

Specification for

Stiffnuts (Unified threads) for aircraft

BS 3A 125 to
3A 132, 3A 136
to 3A 143, 3A
147 to 3A 168,
3A 180, 3A
181, 3A 186,
3A 187, 3A
192, 3A 193,
3A 200, 3A
201, 2A 213 to
2A 216:1981
+A1:2013

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**BS 3A 125 to 3A 132, 3A 136 to 3A 143, 3A 147 to
3A 168, 3A 180, 3A 181, 3A 186, 3A 187, 3A 192,
3A 193, 3A 200, 3A 201, 2A 213 to 2A 216:1981+A1:2013**

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Foreword

This British Standard is published by BSI Standards Limited, under licence from The British Standards Institution.

BS 3A 125 to 3A 132, 3A 136 to 3A 143, 3A 147 to 3A 168, 3A 180, 3A 181, 3A 186, 3A 187, 3A 192, 3A 193, 3A 200, 3A 201, 2A 213 to 2A 216:1981+A1:2013 supersedes BS 3A 125 to 3A 132, 3A 136 to 3A 143, 3A 147 to 3A 168, 3A 180, 3A 181, 3A 186, 3A 187, 3A 192, 3A 193, 3A 200, 3A 201, 2A 213 to 2A 216:1981, which is withdrawn.

Text introduced or altered by Amendment No. 1 is indicated in the text by tags **A1** **A1**. Minor editorial changes are not tagged.

CAUTION. BS A 125, A 126, A 127, A 128, A 136, A 137, A 138, A 139, A 147, A 148, A 149, A 150, A 151, A 152, A 157, A 158, A 159, A 160, A 165, A 166, A 213 and A 215 stiffnuts have cadmium as a plating material which has been restricted and / or banned for use in many countries owing to environmental and health concerns. They should not be used in new product designs. Local officials should be consulted about any concerns on using cadmium plated parts.

Self-retaining nuts were first introduced to the British aircraft industry during the 1930's. They were widely adopted and soon constituted a large proportion of the nuts used in aircraft construction.

Being proprietary articles, the nuts were required by the airworthiness authorities to undergo test and approval by the Royal Aircraft Establishment, Farnborough, who in 1942 published a specification¹⁾, AD 114, setting out the design and test requirements. The term "stiffnut" was chosen as the most suitable descriptive name for generic use.

The specification AD 114 was the first step towards standardization of stiffnuts, and specified certain general requirements and the minimum performance acceptable in respect of retaining properties. Manufacture, however, was to proprietary drawings approved by the RAE and nuts were known to users by their proprietary names and part numbers. This continued until 1947, when drawings were issued in the Society of British Aerospace Companies Limited AGS series providing common part numbers to which nuts of any make could be supplied; maximum envelope dimensions were specified and also other features affecting interchangeability from the user's point of view, but the nuts were still manufactured and inspected to the makers' drawings. At a later date, too, performance testing of production quantities was introduced to ensure that the frictional properties were maintained at or above the standard of AD 114, which had covered only the type testing of prototype nuts when submitted for approval.

With the opportunity afforded by the advent of the Unified screw thread, British Standards A 125 to A 168 were published in 1954 to fulfil the functions previously performed by AD 114, the AGS drawings, production test schedules and, to a large extent, the manufacturers' drawings. The AGS drawings were devised around a number of existing products and could not, therefore, supply a precise definition, but it has been possible in the new series of nuts to coordinate development with the preparation of the British Standards, resulting in a much fuller specification. The aim throughout has been to define and dimension the product completely so that the standards are adequate for manufacture and inspection, except for the friction element, which is defined by the space it may occupy and the performance which it has to attain. Stiffnuts supplied to these British Standards will therefore be interchangeable, one make with another, within the specified limiting conditions (e.g. of temperature, etc.).

This revision brings these British Standards up to date, notably with regard to the qualification approval requirements and the references to other standards.

¹⁾ Now issued by the Ministry of Defence, Assistant Directorate of Standardization (Air).

This revision supersedes the previous edition published in 1958, which is therefore withdrawn.

These standards make reference to the latest issues of the following.

a) *British Standards*

BS 919-1: *Screw gauge limits and tolerances – Part 1: Specification for gauges for screw threads of unified form*

BS 1580-1: *Unified screw threads Part 1: Screw threads with diameters $\frac{1}{4}$ in and larger*

BS 1580-3: *Unified screw threads - Part 3: Screw threads with diameters below $\frac{1}{4}$ in – Requirements*

BS 2870, *Rolled copper and copper alloys. Sheet, strip and foil.*

BS 2874, *Copper and copper alloys. Rods and sections (other than forging stock).*

BS 3488, *Technical anhydrous lanolin.*

BS EN 2133: *Cadmium plating of steels with specified tensile strength ≤ 1450 MPa, copper, copper alloys and nickel alloys*

A 102, *Steel bolts (Unified hexagons and Unified threads) for aircraft.*

A 104, *Corrosion-resisting steel bolts (Unified hexagons and Unified threads) for aircraft.*

A 169, *Aluminium alloy bolts (Unified hexagons and Unified threads) for aircraft.*

L 80, *Sheet and strip of aluminium-2 $\frac{1}{4}$ per cent magnesium alloy (soft-0).*

L 81, *Sheet and strip of aluminium-2 $\frac{1}{4}$ per cent magnesium alloy (three-quarter hard-H6).*

L 163, *Specification for sheet and strip of aluminium-coated aluminium-copper-magnesium-silicon-manganese alloy (solution treated, cold worked for flattening and aged at room temperature) (Cu 4.4, Mg 0.5, Si 0.8, Mn 0.8).*

L 168, *Specification for bars and extruded sections of aluminium-copper-magnesium-silicon-manganese alloy (solution treated and artificially aged) (not exceeding 200 mm diameter or minor sectional dimension).*

S 80, *Specification for high chromium-nickel corrosion-resisting steel billets, bars, forgings and parts (880–1 080 MPa; limiting ruling section 100 mm).*

S 92, *Carbon-manganese steel (suitable for welding).*

S 95, *1 $\frac{1}{2}$ per cent nickel-chromium-molybdenum steel.*

S 112, *Semi-free cutting carbon steel, bright bars for machining (primarily intended for the manufacture of nuts).*

S 113, *“40” carbon steel bright bars for machining (primarily intended for the manufacture of nuts).*

S 114, *Manganese-molybdenum steel.*

S 117, *1 per cent chromium steel.*

S 137, *Specification for high chromium-nickel corrosion-resisting steel bright bars (free machining) (880–1 080 MPa; limiting ruling section 70 mm).*

S 154, *2 $\frac{1}{2}$ per cent nickel-chromium-molybdenum steel billets, bars, forgings and parts (880–1 080 MPa; limiting ruling section 150 mm).*

S 510, *Carbon steel sheet and strip (430–540 MN/m²) (suitable for welding).*

S 511, *Deep drawing carbon steel sheet and strip (280–400 MN/m²) (suitable for welding).*

S 526, *Softened 18/10 chromium-nickel corrosion-resisting steel sheet and strip (titanium stabilized: 54 hbar).*

S 527, *Softened 18/10 chromium-nickel corrosion-resisting steel sheet and strip (niobium stabilized: 54 hbar).*

b) *Ministry of Defence specifications*

AD 114, *Design requirements, qualification approval tests and acceptance test for AGS 2000 series stiffnuts (BA and BSF threads)²⁾.*

BS 1872: *Specification for electroplated coatings of tin*

DEF STAN, 03-9 *Electro-deposition of silver.*

Def Stan 80-217: *Corrosion Preventive Compound: Soft Film, Cold Application*

Def Stan 03-19: *Electro-Deposition of Cadmium*

Def-Stan 03-25: *Sulfuric Acid Anodizing of Aluminium and Aluminium Alloys*

DTD 10: *Nickel-Copper Alloy Cold Rolled and Annealed Sheet and Strip*

DTD 417, *Lubricating oil, aircraft controls: anti-freezing.*

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ADS RS732 *Manufacturers Identification Monogram for Aerospace Fasteners*

TS200 QUALIFIED MANUFACTURERS FOR ADS AEROSPACE
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Summary of pages

This document comprises a front cover, an inside front cover, pages i to vi, pages 1 to 31 and a back cover.

This standard has been updated (see copyright date) and may have had amendments incorporated. This will be indicated in the amendment table on the inside front cover.

²⁾ Referred to in foreword only.

³⁾ TS200 only is obtainable from website www.adsgroup.org.uk

Section 1. General requirements

1 Scope

1.1 These British Standards cover the dimensions, material, finish, testing and identification of aircraft stiffnuts with Unified threads. According to the materials used in their construction, the stiffnuts are classified as satisfactory for use at sustained temperatures within the following ranges:

- a) – 75 °C to + 425 °C: corrosion-resisting steel nuts, silver plated or unplated
- b) – 75 °C to + 200 °C: steel and corrosion-resisting steel nuts, cadmium plated
- c) – 75 °C to + 125 °C: aluminium alloy, brass or bronze nuts.

NOTE All nuts are capable of remaining effective for servicing operations at – 40 °C.

1.2 Stiffnuts of the following types are covered by these British Standards:

- a) *hexagon nuts*: ordinary, thin and cap
- b) *anchor nuts*:
 - 1) *double-lug fixed*: ordinary, thin and cap
 - 2) *double-lug floating*: ordinary and thin
 - 3) *single-lug fixed*: ordinary and thin.
- c) *stripnuts floating*: ordinary and thin.

1.3 In these standards, the nut bodies, whether of normal hexagon form or not, have a thread strength at least as great as the corresponding standard nuts.

2 Definitions

For the purposes of these British Standards the following definitions apply.

2.1

attachment plate (or cage)

the formed sheet-metal plate of a floating anchor nut that carries the rivet lugs and retains the nut body, allowing a specified float in relation to the structure

2.2

baseplate

the plate, normal to the axis of the nut, that forms the rivet lugs of a fixed anchor nut or the flange of a floating anchor nut or stripnut for retaining the nut body in the attachment plate. The baseplate is always integral with the nut body

2.3

batch

the output of an effectively continuous production run of each size of nut, free from any changes such as might be expected to result in an appreciable variation in the quality of the finished product (See section 2.)

2.4

bolt

unless otherwise stated, the term “bolt” includes any screwed bolt or stud of the same material, screw thread and finish as the standard bolt specified in clause 14

2.5

bolt tolerance test

a test to measure the torque required to remove a stiffnut from a bolt of minimum diameter after the friction element has been strained by assembly on a bolt of maximum diameter

2.6

cap nut

a stiffnut whose threaded bore is closed by a metal cap above the friction element, to prevent leakage of liquid or gas

2.7

endurance test

a test to measure the torque required to remove a stiffnut from a standard bolt after a specified number of applications

2.8

fixed anchor nut

a stiffnut having, at the bearing face and integral with the nut body, a lug or lugs by which it may be riveted in position, the nut becoming rigidly located in relation to the supporting structure

2.9

floating anchor nut

a stiffnut in which the nut body, integral with a baseplate, is retained in an attachment plate that has lugs by which it may be riveted in position. Provision is made for a limited amount of movement of the nut within the attachment plate to allow alignment on assembly

2.10

friction element

the portion of a stiffnut, above the nut body, designed to impose friction between the stiffnut and the screw thread on which it is mounted. The friction element is contained between the minimum thread length and the maximum overall height of the stiffnut, and within the maximum plan form of the standard nut body

2.11
integral

the baseplate is said to be integral with the nut body when the two are manufactured in one piece or when they are joined by welding, brazing or similar fusion process

2.12
nut body

the portion of a stiffnut containing the screw thread and having wall thickness and height sufficient to provide the required strength

2.13
random sample

a sample taken in such a manner that every nut in the batch has a substantially equal chance of selection, so that the sample is thus a representative cross section of the whole batch

2.14
stiffnut

a nut body surmounted by a device that imposes friction between the nut and the screw thread on which it is mounted; the friction is of such a value that the nut may be considered self-retaining. The friction is independent of the loading on the face of the nut

2.15
stripnuts

a number of nut bodies integral with baseplates in a continuous strip of formed section for riveting to the supporting structure. Provision is made for a limited amount of movement of the nuts within the attachment strip to allow alignment on assembly

2.16
thrust test (for anchor nuts)

a test to confirm that the anchorage will withstand the thrust likely to be applied by a bolt under adverse conditions of assembly

2.17
torque test

a test to measure the torque required to remove a stiffnut from a standard bolt

2.18
torsional strength test (for anchor nuts and stripnuts)

a test to confirm that the anchorage will withstand any torsion likely to be applied through the bolt under adverse conditions of assembly

3 Design and dimensions

3.1 All nuts shall, after coating where applicable, conform to the dimensions and tolerances specified in Table 6 to Table 12.

3.2 The friction elements and certain other features of the nuts are defined in Table 6 to Table 12 by maximum envelope dimensions, and in section 2 by functional test requirements. For inspection purposes the manufacturer shall provide approved drawings (see clause 10) of all such features, with adequate dimensions and limits and including specifications for jointing processes and non-metallic locking elements. Any changes in these features shall be notified to the quality assurance authority (see clause 10) who may require requalification testing before approving the drawing changes.

4 Material and manufacture

4.1 Nut bodies, baseplates, metal caps, attachment plates and strips shall be manufactured from the appropriate materials specified in Table 4. Materials used in friction elements and in jointing processes shall be in accordance with the approved drawings; they shall not be adversely affected by contact with or immersion in fuels, lubricants or other fluids used in aircraft (e.g. water, petroleum oils, synthetic oils (sebacic and adipic esters), silicone greases, castor oil, propan-2-ol mixtures, ethanol, methanol, ethanediol, glycerol).

4.2 Nut bodies shall be produced by a machining process; baseplates of anchor nuts shall either be machined as an integral part of the nut body or shall be produced from strip or sheet and joined by welding, brazing or other fusion process. The body and base-plate of floating anchor nuts and stripnuts shall be separate from, but shall be retained within, the attachment plate or strip.

4.3 The friction device shall not cause undue damage or excessive wear on the thread of the bolt. The endurance test (see clause 17) shall serve to indicate the satisfactory nature of the design in this respect.

5 Freedom from defects

The nuts shall be free from harmful defects.

NOTE Nuts containing defects may be deemed not to comply with the requirements of these standards at any time, although they have been made from material passed and released to the material specification.

6 Protective A_1 finish A_1

6.1 A protective treatment shall be applied as specified in **6.2** to **6.5**. Metallic or anodic coatings shall be applied before assembly of any non-metallic friction element, but organic coatings (as in **6.5**) shall be applied after such assembly. Each metallic element (except elements to be joined by welding, brazing, etc.) of floating anchor nuts, stripnuts and cap nuts shall be coated (or anodized) before incorporation in the nut assembly. Bruising of plated surfaces during assembly of elements is acceptable.

6.2 Except as provided for in **6.3**, steel nuts shall be uniformly coated with cadmium in accordance with A_1 DEF STAN 03-19 and BS EN 2133. A_1

6.3 Corrosion-resisting steel nuts shall be coated as follows.

- a) Corrosion-resisting steel nuts except those complying with the requirements of the British Standards listed in item b) shall be uniformly coated with cadmium in accordance with A_1 DEF STAN 03-19 and BS EN 2133. A_1
- b) Nuts complying with the following British Standards shall either be silver plated in accordance with DEF STAN 03-9, except that an average thickness in accordance with A_1 DEF STAN 03-19 and BS EN 2133 A_1 is acceptable, or, if required by the purchaser, shall be supplied unplated:

A 180	A 192
A 181	A 193
A 186	A 200
A 187	A 201

Immediately after plating, the nuts shall be dipped in a solution of 2 % mineral jelly in white spirit.

6.4 Brass and bronze nuts shall be uniformly coated with tin in accordance with A_1 BS 1872 Cu/Cu/Sn/8/m. A_1

6.5 Aluminium alloy nuts shall be anodically treated in accordance with A_1 DEF STAN 03-25 A_1 (see note), and after identification colouring, shall be dipped in a lubricant complying with the requirements of A_1 DEF STAN 80-217 A_1 or BS 3488.

NOTE Slightly different colours will result from the different processes.

7 Screw threads

7.1 All nuts. The screw threads shall have the thread form and pitches specified in BS 1580-1 A_1 Text deleted A_1 and BS 1580-3, as applicable.

7.2 Steel, corrosion-resisting steel, brass and bronze nuts. After coating, the minimum major, effective and minor diameters shall be not less than the minimum dimensions for class 2B nuts specified in A_1 Table 6 of BS 1580-1:2007 and Table 4 and 8 of BS 1580-3:2007, A_1 as applicable.

Before coating, the maximum effective and minor diameters shall not exceed the maximum dimensions for class 2B nuts specified in Table 12 of BS 1580-1 & BS 1580-2:1962 and Tables 42 and 46 of BS 1580-3:1965, as applicable.

7.3 Aluminium alloy nuts. After anodizing, the screw threads shall conform to the class 2B limits and tolerances specified in A_1 Table 6 of BS 1580-1:2007 and Table 4 and 8 of BS 1580-3:2007, A_1 as applicable.

7.4 Gauges. The screw threads shall be gauged by the methods described in BS 919-1.

8 Squareness of face to thread

8.1 General. The axis of the thread of the nut shall be square to the bearing face of the nut, within the tolerance specified in Table 1. This tolerance shall be calculated from the following formula for nuts up to $\frac{5}{8}$ in and is constant thereafter:

$$\text{squareness tolerance} = \left(\frac{\text{maximum size across flats}}{\text{maximum size across flats}} \times 0.006 \right) + 0.003 \text{ in}$$

Not fewer than 12 nuts shall be examined for squareness of base to thread axis. If the squareness gauge shown in Appendix A is employed, it shall be used as specified in **8.2** before incorporation of the locking features.

If it is proposed to check only finished nuts, these may be taken from those sampled under clause **11**, but the method of testing for squareness shall be acceptable to the quality assurance authority.

8.2 Method for using squareness gauge. The nut shall be screwed by hand on to a tapered truncated screw gauge until the thread of the nut is tight on the thread of the screw gauge. A sliding sleeve, having a face diameter equal to the minimum distance across the flats of the corresponding hexagon nut and exactly at 90° to the axis of the screw gauge shall then be brought into contact with the leading face of the nut, and it shall not be possible for a feeler gauge, of thickness equal to the squareness tolerance, to enter between the leading face of the nut and the face of the sleeve. The batch of nuts shall be deemed to comply with the requirements of clause 8 if the nuts tested comply with the requirements of this test. Nuts tested under clause 8 shall not subsequently be released as complying with the requirements of these standards and shall be completely segregated from the batch they represent.

Table 1 — Tolerance on squareness

Nut size	Tolerance ^a in	Nut size	Tolerance ^a in
No. 4-40 UNC	0.0040		
No. 6-32 UNC	0.0045		
No. 8-32 UNC	0.0050	1/2 in UNF	0.008
No. 10-32 UNF	0.0050	9/16 in UNF	0.008
1/4 in UNF	0.006	5/8 in UNF	0.009
5/16 in UNF	0.006	3/4 in UNF	0.009
3/8 in UNF	0.006	7/8 in UNF	0.009
7/16 in UNF	0.007	1 in UNF	0.009

^a For nuts tested after assembly to baseplates, the tolerance may be increased by up to 0.005 in.

9 Identification and marking

9.1 Identification of Unified threads

9.1.1 Hexagon stiffnuts. The method of identification for hexagon nuts of No. 8-32 UNC nominal size and over shall be by means of indented contiguous circles, on one or more of the hexagon flats, as shown in Figure 1. The circles shall be of the sizes shown below.

NOTE The circles will normally be applied to the hexagon bar and will therefore appear at random on the nuts.

Size of stiffnuts	Diameter of identification circles in
No. 8-32 UNC and No. 10-32 UNF	5/64
1/4 in UNF up to and including 7/16 in UNF	3/32
1/2 in UNF and over	3/16

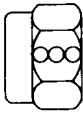


Figure 1 — Marking on hexagon stiffnuts

9.1.2 Stripnuts. Stripnuts of No. 8-32 UNC nominal size and over shall be marked with the circles specified in 9.1.1, indented either on the nut body, the baseplate, or the attachment strip, at the option of the manufacturer (see Figure 2).

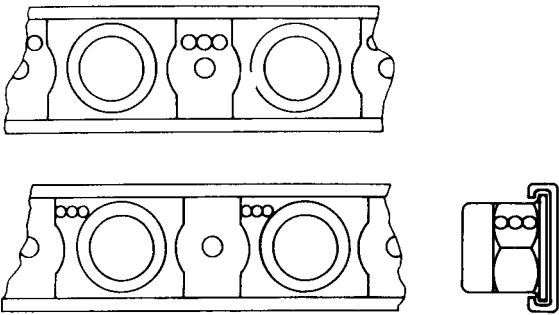


Figure 2 — Marking on stripnuts

9.1.3 Other stiffnuts. No marking for the identification of Unified threads is specified for other than ordinary and thin hexagon stiffnuts as differences in design render the other forms of stiffnuts with Unified threads readily distinguishable from their BA and BSF equivalents. Thus, double-lug anchor nuts with Unified threads are distinguishable from their BA and BSF counterparts on account of the smaller distance between rivet hole centres; the sides of the baseplate of Unified single-lug anchor nuts are approximately parallel as compared with the more triangular form of the base plates of the BA and BSF nuts.