
**Steel flat products for pressure
purposes — Technical delivery
conditions —**

**Part 2:
Non-alloy and alloy steels with
specified elevated temperature
properties**

*Produits plats en acier pour service sous pression — Conditions
techniques de livraison —*

*Partie 2: Aciers non alliés et aciers alliés avec caractéristiques
spécifiées à température élevée*

ISO 9328-2:2018

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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).

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).

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 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 the following URL: www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 17, *Steel*, Subcommittee SC 10, *Steel for pressure purposes*.

This fourth edition cancels and replaces the third edition (ISO 9328-2:2011), which has been technically revised. The following changes have been made:

- the term “product thickness” has been replaced with “nominal thickness”;
- normalizing rolling is also considered for steel grade 16Mo3 (see [Annex A](#));
- the technical data in [Annex A](#) have been aligned with EN 10028-2;
- in [Table B.1](#), “B ≤ 0,001 0” has been added and the specifications of “P” and “S” have been changed.

A list of all the parts in the ISO 9328 series can be found on the ISO website.

Steel flat products for pressure purposes — Technical delivery conditions —

Part 2:

Non-alloy and alloy steels with specified elevated temperature properties

1 Scope

This document specifies the technical delivery conditions for plates and strip for pressure equipment made of non-alloy and alloy steels as specified in [Tables A.1](#) and [B.1](#). The requirements and definitions of ISO 9328-1 also apply to this document.

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 4948-1, *Steels — Classification — Part 1: Classification of steels into unalloyed and alloy steels based on chemical composition*

ISO 4948-2, *Steels — Classification — Part 2: Classification of unalloyed and alloy steels according to main quality classes and main property or application characteristics*

ISO 9328-1:2018, *Steel flat products for pressure purposes — Technical delivery conditions — Part 1: General requirements*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 9328-1 apply.

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

- IEC Electropedia: available at <http://www.electropedia.org/>
- ISO Online browsing platform: available at <https://www.iso.org/obp>

4 Classification and designation

4.1 Classification

In accordance with ISO 4948-1 and ISO 4948-2, the steel grades P235GH, P265GH, P295GH and P355GH (see [Annex A](#)) and PT410GH, PT450GH and PT480GH (see [Annex B](#)) are non-alloy-quality steels. All other grades are alloyed special steels.

4.2 Designation

Shall be in accordance with ISO 9328-1.

NOTE 1 Non-alloy grades in [Annex A](#) are classified in accordance with their yield strength, non-alloy grades in [Annex B](#) are classified in accordance with their tensile strength.

NOTE 2 Information on the designation of comparable steel grades in national or regional standards is given in [Annex C](#).

5 Information to be supplied by the purchaser

5.1 Mandatory information

Shall be in accordance with ISO 9328-1 and [6.2.3](#).

5.2 Options

A number of options are specified in this document. These are listed below under a) to t). Additionally, the relevant options of ISO 9328-1 apply. If the purchaser does not indicate a wish to implement any of these options at the time of enquiry and order, the products shall be supplied in accordance with the basic specification (shall be in accordance with ISO 9328-1):

- a) tests in the simulated normalized condition (see [6.2.2](#));
- b) products delivered untreated (see [6.2.4](#) and [6.2.5](#));
- c) maximum carbon-equivalent value for P235GH, P265GH, P295GH and P355GH (see [6.3.3](#));
- d) specification of an impact energy value of 40 J (see [Table A.2](#), footnote ^h);
- e) test on simulated heat-treated samples (see [6.7.2](#));
- f) hydrogen-induced cracking (HIC) test in accordance with [Annex G](#) (see [6.10](#));
- g) step cooling test in accordance with [Annex H](#) (see [6.11](#));
- h) mid-thickness test pieces for the impact test and/or tensile test (see [Clause 8](#));
- i) lower copper content and maximum tin content (see [Table A.1](#), footnote ^b);
- j) minimum chromium content of 0,80 % (see [Table A.1](#), footnote ^f);
- k) maximum carbon content of 0,17 % for nominal thicknesses greater than 150 mm (see [Table A.1](#), footnote ^g);
- l) maximum contents of Al ($\leq 0,020$ %), Ti ($\leq 0,01$ %) and Zr ($\leq 0,01$ %) (see [Table A.1](#), footnote ⁱ);
- m) mechanical properties for nominal thicknesses > 250 mm (see [Table A.2](#), footnote ^a);
- n) specification of the delivery condition +QT where the usual delivery condition is +NT (see [Table A.2](#), footnote ^c and [Table A.3](#), footnote ^c);
- o) additional impact energy values (see [Table A.2](#), footnote ⁱ);
- p) 0,2 % proof strength ($R_{p0,2}$) values at elevated temperature for increased nominal thicknesses (see [Table A.3](#), footnote ^b);
- q) increased carbon content for grades PT410GH, PT450GH and PT480GH (see [Table B.1](#), footnote ^c);
- r) Al additions not permitted (see [Table B.1](#), footnote ^d);