SLOVENSKI STANDARD
SIST EN 20898-1:1996

01-april-1996

Mehanske lastnosti veznih elementov - 1. del: Vijaki

Mechanical properties of fasteners - Part 1: Bolts, screws and studs (ISO 898-1:1988)

Mechanische Eigenschaften von Verbindungselementen - Teil 1: Schrauben (ISO 898-1:1988)

Caractéristiques mécaniques des éléments de fixation - Partie 1: Boulons, vis et goujons (ISO 898-1:1988)

Ta slovenski standard je istoveten z: EN 20898-1:1991

ICS:

21.060.10 Sorniki, vijaki, stebelni vijaki Bolts, screws, studs

SIST EN 20898-1:1996 **en**

CEN

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

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TO THE MEMBERS OF CEN

AUX MEMBRES DU CEN

AN DIE MITGLIEDER DES CEN

ADOPTED EUROPEAN STANDARD	-
NORME EUROPEENNE ADOPTEE	- EN 20898-1:1991
ANGENOMMENE EUROPÄISCHE NORM	-
	- Mechanical properties of fasteners - Part 1:
	- Bolts, screws and studs (ISO 898-1:1988)

Date of ratification (dor):	1991-02-11
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1991-02-13
EN 20 898-1 00034/15875

Dear Members,

As a result of the favourable response to the formal vote, the above-mentioned draft European Standard is accepted as a European Standard.

You will find enclosed the title pages of this European Standard in the three official versions. This standard is identical to the ISO standard as referred to.

The obligations of CEN members towards European Standards are laid down in the Common CEN/CENELEC Rules clause 5, subclause 5.2.2.

We kindly ask you to send to the Central Secretariat a copy of the corresponding national version of the European Standard.

Yours faithfully,

Chers Membres,

Comme suite au résultat favorable du vote formel, le projet de Norme Européenne ci-dessus mentionné, est accepté comme Norme Européenne.

Nous vous prions de trouver ci-joint les pages de titres de cette Norme Européenne dans les trois versions officielles. Cette norme est identique à la norme ISO mentionnée.

Les obligations des membres du CEN face aux Normes Européennes sont établies dans les Règles Communes CEN/CENELEC, article 5, paragraphe 5.2.2.

Nous vous demandons de bien vouloir envoyer copie de la version nationale correspondante de la Norme Européenne au Secrétariat Central du CEN.

Veuillez agréer, Chers Membres, l'expression de nos sentiments distingués.

Sehr geehrte Mitglieder,

aufgrund des positiven Ergebnisses der Umfrage ist der o.g. Europäische Norm-Entwurf als Europäische Norm angenommen.

Anbei senden wir Ihnen die Titelseiten dieser Europäischen Norm in den drei offiziellen Sprachfassungen. Diese Norm ist dieselbe wie die obengenannte ISO-Norm.

Die Verpflichtung der CEN-Mitglieder für diese Europäische Norm ist in den Gemeinsamen CEN/CENELEC-Regeln, Abschnitt 5, Unterabschnitt 5.2.2 festgelegt.

Wir bitten Sie, eine Kopie der entsprechenden nationalen Fassung der Europäischen Norm an das Zentralsekretariat zu senden.

Mit freundlichen Grüßen

H. Plissart
Division Manager

Enclosures

DK/acc

INTERNATIONAL STANDARD

ISO 898-1

Second edition
1988-02-15

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

Mechanical properties of fasteners —

Part 1 :
Bolts, screws and studs

Caractéristiques mécaniques des éléments de fixation —

Partie 1 : Boulons, vis et goujons

Reference number
ISO 898-1 : 1988 (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 898-1 was prepared by Technical Committee ISO/TC 2, *Fasteners.*

This second edition cancels and replaces the first edition (ISO 898-1 : 1978), to which the following major alterations have been made :

a) the chemical compositions and tempering temperatures of steels have been revised;

b) the maximum hardness values for bolts, screws and studs of property classes 3.6 to 5.8 and 8.8 have been increased;

c) the surface hardnesses for bolts, screws and studs of property classes 8.8 to 12.9 have been revised;

d) the application of test programmes A and B has been revised and specified more clearly;

e) property classes 4.8, 5.8 and 6.8 are no longer tested according to test programme A;

f) the surface integrity test has been added to test programme A, the wedge loading test for bolts and screws with nominal thread diameter $d < 4$ mm or nominal length $l < 2{,}5d$ has been deleted from test programme B;

g) for nominal thread diameters 10 and 12 mm, the metric fine pitch was changed from 1,25 to 1 and 1,5 respectively, because these are the preferred pitches (see also ISO 8676 and ISO 8765) : the minimum tensile loads and proofing loads were changed as a consequence;

h) the application of the wedge loading test for bolts and screws with head bearing diameter above $1{,}7d$ has been specified.

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.

Printed in Switzerland

Contents

Mechanical properties of fasteners —

Part 1 :
Bolts, screws and studs

1 Scope and field of application

This part of ISO 898 specifies the mechanical properties of bolts, screws and studs when tested at room temperature (see ISO 1). Properties will vary at higher and lower temperature.

This part of ISO 898 applies to bolts, screws and studs

— with nominal thread diameter d < 39 mm (coarse and fine pitch);

— with triangular ISO thread according to ISO 68;

— with diameter/pitch combinations according to ISO 261 and ISO 262;

— with thread tolerance according to ISO 965-1 and ISO 965-2;

— of any shape;

— made of carbon steel or alloy steel.

It does not apply to set screws and similar threaded fasteners (see ISO 898-5).

It does not specify requirements for such properties as

— weldability;

— corrosion-resistance (see ISO 3506);

— ability to withstand temperatures above +300 °C or below −50 °C.

NOTE — The designation system of this part of ISO 898 may be used for sizes outside the limits laid down in this clause (e.g. d > 39 mm), provided that all mechanical requirements of the property classes are met.

2 References

ISO 1, *Standard reference temperature for industrial length measurements.*

ISO 68, *ISO general purpose screw threads — Basic profile.*

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

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 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 or sizes for general purpose bolt and nut threads — Medium quality.*

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

ISO 6157-3, *Fasteners — Surface discontinuities — Part 3: Bolts, screws and studs for special requirements.* [1)]

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

ISO 6508, *Metallic materials — Hardness test — Rockwell test — Scales A, B, C, D, E, F, G, H, K.*

ISO 6892, *Metallic materials — Tensile testing.*

3 Designation system

The designation system for property classes of bolts, screws and studs is shown in table 1. The abscissae show the nominal tensile strength values, R_m, in newtons per square millimetre, while the ordinates show those of the minimum elongation after fracture, A min., as a percentage.

1) At present at the stage of draft.

The property class symbol consists of two figures:

— the first indicates 1/100 of the nominal tensile strength in newtons per square millimetre (see R_m in table 3);

— the second figure indicates 10 times the ratio between lower yield stress R_{eL} (or proof stress $R_{p0,2}$) and nominal tensile strength R_m (yield stress ratio).

The multiplication of these two figures will give 1/10 of the yield stress in newtons per square millimetre.

Lower yield stress R_{eL} (or proof stress $R_{p0,2}$) and minimum tensile strength R_m are equal to or greater than the nominal values (see table 3).

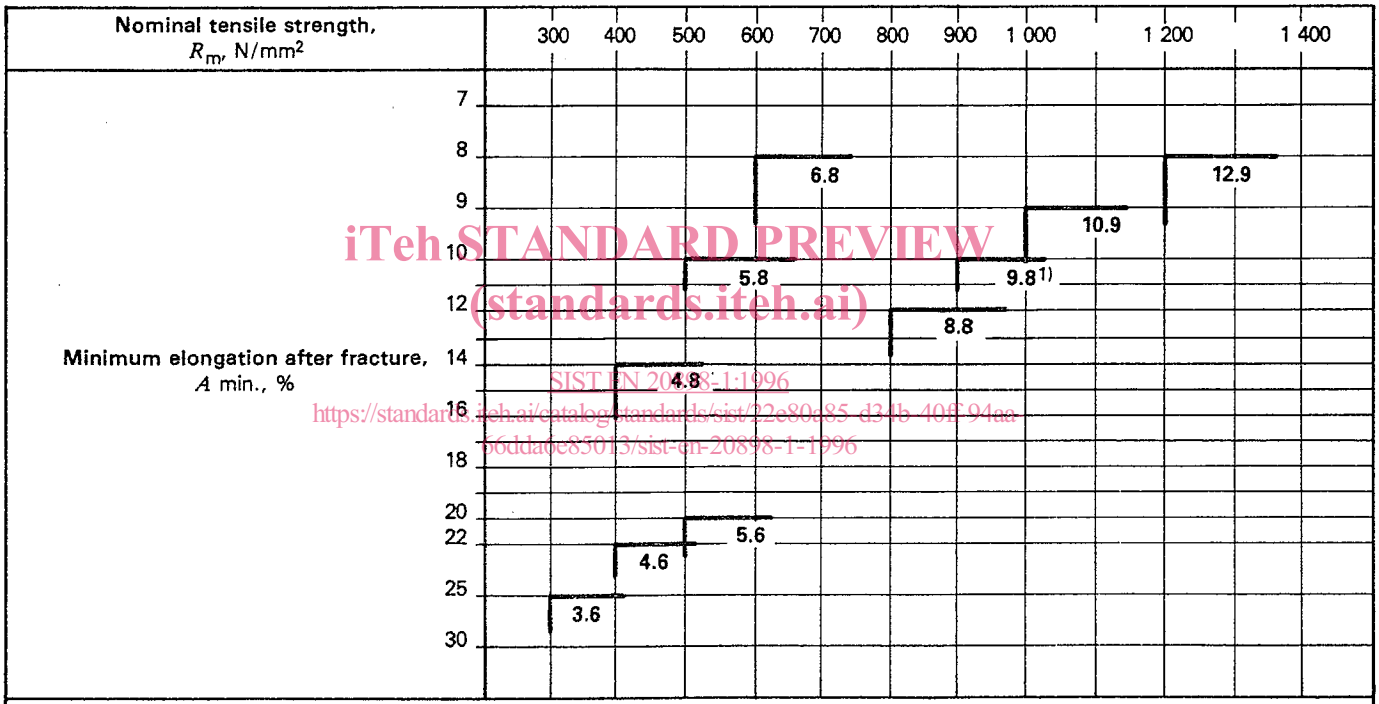
4 Materials

Table 2 specifies steels for the different property classes of bolts, screws and studs.

The minimum tempering temperatures listed in table 2 are mandatory for property classes 8.8 to 12.9 in all cases.

The chemical composition limits are mandatory only for those fasteners which are not subject to tensile testing.

Table 1 — System of coordinates



Relationship between yield stress and tensile strength				
Second figure of symbol		.6	.8	.9
$\frac{\text{Lower yield stress } R_{eL} \text{ or proof stress } R_{p0,2}}{\text{Nominal tensile strength } R_m} \times 100$	%	60	80	90

1) Applies only to thread diameter $d < 16$ mm.

NOTE — Although a great number of property classes are specified in this part of ISO 898, this does not mean that all classes are appropriate for all items. Further guidance for application of the specific property classes is given in the relevant product standard. For non-standard items, it is advisable to follow as closely as possible the choice already made for similar standard items.

Table 2 — Steels

Property class	Material and treatment	Chemical composition limits (check analysis) % C min.	C max.	P max.	S max.	Tempering temperature °C min.
3.6[1]	Carbon steel	—	0,20	0,05	0,06	—
4.6[1]		—	0,55	0,05	0,06	—
4.8[1]						
5.6		0,15	0,55	0,05	0,06	—
5.8[1]		—	0,55	0,05	0,06	
6.8[1]						
8.8[2]	Carbon steel with additives (e.g. Boron or Mn or Cr) quenched and tempered or	0,15[3]	0,40	0,035	0,035	425
	Carbon steel quenched and tempered	0,25	0,55	0,035	0,035	
9.8	Carbon steel with additives (e.g. Boron or Mn or Cr) quenched and tempered or	0,15[3]	0,35	0,035	0,035	425
	Carbon steel quenched and tempered	0,25	0,55	0,035	0,035	
10.9[4]	Carbon steel with additives (e.g. Boron or Mn or Cr) quenched and tempered	0,15[3]	0,35	0,035	0,035	340
10.9[5]	Carbon steel quenched and tempered or	0,25	0,55	0,035	0,035	425
	Carbon steel with additives (e.g. Boron or Mn or Cr) quenched and tempered or	0,20[3]	0,55	0,035	0,035	
	Alloy steel quenched and tempered[7]	0,20	0,55	0,035	0,035	
12.9[5], [6]	Alloy steel quenched and tempered[7]	0,20	0,50	0,035	0,035	380

1) Free cutting steel is allowed for these property classes with the following maximum sulfur, phosphorus and lead contents: sulfur 0,34 %; phosphorus 0,11 %; lead 0,35 %.

2) For nominal diameters above 20 mm the steels specified for property class 10.9 may be necessary in order to achieve sufficient hardenability.

3) In case of plain carbon boron alloyed steel with a carbon content below 0,25 % (ladle analysis), the minimum manganese content shall be 0,6 % for property class 8.8 and 0,7 % for 9.8 and 10.9.

4) Products shall be additionally identified by underlining the symbol of the property class (see clause 9).

5) For the materials of these property classes, it is intended that there should be a sufficient hardenability to ensure a structure consisting of approximately 90 % martensite in the core of the threaded sections for the fasteners in the "as-hardened" condition before tempering.

6) A metallographically detectable white phosphorous enriched layer is not permitted for property class 12.9 on surfaces subjected to tensile stress.

7) Alloy steel shall contain one or more of the alloying elements chromium, nickel, molybdenum or vanadium.

5 Mechanical properties

When tested by the methods described in clause 8, the bolts, screws and studs shall, at room temperature, have the mechanical properties set out in table 3.

Table 3 — Mechanical properties of bolts, screws and studs

Sub-clause No.	Mechanical property			Property class										
				3.6	4.6	4.8	5.6	5.8	6.8	8.8[1] d < 16 mm	8.8[1] d > 16 mm[2]	9.8[3]	10.9	12.9
5.1 and 5.2	Tensile strength, R_m[4), 5)], N/mm²		nom.	300	400		500		600	800	800	900	1 000	1 200
			min.	330	400	420	500	520	600	800	830	900	1 040	1 220
5.3	Vickers hardness, HV, $F \geq 98$ N		min.	95	120	130	155	160	190	250	255	290	320	385
			max.	250						320	335	360	380	435
5.4	Brinell hardness, HB, $F = 30\,D^2$		min.	90	114	124	147	152	181	238	242	276	304	366
			max.	238						304	318	342	361	414
5.5	Rockwell hardness, HR	min.	HRB	52	67	71	79	82	89	—	—	—	—	—
			HRC	—	—	—	—	—	—	22	23	28	32	39
		max.	HRB	99,5						—	—	—	—	—
			HRC	—						32	34	37	39	44
5.6	Surface hardness, HV 0,3		max.	—						6)				
5.7	Lower yield stress, R_{eL}[7)], N/mm²		nom.	180	240	320	300	400	480	—	—	—	—	—
			min.	190	240	340	300	420	480	—	—	—	—	—
5.8	Proof stress, $R_{p0,2}$, N/mm²		nom.	—						640	640	720	900	1 080
			min.	—						640	660	720	940	1 100
5.9	Stress under proofing load, S_p	S_p/R_{eL} or $S_p/R_{p0,2}$		0,94	0,94	0,91	0,93	0,90	0,92	0,91	0,91	0,90	0,88	0,88
		N/mm²		180	225	310	280	380	440	580	600	650	830	970
5.10	Elongation after fracture, A		min.	25	22	14	20	10	8	12	12	10	9	8
5.11	Strength under wedge loading[5)]			The values for full size bolts and screws (not studs) shall not be smaller than the minimum values for tensile strength shown in 5.2										
5.12	Impact strength, J		min.	—			25	—		30	30	25	20	15
5.13	Head soundness			no fracture										
5.14	Minimum height of non-decarburized thread zone, E			—						$\frac{1}{2} H_1$			$\frac{2}{3} H_1$	$\frac{3}{4} H_1$
	Maximum depth of complete decarburization, G		mm	—						0,015				

1) For bolts of property class 8.8 in diameters $d < 16$ mm, there is an increased risk of nut stripping in the case of inadvertent over-tightening inducing a load in excess of proofing load. Reference to ISO 898-2 is recommended.

2) For structural bolting the limit is 12 mm.

3) Applies only to nominal thread diameters $d < 16$ mm.

4) Minimum tensile properties apply to products of nominal length $l \geq 2{,}5d$. Minimum hardness applies to products of length $l < 2{,}5d$ and other products which cannot be tensile-tested (e.g. due to head configuration).

5) For testing of full-size bolts, screws and studs, the loads given in tables 6 to 9 shall be applied.

6) Surface hardness shall not be more than 30 Vickers points above the measured core hardness on the product when readings of both surface and core are carried out at HV 0,3. For property class 10.9, any increase in hardness at the surface which indicates that the surface hardness exceeds 390 HV is not acceptable.

7) In cases where the lower yield stress R_{eL} cannot be determined, it is permissible to measure the proof stress $R_{p0,2}$.