

BRITISH STANDARD

British Association (B.A.) screw threads – Requirements

ICS 21.040.30



NO COPYING WITHOUT BSI PERMISSION EXCEPT AS PERMITTED BY COPYRIGHT LAW

Publishing and copyright information

The BSI copyright notice displayed in this document indicates when the document was last issued.

© BSI 2008

ISBN 978 0 580 60893 3

The following BSI references relate to the work on this standard:

Committee reference FME/9

Draft for comment 08/30173466 DC

Publication history

First published May 1919

Second edition, May 1951

Third edition, September 2008

Amendments issued since publication

Amd. no.	Date	Text affected
-----------------	-------------	----------------------

Contents

Foreword *ii*

1	Scope	<i>1</i>
2	Normative references	<i>1</i>
3	Terms and definitions and symbols	<i>1</i>
4	Profile of British Association (B.A.) screw thread	<i>2</i>
5	Basic sizes of B.A. threads	<i>3</i>
6	Tolerance classes and limits of sizes, and tolerances, for B.A. threads	<i>3</i>
7	Gauges	<i>4</i>

Annexes

Annex A (informative)	Basis of sizes of B.A. threads	<i>12</i>
Annex B (informative)	Bases of allowances and tolerances for B.A. threads	<i>12</i>
Annex C (informative)	Effect of errors in pitch and flank angle on the effective diameter	<i>14</i>
Annex D (informative)	Approximate inch equivalents of B.A. thread sizes	<i>16</i>

Bibliography *21*

List of figures

Figure 1	– Basic form of B.A. thread	<i>2</i>
Figure 2	– Tolerance zones for a close class external thread and an internal thread	<i>5</i>
Figure 3	– Tolerance zones for a normal class external thread and an internal thread	<i>5</i>
Figure 4	– Example of effective diameter tolerance zones (Effective diameter tolerance zones for size 2 B.A. threads illustrated)	<i>6</i>

List of tables

Table 1	– Basic sizes of British Association (B.A.) screw threads	<i>7</i>
Table 2	– Limits and tolerances for close class external threads – Sizes 0 B.A. to 10 B.A.	<i>8</i>
Table 3	– Limits and tolerances for normal class external threads – Sizes 0 B.A. to 10 B.A.	<i>9</i>
Table 4	– Limits and tolerances for normal class external threads – Sizes 11 B.A. to 16 B.A.	<i>10</i>
Table 5	– Limits and tolerances for internal threads – Sizes 0 B.A. to 16 B.A.	<i>11</i>
Table B.1	– Summary of tolerance formulae	<i>13</i>
Table D.1	– Basic sizes of British Association (B.A.) screw threads – Approximate inch equivalents	<i>16</i>
Table D.2	– Limits and tolerances for close class external threads – Sizes 0 B.A. to 10 B.A. – Approximate inch equivalents	<i>17</i>
Table D.3	– Limits and tolerances for normal class external threads – Sizes 0 B.A. to 10 B.A. – Approximate inch equivalents	<i>18</i>
Table D.4	– Limits and tolerances for normal class external threads – Sizes 11 B.A. to 16 B.A. – Approximate inch equivalents	<i>19</i>
Table D.5	– Limits and tolerances for internal threads – Sizes 0 B.A. to 16 B.A. – Approximate inch equivalents	<i>20</i>

Summary of pages

This document comprises a front cover, an inside front cover, pages i and ii, pages 1 to 21 and a back cover.

Foreword

Publishing information

This British Standard is published by BSI and came into effect on 30 September 2008. It was prepared by Subcommittee SFTSE/1, *Screws and fasteners technical specification committee*, under the authority of Technical Committee FME/9, *Nuts, bolts and accessories*. A list of organizations represented on this committee can be obtained on request to its secretary.

Supersession

This British Standard supersedes BS 93:1951, which is withdrawn.

Relationship with other publications

This British Standard is intended for use with BS 919-2, which specifies the corresponding screw gauges.

Information about this document

This British Standard has been fully revised to bring it up to date. This British Standard specifies the British Association (B.A.) system of screw threads, which comprises 17 graded metric sizes designated by the numbers 0 to 16. Approximate inch equivalents are also given.

Hazard warnings

WARNING. Attention is drawn to the fact that, with the different screw thread forms available, there is the possibility of a mismatch, which is potentially hazardous. It is the responsibility of the designer of the end product to ensure that this possibility is reduced to a minimum. For further information on mismatches of screw thread systems see PD 6494.

Presentational conventions

The provisions of this standard are presented in roman (i.e. upright) type. Its requirements are expressed in sentences in which the principal auxiliary verb is “shall”.

Commentary, explanation and general informative material is presented in smaller italic type, and does not constitute a normative element.

Contractual and legal considerations

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.

1 Scope

This British Standard specifies limits of sizes, and tolerances, for single start parallel screw threads of British Association (B.A.) form. It is not applicable to screw threads associated with interference fits, such as those on the “metal ends” of studs and in the corresponding tapped holes.

This British Standard specifies the following:

- a) basic sizes for B.A. threads, sizes 0 B.A. to 16 B.A.;
- b) limits of size, and tolerances, for close class and normal class external threads of sizes 0 B.A. to 10 B.A.;
- c) limits of size, and tolerances, for normal class external threads of sizes 11 B.A. to 16 B.A.;
- d) limits of size, and tolerances, for a single class of internal threads of sizes 0 B.A. to 16 B.A.

2 Normative references

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

BS 919-2, *Screw gauge limits and tolerances – Part 2: Specification for gauges for screw threads of Whitworth and B.A. forms*

BS 6528:1984, *Glossary of terms for cylindrical screw threads*

3 Terms and definitions and symbols

3.1 Terms and definitions

For the purposes of this British Standard the terms and definitions given in BS 6528:1984 and the following apply.

3.1.1 effective diameter

diameter of the pitch cylinder

NOTE 1 This is the “simple” effective diameter, as distinct from the “virtual” effective diameter (see 3.1.2).

NOTE 2 Also known as the pitch diameter.

3.1.2 virtual effective diameter

effective diameter of an imaginary thread of perfect pitch and flank angle, having the full depth of flanks, but clear at the crests and roots, which would just assemble with the actual thread over the prescribed length of engagement

NOTE The “virtual” effective diameter exceeds the simple effective diameter in the case of an external thread, but is less than the simple effective diameter in the case of an internal thread, by an amount corresponding to the combined diametral effects due to any errors in the pitch and/or the flank angles of the thread.

3.2 Symbols

For the purposes of this British Standard the following symbols apply.

NOTE 1 These are repeated from BS 6528:1984 for the convenience of users of this standard.

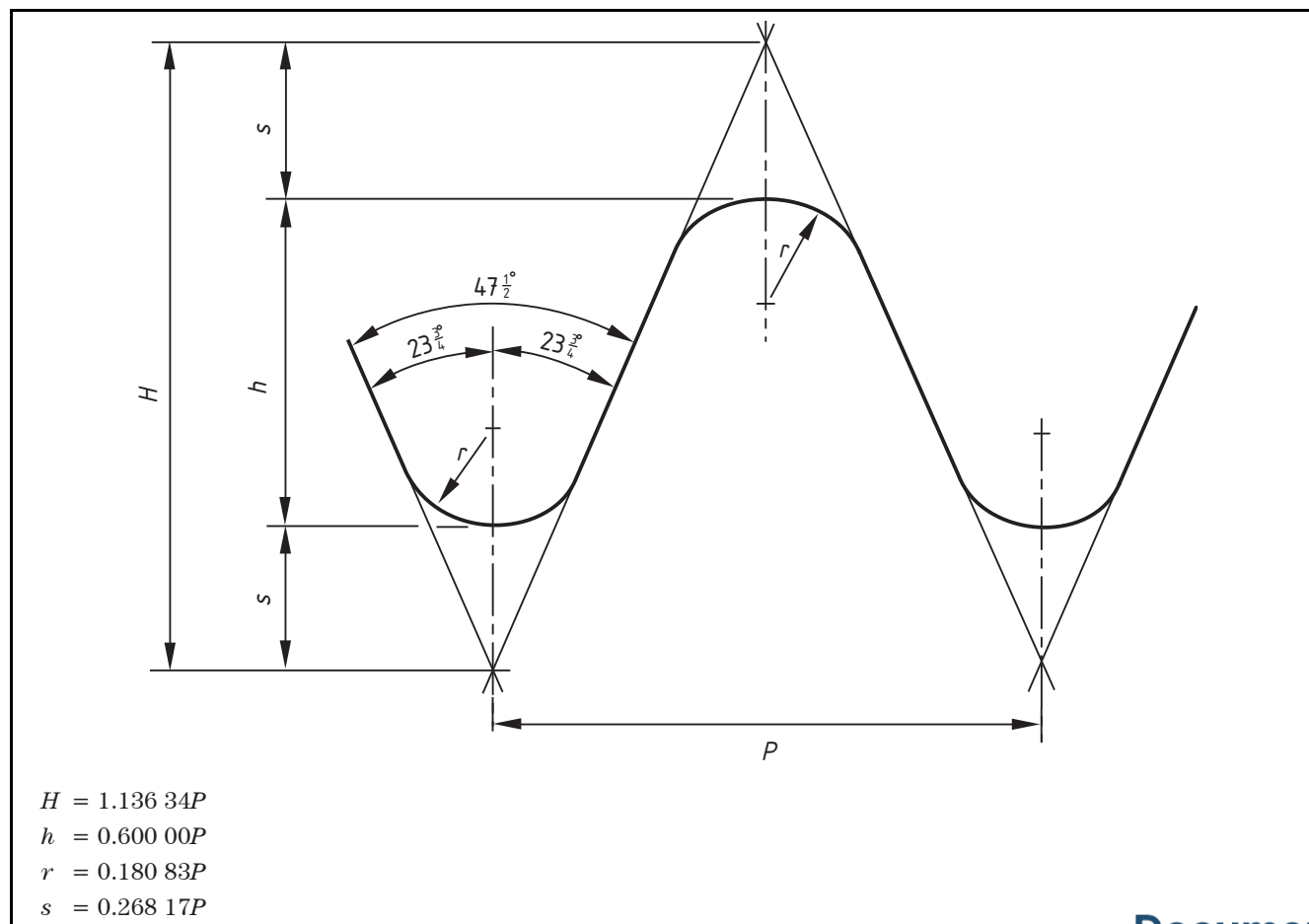
D	major diameter of internal thread
D_1	minor diameter of internal thread
D_2	effective diameter of internal thread (see Note 2)
d	major diameter of external thread
d_1	minor diameter of external thread
d_2	effective diameter of external thread (see Note 2)
H	height of fundamental triangle
P	pitch

NOTE 2 These are the symbols given for pitch diameter in BS 6528:1984.

4 Profile of British Association (B.A.) screw thread

The basic profile of the British Association (B.A.) screw thread shall be as shown in Figure 1. The thread shall be a symmetrical V-thread, with an included angle of $47\frac{1}{2}^\circ$, having its crests and roots rounded with equal radii, such that the basic depth of the thread is 0.600 00 times the pitch.

Figure 1 Basic form of B.A. thread



5 Basic sizes of B.A. threads

The basic sizes of B.A. screw threads shall be as given in Table 1.

NOTE The basis of these sizes is given in Annex A.

6 Tolerance classes and limits of sizes, and tolerances, for B.A. threads

COMMENTARY ON CLAUSE 6

This British Standard specifies one tolerance class for internal threads of sizes 0 B.A. to 16 B.A., and two tolerance classes for external threads, close class for sizes 0 B.A. to 10 B.A. and normal class for sizes 0 B.A. to 16 B.A. Tolerances are not specified for close class external threads of sizes 11 B.A. to 16 B.A., as these sizes are not normally highly stressed.

The bases of the allowances and tolerances are given in Annex B.

External threads shall be of one of the following tolerance classes.

- a) *Close class external threads.* Limits and tolerances for close class external threads of sizes 0 B.A. to 10 B.A. shall be as specified in Table 2.

NOTE 1 Close class external threads are intended for precision parts subject to stress, no allowance being provided between the maximum external thread diameters and the minimum internal thread diameters (see Figure 2). They should be used only for special work where a high degree of accuracy of pitch and thread form is particularly required.

If close class external threads are to be coated, the finished sizes of the screw threads after coating 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 coating 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 external threads.* Limits and tolerances for normal class external threads of sizes 0 B.A. to 10 B.A. shall be as specified in Table 3. Limits and tolerances for normal class external threads of sizes 11 B.A. to 16 B.A. shall be as specified in Table 4.

NOTE 2 Normal class external threads are intended for general commercial production and are suitable for general engineering use. The limits on normal class external threads of sizes 0 B.A. to 10 B.A. are so disposed in relation to the basic size as to provide an allowance of 0.025 mm (0.001 in) between the maximum external thread diameters and the minimum internal thread diameters, which may be utilized either as a clearance for easy assembly or to make provision for coating (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.

If normal class external threads of sizes 11 B.A. to 16 B.A. are to be coated, the finished sizes of the screw threads after coating 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 coating 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 3 Because of the tendency for close-fitting external and internal threads made of stainless steel to seize when tightened together, it is recommended that for external threads made of stainless steel the normal class limits before coating be used.

Internal threads shall be of a single tolerance class. Limits and tolerances for uncoated internal threads and for coated internal threads shall be as specified in Table 5.

NOTE 4 Errors in the pitch and flank angles of a thread increase the effective diameter of an external thread and decrease the effective diameter of an internal thread. The minimum material limits specified in Table 2 to Table 5 apply to the simple effective diameter (see 3.1.1), and the maximum material limits apply to the virtual effective diameter (see 3.1.2), i.e. the effective diameter as increased (for external threads) or decreased (for internal threads) by the diametral equivalents of any errors present in the flank angles and in the pitch of the thread over the length of engagement. (See Annex C.)

NOTE 5 For the convenience of users of this standard, approximate inch equivalents of the basic sizes, and limits and tolerances for sizes from 0 B.A. to 16 B.A. inclusive, are given in Annex D. The conversions given in Table D.1 to Table D.5 have been calculated from the rounded-off standard sizes in millimetres, approximated to the nearest 0.000 1 in.

NOTE 6 It is recommended that B.A. threads be used in preference to B.S.W. and B.S.F. threads for all threads smaller than 1/4 in diameter.

NOTE 7 It is recommended that, in the selection of sizes, preference be given to even numbered B.A. sizes.

7 Gauges

The dimensions of the screw threads shall be checked using gauges conforming to BS 919-2.

NOTE BS 919-2 specifies the dimensions of gauges in imperial units. However, in practice these gauges are sufficiently accurate to be used for checking screw threads for conformity to this British Standard.