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SPECIFICATION FOR

PRECISION HEXAGON BOLTS, SCREWS AND NUTS (B.S.W. & B.S.F. THREADS)

B.S. 1083 : 1965

Incorporating amendment No. 2, issued May 1967 (PD 6141)
(For amendment No. 1 (PD 5907), see page 2 of cover)

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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 20th August, 1965.

First published, 1942.
First revision, March, 1951.
Second revision, August, 1965.

The Institution desires to call attention to the fact that this British Standard does not purport to include all the necessary provisions of a contract.

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This standard makes reference to the following British Standards:

B.S. 84. Parallel screw threads of Whitworth form.
B.S. 131. Methods for notched bar tests.
Part 1. The Izod impact test on metals.
B.S. 240. Method for Brinell hardness test.
B.S. 860. Table of approximate comparison of hardness scales.
B.S. 919. Screw gauge limits and tolerances.
Part 2. Gauges for screw threads other than those of Unified form.
B.S. 969. Plain limit gauges: Limits and tolerances.
B.S. 1574. Split cotter pins.

British Standards are revised, when necessary, by the issue either of amendment slips or of revised editions. It is important that users of British Standards should ascertain that they are in possession of the latest amendments or editions.

The following B.S.I. references relate to the work on this standard:
Committee reference MEE/60 Draft for comment D64/4771

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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:

Associated Offices' Technical Committee
Association of Consulting Engineers
Association of Mining Electrical and Mechanical Engineers
Board of Trade
British Chemical Plant Manufacturers' Association
British Compressed Air Society
*British Electrical and Allied Manufacturers' Association
British Gear Manufacturers' Association
*British Internal Combustion Engine Manufacturers' Association
*British Iron and Steel Federation
*British Mechanical Engineering Federation
*British Railways Board
Crown Agents for Oversea Governments and Administrations
Electricity Council, The Generating Board and the Area Boards in England and Wales
*Engineering Equipment Users' Association
Gas Council
*High Commission of India
Institute of Marine Engineers
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 and Allied Manufacturers' Association of Great Britain
London Transport Board
*Machine Tool Trades Association
Ministry of Defence. Army Department
*Ministry of Defence, Navy Department
Ministry of Labour (H.M. Factory Inspectorate)
Ministry of Power
Ministry of Public Building and Works
Ministry of Technology — National Engineering Laboratory
Ministry of Transport
National Coal Board
*National Physical Laboratory (Ministry of Technology)
Radio Industry Council
Royal Institute of British Architects

The Government department and scientific and industrial organizations marked with an asterisk in the above list, together with the following, were directly represented on the committee entrusted with the preparation of this British Standard:

Agricultural Engineers' Association
Association of Hydraulic Equipment Manufacturers
Bright Bolt & Nut Manufacturers' Association
Bright Steel Bar Association
British Constructional Steelwork Association
British Cycle & Motor Cycle Industries Association Limited
Council of British Manufacturers of Petroleum Equipment
Electronic Engineering Association
Fasteners and Turned Parts Institute
Heat Treated Bolt Association
Institute of Iron and Steel Wire Manufacturers
Ministry of Aviation
Post Office
Rolled Thread Screw Association
Society of Motor Manufacturers & Traders, Ltd.
Washer Manufacturers' Association

BRITISH STANDARD SPECIFICATION FOR

PRECISION HEXAGON BOLTS, SCREWS AND NUTS (B.S.W. AND B.S.F. THREADS)

FOREWORD

This British Standard has been prepared under the authority of the Mechanical Engineering Standards Committee.

Since the last revision of B.S. 1083 was published in 1951, an ISO Recommendation has established an ISO inch (Unified) thread and an ISO metric thread as world standards for the future. Fasteners having the ISO inch thread are already being used in many fields and it may be expected that fasteners having the ISO metric thread will come increasingly into use. If this occurs, the extent of use of fasteners covered by B.S. 1083 will obviously diminish.

It is recognized that any change-over period will necessarily be longer in some industries than in others and as fasteners to B.S. 1083 are still widely used it is considered that the standard should be brought up to date as far as general requirements are concerned.

The principal changes in this revision are the deletion of the 2 B.A. fasteners and of tables for short and long bolts, some alterations in the thicknesses of bolt heads and lock-nuts to bring them into line with present-day practice and alignment of the provisions for features such as length tolerances, eccentricity of bolts and countersinking of nuts with those for Unified fasteners. No change has been made in the requirements for material.

SPECIFICATION

SCOPE

1. This British Standard covers precision hexagon bolts, screws and nuts having B.S.W. or B.S.F. threads in a range of nominal sizes from ¼ in to 2 in inclusive. The dimensional requirements of this standard apply to both ferrous and non-ferrous bolts, screws and nuts. Mechanical properties are given only in respect of steel bolts, screws and nuts and the finishes in which they are normally supplied are described in Clause 3.

MATERIAL

2. The steel used for the manufacture of the bolts, screws and nuts shall be such that the finished products possess the mechanical properties appropriate to the particular class of bolts, screws and nuts ordered by purchaser, as designated by the grade letter and as set out in Tables 4 and 5 of Appendix A.

If the bolts and screws are produced by cold forging they shall except in the case of precision bolts and screws bright finished to grade letter A (see Appendix A), be heat-treated after forging. Bolts, screws and nuts produced by hot-forging or turning from the bar shall be heat-treated when this is necessary to give the requisite mechanical properties.

FINISH

3. *a. General.* The bolts, screws and nuts shall be cleanly finished, sound and free from defects.

b. Types of finish. Steel precision bolts, screws and nuts are normally supplied with the following finishes:

(i) *Heat-treated bolts and screws.* The surfaces of these bolts and screws are customarily dull black from heat treatment, although the manufacturer may machine some of the surfaces of the larger bolts and screws after heat treatment.

(ii) *Bright finished bolts and screws.* This term is used to describe bolts and screws which are machined on all surfaces or which have a finish on the hexagons produced by bright drawing and regarded as a machined finish.

(iii) *Nuts.* These may be bright on all surfaces or dull black when heat treated.

(iv) *Special finishes.* If steel bolts, screws or nuts are required bright all over, the purchaser should state this in his enquiry and order.

If the purchaser requires bolts, screws or nuts of steel or other material to be coated, he should state the type of coating required in his enquiry and order.

DIMENSIONS

4. The bolts, screws and nuts shall conform to the dimensions and tolerances given in Tables 1 to 3 inclusive, and Clauses 5 to 11 inclusive.

LENGTH OF BOLTS AND SCREWS

5. *a.* The nominal length of a bolt or screw shall be the distance from the underside of the head to the extreme end of the shank including any chamfer or radius.

NOTE. The nominal lengths of bolts and screws normally stocked are given in Appendix C.

b. The tolerance on the nominal length shall be as given below:

Nominal length	Diameter	Tolerance on length
in	in	in
Up to and including 1	Up to and including ¾	+ 0 − 1/32
	Over ¾	+ 0 − 1/16
Over 1 up to and including 2	Up to and including ¾	+ 0 − 1/16
	Over ¾	+ 0 − 1/8
Over 2 up to and including 6	Up to and including ¾	+ 0 − 3/32
	Over ¾	+ 0 − 3/16
Over 6	All diameters	+ 0 − 3/16

ENDS OF BOLTS AND SCREWS

6. The ends of bolts and screws may, at the option of the manufacturer, be finished with either a flat chamfer with a 90° included angle to a depth slightly exceeding the depth of thread or a radius approximately equal to 1¼ times the nominal diameter of shank. When bolts and screws are made with rolled threads the lead formed at the end of the bolt or screw by the thread rolling operation may be regarded as providing the necessary chamfer to the end, no other machining operation being necessary, and the end shall be reasonably square with the centre line of the shank.

SCREW THREADS

7. *a. General.* The screw threads shall be B.S.W. or B.S.F. in accordance with B.S. 84, ' Parallel screw threads of Whitworth form ' as specified by the purchaser.

b. Bolts and screws. The screw threads may be cut or rolled at the option of the manufacturer and shall conform to the limits and tolerances for medium class specified in B.S. 84.

c. Nuts. The screw threads shall conform to the limits and tolerances for normal class specified in B.S. 84.

d. Gauging of screw threads. Screw threads shall be gauged in accordance with the system recommended in B.S. 919, ' Screw gauge limits and tolerances ', Part 2, ' Gauges for screw threads other than those of Unified form '.

LENGTH OF THREAD

8. *a. Bolts.* The length of thread on bolts shall be the distance from the end of the bolt (including any chamfer or radius) to the leading face of a screw ring gauge which has been screwed as far as possible on to the bolt by hand.

The minimum thread length shall be twice the diameter.

Bolts that are too short for minimum thread length shall be threaded as screws and shall be designated screws.

NOTE. The shortest designated lengths for bolts are tabulated for guidance in Appendix C.

b. Screws. Screws shall be so threaded that a screw ring gauge can be screwed by hand to within a distance from the underside of the head not exceeding two and a half times the pitch for diameters up to and including 1 in, and three and a half times the pitch for diameters over 1 in.

c. Tolerances. (i) *Tolerance on bolt thread length.* The tolerance on thread length shall be plus $\frac{3}{16}$ in or 2½ threads, whichever is the greater, for all lengths.

(ii) *Tolerance on eccentricity.* Tolerance on eccentricity (including out of parallelism) of thread in relation to body for sizes up to and including ¾ in shall be 0·010 in for each inch of length when measured in a sleeve gauge. For sizes over ¾ in, total eccentricity shall be the subject of agreement between manufacturer and purchaser.

NOTE. Details of the sleeve gauge referred to above are given in Appendix B.

NUTS—SQUARENESS OF THREAD TO FACE

9. The axis of the thread of the nut shall be square to the face of the nut subject to the ' squareness tolerance ' specified in Table 2, Column 11 and Table 3, Column 16.

The nut shall be screwed by hand on to a tapered truncated screw gauge until the thread of the nut is tight on the thread of the screw gauge. A sleeve, sliding on a parallel extension of the tapered screw gauge, and which has a face diameter equal to the minimum distance across flats of the nuts and exactly at 90° to the axis of the screw gauge, shall be brought into contact with the leading face of the nut. With the sleeve in this position it shall not be possible for a feeler gauge of thickness equal to the ' squareness tolerance ' to enter anywhere between the leading face of the nut and the face of the sleeve.

NOTE. Details of the gauge referred to above are given in Appendix B.

CHAMFERING AND WASHER-FACING

10. *a. Bolts and screws.* Bolt and screw heads shall have a chamfer of approximately 30° on their upper faces, and, at the option of the manufacturer, a washer face or full bearing face on the underside.

b. *Nuts*. (i) Ordinary nuts and slotted nuts shall have a chamfer of approximately 30° on their upper faces and, at the option of the manufacturer, may, in addition, have a similar chamfer or a washer face on their lower faces.

(ii) Lock-nuts shall have a chamfer of approximately 30° on both faces.

(iii) Castle nuts shall have the sharp edge on their upper faces removed and, at the option of the manufacturer, may, in addition, have a chamfer of approximately 30° or a washer face on their lower faces. The hexagonal portion shall have a chamfer of approximately 30° at the point where it joins the castellated portion.

(iv) All nuts shall be countersunk on the bearing face at an included angle of 120 ± 10°: the diameter of the countersink shall not exceed the nominal major diameter of the thread (see Fig. 10).

With the exception of slotted nuts and castle nuts, all hexagon nuts chamfered at both ends shall also have a countersink as above at both ends of the thread.

NOTE. The option referred to in Subclauses *a* and *b* above shall apply unless the purchaser in his enquiry and order specifically states that he requires one of the alternatives available.

Attention is drawn to the fact that these alternative methods of finishing the underside of bolt and screw heads and the lower face of nuts are associated both with the nominal size and the particular method of manufacture. A request by the purchaser for a specific type of finish limits the manufacturing processes available and it is therefore recommended that the purchaser avoid making such a request unless circumstances fully justify it.

SPLIT-PIN HOLES AND SLOTS

11. Bolts with split-pin holes will be supplied only when specially ordered. The purchaser should state in his enquiry and order, dimension *J*. (See Table 1, Fig. 1.)

A tolerance of $+ \frac{1}{32}$ in $- 0$ shall be permissible on the specified *J* (see Fig. 1).

The maximum ' off-centre ' distance between the centre-line of the split-pin hole in bolts and the axis of the thread as given in Table 1, Column 18. This shall be checked by means of a screwed ring gauge with appropriate slot and a plain plug gauge which shall be a ' GO ' gauge in the minimum split-pin hole. (See Fig. 19 in Appendix B.)

The maximum ' off-centre ' distance between the centre-line of the slots in slotted nuts and the axis of the tapped hole is given in Table 3, Column 15. This shall be checked by means of a screwed plug gauge with appropriate slot and a plain plug gauge which shall be a ' GO ' gauge in the minimum slot. (See Fig. 20 in Appendix B.)

NOTE. For full dimensional and other requirements of split cotter pins, reference should be made to B.S. 1574, ' Split cotter pins '.

MARKING

12. Bolts and screws of grades P, R, T, V and X shall have the appropriate grade letter marked on the head, and nuts of grades P, R and T shall have the grade letter marked on one of the hexagon flats. The letter shall be indented on nuts and either indented or embossed on bolts and screws, but if embossed, the letter shall not project more than $\frac{1}{64}$ in.

INSPECTION AND TESTING

13. The manufacturer shall take the necessary steps to ensure that the requirements specified in this standard are fulfilled, but if, in addition, the purchaser desires the manufacturer to certify or demonstrate that the bolts, screws and nuts comply with this standard, the details and cost of any further inspection entailed shall be the subject of agreement between the purchaser and the manufacturer.

TABLE 1. HEXAGON HEAD BOLTS AND SCREWS

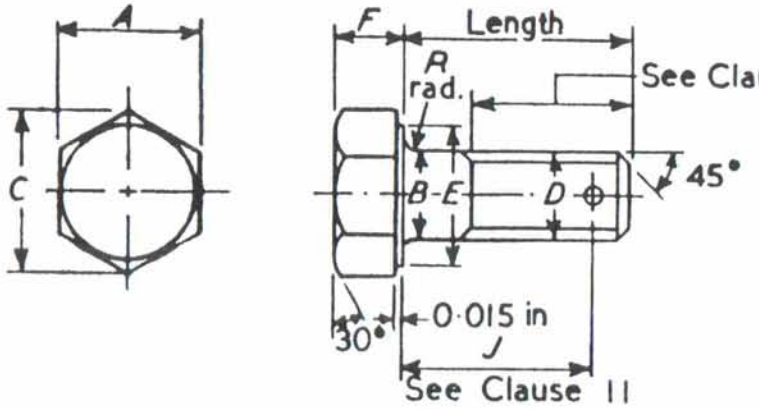


Fig. 1. Hexagon head bolt, washer faced

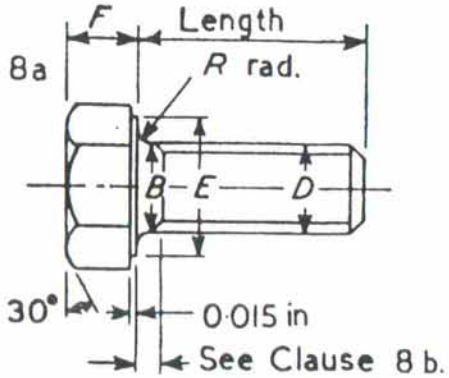


Fig. 2. Hexagon head screw, washer faced

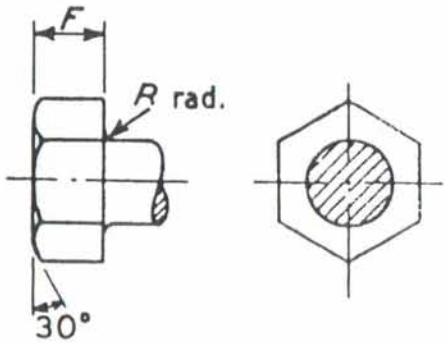


Fig. 3. Full bearing
Alternative type of head permissible on bolts and screws

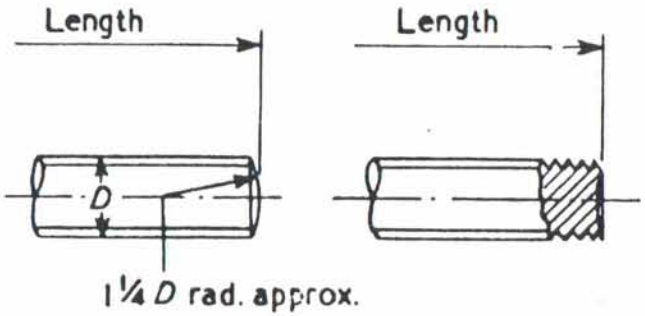


Fig. 4. Rounded end **Fig. 5. Rolled thread end**
Alternative types of end permissible on bolts and screws

TABLE 1. HEXAGON HEAD BOLTS AND SCREWS

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
Nominal size *D*	Number of threads per inch		Diameter of unthreaded portion of shank *B*		Width across flats *A*		Width across corners *C*	Diameter of washer face *E*		Thickness of head *F*		Radius under head *R*		Split cotter pin holes, see Clause 11			
														Diameter of hole		Drill sizes	Maximum off-centre distance between centre line of hole and thread
	B.S.W.	B.S.F.	Max.	Min.	Max.	Min.†	Max.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.		
in			in	in	in	in	in	in	in	in	in	in	in	in	in	mm	in
¼	20	26	0·2500	0·2465	0·445	0·438	0·51	0·428	0·418	0·176	0·166	0·025	0·015	0·075	0·070	1·80	0·006
5/16	18	22	0·3125	0·3090	0·525	0·518	0·61	0·508	0·498	0·218	0·208	0·025	0·015	0·075	0·070	1·80	0·006
⅜	16	20	0·3750	0·3715	0·600	0·592	0·69	0·582	0·572	0·260	0·250	0·025	0·015	0·075	0·070	1·80	0·006
7/16	14	18	0·4375	0·4335	0·710	0·702	0·82	0·690	0·680	0·302	0·292	0·025	0·015	0·110	0·104	2·65	0·007
½	12	16	0·5000	0·4960	0·820	0·812	0·95	0·800	0·790	0·343	0·333	0·025	0·015	0·110	0·104	2·65	0·007
9/16	12	16	0·5625	0·5585	0·920	0·912	1·06	0·900	0·890	0·375	0·365	0·045	0·020	0·143	0·136	3·50	0·008
⅝	11	14	0·6250	0·6190	1·010	1·000	1·17	0·985	0·975	0·417	0·407	0·045	0·020	0·143	0·136	3·50	0·008
¾	10	12	0·7500	0·7440	1·200	1·190	1·39	1·175	1·165	0·500	0·480	0·045	0·020	0·174	0·166	4·20	0·009
⅞	9	11	0·8750	0·8670	1·300	1·288	1·50	1·273	1·263	0·583	0·563	0·065	0·040	0·174	0·166	4·20	0·009
1	8	10	1·0000	0·9920	1·480	1·468	1·71	1·453	1·443	0·666	0·636	0·095	0·060	0·208	0·199	5·10	0·010
1⅛	7	9	1·1250	1·1170	1·670	1·640	1·93	1·620	1·610	0·750	0·710	0·095	0·060	0·208	0·199	5·10	0·010
1¼	7	9	1·2500	1·2420	1·860	1·815	2·15	1·795	1·785	0·830	0·790	0·095	0·060	0·238	0·228	5·80	0·011
1⅜*	—	8	1·3750	1·3650	2·050	2·005	2·37	1·985	1·975	0·920	0·880	0·095	0·060	0·238	0·228	5·80	0·011
1½	6	8	1·5000	1·4900	2·220	2·175	2·56	2·155	2·145	1·000	0·960	0·095	0·060	0·238	0·228	5·80	0·011
1¾	5	7	1·7500	1·7400	2·580	2·520	2·98	2·495	2·485	1·170	1·110	0·095	0·060	0·271	0·261	6·60	0·012
2	4·5	7	2·0000	1·9900	2·760	2·700	3·19	2·675	2·665	1·330	1·270	0·095	0·060	0·333	0·323	8·20	0·015

* Not standard with B.S.W. thread.

† When bolts from ¼ in to 1 in nominal size are hot forged, the tolerance on the width across flats shall be two and a half times the tolerance shown in the table and shall be unilaterally minus from maximum size.

TABLE 2. HEXAGON ORDINARY NUTS AND LOCK-NUTS

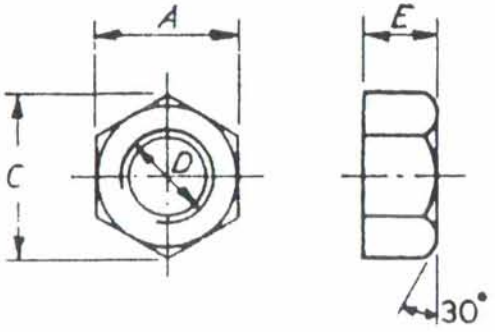


Fig. 6. Hexagon ordinary nut, full bearing

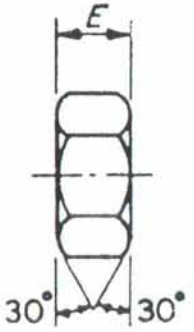


Fig. 7. Double chamfered

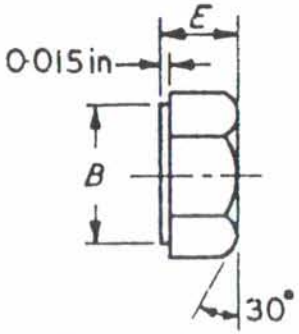


Fig. 8. Washer faced

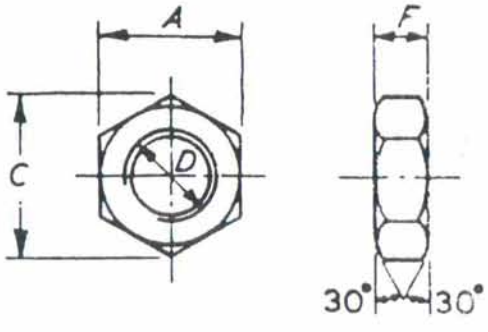


Fig. 9. Hexagon lock-nut

Alternative types of hexagon ordinary nuts permissible

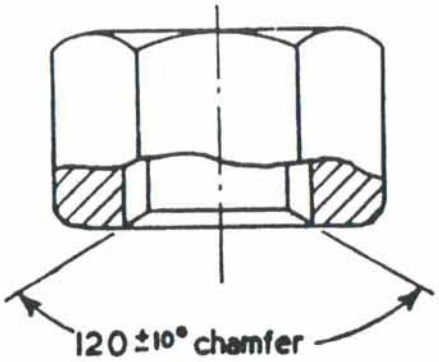


Fig. 10. Enlarged view of nut countersink (see Subclause 10*b*)

TABLE 2. HEXAGON ORDINARY NUTS AND LOCK-NUTS

As altered May, 1967

1	2	3	4	5	6	7	8	9	10	11
Nominal size *D*	Width across flats *A*		Width across corners *C*	Diameter of washer face *B*		Thickness				Tolerance on squareness of thread to face of nut. See Clause 9
						Ordinary nuts *E*		Lock-nuts‡ *F*		
	Max.	Min.†	Max.	Max.	Min.	Max.	Min.	Max.	Min.	Max.
in	in	in	in	in	in	in	in	in	in	in
1/4	0·445	0·438	0·51	0·428	0·418	0·200	0·190	0·133 (0·161)	0·123 (0·151)	0·007
5/16	0·525	0·518	0·61	0·508	0·498	0·250	0·240	0·166 (0·192)	0·156 (0·182)	0·009
3/8	0·600	0·592	0·69	0·582	0·572	0·312	0·302	0·208 (0·224)	0·198 (0·214)	0·010
7/16	0·710	0·702	0·82	0·690	0·680	0·375	0·365	0·250	0·240	0·011
1/2	0·820	0·812	0·95	0·800	0·790	0·437	0·427	0·291	0·281	0·013
9/16	0·920	0·912	1·06	0·900	0·890	0·500	0·490	0·333	0·323	0·013
5/8	1·010	1·000	1·17	0·985	0·975	0·562	0·552	0·375	0·365	0·014
3/4	1·200	1·190	1·39	1·175	1·165	0·687	0·677	0·458	0·448	0·017
7/8	1·300	1·288	1·50	1·273	1·263	0·750	0·740	0·500	0·490	0·020
1	1·480	1·468	1·71	1·453	1·443	0·875	0·865	0·583	0·573	0·020
1 1/8	1·670	1·640	1·93	1·620	1·610	1·000	0·990	0·666	0·656	0·024
1 1/4	1·860	1·815	2·15	1·795	1·785	1·125	1·105	0·750	0·730	0·024
1 3/8*	2·050	2·005	2·37	1·985	1·975	1·250	1·230	0·833	0·813	0·026
1 1/2	2·220	2·175	2·56	2·155	2·145	1·375	1·355	0·916	0·896	0·026
1 3/4	2·580	2·520	2·98	2·495	2·485	1·625	1·605	1·083	1·063	0·030
2	2·760	2·700	3·19	2·675	2·665	1·750	1·730	1·166	1·146	0·030

* Not standard with B.S.W. thread.

† When nuts from 1/4 in to 1 in nominal size are hot forged, the tolerance on the width across flats shall be two and a half times the tolerance shown in the table and shall be unilaterally minus from maximum size.

‡ Alternative thickness values have been provided, in parentheses, for sizes 1/4 in, 5/16 in and 3/8 in to cater for different manufacturing processes. This option shall not apply unless the purchaser in his enquiry and order specifically states which of the alternative thickness values he requires.

TABLE 3. HEXAGON SLOTTED NUTS AND CASTLE NUTS

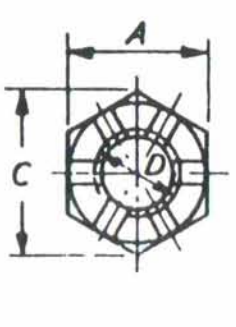
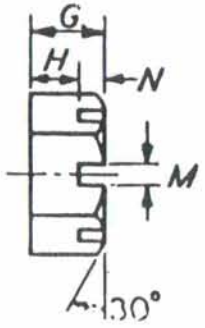


Fig. 11. Hexagon slotted nut, full bearing



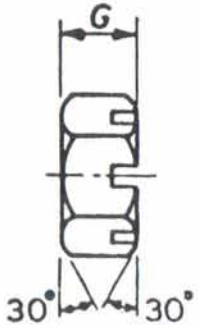


Fig. 12. Double chamfered

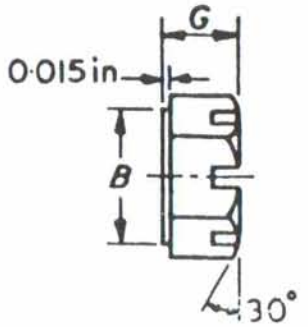


Fig. 13. Washer faced

Alternative types of hexagon slotted nuts

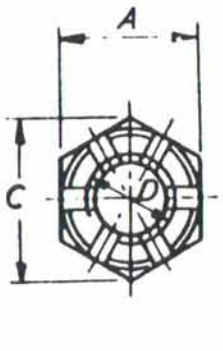
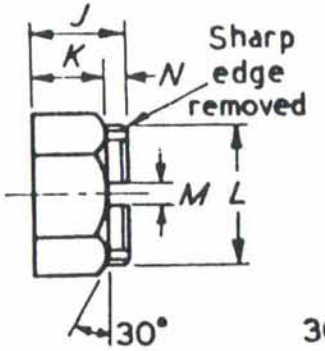


Fig. 14. Hexagon castle nut, full bearing



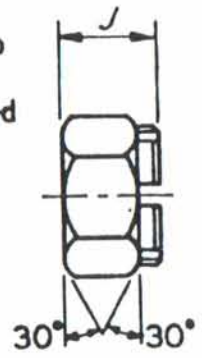


Fig. 15. Double chamfered

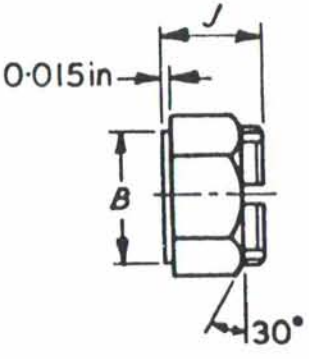


Fig. 16. Washer faced

Alternative types of hexagon castle nuts

TABLE 3. HEXAGON SLOTTED NUTS AND CASTLE NUTS

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Nominal size *D*	Slotted nuts				Castle nuts						Slotted and castle nuts				Tolerance for squareness of thread to face of nut. See Clause 9
	Thickness *G*		Lower face of nut to bottom of slots *H*		Total thickness *J*		Thickness of hexagon portion and from lower face of nut to bottom of slots *K*		Castellated portion		Slots			Max. off-centre distance between centre line of slots and tapped hole. See Clause 11	
									Diameter *L*		Width *M*		Depth *N*		
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Approx.		Max.
in	in	in	in	in	in	in	in	in	in	in	in	in	in	in	in
1/4	0·260	0·250	0·170	0·160	0·290	0·280	0·200	0·190	0·430	0·425	0·100	0·090	0·090	0·012	0·007
5/16	0·280	0·270	0·190	0·180	0·340	0·330	0·250	0·240	0·510	0·500	0·100	0·090	0·090	0·012	0·009
3/8	0·312	0·302	0·222	0·212	0·402	0·392	0·312	0·302	0·585	0·575	0·100	0·090	0·090	0·012	0·010
7/16	0·375	0·365	0·235	0·225	0·515	0·505	0·375	0·365	0·695	0·685	0·135	0·125	0·140	0·014	0·011
1/2	0·437	0·427	0·297	0·287	0·577	0·567	0·437	0·427	0·805	0·795	0·135	0·125	0·140	0·014	0·013
9/16	0·500	0·490	0·313	0·303	0·687	0·677	0·500	0·490	0·905	0·895	0·175	0·165	0·187	0·017	0·013
5/8	0·562	0·552	0·375	0·365	0·749	0·739	0·562	0·552	0·995	0·985	0·175	0·165	0·187	0·017	0·014
3/4	0·687	0·677	0·453	0·443	0·921	0·911	0·687	0·677	1·185	1·165	0·218	0·208	0·234	0·022	0·017
7/8	0·750	0·740	0·516	0·506	0·984	0·974	0·750	0·740	1·285	1·265	0·218	0·208	0·234	0·022	0·020
1	0·875	0·865	0·595	0·585	1·155	1·145	0·875	0·865	1·465	1·445	0·260	0·250	0·280	0·027	0·020
1 1/8	1·000	0·990	0·720	0·710	1·280	1·270	1·000	0·990	1·655	1·635	0·260	0·250	0·280	0·027	0·024
1 1/4	1·125	1·105	0·797	0·777	1·453	1·433	1·125	1·105	1·845	1·825	0·300	0·290	0·328	0·030	0·024
1 3/8*	1·250	1·230	0·922	0·902	1·578	1·558	1·250	1·230	2·035	2·015	0·300	0·290	0·328	0·030	0·026
1 1/2	1·375	1·355	1·047	1·027	1·703	1·683	1·375	1·355	2·200	2·180	0·300	0·290	0·328	0·030	0·026
1 3/4	1·625	1·605	1·250	1·230	2·000	1·980	1·625	1·605	2·555	2·535	0·343	0·333	0·375	0·034	0·030
2	1·750	1·730	1·282	1·262	2·218	2·198	1·750	1·730	2·735	2·715	0·426	0·416	0·468	0·042	0·030

* Not standard with B.S.W. thread.

For widths across flats, width across corners, and diameter of washer face, see Table 2.

APPENDIX A

MECHANICAL PROPERTIES OF FINISHED STEEL HEXAGON HEAD BOLTS AND SCREWS AND HEXAGON NUTS

TABLE 4. BOLTS AND SCREWS

1	2	3	4	5	6	7	8
	Properties of finished bolts						
Grade	Minimum tensile strength. See Note 1	Minimum yield stress. See Note 2	Minimum elongation on a gauge length $4\sqrt{\text{area}}$ See Note 3	Minimum Izod impact value — Diameter or width across flats: Up to ¾ in	Minimum Izod impact value — Diameter or width across flats: Over ¾ in up to and including 1⅛ in	Minimum Izod impact value — Diameter or width across flats: Over 1⅛ in	Brinell hardness numbers. See Note 4
	tonf/in²	tonf/in²	per cent	ft lbf	ft lbf	ft lbf	HB10/3000
A	28	—	10 / 14 See Note 4	—	—	—	—
B	28	—	17	—	—	—	—
P	35	—	15	20	15	10	152/240
R	45	34	20	40	35	25	201/285
T	55	41	16	35	30	20	248/335
V	65	52	14	35	30	20	293/370
X	75	63	12	15	15	15	341/410

NOTE 1. When the ultimate tensile and yield stress tests are made on a bolt or screw, the method employed shall be as follows: An ordinary nut or its equivalent in the form of an adaptor shall be screwed onto the bolt or screw so as to be clear of the run-out of thread towards the head and also clear of any imperfect threads at the point. The load shall then be applied to the head and to the nut or adaptor. In the calculations the cross-sectional area of the thread shall be based on the formula:

$$\text{Area} = \pi\left(\frac{\text{Basic effective diameter}^* + \text{basic minor}^* \text{ diameter}}{4}\right)^2$$

NOTE 2. The yield stress values given shall not be used as acceptance values except by special arrangement between the purchaser and the manufacturer. It frequently happens, especially with steels of tensile strength over 50 tonf/in², that the yield point is ill-defined. In the case of a steel which does not show a well-defined yield point, the yield point is to be interpreted as the ' proof stress ' corresponding to 0·5 per cent permanent elongation.

* As specified for the thread in question in B.S. 84, ' Parallel screw threads of Whitworth form '.

NOTE 3. B.S. 18, ' Methods for tensile testing of metals ', now specifies a gauge length of $5{\cdot}65\sqrt{\text{area}}$, but elongation values appropriate to this length are not yet available for the higher grades of steel. The values in Column 4 have therefore been retained pending further information on the subject.

NOTE 4. For Grade A bolts or screws the minimum elongation shall be 10 per cent for ¼ in and $\frac{5}{16}$ in nominal sizes and 14 per cent for all other sizes up to and including 2 in.

NOTE 5. For bolts and screws below ½ in diameter a notched fracture test may be substituted for the Izod impact test (see B.S. 131, ' Methods for notched bar tests ', Part 1, ' The Izod impact test on metals ').

NOTE 6. Brinell hardness numbers are given for guidance only and a hardness test is not part of the requirements of the standard. When a Brinell hardness test is made, it is carried out in accordance with the method specified in B.S. 240, ' Method for Brinell hardness test ', Part 1, ' Testing of metals ', and is made on the top of the head or on the point of the bolt or screw.

TABLE 5. NUTS

1	2	3	4	5
Grade	**Common application of nut**	**Ultimate tensile stress**	**Minimum elongation on a gauge length equal to $4\sqrt{\text{area}}$. See Note 1**	**Brinell hardness number. See Note 2**
		tons/in²	per cent	HB10/3000
A	Nuts for A, B, P and R bolts	28 min.	10 14	120/235 120/235
P	Nuts for T bolts	35 min.	15	152/240
R	Nuts for V bolts	45 min.	20	201/271
T	Nuts for X bolts	55 min.	18	248/335

NOTE 1. B.S. 18, ' Methods for tensile testing of metals ', now specifies a gauge length of $5{\cdot}65\sqrt{\text{area}}$, but elongation values appropriate to this length are not yet available for the higher grades of steel. The values in Column 4 have therefore been retained pending further information on the subject.

NOTE 2. For nuts which are manufactured from the bar, the Brinell hardness numbers are given for guidance only and are not part of the requirements of this standard. When nuts are manufactured by cold forming from round wire, with or without subsequent heat-treatment, the Brinell hardness numbers apply as part of the requirements of this standard.

The preparation of nuts to be tested and the method of testing shall be in accordance with B.S. 240, ' Method for Brinell hardness test '. If Vickers or Rockwell methods are used, reference should be made to B.S. 860, ' Table of approximate comparison of hardness scales ', for appropriate values.

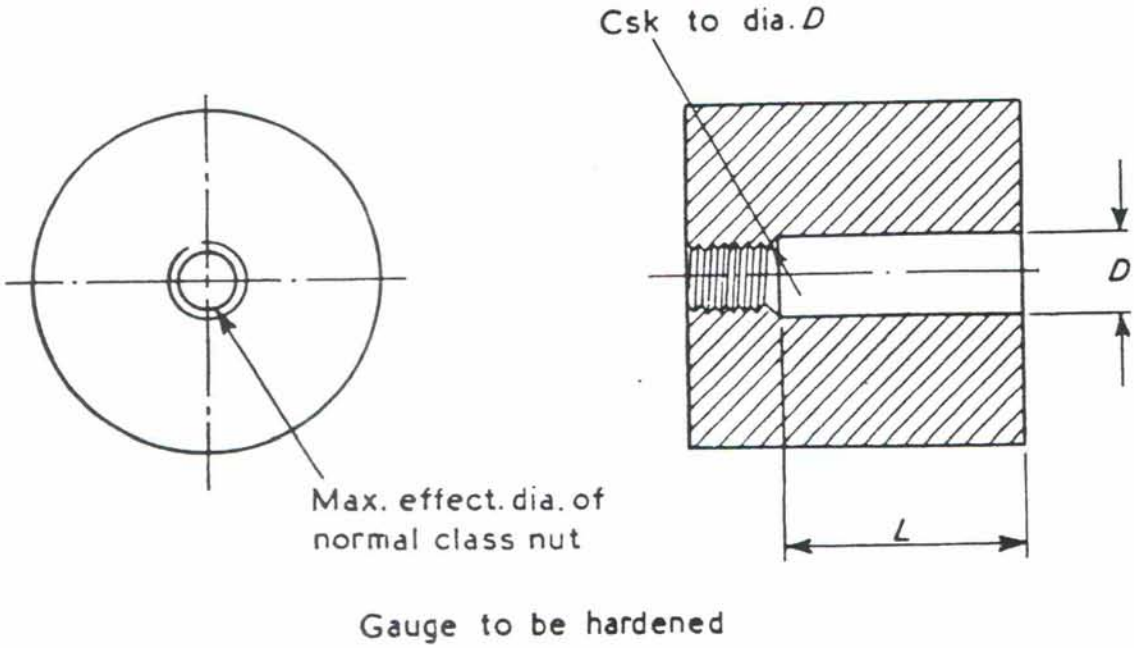
The test shall be made on the end faces of the nuts.

APPENDIX B

RECOMMENDED GAUGES

Details of gauges suitable for checking various features of the bolts, screws and nuts specified in this standard are given below. They are offered for guidance and do not form part of the requirements of this standard.

B1. Eccentricity. Subclause 8*c*(ii).



D—Maximum diameter of screw plus clearance allowance
L—Length of screw minus one screw diameter

Fig. 17. Eccentricity gauge

B2. Squareness of thread to face of nut. Clause 9.

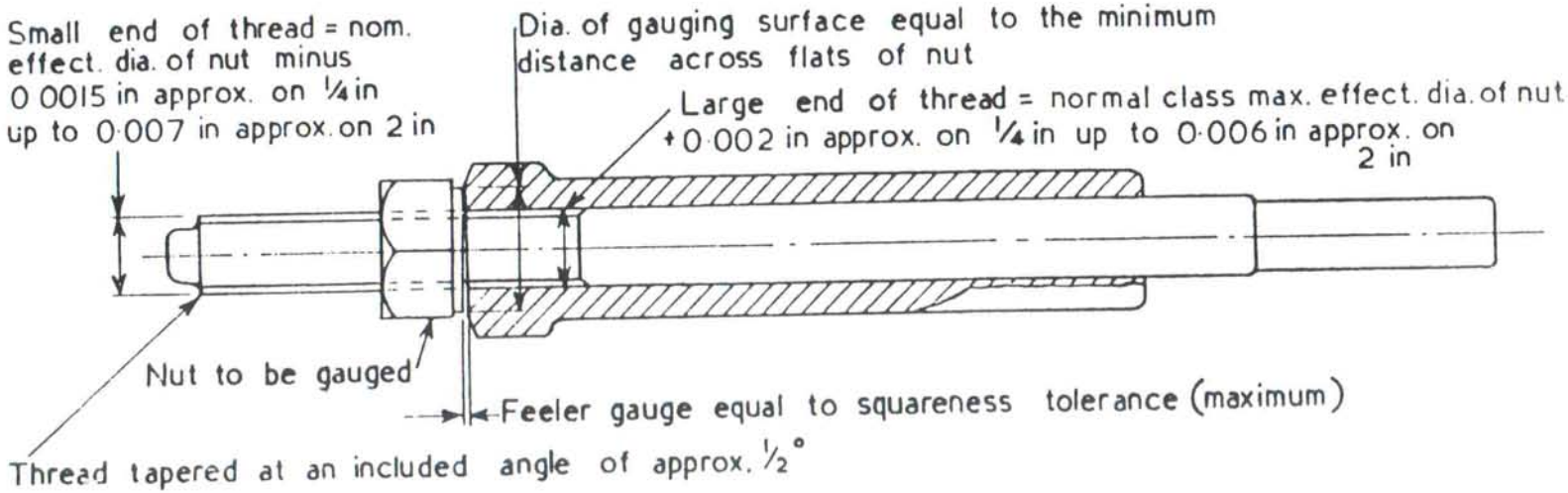


Fig. 18. Nut squareness gauge

B3. Off-centre distance between centre line of split pin hole in bolt and axis of thread (Fig. 19) and off-centre distance between centre line of slots in slotted nuts and axis of tapped hole (Fig. 20). Clause 11.

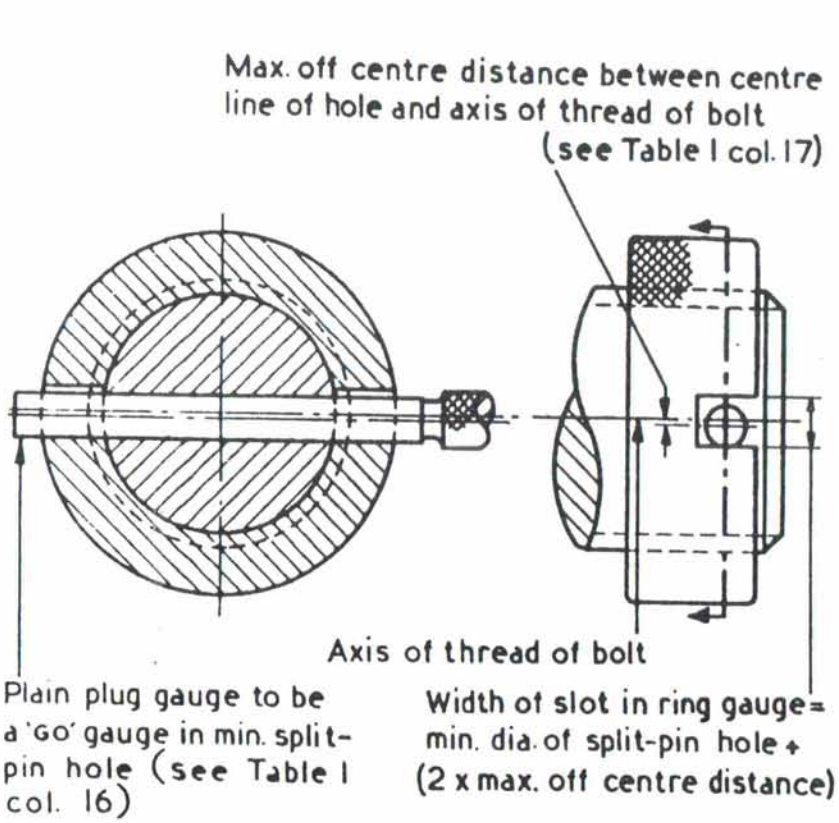


Fig. 19. Split pin hole gauge for bolts

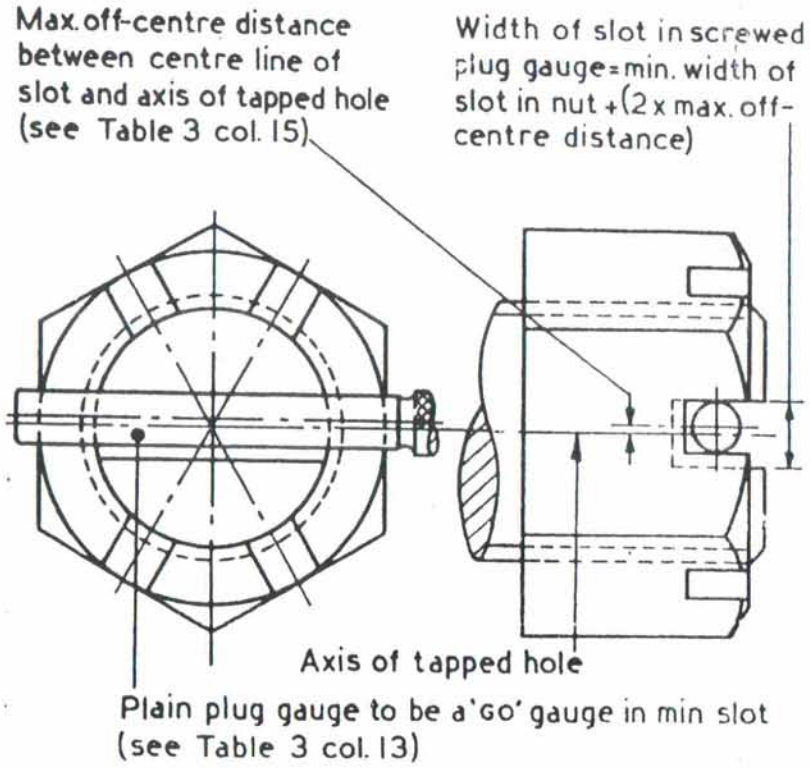


Fig. 20. Slot gauge for nuts

It is recommended that the screw ring gauge and the screw plug gauge illustrated above be made to the tolerances specified for screw gauges in B.S. 919, ' Screw gauge limits and tolerances ', Part 2, ' Gauges for screw threads other than those of Unified form ', and the plain plug gauges to the tolerances for plug gauges specified in B.S. 969, ' Plain limit gauges: Limits and tolerances '.

It is also recommended that the width of the slots in both the screw ring gauge and the screw plug gauge be made to the tolerances for gap gauges specified in B.S. 969. These tolerances should cover both the width of slot and the off-centre distance.

APPENDIX C

STANDARD SIZES OF STEEL HEXAGON HEAD PRECISION BOLTS AND SCREWS

Sizes marked ' X ' in the tables below are normally stocked with B.S.W. and B.S.F. threads.
Sizes marked ' F ' in the tables below are normally stocked with B.S.F. threads only.

TABLE 6. BRIGHT BOLTS. GRADE A

Nominal size *D*	Nominal length in inches																
	¾	⅞	1¼	1	1½	1¾	2	2¼	2½	2¾	3	3½	4	4½	5	5½	6
in																	
¼	X	X	X	X	X	X	X	X	X	X	X	X					
5/16		X	X	X	X	X	X	X	X	X	X	X	X				
⅜			X	X	X	X	X	X	X	X	X	X	X	X	X		
7/16				X	X	X	X	X	X	X	X	X	X	X	X		
½					X	X	X	X	X	X	X	X	X	X	X	X	X
⅝						X	X	X	X	X	X	X	X	X	X	X	X
¾							X	X	X	X	X	X	X	X	X	X	X
⅞								X	X	X	X	X	X	X	X	X	X
1											X	X	X	X	X	X	X

TABLE 7. BRIGHT SCREWS. GRADE A

Nominal size *D*	Nominal length in inches																				
	¼	5/16	⅜	7/16	½	5/8	¾	⅞	1	1¼	1½	1¾	2	2¼	2½	2¾	3	3½	4	5	6
in																					
¼					X	X	X		X	X	X	X	X	X	X						
5/16					X	X	X		X	X	X	X	X	X	X		X				
⅜					X	X	X		X	X	X	X	X	X:	X	X	X	X	X		
7/16							X		X	X	X	X	X	X	X	X	X	X	X		
½							X		X	X	X	X	X	X	X	X	X	X	X		
5/8									X	X	X	X	X	X	X	X	X	X	X		
¾									X	X	X	X	X	X	X	X	X	X	X		
⅞											X	X	X	X	X	X	X	X	X		
1											X	X	X	X	X	X	X	X	X	X	X

TABLE 8. HEAT-TREATED BOLTS. GRADE R

Nominal size *D*	Nominal length in inches																			
			¾	⅞	1	1⅛	1¼	1⅜	1½	1¾	2	2¼	2½	2¾	3	3¼	3½	4	4½	5	5½	6
in																						
¼			X	X	X	F	X	F	X	X	X	X	X	X	X	F	X	X	X			
5/16				X	X	F	X	F	X	X	X	X	X	X	X	F	X	X	X			
⅜					X	F	X	F	X	X	X	X	X	X	X	X	X	X	X			
7/16							X		X	X	X	X	X	X	X	X	X	X	X	X		
½									X	X	X	X	X	X	X	X	X	X	X	X	X	X
⅝										F	F	F	F	F	F	F	F	F	F	F	F	F
¾											F	F	F	F	F	F	F	F	F	F	F	F

TABLE 9. HEAT-TREATED SCREWS. GRADE R

Nominal size *D*	Nominal length in inches														
	½	⅝	¾	⅞	1	1¼	1½	1¾	2	2¼	2½	2¾	3	3¼	3½	4
in																
¼	X	X	X	X	X	X	X	X	X	X	X					
5/16	X	X	X	X	X	X	X	X	X	X	X	X	X			
⅜	X	X	X	X	X	X	X	X	X	X	X	X	X			
7/16			X		X	X	X	X	X	X	X	X	X			
½			X	X	X	X	X	X	X	X	X	X	X	X	X	X
⅝					F	F	F	F	F		F		F		F	F

TABLE 10. SHORTEST LENGTHS DESIGNATED AS BOLTS

(See Subclause 8*a*)

Nominal size *D*	Shortest length of bolts
in	in
¼	¾
5/16	⅞
⅜	1
7/16	1¼
½	1⅜
9/16	1½
⅝	1¾
¾	2
⅞	2¼
1	2¾
1⅛	3
1¼	3¼
1½	4
1¾	4½
2	5

PD 5907

Amendment No.1, published 11 August, 1966

to B.S. 1083 : 1965

Precision hexagon bolts, screws and nuts

At a fully representative conference held on 23rd November, 1965 consideration was given to the action to be taken in relation to the move to metric as far as British Standards for screw threads were concerned and it was decided that:

British industry should be strongly recommended to adopt the internationally agreed ISO metric threads* or ISO inch threads† but that the ISO inch threads should be regarded as second choice. The implementation of this recommendation means that B.A., B.S.F. and B.S.W. threads should become obsolescent and should not be used in new designs.

ACCORDINGLY IT HAS BEEN AGREED THAT B.S. 1083 BE RENDERED OBSOLESCENT: IT WILL BE MADE OBSOLETE IN DUE COURSE.

NOTE. The equivalent metric standard is B.S. 3692, 'Dimensions of ISO metric precision hexagon bolts, screws and nuts'.

* B.S. 3643, 'ISO metric screw threads'.
† B.S. 1580, 'Unified screw threads'.

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