
Magnezij in magnezijeve zlitine - Magnezijeve zlitine za lite anode

Magnesium and magnesium alloys - Magnesium alloys for cast anodes

Magnesium und Magnesiumlegierungen - Magnesiumlegierungen für Gußanoden

Magnésium et alliages de magnésium - Alliages de magnésium pour anodes coulées

Ta slovenski standard je istoveten z: EN 12438:1998

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ICS:

77.120.20	Magnezij in magnezijeve zlitine	Magnesium and magnesium alloys
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EUROPEAN STANDARD
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EN 12438

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Descriptors: magnesium, magnesium alloys, anodes, castings, ingots, designation, quality, chemical composition, specifications, tests, electrochemical methods

English version

Magnesium and magnesium alloys - Magnesium alloys for cast
anodes

Magnésium et alliages de magnésium - Alliages de
magnésium pour anodes coulées

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Magnesiumlegierungen für Gußanoden

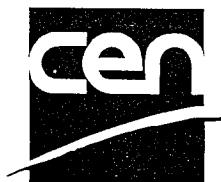
This European Standard was approved by CEN on 25 March 1998.

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.

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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 190 "Foundry technology", the secretariat of which is held by DIN.

Within its programme of work, Technical Committee CEN/TC 190 requested CEN/TC 190/WG 3.10 " Cast magnesium" to prepare the following standard :

EN 12438

Magnesium and magnesium alloys - Magnesium alloys for cast anodes

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 October 1998, and conflicting national standards shall be withdrawn at the latest by October 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.

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Introduction

This European Standard classifies the commercially available magnesium anode alloys into a number of grades suitable for the applications to which they might be put. The annexes A and B describe methods for electrochemical tests with corresponding recommended values. Annex C gives a list of corresponding international designations and former national designations.

1 Scope

This European Standard specifies the chemical composition of magnesium alloy ingots for anodes and chemical composition of magnesium alloy anode castings.

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 1559-1

Founding – Technical conditions of delivery – Part 1: General

EN 1559-5

Founding – Technical conditions of delivery – Part 5: Additional requirements for magnesium alloy castings

ISO 31-0 : 1992

Quantities and units – Part 0: General principles

NOTE: Informative references to documents used in the preparation of this standard, and cited at the appropriate places in the text, are listed in a bibliography, see annex D.

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3 Designations

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3.1 Material

The material shall be designated either by symbol or by number (see tables 1 and 2).

3.2 Casting process

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

- S Sand casting;
- K Permanent mould casting (gravity);
- C Continuous casting.

4 Requirements

4.1 General

The requirements for technical delivery conditions given in EN 1559-1 and EN 1559-5 shall apply.

4.2 Chemical composition

The chemical composition of magnesium based alloy ingots for anodes shall conform to the requirements for the appropriate material given in table 1. The chemical composition of magnesium based alloy anode castings shall conform to the requirements for the appropriate material given in table 2.

Table 1: Chemical composition of magnesium alloy ingots for anode castings

Alloy group	Material designation		Composition in percent (mass fraction)									
	Symbol	Number	Ele- ment	Mg	Al	Zn	Mn	Si	Fe	Cu	Ni	Others each
MgAlZn	EN-MBMgAl3Zn1	EN-MB21130	min.	Rem.	2,6	0,7	0,20	—	—	—	—	—
			max.	—	3,5	1,4	1,0	0,30	0,01	0,05	0,001	0,05
	EN-MBMgAl6Zn1	EN-MB21140	min.	Rem.	5,6	0,7	0,20	—	—	—	—	—
			max.	—	6,5	1,4	1,0	0,30	0,01	0,05	0,001	0,05
MgMn	EN-MBMgAl6Zn3	EN-MB21150	min.	Rem.	5,1	2,1	0,20	—	—	—	—	—
			max.	—	7,0	4,0	1,0	0,30	0,01	0,05	0,001	0,05
	EN-MBMgMn1	EN-MB40010	min.	Rem.	—	—	0,50	—	—	—	—	—
			max.	—	0,01	0,05	1,3	0,05	0,02	0,02	0,001	0,05
	EN-MBMgMn2	EN-MB40020	min.	Rem.	—	—	1,20	—	—	—	—	—
			max.	—	0,01	0,05	2,5	0,05	0,02	0,02	0,001	0,05

NOTE: The material designation is in accordance with EN 1754.

Table 2: Chemical composition of magnesium alloy anode castings

Alloy group	Material designation		Casting process ¹⁾	Composition in percent (mass fraction)											
	Symbol	Number		Ele- ment	Mg	Al	Zn	Mn	Si	Fe	Cu	Ni	Others each	As+Sb+ Pb+Cr+Ni ²⁾	Cd+ Hg+Se ²⁾
MgAlZn	EN-MAMgAl3Zn1	EN-MA21130	S, K, C	min. max.	Rem. —	2,5 3,5	0,6 1,4	0,2 1,0	— 0,3	— 0,02	— 0,05	— 0,002	— 0,05	— 0,1	— 0,01
	EN-MAMgAl6Zn1	EN-MA21140	S, K, C	min. max.	Rem. —	5,5 6,5	0,6 1,4	0,2 1,0	— 0,3	— 0,02	— 0,05	— 0,002	— 0,05	— 0,1	— 0,01
	EN-MAMgAl6Zn3	EN-MA21150	S, K, C	min. max.	Rem. —	5,0 7,0	2,0 4,0	0,2 1,0	— 0,3	— 0,02	— 0,05	— 0,002	— 0,05	— 0,1	— 0,01
	EN-MAMgMn1	EN-MA40010	S, K, C	min. max.	Rem. —	— 0,01	— 0,05	0,5 1,3	— 0,05	— 0,03	— 0,02	— 0,002	— 0,05	— 0,1	— 0,01
MgMn	EN-MAMgMn2	EN-MA40020	S, K, C	min. max.	Rem. —	— 0,01	— 0,05	1,2 2,5	— 0,05	— 0,03	— 0,02	— 0,002	— 0,05	— 0,1	— 0,01

¹⁾ S = Sand casting; K = Permanent mould casting (gravity); C = Continuous casting²⁾ Only for anodes used in potable water (tap water)

NOTE: The material designation is in accordance with EN 1754.

5 Testing

5.1 Analysis of chemical composition

Sufficient samples shall be taken by the manufacturer to assure conformance to the chemical composition requirements of the alloys in tables 1 and 2. Samples shall be taken from the molten metal at the time of casting. Samples shall be representative of the material delivered.

5.2 Electrochemical testing

If applicable, electrochemical testing shall be carried out in accordance with annexes A and B.

6 Rounding of numbers

In recording chemical analysis, 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 rounding of numbers shall meet the requirements of ISO 31-0 : 1992, annex B, clause 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.

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Annex A (normative)

Test method for the determination of the electrode potential of galvanic anodes

A.1 Test pieces

Test pieces shall be sections of the anodes where the core is removed.

Before starting the test, the test pieces shall be degreased with a solvent (e.g. xylol), then be cleaned in running tap water with a plastic brush, then be washed with ethanol and then be dried in air at room temperature.

A.2 Test apparatus

The test shall be carried out with the apparatus shown schematically in figure A.1.

A.3 Test solution

The test solution shall be a sodium chloride solution of concentration 0,0010 mol NaCl/l de-ionized water.

A.4 Electrical connection

A galvanostatical polarization connection shall be used.

A.5 Test procedure

Four single measurements shall be made on four different test pieces.

After putting the test piece into a measuring cell filled with sodium chloride solution, the temperature of the electrolyte solution shall be adjusted to $(60 \pm 3) ^\circ\text{C}$.

The reference electrode (e.g. a saturated calomel electrode) shall be connected to the measuring cell by means of an electrolyte bridge and a Haber-Luggin capillary tube.

The capillary tube shall be moved towards, and located as near as possible to the test piece surface and this distance should not be more than twice the outside diameter of the capillary tube.

Application of the current is galvanostatically effected by using a galvanostat or a 12 V battery.

After 24 h test the potential of electrodes shall be read from the voltmeter.

The four single values and the mean value, each related to the standard hydrogen electrode, shall be given in the test report.

NOTE: With a current density of $(50 \pm 1) \mu\text{A}/\text{cm}^2$ in a sodium chloride solution of concentration 0,0010 mol NaCl/l water at $(60 \pm 3) ^\circ\text{C}$ an average of the electrode potential of the anodes more negative than $U_{\text{H}} = -0,9 \text{ V}$ is recommended. This is to make sure that there is no passivation of the anode in low conductivity electrolytes.