

Specification for

General requirements for bolts and free running nuts of tensile strength not exceeding 1249 MPa

Committees responsible for this British Standard

The preparation of this British Standard was entrusted by the Aerospace Standards Policy Committee (ACE/-) to Technical Committee ACE/12, upon which the following bodies were represented:

- The Association of Electronics, Telecommunications and Business Equipment Industries
- British Industrial Fasteners Federation
- Ministry of Defence
- Society of British Aerospace Companies Ltd.

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Foreword

This British Standard, prepared under the direction of the Aerospace Standards Policy Committee, has been revised primarily to improve the manufacture of aerospace bolts and free running nuts and the quality of their inspection. It also brings these requirements up to date in relation to current specifications for aerospace fasteners either published or in the course of publication. It constitutes a revision of British Standard 2A 100: 1968 which is withdrawn.

The revision does not affect the interchangeability of items manufactured to their own individual or nut standard, and fasteners manufactured in compliance with British Standard 2A 100 : 1968, may continue to be furnished until stocks are exhausted.

This British Standard is intended for use in conjunction with those 'A' series British Standards in which compliance with this standard is a specific requirement. It may also be applicable to other aerospace bolts and nuts if required by the contract, drawing or order.

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

Summary of pages

This document comprises a front cover, an inside front cover, pages i to ii, pages 1 to 16, an inside back cover and a back cover.

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Sidelining in this document indicates the most recent changes by amendment.

1 Scope

This British Standard specifies the general requirements for aerospace bolts and free running nuts of tensile strength not exceeding 1249 MPa.

2 Material

The bolts and nuts shall be manufactured from the material specified in the relevant bolt or nut standard.

NOTE. Bolts or nuts may be rejected at any time for faults in or revealed by manufacture although they have been made from material passed previously.

3 Manufacture

3.1 Bolts

Bolts shall be manufactured by machining from bar, by cold-forging or hot-forging.

3.2 Cold-forged or hot-forged steel bolts

Cold-forged or hot-forged steel bolts shall be manufactured by a process to fulfil the requirements in clause 10.

3.3 Screw threads

3.3.1 All unified class 3A threads that comply with BS 1580 and all threads that comply with BS 4084 shall be rolled in the finally heat treated condition

3.3.2 Unless otherwise specified by the bolt standard all other threads shall be cut or rolled at the option of the bolt manufacturer, however the lead end chamfer of bolts $\frac{3}{8}$ in nominal size and under may deviate from that indicated on the bolt standard or drawing, due to metal extrusion on thread rolling, subject to the following requirements being met.

(a) The minor diameter of the lead thread shall be continuous.

(b) The lead end face shall be square to the axis of the thread within the tolerance permitted by the following test.

The bolt shall be screwed into a ring gauge the face of which is square to the axis of the thread, until the low point of the lead end is flush with the gauge face. The protrusion shall not exceed one pitch or 0.030 in, whichever is the smaller.

4 Dimensions

All bolts and nuts shall comply with the dimensions and tolerances specified in the relevant standard.

5 Runout and lead threads for rolled threads

Rolled threads shall have runout and lead threads complying with British Standard A 231.

6 Screw thread form and class of fit

6.1 When British Association (BA) threads are specified for bolts they shall comply with the close class limits and fits specified in BS 93¹⁾.

In view of the tendency for closely fitting bolts and nuts in corrosion resisting steel to seize when tightened together, the major, effective and minor diameters of unplated corrosion resisting steel bolts shall be 0.001 in smaller than the maximum limits for close class bolts specified in BS 93¹⁾.

NOTE. In order to avoid any undue restriction of the tolerance allowed for screwing, the major, effective and minor diameters may be 0.001 in smaller than the minimum limits for close class bolts specified in BS 93¹⁾.

6.2 When BA threads are specified for nuts they shall comply with the limits and fits specified in BS 93¹⁾.

6.3 When British Standard Fine (BSF) threads are specified for bolts they shall comply with the medium class limits and fits specified in BS 84¹⁾.

In view of the tendency for closely fitting bolts and nuts in corrosion resisting steel to seize when tightened together, the major, effective and minor diameters of unplated corrosion resisting steel bolts $\frac{7}{8}$ in BSF and larger shall be 0.002 in smaller than the maximum limits for medium class bolts specified in BS 84¹⁾.

NOTE. In order to avoid any undue restriction of the tolerance allowed for screwing, the major, effective and minor diameters of $\frac{7}{8}$ in BSF and larger may be 0.002 in smaller than the minimum limits for medium class bolts specified in BS 84¹⁾.

6.4 When BSF threads are specified for nuts they shall comply with the normal class limits and fits specified in BS 84¹⁾.

6.5 Unless otherwise specified in the product standard unified threads for bolts shall comply with the class 2A limits and fits specified in BS 1580 or BS 4084 as applicable.

6.6 Unless otherwise specified in the product standard unified threads for nuts shall comply with the class 2B limits and fits specified in BS 1580 or BS 4084 as applicable.

¹⁾ Obsolescent.

7 Anti-corrosion treatment

Anti-corrosion treatments specified for the bolts or nuts in the relevant standard shall, unless otherwise specified, comply with the requirements of the latest issue of the following appropriate process specification:

anodizing: Defence Standard 03-24 (chromic process);

cadmium plating: Defence Standard 03-19.

8 Identification marking

8.1 Hexagonal-headed bolts

8.1.1 Unless otherwise stated on the product standard, fasteners shall be identified as stated in **8.1.2** to **8.1.5**.

8.1.2 Bolts of 2 BA and No. 10 nominal size and larger shall have the complete part number (e.g. A 102 3D) applied to the upper face of the head.

8.1.3 Bolts with unified threads shall have the appropriate identification applied as indicated in appendix A of this standard.

8.1.4 Each individual package of bolts shall have the complete part number and batch identification number or code clearly shown on each label.

8.1.5 Bolts shall have the manufacturer's identification applied to the upper face of the head.

8.2 Bolts with other than hexagon heads

8.2.1 Unless otherwise stated on the product standard, fasteners shall be identified as stated in **8.2.2** to **8.2.4**.

8.2.2 Pan head and mushroom head bolts with unified threads shall have the appropriate identification applied as indicated in appendix A of this standard.

8.2.3 Pan, mushroom and countersunk head bolts of 2 BA and No. 10 nominal size and larger shall have the length identification only as given in the appropriate bolt standard marked on the head, unless otherwise stated in the individual product standard.

8.2.4 Each individual package of bolts shall have the complete part number and batch identification number or code clearly shown on each label.

8.3 Hexagon nuts

8.3.1 Unless otherwise stated on the product standard, fasteners shall be identified as stated in **8.3.2** to **8.3.5**.

8.3.2 Nuts of 7/16 in nominal diameter and larger shall have the number of the relevant British Standard (e.g. A 103) applied on one or more of the hexagonal surfaces.

8.3.3 Nuts of 2 BA and No. 10 nominal size and larger with left hand threads shall have the letter 'L' applied to one of the hexagon surfaces.

8.3.4 Nuts with unified threads of No. 8 nominal size and larger shall be marked with the identification as indicated in appendix A of this standard.

8.3.5 Each individual package of nuts shall have the complete part number and batch identification number or code clearly shown on each label.

8.4 Method of marking

The method of marking shall be at the option of the manufacturer when in accordance with one of the following. All marking shall be applied to the fasteners in the uncoated condition.

8.4.1 Marking shall be applied by use of controlled pressure die stamping using a Character marking die of a rounded tip form not less than 0.025 inch height. The depth of impression shall be kept to a minimum consistent with legibility and not more than 0.010 inch depth.

8.4.2 Marking shall be integrally forged with a Character from that is not less than 0.025 inch height.

8.4.3 Marking shall be by microprocessor 'controlled dot peen' with a spherical indenting stylus of 0.005 inch an indentation depth of 0.001 to 0.002 inch for steel with a hardness less than 54 Rockwell 'C' and indentation depth of not more than 0.003 inch for aluminium.

9 Quality assurance procedure

9.1 General

9.1.1 Quality assurance authority

The quality assurance authority for fasteners manufactured in accordance with this standard shall be the British civil and/or military airworthiness authorities as appropriate or their delegated representative(s) who may be the prime contractor.

NOTE. The majority of aerospace fasteners required under this standard satisfy the requirements of both military and civil quality assurance authorities. A minority of fasteners are procured to satisfy the requirements of one quality assurance authority only.

9.1.2 Quality assurance system

The quality assurance system selected shall satisfy the requirements of the quality assurance authority.

NOTE. Appropriate quality assurance systems are as follows:

- (a) BS 5750 : Part 2 with QAS 3640/65;
- (b) British Civil Airworthiness Requirements (BCAR A8-2 supplier group A2).

9.1.3 Responsibility for inspection and tests

The manufacturer shall be responsible for the performance of all inspection and test requirements specified herein. Each manufacturer shall use their own or, exceptionally, any other facilities approved in accordance with 9.1.2 for the implementation of these quality assurance and test requirements.

9.2 Acceptance of production batches

9.2.1 Definition of batch

A batch shall consist of finished bolts or nuts which are of the same type and diameter, fabricated by the same process from material of the same cast, heat treated as one lot and plated as one lot and produced as one continuous run, free from any interruptions or changes.

9.2.2 Sampling

Random samples shall be taken from each batch in accordance with 9.2.3 for dimensional and non-destructive inspection, and in accordance with 10.3.1 for destructive testing.

9.2.3 Samples for dimensional and non-destructive inspection

Samples for dimensional and non-destructive inspection shall be taken from each batch in accordance with BS 6001 at the levels given in table 1.

The acceptance or rejection shall depend upon the acceptable quality levels (AQLs) applied to the characteristics as given in table 1.

9.3 Surface texture

Surface texture shall be as specified in table 2 and shall be determined visually except in cases of dispute when measurements shall be made in accordance with BS 1134.

Table 1. Inspection levels

AQL	Inspection level II	Inspection level S-I
0.065	Magnetic flaw detection after plating	—
1.0	Thread size Shank diameter (where tolerance is 0.001 in or less)	Thread run-out Underhead radius Squareness Driving geometry
2.5	Surface texture (visual) Burr and plating (visual) Identifications (visual)	Plain shank length Straightness of shank (except when ground) Concentricity
4.0	Nut thickness Overall length Shank diameter (where tolerance exceeds 0.001 in) Point chamfer (visual) Other dimensional characteristics	Head height

Table 2. Surface texture

	Features	Surface roughness to BS 1134 R_e max
		μm (μin)
Bolts	Shank, head bearing face and fillet radius	Close tolerance shank 0.8 (32)
		Other than close tolerance shank 1.6 (63)
	Thread flank and root radius	Rolled thread 0.8 (32)
		Cut thread 1.6 (63)
	Other surfaces	3.2 (125)
Nuts	Bearing faces	3.2 (125) (circular lay)
	Other surfaces	3.2 (125)