

**Aluminium and aluminium alloys – Castings**

Chemical composition and mechanical properties

English version of DIN EN 1706

**DIN**  
**EN 1706**

ICS 77.150.10

Supersedes DIN 1725-2  
and DIN 1725-2 Suppl 1,  
February 1986 editions.

Descriptors: Aluminium, castings.

Aluminium und Aluminiumlegierungen – Gußstücke – Chemische  
Zusammensetzung und mechanische Eigenschaften**European Standard EN 1706 : 1997 has the status of a DIN Standard.***A comma is used as the decimal marker.***National foreword**

This standard has been prepared by CEN/TC 132.

The responsible German body involved in its preparation was the *Normenausschuß Nichtmetalle* (Nonferrous Metals Standards Committee), Technical Committee *Aluminium-Gußlegierungen*.

For ease of reference, a National Annex is provided overleaf in which the material grades specified in European Standards are correlated with those previously used in Germany.

**Amendments**

DIN 1725-2 and DIN 1725-2 Suppl 1, February 1986 editions, have been superseded by the specifications of EN 1706.

**Previous editions**

DIN 1713-2: 1941-12; DIN 1744: 1936-09, 1940-03; DIN 1725: 1942-11; DIN 1725-2: 1943-07, 1945-01, 1951-06, 1959x-06, 1970-09, 1973-05, 1973-09, 1986-02; DIN 1725-2 Suppl 1: 1986-02.

Continued overleaf.  
EN comprises 18 pages.

## National Annex NA

List of aluminium and aluminium alloy designations used in European Standards correlated with those used previously in Germany

DIN EN 1706			DIN 1725-2	
Alloy group	Designation		Designation	
	Numerical	Chemical	Symbol	Material number
AlCu	EN AC-21000	EN AC-Al Cu4MgTi	G-AlCu4TiMg	3.1371
	EN AC-21100	EN AC-Al Cu4Ti	G-AlCu4Ti	3.1841
AlSiMgTi	EN AC-41000	EN AC-Al Si2MgTi	—	—
AlSi7Mg	EN AC-42000	EN AC-Al Si7Mg	—	—
	EN AC-42100	EN AC-Al Si7Mg0,3	G-AlSi7Mg	3.2371
	EN AC-42200	EN AC-Al Si7Mg0,6	—	—
AlSi10Mg	EN AC-43000	EN AC-Al Si10Mg(a)	G-AlSi10Mg	3.2381
	EN AC-43100	EN AC-Al Si10Mg(b)	—	—
	EN AC-43200	EN AC-Al Si10Mg(Cu)	G-AlSi10Mg(Cu)	3.2383
	EN AC-43300	EN AC-Al Si9Mg	G-AlSi9Mg	3.2373
	EN AC-43400	EN AC-Al Si10Mg(Fe)	GD-AlSi10Mg	3.2382
AlSi	EN AC-44000	EN AC-Al Si11	G-AlSi11	3.2211
	EN AC-44100	EN AC-Al Si12(b)	—	—
	EN AC-44200	EN AC-Al Si12(a)	G-AlSi12	3.2581
	EN AC-44300	EN AC-Al Si12(Fe)	GD-AlSi12	3.2582
	EN AC-44400	EN AC-Al Si9	—	—
AlSi5Cu	EN AC-45000	EN AC-Al Si6Cu4	G-AlSi6Cu4	3.2151
	EN AC-45100	EN AC-Al Si5Cu3Mg	—	—
	EN AC-45200	EN AC-Al Si5Cu3Mn	—	—
	EN AC-45300	EN AC-Al Si5Cu1Mg	—	—
	EN AC-45400	EN AC-Al Si5Cu3	—	—
AlSi9Cu	EN AC-46000	EN AC-Al Si9Cu3(Fe)	GD-AlSi9Cu3	3.2163
	EN AC-46100	EN AC-Al Si11Cu2(Fe)	—	—
	EN AC-46200	EN AC-Al Si8Cu3	G-AlSi9Cu3	3.2163
	EN AC-46300	EN AC-Al Si7Cu3Mg	—	—
	EN AC-46400	EN AC-Al Si9Cu1Mg	—	—
	EN AC-46500	EN AC-Al Si9Cu3(Fe)(Zn)	—	—
	EN AC-46600	EN AC-Al Si7Cu2	—	—
AlSi(Cu)	EN AC-47000	EN AC-Al Si12(Cu)	G-AlSi12(Cu)	3.2583
	EN AC-47100	EN AC-AlSi12Cu1(Fe)	GD-AlSi12(Cu)	3.2982
AlSiCuNiMg	EN AC-48000	EN AC-Al Si12CuNiMg	—	—
AlMg	EN AC-51000	EN AC-Al Mg3(b)	—	—
	EN AC-51100	EN AC-AlMg3(a)	G-AlMg3	3.3541
	EN AC-51200	EN AC-Al Mg9	GD-AlMg9	3.3292
	EN AC-51300	EN AC-Al Mg5	G-AlMg5	3.3561
	EN AC-51400	EN AC-Al Mg5(Si)	G-AlMg5Si	3.3261
AlZnMg	EN AC-71000	EN AC-Al Zn5Mg	—	—

ICS 77.150.10

Descriptors: Aluminium, castings.

**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 Zusammen-  
setzung und mechanische  
Eigenschaften

This European Standard was approved by CEN on 1997-08-09.

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.

The European Standards exist 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.

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**CEN**

European Committee for Standardization  
Comité Européen de Normalisation  
Europäisches Komitee für Normung

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

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## 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 : Additional 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 solidification.

### **3.9 pressure tightness**

The tendency 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 artificial 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<sup>2</sup> cross sectional area with a minimum thickness of 2,0 mm.

### 6.3.3 Test pieces taken from castings

**6.3.3.1** If test pieces are taken from castings then their geometry, location, test frequency and values relevant shall be agreed between manufacturer and purchaser.

**6.3.3.2** For circular test pieces the minimum diameter shall be 4,0 mm.

For proof stress and tensile strength, the value obtained in the castings may be greater than the values specified in tables 2, 3, 4 or not less than 70 % of the values specified.

For elongation, the values obtained from castings may be greater than the values specified in the tables or up to 50 % less in some locations.

NOTE : This does not apply to pressure die castings.

### 6.4 Hardness tests

Hardness Tests shall be carried out in accordance with EN 10003-1 on porosity free areas of castings or on the portion of a broken test piece which has not been stressed.

## 7 Rounding rules for determination of compliance

In recording chemical analysis or mechanical property results, the number representing the result for any value specified in this standard shall be expressed to the same number of decimal places as the corresponding number in this standard.

The following rounding rules shall be used for determination of compliance with this standard :

- a) when the figure immediately after the last figure to be retained is less than 5, the last figure to be retained remains unchanged ;
- b) when the figure immediately after the last figure to be retained is greater than 5, or equal to 5 and followed by at least one figure other than zero, the last figure to be retained is increased by one ;
- c) when the figure immediately after the last figure to be retained is equal to 5 and followed by zeros only, the last figure to be retained remains unchanged if even, and is increased by one if odd.

Table 1 : Chemical compositions of casting alloys (expressed in percentage by mass)

Alloy Group	Alloy designation		Chemical composition in % by mass													Others <sup>1)</sup>	
	Numerical	Chemical symbols	Si	Fe	Cu	Mn	Mg	Cr	Ni	Zn	Pb	Sn	Ti	Each	Total	Aluminium Remainder	
AlCu	EN AC-21000	EN AC-Al Cu4MgTi	0,20 (0,15)	0,35 (0,30)	4,2 to 5,0	0,10	0,15 to 0,35 (0,20 to 0,35)	-	0,05	0,10	0,05	0,05	0,15 to 0,30 (0,15 to 0,25)	0,03	0,10	Remainder	
	EN AC-21100	EN AC-Al Cu4Ti	0,18 (0,15)	0,19 (0,15)	4,2 to 5,2	0,55	-	-	-	0,07	-	-	0,15 to 0,30 (0,15 to 0,25)	0,03	0,10	Remainder	
AlSiMgTi	EN AC-41000	EN AC-Al Si2MgTi	1,6 to 2,4	0,60 (0,50)	0,10 (0,08)	0,30 to 0,50	0,45 to 0,65 (0,50 to 0,65)	-	0,05	0,10	0,05	0,05	0,05 to 0,20 (0,07 to 0,15)	0,05	0,15	Remainder	
AlSi7Mg	EN AC-42000	EN AC-Al Si7Mg	6,5 to 7,5	0,55 (0,45)	0,20 (0,15)	0,35	0,20 to 0,65 (0,25 to 0,65)	-	0,15	0,15	0,15	0,05	0,05 to 0,25 (0,05 to 0,20)	0,05	0,15	Remainder	
	EN AC-42100	EN AC-Al Si7Mg0,3	6,5 to 7,5	0,19 (0,15)	0,05 (0,03)	0,10	0,25 to 0,45 (0,30 to 0,45)	-	-	0,07	-	-	0,08 to 0,25 (0,10 to 0,18)	0,03	0,10	Remainder	
EN AC-42200	EN AC-Al Si7Mg0,6	6,5 to 7,5	0,19 (0,15)	0,19 (0,15)	0,05 (0,03)	0,10	0,45 to 0,70 (0,50 to 0,70)	-	-	0,07	-	-	0,08 to 0,25 (0,10 to 0,18)	0,03	0,10	Remainder	
AlSi10Mg	EN AC-43000	EN AC-Al Si10Mg(a)	9,0 to 11,0	0,55 (0,40)	0,05 (0,03)	0,45	0,20 to 0,45 (0,25 to 0,45)	-	0,05	0,10	0,05	0,05	0,15	0,05	0,15	Remainder	
	EN AC-43100	EN AC-Al Si10Mg(b)	9,0 to 11,0	0,55 (0,45)	0,10 (0,08)	0,45	0,20 to 0,45 (0,25 to 0,45)	-	0,05	0,10	0,05	0,05	0,15	0,05	0,15	Remainder	
	EN AC-43200	EN AC-Al Si10Mg(Cu)	9,0 to 11,0	0,65 (0,55)	0,35 (0,30)	0,55	0,20 to 0,45 (0,25 to 0,45)	-	0,15	0,35	0,10	-	0,20 (0,15)	0,05	0,15	Remainder	
	EN AC-43300	EN AC-Al Si9Mg	9,0 to 10,0	0,19 (0,15)	0,05 (0,03)	0,10	0,25 to 0,45 (0,30 to 0,45)	-	-	0,07	-	-	0,15	0,03	0,10	Remainder	
EN AC-43400	EN AC-Al Si10Mg(Fe)	9,0 to 11,0	1,0 (0,45 to 0,9)	0,10 (0,08)	0,10 (0,08)	0,55	0,20 to 0,50 (0,25 to 0,50)	-	0,15	0,15	0,15	0,05	0,20 (0,15)	0,05	0,15	Remainder	
AlSi	EN AC-44000	EN AC-Al Si11	10,0 to 11,8	0,19 (0,15)	0,05 (0,03)	0,10	0,45	-	-	0,07	-	-	0,15	0,03	0,10	Remainder	
	EN AC-44100	EN AC-Al Si12(b)	10,5 to 13,5	0,65 (0,55)	0,15 (0,10)	0,55	0,10	-	0,10	0,15	0,10	-	0,20 (0,15)	0,05	0,15	Remainder	
	EN AC-44200	EN AC-Al Si12(a)	10,5 to 13,5	0,55 (0,40)	0,05 (0,03)	0,35	-	-	-	0,10	-	-	0,15	0,05	0,15	Remainder	
	EN AC-44300	EN AC-Al Si12(Fe)	10,5 to 13,5	1,0 (0,45 to 0,9)	0,10 (0,08)	0,55	-	-	-	0,15	-	-	0,15	0,05	0,25	Remainder	
EN AC-44400	EN AC-Al Si9	8,0 to 11,0	0,65 (0,55)	0,10 (0,08)	0,50	0,50	0,10	0,05	0,15	0,15	0,05	0,15	0,05	0,15	Remainder		
AlSi5Cu	EN AC-45000	EN AC-Al Si6Cu4	5,0 to 7,0	1,0 (0,9)	3,0 to 5,0	0,20 to 0,65	0,55	0,15	0,45	2,0	0,30	0,15	0,25 (0,20)	0,05	0,35	Remainder	
	EN AC-45100	EN AC-Al Si5Cu3Mg	4,5 to 6,0	0,60 (0,50)	2,6 to 3,6	0,55	0,15 to 0,45 (0,20 to 0,45)	-	0,10	0,20	0,10	0,05	0,25 (0,20)	0,05	0,15	Remainder	
	EN AC-45200	EN AC-Al Si5Cu3Mn	4,5 to 6,0	0,8 (0,7)	2,5 to 4,0	0,20 to 0,55	0,40	-	0,30	0,55	0,20	0,10	0,20 (0,15)	0,05	0,25	Remainder	
	EN AC-45300	EN AC-Al Si5Cu1Mg	4,5 to 5,5	0,65 (0,55)	1,0 to 1,5	0,55	0,35 to 0,65 (0,40 to 0,65)	-	0,25	0,15	0,15	0,05	0,05 to 0,25 (0,05 to 0,20)	0,05	0,15	Remainder	
	EN AC-45400	EN AC-Al Si5Cu3	4,5 to 6,0	0,60 (0,50)	2,6 to 3,6	0,55	0,05	-	0,10	0,20	0,10	0,05	0,25 (0,20)	0,05	0,15	Remainder	

continued

"continued"

**Table 1 (concluded)**

Alloy Group	Alloy designation		Chemical composition in % by mass													Others <sup>1)</sup>		Aluminium Remainder
			Si	Fe	Cu	Mn	Mg	Cr	Ni	Zn	Pb	Sn	Ti					
														Each	Total			
AlSi9Cu	Numerical	Chemical symbols																
	EN AC-46000	EN AC-Al Si9Cu3(Fe)	8,0 to 11,0	1,3 (0,6 to 1,1)	2,0 to 4,0	0,55	0,05 to 0,55 (0,15 to 0,55)	0,15	0,55	1,2	0,35	0,25	0,25 (0,20)	0,05	0,25		Remainder	
	EN AC-46100	EN AC-Al Si11Cu2(Fe)	10,0 to 12,0	1,1 (0,45 to 1,0)	1,5 to 2,5	0,55	0,30	0,15	0,45	1,7	0,25	0,25	0,25 (0,20)	0,05	0,25		Remainder	
	EN AC-46200	EN AC-Al Si8Cu3	7,5 to 9,5	0,8 (0,7)	2,0 to 3,5	0,15 to 0,65	0,05 to 0,55 (0,15 to 0,55)	-	0,35	1,2	0,25	0,15	0,25 (0,20)	0,05	0,25		Remainder	
	EN AC-46300	EN AC-Al Si7Cu3Mg	6,5 to 8,0	0,8 (0,7)	3,0 to 4,0	0,20 to 0,65	0,30 to 0,60 (0,35 to 0,60)	-	0,30	0,65	0,15	0,10	0,25 (0,20)	0,05	0,25		Remainder	
	EN AC-46400	EN AC-Al Si9Cu1Mg	8,3 to 9,7	0,8 (0,7)	0,8 to 1,3	0,15 to 0,55	0,25 to 0,65 (0,30 to 0,65)	-	0,20	0,8	0,10	0,10	0,10 to 0,20 (0,10 to 0,18)	0,05	0,25		Remainder	
	EN AC-46500	EN AC-Al Si9Cu3(Fe)(Zn)	8,0 to 11,0	1,3 (0,6 to 1,2)	2,0 to 4,0	0,55	0,05 to 0,55 (0,15 to 0,55)	0,15	0,55	3,0	0,35	0,25	0,25 (0,20)	0,05	0,25		Remainder	
	EN AC-46600	EN AC-Al Si7Cu2	6,0 to 8,0	0,8 (0,7)	1,5 to 2,5	0,15 to 0,65	0,35	-	0,35	1,0	0,25	0,15	0,25 (0,20)	0,05	0,15		Remainder	
AlSi(Cu)	EN AC-47000	EN AC-Al Si12(Cu)	10,5 to 13,5	0,8 (0,7)	1,0 (0,9)	0,05 to 0,55	0,35	0,10	0,30	0,55	0,20	0,10	0,20 (0,15)	0,05	0,25		Remainder	
	EN AC-47100	EN AC-Al Si12Cu1(Fe)	10,5 to 13,5	1,3 (0,6 to 1,1)	0,7 to 1,2	0,55	0,35	0,10	0,30	0,55	0,20	0,10	0,20 (0,15)	0,05	0,25		Remainder	
AlSiCuNiMg	EN AC-48000	EN AC-Al Si12CuNiMg	10,5 to 13,5	0,7 (0,6)	0,8 to 1,5	0,35	0,8 to 1,5 (0,9 to 1,5)	-	0,7 to 1,3	0,35	-	-	0,25 (0,20)	0,05	0,15		Remainder	
AlMg	EN AC-51000	EN AC-Al Mg3(b)	0,55 (0,45)	0,55 (0,45)	0,10 (0,08)	0,45	2,5 to 3,5 (2,7 to 3,5)	-	-	0,10	-	-	0,20 (0,15)	0,05	0,15		Remainder	
	EN AC-51100	EN AC-Al Mg3(a)	0,55 (0,45)	0,55 (0,40)	0,05 (0,03)	0,45	2,5 to 3,5 (2,7 to 3,5)	-	-	0,10	-	-	0,20 (0,15)	0,05	0,15		Remainder	
	EN AC-51200	EN AC-Al Mg9	2,5 (0,45 to 0,9)	1,0 (0,45 to 0,9)	0,10 (0,08)	0,55	8,0 to 10,5 (8,5 to 10,5)	-	0,10	0,25	0,10	0,10	0,20 (0,15)	0,05	0,15		Remainder	
	EN AC-51300	EN AC-Al Mg5	0,55 (0,35)	0,55 (0,45)	0,10 (0,05)	0,45	4,5 to 6,5 (4,8 to 6,5)	-	-	0,10	-	-	0,20 (0,15)	0,05	0,15		Remainder	
	EN AC-51400	EN AC-Al Mg5(Si)	1,5 (1,3)	0,55 (0,45)	0,05 (0,03)	0,45	4,5 to 6,5 (4,8 to 6,5)	-	-	0,10	-	-	0,20 (0,15)	0,05	0,15		Remainder	
	EN AC-71000	EN AC-Al Zn5Mg	0,30 (0,25)	0,80 (0,70)	0,15 to 0,35	0,40	0,40 to 0,70 (0,45 to 0,70)	0,15 to 0,60	0,05	4,50 to 6,00	0,05	0,05	0,10 to 0,25 (0,12 to 0,20)	0,05	0,15		Remainder	

Note 1 : Figures in brackets are ingot compositions where they differ from the casting.

Note 2 : In each alloy group, the alloys are arranged in descending order of casting tonnage produced in Europe.

Note 3 : Limits are expressed as a maximum unless shown as a range.

1) "Others", does not include modifying or refining elements such as Na, Sr, Sb and P.

Note 1 : Figures in brackets are ingot compositions where they differ from the casting.

Note 2 : In each alloy group, the alloys are arranged in descending order of casting tonnage produced in Europe.

Note 3 : Limits are expressed as a maximum unless shown as a range.

1) "Others", does not include modifying or refining elements such as Na, Sr, Sb and P.



**Table 2 : Mechanical properties of sand cast alloys for separately cast test pieces**

Alloy group	Alloy designation		Temper designation	Tensile strength $R_m$ MPa min.	Proof stress $R_{p0.2}$ MPa min.	Elongation $A_{50mm}$ % min.	Brinell hardness HBS min.
	Numerical	Chemical symbols					
AlCu	EN AC-21000	EN AC-Al Cu4MgTi	T4	300	200	5	90
	EN AC-21100	EN AC-Al Cu4Ti	T6	300	200	3	95
			T64	280	180	5	85
AlSiMgTi	EN AC-41000	EN AC-Al Si2MgTi	F	140	70	3	50
			T6	240	180	3	85
AlSi7Mg	EN AC-42000	EN AC-Al Si7Mg	F	140	80	2	50
			T6	220	180	1	75
	EN AC-42100	EN AC-Al Si7Mg0,3	T6	230	190	2	75
AlSi10Mg	EN AC-42200	EN AC-Al Si7Mg0,6	T6	250	210	1	85
	EN AC-43000	EN AC-Al Si10Mg(a)	F	150	80	2	50
			T6	220	180	1	75
AlSi	EN AC-43100	EN AC-Al Si10Mg(b)	F	150	80	2	50
			T6	220	180	1	75
	EN AC-43200	EN AC-Al Si10Mg(Cu)	F	160	80	1	50
AlSi5Cu			T6	220	180	1	75
	EN AC-43300	EN AC-Al Si9Mg	T6	230	190	2	75
	EN AC-44000	EN AC-Al Si11	F	150	70	6	45
AlSi5Cu	EN AC-44100	EN AC-Al Si12(b)	F	150	70	4	50
	EN AC-44200	EN AC-Al Si12(a)	F	150	70	5	50
	EN AC-45000	EN AC-Al Si6Cu4	F	150	90	1	60
AlSi9Cu	EN AC-45200	EN AC-Al Si5Cu3Mn	F	140	70	1	60
			T6	230	200	< 1	90
	EN AC-45300	EN AC-Al Si5Cu1Mg	T4	170	120	2	80
AlSi(Cu)			T6	230	200	< 1	100
	EN AC-46200	EN AC-Al Si8Cu3	F	150	90	1	60
	EN AC-46400	EN AC-Al Si9Cu1Mg	F	135	90	1	60
AlMg	EN AC-46600	EN AC-Al Si7Cu2	F	150	90	1	60
	EN AC-47000	EN AC-Al Si12(Cu)	F	150	80	1	50
	EN AC-51000	EN AC-Al Mg3(b)	F	140	70	3	50
AlZnMg	EN AC-51100	EN AC-Al Mg3(a)	F	140	70	3	50
	EN AC-51300	EN AC-Al Mg5	F	160	90	3	55
	EN AC-51400	EN AC-Al Mg5(Si)	F	160	100	3	60
AlZnMg	EN AC-71000	EN AC-Al Zn5Mg	T1	190	120	4	60

1 N/mm<sup>2</sup> = 1 MPa



**Table 3 : Mechanical properties of chill cast alloys for separately cast test pieces**

Alloy group	Alloy designation		Temper designation	Tensile strength $R_m$ MPa min.	Proof stress $R_{p0.2}$ MPa min.	Elongation $A_{50mm}$ % min.	Brinell hardness HBS min.
	Numerical	Chemical symbols					
AlCu	EN AC-21000	EN AC-Al Cu4MgTi	T4	320	200	8	95
	EN AC-21100	EN AC-Al Cu4Ti	T6	330	220	7	95
			T64	320	180	8	90
AlSiMgTi	EN AC-41000	EN AC-Al Si2MgTi	F	170	70	5	50
			T6	260	180	5	85
AlSi7Mg	EN AC-42000	EN AC-Al Si7Mg	F	170	90	2,5	55
			T6	260	220	1	90
			T64	240	200	2	80
AlSi10Mg	EN AC-42100	EN AC-Al Si7Mg0,3	T6	290	210	4	90
			T64	250	180	8	80
	EN AC-42200	EN AC-Al Si7Mg0,6	T6	320	240	3	100
			T64	290	210	6	90
	EN AC-43000	EN AC-Al Si10Mg(a)	F	180	90	2,5	55
			T6	260	220	1	90
			T64	240	200	2	80
	EN AC-43100	EN AC-Al Si10Mg(b)	F	180	90	2,5	55
			T6	260	220	1	90
			T64	240	200	2	80
	EN AC-43200	EN AC-Al Si10Mg(Cu)	F	180	90	1	55
			T6	240	200	1	80
	EN AC-43300	EN AC-Al Si9Mg	T6	290	210	4	90
			T64	250	180	6	80
AlSi	EN AC-44000	EN AC-Al Si11	F	170	80	7	45
	EN AC-44100	EN AC-Al Si12(b)	F	170	80	5	55
	EN AC-44200	EN AC-Al Si12(a)	F	170	80	6	55
AlSi5Cu	EN AC-45000	EN AC-Al Si6Cu4	F	170	100	1	75
	EN AC-45100	EN AC-Al Si5Cu3Mg	T4	270	180	2,5	85
			T6	320	280	< 1	110
	EN AC-45200	EN AC-Al Si5Cu3Mn	F	160	80	1	70
			T6	280	230	< 1	90
	EN AC-45300	EN AC-Al Si5Cu1Mg	T4	230	140	3	85
AlSi9Cu			T6	280	210	< 1	110
	EN AC-45400	EN AC-Al Si5Cu3	T4	230	110	6	75
	EN AC-46200	EN AC-Al Si8Cu3	F	170	100	1	75
	EN AC-46300	EN AC-Al Si7Cu3Mg	F	180	100	1	80
	EN AC-46400	EN AC-Al Si9Cu1Mg	F	170	100	1	75
			T6	275	235	1,5	105
	EN AC-46600	EN AC-Al Si7Cu2	F	170	100	1	75
AlSi(Cu)	EN AC-47000	EN AC-Al Si12(Cu)	F	170	90	2	55
AlSiCuNiMg	EN AC-48000	EN AC-Al Si12CuNiMg	T5	200	185	< 1	90
			T6	280	240	< 1	100
AlMg	EN AC-51000	EN AC-Al Mg3(b)	F	150	70	5	50
	EN AC-51100	EN AC-Al Mg3(a)	F	150	70	5	50
	EN AC-51300	EN AC-Al Mg5	F	180	100	4	60
	EN AC-51400	EN AC-Al Mg5(Si)	F	180	110	3	65
AlZnMg	EN AC-71000	EN AC-Al Zn5Mg	T1	210	130	4	65

1 N/mm<sup>2</sup> = 1 MPa

**Table 4 : Mechanical properties of investment cast alloys for separately cast test bars**

Alloy group	Alloy designation		Temper designation	Tensile strength $R_m$ MPa min.	Proof stress $R_{p0.2}$ MPa min.	Elongation $A_{50mm}$ % min.	Brinell hardness HBS min.
	Numerical	Chemical symbols					
AlCu	EN AC-21000	EN AC-Al Cu4MgTi	T4	300	220	5	90
AlSi7Mg	EN AC-42000	EN AC-Al Si7Mg	F	150	80	2	50
			T6	240	190	1	75
	EN AC-42100	EN AC-Al Si7Mg0,3	T6	260	200	3	75
	EN AC-42200	EN AC-Al Si7Mg0,6	T6	290	240	2	85
AlSi	EN AC-44100	EN AC-Al Si12(b)	F	150	80	4	50
AlSi5Cu	EN AC-45200	EN AC-Al Si5Cu3Mn	F	160	80	1	60
AlMg	EN AC-51300	EN AC-Al Mg5	F	170	95	3	55
1 N/mm <sup>2</sup> = 1 MPa							

## Annex A (informative)

### Comparison of casting characteristics, mechanical and other properties

The annex is included in this standard for the guidance of designers and users of casting alloys and aims to indicate the common casting methods used and to broadly rank the alloys in the property listed. Rankings vary with the production method, and with the heat treatment condition of the casting and rankings are only applicable in the column concerned. Some numerical values are also included for guidance.

**Table A.1 : Mechanical properties of pressure die cast alloys (see 6.3.2.5)**

Alloy group	Alloy designation		Temper designation	Tensile strength $R_m$ MPa min.	Proof stress $R_{p0.2}$ MPa min.	Elongation $A_{50mm}$ % min.	Brinell hardness HBS min.
	Numerical	Chemical					
AlSi10Mg	EN AC-43400	EN AC-Al Si10Mg(Fe)	F	240	140	1	70
AlSi	EN AC-44300	EN AC-Al Si12(Fe)	F	240	130	1	60
	EN AC-44400	EN AC-Al Si9	F	220	120	2	55
AlSi9Cu	EN AC-46000	EN AC-Al Si9Cu3(Fe)	F	240	140	< 1	80
	EN AC-46100	EN AC-Al Si11Cu2(Fe)	F	240	140	< 1	80
	EN AC-46200	EN AC-Al Si8Cu3	F	240	140	1	80
	EN AC-46500	EN AC-Al Si9Cu3(Fe)(Zn)	F	240	140	< 1	80
AlSi(Cu)	EN AC-47100	EN AC-Al Si12Cu1(Fe)	F	240	140	1	70
AlMg	EN AC-51200	EN AC-Al Mg9	F	200	130	1	70
1 N/mm <sup>2</sup> = 1 MPa							

Table A.2 : Comparison of casting characteristics, mechanical and other properties 1)

Alloy Groupe	Alloy designation		Casting method				Castability			Other properties							Mechanical properties <sup>2)</sup>					
	Numerical	Chemical Symbols	Sand casting	Permanent mould casting	Pressure die casting	Investment casting	Fluidity	Resistance to hot tearing	Pressure tightness	Machinability		Resistance to corrosion	Decorative anodizing	Ability to be welded <sup>2)</sup>	Ability to be polished	Linear thermal expansion 10 <sup>-6</sup> /K 293K-373K <sup>3)</sup>	Electrical conductivity MS/m <sup>3)</sup>	Thermal conductivity W/(m.K) <sup>3)</sup>	Strength at room temp <sup>7)</sup>	Strength at elevated temp to 200 °C <sup>7)</sup>	Ductility (Shock resistance) <sup>7) 8)</sup>	Fatigue Strength MPa <sup>9) 10)</sup>
										Al cast	After heat treatment											
AlCu	EN AC-21000	EN AC-Al Cu4MgTi	•	•		•	C	D	D	-	A	D	C	D	B	23	16 to 23	120 to 150	A	B	A	80 to 110
	EN AC-21100	EN AC-Al Cu4Ti	•	•			C	D	D	-	A	D	C	D	B	23	16 to 23	120 to 150	A	B	A	80 to 110
AlSiMgTi	EN AC-41000	EN AC-Al Si2MgTi	•	•			C	C	C	C	B	B	B	B	B	23	19 to 25	140 to 160	B		B	-
AlSi7Mg	EN AC-42000	EN AC-Al Si7Mg	•	•		•	B	A	B	B/C	B	B/C	D	B	C	22	19 to 25	150 to 170	B	C	C	80 to 110
	EN AC-42100	EN AC-Al Si7Mg0,3	•	•		•	B	A	B	-	B	B	D	B	C	22	21 to 27	160 to 180	A	C	A	80 to 110
	EN AC-42200	EN AC-Al Si7Mg0,6	•	•		•	B	A	B	-	B	B	D	B	C	22	20 to 26	150 to 180	A	C	A	80 to 110
	EN AC-43000	EN AC-Al SiMg(a)	•	•			A	A	B	B/C	B	B	E	A	D	21	19 to 25	150 to 170	B	C	C	80 to 110
AlSi10Mg	EN AC-43100	EN AC-Al Si10Mg(b)	•	•			A	A	B	B/C	B	B/C	E	A	D	21	18 to 25	140 to 170	B	C	C	80 to 110
	EN AC-43200	EN AC-Al Si10Mg(Cu)	•	•			A	A	B	B/C	B	C	E	A	C	21	16 to 24	130 to 170	B	C	C	80 to 110
	EN AC-43300	EN AC-Al Si9Mg	•	•			A	A	B	B/C	B	B	E	A	D	21	20 to 26	150 to 180	A	C	A	80 to 110
	EN AC-43400	EN AC-Al Si10Mg(Fe)			•		A	A	C	B	-	C	E	D	D	21	16 to 21	130 to 150	B	C	C	60 to 90

"continued"

"continued"

**Table A.2 : Comparison of casting characteristics, mechanical and other properties <sup>1)</sup> (to be continued)**

Alloy Groupe	Alloy designation		Casting method				Castability			Other properties							Mechanical properties <sup>2)</sup>					
	Numerical	Chemical Symbols	Sand casting	Permanent mould casting	Pressure die casting	Investment casting	Fluidity	Resistance to hot tearing	Pressure tightness	Machinability		Resistance to corrosion	Decorative anodizing	Ability to be welded  2)	Ability to be polished	Linear thermal expansion  10 <sup>-6</sup> /K 293K-373K  3)	Electrical conductivity MS/m  3)	Thermal conductivity W/(m K)  3)	Strength at room temp  7)	Strength at elevated temp to 200 °C  7)	Ductility (Shock resistance)  7) 8)	Fatigue Strength MPa  9) 10)
										Al cast	After heat treatment											
AlSi	EN AC-44000	EN AC-Al Si11	•	•			A	A	A	C <sup>4)</sup>	-	B	E	A	D	21	18 to 24	140 to 170	D	C	A	60 to 90
	EN AC-44100	EN AC-Al Si12(b)	•	•		•	A	A	A	C	-	B/C	E	A	D	20	16 to 23	130 to 160	D	C	B	60 to 90
	EN AC-44200	EN AC-Al Si12(a)	•	•			A	A	A	C	-	B	E	A	D	20	17 to 24	140 to 170	D	C	A	60 to 90
	EN AC-44300	EN AC-Al Si12(Fe)				•	A	A	C	C	-	c	E	D	D	20	16 to 22	130 to 160	B	C	C	60 to 90
	EN AC-44400	EN AC-Al Si9				•	A	A	C	C	C	-	C	E	D	21	16 to 22	130 to 150	C	C	C	60 to 90
AlSi5Cu	EN AC-45000	EN AC-Al Si6Cu4	•	•			B	B	B	B	-	D	D	C	B	22	14 to 17	110 to 120	D	A	C	60 to 90
	EN AC-45100	EN AC-Al Si5Cu3Mg		•			B	B	B	B	A	D	D	C	B	22	16 to 19	130	A	A	C	80 to 110
	EN AC-45200	EN AC-Al Si5Cu3Mn	•	•		•	B	B	B	B	B	D	D	C	B	22	15 to 19	120 a 130	A	A	C	70 to 100
	EN AC-45300	EN AC-Al Si5Cu1Mg	•	•			C	B	C	B	B	D	D	C	B	22	19 to 23	140 to 150	B	B	B	70 to 100
	EN AC-45400	EN AC-Al Si5Cu3		•			B	B	B	B	B	D	D	C	B	22	16 to 19	120 to 130	B	A	A	70 to 100
"continued"																						

Table A.2 : Comparison of casting characteristics, mechanical and other properties <sup>1)</sup> (to be continued)

Alloy designation		Casting method				Castability			Other properties						Mechanical properties <sup>2)</sup>						
Alloy Groupe	Numerical	Chemical Symbols	Sand casting	Permanent mould casting	Pressure die casting	Investment casting	Fluidity	Resistance to hot tearing	Pressure tightness	Machinability		Decorative anodizing	Ability to be welded <sup>2)</sup>	Ability to be polished	Linear thermal expansion 10 <sup>-6</sup> /°K 293K-373K	Electrical conductivity MS/m	Thermal conductivity W/(m.K)	Strength at room temp <sup>7)</sup>	Strength at elevated temp to 200 °C <sup>7)</sup>	Ductility (Shock resistance) <sup>7) 8)</sup>	Fatigue Strength MPa <sup>9) 10)</sup>
										At cast	After heat treatment					<sup>3)</sup>	<sup>3)</sup>				
AlSi9Cu	EN AC-46000	EN AC-Al Si9Cu3(Fe)			•		B	B	C	B	-	E	F	C	21	13 to 17	110 to 120	B	B	D	60 to 90
	EN AC-46100	EN AC-Al Si11Cu2(Fe)			•		A	B	C	C	-	E	F	C	20	14 to 18	120 to 130	B	B	D	60 to 90
	EN AC-46200	EN AC-Al Si8Cu3	•	•	•		B	B	B <sup>5)</sup>	B	-	E	B	C	21	14 to 18	110 to 130	B	A	C	60 to 90
	EN AC-46300	EN AC-Al Si7Cu3Mg		•			B	B	B	C	-	E	B	C	21	14 to 17	110 to 120	D	A	C	60 to 90
	EN AC-46400	EN AC-Al Si9Cu1Mg	•	•			B	B	B	B	B	E	B	D	21	16 to 22	130 to 150	A	B	C	60 to 90
AlSi9Cu	EN AC-46500	EN AC-Al Si9Cu3 (Fe)(Zn)			•		B	B	B	B	-	E	F	C	21	13 to 17	110 to 120	B	A	D	60 to 90
	EN AC-46600	EN AC-Al Si7Cu2	•	•			B	B	B	B	-	E	C	C	21	15 to 19	120 to 130	D	B	C	50 to 70
AlSi9Cu	EN AC-47000	EN AC-Al Si12(Cu)	•	•			A	A	A	C	-	E	A	C	20	16 to 22	130 to 150	D	B	C	60 to 90
	EN AC-47100	EN AC-Al Si12Cu1(Fe)			•		A	A	C	C	-	E	F	C	20	15 to 20	120 to 150	B	B	C	60 to 90
AlSiCu NiMg	EN AC-48000	EN AC-Al Si12CuNiMg		•			A	A	A	-	B	E	A	C	20	15 to 23	130 to 160	A	A	D	80 to 110

"continued"

"continued"

Table A.2 : Comparison of casting characteristics, mechanical and other properties <sup>1)</sup> (concluded)

Alloy Group	Alloy designation		Casting method					Castability <sup>4</sup>				Other properties						Mechanical properties <sup>2)</sup>				
	Numerical	Chemical Symbols	Sand casting	Permanent mould casting	Pressure die casting	Investment casting	Fluidity	Resistance to hot tearing	Pressure tightness	Machinability		Resistance to corrosion	Decorative anodizing	Ability to be welded • 2)	Ability to be polished	Linear thermal expansion 10 <sup>-6</sup> /K 293K-373K	Electrical conductivity MS/m	Thermal conductivity W/(m K)	Strength at room temp 7)	Strength at elevated temp to 200 °C 7)	Ductility (Shock resistance) 7) 8)	Fatigue Strength MPA 9) 10)
										At cast	After heat treatment											
AlSi9Cu	EN AC-51000	EN AC-Al Mg3 (b)	•	•			C	D	D	A	-	A	A	C	A	24	17 to 22	130 to 140	D	B	B	60 to 90
	EN AC-51100	EN AC-Al Mg3 (a)	•	•	•		C	D	D	A	-	A	A	C	A	24	17 to 22	130 to 140	D	B	B	60 to 90
	EN AC-51200	EN AC-Al Mg9	•	•		•	C	D	D	A	-	A	B	C	A	24	11 to 14	60 to 90	C	B	C	60 to 90
	EN AC-51300	EN AC-Al Mg5	•	•			C	D	D	A	-	A	A	C	A	24	15 to 21	110 to 130	D	B	B	60 to 90
	EN AC-51400	EN AC-Al Mg5(Si)	•	•			C	D	D	A	-	A	B	C	A	24	15 to 21	110 to 140	D	B	B	60 to 90
AlSiCu NiMg	EN AC-48000	EN AC-Al Zn5Mg	•	•			C	D	D	A	A	B	B	C	B	24	19 to 21	130 to 140	C	D	B	60 to 90

● Indicates the casting process most commonly used for each alloy : A : Excellent ; D : Poor ; B : Good ; E : Not recommended ; C : Fair ; F : Unsuitable

NOTE : Within a family of alloys the use of two letters with an oblique stroke, for example B/C, allows small differences to be indicated.

Foot notes :

1) Rankings are only applicable in the column concerned.

2) Ability to weld pressure die castings depends on the amount of included gas and in most cases is very poor. With special die casting processes, values from B to C may be obtained.

3) Electrical and thermal conductivities are influenced by variations of chemical composition within a specification, the metallurgical structure, soundness, cooling rate and temper.

4) With Mg > 0,1 the ranking is B.

5) For alloy 46200, pressure tightness becomes C for the pressure die cast version.

6) Best available temper, the best strength and ductility are not found in the same temper.

7) Rankings are derived from tensile and ductility values of the alloys, equally divided from A to D.

8) The ductility (shock resistance) of an alloy is directly related to its elongation, the higher the elongation, the better the shock resistance. In contrast to ferrous alloys, aluminium alloys do not exhibit a transition temperature below which there is a sudden deterioration in shock resistance.

9) Best available casting method.

10) Values for rotating bending conditions up to 50 x 10<sup>6</sup> cycles (Wöhler curves).  
1 N/mm<sup>2</sup> = 1 MPa