INTERNATIONAL STANDARD

ISO 301

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Zinc alloy ingots intended for castings

Alliages de zinc en lingots destinés à la fonderie

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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.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. 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 document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

ISO 301 was prepared by Technical Committee ISO/TC 18, *Zinc and zinc alloys*, Subcommittee SC 2, *Zinc alloys for casting*.

This second edition cancels and replaces the first edition (ISO 301:1981), which has been technically revised.

Zinc alloy ingots intended for castings

1 Scope

This International Standard specifies the designations, chemical compositions, marking and other requirements for zinc alloys, in ingots (or liquid form), produced for foundry purposes.

2 Normative references

The following referenced documents are indispensable for the application 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 752, *Zinc ingots*

ISO 20081, *Zinc and zinc alloys — Method of sampling — Specifications*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

3.1
zinc alloys
zinc with additions of one or more alloying elements, such as: Al, Mg, Cu

NOTE Zinc alloys are normally supplied in ingot form, but may be available in liquid form.

3.2
ingot
cast product intended for remelting

3.3
jumbo
large ingot, not suitable for manual handling, weighing at least 30 kg

NOTE Normally a jumbo weighs several hundred kilograms.

3.4
bundle
collection of ingots taken from one or more **batches** (3.6) and secured, for example by banding, for the purposes of handling, shipment and storage

3.5
cast
liquid metal which can be cast either by a non-continuous or a continuous casting process

3.5.1
cast from non-continuous casting process
heat
product of one furnace, or crucible melt

3.5.2
cast from continuous casting process
identified quantity of liquid metal

3.6
batch
number of ingots or blocks or jumbos, taken from a single cast

4 Alloy designation

4.1 General

Zinc alloys conforming to this International Standard are designated either by a symbol (see 4.2) or by a number (see 4.3). For marking and labelling purposes only (see Clause 10), the regional or national short designation and/or colour code may be used (see 4.4 and Table 1).

NOTE Informative Annex A gives the relationship between the national alloy designations and the designations used in this International Standard.

4.2 Designation of zinc alloys by a symbol

The designation shall be as given in Table 1.

EXAMPLE ZnAl4Cu1 designates a zinc alloy containing, nominally, 4 % aluminium and 1 % copper.

4.3 Designation of zinc alloys by a number

The designation by a number shall consist of the ISO designation or active regional marking, i.e. two letters ZL (denoting zinc alloy), and four numerals, having the following significance:

— the first two numerals indicate the nominal aluminium content;

— the third numeral indicates the nominal copper content; and

— the fourth numeral indicates the nominal content of the next highest alloying element. If this is less than 1 %, the fourth numeral shall be “0”.

4.4 Colour code

The alloy colour code shall consist of two colours. The colours shall be as given in Table 1, in relation to the alloy symbols or alloy numbers.

5 Manufacture

The zinc alloy shall be manufactured from:

a) zinc ingots or liquid zinc conforming to grade ZN1 or ZN2 of ISO 752, with the addition of appropriate alloying elements (see Table 1), and/or

b) identifiable casting-process returns, e.g. sprues, runners and overflows, and/or

c) identifiable castings rejected from the foundry, or after secondary operations.

Materials that could cause contamination shall not be used.

6 Ordering information

To facilitate commercial relations with the supplier, the purchaser shall state, in the enquiry and order, the following information:

a) the number and date of this International Standard (ISO 301:2006);

b) the designation of the zinc alloy required, by either symbol or number (see 4.2 and 4.3);

c) the total mass required, and whether the ingot or liquid form is required;

d) whether a specific ingot shape is required (see 7.2);

e) whether an inspection document is required (see Clause 11).

7 Requirements

7.1 Chemical composition

The ingots or liquid shall conform to the requirements for chemical composition given for the appropriate alloy in Table 1.

7.2 Shape of ingots

The shape of ingots shall be at the discretion of the supplier, unless a specific shape is agreed between the purchaser and the supplier at the time of ordering [see Clause 6 d)].

7.3 Surface condition of ingots

The surface condition of the ingots shall be such that it does not affect the chemical composition and is not detrimental to the use of the ingots.

8 Sampling

Sampling of zinc alloy ingots and liquid, for verification of compliance with the chemical composition requirements, shall be in accordance with ISO 20081.

9 Chemical analysis

9.1 Analysis methods

The chemical compositions listed in this International Standard shall be determined by the methods of analysis that are specific for zinc and zinc alloys. For this purpose, International Standards together with AS, ASTM, EN and JIS standards apply, the selection of standards being limited by the following rules:

a) the scope of the method of analysis shall fit into the chemical compositions scope of the product;

b) optical emission spectrometry analysis of solid samples is recommended only for production control purposes and end-product certification;

c) in case of commercial dispute, wet-chemical reference methods shall be used;

d) in case of commercial dispute, ISO procedures listed within International Standards (if available) shall be used primarily, EN, ASTM, AS and JIS standards secondarily. In the latter case, priority is given to the method selected by the customer.

9.2 Rounding procedure

In expressing the results for the analysis, the values obtained shall be rounded in one step to the same number of figures used to express the specified limit in Table 1. The following rules shall be used for rounding in one step.

a) If the figure immediately after the last figure to be retained is less than five, the last figure to be retained shall be kept unchanged.

b) If the figure immediately after the last figure to be retained is greater than five, the last figure to be retained shall be increased by one.

c) If the figure immediately after the last figure to be retained is equal to five, the last figure to be retained shall be the nearest even number.

EXAMPLES

— 3,62 becomes 3,6

— 3,65 becomes 3,6

— 3,67 becomes 3,7

— 3,72 becomes 3,7

— 3,75 becomes 3,8

— 3,77 becomes 3,8

10 Marking and labelling

10.1 Ingot

Each ingot shall be marked with the following minimum information:

a) name or identification of manufacturer;

b) where required regionally, the zinc alloy designation, by alloy symbol and/or number, and/or colour code, and/or short designation (see column 4 of Table 1).

NOTE If the ingots are permanently marked with the national/regional marking and are to be colour coded, then the first colour (white) may be omitted and only the second colour, as given in Table 1, is needed in order to identify the alloy.

10.2 Bundle and jumbo

Each bundle of ingots, each bundle of small jumbos and each individually supplied jumbo shall be marked, or labelled, with the following minimum information:

a) name or identification of manufacturer;

b) the zinc alloy designation, by alloy symbol, and/or alloy number, and/or colour code, and/or short designation (see Clause 4 and Table 1);

NOTE If the ingots are permanently marked with the national/regional marking and are to be colour coded, then the first colour (white) may be omitted and only the second colour, as given in Table 1, is needed in order to identify the alloy.

c) the batch or cast reference;

d) total net mass of the bundle, or the mass of each individual jumbo.

11 Inspection documents

If requested by the purchaser at the time of ordering, the supplier shall furnish inspection documents with each consignment. The documentation shall be as chosen by the purchaser [see Clause 6 e)], and shall be in accordance with either a) or b) as follows:

a) **a certificate of chemical composition**, giving the results obtained on the specific casts in the consignment;

b) **a declaration of conformity** of the consignment with the order requirements. This declaration shall include the following information:

   1) name and address of supplier;

   2) date of declaration of conformity;

   3) name and address of the purchaser;

   4) purchaser's order number;

   5) a description of the goods and the quantity supplied;

   6) identification of this International Standard and the designation(s) of the alloy(s) supplied;

   7) the following declaration:

      “The goods detailed have been manufactured to conform with the requirements of the purchaser's order and to the description, quantity and specification detailed thereon.”

      Signed: ……;

      (supplier's authorized representative).

Table 1 — Chemical composition of zinc alloy ingot or liquid

Composition in % (mass fraction)

Alloy symbol	Colour code	Alloy number	Short designation	Element	Al	Cu	Mg	Pb	Cd	Sn	Fe	Zn
ZnAl4	white/yellow	ZL0400	ZL3	min.	3,9	—	0,03	—	—	—	—	Remainder
				max.	4,3	0,1	0,06	0,004 0	0,003 0	0,001 5	0,035	
ZnAl4Cu1	white/black	ZL0410	ZL5	min.	3,9	0,7	0,03	—	—	—	—	Remainder
				max.	4,3	1,1	0,06	0,004 0	0,003 0	0,001 5	0,035	
ZnAl4Cu3	white/green	ZL0430	ZL2	min.	3,9	2,7	0,03	—	—	—	—	Remainder
				max.	4,3	3,3	0,06	0,004 0	0,003 0	0,001 5	0,035	
ZnAl8Cu1	white/blue	ZL0810	ZL8	min.	8,2	0,9	0,02	—	—	—	—	Remainder
				max.	8,8	1,3	0,03	0,005	0,005	0,002	0,035	
ZnAl11Cu1	white/orange	ZL1110	ZL12	min.	10,8	0,5	0,02	—	—	—	—	Remainder
				max.	11,5	1,2	0,03	0,005	0,005	0,002	0,05	
ZnAl27Cu2	white/violet	ZL2720	ZL27	min.	25,5	2,0	0,012	—	—	—	—	Remainder
				max.	28,0	2,5	0,020	0,005	0,005	0,002	0,07	

Annex A
(informative)

Relationship between the alloy designations used in this International Standard and the corresponding designations previously used in a number of countries

Table A.1 — National alloy designations and corresponding designations in this International Standard

Alloy symbol	Alloy number	Europe CEN EN 1774	Japan JIS H5301	Australia AS 1881	USA ASTM B 240	U.N.S. Unified Numbering System
ZnAl4	ZL0400	ZnAl4	ZDC 2	ZnAl4	AG40A	Z33521
ZnAl4Cu1	ZL0410	ZnAl4Cu1	ZDC 1	ZnAl4Cu1	AC41A	Z35530
ZnAl4Cu3	ZL0430	ZnAl4Cu3	—	—	AC43A	Z35540
ZnAl8Cu1	ZL0810	ZnAl8Cu1	—	—	ZA8	Z35635
ZnAl11Cu1	ZL1110	ZnAl11Cu1	—	ZnAl11Cu1	ZA12	Z35630
ZnAl27Cu2	ZL2720	ZnAl27Cu2	—	ZnAl27Cu2	ZA27	Z35840

Bibliography

[1] ISO/TR 7003, *Unified format for the designation of metals*

[2] ISO 3815-1, *Zinc and zinc alloys — Part 1: Analysis of solid samples by optical emission spectrometry*

[3] EN 1774, *Zinc and zinc alloys — Alloys for foundry purposes — Ingot and liquid*

[4] JIS H5301, *Zinc alloys die castings*

[5] AS 1881, *Zinc alloys — Casting ingots and castings — Quality requirements*

[6] ASTM B 240, *Standard specification for zinc and zinc-aluminum (ZA) alloys in ingot form for foundry and die castings*

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