International Standard 121

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Magnesium-aluminium-zinc alloy ingots and alloy castings — Chemical composition, and mechanical properties of sand cast reference test bars

Lingots et pièces moulées en alliages magnésium-aluminium-zinc — Composition chimique et caractéristiques mécaniques des éprouvettes de référence moulées en sable

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FOREWORD

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Draft International Standards adopted by the technical committees are circulated to the member bodies for approval before their acceptance as International Standards by the ISO Council.

International Standard ISO 121 was developed by Technical Committee ISO/TC 79, *Light metals and their alloys.*

It was submitted directly to the ISO Council, in accordance with clause 5.10.1 of part 1 of the Directives for the technical work of ISO. It cancels and replaces ISO Recommendation R 121-1971, which had been approved by the member bodies of the following countries :

Austria	India	Portugal
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Canada	Italy	Switzerland
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Finland	New Zealand	Turkey
France	Norway	USA
Germany, F.R.	Poland	USSR

The member bodies of the following countries had expressed disapproval of the document on technical grounds :

United Kingdom
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This International Standard also cancels and replaces ISO Recommendation R 122-1959, which had been approved by the member bodies of the following countries :

Austria	Hungary	Portugal
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Canada	Japan	Spain
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Czechoslovakia	New Zealand	Switzerland
France	Norway	United Kingdom
Germany, F.R.	Poland	USSR

The member body of the following country had expressed disapproval of the document on technical grounds :

USA

Printed in Switzerland

Magnesium-aluminium-zinc alloy ingots and alloy castings — Chemical composition, and mechanical properties of sand cast reference test bars

1 SCOPE AND FIELD OF APPLICATION

This International Standard specifies the chemical compositions of magnesium-aluminium-zinc alloy[1] ingots for casting purposes and of magnesium-aluminium-zinc alloy castings, together with requirements for the mechanical properties of sand cast reference test bars in these alloys in various tempers as defined in ISO/R 2107.

NOTE — The alloys referred to in table 1 belong to the same family of magnesium-aluminium-zinc alloys, but the development of compositions for use in foundries has proceeded, in different countries and at different times, along two distinct lines :

a) alloys of relatively high zinc content;

b) alloys of relatively low zinc content.

To take account of these differences, it has been necessary to specify the five compositions given in table 1.

Alloy Mg-Al8Zn1, although having wider compositional tolerances, has properties which are suitable for numerous applications for which more closely specified alloys are not necessary.

Differences between these five compositions are less marked in regard to mechanical properties than in regard to some other characteristics, such as casting properties, provided that comparisons are made between alloys in corresponding states.

2 REFERENCES

ISO/R 190, *Tensile testing of light metals and their alloys.*

ISO 2092, *Light metals and their alloys — Code of designation.*[2]

ISO/R 2107, *Light metals and their alloys — Temper designations.*

ISO 2377, *Magnesium alloy sand castings — Reference test bar.*

3 CHEMICAL COMPOSITION

3.1 Magnesium-aluminium-zinc alloy ingots for casting purposes

See table 1.

TABLE 1

Alloy	Chemical composition, %						
	Al	Zn	Mn	Si, max.	Fe, max.	Cu, max.	Ni, max.
Mg-Al8Zn	7,5 to 8,5	0,3 to 0,8	0,20 to 0,6	0,2	0,03	0,15	0,01
Mg-Al9Zn	8,3 to 9,8	0,3 to 0,8	0,20 to 0,6	0,2	0,03	0,15	0,01
Mg-Al9Zn2	8,0 to 9,5	1,7 to 2,3	0,13 to 0,5	0,2	0,03	0,15	0,01
Mg-Al6Zn3	5,0 to 6,5	2,3 to 3,3	0,15 to 0,5	0,2	0,03	0,15	0,01
Mg-Al8Zn1	7,0 to 9,2	0,4 to 1,8	0,2 min.	0,3	0,05	0,3	0,02

1) For designations, see ISO 2092.

2) At present at the stage of draft. (Revision of ISO/R 2092-1971.)

3.2 Castings in magnesium-aluminium-zinc alloys

See table 2.

4 MECHANICAL PROPERTIES OF SAND CAST REFERENCE TEST BARS

The required mechanical properties for sand cast reference test bars are given in table 3.

A standard reference test bar and a sand mould comprising a group of four test bars, complying with the requirements of ISO 2377, will allow the minimum characteristics to be obtained.

Alternatively, test bars of diameter not less than 13 mm, which may be machined to a diameter of not less than 11,3 mm, may be used for reference purposes. As is the case for the ISO bar, such alternative test bars shall be cast in groups of four, entirely in sand moulds, with no other form of additional chilling.

5 CASTING METHODS AND TEMPERS OF PRODUCTS

The casting methods and the tempers of products made from these alloys are given in table 4; the most widely used are indicated in italic.

TABLE 4

Alloy	Casting method	Temper
Mg-Al8Zn	*Sand* Gravity die *Pressure die*	*As cast* *Solution-treated* Fully heat-treated
Mg-Al9Zn	*Sand* *Gravity die* *Pressure die*	*As cast* *Solution-treated* *Fully heat-treated*
Mg-Al9Zn2	*Sand* *Gravity die* Pressure die	As cast *Solution-treated* *Fully heat-treated*
Mg-Al6Zn3	*Sand* Gravity die	*As cast* Solution-treated
Mg-Al8Zn1	*Sand* Gravity die Pressure die	*As cast* Solution-treated

NOTE – Pressure die castings are only supplied "as cast".

TABLE 2

Alloy	Chemical composition, %						
	Al	Zn	Mn	Si, max.	Fe, max.	Cu, max.	Ni, max.
Mg-Al8Zn	7,5 to 9,0	0,2 to 1,0	0,15 to 0,6	0,3	0,05	0,2	0,01
Mg-Al9Zn	8,3 to 10,3	0,2 to 1,0	0,15 to 0,6	0,3	0,05	0,2	0,01
Mg-Al9Zn2	8,0 to 10,0	1,5 to 2,5	0,10 to 0,5	0,3	0,05	0,2	0,01
Mg-Al6Zn3	5,0 to 7,0	2,0 to 3,5	0,10 to 0,5	0,3	0,05	0,2	0,01
Mg-Al8Zn1	7,0 to 9,5	0,3 to 2,0	0,15 min.	0,5	0,05	0,35	0,02

TABLE 3

Alloy	Temper	Tensile strength* R_m N/mm²	0,2 % yield strength $R_{p0,2}$ N/mm²	Elongation A %
Mg-Al8Zn	M	140	75	1
	TB	230	75	6
	TF	235	95	2
Mg-Al9Zn	M	140	75	1
	TB	230	75	6
	TF	235	110	1
Mg-Al9Zn2	M	140	75	1
	TB	230	75	5
	TF	235	110	1
Mg-Al6Zn3	M	160	75	3
Mg-Al8Zn1	M	140	75	(not required)

* See ISO/R 190.