
INTERNATIONAL STANDARD



3581

INTERNATIONAL ORGANIZATION FOR STANDARDIZATION • МЕЖДУНАРОДНАЯ ОРГАНИЗАЦИЯ ПО СТАНДАРТИЗАЦИИ • ORGANISATION INTERNATIONALE DE NORMALISATION

Covered electrodes for manual arc welding of stainless and other similar high alloy steels – Code of symbols for identification

Électrodes enrobées pour le soudage manuel à l'arc des aciers inoxydables et autres aciers similaires fortement alliés – Code de symbolisation pour l'identification

First edition – 1976-02-01

(standards.iteh.ai)

[ISO 3581:1976](https://standards.iteh.ai/catalog/standards/sist/1036aebc-460b-4266-ac52-37a32d8ed1fe/iso-3581-1976)

<https://standards.iteh.ai/catalog/standards/sist/1036aebc-460b-4266-ac52-37a32d8ed1fe/iso-3581-1976>



UDC 621.791.052.001.3

Ref. No. ISO 3581-1976 (E)

Descriptors : welding, covered electrodes, manual metal arc welding, stainless steels, high alloy steels, specifications, chemical composition, symbols, marking.

Price based on 5 pages

FOREWORD

ISO (the International Organization for Standardization) is a worldwide federation of national standards institutes (ISO Member Bodies). The work of developing International Standards is carried out through ISO Technical Committees. Every Member Body interested in a subject for which a Technical Committee has been set up 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.

Draft International Standards adopted by the Technical Committees are circulated to the Member Bodies for approval before their acceptance as International Standards by the ISO Council.

International Standard ISO 3581 was drawn up by Technical Committee ISO/TC 44, *Welding*, and circulated to the Member Bodies in December 1974.

STANDARD PREVIEW
(standards.iteh.ai)

It has been approved by the Member Bodies of the following countries :

Austria	India	ISO 3581:1976
Belgium	Ireland	Sweden
Bulgaria	Italy	Switzerland
Canada	Netherlands	Turkey
Czechoslovakia	New Zealand	United Kingdom
Finland	Romania	U.S.A.
France	South Africa, Rep. of	Yugoslavia
Germany	Spain	

The Member Bodies of the following countries expressed disapproval of the document on technical grounds :

Australia
U.S.S.R.

Covered electrodes for manual arc welding of stainless and other similar high alloy steels – Code of symbols for identification

1 SCOPE AND FIELD OF APPLICATION

This International Standard establishes a code for the identification of covered electrodes by means of symbols related to the chemical composition of the deposited weld metal and type of covering.

It deals only with covered electrodes for manual arc welding of stainless and other similar high alloy steels.

The purpose of the codification is to facilitate mutual understanding among people dealing with welding in the various countries by identifying electrodes according to certain rules.

2 REFERENCE

ISO 2401, *Covered electrodes – Determination of the efficiency, metal recovery and deposition coefficient.*

3 GENERAL

The codification is divided into six parts :

3.1 The first part symbolizes the type of product.

3.2 The second part is a symbol for the chemical composition of the deposited weld metal.

3.3 The third part is a symbol for the type of covering.

3.4 The fourth part is a symbol for metal recovery.

3.5 The fifth part is a symbol for the welding characteristics of the electrode.

3.6 The sixth part is a symbol **X** indicating that the electrode has some special properties (synthetic, fully austenitic, etc.). This part is always compulsory when the electrode has some special feature. In this case the symbols for metal recovery (3.4) and for welding characteristics (3.5) are also compulsory.

4 SYMBOLS AND REQUIREMENTS

4.1 Symbol for the product

The general symbol for covered electrodes for manual arc welding is the letter **E**.

4.2 Symbol for composition

The symbols used for the chemical composition of the deposited weld metal are given in table 1. The correspondence between symbols given in this table and symbols referring to American, British and German standards is given in the annex (table 3).

4.3 Symbol for the type of covering

The type of covering is symbolized by a letter :

- B** = basic
- R** = rutile
- S** = other types.

B

Electrodes of the basic type have a rather thick covering containing considerable quantities of calcium or other basic carbonates together with fluorspar or other fluor compositions. The slag is very fluid and rises quickly to the surface of the weld. Slag inclusions are therefore not likely to occur. After solidification, the slag generally has a brown to dark-brown colour and a glossy appearance. It is, except for root passes, easy to detach. Basic electrodes give a medium penetration, and they can, as a rule, be used for welding in all positions as well as for pipe welding. Basic electrodes should be welded with a short arc in order to give good quality welds.

When manufactured, the basic electrodes are baked at a temperature sufficient to result in a low water content of the covering. In order to avoid porosity, basic electrodes must be stored under dry conditions or, if they have absorbed moisture, be redried before use according to the recommendations of the manufacturer.

TABLE 1*

Symbol	C max.	Cr	Ni	Mo	Other elements
13	0,12	11 to 14			
13.1	0,07	12 to 15	0,8 to 1,5		
13.4	0,07	12 to 15	3 to 5	1,0 max.	
17	0,10	15 to 18			
17.0.1	0,25	15 to 18		1 to 1,5	
30	0,10	27 to 30			
19.9	0,08	18 to 21	8 to 11		
19.9 L	0,04	18 to 21	8 to 11		
19.9 Nb	0,08	18 to 21	8 to 11		Nb ¹⁾
19.9 L Nb	0,04	18 to 21	8 to 11		Nb ¹⁾
19.12.2	0,08	17 to 20	11 to 14	2 to 2,5	
19.12.2 L	0,04	17 to 20	11 to 14	2 to 2,5	
19.12.2 Nb	0,08	17 to 20	11 to 14	2 to 2,5	Nb ¹⁾
19.12.3	0,08	17 to 20	10 to 14	2,5 to 3,5	
19.12.3 L	0,04	17 to 20	10 to 14	2,5 to 3,5	
19.12.3 Nb	0,08	17 to 20	10 to 14	2,5 to 3,5	Nb ¹⁾
19.13.4	0,08	17 to 21	11 to 15	3,5 to 5,5	
19.13.4 L	0,04	17 to 21	11 to 15	3,5 to 5,5	
19.13.4 Nb	0,08	17 to 21	11 to 15	3,5 to 5,5	Nb ¹⁾
22.12	0,15	20 to 23	10 to 13		
23.12	0,15	22 to 26	11 to 15		
23.12 L	0,04	22 to 26	11 to 15		
23.12 Nb	0,12	22 to 25	11 to 15		Nb ¹⁾
23.12 W	0,20	22 to 25	11 to 15		W 2 to 4
23.12.2	0,12	22 to 25	11 to 15	2 to 3	
16.8.2	0,10	14,5 to 16,5	7,5 to 9,5	1 to 2	
17.8.2	0,10	16,5 to 18,5	9 to 9,5	1,5 to 2,5	
18.8 Mn	0,20	17 to 20	7 to 10		Mn 5 to 8
18.15.3 L	0,04	16,5 to 19,5	13 to 16	2,5 to 3,5	
25.20	0,20	24 to 28	18 to 22		
25.20 L	0,04	24 to 28	18 to 22		
25.20 Nb	0,12	24 to 28	18 to 22		Nb ¹⁾
25.20.2	0,12	25 to 28	20 to 22	2 to 3	
25.20 C	0,25/45	24 to 28	18 to 22		
25.25.2 Nb	0,10	24 to 27	24 to 26	2 to 2,5	Nb ¹⁾
18.20.2 Cu Nb	0,10	17 to 20	19 to 22	2 to 2,5	Cu 1,8 to 2,2 Nb ¹⁾
20.25.5 L Cu	0,04	19 to 22	24 to 26	4 to 6	Cu 1 to 3
23.27.3 L Cu Nb	0,04	21 to 25	25 to 29	2,5 to 4,3	Cu 2,5 to 3,5 Nb ¹⁾
25.16 C Mn	0,25/45	23 to 26	14,5 to 17		Mn 5 to 8
20.9 Nb	0,13	18 to 21	8 to 10	0,35 to 0,65	Nb ¹⁾
20.9.3	0,10	18,5 to 21	8 to 10	2 to 4	
25.4	0,15	24 to 27	4 to 6		
29.9	0,15	28 to 32	8 to 12		
18.36	0,25	14 to 19	33 to 38		
17.12 Si	0,15	17 to 19	11 to 13		Si 3,8 to 4,8
24.14 Si	0,12	22 to 25	13 to 15		Si 1,5 to 2,2
16.25.6	0,12	14 to 17	23 to 25	5 to 7	

1) Nb content = min. 8 X C content and max. 1,2 %. Part of Nb can be replaced by Ta. The analysed Nb content often includes the Ta content.

* Subdivision proposed by the I.I.W.
Note of the I.I.W.:

"It has not been possible to describe the different deposited weld metals as "ferritic", "austenitic", etc., as for instance most "austenitic" deposited weld metals have a ferrite content of 5 to 10 %. Nor is it possible to divide the electrodes according to the type of steel welded, as for instance ferritic welds often are welded with "austenitic" electrodes. The subdivision is therefore based on the type of chemical composition symbolized".

Stainless electrodes with basic coating are particularly used for the welding of thick plates, highly restrained joints and joints in the vertical and overhead positions.

R

The covering of stainless electrodes of this type contains large amounts of rutile or components derived from titanium oxide; oxides may include basic components.

The electrodes are easy to ignite, have a stable arc and low spatter losses. They are easy to weld in all positions, and slag detachability and bead appearance are good. The deposited weld metal quality is also good.

When manufactured, stainless electrodes with rutile covering are generally baked at high temperatures. In order to avoid porosity they must be stored under dry conditions or, if they have absorbed moisture, be redried before use according to the recommendations of the manufacturer.

S

This symbol is used for electrodes that cannot be defined as basic or rutile ones.

4.4 Symbol for the metal recovery

The method for determining the recovery of an electrode is specified in ISO 2401. In this code, only the nominal electrode efficiency is considered. If the recovery is less than 110 %, no symbol is used. The higher values found by the method for determining the recovery, rounded to the nearest multiple of 10, are used as a symbol for metal recovery, i.e. 110, 120, 130, 140, 150, etc.

4.5 Symbol for welding characteristics

4.5.1 The general welding positions for which the electrode is recommended are symbolized by a digit, as follows :

- 1 All positions
- 2 All positions, except vertical downward
- 3 Flat butt weld, flat fillet weld, horizontal/vertical fillet weld
- 4 Flat butt weld, flat fillet weld.
- 5 As 3, and recommended for vertical downward.

4.5.2 The welding current and open-circuit voltage are symbolized by a digit corresponding to the characteristics of the welding equipment required in order to ensure working conditions free of incidents such as instability or interruptions of the arc.

The open-circuit voltage necessary for striking the arc varies according to the diameter of the electrode. A reference diameter is required for symbolization.

Table 2 applies to electrode diameters greater than or equal to 2,5 mm. If electrodes of smaller diameter are used, a higher voltage may be necessary.

The frequency of the alternating current is assumed to be 50 or 60 Hz. The open-circuit voltage necessary when electrodes are used on direct current is closely related to the dynamic characteristics of the welding power-source. Consequently no indication of the minimum open-circuit voltage for direct current can be given.

TABLE 2

Symbol	Direct current Recommended polarity ²⁾	Alternating current Minimum open-circuit voltage
		V
0 ¹⁾	+	
1	+ or –	50
2	–	50
3	+	50
4	+ or –	70
5	–	70
6	+	70
7	+ or –	90
8	–	90
9	+	90

1) Symbol reserved for electrodes used exclusively on direct current.

2) Positive polarity +, negative polarity –

4.6 Symbol for special properties

The symbol X indicates that the electrode has one or more special or abnormal properties. Synthetic electrodes, for example, could be characterized in this way. There are also other examples. Normally, austenitic deposited weld metals of the 19.9-types have a ferrite content of 5 to 10 %. For special purposes, fully austenitic or low ferrite variants are also developed. Such electrodes could be marked by the symbol X.

The special properties should not, however, be codified. The symbol X only recommends the user to study the electrode manufacturer's catalogue for further information.

5 INSTRUCTIONS FOR USE

In order to promote the use of this identification, the codification is split into two sections.

5.1 Compulsory section

This section includes the symbols for the type of product, for the chemical composition of the deposited weld metal, and for the type of covering, and a symbol X indicating that the electrode has some special properties, i.e. the symbols defined in 4.1, 4.2, 4.3 and 4.6.

5.2 Optional section

This section includes the symbols for the metal recovery and for the welding characteristics of the electrode.

Examples :

1) Covered electrode for manual electric arc welding, having a rutile covering and depositing weld metal of the following chemical analysis :

C	0,08
Cr	19
Ni	10

It may be used for welding in all positions. To be connected on direct current welding to the positive pole; on alternating current welding, requiring an open-circuit voltage of 70 V. Metal recovery : 120 %.

The complete codification for the electrode will therefore be

E 19 9 R 120 16

and the compulsory part will be

E 19 9 R

2) Covered electrode for manual electric arc welding, having a basic covering and depositing weld metal having the following chemical analysis :

C	0,1
Cr	17
Ni	9
Mn	7

It may be used for welding in all positions except the vertical downward one. To be connected on direct current welding to the positive pole; on alternating current welding, requiring an open-circuit voltage of 70 V. Nominal efficiency : 150 %. Mild steel core wire. The codification for the electrode will therefore be

E 18 8 Mn B 15 0 26 X

iTeh STANDARD PREVIEW
(standards.iteh.ai)

<https://standards.iteh.ai/catalog/standards/sist/1036aebc-460b-4266-ac52-37a32d8ed1fe/iso-3581-1976>

ANNEX

TABLE 3 – Correspondence between symbolization in this International Standard and symbolization used in American, British and German standards

Symbol	Corresponding symbolization in national standards		
	AWS	BS	DIN
13	410	13	13
13.1			
13.4			13.4
17	430	17	17
17.0.1			
30			30
19.9	308	19.9	19.9
19.9 L	308 L	19.9 L	19.9 nC
19.9 Nb	347	19.9 Nb	19.9 Nb
19.9 L Nb			
19.12.2	316		
19.12.2 L	316 L		
19.12.2 Nb	318		
19.12.3		19.12.3	19.12.3
19.12.3 L		19.12.3 L	19.12.3 nC
19.12.3 Nb		19.12.3 Nb	19.12.3 Nb
19.13.4	317	19.13.4	19.13.4
19.13.4 L		19.13.4 L	
19.13.4 Nb		19.13.4 Nb	
22.12			22.12
23.12	309	23.12	23.12 nC
23.12 L			23.12 Nb
23.12 Nb	309 Cb	23.12 Nb	
23.12 W		23.12 W	
23.12.2	209 Mo	23.12.2	
16.8.2	16.8.2		
17.8.2		17.8.2	
18.8 Mn			18.8 Mn 6
18.15.3 L			18.15.3 nC
25.20	310	25.20	25.20
25.20 L			
25.20 Nb	310 Cb	25.20 Nb	
25.20.2	310 Mo		
25.20 C		25.20 H	
25.25.2 Nb			25.25.2 Nb
18.20.2 Cu Nb			18.20.2 Cu Nb
20.25.5 L Cu			
23.27.3 L Cu Nb			
25.16 C Mn			
20.9 Nb	349		
20.9.3		20.9.3	
25.4			25.4
29.9	312		
18.36	330		18.36
17.12 Si			
24.14 Si			
16.25.6			

iTeh STANDARD PREVIEW

This page intentionally left blank
(standards.iteh.ai)

[ISO 3581:1976](#)

<https://standards.iteh.ai/catalog/standards/sist/1036aebc-460b-4266-ac52-37a32d8ed1fe/iso-3581-1976>