

भारतीय मानक

औद्योगिक बन्धक सामग्री — इस्पात के चूड़ीदार बन्धक
तकनीकी पूर्ती शर्ते — यांत्रिक गुणधर्म

भाग 20 1 मि.मी. से 10 मि.मी. तक अभिहित व्यास वाले काबले
और पेंच के लिए मरोड़ परीक्षण और न्यूनतम बल आघूर्ण

Indian Standard

**INDUSTRIAL FASTENERS — THREADED
STEEL FASTENERS — TECHNICAL SUPPLY
CONDITIONS — MECHANICAL PROPERTIES**

**PART 20 TORSIONAL TEST AND MINIMUM TORQUES FOR BOLTS AND SCREWS WITH
NOMINAL DIAMETERS 1 mm To 10 mm**

(ISO TITLE : MECHANICAL PROPERTIES OF FASTENERS —
PART 7 : TORSIONAL TEST AND MINIMUM TORQUES FOR BOLTS AND
SCREWS WITH NOMINAL DIAMETERS 1 mm To 10 mm)

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NATIONAL FOREWORD

This Indian Standard which is identical with ISO 898-7 : 1992 'Mechanical properties of fasteners — Part 7 : Torsional test and minimum torques for bolts and screws with nominal diameters 1 mm to 10 mm', issued by the International Organization for Standardization (ISO) was adopted by the Bureau of Indian Standards on the recommendation of Bolts, Nuts and Fasteners Accessories Sectional Committee, and approval of Light Mechanical Engineering Division Council.

The text of ISO standard has been approved as suitable for publication as Indian Standard without deviations. Certain terminology and conventions are however not identical to those used in Indian Standards. Attention is particularly drawn to the following:

- a) Wherever the words 'International Standard' appear, referring to this standard, they should be read as 'Indian Standard', and
- b) Comma (,) has been used as a decimal marker while in Indian Standards the current practice is to use a point (.) as the decimal marker.

In this adopted standard, reference appears to ISO 898-1 : 1988. The Indian Standard IS 1367 (Part 3) : 1991 'Technical supply conditions for threaded steel fasteners : Part 3 Mechanical properties and test methods for bolts, screws and studs with full loadability (*third revision*)', which is identical with ISO 898-1 : 1988.

Indian Standard

INDUSTRIAL FASTENERS — THREADED STEEL FASTENERS — TECHNICAL SUPPLY CONDITIONS — MECHANICAL PROPERTIES

PART 20 TORSIONAL TEST AND MINIMUM TORQUES FOR BOLTS AND SCREWS WITH NOMINAL DIAMETERS 1 mm To 10 mm

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.

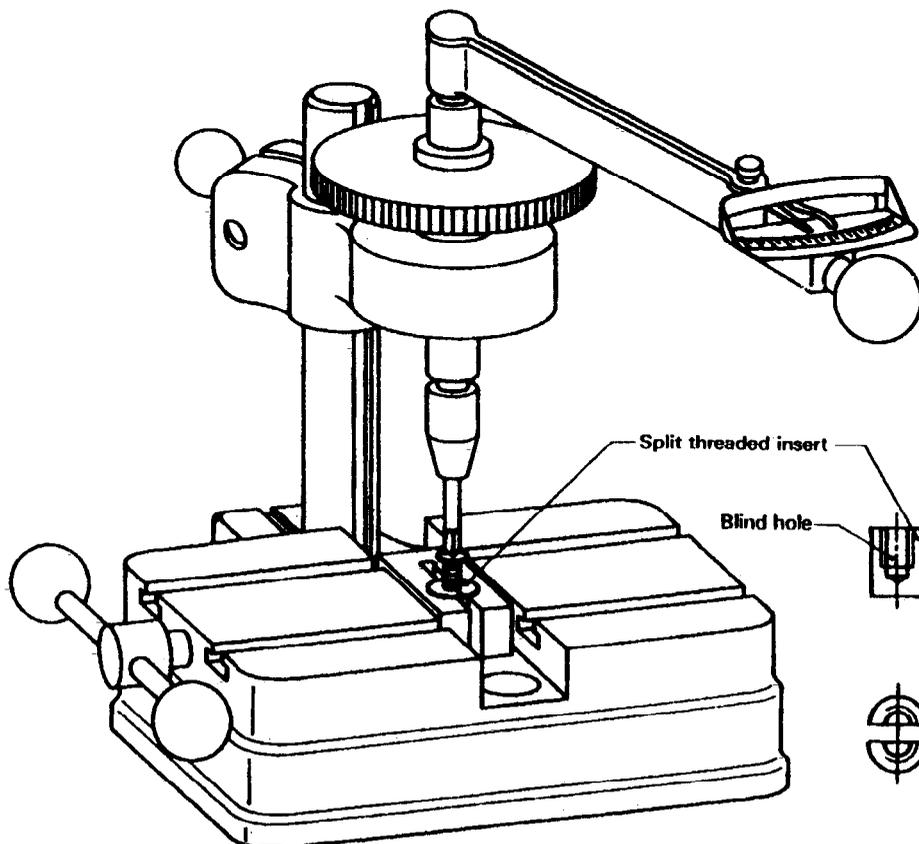


Figure 1 — Example of a device for the torsional test

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⁾ $M_{B \text{ min}}$ 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 contains property 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 × 1, M10 × 1 and M10 × 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.

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