SLOVENSKI STANDARD
SIST EN ISO 16047:2005

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Vezni elementi – Preskus torzijskega momenta/prednapetosti (ISO 16047:2005)

Fasteners - Torque/clamp force testing (ISO 16047:2005)

Verbindungselemente - Drehmoment/Vorspannkraft-Versuch (ISO 16047:2005)

Eléments de fixation - Essais couple/tension (ISO 16047:2005)

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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.

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Foreword

This document (EN ISO 16047:2005) has been prepared by Technical Committee ISO/TC 2 "Fasteners" in collaboration with Technical Committee CEN/TC 185 "Threaded and non-threaded mechanical fasteners and accessories", 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of an identical text or by endorsement, at the latest by August 2005, and conflicting national standards shall be withdrawn at the latest by August 2005.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Slovakia, Slovenia, Spain, Sweden, Switzerland and United Kingdom.

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The text of ISO 16047:2005 has been approved by CEN as EN ISO 16047:2005 without any modifications.

INTERNATIONAL STANDARD

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Fasteners — Torque/clamp force testing

Éléments de fixation — Essais couple/tension

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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.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

ISO 16047 was prepared by Technical Committee ISO/TC 2, *Fasteners*, Subcommittee SC 1, *Mechanical properties of fasteners*.

Fasteners — Torque/clamp force testing

1 Scope

This International Standard specifies the conditions for carrying out torque/clamp force tests on threaded fasteners and related parts.

It is applicable, basically, to bolts, screws, studs and nuts made of carbon steel and alloy steel, whose mechanical properties are specified in ISO 898-1, ISO 898-2 or ISO 898-6, having ISO metric threads with thread sizes M3 to M39. It is also applicable to the combination of other externally and internally threaded fasteners with a triangular ISO thread according to ISO 68-1.

It is not applicable to set screws and similar threaded fasteners that are not under tensile stresses, nor to screws which form their own mating thread or threaded fasteners having additional self-locking features.

Unless otherwise agreed, the tests are carried out at room temperature. However, tests carried out under standard conditions are made at a temperature of 10 °C to 35 °C.

This method allows determination of the tightening characteristics of threaded fasteners and related parts.

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 273:1979, *Fasteners — Clearance holes for bolts and screws*

ISO 898-1, *Mechanical properties of fasteners made of carbon steel and alloy steel — Part 1: Bolts, screws and studs*

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

ISO 898-6, *Mechanical properties of fasteners — Part 6: Nuts with specified proof load values — Fine pitch thread*

ISO 4014, *Hexagon head bolts — Product grades A and B*

ISO 4017, *Hexagon head screws — Product grades A and B*

ISO 4032, *Hexagon nuts, style 1 — Product grades A and B*

ISO 4033, *Hexagon nuts, style 2 — Product grades A and B*

ISO 4042:1999, *Fasteners — Electroplated coatings*

ISO 4759-3:2000, *Tolerances for fasteners — Part 3: Plain washers for bolts, screws and nuts — Product grades A and C*

ISO 4762, *Hexagon socket head cap screws*

ISO 6892, *Metallic materials — Tensile testing at ambient temperature*

ISO 7093-1, *Plain washers — Large series — Product grade A*

ISO 8673, *Hexagon nuts, style 1, with metric fine pitch thread — Product grades A and B*

ISO 8674, *Hexagon nuts, style 2, with metric fine pitch thread — Product grades A and B*

ISO 8765, *Hexagon head bolts with metric fine pitch thread — Product grades A and B*

ISO 15071, *Hexagon bolts with flange — Small series — Product grade A*

ISO 15072, *Hexagon bolts with flange with metric fine pitch thread — Small series — Product grade A*

3 Terms and definitions

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

3.1
clamp force
F
axial tension acting on the bolt shank or compression acting on the clamped member during tightening

3.2
yield clamp force
F_y
clamp force at which the bolt shank or the engaged thread yield under combined stress condition in tightening

3.3
ultimate clamp force
F_u
maximum clamp force under combined stress condition potentially induced before bolt shank fracture

3.4
tightening torque
wrenching torque
applied torque
T
overall torque applied on nut or bolt head in tightening

3.5
yield tightening torque
T_y
tightening torque with which yield clamp force is gained

3.6
thread torque
T_{th}
torque acting on bolt shank through mating threads during tightening

3.7
bearing surface friction torque
T_b
torque acting on clamped member through bearing surfaces during tightening

3.8
ultimate tightening torque
T_u
tightening torque with which ultimate clamp force is gained

4 Symbols and their designations

See Table 1.

Table 1 — Symbols and their designations

Symbol	Designation
d	Nominal thread diameter
d_2	Basic pitch diameter of thread
d_4	Diameter of hole of test fixture
d_h	Clearance hole diameter of washer or bearing part (nominal value)
D_b	Diameter of bearing surface under nut or bolt head for friction (theoretical or measured)
D_o	Outer diameter of bearing surface, $d_{w\,min}$ or $d_{k\,min}$ (see product standards)
D_p	Diameter of plain area of bearing plate
F	Clamp force
F_p	Proof load according to ISO 898-1, ISO 898-2 or ISO 898-6, whichever is relevant
F_u	Ultimate clamp force
F_y	Yield clamp force
h	Thickness of test-bearing plate or test washer
K	Torque coefficient, $K = \frac{T}{Fd}$
L_c	Clamp length
L_t	Length of complete thread between bearing surfaces
P	Pitch of the thread
T	Tightening torque
T_b	Bearing surface friction torque
T_{th}	Thread torque
T_u	Ultimate tightening torque
T_y	Yield tightening torque
Θ	Rotation angle
μ_b	Coefficient of friction between bearing surfaces under nut or bolt head
μ_{th}	Coefficient of friction between threads
μ_{tot}	Coefficient of total friction