
INTERNATIONAL STANDARD



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Covered electrodes for manual arc welding of creep-resisting steels – Code of symbols for identification

Électrodes enrobées pour le soudage manuel à l'arc des aciers résistant au fluage – Code de symbolisation pour l'identification

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Descriptors : arc welding, manual metal arc welding, covered electrodes, chemical composition, symbols, codes.

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 3580 was drawn up by Technical Committee ISO/TC 44, *Welding*, and circulated to the Member Bodies in December 1974.

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

Austria	India	ISO 3580:1975	Sweden
Belgium	Ireland	https://standards.iteh.ai/catalog/standards/sist/91669028-ddf8-441e-b258-1e841c003a4c/iso-3580-1975	Switzerland
Bulgaria	Italy		Turkey
Canada	Netherlands		United Kingdom
Czechoslovakia	New Zealand		U.S.A.
Finland	Romania		U.S.S.R.
France	South Africa, Rep. of		Yugoslavia
Germany	Spain		

The Member Body of the following country expressed disapproval of the document on technical grounds :

Australia

Covered electrodes for manual arc welding of creep-resisting 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 only deals with covered electrodes for manual arc welding of creep-resisting steels.

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

2 GENERAL

The codification is divided into four parts :

2.1 The first part symbolizes the type of product.

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

2.3 The third part is a symbol for the type of coating.

2.4 The fourth part is a symbol for the welding characteristics of the electrode.

3 SYMBOLS AND REQUIREMENTS

3.1 Symbol for the product

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

3.2 Symbol for the composition

The symbols used for the chemical composition of the deposited weld metal are given in table 1.

TABLE 1

Symbol ¹⁾	C	Si max.	Mn max.	Cr	Mo	Other elements
Mo	max. 0,12	0,8	1,5	-	0,4 to 0,7	
0,5 CrMo	max. 0,12	0,8	1,5	0,3 to 0,8	0,4 to 0,7	
0,5 CrMoV	max. 0,12	0,8	1,5	0,3 to 0,6	0,8 to 1,2	V 0,25 to 0,60
1 CrMo	max. 0,12	0,8	1,5	0,8 to 1,5	0,4 to 0,7	
1 CrMoV	max. 0,12	0,8	1,5	0,9 to 1,3	0,4 to 0,7	V 0,10 to 0,35
2 CrMo	max. 0,12	0,8	1,5	2,0 to 2,6	0,9 to 1,3	
5 CrMo	max. 0,12	0,9	1,5	4,0 to 6,0	0,4 to 0,7	
5 CrMoV	max. 0,12	0,9	1,5	4,0 to 6,0	0,4 to 0,7	V 0,10 to 0,35
9 CrMo	max. 0,12	0,9	1,5	8,0 to 10,0	0,9 to 1,2	
12 CrMoV	0,15 to 0,22	0,8	1,5	11 to 13	0,8 to 1,2	V 0,20 to 0,40, W 0,40 to 0,60

1) For deposits having a carbon content less than or equal to 0,05 %, the suffix L shall be added.

3.3 Symbol for the type of coating

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 glossy appearance. It is, except for root passes, easy to detach. Basic electrodes should be welded with a short arc in order to give good quality welds (without porosity).

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.

The deposited weld metal is of a high quality and is highly resistant to hot and cold cracking. The deposited weld metal from dry basic electrodes has a low hydrogen content. The risk of underbead cracking is consequently low.

R

Electrodes of the rutile type generally have a medium thick coating containing large quantities of rutile or components derived from titanium oxide. Rutile electrodes have a very stable arc and are very easy to weld in all positions including pipe welding. The penetration is medium and the slag detachability is good. Compared with basic electrodes, the rutile type is less resistant to hot and cold cracking. The hydrogen content of the deposited weld metal is comparatively high. The risk of underbead cracking must therefore be considered when using rutile electrodes.

S

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

3.4 Symbol for the welding characteristics

3.4.1 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.

3.4.2 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 below 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	+ 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 INSTRUCTIONS FOR USE

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

4.1 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, i.e. the symbols defined in 3.1, 3.2 and 3.3.

4.2 Optional section

This section includes the symbols for the welding characteristics of the electrode.

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

C	0,09
Si	0,6
Mn	1,1
Cr	2,2
Mo	0,9

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.

The complete codification for the electrode will therefore be

E 2 Cr Mo B 26

and the compulsory part will be

E 2 Cr Mo B

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