SLOVENSKI STANDARD
SIST EN 1706:1999

01-november-1999

Aluminij in aluminijeve zlitine - Ulitki - Kemiļ na sestava in mehanske lastnosti

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

Aluminium und Aluminiumlegierungen Gußstücke - Chemische Zusammensetzung und mechanische Eigenschaften

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

Ta slovenski standard je istoveten z: **EN 1706:1998**

ICS:

77.150.10	Aluminijski izdelki	Aluminium products

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EUROPEAN STANDARD
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EN 1706

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ICS

Descriptors: aluminium, aluminium alloys, castings, definitions, designation, chemical composition, mechanical properties, tests

English version

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

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

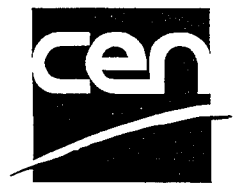
Aluminium und Aluminiumlegierungen - Gußstücke - Chemische Zusammensetzung und mechanische Eigenschaften

This European Standard was approved by CEN on 9 August 1997.

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.



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

Central Secretariat: rue de Stassart, 36 B-1050 Brussels

Content

Foreword

This European Standard 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 1998, and conflicting national standards shall be withdrawn at the latest by September 1998..

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.

1 Scope

This standard specifies the chemical composition limits for aluminium casting alloys and mechanical properties of separately cast test bars for these alloys. As a guide to the selection of alloys for a specific use or process, annex A "Comparison of casting characteristics mechanical and other properties", is included for information only.

This standard shall be used in conjunction with the following standards :

EN 1676	Aluminium and aluminium alloys - Alloyed aluminium ingots for remelting - Specifications
EN 1559-1	Founding - Technical conditions of delivery - Part 1 : General
prEN 1559-4	Founding - Technical conditions of delivery - Part 4 : Additionnal requirements for aluminium alloys castings
EN ISO 8062	Castings - System of dimensional tolerances and machining allowances

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.

EN 1676	Aluminium and aluminium alloys - Alloyed aluminium ingots for remelting - Specifications.
EN 1780-1	Aluminium and aluminium alloys - Designation of unalloyed and alloyed aluminium ingots for remelting, master alloys and castings - Part 1 : Numerical designation system.
EN 1780-2	Aluminium and aluminium alloys - Designation of unalloyed and 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 unalloyed and 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 tests (at ambient temperature) "including Addendum AC1:1990".
EN 10003-1	Metallic materials - Hardness testing - Part 1 : Brinell test.
prEN 12258-1	Aluminium and aluminium alloys - Terms and definitions - Part 1 : General.

3 Definitions

For the purpose of this European Standard, the definitions in prEN 12258-1 apply together with the following :

3.1 casting

Process in which molten metal is poured into a mould and solidified.

3.2 sand casting

Process in which molten metal is poured into a sand mould and solidified (at atmospheric pressure).

3.3 permanent mould casting ; chill casting

Process in which molten metal is poured into a permanent mould and solidified (at atmospheric pressure).

3.4 low pressure die casting

Process in which molten metal is poured into a permanent metal mould and solidified under low pressure (typically 0,7 bar above atmospheric pressure).

3.5 pressure die casting ; high pressure die casting

Process in which molten metal is injected into a permanent metal mould and solidified under high pressure (typically 700 bars above atmospheric pressure).

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.

3.7 fluidity

The ability of an alloy to make thin wall castings and reproduce fine detail.

3.8 hot tearing

Tendency for a crack to form in a casting due to the development of internal stress during sodification.

3.9 pressure tightness

The tendancy not to leak on pressure testing.

4 Designation systems

4.1 Numerical designation system

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

4.2 Chemical symbol based designation system

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

4.3 Temper designations

The following abbreviations shall be used for the conditions of heat treatment, referred to tables 2, 3, 4 and 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.

4.4 Casting processes

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

S sand casting ;

K chill or permanent mould casting ;

D pressure die casting ;

L investment casting.

4.5 Designations to appear on drawings

The designation shall appear on the drawings.

An example of the full standard, material designation, casting process and temper is :

EN 1706 AC-42000KT6 (numerical)

EN 1706 AC-Al Si7MgKT6 (chemical)

which indicates Aluminium casting alloy 42000, chill cast, solution heat treated and fully artificially aged.

5 Chemical composition

5.1 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 specified in percentage by mass in table 1.

NOTE : Also included in Table 1 are the 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 manufacturer and purchaser. This particularly applies to modifying or refining elements such as sodium, strontium, antimony and phosphorous. Alloying elements and impurities shall be expressed in the following sequence silicon, iron, copper, manganese, magnesium, chromium, nickel, zinc, titanium, other elements total, aluminium.

Additional specified elements with specific limit shall be inserted, in alphabetical order with respect to their chemical symbols between zinc and titanium, or are specified in footnotes, and that order shall include lead and tin.

5.2 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 to be carried out on a casting it is recommended that a part of the casting is remelted and cast into a metallic die to avoid the effects of segregation. The level of certain elements such as sodium, strontium and magnesium may be 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.

6 Mechanical properties

6.1 General

The minimum mechanical properties for separately cast test pieces for sand cast, chill cast, investment cast and pressure die cast conditions shall be in accordance with tables 2, 3, 4.

For each alloy, mechanical properties are only specified for the commonly used methods of casting and for commonly used tempers. For other processes and tempers, characteristics shall be agreed between manufacturer and purchaser.

NOTE : The mechanical properties of pressure die castings are very dependent on injection parameters and the properties in table A.1 are for guidance only.

6.2 Tensile tests

Tensile Tests shall be carried out in accordance with EN 10002-1.

6.3 Test pieces

6.3.1 General

This standard does not specify the exact design of test pieces which shall be by agreed between manufacturer and purchaser. The use of existing rules or standards is recommended until a suitable European Standard is published. However, the following conditions shall apply :

6.3.2 Separately cast test bars

6.3.2.1 General

When tensile tests are required on separately cast test bars then the test bars shall be cast at the same time and from the same melt or melts as the castings. When applicable they shall be heat treated with the castings.

NOTE : Separately cast test pieces have a valuable function as a check on melt quality. However, the values obtained from castings can differ from the minimum values specified in the tables because of variations in structure arising from differences in section thickness and soundness (see 6.3.3).

6.3.2.2 Sand cast pieces

The following conditions apply to sand cast test pieces :

1) they shall be cast in sand moulds without artifical chilling ; using the same sand system as used for the castings ;

2) as cast diameter shall be a minimum of 12,0 mm ;

3) the gauge length and parallel length shall conform to EN 10002-1.

NOTE : Test pieces may be tested in the machined or unmachined condition.

6.3.2.3 Chill cast pieces

The following conditions shall apply to chill cast pieces :

1) they shall be cast into metallic moulds ;

2) as cast diameter shall be a minimum of 12,0 mm ;

3) the gauge length and parallel length shall conform to EN 10002-1.

NOTE : Test pieces may be tested in the machined or unmachined condition.

6.3.2.4 Investment cast pieces

The following conditions shall apply to investment cast test pieces :

1) they shall be cast entirely in a ceramic mould without artificial chilling ;

2) as cast diameter shall be a minimum of 5,0 mm ;

3) the gauge length and parallel length shall conform to EN 10002-1.

NOTE : Test pieces may be tested in the machined or unmachined condition.

6.3.2.5 Pressure die cast bars

Pressure die cast test pieces are not normally produced. The values given in table A.1 are for guidance only. These are not typical values but are the minimum values that may be expected from separately pressure die cast test pieces of 20,0 mm^2 cross sectional area with a minimum thickness of 2,0 mm.