BS ISO 4991:2024

BSI Standards Publication

# Steel castings for pressure purposes

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# National foreword

This British Standard is the UK implementation of ISO 4991:2024. It supersedes BS ISO 4991:2015, which is withdrawn.

The UK participation in its preparation was entrusted to Technical Committee ISE/111, Steel Castings and Forgings.

A list of organizations represented on this committee can be obtained on request to its committee manager.

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# Steel castings for pressure purposes

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# Contents

Page

**Foreword** ... **iv**
**1 Scope** ... **1**
**2 Normative references** ... **1**
**3 Terms and definitions** ... **1**
**4 Information to be supplied by the purchaser** ... **1**
**5 Heat treatment** ... **2**
**6 Welding** ... **2**
**7 Requirements** ... **2**
7.1 Chemical composition ... 2
7.2 Mechanical properties ... 2
**8 Inspection and testing** ... **3**
8.1 General ... 3
8.2 Sampling ... 3
8.3 Formation of test lots ... 3
8.4 Non-destructive testing ... 3
8.5 Marking ... 3
**9 Supplementary requirements** ... **3**
**Annex A** (normative) **Supplementary requirements** ... **11**
**Annex B** (informative) **Welding conditions** ... **13**
**Annex C** (informative) **Creep properties** ... **15**
**Annex D** (informative) **UNS cast grades similar to ISO cast grades** ... **18**
**Bibliography** ... **20**

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Full document details: BS ISO 4991:2024

# 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 document 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).

ISO draws attention to the possibility that the implementation of this document may involve the use of (a) patent(s). ISO takes no position concerning the evidence, validity or applicability of any claimed patent rights in respect thereof. As of the date of publication of this document, ISO had not received notice of (a) patent(s) which may be required to implement this document. However, implementers are cautioned that this may not represent the latest information, which may be obtained from the patent database available at www.iso.org/patents. ISO shall not be held responsible for identifying any or all such patent rights.

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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 fourth edition cancels and replaces the third edition (ISO 4991:2015), which has been technically revised.

The main changes are as follows:

— grade names and numbers have been corrected;

— a cast steel grade for higher temperature applications (550 °C to 700 °C) has been added;

— two austenitic-ferritic stainless steel (duplex) grades have been added for pressure parts up to 250 °C;

— the application temperature range of some special steels has been extended;

— qualification requirements for welders have been added.

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.

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# Steel castings for pressure purposes

## 1 Scope

This document covers steel castings for pressure containing parts.

It includes materials which are used for the manufacture of components subject to pressure vessel codes and components not subject to codes.

This document relates to castings manufactured from unalloyed and alloyed steel grades (characterized by their chemical composition given in Table 1, and mechanical properties in Tables 2, 3, 4 and 5).

NOTE Annex D gives information on ISO grade designation and available UNS numbers which are similar to the ISO grade designation.

## 2 Normative references

The following documents are referred to in the text in such a way that some or all of their content are requirements for 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 148-1, *Metallic materials — Charpy pendulum impact test — Part 1: Test method*

ISO 4885, *Ferrous materials — Heat treatments — Vocabulary*

ISO/TS 4949, *Steel names based on letter symbols*

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

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 9606-1, *Qualification testing of welders — Fusion welding — Part 1: Steels*

ISO 11970, *Specification and qualification of welding procedures for production welding of steel castings*

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

## 3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 4885, ISO/TS 4949 and ISO 4990 apply.

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

— ISO Online browsing platform: available at https://www.iso.ort/obp.

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

## 4 Information to be supplied by the purchaser

Materials specified in this document shall conform to the applicable requirements of ISO 4990, including the supplementary requirements listed in Annex A that are specified in the enquiry and purchase order.

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## 5 Heat treatment

The type of heat treatment shall conform with Table 6 for the specified grades. The temperatures given are for information only.

When a grade may be delivered at different strength levels depending on the type of heat treatment (see Table 2), the purchaser shall state at the time of enquiry and order the type of heat treatment required.

The symbols for the type of heat treatment are as follows:

— +N normalized

— +QT quenched and tempered

— +AT solution treated

NOTE For definitions, see ISO 4885.

## 6 Welding

Welding is permitted, unless otherwise agreed. All the welds shall conform to the same criteria for non-destructive testing as the relevant part of the casting. Welding shall be carried out in accordance with ISO 11970, and the welding personnel for permanent joining of components shall be qualified according to ISO 9606-1.

The welding conditions are given in Annex B.

## 7 Requirements

### 7.1 Chemical composition

An analysis of each heat shall be made by the manufacturer to determine the contents of the specified elements.

The chemical composition shall comply with the values given in Table 1.

Permissible deviations for the product analysis are specified in ISO 4990.

### 7.2 Mechanical properties

The mechanical properties shall comply with the values given in Tables 2, 3, 4 and 5.

Mechanical properties shall be measured on test pieces taken from test blocks (according to ISO 4990).

The tensile tests at room temperature shall be carried out in accordance with ISO 6892-1 and, if specified, impact tests in accordance with ISO 148-1.

If required by agreement at the time of enquiry and order, impact energy properties at low temperature shall conform with Table 3.

If required by agreement at the time of enquiry and order, impact energy values at room temperature shall conform with Table 4.

If required by agreement at the time of enquiry and order, verification of the elevated temperature proof stress values shall be carried out at elevated temperatures in accordance with ISO 6892-2. In such a case, the values shall conform with Table 5.

Creep resistance mean values are given for information, for some grades in Annex C.

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# 8 Inspection and testing

## 8.1 General

For all products ordered to the requirements of this document, specific inspection and testing is required.

## 8.2 Sampling

Test blocks shall be heat treated in production furnaces to the same procedure as the castings they represent.

Test pieces shall not be cut from the test block until the latter has been heat treated.

## 8.3 Formation of test lots

The formation of test lots shall be carried out in accordance with ISO 4990.

## 8.4 Non-destructive testing

The following information shall be given at the time of enquiry and order in accordance with ISO 4990:

— non-destructive testing required,

— area to be tested,

— acceptance criteria.

## 8.5 Marking

Castings shall be marked for material identification.

a) Heat numbers or serial numbers that are traceable to heat numbers, shall be marked on all castings.

b) For small castings, it may be agreed at the time of the enquiry and order that they may be batched and that their identification is marked on a label attached to each batch.

c) Castings shall be marked with the manufacturer's identification or symbol except where other provisions have been made between the manufacturer and purchaser.

d) When more than one heat treatment type is available, the heat treatment applied shall be marked with a suffix added to the grade designation (see Table 2).

# 9 Supplementary requirements

This document also specifies supplementary requirements, which may be applied to steel castings. These requirements are provided for use when additional testing or inspection is desired and apply only when individually specified by the purchaser.

A list of supplementary requirements which may be used at the option of the purchaser is given in ISO 4990 and in Annex A.

If ferrite determination is required for austenitic and austenitic-ferritic grades, it may be made using ISO 13520.

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