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English Version

Welding consumables - Wire electrodes and weld deposits for gas shielded metal arc welding of non alloy and fine grain steels - Classification (ISO 14341:2010)

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 (ISO 14341:2010)

Schweißzusätze - Drahtelektroden und Schweißgut zum Metall-Schutzgasschweißen von unlegierten Stählen und Feinkornstählen - Einteilung (ISO 14341:2010)

This European Standard was approved by CEN on 25 December 2010.

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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 CEN-CENELEC Management Centre has the same status as the official versions.

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Foreword

The text of ISO 14341:2010 has been prepared by Technical Committee ISO/TC 44 “Welding and allied processes” of the International Organization for Standardization (ISO) and has been taken over as EN ISO 14341:2011 by Technical Committee CEN/TC 121 “Welding” the secretariat of which is held by DIN.

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of an identical text or by endorsement, at the latest by July 2011, and conflicting national standards shall be withdrawn at the latest by July 2011.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN [and/or CENELEC] shall not be held responsible for identifying any or all such patent rights.

This document supersedes EN ISO 14341:2008.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland and the United Kingdom.

Endorsement notice

The text of ISO 14341:2010 has been approved by CEN as a EN ISO 14341:2011 without any modification.

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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.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

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.

ISO 14341 was prepared by Technical Committee ISO/TC 44, *Welding and allied processes*, Subcommittee SC 3, *Welding consumables*.

This second edition cancels and replaces the first edition (ISO 14341:2002).

Requests for official interpretation of any aspect of this International Standard 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 www.iso.org.

Introduction

This International Standard recognizes that there are two somewhat different approaches in the global market to classifying a given wire electrode, and allows for either or both to be used, to suit a particular market need. Application of either type of classification designation (or both where suitable) identifies a product as classified in accordance with this International Standard.

This International Standard provides a classification in order to designate wire electrodes in terms of their chemical composition and, where required, in terms of the yield strength, tensile strength and elongation of the all-weld metal. The ratio of yield strength 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 does not necessarily ensure that the weld metal tensile strength matches that of the parent material. Therefore, where the application requires matching tensile strength, selection of the consumable should be made by reference to column 3 of Table 1A or 1B.

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

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

1 Scope

This International Standard specifies requirements for classification of wire electrodes and weld deposits in the as-welded condition and in the post-weld heat-treated condition for gas shielded metal arc welding of non alloy and fine grain steels with a minimum yield strength of up to 500 MPa or a minimum tensile strength of up to 570 MPa. One wire electrode can be tested and classified with different shielding gases.

This International Standard constitutes a combined specification providing classification utilizing a system based upon the yield strength and the average impact energy of 47 J of all-weld metal, or utilizing a system based upon the tensile strength and the average impact energy of 27 J of all-weld metal.

a) Clauses and tables which carry the suffix letter “A” are applicable only to wire electrodes classified to the system based upon the yield strength and the average impact energy of 47 J of all-weld metal in accordance with this International Standard.

b) Clauses and tables which carry the suffix letter “B” are applicable only to wire electrodes classified to the system based upon the tensile strength and the average impact energy of 27 J of all-weld metal in accordance with this International Standard.

c) Clauses and tables which have neither the suffix letter “A” nor the suffix letter “B” are applicable to all wire electrodes classified in accordance with this International Standard.

2 Normative references

The following referenced documents are indispensable for the application 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 544, *Welding consumables — Technical delivery conditions for filler materials and fluxes — Type of product, dimensions, tolerances and markings*

ISO 13916, *Welding — Guidance on the measurement of preheating temperature, interpass temperature and preheat maintenance temperature*

ISO 14175:2008, *Welding consumables — Gases and gas mixtures for fusion welding and allied processes*

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

ISO 15792-1:2000, *Welding consumables — Test methods — Part 1: Test methods for all-weld metal test specimens in steel, nickel and nickel alloys*

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

3 Classification

Classification designations are based upon two approaches to indicate the tensile properties and the impact properties of the all-weld metal obtained with a given electrode. The two designation approaches include additional designators for some other classification requirements, but not all, as will be clear from the following subclauses. In most cases, a given commercial product can be classified in both systems. Then either or both classification designations can be used for the product.

A wire electrode shall be classified according to its chemical composition as in Table 3A or Table 3B. A weld deposit shall be classified with additional symbols according to the mechanical properties of its all-weld metal, using a shielding gas from a specific group.

3A Classification by yield strength and 47 J impact energy

The classification is divided into five 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 elongation of the all-weld metal (see Table 1A);

3) the third part gives a symbol indicating the impact properties of the all-weld metal (see Table 2);

4) the fourth part gives a symbol indicating the shielding gas used (see 4.4);

5) the fifth part gives a symbol indicating the chemical composition of the wire electrode used (see Table 3A).

3B Classification by tensile strength and 27 J impact energy

The classification is divided into five 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 elongation of the all-weld metal in either the as-welded or post-weld heat-treated condition (see Table 1B);

3) the third part gives a symbol indicating the impact properties of the all-weld metal in the same condition as specified for the tensile strength (see Table 2). The letter U after this symbol indicates that the deposit meets an average optional requirement of 47 J at the designated Charpy test temperature;

4) the fourth part gives a symbol indicating the shielding gas used (see 4.4);

5) the fifth part gives a symbol indicating the chemical composition of the wire electrode used (see Table 3B).

4 Symbols and requirements

4.1 Symbol for product/process

The symbol for a weld deposit produced by gas shielded metal arc welding shall be the letter G placed at the beginning of the designation.

The symbol for a wire electrode for use in gas shielded metal arc welding shall be the letter G placed at the beginning of the wire electrode designation.

4.2 Symbol for strength and elongation of all-weld metal

4.2A Classification by yield strength and 47 J impact energy

The symbols in Table 1A indicate the yield strength, tensile strength, and elongation of the all-weld metal in the as-welded condition determined in accordance with Clause 5.

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

Symbol	Minimum yield strength [a] MPa	Tensile strength MPa	Minimum elongation [b] %
35	355	440 to 570	22
38	380	470 to 600	20
42	420	500 to 640	20
46	460	530 to 680	20
50	500	560 to 720	18

[a] For yield strength, the lower yield strength (R_{eL}) is used when yielding occurs, otherwise the 0,2 % proof strength ($R_{p0,2}$) is used.

[b] Gauge length is equal to five times the test specimen diameter.

4.2B Classification by tensile strength and 27 J impact energy

The symbols in Table 1B indicate the yield strength, tensile strength, and elongation of the all-weld metal in the as-welded condition or in the post-weld heat-treated condition determined in accordance with Clause 5.

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

Symbol [a]	Minimum yield strength [b] MPa	Tensile strength MPa	Minimum elongation [c] %
43X	330	430 to 600	20
49X	390	490 to 670	18
55X	460	550 to 740	17
57X	490	570 to 770	17

[a] X is A or P, where A indicates testing in the as-welded condition and P indicates testing in the post-weld heat-treated condition.

[b] For yield strength, the lower yield strength (R_{eL}) is used when yielding occurs, otherwise the 0,2 % proof strength ($R_{p0,2}$) is used.

[c] Gauge length is equal to five times the test specimen diameter.

4.3 Symbol for impact properties of all-weld metal

4.3A Classification by yield strength and 47 J impact energy

The symbols in Table 2 indicate the temperature at which an impact energy of 47 J is achieved under the conditions given in Clause 5.

Three test specimens shall be tested. Only one individual value may be lower than 47 J but not lower than 32 J.

4.3B Classification by tensile strength and 27 J impact energy

The symbols in Table 2 indicate the temperature at which an impact energy of 27 J is achieved under the conditions given in Clause 5.

Five test specimens shall be tested. The lowest and highest values obtained shall be disregarded. Two of the three remaining values shall be greater than the specified 27 J level, one of the three may be lower but shall not be less than 20 J. The average of the three remaining values shall be at least 27 J.

The addition of the optional symbol U, immediately after the symbol for condition of heat treatment, indicates that the supplemental requirement of 47 J impact energy at the normal 27 J impact test temperature has also been satisfied. For the 47 J impact requirement, the number of specimens tested and values obtained shall meet the requirement of 4.3A.

When an all-weld metal has been classified for a certain temperature, it automatically covers any higher temperature listed in Table 2.

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

Symbol	Temperature for minimum average impact energy of 47 J [ab] or 27 J [b] °C
Z	No requirement
A [a] or Y [b]	+ 20
0	0
2	− 20
3	− 30
4	− 40
5	− 50
6	− 60
7	− 70
8	− 80
9	− 90
10	− 100

[a] See 4.3A.

[b] See 4.3B.

4.4 Symbol for shielding gas

The symbols for shielding gases shall be in accordance with ISO 14175:2008, for example:

— The symbol M12, for mixed gases, shall be used when the classification has been performed with shielding gas ISO 14175-M12, but without helium;

— The symbol M13 shall be used when the classification has been performed with shielding gas ISO 14175-M13;

— The symbol M20, for mixed gases, shall be used when the classification has been performed with shielding gas ISO 14175-M20, but without helium;

— The symbol M21, for mixed gases, shall be used when the classification has been performed with shielding gas ISO 14175-M21, but without helium;

— The symbol C1 shall be used when the classification has been performed with shielding gas ISO 14175-C1, carbon dioxide;

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

4.5 Symbol for chemical composition of wire electrodes

The symbol in Table 3A or Table 3B indicates the chemical composition of the wire electrode and includes an indication of characteristic alloying elements.

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	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 [b]	Any other agreed composition											

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

[b] 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.

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

Symbol	Chemical composition, % (by mass) [ab]											
	C	Si	Mn	P	S	Ni	Cr	Mo	V	Cu	Al	Ti + Zr
S2	0,07	0,40 to 0,70	0,90 to 1,40	0,025	0,030	—	—	—	—	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	—	—	—	—	0,50	—	—
S4	0,06 to 0,15	0,65 to 0,85	1,00 to 1,50	0,025	0,035	—	—	—	—	0,50	—	—
S6	0,06 to 0,15	0,80 to 1,15	1,40 to 1,85	0,025	0,035	—	—	—	—	0,50	—	—
S7	0,07 to 0,15	0,50 to 0,80	1,50 to 2,00	0,025	0,035	—	—	—	—	0,50	—	—
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- 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

Table 3B (*continued*)

Symbol	Chemical composition, % (by mass) [a,b]										
	C	Si	Mn	P	S	Ni	Cr	Mo	V	Cu	Al	Ti + Zr
SN1	0,12	0,20 to 0,50	1,25	0,025	0,025	0,60 to 1,00	—	0,35	—	0,35	—	—
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 [c]	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] Consumables not listed in this table can be symbolized SZ. The chemical symbol established by the manufacturer may be added in brackets.

5 Mechanical tests

5A Classification by yield strength and 47 J impact energy

Tensile and impact tests and any required retests shall be carried out in the as-welded condition using an all-weld metal test assembly type 1.3 in accordance with ISO 15792-1:2000, using a 1,2 mm diameter wire electrode under welding conditions specified in 5.1A and 5.2A.

5B Classification by tensile strength and 27 J impact energy

Tensile and impact tests shall be carried out in the as-welded condition or in the post-weld heat-treated condition using an all-weld metal test assembly type 1.3 in accordance with ISO 15792-1:2000, using a 1,2 mm diameter wire electrode under welding conditions specified in 5.1B and 5.2B. If 1,2 mm is not manufactured, the closest size at settings as recommended by the manufacturer shall be used.

5.1 Preheating and interpass temperatures

5.1A Classification by yield strength and 47 J impact energy

Preheating is not required; welding may start from room temperature. The interpass temperature shall be measured using temperature indicator crayons, surface thermometers or thermocouples (see ISO 13916).

The interpass temperature shall not exceed 250 °C. If, after any pass, this interpass temperature is exceeded, the test assembly shall be cooled in air to a temperature below that limit.

5.1B Classification by tensile strength and 27 J impact energy

Preheating and interpass temperatures shall be selected for the appropriate weld metal type from Table 4B. The interpass temperature shall be measured using temperature indicator crayons, surface thermometers or thermocouples (see ISO 13916).

Welding shall continue until the assembly has reached a maximum interpass temperature (165 °C). If, after any pass, this interpass temperature is exceeded, the test assembly shall be cooled in air to a temperature within that range. If below the indicated interpass temperature, the test assembly shall be reheated into interpass range.

Table 4B — Preheating and interpass temperatures
(Classification by tensile strength and 27 J impact energy)

Symbol	Preheat temperature °C	Interpass temperature °C
S2, S3, S4, S6, S7, S11, S12, S13, S14, S15, S16, S17, S18	Room temperature	150 ± 15
S1M3, S2M3, S2M31, S3M3T, S3M1, S3M1T, S4M31, S4M3T	Minimum 100	
SN1, SN2, SN3, SN5, SN7, SN71, SN9		
SNCC, SNCCT, SNCCT1, SNCCT2		
SN1M2T, SN2M1T, SN2M2T, SN2M3T, SN2M4T		
SZ	As agreed between purchaser and supplier	

5.2 Welding conditions and pass sequence

5.2A Classification by yield strength and 47 J impact energy

The welding conditions in Table 5A shall be used with the pass sequence in Table 6A. The direction of welding used to complete a layer consisting of two passes shall not vary. However, the direction of the welding of layers shall be alternated.

Table 5A — Welding conditions

Diameter mm	Welding current A	Welding voltage V	Contact tube distance mm
1,2	280 ± 20	[a]	20 ± 3

[a] The welding voltage will depend on the choice of shielding gas.

Table 6A — Pass sequence

Electrode diameter	Split weave		
mm	Layer No.	Passes per layer	Number of layers
1,2	1 to top	2[a]	6 to 10

[a] The top two layers may be completed with three passes per layer.

5.2B Classification by tensile strength and 27 J impact energy

The welding conditions in Table 5B shall be used with the pass sequence in Table 6B. The direction of welding for each pass shall not vary. However, the direction of the welding for different passes may be alternated.

Table 5B — Welding conditions

Diameter mm	Welding current A	Welding voltage V	Contact tube distance mm
1,2	290 ± 30	[a]	20 ± 3

[a] The welding voltage will depend on the choice of shielding gas.

Table 6B — Pass sequence

Electrode diameter mm	Layer No.	Passes per layer	Number of layers
1,2	1 to top	2 or 3	6 to 10

5.3 Post-weld heat-treated (PWHT) condition

5.3A Classification by yield strength and 47 J impact energy

No PWHT condition is used in this specification.

5.3B Classification by tensile strength and 27 J impact energy

Test assemblies made with wire electrodes classified in the PWHT condition shall be heat treated at 620 °C ± 15 °C for 1 h ($^{+15}_{0}$ min). The furnace shall be at a temperature not higher than 315 °C when the test assembly is placed in it. The heating rate, from that point to the 620 °C ± 15 °C holding temperature, shall not exceed 220 °C/h. When the holding time has been completed, the assembly shall be allowed to cool in the furnace to a temperature below 315 °C at a rate not exceeding 195 °C/h. The assembly may be removed from the furnace at any temperature below 315 °C and allowed to cool in still air to room temperature.

6 Chemical analysis

Chemical analysis shall be performed on specimens of the wire. Any analytical technique may be used, but in case of dispute, reference shall be made to established published methods.

In the case of chemical elements which do not change during production, chemical analysis of the wire may be substituted by an analysis of product in process or raw material or a report of the ladle chemical analysis of a raw material.

6A Classification by yield strength and 47 J impact energy

The results of the chemical analysis shall fulfil the requirements given in Table 3A for the classification under test.

6B Classification by tensile strength and 27 J impact energy

The results of the chemical analysis shall fulfil the requirements given in Table 3B for the classification under test.

7 Rounding procedure

For purposes of determining compliance with the requirements of this International Standard, the actual test values obtained shall be subjected to ISO 80000-1:2009, Clause B.3, Rule A. If the measured values are obtained by equipment calibrated in units other than those of this International Standard, the measured values shall be converted to the units of this International Standard before rounding. If an arithmetic average value is to be compared to the requirements of this International Standard, rounding shall be done only after calculating the arithmetic average. If the test method cited in Clause 2 contains instructions for rounding that conflict with the instructions of this International Standard, the rounding requirements of the test method shall apply. The rounded results shall fulfil the requirements of the appropriate table for the classification under test.

8 Retests

If any test fails to meet the requirement, that test shall be repeated twice. The results of both retests shall meet the requirements. Specimens for the retest may be taken from the original test assembly or from a new test assembly. For chemical analysis, retest need only be for those specific elements that failed to meet their test requirement. If the results of one or both retests fail to meet the requirement, the material under test shall be considered as not meeting the requirements of this specification for that classification.

In the event that, during preparation or after completion of any test, it is clearly determined that prescribed or proper procedures were not followed in preparing the weld test assembly or test specimen(s), or in conducting the tests, the test shall be considered invalid, without regard to whether the test was actually completed, or whether the test results met, or failed to meet, the requirements. That test shall be repeated, following proper prescribed procedures. In this case, the requirement for doubling the number of test specimens does not apply.

9 Technical delivery conditions

Technical delivery conditions shall meet the requirements in ISO 544 and ISO 14344.

10 Examples of designation

10A Classification by yield strength and 47 J impact energy

The designation of the wire electrode shall follow the principle given in the example below.

EXAMPLE 1A

A weld deposit produced by gas shielded metal arc welding having a minimum yield strength of 460 MPa (46) and a minimum average impact energy of 47 J at – 50 °C (5) under mixed gas (M21) using the wire 3Si1 is designated as follows:

ISO 14341-A-G 46 5 M21 3Si1

A wire electrode complying with the chemical requirement of 3Si1 in Table 3A is designated as follows:

ISO 14341-A-G 3Si1

where

ISO 14341-A is the number of this International Standard, with classification by yield strength and 47 J impact energy;

G designates a wire electrode and/or deposit produced by gas shielded metal arc welding (see 4.1);

46 is the strength and elongation (see Table 1A);

5 is the impact properties (see Table 2);

M21 is the shielding gas (see 4.4);

3Si1 is the chemical composition of the wire electrode (see Table 3A).

10B Classification by tensile strength and 27 J impact energy

The designation of the wire electrode shall follow the principle given in the examples below.

EXAMPLE 1B

A weld deposit produced by gas shielded metal arc welding having a minimum tensile strength of 490 MPa (49) and a minimum average impact energy of 27 J at – 60°C (6) in the as-welded condition under mixed gas (M21) using the wire S3 is designated as follows:

ISO 14341-B-G 49A 6 M21 S3

A wire electrode complying with the chemical requirement of S3 in Table 3B is designated as follows:

ISO 14341-B-G S3

where

ISO 14341-B is the number of this International Standard, with classification by tensile strength and 27 J impact energy;

G designates a wire electrode and/or deposit produced by gas shielded metal arc welding (see 4.1);

49A is the strength and elongation in the as-welded condition (see Table 1B);

6 is the impact properties in the as-welded condition (see Table 2);

M21 is the shielding gas (see 4.4);

S3 is the chemical composition of the wire electrode (see Table 3B).

EXAMPLE 2B

A weld deposit produced by gas shielded metal arc welding having a minimum tensile strength of 490 MPa (49) and a minimum average impact energy of 47 J at 0 °C (0) in the as-welded condition under carbon dioxide (C1) using the wire S11 is designated as follows:

ISO 14341-B-G 49A 0U C1 S11

A wire electrode complying with the chemical requirement of S11 in Table 3B is designated as follows:

ISO 14341-B-G S11

where

ISO 14341-B is the number of this International Standard, with classification by tensile strength and 27 J impact energy;

G designates a wire electrode or deposit produced by gas shielded metal arc welding (see 4.1);

49A is the strength and elongation in the as-welded condition (see Table 1B);

0U is the impact properties in the as-welded condition [see 3B 3) and Table 2];

C1 is the shielding gas (see 4.4);

S11 is the chemical composition of the wire electrode (see Table 3B).