SLOVENSKI STANDARD
SIST EN ISO 898-1:2009

01-junij-2009

Nadomešča:
SIST EN ISO 898-1:2001

Mehanske lastnosti veznih elementov iz ogljikovega in legiranega jekla - 1. del: Vijaki s specificiranim trdnostnim razredom - Grobi in fini navoj (ISO 898-1:2009)

Mechanical properties of fasteners made of carbon steel and alloy steel - Part 1: Bolts, screws and studs with specified property classes - Coarse thread and fine pitch thread (ISO 898-1:2009)

Mechanische Eigenschaften von Verbindungselementen aus Kohlenstoffstahl und legiertem Stahl - Teil 1: Schrauben mit festgelegten Festigkeitsklassen - Regelgewinde und Feingewinde (ISO 898-1:2009)

Caractéristiques mécaniques des éléments de fixation en acier au carbone et en acier allié - Partie 1: Vis, goujons et tiges filetées de classes de qualité spécifiées - Filetages à pas gros et filetages à pas fin (ISO 898-1:2009)

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ICS:

21.040.01	Navoji na splošno	Screw threads in general
21.060.10	Sorniki, vijaki, stebelni vijaki	Bolts, screws, studs

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EUROPEAN STANDARD
NORME EUROPÉENNE
EUROPÄISCHE NORM

EN ISO 898-1

April 2009

ICS 21.060.10

Supersedes EN ISO 898-1:1999

English Version

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Foreword

This document (EN ISO 898-1:2009) has been prepared by Technical Committee ISO/TC 2 "Fasteners" in collaboration with Technical Committee CEN/TC 185 “Fasteners” 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of an identical text or by endorsement, at the latest by October 2009, and conflicting national standards shall be withdrawn at the latest by October 2009.

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Endorsement notice

The text of ISO 898-1:2009 has been approved by CEN as a EN ISO 898-1:2009 without any modification.

INTERNATIONAL STANDARD

ISO 898-1

Fourth edition
2009-04-01

Mechanical properties of fasteners made of carbon steel and alloy steel —

Part 1: Bolts, screws and studs with specified property classes — Coarse thread and fine pitch thread

Caractéristiques mécaniques des éléments de fixation en acier au carbone et en acier allié —

Partie 1: Vis, goujons et tiges filetées de classes de qualité spécifiées — Filetages à pas gros et filetages à pas fin

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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 2.

The main task of technical committees is to prepare International Standards. 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.

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ISO 898-1 was prepared by Technical Committee ISO/TC 2, *Fasteners*, Subcommittee SC 1, *Mechanical properties of fasteners*.

This fourth edition cancels and replaces the third edition (ISO 898-1:1999), which has been technically revised.

ISO 898 consists of the following parts, under the general title *Mechanical properties of fasteners made of carbon steel and alloy steel*:

— *Part 1: Bolts, screws and studs with specified property classes — Coarse thread and fine pitch thread*

— *Part 2: Nuts with specified proof load values — Coarse thread*

— *Part 5: Set screws and similar threaded fasteners not under tensile stresses*

— *Part 6: Nuts with specified proof load values — Fine pitch thread*

— *Part 7: Torsional test and minimum torques for bolts and screws with nominal diameters 1 mm to 10 mm*

Mechanical properties of fasteners made of carbon steel and alloy steel —

Part 1: Bolts, screws and studs with specified property classes — Coarse thread and fine pitch thread

1 Scope

This part of ISO 898 specifies mechanical and physical properties of bolts, screws and studs made of carbon steel and alloy steel when tested at an ambient temperature range of 10 °C to 35 °C. Fasteners — the term used when bolts, screws and studs are considered all together — that conform to the requirements of this part of ISO 898 are evaluated at that ambient temperature range. They might not retain the specified mechanical and physical properties at elevated temperatures (see Annex B) and/or lower temperatures.

NOTE 1 Fasteners conforming to the requirements of this part of ISO 898 are used in applications ranging from −50 °C to +150 °C. Users are advised to consult an experienced fastener metallurgist for temperatures outside the range of −50 °C to +150 °C and up to a maximum temperature of +300 °C when determining appropriate choices for a given application.

NOTE 2 Information for the selection and application of steels for use at lower and elevated temperatures is given, for example, in EN 10269, ASTM F2281 and in ASTM A 320/A 320M.

Certain fasteners might not fulfil the tensile or torsional requirements of this part of ISO 898-1 because the geometry of their heads reduces the shear area in the head compared to the stress area in the thread. These include fasteners having a low head, with or without external driving feature, a low round or cylindrical head with internal driving feature or a countersunk head with internal driving feature (see 8.2).

This part of ISO 898 is applicable to bolts, screws and studs

a) made of carbon steel or alloy steel,

b) having triangular ISO metric screw thread according to ISO 68-1,

c) with coarse pitch thread M1,6 to M39, and fine pitch thread M8×1 to M39×3,

d) with diameter/pitch combinations according to ISO 261 and ISO 262,

e) having thread tolerances according to ISO 965-1, ISO 965-2 and ISO 965-4.

It is not applicable to set screws and similar threaded fasteners not under tensile stresses (see ISO 898-5).

It does not specify requirements for such properties as

— weldability,

— corrosion resistance,

— resistance to shear stress,

— torque/clamp force performance, or

— fatigue resistance.

2 Normative references

The following referenced documents are indispensable for the application 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 68-1, *ISO general purpose screw threads — Basic profile — Part 1: Metric screw threads*

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

ISO 225, *Fasteners — Bolts, screws, studs and nuts — Symbols and designations of dimensions*

ISO 261, *ISO general purpose metric screw threads — General plan*

ISO 262, *ISO general purpose metric screw threads — Selected sizes for screws, bolts and nuts*

ISO 273, *Fasteners — Clearance holes for bolts and screws*

ISO 724, *ISO general-purpose metric screw threads — Basic dimensions*

ISO 898-2, *Mechanical properties of fasteners — Part 2: Nuts with specified proof load values — Coarse thread*

ISO 898-5, *Mechanical properties of fasteners made of carbon steel and alloy steel — Part 5: Set screws and similar threaded fasteners not under tensile stresses*

ISO 898-7, *Mechanical properties of fasteners — Part 7: Torsional test and minimum torques for bolts and screws with nominal diameters 1 mm to 10 mm* [1)]

ISO 965-1, *ISO general-purpose metric screw threads — Tolerances — Part 1: Principles and basic data*

ISO 965-2, *ISO general purpose metric screw threads — Tolerances — Part 2: Limits of sizes for general purpose external and internal screw threads — Medium quality*

ISO 965-4, *ISO general purpose metric screw threads — Tolerances — Part 4: Limits of sizes for hot-dip galvanized external screw threads to mate with internal screw threads tapped with tolerance position H or G after galvanizing*

ISO 4042, *Fasteners — Electroplated coatings*

ISO 4885:1996, *Ferrous products — Heat treatments — Vocabulary*

ISO 6157-1, *Fasteners — Surface discontinuities — Part 1: Bolts, screws and studs for general requirements*

ISO 6157-3, *Fasteners — Surface discontinuities — Part 3: Bolts, screws and studs for special requirements*

ISO 6506-1, *Metallic materials — Brinell hardness test — Part 1: Test method*

ISO 6507-1, *Metallic materials — Vickers 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* [2)]

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1) Under revision.

2) To be published. (Revision of ISO 6892:1998)

ISO 7500-1, *Metallic materials — Verification of static uniaxial testing machines — Part 1: Tension/compression testing machines — Verification and calibration of the force-measuring system*

ISO 10683, *Fasteners — Non-electrolytically applied zinc flake coatings*

ISO 10684:2004, *Fasteners — Hot dip galvanized coatings*

ISO 16426, *Fasteners — Quality assurance system*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

3.1
finished fastener
fastener for which all manufacturing steps have been completed, with or without any surface coating and with full or reduced loadability, and which has not been machined into a test piece

3.2
machined test piece
test piece machined from a fastener to evaluate material properties

3.3
full-size fastener
finished fastener with a shank diameter of $d_s > d$ or $d_s \approx d$, or screw threaded to the head, or fully threaded stud

3.4
fastener with waisted shank
finished fastener with a shank diameter of $d_s \leq d_2$

3.5
base metal hardness
hardness closest to the surface (when traversing from core to outside diameter) just before an increase or decrease occurs, denoting, respectively, carburization or decarburization

3.6
decarburization
depletion of carbon from the surface layer of a ferrous product

[ISO 4885:1996]

3.7
partial decarburization
decarburization with loss of carbon sufficient to cause a lighter shade of tempered martensite and significantly lower hardness than that of the adjacent base metal without, however, showing ferrite grains under metallographic examination

3.8
complete decarburization
decarburization with sufficient carbon loss to show the presence of clearly defined ferrite grains under metallographic examination

3.9
carburization
result of increasing surface carbon to a content above that of the base metal

4 Symbols and abbreviated terms

For the purposes of this document, the symbols and abbreviated terms given in ISO 225 and ISO 965-1 and the following, apply.

A	Percentage elongation after fracture (of machined test piece), %
A_f	Elongation after fracture for full-size fastener
$A_{s,nom}$	Nominal stress area in thread, mm^2
A_{ds}	Cross sectional area of waisted shank, mm^2
b	Thread length, mm
b_m	Thread length of stud (metal) end, mm
d	Nominal thread diameter, mm
d_o	Diameter of machined test piece, mm
d_1	Basic minor diameter of external thread, mm
d_2	Basic pitch diameter of external thread, mm
d_3	Minor diameter of external thread, mm
d_a	Transition diameter (internal diameter of the bearing face), mm
d_h	Hole diameter of wedge or block, mm
d_s	Diameter of unthreaded shank, mm
E	Height of non-decarburized zone in thread, mm
F_m	Ultimate tensile load, N
$F_{m,min}$	Minimum ultimate tensile load, N
F_p	Proof load, N
F_{pf}	Load at 0,004 8 d non-proportional elongation for full-size fastener, N
G	Depth of complete decarburization in thread, mm
H	Height of fundamental triangle, mm
H_1	Height of external thread in maximum material condition, mm
k	Height of the head, mm
K_V	Impact strength, J
l	Nominal length, mm
l_o	Total length of fastener before loading, mm
l_1	Total length of fastener after first unloading, mm
l_2	Total length of fastener after second unloading, mm
l_s	Length of unthreaded shank, mm
l_t	Overall length of stud, mm
l_{th}	Free threaded length of fastener in testing device, mm
L_c	Length of straight portion (of machined test piece), mm
L_o	Original gauge length (of machined test piece), mm

L_t	Total length of machined test piece, mm
L_u	Final gauge length (of machined test piece), mm
ΔL_p	Plastic elongation, mm
M_B	Breaking torque, Nm
P	Pitch of thread, mm
r	Fillet radius, mm
R_{eL}	Lower yield strength for machined test piece, MPa
R_m	Tensile strength, MPa
$R_{p0,2}$	Stress at 0,2 % non-proportional elongation for machined test piece, MPa
R_{pf}	Stress at 0,0048 d non-proportional elongation for full-size fastener, MPa
s	Width across flats, mm
S_o	Cross-sectional area of machined test piece before tensile test, mm^2
S_p	Stress under proof load, MPa
S_u	Cross-sectional area of machined test piece after fracture, mm^2
Z	Percentage reduction of area after fracture for machined test piece, %
α	Wedge angle for tensile test under wedge loading
β	Angle of the solid block for head soundness test
nom	Subscript added to symbol to denote nominal value
max	Subscript added to symbol to denote maximum value
min	Subscript added to symbol to denote minimum value

5 Designation system for property classes

The symbol for property classes of bolts, screws, and studs consists of two numbers, separated by a dot (see Tables 1 to 3):

— the number to the left of the dot consists of one or two digits and indicates 1/100 of the nominal tensile strength, $R_{m,nom}$, in megapascals (see Table 3, No. 1);

— the number to the right of the dot indicates 10 times the ratio between the nominal yield strength (lower yield strength), $R_{eL,nom}$, or nominal stress at 0,2 % non-proportional elongation, $R_{p0,2,nom}$, or nominal stress at 0,0048 d non-proportional elongation, $R_{pf,nom}$ (see Table 3, Nos. 2 to 4), and the nominal tensile strength, $R_{m,nom}$, as specified in Table 1 (yield strength ratio).

Table 1 — Ratio of nominal yield strength and nominal tensile strength

Number right of dot	.6	.8	.9
$\frac{R_{eL,nom}}{R_{m,nom}}$ or $\frac{R_{p0,2,nom}}{R_{m,nom}}$ or $\frac{R_{pf,nom}}{R_{m,nom}}$	0,6	0,8	0,9

EXAMPLE A fastener of nominal tensile strength $R_{m,nom}$ = 800 MPa and with a yield strength ratio of 0,8 has the property class designation 8.8. A fastener with the same material properties but with reduced loadability is designated by 08.8 (see 10.4).