SOCKET CAP, SHOULDER, SET SCREWS, HEX, AND SPLINE KEYS

IFI NOTES:

1. ***ASME B18.3 is a standard developed through the procedures of The American Society of Mechanical Engineers. B18.3 is under the jurisdiction of ASME Standards Committee B18 and is the direct responsibility of its Subcommittee 3.***

2. ***B18.3 presents requirements for 6 basic products:***

   - ***hexagon and spline socket head cap screws***
   - ***drilled hexagon socket head cap screws***
   - ***hexagon and spline socket flat countersunk head cap screws***
   - ***hexagon and spline socket button head cap screws***
   - ***hexagon socket head shoulder screws***
   - ***hexagon and spline socket set screws***

   The standard also includes driving bits and keys for both hexagon and spline socket screws.

3. ***This 2002 standard is a revision of the earlier 1998 version and includes numerous changes including new quality assurance provisions, and gaging techniques for countersunk screws.***

4. ***ASME B18.3-2002 is reprinted with the permission of its publisher, The American Society of Mechanical Engineers, Three Park Avenue, New York, NY 10016-5990, U.S.A.***

1. INTRODUCTORY NOTES

1.1 Scope

1.1.1 This standard covers complete general and dimensional data for various types of hexagon and spline (fluted) socket cap screws, shoulder screws, set screws, and hexagon and spline keys recognized as American National Standard. Also included are appendixes that provide specifications for hexagon and spline socket gages and gaging, tables showing applicability of keys and bits to various socket screw types and sizes, drill and counterbore sizes for socket head cap screws, and formulas on which dimensional data are based. However, where questions arise concerning acceptance of product, the dimensions in the tables shall govern over recalculation by formula.

1.1.2 The inclusion of dimensional data in this standard is not intended to imply that all of the products described are stock production sizes. Consumers should consult with manufacturers concerning lists of stock production sizes.

1.2 Socket Cap Screws

The head types covered by this standard include the following.

1.2.1 Socket Head Cap Screws. The socket head shall have flat chamfered top surface with smooth or knurled cylindrical sides and a flat bearing surface. Specifications are given in Tables 1A through 1F, pages G–4 thru G–11. Both hexagon and spline socket types are included.

Dimensions for drilled holes and counterbores are included in Appendix A, Table A1, page G–42.

1.2.2 Drilled Hexagon Socket Head Cap Screws. Specifications for hexagon socket head cap screws having 2, 4, and 6 holes drilled in the head for lock wire application are given in Table 1F, page G–11.

1.2.3 Socket Flat Countersunk Head Cap Screws. The flat countersunk head shall have a flat top surface and a conical bearing surface with included angle of approximately 82 deg. Specifications are given in Tables 2A, 2B, and 2C, pages G–15 thru G–19. Both hexagon and spline socket types are included.

1.2.4 Socket Button Head Cap Screws. The button head shall have a low rounded top surface with a large flat bearing surface. Specifications are given in Table 3, page G–20. Both hexagon and spline socket types are included.

1.2.5 Socket Low Head Cap Screws. These are similar to socket head cap screws except they have reduced head height and a smaller socket size. They are designed to be used in applications where height clearance is a problem. Specifications are given in Table 1G. Spline socket types are excluded.

1.3 Socket Head Shoulder Screws

The socket head shoulder screw is a hexagon socket head screw having a cylindrical shoulder under the head. Specifications are given in Table 4, page G–23.

1.4 Socket Set Screws

The socket set screw is a screw threaded the entire length except for its length of point. The point is designed to bear on a mating part. The common point styles are cup, flat, oval, cone, and half dog. Specifications for set screws are shown in Tables 5A through 5C, pages G–26 thru G–31, for both hexagon and spline socket types.

1.5 Keys and Bits for Driving Socket Screws

The tools for driving socket screws are hexagon or spline keys and bits, the specifications for which appear in Tables 8 and 9, respectively, pages G–35 and G–37.

1.6 Dimensions

All dimensions in this standard are given in inches, unless stated otherwise.

All dimensions apply prior to coating, unless stated otherwise.

1.7 Finish

Because of the high hardness of these products, it is recommended that they not be electroplated.

1.8 Identification Marking

Products described in Paras. 1.2.1 thru 1.2.4 and 1.3 with diameters larger than #10 must be marked with the identification of the source manufacturer or private label distributor accepting the responsibility for conformance to this standard. Marking size, type and location of marks are at manufacturer's option. Products shall not be marked on bearing surface.

1.9 Options

Options, where specified, shall be at the discretion of the manufacturer, unless agreed

upon otherwise by the manufacturer and purchaser.

1.10 Responsibility for Modifications

The manufacturer shall not be held responsible for malfunctions of product due to plating or other modifications, when such plating or modification is not accomplished under his control or direction.

1.11 Terminology

For definitions of terms relating to fasteners or to component features thereof used in this standard, refer to ASME B18.12, *Glossary of Terms for Mechanical Fasteners*, page N–1.

1.12 Referenced Standards

Titles and sources of availability of referenced standards are given on page N–38.

2. GENERAL DATA

2.1 Sockets

In accordance with the provisions set forth in the notes to the respective dimensional tables, screws shall have hexagon or spline sockets as designated by the purchaser.

Gages and gaging procedures are included in Appendix I. For coated products, use GO gages identical in design and tolerances to those shown in Appendix I, page G–38, except having minimum dimensions equal to minimum sizes of keys and bits shown in Tables 8 and 9, respectively, pages G–35 and G–37. Due to possible buildup of the socket, coated products may not accept a standard hex or spline key.

2.1.1 Hexagon Sockets. Hexagon sockets shall conform with the specifications given in Table 6, page G–33.

2.1.2 Spline Sockets. Spline sockets shall conform with the specifications given in Table 7, page G–34.

2.2 Threads

Threads on all screw products covered by this standard shall be in accordance with ASME B1.1, page A–33, for the series and class specified in the notes to the respective product dimensional tables.

Acceptability of screw threads shall be based on System 22 in accordance with ASME B1.3M, page A–63, except where otherwise noted in Note 5 of Table 5A, page G–28.

2.3 Quality Assurance

Products will be furnished in accordance with ASME B18.18.1, page M–5, with the thread acceptability to Inspection Level C, unless otherwise specified.

2.4 Dimensional Characteristics

Products shall conform to the dimensions indicated in the respective tables. The designated characteristics defined within the notes of each product table shall be inspected in accordance with ASME B18.18.2. For nondesignated dimensional characteristics the provisions of ASME B18.18.1 shall apply. Should a nondesignated dimension be determined to have a variance, it shall be deemed conforming to this standard if the user, who is the installer accepts the variance based on fit, form, and function considerations. Where verifiable in-process inspection is used in accordance with ASME B18.18.3 or ASME B18.18.4M, the final inspection level sample sizes of those respective standards shall apply.

SOCKET CAP, SHOULDER, SET SCREWS, HEX, AND SPLINE KEYS

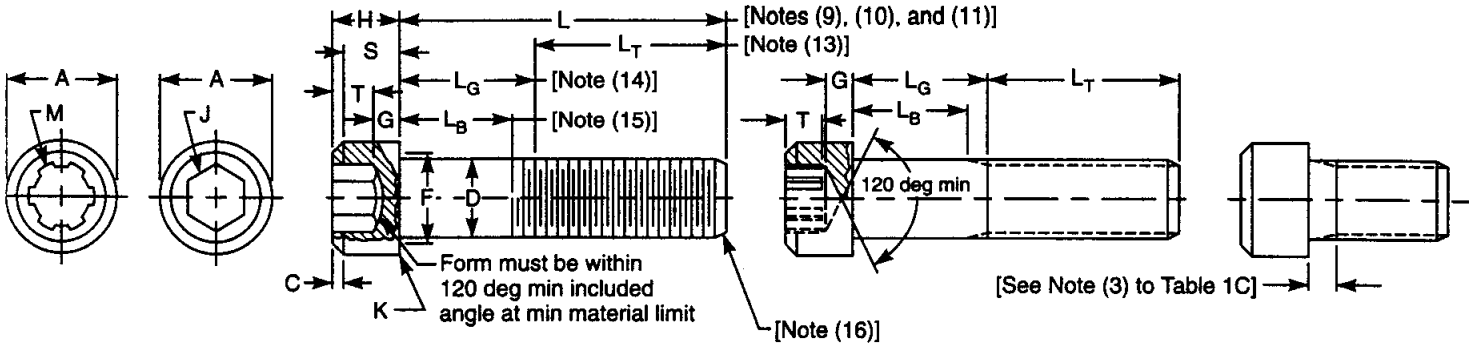


Table 1A Dimensions of Hexagon and Spline Socket Head Cap Screws

Nominal Size or Basic Screw Diameter		D		A		H		C	M	J		T	G	K
		Body Diameter		Head Diameter		Head Height		Chamfer or Radius	Spline Socket Size	Hexagon Socket Size		Key Engagement	Wall Thickness	Chamfer or Radius
		Max	Min	Max	Min	Max	Min	Max	Nom	Nom		Min	Min	Max
0	0.0600	0.0600	0.0568	0.096	0.091	0.060	0.057	0.004	0.060	...	0.050	0.025	0.020	0.007
1	0.0730	0.0730	0.0695	0.118	0.112	0.073	0.070	0.005	0.072	1/16	0.062	0.031	0.025	0.007
2	0.0860	0.0860	0.0822	0.140	0.134	0.086	0.083	0.008	0.096	5/64	0.078	0.038	0.029	0.007
3	0.0990	0.0990	0.0949	0.161	0.154	0.099	0.095	0.008	0.096	5/64	0.078	0.044	0.034	0.007
4	0.1120	0.1120	0.1075	0.183	0.176	0.112	0.108	0.009	0.111	3/32	0.094	0.051	0.038	0.008
5	0.1250	0.1250	0.1202	0.205	0.198	0.125	0.121	0.012	0.111	3/32	0.094	0.057	0.043	0.008
6	0.1380	0.1380	0.1329	0.226	0.218	0.138	0.134	0.013	0.133	7/64	0.109	0.064	0.047	0.008
8	0.1640	0.1640	0.1585	0.270	0.262	0.164	0.159	0.014	0.168	9/64	0.141	0.077	0.056	0.008
10	0.1900	0.1900	0.1840	0.312	0.303	0.190	0.185	0.018	0.183	5/32	0.156	0.090	0.065	0.008
1/4	0.2500	0.2500	0.2435	0.375	0.365	0.250	0.244	0.025	0.216	3/16	0.188	0.120	0.095	0.010
5/16	0.3125	0.3125	0.3053	0.469	0.457	0.312	0.306	0.033	0.291	1/4	0.250	0.151	0.119	0.010
3/8	0.3750	0.3750	0.3678	0.562	0.550	0.375	0.368	0.040	0.372	5/16	0.312	0.182	0.143	0.010
7/16	0.4375	0.4375	0.4294	0.656	0.642	0.438	0.430	0.047	0.454	3/8	0.375	0.213	0.166	0.015
1/2	0.5000	0.5000	0.4919	0.750	0.735	0.500	0.492	0.055	0.454	3/8	0.375	0.245	0.190	0.015
5/8	0.6250	0.6250	0.6163	0.938	0.921	0.625	0.616	0.070	0.595	1/2	0.500	0.307	0.238	0.015
3/4	0.7500	0.7500	0.7406	1.125	1.107	0.750	0.740	0.085	0.620	5/8	0.625	0.370	0.285	0.015
7/8	0.8750	0.8750	0.8647	1.312	1.293	0.875	0.864	0.100	0.698	3/4	0.750	0.432	0.333	0.020
1	1.0000	1.0000	0.9886	1.500	1.479	1.000	0.988	0.114	0.790	3/4	0.750	0.495	0.380	0.020
1-1/8	1.1250	1.1250	1.1086	1.688	1.665	1.125	1.111	0.129	...	7/8	0.875	0.557	0.428	0.020
1-1/4	1.2500	1.2500	1.2336	1.875	1.852	1.250	1.236	0.144	...	7/8	0.875	0.620	0.475	0.020
1-3/8	1.3750	1.3750	1.3568	2.062	2.038	1.375	1.360	0.160	...	1	1.000	0.682	0.523	0.020
1-1/2	1.5000	1.5000	1.4818	2.250	2.224	1.500	1.485	0.176	...	1	1.000	0.745	0.570	0.020
1-3/4	1.7500	1.7500	1.7295	2.625	2.597	1.750	1.734	0.207	...	1-1/4	1.250	0.870	0.665	0.020
2	2.0000	2.0000	1.9780	3.000	2.970	2.000	1.983	0.238	...	1-1/2	1.500	0.995	0.760	0.020
2-1/4	2.2500	2.2500	2.2280	3.375	3.344	2.250	2.232	0.269	...	1-3/4	1.750	1.120	0.855	0.036
2-1/2	2.5000	2.5000	2.4762	3.750	3.717	2.500	2.481	0.300	...	1-3/4	1.750	1.245	0.950	0.036
2-3/4	2.7500	2.7500	2.7262	4.125	4.090	2.750	2.730	0.332	...	2	2.000	1.370	1.045	0.036
3	3.0000	3.0000	2.9762	4.500	4.464	3.000	3.979	0.363	...	2-1/4	2.250	1.495	1.140	0.036
3-1/4	3.2500	3.2500	3.2262	4.875	4.837	3.250	3.228	0.394	...	2-1/4	2.250	1.620	1.235	0.036
3-1/2	3.5000	3.5000	3.4762	5.250	5.211	3.500	3.478	0.426	...	2-3/4	2.750	1.745	1.330	0.036
3-3/4	3.7500	3.7500	3.7262	5.625	5.584	3.750	3.727	0.458	...	2-3/4	2.750	1.870	1.425	0.036
4	4.0000	4.0000	3.9762	6.000	5.958	4.000	3.976	0.489	...	3	3.000	1.995	1.520	0.036
See Notes	1, 2, 3	2, 15		3				4	20	21				6

NOTES TO TABLE 1A:

1. Nominal Size. Where specifying nominal size in decimals, zeros preceding decimal and in the fourth decimal place shall be omitted.

2. Body. The term *body* refers to the unthreaded cylindrical portion of the shank for those screws not threaded to the head.

3. Head Diameter. Heads may be plain or knurled at the option of the manufacturer, unless specified otherwise by the customer. For knurled screws, the maximum head diameter shall be measured across the tops of the knurl, and the minimum head diameter shall be the diameter of the unknurled portion, or the diameter across the tops of the knurl for those screws not having an unknurled portion, just above the radius or chamfer at the bottom edge of the head.

4. Head Chamfer. The top of the head shall be flat. The intersection of the top of the head and the side of the head may be chamfered or radiused within the limits of C, at the manufacturer's option.

5. Bearing Surface. The plane of the bearing surface shall be perpendicular to the axis of the shank within a maximum deviation of one degree, obtained by holding the screw on the body or major thread diameter within one diameter of the bearing surface of the head, but beyond the maximum length of the fillet (F_L), and inspecting on an optical comparator, or comparable inspection equipment, rotating the axis of the shank 360 deg.

6. Edge of Head. The edge between the bearing surface and the side of the head may be broken (rounded or chamfered), but the radius or chamfer measured along with bearing surface shall not exceed the values listed for K.

7. Runout

(a) The runout of the head with the axis of the shank shall be within 2 percent of the maximum basic screw diameter dimension (D) or 0.006 in., whichever is greater.

Runout for the above is defined as the full indicator movement (FIM) obtained by holding the screw on the body or major screw thread diameter within one diameter of the bearing surface of the head, but beyond the maximum length of the fillet (F_L), rotating 360 deg and indicating on the outside diameter of the head.

(b) The runout of the socket with the axis of the shank of the screw shall be within 3 percent of the maximum screw diameter (D) or 0.005 inches, whichever is greater for sizes through 1/2 in. diameter and 6 percent for sizes above 1/2 in. diameter.

Runout for the above is defined as the full indicator movement (FIM) obtained by holding the screw on the body or major screw thread diameter within one diameter of the bearing surface of the head, but beyond the maximum length of the fillet (F_L), rotating 360 deg, indicating on each of the six hexagon flats.

(c) The conformance of screws to shank straightness or camber limitations set forth as D_e in Table 1E shall be checked by the use of the procedures and typical gage illustrated in Appendix III.

8. Fillet. For all lengths of screws the form of the underhead fillet shall be optional, as depicted in the illustration above Table 1B, page G–7, provided it is a smooth and continuous concave curve fairing into the bearing surface of the head, and the screw shank is within the envelope established by the limits for fillet extension, length, and juncture radius specified in Table 1B.

9. Length. The length of the screw shall be measured parallel to the axis of the screw from the plane of the bearing surface under the head to the plane of the flat of the point. The portion of the screw contained within dimension L is commonly called the *shank*. The basic length dimension on the product shall be the nominal length expressed as a two-place decimal.

10. Standard Lengths. Standard length increments for socket head cap screws shall be as tabulated below:

Nom Screw Size, in.	Nom Screw Length, in.	Standard Length Increment
0 to 1.00, incl.	0.13 thru 0.25	0.06
	0.25 thru 1.00	0.13
	1.00 thru 3.50	0.25
	3.50 thru 7.00	0.50
	7.00 thru 10.00	1.00
Over 1.00	1.00 thru 7.00	0.50
	7.00 thru 10.00	1.00
	Over 10.00	2.00

11. Length Tolerances. The allowable tolerance on length shall be as tabulated below:

Nom Screw Size	0 thru 3/8, incl.	7/16 thru 3/4, incl.	7/8 thru 1-1/2, incl.	Over 1-1/2
Nom Screw Length, in.	Tolerance on Length			
Up to 1.00, incl.	– 0.03	– 0.03	– 0.05	...
Over 1.00 to 2.50, incl.	– 0.04	– 0.06	– 0.10	– 0.18
Over 2.50 to 6.00, incl.	– 0.06	– 0.08	– 0.14	– 0.20
Over 6.00	– 0.12	– 0.12	– 0.20	– 0.24

12. Threads. Threads shall be Unified external threads with radius root: Class 3A UNRC and UNRF Series for screw sizes 0 (0.060 in.) through 1 in.; Class 2A UNRC and UNRF Series for sizes over 1 in. to 1-1/2 in., inclusive;

NOTES TO TABLE 1A CONT.

and Class 2A UNR Series for sizes larger than 1-1/2 in.

For plated or unplated screws, acceptability shall be based upon System 22, ASME B1.3M, page A–63.

Class 3A does not provide a plating allowance. When plated products are required, it is recommended that they be procured from the manufacturer (see Para. 1.8 of Introductory Notes).

13. Thread Length L_T. The length of thread shall be measured, parallel to the axis of the screw, from the extreme point to the last complete (full-form) thread. The thread length on socket head cap screws shall be as defined by Table 1C, page G–8, and notes thereto.

14. Grip Gaging Length L_G. Grip gaging length is the distance, measured parallel to the axis of the screw, from the bearing surface of the head to the first complete (full-form) thread under the head (see Table 1C).

15. Body Length L_B. Body length is the length, measured parallel to the axis of the screw, of the unthreaded portion of the shank (see Table 1C).

16. Screw Point Chamfer. The point shall be flat or slightly concave and chamfered. The plane of the point shall be approximately normal to the axis of the screw. The chamfer shall extend slightly below the root of the thread, and the edge between the flat and chamfer may be slightly rounded. The included angle of the point should be approximately 90 deg. Chamfering of screw sizes up to and including size 8 (0.164 in.) and lengths below 0.75D shall be optional.

17. Material

(a) Steel, alloy. Cap screws shall be fabricated from an alloy steel and shall conform in all respects to ASTM A574, page G–48.

(b) Steel, corrosion-resistant. Cap screws shall be fabricated from a corrosion-resistant steel and shall conform in all respects to ASTM F837.

18. Surface Roughness. For alloy steel screws of sizes up to and including 5/8 in., and nominal lengths equal to or less than 8 times the basic screw diameter, the surface roughness of the screws before plating shall not exceed 63 μ in. (arithmetical average) on the fillet and head bearing surfaces, nor exceed 32 μ in. (arithmetical average) on the threads.

For larger sizes, longer lengths, and corrosion-resistant steel screws, the surface roughness of the screws prior to plating shall not exceed 125 μ in. (arithmetical average) on the body [see Note (2)], fillet [see Note (8)], and head bearing surfaces.

Normally, it shall be sufficient to ascertain that these surfaces on screws have the equivalent of a smooth machined finish by visual comparison with known surface standards. However, where it is practical and deemed necessary to measure these surfaces with commercially available equipment, roughness measurements shall be taken axially on the body and fillet surfaces, and circumferentially on the bearing surface. (See ASME B46.1, *Surface Texture*.)

19. Drawings. On socket screw drawings, when the distance from the bearing surface of the head to the threading is dimensioned, regardless of type of thread representation (see ASME Y14.6, *Engineering Drawing and Related Documentation Practices, Screw Thread Representation*, for description of schematic and simplified thread representation), the dimension should be noted to indicate whether body length or grip length is required.

20. See Table 7, page G–34, for spline socket dimensions, and Appendix I, page G–38, for gaging of spline sockets.

21. See Table 6, page G–33, for hexagon socket dimensions, and Appendix I for gaging of hexagon sockets.

22. Dimensional Conformance. Socket Head Cap Screws shall have the following designated characteristics inspected to ASME B18.18.2 to the inspection levels shown:

Characteristic	Inspection Level
Threads	C
Head Diameter	C
Socket Size (gaged)	C
Length	C
Fillet Transition Diameter	C

23. Designation. To promote uniformity and understanding in communications relating to products conforming to this standard, it is recommended that Hexagon and Spline Socket Head Cap Screws be designated in accordance with the following data, preferably in the sequence shown:

(a) product name
(b) designation of the standard
(c) nominal size (number, fractional or decimal equivalent)
(d) thread pitch
(e) nominal length (fractional or decimal equivalent)
(f) material
(g) protective finish, if required

EXAMPLES:

Hexagon Socket Head Cap Screws, ASME B18.3, 6 – 32 × 3/4, Alloy Steel

Spline Socket Head Cap Screws, ASME B18.3, 0.138 – 32 × 0.750, Alloy Steel, Zinc Plated

For the recommended B18 part identifying numbering system (PIN), see ASME B18.24.1.

24. For formulas for dimensions, see Appendix C, page G–44.

25. For additional requirements, see Introductory Notes and General Data, page G–1.

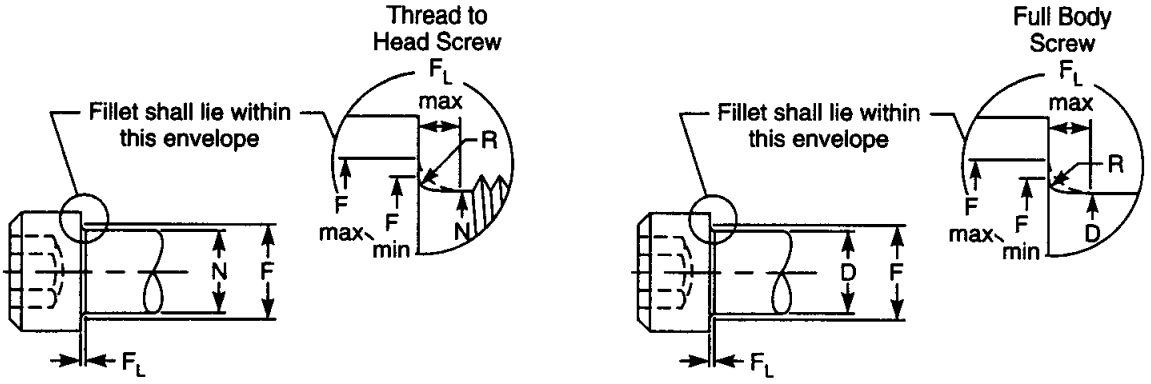


Table 1B Dimensions of Underhead Fillets for Socket Head Cap Screws

Nominal Screw Size		N	F		F_L	R	D	
		Thread to Head Screw	Fillet Juncture Diameter at Bearing Surface		Fillet Length	Juncture Radius	Full Body Unthreaded Length Body Diameter	
		Min	Max	Min	Max	Min	Max	Min
0	0.0600	0.051	0.074	0.062	0.012	0.002	0.0600	0.0560
1	0.0730	0.061	0.087	0.075	0.012	0.003	0.0730	0.0695
2	0.0860	0.073	0.102	0.090	0.014	0.003	0.0860	0.0822
3	0.0990	0.084	0.115	0.102	0.014	0.004	0.0990	0.0949
4	0.1120	0.094	0.130	0.117	0.015	0.004	0.1120	0.1075
5	0.1250	0.107	0.145	0.132	0.017	0.005	0.1250	0.1202
6	0.1380	0.116	0.158	0.144	0.017	0.005	0.1380	0.1329
8	0.1640	0.142	0.188	0.172	0.020	0.006	0.1640	0.1585
10	0.1900	0.160	0.218	0.202	0.024	0.006	0.1900	0.1840
1/4	0.2500	0.215	0.278	0.261	0.024	0.007	0.2500	0.2435
5/16	0.3125	0.273	0.347	0.329	0.029	0.009	0.3125	0.3053
3/8	0.3750	0.331	0.415	0.397	0.034	0.012	0.3750	0.3678
7/16	0.4375	0.388	0.484	0.465	0.039	0.014	0.4375	0.4294
1/2	0.5000	0.446	0.552	0.531	0.044	0.016	0.5000	0.4919
5/8	0.6250	0.562	0.689	0.664	0.054	0.021	0.6250	0.6163
3/4	0.7500	0.681	0.828	0.800	0.066	0.025	0.7500	0.7406
7/8	0.8750	0.798	0.963	0.932	0.075	0.031	0.8750	0.8647
1	1.0000	0.914	1.100	1.068	0.085	0.034	1.0000	0.9886
1-1/8	1.1250	1.023	1.235	1.198	0.094	0.039	1.1250	1.1086
1-1/4	1.2500	1.148	1.370	1.333	0.102	0.044	1.2500	1.2336
1-3/8	1.3750	1.256	1.505	1.466	0.110	0.048	1.3750	1.3568
1-1/2	1.5000	1.381	1.640	1.601	0.119	0.052	1.5000	1.4818
1-3/4	1.7500	1.609	1.910	1.869	0.136	0.062	1.7500	1.7295
2	2.0000	1.843	2.180	2.128	0.153	0.071	2.0000	1.9780
2-1/4	2.2500	2.093	2.450	2.398	0.170	0.080	2.2500	2.2280
2-1/2	2.5000	2.324	2.720	2.662	0.187	0.088	2.5000	2.4762
2-3/4	2.7500	2.574	2.990	2.936	0.204	0.097	2.7500	2.7262
3	3.0000	2.824	3.260	3.206	0.221	0.106	3.0000	2.9762
3-1/4	3.2500	3.073	3.530	3.476	0.238	0.114	3.2500	3.2262
3-1/2	3.5000	3.323	3.800	3.746	0.255	0.124	3.5000	3.4762
3-3/4	3.7500	3.573	4.070	4.016	0.272	0.134	3.7500	3.7262
4	4.0000	3.823	4.340	4.286	0.289	0.143	4.0000	3.9762

SOCKET CAP, SHOULDER, SET SCREWS, HEX, AND SPLINE KEYS

Table 1C Body and Grip Lengths for Socket Head Cap Screws

Nom Size	0		1		2		3		4		5		6		8		10	
Nom Length	L_G	L_B	L_G	L_B	L_G	L_B	L_G	L_B	L_G	L_B	L_G	L_B	L_G	L_B	L_G	L_B	L_G	L_B
0.75	0.25	0.19																
0.88	0.25	0.19	0.25	0.17	0.25	0.16	0.25	0.15										
1.00	0.50	0.44	0.25	0.17	0.25	0.16	0.25	0.15	0.25	0.12	0.25	0.12						
1.25	0.75	0.69	0.62	0.55	0.62	0.54	0.62	0.52	0.25	0.12	0.25	0.12	0.50	0.34	0.38	0.22	0.38	0.17
1.50	...	...	0.88	0.80	0.88	0.79	0.88	0.77	0.75	0.62	0.75	0.62	0.50	0.34	0.38	0.22	0.38	0.17
1.75	...	...	...	...	1.12	1.04	1.12	1.02	0.75	0.62	0.75	0.62	1.00	0.84	0.88	0.72	0.88	0.67
2.00	...	...	...	...	...	...	1.38	1.27	1.25	1.12	1.25	1.12	1.00	0.84	0.88	0.72	0.88	0.67
2.25	...	...	...	...	...	...	...	...	1.25	1.12	1.25	1.12	1.50	1.34	1.38	1.22	1.38	1.17
2.50	...	...	...	...	...	...	...	...	...	...	1.75	1.62	1.50	1.34	1.38	1.22	1.38	1.17
2.75	...	...	...	...	...	...	...	...	...	...	...	...	2.00	1.84	1.88	1.72	1.88	1.67
3.00	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1.88	1.72	1.88	1.67
3.25	...	...	...	...	...	...	...	...	...	...	...	...	...	...	2.38	2.22	2.38	2.17
3.50	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	2.38	2.17
3.75	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	2.88	2.67
4.00	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	2.88	2.67

Nom Size	1/4		5/16		3/8		7/16		1/2		5/8		3/4		7/8		1	
Nom Length	L_G	L_B	L_G	L_B	L_G	L_B	L_G	L_B	L_G	L_B	L_G	L_B	L_G	L_B	L_G	L_B	L_G	L_B
1.50	0.50	0.25																
1.75	0.50	0.25	0.62	0.35	0.50	0.19												
2.00	1.00	0.75	0.62	0.35	0.50	0.19	0.62	0.27										
2.25	1.00	0.75	1.12	0.85	1.00	0.69	0.62	0.27	0.75	0.36								
2.50	1.50	1.25	1.12	0.85	1.00	0.69	1.12	0.77	0.75	0.36	0.75	0.30						
2.75	1.50	1.25	1.62	1.35	1.50	1.19	1.12	0.77	0.75	0.36	0.75	0.30						
3.00	2.00	1.75	1.62	1.35	1.50	1.19	1.62	1.27	1.50	1.12	0.75	0.30	1.00	0.50				
3.25	2.00	1.75	2.12	1.85	2.00	1.69	1.62	1.27	1.50	1.12	1.50	1.04	1.00	0.50	1.00	0.44		
3.50	2.50	2.25	2.12	1.85	2.00	1.69	2.12	1.77	1.50	1.12	1.50	1.04	1.00	0.50	1.00	0.44	1.00	0.38
3.75	2.50	2.25	2.62	2.35	2.50	2.19	2.12	1.77	2.25	1.86	1.50	1.04	1.00	0.50	1.00	0.44	1.00	0.38
4.00	3.00	2.75	2.62	2.35	2.50	2.19	2.62	2.27	2.25	1.86	2.25	1.80	2.00	1.50	1.00	0.44	1.00	0.38
4.25	3.00	2.75	3.12	2.85	3.00	2.69	2.62	2.27	2.25	1.86	2.25	1.80	2.00	1.50	2.00	1.44	1.00	0.38
4.50	3.50	3.25	3.12	2.85	3.00	2.69	3.12	2.77	3.00	2.62	2.25	1.80	2.00	1.50	2.00	1.44	2.00	1.38
4.75	3.50	3.25	3.62	3.35	3.50	3.19	3.12	2.77	3.00	2.62	3.00	2.54	2.00	1.50	2.00	1.44	2.00	1.38
5.00	4.00	3.75	3.62	3.35	3.50	3.19	3.62	3.27	3.00	2.62	3.00	2.54	3.00	2.50	2.00	1.44	2.00	1.38
5.25	...	...	4.12	3.85	4.00	3.69	3.62	3.27	3.75	3.36	3.00	2.54	3.00	2.50	3.00	2.44	2.00	1.38
5.50	...	...	4.12	3.85	4.00	3.69	4.12	3.77	3.75	3.36	3.75	3.30	3.00	2.50	3.00	2.44	3.00	2.38
5.75	...	...	4.62	4.35	4.50	4.19	4.12	3.77	3.75	3.36	3.75	3.30	3.00	2.50	3.00	2.44	3.00	2.38
6.00	...	...	4.62	4.35	4.50	4.19	4.62	4.27	4.50	4.12	3.75	3.30	4.00	3.50	3.00	2.44	3.00	2.38
6.25	...	...	5.12	4.85	5.00	4.69	4.62	4.27	4.50	4.12	4.50	4.04	4.00	3.50	4.00	3.44	3.00	2.38
6.50	...	...	...	...	5.00	4.69	5.12	4.77	4.50	4.12	4.50	4.04	4.00	3.50	4.00	3.44	4.00	3.38
6.75	...	...	...	...	5.50	5.19	5.12	4.77	5.25	4.86	4.50	4.04	4.00	3.50	4.00	3.44	4.00	3.38
7.00	...	...	...	...	5.50	5.19	5.62	5.27	5.25	4.86	5.25	4.80	5.00	4.50	4.00	3.44	4.00	3.38
7.25	...	...	...	...	6.00	5.69	5.62	5.27	5.25	4.86	5.25	4.80	5.00	4.50	5.00	4.44	4.00	3.38
7.50	...	...	...	...	6.00	5.69	6.12	5.77	6.00	5.62	5.25	4.80	5.00	4.50	5.00	4.44	5.00	4.38
7.75	...	...	...	...	...	...	6.12	5.77	6.00	5.62	6.00	5.54	5.00	4.50	5.00	4.44	5.00	4.38
8.00	...	...	...	...	...	...	6.62	6.27	6.00	5.62	6.00	5.54	6.00	5.50	5.00	4.44	5.00	4.38
8.50	...	...	...	...	...	...	7.12	6.77	7.00	6.62	6.75	6.30	6.00	5.50	6.00	5.44	6.00	5.38
9.00	...	...	...	...	...	...	7.62	7.27	7.00	6.62	6.75	6.30	7.00	6.50	6.00	5.44	6.00	5.38
9.50	...	...	...	...	...	...	...	...	8.00	7.62	7.75	7.30	7.00	6.50	7.00	6.44	7.00	6.38
10.00	...	...	...	...	...	...	...	...	8.00	7.62	7.75	7.30	8.00	7.50	7.00	6.44	7.00	6.38
11.00	...	...	...	...	...	...	...	...	...	...	9.25	8.80	9.00	8.50	8.00	7.44	8.00	7.38
12.00	...	...	...	...	...	...	...	...	...	...	10.25	9.80	10.00	9.50	9.00	8.44	9.00	8.38
13.00	...	...	...	...	...	...	...	...	...	...	...	...	11.00	10.50	10.00	9.44	10.00	9.38
14.00	...	...	...	...	...	...	...	...	...	...	...	...	12.00	11.50	11.00	10.44	11.00	10.38
15.00	...	...	...	...	...	...	...	...	...	...	...	...	13.00	12.50	12.00	11.44	12.00	11.38
16.00	...	...	...	...	...	...	...	...	...	...	...	...	...	...	13.00	12.44	13.00	12.38
17.00	...	...	...	...	...	...	...	...	...	...	...	...	...	...	14.00	13.44	14.00	13.38
18.00	...	...	...	...	...	...	...	...	...	...	...	...	...	...	15.00	14.44	15.00	14.38
19.00	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	16.00	15.38
20.00	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	17.00	16.38

NOTES TO TABLE 1C:

1. The tabulated L_G values are maximum and represent the minimum design grip length of the screw. They shall be measured from the bearing surface of the head to the face of a GO thread ring gage, having the thread countersink and/or counterbore removed, which has been assembled by hand as far as the thread will permit. The tabulated L_B values are minimum and represent the minimum body length of the screw. They are equal to L_G minus 5 times the pitch of the UNRC thread for the respective screw size.

2. Screws having nominal lengths falling between those for which L_G and L_B values are tabulated in this table shall have L_G and L_B dimensions conforming with those of the next shorter tabulated nominal length for the respective screw size. For example: for a 1/4 in. size screw, 1.88 in. long, L_G = 0.50 in. and L_B = 0.25 in.

3. For screws of nominal lengths above the heavy line in this table, the complete (full form) threads, measured with a thread ring gage having the thread chamfer and/or counterbore removed, shall extend to within two pitches (threads) of the head for sizes 0 (0.060 in.) through 5/8 in., inclusive; and shall extend as close to the head as is practicable for sizes larger than 5/8 in.

Screws over 1 in. in diameter and of lengths shorter than the minimum thread length L_T plus 5 times the pitch of the UNRC thread for the respective screw size shall have complete (full-form) threads extending as close to the head as practicable. See Note (4) for L_T values.

4. For screws of nominal lengths longer than those for which L_G and L_B values are tabulated in this table and for screws over 1 in. in diameter, the maximum grip gaging length L_G and the minimum body length L_B of the screws shall be determined as shown in Table 1D:

$$L_G = L - L_T$$
$$L_B = L - L_{TT}$$

where

L = nom length
L_T = min thread length
L_{TT} = max total thread length

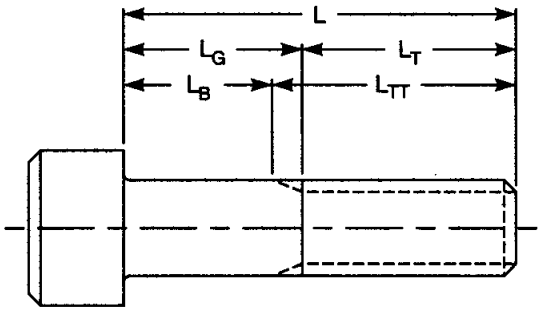


Table 1D Screws Beyond Sizes in Table 1C

Nom Size or Basic Screw Dia		L_T Thread Length Min	L_{TT} Total Thread Length Max	Nom Size or Basic Screw Dia		L_T Thread Length Min	L_{TT} Total Thread Length Max
0	0.0600	0.50	0.62	7/8	0.8750	2.25	3.69
1	0.0730	0.62	0.77	1	1.0000	2.50	4.12
2	0.0860	0.62	0.80	1-1/8	1.1250	2.81	4.65
3	0.0990	0.62	0.83	1-1/4	1.2500	3.12	5.09
4	0.1120	0.75	0.99	1-3/8	1.3750	3.44	5.65
5	0.1250	0.75	1.00	1-1/2	1.5000	3.75	6.08
6	0.1380	0.75	1.05	1-3/4	1.7500	4.38	7.13
8	0.1640	0.88	1.19	2	2.0000	5.00	8.11
10	0.1900	0.88	1.27	2-1/4	2.2500	5.62	8.99
1/4	0.2500	1.00	1.50	2-1/2	2.5000	6.25	10.00
5/16	0.3125	1.12	1.71	2-3/4	2.7500	6.88	10.87
3/8	0.3750	1.25	1.94	3	3.0000	7.50	11.75
7/16	0.4375	1.38	2.17	3-1/4	3.2500	8.12	12.63
1/2	0.5000	1.50	2.38	3-1/2	3.5000	8.75	13.50
5/8	0.6250	1.75	2.82	3-3/4	3.7500	9.38	14.37
3/4	0.7500	2.00	3.25	4	4.0000	10.00	15.25

Table 1E Shank Straightness for Socket Head Cap Screws

Nom Size		0	1	2	3	4	5	6	8	10
Nom Length		D_e Diameters (Note 1) and Appendix III								
Over	To Incl.	D_e	D_e	D_e	D_e	D_e	D_e	D_e	D_e	D_e
0	0.25	0.063	0.076	...	...	...	...	...	...	...
0.25	0.50	0.065	0.078	...	...	...	...	...	...	...
0.50	0.75	0.068	0.080	...	...	...	...	...	...	...
0.75	1	0.070	0.082	...	...	...	...	...	...	...
1	1.50	...	0.087	...	...	...	...	...	...	...
0	0.50	...	...	0.090	0.103	0.116	...	...	...	...
0.50	1	...	...	0.095	0.107	0.120	...	...	...	...
1	1.50	...	...	0.099	0.111	0.123	...	...	...	...
1.50	2	...	...	0.103	0.115	0.127	...	...	...	...
2	2.50	...	...	...	...	0.131	...	...	...	...
0	0.75	...	...	...	...	...	0.130	0.143	0.168	...
0.75	1.50	...	...	...	...	...	0.136	0.148	0.173	...
1.50	2.25	...	...	...	...	...	0.140	0.153	0.178	...
2.25	3	...	...	...	...	...	0.146	0.158	0.183	...
3	4	...	...	...	...	...	0.150	0.163	0.189	...
0	1	...	...	...	...	...	...	...	...	0.196
1	2	...	...	...	...	...	...	...	...	0.201
2	3	...	...	...	...	...	...	...	...	0.207
3	4	...	...	...	...	...	...	...	...	0.213
4	6	...	...	...	...	...	...	...	...	0.215

Nom Size		1/4	5/16	3/8	7/16	1/2	5/8	3/4	7/8	1
Nom Length		D_e Diameters (Note 1) and Appendix III								
Over	To Incl.	D_e	D_e	D_e	D_e	D_e	D_e	D_e	D_e	D_e
0	1	0.255	0.317	0.379	0.441	...	...	...	...	...
1	2	0.260	0.322	0.383	0.445	...	...	...	...	...
2	3	0.265	0.326	0.387	0.449	...	...	...	...	...
3	4	0.270	0.331	0.391	0.453	...	...	...	...	...
4	6	0.275	0.337	0.400	0.462	...	...	...	...	...
0	2	...	...	...	...	0.507	0.631	0.756	0.880	1.005
2	4	...	...	...	...	0.514	0.638	0.762	0.886	1.010
4	6	...	...	...	...	0.521	0.644	0.767	0.891	1.015
6	8	...	...	...	...	0.525	0.650	0.773	0.897	1.020
8	10	...	...	...	...	...	...	0.775	0.900	1.025

Nom Size		1-1/8	1-1/4	1-3/8	1-1/2	1-3/4	2	2-1/4
Nom Length		D_e Diameters (Note 1) and Appendix III						
Over	To Incl.	D_e	D_e	D_e	D_e	D_e	D_e	D_e
0	6	1.140	1.265	1.390	1.515	1.765	2.015	2.265
6	12	1.155	1.280	1.405	1.530	1.780	2.030	2.280
12	18	1.170	1.295	1.420	1.545	1.795	2.045	2.295
18	24	1.185	1.310	1.435	1.560	1.810	2.060	2.310

Nom Size		2-1/2	2-3/4	3	3-1/4	3-1/2	3-3/4	4
Nom Length		D_e Diameters (Note 1) and Appendix III						
Over	To Incl.	D_e	D_e	D_e	D_e	D_e	D_e	D_e
0	6	2.515	2.765	3.015	3.265	3.515	3.765	4.015
6	12	2.530	2.780	3.030	3.280	3.530	3.780	4.030
12	18	2.545	2.795	3.045	3.295	3.545	3.795	4.045
18	24	2.560	2.810	3.060	3.310	3.560	3.810	4.060

NOTE:

1. The largest diameter D_e specified for the various screw sizes shall apply for any nominal screw length longer than that tabulated for the respective nominal screw size.

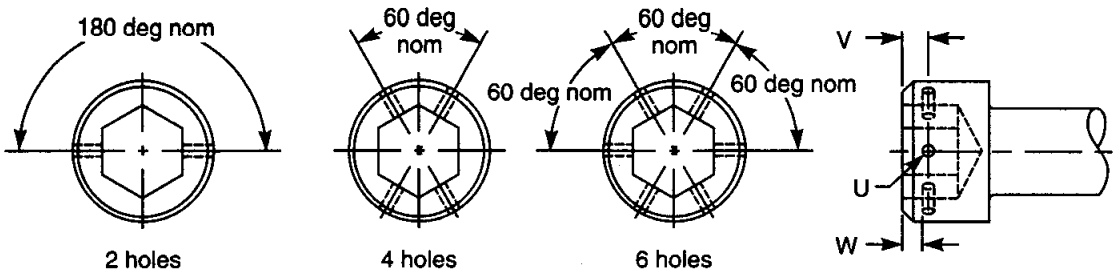


Table 1F Dimensions of Drilled Hexagon Socket Head Cap Screws

Nom Size or Basic Screw Dia		U		V		W	Drill Check Plug Dia		Hole Alignment Check Plug Dia
		Drilled Hole Dia		Head to Center of Hole		Head to Edge of Hole	Type I	Type II	
		Number	Basic	Max	Min	Min	Basic	Basic	
4	0.1120	65	0.0350	0.040	0.026	0.008	0.030	0.033	0.025
5	0.1250	65	0.0350	0.045	0.030	0.012	0.030	0.033	0.025
6	0.1380	65	0.0350	0.050	0.035	0.018	0.030	0.033	0.025
8	0.1640	56	0.0465	0.060	0.040	...	0.035	0.044	0.030
10	0.1900	56	0.0465	0.065	0.045	...	0.035	0.044	0.030
1/4	0.2500	56	0.0465	0.085	0.065	...	0.035	0.044	0.030
5/16	0.3125	56	0.0465	0.104	0.084	...	0.035	0.044	0.030
3/8	0.3750	52	0.0635	0.123	0.103	...	0.052	0.061	0.047
7/16	0.4375	52	0.0635	0.141	0.121	...	0.052	0.061	0.047
1/2	0.5000	52	0.0635	0.160	0.140	...	0.052	0.061	0.047
5/8	0.6250	52	0.0635	0.198	0.178	...	0.052	0.061	0.047
3/4	0.7500	42	0.0935	0.235	0.215	...	0.082	0.091	0.077
7/8	0.8750	42	0.0935	0.273	0.253	...	0.082	0.091	0.077
1	1.0000	42	0.0935	0.310	0.290	...	0.082	0.091	0.077
1-1/8	1.1250	31	0.1200	0.348	0.328	...	0.109	0.117	0.104
1-1/4	1.2500	31	0.1200	0.385	0.365	...	0.109	0.117	0.104
1-3/8	1.3750	31	0.1200	0.423	0.403	...	0.109	0.117	0.104
1-1/2	1.5000	31	0.1200	0.460	0.440	...	0.109	0.117	0.104
See Notes	1	3, 4					4		4

NOTES TO TABLE 1F:

1. Nominal Size. Where specifying nominal size in decimals, zeros preceding decimal and in the fourth decimal place shall be omitted.

2. Screws. Drilled hexagon socket head cap screws shall conform to the respective dimensions and requirements set forth in Table 1A, page G–4, and the notes thereto, except for the holes in the head as specified in this table and the following notes.

3. Number of Holes. Screws shall have 2, 4, or 6 holes drilled in the head as designated by the purchaser. For sizes 6 (0.138 in.) and smaller, the use of only 2 holes is recommended.

4. Holes. Hole size and location from the top of the head shall conform to the specifications given in this table. For sizes 8 (0.164 in.) and larger, the drilled hole shall lie within the flats of the hexagon socket and not break through the socket corners. Positioning of holes on opposite sides of the socket shall be such that the hole alignment check plug will pass completely through the head on all screw sizes.

For commercial quality screws, the edge of the holes on the outside of the head may be chamfered or broken. The edge of the holes within the socket may contain burrs to the extent that the socket will accept a key having the standard minimum width across the flats (see Table 8, page G–35) and the holes must allow the Type I drill check plug to pass from the outside of the head into the socket.

For aircraft quality screws, the edge of the holes on the outside of the head shall be chamfered and there shall be no burr chips or slivers that might become dislodged during usage. The socket shall accept a key having the standard

NOTES TO TABLE 1F CONT.

maximum width across the flats (see Table 8) and the holes must allow the Type II drill check plug to pass from the outside of the head into the socket.

Chamfer on the edge of the holes, whether provided optionally or as required, shall be subject to visual inspection only.

5. Designation. To promote uniformity and understanding in communications relating to products conforming to this standard, it is recommended that Drilled Hexagon Socket Head Cap Screws be designated in accordance with the following data, preferably in the sequence shown:

(a) product name, including number of holes
(b) designation of the standard
(c) nominal size (number, fractional or decimal equivalent)
(d) thread pitch
(e) nominal length (fractional or decimal equivalent)
(f) material
(g) protective finish, if required

EXAMPLES:

Drilled (2 holes) Hexagon Socket Head Cap Screws, ASME B18.3, 6 – 32 × 3/4, Alloy Steel

Drilled (6 holes) Hexagon Socket Head Cap Screws, ASME B18.3, 0.375 – 16 × 1.250, Alloy Steel, Zinc Plated

For the recommended B18 part identifying numbering system (PIN), see ASME B18.24.1.

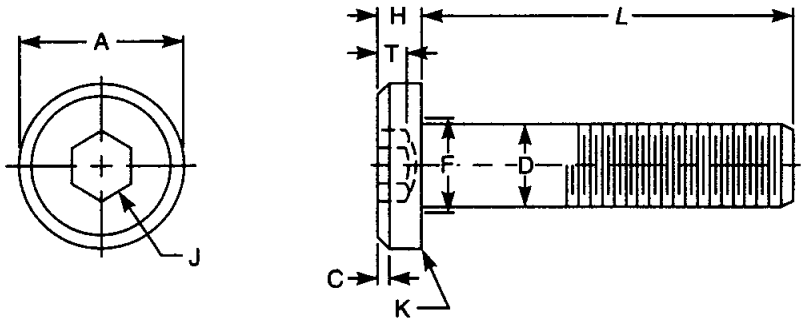


Table 1G Dimensions of Low Head Hexagon Socket Cap Screws

Nominal Size or Basic Screw Diameter		D		A		H		C	J		T	K
		Body Diameter		Head Diameter		Head Height		Chamfer or Radius	Hexagon Socket Size		Key Engagement	Chamfer or Radius
		Max	Min	Max	Min	Max	Min	Max	Nom		Min	Max
4	0.1120	0.1120	0.1075	0.183	0.178	0.059	0.053	0.009		0.050	0.038	0.008
5	0.1250	0.1250	0.1202	0.205	0.200	0.065	0.059	0.012	1/16	0.062	0.044	0.008
6	0.1380	0.1380	0.1329	0.226	0.221	0.072	0.066	0.013	1/16	0.062	0.050	0.008
8	0.1640	0.1640	0.1585	0.270	0.265	0.085	0.079	0.014	5/64	0.078	0.060	0.008
10	0.1900	0.1900	0.1840	0.312	0.307	0.098	0.092	0.018	3/32	0.094	0.072	0.008
1/4	0.2500	0.2500	0.2435	0.375	0.369	0.127	0.121	0.025	1/8	0.125	0.094	0.010
5/16	0.3125	0.3125	0.3053	0.437	0.431	0.158	0.152	0.033	5/32	0.156	0.110	0.010
3/8	0.3750	0.3750	0.3678	0.562	0.556	0.192	0.182	0.040	3/16	0.188	0.115	0.010
7/16	0.4375	0.4375	0.4294	0.625	0.618	0.223	0.213	0.047	7/32	0.219	0.135	0.015
1/2	0.5000	0.5000	0.4919	0.750	0.743	0.254	0.244	0.055	1/4	0.250	0.151	0.015
5/8	0.6250	0.6250	0.6163	0.875	0.867	0.316	0.306	0.070	5/16	0.312	0.250	0.015
See Notes	1	2		3				4				6

NOTES TO TABLE 1G:

GENERAL NOTE: This product, although a high strength precision fastener, is recommended for lighter fastening applications. It is not suggested for use in critical high strength applications where socket head cap screws should normally be used. They are designed to be used in applications where head height clearance is a problem. Because of their reduced head height, and smaller socket size, they normally cannot be properly preloaded as a standard socket cap screw and should not be subjected to high dynamic loads.

1. Nominal Size. Where specifying nominal size in decimals, zeros preceding decimal and in the fourth decimal place shall be omitted.

2. Body. The term *body* refers to the unthreaded cylindrical portion of the shank for those screws not threaded to the head.

3. Head Diameter. Heads shall be plain, not knurled.

4. Head Chamfer. The top of the head shall be flat. The intersection of the top of the head and side of the head may be chamfered or radiused within the limits of C, at the manufacturer's option.

5. Bearing Surface. The plane of the bearing surface shall be perpendicular to the axis of the shank, with a maximum deviation of one degree, obtained by holding the screw on the body or major thread diameter within one dia of the bearing surface of the head, but beyond the maximum

NOTES TO TABLE 1G CONT.

length of the fillet (F_L), and inspecting on an optical comparator, or comparable inspection equipment, rotating the shank 360 deg.

6. Edge of Head. The edge between the bearing surface and the side of the head may be broken (rounded or chamfered), but the radius or chamfer measured along the bearing surface shall not exceed the values listed for K.

7. Runout

(a) The runout of the head with the axis of the shank shall be within 2 percent of the maximum basic screw diameter dimension (D) or 0.006 in., whichever is greater.

Runout for the above is defined as the full indicator movement (FIM) obtained by holding the screw on the body or major screw thread diameter within one diameter of the bearing surface of the head, but beyond the maximum length of the fillet (F_L), rotating 360 deg and indicating on the outside diameter of the head.

(b) The runout of the socket with the axis of the shank of the screw shall be within 3 percent of the maximum screw diameter (D) or 0.005 in., whichever is greater for sizes through 1/2 in. diameter and 6 percent for sizes above 1/2 in. diameter.

Runout for the above is defined as the full indicator movement (FIM) obtained by holding the screw on the body or major screw thread diameter within one diameter of the bearing surface of the head, but beyond the maximum length of the fillet (F_L), rotating 360 deg, indicating on each of the six hexagon flats.

(c) The conformance of screws to shank straightness or camber limitations set forth as D_e in Table 1E shall be checked by the use of the procedures and typical gage illustrated in Appendix III.

8. Fillet. For all lengths of screws, the form of the underhead fillet shall be optional, as depicted in the illustration above Table 1B, provided it is a smooth and continuous concave curve fairing into the bearing surface of the head, and the screw shank is within the envelope established by the limits for fillet extension, length, and juncture radius specified in Table 1B. (Note Table 1B is found in the socket head cap screws information.)

9. Length. The length of the screw shall be measured parallel to the axis of the screw from the plane of the bearing surface under the head to the plane of the flat of the point. The portion of the screw contained within dimension L is commonly called the shank. The basic length dimension on the product shall be the nominal length expressed as a two-placed decimal.

10. Standard Lengths and Sizes. (Alloy Steel)

Most manufacturers consider the following diameters as standard stock items:

#8-32 up to one inch long
#10-24 up to one inch long
#10-32 up to one inch long
1/4-20 up to one inch long
5/16-18 up to 1-1/2 inch long
3/8-16 up to 1-1/2 inch long
1/2-13 up to 1-1/2 inch long

All of the above sizes are threaded to the head. For the exact size needed, consult with the supplier.

11. All other Characteristics are the same as Notes to Table 1A for Socket Head Cap Screws, Paras. 11 thru 23. **Exception: Since these are not full-size socket screw products, the requirements of Paras 7.2 and 7.3 of ASTM A574, page G–50, as specified in (17) of Table 1A will not apply.**

Since these are not ordinarily made in spline sockets, Table 1A Notes 20 and 21 will not apply.

Since these are not ordinarily made in Stainless Steel, Note 17(b), Table 1A, will not apply.

12. The minimum tensile requirements for Alloy Steel Low Head Socket Cap Screws are the same as for Alloy Steel Socket Button Cap Screws, for the same length and diameter, as per ASTM F835, page G–56.

13. Designation. To promote uniformity and understanding in communications relating to products conforming to this standard, it is recommended that Hexagon Low Head Socket Cap Screws be designated in accordance with the following data, preferably in the sequence shown:

(a) product name
(b) designation of the standard
(c) nominal size (number, fractional or decimal equivalent)
(d) thread pitch
(e) nominal length (fractional or decimal equivalent)
(f) material
(g) protective finish, if required

EXAMPLES:

Hexagon Low Head Socket Cap Screws, ASME B18.3, 8 – 32 × 3/4, Alloy Steel

Hexagon Low Head Socket Cap Screws, ASME B18.3, 0.164 – 32 × 0.750, Alloy Steel, Zinc Plated

For the recommended B18 part identifying numbering system (PIN), see ASME B18.24.1.

14. For additional requirements, see Introductory Notes and General Data, page G–1.

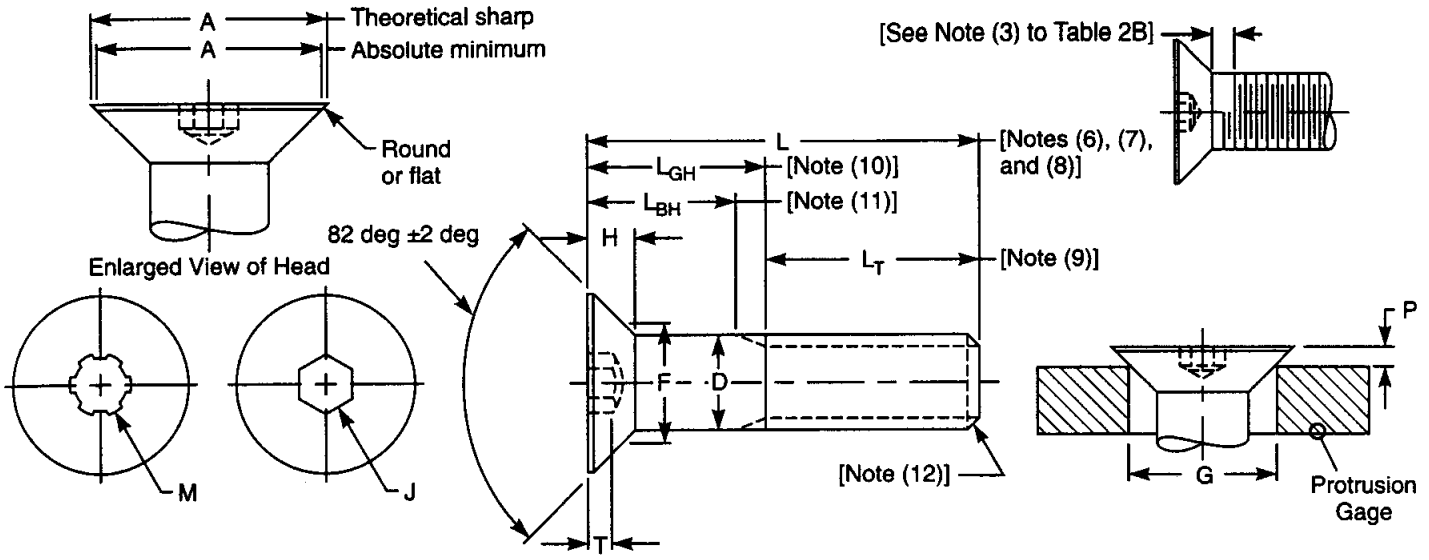


Table 2A Dimensions of Hexagon and Spline Socket Flat Countersunk Head Cap Screws

Nominal Size or Basic Screw Dia		D		A		H	G		P		M	J		T	F
		Body Dia		Head Dia		Head Height	Protrusion Gage Dia		Protrusion		Spline Socket Size	Hexagon Socket Size		Key Engagement	Fillet Transition Dia
		Max	Min	Theo. Sharp Max	Abs. Min	Ref	Max	Min	Max	Min		Nominal		Min	Max
0	0.0600	0.0600	0.0568	0.138	0.117	0.044	0.078	0.077	0.036	0.026	0.048	...	0.035	0.025	0.072
1	0.0730	0.0730	0.0695	0.168	0.143	0.054	0.101	0.100	0.040	0.028	0.060	...	0.050	0.031	0.089
2	0.0860	0.0860	0.0822	0.197	0.168	0.064	0.124	0.123	0.043	0.031	0.060	...	0.050	0.038	0.106
3	0.0990	0.0990	0.0949	0.226	0.193	0.073	0.148	0.147	0.046	0.033	0.072	1/16	0.062	0.044	0.119
4	0.1120	0.1120	0.1075	0.255	0.218	0.083	0.172	0.171	0.049	0.036	0.072	1/16	0.062	0.055	0.136
5	0.1250	0.1250	0.1202	0.281	0.240	0.090	0.196	0.195	0.051	0.037	0.096	5/64	0.078	0.061	0.153
6	0.1380	0.1380	0.1329	0.307	0.263	0.097	0.220	0.219	0.052	0.037	0.096	5/64	0.078	0.066	0.168
8	0.1640	0.1640	0.1585	0.359	0.311	0.112	0.267	0.266	0.055	0.039	0.111	3/32	0.094	0.076	0.194
10	0.1900	0.1900	0.1840	0.411	0.359	0.127	0.313	0.312	0.058	0.041	0.145	1/8	0.125	0.087	0.220
1/4	0.2500	0.2500	0.2435	0.531	0.480	0.161	0.424	0.423	0.064	0.043	0.183	5/32	0.156	0.111	0.280
5/16	0.3125	0.3125	0.3053	0.656	0.600	0.198	0.539	0.538	0.070	0.047	0.216	3/16	0.188	0.135	0.343
3/8	0.3750	0.3750	0.3678	0.781	0.720	0.234	0.653	0.652	0.076	0.050	0.251	7/32	0.219	0.159	0.405
7/16	0.4375	0.4375	0.4294	0.844	0.781	0.234	0.690	0.689	0.092	0.063	0.291	1/4	0.250	0.159	0.468
1/2	0.5000	0.5000	0.4919	0.938	0.872	0.251	0.739	0.738	0.119	0.087	0.372	5/16	0.312	0.172	0.530
5/8	0.6250	0.6250	0.6163	1.188	1.112	0.324	0.962	0.961	0.135	0.096	0.454	3/8	0.375	0.220	0.655
3/4	0.7500	0.7500	0.7406	1.438	1.355	0.396	1.186	1.185	0.150	0.105	0.454	1/2	0.500	0.220	0.780
7/8	0.8750	0.8750	0.8647	1.688	1.604	0.468	1.411	1.410	0.165	0.118	...	9/16	0.562	0.248	0.905
1	1.0000	1.0000	0.9886	1.938	1.841	0.540	1.635	1.634	0.181	0.130	...	5/8	0.625	0.297	1.030
1-1/8	1.1250	1.1250	1.1086	2.188	2.079	0.611	1.859	1.858	0.196	0.140	...	3/4	0.750	0.325	1.187
1-1/4	1.2500	1.2500	1.2336	2.438	2.316	0.683	2.083	2.082	0.212	0.150	...	7/8	0.875	0.358	1.312
1-3/8	1.3750	1.3750	1.3568	2.688	2.553	0.755	2.306	2.305	0.228	0.162	...	7/8	0.875	0.402	1.437
1-1/2	1.5000	1.5000	1.4818	2.938	2.791	0.827	2.530	2.529	0.243	0.173	...	1	1.000	0.435	1.562
See Notes	1	2		3		4	5		5		18	19			13

NOTES TO TABLE 2A:

1. Nominal Size. Where specifying nominal size in decimals, zeros preceding decimal and in the fourth decimal place shall be omitted.

2. Body. The term *body* refers to the unthreaded cylindrical portion of the shank for those screws not threaded to the head.

NOTES TO TABLE 2A CONT.

3. Head Diameters. Maximum sharp values under column A are theoretical values only, as it is not practical to make the edges of the head sharp. The maximum sharp value represents the exact diameter of a hole countersunk to exactly 82 deg, in which a screw having maximum head size will fit flush.

4. Head Height. Tabulated values for head height are given for reference only and are calculated to the maximum formulation.

5. Protrusion. Suitability of socket flat countersunk head cap screws for application in countersinks designed to the principal dimensions of the screws shall be determined by use of a protrusion gage. The protrusion limits shown shall apply only when the gaging diameter is exactly as indicated with the gaging edge of a sharpness obtained by lapping the hole and the top surface of the gage. The top of the head shall be flat within the limits of the protrusion tolerance. See Appendix II for gaging details.

6. Length. The length of the screw shall be measured, parallel to the axis of the screw, from the plane of the top of the head to the plane of the flat of the point. The basic length dimension on the product shall be the nominal length expressed as a two-place decimal.

7. Standard Lengths. Standard length increments for socket flat countersunk head cap screws shall be as tabulated below:

Nom Screw Size, in.	Nom Screw Length, in.	Standard Length Increment
0 to 1.00, incl.	0.13 thru 0.25	0.06
	0.25 thru 1.00	0.13
	1.00 thru 3.50	0.25
	3.50 thru 7.00	0.50
	7.00 thru 10.00	1.00
Over 1.00	1.00 thru 7.00	0.50
	7.00 thru 10.00	1.00
	Over 10.00	2.00

8. Length Tolerances. The allowable tolerance on length shall be as tabulated below:

Nom Screw Size	0 thru 3/8, incl.	7/16 thru 3/4, incl.	7/8 thru 1-1/2, incl.
Nom Screw Length, in.	Tolerance on Length		
Up to 1.00, incl.	– 0.03	– 0.03	– 0.05
Over 1.00 to 2.50, incl.	– 0.04	– 0.06	– 0.10
Over 2.50 to 6.00, incl.	– 0.06	– 0.08	– 0.14
Over 6.00	– 0.12	– 0.12	– 0.20

9. Thread Length L_T. The length of the thread shall be measured, parallel to the axis of the screw, from the extreme point to the last complete (full-form) thread. Thread length, on socket flat countersunk head cap screws, shall be as defined by Table 2B and notes thereto.

10. Grip Gaging Length L_{GH}. Grip gaging length is the distance, measured parallel to the axis of the screw, from the top of the head to the first complete (full form) thread under the head (see Table 2C, page G–19).

11. Body Length L_{BH}. Body length is the length, measured parallel to the axis of the screw, of the unthreaded portion of the shank and the head height (see Table 2C).

12. Screw Point Chamfer. The point shall be flat or slightly concave and chamfered. The plane of the point shall be approximately normal to the axis of the screw. The chamfer shall extend slightly below the root of the thread and the edge between the flat and chamfer may be slightly rounded. The included angle of the point should be approximately 90 deg. Chamfering of screw sizes up to and including size 8 (0.164 in.) and lengths below 1.5D shall be optional.

13. Fillet. A fillet between the conical bearing surface of the head and the shank (body) of the screw is allowable above the maximum F value (Table 2A).

14. Bearing Surface. The runout of the conical bearing surface shall be within one degree obtained by holding the screw on the body or major screw thread diameter within one diameter of the bearing surface of the head, but beyond the maximum length of the fillet (F), rotating 360 deg and inspecting on an optical comparator, or comparable inspection equipment.

15. Runout

(a) The runout of the socket with the axis of the shank of the screw shall be within 3 percent of the maximum screw diameter (D) or 0.005 in., whichever is greater for sizes through 1/2 in. diameter and 6 percent for sizes above 1/2 in. diameter.

Runout for above is defined as the full indicator movement (FIM) obtained by holding the screw on the body or major thread diameter within one diameter of the bearing surface of the head, but beyond the maximum length of the fillet (F), rotating 360 deg, indicating on each of the six hexagon flats.

(b) The conformance of screws to shank straightness or camber limitations shall be as set forth as D_e in Table 1E (Socket Head Cap Screws), and shall be checked by the use of the procedures and typical gage illustrated in Appendix III.

16. Threads. Threads shall be Unified external threads with radius root: Class 3A UNRC and UNRF Series for sizes 0 (0.060 in.) through 1 in.; Class 2A UNRC and UNRF Series for sizes over 1 in. to 1-1/2 in., inclusive.

Acceptability shall be based on System 22, ASME B1.3M, page A–63.

NOTES TO TABLE 2A CONT.

Class 3A does not provide a plating allowance. When plated products are required it is recommended that they be procured from the manufacturer (see Para. 1.10 of Introductory Notes).

17. Material

(a) Steel, alloy. Flat countersunk head cap screws shall be fabricated from an alloy steel and shall conform in all respects to ASTM F835, page G–56.

(b) Steel, corrosion-resistant. Flat countersunk head cap screws shall be fabricated from austenitic corrosion-resistant steel and shall conform in all respects to ASTM F879, page G–68.

18. See Table 7, page G–34, for spline socket dimensions, and Appendix I, page G–38, for gaging of spline sockets.

19. See Table 6, page G–33, for hexagon socket dimensions, and Appendix I for gaging of hexagon sockets.

20. Dimensional Conformance. Flat Countersunk Socket Head Cap Screws shall have the following designated characteristics inspected to ASME B18.18.2 to the inspection levels shown:

Characteristic	Inspection Level
Threads	C
Protrusion/Flushness	C
Socket Size (gaged)	C
Length	C

21. Designation. To promote uniformity and understanding in communications relating to products conforming to this standard, it is recommended that Hexagon and Spline Flat Countersunk Socket Head Cap Screws be desginated in accordance with the following data, preferably in the sequence shown:

(a) product name
(b) designation of the standard
(c) nominal size (number, fractional or decimal equivalent)
(d) thread pitch
(e) nominal length (fractional or decimal equivalent)
(f) material
(g) protective finish, if required

EXAMPLES:

Hexagon Socket Flat Countersunk Head Cap Screws, ASME B18.3, 1/4 – 28 × 1-3/4, Alloy Steel

Hexagon Socket Flat Countersunk Head Cap Screws, ASME B18.3, 0.250 – 28 × 1.750, Corrosion Resistant Steel

Hexagon Socket Flat Countersunk Head Cap Screws, ASME B18.3, 6 – 32 × 0.500, Alloy Steel, Zinc Plated

For the recommended B18 part identifying numbering system (PIN), see ASME B18.24.1.

22. For additional requirements, see Introductory Notes and General Data, page G–1.

23. For formulas for dimensions, see Appendix C, page G–44.

Table 2B Body and Grip Lengths for Socket Flat Countersunk Head Cap Screws

Nom Size	0		1		2		3		4		5		6		8		10	
Nom Length	L_{GH}	L_{BH}	L_{GH}	L_{BH}	L_{GH}	L_{BH}	L_{GH}	L_{BH}	L_{GH}	L_{BH}	L_{GH}	L_{BH}	L_{GH}	L_{BH}	L_{GH}	L_{BH}	L_{GH}	L_{BH}
0.75	0.25	0.19																
0.88	0.25	0.19	0.25	0.17	0.25	0.16	0.25	0.15										
1.00	0.50	0.44	0.25	0.17	0.25	0.16	0.25	0.15										
1.25	0.75	0.69	0.62	0.55	0.62	0.54	0.62	0.52	0.50	0.38	0.50	0.38	0.50	0.34	0.38	0.22		
1.50	...	...	0.88	0.80	0.88	0.79	0.88	0.77	0.50	0.38	0.50	0.38	0.50	0.34	0.38	0.22	0.62	0.42
1.75	...	...	...	...	1.12	1.04	1.12	1.02	1.00	0.88	1.00	0.88	1.00	0.84	0.88	0.72	0.62	0.42
2.00	...	...	...	...	...	...	1.38	1.27	1.00	0.88	1.00	0.88	1.00	0.84	0.88	0.72	1.12	0.92
2.25	...	...	...	...	...	...	...	...	1.50	1.38	1.50	1.38	1.50	1.34	1.38	1.22	1.12	0.92
2.50	...	...	...	...	...	...	...	...	...	...	...	...	1.50	1.34	1.38	1.22	1.62	1.42
2.75	...	...	...	...	...	...	...	...	...	...	...	...	2.00	1.84	1.88	1.72	1.62	1.42
3.00	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1.88	1.72	2.12	1.92
3.25	...	...	...	...	...	...	...	...	...	...	...	...	...	...	2.38	2.22	2.12	1.92
3.50	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	2.62	2.42
3.75	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	2.62	2.42
4.00	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	3.12	2.92

Nom Size	1/4		5/16		3/8		7/16		1/2		5/8		3/4		7/8		1	
Nom Length	L_{GH}	L_{BH}	L_{GH}	L_{BH}	L_{GH}	L_{BH}	L_{GH}	L_{BH}	L_{GH}	L_{BH}	L_{GH}	L_{BH}	L_{GH}	L_{BH}	L_{GH}	L_{BH}	L_{GH}	L_{BH}
1.75	0.75	0.50																
2.00	0.75	0.50	0.88	0.60														
2.25	1.25	1.00	0.88	0.60	1.00	0.69												
2.50	1.25	1.00	1.38	1.10	1.00	0.69	1.12	0.77	1.00	0.62								
2.75	1.75	1.50	1.38	1.10	1.50	1.19	1.12	0.77	1.00	0.62								
3.00	1.75	1.50	1.88	1.60	1.50	1.19	1.62	1.27	1.00	0.62								
3.25	2.25	2.00	1.88	1.60	2.00	1.69	1.62	1.27	1.75	1.36	1.50	1.04						
3.50	2.25	2.00	2.38	2.10	2.00	1.69	2.12	1.77	1.75	1.36	1.50	1.04	1.50	1.00				
3.75	2.75	2.50	2.38	2.10	2.50	2.19	2.12	1.77	1.75	1.36	1.50	1.04	1.50	1.00	1.50	0.94		
4.00	2.75	2.50	2.88	2.60	2.50	2.19	2.62	2.27	2.50	2.12	2.25	1.80	1.50	1.00	1.50	0.94	1.50	0.88
4.25	3.25	3.00	2.88	2.60	3.00	2.69	2.62	2.27	2.50	2.12	2.25	1.80	1.50	1.00	1.50	0.94	1.50	0.88
4.50	3.25	3.00	3.38	3.10	3.00	2.69	3.12	2.77	2.50	2.12	2.25	1.80	2.50	2.00	1.50	0.94	1.50	0.88
4.75	3.75	3.50	3.38	3.10	3.50	3.19	3.12	2.77	3.25	2.86	3.00	2.54	2.50	2.00	2.50	1.94	1.50	0.88
5.00	3.75	3.50	3.88	3.60	3.50	3.19	3.62	3.27	3.25	2.86	3.00	2.54	2.50	2.00	2.50	1.94	2.50	1.88
5.25	4.25	4.00	3.88	3.60	4.00	3.69	3.62	3.27	3.25	2.86	3.00	2.54	2.50	2.00	2.50	1.94	2.50	1.88
5.50	...	...	4.38	4.10	4.00	3.69	4.12	3.77	4.00	3.62	3.75	3.30	3.50	3.00	2.50	1.94	2.50	1.88
5.75	...	...	4.38	4.10	4.50	4.19	4.12	3.77	4.00	3.62	3.75	3.30	3.50	3.00	3.50	2.94	2.50	1.88
6.00	...	...	4.88	4.60	4.50	4.19	4.62	4.27	4.00	3.62	3.75	3.30	3.50	3.00	3.50	2.94	3.50	2.88
6.25	...	...	4.88	4.60	5.00	4.69	4.62	4.27	4.75	4.36	4.50	4.04	3.50	3.00	3.50	2.94	3.50	2.88
6.50	...	...	5.38	5.10	5.00	4.69	5.12	4.77	4.75	4.36	4.50	4.04	4.50	4.00	3.50	2.94	3.50	2.88
6.75	...	...	...	...	5.50	5.19	5.12	4.77	4.75	4.36	4.50	4.04	4.50	4.00	4.50	3.94	3.50	2.88
7.00	...	...	...	...	5.50	5.19	5.62	5.27	5.50	5.12	5.25	4.80	4.50	4.00	4.50	3.94	4.50	3.88
7.25	...	...	...	...	6.00	5.69	5.62	5.27	5.50	5.12	5.25	4.80	4.50	4.00	4.50	3.94	4.50	3.88
7.50	...	...	...	...	6.00	5.69	6.12	5.77	5.50	5.12	5.25	4.80	5.50	5.00	4.50	3.94	4.50	3.88
7.75	...	...	...	...	6.50	6.19	6.12	5.77	6.25	5.86	6.00	5.54	5.50	5.00	5.50	4.94	4.50	3.88
8.00	...	...	...	...	...	...	6.62	6.27	6.25	5.86	6.00	5.54	5.50	5.00	5.50	4.94	5.50	4.88
8.50	...	...	...	...	...	...	7.12	6.77	7.00	6.62	6.75	6.30	6.50	6.00	5.50	4.94	5.50	4.88
9.00	...	...	...	...	...	...	7.62	7.27	7.00	6.62	6.75	6.30	6.50	6.00	6.75	6.19	6.50	5.88
9.50	...	...	...	...	...	...	8.12	7.77	8.00	7.62	7.75	7.30	7.50	7.00	6.75	6.19	6.50	5.88
10.00	...	...	...	...	...	...	...	...	8.00	7.62	7.75	7.30	7.50	7.00	7.75	7.19	7.50	6.88
11.00	...	...	...	...	...	...	...	...	...	...	9.25	8.80	9.00	8.50	8.75	8.19	8.50	7.88
12.00	...	...	...	...	...	...	...	...	...	...	10.25	9.80	10.00	9.50	9.75	9.19	9.50	8.88
13.00	...	...	...	...	...	...	...	...	...	...	...	...	11.00	10.50	10.75	10.19	10.50	9.88
14.00	...	...	...	...	...	...	...	...	...	...	...	...	12.00	11.50	11.75	11.19	11.50	10.88
15.00	...	...	...	...	...	...	...	...	...	...	...	...	13.00	12.50	12.75	12.19	12.50	11.88
16.00	...	...	...	...	...	...	...	...	...	...	...	...	...	...	13.75	13.19	13.50	12.88
17.00	...	...	...	...	...	...	...	...	...	...	...	...	...	...	14.75	14.19	14.50	13.88
18.00	...	...	...	...	...	...	...	...	...	...	...	...	...	...	15.75	15.19	15.50	14.88
19.00	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	16.50	15.88
20.00	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	17.50	16.88

NOTES TO TABLE 2B:

1. Tabulated L_{GH} values are maximum and represent the minimum design grip length, including the reference head height of the screw. They shall be measured from the top of the head to the face of a GO thread ring gage, having the thread countersink and/or counterbore removed, which has been assembled by hand as far as the thread will permit. The tabulated L_{BH} values are minimum and represent the minimum body length, including the reference head height of the screw. They are equal to L_{GH} minus 5 times the pitch of the UNRC thread for the respective screw size.

2. Screws having nominal lengths falling between those for which L_{GH} and L_{BH} values are tabulated in this table shall have L_{GH} and L_{BH} dimensions conforming with those of the next shorter tabulated nominal length for the respective screw size. For example: for a 1/4 in. size screw, 2.13 in. long, L_{GH} = 0.75 in. and L_{BH} = 0.50 in.

3. For screws of nominal lengths above the heavy bold line in this table, the complete (full form) threads, measured with a thread ring gage having the thread chamfer and/or counterbore removed, shall extend to within two pitches (threads) of the intersection of the conical portion of the head with the basic screw diameter.

Screws over 1 in. in diameter and of lengths shorter than the minimum thread length L_T plus 5 times the pitch of the UNRC thread for the respective screw size shall have complete (full form) threads extending as close to the head as practicable. See Note (4) for L_T values.

4. For screws of nominal lengths longer than those for which L_{GH} and L_{BH} values are tabulated in this table and for screws over 1 in. in diameter, the maximum grip gaging length L_{GH} and the minimum body length L_{BH} of the screws shall be determined as shown in Table 2C:

$$L_{GH} = L - L_T$$
$$L_{BH} = L - L_{TT}$$

where

L = nom length
L_T = min thread length
L_{TT} = max total thread length

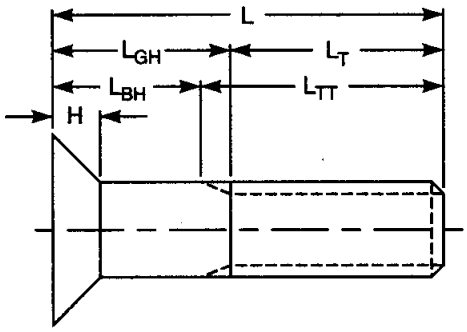


Table 2C Screws Beyond Sizes in Table 2B

Nom Size or Basic Screw Dia		L_T Thread Length Min	L_{TT} Total Thread Length Max	Nom Size or Basic Screw Dia		L_T Thread Length Min	L_{TT} Total Thread Length Max
0	0.0600	0.50	0.62	3/8	0.3750	1.25	1.94
1	0.0730	0.62	0.77	7/16	0.4375	1.38	2.17
2	0.0860	0.62	0.80	1/2	0.5000	1.50	2.38
3	0.0990	0.62	0.83	5/8	0.6250	1.75	2.82
4	0.1120	0.75	0.99	3/4	0.7500	2.00	3.25
5	0.1250	0.75	1.00	7/8	0.8750	2.25	3.69
6	0.1380	0.75	1.05	1	1.0000	2.50	4.12
8	0.1640	0.88	1.19	1-1/8	1.1250	2.81	4.65
10	0.1900	0.88	1.27	1-1/4	1.2500	3.12	5.09
1/4	0.2500	1.00	1.50	1-3/8	1.3750	3.44	5.65
5/16	0.3125	1.12	1.71	1-1/2	1.5000	3.75	6.08

SOCKET CAP, SHOULDER, SET SCREWS, HEX, AND SPLINE KEYS

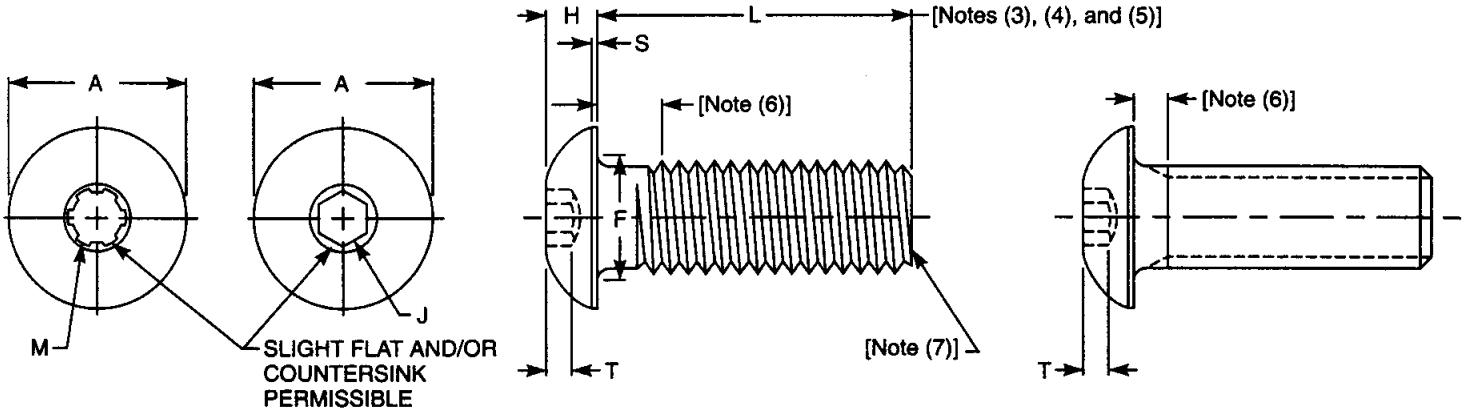


Table 3 Dimensions of Hexagon and Spline Socket Button Head Cap Screws

Nominal Size or Basic Screw Diameter		A		H		S	M	J		T	F		L
		Head Diameter		Head Height		Head Side Height	Spline Socket Size	Hexagon Socket Size		Key Engagement	Fillet Transition Diameter		Maximum Standard Length
		Max	Min	Max	Min	Ref	Nom	Nom		Min	Max	Min	Nom
0	0.0600	0.114	0.104	0.032	0.026	0.010	0.048	...	0.035	0.020	0.080	0.070	0.50
1	0.0730	0.139	0.129	0.039	0.033	0.010	0.060	...	0.050	0.028	0.093	0.083	0.50
2	0.0860	0.164	0.154	0.046	0.038	0.010	0.060	...	0.050	0.028	0.106	0.096	0.50
3	0.0990	0.188	0.176	0.052	0.044	0.010	0.072	1/16	0.062	0.035	0.119	0.109	0.50
4	0.1120	0.213	0.201	0.059	0.051	0.015	0.072	1/16	0.062	0.035	0.132	0.122	0.50
5	0.1250	0.238	0.226	0.066	0.058	0.015	0.096	5/64	0.078	0.044	0.145	0.135	0.50
6	0.1380	0.262	0.250	0.073	0.063	0.015	0.096	5/64	0.078	0.044	0.158	0.148	0.63
8	0.1640	0.312	0.298	0.087	0.077	0.015	0.111	3/32	0.094	0.052	0.194	0.184	0.75
10	0.1900	0.361	0.347	0.101	0.091	0.020	0.145	1/8	0.125	0.070	0.220	0.210	1.00
1/4	0.2500	0.437	0.419	0.132	0.122	0.031	0.183	5/32	0.156	0.087	0.290	0.280	1.00
5/16	0.3125	0.547	0.527	0.166	0.152	0.031	0.216	3/16	0.188	0.105	0.353	0.343	1.00
3/8	0.3750	0.656	0.636	0.199	0.185	0.031	0.251	7/32	0.219	0.122	0.415	0.405	1.25
1/2	0.5000	0.875	0.851	0.265	0.245	0.046	0.372	5/16	0.312	0.175	0.560	0.540	2.00
5/8	0.6250	1.000	0.970	0.331	0.311	0.062	0.454	3/8	0.375	0.210	0.685	0.665	2.00
See Notes	1			2			13	14			8		3, 4, 5, 6

NOTES TO TABLE 3:

GENERAL NOTE:
This product is designed and recommended for light fastening applications such as guards, hinges, etc. It is not suggested for use in critical high strength applications where socket head cap screws should normally be used.

NOTES:

1. Nominal Size. Where specifying nominal size in decimals, zeros preceding decimal and in the fourth decimal place shall be omitted.

2. Head Height. Tabulated head heights represent metal-to-metal measurements; that is, the truncation of the

NOTES TO TABLE 3 CONT.

rounded surface caused by the socket is not considered part of the head height.

3. Length. The length of the screw shall be measured, parallel to the axis of the screw, from the plane of the bearing surface under the head to the plane of the flat of the point. The portion of the screw contained within dimension L is commonly called the shank. The basic length dimension on the product shall be the nominal length expressed as a two-place decimal.

4. Standard Lengths. Standard length increments for socket button head cap screws shall be as tabulated below:

Nominal Screw Length	Standard Length Increment
0.13 thru 0.25	0.06
0.25 thru 1.00	0.13
1.00 thru 2.00	0.25

5. Length Tolerances. Allowable tolerance on length shall be as tabulated below:

Nominal Screw Size	0 thru 3/8, incl.	1/2 thru 5/8, incl.
Nominal Screw Length	Tolerance on Length	
Up to 1.00, incl.	– 0.03	– 0.03
Over 1.00 to 2.00, incl.	– 0.04	– 0.06
Over 2.00	– 0.04	– 0.06

6. Thread Length. For screws of nominal lengths equal to or shorter than standard maximum lengths L listed in this table, the complete (full form) threads, measured with a thread ring gage having the thread chamfer and/or counterbore removed, shall extend to within two pitches (threads) of the bearing surface of the head. For longer screws, the length of the complete thread shall, at the option of the manufacturer, be between the minimum limit of twice the basic screw diameter plus 0.50 in. and the maximum limit within two pitches (threads) of the head. The unthreaded portion of the screw shall be at nominal diameter. The tolerance on the unthreaded portion (body diameter) of the screw shall be the same as Column D, Table 1A (Socket Head Cap Screws), page G–4.

7. Screw Point Chamfer. The point shall be flat or slightly concave and chamfered. The plane of the point shall be approximately normal to the axis of the screw. The chamfer shall extend slightly below the root of the thread, and the edge between flat and chamfer may be slightly rounded. The included angle of the point should be approximately 90 deg. Chamfering of screw sizes up to and including size 8 (0.164 in.) and lengths below 0.75d shall be optional.

8. Fillet. The form of the fillet shall be optional provided it flairs into the bearing surface between the minimum and maximum diameter F. The fillet shall be a smooth and continuous curve having a bearing surface juncture radius no less than that tabulated below:

Nominal Screw Size	Juncture Radius, Min	Nominal Screw Size	Juncture Radius, Min
0	0.002	10	0.006
1	0.003	1/4	0.007
2	0.003	5/16	0.009
3	0.004	3/8	0.012
4	0.004	1/2	0.016
5	0.005	5/8	0.021
6	0.005		
8	0.006		

9. Bearing Surface. The plane of the bearing surface shall be perpendicular to the axis of the shank within 2 deg obtained by holding the screw on the body or major thread diameter within one diameter of the bearing surface of the head, but beyond the maximum length of the fillet (F), rotating 360 deg, and inspecting on an optical comparator, or comparable inspection equipment.

10. Runout

(a) The runout of the head with the axis of the shank shall be within 3 percent of the maximum basic screw diameter dimension (D) or 0.008 in., whichever is greater.

Runout for the above is defined as the full indicator movement (FIM) obtained by holding the screw on the body or major thread diameter next to the head, but beyond the maximum length of the fillet (F), rotating the screw 360 deg, with the indicator riding on the outer surface of the head on the rounded portion, adjacent to, but not on the extreme periphery of the head.

(b) The runout of the socket with the axis of the shank of the screw shall be within 3 percent of the maximum screw diameter (D) or 0.005 in., whichever is greater for sizes through 1/2 in. diameter and 6 percent for sizes above 1/2 in. diameter.

Runout for the above is defined as the full indicator movement (FIM) obtained by holding the screw on the body or major screw thread diameter within one diameter of the bearing surface of the head, but beyond the maximum length of the fillet (F), rotating 360 deg, indicating on each of the hexagon flats.

11. Threads. Threads shall be Unified external threads with radius root: Class 3A UNRC and UNRF Series.

Acceptability shall be based on System 22, ASME B1.3M, page A–63.

Class 3A does not provide a plating allowance. When plated products are required, it is recommended that they be procured from the manufacturer (see Para. 1.10).

NOTES TO TABLE 3 CONT.

12. Material

(a) Steel, alloy. Button head cap screws shall be fabricated from an alloy steel and shall conform in all respects to ASTM F835, *Specification for Alloy Steel Socket Button and Flat Countersunk Head Cap Screws (Inch)*, page G–56.

(b) Steel, corrosion-resistant. Button head cap screws shall be fabricated from austenitic corrosion-resistant steel and shall conform in all respects to ASTM F879, *Specification for Stainless Steel Socket Button and Flat Countersunk Head Cap Screws*, page G–68.

13. See Table 7 for spline socket dimensions and Appendix I for gaging of spline sockets.

14. See Table 6 for hexagon socket dimensions and Appendix I for gaging of hexagon sockets.

15. Dimensional Conformance. Socket Button Head Cap Screws shall have the following designated characteristics inspected to ASME B18.18.2 to the inspection levels shown:

Characteristic	Inspection Level
Threads	C
Head Diameter	C
Socket Size (gaged)	C
Length	C
Fillet Transition Diameter	C

16. Designation. To promote uniformity and understanding in communications relating to products conforming to this standard, it is recommended that Hexagon and Spline Socket Button Head Cap Screws be designated in accordance with the following data, preferably in the sequence shown:

(a) product name
(b) designation of the standard
(c) nominal size (number, fractional or decimal equivalent)
(d) thread pitch
(e) nominal length (fractional or decimal equivalent)
(f) material
(g) protective finish, if required

EXAMPLES:

Hexagon Socket Button Head Cap Screws, ASME B18.3, 10 – 32 × 3/4, Alloy Steel

Hexagon Socket Button Head Cap Screws, ASME B18.3, 0.190 – 32 × 0.750, Alloy Steel, Zinc Plated

For the recommended B18 part identifying numbering system (PIN), see ASME B18.24.1.

17. ***(IFI Note: ASME B18.3 does not specify body diameter tolerances for Button Head Cap Screws. When needed, IFI recommends body diameter tolerances be the same as those specified in Table 1A, page G–4.)***

18. For additional requirements, see Introductory Notes and General Data, page G–1.

19. For formulas for dimensions, see Appendix C, page G–45.

SOCKET CAP, SHOULDER, SET SCREWS, HEX, AND SPLINE KEYS

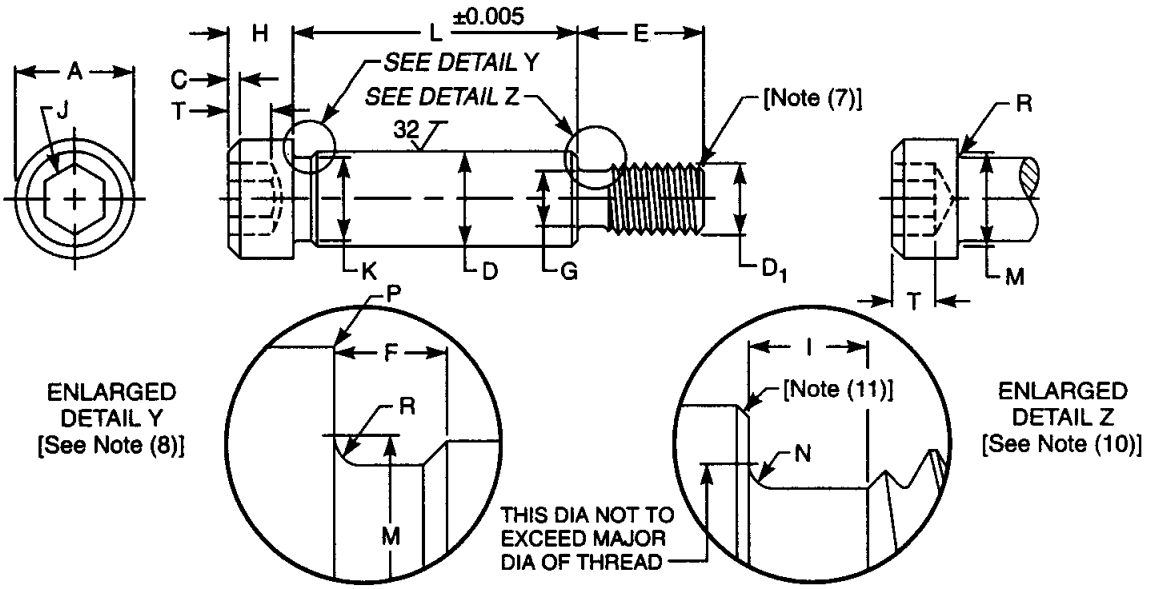


Table 4 Dimensions of Hexagon Socket Head Shoulder Screws

Nominal Size or Basic Shoulder Diameter		D Shoulder Diameter		A Head Diameter		H Head Height		C Chamfer or Radius	J Hexagon Socket Size		T Key Engagement	M Fillet Transition Diameter	R Head Fillet Radius
		Max	Min	Max	Min	Max	Min	Max	Nom		Min	Max	Min
1/4	0.250	0.2480	0.2460	0.375	0.357	0.188	0.177	0.020	1/8	0.125	0.094	0.276	0.009
5/16	0.312	0.3105	0.3085	0.438	0.419	0.219	0.209	0.026	5/32	0.156	0.117	0.345	0.012
3/8	0.375	0.3730	0.3710	0.562	0.543	0.250	0.240	0.031	3/16	0.188	0.141	0.413	0.015
1/2	0.500	0.4980	0.4960	0.750	0.729	0.312	0.302	0.040	1/4	0.250	0.188	0.550	0.020
5/8	0.625	0.6230	0.6210	0.875	0.853	0.375	0.365	0.050	5/16	0.312	0.234	0.687	0.024
3/4	0.750	0.7480	0.7460	1.000	0.977	0.500	0.490	0.069	3/8	0.375	0.281	0.826	0.030
1	1.000	0.9980	0.9960	1.312	1.287	0.625	0.610	0.083	1/2	0.500	0.375	1.098	0.040
1-1/4	1.250	1.2480	1.2460	1.750	1.723	0.750	0.735	0.102	5/8	0.625	0.469	1.368	0.050
1-1/2	1.500	1.4980	1.4960	2.125	2.095	1.000	0.980	0.138	7/8	0.875	0.656	1.638	0.060
1-3/4	1.750	1.7480	1.7460	2.375	2.345	1.125	1.105	0.157	1	1.000	0.750	1.908	0.070
2	2.000	1.9980	1.9960	2.750	2.720	1.250	1.230	0.176	1-1/4	1.250	0.937	2.178	0.080
See Notes		1		2					15			8	

Nominal Size or Basic Shoulder Diameter		K Shoulder Neck Diameter	F Shoulder Neck Width	D_1 Nominal Thread Size or Basic Thread Diameter		Threads per in.	G Thread Neck Diameter		I Thread Neck Width	N Thread Neck Fillet		E Thread Length	P Chamfer or Radius
		Min	Max				Max	Min	Max	Max	Min	Basic	Max
1/4	0.250	0.227	0.093	10	0.1900	24	0.142	0.133	0.083	0.023	0.017	0.375	0.010
5/16	0.312	0.289	0.093	1/4	0.2500	20	0.193	0.182	0.100	0.028	0.022	0.438	0.010
3/8	0.375	0.352	0.093	5/16	0.3125	18	0.249	0.237	0.111	0.031	0.025	0.500	0.010
1/2	0.500	0.477	0.093	3/8	0.3750	16	0.304	0.291	0.125	0.035	0.029	0.625	0.010
5/8	0.625	0.602	0.093	1/2	0.5000	13	0.414	0.397	0.154	0.042	0.036	0.750	0.015
3/4	0.750	0.727	0.093	5/8	0.6250	11	0.521	0.502	0.182	0.051	0.045	0.875	0.015
1	1.000	0.977	0.125	3/4	0.7500	10	0.638	0.616	0.200	0.055	0.049	1.000	0.020
1-1/4	1.250	1.227	0.125	7/8	0.8750	9	0.750	0.726	0.222	0.062	0.056	1.125	0.020
1-1/2	1.500	1.478	0.125	1-1/8	1.1250	7	0.964	0.934	0.286	0.072	0.066	1.500	0.020
1-3/4	1.750	1.728	0.125	1-1/4	1.2500	7	1.089	1.059	0.286	0.072	0.066	1.750	0.020
2	2.000	1.978	0.125	1-1/2	1.5000	6	1.307	1.277	0.333	0.102	0.096	2.000	0.020
See Notes		18	8	8		13	10		10	10			

NOTES TO TABLE 4:

NOTES:

1. Shoulder. Shoulder refers to the enlarged unthreaded portion of the screw, the diameter of which serves as the basis for derivation of the nominal size.

2. Head Diameter. The head may be plain or knurled at the option of the manufacturer.

3. Head Chamfer. The top of the head shall be flat. The intersection of the top of the head and the side of the head may be chamfered or radiused within the limits of C, at the manufacturer's option.

4. Length. The length of the screw shall be measured, parallel to the axis of the screw, from the plane of the bearing surface under the head to the plane of the shoulder at the threaded end. The basic length dimension on the product shall be the nominal length expressed as a three-place decimal.

5. Standard Lengths. The difference between consecutive lengths of standard screws shall be as designated in the following tabulation:

Nominal Screw Length	Standard Length Increment
0.25 thru 0.75	0.13
0.75 thru 5.00	0.25
Over 5.00	0.50

6. Thread Length Tolerance. Tolerance on thread length E shall be –0.020 in. for screw sizes up to 3/8 in., inclusive, and –0.030 in. for screw sizes larger than 3/8 in.

7. Screw Point Chamfer. The point shall be flat or slightly concave, and chamfered. The plane of the point shall be approximately normal to the axis of the screw. The chamfer shall extend slightly below the root of the thread, and the edge between flat and chamfer may be slightly rounded. The included angle of the point should be approximately 90 deg.

8. Neck and Fillet Under Head. Screws may be necked under the head at the option of the manufacturer. The fillet extension above D, at the intersection of the head bearing surface and neck or shoulder, shall be controlled by maximum dimension M and minimum radius of curvature R.

9. Bearing Surface. The plane of the bearing surface shall be perpendicular to the axis of the shank, within two degrees obtained by holding the screw on the shoulder or major thread diameter within one diameter of the bearing surface of the head, rotating 360 deg, and inspecting on an optical comparator, or comparable inspection equipment.

10. Neck Under Shoulder. The neck under the shoulder shall allow the shoulder to seat against the face of a standard basic GO thread ring gage.

11. Edge of Shoulder. The edge of the shoulder may be broken. The radius or chamfer shall not exceed 0.005 in. for shoulders to 0.373 in. diameter and 0.008 in. for larger diameters.

12. Runout

(a)The runout of the head with the axis of the shoulder shall be within two percent of the nominal size, or 0.006 in., whichever is greater.

Runout for the above is defined as the full indicator movement (FIM) obtained by holding the screw on the shoulder within one diameter of the bearing surface of the head, but beyond the maximum length of (F), rotating the screw 360 deg and indicating on the outside diameter of the head.

(b)The runout of the socket with the axis of the shank of the screw shall be within three percent of the maximum shoulder diameter (D) or 0.005 in., whichever is greater for sizes through 1/2 in. diameter and six percent for sizes above 1/2 in. diameter.

Runout for the above is defined as the full indicator movement (FIM) obtained by holding the screw on the shoulder or major screw thread diameter within one diameter of the bearing surface of the head, but beyond the maximum length of (F), rotating 360 deg, indicating on each of the six hexagon flats.

Runout between the thread and shoulder shall be checked by firmly seating the screw in a threaded bushing. The threads of the bushing must be basic size and the bushing OD must be concentric with its axis, and the ends must be square with its axis.

The runout between the thread and shoulder shall be a maximum of 0.004 in. full indicator movement (FIM) when checked on the shoulder diameter at a distance of 0.188 in. from the shoulder at the threaded end, and at within 0.005 in. full indicator movement (FIM) per inch of shoulder length, with a maximum of 0.025 in., when checked on the shoulder distance of 2 × F from the underside of the head. The bushing is to be rotated in a V block or equivalent, 360 deg, with the indicator riding on the major diameter of the shoulder in the appropriate locations.

The squareness of the shoulder shall be perpendicular to the axis of the screw, within two degrees obtained by holding the screw on the shoulder diameter within one diameter of the thread end of the shoulder, rotating 360 deg, and inspecting on an optical comparator or comparable inspection equipment.

13. Threads. Threads shall be Unified external thread, Class 3A, UNC Series.

Acceptability is to be based on System 22, ASME B1.3M, page A–63.

Class 3A does not provide a plating allowance. When plated products are required, it is recommended that they be procured from the manufacturer (see Para. 1.10).

NOTES TO TABLE 4 CONT.

14. Material. Shoulder screws shall be fabricated from an alloy steel having one or more of the following alloying elements: chromium, nickel, molybdenum, or vanadium, in sufficient quantity to assure that the specified hardness range of 32–43 HRC at the surface is met when hardened by quenching from the austenitizing temperature and tempered at not lower than 650°F (343°C). Decarburization and carburization limits shall be the same as those specified for socket head cap screws in ASTM A574, *Specification for Alloy Steel Socket Head Cap Screws*, page G–48.

Shoulder screws shall meet the following mechanical property requirements: the hardness shall be 32–43 HRC anywhere in the section.

There are no other specific mechanical tests called out, but for design considerations, these shoulder screws should develop the following:

(a) 140,000 psi minimum tensile strength based on the minimum thread neck area;

(b) 84,000 psi minimum shear strength in the thread neck area, based on the minimum thread neck area;

(c) 84,000 psi minimum shear strength in the shoulder, based on the minimum shoulder area.

15. See Table 6 for hexagon socket dimensions and Appendix I for gaging of hexagon sockets.

16. Dimensional Conformance. Socket Head Shoulder Screws shall have the following designated characteristics inspected to ASME B18.18.2, page M–11, to the inspection levels shown:

Characteristic	Inspection Level
Threads	C
Shoulder Diameter	C
Shoulder Length	C
Thread Length	C
Head Diameter	C
Socket Size Gaged	C

17. Designation. To promote uniformity and understanding in communications relating to products conforming to this standard, it is recommended that Hexagon Socket Head Shoulder Screws be designated in accordance with the following data, preferably in the sequence shown:

(a) product name
(b) designation of the standard
(c) nominal size (number, fractional or decimal equivalent)
(d) thread pitch
(e) nominal length (fractional or decimal equivalent)
(f) material
(g) protective finish, if required

EXAMPLES:

Hexagon Socket Head Shoulder Screws, ASME B18.3, 1/4 × 1-1/4, Alloy Steel

Hexagon Socket Head Shoulder Screws, ASME B18.3, 0.250 × 1.250, Alloy Steel Phosphate Coated

For the recommended B18 part identifying numbering system (PIN), see ASME B18.24.1.

18. For additional requirements see Introductory Notes, page G–1.

19. For formulas for dimensions, see Appendix C, page G–46.

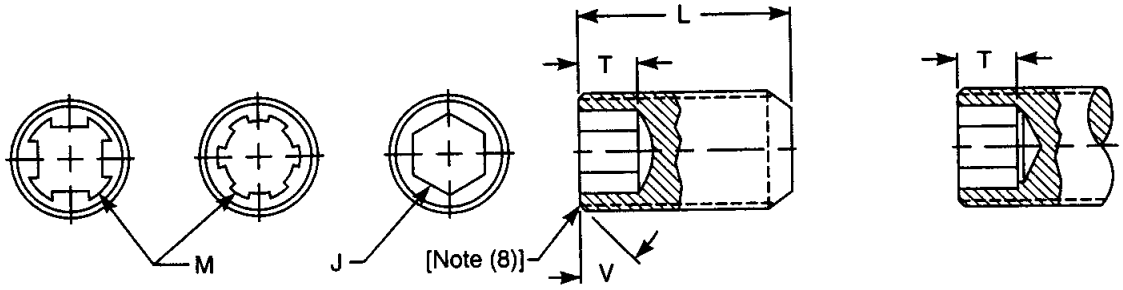


Table 5A Dimensions of Hexagon and Spline Socket Set Screws

Nominal Size or Basic Screw Diameter		J		M		T		C		R	Y
		Hexagon Socket Size		No. of Splines and Spline Socket Size		Min Key Engagement to Develop Functional Capability of Key		Cup and Flat Point Diameters		Oval Point Radius	Cone Point Angle 90 deg ±2 deg for These Nominal Lengths or Longer; 118 deg ±2 deg for Shorter Nominal Lengths
						Hex Socket T_H Min	Spline Socket T_S Min				
		Nom		Nom				Max	Min	Basic	
0	0.0600	...	0.028	4	0.033	0.050	0.026	0.033	0.027	0.045	0.09
1	0.0730	...	0.028	4	0.033	0.060	0.035	0.040	0.033	0.055	0.09
2	0.0860	...	0.035	4 and 6	0.048	0.060	0.040	0.047	0.039	0.064	0.13
3	0.0990	...	0.050	4 and 6	0.048	0.070	0.040	0.054	0.045	0.074	0.13
4	0.1120	...	0.050	6	0.060	0.070	0.045	0.061	0.051	0.084	0.19
5	0.1250	1/16	0.062	4	0.072	0.080	0.055	0.067	0.057	0.094	0.19
6	0.1380	1/16	0.062	6	0.072	0.080	0.055	0.074	0.064	0.104	0.19
8	0.1640	5/64	0.078	6	0.096	0.090	0.080	0.087	0.076	0.123	0.25
10	0.1900	3/32	0.094	4	0.111	0.100	0.080	0.102	0.088	0.142	0.25
1/4	0.2500	1/8	0.125	6	0.145	0.125	0.125	0.132	0.118	0.188	0.31
5/16	0.3125	5/32	0.156	6	0.183	0.156	0.156	0.172	0.156	0.234	0.38
3/8	0.3750	3/16	0.188	6	0.216	0.188	0.188	0.212	0.194	0.281	0.44
7/16	0.4375	7/32	0.219	6	0.251	0.219	0.219	0.252	0.232	0.328	0.50
1/2	0.5000	1/4	0.250	6	0.291	0.250	0.250	0.291	0.270	0.375	0.57
5/8	0.6250	5/16	0.312	6	0.372	0.312	0.312	0.371	0.347	0.469	0.75
3/4	0.7500	3/8	0.375	6	0.454	0.375	0.375	0.450	0.425	0.562	0.88
7/8	0.8750	1/2	0.500	6	0.595	0.500	0.500	0.530	0.502	0.656	1.00
1	1.0000	9/16	0.562	6	...	0.562	...	0.609	0.579	0.750	1.13
1-1/8	1.1250	9/16	0.562	6	...	0.562	...	0.689	0.655	0.844	1.25
1-1/4	1.2500	5/8	0.625	...	...	0.625	...	0.767	0.733	0.938	1.50
1-3/8	1.3750	5/8	0.625	...	...	0.625	...	0.848	0.808	1.031	1.63
1-1/2	1.5000	3/4	0.750	...	...	0.750	...	0.926	0.886	1.125	1.75
1-3/4	1.7500	1	1.000	...	...	1.000	...	1.086	1.039	1.312	2.00
2	2.0000	1	1.000	...	...	1.000	...	1.244	1.193	1.500	2.25
See Notes	1, 16	14		13		7		9		10	9

(Table 5A continued next page.)

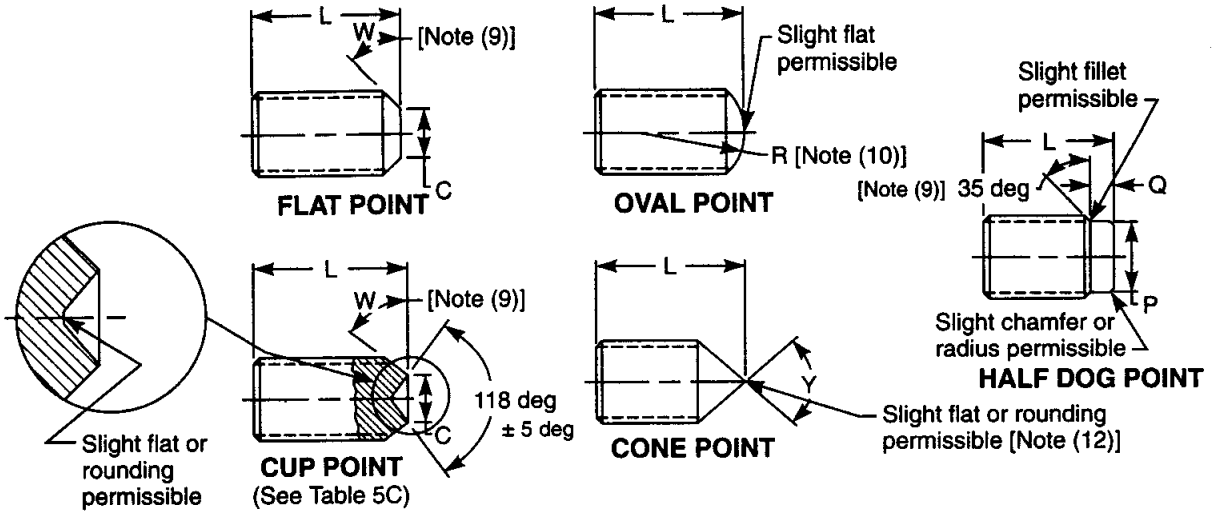


Table 5A Dimensions of Hexagon and Spline Socket Set Screws (Continued)

Nominal Size or Basic Screw Diameter		P		Q		B			B_1		
		Half Dog Point				Shortest Optimum Nominal Length to Which T_H Applies			Shortest Optimum Nominal Length to Which T_S Applies		
		Diameter		Length		Cup and Flat Points	90 deg Cone and Oval Points	Half Dog Point	Cup and Flat Points	90 deg Cone and Oval Points	Half Dog Point
		Max	Min	Max	Min						
0	0.0600	0.040	0.037	0.017	0.013	0.13	0.13	0.13	0.06	0.13	0.13
1	0.0730	0.049	0.045	0.021	0.017	0.13	0.19	0.13	0.13	0.19	0.13
2	0.0860	0.057	0.053	0.024	0.020	0.13	0.19	0.19	0.13	0.19	0.19
3	0.0990	0.066	0.062	0.027	0.023	0.19	0.19	0.19	0.13	0.19	0.19
4	0.1120	0.075	0.070	0.030	0.026	0.19	0.19	0.19	0.13	0.19	0.19
5	0.1250	0.083	0.078	0.033	0.027	0.19	0.19	0.19	0.13	0.19	0.19
6	0.1380	0.092	0.087	0.038	0.032	0.19	0.25	0.19	0.13	0.25	0.19
8	0.1640	0.109	0.103	0.043	0.037	0.19	0.25	0.25	0.19	0.25	0.25
10	0.1900	0.127	0.120	0.049	0.041	0.19	0.25	0.25	0.19	0.25	0.25
1/4	0.2500	0.156	0.149	0.067	0.059	0.25	0.31	0.31	0.25	0.31	0.31
5/16	0.3125	0.203	0.195	0.082	0.074	0.31	0.44	0.38	0.31	0.44	0.38
3/8	0.3750	0.250	0.241	0.099	0.089	0.38	0.44	0.44	0.38	0.44	0.44
7/16	0.4375	0.297	0.287	0.114	0.104	0.44	0.63	0.50	0.44	0.63	0.50
1/2	0.5000	0.344	0.334	0.130	0.120	0.50	0.63	0.63	0.50	0.63	0.63
5/8	0.6250	0.469	0.456	0.164	0.148	0.63	0.88	0.88	0.63	0.88	0.88
3/4	0.7500	0.562	0.549	0.196	0.180	0.75	1.00	1.00	0.75	1.00	1.00
7/8	0.8750	0.656	0.642	0.227	0.211	0.88	1.00	1.00	0.88	1.25	1.00
1	1.0000	0.750	0.734	0.260	0.240	1.00	1.25	1.25	...	...	...
1-1/8	1.1250	0.844	0.826	0.291	0.271	1.25	1.50	1.25	...	...	...
1-1/4	1.2500	0.938	0.920	0.323	0.303	1.25	1.50	1.50	...	...	...
1-3/8	1.3750	1.031	1.011	0.354	0.334	1.50	1.75	1.50	...	...	...
1-1/2	1.5000	1.125	1.105	0.385	0.365	1.50	2.00	1.75	...	...	...
1-3/4	1.7500	1.312	1.289	0.448	0.428	1.75	2.25	2.00	...	...	...
2	2.0000	1.500	1.474	0.510	0.490	2.00	2.50	2.50	...	...	...
See Notes	1, 16	9, 11				7, 8, 9					

NOTES TO TABLE 5A:

1. Nominal Size. Where specifying nominal size in decimals, zeros preceding decimal and in the fourth decimal place shall be omitted.

2. Length. The length of the screw shall be measured overall, parallel to the axis of the screw. The basic length dimension on the product shall be the nominal length expressed as a two-place decimal.

NOTES TO TABLE 5A CONT.

3. Standard Lengths. Standard length increments for set screws shall be as tabulated below:

Nominal Screw Length, in.	Standard Length Increment
0.13 thru 0.19*	0.03
0.13 thru 0.50	0.06
0.50 thru 1.00	0.13
1.00 thru 2.00	0.25
2.00 thru 6.00	0.50
Over 6.00	1.00

*Applicable only to sizes 0 (0.060 in.) thru 3 (0.099 in.), inclusive.

4. Tolerance on Length. Tolerance on length of set screws shall be as tabulated below:

Nominal Screw Length, in.	Tolerance on Length
Up to 0.63, incl.	± 0.01
Over 0.63 to 2.00, incl.	± 0.02
Over 2.00 to 6.00, incl.	± 0.03
Over 6.00	± 0.06

5. Threads. Threads shall be Unified external thread: Class 3A, UNC and UNF Series.

Thread lead deviation is controlled by standard thread gages within a thread length equal to 1.5 basic thread diameters. When using set screws longer than 1.5 basic diameters in length, the pitch diameter of the set screw may need to be reduced, or the tapped hole's pitch diameter may need to be increased to avoid interference during assembly.

For all thread diameters #5 and smaller, thread acceptability will be based on System 21, ASME B1.3M, page A–63.

For all thread diameters #6 and larger, thread acceptability will be based on System 22, ASME B1.3M, when the set screw thread length has a minimum of seven pitch lengths.

For all set screws equal or shorter than seven pitch lengths, thread acceptability will be based on System 21, ASME B1.3M. The chart below shows the lengths equal to seven pitch lengths:

Pitch	7 Pitch Lengths	Pitch	7 Pitch Lengths
40	0.175	12	0.583
36	0.194	11	0.636
32	0.219	10	0.700
28	0.250	9	0.778
24	0.292	8	0.875
20	0.350	7	1.000
18	0.389	6	1.167
16	0.437	5	1.400
14	0.500	4-1/2	1.556
13	0.538		

Class 3A threads do not provide a plating allowance. When set screws must be plated, they should be manufactured with an undersize pitch diameter to accommodate the plating. When plated products are required, it is recommended that they be procured from the manufacturer (see Introductory Notes Para. 1.10).

When standard socket set screws are plated, thread interference is likely to occur during assembly.

6. Material

(a) Steel, alloy. Socket set screws shall be fabricated from alloy steel and shall conform in all respects to ASTM F912, page G–63.

(b) Steel, corrosion-resistant. Socket set screws shall be fabricated from austenitic corrosion-resistant steel and shall conform in all respects to ASTM F880, page G–74.

7. Socket Depths. The key engagement dimensions given in columns T_H and T_S of this table shall apply only to nominal screw lengths equal to or longer than the lengths listed in columns B and B_1, respectively. For hexagon socket key engagement dimensions in screws of shorter nominal lengths than those listed in column B of this table, see Table 5B. Spline sockets in screws shorter than those listed in column B_1 of this table shall be as deep as practicable.

8. Face. The plane of the face on the socket end of the screw shall be approximately normal to the axis of the screw, and shall be chamfered on screws longer than lengths listed in this table, columns B and B_1. The chamfer angle V shall be between 30 deg and 45 deg. The chamfer shall extend slightly below the root diameter of the thread and the edge between flat and chamfer may be slightly rounded. For screws equal to or shorter than the lengths listed in columns B and B_1, or screws 0.250 inches in diameter or greater, with a National Coarse thread, including lengths longer than listed in column B and B_1, chamfering shall be at the option of the manufacturer. If chamfered, the chamfer angle V shall not exceed 45 deg.

9. Point Angles. Point angles specified shall apply only to those portions of the angles that lie below the root diameter of the thread. The angles may vary in the threaded portions due to manufacturing processes.

W shall be 45 deg + 5 deg – 0 deg, for screws of lengths equal to or longer than the lengths listed in this table, columns B and B_1, and 30 deg minimum for shorter screws.

10. Oval Point Radius Tolerance. The tolerance shall be +0.015 in. for screw nominal sizes through 5 (0.125 in.) and +0.031 in. for screw nominal sizes 6 (0.138 in.) and larger.

11. Half Dog Point Runout. The runout of the half dog point shall not exceed three percent of the nominal size and shall not exceed 0.010 FIM for sizes up to and including 3/4 in. diameter and 0.020 FIM for sizes over 3/4 in. diameter.

NOTES TO TABLE 5A CONT.

Runout is defined as the full indicator movement (FIM) obtained by holding on the thread major diameter near the half dog point, and rotating the screw 360 deg and indicating on the half dog point diameter.

12. Flat Point. The plane of the end on the flat of the point shall be perpendicular to the axis of the thread within two degrees obtained by holding the screw on the major thread diameter near the flat point, and inspecting on an optical comparator, or comparable inspection equipment.

13. Cone Point Configuration. The apex of the cone may be flatted or rounded to the extent of 10 percent of the basic diameter of the screw.

14. Spline Sockets. See Table 7, page G–34, for spline socket dimensions, and Appendix I, page G–38, for gaging of spline sockets.

15. Hexagon Sockets. See Table 6, page G–33, for hexagon socket dimensions, and Appendix I for gaging of hexagon sockets.

16. Dimensional Conformance. Socket Set Screws shall have the following designated characteristics inspected to ASME B18.18.2 to the inspection levels shown:

Characteristic	Inspection Level
Threads	C
Min Key Engagement	C
Socket Size (gaged)	C
Length	C

17. Designation. To promote uniformity and understanding in communications relating to products conforming to this standard, it is recommended that Hexagon and Spline Socket Set Screws be designated in accordance with the following data, preferably in the sequence shown:

(a) product name and point style
(b) designation of the standard
(c) nominal size (number, fractional or decimal equivalent)
(d) thread pitch
(e) nominal length (fractional or decimal equivalent)
(f) material
(g) protective finish, if required

EXAMPLES:

Hexagon Socket Set Screw, Cup Point, ASME B18.3, 1/4 – 20 × 1/4, Alloy Steel

Spline Socket Set Screw, Flat Point, ASME B18.3, 0.112 – 40 × 0.125, Alloy Steel, Zinc Plated

Hexagon Socket Set Screw, Cup Point, ASME B18.3, 6 –32 × 0.250, Corrosion Resistant Steel

For the recommended B18 part identifying numbering system (PIN), see ASME B18.24.1.

18. For additional requirements see Introductory Notes and General Data, page G–1.

19. For formulas for dimensions, see Appendix C, page G–46.

SOCKET CAP, SHOULDER, SET SCREWS, HEX, AND SPLINE KEYS

CAUTION: *The use of short length set screws listed in this table can result in failure of the socket, key, or mating threads during tightening because key engagement and thread length are less than optimum. Therefore, it is strongly recommended that screws of lengths equal to or greater than the lengths specified in columns B and B_1 of Table 5A be used wherever possible.*

See Table 5A, and the illustrations and notes thereto, for additional dimensions and specifications.

Table 5B Hexagon Key Engagements for Short Length Set Screws

Nominal Size or Basic Screw Diameter		J		L	T_H		
		Hexagon Socket Size		Nominal Screw Lengths	Minimum Key Engagement		
		Nom			Cup (1) and Flat Points	118 deg Cone and Oval Points	Half Dog Point
0	0.0600	0.028		0.06 0.09	0.030 0.040	0.028 0.040 (2)	. . . (3) 0.028
1	0.0730	0.035		0.06 0.09	0.030 0.040	0.029 0.040 (2)	. . . (3) 0.040
2	0.0860	0.035		0.06 0.09	0.030 0.040	0.029 0.040	. . . (3) 0.035
3	0.0990	0.050		0.09 0.13	0.040 0.055	0.039 0.040 (2)	. . . (3) 0.045
4	0.1120	0.050		0.09 0.13	0.045 0.060	0.039 0.045	. . . (3) 0.045
5	0.1250	1/16	0.062	0.09 0.13	0.040 0.060	0.039 0.045	. . . (3) 0.045
6	0.1380	1/16	0.062	0.09 0.13 0.16	0.040 0.060 0.070	0.039 0.045 0.065	. . . (3) 0.045 0.065
8	0.1640	5/64	0.078	0.13 0.16 0.19	0.060 0.070 . . . (4)	0.050 0.060 0.065	0.045 0.060 0.065
10	0.1900	3/32	0.094	0.13 0.19	0.060 . . . (4)	0.042 0.060	0.042 0.060
1/4	0.2500	1/8	0.125	0.19 0.25	0.090 . . . (4)	0.065 0.110	0.055 0.090
5/16	0.3125	5/32	0.156	0.25 0.31	0.125 . . . (4)	0.099 0.140	0.090 0.105
3/8	0.3750	3/16	0.188	0.25 0.31 0.50	0.110 0.140 . . . (4)	0.090 0.115 0.165	0.075 0.105 0.155
7/16	0.4375	7/32	0.219	0.50 0.44	0.160 . . . (4)	0.125 0.160	0.125 0.160
1/2	0.5000	1/4	0.250	0.50 0.44 0.50	0.175 0.215 . . . (4)	0.130 0.155 0.195	0.130 0.155 0.195
5/8	0.6250	5/16	0.312	0.50	0.205	0.145	0.145
3/4	0.7500	3/8	0.375	0.63 0.75	0.255 . . . (4)	0.190 0.325	0.190 0.295
7/8	0.8750	1/2	0.500	0.75 0.87	0.330 . . . (4)	0.255 0.419	0.225 0.330
1	1.0000	9/16	0.562	0.75 0.87 1.00	0.280 0.380 . . . (4)	0.175 0.280 0.380	0.175 0.280 0.380

NOTES:

1. Cup angle may be 118 deg or 130 deg, +5 deg, depending upon screw length and manufacturing process.
2. Cone point angle for these lengths shall be 90 deg; see column Y in Table 5A.
3. These sizes are impractical to manufacture because of point configuration and short length.
4. These screws are covered in Table 5A.

Table 5C Dimensions of Optional Cup Points

Nominal Size or Basic Screw Diameter		C_1 Point Diameter		C_2 Point Diameter		S Point Length	
		Max	Min	Max	Min	Max	Min
0	0.0600	0.032	0.027	0.027	0.022	0.007	0.004
1	0.0730	0.038	0.033	0.035	0.030	0.008	0.005
2	0.0860	0.043	0.038	0.043	0.038	0.010	0.007
3	0.0990	0.050	0.045	0.051	0.046	0.011	0.007
4	0.1120	0.056	0.051	0.059	0.054	0.013	0.008
5	0.1250	0.062	0.056	0.068	0.063	0.014	0.009
6	0.1380	0.069	0.062	0.074	0.068	0.017	0.012
8	0.1640	0.082	0.074	0.090	0.084	0.021	0.016
10	0.1900	0.095	0.086	0.101	0.095	0.024	0.019
1/4	0.2500	0.125	0.114	0.156	0.150	0.027	0.022
5/16	0.3125	0.156	0.144	0.190	0.185	0.038	0.033
3/8	0.3750	0.187	0.174	0.241	0.236	0.041	0.036
7/16	0.4375	0.218	0.204	0.286	0.281	0.047	0.042
1/2	0.5000	0.250	0.235	0.333	0.328	0.054	0.049
5/8	0.6250	0.312	0.295	0.425	0.420	0.067	0.062
3/4	0.7500	0.375	0.357	0.523	0.518	0.081	0.076
7/8	0.8750	0.437	0.418	—	—	—	—
1	1.0000	0.500	0.480	—	—	—	—
1-1/8	1.1250	0.562	0.542	—	—	—	—
1-1/4	1.2500	0.625	0.605	—	—	—	—
1-3/8	1.3750	0.687	0.667	—	—	—	—
1-1/2	1.5000	0.750	0.730	—	—	—	—
1-3/4	1.7500	0.875	0.855	—	—	—	—
2	2.0000	1.000	0.980	—	—	—	—

NOTES:

1. Type A point shown in Fig. 1 is the cup point dimensioned in Table 5A. Types B, C, D, E, F, and G are typical variations of the cup point which are supplied by some manufacturers.
2. For dimensions not shown above, refer to Table 5A.

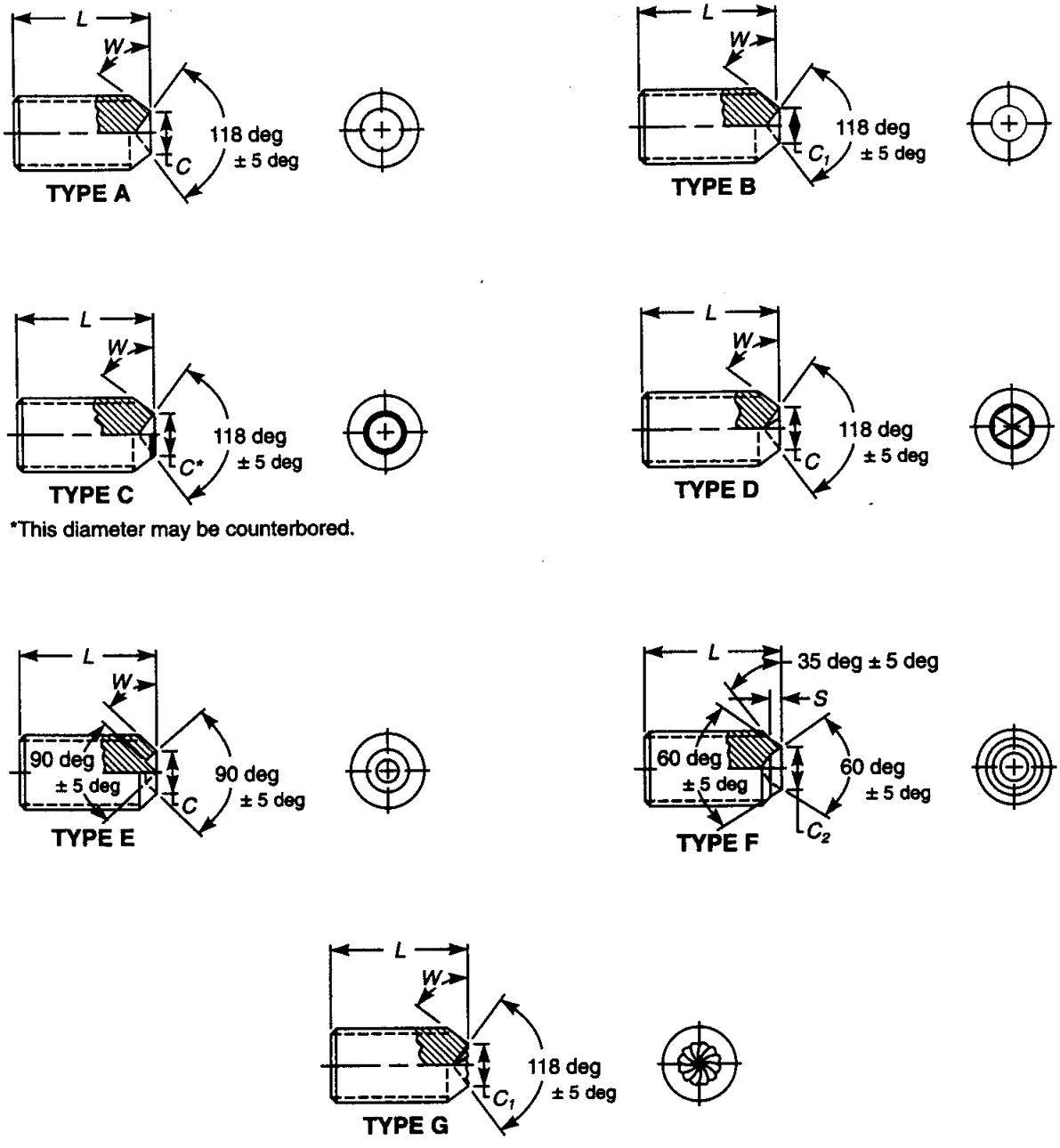


Fig. 1 Optional Types of Cup Points

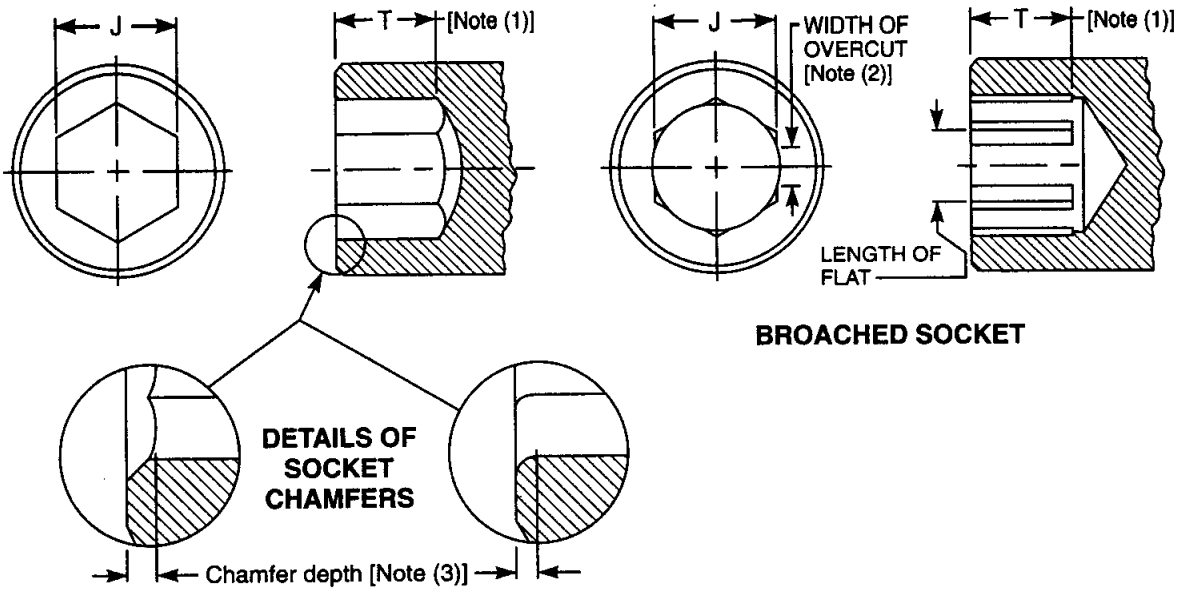


Table 6 Dimensions of Hexagon Sockets

Nominal Socket Size		J Socket Width Across Flats Max	J Socket Width Across Flats Min	Nominal Socket Size		J Socket Width Across Flats Max	J Socket Width Across Flats Min	Nominal Socket Size		J Socket Width Across Flats Max	J Socket Width Across Flats Min
...	0.028	0.0285	0.0280	3/16	0.188	0.1900	0.1875	7/8	0.875	0.8850	0.8750
...	0.035	0.0355	0.0350	7/32	0.219	0.2217	0.2187	1	1.000	1.0200	1.0000
...	0.050	0.0510	0.0500	1/4	0.250	0.2530	0.2500	1-1/4	1.250	1.2750	1.2500
1/16	0.062	0.0635	0.0625	5/16	0.312	0.3160	0.3125	1-1/2	1.500	1.5300	1.5000
5/64	0.078	0.0791	0.0781	3/8	0.375	0.3790	0.3750	1-3/4	1.750	1.7850	1.7500
3/32	0.094	0.0952	0.0937	7/16	0.438	0.4420	0.4375	2	2.000	2.0400	2.0000
7/64	0.109	0.1111	0.1094	1/2	0.500	0.5050	0.5000	2-1/4	2.250	2.2950	2.2500
1/8	0.125	0.1270	0.1250	9/16	0.562	0.5680	0.5625	2-3/4	2.750	2.8050	2.7500
9/64	0.141	0.1426	0.1406	5/8	0.625	0.6310	0.6250	3	3.000	3.0600	3.0000
5/32	0.156	0.1587	0.1562	3/4	0.750	0.7570	0.7500	...	...	...	...

NOTES TO TABLE 6:

1. Applicable socket depths are specified in the dimensional tables and notes for the respective screw types.
2. For broached sockets, the maximum acceptable overcut shall be a size causing an average 20 percent flat length reduction in the maximum dimension across flat hexagon for socket sizes up to and including 1 in., and 30 percent for larger sockets. The maximum overcut on any one of the six flats shall not exceed a 40 percent reduction in flat length for any size socket.
3. Where hexagon sockets are chamfered, the depth of chamfer shall not exceed 10 percent of the nominal socket size for sizes up to and including 1/16 in., and 7.5 percent for larger sizes. For chamfered sockets, it is permissible for the NOT GO socket gage to enter to the depth of chamfer as specified in Appendix I, page G–38.
4. Sockets up to and including 1 in. nominal size shall be checked in accordance with the hexagon socket gages and gaging specified in Appendix I. Suitability of larger sockets shall be determined by means of direct measurement for various technical and economic reasons.
5. Dimensions of sockets apply before plating. When plated, see Para. 2.1 of General Data for gaging.
6. Broach petals at the bottom of the socket are permissible.
7. For additional requirements, see Introductory Notes and General Data, page G–1.

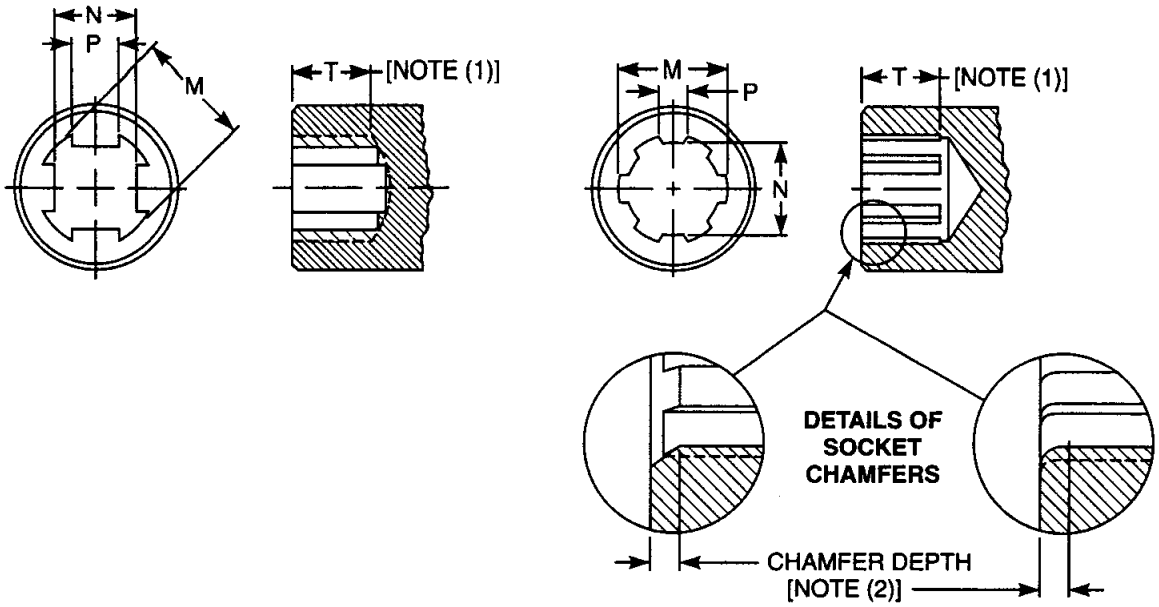


Table 7 Dimensions of Spline Sockets

Nominal Socket and Key Size	Number of Teeth	M		N		P	
		Socket Major Diameter		Socket Minor Diameter		Width of Tooth	
		Max	Min	Max	Min	Max	Min
0.033	4	0.0350	0.0340	0.0275	0.0260	0.0120	0.0115
0.048	4	0.050	0.049	0.0395	0.038	0.017	0.016
0.048	6	0.050	0.049	0.041	0.040	0.011	0.010
0.060	6	0.062	0.061	0.051	0.050	0.014	0.013
0.069	4	0.071	0.070	0.0545	0.053	0.021	0.020
0.072	6	0.074	0.073	0.064	0.063	0.016	0.015
0.076	4	0.079	0.078	0.0575	0.056	0.023	0.022
0.096	6	0.098	0.097	0.082	0.080	0.022	0.021
0.111	6	0.115	0.113	0.098	0.096	0.025	0.023
0.133	6	0.137	0.135	0.118	0.116	0.030	0.028
0.145	6	0.149	0.147	0.128	0.126	0.032	0.030
0.168	6	0.173	0.171	0.150	0.147	0.036	0.033
0.183	6	0.188	0.186	0.163	0.161	0.039	0.037
0.216	6	0.221	0.219	0.190	0.188	0.050	0.048
0.251	6	0.256	0.254	0.221	0.219	0.060	0.058
0.291	6	0.298	0.296	0.254	0.252	0.068	0.066
0.372	6	0.380	0.377	0.319	0.316	0.092	0.089
0.454	6	0.463	0.460	0.386	0.383	0.112	0.109
0.595	6	0.604	0.601	0.509	0.506	0.138	0.134
0.620	6	0.631	0.627	0.535	0.531	0.149	0.145
0.698	6	0.709	0.705	0.604	0.600	0.168	0.164
0.790	6	0.801	0.797	0.685	0.681	0.189	0.185

NOTES TO TABLE 7:

1. Applicable socket depths are specified in the dimensional tables and notes for the respective screw types.
2. Where spline sockets are chamfered, the depth of chamfer shall not exceed 10 percent of the nominal socket size for sizes up to and including 0.060 in., and 7.5 percent for larger sizes. For chamfered sockets, it is permissible for the NOT GO socket gage to enter to the depth of chamfer as specified in Appendix I, page G–38.
3. Where both six and four splines are available, six splines will be supplied unless four splines are ordered.
4. Broach petals at the bottom of the socket are permissible.
5. For additional requirements see Introductory Notes and General Data, page G–1.

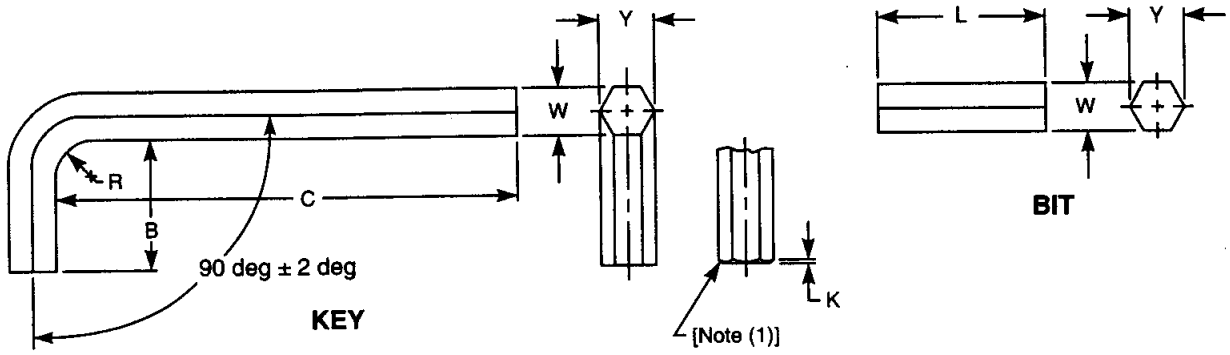


Table 8 Dimensions of Hexagon Keys and Bits

Nominal Key or Bit and Socket Size		W Hexagon Width Across Flats		Y Hexagon Width Across Corners		B Length		C Length				R Radius of Bend	L Length of Bit	K Chamfer
								Short Arm Series		Long Arm Series				
		Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Min	±0.062	Max
...	0.028	0.0280	0.0275	0.0314	0.0300	0.312	0.125	1.312	1.125	2.688	2.500	0.062	...	0.003
...	0.035	0.0350	0.0345	0.0393	0.0378	0.438	0.250	1.312	1.125	2.766	2.578	0.062	...	0.004
...	0.050	0.0500	0.0490	0.0560	0.0540	0.625	0.438	1.750	1.562	2.938	2.750	0.062	...	0.006
1/16	0.062	0.0625	0.0615	0.0701	0.0680	0.656	0.469	1.844	1.656	3.094	2.906	0.062	...	0.008
5/64	0.078	0.0781	0.0771	0.0880	0.0859	0.703	0.516	1.969	1.781	3.281	3.094	0.078	...	0.008
3/32	0.094	0.0937	0.0927	0.1058	0.1035	0.750	0.562	2.094	1.906	3.469	3.281	0.094	...	0.009
7/64	0.109	0.1094	0.1079	0.1238	0.1210	0.797	0.609	2.219	2.031	3.656	3.469	0.109	...	0.014
1/8	0.125	0.1250	0.1235	0.1418	0.1390	0.844	0.656	2.344	2.156	3.844	3.656	0.125	...	0.015
9/64	0.141	0.1406	0.1391	0.1593	0.1566	0.891	0.703	2.469	2.281	4.031	3.844	0.141	...	0.016
5/32	0.156	0.1562	0.1547	0.1774	0.1745	0.938	0.750	2.594	2.406	4.219	4.031	0.156	...	0.016
3/16	0.188	0.1875	0.1860	0.2135	0.2105	1.031	0.844	2.844	2.656	4.594	4.406	0.188	...	0.022
7/32	0.219	0.2187	0.2172	0.2490	0.2460	1.125	0.938	3.094	2.906	4.969	4.781	0.219	...	0.024
1/4	0.250	0.2500	0.2485	0.2845	0.2815	1.219	1.031	3.344	3.156	5.344	5.156	0.250	...	0.030
5/16	0.312	0.3125	0.3110	0.3570	0.3531	1.344	1.156	3.844	3.656	6.094	5.906	0.312	...	0.032
3/8	0.375	0.3750	0.3735	0.4285	0.4238	1.469	1.281	4.344	4.156	6.844	6.656	0.375	...	0.044
7/16	0.438	0.4375	0.4355	0.5005	0.4944	1.594	1.406	4.844	4.656	7.594	7.406	0.438	...	0.047
1/2	0.500	0.5000	0.4975	0.5715	0.5650	1.719	1.531	5.344	5.156	8.344	8.156	0.500	...	0.050
9/16	0.562	0.5625	0.5600	0.6420	0.6356	1.844	1.656	5.844	5.656	9.094	8.906	0.562	...	0.053
5/8	0.625	0.6250	0.6225	0.7146	0.7080	1.969	1.781	6.344	6.156	9.844	9.656	0.625	...	0.055
3/4	0.750	0.7500	0.7470	0.8580	0.8512	2.219	2.031	7.344	7.156	11.344	11.156	0.750	...	0.070
7/8	0.875	0.8750	0.8720	1.0020	0.9931	2.469	2.281	8.344	8.156	12.844	12.656	0.875	...	0.076
1	1.000	1.0000	0.9970	1.1470	1.1350	2.719	2.531	9.344	9.156	14.344	14.156	1.000	...	0.081
1-1/4	1.250	1.2500	1.2430	1.4337	1.4138	3.250	2.750	11.500	11.000	...	...	1.250	3.750	0.092
1-1/2	1.500	1.5000	1.4930	1.7204	1.6981	3.750	3.250	13.500	13.000	...	...	1.500	4.500	0.104
1-3/4	1.750	1.7500	1.7430	2.0072	1.9825	4.250	3.750	15.500	15.000	...	...	1.750	5.250	0.115
2	2.000	2.0000	1.9930	2.2939	2.2668	4.750	4.250	17.500	17.000	...	...	2.000	6.000	0.126
2-1/4	2.250	2.2500	2.2430	2.5807	2.5511	5.250	4.750	19.500	19.000	...	...	2.250	6.750	0.137
2-3/4	2.750	2.7500	2.7420	3.1541	3.1187	6.250	5.750	23.500	23.000	...	...	2.750	8.250	0.159
3	3.000	3.0000	2.9920	3.4409	3.4030	6.750	6.250	25.500	25.000	...	...	3.000	9.000	0.171
See Notes				2				7					4	1

NOTES TO TABLE 8:

1. Each end shall be square with the axis of each arm within 4 deg, and edges may be sharp or chamfered at the option of the manufacturer. The chamfer shall not exceed the values listed.

2. Any truncation or rounding of hexagon corners within the specified across-corner dimensions shall be evident on all corners.

3. Material (Steel Alloy). Hexagon keys and bits shall be fabricated from an alloy steel having two or more of the following alloying elements: chromium, nickel, molybdenum, or vanadium, in sufficient quantity to assure that the specified minimum hardness of 48 HRC at the surface for sizes up to and including 3/8 in., and 45 HRC for sizes over 3/8 in., is met when hexagon keys and bits are hardened by quenching from the austenitizing temperature and tempered.

NOTES TO TABLE 8 CONT.

4. For nominal socket sizes above 1 in., it is recommended that bits be used in conjunction with standard hexagon wrenches or power drives. When the application makes the use of keys necessary, the keys should conform to the dimensions listed. Bits 1 in. and smaller are available, but the lengths have not been standardized.

5. For plated hexagon keys and bits, all dimensions are before plating. Because of the high hardness of these products, it is recommended that they not be electroplated.

6. For applicability of keys and bits to various socket screw types and sizes, see Appendix B, page G–43.

7. Hexagon Keys are furnished as Short Arm or Long Arm Series.

8. Designation. To promote uniformity and understanding in communications relating to products conforming to this standard, it is recommended that Hexagon Keys or Bits be designated in accordance with the following data, preferably in the sequence shown:

(a) product name
(b) designation of the standard
(c) nominal key or bit size
(d) series
(e) protective finish, if required

EXAMPLES:

Hexagon Key, ASME B18.3, 1/8 Short Arm Series

Hexagon Key, ASME B18.3, 1/8 Long Arm Series, Nickel Plated

Hexagon Key Bit, ASME B18.3, 1-1/2 Hex

9. For formulas for dimensions, see Appendix C, page G–46.

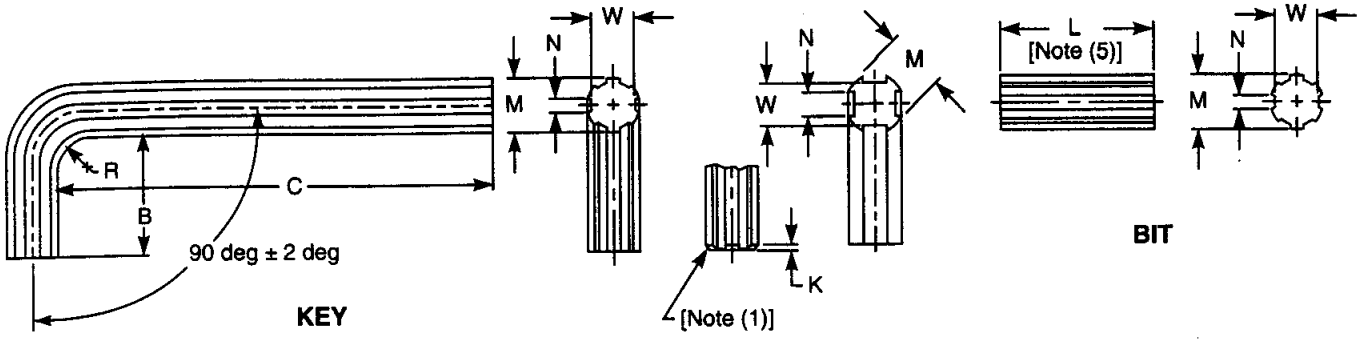


Table 9 Dimensions of Spline Keys and Bits

Nominal Key and Socket Size	M		W		Number of Splines	N		B		C				R	K
	Major Diameter		Minor Diameter			Width of Space		Length		Length				Radius of Bend	Chamfer
										Short Arm Series		Long Arm Series			
	Max	Min	Max	Min		Max	Min	Max	Min	Max	Min	Max	Min	Min	Max
0.033	0.0330	0.0320	0.0250	0.0240	4	0.0140	0.0130	0.312	0.125	1.312	1.125	...	...	0.062	0.003
0.048	0.0480	0.0470	0.0370	0.0360	4	0.0190	0.0180	0.438	0.250	1.312	1.125	...	...	0.062	0.004
0.048	0.0480	0.0470	0.0390	0.0380	6	0.0130	0.0120	0.438	0.250	1.312	1.125	...	...	0.062	0.004
0.060	0.0600	0.0590	0.0490	0.0480	6	0.0160	0.0150	0.625	0.438	1.750	1.562	...	...	0.062	0.006
0.069	0.0690	0.0680	0.0510	0.0500	4	0.0260	0.0250	0.656	0.469	1.844	1.656	...	...	0.062	0.007
0.072	0.0720	0.0710	0.0620	0.0610	6	0.0190	0.0180	0.656	0.469	1.844	1.656	...	...	0.062	0.008
0.076	0.0760	0.0750	0.0530	0.0520	4	0.0280	0.0270	0.656	0.469	1.844	1.656	...	...	0.062	0.008
0.096	0.0960	0.0950	0.0790	0.0775	6	0.0240	0.0230	0.703	0.516	1.969	1.781	...	...	0.078	0.008
0.111	0.1110	0.1100	0.0940	0.0925	6	0.0280	0.0270	0.750	0.562	2.094	1.906	...	...	0.094	0.009
0.133	0.1330	0.1310	0.1140	0.1120	6	0.0340	0.0320	0.797	0.609	2.219	2.031	3.656	3.469	0.125	0.014
0.145	0.1450	0.1435	0.1240	0.1225	6	0.0355	0.0340	0.844	0.656	2.344	2.156	3.844	3.656	0.125	0.015
0.168	0.1680	0.1660	0.1440	0.1420	6	0.0410	0.0390	0.891	0.703	2.469	2.281	4.031	3.844	0.156	0.016
0.183	0.1830	0.1815	0.1580	0.1565	6	0.0440	0.0425	0.938	0.750	2.594	2.406	4.219	4.031	0.156	0.016
0.216	0.2160	0.2145	0.1840	0.1825	6	0.0550	0.0535	1.031	0.844	2.844	2.656	4.594	4.406	0.188	0.022
0.251	0.2510	0.2495	0.2140	0.2125	6	0.0655	0.0640	1.125	0.938	3.094	2.906	4.969	4.781	0.219	0.024
0.291	0.2910	0.2895	0.2460	0.2445	6	0.0775	0.0760	1.219	1.031	3.344	3.156	5.344	5.156	0.250	0.030
0.372	0.3720	0.3705	0.3100	0.3085	6	0.0975	0.0960	1.344	1.156	3.844	3.656	6.094	5.906	0.312	0.032
0.454	0.4540	0.4525	0.3770	0.3755	6	0.1185	0.1170	1.469	1.281	4.344	4.156	6.844	6.656	0.375	0.044
0.595	0.5950	0.5935	0.5000	0.4975	6	0.1460	0.1445	1.719	1.531	5.344	5.156	8.344	8.156	0.500	0.050
0.620	0.6200	0.6175	0.5240	0.5215	6	0.1615	0.1590	1.844	1.656	5.844	5.656	9.094	8.906	0.500	0.053
0.698	0.6980	0.6955	0.5930	0.5905	6	0.1805	0.1780	1.844	1.656	5.844	5.656	...	...	0.562	0.055
0.790	0.7900	0.7875	0.6740	0.6715	6	0.1975	0.1950	1.969	1.781	6.344	6.156	...	...	0.625	0.070
See Notes										6					1

NOTES:

1. Each end shall be square with the axis of each arm within 4 deg, and edges may be sharp or chamfered at the option of the manufacturer. The chamfer shall not exceed the values listed.
2. Material (Steel Alloy). The spline keys shall be fabricated from an alloy steel having two or more of the following alloying elements: chromium, nickel, molybdenum, or vanadium, in sufficient quantity to assure that the specified minimum hardness of 48 HRC at the surface for sizes up to and including 0.372 in., and 45 HRC for sizes over 0.372 in., is met when spline keys are hardened by quenching from the austenitizing temperature and tempered.
3. For plated keys, all dimensions are before plating. Because of the high hardness of these products, it is recommended that they not be electroplated.
4. For applicability of keys to various socket screw types and sizes, see Appendix B, page G–43.
5. Bits are available, but lengths have not been standardized.
6. Spline keys shall be furnished as Short Arm Series or Long Arm Series.
7. Designation. To promote uniformity and understanding in communications relating to products conforming to this standard, it is recommended that Spline Keys be designated in accordance with the following data, preferably in the sequence shown:
   (a) product name (b) designation of the standard (c) nominal key size
   (d) series (e) protective finish, if required

   EXAMPLES:
   Spline Key, ASME B18.3, 0.111 Short Arm Series
   Spline Key, ASME B18.3, 0.372 Long Arm Series, Nickel Plated
8. For formulas for dimensions, see Appendix C, page G–46.

APPENDIX I

GAGES AND GAGING FOR HEXAGON AND SPLINE SOCKETS

(This Appendix is mandatory and is placed after the main text for convenience.)

GENERAL

The gages specified herein are intended for use in determining the acceptability of sockets up to and including the 1 in. nominal hexagon socket size and the 0.790 in. nominal spline socket size. Suitability of hexagon sockets of nominal sizes larger than 1 in. shall be determined by direct measurement for various technical and economic reasons. For dimensions of gages for sockets and spline sockets, see Tables IA and IB.

GAGING OF HEXAGON SOCKETS

Hexagon sockets in screws shall allow the GO member of the gage to enter freely to the minimum key engagement depths specified in the dimensional tables for the respective screw types.

For hexagon sockets that are not chamfered, the NOT GO gage member shall not enter any of the three across-flat dimensions of the socket for nominal socket sizes of 1/8 in. and larger, and the hexagonal NOT GO gage member shall not enter the socket for nominal socket sizes smaller than 1/8 in.

For chamfered hexagon sockets, the NOT GO gage member shall be permitted to enter only to a depth equivalent to 10 percent of the nominal socket size for nominal socket sizes up to and including 1/16 in., and to 7.5 percent of the nominal socket sizes for larger sockets.

GAGING OF SPLINE SOCKETS

Spline sockets in screws shall allow the GO member of the gage to enter freely to the minimum key engagement depths specified in the dimensional tables for the respective screw types.

For spline sockets that are not chamfered, the NOT GO gage member shall not enter the socket.

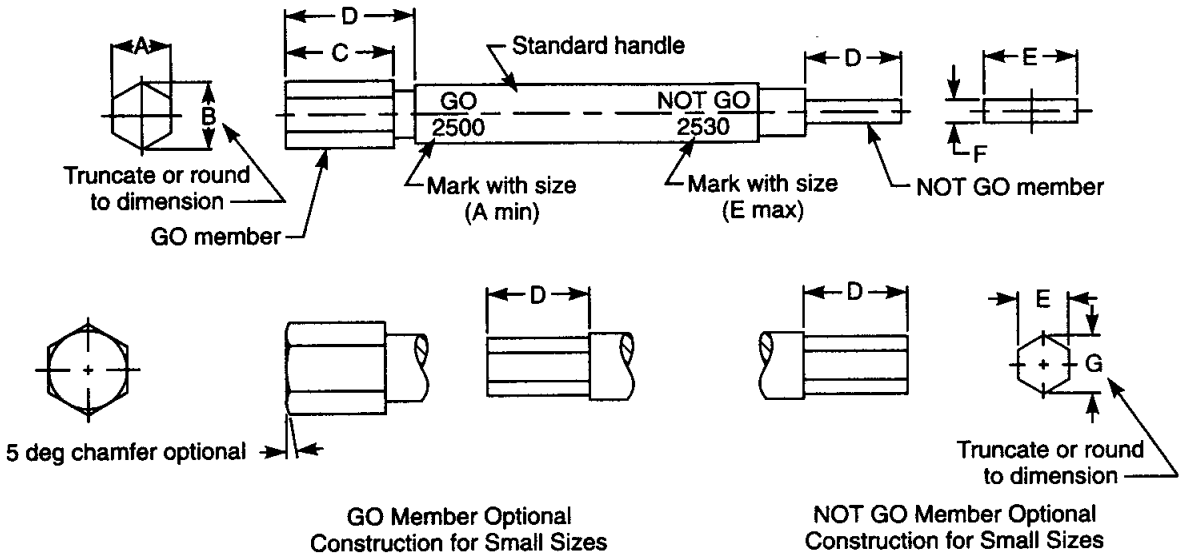
For chamfered spline sockets, the NOT GO gage member shall be permitted to enter only to a depth equivalent to 10 percent of the nominal socket size for nominal socket sizes up to and including 0.060 in., and to 7.5 percent of the nominal socket size for larger sockets.

GAGES

Gages shall be made from any grade of steel, through hardened and tempered to 60 HRC minimum. They shall be thermally stabilized and given suitable surface treatment to obtain maximum abrasion resistance.

The form of hexagonal and spline gage members shall be within the tolerance zone specified. See ASME Y14.5M, *Engineering Drawing and Related Documentation Practices, Dimensioning and Tolerancing.*

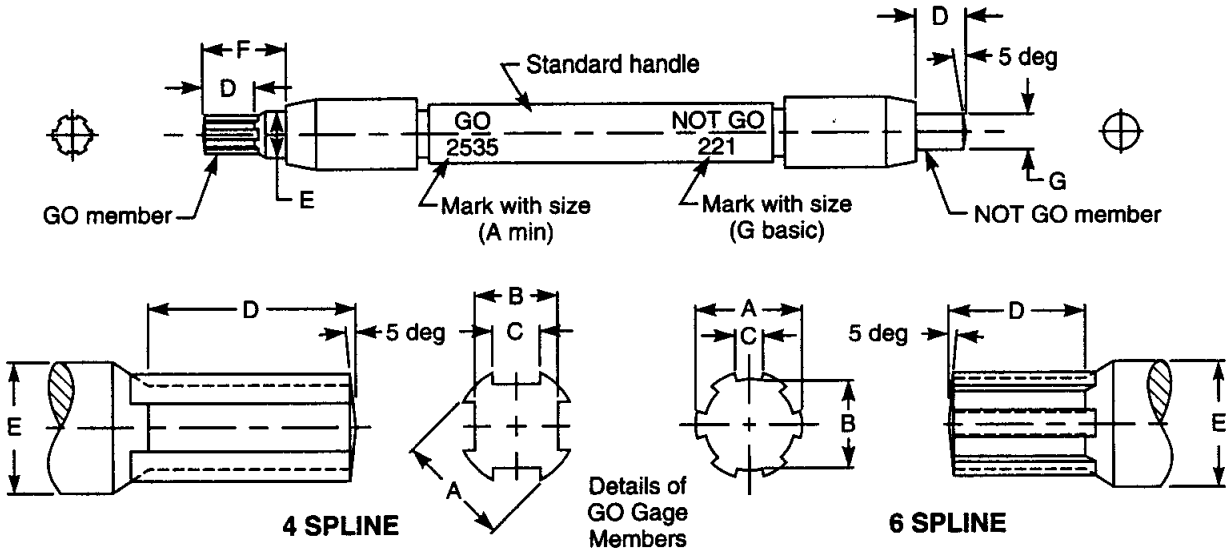
The surface roughness on hexagon and spline flats shall be 8 μ in. (arithmetical average) maximum. See ASME B46.1, *Surface Texture.*



Appendix I, Table IA Dimensions of Gages for Hexagon Sockets

Nominal Socket Size		A		B		C	D	E		F		G	
		GO Gage Width Across Flats		GO Gage Width Across Corners		GO Gage Length	Usable Gage Length	NOT GO Gage Width		NOT GO Gage Thickness		NOT GO Gage Width Across Corners	
		Max	Min	Max	Min	Min	Min	Max	Min	Max	Min	Max	Min
...	0.028	0.0281	0.0280	0.0316	0.0314	0.062	0.062	0.0285	0.0284	...	...	0.0308	0.0303
...	0.035	0.0351	0.0350	0.0395	0.0393	0.093	0.093	0.0355	0.0354	...	...	0.0386	0.0381
...	0.050	0.0501	0.0500	0.0562	0.0560	0.187	0.187	0.0510	0.0509	...	...	0.0550	0.0545
1/16	0.062	0.0626	0.0625	0.0703	0.0701	0.187	0.187	0.0635	0.0634	...	...	0.0688	0.0683
5/64	0.078	0.0782	0.0781	0.0882	0.0880	0.187	0.187	0.0791	0.0790	...	...	0.0862	0.0857
3/32	0.094	0.0939	0.0937	0.1060	0.1058	0.250	0.250	0.0952	0.0950	...	...	0.1036	0.1031
7/64	0.109	0.1096	0.1094	0.1240	0.1238	0.250	0.250	0.1111	0.1109	...	...	0.1212	0.1207
1/8	0.125	0.1252	0.1250	0.1420	0.1418	0.250	0.250	0.1270	0.1268	0.057	0.055	...	...
9/64	0.141	0.1408	0.1406	0.1595	0.1593	0.250	0.250	0.1426	0.1424	0.064	0.062	...	...
5/32	0.156	0.1564	0.1562	0.1776	0.1774	0.250	0.250	0.1587	0.1585	0.071	0.069	...	...
3/16	0.188	0.1877	0.1875	0.2137	0.2135	0.250	0.375	0.1900	0.1898	0.088	0.086	...	...
7/32	0.219	0.2189	0.2187	0.2492	0.2490	0.250	0.437	0.2217	0.2215	0.102	0.100	...	...
1/4	0.250	0.2502	0.2500	0.2848	0.2845	0.312	0.500	0.2530	0.2528	0.117	0.115	...	...
5/16	0.312	0.3127	0.3125	0.3573	0.3570	0.312	0.625	0.3160	0.3158	0.150	0.148	...	...
3/8	0.375	0.3752	0.3750	0.4288	0.4285	0.500	0.750	0.3790	0.3788	0.180	0.178	...	...
7/16	0.438	0.4377	0.4375	0.5008	0.5005	0.500	0.875	0.4420	0.4418	0.211	0.209	...	...
1/2	0.500	0.5002	0.5000	0.5718	0.5715	0.500	1.000	0.5050	0.5048	0.241	0.239	...	...
9/16	0.562	0.5627	0.5625	0.6424	0.6420	0.750	1.125	0.5680	0.5678	0.269	0.267	...	...
5/8	0.625	0.6252	0.6250	0.7150	0.7146	0.750	1.250	0.6310	0.6308	0.302	0.300	...	...
3/4	0.750	0.7502	0.7500	0.8585	0.8580	0.750	1.500	0.7570	0.7568	0.364	0.362	...	...
7/8	0.875	0.8752	0.8750	1.0025	1.0020	0.875	1.750	0.8850	0.8848	0.423	0.421	...	...
1	1.000	1.0002	1.0000	1.1475	1.1470	1.000	2.000	1.0100	1.0098	0.489	0.487	...	...

SOCKET CAP, SHOULDER, SET SCREWS, HEX, AND SPLINE KEYS



Appendix I, Table IB Dimensions of Gages for Spline Sockets

Nominal Socket Size	Number of Splines	A		B		C		D	E	F	G
		GO Gage Major Diameter		GO Gage Minor Diameter		GO Gage Space Width		Gage Length	Shoulder Diameter	Length	NOT GO Gage Diameter
		Max	Min	Max	Min	Max	Min	Min	± 0.0020	Min	Basic (1)
0.033	4	0.0337	0.0335	0.0252	0.0250	0.0125	0.0123	0.0625	0.0350	0.093	0.0275
0.048	4	0.0487	0.0485	0.0372	0.0370	0.0175	0.0173	0.0625	0.0520	0.187	0.0395
0.048	6	0.0487	0.0485	0.0397	0.0395	0.0115	0.0113	0.0625	0.0520	0.187	0.0410
0.060	6	0.0607	0.0605	0.0497	0.0495	0.0145	0.0143	0.0625	0.0625	0.187	0.0510
0.069	4	0.0697	0.0695	0.0517	0.0515	0.0215	0.0213	0.0625	0.0700	0.187	0.0545
0.072	6	0.0727	0.0725	0.0627	0.0625	0.0165	0.0163	0.0625	0.0730	0.187	0.0640
0.076	4	0.0767	0.0765	0.0547	0.0545	0.0235	0.0233	0.0625	0.0770	0.187	0.0575
0.096	6	0.0967	0.0965	0.0797	0.0795	0.0225	0.0223	0.0938	0.0980	0.250	0.0820
0.111	6	0.1127	0.1125	0.0957	0.0955	0.0255	0.0253	0.0938	0.1130	0.250	0.0980
0.133	6	0.1347	0.1345	0.1157	0.1155	0.0305	0.0303	0.0938	0.1360	0.250	0.1180
0.145	6	0.1467	0.1465	0.1257	0.1255	0.0325	0.0323	0.1250	0.1470	0.250	0.1280
0.168	6	0.1707	0.1705	0.1467	0.1465	0.0365	0.0363	0.0938	0.1719	0.250	0.1500
0.183	6	0.1857	0.1855	0.1607	0.1605	0.0395	0.0393	0.1875	0.1875	0.375	0.1630
0.216	6	0.2187	0.2185	0.1877	0.1875	0.0505	0.0503	0.1875	0.2187	0.437	0.1900
0.251	6	0.2537	0.2535	0.2187	0.2185	0.0605	0.0603	0.2500	0.2570	0.500	0.2210
0.291	6	0.2957	0.2955	0.2517	0.2515	0.0685	0.0683	0.2500	0.2968	0.625	0.2540
0.372	6	0.3767	0.3765	0.3157	0.3155	0.0925	0.0923	0.3750	0.3770	0.750	0.3190
0.454	6	0.4597	0.4595	0.3827	0.3825	0.1125	0.1123	0.3750	0.4687	0.875	0.3860
0.595	6	0.6007	0.6005	0.5057	0.5055	0.1385	0.1383	0.5000	0.6094	1.000	0.5090
0.620	6	0.6267	0.6265	0.5307	0.5305	0.1495	0.1493	0.5000	0.6406	1.000	0.5350
0.698	6	0.7047	0.7045	0.5997	0.5995	0.1685	0.1683	0.5000	0.7187	1.125	0.6040
0.790	6	0.7967	0.7965	0.6807	0.6805	0.1895	0.1893	0.5625	0.7969	1.250	0.6850

NOTE:

1. Class Y plug gage tolerances shall apply.

APPENDIX II
PROTRUSION GAGING OF FLAT COUNTERSUNK HEADS

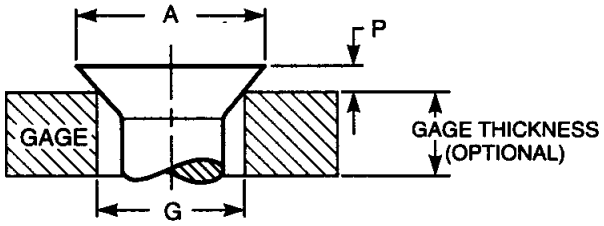
(This Appendix is mandatory and is placed after the main text for convenience.)

Suitability of flat countersunk head screws for application in countersinks designed to the principal dimensions of the screws shall be determined by use of a protrusion gage as illustrated below.

The protrusion dimensions and the gage diameters are specified in Table 2A.

To ensure adequate service life, the protrusion gage should be made of tool steel having a hardness of not less than Rockwell C60 (60 HRC).

If heads meet the original flushness requirements in a flushness gage, as established in ASME B18.3-1986 and prior issues, they are acceptable, and they will meet current requirements. The flushness gage must meet, or be more discriminating than, the original flushness gage requirement (flush in an 82 deg by "A" diameter countersink). The original flushness tolerances are included for information only, see Appendix C, page G–45.



APPENDIX III
STRAIGHTNESS GAGE AND GAGING

The Appendix II of B18.2.1 is identical and found on page C–28.

APPENDIX A
DRILL AND COUNTERBORE SIZES FOR SOCKET HEAD CAP SCREWS

(This Appendix is not part of ASME B18.3-2002, and is included here for information purposes only.)

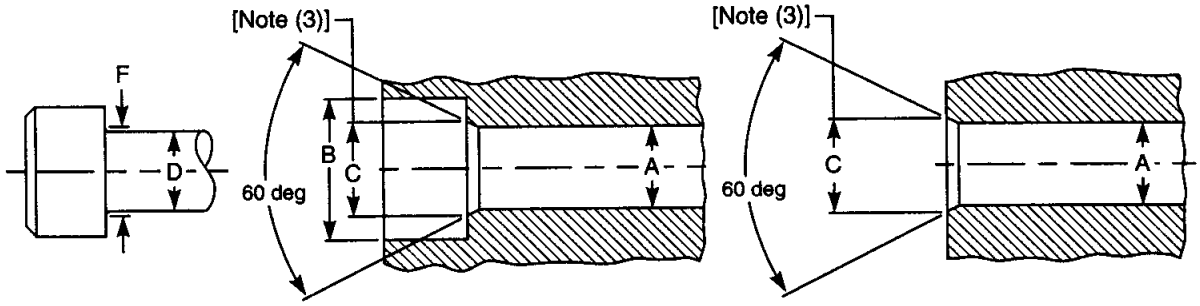


Table A1 Drill and Counterbore Sizes for Socket Head Cap Screws

Nominal Size or Basic Screw Diameter		A				B	C
		Nominal Drill Size				Counterbore Diameter	Countersink
		Close Fit		Normal Fit			
		Number or Fractional Size	Decimal Size	Number or Fractional Size	Decimal Size		
0	0.0600	51	0.067	49	0.073	1/8	0.074
1	0.0730	46	0.081	43	0.089	5/32	0.087
2	0.0860	3/32	0.094	36	0.106	3/16	0.102
3	0.0990	36	0.106	31	0.120	7/32	0.115
4	0.1120	1/8	0.125	29	0.136	7/32	0.130
5	0.1250	9/64	0.141	23	0.154	1/4	0.145
6	0.1380	23	0.154	18	0.170	9/32	0.158
8	0.1640	15	0.180	10	0.194	5/16	0.188
10	0.1900	5	0.206	2	0.221	3/8	0.218
1/4	0.2500	17/64	0.266	9/32	0.281	7/16	0.278
5/16	0.3125	21/64	0.328	11/32	0.344	17/32	0.346
3/8	0.3750	25/64	0.391	13/32	0.406	5/8	0.415
7/16	0.4375	29/64	0.453	15/32	0.469	23/32	0.483
1/2	0.5000	33/64	0.516	17/32	0.531	13/16	0.552
5/8	0.6250	41/64	0.641	21/32	0.656	1	0.689
3/4	0.7500	49/64	0.766	25/32	0.781	1-3/16	0.828
7/8	0.8750	57/64	0.891	29/32	0.906	1-3/8	0.963
1	1.0000	1-1/64	1.016	1-1/32	1.031	1-5/8	1.100
1-1/4	1.2500	1-9/32	1.281	1-5/16	1.312	2	1.370
1-1/2	1.5000	1-17/32	1.531	1-9/16	1.562	2-3/8	1.640
1-3/4	1.7500	1-25/32	1.781	1-13/16	1.812	2-3/4	1.910
2	2.0000	2-1/32	2.031	2-1/16	2.062	3-1/8	2.180
See Notes		1		2			3

NOTES:

1. Close Fit. The close fit is normally limited to holes for those lengths of screws that are threaded to the head (see Table 1C) in assemblies where only one screw is to be used or where two or more screws are to be used and the mating holes are to be produced either at assembly or by matched and coordinated tooling.
2. Normal Fit. The normal fit is intended for screws of relatively long length or for assemblies involving two or more screws where the mating holes are to be produced by conventional tolerancing methods. It provides for the maximum allowable eccentricity of the longest standard screws and for certain variations in the parts to be fastened, such as: deviations in hole straightness, angularity between the axis of the tapped hole and that of the hole for the shank, differences in center distances of the mating holes, etc.
3. Countersink. It is considered good practice to countersink or break the edges of holes that are smaller than F (max) (see Table 1B, page G–7) in parts having a hardness which approaches, equals, or exceeds the screw hardness. If such holes are not countersunk, the heads of screws may not seat properly or the sharp edges on holes may deform the fillets on screws thereby making them susceptible to fatigue in applications involving dynamic loading. The countersink or corner relief, however, should not be larger than is necessary to ensure that the fillet on the screw is cleared. Normally, the diameter of countersink does not have to exceed *F* (max) (see Table 1B). Countersinks or corner reliefs in excess of this diameter reduce the effective bearing area and introduce the possibility of embedment where the parts to be fastened are softer than the screws or brinnelling or flaring of the heads of the screws where the parts to be fastened are harder than the screws.

APPENDIX B
APPLICABILITY OF KEYS AND BITS TO VARIOUS SOCKET SCREW TYPES AND SIZES

(This Appendix is not part of ASME B18.3-2002, and is included here for information purposes only.)

Table B1 Applicability of Hexagon Keys and Bits

Nominal Key or Bit Size		Cap Screws	Flat Countersunk Head Cap Screws	Button Head Cap Screws	Shoulder Screws	Set Screws	Low Head Cap Screws
		Nominal Screw Sizes					
...	0.028	...	...	...	...	0	...
...	0.035	...	0	0	...	1 and 2	...
...	0.050	0	1 and 2	1 and 2	...	3 and 4	4
1/16	0.062	1	3 and 4	3 and 4	...	5 and 6	5 and 6
5/64	0.078	2 and 3	5 and 6	5 and 6	...	8	8
3/32	0.094	4 and 5	8	8	...	10	10
7/64	0.109	6	...	...	...	...	...
1/8	0.125	...	10	10	1/4	1/4	1/4
9/64	0.141	8	...	...	...	...	...
5/32	0.156	10	1/4	1/4	5/16	5/16	5/16
3/16	0.188	1/4	5/16	5/16	3/8	3/8	3/8
7/32	0.219	...	3/8	3/8	...	7/16	7/16
1/4	0.250	5/16	7/16	...	1/2	1/2	1/2
5/16	0.312	3/8	1/2	1/2	5/8	5/8	5/8
3/8	0.375	7/16 and 1/2	5/8	5/8	3/4	3/4	...
7/16	0.438	...	...	...	...	...	...
1/2	0.500	5/8	3/4	...	1	7/8	...
9/16	0.562	...	7/8	...	...	1 and 1-1/8	...
5/8	0.625	3/4	1	...	1-1/4	1-1/4 and 1-3/8	...
3/4	0.750	7/8 and 1	1-1/8	...	...	1-1/2	...
7/8	0.875	1-1/8 and 1-1/4	1-1/4 and 1-3/8	...	1-1/2	...	...
1	1.000	1-3/8 and 1-1/2	1-1/2	...	1-3/4	1-3/4 and 2	...
1-1/4	1.250	1-3/4	...	...	2	...	...
1-1/2	1.500	2	...	...	...	...	...
1-3/4	1.750	2-1/4 and 2-1/2	...	...	...	...	...
2	2.000	2-3/4	...	...	...	...	...
2-1/4	2.250	3 and 3-1/4	...	...	...	...	...
2-3/4	2.750	3-1/2 and 3-3/4	...	...	...	...	...
3	3.000	4	...	...	...	...	...

Table B2 Applicability of Spline Keys and Bits

Nominal Key Size	Cap Screws	Flat Countersunk Head Cap Screws	Button Head Cap Screws	Set Screws
	Nominal Screw Sizes			
0.033	...	...	...	0 and 1
0.048	...	0	0	2 and 3
0.060	0	1 and 2	1 and 2	4
0.069	...	...	...	5
0.072	1	3 and 4	3 and 4	5 and 6
0.076	...	...	...	6
0.096	2 and 3	5 and 6	5 and 6	8
0.111	4 and 5	8	8	10
0.133	6	...	...	...
0.145	...	10	10	1/4
0.168	8	...	...	...
0.183	10	1/4	1/4	5/16
0.216	1/4	5/16	5/16	3/8
0.251	...	3/8	3/8	7/16
0.291	5/16	7/16	...	1/2
0.372	3/8	1/2	1/2	5/8
0.454	7/16 and 1/2	5/8 and 3/4	5/8	3/4
0.595	5/8	...	...	7/8
0.620	3/4	...	...	...
0.698	7/8	...	...	...
0.790	1	...	...	...

APPENDIX C
FORMULAS FOR DIMENSIONS

(This Appendix is not part of ASME B18.3-2002, and is included here for information purposes only.)

Hexagon and Spline Socket Head Cap Screws

Body Diameter *D*, Table 1A, page G–4

D (max) = Basic or nominal size — see Table 1A , page G–4, for values

D (min) = Minimum major diameter Class 3A UNRF threads for sizes 0 thru 1 in., Table 4, page A–46

= Minimum major diameter Class 3A UNRC threads for sizes over 1 in.

Head Diameter *A*, Table 1A

A (max) = See Table 1A for value for sizes 0 thru 10

= 1.50*D* (max) for sizes 1/4 in. thru 4 in.

A (min) = *A* (max) – 0.021 $\sqrt{D\,(\text{max})}$

Head Height *H*, Table 1A

H (max) = *D* (max)

H (min) = *H* (max) – 0.012 $\sqrt{D\,(\text{max})}$

Head Side Height *S*, Table 1A

S (min) = 0.90*H* (max)

Key Engagement *T*, Table 1A

T (min) = 0.50*H* (max) – 0.005

Wall Thickness *G*, Table 1A

G (min) = 0.34*H* (max) for sizes 0 thru 10

= 0.38*H* (max) for sizes 1/4 in. thru 4 in.

Hexagon and Spline Socket Flat Counersunk Head Cap Screws

Body Diameter *D*, Table 2A, page G–15

D (max) = Basic or nominal size — see Table 2A for values

D (min) = Minimum major diameter Class 3A UNRF threads for sizes 0 thru 1 in.

= Minimum major diameter Class 3A UNRC threads for sizes over 1 in.

Head Diameter *A*, Table 2A

A (max) Theor. Sharp = No formula for sizes 0 thru 3 – see Table 2A for values

= 2*D* (max) + 0.031 for sizes 4 thru 3/8 in.

= 2*D* (max) – 0.031 for 7/16 in. size

= 2*D* (max) – 0.062 for sizes 1/2 in. thru 1-1/2 in.

APPENDIX C (Cont.)
FORMULAS FOR DIMENSIONS

Maximum Head Height *H*, Table 2A, page G–15

$$H \text{ maximum (ref)} = \left[\frac{A \text{ (max)} - D \text{ (max)}}{2} \right] \cot 41 \text{ deg}$$

Head Protrusion, Table 2A

Original Flushness Tolerance[1]

Nominal Size		Flushness Tolerance	Nominal Size		Flushness Tolerance
0	0.0600	0.006	3/8	0.3750	0.018
1	0.0730	0.007	7/16	0.4375	0.018
2	0.0860	0.008	1/2	0.5000	0.018
3	0.0990	0.010	5/8	0.6250	0.022
4	0.1120	0.011	3/4	0.7500	0.024
5	0.1250	0.012	7/8	0.8750	0.025
6	0.1380	0.013	1	1.0000	0.028
8	0.1640	0.014	1-1/8	1.1250	0.031
10	0.1900	0.015	1-1/4	1.2500	0.035
1/4	0.2500	0.016	1-3/8	1.3750	0.038
5/16	0.3125	0.017	1-1/2	1.5000	0.042

NOTE:
1. Tolerance is prior to ASME B18.3-2002.

Key Engagement *T* (min), Table 2A, page G–15

T (min) = 0.68*H* – 0.005 for sizes 0 thru 3
= 0.68*H* for sizes over 3 thru 5/8 in.
= 0.53*H* approx for sizes 3/4 in. thru 1-1/2 in.

Hexagon and Spline Socket Button Head Cap Screws

Head Diameter *A*, Table 3, page G–20

A (max)[1] = 1.90*D* for sizes 0 thru 10
= 1.75*D* for sizes 1/4 thru 1/2 in.
= 1.60*D* for 5/8 in. size

Head Height *H*, Table 3
H (max)[1] = 0.53*D* (min)

Key Engagement *T* (min), Table 3
T (min) = 0.56*J* (min)

Hexagon Socket Head Shoulder Screws

Shoulder Diameter *D*, Table 4, page G–23
D (max) = Nominal size – 0.002
D (min) = *D* (max) – 0.002

Head Diameter *A*, Table 4
A (max) No formula – see Table 4 for values
A (min) No formula – see Table 4 for values

Head Height *H*, Table 4
H (max) = 0.50 (nom size) + 0.0625 for sizes 1/4 in. thru 5/8 in.
= 0.50 (nom size) + 0.125 for sizes 3/4 in. thru 1-1/4 in.

Thread Neck Diameter *G*, Table 4
G (min) = Minimum minor diameter Class 3A thread

Thread Neck Width *I*, Table 4
I (max) = 2.00 UNC thread pitches

Hexagon and Spline Socket Set Screws

Key Engagement T_H and T_S, Table 5A, page G–26
T_H (min) = No formula for sizes 0 thru 10 — see Table 5A for values
= *J* (nom) for sizes 1/4 in. thru 2 in.
T_S (min)[1] = No formula for sizes 0 thru 10 — see Table 5A for values
= 0.50*D* for sizes 1/4 thru 3/4 in.
= 0.573*D* for 7/8 in. size

Oval Point Radius *R*, Table 5A
R (basic)[1] = 0.75*D*

Half Dog Point Length *Q*, Table 5A
Q (basic)[1] = 0.25*D*

Half Dog Point Diameter *P*, Table 5A
P (max)[1] = 0.667*D* for sizes 0 thru 10
= 0.75*D* – 0.031 for sizes 1/4 in. thru 1/2 in.
= 0.75*D* for sizes 5/8 in. thru 2 in.

Hexagon Keys

Radius of Bend *R*, Table 8, page G–35
R (min) = No formula — see Table 8 for key sizes 0.028 thru 0.050
= *W* (max) for key sizes 1/16 in. thru 1 in.

Spline Keys

Radius of Bend *R*, Table 9, G–37
R (min)[2] = No formula — see Table 9 for key sizes 0.033 thru 0.133 and 0.168
= 0.50*D* for key sizes 0.145, 0.183 thru 0.454, and 0.620 thru 0.790
= 0.50*D* + 0.062 for 0.595 key size.

NOTES:
1. Where *D* is the basic diameter of screw.
2. Where *D* is the basic diameter of set screw in which socket size is used.

APPENDIX D
HEXAGON AND SPLINE SOCKET HEAD CAP SCREWS (1936 SERIES)

(This Appendix is not part of ASME B18.3-2002 and is included for informational purposes only.)

Prior to 1961, the 1936 Series of socket head cap screws were recognized as standard. The 1936 Series screws are no longer stocked by screw manufacturers and are now available only on special order. The major differences between the 1936 Series screws and the present standard screws (1960 Series) are that, for some sizes, the 1936 Series had smaller head diameters and/or socket sizes and/or different thread lengths. Users desiring additional information on the 1936 Series should refer to Appendix IV of ASA B18.3-1961, or should consult socket screw manufacturers.

In the event of an order, unless otherwise specified, the manufacturer may use the thread length and length tolerances for 1960 Series style socket cap screws on 1936 Series style socket cap screws.