International Standard 8642

INTERNATIONAL ORGANIZATION FOR STANDARDIZATION•МЕЖДУНАРОДНАЯ ОРГАНИЗАЦИЯ ПО СТАНДАРТИЗАЦИИ•ORGANISATION INTERNATIONALE DE NORMALISATION

Aerospace — Self-locking nuts with maximum operating temperature greater than 425 °C — Test methods

Aéronautique et espace — Écrous à freinage interne dont la température maximale d'utilisation est supérieure à 425 °C — Méthodes de contrôle et d'essai

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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.

Draft International Standards adopted by the technical committees are circulated to the member bodies for approval before their acceptance as International Standards by the ISO Council. They are approved in accordance with ISO procedures requiring at least 75 % approval by the member bodies voting.

International Standard ISO 8642 was prepared by Technical Committee ISO/TC 20, *Aircraft and space vehicles.*

Users should note that all International Standards undergo revision from time to time and that any reference made herein to any other International Standard implies its latest edition, unless otherwise stated.

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Aerospace — Self-locking nuts with maximum operating temperature greater than 425 °C — Test methods

1 Scope and field of application

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

Other test devices or test methods than those specified in this International Standard may be used, but, in the event of a dispute, the requirements laid down in this International Standard shall take precedence.

This International Standard shall be used in conjunction with the procurement specification laid down in ISO 8641.

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

2 References

ISO 691, *Wrench and socket openings — Metric series — Tolerances for general use.*

ISO/R 1024, *Rockwell superficial hardness test (N and T scales) for steel.*

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

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

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

ISO 6508, *Metallic materials — Hardness test — Rockwell test (scales A — B — C — D — E — F — G — H — K).*

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

ISO 8641, *Aerospace — Self-locking nuts with maximum operating temperature greater than* 425 °C *— Procurement specification.*[1)]

3 Inspections and tests

3.1 Hardness test

3.1.1 Procedure

The authorized procedures are as follows :

— Rockwell hardness, in accordance with ISO 6508;

— Vickers hardness, in accordance with ISO 6507/1;

— Rockwell superficial hardness, in accordance with ISO/R 1024;

— microhardness[2)].

It is strongly recommended to use the method corresponding to the hardness unit indicated. Should this not be possible, the use of conversion charts is allowed, but, given their inaccuracy, the results obtained shall be used warily. In the event of a dispute, the results obtained using the method corresponding to the hardness unit indicated shall take precedence.

3.1.2 Method

This test shall be carried out at ambient temperature.

1) At present at the stage of draft.

2) Will be dealt with in a future International Standard.

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

a) thickness at least equal to 10 times the penetration depth;

b) deviation in 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 a resin capable of maintaining it in the correct position.

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 to be tested.

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

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

3.2 Bearing surface squareness test

3.2.1 Test device

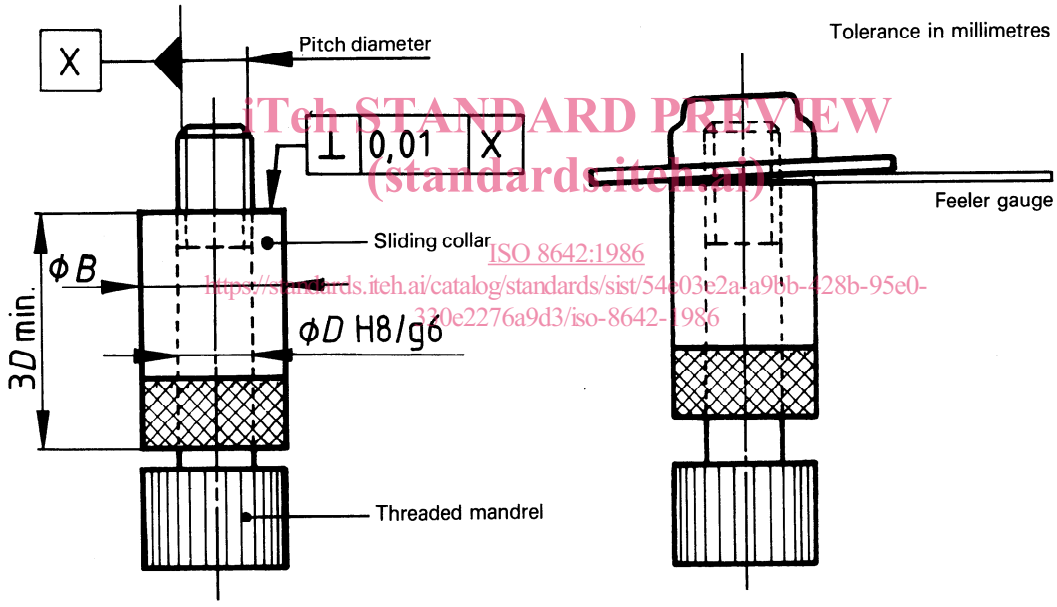
The test device is illustrated in figure 1.

The test device includes the following elements :

a) a threaded mandrel with end in accordance with ISO 5855/1 and ISO 5855/2, except for the pitch diameter which shall be in accordance with the values specified in table 3 for the maximum mandrel;

b) a collar sliding on the plain portion of the threaded mandrel the external diameter B of which shall be at least equal to reference dimension A for types I, III and VI nuts in figure 2 and equal to reference dimension A for types II, IV and V nuts in figure 2;

c) an appropriate feeler gauge.



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

Figure 1

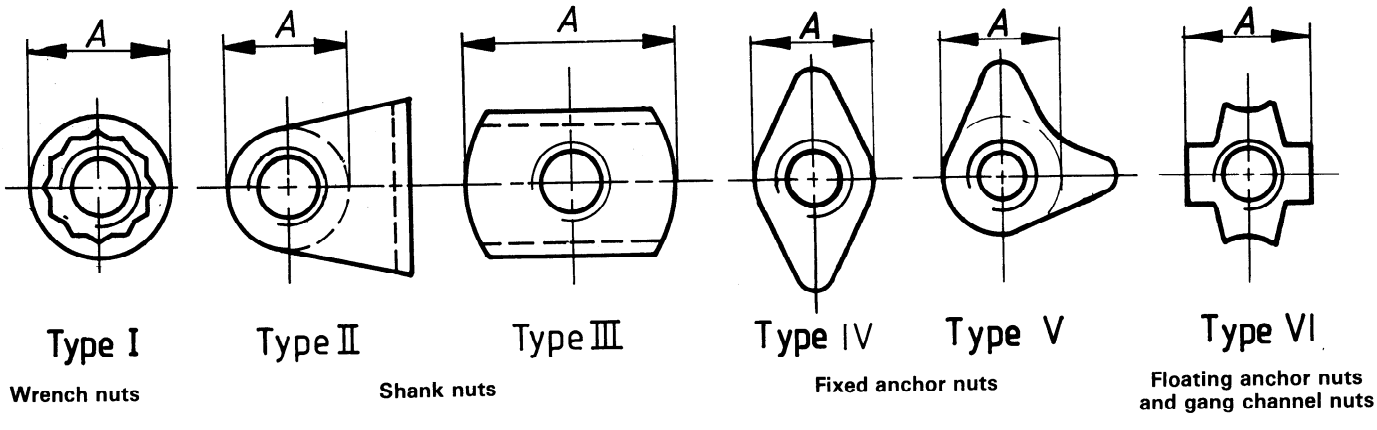


Figure 2

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 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 the thickness of which shall correspond to the permissible squareness error as laid down in the drawing or the procurement specification.

3.3 Axial load test

3.3.1 Test device

The test device is illustrated in figure 3.

The test device includes the following elements :

a) a bearing plate in steel, heat-treated to HRC ≥ 40;

b) a bolt with a rolled thread and characteristics as follows :

1) threads : in accordance with ISO 5855/1 and ISO 5855/2,

2) tensile strength classification : greater than that of the nut to be tested,

3) material : alloy steel, non-coated;

c) a torque wrench.

3.3.2 Method

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

3.3.2.1 80 % test

This test shall be carried out at ambient temperature.

Lubricate the bolt and nut threads with synthetic aero engine oil.

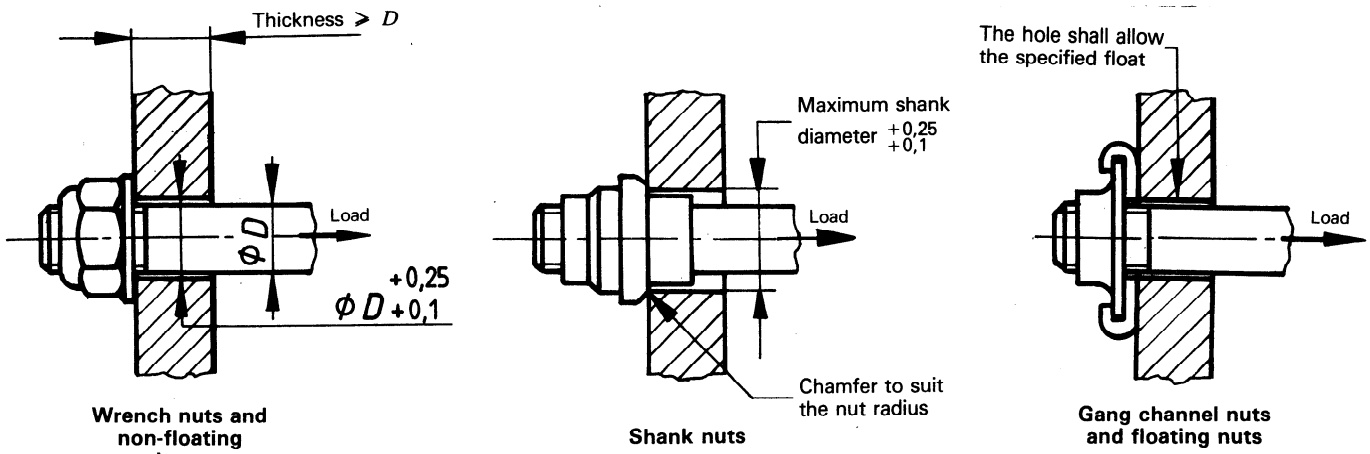
Assemble the bearing plate onto the bolt. Assemble the nut and measure the locking torque, using the torque wrench, when the protrusion is 2 pitches minimum (including chamfer).

Position the assembly on the tensile machine. Apply the load slowly and progressively in the direction shown in figure 3. Reduce the load slowly and progressively when the value stipulated in the procurement specification has been reached.

Remove the assembly from the tensile machine. Unscrew the nut through half a turn and cease movement, then again unscrew and measure the breakaway torque, using the torque wrench.

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

Tolerances in millimetres



Wrench nuts and non-floating anchor nuts

Shank nuts

Gang channel nuts and floating nuts

Figure 3

3.3.2.2 100 % test

This test shall be carried out at ambient temperature.

If preliminary exposure to temperature is necessary for the test, heat the nut and maintain it at the temperature stipulated in the procurement specification; take the nut from the oven and allow it to cool slowly to ambient temperature.

Then, in all cases, proceed as described below.

Lubricate the bolt and nut threads with synthetic aero engine oil. Assemble the bearing plate 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 in the direction shown in figure 3. Reduce the load slowly and progressively when the value stipulated 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, to 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 illustrated 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 a rolled thread and characteristics as follows :

1) threads : in accordance with ISO 5855/1 and ISO 5855/2,

2) tensile strength classification : no particular requirement,

3) material : no particular requirement;

c) a torque wrench, having a socket with an opening tolerance conforming to ISO 691 for hexagonal and bi-hexagonal wrenching or ISO 7403 for spline wrenching.

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 with synthetic aero engine oil. Insert the modified nut into the slot. Assemble the bolt and moderately tighten it, then assemble the block into a vice.

Repeat the operations described below the number of times specified in the procurement specification.

Apply the torque to the nut, in a tightening movement, as stipulated in the procurement specification, with the aid of the torque wrench.

Tolerance in millimetres

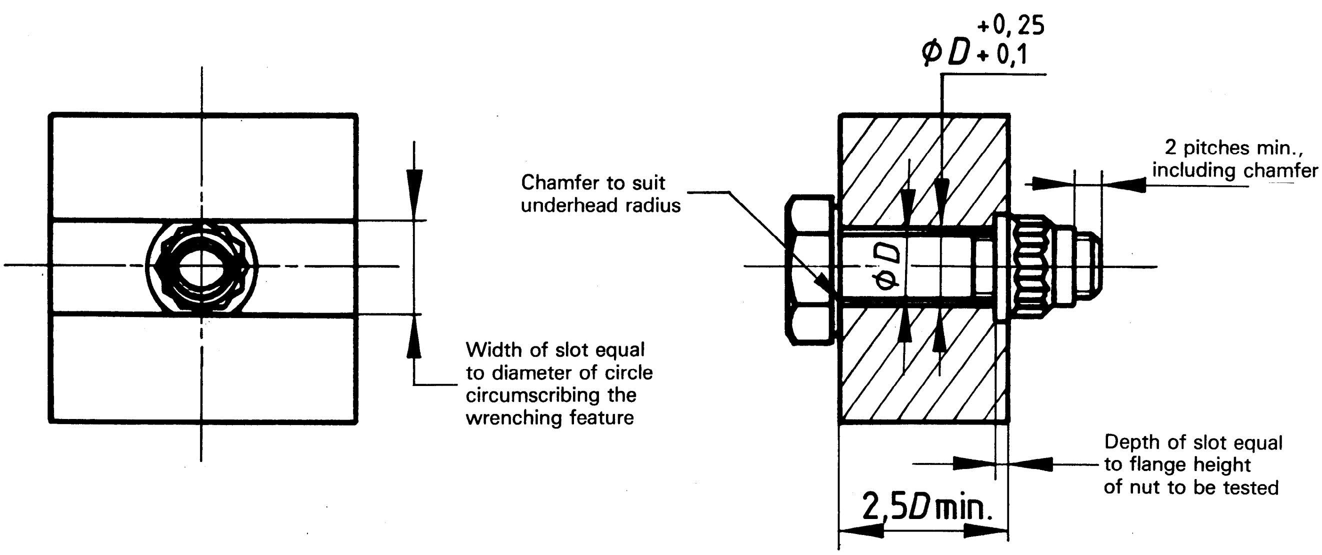


Figure 4

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

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 magnification after sectioning to check conformity with the requirements of the procurement specification.

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

3.5 Torque-out test

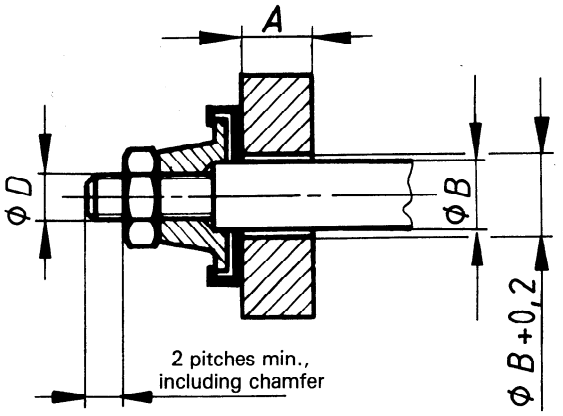
This test applies only to nuts made from more than one part, either by design (floating anchor nuts or gang channel nuts) or for manufacturing purposes (fixed anchor nuts the threaded element of which is assembled to the baseplate by brazing or clinching).

It aims to check that the retention device is able to resist rotation of the threaded portion during tightening and untightening.

3.5.1 Test device

The test device is illustrated in figure 5.

Dimensions in millimetres



D	3	3,5	4	5	6	7	8	10
A min.	6	6	8	8	8	14	14	14
$B_{-0,05}^{0}$	3,4	3,9	4,4	5,5	6,5	7,5	8,5	10,5

Figure 5

The test device includes the following elements :

a) a fixing plate;

b) a shouldered mandrel threaded in accordance with ISO 5855/1 and ISO 5855/2 [1];

c) a locknut threaded in accordance with ISO 5855/1 and ISO 5855/2;

d) rivets with universal heads or bolts with cylindrical heads and hexagonal nuts to fix the nut or the portion of the channel to be tested (standardized aerospace fasteners);

e) a torque wrench.

3.5.2 Method

This test shall be carried out at ambient temperature.

Attach the nut or portion of the channel to be tested on the plate by means of rivets or bolts and nuts, the preformed heads of rivets or the heads of bolts being located on the same side as the element to be tested. Lubricate the mandrel and nut threads with synthetic aero engine oil. Screw in the mandrel so that the shoulder contacts the threaded element of the nut (on bearing surface or bottom of counterbore). Apply the torque to the nut, in a tightening movement, as stipulated in the procurement specification, using the torque wrench.

Assemble the locknut and apply the same torque in the reverse direction using the same procedure.

Dismantle the assembly, then submit the threaded element as well as the base-plate, the cage or the channel to a visual examination and, if necessary, to 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.

3.6 Push-out test

This test applies only to gang channel nuts and anchor nuts with the exception of corner nuts shown in figure 6 and reduced series single lug nuts.

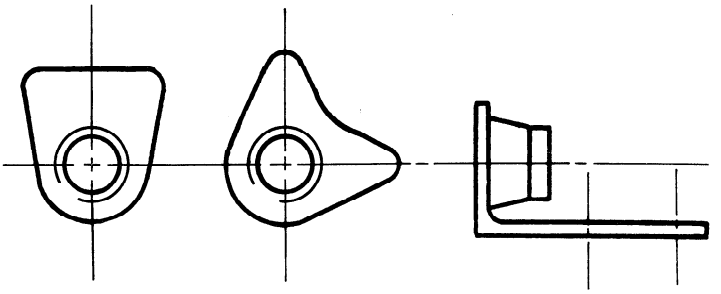


Figure 6

1) A shouldered sleeve mounted on a bolt may also be used.