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Aerospace — Collar, threaded, self-locking — Test method for torque and preload

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ISO copyright office
CP 401 • Ch. de Blandonnet 8
CH-1214 Vernier, Geneva
Phone: +41 22 749 01 11
Email: copyright@iso.org
Website: www.iso.org

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Foreword

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This document was prepared by Technical Committee ISO/TC 20, *Aircraft and space vehicles*, Subcommittee SC 4, *Aerospace fastener systems*.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

Aerospace — Collar, threaded, self-locking — Test method for torque and preload

1 Scope

This document describes torque and preload test method for threaded collars. This test method is used to measure the locking torque, breakaway torque, torque off and preload of threaded collars.

2 Normative references

There are no normative references in this document.

3 Terms and definitions

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

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at https://www.electropedia.org/

3.1
locking torque
highest torque value obtained in the installation direction prior to contact with the bearing surface

3.2
breakaway torque
torque required to start threaded collar rotation from its installed position

Note 1 to entry: The breakaway torque shall be measured after twisting off the hex portion and after removal of the preload.

Note 2 to entry: The breakaway torque is for seated breakaway test only.

3.3
test bolt
bolt to be used in conjunction with the collar during the test

4 General requirements

4.1 Test apparatus

A torque tension test bench, torsion machine or the equivalent precision machine shall be used for the test, which shall have been calibrated within a period of 12 months prior to the test date.

4.2 Test bolt

Test bolt shall be in accordance with product specification.

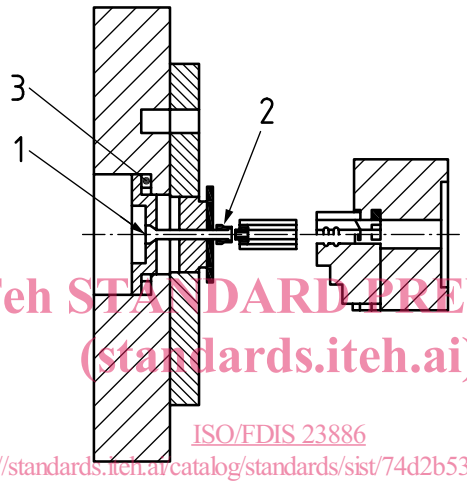
4.3 Test accessories

The material of the collar bearing surface (see Figure A.2, item 8) shall be alloy steel; the roughness of the interface contacting with the collar shall be between Ra = 0,4 µm and Ra = 0,8 µm. The hardness shall be 50 HRC to 60 HRC.

5 Detail requirements

5.1 Test procedures

a) Install the test bolt on the torsion machine; install the threaded collar finger tight against the locking element; install the threaded collar hex head into the socket adapted to the machine drive mechanism. See Figure 1. Measure the distance between the end surface of the bolt and threaded collar; then calculate the cycling number.



Key

1 test bolt
2 threaded collar
3 cell

Figure 1 — start point at the assembling process

b) Rotate the threaded collar at the rate of (10 ± 2) r/min. Continue applying the torque until the threaded collar seats (the hex portion of threaded collar twists off), as shown in Figure 2.

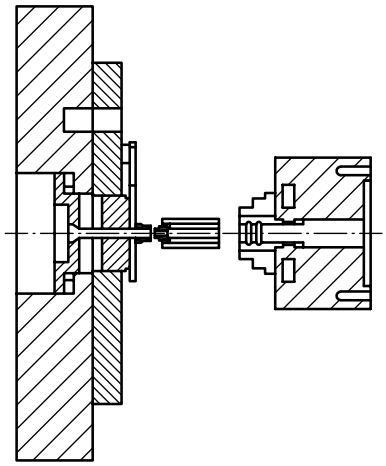


Figure 2 — the assembling process

c) Release the axial load. A recommended test fixture is given in Annex A. Relative rotation between test bolt and threaded collar is not possible during the process.

d) The unlocking area of threaded collar shall be clamped by the torsion machine, as shown in Figure 3. Reverse the torque at the speed of (10 ± 2) r/min.

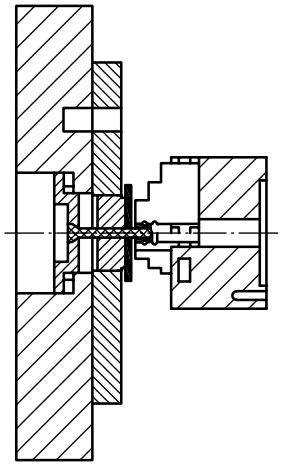
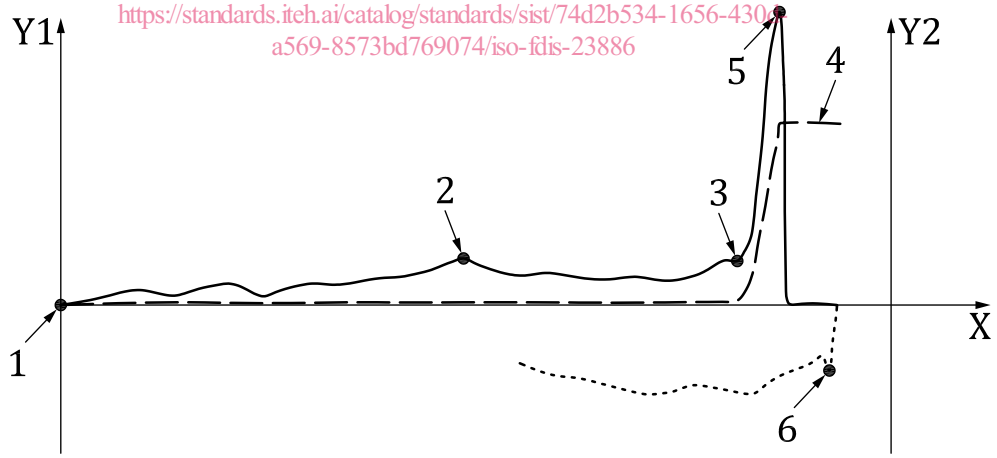


Figure 3 — the disassembling process

5.2 Experiment data processing

Record the angle and corresponding torque during the test and record the torque-angle curve and tension-angle curve, and determine the locking torque, preload, torque off and breakaway torque as shown in Figure 4.



Key

———	torque-angle curve in assembling process	1	point where torque occurs first
— —	tension-angle curve in assembling process	2	locking torque
.....	torque-angle curve in disassembling process	3	seating point
Y1	torque	4	preload
Y2	tension	5	torque off
X	angle	6	breakaway torque

Figure 4 — Torque/Tension/Angle curve

5.3 Test reports

The test report shall include the following data:

a) part number, lot identification and manufacturer of collar;

b) model, serial number and calibration date of test machine;

c) locking torque, preload, torque off and breakaway torque;

d) results.

Annex A
(informative)

Recommended test fixture

Recommended test fixtures for torque and preload are shown in Figure A.1 and Figure A.2.

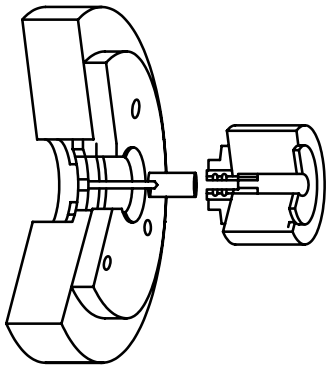
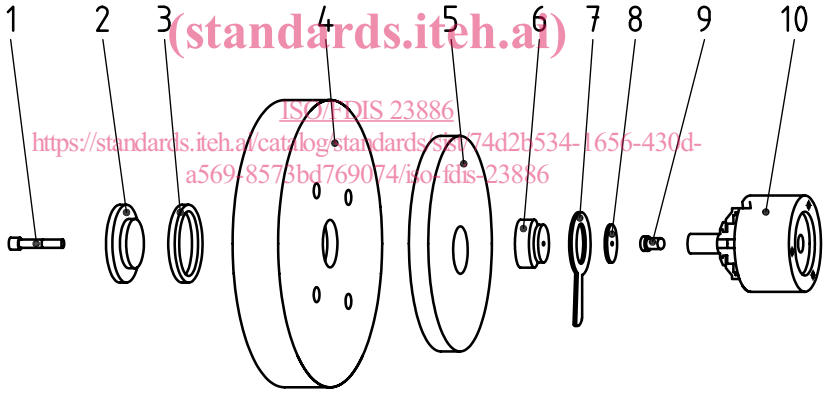


Figure A.1 — Sketch map of test fixture



Key

1 test bolt
2 test bolt fixing device
3 load cell
4 part of torsion machine
5 plate with internal left-hand thread
6 preload release fixture with external left-hand thread
7 washer fixing device
8 washer contacting with collar bearing surface
9 threaded collar
10 clamping chuck of torsion machine

Figure A.2 — Exploded assembly drawing of test fixture

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