

British Standard Aerospace Series: Methods of test for

Self-locking nuts with maximum operating temperature less than or equal to 425 °C

[ISO title: Aerospace — Fasteners — Self-locking nuts with maximum operating temperature less than or equal to 425 °C — Test methods]

Série aérospatiale. Ecrous à freinage interne — Température maximale d'utilisation 425 °C — Méthodes d'essai

Luft- und Raumfahrt-Reihe. Prüfverfahren für selbstsichernde Muttern mit einer maximalen Betriebstemperatur ≤ 425 °C

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National foreword

This British Standard which has been prepared under the direction of the Aerospace Standards Committee, is identical with ISO 7481-1984 'Aerospace — Fasteners — Self-locking nuts with maximum operating temperature less than or equal to 425 °C — Test methods' published by the International Organization for Standardization (ISO).

Terminology and conventions. The text of the international standard has been approved as suitable for publication as a British Standard without deviation. Some terminology and certain conventions are not identical with those used in British Standards; attention is drawn especially to the following.

The comma has been used as a decimal marker. In British Standards it is current practice to use a full point on the baseline as the decimal marker.

Wherever the words 'International Standard' appear referring to this standard, they should be read as 'British Standard'.

Cross-references

International standard	Corresponding British Standard
ISO/R80-1968	BS 891 Method for Rockwell hardness test Part 1 : 1962 Testing of metals (Technically equivalent)
ISO 1101-1983	BS 308 Engineering drawing practice Part 3 : 1972 Geometrical tolerancing (Technically equivalent)

International standard	Corresponding British Standard
ISO 5855/1-1981	BS 6293 MJ threads for aerospace construction Part 1 : 1982 Specification for dimensions of basic profile (Identical)
ISO 5855/2-1981	Part 2 : 1982 Specification for dimensions for bolts and nuts (Identical)
ISO 7403-1983	British Standard A 294 : 1984 Specification for spline drive wrenching configuration. Metric series (Identical)

The Technical Committee has reviewed the provisions of ISO 468, ISO 691 and ISO 6507/1, to which reference is made in the text, and has decided that they are acceptable for use in conjunction with this standard.

British Standards related to ISO 468 are BS 1134 'Method for the assessment of surface texture' Part 1 : 1972 'Method and instrumentation' and Part 2 : 1972 'General information and guidance'. British Standards related to ISO 691 and ISO 6507/1 are, respectively, BS 192 : 1982 'Specification for open-ended wrenches' and BS 427 'Method for Vickers hardness test' Part 1 : 1961 'Testing of metals'.

Compliance with a British Standard does not of itself confer immunity from legal obligations.

1 Scope and field of application

This International Standard specifies test methods for metric self-locking nuts with MJ threads and whose maximum operating temperature is less than or equal to 425 °C, intended for use in aerospace construction. It describes the test device and the method for each test.

It shall be used in conjunction with the relevant procurement specification.¹⁾

It applies to self-locking nuts as defined above, provided that the relevant documents (dimensional standard, drawing, procurement specification, etc.) refer to this International Standard.

2 References

ISO/R 80, *Rockwell hardness test (B and C scales) for steel*.

ISO 468, *Surface roughness — Parameters, their values, and general rules for specifying requirements*.

ISO 691, *Spanner gaps and sockets — Metric series — Tolerances for general use*.

ISO 1101, *Technical drawings — Geometrical tolerances — Tolerancing of form, orientation, location and run-out — Generalities, definitions, symbols, indications on drawings*.

ISO 5855/1, *Aerospace construction — MJ threads — Part 1 : Basic profile*.

ISO 5855/2, *Aerospace — MJ threads — Part 2 : Dimensions of screws and nuts*.

ISO 6507/1, *Metallic materials — Hardness test — Vickers test — Part 1 : HV 5 to HV 100*.

ISO 7403, *Fasteners for aerospace construction — Spline drive wrenching configuration — Metric series*.

3 Inspections and tests

3.1 Hardness test

3.1.1 Procedure

The choice depends on the configuration of the nut and available equipment. The authorized procedures are :

- Rockwell hardness as per ISO/R 80;
- Vickers hardness as per ISO 6507/1;
- Rockwell superficial hardness;
- microhardness.

3.1.2 Method

This test shall be carried out at ambient temperature.

The measurement zone (bearing surface, across flats, under-side of anchor nut lugs, etc.) shall correspond to the following conditions :

- thickness at least equal to 10 times the penetration depth;
- parallelism with respect to bearing surface not greater than 3°.

Should this not be possible, carry out this test on a cut section after moulding the nut into thermosetting resin.

Remove all possible coating (protection, lubrication, paint, etc.) in the measurement zone. True up the bearing surface to obtain the required relationship. These two operations shall not generate any heat liable to modify the characteristics of the material constituting the nut being tested.

¹⁾ In preparation.

Carry out the test and then check conformity with the requirements of the dimensional standard or drawing.

NOTE — Nuts subjected to this test shall not be used again.

3.2 Bearing surface squareness test

3.2.1 Test device

The test device is portrayed in figure 1.

The test device includes the following elements :

- a threaded mandrel with end per ISO 5855/1 and ISO 5855/2, with the exception of the pitch diameter which shall be in accordance with the values specified in table 3 for the maximum mandrel.
- a collar sliding on the plain portion of the threaded mandrel whose external diameter B is at least equal to reference dimension A for type I, II and V nuts in figure 2 and equal to reference dimension A for type III and IV nuts in figure 2;
- an appropriate feeler gauge.

3.2.2 Method

The test shall be carried out at ambient temperature.

For floating nuts, extract the nut from the cage or channel.

Screw the threaded mandrel by hand into the nut or threaded part until it engages with the self-locking zone.

Move the collar into contact with the bearing surface.

Evaluate the out-of-squareness by means of a feeler gauge whose thickness corresponds to the permissible squareness error permitted by the dimensional standard, the drawing or the procurement specification.

3.3 Axial load test

3.3.1 Test device

The test device is portrayed in figure 3.

The test device includes the following elements :

- a bearing plate in steel, heat-treated to HRC > 40 ;
- a conical washer (for testing countersunk nuts);
- a bolt with characteristics as follows :
 - threads : per ISO 5855/1 and ISO 5855/2;
 - tensile strength classification : greater than that of the nut under test;
 - material : alloy steel, non-coated.

3.3.2 Method

The axial load is transmitted to the nut by the bolt, the nut resting on the bearing plate.

For countersunk nuts, a conical washer is interposed.

3.3.2.1 80 % test

This test shall be carried out at ambient temperature.

Lubricate the bolt and nut threads as stated in table 1 (if necessary). Assemble the bearing plate, and possibly the conical washer, onto the bolt. Assemble the nut and measure the locking torque when the protrusion is 2 pitches minimum (including chamfer).

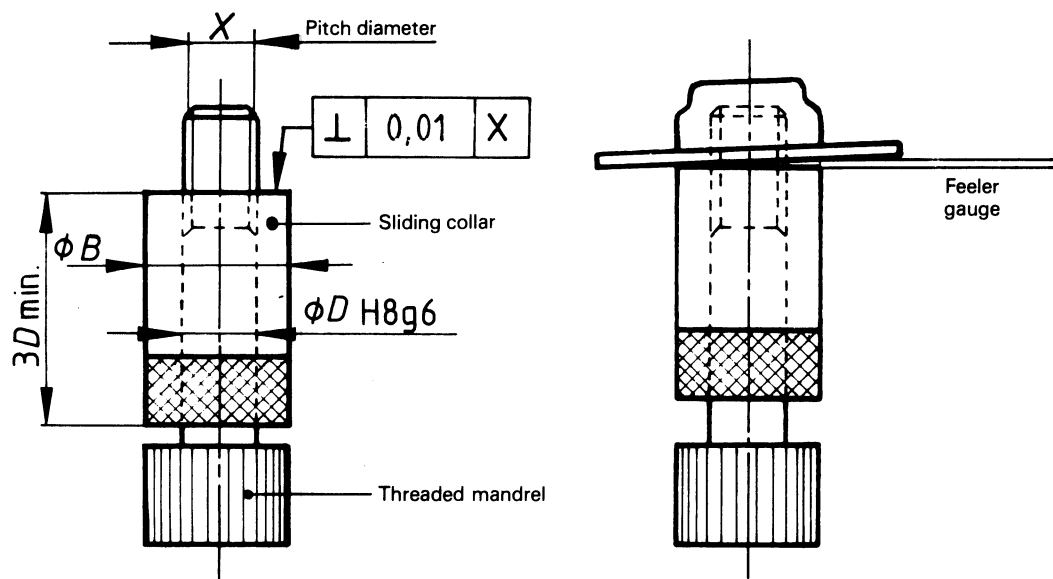
Position the assembly on the tensile machine. Apply the load slowly and progressively. Reduce the load slowly and progressively when the value quoted in the procurement specification has been reached.

Remove the assembly from the tensile machine. Unscrew the nut 1/2 turn and cease movement, then again unscrew and measure the breakaway torque.

Remove the nut, then submit it to a visual examination, and if necessary, an examination under low magnification after sectioning, to check conformity with the requirements of the procurement specification.

Table 1 — Test bolt and lubrication

Nut to be tested			Test bolt		Additional lubrication
Locking	Material	Coating	Material	Coating	
Plastic insert	Any	Any	Alloy steel	Cadmium	None
Metallic	Steel or alloy steel	Any	Alloy steel	Cadmium	None
	Stainless steel	Silver or MoS ₂	Stainless steel	None	Synthetic oil
		None	Stainless steel	Silver	



NOTE — For clinch nuts, the sliding collar shall have a counterbore to accommodate the shank.

Figure 1

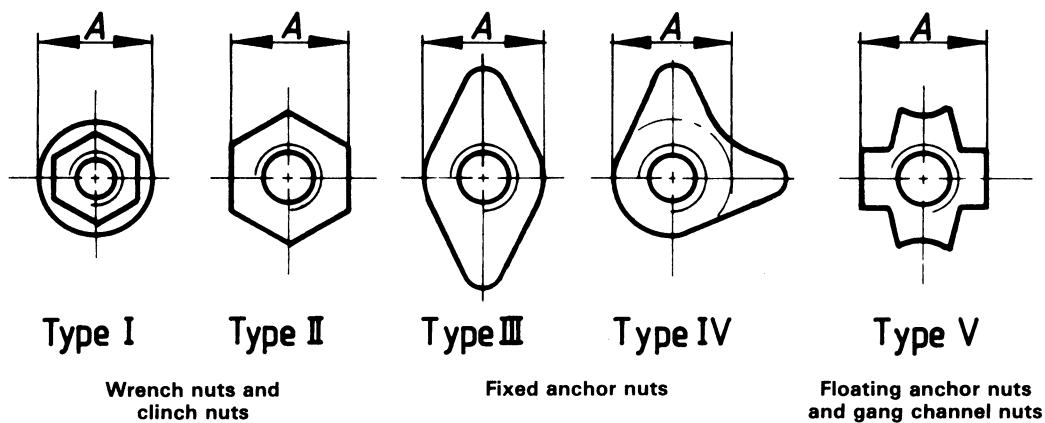


Figure 2

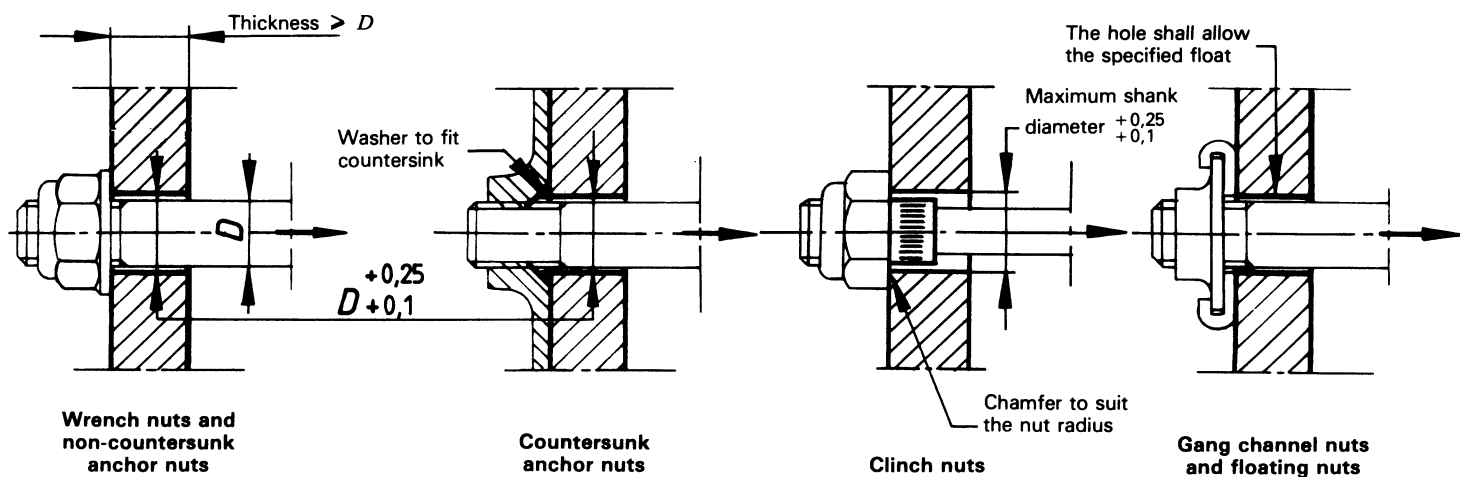


Figure 3

3.3.2.2 100 % test

This test shall be carried out at ambient temperature.

If the test includes a heat soak, then heat the nut and maintain it at the temperature quoted in the procurement specification; take the nut from the oven and allow it to cool slowly to ambient temperature, then proceed as follows.

For all cases, lubricate the bolt and nut threads as specified in table 1 (if necessary), assemble the bearing plate and, if required, the conical washer, onto the bolt; assemble the nut with a protrusion of 2 pitches minimum (including chamfer).

Position the assembly on the tensile machine and apply the load slowly and progressively. Reduce the load slowly and progressively when the value quoted in the procurement specification has been reached.

Remove the assembly from the tensile machine. Remove the nut, then submit it to a visual examination, and if necessary, an examination under low magnification after sectioning to check conformity with the requirements of the procurement specification.

NOTE — Nuts subjected to this test shall not be used again.

3.4 Wrenching feature test

This test applies only to wrenchable nuts.

3.4.1 Test device

The test device is portrayed in figure 4.¹⁾

The test device includes the following elements :¹⁾

- a) a block of steel, heat-treated to HRC > 40 ;
- b) a bolt with characteristics as follows :
 - 1) threads : per ISO 5855/1 and ISO 5855/2;
 - 2) tensile strength classification : no particular requirement;
 - 3) material : no particular requirement.

3.4.2 Method

This test shall be carried out at ambient temperature.

Make two flats on the flange of the nut so that it has a clearance of 0,05 to 0,1 mm inside the slot, lubricate the bolt and nut threads as specified in table 1 (if necessary). Insert the modified nut into the slot. Assemble the bolt and moderately tighten it, then assemble the block into a vice.

Repeat the following operations the number of times specified in the procurement specification :

Apply the torque to the nut, in a tightening movement, as quoted in the procurement specification, with the aid of a socket wrench with an opening tolerance conforming to ISO 691 or ISO 7403. Remove, then replace the socket wrench. Apply the same torque to the nut in an untightening direction.

Finally, dismantle the assembly, then submit the nut to a visual examination and, if necessary, to an examination under low

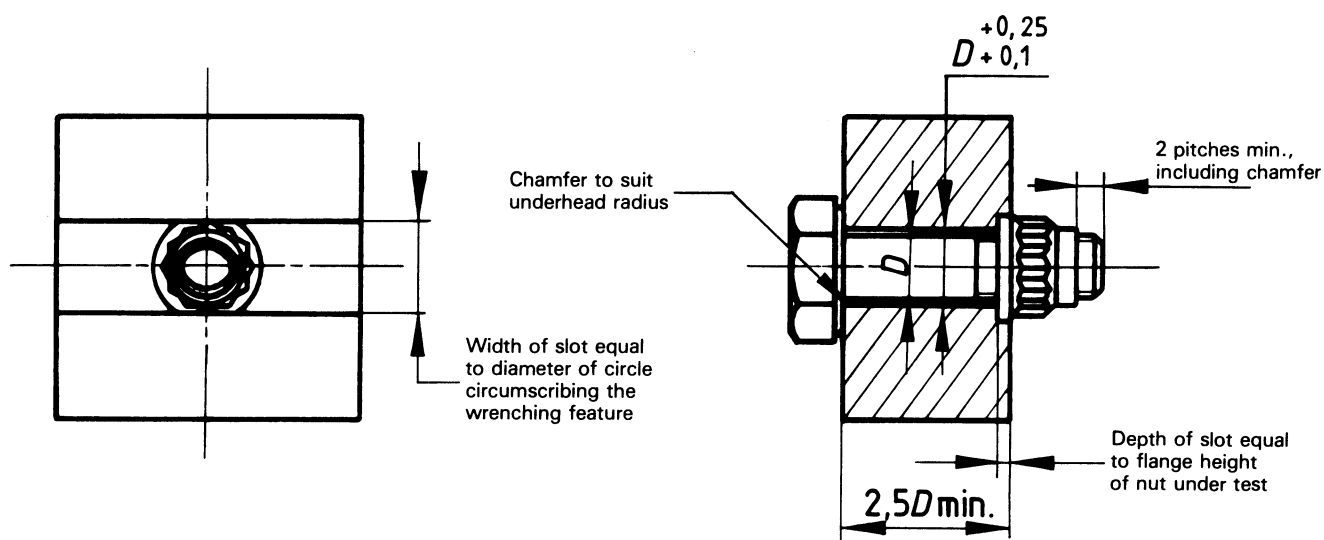


Figure 4

¹⁾ It is also possible to conduct this test with nuts welded on a block of the same material, the assembly being heat-treated to the correct level.