



SLOVENSKI STANDARD
SIST EN ISO 4957:2000
01-november-2000

Orodna jekla (ISO 4957:1999)

Tool steels (ISO 4957:1999)

Werkzeugstähle (ISO 4957:1999)

Aciers a outils (ISO 4957:1999)

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77.140.35 Orodna jekla

Tool steels

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English version

Tool steels (ISO 4957:1999)

Aciers à outils (ISO 4957:1999)

Werkzeugstähle (ISO 4957:1999)

This European Standard was approved by CEN on 15 December 1999.

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This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN member into its own language and notified to the Central Secretariat has the same status as the official versions.

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COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

Central Secretariat: rue de Stassart, 36 B-1050 Brussels

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Foreword

The text of the International Standard ISO 4957:1999 has been prepared by Technical Committee ISO/TC 17 "Steel" in collaboration with Technical Committee ECISS/TC 23 "Steels for heat treatment, alloy steels and free-cutting steels - Qualities and dimensions", the secretariat of which is held by DIN.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by June 2000, and conflicting national standards shall be withdrawn at the latest by June 2000.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and the United Kingdom.

NOTE FROM CEN/CS: The foreword is susceptible to be amended on reception of the German language version. The confirmed or amended foreword, and when appropriate, the normative annex ZA for the references to international publications with their relevant European publications will be circulated with the German version.

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Endorsement notice

[SIST EN ISO 4957:2000](#)

The text of the International Standard ISO 4957:1999 was approved by CEN as a European Standard without any modification.

INTERNATIONAL STANDARD

**ISO
4957**

Second edition
1999-12-15

Tool steels

Aciers à outils

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ISO 4957:1999(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. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 3.

Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

Attention is drawn to the possibility that some of the elements of this International Standard may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

International Standard ISO 4957 was prepared by Technical Committee ISO/TC 17, *Steel*, Subcommittee SC 4, *Heat treatable and alloy steels*.

This second edition cancels and replaces the first edition (ISO 4957:1980) which has been technically revised.

Annex B forms a normative part of this International Standard, annexes A and C are for information only.

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Tool steels

1 Scope

1.1 This International Standard covers the following grades of wrought tool steels:

- a) non-alloy cold-work tool steels;
- b) alloy cold-work tool steels;
- c) alloy hot-work tool steels;
- d) high-speed tool steels.

If not stated otherwise, this International Standard applies to all types of hot-rolled, forged, cold-drawn or cold-rolled products which are supplied in one of the surface and heat-treatment conditions given in 4.1.2 and Table 1.

Products according to this International Standard may be produced by powder metallurgy.

NOTE 1 The Tables 2, 4, 6 and 8 cover only those steels which have gained certain international importance, which does not mean however, that they are available in all industrial countries. In addition, a number of other steels for tools are specified in regional, national or company standards.

NOTE 2 Where the heat resistance of the tools is of particular importance, as for example in the case of tools for hot forming glass, the material selection should be based on ISO 4955 or ISO 9722.

1.2 In addition to this International Standard, the general technical delivery requirements of ISO 404 are applicable.

2 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this International Standard. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. However, parties to agreements based on this International Standard are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. For undated references, the latest edition of the normative document referred to applies. Members of ISO and IEC maintain registers of currently valid International Standards.

ISO 377:1997, *Steel and steel products — Location and preparation of samples and test pieces for mechanical testing.*

ISO 404:1992, *Steel and steel products — General technical delivery requirements.*

ISO 1035-1:1980, *Hot-rolled steel bars — Part 1: Dimensions of round bars.*

ISO 1035-3:1980, *Hot-rolled steel bars — Part 3: Dimensions of flat bars.*

ISO 1035-4:1982, *Hot-rolled steel bars — Part 4: Tolerances.*

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ISO 4948-1:1982, *Steels — Classification — Part 1: Classification of steels into unalloyed and alloy steels based on chemical composition.*

ISO 6506:1981¹⁾, *Metallic materials — Hardness test — Brinell test.*

ISO 6508:1986²⁾, *Metallic materials — Hardness test — Rockwell test (scales A - B - C - D - E - F - G - H - K).*

ISO 6929:1987, *Steel products — Definitions and classification.*

ISO/TR 9769:1991, *Steel and iron — Review of available methods of analysis.*

ISO 10474:1991, *Steel and steel products — Inspection documents.*

ISO 14284:1996, *Steel and iron — Sampling and preparation of samples for the determination of chemical composition.*

3 Terms and definitions

For the purposes of this International Standard, the terms and definitions given in ISO 4948-1 and ISO 6829 as well as the following apply.

3.1**product forms**

[ISO 6929]

3.2**unalloyed and alloyed steel**

[ISO 4948-1]

3.3**tool steels**

special steels suitable for working or processing of materials, for handling and measuring workpieces and, for this purpose, exhibiting high hardness and wear resistance and/or toughness

3.3.1**cold-work tool steels**

non-alloy or alloy tool steels for applications in which the surface temperature is generally below 200 °C

3.3.2**hot-work tool steels**

alloy tool steels for applications in which the surface temperature is generally over 200 °C

3.3.3**high-speed tool steels**

steels used mainly for machining and for forming processes and which, because of their chemical composition, have the highest high-temperature hardness and temper resistance up to about 600 °C

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1) To be replaced by ISO 6506-1, ISO 6506-2 and ISO 6506-3.

2) To be replaced by ISO 6508-1, ISO 6508-2 and ISO 6508-3.

4 Requirements

4.1 Manufacturing process

4.1.1 General

The manufacturing process of the steel and the products is left to the discretion of the manufacturer, with the restrictions given in 4.1.2.

When he so requests, the purchaser shall be informed what steel making process is being used.

4.1.2 Heat-treatment condition and surface condition on delivery

The heat-treatment and surface conditions of the products shall comply with the agreements when ordering.

4.1.2.1 Heat-treatment condition

The heat-treatment conditions are given in Table 1.

Unless otherwise specified in the order, the tool steels (except C45U, Table 2, 35CrMo7, X38CrMo16 and 40CrMnNiMo8-6-4, Table 4, 55NiCrMoV7, Table 6) are delivered in the annealed condition.

4.1.2.2 Surface condition

Usual surface conditions are:

- a) the hot-rolled or forged condition (= as hot worked);
- b) the machined (ground, polished, turned, peeled or milled) condition;
- c) the cold-reduced condition.

4.2 Chemical composition and mechanical properties

4.2.1 Table 1 gives a survey of combinations of usual heat-treatment conditions at delivery and requirements according to Tables 2 to 9 (chemical composition, hardness).

4.2.2 For hardness-tempering temperature-curves of the steels see annex A.

4.2.3 For hardness penetration depth of non-alloy cold-work tool steels, see Table 2, footnote d.

4.3 Surface quality

4.3.1 All products shall have a workmanlike finish and shall be clean and free from surface imperfections likely to have an adverse effect on their processing or designated application.

4.3.2 Ground, polished or finished-machined products shall be free from surface imperfections and surface decarburization.

4.3.3 Hot-rolled, forged, cold-drawn or rough-machined products shall be ordered with sufficient material to be removed from all surfaces by machining or grinding to allow for

- a) surface decarburization and
- b) surface imperfections.

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As long as no International Standard for the machining allowances of tool steels is available, the allowances shall be agreed at the time of enquiry and order.

4.4 Shape, dimensions and tolerances

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

For rolled flat and round bars, the following International Standards cover dimensions and/or tolerances for products included in this International Standard: ISO 1035-1, ISO 1035-3 and ISO 1035-4.

NOTE By agreement, the tolerances can be all plus or other disposition than equal plus/minus.

5 Inspection, testing and conformance of products**5.1 Inspection and testing procedures and types of inspection documents**

5.1.1 For each delivery, the issue of any inspection document in accordance with ISO 10474 may be agreed upon at the time of enquiry and order.

5.1.2 If, in accordance with the agreements made at the time of enquiry and order, a test report is to be provided, this shall cover:

- a) the statement that the material complies with the requirements of the order;
- b) the results of the cast analysis for all elements specified for the type of steel supplied.

5.1.3 If, in accordance with the agreements in the order, an inspection certificate 3.1.A, 3.1.B or 3.1.C or an inspection report 3.2 (see ISO 10474) is to be provided, the specific inspections and tests described in 5.2 shall be carried out and their results shall be certified in the document.

In addition the document shall cover

- a) the results of the cast analysis provided by the manufacturer for all elements specified for the steel type concerned;
- b) the results of all inspections and tests ordered by supplementary requirements (see annex B);
- c) the symbol letters of numbers connecting the inspection documents, the test pieces and products to each other.

5.2 Specific inspection and testing**5.2.1 Number of sample products****5.2.1.1 Chemical composition**

The cast analysis is given by the manufacturer. For product analysis see B.2 in annex B.

5.2.1.2 Mechanical properties

One sample product per test unit shall be tested.

5.2.1.2.1 For material delivered in the annealed or annealed and cold rolled or annealed and cold drawn condition, the test unit shall consist of products from the same cast and the same heat-treatment batch.

In the case of material heat treated in a continuous furnace, a heat-treatment batch is regarded as that quantity of products (of the same cast and dimensions) which without any interruptions, was under constant treatment conditions (same furnace temperature, atmosphere and transportation speed) through the furnace.

5.2.1.2.2 For material delivered in the quenched and tempered condition, the test unit shall consist of products from the same cast, heat-treatment and thickness.

However, if the manufacturer verifies that the thickness has no significant effect on the hardness in the quenched and tempered condition, then different thicknesses may be covered in a test unit.

5.2.1.3 Inspection of the surface quality

Unless otherwise agreed when ordering (see B.5), the number of products to be inspected for surface quality is left to the discretion of the inspector.

5.2.1.4 Dimensional inspection

Unless otherwise agreed when ordering (see B.6) the number of products to be inspected for their shape and dimensions is left to the discretion of the inspector.

5.2.2 Sampling

5.2.2.1 The general conditions for selection and preparation of samples and test pieces shall be in accordance with ISO 377 and ISO 14284.

5.2.2.2 For the Brinell hardness test the surface of the sample product or of a test piece taken from the sample product in the delivery condition shall be prepared in accordance with the requirements of ISO 6506.

5.2.3 Test methods

5.2.3.1 The Brinell hardness test shall be made in accordance with ISO 6506.

5.2.3.2 Unless otherwise agreed (see B.5), the surface quality shall be inspected visually.

5.2.4 Retests

For retests, ISO 404 shall apply.

6 Marking

The manufacturer shall mark the products or the bundles or boxes containing the products in a suitable way, so that the identification of the cast, the steel type and the origin of the delivery is possible (see B.8).

7 Ordering and designation

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

- a) The quantity to be delivered.
- b) The designation of the product form (e.g. bar) followed by
 - 1) either the designation of the dimensional standard and the dimensions and tolerances selected from it (see 4.4) or
 - 2) the designation of any other document covering the dimensions and tolerances required for the product.