BRITISH STANDARD

BS 811:1950

Incorporating Amendment issued July, 1951

Specification

Cycle threads

Co-operating organizations

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

Admiralty
Air Ministry
Associated Offices Technical Committee
Association of Consulting Engineers (Incorporated)
British Chemical Plant Manufacturers' Association
British Compressed Air Society
British Electrical and Allied Manufacturers' Association
British Engineers' Association
British Internal Combustion Engine Manufacturers' Association
British Iron and Steel Federation
British Railways
Crown Agents for the Colonies
Department of Scientific and Industrial Research
Engineering Equipment Users' Association
Institute of Marine Engineers
Institute of Petroleum
Institution of Civil Engineers
Institution of Gas Engineers
Institution of Heating and Ventilating Engineers
Institution of Mechanical Engineers
Institution of Mechanical Engineers (Automobile Division)
Institution of Production Engineers
Locomotive Manufacturers' Association
Machine Tool Trades Association
Ministry of Labour and National Service
Ministry of Supply
Ministry of Transport
Ministry of Works
Office of the High Commissioner for India
War Office

This British Standard, having been approved by the Mechanical Engineering Industry Standards Committee and endorsed by the Chairman of the Engineering Divisional Council, was published under the authority of the General Council on 24th May 1950

First published, October, 1938
First revision, May, 1950

The Technical Committee on Screw Threads, which was entrusted with the preparation of this Standard, has worked in close co-operation with the British Cycle and Motor Cycle Manufacturers' and Traders' Union.

Amendments issued since publication

Amd. No.	Date	Comments

Contents

Foreword

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

A complete list of British Standards, numbering over 4 000, indexed and cross-indexed for reference, together with an abstract of each standard, will be found in the Institution's Yearbook.

NOTE Recommendation on the application of the B.S.C. thread:
In view of the fact that there is a close resemblance between the form of the B.S.C. thread and the form of Whitworth and B.A. threads, and that in certain sizes there is also a similarity between the pitches and diameters of the cycle thread and those of the Whitworth and B.A. series, *the Institution most strongly recommends that the use of the B.S.C. thread be restricted to bolts and nuts and screwed parts to be used in cycle and motor cycle manufacture*. Any introduction of the B.S.C. thread into general engineering would inevitably result in confusion due to the visual resemblance to, *but lack of interchangeability with,* threads of Whitworth or B.A. form.

This British Standard for cycle threads has been prepared under the authority of the Mechanical Engineering Industry Standards Committee and in close collaboration with the British Cycle and Motor Cycle Manufacturers' and Traders' Union.

The standard was first issued in 1938, and in that edition was limited to the standardization of the thread form and the basic dimensions. This present edition reproduces the former thread form and basic dimensions unaltered, and has been prepared to include tables of limits and tolerances.

The form of thread was first formulated by the Cycle Engineers' Institute in 1902 to provide a thread of suitable design and mechanical strength for the bolts, nuts, nipples, spokes, and other threaded parts of cycles and motor cycles.

In 1933 the British Cycle and Motor Cycle Manufacturers' and Traders' Union approached the British Standards Institution for the recognition of this thread as a British Standard.

The first edition of the British Standard did not, however, attempt to include all the many pitches and diameters which had been or were then in use. The C.E.I. thread system would appear to have been peculiar in that, as originally developed, it included a series of threads applicable to any size of stock, rather than organized and progressive sizes, and in practice this had resulted in a considerable diversity of diameters and associated pitches. Since there appeared to be no justification for this complexity, the British Standard, in its first edition, standardized only a selection of the more commonly used sizes.

These sizes have since become established as the threads in regular use in the cycle and motor cycle industries, and they are perpetuated in this second edition.

The tolerances, other than those for the threads on spokes and nipples, have been derived from similar formulae to those adopted for the tolerances in the 1940 edition of BS 84, "Screw threads of Whitworth form," the appropriate correction being made for the difference between the angles of the Whitworth thread and the cycle thread. The bases for calculating the tolerances are given for reference in Appendix B.

The first edition of this standard included, in deference to usage at that time, a 20 t.p.i. series as an alternative to the normal series for bolts and nuts and similar applications, but the continuance of that series was not recommended. In the present edition this 20 t.p.i. series is omitted from the tables of threads having the form of the cycle thread, but in view of the use in the cycle industry of this pitch series with a Whitworth form thread the appropriate dimensions are given in Appendix A.

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

Compliance with a British Standard does not of itself confer immunity from legal obligations.

Summary of pages

This document comprises a front cover, an inside front cover, pages i to iv, pages 1 to 17 and a back cover.

This standard has been updated (see copyright date) and may have had amendments incorporated. This will be indicated in the amendment table on the inside front cover.

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1 Form of cycle thread

The basic form of the British Standard cycle thread shall be as shown in Figure 1.

2 Dimensions

The basic dimensions and limits and tolerances for British Standard cycle threads shall be as given in Table 1 to Table 13.

Table 1 to Table 7 provide for the threads for bolts and nuts and similar applications.

NOTE It is a customary practice in the cycle industry to use a 20 t.p.i. series of Whitworth form threads as an alternative to the cycle form thread series given in Table 1 to Table 7. Full details of Whitworth form threads are given in BS 84:1940, "Screw threads of Whitworth form," but for convenience the relevant dimensions are reproduced in Appendix A, Table 14 to Table 16.

Table 8 to Table 10 provide for threads for spokes and nipples. They are right hand. The spoke threads are normally rolled, and the basic *effective* diameter has been taken as the nominal size of the end portion of the spoke on which the thread is rolled: it is to be noted that this diameter is not necessarily that of the body of the spoke.

Table 11 to Table 13 provide for a number of threads used in current practice for the particular applications stated.

The bases of the tolerances are explained in Appendix B. Figure 2 illustrates the tolerance zones on the threads.

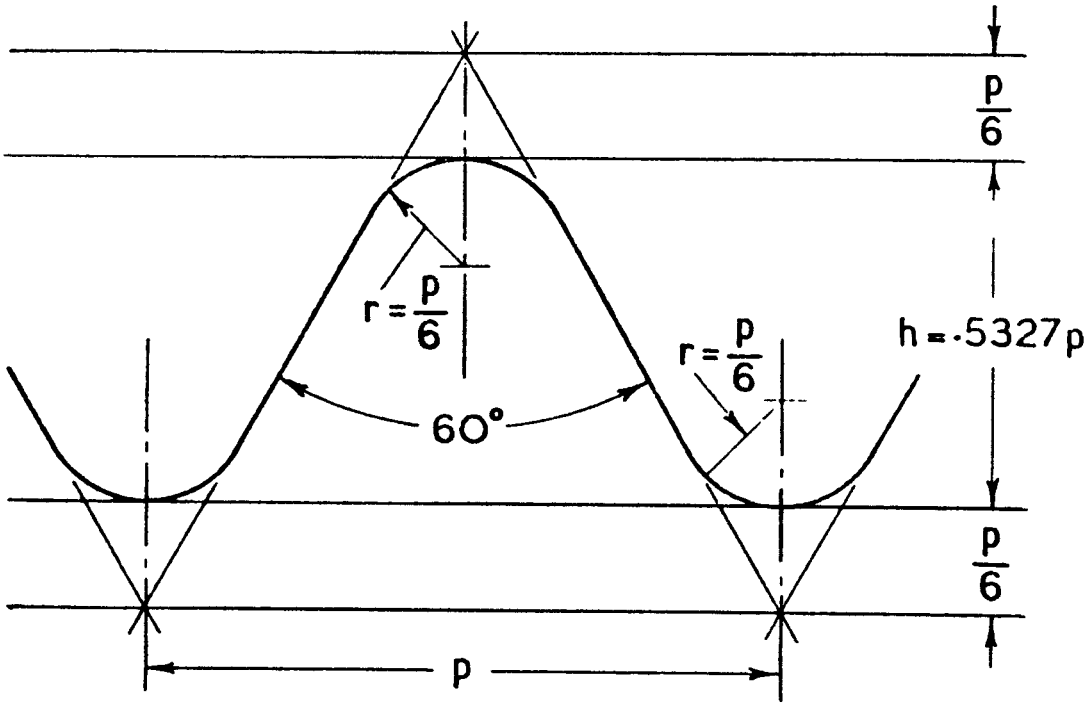
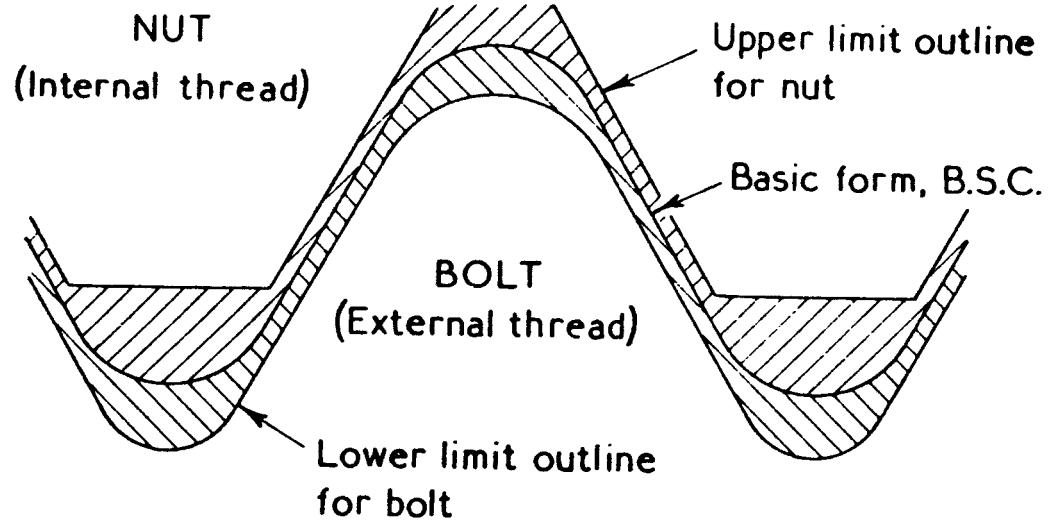


Figure 1 — Basic form of British Standard cycle thread



Tolerance zone for nut or internal thread shown thus /////
**Tolerance zone for bolt or external thread shown thus **

Figure 2 — Tolerance zones

The limits given in the tables represent the acceptance limits for the finished components.

It is to be appreciated that if the components are to be plated or hardened after machining it may be necessary for them to be machined to modified limits so that the components, as finally finished, may be within the limits given in the tables, but see exception stated in Clause **4**.

3 Classes of fit

The following classes of accuracy, or fit, are provided:—

B.S.C. bolts and nuts, Close, Medium and Free classes.

B.S.C. spokes and nipples, Medium class.

B.S.C. threads for special applications, Medium class.

B.S.W. bolts and nuts (20 t.p.i. series), Medium class.

These classes of accuracy may be described as follows:—

Close class. The close class applies to screw threads requiring a fine, snag fit.

This grade of fit is obtainable consistently only by the use of the highest quality screwing tools supported by a very efficient system of gauging and inspection. It is recommended only for special work where refined accuracy of pitch and thread form are particularly required.

Medium class. The medium class applies to the better class of ordinary interchangeable screw threads.

Free class. The free class applies to the great bulk of screw threads of ordinary commercial quality.

The choice between the three classes for a particular purpose rests with the designer. The two threads of any mating pair need not necessarily be made to the same class, and in some circumstances it may be desirable to specify their manufacture to different classes. For example, for the special bolts and nuts and threaded parts used on motor cycle power units the close class for bolts (external threads) and the medium class for nuts (internal threads) would be appropriate; for ordinary bolts and nuts and threaded parts on power units and the bolts and nuts for motor cycle and cycle frame construction, medium class for bolts (external threads) and free class for nuts (internal threads) would be adequate.

NOTE None of the classes in this specification apply to screw threads which have to mate with an interference fit.

4 Stainless steel components

In view of the tendency for closely fitting threaded components of stainless steel to seize when tightened together, it is recommended that the maximum permissible size for all stainless steel bolts and externally threaded components should be 0.001 in. below their basic size. The same manufacturing tolerances should be allowed, however, on these components as for components of other materials.

5 Internal threads

No tolerance is laid down for the major diameter of internal threads. It is recommended, however, that the radius at the major diameter of internal threads should never be less than one-half the standard radius for the pitch of thread concerned.

The minor diameter tolerances are such as to permit of the use of a tapping drill of ample size to prevent binding at the root of the tap. It is to be understood that if full advantage is taken of the generous tolerances allowed on the minor diameters of internal threads, the crests of these threads will be flat.

6 Errors in pitch and flank angles

The effective diameter tolerances are intended to cover not only errors in the simple effective diameter but also the effects of all errors present in the pitch and the flank angles.

NOTE A detailed explanation of the effect of errors in pitch and angle in relation to the tolerance on effective diameter is given in Appendix C.

7 Designation of British Standard cycle threads

It is recommended that British Standard cycle threads be referred to on drawings, etc., by their basic major diameter and number of threads per inch, followed by the abbreviation "BSC" and the class. If a thread is left-hand, the symbol "LH" should follow the designation.

Example:—

¼ —26. BSC — Free.

1.290 —24. BSC — Med. LH

Table 1 — British Standard cycle threads for bolts and nuts and similar applications

Basic Dimensions

1	2	3	4	5	6	7
Nominal diameter of screw	No. of threads per inch	Pitch	Depth of thread	Basic diameters		
				Major	Effective	Minor
in.		in.	in.	in.	in.	in.
1/8	40	0.02500	0.0133	0.1250	0.1117	0.0984
5/32	32	0.03125	0.0166	0.1563	0.1397	0.1231
3/16	32	0.03125	0.0166	0.1875	0.1709	0.1543
7/32	26	0.03846	0.0205	0.2188	0.1983	0.1778
1/4	26	0.03846	0.0205	0.2500	0.2295	0.2090
9/32	26	0.03846	0.0205	0.2813	0.2608	0.2403
5/16	26	0.03846	0.0205	0.3125	0.2920	0.2715
3/8	26	0.03846	0.0205	0.3750	0.3545	0.3340
7/16	26	0.03846	0.0205	0.4375	0.4170	0.3965
1/2	26	0.03846	0.0205	0.5000	0.4795	0.4590
9/16	26	0.03846	0.0205	0.5625	0.5420	0.5215
5/8	26	0.03846	0.0205	0.6250	0.6045	0.5840
11/16	26	0.03846	0.0205	0.6875	0.6670	0.6465
3/4	26	0.03846	0.0205	0.7500	0.7295	0.7090

Table 2 — British Standard cycle threads for bolts and nuts and similar applications
Limits and tolerances

Bolts **Close class**

1	2	3	4	5	6	7	8	9	10	11
Nom. dia.	t.p.i.	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.
1/8	40	0.1250	0.0033	0.1217	0.1117	0.0017	0.1100	0.0984	0.0038	0.0946
5/32	32	0.1563	0.0037	0.1526	0.1397	0.0019	0.1378	0.1231	0.0042	0.1189
3/16	32	0.1875	0.0037	0.1838	0.1709	0.0019	0.1690	0.1543	0.0042	0.1501
7/32	26	0.2188	0.0041	0.2147	0.1983	0.0021	0.1962	0.1778	0.0046	0.1732
1/4	26	0.2500	0.0042	0.2458	0.2295	0.0022	0.2273	0.2090	0.0047	0.2043
9/32	26	0.2813	0.0043	0.2770	0.2608	0.0023	0.2585	0.2403	0.0048	0.2355
5/16	26	0.3125	0.0044	0.3081	0.2920	0.0024	0.2896	0.2715	0.0049	0.2666
3/8	26	0.3750	0.0045	0.3705	0.3545	0.0025	0.3520	0.3340	0.0050	0.3290
7/16	26	0.4375	0.0047	0.4328	0.4170	0.0027	0.4143	0.3965	0.0052	0.3913
1/2	26	0.5000	0.0048	0.4952	0.4795	0.0028	0.4767	0.4590	0.0053	0.4537
9/16	26	0.5625	0.0049	0.5576	0.5420	0.0029	0.5391	0.5215	0.0054	0.5161
5/8	26	0.6250	0.0050	0.6200	0.6045	0.0030	0.6015	0.5840	0.0055	0.5785
11/16	26	0.6875	0.0051	0.6824	0.6670	0.0031	0.6639	0.6465	0.0056	0.6409
3/4	26	0.7500	0.0052	0.7448	0.7295	0.0032	0.7263	0.7090	0.0057	0.7033

Table 3 — British Standard cycle threads for bolts and nuts and similar applications
Limits and tolerances

Bolts **Medium class**

1	2	3	4	5	6	7	8	9	10	11
Nom. dia.	t.p.i.	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.
1/8	40	0.1250	0.0041	0.1209	0.1117	0.0025	0.1092	0.0984	0.0057	0.0927
5/32	32	0.1563	0.0045	0.1518	0.1397	0.0028	0.1369	0.1231	0.0063	0.1168
3/16	32	0.1875	0.0047	0.1828	0.1709	0.0029	0.1680	0.1543	0.0065	0.1478
7/32	26	0.2188	0.0051	0.2137	0.1983	0.0032	0.1951	0.1778	0.0071	0.1707
1/4	26	0.2500	0.0053	0.2447	0.2295	0.0033	0.2262	0.2090	0.0072	0.2018
9/32	26	0.2813	0.0054	0.2759	0.2608	0.0034	0.2574	0.2403	0.0074	0.2329
5/16	26	0.3125	0.0055	0.3070	0.2920	0.0036	0.2884	0.2715	0.0075	0.2640
3/8	26	0.3750	0.0057	0.3693	0.3545	0.0038	0.3507	0.3340	0.0077	0.3263
7/16	26	0.4375	0.0060	0.4315	0.4170	0.0040	0.4130	0.3965	0.0079	0.3886
1/2	26	0.5000	0.0061	0.4939	0.4795	0.0042	0.4753	0.4590	0.0081	0.4509
9/16	26	0.5625	0.0063	0.5562	0.5420	0.0044	0.5376	0.5215	0.0083	0.5132
5/8	26	0.6250	0.0065	0.6185	0.6045	0.0045	0.6000	0.5840	0.0085	0.5755
11/16	26	0.6875	0.0067	0.6808	0.6670	0.0047	0.6623	0.6465	0.0086	0.6379
3/4	26	0.7500	0.0068	0.7432	0.7295	0.0048	0.7274	0.7090	0.0088	0.7002

Table 4 — British Standard cycle threads for bolts and nuts and similar applications
Limits and tolerances

Bolts **Free class**

1	2	3	4	5	6	7	8	9	10	11
Nom. dia.	t.p.i.	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.
1/8	40	0.1250	0.0054	0.1196	0.1117	0.0038	0.1079	0.0984	0.0070	0.0914
5/32	32	0.1563	0.0060	0.1503	0.1397	0.0042	0.1355	0.1231	0.0077	0.1154
3/16	32	0.1875	0.0062	0.1813	0.1709	0.0044	0.1665	0.1543	0.0079	0.1464
7/32	26	0.2188	0.0068	0.2120	0.1983	0.0048	0.1935	0.1778	0.0087	0.1691
1/4	26	0.2500	0.0070	0.2430	0.2295	0.0050	0.2245	0.2090	0.0089	0.2001
9/32	26	0.2813	0.0071	0.2742	0.2608	0.0051	0.2557	0.2403	0.0090	0.2313
5/16	26	0.3125	0.0074	0.3051	0.2920	0.0054	0.2866	0.2715	0.0093	0.2622
3/8	26	0.3750	0.0077	0.3673	0.3545	0.0057	0.3488	0.3340	0.0096	0.3244
7/16	26	0.4375	0.0080	0.4295	0.4170	0.0060	0.4110	0.3965	0.0099	0.3866
1/2	26	0.5000	0.0083	0.4917	0.4795	0.0063	0.4732	0.4590	0.0102	0.4488
9/16	26	0.5625	0.0086	0.5539	0.5420	0.0066	0.5354	0.5215	0.0105	0.5110
5/8	26	0.6250	0.0088	0.6162	0.6045	0.0068	0.5977	0.5840	0.0107	0.5733
11/16	26	0.6875	0.0091	0.6784	0.6670	0.0071	0.6599	0.6465	0.0110	0.6355
3/4	26	0.7500	0.0092	0.7408	0.7295	0.0072	0.7223	0.7090	0.0111	0.6979

Table 5 — British Standard cycle threads for bolts and nuts and similar applications
Limits and tolerances

Nuts **Close class**

1	2	3	4	5	6	7	8	9
Nom. size	t.p.i.	Major diameter	Effective diameter			Minor diameter		
		min.	max.	tol.	min.	max.	tol.	min.
in.		in.	in.	in.	in.	in.	in.	in.
1/8	40	0.1250	0.1134	0.0017	0.1117	0.1074	0.0090	0.0984
5/32	32	0.1563	0.1416	0.0019	0.1397	0.1334	0.0103	0.1231
3/16	32	0.1875	0.1728	0.0019	0.1709	0.1646	0.0103	0.1543
7/32	26	0.2188	0.2004	0.0021	0.1983	0.1895	0.0117	0.1778
1/4	26	0.2500	0.2317	0.0022	0.2295	0.2207	0.0117	0.2090
9/32	26	0.2813	0.2631	0.0023	0.2608	0.2520	0.0117	0.2403
5/16	26	0.3125	0.2944	0.0024	0.2920	0.2832	0.0117	0.2715
3/8	26	0.3750	0.3570	0.0025	0.3545	0.3457	0.0117	0.3340
7/16	26	0.4375	0.4197	0.0027	0.4170	0.4082	0.0117	0.3965
1/2	26	0.5000	0.4823	0.0028	0.4795	0.4707	0.0117	0.4590
9/16	26	0.5625	0.5449	0.0029	0.5420	0.5332	0.0117	0.5215
5/8	26	0.6250	0.6075	0.0030	0.6045	0.5957	0.0117	0.5840
11/16	26	0.6875	0.6701	0.0031	0.6670	0.6582	0.0117	0.6465
3/4	26	0.7500	0.7327	0.0032	0.7295	0.7207	0.0117	0.7090

Table 6 — British Standard cycle threads for bolts and nuts and similar applications
Limits and tolerances

Nuts **Medium class**

1	2	3	4	5	6	7	8	9
Nom. size	t.p.i.	Major diameter	Effective diameter			Minor diameter		
		min.	max.	tol.	min.	max.	tol.	min.
in.		in.	in.	in.	in.	in.	in.	in.
1/8	40	0.1250	0.1142	0.0025	0.1117	0.1074	0.0090	0.0984
5/32	32	0.1563	0.1425	0.0028	0.1397	0.1334	0.0103	0.1231
3/16	32	0.1875	0.1738	0.0029	0.1709	0.1646	0.0103	0.1543
7/32	26	0.2188	0.2015	0.0032	0.1983	0.1895	0.0117	0.1778
1/4	26	0.2500	0.2328	0.0033	0.2295	0.2207	0.0117	0.2090
9/32	26	0.2813	0.2642	0.0034	0.2608	0.2520	0.0117	0.2403
5/16	26	0.3125	0.2956	0.0036	0.2920	0.2832	0.0117	0.2715
3/8	26	0.3750	0.3583	0.0038	0.3545	0.3457	0.0117	0.3340
7/16	26	0.4375	0.4210	0.0040	0.4170	0.4082	0.0117	0.3965
1/2	26	0.5000	0.4837	0.0042	0.4795	0.4707	0.0117	0.4590
9/16	26	0.5625	0.5464	0.0044	0.5420	0.5332	0.0117	0.5215
5/8	26	0.6250	0.6090	0.0045	0.6045	0.5957	0.0117	0.5840
11/16	26	0.6875	0.6717	0.0047	0.6670	0.6582	0.0117	0.6465
3/4	26	0.7500	0.7343	0.0048	0.7295	0.7207	0.0117	0.7090

Table 7 — British Standard cycle threads for bolts and nuts and similar applications
Limits and tolerances

Nuts **Free class**

1	2	3	4	5	6	7	8	9
Nom. size	**t.p.i.**	**Major diameter**	**Effective diameter**			**Minor diameter**		
		min.	**max.**	**tol.**	**min.**	**max.**	**tol.**	**min.**
in.		in.	in.	in.	in.	in.	in.	in.
1/8	40	0.1250	0.1155	0.0038	0.1117	0.1074	0.0090	0.0984
5/32	32	0.1563	0.1439	0.0042	0.1397	0.1334	0.0103	0.1231
3/16	32	0.1875	0.1753	0.0044	0.1709	0.1646	0.0103	0.1543
7/32	26	0.2188	0.2031	0.0048	0.1983	0.1895	0.0117	0.1778
1/4	26	0.2500	0.2345	0.0050	0.2295	0.2207	0.0117	0.2090
9/32	26	0.2813	0.2659	0.0051	0.2608	0.2520	0.0117	0.2403
5/16	26	0.3125	0.2974	0.0054	0.2920	0.2832	0.0117	0.2715
3/8	26	0.3750	0.3602	0.0057	0.3545	0.3457	0.0117	0.3340
7/16	26	0.4375	0.4230	0.0060	0.4170	0.4082	0.0117	0.3965
1/2	26	0.5000	0.4858	0.0063	0.4795	0.4707	0.0117	0.4590
9/16	26	0.5625	0.5486	0.0066	0.5420	0.5332	0.0117	0.5215
5/8	26	0.6250	0.6113	0.0068	0.6045	0.5957	0.0117	0.5840
11/16	26	0.6875	0.6741	0.0071	0.6670	0.6582	0.0117	0.6465
3/4	26	0.7500	0.7367	0.0072	0.7295	0.7207	0.0117	0.7090

Table 8 — British Standard cycle threads for spokes and nipples
Basic dimensions

1	2	3	4	5	6	7	8
Nominal diameter of wire[a]		Number of threads per in. (R.H.)	Pitch	Depth of thread	Basic diameters		
					Major	Effective[b]	Minor
S.W.G.	in.		in.	in.	in.	in.	in.
15	0.072	56	0.01786	0.0095	0.0825	0.0730	0.0635
14	0.080	56	0.01786	0.0095	0.0905	0.0810	0.0715
13	0.092	56	0.01786	0.0095	0.1025	0.0930	0.0835
12	0.104	56	0.01786	0.0095	0.1145	0.1050	0.0955
11	0.116	44	0.02276	0.0121	0.1291	0.1170	0.1049
10	0.128	40	0.02500	0.0133	0.1423	0.1290	0.1157
9	0.144	40	0.02500	0.0133	0.1583	0.1450	0.1317
8	0.160	32	0.03125	0.0166	0.1776	0.1610	0.1444

[a] The diameter is that of the end portion of the spoke on which the thread is rolled and is not necessarily the same as that of the body of the spoke.

[b] This diameter is the same as the maximum acceptable diameter of wire.

Table 9 — British Standard cycle threads for spokes and nipples
Limits and tolerances

Spokes **Medium class**

1	2	3	4	5	6	7	8	9	10	11	12
Nominal diameter of wire[a]		t.p.i.	Major diameter			Effective diameter			Minor diameter		
			max.	tol.	min.	max.[b]	tol.	min.	max.	tol.	min.
S.W.G.	in.		in.	in.	in.	in.	in.	in.	in.	in.	in.
15	0.072	56	0.0825	0.0040	0.0785	0.0730	0.0028	0.0702	0.0635	0.0056	0.0579
14	0.080	56	0.0905	0.0040	0.0865	0.0810	0.0028	0.0782	0.0715	0.0056	0.0659
13	0.092	56	0.1025	0.0040	0.0985	0.0930	0.0028	0.0902	0.0835	0.0056	0.0779
12	0.104	56	0.1145	0.0040	0.1105	0.1050	0.0028	0.1022	0.0955	0.0056	0.0899
11	0.116	44	0.1291	0.0049	0.1242	0.1170	0.0033	0.1137	0.1049	0.0065	0.0984
10	0.128	40	0.1423	0.0054	0.1369	0.1290	0.0035	0.1255	0.1157	0.0070	0.1087
9	0.144	40	0.1583	0.0054	0.1529	0.1450	0.0035	0.1415	0.1317	0.0070	0.1247
8	0.160	32	0.1776	0.0066	0.1710	0.1610	0.0041	0.1569	0.1444	0.0082	0.1362

[a] The diameter is that of the end portion of the spoke on which the thread is rolled, and is not necessarily the same as that of the body of the spoke.

[b] This diameter is the same as the maximum acceptable diameter of wire.

Table 10 — British Standard cycle threads for spokes and nipples
Limits and tolerances

Nipples **Medium class**

1	2	3	4	5	6	7	8	9
Nominal diameter	t.p.i.	Major diameter min.	Effective diameter			Minor diameter		
			max.	tol.	min.	max.	tol.	min.
S.W.G.		in.	in.	in.	in.	in.	in.	in.
15	56	0.0825	0.0763	0.0033	0.0730	0.0702	0.0067	0.0635
14	56	0.0905	0.0843	0.0033	0.0810	0.0782	0.0067	0.0715
13	56	0.1025	0.0963	0.0033	0.0930	0.0902	0.0067	0.0835
12	56	0.1145	0.1083	0.0033	0.1050	0.1022	0.0067	0.0955
11	44	0.1291	0.1209	0.0039	0.1170	0.1134	0.0085	0.1049
10	40	0.1423	0.1332	0.0042	0.1290	0.1251	0.0094	0.1157
9	40	0.1583	0.1492	0.0042	0.1450	0.1411	0.0094	0.1317
8	32	0.1776	0.1660	0.0050	0.1610	0.1561	0.0117	0.1444

Table 11 — British Standard cycle threads for special applications

Basic dimensions

Nominal diameter of screw	t.p.i.	Pitch	Depth of thread	Basic diameters			Application
				Major	Effective	Minor	
in.		in.	in.	in.	in.	in.	
$^{17}/_{64}$	26 R.H.	0.03846	0.0205	0.2656	0.2451	0.2246	Cycle and motor cycle crank cotters.
$^{7}/_{8}$	24 R.H.	0.04167	0.0222	0.8750	0.8528	0.8306	Steering columns of juvenile cycles.
$^{31}/_{32}$	30 R.H.	0.03333	0.0178	0.9688	0.9510	0.9332	Steering columns.
1	24 R.H.	0.04167	0.0222	1.0000	0.9778	0.9556	
$1^{1}/_{8}$	26 R.H.	0.03846	0.0205	1.1250	1.1045	1.0840	Motor cycle and tandem steering columns.
1.290	24 L.H.	0.04167	0.0222	1.2900	1.2678	1.2456	Lock rings for sprockets on rear hubs.
1.370	24 R.H.	0.04167	0.0222	1.3700	1.3478	1.3256	Hub sprockets and bottom bracket cups.
1.370	24 L.H.						
1.450	26 R.H.	0.03846	0.0205	1.4500	1.4295	1.4090	Tandem bottom bracket cups.
1.450	26 L.H.						
$1^{9}/_{16}$	24 L.H.	0.04167	0.0222	1.5625	1.5403	1.5181	Carrier cycle sprockets and lock rings.
$1^{5}/_{8}$	24 R.H.	0.04167	0.0222	1.6250	1.6028	1.5806	

Table 12 — British Standard cycle threads for special applications
Limits and tolerances

Male threads **Medium class**

1	2	3	4	5	6	7	8	9	10	11
Nominal diameter	t.p.i.	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.
17/64	26	0.2656	0.0053	0.2603	0.2451	0.0033	0.2418	0.2246	0.0072	0.2174
7/8	24	0.8750	0.0066	0.8684	0.8528	0.0045	0.8483	0.8306	0.0086	0.8220
31/32	30	0.9688	0.0064	0.9624	0.9510	0.0045	0.9465	0.9332	0.0082	0.9250
1	24	1.0000	0.0067	0.9933	0.9778	0.0046	0.9732	0.9556	0.0087	0.9469
1 1/8	26	1.1250	0.0066	1.1184	1.1045	0.0047	1.0998	1.0840	0.0086	1.0754
1.290	24	1.2900	0.0059	1.2841	1.2678	0.0039	1.2639	1.2456	1.0079	1.2377
1.370	24	1.3700	0.0070	1.3630	1.3478	0.0050	1.3428	1.3256	0.0090	1.3166
1.450	26	1.4500	0.0069	1.4431	1.4295	0.0050	1.4245	1.4090	0.0089	1.4001
1 9/16	24	1.5625	0.0071	1.5554	1.5403	0.0051	1.5352	1.5181	0.0091	1.5090
1 5/8	24	1.6250	0.0071	1.6179	1.6028	0.0051	1.5977	1.5806	0.0092	1.5714

Table 13 — British Standard cycle threads for special applications
Limits and tolerances

Female threads **Medium class**

1	2	3	4	5	6	7	8	9
Nom. dia.	t.p.i.	Major diameter	Effective diameter			Minor diameter		
		min.	max.	tol.	min.	max.	tol.	min.
in.		in.	in.	in.	in.	in.	in.	in.
17/64	26	0.2656	0.2484	0.0033	0.2451	0.2363	0.0117	0.2246
7/8	24	0.8750	0.8573	0.0045	0.8528	0.8439	0.0133	0.8306
31/32	30	0.9688	0.9555	0.0045	0.9510	0.9439	0.0107	0.9332
1	24	1.0000	0.9824	0.0046	0.9778	0.9689	0.0133	0.9556
1 1/8	26	1.1250	1.1092	0.0047	1.1045	1.0957	0.0117	1.0840
1.290	24	1.2900	1.2717	0.0039	1.2678	1.2589	0.0133	1.2456
1.370	24	1.3700	1.3528	0.0050	1.3478	1.3389	0.0133	1.3256
1.450	26	1.4500	0.4345	0.0050	1.4295	1.4207	0.0117	1.4090
1 9/16	24	1.5625	1.5454	0.0051	1.5403	1.5314	0.0133	1.5181
1 5/8	24	1.6250	1.6079	0.0051	1.6028	1.5939	0.0133	1.5806

Appendix A British Standard Whitworth form threads for bolts and nuts and similar applications (20 t.p.i. series)

Table 14 — Basic dimensions

1	2	3	4	5	6	7
Nominal diameter of screw	No. of threads per in.	Pitch	Depth of thread	Basic diameters		
				Major	Effective	Minor
in.		in.	in.	in.	in.	in.
7/16	20	0.05000	0.0320	0.4375	0.4055	0.3735
1/2	20	0.05000	0.0320	0.5000	0.4680	0.4360
9/16	20	0.05000	0.0320	0.5625	0.5305	0.4985
5/8	20	0.05000	0.0320	0.6250	0.5930	0.5610
11/16	20	0.05000	0.0320	0.6875	0.6555	0.6235
3/4	20	0.05000	0.0320	0.7500	0.7180	0.6860

Table 15 — British Standard Whitworth form threads for bolts and nuts and similar applications (20 t.p.i. series)

Limits and tolerances

Bolts **Medium class**

1	2	3	4	5	6	7	8	9	10	11
Nominal diameter	t.p.i.	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.
7/16	20	0.4375	0.0067	0.4308	0.4055	0.0045	0.4010	0.3735	0.0090	0.3645
1/2	20	0.5000	0.0067	0.4933	0.4680	0.0045	0.4635	0.4360	0.0090	0.4270
9/16	20	0.5625	0.0070	0.5555	0.5305	0.0048	0.5257	0.4985	0.0093	0.4892
5/8	20	0.6250	0.0070	0.6180	0.5930	0.0048	0.5882	0.5610	0.0093	0.5517
11/16	20	0.6875	0.0070	0.6805	0.6555	0.0048	0.6507	0.6235	0.0093	0.6142
3/4	20	0.7500	0.0070	0.7430	0.7180	0.0048	0.7132	0.6860	0.0093	0.6767

Table 16 — Limits and tolerances

Nuts **Medium class**

1	2	3	4	5	6	7	8	9
Nom. dia.	t.p.i.	Major diameter	Effective diameter			Minor diameter		
		min.	max.	tol.	min.	max.	tol.	min.
in.		in.	in.	in.	in.	in.	in.	in.
7/16	20	0.4375	0.4100	0.0045	0.4055	0.3905	0.0170	0.3735
1/2	20	0.5000	0.4725	0.0045	0.4680	0.4530	0.0170	0.4360
9/16	20	0.5625	0.5353	0.0048	0.5305	0.5155	0.0170	0.4985
5/8	20	0.6250	0.5978	0.0048	0.5930	0.5780	0.0170	0.5610
11/16	20	0.6875	0.6603	0.0048	0.6555	0.6405	0.0170	0.6235
3/4	20	0.7500	0.7228	0.0048	0.7180	0.7030	0.0170	0.6860

Appendix B Bases of tolerances for British Standard cycle threads

The formulae used for the calculation of the tolerances on British Standard cycle threads, other than those for the threads on spokes and nipples, are based on those established in BS 84:1940, "Screw threads of Whitworth form."

Effective diameter tolerances. For Whitworth form threads the formula for the medium class effective diameter tolerances, for both bolts and nuts is:

$$T = 0.002\sqrt[3]{D} + 0.003\sqrt{L_e} + 0.005\sqrt{p}$$

where

T = effective diameter tolerance for medium class in inches.

D = major diameter of thread in inches.

L_e = length of engagement in inches.

p = pitch in inches.

When corrected for a 60° thread, this formula becomes:

$$T = 0.002\sqrt[3]{D} + 0.0027\sqrt{L_e} + 0.00352\sqrt{p}$$

In order to apply this formula it is necessary to assume certain lengths of engagement. For bolts and nuts and similar applications the length of engagement has been taken as equal to the major diameter of the thread. For special threads, lengths of engagement typical of current practice have been taken as follows:—

Special threads

Nominal diameter inches	t.p.i.	Length of engagement inches
17/64	26	0.25
7/8	24	0.5
31/32	30	0.5
1	24	0.5
1 1/8	26	0.5
1.290	24	0.125
1.370	24	0.56
1.450	26	0.56
1 9/16	24	0.56
1 5/8	24	0.56

The effective diameter tolerances for the close class are taken as two-thirds of those for the medium class. For the free class the effective diameter tolerances are enlarged to 1½ times those for the medium class. Thus the effective diameter tolerances increase by the same factor of 50 per cent in passing both from the close to the medium class and from the medium to the free class.

Major diameter of bolt. The tolerance on the major diameter of a bolt is derived from the tolerance on its effective diameter by adding to it an amount equal to $0.01\sqrt{p}$. This rule applies to all three classes.

Minor diameter of bolt. The tolerance on the minor diameter of a bolt is derived from the tolerance on its effective diameter by adding to it an amount equal to $0.013\sqrt{p}$ in the case of close classes, and $0.02\sqrt{p}$ for both medium and free classes.

Minor diameter of nut. The tolerance on the minor diameter of a nut, which is the same for all three classes, is as follows :—

Tolerance on minor diameter of nut } = {
- $0.2\,p + 0.004$ in. for 26 t.p.i. and finer.
- $0.2\,p + 0.005$ in. for 24 t.p.i.

Spokes and nipples. The formulae used for the calculation of the tolerances on British Standard cycle threads for spokes and nipples are as follows. p being the pitch in inches :—

Bases of tolerances

Spoke major diameter	$= 0.2p + 0.0004$ in.
Spoke effective diameter	$= 0.1p + 0.0010$ in.
Spoke minor diameter	$= 0.2p + 0.0020$ in.
Nipple effective diameter	$= 0.12p + 0.0012$ in.
Nipple minor diameter	$= 0.375p$'

Appendix C Tolerances on pitch and angle in relation to tolerance on effective diameter

1 Effect of pitch errors

An error in pitch virtually increases the effective diameter of a bolt and decreases the effective diameter of a nut.

if δp represents the maximum error in the axial displacement between any two points on a screw thread within the length of engagement, the corresponding virtual increase (decrease) in the effective diameter of the thread in the case of a bolt (nut) is given by the following expressions :—

Thread form	Virtual change in effective diameter
British Standard Cycle	$1.732\ \delta p$
Whitworth	$1.921\ \delta p$

2 Effect of errors in angle

An error in one or both of the flank angles virtually increases the effective diameter of a bolt and decreases the effective diameter of a nut.

If δa, and δa_2 represent the errors present in the two flank angles of a screw thread, the corresponding virtual increase (decrease) in the effective diameter of the thread in the case of a bolt (nut) is given by the following expressions:—

Thread form	Virtual change in effective diameter
British Standard Cycle	$0.0074\ p\ (\delta a_1 + \delta a_2)$
Whitworth	$0.0105\ p\ (\delta a_1 + \delta a_2)$

where

p = nominal pitch of thread

$(\delta p_1 + \delta a_2)$ = sum of errors of the opposite flank angles in degrees, *regardless of their signs*.

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