

Specification for

British Association (B.A.) screw threads —

With tolerances for sizes 0 B.A.
to 16 B.A.

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The Mechanical Engineering Industry Standards Committee, under whose supervision this British Standard was prepared, consists of representatives from the following Government departments and scientific and industrial organizations :—

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British Compressed Air Society	Institution of Mechanical Engineers (Automobile Division)
British Electrical and Allied Manufacturers' Association*	Institution of Production Engineers
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British Railways, The Railway Executive	Ministry of Labour and National Service (Factory Department)
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Institute of Marine Engineers	Ministry of Works
	Office of the High Commissioner for India
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The Government department and industrial organization marked with an asterisk in the above list, together with the following, were directly represented on the committees entrusted with the preparation of this standard :—

Aircraft Bolt & Nut Manufacturers' Association	Metal Screw Thread Manufacturers' Association (Rolled Screw and Turned Screw Sections)
Bright Bolt & Nut Manufacturers' Association	National Physical Laboratory
Cold Headed Heat Treated Bolt Association	Scientific Instrument Manufacturers' Association
Cut Thread Screwing Tool Manufacturers' Association	Society of British Aircraft Constructors
General Post Office	Telecommunication Engineering and Manufacturing Association
Ground Threads Tap Association	

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Foreword

In order to keep abreast of progress in the industries concerned, British Standards are subject to periodical review. Suggestions for improvements will be recorded and in due course brought to the notice of the committees charged with the revision of the standards to which they refer.

A complete list of British Standards, numbering over 9,000, fully indexed and with a note of the contents of each, will be found in the BSI Catalogue which may be purchased from BSI Sales Department. The Catalogue may be consulted in many public libraries and similar institutions.

This standard makes reference to the following British Standards :—

BS 919, *Screw thread gauge tolerances*.

BS 1044, *Recommended designs for plug, ring and gap gauges*.

This revision of the British Standard for B.A. screw threads has been prepared under the authority of the Mechanical Engineering Industry Standards Committee.

The first British Standard schedule of B.A. screw thread dimensions was included in the report No. 20 of British Standard screw threads, first issued in 1905. That schedule gave the basic dimensions for sizes 0 to 25 but did not include tables of tolerances.

In 1919 a more comprehensive British Standard was issued, including the basic sizes from Nos. 0 to 25 and limits and tolerances for one class of fit for Nos. 0 to 15.

The present revision has been undertaken in response to representations, firstly that the tolerances in the 1919 edition were too close for the economic commercial production of bolts, nuts and screws, and secondly that for such commercial bolts, nuts and screws it was desirable to have an allowance between the maximum bolt and minimum nut to facilitate assembly or to permit of the plating of the bolts and screws after manufacture. The present revision accordingly provides for a series of increased tolerances for the bolts and nuts, together with an allowance for general commercial usage.

It has, however, been considered that for more precise engineering and particularly for highly stressed bolts the bolt tolerances included in the 1919 edition were appropriate and these have accordingly been retained as characterizing one of the classes of bolt.

In the present edition of the standard an Appendix has been included giving a recommended system of gauging for use in the inspection of B.A. screw threads.

A British Standard does not purport to include all the necessary provisions of a contract. Users of British Standards are responsible for their correct application.

Compliance with a British Standard does not of itself 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 17 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 standard relates to parallel screw threads having the British Association (B.A.) form of thread.

It covers:

- i) Basic sizes for B.A. threads, sizes 0 B.A. to 25 B.A.
- ii) Limits and tolerances for close and normal classes of bolt¹⁾, sizes 0 B.A. to 10 B.A.
- iii) Limits and tolerances for normal class of bolt, sizes 11 B.A. to 16 B.A.
- iv) Limits and tolerances for B.A. nuts, sizes 0 B.A. to 16 B.A.
- v) Basis of B.A. sizes. (Appendix A.)
- vi) Bases of allowances and tolerances. (Appendix B.)

vii) The effect of errors in pitch and angle upon the effective diameter. (Appendix C.)

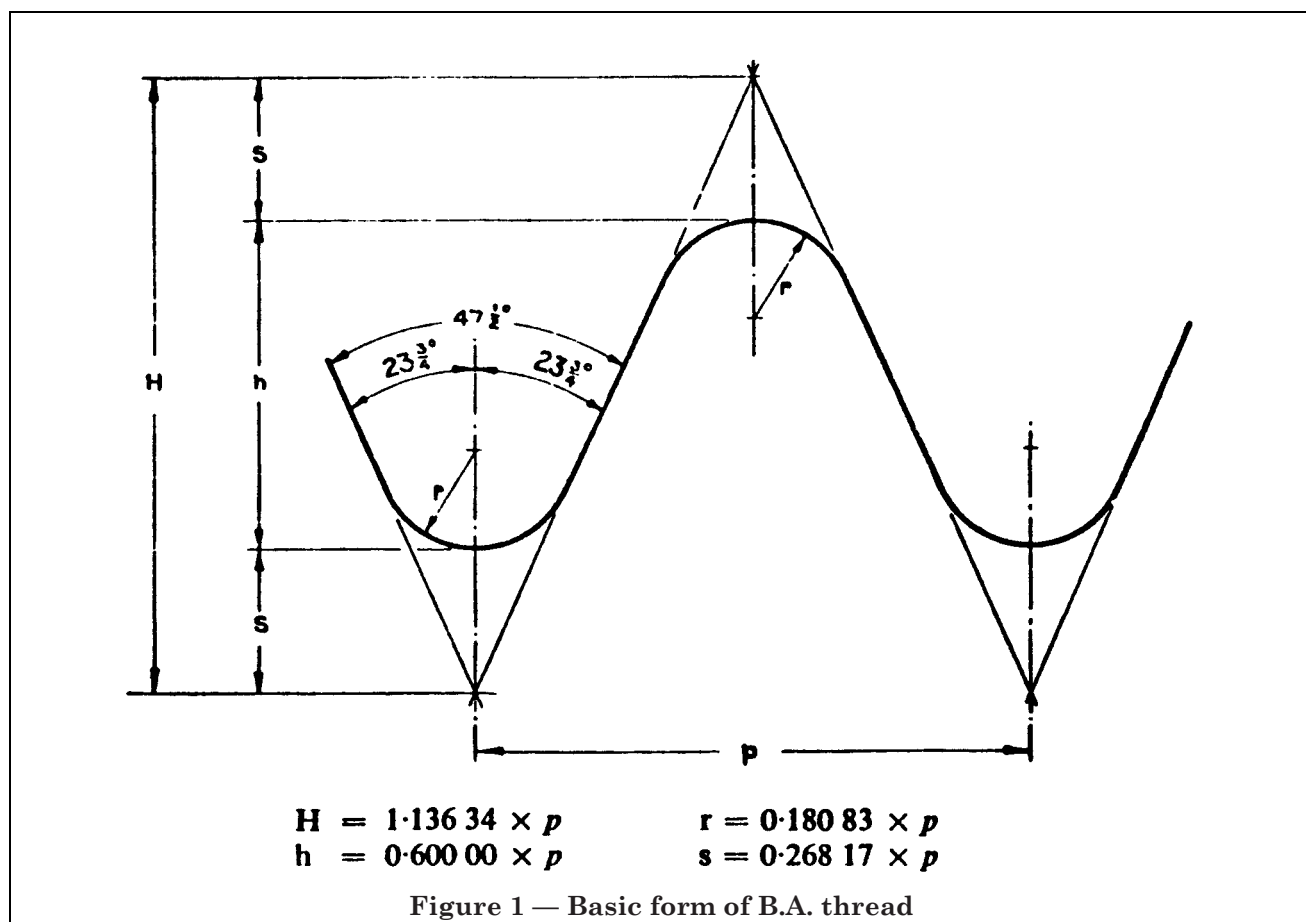
viii) Recommended system of gauging. (Appendix D.)

ix) Approximate inch equivalents of metric tables. (Appendix E.)

NOTE The standard is not intended to apply to screw threads associated with interference fits such as those on the "metal-ends" of studs and the corresponding tapped holes.

2 Form of thread

The basic form of the British Association (B.A.) thread is shown in Figure 1. It is a symmetrical V thread, of $47\frac{1}{2}^\circ$ included angle, having its crests and roots rounded with equal radii, such that the basic depth of thread is 0.6000 of the pitch.



¹⁾ The terms bolt and nut are used in a general sense to designate external and internal threads respectively.

3 B.A. series of sizes

The British Association system of screw threads comprises twenty-six graded sizes designated by a sequence of numbers.

The basic sizes of the series are given in Table 1. These metric sizes constitute the B.A. standard series of screw threads.

The basis of these sizes is given in Appendix A.

4 Classes of fit

Provision is made in this British Standard for one class of fit for nuts, sizes 0 B.A. to 16 B.A., and two classes for bolts, close class for sizes 0 B.A. to 10 B.A. and normal class for sizes 0 B.A. to 16 B.A. Close class fits are not included for bolts, sizes 11 B.A. to 16 B.A., as these bolts are not normally highly stressed.

Particulars with regard to the various classes of bolts and nuts are as follows :—

a) *Close class bolts*. These are intended for precision parts subject to stress, no allowance being provided between maximum bolt and minimum nut (see Figure 2), and should be used only for special work where refined accuracy of pitch and thread form is particularly required. Close class bolts, sizes 0 B.A. to 10 B.A., shall conform to the limits and tolerances in Table 2.

NOTE Should close class bolts require to be plated, the finished sizes of the screw threads after plating shall not exceed the upper limits specified in Table 2. In order to avoid any undue restriction of the tolerance for screwing, the sizes of the screw threads before plating shall be not more than the 0.025 mm. (0.001 in.) smaller than lower limits specified in Table 2. (See also Figure 4.)

b) *Normal class bolts*. These are intended for general commercial production and will be suitable for general engineering use. The limits on normal class bolts, sizes 0 B.A. to 10 B.A., are so disposed in relation to basic size as to provide an allowance of 0.025 mm. (0.001 in.) between maximum bolt and minimum nut which may be utilized either as a clearance for easy assembly or to make provision for plating (see Figure 3 and Figure 4). It is considered that an allowance for easy assembly is not required for sizes 11 B.A. to 16 B.A.

Normal class bolts, sizes 0 B.A. to 10 B.A., shall conform to the limits and tolerances in Table 3.

Normal class bolts, sizes 11 B.A. to 16 B.A., shall conform to the limits and tolerances in Table 4.

NOTE 1 Should normal class bolts, sizes 11 B.A. to 16 B.A., require to be plated the finished sizes of the screw threads after plating shall not exceed the upper limits specified in Table 4. In order to avoid any undue restriction of the tolerance for screwing, the sizes of the screw threads before plating shall be not more than 0.025 mm. (0.001 in.) smaller than the lower limits specified in Table 4. (See also Figure 4.)

NOTE 2 Stainless steel bolts. In view of the tendency for closely fitting bolts and nuts of stainless steel to seize when tightened together, it is recommended that for bolts made in stainless steel the normal class limits before plating be used.

c) *Nuts*. These shall conform, whether supplied unplated or plated, to the limits and tolerances in Table 5.

d) *Tolerances on effective diameter, pitch and flank angles*. Errors in the pitch and flank angles of a thread virtually increase the effective diameter of a bolt and decrease the effective diameter of a nut. The minimum *metal* limits stated in the tables apply to the simple effective diameter (as measured along the pitch line of the thread), and the maximum *metal* limits apply to the effective diameter as virtually increased (for bolts) or decreased (for nuts) by the diametral equivalents of any errors present in the flank angles and in the pitch over the length of engagement.

(See Appendix C.)

The use of the GO and NOT GO screw gauges recommended in Appendix D ensures that, for all practical purposes, the above requirements are satisfied.

5 Approximate inch equivalents

For the convenience of users of this standard, Appendix E has been prepared, giving the approximate inch equivalents of the basic sizes, and limits and tolerances for sizes from 0 to 16 B.A. inclusive. The conversions in these tables have been calculated from the rounded-off standard sizes in millimetres, approximated to the nearest 0.0001 in.

6 Recommendations

The Institution recommends that the B.A. screw thread system be used in preference to the B.S.W. and B.S.F. systems for all screws smaller than ¼ in. It is, however, recommended that the use of the 0 B.A. thread be discontinued in favour of the ¼ in. B.S.F.

It is recommended that in the selection of sizes preference be given to even numbered B.A. sizes.

Table 1 — Basic sizes of British Association (B.A.) screw threads

1	2	3	4	5	6	7	8
Designation number	Pitch	Depth of thread	Major diameter	Effective diameter	Minor diameter	Approximate cross-sectional area at bottom of thread	Designation number
			Bolt and nut	Bolt and nut	Bolt and nut		
	mm.	mm.	mm.	mm.	mm.	sq. mm.	
0	1.000 0	0.600	6.00	5.400	4.80	18.10	0
1	0.900 0	0.540	5.30	4.760	4.22	13.99	1
2	0.810 0	0.485	4.70	4.215	3.73	10.93	2
3	0.730 0	0.440	4.10	3.660	3.22	8.14	3
4	0.660 0	0.395	3.60	3.205	2.81	6.20	4
5	0.590 0	0.355	3.20	2.845	2.49	4.87	5
6	0.530 0	0.320	2.80	2.480	2.16	3.66	6
7	0.480 0	0.290	2.50	2.210	1.92	2.89	7
8	0.430 0	0.260	2.20	1.940	1.68	2.22	8
9	0.390 0	0.235	1.90	1.665	1.43	1.61	9
10	0.350 0	0.210	1.70	1.490	1.28	1.29	10
11	0.310 0	0.185	1.50	1.315	1.13	1.00	11
12	0.280 0	0.170	1.30	1.130	0.96	0.72	12
13	0.250 0	0.150	1.20	1.050	0.90	0.64	13
14	0.230 0	0.140	1.00	0.860	0.72	0.41	14
15	0.210 0	0.125	0.90	0.775	0.65	0.33	15
16	0.190 0	0.115	0.79	0.675	0.56	0.25	16
17	0.170 0	0.100	0.70	0.600	0.50	0.20	17
18	0.150 0	0.090	0.62	0.530	0.44	0.15	18
19	0.140 0	0.085	0.54	0.455	0.37	0.11	19
20	0.120 0	0.070	0.48	0.410	0.34	0.091	20
21	0.110 0	0.065	0.42	0.355	0.29	0.066	21
22	0.100 0	0.060	0.37	0.310	0.25	0.049	22
23	0.090 0	0.055	0.33	0.275	0.22	0.038	23
24	0.080 0	0.050	0.29	0.240	0.19	0.028	24
25	0.070 0	0.040	0.25	0.210	0.17	0.023	25

NOTE For approximate inch equivalents see Table 7.