
**Welding consumables — Technical
delivery conditions for filler materials
and fluxes — Type of product,
dimensions, tolerances and markings**

*Produits consommables pour le soudage — Conditions techniques
de livraison des produits d'apport et des flux — Type de produits,
dimensions, tolérances et marquage*

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see <http://www.iso.org/directives>).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see <http://www.iso.org/patents>).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation on the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT) see the following URL: <http://www.iso.org/iso/foreword.html>.

This document was prepared by Technical Committee ISO/TC 44, *Welding and allied processes*, Subcommittee SC 3, *Welding consumables*.

This fifth edition cancels and replaces the fourth edition (ISO 544:2011), which has been technically revised.

The main changes compared to the previous edition are as follows:

- in 5.4, clarification that fluxes can be obtainable in different particle size distributions is given (not all fluxes are available in multiple particle size distributions);
- Table 2 has been changed;
- in Table 4, a new spool type B400 has been added;
- 8.1.2 has been revised to include reels and rims
- 8.2, bullet number 5 has been revised.

Requests for official interpretations of any aspect of this document should be directed to the Secretariat of ISO/TC 44/SC 3 via your national standards body. A complete listing of these bodies can be found at <http://www.iso.org>.

Welding consumables — Technical delivery conditions for filler materials and fluxes — Type of product, dimensions, tolerances and markings

1 Scope

This document specifies technical delivery conditions for filler materials and fluxes for fusion welding.

This document does not apply to other auxiliary materials such as shielding gases.

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 14174, *Welding consumables — Fluxes for submerged arc welding and electroslag welding — Classification*

ISO 14344, *Welding consumables — Procurement of filler materials and fluxes*

ISO 80000-1:2009, *Quantities and units — Part 1: General*

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 Product type and welding process

The types of products covered by this document and the welding process(es) in which they are used are listed in [Table 1](#).

NOTE The corresponding reference numbers for each welding process in accordance with ISO 4063 are given for information.

5 Dimensions and tolerances

5.1 Solid wires and solid wire electrodes, tubular cored wires and tubular cored electrodes, solid and tubular cored rods and covered electrodes

Dimensions and tolerances for solid wires and solid wire electrodes, tubular cored wires and tubular cored electrodes, solid and tubular cored rods and covered electrodes are given in [Table 2](#).

Table 1 — Product type and welding process

Product type	Welding process(es) ^a
Cored strip electrode	EG, ES, S
Covered electrode	E
Solid rod	W, O, P
Solid strip electrode	ES, S
Solid wire	W, P, L, EB
Solid wire electrode	EG, ES, G, S
Tubular cored rod	W, O, P
Tubular cored wire	L, W
Tubular cored electrode	EG, ES, P, S, T
Thin foil	L, EB
^a The corresponding reference numbers for each welding process in accordance with ISO 4063 are: — E Manual metal arc welding (111); — EB Electron beam welding (51); — EG Electrode gas welding (73); — ES Electroslag welding (72); — G MIG/MAG welding with solid wire electrode (131, 135); — L Laser welding (52); — O Oxyfuel gas welding (31); — P Plasma arc welding (15); — S Submerged arc welding (12); — T Metal arc welding with tubular cored electrode with a gas shield (132, 133, 136 and 138) or without a gas shield (114); — W Gas tungsten arc welding (14).	

5.2 Solid strip electrodes

Dimensions and tolerances for solid strip electrodes are given in [Table 3](#).

5.3 Cored strip electrodes and thin foils

Dimensions and tolerances for cored strip electrodes and thin foils shall be in accordance with the relevant application standard.

Table 2 — Dimensions and tolerances for wires, rods, and covered electrodes

Dimensions in millimetres

Nominal diameter	Solid wires and solid wire electrodes ^a		Tubular cored wires and tubular cored electrodes ^a	Solid and tubular cored rods ^a			Covered electrodes ^{a,b}			
	S, ES, EG		T, S, EG	Welding process W, O, P			E			
	G, W, L, EB Diameter tolerance	Diameter tolerance	Diameter tolerance	Diameter tolerance	Length	Length tolerance	Diameter of core wire	Diameter tolerance	Length	Length tolerance
0,5	+0,01 -0,03	—	—	—	—	—	—	—	—	—
0,6										
0,8	+0,01 -0,04	—	+0,02 -0,05	±0,1	500 ≤ l ≤ 1 000	±5	1,6 2,0 2,5 2,6	±0,06	200 ≤ l ≤ 350	±10
0,9										
1,0										
1,2										
1,4	+0,01 -0,04	±0,04	+0,02 -0,06	±0,1	500 ≤ l ≤ 1 000	±5	1,6 2,0 2,5 2,6	±0,06	200 ≤ l ≤ 350	±10
1,6										
1,8										
2,0										
2,4	+0,01 -0,07	±0,06	+0,02 -0,07	±0,1	500 ≤ l ≤ 1 000	±5	3,2 4,0 5,0 6,0 8,0	±0,10	275 ≤ l ≤ 450 ^c	±10
2,5										
2,8										
3,0										
3,2	—	±0,06	+0,02 -0,08	±0,1	500 ≤ l ≤ 1 000	±5	3,2 4,0 5,0 6,0 8,0	±0,10	275 ≤ l ≤ 450 ^c	±10
4,0										
5,0										
6,0										
8,0										

^a When an electrode diameter is not manufactured, the next closest diameter shall be tested but the tolerances given in this table are to be used.^b Dimensions for the core wire.^c For special cases (e.g. gravity welding), length, l < 1 000 mm

Table 3 — Dimensions and tolerances for solid strip electrodes

Parameter	Dimensions mm	Tolerances mm
Nominal thickness	≤1,0	±0,05
Nominal width	≤100	+0,5 0
	>100	+0,8 0

5.4 Fluxes

The flux shall be granular and so constituted that it can be conveyed freely by the flux feed system. The particle size distribution shall be uniform and consistent in the different packaging units. The fluxes may be obtainable in different particle size distributions (see ISO 14174).

6 Rounding procedure

Actual test values obtained shall be subject to ISO 80000-1:2009, B.3, Rule A. If the measured values are obtained by equipment calibrated in units other than those of this document, the measured values shall be converted to the units of this document before rounding. If an average value is to be compared to the requirements of this document, rounding shall be done only after calculating the average. The rounded results shall fulfil the requirements of the appropriate table for the classification under test.

7 Condition of welding consumables

7.1 Covered electrodes

The electrode covering shall be concentric and consistent along the electrode length in order to avoid asymmetrical melting-off of the covering during welding. The electrode covering shall not exhibit any irregularities, cracks or other surface defects which would adversely affect the welding operation. The coating shall firmly adhere to the core wire and shall not break off during proper handling and usage.

The grip end of the electrode shall be free from covering material over a length of at least 15 mm.

NOTE The striking end can include arc ignition enhancing material.

7.2 Wires, rods, and strips

The surface of the welding consumable shall be free from contamination and surface defects that can adversely affect welding. Any surface finish is allowed, provided that the welding operation and the properties of the weld metal are not adversely affected.

All cored products shall have the core ingredients distributed uniformly throughout their length such that the performance of the products, the chemical composition and the properties of the deposited weld metal are not adversely affected.

Wires and strips can be delivered in coils or wound on spools in accordance with [Figure 1](#) and [Table 4](#). Wires and strips shall not exhibit kinks, waves, sharp bends or other irregularities that could interfere with continuous feeding. The beginning and end of the wire, spooled in one length, shall be secured.

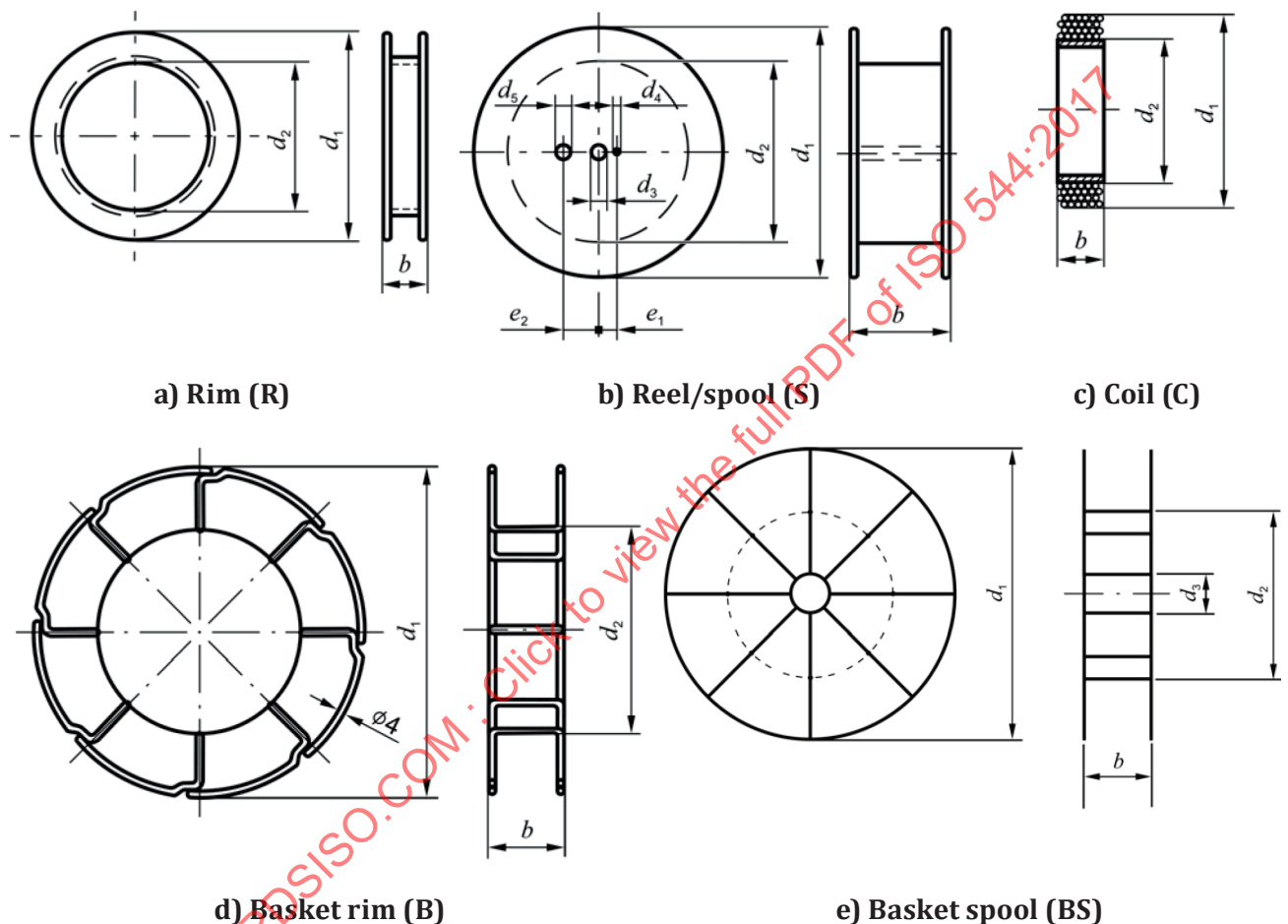
Welding consumables on coils without formers shall be tied in at least three places spaced approximately equally around the circumference of the coil.

Solid wires and solid wire electrodes for steel shall not exhibit a helix greater than specified in the next two paragraphs.

The helix is defined as the vertical separation between any part of one loop of wire placed on a flat surface without restraint and the flat surface. It shall not be more than 25 mm for spools having an outside diameter of up to 200 mm (S 200) and not more than 50 mm for spools having a diameter of more than 200 mm (see Table 4).

The cast (diameter of some loops of wire placed on a flat surface without restraint), helix and condition of all wires shall be such as to be suitable for uniform uninterrupted feeding on automatic or semi-automatic welding equipment.

Dimensions in millimetres



Key

$b, d_1, d_2, d_3, d_4, d_5, e_1, e_2$ for definitions, see Table 4.

NOTE Reel/spool (S) may have two pinholes.

Figure 1 — Reels, rims, spools and coils

Table 4 — Dimensions and tolerances of reels, rims, spools, and coils

Dimensions in millimetres

Type	Designation ^a	Outer diameter ^a d_1	Inner diameter ^a d_2	Outer width ^a b	Bore diameter ^a d_3	Pinhole		Distance from axis ^a e_1	e_2
						Diameter ^a d_4	d_5		
Reel/spool (S)	S 100	100 ± 2	—	45 ⁰ ₋₂	16,5 ⁺¹ ₀	—	—	—	—
Reel/spool (S)	S 117	117 ± 1	—	71 ⁰ ₋₂	48,0 ^{+0,6} ₀	—	—	—	—
Reel/spool (S)	S 200	200 ± 3	—	55 ⁰ ₋₃	50,5 ^{+2,5} ₀	10 ⁺¹ ₀	—	44,5 ± 0,5	—
Reel/spool (S)	S 300	300 ± 5	—	103 ⁰ ₋₃	50,5 ^{+2,5} ₀	10 ⁺¹ ₀	—	44,5 ± 0,5	—
Reel/spool (S)	S 350	350 ± 5	—	103 ⁰ ₋₃	50,5 ^{+2,5} ₀	10 ⁺¹ ₀	—	44,5 ± 0,5	—
Reel/spool (S)	S 560	560 ⁰ ₋₁₀	—b	305 ⁰ ₋₁₀	35,0 ± 1,5	16,7 ± 0,7	16,7 ± 0,7	63,5 ± 1,5	63,5 ± 1,5
Reel/spool (S)	S 610	610 ⁰ ₋₁₀	—b	345 ⁰ ₋₁₀	35,0 ± 1,5	16,7 ± 0,7	16,7 ± 0,7	63,5 ± 1,5	63,5 ± 1,5
Reel/spool (S)	S 760E	760 ⁰ ₋₁₀	—	290 ⁺¹⁰ ₋₁	40,5 ⁺¹ ₀	25 ⁺¹ ₀	35 ⁺¹ ₀	65 ± 1	110 ± 1
Reel/spool (S)	S 760A	760 ⁰ ₋₁₀	—b	345 ⁰ ₋₁₀	35,0 ± 1,5	16,7 ± 0,7	16,7 ± 0,7	63,5 ± 1,5	63,5 ± 1,5
Rim (R)	R 435	435 ± 5	300 ⁺¹⁵ ₀	90 ⁰ ₋₁₅	—	—	—	—	—
^a Other dimensions can be agreed.									
^b Outside diameter of barrel, d_2 , shall be such as to permit feeding of the filler materials.									

Table 4 (continued)

Type	Designation ^a	Outer diameter ^a d_1	Inner diameter ^a d_2	Outer width ^a b	Bore diameter ^a d_3	Diameter ^a		Pinhole	
						d_4	d_5	e_1	e_2
Basket rim (B)	B 300	300 ⁺⁰ ₋₅	180 ± 2	100 ± 3	—	—	—	—	—
Basket rim (B)	B 400	400 ⁺⁶ ₋₂	190 ± 5	215 ± 3	—	—	—	—	—
Basket rim (B)	B 435	435 ⁺⁰ ₋₅	300 ± 5	70 ± 3	—	—	—	—	—
Basket rim (B)	B 450	≤ 450	300 ± 5	100 ± 3	—	—	—	—	—
Basket spool (BS)	BS 200	200 ⁺⁴ ₋₃	100 ⁺⁷ ₋₅	55 ± 3	50,5 ^{+2,5} ₀	—	—	—	—
Basket spool (BS)	BS 300	300 ± 5	189 ± 0,5	103 ⁺⁰ ₋₃	50,5 ^{+2,5} ₀	—	—	—	—
Coil (C)	C 435	≤ 435	300 ⁺¹⁵ ₀	90 ⁺⁰ ₋₁₅	—	—	—	—	—
Coil (C)	C 450	≤ 450	300 ⁺¹⁵ ₋₅	100 ⁺¹⁰ ₋₅	—	—	—	—	—
Coil (C)	C 750	≤ 750	570 ⁺²⁰ ₀	90 ⁺⁰ ₋₁₀	—	—	—	—	—
Coil (C)	C 800	≤ 800	600 ⁺²⁰ ₀	120 ⁺¹⁰ ₋₅	—	—	—	—	—
^a Other dimensions can be agreed.									
^b Outside diameter of barrel, d_2 , shall be such as to permit feeding of the filler materials.									

8 Marking

8.1 Marking on the product

8.1.1 Covered electrodes

Covered electrodes shall be durably marked on the covering, near the grip end or on the grip end, with at least an identification traceable to either the supplier trade name or the electrode classification.

8.1.2 Wires and strips

Welding consumables wound on spools, reels, rims or in coils shall be durably marked on the spool, reel rim or coil with an identification traceable to the unique manufacturer or supplier product type.

8.1.3 Rods

Each tungsten inert gas arc welding, plasma arc welding, and oxyfuel gas welding rod shall be durably marked with an identification traceable to the unique manufacturer or supplier product type.

In addition to the traceable identification, it is recommended that at least the compulsory part of the standard designation be used or colour print for identification.

8.2 Marking on the package

The outside of each smallest package unit shall be clearly marked with the following information as a minimum:

- name of manufacturer or supplier;
- trade name;
- designation in accordance with the relevant International Standard;
- dimensions in accordance with [Clause 5](#);
- for fluxes, particle size range, where applicable, in accordance with ISO 14174;
- batch/heat or lot number;
- type of current and polarity, where applicable;
- number of pieces or nominal net mass;
- redrying instructions or reference to a relevant information source, where applicable;
- approvals, where applicable;
- health and safety warnings in accordance with local, national, and regional standards and regulations, as required.

9 Packaging

The manufacturer, supplier or distributor shall pack welding filler materials and fluxes so that when suitably transported and stored in a dry storeroom, sufficient safeguard against damage and deterioration is provided.