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## High strength cast steels for general engineering and structural purposes

*Aciers moulés à haute résistance pour construction mécanique et  
construction métallique d'usage général*

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ISO 9477:2015

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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.

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](http://www.iso.org/directives)).

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. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see [www.iso.org/patents](http://www.iso.org/patents)).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation on the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the WTO principles in the Technical Barriers to Trade (TBT) see the following URL: [Foreword - Supplementary information](http://Foreword - Supplementary information).

The committee responsible for this document is ISO/TC 17, *Steel*, Subcommittee SC 11, *Steel castings*.

This second edition cancels and replaces the first edition (ISO 9477:1992), which has been technically revised with the following changes:

- [Clause 7](#) has been revised.

# High strength cast steels for general engineering and structural purposes

## 1 Scope

This International Standard specifies requirements for four grades of heat treated cast carbon and alloy steels for general engineering and structural purposes.

In cases where castings are produced by welding component parts together, this International Standard does not cover the welding process or the properties of the weldment.

The four steel grades are intended for service at ambient temperature. However, properties at other temperatures can be agreed on through the use of supplementary requirements in ISO 4990.

## 2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

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

## 3 General conditions for delivery

Materials furnished in accordance with this International Standard shall conform to the applicable requirements of ISO 4990, including the supplementary requirements that are indicated in the inquiry and purchase order.

## 4 Heat treatment

The type of heat treatment is left to the discretion of the manufacturer, unless specifically agreed upon at the time of ordering.

## 5 Chemical requirements

**5.1** The maximum contents of silicon, sulphur, and phosphorous shall be 0,60 %, 0,025 %, and 0,030 %, respectively.

**5.2** The chemical composition may be agreed upon between the manufacturer and purchaser through the use of supplementary requirement [7.2](#).

**5.3** The maximum carbon equivalent allowed in the supplied chemical composition may be agreed upon between the manufacturer and purchaser through the use of supplementary requirement [7.3](#).

## 6 Mechanical properties

**6.1** Steel used for castings shall conform to the mechanical properties given in [Table 1](#).

**6.2** Either the reduction of area or the impact strength shall be determined and shall conform to the requirements specified for the grade in [Table 1](#). The choice of test will be at the discretion of the manufacturer, unless specified by the purchaser at the time of ordering.

**6.3** In the case of castings supplied in the quench and tempered condition and where the thickness is >75 mm, ISO 4990:2015, B.6.1.3 shall be required.

## 7 Supplementary requirements

**7.1** A list of standardized supplementary requirements for use at the option of the purchaser is given in ISO 4990.

**7.2** The chemical composition shall be selected by an agreement between the manufacturer and the purchaser.

**7.3** The carbon equivalent, CE, of the supplied alloy is defined as follows:

$$CE = C + Mn/6 + (Cr + Mo + V)/5 + (Ni + Cu)/15$$

The carbon equivalent shall be limited to a maximum value by an agreement between the manufacturer and the purchaser.

**Table 1 — Mechanical properties at ambient temperatures on test blocks (28 mm thick)**

Steel grade	$R_{eH}$	$R_m$	$A$	By choice, according to order	
	min. MPa	min. MPa	min. %	$Z^a$ min. %	$KV^a$ min. J
410–620	410	620 to 770	16	40	20
540–720	540	720 to 870	14	35	20
620–820	620	820 to 970	11	30	18
840–1030	840	1 030 to 1 180	7	22	15

$R_{eH}$  if measurable, otherwise the 0,2 % proof stress

$R_m$  tensile strength

$A$  percentage elongation

$Z$  reduction of area

$KV$  impact energy

1 MPa = 1 N/mm<sup>2</sup>

**NOTE 1** The required mechanical properties are obtained from 28 mm thick standard test blocks, cast either separately from, or attached to, the casting that they represent. The test values so exhibited therefore represent the quality of steel from which the castings have been poured. They do not necessarily represent the properties of the casting themselves, which might be affected by solidification conditions and the rate of cooling during heat treatment, which, in turn, are influenced by casting thickness, size, and shape, if the thickness of the casting is considerably greater than 75 mm, the application of the supplementary requirement in ISO 4990:2015, B.6.1.3 is mandatory.

**NOTE 2** Ambient temperature is taken as 23 °C ± 5 °C.

<sup>a</sup> See [Clause 6](#).

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