April 1995

Mechanical properties of fasteners

Torsional test and minimum torques for bolts and screws with nominal diameters 1 mm to 10 mm (ISO 898-7:1992)

English version of DIN EN 20898-7

DIN EN 20898-7

This standard incorporates the English version of ISO 898-7

ICS 21.060.10

Supersedes DIN 267-25, November 1984 edition.

Descriptors: Fasteners, bolts, screws, mechanical properties, testing.

Mechanische Eigenschaften von Verbindungselementen. Teil 7: Torsionsversuch und Mindest-Bruchdrehmomente für Schrauben mit Nenndurchmessern 1 mm bis 10 mm (ISO 898-7:1992)

European Standard EN 20898-7:1995 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/185 to adopt International Standard ISO 898-7 as a European Standard.

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

DIN EN 20898-1 is the standard corresponding to International Standard ISO 898-1 referred to in clause 2.

Amendments

In comparison with DIN 267-25, November 1984 edition, the following amendments have been made.

a) The scope of the torsional test has been limited to cover only bolts and screws of property classes 8.8 to 12.9.

b) The minimum breaking torque has been changed for property class 12.9 bolts and screws with M10 × 1 thread and property classes 8.8, 10.9 and 12.9 bolts and screws with M10 × 1,25 thread.

c) For property class 9.8 bolts and screws, additional minimum breaking torque values have been specified.

Previous edition

DIN 267-25: 1984-11.

Standard referred to

(and not included in **Normative reference** and **Annex ZA**):

DIN EN 20898-1 Mechanical properties of fasteners; bolts, screws and studs (ISO 898-1:1988)

EN comprises 6 pages.

EUROPEAN STANDARD
NORME EUROPÉENNE
EUROPÄISCHE NORM

EN 20898-7

January 1995

ICS 21.060.10

Descriptors: Fasteners, bolts, screws, mechanical properties, testing.

English version

Mechanical properties of fasteners
Part 7: Torsional test and minimum torques for bolts and screws with nominal diameters 1 mm to 10 mm (ISO 898-7:1992)

Caractéristiques mécaniques des éléments de fixation. Partie 7: Essai de torsion et couples minimaux de rupture des vis de diamètre nominal de filetage de 1 mm à 10 mm (ISO 898-7:1992)

Mechanische Eigenschaften von Verbindungselementen. Teil 7: Torsionsversuch und Mindest-Bruchdrehmomente für Schrauben mit Nenndurchmessern 1 mm bis 10 mm (ISO 898-7:1992)

This European Standard was approved by CEN on 1995-01-04 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 20898-7:1995 E

Foreword

International Standard

ISO 898-7:1992 Mechanical properties of fasteners; torsional test and minimum torques for bolts and screws with nominal diameters 1 mm to 10 mm,

which was prepared by ISO/TC 2 'Fasteners' of the International Organization for Standardization, has been adopted by Technical Committee CEN/TC 185 'Threaded and non-threaded mechanical fasteners and accessories'.

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 July 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 898-7:1992 was approved by CEN as a European Standard without any modification.

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

1 Scope

This part of ISO 898 specifies a torsional test for the determination of the breaking torque of bolts and screws with nominal diameters 1 mm to 10 mm with property classes 8.8 to 12.9 in accordance with ISO 898-1. The test applies to bolts and screws with thread less than M3 for which no breaking and proof loads are indicated in ISO 898-1, as well as to short bolts and screws with nominal diameters 3 mm to 10 mm which cannot be subjected to a tensile test.

The minimum breaking torques are not valid for hexagon socket set screws.

2 Normative reference

The following standard contains provisions which, through reference in this text, constitute provisions of this part of ISO 898. At the time of publication, the edition indicated was valid. All standards are subject to revision, and parties to agreements based on this part of ISO 898 are encouraged to investigate the possibility of applying the most recent edition of the standard indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.

ISO 898-1:1988, *Mechanical properties of fasteners — Part 1: Bolts, screws and studs.*

3 Torsional test

3.1 Principle

Determination of the breaking torque by clamping the bolt or screw to be tested into a test device.

3.2 Apparatus

3.2.1 **Test device for torsional test**, such as is shown in figure 1.

3.2.2 **Torquemeter**, with a scale which shall not exceed the quintuple of the respective minimum breaking torque. The maximum inaccuracy of the torquemeter shall be $\pm$ 7 % of the minimum breaking torque to be tested.

3.3 Test conditions

The bolt or screw shall be exclusively subjected to torsion whereby the respective minimum breaking torque according to table 2 shall be reached before rupture occurs. The test result shall not be influenced by head friction or by thread friction.

3.4 Procedure

Clamp the bolt or screw into the test device over at least two full threads, having a free thread length of at least one thread diameter present between the head of the bolt or screw and the threaded insert (see figure 1). Apply the torque in a continuously increasing manner.

4 Minimum breaking torques

The following formula applies to the determination of the minimum breaking torques:

$$M_{B\,min} = \tau_{B\,min} \cdot W_{p\,min}$$

with

$$W_{p\,min} = \frac{\pi}{16} \cdot d_{3\,min}^3$$

and

$$\tau_{B\,min} = X \cdot R_{m\,min}$$

where

$M_{B\,min}$ is the minimum breaking torque (see table 2);

τ_B is the torsional strength;

W_p is the polar moment of resistance;

$d_{3\,min}$ is the minimum value of the minor diameter of the external thread;

R_m is the tensile strength; and

X is the strength ratio τ_B/R_m (see table 1)

5 Evaluation of the torque test

The tested bolt or screw is regarded as having passed the torque test if no rupture occurs before the minimum breaking torques specified in table 2 are reached.

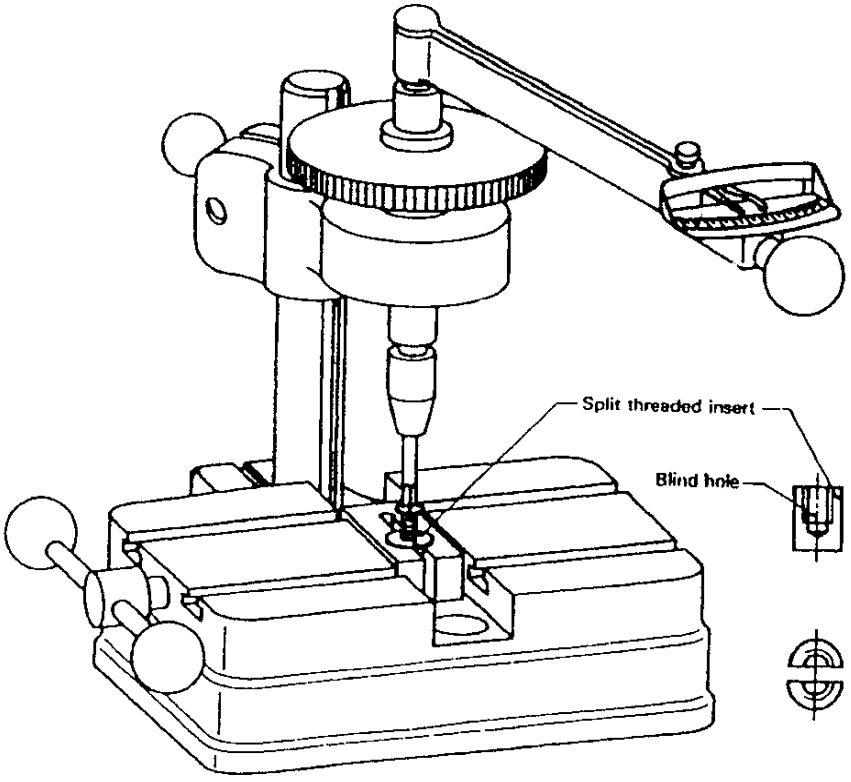

Figure 1 — Example of a device for the torsional test

Table 1 — Strength ratio X

Property class	8.8	9.8	10.9	12.9
Ratio X	0,84	0,815	0,79	0,75

Table 2 — Minimum breaking torques

Thread	Pitch mm	Minimum breaking torque[1] $M_{B\ min}$ N·m			
		Property class			
		8.8	9.8	10.9	12.9
M1	0,25	0,033	0,036	0,040	0,045
M1,2	0,25	0,075	0,082	0,092	0,10
M1,4	0,3	0,12	0,13	0,14	0,16
M1,6	0,35	0,16	0,18	0,20	0,22
M2	0,4	0,37	0,40	0,45	0,50
M2,5	0,45	0,82	0,90	1,0	1,1
M3	0,5	1,5	1,7	1,9	2,1
M3,5	0,6	2,4	2,7	3,0	3,3
M4	0,7	3,6	3,9	4,4	4,9
M5	0,8	7,6	8,3	9,3	10
M6	1	13	14	16	17
M7	1	23	25	28	31
M8	1,25	33	36	40	44
M8 × 1	–	38	42	46	52
M10	1,5	66	72	81	90
M10 × 1	–	84	92	102	114
M10 × 1,25	–	75	82	91	102

1) These minimum breaking torques are valid for bolts and screws with the thread tolerances 6g, 6f and 6e.

Annex A
(informative)

Explanatory note

ISO 898-1 conlains properly classes for bolts and screws but only indicates minimum breaking loads and proof loads for threads equal to or greater than M3 because in the case of smaller bolts and screws the influence of the thread tolerances and the tolerances of the test device is such that an exact determination of breaking loads and proof loads is not possible.

Also since bolts and screws with threads greater than M3 up to approximately M10 often cannot be subjected to a tensile test (or proof load test) due to their short lengths, minimum breaking torques have been specified for bolts and screws M1 to M10 (including the fine pitch threads M8 x 1, M10 x 1 and M10 x 1,25) which allow an evaluation of the functional properties of the bolts and screws. For the time being, minimum breaking torques can be specified for property classes 8.8 to 12.9 only, because for lower property classes the test results are widely scattered and therefore more studies are required.

The indicated minimum breaking torques are to be applied without taking account of friction and the type of test device is optional according to this part of ISO 898. Figure 1 is only an example of a suitable test device.

The minimum breaking torques have been determined on the basis of cross-sections resulting from the minimum values of the minor diameter of the thread tolerance 6g. Tests have shown that the torques can also be used for bolts and screws with thread tolerances 6f and 6e.

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	Year
ISO 898-1	1988	Mechanical properties of fasteners - Part 1: Bolts, screws and studs	EN 20898-1	1991