

Specification for

**British Association
(B.A.) low tensile
screws and nuts for
aeronautical purposes**

NOTE The Institution desires to call attention to the fact that this standard is intended to include the technical provisions necessary for the supply of the material herein referred to, but does not purport to comprise all the necessary provisions of a contract.

Foreword

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The start and finish of text introduced or altered by Amendment No.6:2012 is indicated in the text by tags **A6** **A6**. Minor editorial changes are not tagged.

CAUTION. BS A 31, 32, 33 and 34 screws and BS A 47 and 48 nuts 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 using 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 11 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.

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NOTE The screws and nuts covered by these British Standards conform to the dimensions specified in BS 57:1951, "B.A. screws, bolts, nuts and plain washers". The details given in Table 3 to Table 7 have been taken from that specification.

1 Scope

These British Standards cover dimensions, material, finish and part numbers for British Association (B.A.) cheese, round, countersunk, and raised-countersunk head screws, and dimensions, material, finish and code letters for British Association (B.A.) hexagon ordinary (or full) and thin (or lock) nuts for aeronautical use.

2 Material and manufacture

The screws (turned from bar or cold forged) and nuts shall be manufactured from the appropriate material specified in Table 1 and Table 2 respectively.

2A Freedom from defects

- a) The screws and nuts shall be free from harmful defects.
- b) Screws and nuts may be rejected at any time for faults in, or revealed by, manufacture although they have been made from material passed previously for chemical composition and mechanical tests.

3 Dimensions

- a) With the exception of the thread, the screws and nuts shall before coating conform to the dimensions and tolerances given in Table 3 to Table 6 for screws and Table 7 for nuts respectively.
- b) Screw heads shall be concentric with the shank. Slots shall be clean and free from burrs and, on visual inspection, shall appear to be closely coincident with the centre-line of the head.

4 Length of screws

- a) *Cheese and round heads.* The nominal length shall be the distance from the underside of the head to the extreme end of the shank, including any chamfer or radius.
- b) *Countersunk heads.* The nominal length shall be the distance from the upper surface of the head to the extreme end of the shank, including any chamfer or radius.
- c) *Raised-countersunk heads.* The nominal length shall be the distance from the upper surface of the head (excluding the raised portion) to the extreme end of the shank, including any chamfer or radius.

d) *Tolerance on length.* The permissible tolerance on the nominal length of screws shall be as follows:—

Nominal length	Tolerance
Up to and including $\frac{1}{8}$ in.	+ 0.01 in. – 0
Above $\frac{1}{8}$ in. up to and including $\frac{1}{2}$ in.	+ 0.02 in. – 0
Above $\frac{1}{2}$ in.	+ $\frac{1}{32}$ in. – 0

5 Ends of screws (See Figure 1.)

- a) *Cut threads.* All screws with cut threads shall be finished with either a flat chamfer with a 90° included angle to a depth slightly exceeding the depth of thread, or a radius approximately equal to $1\frac{1}{4}$ times the nominal diameter of the shank.
- b) *Rolled threads.* Screws with rolled threads need not be pointed, the lead formed during the thread rolling being sufficient, but the end shall be at right angles to the axis of the screw within the tolerance permitted by the following test:—

The screw 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 screw end is flush with the gauge face. The distance between the gauge face and the high point of the screw end shall not exceed one pitch.

6 Screw threads

- a) *Screws.*
 - i) The screw threads may be either cut or rolled at the option of the manufacturer. They shall conform (after coating, if required) to the limits and tolerances specified for close class bolts in BS 93:1951 "British Association (B.A.) screw threads".
 - ii) The minimum major, effective, and minor diameters of threads of screws required to be coated may, before coating, be 0.001 in. smaller than the minimum dimensions specified in Table 8 of BS 93:1951, in order to avoid any undue restriction of the tolerance allowed for screwing.
 - iii) In view of the tendency for closely fitting threads in stainless steel to seize when tightened together, the maximum major, effective and minor diameters of stainless steel screws shall be 0.001 in. below the maximum specified in BS 93:1951, Table 8. The full close class tolerance specified in Table 8 of that standard shall, however, be allowed.
- b) *Nuts.* The screw threads shall conform to the limits and tolerances specified in BS 93:1951. They shall be required to pass gauges approved by the Inspecting Authority.

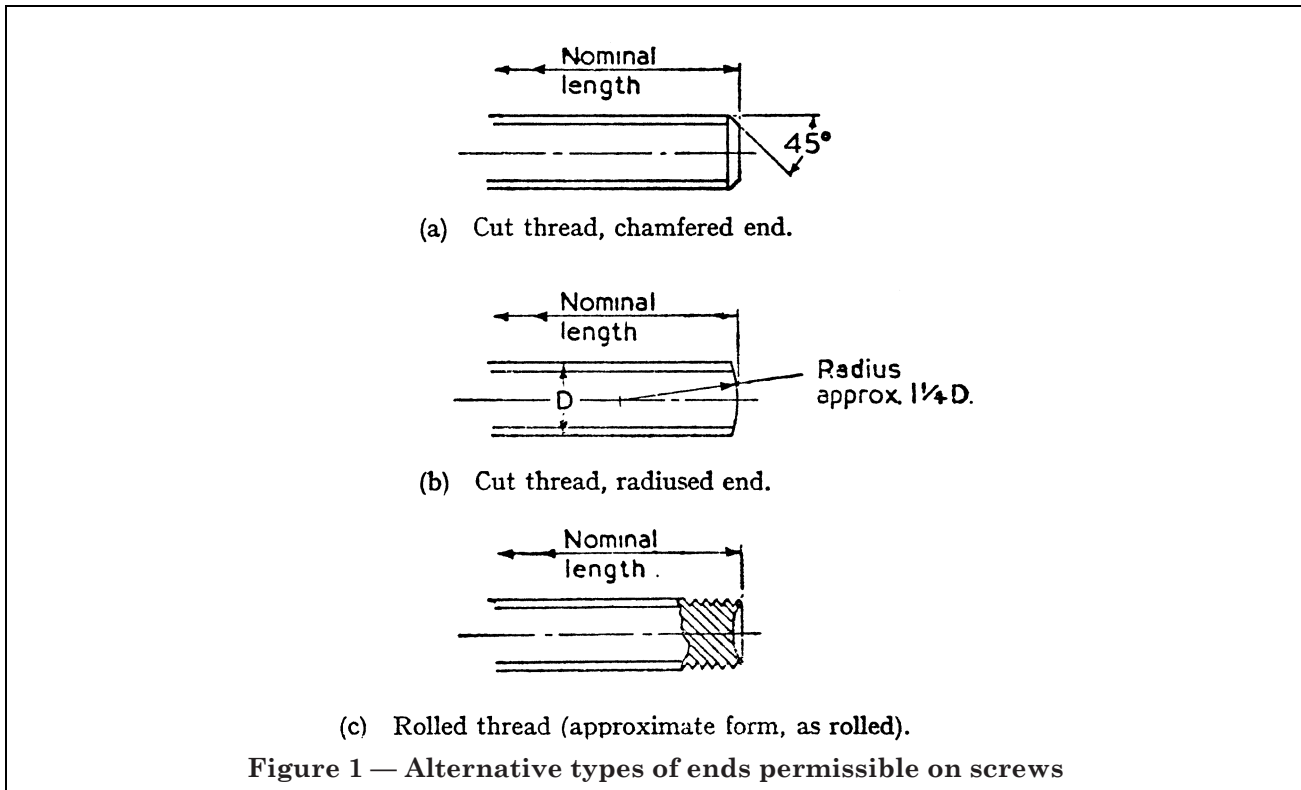


Figure 1 — Alternative types of ends permissible on screws

7 Length of thread on screws

a) *Cheese and round heads.* These shall be threaded to leave a limited length of unthreaded shank under the head. The length of unthreaded shank is defined as the distance from the leading face of a nut which has been screwed as far as possible on to the screw by hand to the underside of the head. The nut shall have threads as specified in Clause 6 b) and shall not be countersunk.

The length of unthreaded shank shall not exceed the following:—

Nominal length of screw	Length of unthreaded shank
Up to and including 5 times the diameter	Not to exceed 1 1/2 times the pitch.
Greater than 5 times the diameter	Not to exceed 2 1/2 times the pitch.

b) *Countersunk and raised-countersunk heads.* These shall be threaded right up to the head.

8 Chamfering

All nuts shall have a chamfer of approximately 30° on both faces.

8A Countersinking

All nuts shall be countersunk on one face to the major diameter of the thread at an angle of 90°–120°, as indicated in Figure 6 and Figure 7.

9 ^{A6} Protective finish ^{A6}

The screws and nuts shall conform to the finish for the appropriate material specified in Table 1 and Table 2 respectively.

10 Identification

The screws and nuts shall be identified for ordering purposes by the relevant British Standard ^{A6} identifier ^{A6} (see Table 1 and Table 2) and the appropriate part number (see Table 8) in the case of screws, or the appropriate code letter (see Table 9) in the case of nuts, e.g.:

A countersunk head aluminium alloy 1/2 in. 4 B.A. screw is BS A 41 BS B 16.

An aluminium alloy 4 B.A. ordinary nut is BS A 51 B.

Table 1 – B.A. Screws – British Standard identifiers. Material and protective finish

British Standard	Type of head	Material			Protective finish
		Description	Quality or specification	Minimum tensile strength tons per sq. in. (MPa)	
BS A 31 BS A 32 BS A 33 BS A 34	Cheese Round Countersunk Raised countersunk	Mild steel	Commercial quality	25 (386)	Cadmium coated in accordance with Def Stan 03-19 or BS EN 2133
BS A 35 BS A 36 BS A 37 BS A 38	Cheese Round Countersunk Raised countersunk	Stainless steel	BS EN 10088-3: - X12CrS13(1.4005) - X17CrNi16-2(1.4057) - X5CrNi18-10(1.4301) - X5CrNiMo17-12-2(1.4401) - X8CrNiS18-9(1.4305) - X6CrNiTi18-10(1.4541) - X2CrNi18-9(1.4307) BS EN 10263-5: - X5CrNi18-10(1.4301) - X5CrNiMo17-12-2(1.4401) - X6CrNiTi18-10(1.4541) - X3CrNiMo17-13-3(1.4436) - X2CrNiMo17-12-2(1.4404) - X6CrNiMoTi17-2-2(1.4571) - X2CrNi18-9(1.4307)	35 (540)	Natural
BS A 39 BS A 40 BS A 41 BS A 42	Cheese Round Countersunk Raised countersunk	Aluminium alloy	BS 1473, (A6) 2014A-T6 5056A-H24 BS EN 755, 2014A-T4 or T6	20 (309)	Anodized in accordance with (A6) Def Stan 03-25
BS A 43 BS A 44 BS A 45 BS A 46	Cheese Round Countersunk Raised countersunk	Brass	(A6) BS EN 12163, CW508L or CW712R BS EN 12164, CW614N BS EN 12166, CW508L, CW712R, CW614N	20 (309)	(A6) Electro-deposition of tin in accordance with BS 1872

Table 2 – B.A. Nuts – British Standard identifiers. Material and protective finish

British Standard	Type of head	Material			Protective finish
		Description	Quality or specification	Minimum tensile strength tons per sq. in. (MPa)	
BS A 47	Ordinary	Mild steel	Commercial quality	25 (386)	Cadmium coated in accordance with Def Stan 03-19 or BS EN 2133
BS A 48	Thin (or lock)				
BS A 49	Ordinary	Stainless steel	BS EN 10088-3: - X12CrS13(1.4005) - X17CrNi16-2(1.4057) - X5CrNi18-10(1.4301) - X5CrNiMo17-12-2(1.4401) - X8CrNiS18-9(1.4305) - X6CrNiTi18-10(1.4541) - X2CrNi8-9(1.4307) BS EN 10263-5: - X5CrNi18-10(1.4301) - X5CrNiMo17-12-2(1.4401) - X6CrNiTi18-10(1.4541) - X3CrNiMo17-13-3(1.4436) - X2CrNiMo17-12-2(1.4404) - X6CrNiMoTi17-12-2(1.4571) - X2CrNi18-9(1.4307)	35 (540)	Natural
BS A 50	Thin (or lock)				
BS A 51	Ordinary	Aluminium alloy	BS EN 755, 2014A-T4 or T6	20 (309)	Anodized in accordance with Def Stan 03-25
BS A 52	Thin (or lock)				
BS A 53	Ordinary	Brass	BS EN 12163, CW508L or CW712R BS EN 12164, CW614N BS EN 12166, CW508L, CW712R, CW614N	20 (309)	Electro-deposition of tin in accordance with BS 1872
BS A 54	Thin (or lock)				
Footnote deleted					

Table 3 — Dimensions of cheese head screws

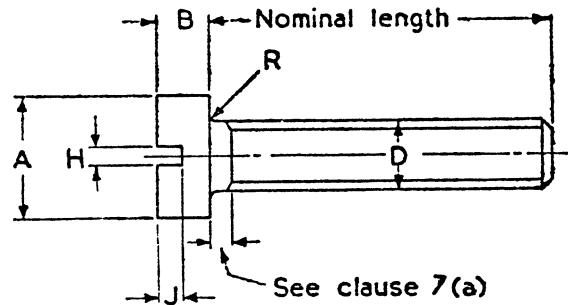


Figure 2

For nominal lengths see Table 8.

1	2	3	4	5	6	7	8	9	10	11
B.A. No.	Diameter of shank and major diameter of thread		Diameter of head ^a		Depth of head		Radius under head	Slot		
	D		A		B		R	Width H		Depth J ^b
	max.		max.	min.	max.	min.	max.	max.	min.	nom.
	mm.	in.	in.	in.	in.	in.	in.	in.	in.	in.
2	4.7	0.185	0.319	0.309	0.130	0.123	0.015	0.052	0.044	0.058
4	3.6	0.142	0.252	0.242	0.101	0.095	0.010	0.040	0.034	0.045
6	2.8	0.110	0.194	0.184	0.078	0.073	0.010	0.033	0.027	0.035
8	2.2	0.087	0.157	0.147	0.063	0.059	0.010	0.030	0.024	0.027
10	1.7	0.067	0.112	0.107	0.045	0.041	0.007	0.024	0.019	0.020
12	1.3	0.051	0.095	0.090	0.038	0.035	0.005	0.020	0.015	0.017

^a *Diameter of head.* — The dimensions specified for the diameter of head are based on the rule $A = 1.75D$, but they have been adjusted slightly to come within the dimensions of diameters of available round bars to British Standard limits.

^b Dimension J is measured from the upper surface of the head to the point at which the slot breaks through.

Table 4 — Dimensions of round head screws

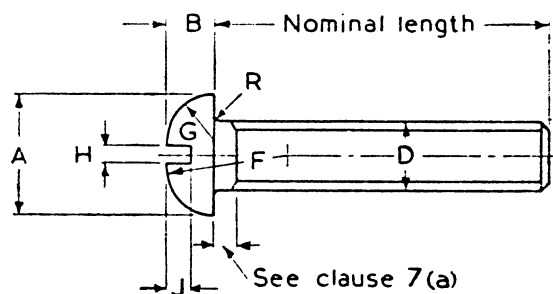


Figure 3

For nominal lengths see Table 8.

1	2	3	4	5	6	7	8	9	10	11	12
B.A. No.	Diameter of shank and major diameter of thread		Diameter of head ^a		Depth of head		Radius under head	Radius of head	Slot		
	D		A		B		R	F	Width		Depth
	max.		max.	min.	max.	min.	max.	approx.	max.	min.	nom.
	mm.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.
2	4.7	0.185	0.319	0.309	0.130	0.123	0.015	0.319	0.052	0.044	0.071
4	3.6	0.142	0.252	0.242	0.101	0.095	0.010	0.252	0.040	0.034	0.056
6	2.8	0.110	0.194	0.184	0.078	0.073	0.010	0.194	0.033	0.027	0.043
8	2.2	0.087	0.157	0.147	0.063	0.059	0.010	0.157	0.030	0.024	0.035
10	1.7	0.067	0.112	0.107	0.045	0.041	0.007	0.112	0.024	0.019	0.025

^a 1. *Diameter of head.* — The dimensions specified for the diameter of head are based on the rule $A = 1.75D$, but they have been adjusted slightly to come within the dimensions of diameters of available roundbars to British Standard limits.

2. *Shape of head.* — The shape of the head shall closely approximate to a half-ellipse. Radius G (struck off the underside of the head) must pass through diameter A and touch radius F.

^b Dimension J is measured from the upper surface of the head to the point at which the slot breaks through.

Table 5 — Dimensions of countersunk head screws

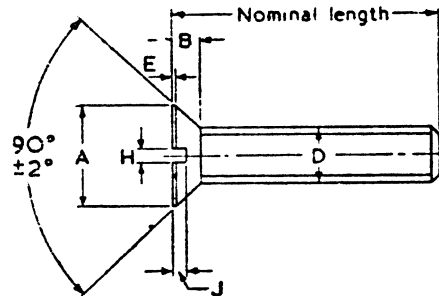


Figure 4

For nominal lengths see Table 8.

1	2	3	4	5	6	7	8	9	10
B.A. No.	Major diameter of thread		Diameter of head ^a		Depth of head		Slot		
	D		A		Total B	E	Width H		Depth J ^b
	max.		max.	min.	nom.	max.	max.	min.	nom.
	mm.	in.	in.	in.	in.	in.	in.	in.	in.
2	4.7	0.185	0.319	0.309	0.077	0.010	0.052	0.044	0.036
4	3.6	0.142	0.252	0.242	0.065	0.010	0.040	0.034	0.031
6	2.8	0.110	0.194	0.184	0.051	0.009	0.033	0.027	0.024
8	2.2	0.087	0.157	0.147	0.043	0.008	0.030	0.024	0.021
10	1.7	0.067	0.112	0.107	0.030	0.007	0.024	0.019	0.016
12	1.3	0.051	0.095	0.090	0.028	0.006	0.020	0.015	0.014

^a *Diameter of head.* — The dimensions specified for the diameter of head are based on the rule $A = 1.75D$, but they have been adjusted slightly to come within the dimensions of diameters of available round bars to British Standard limits.

^b Dimension J is measured from the upper surface of the head to the point at which the slot breaks through.

Table 6 — Dimensions of raised-countersunk head screws

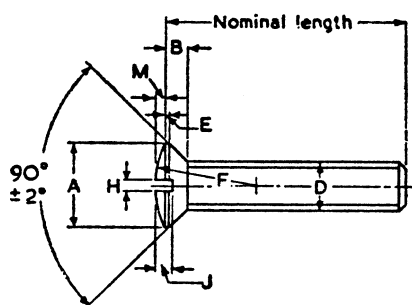


Figure 5

For nominal lengths see Table 8.

1	2	3	4	5	6	7	8	9	10	11	12
B.A. No.	Major diameter of thread		Diameter of head ^a		Depth of head			Radius	Slot		
	D		A		E	B	M		F	H	
	max.		max.	min.	max.	nom.	approx.	nom.	max.	min.	nom.
2	mm. 4.7	in. 0.185	in. 0.319	in. 0.309	in. 0.010	in. 0.077	in. 0.036	in. 0.370	in. 0.052	in. 0.044	in. 0.059
4	3.6	0.142	0.252	0.242	0.010	0.065	0.029	0.283	0.040	0.034	0.049
6	2.8	0.110	0.194	0.184	0.009	0.051	0.023	0.220	0.033	0.027	0.039
8	2.2	0.087	0.157	0.147	0.008	0.043	0.019	0.173	0.030	0.024	0.033
10	1.7	0.067	0.112	0.107	0.007	0.030	0.013	0.134	0.024	0.019	0.024

^a *Diameter of head.* — The dimensions specified for the diameter of head are based on the rule $A = 1.75D$, but they have been adjusted slightly to come within the dimensions of diameters of available round bars to British Standard limits.

^b Dimension J is measured from the upper surface of the head to the point at which the slot breaks through.

**Table 7 — Dimensions of hexagonal ordinary (or full) nuts and thin (or lock) nuts.
(Third angle projection)**

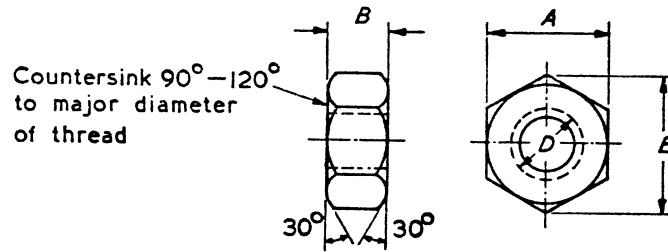


Figure 6 — Hexagonal ordinary nut

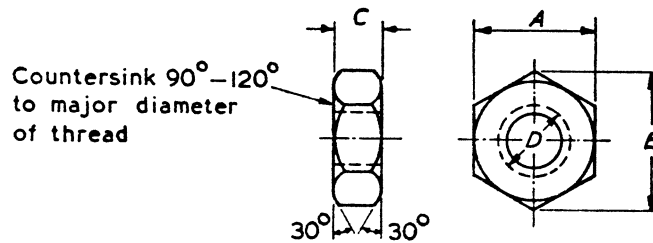


Figure 7 — Hexagonal thin (or lock) nut

NOTE The nuts shall be countersunk on one face only (see Clause 8A).

1	2	3	4	5	6	7	8	9	10
B.A. No.	Nominal diameter of thread D		Width across flats A		Width across corners E	Thickness			
						Ordinary (or full) nuts ^b B		Thin (or lock) nuts C	
	max.	min.	max.	max.	min.	max.	min.		
	mm.	in.	in.	in.	in.	in.	in.	in.	in.
2 ^a	4.7	0.185	0.324	0.319	0.37	0.167	0.157	0.123	0.113
4 ^a	3.6	0.142	0.248	0.243	0.29	0.135	0.125	0.094	0.084
6 ^a	2.8	0.110	0.193	0.188	0.22	0.105	0.095	0.073	0.063
8	2.2	0.087	0.152	0.149	0.18	0.082	0.075	0.058	0.051
10	1.7	0.067	0.117	0.114	0.14	0.064	0.057	—	—
12	1.3	0.051	0.090	0.088	0.10	0.049	0.044	—	—

^a 6, 4 and 2 B.A. nuts in mild steel should be ordered to BS A 27, "Medium tensile steel hexagonal nuts for aircraft purposes."

^b The maximum thicknesses for ordinary nuts are derived from the following formulae:—

B = 0.9D for size 2 B.A.

B = 0.95D for sizes 4 to 12 B.A.

Table 8 — B.A. Screws — Part numbers

NOTE 1 12 B.A. Screws are normally available only with cheese and countersunk heads.

NOTE 2 Aluminium alloy screws are available in sizes 2, 4 and 6 B.A. only.

Length (inches)	Size B.A.					
	2	4	6	8 (See Note 2 above)	10 (See Note 2 above)	12 (See Notes 1 & 2 above)
$\frac{1}{16}$ (0.063)	—	—	—	—	—	X2
$\frac{3}{32}$ (0.094)	—	—	—	—	Y3	X3
$\frac{1}{8}$ (0.125)	—	—	A4	Z4	Y4	X4
$\frac{5}{32}$ (0.156)	—	—	—	—	Y5	X5
$\frac{3}{16}$ (0.188)	C6	B6	A6	Z6	Y6	X6
$\frac{7}{32}$ (0.219)	—	—	—	—	Y7	X7
$\frac{1}{4}$ (0.250)	C8	B8	A8	Z8	Y8	X8
$\frac{5}{16}$ (0.313)	C10	B10	A10	Z10	Y10	—
$\frac{3}{8}$ (0.375)	C12	B12	A12	Z12	Y12	—
$\frac{7}{16}$ (0.438)	C14	B14	A14	Z14	Y14	—
$\frac{1}{2}$ (0.500)	C16	B16	A16	Z16	Y16	—
$\frac{9}{16}$ (0.563)	C18	B18	A18	Z18	Y18	—
$\frac{5}{8}$ (0.625)	C20	B20	A20	Z20	Y20	—
$\frac{3}{4}$ (0.750)	C24	B24	A24	Z24	Y24	—
$\frac{7}{8}$ (0.875)	C28	B28	A28	Z28	—	—
1 (1.000)	C32	B32	A32	Z32	—	—
$1\frac{1}{8}$ (1.125)	C36	B36	A36	—	—	—
$1\frac{1}{4}$ (1.250)	C40	B40	A40	—	—	—
$1\frac{3}{8}$ (1.375)	C44	B44	A44	—	—	—
$1\frac{1}{2}$ (1.500)	C48	B48	A48	—	—	—

Table 9 — B.A. Nuts — Code letters

NOTE 1 Sizes 10 and 12 B.A. are available in ordinary nuts only.

NOTE 2 6, 4 and 2 B.A. nuts in mild steel should be ordered to BS A 27 "Medium tensile steel hexagonal nuts for aircraft purposes."

Size B.A.	Code letter
2 (See Note 2 above)	C
4 (See Note 2 above)	B
6 (See Note 2 above)	A
8	Z
10 (See Note 1 above)	Y
12 (See Note 1 above)	X

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