BRITISH STANDARD

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

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British Standards

Publishing and copyright information

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Contents

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This British Standard supersedes BS 93:1951, which is withdrawn.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

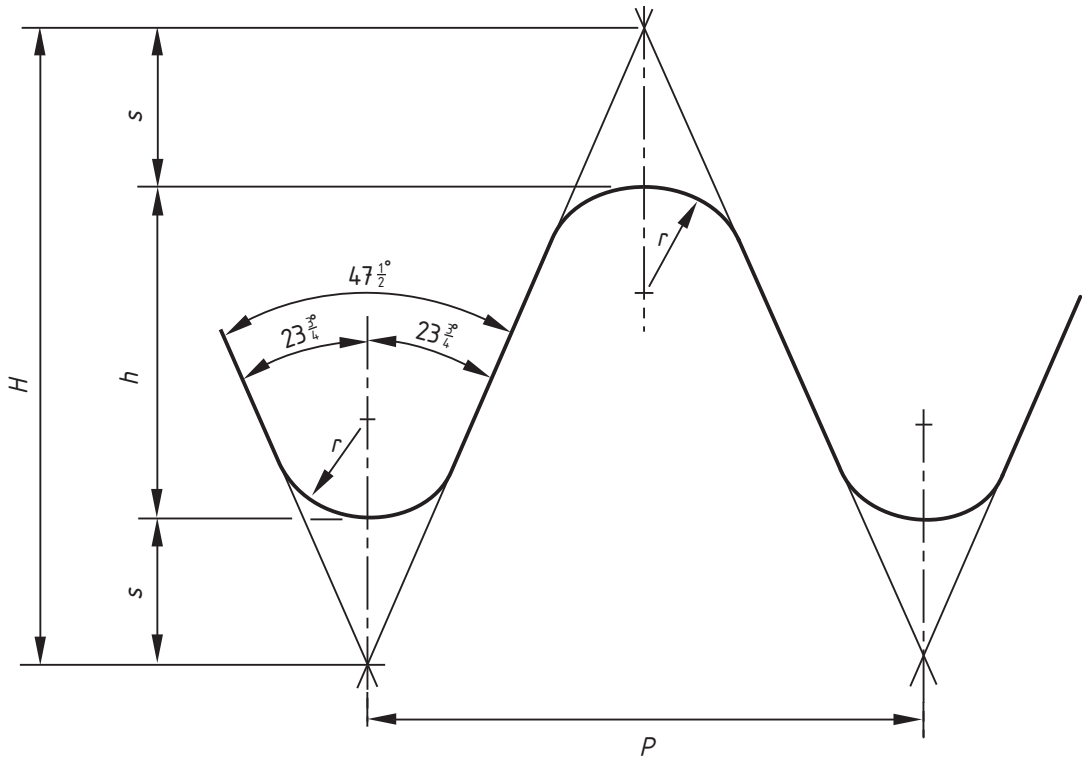
P pitch

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 47½°, 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**



H = 1.136 34P
h = 0.600 00P
r = 0.180 83P
s = 0.268 17P

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 theads 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 ¼ in diameter.

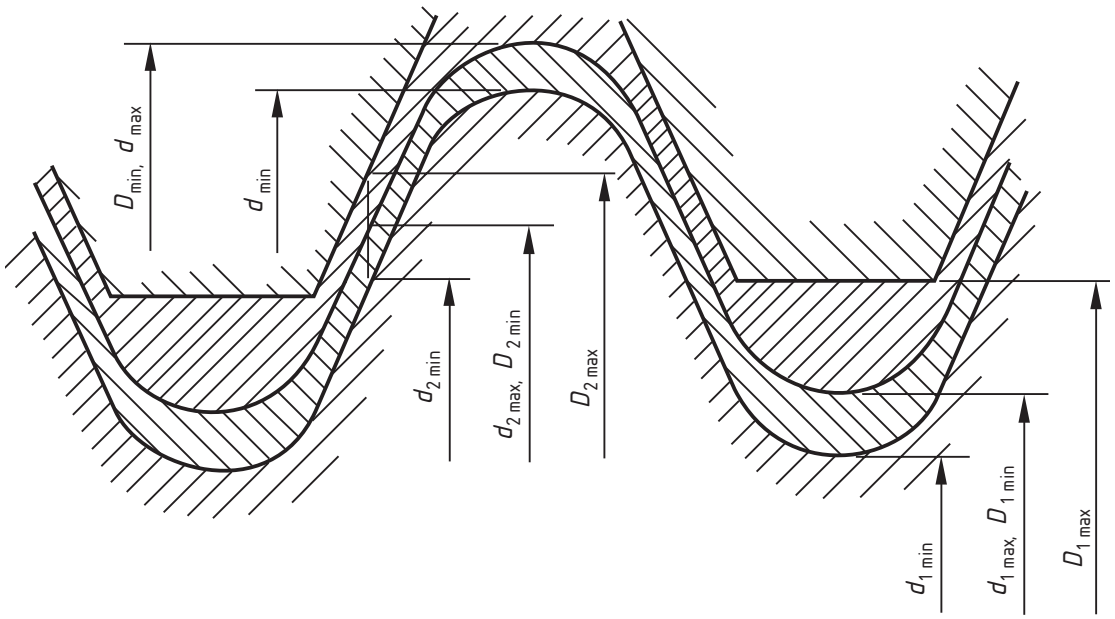
NOTE 7 It is recommended that, in the selection of sizes, preference be given to even numbered B.A. sizes.

7 Gauges

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

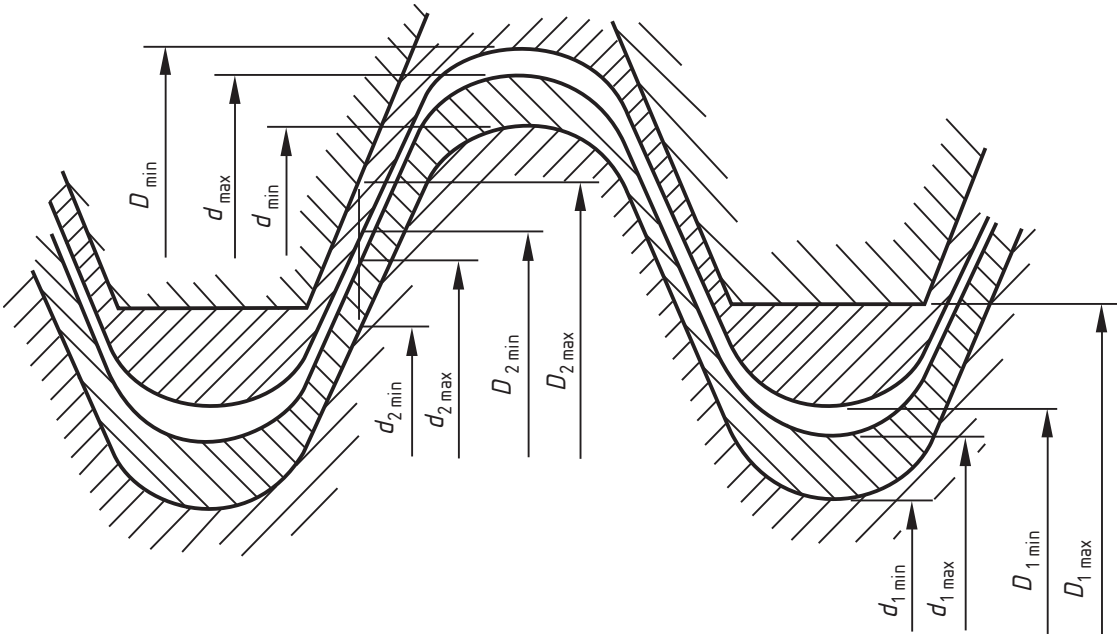
NOTE BS 919-2 specifies the dimensions of gauges in imperial units. However, in practice these gauges are sufficiently accurate to be used for checking screw threads for conformity to this British Standard.

Figure 2 **Tolerance zones for a close class external thread and an internal thread**



D_{2min} and d_{2max} correspond to the basic effective diameter
D_{1min} and d_{1max} correspond to the basic minor diameter

Figure 3 **Tolerance zones for a normal class external thread and an internal thread**



D_{min} corresponds to the basic major diameter
D_{2min} corresponds to the basic effective diameter
D_{1min} corresponds to the basic minor diameter

Figure 4 **Example of effective diameter tolerance zones (Effective diameter tolerance zones for size 2 B.A. threads illustrated)**

Dimensions in millimetres × 0.001

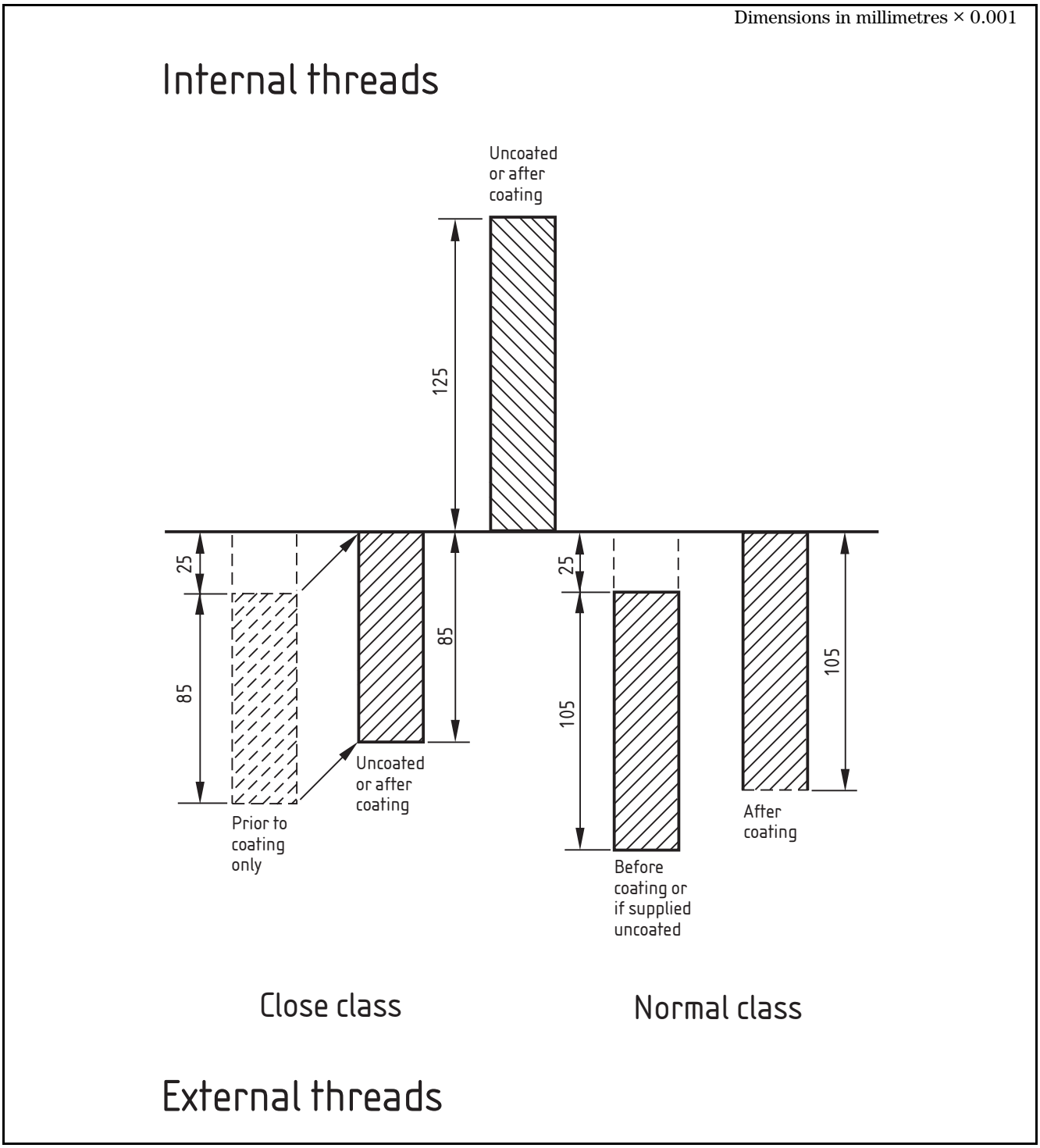


Table 1 **Basic sizes of British Association (B.A.) screw threads**

1	2	3	4	5	6	7	8
Designation number	**Pitch** mm	**Depth of thread** mm	**Major diameter** mm	**Effective diameter** mm	**Minor diameter** mm	**Approximate cross-sectional area at bottom of thread** mm^2	**Designation number**
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

NOTE For approximate inch equivalents see Table D.1.

Table 2 **Limits and tolerances for close class external threads – Sizes 0 B.A. to 10 B.A.**

1	2	3	4	5	6	7	8	9	10	11	12
Designation number	**Pitch**	**Major diameter**			**Effective diameter**			**Minor diameter**			**Designation number**
		Max.	**Tol.**	**Min.**	**Max.**	**Tol.**	**Min.**	**Max.**	**Tol.**	**Min.**	
	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	
0	1.000 0	6.000	0.150	5.850	5.400	0.100	5.300	4.800	0.200	4.600	0
1	0.900 0	5.300	0.135	5.165	4.760	0.090	4.670	4.220	0.185	4.035	1
2	0.810 0	4.700	0.120	4.580	4.215	0.085	4.130	3.730	0.170	3.560	2
3	0.730 0	4.100	0.110	3.990	3.660	0.080	3.580	3.220	0.155	3.065	3
4	0.660 0	3.600	0.100	3.500	3.205	0.075	3.130	2.810	0.145	2.665	4
5	0.590 0	3.200	0.090	3.110	2.845	0.070	2.775	2.490	0.135	2.355	5
6	0.530 0	2.800	0.080	2.720	2.480	0.060	2.420	2.160	0.125	2.035	6
7	0.480 0	2.500	0.070	2.430	2.210	0.060	2.150	1.920	0.115	1.805	7
8	0.430 0	2.200	0.065	2.135	1.940	0.055	1.885	1.680	0.110	1.570	8
9	0.390 0	1.900	0.060	1.840	1.665	0.050	1.615	1.430	0.100	1.330	9
10	0.350 0	1.700	0.055	1.645	1.490	0.050	1.440	1.280	0.095	1.185	10

NOTE For approximate inch equivalents see Table D.2.

Table 3 **Limits and tolerances for normal class external threads – Sizes 0 B.A. to 10 B.A.**

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Designation number	**Pitch**	**Major diameter**				**Effective diameter**				**Minor diameter**				**Designation number**
		Uncoated or before coating			**After coating**	**Uncoated or before coating**			**After coating**	**Uncoated or before coating**			**After coating**	
		Max.	**Tol.**	**Min.**	**Max.**	**Max.**	**Tol.**	**Min.**	**Max.**	**Max.**	**Tol.**	**Min.**	**Max.**	
	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	
0	1.000 0	5.975	0.200	5.775	6.000	5.375	0.125	5.250	5.400	4.775	0.250	4.525	4.800	0
1	0.900 0	5.275	0.180	5.095	5.300	4.735	0.115	4.620	4.760	4.195	0.230	3.965	4.220	1
2	0.810 0	4.675	0.160	4.515	4.700	4.190	0.105	4.085	4.215	3.705	0.210	3.495	3.730	2
3	0.730 0	4.075	0.145	3.930	4.100	3.635	0.100	3.535	3.660	3.195	0.195	3.000	3.220	3
4	0.660 0	3.575	0.130	3.445	3.600	3.180	0.090	3.090	3.205	2.785	0.180	2.605	2.810	4
5	0.590 0	3.175	0.120	3.055	3.200	2.820	0.085	2.735	2.845	2.465	0.170	2.295	2.490	5
6	0.530 0	2.775	0.105	2.670	2.800	2.455	0.080	2.375	2.480	2.135	0.155	1.980	2.160	6
7	0.480 0	2.475	0.095	2.380	2.500	2.185	0.075	2.110	2.210	1.895	0.145	1.750	1.920	7
8	0.430 0	2.175	0.085	2.090	2.200	1.915	0.070	1.845	1.940	1.655	0.135	1.520	1.680	8
9	0.390 0	1.875	0.080	1.795	1.900	1.640	0.065	1.575	1.665	1.405	0.130	1.275	1.430	9
10	0.350 0	1.675	0.070	1.605	1.700	1.465	0.060	1.405	1.490	1.255	0.120	1.135	1.280	10

NOTE For approximate inch equivalents, see Table D.3.

Table 4 **Limits and tolerances for normal class external threads – Sizes 11 B.A. to 16 B.A.**

1	2	3	4	5	6	7	8	9	10	11	12
Designation number	**Pitch**	**Major diameter**			**Effective diameter**			**Minor diameter**			**Designation number**
		Max.	**Tol.**	**Min.**	**Max.**	**Tol.**	**Min.**	**Max.**	**Tol.**	**Min.**	
	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	
11	0.310 0	1.500	0.080	1.420	1.315	0.055	1.260	1.130	0.110	1.020	11
12	0.280 0	1.300	0.070	1.230	1.130	0.055	1.075	0.960	0.105	0.855	12
13	0.250 0	1.200	0.065	1.135	1.050	0.050	1.000	0.900	0.100	0.800	13
14	0.230 0	1.000	0.060	0.940	0.860	0.050	0.810	0.720	0.095	0.625	14
15	0.210 0	0.900	0.055	0.845	0.775	0.045	0.730	0.650	0.090	0.560	15
16	0.190 0	0.790	0.050	0.740	0.675	0.045	0.630	0.560	0.090	0.470	16

NOTE For approximate inch equivalents, see Table D.4.

Table 5 **Limits and tolerances for internal threads – Sizes 0 B.A. to 16 B.A.**

1	2	3	4	5	6	7	8	9	10
Designation number	**Pitch**	**Major diameter**	**Effective diameter**			**Minor diameter**			**Designation number**
		Min.	**Min.**	**Tol.**	**Max.**	**Min.**	**Tol.**	**Max.**	
	mm	mm	mm	mm	mm	mm	mm	mm	
0	1.000 0	6.000	5.400	0.150	5.550	4.800	0.375	5.175	0
1	0.900 0	5.300	4.760	0.140	4.900	4.220	0.340	4.560	1
2	0.810 0	4.700	4.215	0.125	4.340	3.730	0.305	4.035	2
3	0.730 0	4.100	3.660	0.120	3.780	3.220	0.275	3.495	3
4	0.660 0	3.600	3.205	0.110	3.315	2.810	0.250	3.060	4
5	0.590 0	3.200	2.845	0.100	2.945	2.490	0.220	2.710	5
6	0.530 0	2.800	2.480	0.095	2.575	2.160	0.200	2.360	6
7	0.480 0	2.500	2.210	0.090	2.300	1.920	0.180	2.100	7
8	0.430 0	2.200	1.940	0.080	2.020	1.680	0.160	1.840	8
9	0.390 0	1.900	1.665	0.075	1.740	1.430	0.145	1.575	9
10	0.350 0	1.700	1.490	0.070	1.560	1.280	0.130	1.410	10
11	0.310 0	1.500	1.315	0.065	1.380	1.130	0.115	1.245	11
12	0.280 0	1.300	1.130	0.065	1.195	0.960	0.105	1.065	12
13	0.250 0	1.200	1.050	0.060	1.110	0.900	0.095	0.995	13
14	0.230 0	1.000	0.860	0.060	0.920	0.720	0.085	0.805	14
15	0.210 0	0.900	0.775	0.055	0.830	0.650	0.080	0.730	15
16	0.190 0	0.790	0.675	0.055	0.730	0.560	0.070	0.630	16

NOTE For approximate inch equivalents, see Table D.5.

Annex A (informative) Basis of sizes of B.A. threads

The basic sizes of the pitch and the major diameter given in Table 1 have been calculated from the following formulae and rounded to four decimal places and two decimal places respectively.

The basic sizes of the pitch, in millimetres, have been calculated from the formula $P = (0.9)^n$ where n is the number designating the size of the thread.

The basic sizes of the major diameter, in millimetres, have been calculated from the formula $6P^{6/5}$.

The form of the B.A. thread is specified as having the crests and roots rounded with equal radii, such that the basic depth of thread is 0.600 00 times the pitch (see Clause **4** and Figure 1). This means that *double* the depth of thread equals $(6/5)P$. As a result of this, some of the effective diameters and depths of thread given in Table 1, when rounded off, have rounded off to multiples of 0.005 mm. All the other basic sizes in Table 1 are multiples of 0.01 mm.

The tolerances given in Table 2, Table 3, Table 4 and Table 5 have been calculated from the formulae given in Annex B and rounded off to the nearest 0.005 mm. Thus all the limiting sizes given in these tables are multiples of 0.005 mm or 0.01 mm.

Annex B (informative) Bases of allowances and tolerances for B.A. threads

B.1 Allowances

For normal class external threads of sizes 0 B.A. to 10 B.A., uncoated or before coating, there is an allowance of 0.025 mm. There is no allowance on these threads after coating.

Normal class external threads of sizes 11 B.A. to 16 B.A. do not have an allowance.

Close class external threads do not have an allowance.

B.2 Tolerances

The bases of tolerances for B.A. threads are given in **B.3**, **B.4** and **B.5**. A summary of the tolerance formulae is given in Table B.1.

B.3 Tolerances on effective diameters

B.3.1 External threads

The tolerances on the effective diameter of close class external threads, in millimetres, have been derived from the formula $0.08P + 0.02$.

The tolerances on the effective diameter for normal class external threads of sizes 0 B.A. to 10 B.A. and of sizes 11 B.A. to 16 B.A., in millimetres, have been derived from the formula $0.10P + 0.025$. This formula gives tolerances 25% larger than those on close class external threads.

B.3.2 Internal threads

The tolerances on the effective diameter of internal threads, in millimetres, have been derived from the formula $0.12P + 0.03$.

B.4 Tolerances on major diameters

B.4.1 External threads

The tolerances on the major diameter of close class external threads, in millimetres, have been derived from the formula $0.15P$.

The tolerances on the major diameter of normal class external threads, in millimetres, have been derived from the formula $0.20P$ for sizes 0 B.A. to 10 B.A. and from the formula $0.25P$ for sizes 11 B.A. to 16 B.A.

B.4.2 Internal threads

No tolerance is specified for the major diameter of internal threads. It is recommended, however, that the radius at the major diameter of internal threads should be not less than one-half the standard radius, as defined in Figure 1, for the pitch of thread concerned.

B.5 Tolerances on minor diameters

B.5.1 External threads

The tolerances on the minor diameter of close class external threads, in millimetres, have been derived from the formula $2(0.08P + 0.02)$.

The tolerances on the minor diameter of normal class external threads of sizes 0 B.A. to 10 B.A. and of sizes 11 B.A. to 16 B.A., in millimetres, have been derived from the formula $0.20P + 0.050$.

B.5.2 Internal threads

The tolerances on the minor diameter of internal threads, in millimetres, have been derived from the formula $0.375P$.

NOTE These minor diameter tolerances are such as to permit a tapping drill of sufficient size to be used to prevent binding at the root of the tap. If full advantage is taken of these tolerances on the minor diameters of internal threads, the crests of these threads will be flat, as shown in Figure 2 and Figure 3.

Table B.1 **Summary of tolerance formulae**

Thread type and size	**Tolerances on major diameter**	**Tolerances on effective diameter**	**Tolerances on minor diameter**
	mm	mm	mm
Close class external threads 0 B.A. to 10 B.A.	$0.15P$	$0.08P + 0.02$	$2\ (0.08P + 0.02)$
Normal class external threads 0 B.A. to 10 B.A.	$0.20P$	$0.10P + 0.025$	$0.20P + 0.050$
Normal class external threads 11 B.A. to 16 B.A.	$0.25P$	$0.10P + 0.025$	$0.20P + 0.050$
Internal threads	See **B.4.2**	$0.12P + 0.03$	$0.375P$

Annex C (informative) Effect of errors in pitch and flank angle on the effective diameter

C.1 Effect of pitch errors

An error in pitch increases the effective diameter of an external thread and decreases the effective diameter of an internal thread. These increased or decreased effective diameters are termed virtual effective diameters (see **3.1.2**).

In the case of pitch errors, the difference, D_{ep}, in millimetres, between the simple effective diameter (see **3.1.1**) and the virtual effective diameter is given by the following equation:

$$D_{ep} = 2.273 \times \delta P$$

where:

δP is the maximum error in the axial displacement between any two points on a B.A. screw thread within the length of engagement, in millimetres.

C.2 Effect of errors in flank angle

An error in one or both of the flank angles increases the effective diameter of an external thread and decreases the effective diameter of an internal thread. These increased or decreased effective diameters are again virtual effective diameters (see **C.1**).

In the case of errors in flank angle(s), the difference, D_{ef}, in millimetres, between the simple effective diameter (see **3.1.1**) and the virtual effective diameter is given by the following equation:

$$D_{ef} = 0.009\ 1 \times P(\delta\alpha_1 + \delta\alpha_2)$$

where:

P is the basic pitch of the thread, in millimetres;

$(\delta\alpha_1 + \delta\alpha_2)$ is the sum of the errors in the opposite flank angles, in degrees, *regardless of their signs*.

C.3 Criteria for acceptability of a combination of errors in the effective diameter, pitch and flank angle of a screw thread

To be acceptable, the simple effective diameter and virtual effective diameter of internal and external threads need to be as follows.

a) *External threads*. To be acceptable, the simple effective diameter of an external thread (as measured along the pitch line of the thread) has to lie between the limits specified for that diameter. In addition, the virtual effective diameter cannot exceed the upper limit stated for the effective diameter.

b) *Internal threads*. To be acceptable, the simple effective diameter of an internal thread (as measured along the pitch line of the thread) has to lie between the limits specified for that diameter. In addition, the virtual effective diameter cannot be smaller than the lower limit stated for the effective diameter.

If an external thread or an internal thread is inspected with a GO screw gauge made to the design size and a NOT GO gauge for the effective diameter made to the lower limit for the effective diameter of the external thread or the upper limit of the internal thread, the above conditions as regards the size of the simple effective diameter, and its size as influenced by any errors present in the pitch and flank angle of the thread, are safeguarded for practical purposes.

Ideally NOT GO effective diameter gauges should control only the simple effective diameter, and should not be influenced by irregularities of thread form. As ordinarily made, however, they necessarily have flanks of definite length and, therefore, do not strictly control the simple effective diameter of the product thread within the minimum material limit unless the flank angles of the product thread are correct. Such gauges will pass product threads with incorrect flank angles, the simple effective diameters of which can be outside the minimum material limit by an amount proportional to the flank angle errors and the length of the flank of the NOT GO gauge.

Flank angle errors and irregularities of thread form do not necessarily render a product thread unserviceable, but it follows that it is important to supplement the use of such NOT GO effective diameter gauges by some independent check that the form of the product thread is reasonably correct. This check can be made by supervising the thread form of the taps and other threading tools and also by examination of samples of the product thread.

The normal method of inspecting screw threads is by the use of the limit gauges described above. The effective diameter limits of the workpiece are given mainly in order to provide a basis for dimensioning the gauges. Only in cases where it is impracticable to use gauges for economic or other reasons, should direct measurement of the effective diameter by the two or three wire system be employed, and then only in conjunction with an examination of the thread form by optical projection against a master profile in order to check the flank angles and thread form. It is essential that the pitch errors of the screw threads are also measured. In such cases the results need to be interpreted with care, as any surface irregularities, lack of uniformity of diameter, and errors of pitch and flank angles of the screw threads which are present make it very difficult to obtain a reliable estimate of the size of the virtual effective diameter.

It is not possible to lay down definite tolerances for the pitch or the flank angles of a screw thread of any particular size or tolerance class. In any particular case, the maximum permissible combined effects of pitch and flank angle errors would depend upon the difference between the simple effective diameter of the product and the maximum material limit of the effective diameter. In the case of an external thead having its simple effective diameter on the upper limit, no errors at all could be allowed in pitch or flank angle. The combined effect of the errors in pitch and flank angle can only attain a maximum value when the simple effective diameter of an external thread is on its lower limit or when the simple effective diameter of an internal thread is on the upper limit specified.

It is important to realize, therefore, that the tolerance allowed on the effective diameter should not be regarded as being available in full for variations in that element of the thread alone; part of this tolerance should be considered as being reserved to compensate for the effects of errors in pitch and flank angle, which are invariably present to some extent.

Annex D (informative) Approximate inch equivalents of B.A. thread sizes

The approximate inch equivalents of the B.A. thread sizes specified in Table 1 to Table 5 are given in Table D.1 to Table D.5.

Table D.1 **Basic sizes of British Association (B.A.) screw threads – Approximate inch equivalents**

1	2	3	4	5	6	7	8	9
Designation number	**Approximate pitch**	**Approximate number of threads per inch**	**Depth of thread**	**Major diameter**	**Effective diameter**	**Minor diameter**	**Approximate cross-sectional area at bottom of thread**	**Designation number**
	in		in	in	in	in	in^2	
0	0.039 37	25.4	0.023 6	0.236 2	0.212 6	0.189 0	0.028 1	0
1	0.035 43	28.2	0.021 3	0.208 7	0.187 4	0.166 1	0.021 7	1
2	0.031 89	31.4	0.019 1	0.185 0	0.165 9	0.146 8	0.016 9	2
3	0.028 74	34.8	0.017 3	0.161 4	0.144 1	0.126 8	0.012 6	3
4	0.025 98	38.5	0.015 6	0.141 7	0.126 2	0.110 6	0.009 6	4
5	0.023 23	43.1	0.014 0	0.126 0	0.112 0	0.098 0	0.007 5	5
6	0.020 87	47.9	0.012 6	0.110 2	0.097 6	0.085 0	0.005 7	6
7	0.018 90	52.9	0.011 4	0.098 4	0.087 0	0.075 6	0.004 5	7
8	0.016 93	59.1	0.010 2	0.086 6	0.076 4	0.066 1	0.003 4	8
9	0.015 35	65.1	0.009 3	0.074 8	0.065 6	0.056 3	0.002 5	9
10	0.013 78	72.6	0.008 3	0.066 9	0.058 7	0.050 4	0.002 0	10
11	0.012 20	81.9	0.007 3	0.059 1	0.051 8	0.044 5	0.001 6	11
12	0.011 02	90.7	0.006 7	0.051 2	0.044 5	0.037 8	0.001 1	12
13	0.009 84	102.0	0.005 9	0.047 2	0.041 3	0.035 4	0.001 0	13
14	0.009 06	110.0	0.005 5	0.039 4	0.033 9	0.028 3	0.000 6	14
15	0.008 27	121.0	0.004 9	0.035 4	0.030 5	0.025 6	0.000 5	15
16	0.007 48	134.0	0.004 5	0.031 1	0.026 6	0.022 0	0.000 4	16

Table D.2 **Limits and tolerances for close class external threads – Sizes 0 B.A. to 10 B.A. – Approximate inch equivalents**

1	2	3	4	5	6	7	8	9	10	11	12	13
Designation number	**Approximate pitch**	**Approximate number of threads per inch**	**Major diameter**			**Effective diameter**			**Minor diameter**			**Designation number**
			Max.	**Tol.**	**Min.**	**Max.**	**Tol.**	**Min.**	**Max.**	**Tol.**	**Min.**	
	in		in	in	in	in	in	in	in	in	in	
0	0.039 37	25.4	0.236 2	0.005 9	0.230 3	0.212 6	0.003 9	0.208 7	0.189 0	0.007 9	0.181 1	0
1	0.035 43	28.2	0.208 7	0.005 3	0.203 4	0.187 4	0.003 5	0.183 9	0.166 1	0.007 3	0.158 8	1
2	0.031 89	31.4	0.185 0	0.004 7	0.180 3	0.165 9	0.003 3	0.162 6	0.146 8	0.006 7	0.140 1	2
3	0.028 74	34.8	0.161 4	0.004 3	0.157 1	0.144 1	0.003 2	0.140 9	0.126 8	0.006 1	0.120 7	3
4	0.025 98	38.5	0.141 7	0.003 9	0.137 8	0.126 2	0.003 0	0.123 2	0.110 6	0.005 7	0.104 9	4
5	0.023 23	43.1	0.126 0	0.003 6	0.122 4	0.112 0	0.002 8	0.109 2	0.098 0	0.005 3	0.092 7	5
6	0.020 87	47.9	0.110 2	0.003 1	0.107 1	0.097 6	0.002 4	0.095 2	0.085 0	0.004 9	0.080 1	6
7	0.018 90	52.9	0.098 4	0.002 7	0.095 7	0.087 0	0.002 4	0.084 6	0.075 6	0.004 5	0.071 1	7
8	0.016 93	59.1	0.086 6	0.002 6	0.084 0	0.076 4	0.002 2	0.074 2	0.066 1	0.004 3	0.061 8	8
9	0.015 35	65.1	0.074 8	0.002 4	0.072 4	0.065 6	0.002 0	0.063 6	0.056 3	0.003 9	0.052 4	9
10	0.013 78	72.6	0.066 9	0.002 2	0.064 7	0.058 7	0.002 0	0.056 7	0.050 4	0.003 7	0.046 7	10

Table D.3 **Limits and tolerances for normal class external threads – Sizes 0 B.A. to 10 B.A. – Approximate inch equivalents**

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Designation number	**Approximate pitch**	**Approximate number of threads per inch**	**Major diameter**				**Effective diameter**				**Minor diameter**				**Designation number**
			Uncoated or before coating			**After coating**	**Uncoated or before coating**			**After coating**	**Uncoated or before coating**			**After coating**	
			Max.	**Tol.**	**Min.**	**Max.**	**Max.**	**Tol.**	**Min.**	**Max.**	**Max.**	**Tol.**	**Min.**	**Max.**	
	in		in	in	in	in	in	in	in	in	in	in	in	in	
0	0.039 37	25.4	0.235 2	0.007 8	0.227 4	0.236 2	0.211 6	0.004 9	0.206 7	0.212 6	0.188 0	0.009 9	0.178 1	0.189 0	0
1	0.035 43	28.2	0.207 7	0.007 1	0.200 6	0.208 7	0.186 4	0.004 5	0.181 9	0.187 4	0.165 2	0.009 1	0.156 1	0.166 1	1
2	0 031 89	31.4	0.184 1	0.006 3	0.177 8	0.185 0	0.165 0	0.004 2	0.160 8	0.165 9	0.145 8	0.008 2	0.137 6	0.146 8	2
3	0.028 74	34.8	0.160 4	0.005 7	0.154 7	0.161 4	0.143 1	0.003 9	0.139 2	0.144 1	0.125 8	0.007 7	0.118 1	0.126 8	3
4	0.025 98	38.5	0.140 7	0.005 1	0.135 6	0.141 7	0.125 2	0.003 5	0.121 7	0.126 2	0.109 6	0.007 0	0.102 6	0.110 6	4
5	0.023 23	43.1	0.125 0	0.004 7	0.120 3	0.126 0	0.111 0	0.003 3	0.107 7	0.112 0	0.097 0	0.006 6	0.090 4	0.098 0	5
6	0.020 87	47.9	0.109 3	0.004 2	0.105 1	0.110 2	0.096 7	0.003 2	0.093 5	0.097 6	0.084 1	0.006 1	0.078 0	0.085 0	6
7	0.018 90	52.9	0.097 4	0.003 7	0.093 7	0.098 4	0.086 0	0.002 9	0.083 1	0.087 0	0.074 6	0.005 7	0.068 9	0.075 6	7
8	0.016 93	59.1	0.085 6	0.003 3	0.082 3	0.086 6	0.075 4	0.002 8	0.072 6	0.076 4	0.065 2	0.005 4	0.059 8	0.066 1	8
9	0.015 35	65.1	0.073 8	0.003 1	0.070 7	0.074 8	0.064 6	0.002 6	0.062 0	0.065 6	0.055 3	0.005 1	0.050 2	0.056 3	9
10	0.013 78	72.6	0.065 9	0.002 7	0.063 2	0.066 9	0.057 7	0.002 4	0.055 3	0.058 7	0.049 4	0.004 7	0.044 7	0.050 4	10

Table D.4 **Limits and tolerances for normal class external threads – Sizes 11 B.A. to 16 B.A. – Approximate inch equivalents**

1	2	3	4	5	6	7	8	9	10	11	12	13
Designation number	**Approximate pitch** in	**Approximate number of threads per inch**	**Major diameter**			**Effective diameter**			**Minor diameter**			**Designation number**
			Max. in	**Tol.** in	**Min.** in	**Max.** in	**Tol.** in	**Min.** in	**Max.** in	**Tol.** in	**Min.** in	
11	0.012 20	81.9	0.059 1	0.003 2	0.055 9	0.051 8	0.002 2	0.049 6	0.044 5	0.004 3	0.040 2	11
12	0.011 02	90.7	0.051 2	0.002 8	0.048 4	0.044 5	0.002 2	0.042 3	0.037 8	0.004 1	0.033 7	12
13	0.009 84	102.0	0.047 2	0.002 5	0.044 7	0.041 3	0.001 9	0.039 4	0.035 4	0.003 9	0.031 5	13
14	0.009 06	110.0	0.039 4	0.002 4	0.037 0	0.033 9	0.002 0	0.031 9	0.028 3	0.003 7	0.024 6	14
15	0.008 27	121.0	0.035 4	0.002 1	0.033 3	0.030 5	0.001 8	0.028 7	0.025 6	0.003 6	0.022 0	15
16	0.007 48	134.0	0.031 1	0.002 0	0.029 1	0.026 6	0.001 8	0.024 8	0.022 0	0.003 5	0.018 5	16

Table D.5 **Limits and tolerances for internal threads – Sizes 0 B.A. to 16 B.A. – Approximate inch equivalents**

1	2	3	4	5	6	7	8	9	10	11
Designation number	**Approximate pitch**	**Approximate number of threads per inch**	**Major diameter**	**Effective diameter**			**Minor diameter**			**Designation number**
			Min.	**Min.**	**Tol.**	**Max.**	**Min.**	**Tol.**	**Max.**	
	in		in	in	in	in	in	in	in	
0	0.039 37	25.4	0.236 2	0.212 6	0.005 9	0.218 5	0.189 0	0.014 7	0.203 7	0
1	0.035 43	28.2	0.208 7	0.187 4	0.005 5	0.192 9	0.166 1	0.013 4	0.179 5	1
2	0.031 89	31.4	0.185 0	0.165 9	0.005 0	0.170 9	0.146 8	0.012 1	0.158 9	2
3	0.028 74	34.8	0.161 4	0.144 1	0.004 7	0.148 8	0.126 8	0.010 8	0.137 6	3
4	0.025 98	38.5	0.141 7	0.126 2	0.004 3	0.130 5	0.110 6	0.009 9	0.120 5	4
5	0.023 23	43.1	0.126 0	0.112 0	0.003 9	0.115 9	0.098 0	0.008 7	0.106 7	5
6	0.020 87	47.9	0.110 2	0.097 6	0.003 8	0.101 4	0.085 0	0.007 9	0.092 9	6
7	0.018 90	52.9	0.098 4	0.087 0	0.003 6	0.090 6	0.075 6	0.007 1	0.082 7	7
8	0.016 93	59.1	0.086 6	0.076 4	0.003 1	0.079 5	0.066 1	0.006 3	0.072 4	8
9	0.015 35	65.1	0.074 8	0.065 6	0.002 9	0.068 5	0.056 3	0.005 7	0.062 0	9
10	0.013 78	72.6	0.066 9	0.058 7	0.002 7	0.061 4	0.050 4	0.005 1	0.055 5	10
11	0.012 20	81.9	0.059 1	0.051 8	0.002 5	0.054 3	0.044 5	0.004 5	0.049 0	11
12	0.011 02	90.7	0.051 2	0.044 5	0.002 5	0.047 0	0.037 8	0.004 1	0.041 9	12
13	0.009 84	102.0	0.047 2	0.041 3	0.002 4	0.043 7	0.035 4	0.003 8	0.039 2	13
14	0.009 06	110.0	0.039 4	0.033 9	0.002 3	0.036 2	0.028 3	0.003 4	0.031 7	14
15	0.008 27	121.0	0.035 4	0.030 5	0.002 2	0.032 7	0.025 6	0.003 1	0.028 7	15
16	0.007 48	134.0	0.031 1	0.026 6	0.002 1	0.028 7	0.022 0	0.002 8	0.024 8	16

Bibliography

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PD 6494, *Mismatch of screw thread systems*

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