Section B

BRITISH THREADS OF NON-WHITWORTH FORM

British Association (B.A.) Thread

The British Association thread is that generally used in this country for small screws in instrument and electrical work, and to some extent for clock parts. The thread angle and depth of thread are the same as the corresponding dimensions of the Thury thread, and its formulation was first proposed by the British Association in 1884, to be adopted by that body in 1903. The pitches were calculated from $p=(0{\cdot}9)^N$ where N is the designating number of the screw, and the basic major diameters from $D=6p^{1{\cdot}2}$. The present British specification is B.S. 93: 1951 which covers the range 0 to 16 B.A.

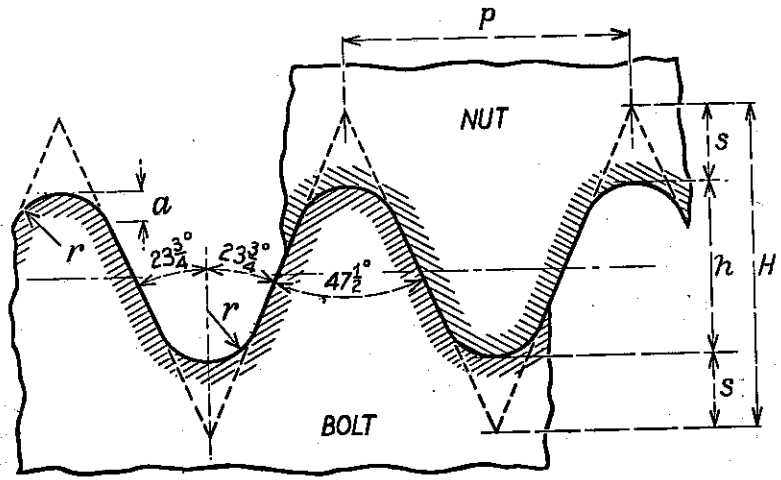

Fig. 1. British Association (B.A.) Thread Form

The B.A. thread has the form shown in Fig. 1, with angles and proportions as follows:

Thread angle (2θ) = 47 deg. 30 mins.; Flank angle (θ) = 23 deg. 45 mins.; Triangular height (H) = 1·1363365 p; Shortening at crest and root (S) = 0·2681683 p; Radius at crest and root (r) = 0·1808346 p; Depth of thread (h) = 0·6 p; Depth of rounding (a) = 0·1080041 p.

Basic thread form dimensions in mm. are given in Table B1, and the basic dimensions for the series are given in Tables B2 and B3, the former in inches and the latter in mm.

Tolerances for B.A. Threads. The tolerances specified by B.S.93: 1951 provide for two classes of bolt fit—"close" and "normal"—the "close" fit applying to the range 0 to 10 B.A., and the "normal" over the range

0 to 16 B.A. Only one class of fit is specified for the nut. The tolerances are derived from the following formulæ:

Close-class bolt tolerances

Effective diameter: $0{\cdot}08p + 0{\cdot}02$ mm.
Major ,, : $0{\cdot}15p$
Minor ,, : $0{\cdot}16p + 0{\cdot}04$ mm.

These are applied to the basic dimensions for 0 to 10 B.A. as given in Tables B2 and B3, which therefore become the maximum values.

Normal-class bolt tolerances

Effective diameter : $0{\cdot}10p + 0{\cdot}025$ mm.
Major ,, (0 to 10 B.A.) : $0{\cdot}20p$
,, ,, (11 to 16 B.A.) : $0{\cdot}25p$
Minor ,, (all) : $0{\cdot}20p + 0{\cdot}050$ mm.

In the case of the range 0 to 10 B.A., these tolerances are applied to dimensions that are 0·025 mm. less than the basic dimensions given in Table B3, thus allowing 0·025 mm. for subsequent plating. No such allowance is made for the range 11 to 16 B.A., for which tolerances are applied to the unmodified basic values of Table B3.

Nuts (all)

Effective diameter tolerances: $0{\cdot}12p + 0{\cdot}03$ mm.
Minor ,, ,, : $0{\cdot}375p$.

These are applied to the basic dimensions of Table B3, unmodified. Values of tolerances in mm. and inches will be found in Tables B4 and B5.

British Standard Cycle Thread (B.S.C.)

At the beginning of the century a need was experienced for a thread form suitable for the various threaded parts of cycles and motor cycles. A form was therefore specified by the Cycle Engineers Institute and was known as C.E.I. thread form. It is now specified by the British Standards Institution in B.S. 811: 1950 and known as the B.S.C.

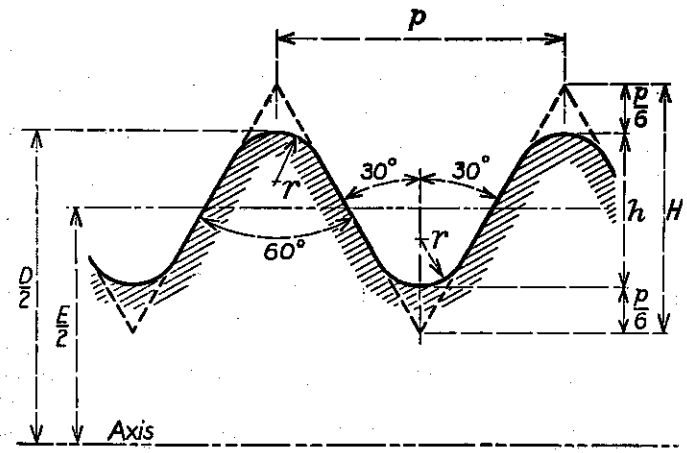

Fig. 2. British Standard Cycle (B.S.C.) Thread

Table B2. BRITISH ASSOCIATION (B.A.) SERIES

Basic Dimensions in Inches

B.A. No.	Pitch	Threads per inch	Depth of Thread	Major Diam.	Effective Diam.	Minor Diam.
0	0·039370	25·4000	0·023622	0·2362	0·2126	0·1890
1	0·035433	28·2222	0·021260	0·2087	0·1874	0·1661
2	0·031890	31·3580	0·019134	0·1850	0·1659	0·1468
3	0·028740	34·7945	0·017244	0·1614	0·1441	0·1268
4	0·025984	38·4849	0·015591	0·1417	0·1262	0·1106
5	0·023228	43·0508	0·013937	0·1260	0·1120	0·0980
6	0·020866	47·9245	0·012520	0·1102	0·0976	0·0850
7	0·018898	52·9167	0·011339	0·0984	0·0870	0·0756
8	0·016929	59·0698	0·010157	0·0866	0·0764	0·0661
9	0·015354	65·1282	0·009213	0·0748	0·0656	0·0563
10	0·013780	72·5714	0·008268	0·0669	0·0587	0·0504
11	0·012205	81·9355	0·007323	0·0591	0·0518	0·0445
12	0·011024	90·7143	0·006614	0·0512	0·0445	0·0378
13	0·009843	101·6000	0·005906	0·0472	0·0413	0·0354
14	0·009055	110·4348	0·005433	0·0394	0·0339	0·0283
15	0·008268	120·9524	0·004960	0·0354	0·0305	0·0256
16	0·007480	133·6842	0·004488	0·0311	0·0266	0·0220
17	0·006693	149·4118	0·004016	0·0276	0·0236	0·0197
18	0·005906	169·3333	0·003543	0·0244	0·0209	0·0173
19	0·005512	181·4286	0·003307	0·0213	0·0179	0·0146
20	0·004724	211·6667	0·002835	0·0189	0·0161	0·0134
21	0·004331	230·9091	0·002598	0·0165	0·0140	0·0114
22	0·003937	254·0000	0·002362	0·0146	0·0122	0·0098

Table B3. BRITISH ASSOCIATION (B.A.) SERIES

Basic Dimensions in mm.

B.A. No.	Major Diam.	Effective Diam.	Minor Diam.	Cross Sectional area at Core (sq. mm.)	Mean Helix Angle	Threads per mm.
0	6·00	5·400	4·80	18·10	3° 22′	1·000000
1	5·30	4·760	4·22	13·99	3° 27′	1·111111
2	4·70	4·215	3·73	10·93	3° 30′	1·234568
3	4·10	3·660	3·22	8·14	3° 38′	1·369863
4	3·60	3·205	2·81	6·20	3° 45′	1·515152
5	3·20	2·845	2·49	4·87	3° 47′	1·694915
6	2·80	2·480	2·16	3·66	3° 54′	1·886793
7	2·50	2·210	1·92	2·89	3° 58′	2·083333
8	2·20	1·940	1·68	2·22	4° 2′	2·325581
9	1·90	1·665	1·43	1·61	4° 16′	2·564103
10	1·70	1·490	1·28	1·29	4° 17′	2·857143
11	1·50	1·315	1·13	1·00	4° 17′	3·225807
12	1·30	1·130	0·96	0·72	4° 31′	3·571429
13	1·20	1·050	0·90	0·64	4° 20′	4·000000
14	1·00	0·860	0·72	0·41	4° 52′	4·347826
15	0·90	0·775	0·65	0·33	4° 56′	4·761905
16	0·79	0·675	0·56	0·25	5° 6′	5·263158
17	0·70	0·600	0·50	0·20	5° 9′	5·882353
18	0·62	0·530	0·44	0·15	5° 9′	6·666667
19	0·54	0·455	0·37	0·11	5° 36′	7·142857
20	0·48	0·410	0·34	0·091	5° 19′	8·333333
21	0·42	0·355	0·29	0·066	5° 38′	9·090909
22	0·37	0·310	0·25	0·049	5° 52′	10·000000

Table B.4 **B.A. THREADS**

Tolerances in mm.

(C=Close class; N=Normal class)

Values marked with an Asterisk (*) are applied to a basic dimension to which a minus allowance of 0·25 mm. has been made.

BA. No.	Major Diam.		Effective Diam.			Minor Diam.		
	Screws		Screws		Nuts	Screws		Nuts
	C	N	C	N	(All)	C	N	(All)
0	·150	·200*	·100	·125*	·150	·200	·250*	·375
1	·135	·180*	·090	·115*	·140	·185	·230*	·340
2	·120	·160*	·085	·105*	·125	·170	·210*	·305
3	·110	·145*	·080	·100*	·120	·155	·195*	·275
4	·100	·130*	·075	·090*	·110	·145	·180*	·250
5	·090	·120*	·070	·085*	·100	·135	·170*	·220
6	·080	·105*	·060	·080*	·095	·125	·155*	·200
7	·070	·095*	·060	·075*	·090	·115	·145*	·180
8	·065	·085*	·055	·070*	·080	·110	·135*	·160
9	·060	·080*	·050	·065*	·075	·100	·130*	·145
10	·055	·070*	·050	·060*	·070	·095	·120*	·130
11		·080		·055	·065		·110	·115
12		·070		·055	·065		·105	·105
13		·065		·050	·060		·100	·095
14		·060		·050	·060		·095	·085
15		·055		·045	·055		·090	·080
16		·050		·045	·055		·090	·070

Table B5. **B.A. THREADS**

Tolerances in Inches (Unit=0·0001-inch)

(C=Close class; N=Normal class)

Values marked with an Asterisk (*) are applied to a basic dimension to which a minus allowance of 0·00098 in. has been made.

B.A. No.	Major Diam.		Effective Diam.			Minor Diam.		
	Screws		Screws		Nuts	Screws		Nuts
	C	N	C	N	(All)	C	N	(All)
0	59	78*	39	49*	59	79	99*	147
1	53	71*	35	45*	55	73	91*	134
2	47	63*	33	42*	50	67	82*	121
3	43	57*	32	39*	47	61	77*	108
4	39	51*	30	35*	43	57	70*	99
5	36	47*	28	33*	39	53	66*	87
6	31	42*	24	32*	38	49	61*	79
7	27	37*	24	29*	36	45	57*	71
8	26	33*	22	28*	31	43	54*	63
9	24	31*	20	26*	29	39	51*	57
10	22	27*	20	24*	27	37	47	51
11		32		22	25		43	45
12		28		22	25		41	41
13		25		19	24		39	38
14		24		20	23		37	34
15		21		18	22		36	31
16		20		18	21		35	28

Table B6. **BRITISH STANDARD CYCLE (B.S.C.)**

Basic Form Dimensions in Inches

Threads per inch	Pitch	Triangular Height	Shortening	Depth of Thread	Depth of Rounding	Radius
56	0·017857	0·01546	0·00297	0·00951	0·00149	0·00297
44	0·022727	0·01968	0·00379	0·01211	0·00189	0·00379
40	0·025000	0·02165	0·00417	0·01332	0·00208	0·00417
32	0·031250	0·02706	0·00521	0·01665	0·00260	0·00521
30	0·033333	0·02887	0·00556	0·01776	0·00278	0·00556
26	0·038462	0·03331	0·00641	0·02049	0·00321	0·00641
24	0·041667	0·03608	0·00694	0·02220	0·00347	0·00694