

Specification for steel bolts (Unified hexagons and Unified threads) for aircraft

ICS 49.030.20

Committees responsible for this British Standard

The preparation of this British Standard was entrusted to Technical Committee ACE/12, *Aerospace fasteners and fastening*, upon which the following bodies were represented:

- Civil Aviation Authority (Airworthiness Division)
- Confederation of British Forgers
- Institute of Petroleum
- Ministry of Defence
- Society of British Aerospace Companies Ltd.

This British Standard, having been prepared under the direction of the Engineering Sector Policy and Strategy Committee, was published under the authority of the Standards Policy and Strategy Committee on 28 January 2002

© The British Standards Institution 2012
Published by BSI Standards Limited 2012

The following BSI references relate to the work on this standard:
Committee reference ACE/12
Drafts for comment
00/704897 DC,
12/30264056 DC

ISBN 978 0 580 79097 3

Amendments issued since publication

Amd. No.	Date	Comments
16374	June 2006	Corrections to Table 3.
C1	October 2009	
A2	November 2012	See Foreword.

Contents

	Page
Committees responsible	Inside front cover
Foreword	ii
1 Scope	1
2 Normative references	1
3 General requirements	1
4 Materials and manufacture	1
5 Dimensions and tolerances	1
6 Screw threads	2
7 Protective finish	2
8 Hardness values	2
9 Identification and marking	2
10 Quality assurance procedure	2
Table 1 — Materials for manufacture of bolts	2
Table 2 — Dimensions of bolts	5
Table 3 — Bearing length L , clamping length M and overall length E	7
Figure 1 — Dimensions of bolts (see Table 2)	4
Figure 2 — Bearing length L , clamping length M and overall length E (see Table 3)	6

Foreword

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

BS 4A 102:2002+A2:2012 supersedes BS 4A 102:2002+A1:2006, which is withdrawn.

Text introduced or altered by Amendment No. 2 is indicated in the text by tags **A2** ^{A2}. Minor editorial changes are not tagged. Previous amendments are not indicated.

This British Standard has been prepared by Technical Committee ACE/12. It is a revision of BS 3A 102:1962 which is superseded and withdrawn.

This revision of BS 3A 102 refers to the relevant requirements in BS A 100. It incorporates amendments 1, 2, 3 and 4 of BS 3A 102 and updates and revises material specifications.

NOTE Fasteners manufactured to previous editions of this specification may continue to be supplied until stocks are exhausted.

CAUTION. BS A 102 bolts 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 the use of cadmium-plated parts.

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

Compliance with a British Standard cannot confer immunity from legal obligations.

Summary of pages

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

The BSI copyright notice displayed in this document indicates when the document was last issued.

1 Scope

This British Standard specifies materials and manufacture, dimensions, protective treatment and quality assurance requirements for steel hexagon-head bolts with unified threads A_2 , cadmium plated, A_2 and a tensile strength of 880/1 080 MPa.

NOTE The latest edition of an Aerospace Series standard is indicated by a prefix number.

2 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this British Standard. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. For undated references, the latest edition of the publication referred to applies.

A_2 BS 4A 100:2003 A_2 , *Specification for general requirements for bolts and free running nuts of tensile strength not exceeding 1 249 MPa.*

BS S 147, *Specification for 0.5 % nickel-chromium-molybdenum steel bars for the manufacture of forged bolts and forged nuts.*

BS S 149, *Specification for 1.75 % nickel-chromium-molybdenum steel bars for the manufacture of forged bolts and forged nuts.*

A_2 BS S 154, *2½% nickel-chromium-molybdenum steel billets, bars, forgings and parts (880–1080 MPa: limiting ruling section 150 mm).*

BS 1580-1:2007, *Unified screw threads – Part 1: Screw threads with diameter ¼ in and larger – Requirements.*

BS 1580-3:2007, *Unified screw threads – Part 3: Screw threads with diameters below ¼ in – Requirements.*

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

Def Stan 03-19, *Electro-Deposition of Cadmium.* A_2

3 General requirements

Bolts shall conform to BS A 100.

4 Materials and manufacture

4.1 The bolts shall be manufactured by one of the following methods:

- a) machined from bright drawn bars which conform to one of the British Standards specified in Table 1;
- b) cold forged from material which conforms to one of the British Standards specified in Table 1.

4.2 The material used for the manufacture of forged bolts shall have the following mechanical properties in the finally heat treated condition:

- a) proof stress (min.): 0.2 % (690 MPa);
- b) tensile stress: 880 MPa to 1 080 MPa;
- c) elongation (min.): 12 %;
- d) Izod impact (min.): 55 J (40 ft. lbf).

5 Dimensions and tolerances

5.1 All finished bolts, after the application of the anti-corrosion coating, shall conform to the dimensions and tolerances specified in Figure 1 and Table 2.

5.2 The clamping length of the bolt shall conform to the dimensions and tolerances given in Table 2, and shall be such that, when a standard nut without countersink or ring gauge is screwed on as far as possible by hand, its leading face within a distance M from the underside of the bolt head. The runout of the thread shall not exceed twice the thread pitch.

5.3 The nominal length of the bolt shall be the minimum bearing length L , which is determined by the minimum clamping length, M , less two thread pitches (see Table 3).

NOTE The bearing lengths L specified in Table 3 are in 0.10 inch increments but where a 0.05 length increment is required this should be by agreement between manufacturer and user and should be identified as follows: $8\frac{1}{2} B$, indicating a 6-32 UNC bolt of bearing length L 0.85 inches. M and E need to be adjusted accordingly.

6 Screw threads

A2 The bolts shall have unified screw threads of the form and fit that conform to BS 4A 100:2003. After the protective finish has been applied, the bolt threads shall not exceed the basic size (maximum metal condition) for the thread size and class of fit. **A2**

A2 7 Protective finish

All bolts shall be coated with cadmium in accordance with Def Stan 03-19 or BS EN 2133. **A2**

8 Hardness values

The hardness values of finished bolts shall be as follows:

- a) 255 min./321 max. HB; or
- b) 270 min./340 max. HV.

9 Identification and marking

A2 The bolts shall be marked in accordance with the requirements specified in BS 4A 100:2003, Clause 8, e.g. A102-20C, which would be marked on a bolt with thread size 8-32 UNC and bearing length 2.0 inches. **A2**

10 Quality assurance procedure

The bolts shall conform to the quality requirements specified in BS A 100, as appropriate to the method of manufacture.

Table 1 — Materials for manufacture of bolts

BS No.	Material	Application
A2 BS S 154 A2	2½ % nickel chromium molybdenum steel	For the manufacture of machined bolts
A2 BS S 147 A2	5 % nickel chromium molybdenum steel	For the manufacture of forged bolts
A2 BS S 149 A2	1.75 % nickel chromium molybdenum steel	For the manufacture of forged bolts

