
**Heat-treatable steels, alloy steels and
free-cutting steels —**

**Part 2:
Alloy steels for quenching and
tempering**

*Aciers pour traitement thermique, aciers alliés et aciers pour
décolletage —*

Partie 2: Aciers alliés pour trempe et revenu

This document is a preview generated by EBS



COPYRIGHT PROTECTED DOCUMENT

© ISO 2016, Published in Switzerland

All rights reserved. Unless otherwise specified, no part of this publication may be reproduced or utilized otherwise in any form or by any means, electronic or mechanical, including photocopying, or posting on the internet or an intranet, without prior written permission. Permission can be requested from either ISO at the address below or ISO's member body in the country of the requester.

ISO copyright office
Ch. de Blandonnet 8 • CP 401
CH-1214 Vernier, Geneva, Switzerland
Tel. +41 22 749 01 11
Fax +41 22 749 09 47
copyright@iso.org
www.iso.org

Contents

	Page
Foreword	v
1 Scope	1
2 Normative references	1
3 Terms and definitions	2
4 Classification and designation	3
4.1 Classification.....	3
4.2 Designation.....	3
5 Information to be supplied by the purchaser	3
5.1 Mandatory information.....	3
5.2 Options and/or supplementary or special requirements.....	3
5.3 Ordering example.....	4
6 Manufacturing process	4
6.1 General.....	4
6.2 Deoxidation.....	4
6.3 Heat-treatment condition and surface condition at delivery.....	4
6.3.1 Heat-treatment condition.....	4
6.3.2 Particular surface conditions.....	4
6.4 Traceability of the cast.....	4
7 Requirements	5
7.1 Chemical composition, mechanical properties and hardenability.....	5
7.1.1 General.....	5
7.1.2 Chemical composition.....	5
7.1.3 Mechanical properties.....	5
7.1.4 Hardenability.....	5
7.1.5 Surface hardness.....	5
7.2 Machinability.....	5
7.3 Cold shearability.....	5
7.4 Grain size.....	6
7.5 Non-metallic inclusions.....	6
7.5.1 Microscopic inclusions.....	6
7.5.2 Macroscopic inclusions.....	6
7.6 Internal soundness.....	6
7.7 Surface quality.....	6
7.8 Decarburization.....	7
7.9 Shape, dimensions and tolerances.....	7
8 Inspection	7
8.1 Testing procedures and types of documents.....	7
8.2 Frequency of testing.....	7
8.3 Specific inspection and testing.....	8
8.3.1 Verification of the hardenability, hardness and mechanical properties.....	8
8.3.2 Visual and dimensional inspection.....	8
9 Test methods	8
9.1 Chemical analysis.....	8
9.2 Mechanical tests.....	8
9.2.1 Tensile test.....	8
9.2.2 Impact test.....	8
9.3 Hardness and hardenability tests.....	8
9.3.1 Hardness in treatment conditions +A and +S.....	8
9.3.2 Verification of hardenability.....	9
9.3.3 Surface hardness.....	9
9.4 Retests.....	9

10	Marking	9
Annex A	(normative) Ruling sections for mechanical properties	31
Annex B	(normative) Supplementary or special requirements	35
Annex C	(informative) Designation of steels given in this part of ISO 683 and of comparable grades covered in various designation systems	37
Annex D	(informative) Dimensional standards applicable to products complying with this part of ISO 683	39
Bibliography		40

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 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.

The committee responsible for this document is ISO/TC 17, *Steel*, Subcommittee SC 4, *Heat treatable and alloy steels*.

This second edition cancels and replaces the first edition (ISO 683-2:2012), of which it constitutes a minor revision.

ISO 683 consists of the following parts, under the general title *Heat-treatable steels, alloy steels and free-cutting steels*:

- *Part 1: Non-alloy steels for quenching and tempering*
- *Part 2: Alloy steels for quenching and tempering*
- *Part 3: Case-hardening steels*
- *Part 4: Free-cutting steels*
- *Part 5: Nitriding steels*
- *Part 14: Hot-rolled steels for quenched and tempered springs*
- *Part 15: Valve steels for internal combustion engines*
- *Part 17: Ball and roller bearing steels*
- *Part 18: Bright steel products*

Heat-treatable steels, alloy steels and free-cutting steels —

Part 2: Alloy steels for quenching and tempering

1 Scope

This part of ISO 683 specifies the technical delivery requirements for

- semi-finished products, hot formed, e.g. blooms, billets, slabs (see Note 1),
- bars (see Note 1),
- wire rod,
- finished flat products, and
- hammer or drop forgings (see Note 1)

manufactured from the direct hardening alloy steels and the alloy flame- and induction-hardening steels listed in [Table 3](#) and supplied in one of the heat-treatment conditions given for the different types of products in [Table 1](#) and in one of the surface conditions given in [Table 2](#).

The steels are, in general, intended for the manufacture of quenched and tempered or austempered (see [3.2](#) and Note 2) and flame- or induction-hardened machine parts (see [Tables 8](#) and [9](#)).

The requirements for mechanical properties given in this part of ISO 683 are restricted to the sizes given in the relevant [Table 8](#).

NOTE 1 Hammer-forged semi-finished products (blooms, billets, slabs, etc.), seamless rolled rings and hammer-forged bars are in the following covered under semi-finished products or bars and not under the term “hammer and drop forgings”.

NOTE 2 For the purposes of simplification, the term “quenched and tempered” is, unless otherwise indicated, used in the following also for the austempered condition.

NOTE 3 For International Standards relating to steels complying with the requirements for the chemical composition in [Table 3](#), however, supplied in other product forms or treatment conditions than given above or intended for special applications, and for other related International Standards, see the Bibliography.

NOTE 4 This part of ISO 683 does not apply to bright products and bars and wire rod for cold heading. For such products, see ISO 683-18 and ISO 4954.

In special cases, variations in these technical delivery requirements or additions to them can form the subject of an agreement at the time of enquiry and order (see [5.2](#) and [Annex B](#)).

In addition to this part of ISO 683, the general technical delivery requirements of ISO 404 are applicable.

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 148-1, *Metallic materials — Charpy pendulum impact test — Part 1: Test method*

- ISO 377, *Steel and steel products — Location and preparation of samples and test pieces for mechanical testing*
- ISO 404:2013, *Steel and steel products — General technical delivery requirements*
- ISO 642, *Steel — Hardenability test by end quenching (Jominy test)*
- ISO 643, *Steels — Micrographic determination of the apparent grain size*
- ISO 3887, *Steels — Determination of depth of decarburization*
- ISO 4885:—¹⁾, *Ferrous products — Heat treatments — Vocabulary*
- 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/TS 4949, *Steel names based on letter symbols*
- ISO 4967, *Steel — Determination of content of non-metallic inclusions — Micrographic method using standard diagrams*
- ISO 6506-1, *Metallic materials — Brinell hardness test — Part 1: Test method*
- ISO 6508-1, *Metallic materials — Rockwell hardness test — Part 1: Test method (scales A, B, C, D, E, F, G, H, K, N, T)*
- ISO 6892-1, *Metallic materials — Tensile testing — Part 1: Method of test at room temperature*
- ISO 6929, *Steel products — Vocabulary*
- ISO 7788, *Steel — Surface finish of hot-rolled plates and wide flats — Delivery requirements*
- ISO 9443, *Heat-treatable and alloy steels — Surface quality classes for hot-rolled round bars and wire rods — Technical delivery conditions*
- ISO 10474, *Steel and steel products — Inspection documents*
- ISO 14284, *Steel and iron — Sampling and preparation of samples for the determination of chemical composition*

3 Terms and definitions

For the purposes of this document, the definitions in ISO 377, ISO 4885, ISO 4948-1, ISO 4948-2, ISO 6929, ISO 14284, and the following apply.

NOTE For deviations from these terms and definitions, see Notes 1 and 2 of [Clause 1](#).

3.1

ruling section

section for which the specified mechanical properties shall apply

Note 1 to entry: Independent of the actual shape and dimensions of the cross-section of the product, the size of its ruling section is always given by a diameter. This corresponds to the diameter of an “equivalent round bar”. That is a round bar which will show the same cooling rate as the actual ruling section of the product concerned at its position for taking the test pieces, when being cooled from austenitizing temperature.

1) Under preparation. Stage at the time of publication: ISO/DIS 4885:2016.