



SLOVENSKI STANDARD
SIST EN 12535:2001

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Welding consumables - Tubular cored electrodes for gas shielded metal arc welding of high strength steels - Classification

Schweißzusätze - Fülldrahtelektroden zum Metall-Schutzgasschweißen von hochfesten Stählen - Einteilung

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Produits consommables pour le soudage - Fils fourrés pour le soudage a l'arc sous protection gazeuse des aciers a haute résistance - Classification

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ICS:

25.160.20 Potrošni material pri varjenju Welding consumables

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en

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EUROPEAN STANDARD

EN 12535

NORME EUROPÉENNE

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ICS 25.160.20

English version

Welding consumables - Tubular cored electrodes for gas shielded metal arc welding of high strength steels - Classification

Produits consommables pour le soudage - Fils fourrés pour le soudage à l'arc sous protection gazeuse des aciers à haute résistance - Classification

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This European Standard was approved by CEN on 24 December 1999.

CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration. Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the Central Secretariat or to any CEN member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN member into its own language and notified to the Central Secretariat has the same status as the official versions.

CEN members are the national standards bodies of Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and United Kingdom.

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EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

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Foreword

This European Standard has been prepared by Technical Committee CEN/TC 121 "Welding", the secretariat of which is held by DS.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by August 2000, and conflicting national standards shall be withdrawn at the latest by August 2000.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and the United Kingdom.

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Introduction

This standard proposes a classification in order to designate tubular cored electrodes in terms of the yield strength, tensile strength and elongation of the all-weld metal. The ratio of yield to tensile strength of weld metal is generally higher than that of parent metal. Users should note that matching weld metal yield strength to parent metal yield strength will not necessarily ensure that the weld metal tensile strength matches that of the parent material. Where the application requires matching tensile strength, selection of the consumable should be based on column 3 of table 1. When selecting the consumables, it should be noted that with increasing thickness of the parent metal, the requirements of tensile strength and proof strength may decrease.

It should be noted that the mechanical properties of all-weld metal test specimens used to classify the tubular cored electrodes will vary from those obtained in production joints because of differences in welding procedure such as electrode diameter, width of weave, gas shield used, welding position and material composition.

1 Scope

This standard specifies requirements for classification of tubular cored electrodes in the as-welded or stress relieved condition for gas shielded metal arc welding of high strength steels with a minimum specified yield strength higher than 500 N/mm². One tubular cored electrode may be tested and classified with different gases.

It is recognized that the operating characteristics of tubular cored electrodes can be modified by the use of pulsed current, but for the purposes of this standard, pulsed current is not used for determining the electrode classification.

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2 Normative references

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This European Standard incorporates by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this European Standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies.

EN 439	Welding consumables - Shielding gases for arc welding and cutting
EN 759	Welding consumables - Technical delivery conditions for welding filler metals - Type of product, dimensions, tolerances and marking
EN 1597-1	Welding consumables - Test methods - Part 1: Test piece for all-weld metal test specimens in steel, nickel and nickel alloys
EN 1597-3	Welding consumables - Test methods - Part 3: Testing of positional capability of welding consumables in a fillet weld
EN 26847	Covered electrodes for manual metal arc welding - Deposition of a weld metal pad for chemical analysis (ISO 6847:1985)
EN ISO 13916	Welding - Guidance on the measurement of preheating temperature, interpass temperature and preheat maintenance temperature (ISO 13916)

ISO 31-0:1992	Quantities and units - Part 0: General principles
ISO 3690	Welding - Determination of hydrogen in deposited weld metal arising from the use of covered electrodes for welding mild and low alloy steels

3 Classification

The classification includes all-weld metal properties obtained with a tubular cored electrode and appropriate shielding gas combination as given below. The classification is based on the tubular cored electrode diameter 1,2 mm, or if this is not manufactured the next larger diameter manufactured, with the exception of the symbol for welding position which is based on EN 1597-3.

The classification is divided into nine parts:

- 1) the first part gives a symbol indicating the product/process to be identified;
- 2) the second part gives a symbol indicating the strength and the elongation of the all-weld metal;
- 3) the third part gives a symbol indicating the impact properties of the all-weld metal;
- 4) the fourth part gives a symbol indicating the chemical composition of the all-weld metal;
- 5) the fifth part gives a symbol indicating the type of electrode core;
- 6) the sixth part gives a symbol indicating the shielding gas;
- 7) the seventh part gives a symbol indicating the welding position;
- 8) the eighth part gives a symbol indicating the hydrogen content of deposited metal;
- 9) the ninth part gives a symbol indicating the stress relief treatment in case this is applied.

In order to promote the use of this standard, the classification is split into two sections:

a) Compulsory section

This section includes the symbols for the type of product, the strength and elongation, the impact properties, the chemical composition, the type of core, the shielding gas and the stress relief treatment, i.e. the symbols defined in 4.1, 4.2, 4.3, 4.4, 4.5, 4.6 and 4.9.

b) Optional section

This section includes the symbols for the welding positions for which the electrode is suitable and the symbol for hydrogen content, i.e. the symbols defined in 4.7 and 4.8.

The full designation (see clause 8) shall be used on packages and in the manufacturer's literature and data sheets.

4 Symbols and requirements

4.1 Symbol for the product/process

The symbol for the tubular cored electrode used in the metal arc welding process shall be the letter T.

4.2 Symbol for strength and elongation of all-weld metal

The symbol in table 1 indicates yield strength, tensile strength and elongation of the all-weld metal determined in accordance with clause 5.

NOTE: Stress relief treatment may alter the strength of the weld metal from that obtained in the as-welded condition.

Table 1 - Symbol for strength and elongation of all-weld metal

Symbol	Minimum ¹⁾ yield strength N/mm ²	Tensile strength N/mm ²	Minimum elongation ²⁾ %
55	550	640 - 820	18
62	620	700 - 890	18
69	690	770 - 940	17
79	790	880 - 1080	16
89	890	940 - 1180	15

1) For yield strength the lower yield (R_{eL}) shall be used when yielding occurs, otherwise the 0,2 % proof strength ($R_{p0,2}$) shall be used.
2) Gauge length is equal to five times the test specimen diameter.

4.3 Symbol for impact properties of all-weld metal

The symbol in table 2 indicates the temperature at which an average impact energy of 47 J is achieved under conditions given in clause 5. Three specimens shall be tested. Only one individual value may be lower than 47 J but not lower than 32 J. When an all-weld metal has been classified for a certain temperature, it automatically covers any higher temperature in table 2.

Table 2 - Symbol for impact properties of all-weld metal

Symbol	Temperature for minimum average impact energy 47 J °C
Z	No requirements
A	+ 20
0	0
2	- 20
3	- 30
4	- 40
5	- 50
6	- 60

NOTE: Stress relief treatment can alter the impact properties of the weld metal from that obtained in the as-welded condition.

4.4 Symbol for chemical composition of all-weld metal

The symbol in table 3 indicates the chemical composition of all-weld metal determined in accordance with clause 6.

Table 3 - Symbol for chemical composition of all-weld metal

Symbol	Chemical composition % ¹⁾²⁾³⁾			
	Mn	Ni	Cr	Mo
Z	Any other agreed composition			
MnMo	1,4 to 2,0	-	-	0,3 to 0,6
Mn1Ni	1,4 to 2,0	0,6 to 1,2	-	-
Mn1,5Ni	1,1 to 1,8	1,3 to 1,8	-	-
Mn2,5Ni	1,1 to 2,0	2,1 to 3,0	-	-
1NiMo	1,4	0,6 to 1,2	-	0,3 to 0,6
1,5NiMo	1,4	1,2 to 1,8	-	0,3 to 0,7
2NiMo	1,4	1,8 to 2,6	-	0,3 to 0,7
Mn1NiMo	1,4 to 2,0	0,6 to 1,2	-	0,3 to 0,7
Mn2NiMo	1,4 to 2,0	1,8 to 2,6	-	0,3 to 0,7
Mn2NiCrMo	1,4 to 2,0	1,8 to 2,6	0,3 to 0,6	0,3 to 0,6
Mn2Ni1CrMo	1,4 to 2,0	1,8 to 2,6	0,6 to 1,0	0,3 to 0,6

1) If not specified: C 0,03 to 0,10 %, Si ≤ 0,90 %, Ni < 0,3 %, Cr < 0,2 %, Mo < 0,2 %, V < 0,05 %
Nb < 0,05 %, Cu < 0,3 %, P < 0,020 % and S < 0,020 %.
2) Single values shown in the table are maximum values.
3) The results shall be rounded to the same number of significant figures as in the specified value using the rules in accordance with annex B, Rule A of ISO 31-0:1992.

4.5 Symbol for type of electrode core

The symbol in table 4 indicates different types of tubular cored electrodes relative to their core composition and slag characteristics.