

Specification for

**100° Countersunk head
steel bolts
(Unified threads),
cadmium plated,
for aircraft**

ICS 49.030.20

NO COPYING WITHOUT BSI PERMISSION EXCEPT AS PERMITTED BY COPYRIGHT LAW

BSI
Documents

AVA

Document Sharing Hub

This British Standard, having been approved by the Aircraft Industry Standards Committee and endorsed by the Chairman of the Engineering Divisional Council, was published under the authority of the General Council of the Institution on 4 June 1962

© 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
Draft for comment AB (ACE) 2149

11/30254197 DC
ISBN 978 0 580 76863 7

Amendments issued since publication

Amd. No.	Date of issue	Comments
4655	October 1962	
4735	November 1962	
5312	August 1964	
6164	May 1967	
2123	October 1976	
5385	July 1988	
A7	July 2012	See Foreword

Contents

	Page
Foreword	ii
1 Scope	1
2 General requirements	1
3 Material and manufacture	1
4 Dimensions	1
5 Screw threads	1
6 Anti-corrosion treatment	1
7 Identification	1
8 Inspection procedure	1
9 Gauging	1
Appendix A Principles of flushness control and recommended gauging practice	10
Appendix B Table for conversion of inches to approximate millimeter equivalents	Inside back cover
Figure 1	2
Figure 1a — Enlarged view of head	2
Figure 1b — Detail of slots	2
Figure 2 — Diagram (part) showing maximum and minimum head conditions	3
Figure 3	5
Figure 4 — Method of measurement of head protrusion	11
Figure 5 — Protrusion gauge block	12
Table 1 — Dimensions	2
Table 2 — Bearing length L , clamping length M and overall length E	5

Foreword

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

This revision of BS A 173:1956 has been prepared to relate the standard to the relevant requirements of BS A 100. Additionally, provision has been made for the use of alternative materials for forged bolts, the use of BS S 96 material for machined bolts, and for closer limits on head protrusion, the values now shown being the same as those given in the American specification NAS. 517.

BS 2A 173:1962+A7:2012 supersedes BS 2A 173:1962 (incorporating Amendments Nos. 1:1962, 2:1962, 3:1964, 4: 1967, 5: 1976 and 6: 1988), which is withdrawn.

Text introduced or altered by Amendment No. 7 (and No. 3) is indicated in the text by tags $\boxed{A7}$ and $\boxed{A7}$. Previous amendments are not indicated.

This British Standard marks a departure from the traditional method of dimensioning countersunk head bolts by means of toleranced dimensions for head diameter, head thickness, land and angle. The method now adopted is known as the “flushness tolerance” method and was first used in a British Standard for countersunk fasteners in BS 1981, “*Unified machine screws and machine screw units*.” Its basic principles and advantages are outlined in Appendix A to this standard, together with suggested methods of gauging.

Reference is made in the standard to the following British Standards:

BS A 100, *Bolts and nuts for aircraft (general clauses)*.

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

BS S 95, *55 ton, 1½ per cent nickel-chromium-molybdenum steel*.

BS S 102, *Carbon-molybdenum steel*.

BS S 105, *Carbon steel*.

BS S 114, *55 ton manganese-molybdenum steel*.

BS S 116, *55 ton carbon steel*.

BS S 117, *55 ton 1 per cent chromium steel*.

BS S 147, *Nickel-chromium-molybdenum steel (bar for the manufacture of forged bolts only)*.

BS S 148, *Low nickel-chromium steel (bar for the manufacture of forged bolts only)*.

BS S 149, *1.75 per cent nickel-chromium-molybdenum steel*.

BS S 154, *2½ % nickel-chromium-molybdenum steel billets, bars, forgings and parts (880 – 1 080 MPa: limiting ruling section 150 mm)*.

BS S 158, *1 % chromium-molybdenum steel bars for the manufacture of forged bolts and forged nuts*.

Reference is also made to:

Def Stan, 03-19 *Electro-deposition of cadmium*.

NOTE 1 The values in British units are to be regarded as the standard. A table is given in Appendix B to provide a ready means of calculating the approximate millimetre equivalents of the inch dimensions. More accurate conversions should be based on the tables in BS 350.

NOTE 2 In place of the customary, but incorrect, use of the ton as a unit of force, the unit called a ton force (abbreviation tonf) has been used in this standard. It is the force which, when acting on a body of mass one ton, gives an acceleration equal to that of standard gravity.

CAUTION. BS A 173 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 12, an inside back cover 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.

1 Scope

This British Standard specifies the materials, dimensions, finish and inspection requirements for steel bolts with 100° countersunk heads and Unified threads $\square_{A7}$, cadmium plated, $\square_{A7}$ for aircraft.

2 General requirements

The bolts shall comply with the relevant requirements of $\square_{A7}$ BS 4A 100:2003 $\square_{A7}$ in respect of manufacture, screw threads, and $\square_{A7}$ protective finish $\square_{A7}$.

3 Material and manufacture

a) The bolts shall be manufactured by either of the following methods:

$\square_{A7}$ i) Machined from bright drawn alloy steel bars that conform to the latest issue of one of the following British Standards: $\square_{A7}$

BS S 95

or BS S 114

or BS S 116 — bolts up to and including $\frac{3}{8}$ inch diameter;

or BS S 117

or BS S 154.

NOTE BS S 96 material may be used until stock are exhausted.

$\square_{A7}$ ii) Forged from alloy steel that conforms to the latest issue of one of the following British Standards: $\square_{A7}$

BS S 102

or BS S 105

or BS S 147

or BS S 148

or BS S 149

or BS S 158

b) In the finally heat-treated condition the mechanical properties of the material used for forged bolts shall be as follows:

0.1 per cent proof stress	not less than 43 tonf/in ² (664 MPa)
Tensile strength	not less than 55 tonf/in ² (850 MPa) not more than 65 tonf/in ² (1 003 MPa)
Elongation on 4 $\sqrt{\text{area}}$	not less than 18 per cent
Izod impact value	not less than 40 ft lbf (54 J)

4 Dimensions

a) All finished bolts, after the application of the $\square_{A7}$ protective finish $\square_{A7}$ shall conform to the dimensions and tolerances given in Table 1 and Table 2.

b) 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 a ring gauge without countersink has been screwed on as far as possible by hand, its leading face is within the distance M from the upper surface of the bolt head. The runout of thread shall not exceed twice the pitch.

c) 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.

5 Screw threads

The bolts shall have Unified threads of the form and class of fit specified in the relevant requirements of $\square_{A7}$ BS 4A 100:2003. After coating, the bolt threads shall not exceed the basic size (maximum material condition) for the thread size and class of fit. $\square_{A7}$

6 $\square_{A7}$ Protective finish $\square_{A7}$

All finished bolts shall be coated with cadmium $\square_{A7}$ in accordance with Def-Stan 03-19 or BS EN 2133. $\square_{A7}$

7 Identification

The British Standard number and part number shall not be applied on the bolts, but shall be clearly marked on the labels of parcels of bolts.

8 Inspection procedure

The bolts shall be inspected in accordance with the relevant requirements of $\square_{A7}$ BS 4A 100:2003. $\square_{A7}$

9 Gauging

a) The method of head dimensioning shown in Table 1 defines maximum and minimum head envelopes which control flushness in the manner defined in Appendix A.

b) The type of gauge shown in Figure 4 and Figure 5 is recommended as being suitable for flushness measurement, but the type of gauge to be used is not a mandatory requirement of this standard. The gauge shown in Figure 4 and Figure 5 does not control the head angle, which will require to be checked at intervals during production. An additional gauge will be necessary for the absolute minimum head diameter.

Table 1 — Dimensions

