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Magnesium and magnesium alloys — Wrought magnesium and magnesium alloys

Magnésium et alliages de magnésium — Magnésium et alliages de magnésium corroyés

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ISO copyright office
CP 401 • Ch. de Blandonnet 8
CH-1214 Vernier, Geneva
Phone: +41 22 749 01 11
Fax: +41 22 749 09 47
Email: copyright@iso.org
Website: www.iso.org

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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.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

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. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT) see www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 79, *Light metals and their alloys*, Subcommittee SC 5, *Magnesium and alloys of cast or wrought magnesium*.

This fifth edition cancels and replaces the fourth edition (ISO 3116:2007), which has been technically revised to include wrought magnesium alloys that have been developed in the past few years.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

Introduction

This document classifies the commercially available magnesium alloys into a number of grades suitable for the application to which they might be put.

Some of the alloys referenced in this document can be the subject of a patent or of patent applications and their listing herein is not to be construed in any way as the granting of a licence under such patent rights.

Magnesium and magnesium alloys — Wrought magnesium and magnesium alloys

1 Scope

This document specifies the chemical composition and mechanical properties of magnesium and magnesium alloys for wrought products in the form of bars and solid sections, tubes and hollow sections, forgings, and plate and sheet.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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 80000-1:2009, *Quantities and units — Part 1: General*

ISO 6892-1, *Metallic materials — Tensile testing — Part 1: Method of test at room temperature*

EN 515, *Aluminium and aluminium alloys — Wrought products — Temper designations*

3 Terms and definitions

No terms and definitions are listed in this document.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at http://www.electropedia.org/

4 Designation

4.1 Material

The material shall be designated by symbols as given in Tables 1 to 47.

The designation for alloys shall consist of a prefix character “M”, which represents magnesium, and not more than three capital letters representing the alloying elements specified in the greatest amount, arranged in order of decreasing percentages, or in alphabetical order if of equal percentages, followed by the respective percentages rounded off to whole numbers and a serial letter in lower case.

The letters used to represent the alloying elements shall be those in Table 1. The third letter is used when the third largest amount of element is above or equal to 1 wt.%. If the third and fourth largest amount of elements are above or equal to 1, the higher amount of elements is taken; if of equal percentage, the third letter is decided by the producer who developed the alloy.

Table 1 — Letters representing alloying elements

Letters	Element	Name of element	Letters	Element	Name of element
A	Al	Aluminium	N	Ni	Nickel
B	Bi	Bismuth	P	Pb	Lead
C	Cu	Copper	Q	Ag	Silver
D	Cd	Cadmium	R	Cr	Chromium
E	RE	Rare Earth	S	Si	Silicon
F	Fe	Iron	T	Sn	Tin
H	Th	Thorium	V	Gd	Gadolinium
J	Sr	Strontium	W	Y	Yttrium
K	Zr	Zirconium	X	Ca	Calcium
L	Li	Lithium	Y	Sb	Antimony
M	Mn	Manganese	Z	Zn	Zinc

In rounding percentages, the nearest whole number shall be used. If two choices are possible, for example when the decimal is followed by a 5 only or a 5 followed only by zeros, the nearest even whole number shall be used. When a range is specified for the alloying element, the rounded mean shall be used in the designation. When only a minimum percentage is specified for the alloying element, the rounded minimum percentage shall be used in the designation. For example:

— an aluminium content of 1,2 wt.% is written as A1;

— an aluminium content of 1,5 wt.% is written as A2;

— an aluminium content of 2,5 wt.% to 3,6 wt.% is written as A3;

— an aluminium content of 2,5 wt.% is written as A2.

The serial letter is defined as “a” or “b” when the two compositions have only minor difference.

For example, ISO-MgAl3Zn1(A) is designated as MAZ31a and ISO-MgAl9Ca1Zn1 is designated as MAXZ911.

A list of national designations corresponding to this document is given in Annex A. A table of physical properties of the listed alloys is given in Annex B.

4.2 Temper designation

The following symbols shall be used for temper designation:

— O: annealed;

— F: as fabricated;

— H × 8: fully hardened (stain hardened to give maximum ultimate tensile strength);

— H × 4: half hardened (stain hardened to give an ultimate tensile strength approximately midway between that of annealed and H × 8 temper);

— H × 2: quarter hardened (stain hardened to give an ultimate tensile strength approximately midway between that of annealed and H × 4 temper);

— H112: Strain hardened from working at elevated temperature or from a limited amount of cold work, and for which there are mechanical properties limits.

— T5: cooled from an elevated temperature shaping process and then artificially aged;

— T6: solution heat treated and then artificially aged.

The temper designations shall be in accordance with EN 515.

Details of heat treatments are given in Annex C.

4.3 Designations of product form

The following symbols shall be used for product form:

— B: bars and solid sections;

— T: tubes and hollow sections;

— F: forgings;

— P: plate and sheet.

4.4 Designation for ordering

EXAMPLE

An order for magnesium bars, conforming to this document, of magnesium alloy MAZ31a, delivered in the as-fabricated condition (F) is as follows:

ISO 3116 - ISO-MgAl3Zn1 (A) (or MAZ31a) - F - B

Tonnage and dimensions shall be specified in addition.

5 Requirements

5.1 Chemical composition

The chemical composition of wrought magnesium alloys, taken as cast analysis at the time the material is cast, shall conform to the requirements for the appropriate material given in Table 2.

5.2 Mechanical properties

The minimum values of the mechanical properties of wrought products in magnesium alloys in the defined temper conditions shall be as given in Tables 3 to 48.

5.3 Frequency of testing

The frequency of testing shall be subject to an agreement between the manufacturer and the purchaser.

6 Sampling

Conditions for sampling, formation of batches and frequency of verification shall be subject to an agreement between the manufacturer and the purchaser.

7 Test pieces

Test pieces shall be taken in the longitudinal direction. For rolled flat products of thickness > 0,6 mm, test pieces may be taken in the long transverse direction.

8 Test methods

8.1 Chemical composition

The determination of the alloying elements given in Table 2 shall be performed in accordance with the relevant International Standards, or other standards as agreed between the supplier and the customer.

8.2 Tensile test

Tensile tests shall be carried out in accordance with ISO 6892-1.

9 Retests

Conditions for retests shall be subject to an agreement between the manufacturer and the purchaser.

10 Rounding of results

The number representing the result for any value specified in this document shall be expressed to the same number of decimal places as the corresponding number in this document. The rounding of numbers shall meet the requirements of ISO 80000-1:2009, B.3, rule A or B. The choice shall be left to the discretion of the manufacturer, unless the use of one of the rules is agreed by the time of acceptance of the order.

Table 2 — Chemical composition of wrought magnesium and magnesium alloys

Alloy group	Material designation			Product form	Composition % (mass fraction)																
	Symbol	Number	Designation		Element	Mg	Al	Zn	Mn	Gd	RE	Li	Zr	Y	Ca		Si	Fe	Cu	Ni	Others each	Others total
Mg	ISO-Mg99.99	ISO-WD11000	MG9999	B	min.	99,99	0,002	0,003	0,002	—	—	—	—	—	—	—	0,002	0,002	0,00 03	0,00 03	0,002	0,01
					max.																
MgAlAg	ISO-MgAl8Ag	ISO-WD25110	MAQ80	F,P	min.	Rem.[a]	7,5	0,35	0,15	—	0,01	—	—	—	0,001	0,02	—	—	—	—	—	—
					max.	—	8,5	0,55	0,35	—	0,10	—	—	—	0,02	0,8 Ag	0,05	0,02	0,02	0,001	0,01	0,30
MgAlCa	ISO-MgAl5Ca1	ISO-WD25120	MAX51	B,T	min.	Rem.	4,5	—	0,15	—	—	—	—	—	0,7	—	—	—	—	—	—	—
					max.	—	5,4	0,30	0,40	—	—	—	—	—	1,5	—	0,10	0,005	0,05	0,005	0,05	0,30
	ISO-MgAl6Ca1	ISO-WD25130	MAX61	B,T,P	min.	Rem.	5,5	—	0,15	—	—	—	—	—	0,7	—	—	—	—	—	—	—
					max.	—	6,5	0,30	0,40	—	—	—	—	—	1,5	—	0,10	0,005	0, 05	0,005	0,05	0,30
	ISO-MgAl6Ca2	ISO-WD25140	MAX62	B,T,P	min.	Rem.	5,5	—	0,15	—	—	—	—	—	1,6	—	—	—	—	—	—	—
					max.	—	6,5	0,30	0,40	—	—	—	—	—	2,5	—	0,10	0,005	0,05	0,005	0,05	0,30
MgAlLi	ISO-MgAl3Li2	ISO-WD26110	MAL32	P	min	Rem.	2,5	0,50	0,20	—	—	1,0	—	—	—	—	—	—	—	—	—	—
					max.	—	3,5	0,8	0,40	—	—	3,0	—	—	—	—	0,01	0,005	0,00 15	0,00 05	0,02	0,15
MgAlMn	ISO-MgAl6Mn	ISO-WD21240	MAM60	B,T,P	Min.	Rem.	5,5	—	0,15	—	—	—	—	—	—	—	—	—	—	—	—	—
					max.	—	6,5	0,30	0,40	—	—	—	—	—	—	—	0,10	0,005	0,01	0,005	0,05	0,30
MgAlSn	ISO-MgAl1Sn1	ISO-WD25150	MAT11	B,P	min.	Rem.	0,50	—	0,10	—	—	—	—	—	—	0,6	—	0,004	—	—	—	—
					max.	—	1,2	—	0,30	—	—	—	—	—	—	1,2Sn	0,01		—	—	0,01	0,15
	ISO-MgAl6Sn1	ISO-WD25160	MAT61	B,P	min.	Rem.	6,0	—	0,2	—	—	—	—	—	—	0,7	—	—	—	—	—	—
					max.	—	6,8	—	0,4	—	—	—	—	—	—	1,3Sn	0,025	0,005	—	—	0,05	0,15
MgAlSr	ISO-MgAl3Sr1	ISO-WD21450	MAJ31	B	min.	Rem.	2,5	0	0,6	—	—	—	—	—	—	0,9	—	—	—	—	—	—
					max.	—	3,5	0,25	0,8	—	—	—	—	—	—	1,5Sr	0,10	0,02	0,05	0,005	0,05	0,15

Key

B = bars and solid sections

T = tubes and hollow sections

F = forgings

P = plate and sheet

RE = neodymium and other heavy rare earth metals

[a] RemAlnder.

[b] Zn+Ag.

Table 2 *(continued)*

Alloy group	Material designation			Product form	Composition % (mass fraction)																	
	Symbol	Number	Designation		Element	Mg	Al	Zn	Mn	Gd	RE	Li	Zr	Y	Ca		Si	Fe	Cu	Ni	Others each	Others total
MgAlZn	ISO-MgAl3Zn1(A)	ISO-WD21150	MAZ31a	B,T,F,P	min.	Rem.	2,4	0,50	0,15	—	—	—	—	—	—	—	—	—	—	—	—	—
					max.	—	3,6	1,5	0,40	—	—	—	—	—	—	—	0,10	0,005	0,05	0,005	0,05	0,30
	ISO-MgAl3Zn1(B)	ISO-WD21151	MAZ31b	B,T,F,P	min.	Rem.	2,4	0,5	0,05	—	—	—	—	—	—	—	—	—	—	—	—	—
					max.	—	3,6	1,5	0,4	—	—	—	—	—	—	—	0,10	0,05	0,05	0,005	0,05	0,30
	ISO-MgAl3Zn1(C)	ISO-WD21153	MAZ31c	B, P	min.	Rem.	2,5	0,50	0,20	—	—	—	—	—	—	—	—	—	—	—	—	—
					max.	—	3,5	1,5	0,40	—	—	—	—	—	—	—	0,05	0,0008	—	—	0,02	0,15
	ISO-MgAl6Zn1	ISO-WD21160	MAZ61	B,T,F, P	min.	Rem.	5,5	0,50	0,15	—	—	—	—	—	—	—	—	—	—	—	—	—
					max.	—	6,5	1,5	0,40	—	—	—	—	—	—	—	0,10	0,005	0,05	0,005	0,05	0,30
	ISO-MgAl8Zn	ISO-WD21170	MAZ80	B,T,F	min.	Rem.	7,8	0,20	0,12	—	—	—	—	—	—	—	—	—	—	—	—	—
					max.	—	9,2	0,8	0,40	—	—	—	—	—	—	—	0,10	0,005	0,05	0,005	0,05	0,30
	ISO-MgAl9Zn1	ISO-WD21180	MAZ91	B,T	min.	Rem.	8,6	0,35	0,15	—	—	—	—	—	—	—	—	—	—	—	—	—
					max.	—	9,5	1,0	0,50	—	—	—	—	—	—	—	0,10	0,005	0,05	0,005	0,05	0,30

Key

B = bars and solid sections

T = tubes and hollow sections

F = forgings

P = plate and sheet

RE = neodymium and other heavy rare earth metals

[a] RemAlnder.

[b] Zn+Ag.

Table 2 *(continued)*

Alloy group	Material designation			Product form	Composition % (mass fraction)																
	Symbol	Number	Designation		Element	Mg	Al	Zn	Mn	Gd	RE	Li	Zr	Y	Ca		Si	Fe	Cu	Ni	Others each	Others total
MgAlCa-Zn	ISO-MgAl3Ca-1Zn1	ISO-WD22110	MAXZ311	B,T	min.	Rem.	2,4	0,5	0,15	—	—	—	—	—	0,7	—	—	—	—	—	—	—
					max.	—	3,6	1,0	0,40	—	—	—	—	—	1,5	—	0,10	0,005	0,05	0,005	0,05	0,30
	ISO-MgAl6Ca-1Zn1	ISO-WD22120	MAXZ611	B,T,P	min.	Rem.	5,5	0,5	0,15	—	—	—	—	—	0,7	—	—	—	—	—	—	—
					max.	—	6,5	1,0	0,40	—	—	—	—	—	1,5	—	0,10	0,005	0,05	0,005	0,05	0,30
	ISO-MgAl6Ca-2Zn1	ISO-WD22130	MAXZ621	B,T,P	min.	Rem.	5,5	0,5	0,15	—	—	—	—	—	1,6	—	—	—	—	—	—	—
					max.		6,5	1,0	0,40	—	—	—	—	—	2,5	—	0,10	0,005	0,05	0,005	0,05	0,30
	ISO-MgAl8Ca-1Zn1	ISO-WD22140	MAXZ811	B, P	min.	Rem.	7,5	0,5	0,15	—	—	—	—	—	0,7	—	—	—	—	—	—	—
					max.	—	8,5	1,5	0,40	—	—	—	—	—	1,5	—	0,10	0,005	0,05	0,005	0,05	0,30
	ISO-MgAl9Ca-1Zn1	ISO-WD22150	MAXZ911	B,T	min.	Rem.	8,6	0,35	0,15	—	—	—	—	—	0,7	—	—	—	—	—	—	—
					max.	—	9,5	1,0	0,50	—	—	—	—	—	1,5	—	0,10	0,005	0,05	0,005	0,05	0,30
	ISO-MgAl9Ca-2Zn1	ISO-WD22160	MAXZ921	B,T	min.	Rem.	8,6	0,35	0,15	—	—	—	—	—	1,6	—	—	—	—	—	—	—
					max.	—	9,5	1,0	0,50	—	—	—	—	—	2,5	—	0,10	0,005	0,05	0,005	0,05	0,30
MgGdY	ISO-MgGd6Y4Zn1	ISO-WD69120	MVWZ641	F,P	min.	Rem.	—	0,3	—	5,5	—	—	0,3	3,0	0,002	0,2	—	—	—	—	—	—
					max.	—	—	1,0	—	6,5	—	—	0,7	4,5	0,020	1,0Ag	0,05	0,02	0,02	0,001	0,01	0,30
	ISO-MgGd7Y5RE1	ISO-WD69130	MVWE751	B	min.	Rem.	—	—	—	6,5	0,9	—	0,4	4,6	—	—	—	—	—	—	—	—
					max.	—	—	—	—	7,5	1,5	—	1,0	5,7	—	—	0,01	—	0,10	0,004	—	0,30
	ISO-MgGd7Y6	ISO-WD69140	MVW76	B	min.	Rem.	—	—	—	6,5	—	—	0,2	5,5	—	—	—	—	—	—	—	—
					max.	—	—	—	0,03	7,5	—	0,2	0,5	6,5	—	—	0,01	0,010	0,02	0,005	0,01	0,30
	ISO-MgGd8Y3	ISO-WD69150	MVW83	B,F,P	min.	Rem.	—	—	—	8,0	—	—	0,4	2,8	—	—	—	—	—	—	—	—
					max.	—	0,02	0,10	0,05	9,0	—	—	0,6	3,5	—	—	0,05	0,01	0,02	0,005	0,01	0,15
	ISO-MgGd8Y4Zn2	ISO-WD69160	MVWZ842	B,F,P	min.	Rem.	—	1,0	0,6	7,5	—	—	—	3,5	—	—	—	—	—	—	—	—
					max.	—	—	2,0	1,0	9,0	—	—	—	5,0	—	—	0,05	0,01	0,02	0,005	0,01	0,15

Key

B = bars and solid sections

T = tubes and hollow sections

F = forgings

P = plate and sheet

RE = neodymium and other heavy rare earth metals

[a] RemAlnder.

[b] Zn+Ag.

Table 2 *(continued)*

Alloy group	Material designation			Product form	Composition % (mass fraction)																	
	Symbol	Number	Designation		Element	Mg	Al	Zn	Mn	Gd	RE	Li	Zr	Y	Ca		Si	Fe	Cu	Ni	Others each	Others total
MgGdZr	ISO-MgGd4Zr1	ISO-WD69170	MVK41	B	min.	Rem.	—	—	—	3,8	—	—	0,8	—	—	—	—	—	—	—	—	—
					max.	—	—	—	0,01	4,2	—	—	1,2	—	—	—	0,02	0,01	0,05	0,01	0,03	0,30
MgLiZn	ISO-MgLi9Zn1	ISO-WD96110	MLZ91	B,T,P	min.	Rem.	—	0,5	—	—	—	8,5	—	—	—	—	—	—	—	—	—	—
					max.	—	0,05	1,5	0,05	—	—	9,5	—	—	0,05	—	0,10	0,005	0,05	0,005	0,05	0,30
MgLiAlZn	ISO-MgLi4Al3Zn3	ISO-WD96120	MLAZ433	P	min.	Rem.	2,5	2,5	—	—	—	3,5	—	—	—	—	—	—	—	—	—	—
					max.	—	3,5	3,5	—	—	—	4,5	—	—	—	—	0,5	0,05	0,05	—	0,05	0,30
	ISO-MgLi-10Al3Zn3	ISO-WD96130	MLAZ1033	P	min.	Rem.	2,5	2,5	—	—	—	9,5	—	—	—	—	—	—	—	—	—	—
					max.	—	3,5	3,5	—	—	—	10,5	—	—	—	—	0,5	0,05	0,05	—	0,05	0,30
MgMn	ISO-MgMn2	ISO-WD43150	MM2	B,T	min.	Rem.	—	—	1,2	—	—	—	—	—	—	—	—	—	—	—	—	—
					max.	—	—	—	2,0	—	—	—	—	—	—	—	0,10	—	0,05	0,01	0,05	0,30
MgYREZr	ISO-MgY4RE3Zr1(B)	ISO-WD95360	MWEK431b	B,F	min.	Rem.	—	—	—	—	2,4	—	0,4	3,7	—	—	—	—	—	—	—	—
					max.	—	—	0,20[b]	0,03	—	4,4	0,2	1,0	4,3	—	—	0,01	0,01	0,02	0,005	0,01	0,30
	ISO-MgY4RE3Zr(C)	ISO-WD95370	MWEK431c	B,P	min.	Rem.	—	—	—	—	2,4	—	0,4	3,7	—	—	—	—	—	—	—	—
					max.	—	—	0,06	0,03	—	4,4	—	1,0	4,3	—	—	—	0,005	0,02	0,00 20	0,01	0,30
	ISO-MgY5RE4Zr1	ISO-WD95350	MWEK541	B,F	min.	Rem.	—	—	—	—	1,5	—	0,4	4,75	—	—	—	—	—	—	—	—
					max.	—	—	0,20[a]	0,03	—	4,0	0,2	1,0	5,5	—	—	0,01	0,01	0,02	0,005	0,01	0,30
	ISO-MgY7RE1Zr1	ISO-WD95380	MWEK711	B	min.	Rem.	—	—	—	—	0,7	—	0,4	6,7	—	—	—	—	—	—	—	—
					max.	—	—	—	—	—	2,0	—	1,0	8,5	—	—	0,01	0,05	—	0,004	—	0,30
	ISO-MgY9RE1Zr1	ISO-WD95390	MWEK911	B	min.	Rem.	—	—	—	—	0,7	—	0,4	8,2	—	—	—	—	—	—	—	—
					max.	—	—	—	—	—	1,9	—	1,0	9,5	—	—	0,01	—	—	0,004	—	0,30

Key

B = bars and solid sections

T = tubes and hollow sections

F = forgings

P = plate and sheet

RE = neodymium and other heavy rare earth metals

[a] RemAlnder.

[b] Zn+Ag.

Table 2 *(continued)*

Alloy group	Material designation			Product form	Composition % (mass fraction)																
	Symbol	Number	Designation		Element	Mg	Al	Zn	Mn	Gd	RE	Li	Zr	Y	Ca		Si	Fe	Cu	Ni	Others each	Others total
MgYZn	ISO-MgY7Zn3	ISO-WD96110	MWZ73	B,T,P	min.	Rem.	—	2,0	—	—	—	—	—	6,2	—	—	—	—	—	—	—	—
					max.	—	—	3,0	—	—	—	—	—	7,4	—	—	0,10	0,005	0,05	0,005	0,05	0,30
	ISO-MgY7Zn5	ISO-WD96120	MWZ75	B,T,P	min.	Rem.	—	4,5	—	—	—	—	—	6,2	—	—	—	—	—	—	—	—
					max.	—	—	5,5	—	—	—	—	—	7,4	—	—	0,10	0,005	0,05	0,005	0,05	0,30
MgZnAl	ISO-MgZn8Al-1Cu1	ISO-WD32110	MZAC811	B	min.	Rem.	0,5	6,0	0,30	—	—	—	—	—	—	—	—	—	0,5	—	—	—
					max.		1,5	8,0	0,70	—	—	—	—	—	—	—	0,01	0,01	1,0	0,01	—	—
MgZnCu	ISO-MgZn2Cu	ISO-WD32120	MZC20	P	min.	Rem.	—	1,5	—	—	0,2	—	—	—	—	—		—	0,30	—	—	—
					max.	—	—	2,5	—	—	0,6Ce	—	—	—	—	—	0,05	0,02	0,6	—	0,01	0,05
MgZn-CuMn	ISO-MgZn-7Cu1Mn1	ISO-WD32150	MZCM711	B	min.	Rem.	—	6,0	0,5	—	—	—	—	—	—	—	—	—	1,0	—	—	—
					max.	—	0,2	7,0	1,0	—	—	—	—	—	—	—	0,01	0,05	1,5	0,01	0,05	0,30
MgZnMn	ISO-MgZn2Mn1	ISO-WD32350	MZM21	B,T,F,P	min.	Rem.	—	1,75	0,6	—	—	—	—	—	—	—	—	—	—	—	—	—
					max.	—	0,1	2,3	1,3	—	—	—	—	—	—	—	0,1	0,06	0,1	0,005	0,05	0,30
	ISO-MgZn2Mn-1RE	ISO-WD32351	MZME210	B,T,P	min.	Rem.	—	1,8	0,50	—	0,10	—	—	—	—	—	—	—	—	—	—	—
					max.	—	0,02	2,4	0,9	—	0,6Ce	—	—	—	—	—	0,01	0,008	0,006	0,004	0,01	0,20
	ISO-MgZn5Mn1	ISO-WD32360	MZM51	B	min.	Rem.	—	4,5	0,5	—	—	—	—	—	—	—	—	—	—	—	—	—
					max.	—	—	6,0	2,0	—	—	—	—	—	—	—	0,01	0,005	0,01	0,004	—	0,30
MgZnZr	ISO-MgZn3Zr	ISO-WD32250	MZK30	B,T,F	min	Rem.	—	2,5	—	—	—		0,45	—	—	—	—	—	—	—	—	—
					max.	—	—	4,0	—	—	—	—	0,8	—	—	—	—	—	—	—	0,05	0,30
	ISO-MgZn6Zr	ISO-WD32260	MZK60	B,T,F	min.	Rem.	—	4,8	—	—	—	—	0,45	—	—	—	—	—	—	—	—	—
					max.	—	—	6,2	—	—	—	—	0,8	—	—	—	—	—	—	—	0,05	0,30

Key

B = bars and solid sections

T = tubes and hollow sections

F = forgings

P = plate and sheet

RE = neodymium and other heavy rare earth metals

[a] RemAlnder.

[b] Zn+Ag.

Table 3 — ISO-Mg 99.99 (MG9999)

Temper	Thickness mm	Tensile strength R_m N/mm² min.	0,2 % Proof stress $R_{p0,2}$ N/mm² min.	Elongation A % min.
Bars and solid sections $t = D$ for solid round bars				
F	1 ≤ t ≤ 10	185	95	22
	10 < t ≤ 40	180	90	21

Table 4 — Alloy ISO-MgAl8Ag (MAQ80)

Temper	Thickness mm	Tensile strength R_m N/mm² min.	0,2 % Proof stress $R_{p0,2}$ N/mm² min.	Elongation A % min.
Forgings				
F	All	320	210	4
Plate and sheet				
F	10 < t ≤ 30	370	250	6
Values for separately forged test pieces shall be agreed between the manufacturer and the customer.				

Table 5 — Alloy ISO-MgAl5Ca1 (MAX51)

Temper	Thickness mm	Tensile strength R_m N/mm² min.	0,2 % Proof stress $R_{p0,2}$ N/mm² min.	Elongation A % min.
Bars and solid sections $t = D$ for solid round bars				
F	1 ≤ t ≤ 65	240	100	8
Tubes and hollow sections				
F	1 ≤ t ≤ 10	240	100	8

Table 6 — Alloy ISO- MgAl6Ca1 (MAX61)

Temper	Thickness mm	Tensile strength R_m N/mm² min.	0,2 % Proof stress $R_{p0,2}$ N/mm² min.	Elongation A % min.
Bars and solid sections $t = D$ for solid round bars				
F	1 ≤ t ≤ 65	250	120	6
Tubes and hollow sections				
F	1 ≤ t ≤ 10	250	120	6
Plate and sheet				
H112	0,5 ≤ t ≤ 3	260	200	4

Table 7 — Alloy ISO-MgAl6Ca2 (MAX62)

Temper	Thickness	Tensile strength	0,2 % Proof stress	Elongation
		R_m	$R_{p0,2}$	A
	mm	N/mm²	N/mm²	%
		min.	min.	min.
Bars and solid sections $t = D$ for solid round bars				
F	1 ≤ t ≤ 65	250	120	6
Tubes and hollow sections				
F	1 ≤ t ≤ 10	250	120	6
Plate and sheet				
H112	0,5 ≤ t ≤ 3	260	200	4

Table 8 — Alloy ISO-MgAl3Li2 (MAL32)

Temper	Thickness	Tensile strength	0,2 % Proof stress	Elongation
		R_m	$R_{p0,2}$	A
	mm	N/mm²	N/mm²	%
		min.	min.	min.
Plate and sheet				
F	All	230	160	18

Table 9 — Alloy ISO-MgAl6Mn (MAM60)

Temper	Thickness	Tensile strength	0,2 % Proof stress	Elongation
		R_m	$R_{p0,2}$	A
	mm	N/mm²	N/mm²	%
		min.	min.	min.
Bars and solid sections $t = D$ for solid round bars				
F	1 ≤ t ≤ 65	250	140	8
Tubes and hollow sections				
F	1 ≤ t ≤ 10	250	140	8
Plate and sheet				
O	0,5 ≤ t ≤ 3	240	140	11
H112	0,5 ≤ t ≤ 3	260	200	4

Table 10 — Alloy ISO-MgAl1Sn1 (MAT11)

Temper	Thickness	Tensile strength	0,2 % Proof stress	Elongation
		R_m	$R_{p0,2}$	A
	mm	N/mm²	N/mm²	%
		min.	min.	min.
Bars and solid sections $t = D$ for solid round bars				
F	t ≤ 16	270	240	16
Plate and sheet				
F	1 < t ≤ 3	220	100	9
F	t ≤ 1	230	200	5
O	t ≤ 1	220	160	12

Table 11 — Alloy ISO-MgAl6Sn1 (MAT61)

Temper	Thickness mm	Tensile strength R_m N/mm² min.	0,2 % Proof stress $R_{p0,2}$ N/mm² min.	Elongation A % min.
Bars and solid sections $t = D$ for solid round bars				
F	t ≤ 16	300	200	13
Plate and sheet				
F	1 < t ≤ 3	280	140	22
F	t ≤ 1	300	230	6
O	t ≤ 1	310	220	23

Table 12 — Alloy ISO-MgAl3Sr1 (MAJ31)

Temper	Thickness mm	Tensile strength R_m N/mm² min.	0,2 % Proof stress $R_{p0,2}$ N/mm² min.	Elongation A % min.
Bars and solid sections $t = D$ for solid round bars				
H8	t ≤ 16	340	220	13

Table 13 — Alloy ISO-MgAL3Zn1 (MAZ31)

Temper	Thickness mm	Tensile strength R_m N/mm² min.	0,2 % Proof stress $R_{p0,2}$ N/mm² min.	Elongation A % min.
Bars and solid sections $t = D$ for solid round bars				
F	1 ≤ t ≤ 10	220	140	10
	10 < t ≤ 65	240	150	10
Tubes and hollow sections				
F	1 ≤ t ≤ 10	220	140	10
Forgings				
F	All	235	130	8
Plate and sheet				
O	0,5 ≤ t ≤ 6	220	105	11
	6 < t ≤ 25	210	105	9
H × 2	0,5 ≤ t ≤ 6	250	160	5
	6 < t ≤ 25	220	120	8
H × 4	0,5 ≤ t ≤ 6	260	200	4
	6 < t ≤ 25	250	160	6
Values for separately forged test pieces shall be agreed between the manufacturer and the customer.				

Table 14 — Alloy ISO-MgAl3Zn1(C) (MAZ31c)

Temper	Thickness mm	Tensile strength R_m N/mm² min.	0,2 % Proof stress $R_{p0,2}$ N/mm² min.	Elongation A % min.
Bars and solid sections $t = D$ for solid round bars				
F	t ≤ 16	290	240	17
Plate and sheet				
O	t ≤ 3	280	230	9

Table 15 — Alloy ISO-MgAL6Zn1 (MAZ61)

Temper	Thickness mm	Tensile strength R_m N/mm² min.	0,2 % Proof stress $R_{p0,2}$ N/mm² min.	Elongation A % min.
Bars and solid sections $t = D$ for solid round bars				
F	1 ≤ t ≤ 10	260	160	6
	10 < t ≤ 40	270	180	10
	40 < t ≤ 65	260	160	10
Tubes and hollow sections				
F	1 < t ≤ 10	260	150	10
Forgings				
F	All	270	152	6
Plate and sheet				
O	0,25 ≤ t ≤ 6	240	140	11
	6 < t ≤ 25	170	120	3
H112	0,5 ≤ t ≤ 6	260	160	4
Values for separately forged test pieces shall be agreed between the manufacturer and the customer.				

Table 16 — Alloy ISO-MgAL8Zn (MAZ80)

Temper	Thickness mm	Tensile strength R_m N/mm² min.	0,2 % Proof stress $R_{p0,2}$ N/mm² min.	Elongation A % min.
Bars and solid sections $t = D$ for solid round bars				
F	t ≤ 40	295	195	10
	40 < t ≤ 60	295	195	8
	60 < t ≤ 130	290	185	8
T5	t ≤ 6	325	205	4
	6 < t ≤ 60	330	230	4
	60 < t ≤ 130	310	205	2
Tubes and hollow sections				
F	t ≤ 10	295	195	7
Forgings				
F	All	290	200	6
Values for separately forged test pieces shall be agreed between the manufacturer and the customer.				

Table 17 — Alloy ISO- MgAl9Zn1 (MAZ91)

Temper	Thickness mm	Tensile strength R_m N/mm² min.	0,2 % Proof stress $R_{p0,2}$ N/mm² min.	Elongation A % min.
Bars and solid sections $t = D$ for solid round bars				
F	1 ≤ t ≤ 65	280	180	8
Tubes and hollow sections				
F	1 ≤ t ≤ 10	280	180	8

Table 18 — Alloy ISO- MgAl3Ca1Zn1 (MAXZ311)

Temper	Thickness mm	Tensile strength R_m N/mm² min.	0,2 % Proof stress $R_{p0,2}$ N/mm² min.	Elongation A % min.
Bars and solid sections $t = D$ for solid round bars				
F	1 ≤ t ≤ 65	220	140	10
Tubes and hollow sections				
F	1 ≤ t ≤ 10	220	140	10

Table 19 — Alloy ISO- MgAl6Ca1Zn1 (MAXZ611)

Temper	Thickness mm	Tensile strength R_m N/mm² min.	0,2 % Proof stress $R_{p0,2}$ N/mm² min.	Elongation A % min.
Bars and solid sections $t = D$ for solid round bars				
F	1 ≤ t ≤ 65	250	120	8
Tubes and hollow sections				
F	1 ≤ t ≤ 10	250	120	8
Plate and sheet				
O	0,5 ≤ t ≤ 6	240	160	8
	6 < t ≤ 25	200	140	4
H112	0,5 ≤ t ≤ 3	260	160	4

Table 20 — Alloy ISO- MgAl6Ca2Zn1 (MAXZ621)

Temper	Thickness mm	Tensile strength R_m N/mm² min.	0,2 % Proof stress $R_{p0,2}$ N/mm² min.	Elongation A % min.
Bars and solid sections $t = D$ for solid round bars				
F	1 ≤ t ≤ 65	250	120	6
Tubes and hollow sections				
F	1 ≤ t ≤ 10	250	120	6
Plate and sheet				
O	0,5 ≤ t ≤ 6	240	140	6
	6 < t ≤ 25	140	120	2
H112	0,5 ≤ t ≤ 3	260	160	4

Table 21 — Alloy ISO- MgAl8Ca1Zn1 (MAXZ811)

Temper	Thickness mm	Tensile strength R_m N/mm² min.	0,2 % Proof stress $R_{p0,2}$ N/mm² min.	Elongation A % min.
Bars and solid sections $t = D$ for solid round bars				
F	1 ≤ t ≤ 65	260	150	6
Plate and sheet				
O	0,5 ≤ t ≤ 6	250	200	6
H112	0,5 ≤ t ≤ 6	300	220	4

Table 22 — Alloy ISO- MgAl9Ca1Zn1 (MAXZ911)

Temper	Thickness	Tensile strength	0,2 % Proof stress	Elongation
		R_m	$R_{p0,2}$	A
	mm	N/mm²	N/mm²	%
		min.	min.	min.
Bars and solid sections $t = D$ for solid round bars				
F	1 ≤ t ≤ 65	280	180	6
Tubes and hollow sections				
F	1 ≤ t ≤ 10	280	180	6

Table 23 — Alloy ISO- MgAl9Ca2Zn1 (MAXZ921)

Temper	Thickness	Tensile strength	0,2 % Proof stress	Elongation
		R_m	$R_{p0,2}$	A
	mm	N/mm²	N/mm²	%
		min.	min.	min.
Bars and solid sections $t = D$ for solid round bars				
F	1 ≤ t ≤ 65	280	180	6
Tubes and hollow sections				
F	1 ≤ t ≤ 10	280	180	6

Table 24 — Alloy ISO-MgGd6Y4Zn1 (MVWZ641)

Temper	Thickness	Tensile strength	0,2 % Proof stress	Elongation
		R_m	$R_{p0,2}$	A
	mm	N/mm²	N/mm²	%
		min.	min.	min.
Forgings				
F	All	350	260	4
Plate and sheet				
F	20 < t ≤ 30	380	280	5
Values for separately forged test pieces shall be agreed between the manufacturer and the customer.				

Table 25 — Alloy ISO-MgGd7Y5RE1 (MVWE751)

Temper	Thickness	Tensile strength	0,2 % Proof stress	Elongation
		R_m	$R_{p0,2}$	A
	mm	N/mm²	N/mm²	%
		min.	min.	min.
Bars and solid sections $t = D$ for solid round bars				
T5	t ≤ 20	450	355	6

Table 26 — Alloy ISO- MgGd7Y6 (MVW76)

Temper	Thickness	Tensile strength	0,2 % Proof stress	Elongation
		R_m	$R_{p0,2}$	A
	mm	N/mm²	N/mm²	%
		min.	min.	min.
Bars and solid sections $t = D$ for solid round bars				
T5A	t ≤ 100	350	230	5
T5B	t ≤ 100	400	260	1

Table 27 — Alloy ISO-MgGd8Y3 (MVW83)

Temper	Thickness	Tensile strength	0,2 % Proof stress	Elongation
		R_m	$R_{p0,2}$	A
	mm	N/mm²	N/mm²	%
		min.	min.	min.
Bars and solid sections $t = D$ for solid round bars				
T5	t ≤ 100	420	320	8
Forgings				
T5	t ≤ 100	380	280	5
Plate and sheet				
T5	t ≤ 100	400	320	6
Values for separately forged test pieces shall be agreed between the manufacturer and the customer.				

Table 28 — Alloy ISO-MgGd8Y4Zn2 (MVWZ842)

Temper	Thickness	Tensile strength	0,2 % Proof stress	Elongation
		R_m	$R_{p0,2}$	A
	mm	N/mm²	N/mm²	%
		min.	min.	min.
Bars and solid sections $t = D$ for solid round bars				
F	10 ≤ t ≤ t 65	350	250	11
T6	10 ≤ t ≤ t 65	500	350	8
Forgings				
F	All	350	280	12
Plate and sheet				
O	6 ≤ t ≤ t 25	350	260	9
T6	6 ≤ t ≤ t 25	450	350	4
Values for separately forged test pieces shall be agreed between the manufacturer and the customer.				

Table 29 — Alloy ISO-MgGd4Zr1 (MVK41)

Temper	Thickness	Tensile strength	0,2 % Proof stress	Elongation
		R_m	$R_{p0,2}$	A
	mm	N/mm²	N/mm²	%
		min.	min.	min.
Bars and solid sections $t = D$ for solid round bars				
F	t ≤ 10	205	140	44
	10 < t ≤ 16	200	130	50

Table 30 — Alloy ISO- MgLi9Zn1 (MLZ91)

Temper	Thickness mm	Tensile strength R_m N/mm² min.	0,2 % Proof stress $R_{p0,2}$ N/mm² min.	Elongation A % min.
Bars and solid sections $t = D$ for solid round bars				
F	1 ≤ t ≤ 10	110	90	20
Tubes and hollow sections				
F	1 ≤ t ≤ 10	110	90	20
Plate and sheet				
O	0,25 ≤ t ≤ 3	130	90	20

Table 31 — Alloy ISO-MgLi4Al3Zn3 (MLAZ433)

Temper	Thickness mm	Tensile strength R_m N/mm² min.	0,2 % Proof stress $R_{p0,2}$ N/mm² min.	Elongation A % min.
Plate and sheet				
F	t ≥ 20	230	140	10

Table 32 — Alloy ISO-MgLi10Al3Zn3 (MLAZ1033)

Temper	Thickness mm	Tensile strength R_m N/mm² min.	0,2 % Proof stress $R_{p0,2}$ N/mm² min.	Elongation A % min.
Plate and sheet				
F	t ≥ 20	140	120	18

Table 33 — Alloy ISO-MgMn2 (MM2)

Temper	Thickness mm	Tensile strength R_m N/mm² min.	0,2 % Proof stress $R_{p0,2}$ N/mm² min.	Elongation A % min.
Bars and solid sections $t = D$ for solid round bars				
F	t ≤ 10	230	120	3
	10 < t ≤ 50	230	120	3
	50 < t ≤ 100	200	120	3
Tubes and hollow sections				
F	t ≤ 2	225	165	2
	t > 2	200	145	1,5

Table 34 — Alloy ISO-MgY4RE3Zr1(B) (MWEK431b)

Temper	Thickness mm	Tensile strength R_m N/mm² min.	0,2 % Proof stress $R_{p0,2}$ N/mm² min.	Elongation A % min.
Bars and solid sections $t = D$ for solid round bars				
T5	$10 \le t \le 50$	230	140	5
	$50 < t \le 100$	220	130	5
T6	$10 \le t \le 50$	220	130	6
	$50 < t \le 100$	220	130	6
Forgings				
T5	All	280	150	6
T6	All	255	160	6
Values for separately forged test pieces shall be agreed between the manufacturer and the customer.				

Table 35 — Alloy ISO- MgY4RE3Zr1(C) (MWEK431c)

Temper	Thickness mm	Tensile strength R_m N/mm² min.	0,2 % Proof stress $R_{p0,2}$ N/mm² min.	Elongation A % min.
Bars and solid sections $t = D$ for solid round bars				
T5	All	305	195	6
Plate and sheet				
T5	All	303	227	12

Table 36 — Alloy ISO-MgY5RE4Zr1 (MWEK541)

Temper	Thickness mm	Tensile strength R_m N/mm² min.	0,2 % Proof stress $R_{p0,2}$ N/mm² min.	Elongation A % min.
Bars and solid sections $t = D$ for solid round bars				
T5	$10 \le t \le 50$	250	170	6
	$50 < t \le 100$	250	160	6
T6	$10 \le t \le 50$	250	160	6
	$50 < t \le 100$	250	160	6
Forgings				
T5	All	290	155	6
T6	All	260	165	6
Values for separately forged test pieces shall be agreed between the manufacturer and the customer.				

Table 37 — Alloy ISO- MgY7RE1Zr1 (MWEK711)

Temper	Thickness	Tensile strength	0,2 % Proof stress	Elongation
		R_m	$R_{p0,2}$	A
	mm	N/mm²	N/mm²	%
		min.	min.	min.
Bars and solid sections $t = D$ for solid round bars				
T5	$t \leq 70$	365	275	8

Table 38 — Alloy ISO- MgY9RE1Zr1 (MWEK911)

Temper	Thickness	Tensile strength	0,2 % Proof stress	Elongation
		R_m	$R_{p0,2}$	A
	mm	N/mm²	N/mm²	%
		min.	min.	min.
Bars and solid sections $t = D$ for solid round bars				
T5	$t \leq 50$	410	340	6

Table 39 — Alloy ISO- MgY7Zn3 (MWZ73)

Temper	Thickness	Tensile strength	0,2 % Proof stress	Elongation
		R_m	$R_{p0,2}$	A
	mm	N/mm²	N/mm²	%
		min.	min.	min.
Bars and solid sections $t = D$ for solid round bars				
F	1 ≤ t ≤ 80	320	240	5
Tubes and hollow sections				
F	2 ≤ t ≤ 10	320	240	5
Plate and sheet				
H112	1 ≤ t ≤ 6	320	240	5

Table 40 — Alloy ISO- MgY7Zn5 (MWZ75)

Temper	Thickness	Tensile strength	0,2 % Proof stress	Elongation
		R_m	$R_{p0,2}$	A
	mm	N/mm²	N/mm²	%
		min.	min.	min.
Bars and solid sections $t = D$ for solid round bars				
F	1 ≤ t ≤ 80	330	250	5
Tubes and hollow sections				
F	1 ≤ t ≤ 10	330	250	5
Plate and sheet				
H112	1 ≤ t ≤ 6	330	250	5

Table 41 — Alloy ISO-MgZn8Al1Cu1 (MZAC811)

Temper	Thickness mm	Tensile strength R_m N/mm² min.	0,2 % Proof stress $R_{p0,2}$ N/mm² min.	Elongation A % min.
Bars and solid sections $t = D$ for solid round bars				
T6	$10 < t \leq 65$	335	290	12

Table 42 — Alloy ISO-MgZn2Cu (MZC20)

Temper	Thickness mm	Tensile strength R_m N/mm² min.	0,2 % Proof stress $R_{p0,2}$ N/mm² min.	Elongation A % min.
Plate and sheet				
F	$0,5 \leq t \leq 3$	320	250	22

Table 43 — Alloy ISO-MgZn7Cu1Mn1 (MZCM711)

Temper	Thickness mm	Tensile strength R_m N/mm² min.	0,2 % Proof stress $R_{p0,2}$ N/mm² min.	Elongation A % min.
Bars and solid sections $t = D$ for solid round bars				
F	$10 \leq t \leq 130$	250	160	7
T6	$10 \leq t \leq 130$	325	300	3

Table 44 — Alloy ISO-MgZn2Mn1 (MZM21)

Temper	Thickness mm	Tensile strength R_m N/mm² min.	0,2 % Proof stress $R_{p0,2}$ N/mm² min.	Elongation A % min.
Bars and solid sections $t = D$ for solid round bars				
F	$t \leq 10$	230	150	8
	$10 < t \leq 75$	245	160	10
Tubes and hollow sections				
F	$t \leq 10$	230	150	8
	$10 < t \leq 75$	245	160	10
Forgings				
F	All	200	125	9
Plate and sheet				
O	$6 \leq t \leq 25$	220	120	8
H × 4	$6 \leq t \leq 25$	250	165	5
Values for separately forged test pieces shall be agreed between the manufacturer and the customer.				

Table 45 — Alloy ISO-MgZn2Mn1RE (MZME210)

Temper	Thickness	Tensile strength	0,2 % Proof stress	Elongation
		R_m	$R_{p0,2}$	A
	mm	N/mm²	N/mm²	%
		min.	min.	min.
Bars and solid sections $t = D$ for solid round bars				
F (340 °C)	t ≤ 16	310	280	19
F (370 °C)	t ≤ 16	300	260	21
F (400 °C)	t ≤ 16	290	250	21
F (430 °C)	t ≤ 16	290	230	19
Tubes and hollow sections				
F	t ≤ 16	250	170	18
Plate and sheet				
F	t ≤ 16	260	180	22

Table 46 — Alloy ISO- MgZn5Mn1 (MZM51)

Temper	Thickness	Tensile strength	0,2 % Proof stress	Elongation
		R_m	$R_{p0,2}$	A
	mm	N/mm²	N/mm²	%
		min.	min.	min.
Bars and solid sections $t = D$ for solid round bars				
T5	t ≤ 100	315	235	10

Table 47 — Alloy ISO-MgZn3Zr (MZK30)

Temper	Thickness	Tensile strength	0,2 % Proof stress	Elongation
		R_m	$R_{p0,2}$	A
	mm	N/mm²	N/mm²	%
		min.	min.	min.
Bars and solid sections $t = D$ for solid round bars				
F	$t \leq 10$	280	200	8
	10 < t ≤ 100	300	225	8
T5	All	275	255	4
Tubes and hollow sections				
T5	All	275	255	4
Forgings				
F	All	290	205	7
Values for separately forged test pieces shall be agreed between the manufacturer and the customer.				

Table 48 — Alloy ISO-MgZn6Zr (MZK60)

Temper	Thickness mm	Tensile strength R_m N/mm² min.	0,2 % Proof stress $R_{p0,2}$ N/mm² min.	Elongation A % min.
Bars and solid sections $t = D$ for solid round bars				
F	t ≤ 50	300	210	5
T5	t ≤ 50	310	230	5
Tubes and hollow sections				
F	All	275	195	5
T5	All	315	260	4
Forgings				
T5	t ≤ 75	290	180	7
T6	t ≤ 75	295	220	4
Values for separately forged test pieces shall be agreed between the manufacturer and the customer.				

Annex A
(informative)

List of national designations corresponding to the ISO designation

Table A.1 — List of national designations corresponding to the ISO designation

Material designation in accordance with ISO 2092	Material designation in accordance with this document	USA ASTM	China GB	Japan JIS	Germany DIN Number	United Kingdom BS Series	France NF
ISO-Mg99.99	MG9999	—	—	—	—	—	—
ISO-MgAl8Ag	MAQ80	—	AQ80M	—	—	—	—
ISO-MgAl5Ca1	MAX51	—	—	AXM510	—	—	—
ISO-MgAl6Ca1	MAX61	—	—	AXM610	—	—	—
ISO-MgAl6Ca2	MAX62	—	—	AXM620	—	—	—
ISO-MgAl3Li2	MAL32	—	AL32M	—	—	—	—
ISO-MgAl6Mn	MAM60	AM60A	—	AM60	—	—	—
ISO-MgAl1Sn1	MAT11	—	AT11M	—	—	—	—
ISO-MgAl6Sn1	MAT61	—	AT61M	—	—	—	—
ISO-MgAl3Sr1	MAJ31	—	AJ31M	—	—	—	—
ISO-MgAl3Zn1(B)	MAZ31b	AZ31B	AZ31S	—	3.5312	MAG 110	G-A3Z1
ISO-MgAl3Zn1(C)	MAZ31c	AZ31D	AZ31N	—	—	—	—
ISO-MgAl6Zn1	MAZ61	AZ61A	AZ61M	AZ61	3.5612	MAG 121	G-A6Z1
ISO-MgAl8Zn	MAZ80	AZ80A	AZ80M	—	3.5812	—	—
ISO-MgAl9Zn1	MAZ91	AZ91A	AZ91M	AZ91	—	—	—
ISO-MgAl3Ca1Zn1	MAXZ311	—	—	AZX311	—	—	—
ISO-MgAl6Ca1Zn1	MAXZ611	—	—	AZX611	—	—	—
ISO-MgAl6Ca2Zn1	MAXZ621	—	—	AZX612	—	—	—
ISO-MgAl8Ca1Zn1	MAXZ811	—	—	AZX811	—	—	—
ISO-MgAl9Ca1Zn1	MAXZ911	—	—	AZX911	—	—	—
ISO-MgAl9Ca2Zn1	MAXZ921	—	—	AZX912	—	—	—
ISO-MgGd6Y4Zn1	MVWZ641	—	VW64M	—	—	—	—
ISO-MgGd7Y5RE1	MVWE751	—	VW75M	—	—	—	—
ISO-MgGd7Y6	MVW76	—	—	—	—	—	—
ISO-MgGd8Y3	MVW83	—	VW83M	—	—	—	—
ISO-MgGd8Y4Zn2	MVWZ842	—	VW84M	—	—	—	—
ISO-MgGd4Zr1	MVK41	—	VK41M	—	—	—	—
ISO-MgLi9Zn1	MLZ91	—	—	LZ91	—	—	—
ISO-MgLi4Al3Zn3	MLAZ433	—	LA43M	—	—	—	—
ISO-MgLi10Al3Zn3	MLAZ1033	—	LA103M	—	—	—	—
ISO-MgMn2	MM2	—	M2M	—	—	—	—
ISO-MgY4RE3Zr1b	MWEK431b	WE43B	—	—	—	—	—
ISO-MgY4RE3Zr1c	MWEK431c	WE43C	—	—	—	—	—
ISO-MgY5RE4Zr1	MWEK541	WE54A	WE54A	—	—	—	—