

INTERNATIONAL STANDARD

ISO
683-10

Second edition
1987-04-01



INTERNATIONAL ORGANIZATION FOR STANDARDIZATION
ORGANISATION INTERNATIONALE DE NORMALISATION
МЕЖДУНАРОДНАЯ ОРГАНИЗАЦИЯ ПО СТАНДАРТИЗАЦИИ

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

Part 10: Wrought nitriding steels

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

Partie 10: Aciers corroyés pour nitruration

Reference number
ISO 683-10:1987 (E)

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.

Draft International Standards adopted by the technical committees are circulated to the member bodies for approval before their acceptance as International Standards by the ISO Council. They are approved in accordance with ISO procedures requiring at least 75 % approval by the member bodies voting.

International Standard ISO 683-10 was prepared by Technical Committee ISO/TC 17, *Steel*.

This second edition cancels and replaces the first edition (ISO 683-10 : 1975), of which it constitutes a technical revision.

Users should note that all International Standards undergo revision from time to time and that any reference made herein to any other International Standard implies its latest edition, unless otherwise stated.

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

Part 10: Wrought nitriding steels

1 Scope and field of application

1.1 This part of ISO 683 gives the technical delivery requirements for

- semi-finished products, for example blooms, billets, slabs (see note 3);
- bars (see note 3);
- wire rod;
- hot-rolled plates (see note 2);
- hammer or drop forgings (see note 3).

manufactured from the nitriding steels listed in table 3 and supplied in one of the heat-treatment conditions given for the different types of products in table 1, line 2 to 5 and in one of the surface conditions given in table 2.

The steels are in general intended for the fabrication of quenched and tempered and subsequently nitrided machine parts.

The requirements for mechanical properties given in this part of ISO 683 are restricted to the sizes given in table 6.

NOTES

- 1 Related International Standards are given in annex C.
- 2 The term "plate" includes in the following, unless otherwise stated, also wide flats.
- 3 Hammer-forged semi-finished products (blooms, billets, slabs etc.) and hammer-forged bars are in the following covered under semi-finished products or bars and not under the term "hammer and drop forgings".

1.2 In special cases variations in these technical delivery requirements or additions to them may form the subject of an agreement at the time of enquiry and order (see annex B).

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

2 References

ISO 83, *Steel — Charpy impact test (U-notch)*.

ISO 148, *Steel — Charpy impact test (V-notch)*.

ISO 377, *Wrought steel — Selection and preparation of samples and test pieces*.

ISO 404, *Steel and steel products — General technical delivery requirements*.

ISO/R 1024, *Rockwell superficial hardness test (N and T scales) for steel*.

ISO 1035, *Hot-rolled steel bars*

- *Part 1: Dimensions of round bars.*
- *Part 2: Dimensions of square bars.*
- *Part 3: Dimensions of flat bars.*
- *Part 4: Tolerances.*

ISO 3887, *Steel, non-alloy and low-alloy — Determination of depth of decarburization*.

ISO 6506, *Metallic materials — Hardness test — Brinell test*.

ISO 6507/1, *Metallic materials — Hardness test — Vickers test — Part 1: HV 5 to HV 100*.

ISO 6892, *Metallic materials — Tensile testing*.

ISO 6929, *Definition of steel products by shape and dimensions*.¹⁾

ISO 7452, *Hot-rolled structural steel plates — Tolerances on dimensions and shape*.

ISO 7788, *Steel — Surface finish of hot-rolled plates and wide flats — Delivery conditions*.

3 Definitions

For deviations from normal definitions, see notes 2 and 3 to 1.1.

1) At present at the stage of draft.

For the purpose of this part of ISO 683, the definitions of ISO 6929, and the following, apply.

3.1 ruling section: That section for which the specified mechanical properties apply.

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, at the position of its cross-section specified for taking the test pieces for the mechanical tests, will, when being cooled from austenitizing temperature, show the same cooling rate as the actual ruling section of the product concerned at its position for taking the test pieces.

3.2 nitriding steels: Heat-treatable steels containing controlled amounts of the nitride forming elements, aluminium, chromium, molybdenum, and/or vanadium and are particularly suited for nitriding.

3.3 nitriding: A heat treatment characterized by keeping a steel product for a sufficiently long time at temperatures below the transformation temperature AC 1 in a nitrogen providing gaseous or liquid salt environment to achieve diffusion of the nitrogen into the steel surface.

An increase in surface hardness, wear resistance and fatigue properties is attained with this treatment.

4 Ordering and designation

The designation of the product in an order shall cover the following:

- a) the designation of the product form (bloom, bar, wire rod, etc.) followed by
 - either the designation of the dimensional standard and the dimensions and tolerances selected from this (see 5.7).
 - or, for example in the case of drop forgings, by the designation of the drawing or any other document covering the dimensions and tolerances required for the product;
- b) if another surface condition than "hot worked" or a special surface quality is required
 - the surface condition (see table 2),
 - the surface quality (see 5.6);
- c) a description of the steel comprising
 - 1) a reference to this part of ISO 683,
 - 2) the designation of the steel type given in table 3,

3) if another heat-treatment condition than the untreated condition is required, the symbol for this other condition (see table 1, column 3),

4) if a document is required, the symbol for the required type of document (see table 8),

5) if any supplementary requirement shall be complied with, the symbol and, where necessary, the details of this supplementary requirement (see annex B).

Example:

To be ordered are:

Hot-rolled round bars,

according to ISO 1035/1,
with a nominal diameter of 40,0 mm,
a nominal length of 8 000 mm,
with a diameter tolerance of $\pm 0,40$ mm (= class S according to ISO 1035/4),
a length tolerance of $0 + 100$ mm (= class L2 according to ISO 1035/4),
all other tolerances as given in ISO 1035/4 for normal cases.

Surface

Blast cleaned (symbol BC, see table 2).

Steel

according to this part of ISO 683
type 31 CrMo 12 (see table 3)
heat-treatment condition: quenched + tempered (symbol Q + T, see table 1)
with an inspection certificate of type IC, (see table 8) and ultrasonically tested (supplementary requirement specified in annex B, clause B.2)
in accordance with test sheet xy.

Designation

Rounds: ISO 1035/1 – 40,0 S $\times$ 8 000 L2
Surface: BC
Steel: ISO 683/10 – 31 CrMo 12 – Q + T – IC – S2
Details: for ultrasonic test, see test sheet xy.

5 Requirements

5.1 Manufacturing process

5.1.1 General

The manufacturing process of steel and of the products is with the restriction given by the requirements in 5.1.2 to 5.1.3, left to the discretion of the manufacturer.

5.1.2 Heat-treatment and surface condition at delivery

5.1.2.1 Normal condition at delivery

Unless otherwise agreed at the time of enquiry and order, the products shall be delivered in the untreated, that means as hot-worked condition.

5.1.2.2 Particular heat-treatment condition

If so agreed at the time of enquiry and order, the products shall be delivered in one of the heat-treatment conditions given in table 1, line 3 to 5.

5.1.2.3 Particular surface conditions

If so agreed at the time of enquiry and order, the products shall be delivered in one of the particular surface conditions given in table 2, line 3 to 6.

5.1.3 Cast separation

The steels shall be delivered separated by casts.

5.2 Chemical composition, hardness and mechanical properties

The requirements for chemical composition, hardness and mechanical properties cited in table 1, column 9, apply as appropriate for the particular heat-treatment condition.

5.3 Technological properties

5.3.1 Machinability

All steels are in the condition "annealed to maximum hardness requirements" machinable.

Where a further improved machinability is required special heat treatments may be agreed at the time of enquiry and order.

5.3.2 Shearability

Under suitable shearing conditions (avoiding local stress peaks, preheating, application of blades with a profile adapted to that of the product etc.) all steels are shearable in the condition "annealed to maximum hardness requirements".

5.4 Structure

For the ferrite content in the core see annex B, clause B.5.

5.5 Internal soundness

The steel shall be free from internal defects likely to have an adverse effect (see annex B, clause B.2).

5.6 Surface quality and decarburization

5.6.1 All products shall have a workmanlike finish.

5.6.2 Minor surface discontinuities, which may occur also under normal manufacturing conditions, such as scores originating in the case of black steel from rolled-in scale, are not to be regarded as defects.

5.6.3 As long as no International Standard on the surface quality of steel products exists, detailed requirements referring to this characteristic shall, where appropriate, be agreed at the time of enquiry and order.

NOTES

1 For bars and wire rod included in this part of ISO 683, a separate International Standard on surface quality is in consideration.

2 It is more difficult to detect and eliminate surface discontinuities from coiled products than from cut lengths. This should be taken into account when agreements on surface quality are made.

3 For hot-rolled plates, the requirements for surface finish are, specified in ISO 7788.

4 Agreements for the admissible surface decarburization should, where appropriate, be based on one of the testing methods given in ISO 3887.

5.6.4 Removal of surface discontinuities by welding is not permitted.

Pending publication of a separate International Standard, the kind and permissible depth for removal of surface discontinuities should, where appropriate, be agreed at the time of enquiry and order.

5.7 Shape, dimensions and tolerances

The shape, dimensions and tolerances of the products shall comply with the requirements agreed at the time of enquiry and order. The agreements shall, as far as possible, be based on corresponding International Standards, otherwise on suitable national standards.

NOTE — The following International Standards cover dimensions and/or tolerances for products included in this part of ISO 683:

- for bars: ISO 1035/1 to 4
- for plates (except for wide flats): ISO 7452.

6 Inspection, testing and conforming of products

6.1 Inspection and testing procedures and types of documents

6.1.1 Table 8 gives a survey of the inspection procedures and the type of documents of ISO 404 which may be agreed at the time of enquiry and order for deliveries according to this part of ISO 683.