Heat-treated steel tapping screws

Mechanical properties
(ISO 2702:1992)
English version of DIN EN ISO 2702

DIN
EN ISO 2702

This standard incorporates the English version of ISO 2702.

ICS 21.060.10

Supersedes DIN 267-12, November 1971 edition.

Descriptors: Fastener, screw, tapping screw, steel, mechanical property, testing.

Wärmebehandelte Blechschrauben aus Stahl; mechanische Eigenschaften
(ISO 2702:1992)

European Standard EN ISO 2702:1994 has the status of a DIN Standard.

A comma is used as the decimal marker.

National foreword

This standard has been published in accordance with a decision taken by CEN/TC 185 to adopt, without alteration, International Standard ISO 2702 as a European Standard.

The responsible German body involved in its preparation was the *Normenausschuß Mechanische Verbindungselemente* (Fasteners Standards Committee).

This standard conforms in substance to DIN 267-12, now withdrawn.

DIN EN ISO 1478 is the standard corresponding to International Standard ISO 1478:1983 referred to in clause 2.

Amendments

In comparison with DIN 267-12, November 1971 edition, the following amendments have been made.

a) Reference to ISO Standards has been made for hardness testing.

b) The unit in which the hardness is to be expressed is Vickers hardness.

c) Test holes are no longer to be pierced by means of a mandrel.

Previous edition

DIN 267-12:1971-11.

Standards referred to

(and not included in **Normative references** and **Annex ZA**)

DIN EN ISO 1478 Tapping screws thread (ISO 1478:1983)

International Patent Classification

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EUROPEAN STANDARD
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EN ISO 2702

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Descriptors: Fastener, screw, tapping screw, steel, mechanical property, testing.

English version

Heat-treated steel tapping screws
Mechanical properties
(ISO 2702:1992)

Vis à tôle en acier traité thermiquement; caractéristiques mécaniques (ISO 2702 : 1992)

Wärmebehandelte Blechschrauben aus Stahl; mechanische Eigenschaften (ISO 2702:1992)

This European Standard was approved by CEN on 1994-07-26 and is identical to the ISO Standard as referred to.

CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration.

Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the Central Secretariat or to any CEN member.

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.

CEN members are the national standards bodies of Austria, Belgium, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and United Kingdom.

CEN

European Committee for Standardization
Comité Européen de Normalisation
Europäisches Komitee für Normung

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

Ref. No. EN ISO 2702:1994 E

Foreword

International Standard

ISO 2702:1992 Heat-treated steel tapping screws; mechanical properties

has been taken over as a European Standard by Technical Committee CEN/TC 185 'Threaded and non-threaded mechanical fasteners and accessories' from the work of ISO/TC 2 'Fasteners' of the International Organization for Standardization (ISO).

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, and conflicting national standards withdrawn, by January 1995 at the latest.

In accordance with the CEN/CENELEC Internal Regulations, the following countries are bound to implement this European Standard:

Austria, Belgium, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and United Kingdom.

Endorsement notice

The text of the International Standard ISO 2702:1992 was approved by CEN as a European Standard without any modification.

NOTE: Normative references to international publications are listed in Annex ZA.

Introduction

The primary objective of this International Standard is to ensure that tapping screws will form mating threads in materials into which they are normally driven without deforming their own thread and without breaking during assembly or service.

1 Scope

This International Standard specifies the characteristics of heat-treated steel tapping screws, with tapping screw thread from ST2,2 to ST8 inclusive in accordance with ISO 1478, together with the corresponding test methods.

2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this International Standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this International Standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.

ISO 1478:1983, *Tapping screws thread.*

ISO 6507-1:1982, *Metallic materials — Hardness test — Vickers test — Part 1: HV 5 to HV 100.*

ISO 6507-2:1983, *Metallic materials — Hardness test — Vickers test — Part 2: HV 0,2 to less than HV 5.*

3 Materials

Tapping screws shall be made from cold heading, case hardening quality steel.

4 Requirements

4.1 Metallurgical requirements

4.1.1 Surface hardness

The minimum surface hardness after heat treatment shall be 450 HV 0,3 (see ISO 6507-2).

4.1.2 Case depth

The case depth shall conform to the values given in table 1.

Table 1 — Case depth

Dimensions in millimetres

Thread	Case depth	
	min.	max.
ST2,2, ST2,6	0,04	0,10
ST2,9, ST3,3, ST3,5	0,05	0,18
ST3,9, ST4,2, ST4,8, ST5,5	0,10	0,23
ST6,3, ST8	0,15	0,28

4.1.3 Core hardness

The core hardness after heat treatment shall be

270 HV 5 to 390 HV 5 for threads $<$ ST3,9, and

270 HV 10 to 390 HV 10 for threads $>$ ST4,2.

4.1.4 Microstructure

The microstructure shall show no band of free ferrite between the case and core.

4.2 Mechanical requirements

4.2.1 Thread-forming capability

Tapping screws shall form a mating thread without deforming their own thread when driven into a test plate, in accordance with 6.2.1.

4.2.2 Torsional strength

Tapping screws shall have a torsional strength such that the torque necessary to cause failure, when tested in accordance with 6.2.2, shall equal or exceed the minimum torque values given in table 3 for the applicable screw threads.

5 Acceptance

For routine acceptance tests, the drive test, torsional test and core hardness test may be used, but for referee purposes all requirements specified in this International Standard shall be satisfied.

6 Test methods

6.1 Test methods for the metallurgical requirements

6.1.1 Surface hardness test

Vickers hardness test shall be carried out in accordance with ISO 6507-2.

The impression of the pyramid shall be made on a flat face, for preference on the screw head.

6.1.2 Case depth (microscopic test)

Case depth shall be measured at the thread flank mid-point between crest and root or, in the case of smaller tapping screws up to ST3,9, in the root of the thread.

For referee purposes, a micro hardness plot shall be made using a Vickers indenter and a 300 g load on the thread profile of a properly prepared metallographic specimen. The case depth shall be the point at which the hardness recorded is 30 HV above the actual core hardness.

6.1.3 Core hardness test

Vickers core hardness test shall be carried out in accordance with ISO 6507-1 at the mid-radius of a transverse section through the screw taken at a distance sufficiently behind the point of the screw to be through the full minor diameter.

6.1.4 Microstructure test

The microstructure test shall be carried out by metallographic examination.

6.2 Test methods for the mechanical requirements

6.2.1 Drive test

The sample screw (coated or uncoated, as received) shall be driven into a test plate until a thread of full diameter is completely through the test plate.

The test plate shall be made from low carbon steel with a carbon content not exceeding 0,23 %. The hardness of the plate shall be 130 HV to 170 HV measured in accordance with ISO 6507-1 and ISO 6507-2. The thickness of the plate shall conform to the values given in table 2.

The test hole shall be drilled, or punched and redrilled, or reamed to the hole diameter specified in table 2 for the size of screw being tested.

Table 2 — Standard test plate thickness and hole diameter for drive test

Dimensions in millimetres

Thread	Plate thickness		Hole diameter	
	min.	max.	min.	max.
ST2,2	1,17	1,30	1,905	1,955
ST2,6	1,17	1,30	2,185	2,235
ST2,9	1,17	1,30	2,415	2,465
ST3,3	1,17	1,30	2,68	2,73
ST3,5	1,85	2,06	2,92	2,97
ST3,9	1,85	2,06	3,24	3,29
ST4,2	1,85	2,06	3,43	3,48
ST4,8	3,10	3,23	4,015	4,065
ST5,5	3,10	3,23	4,735	4,785
ST6,3	4,67	5,05	5,475	5,525
ST8	4,67	5,05	6,885	6,935

In cases where screws are plated subsequent to delivery to the purchaser (or where plating of screws is otherwise under the control of the purchaser), the producer is not responsible for failure due to plating. In such cases, the bolt manufacturer can only be held responsible if it is proved that the failure is not due to any post-treatment. Screws from which the plating has been stripped off cannot be considered as samples.

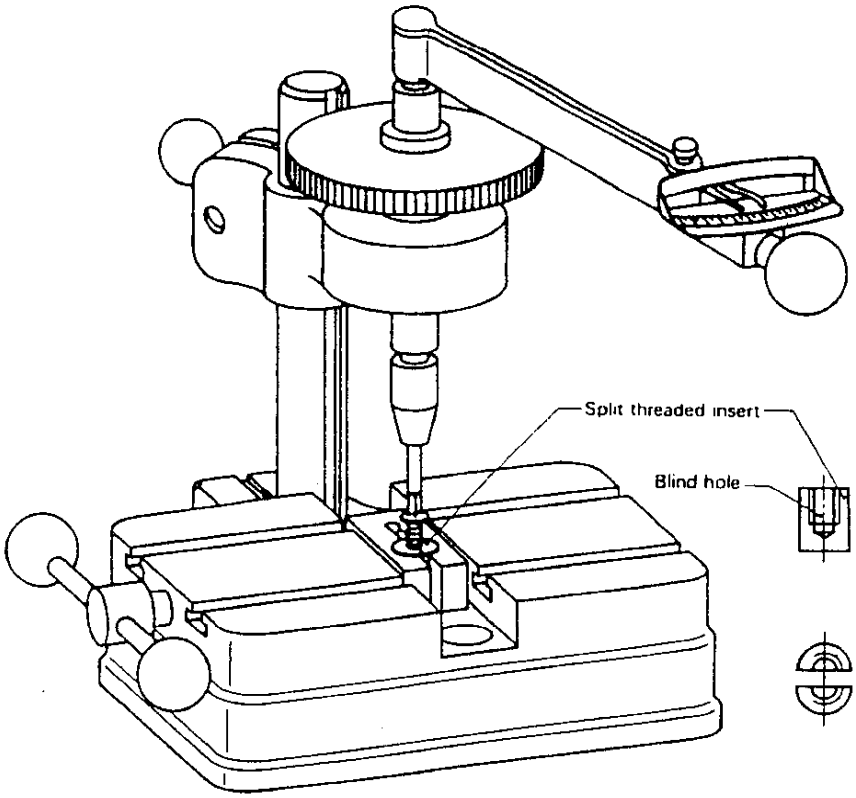

Figure 1 — Torsional test apparatus

6.2.2 Torsional strength test

The shank of the sample screw (coated or uncoated, as received) shall be clamped in a mating, split, threaded die or other device so that the clamped portion of the screw is not damaged and at least two full threads project above the clamping device and at least two full-form threads exclusive of point are held within the clamping device. A threaded insert with a blind hole may be used in place of the clamping device (see figure 1) provided that the hole depth is such as to ensure that breakage will occur beyond the point.

By means of a suitable calibrated torque-measuring device, torque shall be applied to the screw until failure occurs. The screw shall meet the minimum torsional strength requirements given in table 3.

Table 3 — Torsional strength

Thread	Minimum torsional strength N·m
ST2,2	0,45
ST2,6	0,9
ST2,9	1,5
ST3,3	2
ST3,5	2,7
ST3,9	3,4
ST4,2	4,4
ST4,8	6,3
ST5,5	10
ST6,3	13,6
ST8	30,5

Annex ZA (normative)
Normative references to international publications with their relevant European publications

This European Standard incorporates by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this European Standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies (including amendments).

Publication	Year	Title	EN/HD	Year
ISO 1478	1983	Tapping screws thread	EN ISO 1478	1994