ISO 14341

Welding consumables — Wire electrodes and weld deposits for gas shielded metal arc welding of non alloy and fine grain steels — Classification

Produits consommables pour le soudage — Fils-électrodes et métaux d'apport déposés en soudage à l'arc sous protection gazeuse des aciers non alliés et à grains fins — Classification

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below or ISO's member body in the country of the requester.

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Foreword

— all references have been updated;

— in Table 3A, the footnote for Cu that appeared in the 2008 edition has been reintroduced;

— in Table 3B and Table 4B, a new symbol S8 has been added;

— in Table 3B, Ni, Cr, Mo and V values have been added for symbols S2, S3, S4, S5, S6, and S7;

— Clause 8 has been updated to the latest agreed text;

— in Clause 11, an example for a Z classification has been added as Example 2A.

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Introduction

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Welding consumables — Wire electrodes and weld deposits for gas shielded metal arc welding of non alloy and fine grain steels — Classification

1 Scope

Clauses and tables which carry the suffix letter "A" are applicable only to wire electrodes classified

Clauses and tables which carry the suffix letter "B" are applicable only to wire electrodes classified

Clauses and tables which have neither the suffix letter "A" nor the suffix letter "B" are applicable to

2 Normative references

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

Welding consumables — Gases and gas mixtures for fusion welding and allied processes

Welding consumables — Procurement of filler materials and fluxes

Welding consumables — Test methods — Part 1: Test methods for all-weld metal test specimens in steel, nickel and nickel alloys

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3 Terms and definitions

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

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

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4 Classification

4A Classification by yield strength and 47 J impact energy

4B Classification by tensile strength and 27 J impact energy

5 Symbols and requirements

5.1 Symbol for product/process

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5.2 Symbol for strength and elongation of all-weld metal

5.2A Classification by yield strength and 47 J impact energy

Table 1A — Symbols for strength and elongation of all-weld metal

Symbol	Minimum yield s	Tensile strength	Minimum e
R			

5.2B Classification by tensile strength and 27 J impact energy

Table 1B — Symbols for strength and elongation of all-weld metal

S	Minimum yield s	Tensile strength	Minimum e
R			

5.3 Symbol for impact properties of all-weld metal

5.3A Classification by yield strength and 47 J impact energy

5.3B Classification by tensile strength and 27 J impact energy

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

Symbol	Temperature for minimum average i
	−20
	−30
	−40
	−50
	−60
	−70
	−80
	−90
	−100

5.4 Symbol for shielding gas

— the symbol M12, for mixed gases, shall be used when the classification has been performed with

— the symbol M13 shall be used when the classification has been performed with shielding gas

— the symbol M20, for mixed gases, shall be used when the classification has been performed with

— the symbol M21, for mixed gases, shall be used when the classification has been performed with

— the symbol C1 shall be used when the classification has been performed with shielding gas ISO 14175-

— the symbol Z is used for an unspecified shielding gas.

5.5 Symbol for chemical composition of wire electrodes

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Table 3A — Symbol for chemical composition (Classification by yield strength and 47 J impact energy)

Symbol	Chemical composition, % (by mass)[a]											
	C	Si	Mn	P	S	Ni	Cr	Mo	V	Cu[b]	Al	Ti + Zr
2Si	0,06 to 0,14	0,50 to 0,80	0,90 to 1,30	0,025	0,025	0,15	0,15	0,15	0,03	0,35	0,02	0,15
3Si1	0,06 to 0,14	0,70 to 1,00	1,30 to 1,60	0,025	0,025	0,15	0,15	0,15	0,03	0,35	0,02	0,15
3Si2	0,06 to 0,14	1,00 to 1,30	1,30 to 1,60	0,025	0,025	0,15	0,15	0,15	0,03	0,35	0,02	0,15
4Si1	0,06 to 0,14	0,80 to 1,20	1,60 to 1,90	0,025	0,025	0,15	0,15	0,15	0,03	0,35	0,02	0,15
2Ti	0,04 to 0,14	0,40 to 0,80	0,90 to 1,40	0,025	0,025	0,15	0,15	0,15	0,03	0,35	0,05 to 0,20	0,05 to 0,25
2Al	0,08 to 0,14	0,30 to 0,50	0,90 to 1,30	0,025	0,025	0,15	0,15	0,15	0,03	0,35	0,35 to 0,75	0,15
3Ni1	0,06 to 0,14	0,50 to 0,90	1,00 to 1,60	0,020	0,020	0,80 to 1,50	0,15	0,15	0,03	0,35	0,02	0,15
2Ni2	0,06 to 0,14	0,40 to 0,80	0,80 to 1,40	0,020	0,020	2,10 to 2,70	0,15	0,15	0,03	0,35	0,02	0,15
2Mo	0,08 to 0,12	0,30 to 0,70	0,90 to 1,30	0,020	0,020	0,15	0,15	0,40 to 0,60	0,03	0,35	0,02	0,15
4Mo	0,06 to 0,14	0,50 to 0,80	1,70 to 2,10	0,025	0,025	0,15	0,15	0,40 to 0,60	0,03	0,35	0,02	0,15
Z[c]	Any other agreed composition											

[a] Single values shown in the table are maximum values.

[b] Residual copper content in the steel plus any coating shall not exceed 0,35 % by mass.

[c] Consumables for which the chemical composition is not listed in this table shall be symbolized similarly and prefixed by the letter Z. The chemical composition ranges are not specified and therefore two electrodes with the same Z classification may not be interchangeable.

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Table 3B — Symbol for chemical composition (Classification by tensile strength and 27 J impact energy)

Symbol	Chemical composition, % (by mass)[a,b]											
	C	Si	Mn	P	S	Ni	Cr	Mo	V	Cu[c]	Al	Ti + Zr
S2	0,07	0,40 to 0,70	0,90 to 1,40	0,025	0,030	0,15	0,15	0,15	0,03	0,50	0,05 to 0,15	Ti : 0,05 to 0,15 Zr : 0,02 to 0,12
S3	0,06 to 0,15	0,45 to 0,75	0,90 to 1,40	0,025	0,035	0,15	0,15	0,15	0,03	0,50	—	—
S4	0,06 to 0,15	0,65 to 0,85	1,00 to 1,50	0,025	0,035	0,15	0,15	0,15	0,03	0,50	—	—
S6	0,06 to 0,15	0,80 to 1,15	1,40 to 1,85	0,025	0,035	0,15	0,15	0,15	0,03	0,50	—	—
S7	0,07 to 0,15	0,50 to 0,80	1,50 to 2,00	0,025	0,035	0,15	0,15	0,15	0,03	0,50	—	—
S8	0,02 to 0,10	0,55 to 1,10	1,40 to 1,90	0,025	0,035	0,15	0,15	0,15	0,03	0,50		0,10 to 0,30
S11	0,02 to 0,15	0,55 to 1,10	1,40 to 1,90	0,030	0,030	—	—	—	—	0,50	—	0,02 to 0,30
S12	0,02 to 0,15	0,55 to 1,00	1,25 to 1,90	0,030	0,030	—	—	—	—	0,50	—	—
S13	0,02 to 0,15	0,55 to 1,10	1,35 to 1,90	0,030	0,030	—	—	—	—	0,50	0,10 to 0,50	0,02 to 0,30
S14	0,02 to 0,15	1,00 to 1,35	1,30 to 1,60	0,030	0,030	—	—	—	—	0,50	—	—
S15	0,02 to 0,15	0,40 to 1,00	1,00 to 1,60	0,030	0,030	—	—	—	—	0,50	—	0,02 to 0,15
S16	0,02 to 0,15	0,40 to 1,00	0,90 to 1,60	0,030	0,030	—	—	—	—	0,50	—	—
S17	0,02 to 0,15	0,20 to 0,55	1,50 to 2,10	0,030	0,030	—	—	—	—	0,50	—	0,02 to 0,30
S18	0,02 to 0,15	0,50 to 1,10	1,60 to 2,40	0,030	0,030	—	—	—	—	0,50	—	0,02 to 0,30
S1M3	0,12	0,30 to 0,70	1,30	0,025	0,025	0,20	—	0,40 to 0,65	—	0,35		
S2M3	0,12	0,30 to 0,70	0,60 to 1,40	0,025	0,025	—	—	0,40 to 0,65	—	0,50	—	—
S2M31	0,12	0,30 to 0,90	0,80 to 1,50	0,025	0,025	—	—	0,40 to 0,65	—	0,50	—	—
S3M3T	0,12	0,40 to 1,00	1,00 to 1,80	0,025	0,025	—	—	0,40 to 0,65	—	0,50	—	Ti: 0,02 to 0,30
S3M1	0,05 to 0,15	0,40 to 1,00	1,40 to 2,10	0,025	0,025	—	—	0,10 to 0,45	—	0,50	—	—
S3M1T	0,12	0,40 to 1,00	1,40 to 2,10	0,025	0,025	—	—	0,10 to 0,45	—	0,50	—	Ti: 0,02 to 0,30
S4M31	0,07 to 0,12	0,50 to 0,80	1,60 to 2,10	0,025	0,025	—	—	0,40 to 0,60	—	0,50	—	—
S4M3T	0,12	0,50 to 0,80	1,60 to 2,20	0,025	0,025	—	—	0,40 to 0,65	—	0,50	—	Ti: 0,02 to 0,30
SN1	0,12	0,20 to 0,50	1,25	0,025	0,025	0,60 to 1,00	—	0,35	—	0,35	—	—

[a] The electrode shall be analysed for the specific elements for which values are shown in this table. If the presence of other elements is indicated, in the course of this work, the amount of these elements shall be determined to ensure that their total (excluding iron) content does not exceed 0,50 % (by mass).

[b] Single values shown in the table are maximum values.

[c] Including any residual copper in the steel plus any coating.

[d] Consumables not listed in this table can be symbolized SZ. The chemical symbol established by the manufacturer may be added in brackets.

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Table 3B *(continued)*

Symbol	Chemical composition, % (by mass)[a,b]											
	C	Si	Mn	P	S	Ni	Cr	Mo	V	Cu[c]	Al	Ti + Zr
SN2	0,12	0,40 to 0,80	1,25	0,025	0,025	0,80 to 1,10	0,15	0,35	0,05	0,35	—	—
SN3	0,12	0,30 to 0,80	1,20 to 1,60	0,025	0,025	1,50 to 1,90	—	0,35	—	0,35	—	—
SN5	0,12	0,40 to 0,80	1,25	0,025	0,025	2,00 to 2,75	—	—	—	0,35	—	—
SN7	0,12	0,20 to 0,50	1,25	0,025	0,025	3,00 to 3,75	—	0,35	—	0,35	—	—
SN71	0,12	0,40 to 0,80	1,25	0,025	0,025	3,00 to 3,75	—	—	—	0,35	—	—
SN9	0,10	0,50	1,40	0,025	0,025	4,00 to 4,75	—	0,35	—	0,35	—	—
SNCC	0,12	0,60 to 0,90	1,00 to 1,65	0,030	0,030	0,10 to 0,30	0,50 to 0,80	—	—	0,20 to 0,60	—	—
SNCCT	0,12	0,60 to 0,90	1,10 to 1,65	0,030	0,030	0,10 to 0,30	0,50 to 0,80	—	—	0,20 to 0,60	—	Ti: 0,02 to 0,30
SNCCT1	0,12	0,50 to 0,80	1,20 to 1,80	0,030	0,030	0,10 to 0,40	0,50 to 0,80	0,02 to 0,30	—	0,20 to 0,60	—	Ti: 0,02 to 0,30
SNCCT2	0,12	0,50 to 0,90	1,10 to 1,70	0,030	0,030	0,40 to 0,80	0,50 to 0,80	—	—	0,20 to 0,60	—	Ti: 0,02 to 0,30
SN1M2T	0,12	0,60 to 1,00	1,70 to 2,30	0,025	0,025	0,40 to 0,80	—	0,20 to 0,60	—	0,50	—	Ti: 0,02 to 0,30
SN2M1T	0,12	0,30 to 0,80	1,10 to 1,90	0,025	0,025	0,80 to 1,60	—	0,10 to 0,45	—	0,50	—	Ti: 0,02 to 0,30
SN2M2T	0,05 to 0,15	0,30 to 0,90	1,00 to 1,80	0,025	0,025	0,70 to 1,20	—	0,20 to 0,60	—	0,50	—	Ti: 0,02 to 0,30
SN2M3T	0,05 to 0,15	0,30 to 0,90	1,40 to 2,10	0,025	0,025	0,70 to 1,20	—	0,40 to 0,65	—	0,50	—	Ti: 0,02 to 0,30
SN2M4T	0,12	0,50 to 1,00	1,70 to 2,30	0,025	0,025	0,80 to 1,30	—	0,55 to 0,85	—	0,50	—	Ti: 0,02 to 0,30
SZ[d]	Any agreed composition											

[a] The electrode shall be analysed for the specific elements for which values are shown in this table. If the presence of other elements is indicated, in the course of this work, the amount of these elements shall be determined to ensure that their total (excluding iron) content does not exceed 0,50 % (by mass).

[b] Single values shown in the table are maximum values.

[c] Including any residual copper in the steel plus any coating.

[d] Consumables not listed in this table can be symbolized SZ. The chemical symbol established by the manufacturer may be added in brackets.

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6 Mechanical tests

6A Classification by yield strength and 47 J impact energy

6B Classification by tensile strength and 27 J impact energy

6.1 Preheating and interpass temperatures

6.1A Classification by yield strength and 47 J impact energy

6.1B Classification by tensile strength and 27 J impact energy

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Table 4B — Preheating and interpass temperatures

Symbol	Preheat temperature	Interpass tempera-ture

6.2 Welding conditions and pass sequence

6.2A Classification by yield strength and 47 J impact energy

6.2B Classification by tensile strength and 27 J impact energy

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Table 5A — Welding conditions

Diameter	Welding current	Welding voltage	Contact tube distance

Table 5B — Welding conditions

Diameter	Welding current	Welding voltage	Contact tube distance

Table 6A — Pass sequence

Electrode diameter	Split weave		
	Layer No.	Passes per layer	Number of layers

Table 6B — Pass sequence

Electrode diameter	Layer No.	Passes per layer	Number of layers

6.3 Post-weld heat-treated (PWHT) condition

6.3A Classification by yield strength and 47 J impact energy

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6.3B Classification by tensile strength and 27 J impact energy

7 Chemical analysis

7A Classification by yield strength and 47 J impact energy

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7B Classification by tensile strength and 27 J impact energy

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8 Rounding procedure

9 Retests

10 Technical delivery conditions

11 Examples of designation

11A Classification by yield strength and 47 J impact energy

-
ergy of 47 J at −50 °C (5) under mixed gas (M21)

ISO 14341-A-G 46 5 M21 3Si1

11B Classification by tensile strength and 27 J impact energy

energy of 27 J at −60°C (6) in the as-welded con-

ISO 14341-B-G 49A 6 M21 S3

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ISO 14341-A-G 3Si1	ISO 14341-B-G S3
	-
	-
ISO 14341-A-G Z4Mo1	
	ISO 14341-B-G 49A 0U C1 S11
	ISO 14341-B-G S11
-	

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