BS 84:2007

Parallel screw threads of Whitworth form – Requirements

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Summary of pages

This document comprises a front cover, an inside front cover, pages i to iv, pages 1 to 58, an inside back cover and a back cover.

Foreword

Publishing information

This British Standard is published by BSI and came into effect on 30 November 2007. 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This British Standard supersedes BS 84:1956, which is withdrawn.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 includes tables of basic sizes, limits and tolerances for British Standard Whitworth (B.S.W.) and British Standard Fine (B.S.F.) screw threads. In addition it provides a "Selected thread" series of recommended diameter/pitch combinations for use in applications where the standard coarse (B.S.W.) and fine (B.S.F.) series have insufficiently fine pitches.

An allowance (minimum clearance) is provided on certain classes of external threads of sizes up to and including $\frac{3}{4}$ in diameter; the recommended combinations of classes of internal threads and external threads include internal threads having larger effective diameter tolerances than the corresponding sizes of external threads. Three tolerance classes are specified for external threads, close, medium and free. The allowance is provided for medium class and free class external threads by specifying maximum external thread limits below the basic size. The purpose of this allowance is to provide for the threads to be coated if necessary, the coating encroaching within the allowance; it is also intended to permit easy assembly of maximum material condition (MMC) external threads and internal threads, thus facilitating the use of torque wrenches. Two tolerance classes of internal threads are specified, medium and normal.

Close class internal threads are now non-preferred but, in view of their usage in the past and for special uses, limits and tolerances for these are specified in Annex E.

No change has been made in the general three-part formula used as a basis for tolerancing effective diameters, and the formulae used for tolerancing the other thread elements also remain unchanged from those in BS 84:1956; the reason for this is to minimize any changes in the sizes of the gauges used to control the size of the finished work.

The table of recommended diameter/pitch combinations for screw threads in the "Selected thread" series follows very closely the corresponding table (Table 37) in BS 1580-1.

The foreword of BS 84:1956 ended with the following statement. “In conclusion it may be asked why the revision of this standard has been undertaken in view of the standardization of the Unified thread in BS 1580. The reason is that Whitworth threads will undoubtedly continue to be used for many years, especially on replacements or spare parts.” The present revision of BS 84 has been undertaken because, fifty years on, this continues to be the case.

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 Whitworth form, for general engineering use. It is not applicable to threads for threaded pipe joints, screw threads associated with interference fits, such as those on the "metal ends" of studs and in the corresponding tapped holes, or to screw threads which are to be subjected to high temperatures.

This standard specifies the following thread series:

a) a coarse thread series, the British Standard Whitworth (B.S.W.) series, with nominal diameters in the range $\frac{1}{8}$ in to 6 in.

b) a fine thread series, the British Standard fine (B.S.F.) series, with nominal diameters in the range $\frac{3}{16}$ in to $4\frac{1}{4}$ in.

NOTE The tables of limits and tolerances for the B.S.F. series extend up to the 3 in size only, since nominal sizes above 3 in are rarely used.

c) a supplementary selected thread (WHIT. S.) series with nominal diameters from $\frac{1}{4}$ in to 7 in.

d) a truncated Whitworth form series (specified in Annex A).

This British Standard specifies limits of sizes, and tolerances, of uncoated threads and also for metal coated threads (including threads coated with nickel, tin or zinc) with a thickness of coating of the order of 0.000 2 in. It is not applicable to heavily coated threads (i.e. threads with a coating thickness above 0.000 35 in).

NOTE Supplementary information is given in Annex B, Annex C and Annex D.

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 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.

4 Profile of Whitworth screw thread

The basic profile, and the design profile, of the Whitworth thread shall be as shown in Figure 1. The thread shall be a symmetrical V-thread in which the angle between the flanks, measured in an axial plane, is 55°, one-sixth of the V is truncated at the top and bottom, the thread is rounded equally at crests and roots by circular arcs blending tangentially with the flanks and the theoretical depth of the thread is 0.640 327 times the nominal pitch.

NOTE The basic thread depths specified in this standard have been rounded to the nearest 0.000 1 in.

5 Tolerance classes of external and internal threads

External threads and internal threads shall be of one of the following tolerance classes:

a) close class external threads;

NOTE 1 This class of threads is for use where a close fit is required. Threads of this class are obtainable consistently only by the use of the highest quality production equipment supported by a particularly efficient system of gauging and inspection. They are intended for special work where a high degree of accuracy of pitch and thread form are particularly required.

NOTE 2 Limits and tolerances for close class internal threads for special uses are given in Annex E.

b) medium class external threads and internal threads;

NOTE 3 This tolerance class is for ordinary use, but the accuracy of pitch and thread form is greater than that for free class and normal class threads.

c) free class external threads;

NOTE 4 This tolerance class is for ordinary commercial use.

d) normal class internal threads.

NOTE 5 This tolerance class is for ordinary commercial use.

NOTE 6 This class of internal threads is intended for use with medium class and with free class external threads.

The relative magnitudes and positions of the effective diameter tolerance zones, for uncoated threads, for the recommended combinations of tolerance classes shall be as shown in Figure 2.

NOTE 7 The bases of the tolerances and allowances shown in Figure 2 are given in Annex B.

NOTE 8 The choice of fit for a particular purpose rests with the designer. For use in special circumstances, different combinations of classes to those shown in Figure 2 may be specified.

Coated threads of the various tolerance classes shall conform to Clause **7**.

6 Limits of sizes, and tolerances, for uncoated B.S.W. and B.S.F. threads

The basic sizes of B.S.W. series threads shall be as given in Table 1.

The limits and tolerances for the major diameter, effective diameter and minor diameter of the different tolerance classes of B.S.W. series threads shall be as specified in Tables 2 to 6.

The basic sizes of B.S.F. series threads shall be as given in Table 7.

The limits and tolerances for the major diameter, effective diameter and minor diameter of the different tolerance classes of B.S.F. series threads shall be as specified in Tables 8 to 12.

The limits and tolerances for the major diameter, effective diameter and minor diameter of close tolerance class internal threads for special uses shall be as specified in Annex E.

NOTE 1 In Tables 2 to 6 and in Tables 8 to 12, the effective diameter tolerances, which are intended to include the diametral effects of pitch and angle error (see Annex C), have been calculated from the general formula given in Annex B, taking the length of engagement as being equal to the nominal diameter of the thread. In order to reduce to a minimum the number of NOT GO gauges required, the effective diameter tolerances for the B.S.W. and B.S.F. series of threads, although calculated for these lengths of engagement, may be regarded as applicable to lengths of engagement of up to fifteen pitches. The major diameter tolerances and minor diameter tolerances for the B.S.W. and B.S.F. series of threads are applicable to all lengths of engagement.

NOTE 2 In Tables 3 and 5 and Tables 9 and 11, no tolerances are specified for the major diameters of internal threads, but only minimum sizes, which are the same as the basic major diameters specified in Table 1 and Table 7, respectively. The major diameters of internal threads are controlled, in practice, by the major diameters of the taps or other screwing tools used to cut the threads.

NOTE 3 Figure 3, Figure 4 and Figure 5 show, for the three recommended combinations of classes respectively, the relationship between the diametral tolerances for a $\frac{1}{4}$ in B.S.W. external thread and a $\frac{1}{4}$ in B.S.W. internal thread. The minor diameter tolerances for the internal thread are such as to permit a tapping drill of sufficient size to be used to prevent binding at the root of the tap during the tapping operation. If the minor diameter tolerances on internal threads are used to their full extent, the crests of the internal threads will be flat. In special cases, however, where thin nuts are used, it might be desirable not to utilize the tolerance on the minor diameter of the internal thread to its full extent.

Major diameter tolerances on external threads are such as to permit crests which are not perfectly radiused (see Annex D).

The formulae that have been used for calculating the tolerances for major, effective and minor diameters are given in Annex B.

7 Limits of size, and tolerances, for B.S.W. and B.S.F. coated threads

The relative magnitudes and positions of the effective diameter tolerance zones, for coated threads $\leqslant \frac{3}{4}$ in nominal diameter, for the recommended combinations of tolerance classes, shall be as shown in Figure 6.

NOTE 1 Figure 2 which shows the effective diameter tolerance zones for uncoated threads has been used as the basis for Figure 6, and the tolerance zones for coated threads added.

NOTE 2 The coating is accommodated within the allowance in the case of the medium class and free class internal threads, and by adjustment of the tolerance zone in the case of the close class internal threads.

For free class and medium class external threads, both of which are suitable for coating, the finished size of the threads after coating shall not exceed the basic size specified in Table 1 or Table 7, as applicable.

Should it be necessary to coat close class external threads, the finished size of the threads after coating shall not exceed the basic size specified in Table 1 or Table 7, as applicable.

NOTE 3 In order to avoid any undue restriction of the tolerance for screwing, the sizes of close class external threads before coating may be smaller than the lower limits specified in Table 2 and Table 8, as applicable, by an amount not greater than 0.001 in.

For medium class and normal class internal threads, the finished size of the threads after coating shall not fall below the lower limits specified in Tables 3 or 5, or Tables 9 or 11, as applicable.

NOTE 4 Since the coating of medium class internal threads might necessitate a reduction in the manufacturing tolerances in order that, after coating, they conform to the specified lower size limits, it is strongly recommended that normal class internal screw threads be used instead of medium class where coating is required.

For external and internal threads of nominal sizes above $\frac{3}{4}$ in, the finished size of the threads after coating shall fall within the size limits specified in Tables 1 to 12, as applicable.

NOTE 5 In order to avoid any undue restriction of the tolerance for screwing, the sizes of close class external threads before coating may be smaller than the lower limits specified in Table 2 or Table 8, as applicable, by an amount not greater than 0.001 in.

NOTE 6 If internal threads are to be coated, the threads should be made with minimum sizes slightly greater than basic size in order to effect satisfactory assembly after coating. Similarly, medium class and free class external threads of nominal sizes above $\frac{3}{4}$ in which are to be coated, should be made with maximum sizes slightly less than the basic size.

For coated threads, the limiting sizes of medium class and free class external threads before and after coating shall be as specified in Table 4, Table 6, Table 10 or Table 12, as applicable.

8 Stainless steel external threads

Stainless steel external threads shall conform to Clause **6**.

NOTE 1 Owing to the tendency for close-fitting external and internal threads made of stainless steel to seize when tightened together, it is recommended that stainless steel external threads of nominal sizes $\frac{3}{4}$ in and below should not be made to close class limits but rather to the medium class or free class limits specified for uncoated external threads in Table 4, Table 6, Table 10 or Table 12, as applicable.

NOTE 2 It is recommended that stainless steel external threads of nominal sizes above $\frac{3}{4}$ in should have maximum and minimum limits which are 0.001 in smaller than the values specified in the relevant tables.

9 Selected thread series

9.1 General

Unless a special pitch/diameter combination is required for a particular design, the pitch/diameter combinations for the selected thread series shall be as specified in Table 13A or Table 13B. The depths of thread shall be as specified in Table 14. If a pitch/diameter combination other than those specified in Table 13A or Table 13B is required, the number of threads per inch shall be in the series specified in Table 14 (column 1) and the design dimensions and tolerances shall be as specified in **9.3** and **9.4**, respectively.

NOTE 1 This series is for applications for which thread sizes in the B.S.W. and B.S.F. series are not suitable. B.S.W. and B.S.F. pitches are included in Tables 13A and 13B for reference purposes only.

NOTE 2 A fractional series is specified in Table 13A and a decimal series in Table 13B. Both tables contain, above $1\frac{1}{2}$ in diameter, the same $\frac{1}{4}$ in and $\frac{1}{2}$ in steps, the difference between the two tables being that in the decimal series the intermediate $\frac{1}{8}$ in steps have been replaced by steps to the nearest $\frac{1}{10}$ in dimension. This enables the same diameters to be used as are recommended in BS 1916-2.

9.2 Basic sizes

The basic effective diameter and the basic minor diameter shall be determined by subtracting from the basic major diameter specified in Table 13A or Table 13B the basic depth of thread, and twice the basic depth of thread, respectively, as specified in Table 14 (column 3 and column 4, respectively).

9.3 Design sizes

9.3.1 Internal threads

The design sizes of the major diameters, effective diameters and minor diameters of all classes of internal threads shall be the same as the corresponding basic sizes.

9.3.2 External threads

The design sizes of external threads shall be as follows.

a) *Close class.* The design sizes shall be the same as the basic sizes.

b) *Medium class and free class:*

1) *Basic major diameters of $\frac{3}{4}$ in and below.* The design sizes shall be obtained from the basic sizes by subtracting the allowance specified in Table 15.

2) B*asic major diameters above $\frac{3}{4}$ in.* The design sizes shall be the same as the basic sizes.

9.4 Tolerances

The tolerances for internal threads and external threads of nominal diameters up to 20 in shall be as specified in Table 16 to Table 20. For internal and external threads of nominal diameters above 20 in the tolerances shall be calculated from the data and formulae given in Annex B.

NOTE 1 The effective diameter tolerances specified in Table 16 to Table 20 have been calculated from the general formula given in Annex B, assuming a length of engagement of the mating threads equal to ten times the pitch. The tolerances so obtained may be regarded as satisfactory for all normal lengths of engagement, i.e. in the range 5 pitches to 15 pitches.

NOTE 2 For lengths of engagement outside this range, if these tolerances are found to be unsuitable, the effective diameter tolerance should be calculated from the basic formula given in Annex B, giving L_e its actual value.

NOTE 3 No tolerances are specified for the major diameters of internal threads as it is considered that this dimension will be controlled adequately by the crests of the taps or other cutting tools used to produce the threads.

All diametral tolerances shall be applied unilaterally to the design dimensions, i.e. for external threads the tolerance shall be subtracted from the design dimension and for internal threads the tolerance shall be added to the design dimension.

NOTE 4 Examples illustrating the use of Table 14 to Table 20 for determining limits and tolerances of threads in the selected thread series are given following Table 14.

10 Designation of screw threads of Whitworth form

Screw threads in the British Standard Whitworth series shall be designated B.S.W.

Screw threads in the British Standard fine series shall be designated B.S.F.

Screw threads in the selected series with pitch/diameter combinations specified in Table 13A and Table 13B shall be designated Whit. S.

Non-standard threads in the Whitworth selected series, which have pitch/diameter combinations other than those specified in Table 13A and Table 13B shall be designated Whit.

The designation shall include the basic major diameter of the thread and the number of threads per inch.

For left hand threads the designation shall be followed by the letters LH.

EXAMPLES

$\frac{1}{4}$ in — 20 B.S.W.

$\frac{1}{2}$ in — 16 B.S.F., LH

1 in — 20 Whit. S.

0.67 in — 20 Whit.

If the thread tolerance class (close, medium, free or normal) is to be included in the designation this shall be added in parentheses followed by “internal thread” or “external thread”, as applicable.

EXAMPLES

$\frac{1}{4}$ in — 20 B.S.W. (close) external thread

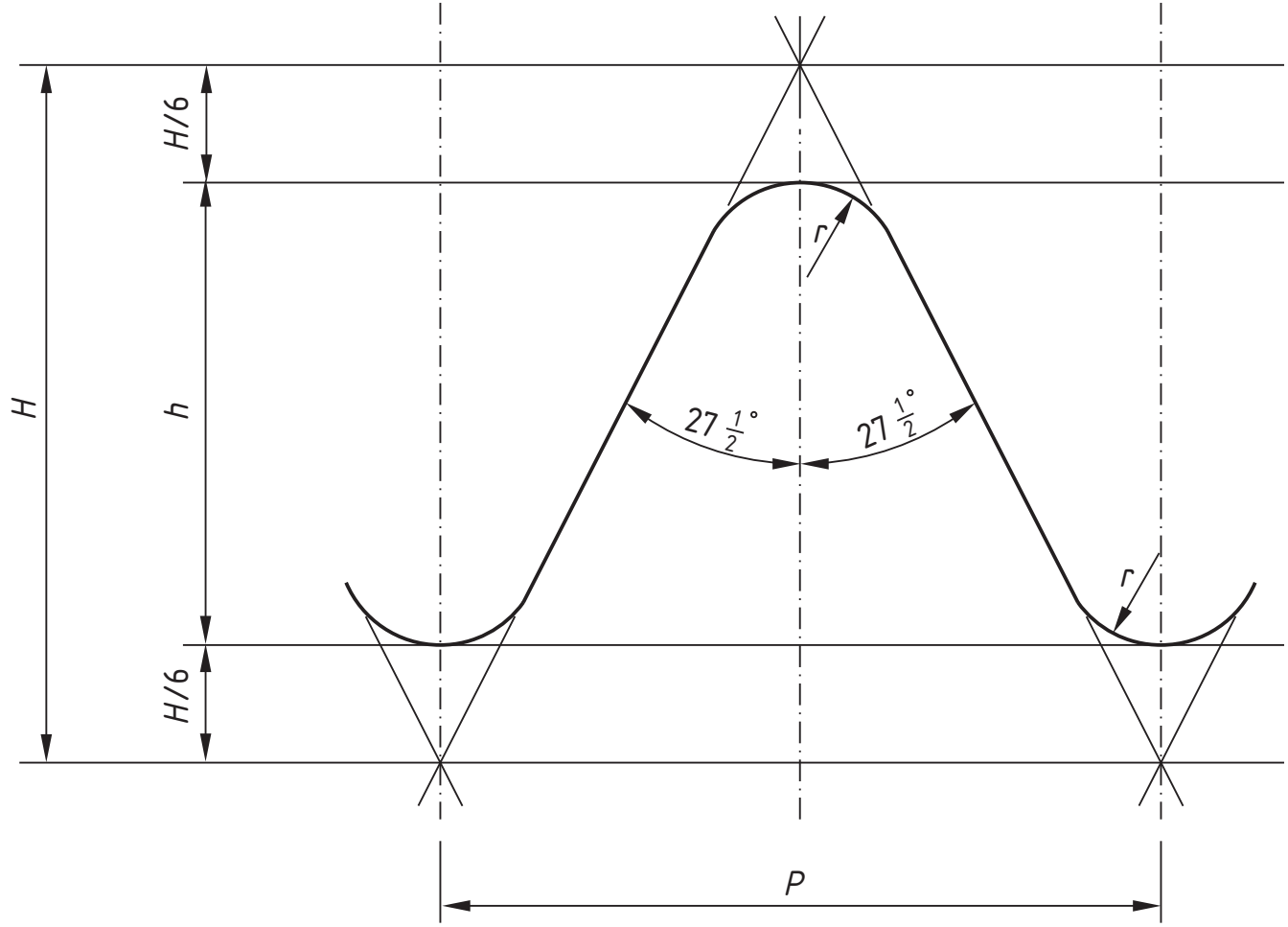
1 in — 20 Whit. S. (free) external thread

$1\frac{1}{2}$ in — 8 B.S.F. (normal) internal thread

11 Gauges

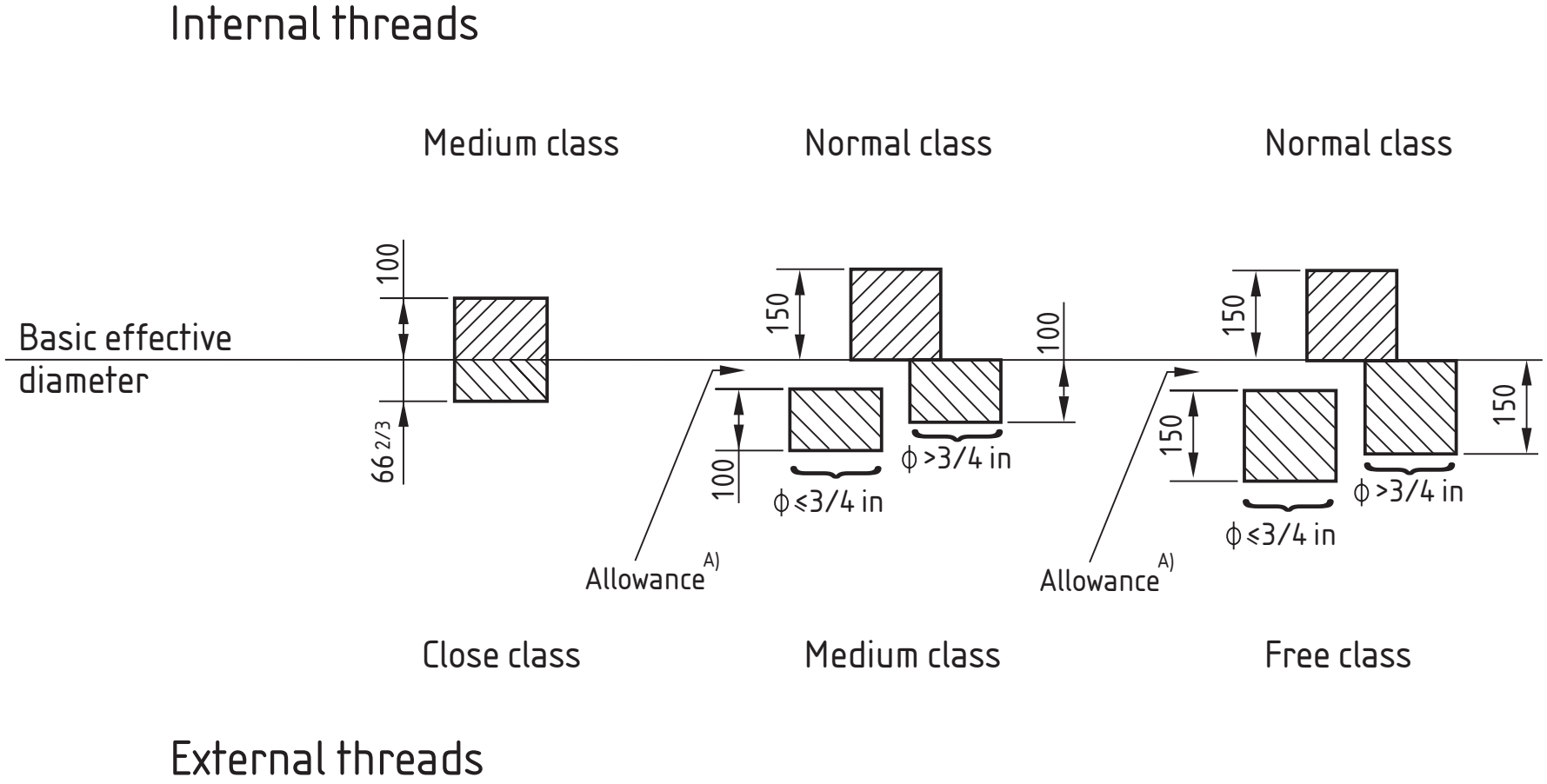
The dimensions of the screw threads shall be checked using screw gauges conforming to BS 919-2.

Figure 1 **Basic form of Whitworth thread**



$H = 0.960\,491P$
$H/6 = 0.160\,082P$
$h = (2/3)H = 0.640\,327P$
$r = 0.137\,329P$

Figure 2 **Effective diameter tolerance zones of recommended combinations of classes of internal and external Whitworth form threads**

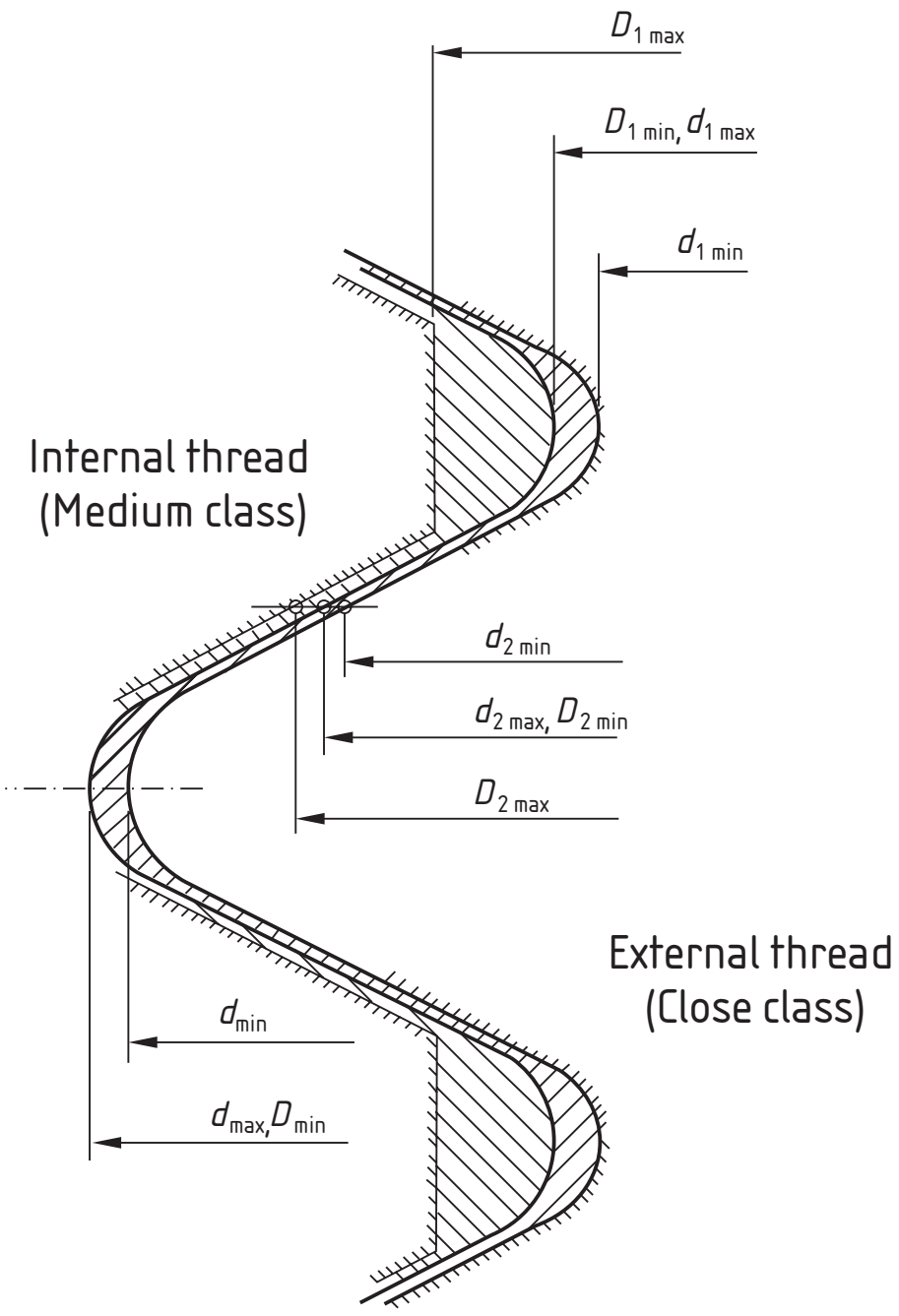


NOTE 1 The tolerance on the effective diameter of a medium class external thread is shown as 100 units and the other values are expressed as a percentage of this tolerance. The formula used to calculate the tolerance on the effective diameter is given in Annex B.

NOTE 2 Limits and tolerances for close class internal threads for special uses are specified in Annex E.

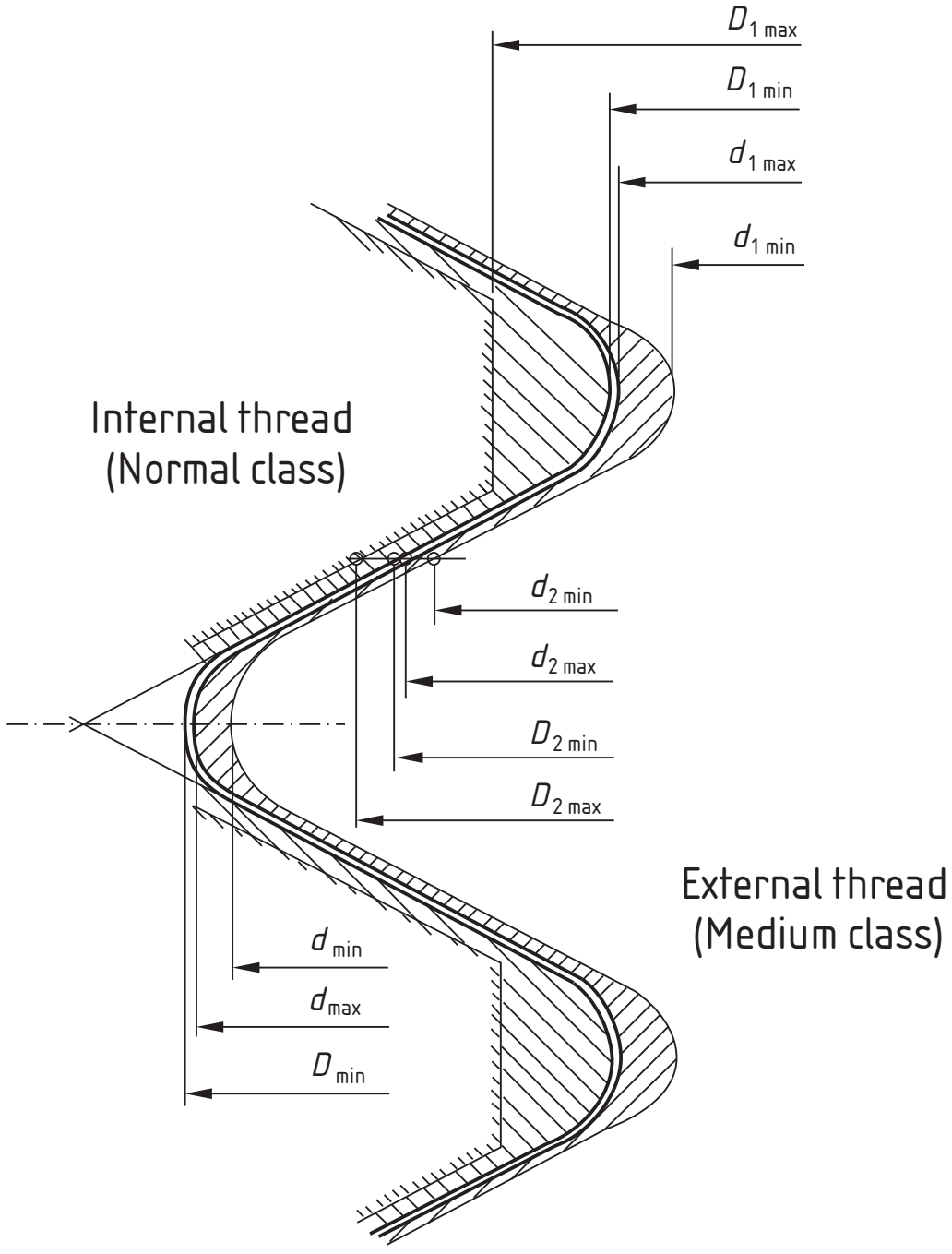
A) See Clause **5** and Annex B.

Figure 3 **Tolerance zones for a close class external thread and a medium class internal thread [$\frac{1}{4}$ in B.S.W. (20 t.p.i.) illustrated]**



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

Figure 4 **Tolerance zones for a medium class external thread with allowance and a normal class internal thread [$\frac{1}{4}$ in B.S.W. (20 t.p.i.) illustrated]**



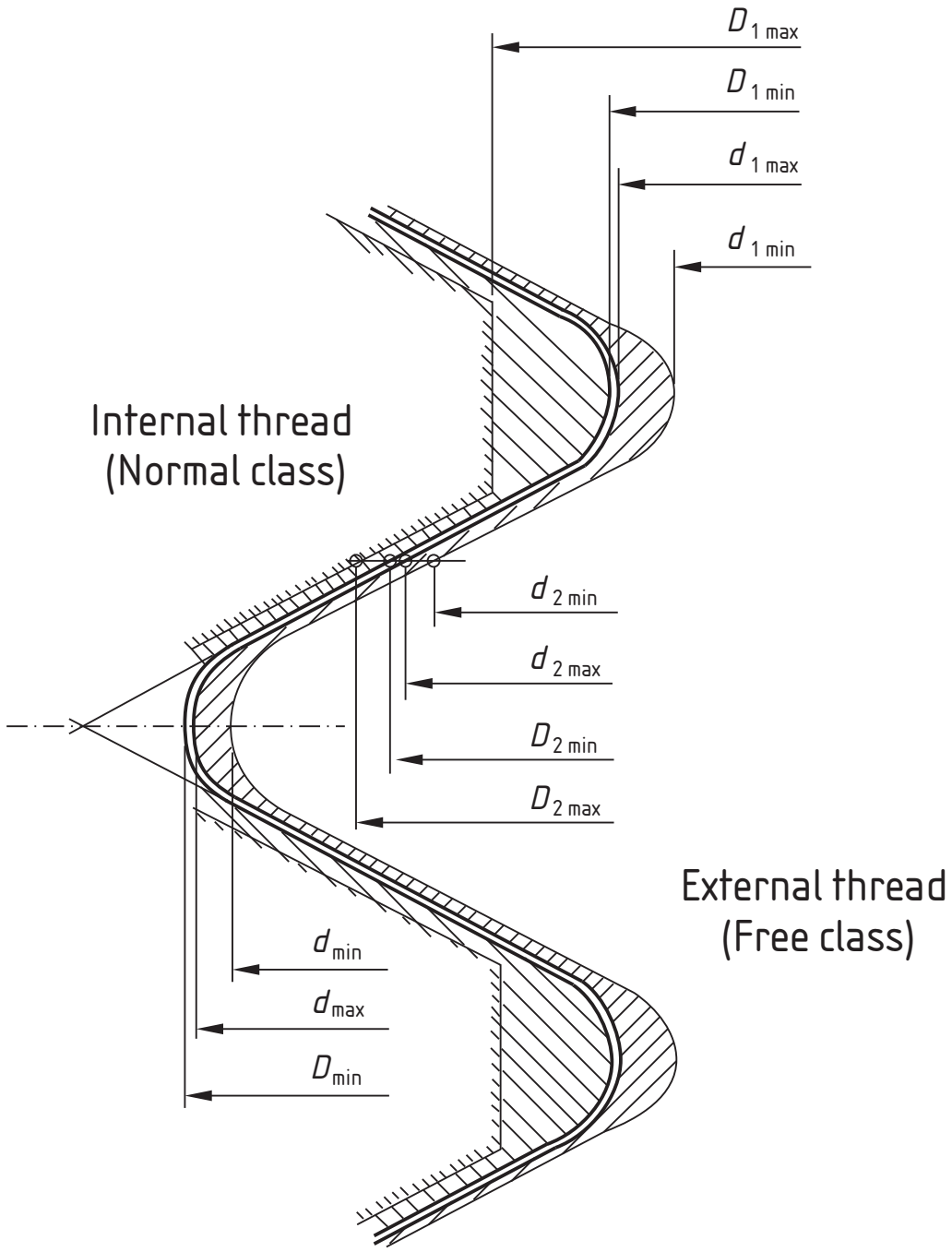
D_{1min} corresponds to the basic minor diameter.

D_{2min} corresponds to the basic effective diameter.

D_{min} corresponds to the basic major diameter.

NOTE The maximum external thread dimensions are applicable to uncoated threads only.

Figure 5 **Tolerance zones for a free class external thread with allowance and a normal class internal thread [$\frac{1}{4}$ in B.S.W. (20 t.p.i.) illustrated]**

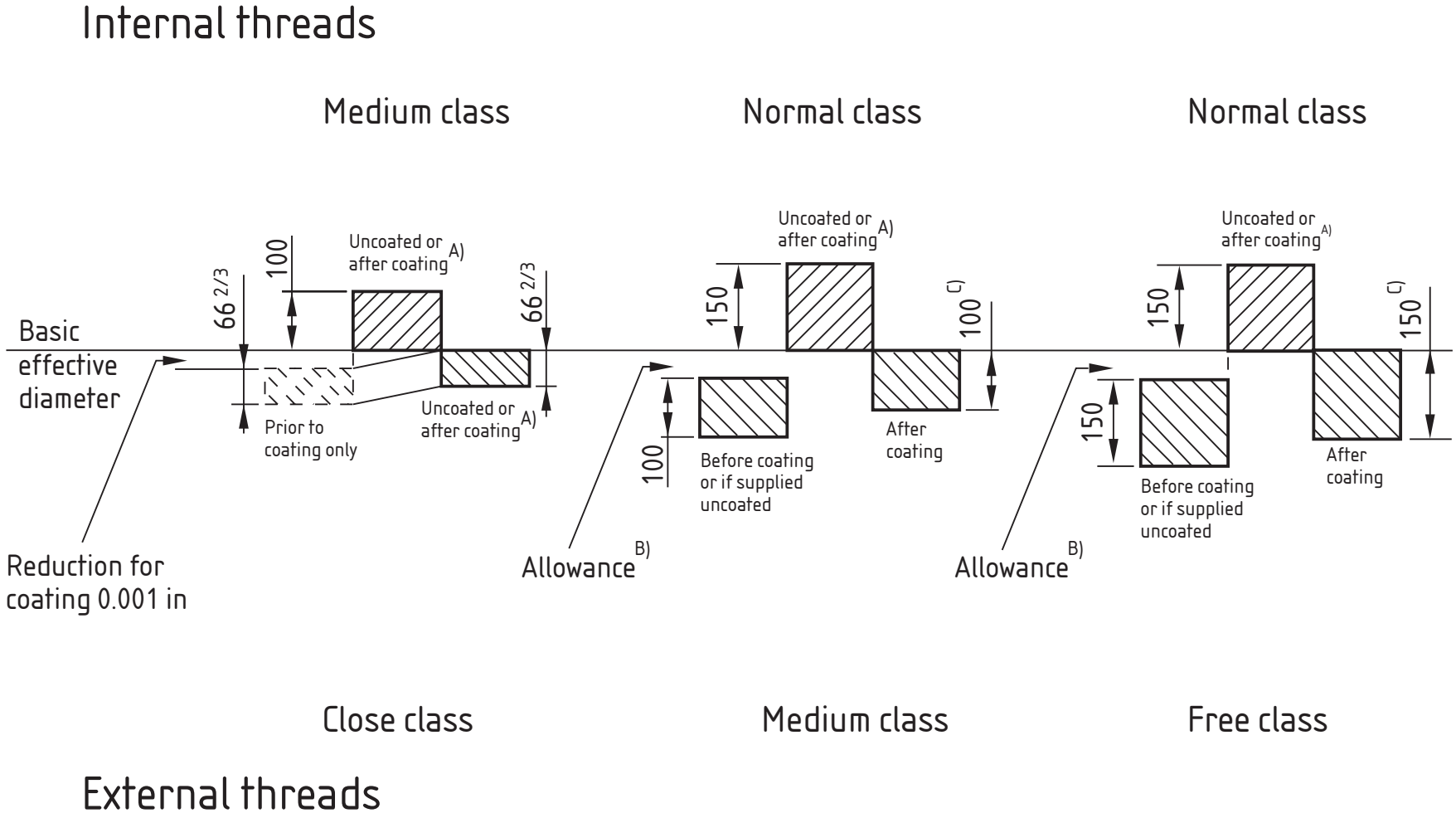


D_{1min} corresponds to the basic minor diameter.

D_{min} corresponds to the basic major diameter.

NOTE The maximum external thread dimensions are applicable to uncoated threads only.

Figure 6 **Effective diameter tolerance zones for external and internal threads, uncoated or before coating, and after coating (c.f. Figure 2) of sizes $\frac{3}{4}$ in nominal size and smaller**



NOTE 1 The tolerance on the effective diameter of a medium class external thread is shown as 100 units and the other values are expressed as a percentage of this tolerance. The formula used to calculate the tolerance on the effective diameter is given in Annex B.

NOTE 2 Limits and tolerances for close class internal threads for special uses are specified in Annex E.

A) See Clause **7**.
B) See Clause **5** and Annex B.
C) Approximate, depending on thickness of coating.

Table 1 **Coarse thread series (B.S.W.) – Basic sizes**

1	2	3	4	5	6	7	8
Nominal size in	**Number of threads per inch** (t.p.i.)	**Pitch** in	**Depth of thread** in	**Major diameter** in	**Effective diameter** in	**Minor diameter** in	**Cross-sectional area at bottom of thread** in^2
$\frac{1}{8}$ A)	40	0.025 00	0.016 0	0.125 0	0.109 0	0.093 0	0.006 8
$\frac{3}{16}$	24	0.041 67	0.026 7	0.187 5	0.160 8	0.134 1	0.014 1
$\frac{1}{4}$	20	0.050 00	0.032 0	0.250 0	0.218 0	0.186 0	0.027 2
$\frac{5}{16}$	18	0.055 56	0.035 6	0.312 5	0.276 9	0.241 3	0.045 7
$\frac{3}{8}$	16	0.062 50	0.040 0	0.375 0	0.335 0	0.295 0	0.068 3
$\frac{7}{16}$	14	0.071 43	0.045 7	0.437 5	0.391 8	0.346 1	0.094 1
$\frac{1}{2}$	12	0.083 33	0.053 4	0.500 0	0.446 6	0.393 2	0.121 4
$\frac{9}{16}$	12	0.083 33	0.053 4	0.562 5	0.509 1	0.455 7	0.163 1
$\frac{5}{8}$	11	0.090 91	0.058 2	0.625 0	0.566 8	0.508 6	0.203 2
$\frac{11}{16}$	11	0.090 91	0.058 2	0.687 5	0.629 3	0.571 1	0.256 2
$\frac{3}{4}$	10	0.100 00	0.064 0	0.750 0	0.686 0	0.622 0	0.303 9
$\frac{7}{8}$	9	0.111 11	0.071 1	0.875 0	0.803 9	0.732 8	0.421 8
1	8	0.125 00	0.080 0	1.000 0	0.920 0	0.840 0	0.554 2
$1\frac{1}{8}$	7	0.142 86	0.091 5	1.125 0	1.033 5	0.942 0	0.696 9
$1\frac{1}{4}$	7	0.142 86	0.091 5	1.250 0	1.158 5	1.067 0	0.894 2
$1\frac{1}{2}$	6	0.166 67	0.106 7	1.500 0	1.393 3	1.286 6	1.300 0
$1\frac{3}{4}$	5	0.200 00	0.128 1	1.750 0	1.621 9	1.493 8	1.753 0
2	4.5	0.222 22	0.142 3	2.000 0	1.857 7	1.715 4	2.311 0
$2\frac{1}{4}$	4	0.250 00	0.160 1	2.250 0	2.089 9	1.929 8	2.925 0
$2\frac{1}{2}$	4	0.250 00	0.160 1	2.500 0	2.339 9	2.179 8	3.732 0
$2\frac{3}{4}$	3.5	0.285 71	0.183 0	2.750 0	2.567 0	2.384 0	4.464 0
3	3.5	0.285 71	0.183 0	3.000 0	2.817 0	2.634 0	5.449 0
$3\frac{1}{4}$	3.25	0.307 69	0.197 0	3.250 0	3.053 0	2.856 0	6.406 0
$3\frac{1}{2}$	3.25	0.307 69	0.197 0	3.500 0	3.303 0	3.106 0	7.577 0
$3\frac{3}{4}$	3	0.333 33	0.213 4	3.750 0	3.536 6	3.323 2	8.674 0
4	3	0.333 33	0.213 4	4.000 0	3.786 6	3.573 2	10.030 0
$4\frac{1}{2}$	2.875	0.347 83	0.222 7	4.500 0	4.277 3	4.054 6	12.910 0
5	2.75	0.363 64	0.232 8	5.000 0	4.767 2	4.534 4	16.150 0
$5\frac{1}{2}$	2.625	0.380 95	0.243 9	5.500 0	5.256 1	5.012 2	19.730 0
6	2.5	0.400 00	0.256 1	6.000 0	5.743 9	5.487 8	23.650 0

A) Dimensionally, the $\frac{1}{8}$ in × 40 t.p.i. thread belongs more appropriately to the B.S.F. series, but it has for so long been associated with the B.S.W. series that it is now included here.

Table 2 **Coarse thread series (B.S.W.) – External threads – Close class – Limits and tolerances**

1	2	3	4	5	6	7	8	9	10	11
Nominal size	**Number of threads per inch**	**Major diameter**			**Effective diameter**			**Minor diameter**		
		Max.	**Tol.**	**Min.**	**Max.**	**Tol.**	**Min.**	**Max.**	**Tol.**	**Min.**
in		in	in	in	in	in	in	in	in	in
$\frac{1}{8}$	40	0.125 0	0.003 5	0.121 5	0.109 0	0.001 9	0.107 1	0.093 0	0.004 0	0.089 0
$\frac{3}{16}$	24	0.187 5	0.004 3	0.183 2	0.160 8	0.002 3	0.158 5	0.134 1	0.005 0	0.129 1
$\frac{1}{4}$	20	0.250 0	0.004 8	0.245 2	0.218 0	0.002 6	0.215 4	0.186 0	0.005 5	0.180 5
$\frac{5}{16}$	18	0.312 5	0.005 2	0.307 3	0.276 9	0.002 8	0.274 1	0.241 3	0.005 9	0.235 4
$\frac{3}{8}$	16	0.375 0	0.005 5	0.369 5	0.335 0	0.003 0	0.332 0	0.295 0	0.006 2	0.288 8
$\frac{7}{16}$	14	0.437 5	0.005 9	0.431 6	0.391 8	0.003 2	0.388 6	0.346 1	0.006 7	0.339 4
$\frac{1}{2}$	12	0.500 0	0.006 3	0.493 7	0.446 6	0.003 4	0.443 2	0.393 2	0.007 2	0.386 0
$\frac{9}{16}$	12	0.562 5	0.006 5	0.556 0	0.509 1	0.003 6	0.505 5	0.455 7	0.007 4	0.448 3
$\frac{5}{8}$	11	0.625 0	0.006 7	0.618 3	0.566 8	0.003 7	0.563 1	0.508 6	0.007 6	0.501 0
$\frac{11}{16}$	11	0.687 5	0.006 8	0.680 7	0.629 3	0.003 8	0.625 5	0.571 1	0.007 7	0.563 4
$\frac{3}{4}$	10	0.750 0	0.007 2	0.742 8	0.686 0	0.004 0	0.682 0	0.622 0	0.008 1	0.613 9
$\frac{7}{8}$	9	0.875 0	0.007 6	0.876 4	0.803 9	0.004 3	0.799 6	0.732 8	0.008 6	0.724 2
1	8	1.000 0	0.008 0	0.992 0	0.920 0	0.004 5	0.915 5	0.840 0	0.009 1	0.830 9
$1\frac{1}{8}$	7	1.125 0	0.008 6	1.116 4	1.033 5	0.004 8	1.028 7	0.942 0	0.009 7	0.932 3
$1\frac{1}{4}$	7	1.250 0	0.008 7	1.241 3	1.158 5	0.004 9	1.153 6	1.067 0	0.009 8	1.057 2
$1\frac{1}{2}$	6	1.500 0	0.009 4	1.490 6	1.393 3	0.005 3	1.388 0	1.286 6	0.010 6	1.276 0
$1\frac{3}{4}$	5	1.750 0	0.010 2	1.739 8	1.621 9	0.005 7	1.616 2	1.493 8	0.011 5	1.482 3
2	4.5	2.000 0	0.010 8	1.989 2	1.857 7	0.006 1	1.851 6	1.715 4	0.012 2	1.703 2
$2\frac{1}{4}$	4	2.250 0	0.011 4	2.238 6	2.089 9	0.006 4	2.083 5	1.929 8	0.012 9	1.916 9
$2\frac{1}{2}$	4	2.500 0	0.011 6	2.488 4	2.339 9	0.006 6	2.333 3	2.179 8	0.013 1	2.166 7
$2\frac{3}{4}$	3.5	2.750 0	0.012 3	2.737 7	2.567 0	0.007 0	2.560 0	2.384 0	0.013 9	2.370 1
3	3.5	3.000 0	0.012 5	2.987 5	2.817 0	0.007 2	2.809 8	2.634 0	0.014 1	2.619 9
$3\frac{1}{4}$	3.25	3.250 0	0.013 0	3.237 0	3.053 0	0.007 4	3.045 6	2.856 0	0.014 6	2.841 4
$3\frac{1}{2}$	3.25	3.500 0	0.013 2	3.486 8	3.303 0	0.007 6	3.295 4	3.106 0	0.014 8	3.091 2
$3\frac{3}{4}$	3	3.750 0	0.013 6	3.736 4	3.5366	0.007 9	3.528 7	3.323 2	0.015 4	3.307 8
4	3	4.000 0	0.013 8	3.986 2	3.7866	0.008 0	3.778 6	3.573 2	0.015 5	3.557 7
$4\frac{1}{2}$	2.875	4.500 0	0.014 3	4.485 7	4.2773	0.008 4	4.268 9	4.054 6	0.016 1	4.038 5
5	2.75	5.000 0	0.014 8	4.985 2	4.7672	0.008 8	4.758 4	4.534 4	0.0166	4.517 8
$5\frac{1}{2}$	2.625	5.500 0	0.015 3	5.484 7	5.2561	0.009 1	5.247 0	5.012 2	0.0171	4.995 1
6	2.5	6.000 0	0.015 8	5.984 2	5.7439	0.009 4	5.734 5	5.487 8	0.0177	5.470 1

Table 3 **Coarse thread series (B.S.W.) – Internal threads – Medium class – Limits and tolerances**

1	2	3	4	5	6	7	8	9
Nominal size	**Number of threads per inch**	**Major diameter**	**Effective diameter**			**Minor diameter**		
		Min.	**Max.**	**Tol.**	**Min.**	**Max.**	**Tol.**	**Min.**
in		in	in	in	in	in	in	in
$\frac{1}{8}$	40	0.125 0	0.111 9	0.002 9	0.109 0	0.102 0	0.009 0	0.093 0
$\frac{3}{16}$	24	0.187 5	0.164 3	0.003 5	0.160 8	0.147 4	0.013 3	0.134 1
$\frac{1}{4}$	20	0.250 0	0.221 9	0.003 9	0.218 0	0.203 0	0.017 0	0.186 0
$\frac{5}{16}$	18	0.312 5	0.281 1	0.004 2	0.276 9	0.259 4	0.018 1	0.241 3
$\frac{3}{8}$	16	0.375 0	0.339 5	0.004 5	0.335 0	0.314 5	0.019 5	0.295 0
$\frac{7}{16}$	14	0.437 5	0.396 6	0.004 8	0.391 8	0.367 4	0.021 3	0.346 1
$\frac{1}{2}$	12	0.500 0	0.451 8	0.005 2	0.446 6	0.416 9	0.023 7	0.393 2
$\frac{9}{16}$	12	0.562 5	0.514 4	0.005 3	0.509 1	0.479 4	0.023 7	0.455 7
$\frac{5}{8}$	11	0.625 0	0.572 4	0.005 6	0.566 8	0.533 8	0.025 2	0.508 6
$\frac{11}{16}$	11	0.687 5	0.635 1	0.005 8	0.629 3	0.596 3	0.025 2	0.571 1
$\frac{3}{4}$	10	0.750 0	0.692 0	0.006 0	0.686 0	0.649 0	0.027 0	0.622 0
$\frac{7}{8}$	9	0.875 0	0.810 3	0.006 4	0.803 9	0.762 0	0.029 2	0.732 8
1	8	1.000 0	0.926 8	0.006 8	0.920 0	0.872 0	0.032 0	0.840 0
$1\frac{1}{8}$	7	1.125 0	1.040 7	0.007 2	1.033 5	0.977 6	0.035 6	0.942 0
$1\frac{1}{4}$	7	1.250 0	1.165 9	0.007 4	1.158 5	1.102 6	0.035 6	1.067 0
$1\frac{1}{2}$	6	1.500 0	1.401 3	0.008 0	1.393 3	1.326 9	0.040 3	1.286 6
$1\frac{3}{4}$	5	1.750 0	1.630 5	0.008 6	1.621 9	1.540 8	0.047 0	1.493 8
2	4.5	2.000 0	1.866 8	0.009 1	1.857 7	1.766 8	0.051 4	1.715 4
$2\frac{1}{4}$	4	2.250 0	2.099 5	0.009 6	2.089 9	1.986 8	0.057 0	1.929 8
$2\frac{1}{2}$	4	2.500 0	2.349 9	0.010 0	2.339 9	2.236 8	0.057 0	2.179 8
$2\frac{3}{4}$	3.5	2.750 0	2.577 4	0.010 4	2.567 0	2.448 1	0.064 1	2.384 0
3	3.5	3.000 0	2.827 8	0.010 8	2.817 0	2.698 1	0.064 1	2.634 0
$3\frac{1}{4}$	3.25	3.250 0	3.064 1	0.011 1	3.053 0	2.924 5	0.068 5	2.856 0
$3\frac{1}{2}$	3.25	3.500 0	3.314 4	0.011 4	3.303 0	3.174 5	0.068 5	3.106 0
$3\frac{3}{4}$	3	3.750 0	3.548 4	0.011 8	3.536 6	3.396 9	0.073 7	3.323 2
4	3	4.000 0	3.798 7	0.012 1	3.786 6	3.646 9	0.073 7	3.573 2
$4\frac{1}{2}$	2.875	4.500 0	4.289 9	0.012 6	4.277 3	4.131 2	0.076 6	4.054 6
5	2.75	5.000 0	4.780 3	0.013 1	4.767 2	4.614 1	0.079 7	4.534 4
$5\frac{1}{2}$	2.625	5.500 0	5.269 8	0.013 7	5.256 1	5.095 4	0.083 2	5.012 2
6	2.5	6.000 0	5.758 0	0.014 1	5.743 9	5.574 8	0.087 0	5.487 8

Table 4 **Coarse thread series (B.S.W.) – External threads – Medium class – Limits and tolerances**

Nominal sizes up to and including $\frac{3}{4}$ in

1	2	3	4	5	6	7	8	9	10	11	12	13	14
Nominal size	**Number of threads per inch**	**Major diameter**				**Effective diameter**				**Minor diameter**			
		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
$\frac{1}{8}$	40	0.123 8	0.004 5	0.119 3	0.125 0	0.107 8	0.002 9	0.104 9	0.109 0	0.091 8	0.006 1	0.085 7	0.093 0
$\frac{3}{16}$	24	0.186 3	0.005 5	0.180 8	0.187 5	0.159 6	0.003 5	0.156 1	0.160 8	0.132 9	0.007 6	0.125 3	0.134 1
$\frac{1}{4}$	20	0.248 8	0.006 1	0.242 7	0.250 0	0.216 8	0.003 9	0.212 9	0.218 0	0.184 8	0.008 4	0.176 4	0.186 0
$\frac{5}{16}$	18	0.311 2	0.006 6	0.304 6	0.312 5	0.275 6	0.004 2	0.271 4	0.276 9	0.240 0	0.008 9	0.231 1	0.241 3
$\frac{3}{8}$	16	0.373 6	0.007 0	0.366 6	0.375 0	0.333 6	0.004 5	0.329 1	0.335 0	0.293 6	0.009 5	0.284 1	0.295 0
$\frac{7}{16}$	14	0.436 0	0.007 5	0.428 5	0.437 5	0.390 3	0.004 8	0.385 5	0.391 8	0.344 6	0.010 1	0.334 5	0.346 1
$\frac{1}{2}$	12	0.498 5	0.008 1	0.490 4	0.500 0	0.445 1	0.005 2	0.439 9	0.446 6	0.391 7	0.011 0	0.380 7	0.393 2
$\frac{9}{16}$	12	0.560 9	0.008 2	0.552 7	0.562 5	0.507 5	0.005 3	0.502 2	0.509 1	0.454 1	0.011 1	0.443 0	0.455 7
$\frac{5}{8}$	11	0.623 3	0.008 6	0.614 7	0.625 0	0.565 1	0.005 6	0.559 5	0.566 8	0.506 9	0.011 6	0.495 3	0.508 6
$\frac{11}{16}$	11	0.685 8	0.008 8	0.677 0	0.687 5	0.627 6	0.005 8	0.621 8	0.629 3	0.569 4	0.011 8	0.557 6	0.571 1
$\frac{3}{4}$	10	0.748 2	0.009 2	0.739 0	0.750 0	0.684 2	0.006 0	0.678 2	0.686 0	0.620 2	0.012 3	0.607 9	0.622 0

Nominal sizes above $\frac{3}{4}$ in

1	2	3	4	5	6	7	8	9	10	11
Nominal size	**Number of threads per inch**	**Major diameter**			**Effective diameter**			**Minor diameter**		
		Max.	**Tol.**	**Min.**	**Max.**	**Tol.**	**Min.**	**Max.**	**Tol.**	**Min.**
in		in	in	in	in	in	in	in	in	in
$\frac{7}{8}$	9	0.875 0	0.009 7	0.865 3	0.803 9	0.006 4	0.797 5	0.732 8	0.013 1	0.719 7
1	8	1.000 0	0.010 3	0.989 7	0.920 0	0.006 8	0.913 2	0.840 0	0.013 9	0.826 1
$1\frac{1}{8}$	7	1.125 0	0.011 0	1.114 0	1.033 5	0.007 2	1.026 3	0.942 0	0.014 8	0.927 2
$1\frac{1}{4}$	7	1.250 0	0.011 2	1.238 8	1.158 5	0.007 4	1.151 1	1.067 0	0.015 0	1.052 0
$1\frac{1}{2}$	6	1.500 0	0.012 1	1.487 9	1.393 3	0.008 0	1.385 3	1.286 6	0.016 2	1.270 4
$1\frac{3}{4}$	5	1.750 0	0.013 1	1.736 9	1.621 9	0.008 6	1.613 3	1.493 8	0.017 5	1.476 3
2	4.5	2.000 0	0.013 8	1.986 2	1.857 7	0.009 1	1.848 6	1.715 4	0.018 5	1.696 9
$2\frac{1}{4}$	4	2.250 0	0.014 6	2.235 4	2.089 9	0.009 6	2.080 3	1.929 8	0.019 6	1.910 2
$2\frac{1}{2}$	4	2.500 0	0.015 0	2.485 0	2.339 9	0.010 0	2.329 9	2.179 8	0.020 0	2.159 8
$2\frac{3}{4}$	3.5	2.750 0	0.015 7	2.734 3	2.567 0	0.010 4	2.556 6	2.384 0	0.021 1	2.362 9
3	3.5	3.000 0	0.016 1	2.983 9	2.817 0	0.010 8	2.806 2	2.634 0	0.021 5	2.612 5
$3\frac{1}{4}$	3.25	3.250 0	0.016 7	3.233 3	3.053 0	0.011 1	3.041 9	2.856 0	0.022 2	2.833 8
$3\frac{1}{2}$	3.25	3.500 0	0.017 0	3.483 0	3.303 0	0.011 4	3.291 6	3.106 0	0.022 5	3.083 5
$3\frac{3}{4}$	3	3.750 0	0.017 6	3.732 4	3.536 6	0.011 8	3.524 8	3.323 2	0.023 4	3.299 8
4	3	4.000 0	0.017 8	3.982 2	3.786 6	0.012 1	3.774 5	3.573 2	0.023 6	3.549 6
$4\frac{1}{2}$	2.875	4.500 0	0.018 5	4.481 5	4.277 3	0.012 6	4.264 7	4.054 6	0.024 4	4.030 2
5	2.75	5.000 0	0.019 2	4.980 8	4.767 2	0.013 1	4.754 1	4.534 4	0.025 2	4.509 2
$5\frac{1}{2}$	2.625	5.500 0	0.019 8	5.480 2	5.256 1	0.013 7	5.242 4	5.012 2	0.026 0	4.986 2
6	2.5	6.000 0	0.020 5	5.979 5	5.743 9	0.014 1	5.729 8	5.487 8	0.026 8	5.461 0

Table 5 **Coarse thread series (B.S.W.) – Internal threads – Normal class – Limits and tolerances**

1	2	3	4	5	6	7	8	9
Nominal size	**Number of threads per inch**	**Major diameter**	**Effective diameter**			**Minor diameter**		
		Min.	**Max.**	**Tol.**	**Min.**	**Max.**	**Tol.**	**Min.**
in		in	in	in	in	in	in	in
$\frac{1}{8}$	40	0.125 0	0.113 3	0.004 3	0.109 0	0.102 0	0.009 0	0.093 0
$\frac{3}{16}$	24	0.187 5	0.166 0	0.005 2	0.160 8	0.147 4	0.013 3	0.134 1
$\frac{1}{4}$	20	0.250 0	0.223 8	0.005 8	0.218 0	0.203 0	0.017 0	0.186 0
$\frac{5}{16}$	18	0.312 5	0.283 2	0.006 3	0.276 9	0.259 4	0.018 1	0.241 3
$\frac{3}{8}$	16	0.375 0	0.341 8	0.006 8	0.335 0	0.314 5	0.019 5	0.295 0
$\frac{7}{16}$	14	0.437 5	0.399 1	0.007 3	0.391 8	0.367 4	0.021 3	0.346 1
$\frac{1}{2}$	12	0.500 0	0.454 3	0.007 7	0.446 6	0.416 9	0.023 7	0.393 2
$\frac{9}{16}$	12	0.562 5	0.517 1	0.008 0	0.509 1	0.479 4	0.023 7	0.455 7
$\frac{5}{8}$	11	0.625 0	0.575 2	0.008 4	0.566 8	0.533 8	0.025 2	0.508 6
$\frac{11}{16}$	11	0.687 5	0.637 9	0.008 6	0.629 3	0.596 3	0.025 2	0.571 1
$\frac{3}{4}$	10	0.750 0	0.695 0	0.009 0	0.686 0	0.649 0	0.027 0	0.622 0
$\frac{7}{8}$	9	0.875 0	0.813 5	0.009 6	0.803 9	0.762 0	0.029 2	0.732 8
1	8	1.000 0	0.930 2	0.010 2	0.920 0	0.872 0	0.032 0	0.840 0
$1\frac{1}{8}$	7	1.125 0	1.044 2	0.010 7	1.033 5	0.977 6	0.035 6	0.942 0
$1\frac{1}{4}$	7	1.250 0	1.169 6	0.011 1	1.158 5	1.102 6	0.035 6	1.067 0
$1\frac{1}{2}$	6	1.500 0	1.405 3	0.012 0	1.393 3	1.326 9	0.040 3	1.286 6
$1\frac{3}{4}$	5	1.750 0	1.634 8	0.012 9	1.621 9	1.540 8	0.047 0	1.493 8
2	4.5	2.000 0	1.871 4	0.013 7	1.857 7	1.766 8	0.051 4	1.715 4
$2\frac{1}{4}$	4	2.250 0	2.104 3	0.014 4	2.089 9	1.986 8	0.057 0	1.929 8
$2\frac{1}{2}$	4	2.500 0	2.354 8	0.014 9	2.339 9	2.236 8	0.057 0	2.179 8
$2\frac{3}{4}$	3.5	2.750 0	2.582 7	0.015 7	2.567 0	2.448 1	0.064 1	2.384 0
3	3.5	3.000 0	2.833 1	0.016 1	2.817 0	2.698 1	0.064 1	2.634 0
$3\frac{1}{4}$	3.25	3.250 0	3.069 7	0.016 7	3.053 0	2.924 5	0.068 5	2.856 0
$3\frac{1}{2}$	3.25	3.500 0	3.320 1	0.017 1	3.303 0	3.174 5	0.068 5	3.106 0
$3\frac{3}{4}$	3	3.750 0	3.554 3	0.017 7	3.536 6	3.396 9	0.073 7	3.323 2
4	3	4.000 0	3.804 7	0.018 1	3.786 6	3.646 9	0.073 7	3.573 2
$4\frac{1}{2}$	2.875	4.500 0	4.296 2	0.018 9	4.277 3	4.131 2	0.076 6	4.054 6
5	2.75	5.000 0	4.786 9	0.019 7	4.767 2	4.614 1	0.079 7	4.534 4
$5\frac{1}{2}$	2.625	5.500 0	5.276 6	0.020 5	5.256 1	5.095 4	0.083 2	5.012 2
6	2.5	6.000 0	5.765 1	0.021 2	5.743 9	5.574 8	0.087 0	5.487 8

Table 6 **Coarse thread series (B.S.W.) – External threads – Free class – Limits and tolerances**

Nominal sizes up to and including $\frac{3}{4}$ in

1	2	3	4	5	6	7	8	9	10	11	12	13	14
Nominal size	**Number of threads per inch**	**Major diameter**				**Effective diameter**				**Minor diameter**			
		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
$\frac{1}{8}$	40	0.123 8	0.005 9	0.117 9	0.125 0	0.107 8	0.004 3	0.103 5	0.109 0	0.091 8	0.007 5	0.084 3	0.093 0
$\frac{3}{16}$	24	0.186 3	0.007 2	0.179 1	0.187 5	0.159 6	0.005 2	0.154 4	0.160 8	0.132 9	0.009 3	0.123 6	0.134 1
$\frac{1}{4}$	20	0.248 8	0.008 0	0.240 8	0.250 0	0.216 8	0.005 8	0.211 0	0.218 0	0.184 8	0.010 3	0.174 5	0.186 0
$\frac{5}{16}$	18	0.311 2	0.008 7	0.302 5	0.312 5	0.275 6	0.006 3	0.269 3	0.276 9	0.240 0	0.011 0	0.229 0	0.241 3
$\frac{3}{8}$	16	0.373 6	0.009 3	0.364 3	0.375 0	0.333 6	0.006 8	0.326 8	0.335 0	0.293 6	0.011 8	0.281 8	0.295 0
$\frac{7}{16}$	14	0.436 0	0.010 0	0.426 0	0.437 5	0.390 3	0.007 3	0.383 0	0.391 8	0.344 6	0.012 6	0.332 0	0.346 1
$\frac{1}{2}$	12	0.498 5	0.010 6	0.487 9	0.500 0	0.445 1	0.007 7	0.437 4	0.446 6	0.391 7	0.013 5	0.378 2	0.393 2
$\frac{9}{16}$	12	0.560 9	0.010 9	0.550 0	0.562 5	0.507 5	0.008 0	0.499 5	0.509 1	0.454 1	0.013 8	0.440 3	0.455 7
$\frac{5}{8}$	11	0.623 3	0.011 4	0.611 9	0.625 0	0.565 1	0.008 4	0.556 7	0.566 8	0.506 9	0.014 4	0.492 5	0.508 6
$\frac{11}{16}$	11	0.685 8	0.011 6	0.674 2	0.687 5	0.627 6	0.008 6	0.619 0	0.629 3	0.569 4	0.014 6	0.554 8	0.571 1
$\frac{3}{4}$	10	0.748 2	0.012 2	0.736 0	0.750 0	0.684 2	0.009 0	0.675 2	0.686 0	0.620 2	0.015 3	0.604 9	0.622 0

Nominal sizes above $\frac{3}{4}$ in

1	2	3	4	5	6	7	8	9	10	11
Nominal size	**Number of threads per inch**	**Major diameter**			**Effective diameter**			**Minor diameter**		
		Max.	**Tol.**	**Min.**	**Max.**	**Tol.**	**Min.**	**Max.**	**Tol.**	**Min.**
in		in	in	in	in	in	in	in	in	in
$\frac{7}{8}$	9	0.875 0	0.012 9	0.862 1	0.803 9	0.009 6	0.794 3	0.732 8	0.016 3	0.716 5
1	8	1.000 0	0.013 7	0.986 3	0.920 0	0.010 2	0.909 8	0.840 0	0.017 3	0.822 7
$1\frac{1}{8}$	7	1.125 0	0.014 5	1.110 5	1.033 5	0.010 7	1.022 8	0.942 0	0.018 3	0.923 7
$1\frac{1}{4}$	7	1.250 0	0.014 9	1.235 1	1.158 5	0.011 1	1.147 4	1.067 0	0.018 7	1.048 3
$1\frac{1}{2}$	6	1.500 0	0.016 1	1.483 9	1.393 3	0.012 0	1.381 3	1.286 6	0.020 2	1.266 4
$1\frac{3}{4}$	5	1.750 0	0.017 4	1.732 6	1.621 9	0.012 9	1.609 0	1.493 8	0.021 8	1.472 0
2	4.5	2.000 0	0.018 4	1.981 6	1.857 7	0.013 7	1.844 0	1.715 4	0.023 1	1.692 3
$2\frac{1}{4}$	4	2.250 0	0.019 4	2.230 6	2.089 9	0.014 4	2.075 5	1.929 8	0.024 4	1.905 4
$2\frac{1}{2}$	4	2.500 0	0.019 9	2.480 1	2.339 9	0.014 9	2.325 0	2.179 8	0.024 9	2.154 9
$2\frac{3}{4}$	3.5	2.750 0	0.021 0	2.729 0	2.567 0	0.015 7	2.551 3	2.384 0	0.026 4	2.357 6
3	3.5	3.000 0	0.021 4	2.978 6	2.817 0	0.016 1	2.800 9	2.634 0	0.026 8	2.607 2
$3\frac{1}{4}$	3.25	3.250 0	0.022 3	3.227 7	3.053 0	0.016 7	3.036 3	2.856 0	0.027 8	2.828 2
$3\frac{1}{2}$	3.25	3.500 0	0.022 7	3.477 3	3.303 0	0.017 1	3.285 9	3.106 0	0.028 2	3.077 8
$3\frac{3}{4}$	3	3.750 0	0.023 5	3.726 5	3.536 6	0.017 7	3.518 9	3.323 2	0.029 3	3.293 9
4	3	4.000 0	0.023 9	3.976 1	3.786 6	0.018 1	3.768 5	3.573 2	0.029 6	3.543 6
$4\frac{1}{2}$	2.875	4.500 0	0.024 8	4.475 2	4.277 3	0.018 9	4.258 4	4.054 6	0.030 7	4.023 9
5	2.75	5.000 0	0.025 7	4.974 3	4.767 2	0.019 7	4.747 5	4.534 4	0.031 8	4.502 6
$5\frac{1}{2}$	2.625	5.500 0	0.026 7	5.473 3	5.256 1	0.020 5	5.235 6	5.012 2	0.032 8	4.979 4
6	2.5	6.000 0	0.027 5	5.972 5	5.743 9	0.021 2	5.722 7	5.487 8	0.033 9	5.453 9

Table 7 **Fine thread series (B.S.F.) – Basic sizes**

1	2	3	4	5	6	7	8
Nominal size	**Number of threads per inch**	**Pitch**	**Depth of thread**	**Major diameter**	**Effective diameter**	**Minor diameter**	**Cross-sectional area at bottom of thread**
in		in	in	in	in	in	in^2
$\frac{3}{16}$	32	0.031 25	0.020 0	0.187 5	0.167 5	0.147 5	0.017 1
$\frac{7}{32}$	28	0.035 71	0.022 9	0.218 8	0.195 9	0.173 0	0.023 5
$\frac{1}{4}$	26	0.038 46	0.024 6	0.250 0	0.225 4	0.200 8	0.031 7
$\frac{9}{32}$	26	0.038 46	0.024 6	0.281 2	0.256 6	0.232 0	0.042 3
$\frac{5}{16}$	22	0.045 45	0.029 1	0.312 5	0.283 4	0.254 3	0.050 8
$\frac{3}{8}$	20	0.050 00	0.032 0	0.375 0	0.343 0	0.311 0	0.076 0
$\frac{7}{16}$	18	0.055 56	0.035 6	0.437 5	0.401 9	0.366 3	0.105 4
$\frac{1}{2}$	16	0.062 50	0.040 0	0.500 0	0.460 0	0.420 0	0.138 5
$\frac{9}{16}$	16	0.062 50	0.040 0	0.562 5	0.522 5	0.482 5	0.182 8
$\frac{5}{8}$	14	0.071 43	0.045 7	0.625 0	0.579 3	0.533 6	0.223 6
$\frac{11}{16}$	14	0.071 43	0.045 7	0.687 5	0.641 8	0.596 1	0.279 1
$\frac{3}{4}$	12	0.083 33	0.053 4	0.750 0	0.696 6	0.643 2	0.324 9
$\frac{7}{8}$	11	0.090 91	0.058 2	0.875 0	0.816 8	0.758 6	0.452 0
1	10	0.100 00	0.064 0	1.000 0	0.936 0	0.872 0	0.597 2
$1\frac{1}{8}$	9	0.111 11	0.071 1	1.125 0	1.053 9	0.982 8	0.758 6
$1\frac{1}{4}$	9	0.111 11	0.071 1	1.250 0	1.178 9	1.107 8	0.963 9
$1\frac{3}{8}$	8	0.125 00	0.080 0	1.375 0	1.295 0	1.215 0	1.159 0
$1\frac{1}{2}$	8	0.125 00	0.080 0	1.500 0	1.420 0	1.340 0	1.410 0
$1\frac{5}{8}$	8	0.125 00	0.080 0	1.625 0	1.545 0	1.465 0	1.686 0
$1\frac{3}{4}$	7	0.142 86	0.091 5	1.750 0	1.658 5	1.567 0	1.928 0
2	7	0.142 86	0.091 5	2.000 0	1.908 5	1.817 0	2.593 0
$2\frac{1}{4}$	6	0.166 67	0.106 7	2.250 0	2.143 3	2.036 6	3.258 0
$2\frac{1}{2}$	6	0.166 67	0.106 7	2.500 0	2.393 3	2.286 6	4.106 0
$2\frac{3}{4}$	6	0.166 67	0.106 7	2.750 0	2.643 3	2.536 6	5.054 0
3	5	0.200 00	0.128 1	3.000 0	2.871 9	2.743 8	5.913 0
$3\frac{1}{4}$	5	0.200 00	0.128 1	3.250 0	3.121 9	2.993 8	7.039 0
$3\frac{1}{2}$	4.5	0.222 22	0.142 3	3.500 0	3.357 7	3.215 4	8.120 0
$3\frac{3}{4}$	4.5	0.222 22	0.142 3	3.750 0	3.607 7	3.465 4	9.432 0
4	4.5	0.222 22	0.142 3	4.000 0	3.857 7	3.715 4	10.840 0
$4\frac{1}{4}$	4	0.250 00	0.160 1	4.250 0	4.089 9	3.929 8	12.130 0

Table 8 **Fine thread series (B.S.F.) – External threads – Close class – Limits and tolerances**

1	2	3	4	5	6	7	8	9	10	11
Nominal size	**Number of threads per inch**	**Major diameter**			**Effective diameter**			**Minor diameter**		
		Max.	**Tol.**	**Min.**	**Max.**	**Tol.**	**Min.**	**Max.**	**Tol.**	**Min.**
in		in	in	in	in	in	in	in	in	in
$\frac{3}{16}$	32	0.187 5	0.004 0	0.183 5	0.167 5	0.002 2	0.165 3	0.147 5	0.004 5	0.143 0
$\frac{7}{32}$	28	0.218 8	0.004 3	0.214 5	0.195 9	0.002 4	0.193 5	0.173 0	0.004 9	0.168 1
$\frac{1}{4}$	26	0.250 0	0.004 5	0.245 5	0.225 4	0.002 5	0.222 9	0.200 8	0.005 0	0.195 8
$\frac{9}{32}$	26	0.281 2	0.004 6	0.276 6	0.256 6	0.002 6	0.254 0	0.232 0	0.005 1	0.226 9
$\frac{5}{16}$	22	0.312 5	0.004 8	0.307 7	0.283 4	0.002 7	0.280 7	0.254 3	0.005 5	0.248 8
$\frac{3}{8}$	20	0.375 0	0.005 1	0.369 9	0.343 0	0.002 9	0.340 1	0.311 0	0.005 8	0.305 2
$\frac{7}{16}$	18	0.437 5	0.005 5	0.432 0	0.401 9	0.003 1	0.398 8	0.366 3	0.006 2	0.360 1
$\frac{1}{2}$	16	0.500 0	0.005 8	0.494 2	0.460 0	0.003 3	0.456 7	0.420 0	0.006 5	0.413 5
$\frac{9}{16}$	16	0.562 5	0.005 9	0.556 6	0.522 5	0.003 4	0.519 1	0.482 5	0.006 6	0.475 9
$\frac{5}{8}$	14	0.625 0	0.006 3	0.618 7	0.579 3	0.003 6	0.575 7	0.533 6	0.007 1	0.526 5
$\frac{11}{16}$	14	0.687 5	0.006 4	0.681 1	0.641 8	0.003 7	0.638 1	0.596 1	0.007 2	0.588 9
$\frac{3}{4}$	12	0.750 0	0.006 8	0.743 2	0.696 6	0.003 9	0.692 7	0.643 2	0.007 7	0.635 5
$\frac{7}{8}$	11	0.875 0	0.007 2	0.867 8	0.816 8	0.004 2	0.812 6	0.758 6	0.008 1	0.750 5
1	10	1.000 0	0.007 6	0.992 4	0.936 0	0.004 4	0.931 6	0.872 0	0.008 5	0.863 5
$1\frac{1}{8}$	9	1.125 0	0.007 9	1.117 1	1.053 9	0.004 6	1.049 3	0.982 8	0.008 9	0.973 9
$1\frac{1}{4}$	9	1.250 0	0.008 1	1.241 9	1.178 9	0.004 8	1.174 1	1.107 8	0.009 1	1.098 7
$1\frac{3}{8}$	8	1.375 0	0.008 5	1.366 5	1.295 0	0.005 0	1.290 0	1.215 0	0.009 6	1.205 4
$1\frac{1}{2}$	8	1.500 0	0.008 7	1.491 3	1.420 0	0.005 2	1.414 8	1.340 0	0.009 8	1.330 2
$1\frac{5}{8}$	8	1.625 0	0.008 8	1.616 2	1.545 0	0.005 3	1.539 7	1.465 0	0.009 9	1.455 1
$1\frac{3}{4}$	7	1.750 0	0.009 3	1.740 7	1.658 5	0.005 5	1.653 0	1.567 0	0.010 4	1.556 6
2	7	2.000 0	0.009 5	1.990 5	1.908 5	0.005 8	1.902 7	1.817 0	0.010 7	1.806 3
$2\frac{1}{4}$	6	2.250 0	0.010 2	2.239 8	2.143 3	0.006 1	2.137 2	2.036 6	0.011 4	2.025 2
$2\frac{1}{2}$	6	2.500 0	0.010 4	2.489 6	2.393 3	0.006 3	2.387 0	2.286 6	0.011 6	2.275 0
$2\frac{3}{4}$	6	2.750 0	0.010 6	2.739 4	2.643 3	0.006 5	2.636 8	2.536 6	0.011 9	2.524 7
3	5	3.000 0	0.011 3	2.988 7	2.871 9	0.006 9	2.865 0	2.743 8	0.012 7	2.731 1

Table 9 **Fine thread series (B.S.F.) – Internal threads – Medium class – Limits and tolerances**

1	2	3	4	5	6	7	8	9
Nominal size	**Number of threads per inch**	**Major diameter**	**Effective diameter**			**Minor diameter**		
		Min.	**Max.**	**Tol.**	**Min.**	**Max.**	**Tol.**	**Min.**
in.		in	in	in	in	in	in	in
$\frac{3}{16}$	32	0.187 5	0.170 8	0.003 3	0.167 5	0.157 7	0.010 2	0.147 5
$\frac{7}{32}$	28	0.218 8	0.199 5	0.003 6	0.195 9	0.184 1	0.011 1	0.173 0
$\frac{1}{4}$	26	0.250 0	0.229 1	0.003 7	0.225 4	0.212 5	0.011 7	0.200 8
$\frac{9}{32}$	26	0.281 2	0.260 5	0.003 9	0.256 6	0.243 7	0.011 7	0.232 0
$\frac{5}{16}$	22	0.312 5	0.287 5	0.004 1	0.283 4	0.268 4	0.014 1	0.254 3
$\frac{3}{8}$	20	0.375 0	0.347 4	0.004 4	0.343 0	0.328 0	0.017 0	0.311 0
$\frac{7}{16}$	18	0.437 5	0.406 6	0.004 7	0.401 9	0.384 4	0.018 1	0.366 3
$\frac{1}{2}$	16	0.500 0	0.465 0	0.005 0	0.460 0	0.439 5	0.019 5	0.420 0
$\frac{9}{16}$	16	0.562 5	0.527 7	0.005 2	0.522 5	0.502 0	0.019 5	0.482 5
$\frac{5}{8}$	14	0.625 0	0.584 7	0.005 4	0.579 3	0.554 9	0.021 3	0.533 6
$\frac{11}{16}$	14	0.687 5	0.647 4	0.005 6	0.641 8	0.617 4	0.021 3	0.596 1
$\frac{3}{4}$	12	0.750 0	0.702 5	0.005 9	0.696 6	0.666 9	0.023 7	0.643 2
$\frac{7}{8}$	11	0.875 0	0.823 0	0.006 2	0.816 8	0.783 8	0.025 2	0.758 6
1	10	1.000 0	0.942 6	0.006 6	0.936 0	0.899 0	0.027 0	0.872 0
$1\frac{1}{8}$	9	1.125 0	1.060 8	0.006 9	1.053 9	1.012 0	0.029 2	0.982 8
$1\frac{1}{4}$	9	1.250 0	1.186 1	0.007 2	1.178 9	1.137 0	0.029 2	1.107 8
$1\frac{3}{8}$	8	1.375 0	1.302 5	0.007 5	1.295 0	1.247 0	0.032 0	1.215 0
$1\frac{1}{2}$	8	1.500 0	1.427 7	0.007 7	1.420 0	1.372 0	0.032 0	1.340 0
$1\frac{5}{8}$	8	1.625 0	1.552 9	0.007 9	1.545 0	1.497 0	0.032 0	1.465 0
$1\frac{3}{4}$	7	1.750 0	1.666 8	0.008 3	1.658 5	1.602 6	0.035 6	1.567 0
2	7	2.000 0	1.917 2	0.008 7	1.908 5	1.852 6	0.035 6	1.817 0
$2\frac{1}{4}$	6	2.250 0	2.152 5	0.009 2	2.143 3	2.076 9	0.040 3	2.036 6
$2\frac{1}{2}$	6	2.500 0	2.402 8	0.009 5	2.393 3	2.326 9	0.040 3	2.286 6
$2\frac{3}{4}$	6	2.750 0	2.653 1	0.009 8	2.643 3	2.576 9	0.040 3	2.536 6
3	5	3.000 0	2.882 2	0.010 3	2.871 9	2.790 8	0.047 0	2.743 8

Table 10 **Fine thread series (B.S.F.) – External threads – Medium class – Limits and tolerances**

Nominal sizes up to and including $\frac{3}{4}$ in

1	2	3	4	5	6	7	8	9	10	11	12	13	14
Nominal size	**Number of threads per inch**	**Major diameter**				**Effective diameter**				**Minor diameter**			
		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
$\frac{3}{16}$	32	0.186 4	0.005 1	0.181 3	0.187 5	0.166 4	0.003 3	0.163 1	0.167 5	0.146 4	0.006 8	0.139 6	0.147 5
$\frac{7}{32}$	28	0.217 7	0.005 5	0.212 2	0.218 8	0.194 8	0.003 6	0.191 2	0.195 9	0.171 9	0.007 4	0.164 5	0.173 0
$\frac{1}{4}$	26	0.248 9	0.005 7	0.243 2	0.250 0	0.224 3	0.003 7	0.220 6	0.225 4	0.199 7	0.007 6	0.192 1	0.200 8
$\frac{9}{32}$	26	0.280 0	0.005 9	0.274 1	0.281 2	0.255 4	0.003 9	0.251 5	0.256 6	0.230 8	0.007 8	0.223 0	0.232 0
$\frac{5}{16}$	22	0.311 3	0.006 2	0.305 1	0.312 5	0.282 2	0.004 1	0.278 1	0.283 4	0.253 1	0.008 4	0.244 7	0.254 3
$\frac{3}{8}$	20	0.373 7	0.006 6	0.367 1	0.375 0	0.341 7	0.004 4	0.337 3	0.343 0	0.309 7	0.008 9	0.300 8	0.311 0
$\frac{7}{16}$	18	0.436 1	0.007 1	0.429 0	0.437 5	0.400 5	0.004 7	0.395 8	0.401 9	0.364 9	0.009 4	0.355 5	0.366 3
$\frac{1}{2}$	16	0.498 5	0.007 5	0.491 0	0.500 0	0.458 5	0.005 0	0.453 5	0.460 0	0.418 5	0.010 0	0.408 5	0.420 0
$\frac{9}{16}$	16	0.561 0	0.007 7	0.553 3	0.562 5	0.521 0	0.005 2	0.515 8	0.522 5	0.481 0	0.010 2	0.470 8	0.482 5
$\frac{5}{8}$	14	0.623 4	0.008 1	0.615 3	0.625 0	0.577 7	0.005 4	0.572 3	0.579 3	0.532 0	0.010 7	0.521 3	0.533 6
$\frac{11}{16}$	14	0.685 8	0.008 3	0.677 5	0.687 5	0.640 1	0.005 6	0.634 5	0.641 8	0.594 4	0.010 9	0.583 5	0.596 1
$\frac{3}{4}$	12	0.748 2	0.008 8	0.739 4	0.750 0	0.694 8	0.005 9	0.688 9	0.696 6	0.641 4	0.011 7	0.629 7	0.643 2

Nominal sizes above $\frac{3}{4}$ in

1	2	3	4	5	6	7	8	9	10	11
Nominal size	**Number of threads per inch**	**Major diameter**			**Effective diameter**			**Minor diameter**		
		Max.	**Tol.**	**Min.**	**Max.**	**Tol.**	**Min.**	**Max.**	**Tol.**	**Min.**
in		in	in	in	in	in	in	in	in	in
$\frac{7}{8}$	11	0.875 0	0.009 2	0.865 8	0.816 8	0.006 2	0.810 6	0.758 6	0.012 2	0.746 4
1	10	1.000 0	0.009 8	0.990 2	0.936 0	0.006 6	0.929 4	0.872 0	0.012 9	0.859 1
$1\frac{1}{8}$	9	1.125 0	0.010 2	1.114 8	1.053 9	0.006 9	1.047 0	0.982 8	0.013 6	0.969 2
$1\frac{1}{4}$	9	1.250 0	0.010 5	1.239 5	1.178 9	0.007 2	1.171 7	1.107 8	0.013 9	1.093 9
$1\frac{3}{8}$	8	1.375 0	0.011 0	1.364 0	1.295 0	0.007 5	1.287 5	1.215 0	0.014 6	1.200 4
$1\frac{1}{2}$	8	1.500 0	0.011 2	1.488 8	1.420 0	0.007 7	1.412 3	1.340 0	0.014 8	1.325 2
$1\frac{5}{8}$	8	1.625 0	0.011 5	1.613 5	1.545 0	0.007 9	1.537 1	1.465 0	0.015 0	1.450 0
$1\frac{3}{4}$	7	1.750 0	0.012 0	1.738 0	1.658 5	0.008 3	1.650 2	1.567 0	0.015 8	1.551 2
2	7	2.000 0	0.012 4	1.987 6	1.908 5	0.008 7	1.899 8	1.817 0	0.016 2	1.800 8
$2\frac{1}{4}$	6	2.250 0	0.013 2	2.236 8	2.143 3	0.009 2	2.134 1	2.036 6	0.017 3	2.019 3
$2\frac{1}{2}$	6	2.500 0	0.013 6	2.486 4	2.393 3	0.009 5	2.383 8	2.286 6	0.017 7	2.268 9
$2\frac{3}{4}$	6	2.750 0	0.013 9	2.736 1	2.643 3	0.009 8	2.633 5	2.536 6	0.018 0	2.518 6
3	5	3.000 0	0.014 8	2.985 2	2.871 9	0.010 3	2.861 6	2.743 8	0.019 3	2.724 5

Table 11 **Fine thread series (B.S.F.) – Internal threads – Normal class – Limits and tolerances**

1	2	3	4	5	6	7	8	9
Nominal size	**Number of threads per inch**	**Major diameter**	**Effective diameter**			**Minor diameter**		
		Min.	**Max.**	**Tol.**	**Min.**	**Max.**	**Tol.**	**Min.**
in		in	in	in	in	in	in	in
$\frac{3}{16}$	32	0.187 5	0.172 5	0.005 0	0.167 5	0.157 7	0.010 2	0.147 5
$\frac{7}{32}$	28	0.218 8	0.201 2	0.005 3	0.195 9	0.184 1	0.011 1	0.173 0
$\frac{1}{4}$	26	0.250 0	0.231 0	0.005 6	0.225 4	0.212 5	0.011 7	0.200 8
$\frac{9}{32}$	26	0.281 2	0.262 4	0.005 8	0.256 6	0.243 7	0.011 7	0.232 0
$\frac{5}{16}$	22	0.312 5	0.289 6	0.006 2	0.283 4	0.268 4	0.014 1	0.254 3
$\frac{3}{8}$	20	0.375 0	0.349 6	0.006 6	0.343 0	0.328 0	0.017 0	0.311 0
$\frac{7}{16}$	18	0.437 5	0.408 9	0.007 0	0.401 9	0.384 4	0.018 1	0.366 3
$\frac{1}{2}$	16	0.500 0	0.467 4	0.007 4	0.460 0	0.439 5	0.019 5	0.420 0
$\frac{9}{16}$	16	0.562 5	0.530 2	0.007 7	0.522 5	0.502 0	0.019 5	0.482 5
$\frac{5}{8}$	14	0.625 0	0.587 4	0.008 1	0.579 3	0.554 9	0.021 3	0.533 6
$\frac{11}{16}$	14	0.687 5	0.650 2	0.008 4	0.641 8	0.617 4	0.021 3	0.596 1
$\frac{3}{4}$	12	0.750 0	0.705 4	0.008 8	0.696 6	0.666 9	0.023 7	0.643 2
$\frac{7}{8}$	11	0.875 0	0.826 1	0.009 3	0.816 8	0.783 8	0.025 2	0.758 6
1	10	1.000 0	0.945 9	0.009 9	0.936 0	0.899 0	0.027 0	0.872 0
$1\frac{1}{8}$	9	1.125 0	1.064 3	0.010 4	1.053 9	1.012 0	0.029 2	0.982 8
$1\frac{1}{4}$	9	1.250 0	1.189 7	0.010 8	1.178 9	1.137 0	0.029 2	1.107 8
$1\frac{3}{8}$	8	1.375 0	1.306 3	0.011 3	1.295 0	1.247 0	0.032 0	1.215 0
$1\frac{1}{2}$	8	1.500 0	1.431 6	0.011 6	1.420 0	1.372 0	0.032 0	1.340 0
$1\frac{5}{8}$	8	1.625 0	1.556 9	0.011 9	1.545 0	1.497 0	0.032 0	1.465 0
$1\frac{3}{4}$	7	1.750 0	1.670 9	0.012 4	1.658 5	1.602 6	0.035 6	1.567 0
2	7	2.000 0	1.921 5	0.013 0	1.908 5	1.852 6	0.035 6	1.817 0
$2\frac{1}{4}$	6	2.250 0	2.157 0	0.013 7	2.143 3	2.076 9	0.040 3	2.036 6
$2\frac{1}{2}$	6	2.500 0	2.407 5	0.014 2	2.393 3	2.326 9	0.040 3	2.286 6
$2\frac{3}{4}$	6	2.750 0	2.658 0	0.014 7	2.643 3	2.576 9	0.040 3	2.536 6
3	5	3.000 0	2.887 4	0.015 5	2.871 9	2.790 8	0.047 0	2.743 8

Table 12 **Fine thread series (B.S.F.) – External threads – Free class – Limits and tolerances**

Nominal sizes up to and including $\frac{3}{4}$ in

1	2	3	4	5	6	7	8	9	10	11	12	13	14
Nominal size	**Number of threads per inch**	**Major diameter**				**Effective diameter**				**Minor diameter**			
		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
$\frac{3}{16}$	32	0.186 4	0.006 8	0.179 6	0.187 5	0.166 4	0.005 0	0.161 4	0.167 5	0.146 4	0.008 5	0.137 9	0.147 5
$\frac{7}{32}$	28	0.217 7	0.007 2	0.210 5	0.218 8	0.194 8	0.005 3	0.189 5	0.195 9	0.171 9	0.009 1	0.162 8	0.173 0
$\frac{1}{4}$	26	0.248 9	0.007 6	0.241 3	0.250 0	0.224 3	0.005 6	0.218 7	0.225 4	0.199 7	0.009 5	0.190 2	0.200 8
$\frac{9}{32}$	26	0.280 0	0.007 8	0.272 2	0.281 2	0.255 4	0.005 8	0.249 6	0.256 6	0.230 8	0.009 7	0.221 1	0.232 0
$\frac{5}{16}$	22	0.311 3	0.008 3	0.303 0	0.312 5	0.282 2	0.006 2	0.276 0	0.283 4	0.253 1	0.010 5	0.242 6	0.254 3
$\frac{3}{8}$	20	0.373 7	0.008 8	0.364 9	0.375 0	0.341 7	0.006 6	0.335 1	0.343 0	0.309 7	0.011 1	0.298 6	0.311 0
$\frac{7}{16}$	18	0.436 1	0.009 4	0.426 7	0.437 5	0.400 5	0.007 0	0.393 5	0.401 9	0.364 9	0.011 7	0.353 2	0.366 3
$\frac{1}{2}$	16	0.498 5	0.009 9	0.488 6	0.500 0	0.458 5	0.007 4	0.451 1	0.460 0	0.418 5	0.012 4	0.406 1	0.420 0
$\frac{9}{16}$	16	0.561 0	0.010 2	0.550 8	0.562 5	0.521 0	0.007 7	0.513 3	0.522 5	0.481 0	0.012 7	0.468 3	0.482 5
$\frac{5}{8}$	14	0.623 4	0.010 8	0.612 6	0.625 0	0.577 7	0.008 1	0.569 6	0.579 3	0.532 0	0.013 4	0.518 6	0.533 6
$\frac{11}{16}$	14	0.685 8	0.011 1	0.674 7	0.687 5	0.640 1	0.008 4	0.631 7	0.641 8	0.594 4	0.013 7	0.580 7	0.596 1
$\frac{3}{4}$	12	0.748 2	0.011 7	0.736 5	0.750 0	0.694 8	0.008 8	0.686 0	0.696 6	0.641 4	0.014 6	0.626 8	0.643 2

Nominal sizes above $\frac{3}{4}$ in

1	2	3	4	5	6	7	8	9	10	11
Nominal size	**Number of threads per inch**	**Major diameter**			**Effective diameter**			**Minor diameter**		
		Max.	**Tol.**	**Min.**	**Max.**	**Tol.**	**Min.**	**Max.**	**Tol.**	**Min.**
in		in	in	in	in	in	in	in	in	in
$\frac{7}{8}$	11	0.875 0	0.012 3	0.862 7	0.816 8	0.009 3	0.807 5	0.758 6	0.015 3	0.743 3
1	10	1.000 0	0.013 1	0.986 9	0.936 0	0.009 9	0.926 1	0.872 0	0.016 2	0.855 8
$1\frac{1}{8}$	9	1.125 0	0.013 7	1.111 3	1.053 9	0.010 4	1.043 5	0.982 8	0.017 1	0.965 7
$1\frac{1}{4}$	9	1.250 0	0.014 1	1.235 9	1.178 9	0.010 8	1.168 1	1.107 8	0.017 5	1.090 3
$1\frac{3}{8}$	8	1.375 0	0.014 8	1.360 2	1.295 0	0.011 3	1.283 7	1.215 0	0.018 4	1.196 6
$1\frac{1}{2}$	8	1.500 0	0.015 1	1.484 9	1.420 0	0.011 6	1.408 4	1.340 0	0.018 7	1.321 3
$1\frac{5}{8}$	8	1.625 0	0.015 5	1.609 5	1.545 0	0.011 9	1.533 1	1.465 0	0.019 0	1.446 0
$1\frac{3}{4}$	7	1.750 0	0.016 2	1.733 8	1.658 5	0.012 4	1.646 1	1.567 0	0.020 0	1.547 0
2	7	2.000 0	0.016 8	1.983 2	1.908 5	0.013 0	1.895 5	1.817 0	0.020 5	1.796 5
$2\frac{1}{4}$	6	2.250 0	0.017 8	2.232 2	2.143 3	0.013 7	2.129 6	2.036 6	0.021 9	2.014 7
$2\frac{1}{2}$	6	2.500 0	0.018 3	2.481 7	2.393 3	0.014 2	2.379 1	2.286 6	0.022 4	2.264 2
$2\frac{3}{4}$	6	2.750 0	0.018 8	2.731 2	2.643 3	0.014 7	2.628 6	2.536 6	0.022 9	2.513 7
3	5	3.000 0	0.019 9	2.980 1	2.871 9	0.015 5	2.856 4	2.743 8	0.024 4	2.719 4

Table 13A **Selected thread series (Whit. S.) – Preferred diameters and pitches – Fractional sizes**

1	2	3	4	5	6	7	8	9	10	11	12
Preferred basic major diameters		**Threads per inch**									
		Standard pitches		**Preferred pitches** [A]							
1st choice in	**2nd choice** in	**B.S.W. series**	**B.S.F. series**	**4**	**6**	**8**	**12**	**16**	**20**	**26**	**32**
$\frac{1}{4}$	—	20	26	—	—	—	—	—	—	—	32
$\frac{5}{16}$	—	18	22	—	—	—	—	—	—	26	32
$\frac{3}{8}$	—	16	20	—	—	—	—	—	—	26	32
$\frac{7}{16}$	—	14	18	—	—	—	—	—	—	26	—
$\frac{1}{2}$	—	12	16	—	—	—	—	—	20	26	—
$\frac{9}{16}$	—	12	16	—	—	—	—	—	20	26	—
$\frac{5}{8}$	—	11	14	—	—	—	—	—	20	26	—
—	$\frac{11}{16}$	11	14	—	—	—	—	16	20	26	—
$\frac{3}{4}$	—	10	12	—	—	—	—	16	20	26	—
—	$\frac{13}{16}$	—	12	—	—	—	—	16	20	26	—
$\frac{7}{8}$	—	9	11	—	—	—	—	(16)	20	(26)	—
—	$\frac{15}{16}$	—	—	—	—	—	12	(16)	20	(26)	—
1	—	8	10	—	—	—	12	(16)	20	(26)	—
—	$1\frac{1}{16}$	—	—	—	—	—	12	(16)	20	(26)	—
$1\frac{1}{8}$	—	7	9	—	—	—	12	(16)	20	(26)	—
—	$1\frac{3}{16}$	—	—	—	—	(8)	12	(16)	20	(26)	—
$1\frac{1}{4}$	—	7	9	—	—	—	12	(16)	20	(26)	—
—	$1\frac{5}{16}$	—	—	—	(6)	(8)	12	(16)	20	(26)	—
$1\frac{3}{8}$	—	—	8	—	(6)	—	12	(16)	20	(26)	—
—	$1\frac{7}{16}$	—	—	—	(6)	(8)	12	(16)	20	(26)	—

[A] Values in parentheses are non-preferred.

Table 13A **Selected thread series (Whit. S.) – Preferred diameters and pitches – Fractional sizes** (*continued*)

1	2	3	4	5	6	7	8	9	10	11	12
Preferred basic major diameters		**Threads per inch**									
		Standard pitches		**Preferred pitches** [A]							
1st choice in	**2nd choice** in	**B.S.W. series**	**B.S.F. series**	**4**	**6**	**8**	**12**	**16**	**20**	**26**	**32**
$1\frac{1}{2}$	—	6	8	—	—	—	12	(16)	20	(26)	—
—	$1\frac{5}{8}$	—	8	—	(6)	—	12	16	20	(26)	—
$1\frac{3}{4}$	—	5	7	—	—	—	12	16	20	(26)	—
—	$1\frac{7}{8}$	—	—	—	(6)	(8)	12	16	20	(26)	—
2	—	$4\frac{1}{2}$	7	—	—	—	12	16	20	(26)	—
—	$2\frac{1}{8}$	—	—	—	(6)	8	12	16	(20)	—	—
$2\frac{1}{4}$	—	4	6	—	—	8	12	16	(20)	—	—
—	$2\frac{3}{8}$	—	—	—	(6)	8	12	16	(20)	—	—
$2\frac{1}{2}$	—	4	6	—	—	8	12	16	(20)	—	—
—	$2\frac{5}{8}$	—	—	—	(6)	8	12	16	(20)	—	—
$2\frac{3}{4}$	—	$3\frac{1}{2}$	6	—	—	8	12	16	(20)	—	—
—	$2\frac{7}{8}$	—	—	—	(6)	8	12	16	(20)	—	—
3	—	$3\frac{1}{2}$	5	—	(6)	8	12	16	(20)	—	—
—	$3\frac{1}{8}$	—	—	—	(6)	8	(12)	16	—	—	—
$3\frac{1}{4}$	—	$3\frac{1}{4}$	5	—	(6)	8	(12)	16	—	—	—
—	$3\frac{3}{8}$	—	—	—	(6)	8	(12)	16	—	—	—
$3\frac{1}{2}$	—	$3\frac{1}{4}$	$4\frac{1}{2}$	—	(6)	8	(12)	16	—	—	—
—	$3\frac{5}{8}$	—	—	—	(6)	8	(12)	16	—	—	—
$3\frac{3}{4}$	—	3	$4\frac{1}{2}$	—	(6)	8	(12)	16	—	—	—
—	$3\frac{7}{8}$	—	—	—	(6)	8	(12)	16	—	—	—
4	—	3	$4\frac{1}{2}$	—	(6)	8	(12)	16	—	—	—

[A] Values in parentheses are non-preferred.

Table 13A **Selected thread series (Whit. S.) – Preferred diameters and pitches – Fractional sizes** (*continued*)

1	2	3	4	5	6	7	8	9	10	11	12
Preferred basic major diameters		**Threads per inch**									
		Standard pitches		**Preferred pitches** [A]							
1st choice in	**2nd choice** in	**B.S.W. series**	**B.S.F. series**	**4**	**6**	**8**	**12**	**16**	**20**	**26**	**32**
—	$4\frac{1}{8}$	—	—	—	(6)	8	(12)	16	—	—	—
$4\frac{1}{4}$	—	—	4	—	(6)	8	(12)	16	—	—	—
—	$4\frac{3}{8}$	—	—	4	(6)	8	(12)	16	—	—	—
$4\frac{1}{2}$	—	$2\frac{7}{8}$	—	4	(6)	8	(12)	16	—	—	—
—	$4\frac{5}{8}$	—	—	4	(6)	8	(12)	16	—	—	—
$4\frac{3}{4}$	—	—	—	4	(6)	8	(12)	16	—	—	—
—	$4\frac{7}{8}$	—	—	4	(6)	8	(12)	16	—	—	—
5	—	$2\frac{3}{4}$	—	4	(6)	8	(12)	16	—	—	—
—	$5\frac{1}{8}$	—	—	4	(6)	8	(12)	16	—	—	—
$5\frac{1}{4}$	—	—	—	4	(6)	8	(12)	16	—	—	—
—	$5\frac{3}{8}$	—	—	4	(6)	8	(12)	16	—	—	—
$5\frac{1}{2}$	—	$2\frac{5}{8}$	—	4	(6)	8	(12)	16	—	—	—
—	$5\frac{5}{8}$	—	—	4	(6)	8	(12)	16	—	—	—
$5\frac{3}{4}$	—	—	—	4	(6)	8	(12)	16	—	—	—
—	$5\frac{7}{8}$	—	—	4	(6)	8	(12)	16	—	—	—
6	—	$2\frac{1}{2}$	—	4	(6)	8	(12)	16	—	—	—
—	$6\frac{1}{4}$	—	—	4	(6)	8	(12)	16	—	—	—
$6\frac{1}{2}$	—	—	—	4	(6)	8	(12)	16	—	—	—
—	$6\frac{3}{4}$	—	—	4	(6)	8	(12)	16	—	—	—
7	—	—	—	4	6	8	12	16	—	—	—

[A] Values in parentheses are non-preferred.

COMMENTARY ON TABLE 13A

Whenever the design permits, a "1st choice" diameter should be selected.

In an extreme case, when even a "2nd choice" diameter cannot be utilized, a suitable "3rd choice" diameter should be selected as follows:

a) up to and including $1\frac{1}{2}$ in: the nearest $\frac{1}{32}$ in size;

b) above $1\frac{1}{2}$ in up to and including 6 in: the nearest $\frac{1}{16}$ in size;

c) above 6 in: the nearest $\frac{1}{8}$ in size.

If possible, rather than selecting a "3rd choice" diameter, a "1st choice" or "2nd choice" diameter should be selected from the decimal series given in Table 13B.

The coarsest pitch suitable for the particular design should normally be used. The pitches for which values are given in parentheses have been included for use in special designs, but their general use should be avoided. This recommendation does not apply to extra fine pitches such as those for use in thin walled designs.

Table 13B **Selected thread series (Whit. S.) – Preferred diameters and pitches – Decimal sizes**

1	2	3	4	5	6	7	8	9	10	11	12
Preferred basic major diameters		**Threads per inch**									
		Standard pitches		**Preferred pitches** [A]							
1st choice in	**2nd choice** in	**B.S.W. series**	**B.S.F. series**	**4**	**6**	**8**	**12**	**16**	**20**	**26**	**32**
—	1.4	—	—	—	(6)	(8)	12	(16)	20	(26)	—
1.5	—	6	8	—	—	—	12	(16)	20	(26)	—
—	1.6	—	—	—	(6)	(8)	12	16	20	(26)	—
1.75	—	5	7	—	—	—	12	16	20	(26)	—
—	1.9	—	—	—	(6)	(8)	12	16	20	(26)	—
2.0	—	$4\frac{1}{2}$	7	—	—	—	12	16	20	(26)	—
—	2.1	—	—	—	(6)	8	12	16	(20)	—	—
2.25	—	4	6	—	—	8	12	16	(20)	—	—
—	2.4	—	—	—	(6)	8	12	16	(20)	—	—
2.5	—	4	6	—	—	8	12	16	(20)	—	—
—	2.6	—	—	—	(6)	8	12	16	(20)	—	—
2.75	—	$3\frac{1}{2}$	6	—	—	8	12	16	(20)	—	—
—	2.9	—	—	—	(6)	8	12	16	(20)	—	—
3.0	—	$3\frac{1}{2}$	5	—	(6)	8	12	16	(20)	—	—
—	3.1	—	—	—	(6)	8	(12)	16	—	—	—
3.25	—	$3\frac{1}{4}$	5	—	(6)	8	(12)	16	—	—	—
—	3.4	—	—	—	(6)	8	(12)	16	—	—	—
3.5	—	$3\frac{1}{4}$	$4\frac{1}{2}$	—	(6)	8	(12)	16	—	—	—
—	3.6	—	—	—	(6)	8	(12)	16	—	—	—
3.75	—	3	$4\frac{1}{2}$	—	(6)	8	(12)	16	—	—	—
—	3.9	—	—	—	(6)	8	(12)	16	—	—	—

[A] Values in parentheses are non-preferred.

Table 13B **Selected thread series (Whit. S.) – Preferred diameters and pitches – Decimal sizes** (*continued*)

1	2	3	4	5	6	7	8	9	10	11	12
Preferred basic major diameters		**Threads per inch**									
		Standard pitches		**Preferred pitches** [A]							
1st choice in	**2nd choice** in	**B.S.W. series**	**B.S.F. series**	**4**	**6**	**8**	**12**	**16**	**20**	**26**	**32**
4.0	—	3	$4\frac{1}{2}$	—	(6)	8	(12)	16	—	—	—
—	4.1	—	—	—	(6)	8	(12)	16	—	—	—
4.25	—	—	4	—	(6)	8	(12)	16	—	—	—
—	4.4	—	—	4	(6)	8	(12)	16	—	—	—
4.5	—	$2\frac{7}{8}$	—	4	(6)	8	(12)	16	—	—	—
—	4.6	—	—	4	(6)	8	(12)	16	—	—	—
4.75	—	—	—	4	(6)	8	(12)	16	—	—	—
—	4.9	—	—	4	(6)	8	(12)	16	—	—	—
5.0	—	$2\frac{3}{4}$	—	4	(6)	8	(12)	16	—	—	—
—	5.1	—	—	4	(6)	8	(12)	16	—	—	—
5.25	—	—	—	4	(6)	8	(12)	16	—	—	—
—	5.4	—	—	4	(6)	8	(12)	16	—	—	—
5.5	—	$2\frac{5}{8}$	—	4	(6)	8	(12)	16	—	—	—
—	5.6	—	—	4	(6)	8	(12)	16	—	—	—
5.75	—	—	—	4	(6)	8	(12)	16	—	—	—
—	5.9	—	—	4	(6)	8	(12)	16	—	—	—
6.0	—	$2\frac{1}{2}$	—	4	(6)	8	(12)	16	—	—	—
—	6.25	—	—	4	(6)	8	(12)	16	—	—	—
6.5	—	—	—	4	(6)	8	(12)	16	—	—	—
—	6.75	—	—	4	(6)	8	(12)	16	—	—	—
7.0	—	—	—	4	6	8	12	16	—	—	—

[A] Values in parentheses are non-preferred.

COMMENTARY ON TABLE 13B

Whenever the design permits, a "1st choice" diameter should be selected.

In an extreme case, when even a "2nd choice" diameter cannot be utilized, a suitable "3rd choice" diameter should be selected as follows:

a) up to and including 1.5 in: the nearest 0.030 in size;

b) above 1.5 in up to and including 6 in: the nearest 0.060 in size;

c) above 6 in: the nearest 0.125 in size.

If possible, rather than selecting a "3rd choice" diameter, a "1st choice" or "2nd choice" diameter should be selected from the fractional series given in Table 13A.

The coarsest thread suitable for the particular design should normally be used. The threads for which values are given in parentheses have been included for use in special designs and their general use should be avoided. This recommendation does not apply to extra fine threads such as those for use in thin walled designs.

Table 14 **Selected thread series (Whit. S.) and non-standard threads – Depths of thread for various pitches**

1	2	3	4
Number of threads per inch [A)]	**Pitch**	**Basic depth of thread**	**Twice basic depth of thread**
	in	in	in
40	0.025 00	0.016 0	0.032 0
36	0.027 78	0.017 8	0.035 6
32	0.031 25	0.020 0	0.040 0
28	0.035 71	0.022 9	0.045 8
26	0.038 46	0.024 6	0.049 2
24	0.041 67	0.026 7	0.053 4
20	0.050 00	0.032 0	0.064 0
18	0.055 56	0.035 6	0.071 2
16	0.062 50	0.040 0	0.080 0
14	0.071 43	0.045 7	0.091 4
12	0.083 33	0.053 4	0.106 8
11	0.090 91	0.058 2	0.116 4
10	0.100 00	0.064 0	0.128 0
8	0.125 00	0.080 0	0.160 0
6	0.166 67	0.106 7	0.213 4
4	0.250 00	0.160 1	0.320 2

NOTE Basic effective diameter = basic major diameter − basic depth of thread (Column 3).
Basic minor diameter = basic major diameter − twice basic depth of thread (Column 4).

[A)] The numbers of threads per inch in bold type are to be preferred.

EXAMPLES ILLUSTRATING THE USE OF TABLES 14 TO 20

EXAMPLE 1

External thread 1.25 in — 12 Whit. S. (close)

Internal thread 1.25 in — 12 Whit. S. (medium)

Basic and design sizes for internal thread and external thread:

Major diameter 1.250 0 in

Effective diameter 1.250 0 − 0.053 4 = 1.196 6 in *Table 14*

Minor diameter 1.250 0 − 0.106 8 = 1.143 2 in *Table 14*

Tolerances for external thread (close class):

Effective diameter −0.004 2 in *Table 16*

Major diameter −(0.004 2 + 0.002 9) = −0.007 1 in *Table 16*

Minor diameter −(0.004 2 + 0.003 8) = −0.008 0 in *Table 16*

Tolerances for internal thread (medium class):

Effective diameter +0.006 2 in *Table 17*

Minor diameter +0.023 7 in *Table 17*

Limits:

External thread

Major diameter 1.250 0 in to 1.242 9 in

Effective diameter 1.196 6 in to 1.192 4 in

Minor diameter 1.143 2 in to 1.135 2 in

Internal thread

Major diameter ⩾1.250 0 in

Effective diameter 1.196 6 in to 1.202 8 in

Minor diameter 1.143 2 in to 1.166 9 in

EXAMPLE 2

External thread 0.5 in — 20 Whit. S. (free)

Internal thread 0.5 in — 20 Whit. S. (normal)

Basic sizes for external and internal threads and design sizes for internal thread:

Major diameter 0.500 0 in

Effective diameter 0.500 0 − 0.032 0 = 0.468 0 in *Table 14*

Minor diameter 0.500 0 − 0.064 0 = 0.436 0 in *Table 14*

Design sizes for external thread:

Major diameter:
Basic size − Allowance = 0.500 0 − 0.001 4 = 0.498 6 in *Table 15*

Effective diameter:
Basic size − Allowance = 0.468 0 − 0.001 4 = 0.466 6 in *Table 15*

Minor diameter:
Basic size − Allowance = 0.436 0 − 0.001 4 = 0.434 6 in *Table 15*

Tolerances for external thread (free class):

Effective diameter −0.006 8 in *Table 20*

Major diameter −(0.006 8 + 0.002 2) = −0.009 0 in *Table 20*

Minor diameter −(0.006 8 + 0.004 5) = −0.011 3 in *Table 20*

Tolerances for internal thread (normal class):

Effective diameter +0.006 8 in *Table 19*

Minor diameter +0.017 0 in *Table 19*

Limits:

External thread

Major diameter 0.498 6 in to 0.489 6 in

Effective diameter 0.466 6 in to 0.459 8 in

Minor diameter 0.434 6 in to 0.423 3 in

Internal thread

Major diameter ⩾0.500 0 in

Effective diameter 0.468 0 in to 0.474 8 in

Minor diameter 0.436 0 in to 0.453 0 in

Table 15 **Selected thread series (Whit. S.) and non-standard threads – External threads – Medium and free class – Allowances**

Number of threads per inch [A]	**Allowance on major, effective and minor diameters** in × 0.001				
	Basic major diameter in	**above**	$\frac{1}{8}$	$\frac{1}{4}$	$\frac{1}{2}$
		up to and including	$\frac{1}{4}$	$\frac{1}{2}$	$\frac{3}{4}$
40, 36			1.1	1.2	1.2
32, 28			1.2	1.3	1.3
26, 24			1.2	1.3	1.4
20				1.4	1.5
18, **16**				1.5	1.6
14, **12**					1.8

[A] The numbers of threads per inch in bold type are to be preferred.

Table 16 **Selected thread series (Whit. S.) and non-standard threads – External threads – Close class – Tolerances**

Number of threads per inch [A]	**Tolerance on effective diameter** in × 0.001													**Tolerance on major diameter**	**Tolerance on minor diameter**
	Basic major diameter in	**above**	$\frac{1}{8}$	$\frac{1}{4}$	$\frac{1}{2}$	$\frac{3}{4}$	$1\frac{1}{4}$	**2**	**3**	**4**	**6**	**8**	**11**	**15**	**Add the following to the "tolerance on effective diameter"** in × 0.001	
		up to and including	$\frac{1}{4}$	$\frac{1}{2}$	$\frac{3}{4}$	$1\frac{1}{4}$	**2**	**3**	**4**	**6**	**8**	**11**	**15**	**20**		
40, 36			2.4	2.6	2.8	3.0	3.2								1.7	2.2
32, 28			2.5	2.7	2.9	3.1	3.3								1.9	2.5
26, 24			2.8	3.0	3.1	3.3	3.6	3.8							2.0	2.7
20				3.0	3.2	3.4	3.6	3.9							2.2	2.9
18, **16**				3.4	3.6	3.7	4.0	4.2	4.4	4.7					2.5	3.2
14, **12**					4.0	4.2	4.4	4.6	4.9	5.1					2.9	3.8
11, 10						4.3	4.5	4.7	4.9	5.2	5.5				3.2	4.1
8						4.7	5.0	5.2	5.4	5.7	6.0	6.2			3.5	4.6
6							5.6	5.8	6.0	6.3	6.6	6.8	7.1		4.1	5.3
4								6.6	6.9	7.1	7.4	7.7	8.0	8.3	5.0	6.5

[A] The numbers of threads per inch in bold type are to be preferred.

Table 17 **Selected thread series (Whit. S.) and non-standard threads – Internal threads – Medium class – Tolerances**

Number of threads per inch [A]	**Tolerance on effective diameter** in × 0.001													**Tolerance on minor diameter (Total tolerance)**
	Basic major diameter in	**above**	$\frac{1}{8}$	$\frac{1}{4}$	$\frac{1}{2}$	$\frac{3}{4}$	$1\frac{1}{4}$	**2**	**3**	**4**	**6**	**8**	**11**	**15**	
		up to and including	$\frac{1}{4}$	$\frac{1}{2}$	$\frac{3}{4}$	$1\frac{1}{4}$	**2**	**3**	**4**	**6**	**8**	**11**	**15**	**20**	in × 0.001
40, 36			3.7	4.0	4.2	4.5	4.9								9.6
32, 28			3.8	4.1	4.3	4.6	5.0								11.1
26, 24			4.1	4.4	4.7	5.0	5.4	5.7							13.3
20				4.5	4.8	5.1	5.5	5.8							17.0
18, **16**				5.1	5.3	5.6	6.0	6.3	6.7	7.0					19.5
14, **12**					6.0	6.2	6.6	7.0	7.3	7.7					23.7
11, 10						6.4	6.7	7.1	7.4	7.8	8.2				27.0
8						7.1	7.5	7.8	8.2	8.5	8.9	9.4			32.0
6							8.4	8.7	9.0	9.4	9.8	10.2	10.7		40.3
4								10.0	10.3	10.7	11.1	11.5	11.9	12.4	57.0

[A] The numbers of threads per inch in bold type are to be preferred.

Table 18 **Selected thread series (Whit. S.) and non-standard threads – External threads – Medium class – Tolerances**

Number of threads per inch [A]	**Tolerance on effective diameter** in × 0.001													**Tolerance on major diameter**	**Tolerance on minor diameter**
	Basic major diameter in	**above**	$\frac{1}{8}$	$\frac{1}{4}$	$\frac{1}{2}$	$\frac{3}{4}$	$1\frac{1}{4}$	**2**	**3**	**4**	**6**	**8**	**11**	**15**	**Add the following to the "tolerance on effective diameter"**
		up to and including	$\frac{1}{4}$	$\frac{1}{2}$	$\frac{3}{4}$	$1\frac{1}{4}$	**2**	**3**	**4**	**6**	**8**	**11**	**15**	**20**	in × 0.001	
40, 36			3.7	4.0	4.2	4.5	4.9								1.7	3.3
32, 28			3.8	4.1	4.3	4.6	5.0								1.9	3.8
26, 24			4.1	4.4	4.7	5.0	5.4	5.7							2.0	4.1
20				4.5	4.8	5.1	5.5	5.8							2.2	4.5
18, **16**				5.1	5.3	5.6	6.0	6.3	6.7	7.0					2.5	5.0
14, **12**					6.0	6.2	6.6	7.0	7.3	7.7					2.9	5.8
11, 10						6.4	6.7	7.1	7.4	7.8	8.2				3.2	6.3
8						7.1	7.5	7.8	8.2	8.5	8.9	9.4			3.5	7.1
6							8.4	8.7	9.0	9.4	9.8	10.2	10.7		4.1	8.2
4								10.0	10.3	10.7	11.1	11.5	11.9	12.4	5.0	10.0

[A] The numbers of threads per inch in bold type are to be preferred.

Table 19 **Selected thread series (Whit. S.) and non-standard threads – Internal threads – Normal class – Tolerances**

Number of threads per inch [A]	**Tolerance on effective diameter** in × 0.001													**Tolerance on minor diameter (Total tolerance)**
	Basic major diameter in	**above**	$\frac{1}{8}$	$\frac{1}{4}$	$\frac{1}{2}$	$\frac{3}{4}$	**1** $\frac{1}{4}$	**2**	**3**	**4**	**6**	**8**	**11**	**15**	
		up to and including	$\frac{1}{4}$	$\frac{1}{2}$	$\frac{3}{4}$	**1** $\frac{1}{4}$	**2**	**3**	**4**	**6**	**8**	**11**	**15**	**20**	in × 0.001
40, 36			5.6	6.0	6.3	6.8	7.3								9.6
32, 28			5.7	6.2	6.5	6.9	7.5								11.1
26, 24			6.2	6.7	7.1	7.5	8.0	8.6							13.3
20				6.8	7.2	7.7	8.2	8.7							17.0
18, **16**				7.6	8.0	8.4	9.0	9.5	10.0	10.6					19.5
14, **12**					8.9	9.4	9.9	10.4	10.9	11.5					23.7
11, 10						9.6	10.1	10.7	11.1	11.7	12.3				27.0
8						10.7	11.2	11.8	12.2	12.8	13.4	14.0			32.0
6							12.5	13.1	13.6	14.1	14.8	15.4	16.1		40.3
4								14.9	15.4	16.0	16.6	17.2	17.9	18.7	57.0

[A] The numbers of threads per inch in bold type are to be preferred.

Table 20 **Selected thread series (Whit. S.) and non-standard threads – External threads – Free class – Tolerances**

Number of threads per inch [A]	**Tolerance on effective diameter** in × 0.001													**Tolerance on major diameter**	**Tolerance on minor diameter**
	Basic major diameter in	**above**	$\frac{1}{8}$	$\frac{1}{4}$	$\frac{1}{2}$	$\frac{3}{4}$	**1** $\frac{1}{4}$	**2**	**3**	**4**	**6**	**8**	**11**	**15**	**Add the following to the "tolerance on effective diameter"** in × 0.001	
		up to and including	$\frac{1}{4}$	$\frac{1}{2}$	$\frac{3}{4}$	**1** $\frac{1}{4}$	**2**	**3**	**4**	**6**	**8**	**11**	**15**	**20**		
26, 24			6.2	6.7	7.1	7.5	8.0	8.6							2.0	4.1
20				6.8	7.2	7.7	8.2	8.7							2.2	4.5
18, **16**				7.6	8.0	8.4	9.0	9.5	10.0	10.6					2.5	5.0
14, **12**					8.9	9.4	9.9	10.4	10.9	11.5					2.9	5.8
11, 10						9.6	10.1	10.7	11.1	11.7	12.3				3.2	6.3
8						10.7	11.2	11.8	12.2	12.8	13.4	14.0			3.5	7.1
6							12.5	13.1	13.6	14.1	14.8	15.4	16.1		4.1	8.2
4								14.9	15.4	16.0	16.6	17.2	17.9	18.7	5.0	10.0

[A] The numbers of threads per inch in bold type are to be preferred.

Annex A (normative) Truncated Whitworth form threads with flat crests

A.1 Profile of truncated Whitworth threads

The basic profile and design profile of truncated Whitworth threads shall be as specified for a Whitworth thread, with the rounded crests at the major diameter of the external thread and at the minor diameter of the internal thread removed at their junctions with the flanks, as illustrated in Figure A.1.

NOTE In the case of internal threads of standard Whitworth form, because of the relatively large tolerance on the minor diameter of the thread, the form of the crest at the minor diameter can vary between the basic rounding at the minimum minor diameter and a flat at the maximum minor diameter. For an internal thread of truncated Whitworth form in accordance with ***A.1****, the crest at the minor diameter will always be flat, the minimum minor diameter corresponding to the point of tangency of the radius of the standard Whitworth form thread and the maximum minor diameter to that specified for the standard Whitworth form thread.*

A.2 Limits and tolerances

A.2.1 General

Limits and tolerances on truncated Whitworth form threads, except for the limits and tolerances on the major diameter of external threads and on the minor diameter of internal threads, shall be as specified for the corresponding standard Whitworth form threads.

Limits and tolerances on the major diameter of external threads and the minor diameter of internal threads shall be as specified in **A.2.2**.

A.2.2 Limits and tolerances on the major diameter of external threads and the minor diameter of internal threads

*COMMENTARY ON **A.2.2***

Figure A.1 shows the tolerance zones of a close class external truncated thread and a medium class internal truncated thread. In the case of the external thread, the design size of the major diameter is reduced by an amount, U, equal to double the depth of the normal rounded crest, which is equal to 0.147 835P. U is twice the distance, measured normal to the axis, from the intersection of the radius, r, with the flank of the thread to the basic major diameter. This is shown in Figure A.1. In the case of the internal thread, the design size of the minor diameter is increased by the same amount.

The tolerances on the flat crests at the major diameter of the external thread and on the flat crests at the minor diameter of the internal thread are denoted by A and B respectively. For any one pitch, these tolerances remain unchanged for all recommended combinations of classes of external threads and internal threads.

The following formulae are used for determining A and B:

$U + A = 0.2P + 0.003$ in

A is the difference between the rounded-off values of (U + A) and U.

In the case of the internal thread, the upper limit of tolerance for the flat crests at the minor diameter is the same as that for threads of standard Whitworth form, so that:

$U + B = 0.2P + 0.004$ in for 26 t.p.i. and finer

$0.2P + 0.005$ in for 24 t.p.i. and 22 t.p.i.

$0.2P + 0.007$ in for 20 t.p.i. and coarser

B is the difference between the rounded-off values of (U + B) and U.

The basic major diameter of external threads and the basic minor diameter of internal threads shall be as specified in Table A.1.

Limits and tolerances on the major diameter of external threads and the minor diameter of internal threads shall be as specified in Table A.2 for truncated threads of British Standard Whitworth (B.S.W.) form and as specified in Table A.3 for truncated threads of British Standard Fine (B.S.F.) form.

A.3 Designation

Truncated Whitworth form threads shall be designated using the designation system specified in Clause **10**, followed by "trunc.".

A.4 Gauging system

The following limit-gauging system shall be used for controlling truncated Whitworth form threads:

a) for external threads:

   1) GO screw ring or calliper gauge;

   2) NOT GO effective diameter calliper gauge;

   3) GO plain calliper gauge for flat crests;

   4) NOT GO plain calliper gauge for flat crests;

b) for internal threads:

   1) GO screw plug gauge;

   2) NOT GO effective diameter plug gauge;

   3) GO plain plug gauge for flat crests;

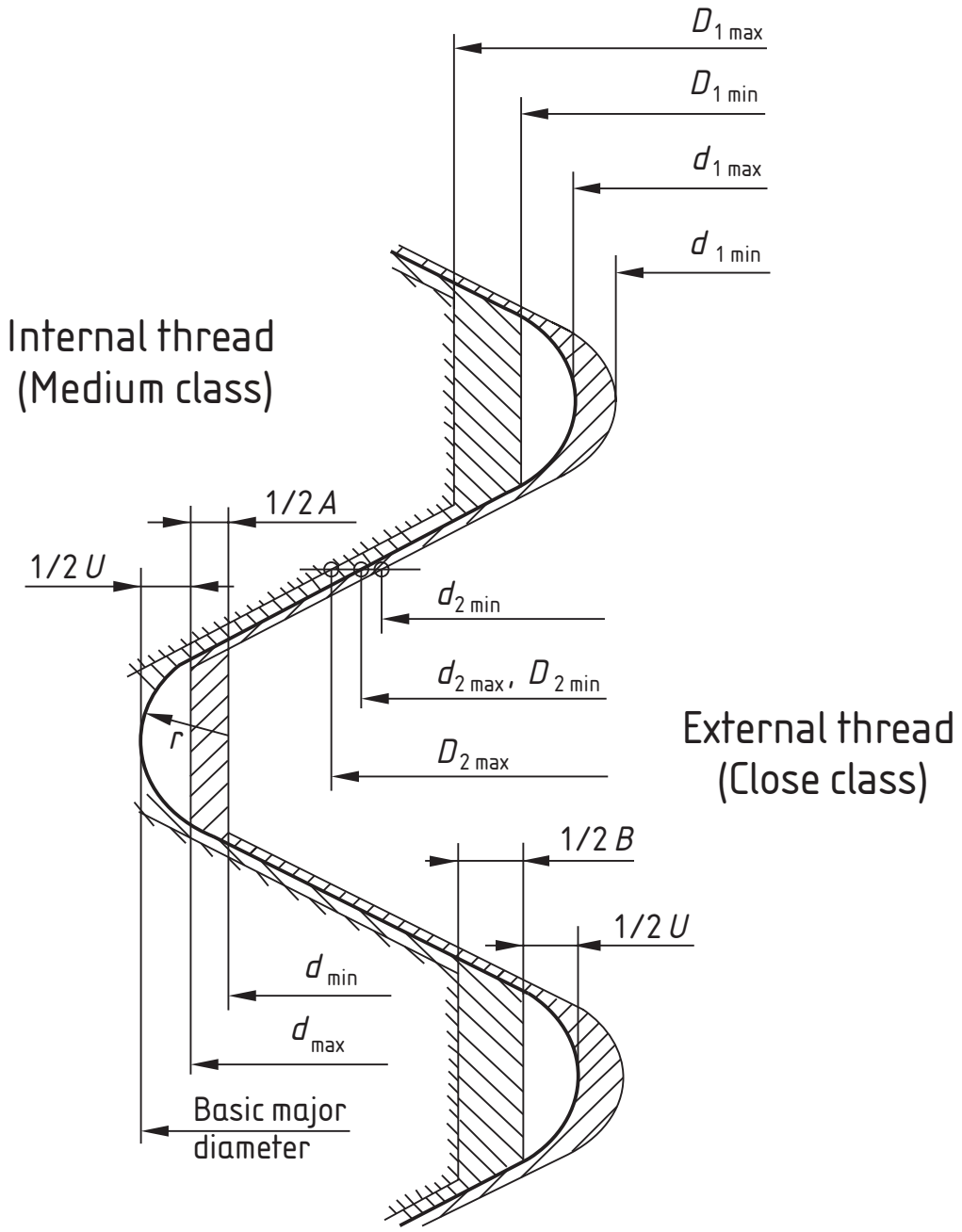
   4) NOT GO plain plug gauge for flat crests.

NOTE 1 For ensuring assembly between parts, both of which have truncated threads, the two GO screw gauges [a)1) and b)1)] may also have truncated threads. However, the roots of the threads of these gauges should not be cleared, but should conform to the normal Whitworth form threads at the roots, in order to control possible eccentricity between the flat crests of the truncated threads on the parts and their effective diameters. On the other hand, for ensuring assembly between parts made by one manufacturer which have truncated threads and parts made by another manufacturer which might have normal Whitworth form threads, it is essential that the two GO screw gauges for the truncated threads have normal rounded crests as well as normal rounded roots.

Generally, therefore, it is recommended that the two GO screw gauges for truncated threads should have normal (full form) Whitworth threads. The threads of the two NOT GO effective diameter gauges should be cleared at the crests and roots in accordance with BS 919-2.

NOTE 2 The GO plain calliper gauge and the GO plain plug gauge [a)3) and b)3)] are not strictly essential, if the GO screw gauges have normal rounded roots, as recommended in Note 1. However, if the workpiece does not pass the GO screw gauges, these plain GO gauges for the crests of the thread can be used to determine whether the flat crest diameter of the internal thread is too large, or the flat minor diameter of the of the internal thread is too small.

Figure A.1 **Tolerance zones for truncated Whitworth threads (close class external thread and medium class internal thread) [$\frac{1}{4}$ in B.S.W. (20 t.p.i.) illustrated]**



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

Table A.1 **Truncated threads – Whitworth form – Basic data**

1	2	3	4	5
Number of threads per inch	**External thread – major diameter**		**Internal thread – minor diameter**	
	Nominal truncation, U [A)] in × 0.001	**Tolerance on truncated major diameter, A** [A)] in × 0.001	**Nominal truncation, U** [A)] in × 0.001	**Tolerance on truncated minor diameter, B** [A)] in × 0.001
40	3.7	4.3	3.7	5.3
36	4.1	4.5	4.1	5.5
32	4.6	4.6	4.6	5.6
28	5.3	4.8	5.3	5.8
26	5.7	5.0	5.7	6.0
24	6.2	5.1	6.2	7.1
22	6.7	5.4	6.7	7.4
20	7.4	5.6	7.4	9.6
19	7.8	5.7	7.8	9.7
18	8.2	5.9	8.2	9.9
16	9.2	6.3	9.2	10.3
14	10.6	6.7	10.6	10.7
12	12.3	7.4	12.3	11.4
11	13.4	7.8	13.4	11.8
10	14.8	8.2	14.8	12.2
9	16.4	8.8	16.4	12.8
8	18.5	9.5	18.5	13.5
7	21.1	10.5	21.1	14.5
6	24.6	11.7	24.6	15.7
5	29.6	13.4	29.6	17.4
4.5	32.9	14.5	32.9	18.5
4	37.0	16.0	37.0	20.0
3.5	42.2	17.9	42.2	21.9
3.25	45.5	19.0	45.5	23.0
3	49.3	20.4	49.3	24.4
2.875	51.4	21.2	51.4	25.2
2.75	53.8	21.9	53.8	25.9
2.625	56.3	22.9	56.3	26.9
2.5	59.1	23.9	59.1	27.9

NOTE 1 To obtain the upper limit for the major diameter of the truncated thread of a close class external thread, subtract the value in Column 2 from its basic major diameter. To obtain the upper limit for the major diameter of the truncated thread of a medium or free class external thread subtract the sum of the appropriate allowance, if any, and the value in Column 2 from its basic major diameter. To obtain the lower limit for the minor diameter of the truncated thread of an internal thread, add the value in Column 4 to its basic minor diameter.

A) See Figure A.1.

Table A.2 **Truncated threads – British Standard Whitworth (B.S.W.) series – External and internal threads – All classes – Limits and tolerances**

1	2	3	4	5	6	7	8	9	10	11
Nominal size	**Number of threads per inch**	**External thread – major diameter close class**			**External thread – major diameter medium and free classes**			**Internal thread – minor diameter all classes**		
		Max.	**Tol.**	**Min.**	**Max.**	**Tol.**	**Min.**	**Max.**	**Tol.**	**Min.**
in		in	in	in	in	in	in	in	in	in
$\frac{1}{8}$	40	0.121 3	0.004 3	0.117 0	0.120 1	0.004 3	0.115 8	0.102 0	0.005 3	0.096 7
$\frac{3}{16}$	24	0.181 3	0.005 1	0.176 2	0.180 1	0.005 1	0.175 0	0.147 4	0.007 1	0.140 3
$\frac{1}{4}$	20	0.242 6	0.005 6	0.237 0	0.241 4	0.005 6	0.235 8	0.203 0	0.009 6	0.193 4
$\frac{5}{16}$	18	0.304 3	0.005 9	0.298 4	0.303 0	0.005 9	0.297 1	0.259 4	0.009 9	0.249 5
$\frac{3}{8}$	16	0.365 8	0.006 3	0.359 5	0.364 4	0.006 3	0.358 1	0.314 5	0.010 3	0.304 2
$\frac{7}{16}$	14	0.426 9	0.006 7	0.420 2	0.425 4	0.006 7	0.418 7	0.367 4	0.010 7	0.356 7
$\frac{1}{2}$	12	0.487 7	0.007 4	0.480 3	0.486 2	0.007 4	0.478 8	0.416 9	0.011 4	0.405 5
$\frac{9}{16}$	12	0.550 2	0.007 4	0.542 8	0.548 6	0.007 4	0.541 2	0.479 4	0.011 4	0.468 0
$\frac{5}{8}$	11	0.611 6	0.007 8	0.603 8	0.609 9	0.007 8	0.602 1	0.533 8	0.011 8	0.522 0
$\frac{11}{16}$	11	0.674 1	0.007 8	0.666 3	0.672 4	0.007 8	0.664 6	0.596 3	0.011 8	0.584 5
$\frac{3}{4}$	10	0.735 2	0.008 2	0.727 0	0.733 4	0.008 2	0.725 2	0.649 0	0.012 2	0.636 8
$\frac{7}{8}$	9	0.858 6	0.008 8	0.849 8				0.762 0	0.012 8	0.749 2
1	8	0.981 5	0.009 5	0.972 0				0.872 0	0.013 5	0.858 5
$1\frac{1}{8}$	7	1.103 9	0.010 5	1.093 4				0.977 6	0.014 5	0.963 1
$1\frac{1}{4}$	7	1.228 9	0.010 5	1.218 4				1.102 6	0.014 5	1.088 1
$1\frac{1}{2}$	6	1.475 4	0.011 7	1.463 7				1.326 9	0.015 7	1.311 2
$1\frac{3}{4}$	5	1.720 4	0.013 4	1.707 0				1.540 8	0.017 4	1.523 4
2	4.5	1.967 1	0.014 5	1.952 6				1.766 8	0.018 5	1.748 3
$2\frac{1}{4}$	4	2.213 0	0.016 0	2.197 0	The limits and tolerances for nominal sizes above $\frac{3}{4}$ in are the same as those of the corresponding sizes of close class external threads.			1.986 8	0.020 0	1.966 8
$2\frac{1}{2}$	4	2.463 0	0.016 0	2.447 0				2.236 8	0.020 0	2.216 8
$2\frac{3}{4}$	3.5	2.707 8	0.017 9	2.689 9				2.448 1	0.021 9	2.426 2
3	3.5	2.957 8	0.017 9	2.939 9				2.698 1	0.021 9	2.676 2
$3\frac{1}{4}$	3.25	3.204 5	0.019 0	3.185 5				2.924 5	0.023 0	2.901 5
$3\frac{1}{2}$	3.25	3.454 5	0.019 0	3.435 5				3.174 5	0.023 0	3.151 5
$3\frac{3}{4}$	3	3.700 7	0.020 4	3.680 3				3.396 9	0.024 4	3.372 5
4	3	3.950 7	0.020 4	3.930 3				3.646 9	0.024 4	3.622 5
$4\frac{1}{2}$	2.875	4.448 6	0.021 2	4.427 4				4.131 2	0.025 2	4.106 0
5	2.75	4.946 2	0.021 9	4.924 3				4.614 1	0.025 9	4.588 2
$5\frac{1}{2}$	2.625	5.443 7	0.022 9	5.420 8				5.095 4	0.026 9	5.068 5
6	2.5	5.940 9	0.023 9	5.917 0				5.574 8	0.027 9	5.546 9

Table A.3 **Truncated threads – British Standard Fine (B.S.F.) series – External and internal threads – All classes – Limits and tolerances**

1	2	3	4	5	6	7	8	9	10	11
Nominal size	**Number of threads per inch**	**External thread – major diameter close class**			**External thread – major diameter medium and free classes**			**Internal thread – minor diameter all classes**		
		Max.	**Tol.**	**Min.**	**Max.**	**Tol.**	**Min.**	**Max.**	**Tol.**	**Min.**
in		in	in	in	in	in	in	in	in	in
$\frac{3}{16}$	32	0.182 9	0.004 6	0.178 3	0.181 8	0.004 6	0.177 2	0.157 7	0.005 6	0.152 1
$\frac{7}{32}$	28	0.213 5	0.004 8	0.208 7	0.212 4	0.004 8	0.207 6	0.184 1	0.005 8	0.178 3
$\frac{1}{4}$	26	0.244 3	0.005 0	0.239 3	0.243 2	0.005 0	0.238 2	0.212 5	0.006 0	0.206 5
$\frac{9}{32}$	26	0.275 5	0.005 0	0.270 5	0.274 3	0.005 0	0.269 3	0.243 7	0.006 0	0.237 7
$\frac{5}{16}$	22	0.305 8	0.005 4	0.300 4	0.304 6	0.005 4	0.299 2	0.268 4	0.007 4	0.261 0
$\frac{3}{8}$	20	0.367 6	0.005 6	0.362 0	0.366 3	0.005 6	0.360 7	0.328 0	0.009 6	0.318 4
$\frac{7}{16}$	18	0.429 3	0.005 9	0.423 4	0.427 9	0.005 9	0.422 0	0.384 4	0.009 9	0.374 5
$\frac{1}{2}$	16	0.490 8	0.006 3	0.484 5	0.489 3	0.006 3	0.483 0	0.439 5	0.010 3	0.429 2
$\frac{9}{16}$	16	0.553 3	0.006 3	0.547 0	0.551 8	0.006 3	0.545 5	0.502 0	0.010 3	0.491 7
$\frac{5}{8}$	14	0.614 4	0.006 7	0.607 7	0.612 8	0.006 7	0.606 1	0.554 9	0.010 7	0.544 2
$\frac{11}{16}$	14	0.676 9	0.006 7	0.670 2	0.675 2	0.006 7	0.668 5	0.617 4	0.010 7	0.606 7
$\frac{3}{4}$	12	0.737 7	0.007 4	0.730 3	0.735 9	0.007 4	0.728 5	0.666 9	0.011 4	0.655 5
$\frac{7}{8}$	11	0.861 6	0.007 8	0.853 8				0.783 8	0.011 8	0.772 0
1	10	0.985 2	0.008 2	0.977 0				0.899 0	0.012 2	0.886 8
$1\frac{1}{8}$	9	1.108 6	0.008 8	1.099 8				1.012 0	0.012 8	0.999 2
$1\frac{1}{4}$	9	1.233 6	0.008 8	1.224 8	The limits and tolerances for nominal sizes above $\frac{3}{4}$ in are the same as those of the corresponding sizes of close class external threads.			1.137 0	0.012 8	1.124 2
$1\frac{3}{8}$	8	1.356 5	0.009 5	1.347 0				1.247 0	0.013 5	1.233 5
$1\frac{1}{2}$	8	1.481 5	0.009 5	1.472 0				1.372 0	0.013 5	1.358 5
$1\frac{5}{8}$	8	1.606 5	0.009 5	1.597 0				1.497 0	0.013 5	1.483 5
$1\frac{3}{4}$	7	1.728 9	0.010 5	1.718 4				1.602 6	0.014 5	1.588 1
2	7	1.978 9	0.010 5	1.968 4				1.852 6	0.014 5	1.838 1
$2\frac{1}{4}$	6	2.225 4	0.011 7	2.213 7				2.076 9	0.015 7	2.061 2
$2\frac{1}{2}$	6	2.475 4	0.011 7	2.463 7				2.326 9	0.015 7	2.311 2
$2\frac{3}{4}$	6	2.725 4	0.011 7	2.713 7				2.576 9	0.015 7	2.561 2
3	5	2.970 4	0.013 4	2.957 0				2.790 8	0.017 4	2.773 4

Annex B (informative) Bases of tolerances and allowances for Whitworth form screw threads

B.1 General

In deciding upon suitable bases for calculating tolerances and allowances for Whitworth form screw threads, the aim has been to provide a minimum number of simple formulae which would be applicable to the several classes and to all reasonable combinations of diameter and pitch. The formulae adopted give tolerances sufficiently large for the usual methods of screw thread manufacture but not so large that the satisfactory functioning of the screw threads is impaired.

B.2 Tolerance classes

The relative magnitudes and positions of the effective diameter tolerance zones for the close, medium and free classes of external threads and the medium and normal classes of internal threads are specified in Figure 2.

The tolerances on the effective diameter of close class external threads and close class internal threads are two thirds of the tolerances on the effective diameter of medium class external threads and medium class internal threads, respectively.

The tolerances on the effective diameter of free class external threads and normal class internal threads are one and a half times the tolerances on the effective diameter of medium class external threads and medium class internal threads, respectively.

Since it is more difficult to control the threading of internal threads than of external threads the recommended classes of internal threads to be associated with close class and medium class external threads have effective diameter tolerances 50% greater than those of the associated external threads.

B.3 Allowances

The free class and medium class external threads of nominal sizes $\frac{3}{4}$ in down to $\frac{1}{4}$ in have an allowance equal to 30% of the tolerance on the effective diameter of a medium class external thread. The allowance for nominal sizes less than $\frac{1}{4}$ in is the same as that for $\frac{1}{4}$ in.

Close class external threads have no allowance.

B.4 Tolerances on effective diameter

The tolerances, T_{d2}, on the effective diameter of medium class external threads, in inches, specified in this British Standard have been calculated from the following equation:

$$T_{d2} = 0.002\sqrt[3]{d} + 0.003\sqrt{L_e} + 0.005\sqrt{P}$$

where:

d is the major diameter of the thread in inches;

L_e is the length of engagement in inches;

P is the pitch in inches.

The tolerances, T_{D2}, on the effective diameter of medium class internal threads, in inches, specified in this British Standard have been calculated from the following equation:

$$T_{D2} = 0.002\sqrt[3]{D} + 0.003\sqrt{L_e} + 0.005\sqrt{P}$$

where:

D is the major diameter of the thread in inches;

L_e is the length of engagement in inches;

P is the pitch in inches.

Tolerances on the effective diameter of close class and normal class internal threads and close class and free class external threads have been obtained by multiplying the values obtained from these formulae by the factors given in **B.2**.

The tolerances on the effective diameter given in Table 2 to Table 6 and Table 8 to Table 12, for the B.S.W. and B.S.F. series respectively, are based on a length of engagement equal to the nominal diameter of the thread, this length being approximately equal to that of a standard internal thread.

The tolerances on the effective diameter given in Table 16 to Table 20 for Whitworth Special threads are based on a length of engagement of ten pitches ($10P$) as this length of engagement approximates to that commonly used in practice for such threads.

B.5 Tolerances on major diameter

B.5.1 External threads

The tolerances on the major diameter of external threads have been derived from the tolerances on the effective diameter by adding $0.01\sqrt{P}$. This rule has been applied to all three classes of external threads.

B.5.2 Internal threads

No tolerances are specified for the major diameter of internal threads. Only the minimum size is specified, which is the same as the basic major diameter. This is because the major diameter of internal threads is effectively controlled by the major diameter of the taps or other screwing tools used.

B.6 Tolerances on minor diameter

B.6.1 External threads

The tolerances on the minor diameter of external threads are related to the corresponding tolerances on the effective diameter, since the root of the external thread is formed in the same manufacturing operation as the flanks. Account also has to be taken of the fact that wear on the cutting or forming tool is greater on the crest of the thread than on the flanks. This is commonly allowed for in practice by making the crests of the thread on the tool to a smaller radius than the basic root radius of the external thread.

The tolerances on the minor diameter of external threads have been derived from the tolerances on the effective diameter by adding $0.013\sqrt{P}$ for close class external threads and $0.02\sqrt{P}$ for medium class and free class external threads.

B.6.2 Internal threads

The tolerances on the minor diameter of all classes of internal threads have been derived as follows:

- for 26 t.p.i. and finer: $0.2P + 0.004$ in;
- for 24 t.p.i. and 22 t.p.i: $0.2P + 0.005$ in;
- for 20 t.p.i. and coarser: $0.2P + 0.007$ in.

B.7 Minimum depths of engagement

The tolerances on the major diameter of external threads and the tolerances on the minor diameter of internal threads, in conjunction with the allowance, if any, provide a minimum depth of engagement of approximately 50% of the basic thread depth.

Annex C (informative) Tolerances on pitch and flank angle in relation to tolerance on 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 inches, between the simple effective diameter (see **3.1.1**) and the virtual effective diameter is given by the following equation:

$$D_{ep} = 1.921 \times \delta P$$

where:

δP is the maximum error in the axial displacement between any two points on a Whitworth form screw thread within the length of engagement, in inches.

C.2 Effects of errors in flank angle

An error in one or both of the flank angles increases the effective diameter of an internal thread and decreases the effective diameter of an external 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 inches, between the simple effective diameter (see **3.1.1**) and the virtual effective diameter is given by the following equation:

$$D_{ef} = 0.0105 \times P \times (\delta a_1 + \delta a_2)$$

where:

P is the pitch of the thread, in inches;

$(\delta a_1 + \delta a_2)$ 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

The simple effective diameter and virtual effective diameter of internal and external threads should be as follows.

a) *External threads.* The simple effective diameter of an external thread (as measured along the pitch line of the thread) should lie between the limits specified for that diameter. In addition, the virtual effective diameter should not exceed the upper limit stated for the effective diameter.

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

When an external thread or an internal thread is inspected with a GO screw gauge made to the design sizes, 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 angles 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 class. In any particular case, the maximum permissible combined effects of pitch and flank angle errors will 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 thread having its simple effective diameter on the upper limit, no errors at all can 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 reserved for compensating for the effects of errors in pitch and flank angle which are invariably present to some extent.

Annex D (informative) Form of the crests of Whitworth threads

D.1 General

It is not necessary for the crests of Whitworth threads to have a perfect radiused form. Provided that the crests fall within the tolerance zones defined in Figure 3, Figure 4 and Figure 5, their exact shape is not critical.

Typical crest forms obtained in the commercial manufacture of internal threads and external threads are shown in Figure D.1. These are not perfectly radiused crests but are acceptable provided that the crest diameters (major diameter of external thread, minor diameter of internal thread) fall within the specified limits of size.

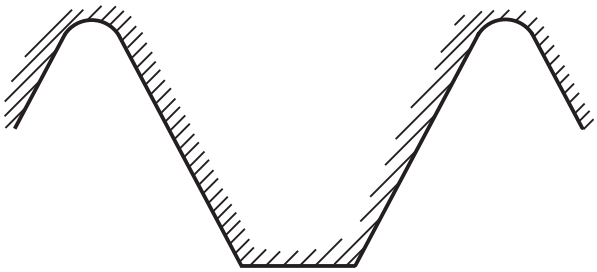
D.2 Internal threads

To ease the tapping operation and obtain the maximum life from screwing taps, the recommended tapping drill sizes given in BS 1157 are the largest standard sizes of drill which should be used to produce holes of sizes towards the upper limit of the relevant internal thread minor diameter. The use of such drills results in flat crested threads, as illustrated in Figure D.1a). An internal thread formed by flutless or rolled thread tapping is illustrated in Figure D.1b).

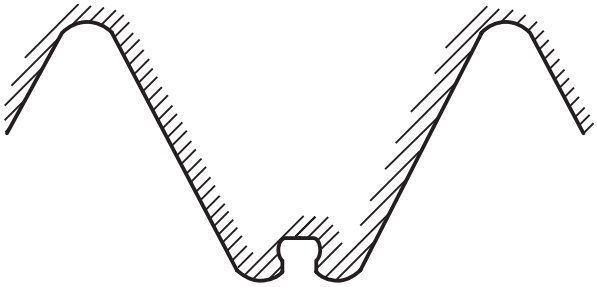
D.3 External threads

A typical form of crest produced by the thread rolling process is illustrated in Figure D.1c). A typical form of crest produced by a thread cutting die is illustrated in Figure D.1d).

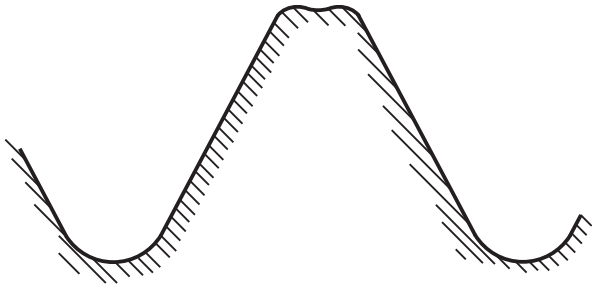
Figure D.1 **Crest forms resulting from different production methods**



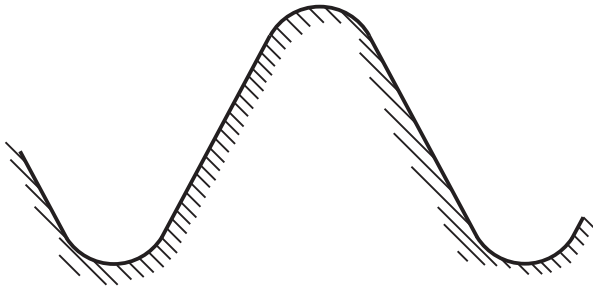
a) Typical crest on tapped internal thread



b) Typical crest on rolled internal thread



c) Typical crest on rolled external thread



d) Typical crest on die cut external thread

Annex E (normative) Limits and tolerances for close class internal threads for special uses

The limits and tolerances for the major diameter, effective diameter and minor diameter of close tolerance class internal threads for special uses shall be as specified in Table E.1, Table E.2 and Table E.3.

Table E.1 **Coarse thread series (B.S.W.) – Internal threads – Close class – Limits and tolerances**

1	2	3	4	5	6	7	8	9
Nominal size	**Number of threads per inch**	**Major diameter**	**Effective diameter**			**Minor diameter**		
		Min.	**Max.**	**Tol.**	**Min.**	**Max.**	**Tol.**	**Min.**
in		in	in	in	in	in	in	in
$\frac{1}{8}$	40	0.125 0	0.110 9	0.001 9	0.109 0	0.102 0	0.009 0	0.093 0
$\frac{3}{16}$	24	0.187 5	0.163 1	0.002 3	0.160 8	0.147 4	0.013 3	0.134 1
$\frac{1}{4}$	20	0.250 0	0.220 6	0.002 6	0.218 0	0.203 0	0.017 0	0.186 0
$\frac{5}{16}$	18	0.312 5	0.279 7	0.002 8	0.276 9	0.259 4	0.018 1	0.241 3
$\frac{3}{8}$	16	0.375 0	0.338 0	0.003 0	0.335 0	0.314 5	0.019 5	0.295 0
$\frac{7}{16}$	14	0.437 5	0.395 0	0.003 2	0.391 8	0.367 4	0.021 3	0.346 1
$\frac{1}{2}$	12	0.500 0	0.450 0	0.003 4	0.446 6	0.416 9	0.023 7	0.393 2
$\frac{9}{16}$	12	0.562 5	0.512 7	0.003 6	0.509 1	0.479 4	0.023 7	0.455 7
$\frac{5}{8}$	11	0.625 0	0.570 5	0.003 7	0.566 8	0.533 8	0.025 2	0.508 6
$\frac{11}{16}$	11	0.687 5	0.633 1	0.003 8	0.629 3	0.596 3	0.025 2	0.571 1
$\frac{3}{4}$	10	0.750 0	0.690 0	0.004 0	0.686 0	0.649 0	0.027 0	0.622 0
$\frac{7}{8}$	9	0.875 0	0.808 2	0.004 3	0.803 9	0.762 0	0.029 2	0.732 8
1	8	1.000 0	0.924 5	0.004 5	0.920 0	0.872 0	0.032 0	0.840 0
$1\frac{1}{8}$	7	1.125 0	1.038 3	0.004 8	1.033 5	0.977 6	0.035 6	0.942 0
$1\frac{1}{4}$	7	1.250 0	1.163 4	0.004 9	1.158 5	1.102 6	0.035 6	1.067 0
$1\frac{1}{2}$	6	1.500 0	1.398 6	0.005 3	1.393 3	1.326 9	0.040 3	1.286 6
$1\frac{3}{4}$	5	1.750 0	1.627 6	0.005 7	1.621 9	1.540 8	0.047 0	1.493 8
2	4.5	2.000 0	1.863 8	0.006 1	1.857 7	1.766 8	0.051 4	1.715 4
$2\frac{1}{4}$	4	2.250 0	2.096 3	0.006 4	2.089 9	1.986 8	0.057 0	1.929 8
$2\frac{1}{2}$	4	2.500 0	2.346 5	0.006 6	2.339 9	2.236 8	0.057 0	2.179 8
$2\frac{3}{4}$	3.5	2.750 0	2.574 0	0.007 0	2.567 0	2.448 1	0.064 1	2.384 0
3	3.5	3.000 0	2.824 2	0.007 2	2.817 0	2.698 1	0.064 1	2.634 0
$3\frac{1}{4}$	3.25	3.250 0	3.060 4	0.007 4	3.053 0	2.924 5	0.068 5	2.856 0
$3\frac{1}{2}$	3.25	3.500 0	3.310 6	0.007 6	3.303 0	3.174 5	0.068 5	3.106 0
$3\frac{3}{4}$	3	3.750 0	3.544 5	0.007 9	3.536 6	3.396 9	0.073 7	3.323 2
4	3	4.000 0	3.794 6	0.008 0	3.786 6	3.646 9	0.073 7	3.573 2
$4\frac{1}{2}$	2.875	4.500 0	4.285 7	0.008 4	4.277 3	4.131 2	0.076 6	4.054 6
5	2.75	5.000 0	4.776 0	0.008 8	4.767 2	4.614 1	0.079 7	4.534 4
$5\frac{1}{2}$	2.625	5.500 0	5.265 2	0.009 1	5.256 1	5.095 4	0.083 2	5.012 2
6	2.5	6.000 0	5.753 3	0.009 4	5.743 9	5.574 8	0.087 0	5.487 8

Table E.2 **Fine thread series (B.S.F.) – Internal threads – Close class – Limits and tolerances**

1	2	3	4	5	6	7	8	9
Nominal size	**Number of threads per inch**	**Major diameter**	**Effective diameter**			**Minor diameter**		
		Min.	**Max.**	**Tol.**	**Min.**	**Max.**	**Tol.**	**Min.**
in		in	in	in	in	in	in	in
$\frac{3}{16}$	32	0.187 5	0.169 7	0.002 2	0.167 5	0.157 7	0.010 2	0.147 5
$\frac{7}{32}$	28	0.218 8	0.198 3	0.002 4	0.195 9	0.184 1	0.011 1	0.173 0
$\frac{1}{4}$	26	0.250 0	0.227 9	0.002 5	0.225 4	0.212 5	0.011 7	0.200 8
$\frac{9}{32}$	26	0.281 2	0.259 2	0.002 6	0.256 6	0.243 7	0.011 7	0.232 0
$\frac{5}{16}$	22	0.312 5	0.286 1	0.002 7	0.283 4	0.268 4	0.014 1	0.254 3
$\frac{3}{8}$	20	0.375 0	0.345 9	0.002 9	0.343 0	0.328 0	0.017 0	0.311 0
$\frac{7}{16}$	18	0.437 5	0.405 0	0.003 1	0.401 9	0.384 4	0.018 1	0.366 3
$\frac{1}{2}$	16	0.500 0	0.463 3	0.003 3	0.460 0	0.439 5	0.019 5	0.420 0
$\frac{9}{16}$	16	0.562 5	0.525 9	0.003 4	0.522 5	0.502 0	0.019 5	0.482 5
$\frac{5}{8}$	14	0.625 0	0.582 9	0.003 6	0.579 3	0.554 9	0.021 3	0.533 6
$\frac{11}{16}$	14	0.687 5	0.645 5	0.003 7	0.641 8	0.617 4	0.021 3	0.596 1
$\frac{3}{4}$	12	0.750 0	0.700 5	0.003 9	0.696 6	0.666 9	0.023 7	0.643 2
$\frac{7}{8}$	11	0.875 0	0.821 0	0.004 2	0.816 8	0.783 8	0.025 2	0.758 6
1	10	1.000 0	0.940 4	0.004 4	0.936 0	0.899 0	0.027 0	0.872 0
$1\frac{1}{8}$	9	1.125 0	1.058 5	0.004 6	1.053 9	1.012 0	0.029 2	0.982 8
$1\frac{1}{4}$	9	1.250 0	1.183 7	0.004 8	1.178 9	1.137 0	0.029 2	1.107 8
$1\frac{3}{8}$	8	1.375 0	1.300 0	0.005 0	1.295 0	1.247 0	0.032 0	1.215 0
$1\frac{1}{2}$	8	1.500 0	1.425 2	0.005 2	1.420 0	1.372 0	0.032 0	1.340 0
$1\frac{5}{8}$	8	1.625 0	1.550 3	0.005 3	1.545 0	1.497 0	0.032 0	1.465 0
$1\frac{3}{4}$	7	1.750 0	1.664 0	0.005 5	1.658 5	1.602 6	0.035 6	1.567 0
2	7	2.000 0	1.914 3	0.005 8	1.908 5	1.852 6	0.035 6	1.817 0
$2\frac{1}{4}$	6	2.250 0	2.149 4	0.006 1	2.143 3	2.076 9	0.040 3	2.036 6
$2\frac{1}{2}$	6	2.500 0	2.399 6	0.006 3	2.393 3	2.326 9	0.040 3	2.286 6
$2\frac{3}{4}$	6	2.750 0	2.649 8	0.006 5	2.643 3	2.576 9	0.040 3	2.536 6
3	5	3.000 0	2.878 8	0.006 9	2.871 9	2.790 8	0.047 0	2.743 8

Table E.3 **Selected and non-standard threads – Internal threads – Close class – Tolerances**

Number of threads per inch [A]	**Tolerance on effective diameter** in × 0.001													**Tolerance on minor diameter (Total tolerance)**
	Basic major diameter in	**above**	$\frac{1}{8}$	$\frac{1}{4}$	$\frac{1}{2}$	$\frac{3}{4}$	$1\frac{1}{4}$	**2**	**3**	**4**	**6**	**8**	**11**	**15**	in × 0.001
		up to and including	$\frac{1}{4}$	$\frac{1}{2}$	$\frac{3}{4}$	$1\frac{1}{4}$	**2**	**3**	**4**	**6**	**8**	**11**	**15**	**20**	
40, 36			2.4	2.6	2.8	3.0	3.2								9.6
32, 28			2.5	2.7	2.9	3.1	3.3								11.1
26, 24			2.8	3.0	3.1	3.3	3.6	3.8							13.3
20				3.0	3.2	3.4	3.6	3.9							17.0
18, **16**				3.4	3.6	3.7	4.0	4.2	4.4	4.7					19.5
14, **12**					4.0	4.2	4.4	4.6	4.9	5.1					23.7
11, 10						4.3	4.5	4.7	4.9	5.2	5.5				27.0
8						4.7	5.0	5.2	5.4	5.7	6.0	6.2			32.0
6							5.6	5.8	6.0	6.3	6.6	6.8	7.1		40.3
4								6.6	6.9	7.1	7.4	7.7	8.0	8.3	57.0

[A] The numbers of threads per inch in bold type are to be preferred.

Bibliography

Standards publications

For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

BS 1157, *Recommendations for tapping drill sizes for use with fluted taps*

BS 1916-2, *Limits and fits for engineering – Part 2: Guide to the selection of fits in BS 1916: Part 1*

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

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