

Specification for aluminium alloy, mushroom-headed, slotted drive, bolts (unified thread)

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Committees responsible for this British Standard

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Civil Aviation Authority (Airworthiness Division)
Confederation of British Forgers
Ministry of Defence
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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. BS 4A 170:1999+A1:2012 supersedes BS 4A 170:1999, which is withdrawn.

The start and finish of text introduced or altered by Amendment No. 1 is indicated in the text by tags **[A1]** and **[A1]**. Minor editorial changes are not tagged.

This revision of BS A 170 refers to the relevant requirements in BS A 100.

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 7 and a back cover.

1 Scope

This British Standard specifies materials and manufacture, dimensions, protective treatment and quality assurance requirements for aluminium alloy, mushroom-headed, slotted, drive bolts with unified threads.

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

2 Normative references

A1 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 **A1**

A1 BS 4A 100:2003 **A1**, *Specification for general requirements for bolts and free running nuts of tensile strength not exceeding 1 249 MPa.*

BS L 168:1978, *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) (Cu 4.4, Mg 0.5, Si 0.7, Mn 0.8).*

A1 BS 1580-1 *Unified screw threads – Part 1: Screw threads with diameters ¼ in and larger – Requirements.*

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

BS EN 2284, *Specification for sulfuric acid anodizing of aluminium and wrought aluminium alloys.* **A1**

3 General requirements

Bolts shall conform to **A1** BS 4A 100:2003 **A1**.

4 Materials and manufacture

The bolts shall be machined from bars that conform to **A1** BS L 168 **A1**.

5 Dimensions and tolerances

5.1 All finished bolts, shall conform to the dimensions and tolerances given in Tables 1 and 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 without countersunk has been screwed on as far as possible by hand, its leading face is within distance M from the underside of the bolt head. The runout of the thread shall not exceed twice the pitch.

5.3 The nominal length of the bolt shall be the minimum bearing length $L_{\min.}$, which shall be the minimum clamping length, $M_{\min.}$ less two thread pitches.

NOTE The bearing lengths L quoted in Table 2 are in 0.10 inch increments but where a 0.05 length increment is required this is permissible by agreement between manufacturer and user and should be identified as follows: 8 ½B, indicating a 6-32 UNC bolt of bearing length 0.85 inches L , M and E should be adjusted accordingly.

6 Screw threads

The bolts shall have unified screw threads of the form and fit specified in **A1** BS 4A 100:2003 **A1**.

A1 7 Protective finish

All finished bolts shall be sulphuric acid anodized, coloured green and sealed in pure water in accordance with BS EN 2284:1991, Type BC.

NOTE Bolts are not always uniformly coloured after dyeing due to the sulphuric acid anodizing process. **A1**

8 Hardness values

NOTE Hardness values are not currently applicable, though they may become applicable in the near future.

9 Identifying and marking

The bolts shall be identified in accordance with the requirements specified in **A1** BS 4A 100:2003 **A1**.

10 Quality assurance procedure

The bolts shall conform to the quality requirements specified in **A1** BS 4A 100:2003 **A1**, as appropriate to the method of manufacture

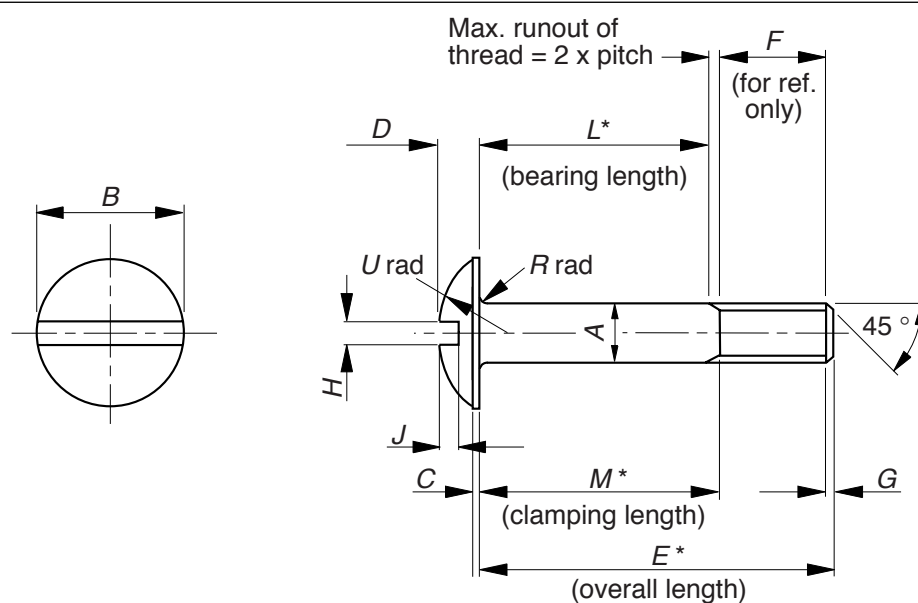
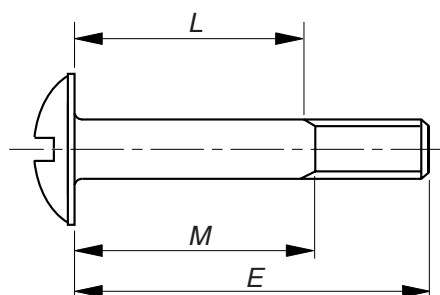


Figure 1 — Dimensions of bolts

* For bearing length L , clamping length M and overall length E see Table 2.



**Figure 2 — Bearing length L ,
clamping length M and overall
length E**

Table 1 — Dimensions of bolts

Decimal nominal thread size	Nominal thread size	Diameter of plain portion of shank		Thread runout (2 × pitch) \sqrt{A}	Min. length of screwed portion of shank F^a	Diameter of head		Thickness of head		Cylindrical portion of head	Radius of head	Radius under bolt head		Depth of chamfer		Slot		
		max.	min.			max.	min.	max.	min.			max.	min.	max.	min.	max.	min.	max.
0.138-32 UNC	6-32 UNC	0.137 5	0.134 5	0.063	0.277	0.316	0.303	0.086	0.074	0.010	ref. only	0.015	0.005	0.030	0.020	0.039	0.048	0.048
0.164-32 UNC	8-32 UNC	0.163 5	0.160 5	0.063	0.327	0.378	0.364	0.102	0.088	0.015	0.255	0.020	0.010	0.030	0.020	0.045	0.054	0.056
0.190-32 UNF	10-32 UNF	0.189 5	0.186 5	0.063	0.377	0.441	0.425	0.118	0.103	0.020	0.304	0.020	0.010	0.030	0.020	0.050	0.060	0.065
0.250-28 UNF	1/4-28 UNF	0.249 5	0.246 5	0.071	0.459	0.565	0.546	0.150	0.133	0.025	0.389	0.030	0.015	0.040	0.030	0.064	0.075	0.073
0.3125-24 UNF	5/16-24 UNF \sqrt{B}	0.312 0	0.309 0	0.083	0.497	0.690	0.666	0.183	0.162	0.030	0.474	0.030	0.015	0.040	0.030	0.072	0.084	0.090

^a This dimension is an absolute minimum associated with maximum length M and minimum length Z . It is not intended for use for manufacturing or inspection purposes.

^b To be measured from the top of the head to the point at which the slot breaks through see Figure 1.

Table 2 — Bearing length L , clamping length M and overall length E (continued)

No. 6-32 UNC				No. 8-32 UNC				No. 10-32 UNF			
Part no.	^a L min.	M +0 -0.03	E +0.04 -0	Part no.	^a L min.	M +0 -0.03	E +0.04 -0	Part no.	^a L min.	M +0 -0.03	E +0.04 -0
	in	in	in		in	in	in		in	in	in
½ B	0.05	0.143	0.45	½ C	0.05	0.143	0.50	½ D	0.05	0.143	0.55
1 B	0.1	0.193	0.50	1 C	0.1	0.193	0.55	1 D	0.1	0.193	0.60
2 B	0.2	0.293	0.60	2 C	0.2	0.293	0.65	2 D	0.2	0.293	0.70
3 B	0.3	0.393	0.70	3 C	0.3	0.393	0.75	3 D	0.3	0.393	0.80
4 B	0.4	0.493	0.80	4 C	0.4	0.493	0.85	4 D	0.4	0.493	0.90
5 B	0.5	0.593	0.90	5 C	0.5	0.593	0.95	5 D	0.5	0.593	1.00
6 B	0.6	0.693	1.00	6 C	0.6	0.693	1.05	6 D	0.6	0.693	1.10
7 B	0.7	0.793	1.10	7 C	0.7	0.793	1.15	7 D	0.7	0.793	1.20
8 B	0.8	0.893	1.20	8 C	0.8	0.893	1.25	8 D	0.8	0.893	1.30
9 B	0.9	0.993	1.30	9 C	0.9	0.993	1.35	9 D	0.9	0.993	1.40
10 B	1.0	1.093	1.40	10 C	1.0	1.093	1.45	10 D	1.0	1.093	1.50
11 B	1.1	1.193	1.50	11 C	1.1	1.193	1.55	11 D	1.1	1.193	1.60
12 B	1.2	1.293	1.60	12 C	1.2	1.293	1.65	12 D	1.2	1.293	1.70
13 B	1.3	1.393	1.70	13 C	1.3	1.393	1.75	13 D	1.3	1.393	1.80
14 B	1.4	1.493	1.80	14 C	1.4	1.493	1.85	14 D	1.4	1.493	1.90
15 B	1.5	1.593	1.90	15 C	1.5	1.593	1.95	15 D	1.5	1.593	2.00
16 B	1.6	1.693	2.00	16 C	1.6	1.693	2.05	16 D	1.6	1.693	2.10
17 B	1.7	1.793	2.10	17 C	1.7	1.793	2.15	17 D	1.7	1.793	2.20
18 B	1.8	1.893	2.20	18 C	1.8	1.893	2.25	18 D	1.8	1.893	2.30
19 B	1.9	1.993	2.30	19 C	1.9	1.993	2.35	19 D	1.9	1.993	2.40
20 B	2.0	2.093	2.40	20 C	2.0	2.093	2.45	20 D	2.0	2.093	2.50
21 B	2.1	2.193	2.50	21 C	2.1	2.193	2.55	21 D	2.1	2.193	2.60
22 B	2.2	2.293	2.60	22 C	2.2	2.293	2.65	22 D	2.2	2.293	2.70
23 B	2.3	2.393	2.70	23 C	2.3	2.393	2.75	23 $\boxed{A_1}$ D $\boxed{A_1}$	2.3	2.393	2.80
24 B	2.4	2.493	2.80	24 C	2.4	2.493	2.85	24 $\boxed{A_1}$ D $\boxed{A_1}$	2.4	2.493	2.90
25 B	2.5	2.593	2.90	25 C	2.5	2.593	2.95	25 $\boxed{A_1}$ D $\boxed{A_1}$	2.5	2.593	3.00
26 B	2.6	2.693	3.00	26 C	2.6	2.693	3.05	26 D	2.6	2.693	3.10
27 B	2.7	2.793	3.10	27 C	2.7	2.793	3.15	27 D	2.7	2.793	3.20
28 B	2.8	2.893	3.20	28 C	2.8	2.893	3.25	28 D	2.8	2.893	3.30

^a See 5.3.

Table 2 — Bearing length L , clamping length M and overall length E (continued)

No. 6-32 UNC				No. 8-32 UNC				No. 10-32 UNF			
Part no.	^a L min.	M +0 -0.03	E +0.04 -0	Part no.	^a L min.	M +0 -0.03	E +0.04 -0	Part no.	^a L min.	M +0 -0.03	E +0.04 -0
	in	in	in		in	in	in		in	in	in
29 B	2.9	2.993	3.30	29 C	2.9	2.993	3.35	29 D	2.9	2.993	3.40
30 B	3.0	3.093	3.40	30 C	3.0	3.093	3.45	30 D	3.0	3.093	3.50
31 B	3.1	3.193	3.50	31 C	3.1	3.193	3.55	31 D	3.1	3.193	3.60
32 B	3.2	3.293	3.60	32 C	3.2	3.293	3.65	32 D	3.2	3.293	3.70
33 B	3.3	3.393	3.70	33 C	3.3	3.393	3.75	33 D	3.3	3.393	3.80
34 B	3.4	3.493	3.80	34 C	3.4	3.493	3.85	34 D	3.4	3.493	3.90
35 B	3.5	3.593	3.90	35 C	3.5	3.593	3.95	35 D	3.5	3.593	4.00
36 B	3.6	3.693	4.00	36 C	3.6	3.693	4.05	36 D	3.6	3.693	4.10
37 B	3.7	3.793	4.10	37 C	3.7	3.793	4.15	37 D	3.7	3.793	4.20
38 B	3.8	3.893	4.20	38 C	3.8	3.893	4.25	38 D	3.8	3.893	4.30
39 B	3.9	3.993	4.30	39 C	3.9	3.993	4.35	39 D	3.9	3.993	4.40
40 B	4.0	4.093	4.40	40 C	4.0	4.093	4.45	40 D	4.0	4.093	4.50
41 B	4.1	4.193	4.50	41 C	4.1	4.193	4.55	41 D	4.1	4.193	4.60
42 B	4.2	4.293	4.60	42 C	4.2	4.293	4.65	42 D	4.2	4.293	4.70
43 B	4.3	4.393	4.70	43 C	4.3	4.393	4.75	43 D	4.3	4.393	4.80
44 B	4.4	4.493	4.80	44 C	4.4	4.493	4.85	44 D	4.4	4.493	4.90
45 B	4.5	4.593	4.90	45 C	4.5	4.593	4.95	45 D	4.5	4.593	5.00

^a See 5.3.

Table 2 — Bearing length L , clamping length M and overall length E (continued)

$\frac{1}{4}$ in UNF				$\frac{5}{16}$ in UNF			
Part no.	^a L min.	M + 0 -0.03	E + 0.04 -0	Part no.	^a L min.	M + 0 -0.03	E + 0.04 -0
	in	in	in		in	in	in
½ E	0.05	0.151	0.65	½ G	0.05	0.163	0.70
1 E	0.1	0.201	0.70	1 G	0.1	0.213	0.75
2 E	0.2	0.301	0.80	2 G	0.2	0.313	0.85
3 E	0.3	0.401	0.90	3 G	0.3	0.413	0.95
4 E	0.4	0.501	1.00	4 G	0.4	0.513	1.05
5 E	0.5	0.601	1.10	5 G	0.5	0.613	1.15
6 E	0.6	0.701	1.20	6 G	0.6	0.713	1.25
7 E	0.7	0.801	1.30	7 G	0.7	0.813	1.35
8 E	0.8	0.901	1.40	8 G	0.8	0.913	1.45
9 E	0.9	1.001	1.50	9 G	0.9	1.013	1.55
10 E	1.0	1.101	1.60	10 G	1.0	1.113	1.65
11 E	1.1	1.201	1.70	11 G	1.1	1.213	1.75
12 E	1.2	1.301	1.80	12 G	1.2	1.313	1.85
13 E	1.3	1.401	1.90	13 G	1.3	1.413	1.95
14 E	1.4	1.501	2.00	14 G	1.4	1.513	2.05
15 E	1.5	1.601	2.10	15 G	1.5	1.613	2.15
16 E	1.6	1.701	2.20	16 G	1.6	1.713	2.25
17 E	1.7	1.801	2.30	17 G	1.7	1.813	2.35
18 E	1.8	1.901	2.40	18 G	1.8	1.913	2.45
19 E	1.9	2.001	2.50	19 G	1.9	2.013	2.55
20 E	2.0	2.101	2.60	20 G	2.0	2.113	2.65
21 E	2.1	2.201	2.70	21 G	2.1	2.213	2.75
22 E	2.2	2.301	2.80	22 G	2.2	2.313	2.85
23 E	2.3	2.401	2.90	23 G	2.3	2.413	2.95
24 E	2.4	2.501	3.00	24 G	2.4	2.513	3.05
25 E	2.5	2.601	3.10	25 G	2.5	2.613	3.15
26 E	2.6	2.701	3.20	26 G	2.6	2.713	3.25
27 E	2.7	2.801	3.30	27 G	2.7	2.813	3.35
28 E	2.8	2.901	3.40	28 G	2.8	2.913	3.45
29 E	2.9	3.001	3.50	29 G	2.9	3.013	3.55
30 E	3.0	3.101	3.60	30 G	3.0	3.113	3.65

^a See 5.3.

Table 2 — Bearing length L , clamping length M and overall length E (continued)

Part no.	$\frac{1}{4}$ in UNF			Part no.	$\frac{5}{16}$ in UNF		
	aL min.	M + 0 -0.03	E + 0.04 -0		aL min.	M + 0 -0.03	E + 0.04 -0
	in	in	in		in	in	in
31 E	3.1	3.201	3.70	31 G	3.1	3.213	3.75
32 E	3.2	3.301	3.80	32 G	3.2	3.313	3.85
33 E	3.3	3.401	3.90	33 G	3.3	3.413	3.95
34 E	3.4	3.501	4.00	34 G	3.4	3.513	4.05
35 E	3.5	3.601	4.10	35 G	3.5	3.613	4.15
36 E	3.6	3.701	4.20	36 G	3.6	$\boxed{A_7}$ 3.713 $\boxed{A_7}$	4.25
37 E	3.7	3.801	4.30	37 G	3.7	$\boxed{A_7}$ 3.813 $\boxed{A_7}$	4.35
38 E	3.8	3.901	4.40	38 G	3.8	$\boxed{A_7}$ 3.913 $\boxed{A_7}$	4.45
39 E	3.9	4.001	4.50	39 G	3.9	$\boxed{A_7}$ 4.013 $\boxed{A_7}$	4.55
40 E	4.0	4.101	4.60	40 G	4.0	$\boxed{A_7}$ 4.113 $\boxed{A_7}$	4.65
41 E	4.1	4.201	4.70	41 G	4.1	4.213	4.75
42 E	4.2	4.301	4.80	42 G	4.2	$\boxed{A_7}$ 4.313 $\boxed{A_7}$	4.85
43 E	4.3	4.401	4.90	43 G	4.3	4.413	4.95
44 E	4.4	4.501	5.00	44 G	4.4	4.513	5.05
45 E	4.5	4.601	5.10	45 G	4.5	4.613	5.15
46 E	4.6	4.701	5.20	46 G	4.6	3.213	5.25
47 E	4.7	4.801	5.30	47 G	4.7	3.313	5.35
48 E	4.8	4.901	5.40	48 G	4.8	3.413	5.45
49 E	4.9	5.001	5.50	49 G	4.9	3.513	5.55
50 E	5.0	5.101	5.60	50 G	5.0	3.613	5.65

^a See 5.3.

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