harmonious development of the activities of standardization, marking and quality certification of goods and attending to connected matters in the country.

Copyright

Review of Indian Standards

Amendments are issued to standards as the need arises on the basis of comments. Standards are also reviewed periodically; a standard along with amendments is reaffirmed when such review indicates that no changes are needed; if the review indicates that changes are needed, it is taken up for revision. Users of Indian Standards should ascertain that they are in possession of the latest amendments or edition by referring to the website-www.bis.gov.in or www.standardsbis.in.

This Indian Standard has been developed from Doc No.: MTD 11 (22968).

Amendments Issued Since Publication

Amend No.	Date of Issue	Text Affected

BUREAU OF INDIAN STANDARDS

Headquarters:

Manak Bhavan, 9 Bahadur Shah Zafar Marg, New Delhi 110002
Telephones: 2323 0131, 2323 3375, 2323 9402 *Website*: www.bis.gov.in

Regional Offices: *Telephones*

Central : 601/A, Konnectus Tower -1, 6th Floor, DMRC Building, Bhavbhuti Marg, New Delhi 110002 { 2323 7617

Eastern : 8th Floor, Plot No 7/7 & 7/8, CP Block, Sector V, Salt Lake, Kolkata, West Bengal 700091 { 2367 0012 2320 9474

Northern : Plot No. 4-A, Sector 27-B, Madhya Marg, Chandigarh 160019 { 265 9930

Southern : C.I.T. Campus, IV Cross Road, Taramani, Chennai 600113 { 2254 1442 2254 1216

Western : Manakalya, 4th Floor, NTH Complex (W Sector), F-10, MIDC, Andheri (East), Mumbai 400093 { 283 25838

Branches : AHMEDABAD, BENGALURU, BHOPAL, BHUBANESHWAR, CHANDIGARH, CHENNAI, COIMBATORE, DEHRADUN, DELHI, FARIDABAD, GHAZIABAD, GUWAHATI, HARYNA, HUBLI, HYDERABAD, JAIPUR, JAMMU & KASHMIR, JAMSHEDPUR, KOCHI, KOLKATA, LUCKNOW, MADURAI, MUMBAI, NAGPUR, NOIDA, PARWANOO, PATNA, PUNE, RAIPUR, RAJKOT, SURAT, VIJAYAWADA.

Published by BIS, New Delhi