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Centrifugally cast steel and alloy products —

Part 1: General testing and tolerances

Produits en acier et alliages moulés par centrifugation —

Partie 1: Conditions générales d'essais et tolérances

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Contents

Page

Foreword.....	iv
1 Scope.....	1
2 Normative references.....	1
3 Terms and definitions.....	1
4 Materials.....	3
5 Supply.....	3
6 Mechanical tests.....	3
7 Surface finish requirements.....	3
8 Minimum sound wall (MSW) thickness and soundness.....	4
9 Dimensional and shape tolerances.....	4
9.1 General.....	4
9.2 Length.....	4
9.3 Straightness.....	4
9.4 Outside and inside diameters.....	5
10 Inspection procedures and standards of acceptance.....	6
11 Production welding.....	6
12 Supplementary requirements.....	6
12.1 General.....	6
12.2 Pressure test.....	6
12.3 Elevated temperature test.....	6
12.4 Acid etch ring test.....	6
12.5 Magnetic particle test.....	7
12.6 Ferrite determination.....	7
12.7 Corrosion testing.....	7
12.8 Eddy current testing.....	7
12.9 Radiography.....	7
12.10 Ultrasonic testing.....	7

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).

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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 17, *Steel*, Subcommittee SC 11, *Steel castings*.

This third edition cancels and replaces the second edition (ISO 13583-1:2015), of which it constitutes a minor revision. The changes are as follows:

- updated titles to normative references;
- editorial update.

A list of all parts in the ISO 13583 series can be found on the ISO website.

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.

Centrifugally cast steel and alloy products —

Part 1: General testing and tolerances

1 Scope

This document specifies the requirements for horizontal and vertical centrifugally cast steel and alloy products to be used in the following applications:

- a) heat resisting;
- b) corrosion resisting;
- c) general engineering.

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 3651-1, *Determination of resistance to intergranular corrosion of stainless steels — Part 1: Austenitic and ferritic-austenitic (duplex) stainless steels — Corrosion test in nitric acid medium by measurement of loss in mass (Huey test)*

ISO 3651-2, *Determination of resistance to intergranular corrosion of stainless steels — Part 2: Ferritic, austenitic and ferritic-austenitic (duplex) stainless steels — Corrosion test in media containing sulfuric acid*

ISO 4986, *Steel and iron castings — Magnetic particle testing*

ISO 4987, *Steel and iron castings — Liquid penetrant testing*

ISO 4990, *Steel castings — General technical delivery requirements*

ISO 4992-1, *Steel castings — Ultrasonic testing — Part 1: Steel castings for general purposes*

ISO 4992-2, *Steel castings — Ultrasonic testing — Part 2: Steel castings for highly stressed components*

ISO 4993, *Steel castings — Radiographic testing*

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

ISO 6892-2, *Metallic materials — Tensile testing — Part 2: Method of test at elevated temperature*

ISO 13520, *Determination of ferrite content in austenitic stainless steel castings*

3 Terms and definitions

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

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

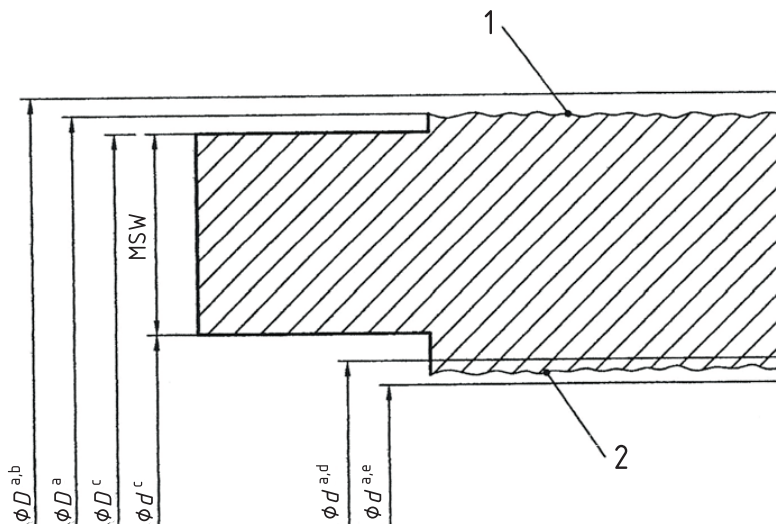
— ISO Online browsing platform: available at <https://www.iso.org/obp>

— IEC Electropedia: available at <https://www.electropedia.org/>

3.1
minimum sound wall thickness
MSW

thickness that remains when all the porosity and roughness associated with the internal and external cast surfaces have been removed by machining

Note 1 to entry: See [Figures 1](#) and [2](#).



Key

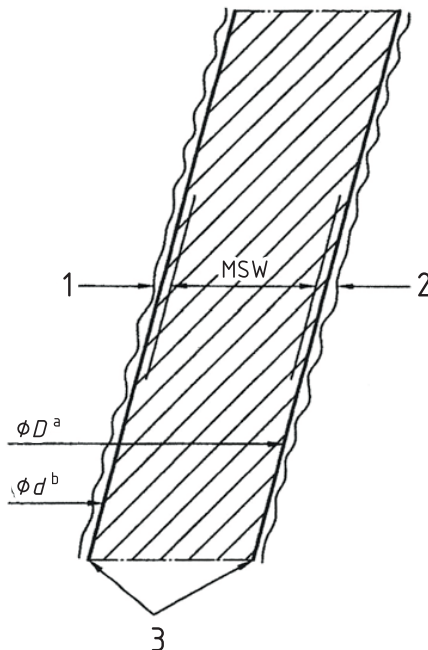
- 1 outside roughness
- 2 inside porosity
- D outside diameter
- d inside diameter
- a As-cast.
- b + tolerance.
- c Machined.
- d + porosity.
- e - tolerance.

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Figure 1 — Horizontal centrifugally cast tube



Key

- 1 inside porosity
- 2 outside roughness
- 3 unmachined surfaces with MSW and additions resulting from tolerances on diameters
- ^a Machined + tolerance.
- ^b Machined – tolerance.

Figure 2 — Vertical centrifugally cast tube

4 Materials

Materials shall be specified by the purchaser.

5 Supply

The product shall conform with the requirements of ISO 4990.

6 Mechanical tests

6.1 Test pieces for mechanical tests shall be taken either from the centrifugally cast product or from separately cast samples from the same melt as the casting and heat treated under the same conditions as the casting they represent. The tensile test shall be carried out in accordance with ISO 6892-1.

Separately cast samples are acceptable only if agreed between purchaser and manufacturer.

6.2 Upon agreement, the tensile test at room temperature may be substituted by an elevated temperature tensile test, a stress to rupture test or a creep test, (see [12.3](#)). The elevated temperature tensile test shall be carried out in accordance with ISO 6892-2.

7 Surface finish requirements

The surface finish shall be agreed between purchaser and manufacturer.

8 Minimum sound wall (MSW) thickness and soundness

8.1 The purchaser may specify an MSW, which may be measured in accordance with either [8.1.1](#) or [8.1.2](#), the method and criteria to be agreed between the purchaser and manufacturer at the time of the enquiry and order.

In the case of cast products supplied with an as-cast internal surface and having a specified MSW thickness, in order to compensate for unsoundness which can be associated with the cast internal surface, it is necessary to add an internal unsoundness allowance. The allowance that will be necessary in any specific cast will vary according to the total as-cast thickness of the cast product and the soundness requirements. In addition, an allowance can be required to accommodate any minor imperfections associated with the as-cast external surface.

8.1.1 A length of the cast product (100 mm minimum length) machined on the inside and outside diameter surfaces to produce a product having at least the specified MSW and dimensions in accordance with the customer's drawing.

8.1.2 The machined profile end (weld preparation) of the product.

8.2 The MSW thickness shall be measured at 90° intervals. All measurements shall be within the MSW tolerance.

9 Dimensional and shape tolerances

9.1 General

The purchaser shall state clearly on the order the tolerances to be achieved, otherwise the following tolerances shall be used.

9.2 Length

The minimum length of the tube shall be agreed upon between the purchaser and manufacturer. In the case where two or more tubes are welded together, if the minimum length is not stated in the enquiry or order, it shall be not less than 1,3 m.

The tolerance on length shall be governed by the diameter of the product as shown in [Table 1](#).

Table 1 — Tolerance on length

Diameter mm	Tolerance mm
≤150	+4 0
>150	+5 0

9.3 Straightness

The deviation from straightness on the full length of tube shall be agreed upon between the purchaser and manufacturer. If no agreement is made, the deviation from straightness shall be at the discretion of the manufacturer.

The cast product may be mechanically straightened at room temperature.

All straightening shall be carried out prior to surface inspection.

9.4 Outside and inside diameters

9.4.1 The tolerance on the outside diameter of the as-cast product shall be in accordance with [Table 2](#).

Table 2 — Tolerance on outside diameter, D

Diameter of product mm	Tolerance mm
≤150	+2 0
>150 but ≤300	+2,5 0
>300 but ≤500	+4 0
>500 but ≤750	+5 0
>750 but ≤1 000	+6 0
>1 000	+8 0

9.4.2 The tolerances on the machined surfaces shall be stated on the enquiry and order. If tolerances are not given, the following tolerances shall be used:

— tolerance on outside diameter +1,5 mm
0 mm

— tolerance on inside diameter 0 mm

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9.4.3 The tolerance on inside diameter, d , of the as-cast product shall be dependent upon the wall thickness of the product as shown in [Table 3](#). For products with an inside diameter greater than 900 mm and a wall thickness greater than 100 mm, the tolerance shall be by agreement between purchaser and manufacturer.

Table 3 — Tolerance on inside diameter, d

d mm	Wall thickness mm	Tolerance mm
≤30	—	0 -3
>30 but ≤300	≤25	0 -3
	>25 but ≤50	0 -4
	>50 but ≤100	0 -5
>300 but ≤900	≤50	0 -4
	>50 but ≤80	0 -5
	>80 but ≤100	0 -6

10 Inspection procedures and standards of acceptance

10.1 As-cast outside diameter surfaces shall be visually examined.

10.1.1 Indications whose depth violates the minimum sound wall thickness are unacceptable.

10.1.2 Cracks are unacceptable.

10.1.3 Grinding and dye penetrant examination, in accordance with ISO 4987, may be used to verify the type, presence, and depth of the indications.

10.2 Unless otherwise stated on the enquiry and order, the dye penetrant inspection of machined end weld bevels shall have a minimum acceptance level of severity level 01 in accordance with ISO 4987. In the event of failure to meet the above requirement, the manufacturer may reduce the length of the tube.

The tube shall then be re-inspected to the above acceptance level.

10.3 Unless otherwise stated on the enquiry or order, the dye penetrant inspection of machined internal and external surfaces shall have a minimum acceptance level of severity level 4 in accordance with ISO 4987.

When dye penetrant inspection of the bore surface is required, the method and areas to be examined shall be agreed upon by the manufacturer and purchaser.

11 Production welding

Finishing welding shall not be carried out unless agreed upon by purchaser and manufacturer.

12 Supplementary requirements

12.1 General

These may be specified by the purchaser and agreed at the time of the enquiry and order.

12.2 Pressure test

This shall be carried out in accordance with ISO 4990.

12.3 Elevated temperature test

12.3.1 Tensile test at elevated temperature shall be carried out in accordance with ISO 6892-2.

12.3.2 The test conditions for stress to rupture tests and creep tests shall be agreed upon by the purchaser and manufacturer.

12.4 Acid etch ring test

A ring may be taken for macro etching from the end of the product to ascertain the proportion of columnar and equiaxed structure.

The test conditions shall be agreed upon by purchaser and manufacturer.