SLOVENSKI STANDARD
SIST EN 1706:2010

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Nadomešča:
SIST EN 1706:1998/prA1:2007
SIST EN 1706:1999

Aluminij in aluminijeve zlitine - Ulitki - Kemična sestava in mehanske lastnosti

Aluminium and aluminium alloys - Castings - Chemical composition and mechanical properties

Aluminium and Aluminiumlegierungen - Gußstücke - Chemische Zusammensetzung und mechanische Eigenschaften

Aluminium et alliages d'aluminium - Pièces moulées - Composition chimique et caractéristiques mécaniques

Ta slovenski standard je istoveten z: **EN 1706:2010**

ICS:

77.150.10	Aluminijski izdelki	Aluminium products

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Aluminium and aluminium alloys - Castings - Chemical composition and mechanical properties

Aluminium et alliages d'aluminium - Pièces moulées - Composition chimique et caractéristiques mécaniques

Aluminium und Aluminiumlegierungen - Gußstücke - Chemische Zusammensetzung und mechanische Eigenschaften

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Foreword

This document (EN 1706:2010) has been prepared by Technical Committee CEN/TC 132 “Aluminium and aluminium alloys”, the secretariat of which is held by AFNOR.

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of an identical text or by endorsement, at the latest by September 2010, and conflicting national standards shall be withdrawn at the latest by September 2010.

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.

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This document supersedes EN 1706:1998.

Within its programme of work, Technical Committee CEN/TC 132 entrusted CEN/TC 132/WG 10 "Castings" to revise EN 1706:1998.

In addition to some additional minor and editorial changes, the following technical modifications were introduced during the revision:

a) In the Scope, new reference to EN 576 was added and reference to EN ISO 8062-3 was updated.

b) New normative references were added (EN 576, EN 1559-1, EN 1559-4 and EN ISO 6506-1). Normative reference to EN 10003-1 was deleted.

c) Term and definition 3.10, order document, was added.

d) Clause 4, Ordering information, was added and subsequent numbering increased by one.

e) Second paragraph (reference to EN 576) in Clause 5.2 was added.

f) Clause 5.5, Designation to appear on drawings, was modified.

g) Clause 7.3.2.5, Pressure die cast test pieces, was modified.

h) In Clause 7.4, reference to EN ISO 6506-1 was updated from EN 10003-1.

i) In Table 1, new Alloy Group “Al” was added, including Al 99,6E and Al 99,7E grades.

j) In Table 1, the following alloys were deleted:

   1) EN AC-45200 [EN AC-Al Si5Cu3Mn];

   2) EN AC-51000 [EN AC-Al Mg3(b)];

   3) EN AC-71000 [EN AC-Al Zn5Mg].

k) In Table 1, the following new alloys were added:

   1) EN AC-21200 [EN AC-Al Cu4MnMg];

2) EN AC-43500 [EN AC-Al Si10MnMg];

3) EN AC-44500 [EN AC-Al Si12(Fe)(b)];

4) EN AC-45500 [EN AC-Al Si7Cu0,5Mg];

5) EN AC-48100 [EN AC-Al Si17Cu4Mg];

6) EN AC-51500 [EN AC-Al Mg5Si2Mn];

7) EN AC-71100 [EN AC-Al Zn10Si8Mg].

l) In Table 1, footnotes “b” to “j” were added.

m) In Table 2, the following alloys were deleted:

1) EN AC-45200 [EN AC-Al Si5Cu3Mn];

2) EN AC-51000 [EN AC-Al Mg3(b)];

3) EN AC-71000 [EN AC-Al Zn5Mg].

n) In Table 2, “Al” Alloy Group and the following alloys were added:

1) EN AC-21200 [EN AC-Al Cu4MnMg];

2) EN AC-44400 [EN AC-Al Si9];

3) EN AC-45500 [EN AC-Al Si7Cu0,5Mg];

4) EN AC-71100 [EN AC-Al Zn10Si8Mg].

o) In Table 3, the following alloys were deleted:

1) EN AC-45200 [EN AC-Al Si5Cu3Mn];

2) EN AC-51000 [EN AC-Al Mg3(b)];

3) EN AC-71000 [EN AC-Al Zn5Mg].

p) In Table 3, “Al” Alloy Group and the following alloys were added:

1) EN AC-21200 [EN AC-Al Cu4MnMg];

2) EN AC-44400 [EN AC-Al Si9];

3) EN AC-45500 [EN AC-Al Si7Cu0,5Mg];

4) EN AC-71100 [EN AC-Al Zn10Si8Mg].

q) In Table 4, EN AC-45200 [EN AC-Al Si5Cu3Mn] alloy was deleted.

r) In Table 4, “Al” Alloy Group and EN AC-48100 [EN AC-Al Si17Cu4Mg] alloy were added.

s) Former Annex A (informative) was split in Annex A (informative) and Annex B (informative).

t) In Table A.1, “Al” Alloy Group and the following alloys were added:

1) EN AC-43500 [EN AC-Al Si10MnMg];

2) EN AC-44500 [EN AC-Al Si12(Fe)(b)];

3) EN AC-48100 [EN AC-Al Si17Cu4Mg];

4) EN AC-51500 [EN AC-Al Mg5Si2Mn].

u) In Table B.1, the same alloys than in Table 1 were added and deleted. New footnote “k” was also added. The suitability for some casting methods was revised for some of the alloys.

v) New Annex C, Comparison between cast aluminium alloy designations, was added.

w) A Bibliography was also added.

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.

1 Scope

This European Standard specifies the chemical composition limits for aluminium casting alloys and mechanical properties of separately cast test pieces for these alloys.

Annex B is included as a guide to the selection of alloys for a specific use or process.

This European Standard is intended to be used in conjunction with EN 576, EN 1559-1, EN 1559-4, EN 1676 and EN ISO 8062-3.

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.

EN 576, *Aluminium and aluminium alloys — Unalloyed aluminium ingots for remelting — Specifications*

EN 1559-1, *Founding — Technical conditions of delivery — Part 1: General*

EN 1559-4, *Founding — Technical conditions of delivery — Part 4: Additional requirements for aluminium alloy castings*

EN 1780-1, *Aluminium and aluminium alloys — Designation of alloyed aluminium ingots for remelting, master alloys and castings — Part 1: Numerical designation system*

EN 1780-2, *Aluminium and aluminium alloys — Designation of alloyed aluminium ingots for remelting, master alloys and castings — Part 2: Chemical symbol based designation system*

EN 1780-3, *Aluminium and aluminium alloys — Designation of alloyed aluminium ingots for remelting, master alloys and castings — Part 3: Writing rules for chemical composition*

EN 10002-1, *Metallic materials — Tensile testing — Part 1: Method of test at ambient temperature*

EN 12258-1:1998, *Aluminium and aluminium alloys — Terms and definitions — Part 1: General terms*

EN ISO 6506-1, *Metallic materials — Brinell hardness test — Part 1: Test method (ISO 6506-1:2005)*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in EN 12258-1:1998 and the following apply.

3.1
casting
process in which molten metal is poured into a mould and solidified

[EN 12258-1:1998, 4.1.1]

3.2
sand casting
process in which molten metal is poured into a sand mould and solidified (at atmospheric pressure)

[EN 12258-1:1998, 4.1.8]

3.3
permanent mould casting
chill casting
process in which molten metal is poured into a permanent metal mould and solidified (at atmospheric pressure)

[EN 12258-1:1998, 4.1.9]

3.4
low pressure die casting
process in which molten metal is poured into a metal mould and solidified under low pressure (typically 7 kPa above atmospheric pressure)

[EN 12258-1:1998, 4.1.11]

NOTE This process can also be used with a sand mould, being called “low pressure sand casting”.

3.5
pressure die casting
high pressure die casting
process in which molten metal is poured into a permanent metal mould and solidified under high pressure (typically 7 MPa)

[EN 12258-1:1998, 4.1.10]

3.6
investment casting
two step process comprising:

a) fabrication of a ceramic mould around a wax or thermoplastic pattern which is lost during this process; and

b) pouring of metal into this mould

[EN 12258-1:1998, 4.1.12]

3.7
fluidity
ability of an alloy to make thin wall castings and reproduce fine details

3.8
hot tearing
tendency for a crack to form in a casting due to the development of internal stress during solidification

3.9
pressure tightness
tendency not to leak on pressure testing

3.10
order document
document or set of documents to which supplier and purchaser agreed at the time of ordering

NOTE An order document may be an order of the purchaser confirmed by the supplier or a quotation of the supplier confirmed by the purchaser.

4 Ordering information

The order document shall include a reference to this European Standard. It shall include all the ordering information as required in EN 1559-1 and EN 1559-4.

5 Designation systems

5.1 Numerical designation system

The numerical designation system shall be in accordance with EN 1780-1.

5.2 Chemical symbol based designation system

The chemical symbol based designation system shall be in accordance with EN 1780-2.

For unalloyed grades, the designation shall be in accordance with EN 576.

5.3 Temper designations

The following abbreviations shall be used as temper designations for the conditions of heat treatment, referred in Tables 2, 3 and 4 and Table A.1:

— F as cast;

— O annealed;

— T1 controlled cooling from casting and naturally aged;

— T4 solution heat treated and naturally aged where applicable;

— T5 controlled cooling from casting and artificially aged or over-aged;

— T6 solution heat treated and fully artificially aged;

— T64 solution heat treated and artificially under-aged;

— T7 solution heat treated and artificially over-aged (stabilised).

NOTE For aluminium casting alloys, solution heat treatment involves quenching from elevated temperatures and distortion may occur.

5.4 Casting process designations

The following abbreviations shall be used as designations for the different casting processes:

— S sand casting;

— K chill or permanent mould casting;

— D pressure die casting;

— L investment casting.

5.5 Designations to appear on drawings

The complete designation of the casting shall appear on the drawings being part of the order information. This designation includes:

— the number of this European Standard;

— the alloy designation;

— the casting process designation;

— the temper designation.

EXAMPLE EN 1706 AC-42000-K-T6 is the complete designation of the alloy EN AC-42000, chill cast solution heat treated and fully artificially aged.

6 Chemical composition

6.1 General

Chemical composition shall be expressed in accordance with the writing rules given in EN 1780-3. The chemical composition of aluminium casting alloys shall be in conformity with the limits specified in Table 1.

NOTE Table 1 also includes the chemical compositions of ingots used to produce castings. These are shown in brackets where they differ from the casting limits and are taken from EN 1676.

When specified, analysis of elements for which specific limits are given in Table 1 shall be carried out. Analysis for other elements shall be carried out only when agreed between supplier and purchaser. This particularly applies to modifying or refining elements such as sodium, strontium, antimony and phosphorus. Alloying elements and impurities shall be expressed in the following sequence: silicon, iron, copper, manganese, magnesium, chromium, nickel, zinc, lead, tin, titanium, other elements each/total, aluminium.

Additional specified elements with specific limit shall be inserted, in alphabetical order with respect to their chemical symbols after titanium, or be specified in footnotes.

6.2 Samples for analysis

When samples are required for analysis by emission spectrometry, they shall be taken from the melt at the time the castings are made and shall be cast into a metallic die.

NOTE If analysis by emission spectrometry is carried out on a casting, it is recommended that a part of the casting is remelted and cast into a metallic die to minimize the unavoidable segregation effect. The level of certain elements such as sodium, strontium and magnesium, is normally reduced by the remelting, and analysis for such elements should be made directly on the casting.

For sampling and analysis, the use of existing rules or standards is recommended until a suitable European Standard is published.