

Specification for corrosion-resisting steel bolts (Unified hexagons and Unified threads), strength class 880 MPa, 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.

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Foreword

This British Standard is published by BSI Standards Limited, under licence from The British Standards Institution. This British Standard has been prepared by Technical Committee ACE/12. It is a revision of BS 3A 104:1962 which is superseded and withdrawn.

BS 4A 104:2002+A2:2012 supersedes BS 4A 104:2002 (incorporating Amendment No. 1), which is withdrawn.

The start and finish of text introduced or altered by Amendment No.2 is indicated in the text by tags **A2** **A2**. Minor editorial changes are not tagged.

This revision of BS 3A 104 refers to the relevant requirements in BS A 100. Amendment A2 introduces changes that take account of the mechanical properties of high expansion heat-resisting steels. In addition amendment A2 introduces a part number code for bolts made from high expansion heat-resisting steels to distinguish them from bolts made from the other materials (see Clause 9).

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

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Summary of pages

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

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1 Scope

This British Standard specifies materials and manufacture, dimensions, protective treatment and quality assurance requirements for corrosion-resisting A_2 and heat-resisting A_2 steel hexagon head bolts with unified threads and a A_2 minimum A_2 tensile strength of 880 A_2 Text deleted. A_2 MPa.

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

2 Normative references

The following documents in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

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

BS S 80, *Specification for high chromium-nickel corrosion-resisting steel forging stock, bars, forgings and parts (880-1 080 MPa, limiting ruling section A_2 100 mm A_2).*

BS S 143, *Specification for chromium-nickel-copper-molybdenum corrosion-resisting steel (precipitation hardening) billets, bars, forgings and parts (930-1 080 MPa).*

BS HR 650, *Specification for high expansion heat-resisting steel bar and wire for the manufacture of bolts, studs, set screws and nuts (Ni 25.5, Cr 15, Ti 2, Mn 1.5, Mo 1.25, Si 0.7, V 0.3) (Limiting ruling section A_2 50 mm A_2).*

A_2 BS EN 2398, *Aerospace series – Heat resisting steel FE-PA2601 (X6NiCrTiMoV26-15) – $R_m = 900$ MPa – Bars for machined bolts – $D = 25$ mm.*

BS EN 2399, *Aerospace series – Heat resisting steel FE-PA2601 (X4NiCrTi MoV26-15) – $R_m \geq 900$ MPa – Bars for forged bolts – $D \leq 25$ mm.*

BS EN ISO 6506-1, *Metallic materials – Brinell hardness test – Part 1: Test method.*

BS EN ISO 6507-1, *Metallic materials – Vickers hardness test – Part 1: Test method.* 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:

- machined from bright drawn bars which conform to one of the British Standards specified in Table 1;
- 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:

- proof stress (min.): 0.2 % A_2 590 A_2 MPa;
- tensile stress A_2 (min) A_2 : 880 MPa A_2 Text deleted. A_2 ;
- elongation (min.): 12%;
- Izod impact (min.): 55 J (40 ft. lbf).

A_2 NOTE This is not applicable to the materials given in BS HR 650, BS EN 2398 and BS EN 2399. A_2

5 Dimensions and tolerances

5.1 All finished bolts 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 specified 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 is within a distance M from the underside of the bolt head. The run-out 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

The bolts shall have unified screw threads of the form and fit specified in the latest edition of British Standard BS A 100.

7 Protective finish

There shall be no protective finish applied. 

8 Hardness values

The hardness values of finished bolts shall be as follows  in accordance with the BS EN ISO 6506-1 and BS EN ISO 6507-1 :

-  a) for machined components: 255 min./321 max. HB or 270 min./340 max. HV;
b) for forged components: 248 min./341 max. HB or 260 min./360 max. HV. 

9 Identification and marking

9.1 Identification

Bolts made from material conforming to BS HR 650, BS EN 2398 or BS EN 2399 shall be identified with a code “X”, e.g. a 4-40 UNC bolt with an “L” dimension of 0.1 inches and made from one of the three materials above shall be identified as “A104X1A” or for bolts made from material conforming to BS S 80 or BS S 143, this shall be identified as “A104-1A”.

9.2 Marking

Bolts shall be marked in accordance with BS 4A 100:2003, Clause 8. Bolts for all nominal sizes made from material conforming to BS HR 650, BS EN 2398 or BS EN 2399 shall be marked with an “X”. 

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
BS S 80	2 1/2% nickel-chromium-molybdenum steel	For the manufacture of machined bolts
BS S 143	Chromium-nickel-molybdenum corrosion-resisting steel	For the manufacture of machined bolts
BS HR 650	High expansion heat-resisting steel	For the manufacture of forged bolts (Nominal size (P) and larger)
BS EN 2398	High expansion heat resisting steel	For the manufacture of machined bolts
BS EN 2399	High expansion heat resisting steel	For the manufacture of forged bolts

