
**Welding consumables — Wire electrodes,
wires and rods for welding of aluminium
and aluminium alloys — Classification**

*Produits consommables pour le soudage — Fils-électrodes, fils et
baguettes pour le soudage de l'aluminium et les alliages d'aluminium —
Classification*

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Foreword

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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 18273 was prepared by the European Committee for Standardization (CEN) in collaboration with Technical Committee ISO/TC 44, *Welding and allied processes*, Subcommittee SC 3, *Welding consumables*, in accordance with the Agreement on technical cooperation between ISO and CEN (Vienna Agreement).

Throughout the text of this document, read “...this European Standard...” to mean “...this International Standard...”.

It should be noted that, with regard to the corresponding EN standard, the designations given in Clause 9 have been adapted to the needs of international standardization.

Contents

Page

Foreword.....	v
Introduction	vi
1 Scope	1
2 Normative references	1
3 Classification.....	1
4 Symbols and requirements.....	1
4.1 Symbols for the product form	1
4.2 Symbol for the chemical composition.....	1
5 Mechanical properties of the weld metal.....	1
6 Chemical analysis	2
7 Retest	2
8 Technical delivery conditions.....	2
9 Designation.....	5

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Foreword

This document (EN ISO 18273:2004) has been prepared by Technical Committee CEN/TC 121 “Welding”, the secretariat of which is held by DIN, in collaboration with Technical Committee ISO/TC 44 “Welding and allied processes”.

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of an identical text or by endorsement, at the latest by September 2004, and conflicting national standards shall be withdrawn at the latest by September 2004.

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, Hungary, Iceland, Ireland, Italy, Luxembourg, Malta, Netherlands, Norway, Portugal, Slovakia, Spain, Sweden, Switzerland and the United Kingdom.

Introduction

For aluminium welding consumables there is no unique relationship between the product form (solid wire or rod) and the welding process used (e.g. gas shielded metal arc welding, gas tungsten arc welding, plasma arc welding or other welding processes). For this reason the solid wires or rods may be classified on the basis of any of the above product forms and can be used as appropriate, for more than one of the above processes.

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1 Scope

This standard specifies requirements for classification of solid wires and rods for fusion welding of aluminium and aluminium alloys. The classification of the solid wires and rods is based on their chemical composition.

2 Normative references

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 (including amendments).

EN ISO 544, *Welding consumables – Technical delivery conditions for welding filler metals – Type of product, dimensions, tolerances and markings (ISO 544:2003)*.

ISO 31-0:1992, *Quantities and units – Part 0: General principles*.

ISO 14344, *Welding and allied processes – Flux and gas shielded electrical welding processes – Procurement guidelines for consumables*.

3 Classification

The classification is divided into two parts:

- a) the first part indicates the product form being solid wires or rods, see 4.1;
- b) the second part gives a numerical symbol indicating the chemical composition of the solid wire or rod, see Table 1.

The aluminium or aluminium alloy chemical composition limits specified are strictly identical to those registered to the Aluminum Association, Washington DC 20006, USA, for the corresponding alloys.

4 Symbols and requirements

4.1 Symbols for the product form

The symbol for the solid wire and rod shall be S.

NOTE One product form may be used for more than one welding process.

4.2 Symbol for the chemical composition

The numerical symbol in Table 1 indicates the chemical composition of a solid wire and rod, determined under conditions given in clause 6.

NOTE In addition the chemical symbol may be used.

5 Mechanical properties of the weld metal

Mechanical properties of the weld metal are not part of the classification.

6 Chemical analysis

Chemical analysis shall be performed on samples of the product or the stock from which it is made. Any analytical technique may be used, but in case of dispute reference shall be made to established published methods.

7 Retest

If any test fails to meet the requirement, that test shall be repeated twice. The results of both retests shall meet the requirement. Specimens for the retest may be taken from the original test sample or from a new test sample. For chemical analysis, retest need be only 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 sample 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 requirement. That test shall be repeated, following proper prescribed procedures. In this case, the requirement for doubling the number of test specimens does not apply.

8 Technical delivery conditions

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

Table 1 — Symbol for the chemical composition of solid wires and rods

Alloy symbol		Chemical composition in % (m/m) ^{a b}														Be	Other each	Other total
Numerical	Chemical	Si	Fe	Cu	Mn	Mg	Cr	Zn	Ga, V	Ti	Zr	Al _{min}						
ALUMINIUM-LOW ALLOYED																		
Al 1070	Al99,7	0,20	0,25	0,04	0,03	0,03	–	0,04	V 0,05	0,03	–	99,70	0,0003	0,03	–	–		
Al 1080A	Al99,8(A)	0,15	0,15	0,03	0,02	0,02	–	0,06	Ga 0,03	0,02	–	99,80	0,0003	0,02	–	–		
Al 1188	Al 99,88	0,06	0,06	0,005	0,01	0,01	–	0,03	Ga 0,03 V 0,05	0,01	–	99,88	0,0003	0,01	–	–		
Al 1100	Al99,0Cu	Si + Fe 0,95		0,05 – 0,20	0,05	–	–	0,10	–	–	–	99,00	0,0003	0,05	0,15	0,15		
Al 1200	Al99,0	Si + Fe 1,00		0,05	0,05	–	–	0,10	–	0,05	–	99,00	0,0003	0,05	0,15	0,15		
Al 1450	Al99,5Ti	0,25	0,40	0,05	0,05	0,05	–	0,07	–	0,10 - 0,20	–	99,50	0,0003	0,03	–	–		
ALUMINIUM-COPPER																		
Al 2319	AlCu6MnZrTi	0,20	0,30	5,8 – 6,8	0,20 – 0,40	0,02	–	0,10	V 0,05 – 0,15	0,10 – 0,20	0,10 – 0,25	Rem	0,0003	0,05	0,15	0,15		
ALUMINIUM-MANGANESE																		
Al 3103	AlMn 1	0,50	0,7	0,10	0,9 - 1,5	0,30	0,10	0,20	–	Ti + Zr 0,10		Rem	0,0003	0,05	0,15	0,15		
ALUMINIUM-SILICIUM																		
Al 4009	AlSi5Cu1Mg	4,5 – 5,5	0,20	1,0 – 1,5	0,10	0,45 – 0,6	–	0,10	–	0,20	–	Rem	0,0003	0,05	0,15	0,15		
Al 4010	AlSi7Mg	6,5 – 7,5	0,20	0,20	0,10	0,30 – 0,45	–	0,10	–	0,20	–	Rem	0,0003	0,05	0,15	0,15		
Al 4011	AlSi7Mg0,5Ti	6,5 – 7,5	0,20	0,20	0,10	0,45 – 0,7	–	0,10	–	0,04 – 0,20	–	Rem	0,04 – 0,07	0,05	0,15	0,15		
Al 4018	AlSi7Mg	6,5 - 7,5	0,20	0,05	0,10	0,50 - 0,8	–	0,10	–	0,20	–	Rem	0,0003	0,05	0,15	0,15		
Al 4043	AlSi5	4,5 - 6,0	0,8	0,30	0,05	0,05	–	0,10	–	0,20	–	Rem	0,0003	0,05	0,15	0,15		
Al 4043A	AlSi5(A)	4,5 - 6,0	0,6	0,30	0,15	0,20	–	0,10	–	0,15	–	Rem	0,0003	0,05	0,15	0,15		
Al 4046	AlSi10Mg	9,0 - 11,0	0,50	0,03	0,40	0,20 - 0,50	–	0,10	–	0,15	–	Rem	0,0003	0,05	0,15	0,15		
Al 4047	AlSi12	11,0 - 13,0	0,8	0,30	0,15	0,10	–	0,20	–	–	–	Rem	0,0003	0,05	0,15	0,15		
Al 4047A	AlSi12(A)	11,0 - 13,0	0,6	0,30	0,15	0,10	–	0,20	–	0,15	–	Rem	0,0003	0,05	0,15	0,15		
Al 4145	AlSi10Cu4	9,3 – 10,7	0,8	3,3 – 4,7	0,15	0,15	0,15	0,20	–	–	–	Rem	0,0003	0,05	0,15	0,15		
Al 4643	AlSi4Mg	3,6 – 4,6	0,8	0,10	0,05	0,10 – 0,30	–	0,10	–	0,15	–	Rem	0,0003	0,05	0,15	0,15		
ALUMINIUM-MAGNESIUM																		
Al 5249	AlMg2Mn0,8Zr	0,25	0,40	0,05	0,50 - 1,1	1,6 - 2,5	0,30	0,20	–	0,15	0,10 - 0,20	Rem	0,0003	0,05	0,15	0,15		
Al 5554	AlMg2,7Mn	0,25	0,40	0,10	0,50 – 1,0	2,4 – 3,0	0,05 – 0,20	0,25	–	0,05 – 0,20	–	Rem	0,0003	0,05	0,15	0,15		
Al 5654	AlMg3,5Ti	Si + Fe 0,45		0,05	0,01	3,1 – 3,9	0,15 – 0,35	0,20	–	0,05 – 0,15	–	Rem	0,0003	0,05	0,15	0,15		
Al 5654A	AlMg3,5Ti	Si + Fe 0,45		0,05	0,01	3,1 – 3,9	0,15 – 0,35	0,20	–	0,05 – 0,15	–	Rem	0,0005	0,05	0,15	0,15		
Al 5754 ^c	AlMg3	0,40	0,40	0,10	0,50	2,6 - 3,6	0,30	0,20	–	0,15	–	Rem	0,0003	0,05	0,15	0,15		
Al 5356	AlMg5Cr(A)	0,25	0,40	0,10	0,05 - 0,20	4,5 - 5,5	0,05 - 0,20	0,10	–	0,06 - 0,20	–	Rem	0,0003	0,05	0,15	0,15		