

---

---

**Magnesium and magnesium alloys —  
Wrought magnesium alloys**

*Magnésium et alliages de magnésium — Alliages de magnésium corroyés*

**iTeh STANDARD PREVIEW**  
**(standards.iteh.ai)**

[ISO 3116:2001](https://standards.iteh.ai/catalog/standards/sist/2574d1d6-ad36-42f8-b9f2-58e97042178b/iso-3116-2001)

<https://standards.iteh.ai/catalog/standards/sist/2574d1d6-ad36-42f8-b9f2-58e97042178b/iso-3116-2001>



**PDF disclaimer**

This PDF file may contain embedded typefaces. In accordance with Adobe's licensing policy, this file may be printed or viewed but shall not be edited unless the typefaces which are embedded are licensed to and installed on the computer performing the editing. In downloading this file, parties accept therein the responsibility of not infringing Adobe's licensing policy. The ISO Central Secretariat accepts no liability in this area.

Adobe is a trademark of Adobe Systems Incorporated.

Details of the software products used to create this PDF file can be found in the General Info relative to the file; the PDF-creation parameters were optimized for printing. Every care has been taken to ensure that the file is suitable for use by ISO member bodies. In the unlikely event that a problem relating to it is found, please inform the Central Secretariat at the address given below.

**iTeh STANDARD PREVIEW**  
**(standards.iteh.ai)**

ISO 3116:2001

<https://standards.iteh.ai/catalog/standards/sist/2574d1d6-ad36-42f8-b9f2-58e97042178b/iso-3116-2001>

© ISO 2001

All rights reserved. Unless otherwise specified, no part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from either ISO at the address below or ISO's member body in the country of the requester.

ISO copyright office  
Case postale 56 • CH-1211 Geneva 20  
Tel. + 41 22 749 01 11  
Fax + 41 22 749 09 47  
E-mail [copyright@iso.ch](mailto:copyright@iso.ch)  
Web [www.iso.ch](http://www.iso.ch)

Printed in Switzerland

## Contents

	Page
Foreword.....	iv
Introduction .....	v
1 Scope .....	1
2 Normative references .....	1
3 Designation .....	1
4 Requirements .....	2
5 Sampling .....	2
6 Test pieces .....	3
7 Test methods.....	3
8 Retests .....	3
9 Rounding of results.....	3
Annex A (informative) List of national designations corresponding to the ISO designation .....	10
Annex B (informative) Physical properties of wrought magnesium alloys.....	11
Annex C (informative) Heat treatment schedules for wrought magnesium alloys.....	12

[ISO 3116:2001](https://standards.iteh.ai/catalog/standards/sist/2574d1d6-ad36-42f8-b9f2-58e97042178b/iso-3116-2001)

<https://standards.iteh.ai/catalog/standards/sist/2574d1d6-ad36-42f8-b9f2-58e97042178b/iso-3116-2001>

## 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.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 3.

Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

Attention is drawn to the possibility that some of the elements of this International Standard may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

International Standard ISO 3116 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 third edition cancels and replaces the second edition (ISO 3116:1981) which has been technically revised.

Annexes A, B and C of this International Standard are for information only.

ISO 3116:2001  
<https://standards.iteh.ai/catalog/standards/sist/2574d1d6-ad36-42f8-b9f2-58e97042178b/iso-3116-2001>

## Introduction

This International Standard 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 International Standard 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.

## iTeh STANDARD PREVIEW (standards.iteh.ai)

[ISO 3116:2001](https://standards.iteh.ai/catalog/standards/sist/2574d1d6-ad36-42f8-b9f2-58e97042178b/iso-3116-2001)

<https://standards.iteh.ai/catalog/standards/sist/2574d1d6-ad36-42f8-b9f2-58e97042178b/iso-3116-2001>

**iTeh STANDARD PREVIEW**  
**(standards.iteh.ai)**

ISO 3116:2001

<https://standards.iteh.ai/catalog/standards/sist/2574d1d6-ad36-42f8-b9f2-58e97042178b/iso-3116-2001>

# Magnesium and magnesium alloys — Wrought magnesium alloys

## 1 Scope

This International Standard specifies the chemical composition and mechanical properties of 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 normative documents contain provisions which, through reference in this text, constitute provisions of this International Standard. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. However, parties to agreements based on this International Standard are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. For undated references, the latest edition of the normative document referred to applies. Members of ISO and IEC maintain registers of currently valid International Standards.

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

ISO 2092, *Light metals and their alloys — Code of designation based on chemical symbols.*

ISO 6892, *Metallic materials — Tensile testing at ambient temperature.*

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

## 3 Designation

### 3.1 Material

The material shall be designated by symbols as given in Tables 1 to 11.

The material symbol designations are in accordance with ISO 2092.

NOTE A list of national designations corresponding to this International Standard is given in annex A and a table of physical properties of the listed alloys is given in annex B.

### 3.2 Temper designation

The following symbols shall be used for temper designation:

- O: annealed;
- F: as fabricated;
- H×8: fully hardened (strain hardened to give maximum ultimate tensile strength);
- H×4: half hardened (strain hardened to give an ultimate tensile strength approximately midway between that of annealed and H×8 temper);

## ISO 3116:2001(E)

- H×2: quarter hardened (strain hardened to give an ultimate tensile strength approximately midway between that of annealed and H×4 temper);
- T5: cooled from an elevated temperature shaping process and then artificially aged;
- T6: solution heat treated and then artificially aged.

The temper designations are in accordance with EN 515.

### 3.3 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.

### 3.4 Designation for ordering

EXAMPLE

An order for magnesium bars, conforming to this International Standard of magnesium alloy ISO-WD 21150, delivered in the as-fabricated condition (F) is as follows:

**ISO 3116 - ISO-MgAl3Zn1 (A) (or WD21150) - F - B** [ISO 3116:2001](https://standards.iteh.ai/catalog/standards/sist/2574d1d6-ad36-42f8-b9f2-c10c42178b/iso-3116-2001)  
Tonnage and dimensions to be specified in addition <https://standards.iteh.ai/catalog/standards/sist/2574d1d6-ad36-42f8-b9f2-c10c42178b/iso-3116-2001>

## 4 Requirements

### 4.1 Chemical composition

The chemical composition of wrought magnesium alloys shall conform to the requirements for the appropriate material given in Table 1.

### 4.2 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 2 to 11.

### 4.3 Frequency of testing

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

## 5 Sampling

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



## 6 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.

## 7 Test methods

### 7.1 Chemical composition

The determination of the alloying elements given in Table 1 shall be performed in accordance with normal practice.

### 7.2 Tensile test

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

## 8 Retests

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

## 9 Rounding of results

The number representing the result for any value specified in this International Standard shall be expressed to the same number of decimal places as the corresponding number in this International Standard. The rounding of numbers shall meet the requirements of annex B, clause B.3, rule A or B in ISO 31-0:1992. 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.

<https://standards.iteh.ai/catalog/standards/sist/2574d1d6-ad36-42f8-b9f2-58e97042178b/iso-3116-2001>

Table 1 — Chemical composition of wrought magnesium alloys

Alloy group	Material designation		Composition % (mass fraction)															
	Symbol	Numbers	Product form <sup>a</sup>	Element	Mg	Al	Zn	Mn	RE <sup>b</sup>	Zr	Y	Li	Si	Fe	Cu	Ni	Others each	Others total
MgAlZn	ISO-MgAl3Zn1(A)	ISO-WD21150	B,T,F,P	min.	Rem. <sup>c</sup>	2,4	0,50	0,15	—	—	—	—	—	—	—	—	—	—
				max.	—	3,6	1,5	0,40	—	—	—	—	—	0,10	0,005	0,05	0,005	0,05
	ISO-MgAl3Zn1(B)	ISO-WD21151	B,T,F,P	min.	Rem.	2,4	0,5	0,05	—	—	—	—	—	—	—	—	—	—
				max.	—	3,6	1,5	0,4	—	—	—	—	—	0,1	0,05	0,05	0,005	0,05
MgMn	ISO-MgAl6Zn1	ISO-WD21160	B,T,F	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
	ISO-MgAl8Zn	ISO-WD21170	B,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
MgZnZr	ISO-MgMn2	ISO-WD43150	B,T	min.	Rem.	—	—	1,2	—	—	—	—	—	—	—	—	—	—
				max.	—	—	—	2,0	—	—	—	—	—	0,10	—	0,05	0,01	0,05
	ISO-MgZn3Zr	ISO-WD32250	B,T,F	min.	Rem.	—	2,5	—	—	0,45	—	—	—	—	—	—	—	—
				max.	—	—	4,0	—	—	0,8	—	—	—	—	—	—	—	0,05
MgZnMn	ISO-MgZn6Zr	ISO-WD32260	B,T,F	min.	Rem.	—	4,8	—	—	0,45	—	—	—	—	—	—	—	—
				max.	—	—	6,2	—	—	0,8	—	—	—	—	—	—	—	0,05
	ISO-MgZn2Mn1	ISO-WD32350	B,T,F,P	min.	Rem.	—	1,75	0,6	—	—	—	—	—	—	—	—	—	—
				max.	—	0,1	2,3	1,3	—	—	—	—	—	0,10	0,06	0,1	0,005	0,05
MgZnCu	ISO-MgZn7Cu1	ISO-WD32150	B	min.	Rem.	—	6,0	0,5	—	—	—	—	—	—	—	—	—	—
				max.	—	0,2	7,0	1,0	—	—	—	—	—	—	0,10	0,05	1,5	0,01
	ISO-MgY5RE4Zr	ISO-WD95350	B,F	min.	Rem.	—	—	—	1,5	0,4	4,75	—	—	—	—	—	—	—
				max.	—	—	0,20	0,03	4,0	1,0	5,5	0,2	0,01	0,010	0,02	0,005	0,01	0,30
MgYREZr	ISO-MgY4RE3Zr	ISO-WD95360	B,F	min.	Rem.	—	—	—	2,4	0,4	3,7	—	—	—	—	—	—	—
				max.	—	—	0,20 <sup>d</sup>	0,03	4,4	1,0	4,3	0,2	0,01	0,010	0,02	0,005	0,01	0,30

a B = Bars and solid sections; T = Tubes and hollow sections; F = Forgings; P = Plate and sheet.  
 b RE = Neodymium and other heavy rare earth metals.  
 c Remainder.  
 d Zn + Ag.

Table 2 — Alloy ISO-MgAl3Zn1

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

Table 3 — Alloy ISO-MgAl6Zn1

Temper	Thickness mm	Tensile strength $R_m$ N/mm <sup>2</sup> min.	0,2 % proof stress $R_{p0,2}$ N/mm <sup>2</sup> min.	Elongation A % min.
<b>Bars and solid sections</b> $t = D$ for solid round bars				
F	$1 \leq t \leq 10$	260	160	6
	$10 < t \leq 40$	270	180	10
	$40 < t \leq 65$	260	160	10
<b>Tubes and hollow sections</b>				
F	$1 \leq t \leq 10$	260	150	10
<b>Forgings</b>				
F	All	270	152	6
NOTE Values for separately forged test pieces must be agreed between manufacturer and customer.				