



SLOVENSKI STANDARD
oSIST prEN ISO 2702:2019
01-junij-2019

Vezni elementi - Toplotno obdelani pločevinski vijaki - Mehanske in fizikalne lastnosti (ISO/DIS 2702:2019)

Fasteners - Heat-treated steel tapping screws - Mechanical and physical properties (ISO/DIS 2702:2019)

Mechanische Verbindungselemente - Wärmebehandelte Blechschrauben - Mechanische und physikalische Eigenschaften (ISO/DIS 2702:2019)

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Fasteners — Heat-treated self-tapping screws — Mechanical and physical properties

ICS: 21.060.10

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Contents

	Page
Foreword	iv
1 Scope	1
2 Normative references	1
3 Terms and definitions	1
4 Materials	1
5 Mechanical and physical properties	1
5.1 General	1
5.2 Surface hardness	1
5.3 Case-hardened depth	1
5.4 Core hardness	2
5.5 Microstructure	2
5.6 Thread-forming ability	2
5.7 Torsional strength	2
6 Test methods	3
6.1 General	3
6.2 Surface hardness test	3
6.3 Case-hardened depth determination	3
6.4 Core hardness test	4
6.5 Microstructure test	4
6.6 Drive test	4
6.7 Torsional test	5

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ISO/DIS 2702:2019(E)

Foreword

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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).

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This document was prepared by Technical Committee ISO/TC 2, *Fasteners*, Subcommittee SC 13, *Fasteners with non-metric thread*.

This fourth edition cancels and replaces the third edition (ISO 2702:2011), which has been technically revised.

The main changes compared to the previous edition are the following:

- document newly structured with regard to requirements and tests;
- case-hardened depth determination described more precisely in 6.3;
- core hardness test described more precisely in 6.4 with two alternatives depending on the size of the thread.

Fasteners — Heat-treated self-tapping screws — Mechanical and physical properties

1 Scope

This document specifies the mechanical and physical properties of heat-treated self-tapping screws made of steel, with thread ST2,2 to ST9,5 in accordance with ISO 1478, together with the related test methods.

Self-tapping screws are designed to form mating threads in materials into which they are driven, without deforming their own thread.

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 1478, *Tapping screws thread*

ISO 6507-1, *Metallic materials — Vickers hardness test — Part 1: Test method*

3 Terms and definitions

No terms and definitions are listed in this document.

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

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

4 Materials

Self-tapping screws shall be made of steel able to be case hardened.

5 Mechanical and physical properties

5.1 General

Self-tapping screws shall meet all the mechanical and physical properties in accordance with [Clause 5](#), regardless of which tests are performed during manufacturing or final inspection.

5.2 Surface hardness

The minimum surface hardness after heat treatment shall be 450 HV 0,3.

5.3 Case-hardened depth

The case-hardened depth shall conform to the values specified in Table 1.

Table 1 — Case-hardened depth

Dimensions in millimetres

Thread				Case-hardened 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	ST9,5		0,15	0,28

5.4 Core hardness

The core hardness after heat treatment shall be:

- 270 HV5 to 370 HV5 for threads \leq ST3,9,
- 270 HV10 to 370 HV10 for threads $>$ ST3,9.

5.5 Microstructure

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

5.6 Thread-forming ability

Self-tapping screws shall form a mating thread without deforming their own thread when driven into a test plate, in accordance with 6.5.

5.7 Torsional strength

When tested in accordance with 6.7, self-tapping screws shall meet the minimum breaking torque values specified in [Table 2](#).

Table 2 — Minimum breaking torque

Thread	Minimum breaking torque
	Nm
ST2,2	0,45
ST2,6	0,9
ST2,9	1,5
ST3,3	2,0
ST3,5	2,7
ST3,9	3,4
ST4,2	4,4
ST4,8	6,3
ST5,5	10,0
ST6,3	13,6
ST8	30,5
ST9,5	68,0

6 Test methods

6.1 General

For routine acceptance tests, the purchaser may use the drive test, torsional test and core hardness test. In case of dispute, all tests specified in [Clause 6](#) shall be carried out.

6.2 Surface hardness test

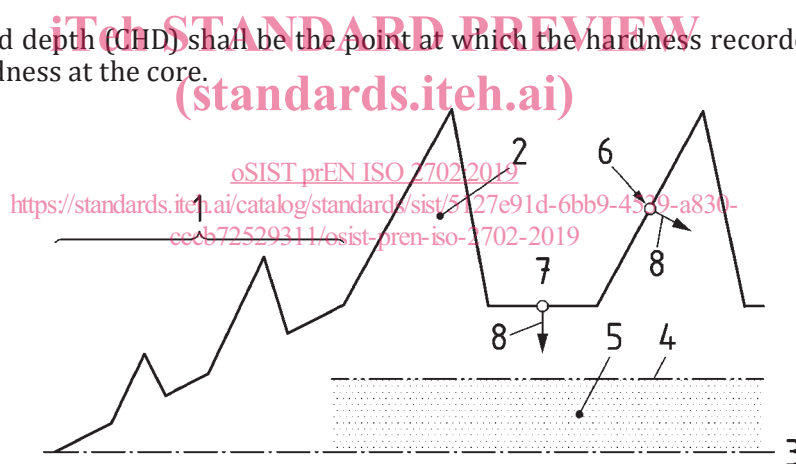
The surface hardness test shall be carried out in accordance with ISO 6507-1, using a Vickers indenter with a test force of 2,942 N (HV0,3). The impression of the pyramid shall be made on a flat surface, preferably on the screw head.

6.3 Case-hardened depth determination

The case-hardened depth (CHD) shall be determined on a longitudinal section in the fully formed thread area. A micro-Vickers indenter with a test force of 2,942 N (HV0,3) shall be used.

The reference hardness shall be determined in the half-radius area of the screw (see [Figure 2](#)) as the average of three HV0,3 hardness readings. A micro-hardness plot shall be performed perpendicular to the surface, beginning at the thread flank mid-point between crest and root for screws with thread > ST3,9 or, in the case of smaller tapping screws up to and including ST3,9 beginning at the root of the thread, as shown in [Figure 1](#).

The case-hardened depth (CHD) shall be the point at which the hardness recorded is 30 HV 0,3 above the reference hardness at the core.



Key

- 1 thread end
- 2 first fully formed thread
- 3 axis of the screw
- 4 half-radius position
- 5 half-radius area (see [Figure 2](#))
- 6 thread flank mid-point
- 7 thread root
- 8 direction of hardness plot

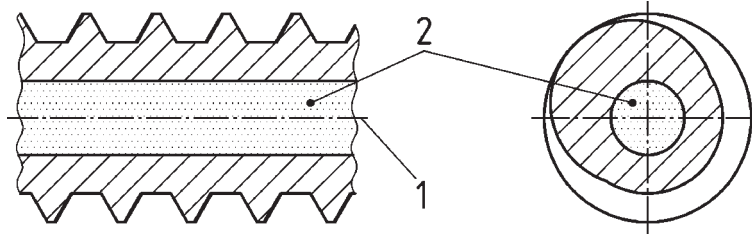
Figure 1 — Determination of the case-hardened depth

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.

ISO/DIS 2702:2019(E)

6.4 Core hardness test

The core hardness test shall be carried out in accordance with ISO 6507-1 in the area between the axis and the half-radius position at a distance sufficiently behind the thread end in the area of the fully formed thread, either on a longitudinal section or on a transverse section (see [Figure 2](#)). HV5 shall be used for threads \leq ST3,9 and HV10 for threads $>$ ST3,9.



Key

- 1 axis of the screw
- 2 half-radius area (with a radius of $0,25d_2$ as specified in ISO 1478)

Figure 2 — Half-radius area for core hardness determination

In case of dispute, the core hardness determination on the transverse section shall be the reference test method.

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6.5 Microstructure test

The microstructure test shall be carried out by metallographic examination on a longitudinal section.

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6.6 Drive test

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The screw shall be tested as received (coated or uncoated). It shall be driven into a test plate until a fully formed thread (full diameter) protrudes 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 determined in accordance with ISO 6507-1. The thickness of the plate shall conform to the values specified in [Table 3](#).

The test hole shall be drilled, or punched and redrilled, or reamed to the hole diameter specified in [Table 3](#) for the size of screw being tested.

Table 3 — 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