ASME B18.3-2003
(Revision of ASME B18.3-1998)

Socket Cap, Shoulder, and Set Screws, Hex and Spline Keys (Inch Series)

AN AMERICAN NATIONAL STANDARD



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Three Park Avenue • New York, NY 10016

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FOREWORD

American National Standards Committee B18 for the standardization of bolts, screws, nuts, rivets, and similar fasteners was organized in March 1922 as Sectional Committee B18 under the aegis of the American Engineering Standards Committee (later the American Standards Association, then the United States of America Standards Institute and, as of October 6, 1969, the American National Standards Institute) with the Society of Automotive Engineers and the American Society of Mechanical Engineers as joint sponsors.

Subcommittee No. 9[1] on Socket Head Cap and Set Screws was organized in April 1929 and completed its first report in November 1931. Seven successive drafts were issued during which the content of the proposal was considerably extended and refined, and in March 1933 copies were distributed to industry for criticism and comment. The suggestions received were carefully reviewed, and in April 1935 the proposal was presented to the members of Sectional Committee B18 for letter ballot vote. Following the acceptance by the two sponsor organizations, it was designated an American Standard (ASA B18.3) in February 1936 by the American Standards Association.

For the purpose of keeping the work of the Subcommittee in line with the developments in industry, the Committee prepared a supplement to the standard in the form of a table covering the dimensions of hexagonal and fluted socket head shoulder screws (stripper bolts) optional, which received approval of the American Standards Association in April 1944 and was designated ASA B18.3a.

In March 1945, the Subcommittee submitted certain fundamental changes and additions to the Standard, and the Sectional Committee recommended issuance of a completely revised standard. Following approval of the Sectional Committee, the revised document was approved by the sponsor organizations and the American Standards Association and designated an American Standard in April 1947.

In accordance with ASA procedure, a review of the standard was undertaken in 1950 and certain additional changes were recommended by the Subcommittee. Cap screw sizes No. 0 and 1 and set screw sizes No. 0, 1, 2, 3, and 4 were added to satisfy increasing demand from various industries. Material, hardness, and thread fit were included to provide a more complete standard. A draft dated November 1951 was distributed to industry for criticism and comment. A further revision, dated November 1953, was presented to Sectional Committee B18 for letter ballot vote. Following approval of the Sectional Committee and sponsors, the proposal was submitted to the American Standards Association. It was approved and designated an American Standard on August 26, 1954.

Shortly after the 1954 standard was issued, work was initiated on the development of standards covering flat countersunk head cap screws, button head cap screws, and cap screws up to 4 in. in diameter. As these proposals evolved with comments received from various industries, it became evident that a major revision was required, particularly in regard to insufficient bearing surface under the head on some sizes as well as increased socket sizes to permit higher set-up torque. The resulting proposed revision was presented to Sectional Committee B18 for letter ballot vote. Following approval of the Sectional Committee and sponsors, the proposal was submitted to the American Standards Association. It was approved and designated an American Standard on December 21, 1961.

Continued surveillance of the 1961 standard by the Subcommittee indicated by 1966 that a complete revision of the document was necessary to provide recognition of technical improvements in materials and manufacturing methods. Work over the next 2 years culminated in a March 1968 draft proposal incorporating revisions in the following areas:

(a) more clearly defined materials for all products

(b) application of Unified radius root threads to all cap screws

(c) refinements to underhead fillets

(d) extension of size coverage for flat countersunk head cap screws to include $\frac{7}{8}$ in. through $1\frac{1}{2}$ in. diameters, and tabulation of body and grip lengths for sizes 0 in. through 1 in.

(e) increased key engagements in socket set screws and implementation of minimum hexagon key engagement in short length set screws

(f) addition of width across corner dimensions for hexagon keys and bits

(g) the inclusion of appendices covering drill and counterbore sizes for socket head cap screws (1960 Series), and gages and gaging for spline sockets.

Following acceptance of this draft by the Subcommittee, it was approved by letter ballot of USA Standards

[1] As of April 1, 1966, Subcommittee 9 was redesignated as Subcommittee 3.

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Committee B18 and the sponsor organizations, and submitted to the United States of America Standards Institute. It was approved and designated a USA Standard on September 19, 1969.

A periodic review of the standard, undertaken by Subcommittee 3 in 1973, resulted in agreement that the document be revised to reflect clarification of the underhead fillet on socket head cap screws, add coverage on drilled socket head cap screws, lengthen the thread undercut on socket head shoulder screws, and extend the coverage on the latter to include the $1\frac{1}{2}$ in., $1\frac{3}{4}$ in., and 2 in. sizes. A proposal incorporating these changes together with numerous editorial corrections was prepared and, subsequent to Subcommittee acceptance, approved by letter ballot to American National Standards Committee B18. Following approval by the sponsor organizations, the proposal was submitted to the American National Standards Institute and designated an American National Standard on November 1, 1976.

A periodic review of the standard, undertaken by the Subcommittee in 1980, resulted in agreement that the document be revised

(a) to clarify the notes on screw point chamfers

(b) in socket tolerances for large sockets and in counterbore sizes to reflect standard tooling

(c) to reference the ASTM document A 574 for the appropriate mechanical and chemical requirements

A proposal containing these changes, as well as many editorial corrections, was prepared for and balloted by letter ballot to the ASME Committee B18. Following approval by the sponsor organization, the proposal was submitted to the American National Standards Institute and designated an American National Standard on January 4, 1982.

A periodic review of the standard, undertaken by the Committee in 1985, resulted in agreement that the document be revised to clarify the dimensions with respect to plated products, and to incorporate by reference the new ASTM documents for the appropriate mechanical, chemical, and testing requirements for the button head, flat countersunk head, and set screw products. A proposal containing these changes, as well as editorial corrections, was prepared and balloted by letter ballot to ASME Committee B18. Following approval by ASME, the proposal was submitted to the American National Standards Institute and designated an American National Standard on August 7, 1986.

A periodic review of this Standard was undertaken by the Committee in 1990. Based on this review, it was determined that the document needed significant revisions to clarify and update the Standard. These revisions would need to address the technical changes in manufacturing methods and changes in the standards community. To accomplish this objective, established quality standards were recognized and integrated into the Standard. In addition, designated characteristics for each product and product identification were established and gaging techniques for countersunk screws were added. These changes were balloted and approved by the ASME B18 Committee. The proposal was submitted to the American National Standards Institute and designated an American National Standard on January 14, 1998.

A periodic review of this Standard was again undertaken by the Committee in 2000. It was determined that there were many technical printing errors that had to be revised. Inspection definitions were added to clarify bearing surface, runout, and straightness for various products. The radius under the head for socket head screws was clarified by the addition of drawings showing the radius on thread to the head socket screws, and also showing the radius on socket screws with an unthreaded shoulder. The protrusion gage dimensions were changed on flat head socket cap screws. The thread requirements for short length socket set screws were also changed. A standard was also developed for low head socket cap screws. These changes were balloted and approved by the ASME B18 Committee. The proposal was submitted to the American National Standards Institute and designated as an American National Standard on July 8, 2003.

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Standardization of Bolts, Nuts, Rivets, Screws, Washers, and Similar Fasteners

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Secretary, B18 Standards Committee
The American Society of Mechanical Engineers
Three Park Avenue
New York, NY 10016-5990

Proposing Revisions. Revisions are made periodically to the Standard to incorporate changes that appear necessary or desirable, as demonstrated by the experience gained from the application of the Standard. Approved revisions will be published periodically.

The Committee welcomes proposals for revisions to this Standard. Such proposals should be as specific as possible, citing the paragraph number(s), the proposed wording, and a detailed description of the reasons for the proposal, including any pertinent documentation.

Interpretations. Upon request, the B18 Committee will render an interpretation of any requirement of the Standard. Interpretations can only be rendered in response to a written request sent to the Secretary of the B18 Standards Committee.

The request for interpretation should be clear and unambiguous. It is further recommended that the inquirer submit his/her request in the following format:

Subject:	Cite the applicable paragraph number(s) and the topic of the inquiry.
Edition:	Cite the applicable edition of the Standard for which the interpretation is being requested.
Question:	Phrase the question as a request for an interpretation of a specific requirement suitable for general understanding and use, not as a request for an approval of a proprietary design or situation. The inquirer may also include any plans or drawings, which are necessary to explain the question; however, they should not contain proprietary names or information.

Requests that are not in this format may be rewritten in the appropriate format by the Committee prior to being answered, which may inadvertently change the intent of the original request.

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SOCKET CAP, SHOULDER, AND SET SCREWS, HEX AND SPLINE KEYS (INCH SERIES)

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 an American National Standard. Also, included are appendices that provide specifications for hexagon and spline socket gages and gaging, tables showing applicability of keys and bits to various socket screws 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 are specified in paras. 1.2.1 through 1.2.5.

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

Dimensions for drilled holes and counterbores are included in Table A-1 of Nonmandatory Appendix A.

1.2.2 Drilled Hexagon Socket Head Cap Screws. Specifications for hexagon socket head cap screws having two, four, and six holes drilled in the head for lock wire application are given in Table 1F.

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. 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. 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.

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 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.

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 through 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.

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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.

1.12 Referenced Standards

The following is a list of publications referenced in this Standard. Unless otherwise specified, the most recent standard available shall be used.

ASME B1.1, Unified Inch Screw Threads (UN and UNR Thread Form)

ASME B1.3M, Screw Thread Gaging Systems for Dimensional Acceptability — Inch and Metric Screw Threads (UN, UNR, UNJ, M, and MJ)

ANSI B18.12, Glossary of Terms for Mechanical Fasteners

ASME B18.18.1M, Inspection and Quality Assurance for General Purpose Fasteners

ASME B18.18.2M, Inspection and Quality Assurance for High Volume Machine Assembly Fasteners

ASME B18.18.3M, Inspection and Quality Assurance for Special Purpose Fasteners

ASME B18.18.4M, Fasteners Produced from a Single Mill Heat With In-Process Control and Lot Traceability

ASME B18.24.1, Part Identifying Number (PIN) Code System Standard for B18 Externally Threaded Products

ASME B46.1, Surface Texture

ASME B47.1, Gage Blanks

ASME Y14.5M, Engineering Drawing and Related Documentation Practices, Dimensioning and Tolerancing

ASME Y14.6, Engineering Drawing and Related Documentation Practices, Screw Thread Representation

Publisher: The American Society of Mechanical Engineers (ASME), Three Park Avenue, New York, NY 10016-5990; Order Department: 22 Law Drive, Box 2300, Fairfield, NJ 07007-2300

ASTM A 574, Standard Specification for Alloy Steel Socket-Head Cap Screws

ASTM F 835, Standard Specification for Alloy Steel Socket Button and Flat Countersunk Head Cap Screws

ASTM F 837, Standard Specification for Stainless Steel Socket-Head Cap Screws

ASTM F 879, Standard Specification for Stainless Steel Socket Button and Flat Countersunk Head Cap Screws

ASTM F 880, Standard Specification for Stainless Steel Socket Set Screws

ASTM F 912, Standard Specification for Alloy Steel Socket Set Screws

Publisher: The American Society for Testing and Materials (ASTM), 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959

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 Mandatory Appendix I. For coated products, use GO gages identical in design and tolerances to those shown in Mandatory Appendix I, except having minimum dimensions equal to minimum sizes of keys and bits shown in Tables 8 and 9, respectively. 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.

2.1.2 Spline Sockets. Spline sockets shall conform with the specifications given in Table 7.

2.2 Threads

Threads on all screw products covered by this Standard shall be in accordance with ASME B1.1 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, ASME B1.1, except where otherwise specified in Note (14) of Table 5A.

2.3 Quality Assurance

Products will be furnished in accordance with ASME B18.18.1M, 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 B18.18.2M. For nondesignated dimensional characteristics, the provisions of ASME B18.18.1M 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 B18.18.3M or ASME B18.18.4M, the final inspection level sample sizes of those respective standards shall apply.

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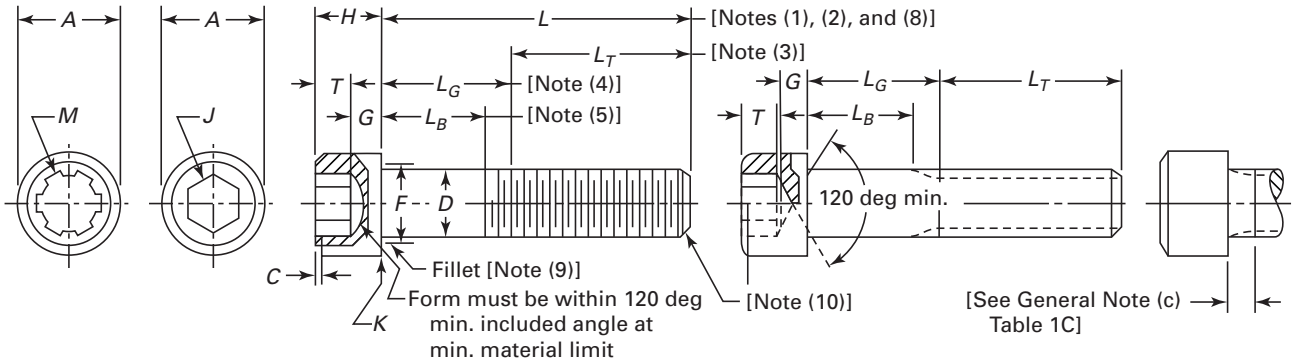


Table 1A Dimensions of Hexagon and Spline Socket Head Cap Screws

Nominal Size (Basic Screw Diameter) [Note (9)]	Body Diameter, *D* [Notes (6) and (10)]		Head Diameter, *A* [Note (11)]		Head Height, *H*		Maximum Chamfer or Radius, *C* [Note (12)]	Nominal Spline Socket Size, *M* [Note (13)]	Nominal Hexagon Socket Size, *J* [Note (14)]		Minimum Key Engagement, *T*	Minimum Wall Thickness, *G*	Maximum Chamfer or Radius, *K* [Note (15)]
	Max.	Min.	Max.	Min.	Max.	Min.	[Note (12)]	[Note (13)]	[Note (14)]				[Note (15)]
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

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Table 1A Dimensions of Hexagon and Spline Socket Head Cap Screws (Cont'd)

GENERAL NOTE: For additional requirements, refer to Notes (8) through (22), and also section 2, General Data, at the beginning of this Standard.

NOTES:

(1) *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.

(2) *Standard Lengths.* Standard length increments for socket head cap screws shall be as tabulated below.

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

(3) *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 and notes thereto.

(4) *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).

(5) *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).

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

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

(8) *Length Tolerances.* The allowable tolerance on length shall be as tabulated below.

	Nominal Screw Size, Tolerances on Lengths			
Nominal Screw Length	0 Through 3/8, Incl.	7/16 Through 3/4, Incl.	7/8 Through 1 1/2, Incl.	Over 1 1/2
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 2.5 to 6.00, incl.	−0.06	−0.08	−0.14	−0.20
Over 6.00	−0.12	−0.12	−0.20	−0.24

(9) *Fillet.* For all lengths of screws, the form of the underhead fillet shall be optional, as depicted in the illustration above Tables 1B-1 and 1B-2, 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 Tables 1B-1 and 1B-2.

(10) *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 the screw sizes up to and including size 8 (0.164 in.) and lengths below 0.75*d* shall be optional.

(11) *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.

(12) *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.

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Table 1A Dimensions of Hexagon and Spline Socket Head Cap Screws (Cont'd)

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

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

(15) *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*.

(16) *Bearing Surface.* The plane of the bearing surface shall be perpendicular to the axis of the shank, within a maximum deviation of 1 deg, obtained by holding the screw on the body or major thread diameter within 1 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.

(17) *Runout*

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

Runout for (a) above is defined as the full indicator movement (FIM) obtained by holding the screw on the body or major screw thread diameter within 1 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% of the maximum screw diameter, *D*, or 0.005 in., whichever is greater for nominal sizes through $\frac{1}{2}$ in. diameter and 6% for nominal sizes above $\frac{1}{2}$ in. diameter.

Runout for (b) above is defined as the full indicator movement (FIM) obtained by holding the screw on the body or major screw thread diameter within 1 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 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 Mandatory Appendix III.

(18) *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 $1\frac{1}{2}$ in., inclusive; and Class 2A UNR Series for sizes larger than $1\frac{1}{2}$ in.

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

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, Introductory Notes).

(19) *Material*

(a) Steel, Alloy. Cap screws shall be fabricated from an alloy steel and shall conform in all respects to ASTM A 574.

(b) Steel, Corrosion-Resistant. Cap screws shall be fabricated from a corrosion-resistant steel and shall conform in all respects to ASTM F 837.

(20) *Surface Roughness.* For alloy steel screws of sizes up to and incuding $\frac{5}{8}$ in., and nominal lengths equal to or less than 8 times the basic screw diameter, the surface roughness of the screws shall not exceed 63 μin. (arithmetical average) on the fillet and head bearing surfaces, nor exceed 32 μin. (arithmetical average) on the threads.

For larger sizes, longer lengths, and corrosion-resistant steel screws, the surface roughness of the screws shall not exceed 125 μin. (arithmetical average) on the body [see Note (10)], fillet [see Note (7)], 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.)

(21) *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 for description of schematic and simplified thread representation), the dimension should be noted to indicate whether body length or grip length is required.

(22) *Dimensional Conformance.* Socket Head Cap Screws shall have the following designated characteristics inspected to ASME B18.18.2M to Inspection Level C: threads, head diameter, socket size (gaged), length, and fillet transition diameter.

(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 × $\frac{3}{4}$, Alloy Steel

Spline Socket Head Cap Screws, ASME B18.3, 0.138-32 × 0.750, Alloy Steel, Zinc Plated. (For plated products, see para. 1.7, Introductory Notes.)

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

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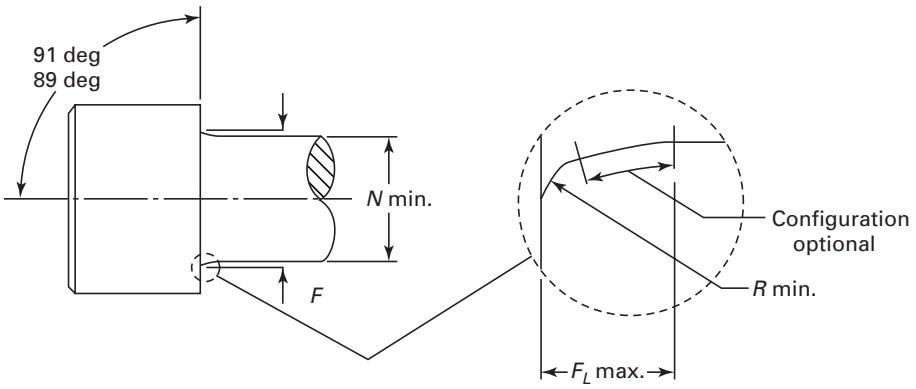


Table 1B-1 Dimensions of Under Head Fillets for Socket Head Cap Screws Threaded to the Head

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

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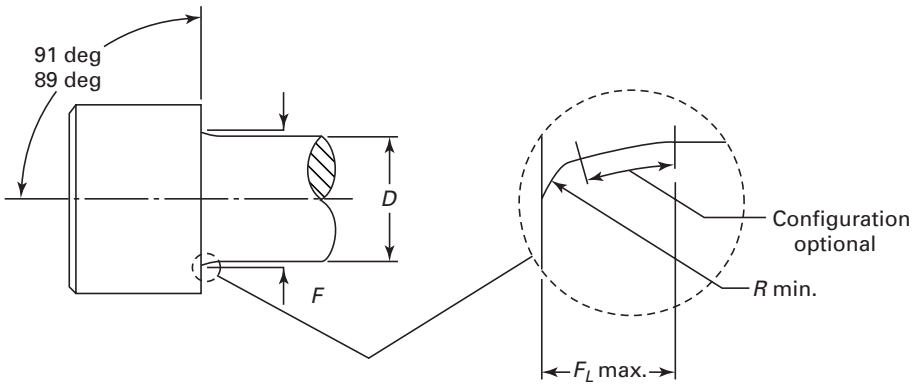


Table 1B-2 Dimensions of Under Head Fillets for Socket Head Cap Screws With an Unthreaded Length of Body Diameter

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

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

Nominal Size	0		1		2		3		4		5		6		8		10	
Nominal 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

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Table 1C Body and Grip Lengths for Socket Head Cap Screws (Cont'd)

Nominal Size	1/4		5/16		3/8		7/16		1/2		5/8		3/4		7/8		1	
Nominal 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

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Table 1C Body and Grip Lengths for Socket Head Cap Screws (Cont'd)

Nominal Size	1/4		5/16		3/8		7/16		1/2		5/8		3/4		7/8		1	
Nominal 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
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

GENERAL NOTES:

(a) 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.

(b) 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.

(c) 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 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 (d) below for L_T values.

(d) 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 = nominal length
L_T = minimum thread length
L_{TT} = maximum total thread length

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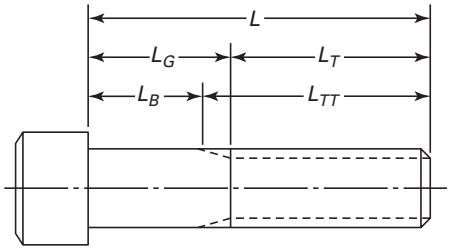


Table 1D Lengths Beyond Sizes in Table 1C

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

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Table 1E Shank Straightness for Socket Head Cap Screws

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

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

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Table 1E Shank Straightness for Socket Head Cap Screws (Cont'd)

Nominal Length	Nominal Size, D_e Diameter [Note (1)]						
	1 1/8	1 1/4	1 3/8	1 1/2	1 3/4	2	2 1/4
Over 0 to 6, incl.	1.140	1.265	1.390	1.515	1.765	2.015	2.265
Over 6 to 12, incl.	1.155	1.280	1.405	1.530	1.780	2.030	2.280
Over 12 to 18, incl.	1.170	1.295	1.420	1.545	1.795	2.045	2.295
Over 18 to 24, incl.	1.185	1.310	1.435	1.560	1.810	2.060	2.310

Nominal Length	Nominal Size, D_e Diameter [Note (1)]						
	2 1/2	2 3/4	3	3 1/4	3 1/2	3 3/4	4
Over 0 to 6, incl.	2.515	2.765	3.015	3.265	3.515	3.765	4.015
Over 6 to 12, incl.	2.530	2.780	3.030	3.280	3.530	3.780	4.030
Over 12 to 18, incl.	2.545	2.795	3.045	3.295	3.545	3.795	4.045
Over 18 to 24, incl.	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. For D_e diameters, see Mandatory Appendix III.

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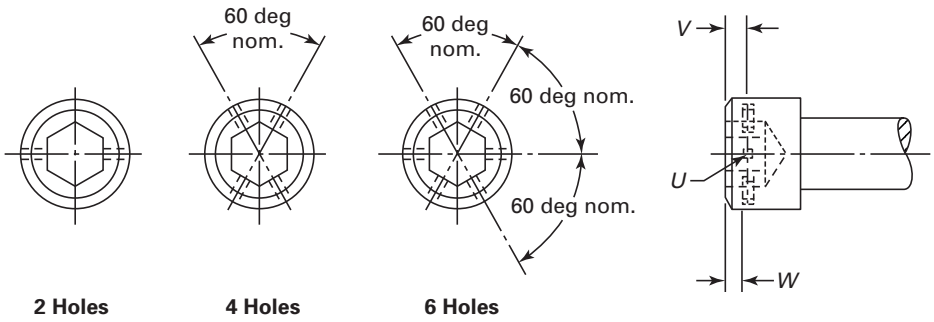


Table 1F Dimensions of Drilled Hexagon Socket Head Cap Screws

Nominal Size (Basic Screw Diameter) [Note (1)]	Drilled Hole Diameter, *U* [Notes (2) and (3)]		Head to Center of Hole, *V*		Minimum Head to Edge of Hole, *W*	Drill Check Plug, Diameter, Basic [Note (3)]		Hole Alignment Check Plug Diameter [Note (3)]
	Number	Basic	Max.	Min.		Type I	Type II	
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

GENERAL NOTE: For additional requirements, refer to Notes (3) and (4).

NOTES:

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

(2) *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.

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Table 1F Dimensions of Drilled Hexagon Socket Head Cap Screws (Cont'd)

(3) *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) 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 maximum width across the flats (see Table 8) and the hole 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 requried, shall be subject to visual inspection only.

(4) *Screws*. Drilled hexagon socket head cap screws shall conform to the respective dimensions and requirements set forth in Table 1A and the notes thereto, except for the holes in the head as specified in this Table and Notes (2) and (3).

(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 plated products, see para. 1.7, Introductory Notes.)

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

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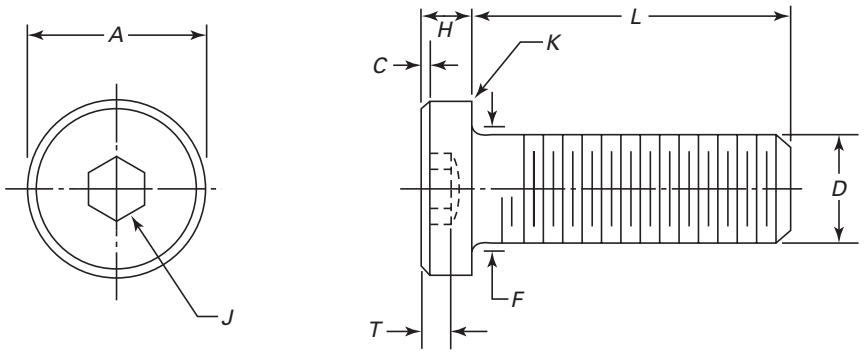


Table 1G Dimensions of Low Head Hexagon Socket Cap Screws

Nominal Size (Basic Screw Diameter) [Note (1)]	Body Diameter, *D* [Note (2)]		Head Diameter, *A* [Note (3)]		Head Height, *H*		Maximum Chamfer or Radius, *C* [Note (4)]	Nominal Hexagon Socket Size, *J*		Minimum Key Engagement, *T*	Maximum Chamfer or Radius, *K*
	Max.	Min.	Max.	Min.	Max.	Min.					
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

GENERAL NOTES:

(a) 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.

(b) For additional requirements, refer to Notes (5) through (13), and also section 2, General Data, of this Standard.

NOTES:

(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 maximun deviation of 1 deg, obtained by holding the screw on the body or major thread diameter within 1 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 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*.

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Table 1G Dimensions of Low Head Hexagon Socket Cap Screws (Cont'd)

(7) *Runout*

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

Runout for (a) above is defined as the full indicator movement (FIM) obtained by holding the screw on the body or major screw thread diameter within 1 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% of the maximum screw diameter, *D*, or 0.005 in., whichever is greater for sizes through $\frac{1}{2}$ in. diameter and 6% for sizes above $\frac{1}{2}$ in. diameter.

Runout for (b) above is defined as the full indicator movement (FIM) obtained by holding the screw on the body or major screw thread diameter within 1 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 Mandatory Appendix III.

(8) *Fillet.* For all lengths of screws, the form of the underhead fillet shall be optional, as depicted in the illustration above Tables 1B-1 and 1B-2, 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 Tables 1B-1 and 1B-2.

(NOTE: Tables 1B-1 and 1B-2 are 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:

(a) #8-32 up to 1 in. long
(b) #10-24 up to 1 in. long
(c) #10-32 up to 1 in. long
(d) $\frac{1}{4}$-20 up to 1 in. long
(e) $\frac{5}{16}$-18 up to $1\frac{1}{2}$ in. long
(f) $\frac{3}{8}$-16 up to $1\frac{1}{2}$ in. long
(g) $\frac{1}{2}$-13 up to $1\frac{1}{2}$ in. 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 (3) through (6), (8), (13), (14), and (18) through (23) of Table 1A for socket head cap screws.

[EXCEPTIONS: Since these are not full-size socket screw products, the requirements of paras. 7.2 and 7.3 of ASTM A574 as specified in Note (19) of Table 1A will not apply. Since these are not ordinarily made in spline sockets, Note (13) of Table 1A will not apply. Since these are not ordinarily made in Stainless Steel, Note (19)(b) of 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 F 835.

(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 818.3, 8-32 × $\frac{3}{4}$, Alloy Steel

Hexagon Low Head Socket Cap Screws, ASME B18.3, 0.164-32 × 0.750, Alloy Steel, Zinc Plated. (For plated products, see para. 1.7, Introductory Notes.)

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

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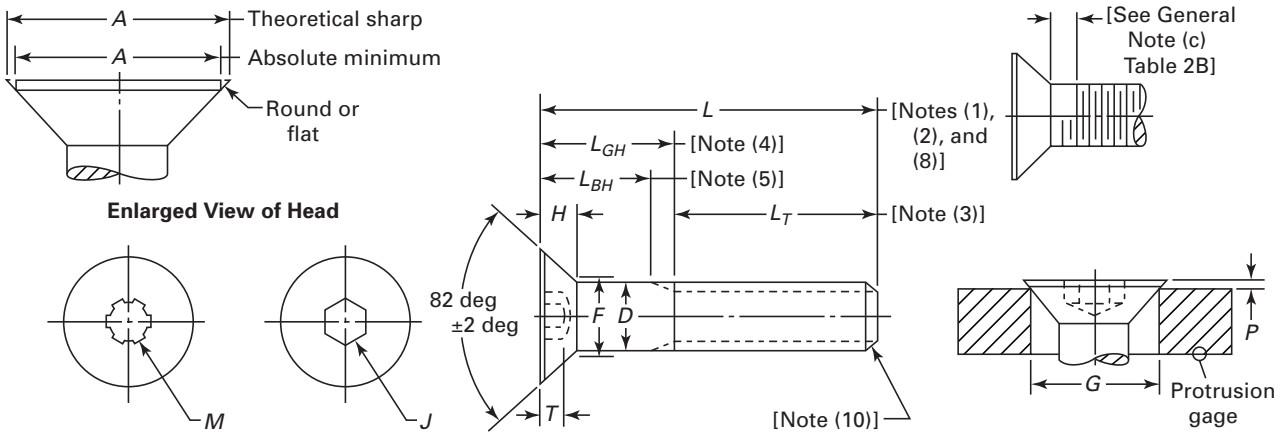


Table 2A Dimensions of Hexagon and Spline Socket Flat Countersunk Head Cap Screws

Nominal Size (Basic Screw Diameter) [Note (6)]	Body Diameter, *D* [Note (7)]		Head Diameter, *A* [Note (11)]		Reference Head Height, *H* [Note (12)]	Protrusion Gage Diameter, *G* [Note (13)]		Protrusion, *P* [Note (13)]		Spline Socket Size, *M* [Note (14)]	Nominal Hexagon Socket Size, *J* [Note (15)]		Minumum Key Engage-ment, *T*	Maximum Fillet Transition Diameter, *F* [Note (9)]
	Max.	Min.	Theo. Sharp, Max.	Abs., Min.		Max.	Min.	Max.	Min.					
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

GENERAL NOTE: For additional requirements, refer to Notes (8) through (20) and section 2, General Data, of this Standard.

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Table 2A Dimensions of Hexagon and Spline Socket Flat Countersunk Head Cap Screws (Cont'd)

NOTES:

(1) *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-placed decimal.

(2) *Standard Lengths.* Standard length increments for socket flat countersunk head cap screws shall be as tabulated below.

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

(3) *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.

(4) *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).

(5) *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).

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

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

(8) *Length Tolerances.* The allowable tolerance on length shall be as tabulated below.

	Nominal Screw Size, Tolerances on Length		
Nominal Screw Length	0 Through 3/8, Incl.	7/16 Through 3/4, Incl.	7/8 Through 1 1/2, Incl.
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 2.5 to 6.00, incl.	−0.06	−0.08	−0.14
Over 6.00	−0.12	−0.12	−0.20

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

(10) *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 the screw sizes up to and including size 8 (0.164 in.) and lengths below 1.5*d* shall be optional.

(11) *Head Diameter.* 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 the hole countersunk to exactly 82 deg, in which a screw having maximum head size will fit flush.

(12) *Head Height.* Tabulated values for head height are given for reference only and are calculated to the maximum formulation.

(13) *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 Mandatory Appendix II for gaging details.

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Table 2A Dimensions of Hexagon and Spline Socket Flat Countersunk Head Cap Screws (Cont'd)

(14) See Table 7 for spline socket dimensions and Mandatory Appendix I for gaging of spline sockets.

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

(16) *Bearing Surface.* The runout of the conical bearing surface shall be within 1 deg obtained by holding the screw on the body or major screw thread diameter within 1 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.

(17) *Runout*

(a) The runout of the socket with the axis of the shank of the screw shall be within 3% of the maximum screw diameter, *D*, or 0.005 in., whichever is greater for nominal sizes through $\frac{1}{2}$ in. diameter and 6% for nominal sizes above $\frac{1}{2}$ in. diameter.

Runout for (a) above is defined as the full indicator movement (FIM) obtained by holding the screw on the body or major thread diameter within 1 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 Mandatory Appendix III.

(18) *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 $1\frac{1}{2}$ in., inclusive.

Acceptability shall be based on System 22, ASME B1.3M.

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, Introductory Notes).

(19) *Material*

(a) Steel, Alloy. Flat countersunk head cap screws shall be fabricated from an alloy steel and shall conform in all respects to ASTM F 835.

(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 F 879.

(20) *Dimensional Conformance.* Flat Countersunk Socket Head Cap Screws shall have the following designated characteristics inspected to ASME B18.18.2M to Inspection Level C: threads, protrusion /flushness, socket size (gaged), and length.

(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 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 Flat Countersunk Head Cap Screws, ASME B18.3, $\frac{1}{4}$-28 × $1\frac{3}{4}$, 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 plated products, see para. 1.7, Introductory Notes.)

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

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

Nominal Size	0		1		2		3		4		5		6		8		10	
Nominal 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

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Table 2B Body and Grip Lengths for Socket Flat Countersunk Head Cap Screws (Cont'd)

Nominal Size	1/4		5/16		3/8		7/16		1/2		5/8		3/4		7/8		1	
Nominal 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	5.5	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

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Table 2B Body and Grip Lengths for Socket Flat Countersunk Head Cap Screws (Cont'd)

Nominal Size	1/4		5/16		3/8		7/16		1/2		5/8		3/4		7/8		1	
Nominal 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}
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

GENERAL NOTES:

(a) 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.

(b) 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.

(c) 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 General Note (d) for L_T values.

(d) 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 = nominal length
L_T = minimum thread length
L_{TT} = maximum total thread length

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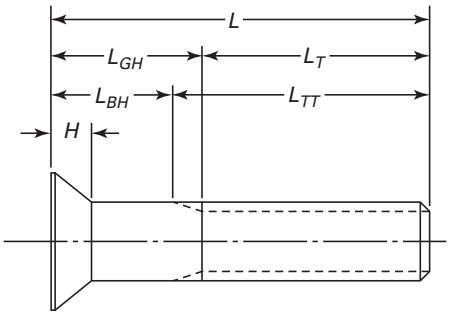


Table 2C Lengths Beyond Sizes in Table 2B

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

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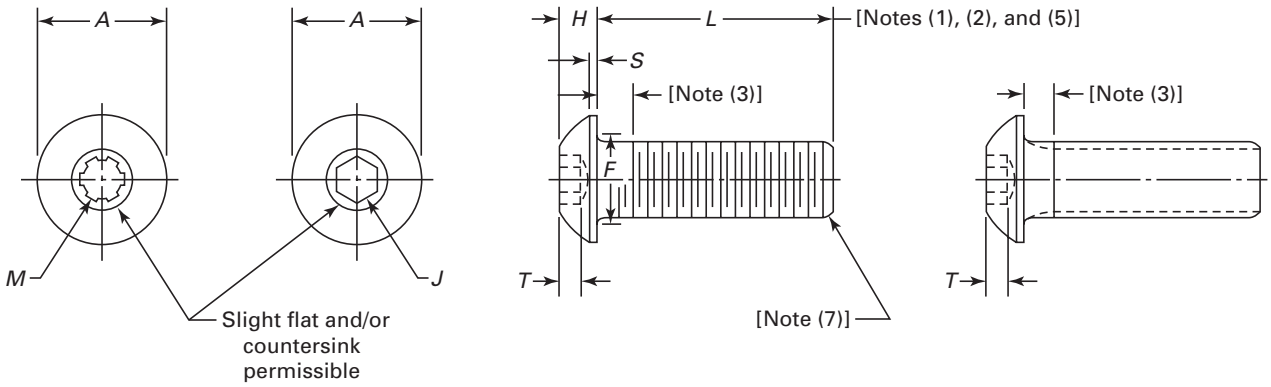


Table 3 Dimensions of Hexagon and Spline Socket Button Head Cap Screws

Nominal Size (Basic Screw Diameter) [Note (6)]	Head Diameter, *A*		Head Height, *H* [Note (7)]		Head Side Height, *S* (Ref.)	Nominal Spline Socket Size, *M* [Note (8)]	Nominal Hexagon Socket Size, *J* [Note (9)]		Minimum Key Engagement, *T*	Fillet Transition Diameter, *F* [Note (10)]		Nominal Maximum Standard Length, *L* [Note (4)]
	Max.	Min.	Max.	Min.						Max.	Min.	
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

GENERAL NOTES:

(a) 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.

(b) For additional requirements, refer to Notes (3) and (5) through (15) and section 2, General Data, of this Standard.

NOTES:

(1) *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.

(2) *Standard Lengths.* Standard length increments for socket button head cap screws shall be as tabulated below.

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

(3) *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 Body Diameter (D), Table 1A, Socket Head Cap Screws.

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Table 3 Dimensions of Hexagon and Spline Socket Button Head Cap Screws (Cont'd)

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

(5) *Length Tolerances.* Allowable tolerance on length shall be as tabulated below.

	Nominal Screw Size, Tolerances on Length	
Nominal Screw Length	0 Through 3/8, Incl.	1/2 Through 5/8, Incl.
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) *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 not less than that tabulated below.

Nominal Screw Size	Minimum Juncture Radius	Nominal Screw Size	Minimum Juncture Radius
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		

(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 0.75*d* shall be optional.

(8) *Head Height.* Tabulated head heights represent metal-to-metal measurements; that is, the truncation of the rounded surface caused by the socket is not considered part of the head height.

(9) See Table 7 for spline socket dimensions and Mandatory Appendix I for gaging of spline sockets.

(10) See Table 6 for hexagon socket dimensions and Mandatory Appendix I for gaging of hexagon sockets.

(11) *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 1 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.

(12) *Runout*

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

Runout for (a) 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% of the maximum screw diameter, *D*, or 0.005 in., whichever is greater for nominal sizes through 1/2 in. diameter and 6% for nominal sizes above 1/2 in. diameter.

Runout for (b) above is defined as the full indicator movement (FIM) obtained by holding the screw on the body or major screw thread diameter within 1 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.

(13) *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.

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, Introductory Notes).

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Table 3 Dimensions of Hexagon and Spline Socket Button Head Cap Screws (Cont'd)

(14) *Material*

(a) Steel, Alloy. Button head cap screws shall be fabricated from an alloy steel and shall conform in all respects to ASTM F 835.

(b) Steel, Corrosion-Resistant. Button head cap screws shall be fabricated from austenitic corrosion-resistant steel and shall conform in all respects to ASTM F 879.

(15) *Dimensional Conformance.* Socket Button Head Cap Screws shall have the following designated characteristics inspected to ASME B18.18.2M to Inspection Level C: threads, head diameter, socket size (gaged), length, and fillet transition diameter.

(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 plated products, see para. 1.7, Introductory Notes.)

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

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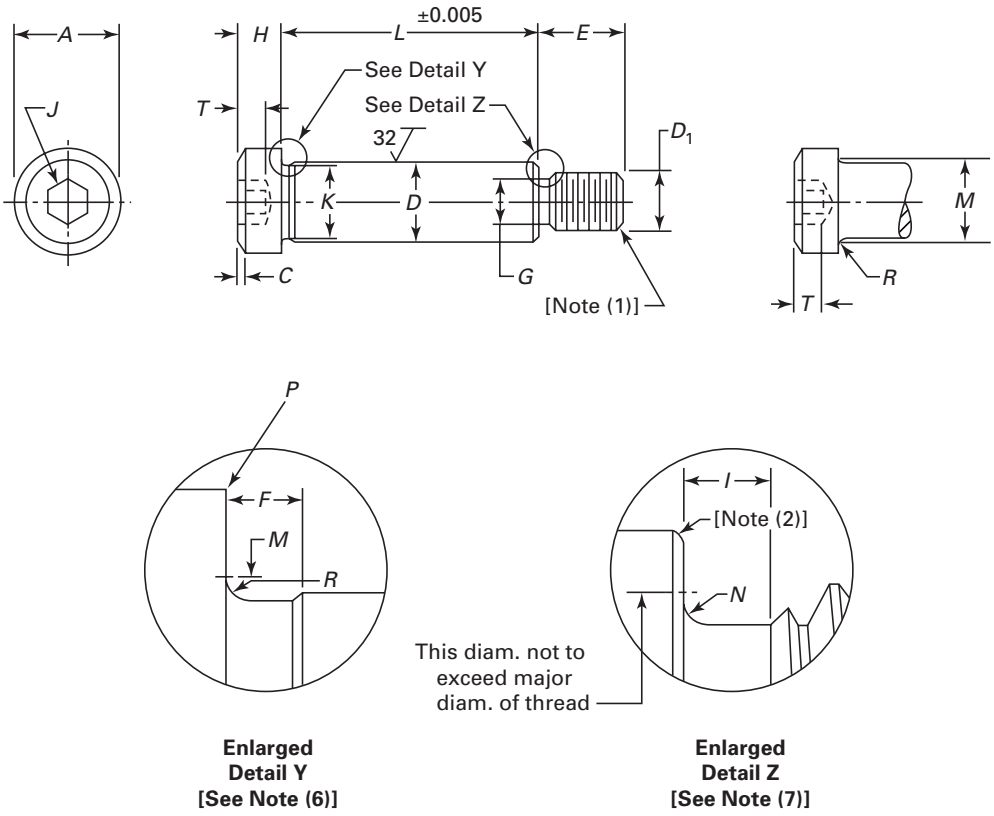


Table 4 Illustration

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Table 4 Dimensions of Hexagon Socket Head Shoulder Screws

Nominal Size (Basic Shoulder Diameter)	Shoulder Diameter, *D* [Note (1)]		Head Diameter, *A* [Note (8)]		Head Height, *H*		Max. Chamfer or Radius, *C*	Nominal Hexagon Socket Size, *J* [Note (9)]		Min. Key Engagement, *T*	Max. Fillet Transition Diameter, *M* [Note (6)]	Min. Head Fillet Radius, *R*
	Max.	Min.	Max.	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

GENERAL NOTES: For additional requirements refer to Notes (4) through (16) and section 2, General Data, of this Standard.

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) *Length.* The length of the shoulder 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-placed decimal.

(3) *Standard Lengths.* The difference between consecutive lengths of standard shoulder screws shall be as designated in the following tabulation.

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

(4) *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.

(5) *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. (See Detail Z.)

(6) *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*. (See Detail Y.)

(7) *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.

(8) *Head Diameter.* The head may be plain or knurled at the option of the manufacturer.

(9) See Table 6 for hexagon socket dimensions and Mandatory Appendix I for gaging of hexagon sockets.

(10) *Threads.* Threads shall be Unified external thread: Class 3A, UNC Series. Acceptability is to be based on System 22, ASME B1.3M. 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, Introductory Notes).

(11) *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.

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

(13) *Bearing Surface.* The plane of the bearing surface shall be perpendicular to the axis of the shank, within 2 deg obtained by holding the shoulder screw on the shoulder or major thread diameter within 1 diameter of the bearing surface of the head, rotating 360 deg, and inspecting on an optical comparator, or comparable inspection equipment.

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Table 4 Dimensions of Hexagon Socket Head Shoulder Screws (Cont'd)

Nominal Size (Basic Shoulder Diameter)	Min. Shoulder Neck Diameter, *K* [Note (6)]	Max. Shoulder Neck Width, *F* [Note (6)]	Nominal Thread Diameter, D_1 [Note (10)]		Threads, in.	Thread Neck Diameter, *G* [Note (7)]		Max. Thread Neck Width, *I* [Note (7)]	Thread Neck Fillet, *N* [Note (7)]		Basic Thread Length, *E*	Max. Chamfer or Radius, *P*
						Max.	Min.		Max.	Min.		
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

(14) *Runout*

(a) The runout of the head with the axis of the shoulder shall be within 2% of the nominal size, or 0.006 in., whichever is greater.

Runout for (a) above is defined as the full indicator movement (FIM) obtained by holding the shoulder screw on the shoulder within one diameter of the bearing surface of the head, but beyond the maximum length of *F*, rotating the shoulder 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 shoulder screw shall be within 3% of the maximum shoulder diameter, *D*, or 0.005 in., whichever is greater for nominal sizes through 1/2 in. diameter and 6% for nominal sizes above 1/2 diameter.

Runout for (b) above is defined as the full indicator movement (FIM) obtained by holding the shoulder screw on the shoulder or major screw thread diameter within 1 diameter of the bearing surface of the head, but beyond the maximum length of *F*, rotating 360 deg and indicating on each of the six hexagon flats.

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

The runout between the screw 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 a 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 shoulder screw, within 2 deg obtained by holding the shoulder screw on the shoulder diameter within 1 diameter of the thread end of the shoulder, rotating 360 deg, and inspecting on an optical comparator or comparable inspection equipment.

(15) *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 ensure that the specified hardness range of 32 HRC to 43 HRC at the surface is met when hardened by quenching from the austenitizing temperature and tempered at not lower than 343°C (650°F). Decarburization and carburization limits shall be the same as those specified for socket head cap screws in ASTM A 574.

Shoulder screws shall meet the following mechanical property requirements; the hardness shall be 32 HRC to 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

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

(16) *Dimensional Conformance.* Socket Head Shoulder Screws shall have the following designated characteristics inspected to ASME B18.18.2M to Inspection Level C:

(a) threads

(b) shoulder diameter

(c) shoulder length

(d) thread length

(e) head diameter

(f) socket size gaged

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Table 4 Dimensions of Hexagon Socket Head Shoulder Screws (Cont'd)

(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) nominal length (fractional or decimal equivalent).
(e) material.
(f) protective finish, if required. (For plated products, see para. 1.7, Introductory Notes.)

EXAMPLES:

Hexagon Socket Head Shoulder Screws, ASME B18.3, $\frac{1}{4} \times 1\frac{1}{4}$, 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.

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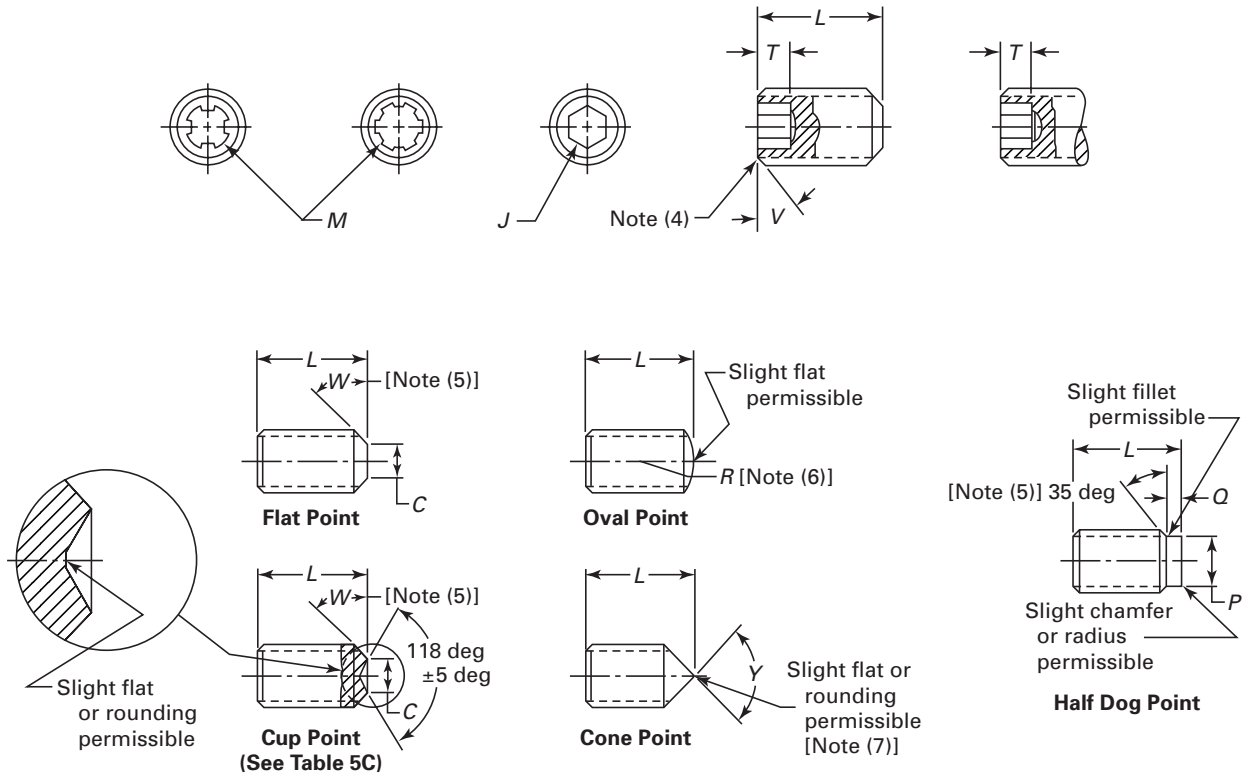


Table 5A Illustration

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Table 5A Dimensions of Hexagon and Spline Socket Set Screws

Nominal Size (Basic Screw Diameter) [Note (5)]	Nominal Hexagon Socket Size, J [Note (8)]		Nominal Number of Splines and Spline Socket Size, M [Note (9)]	Minimum Key Engagement to Develop Functional Capability of Key, T [Note (10)]		Cup and Flat Point Diameters, C [Note (5)]		Basic Oval Point Radius, R [Note (6)]	Cone Point Angle 90 deg ± 2 deg for These Nominal Lengths or Longer: 118 ± 2 deg for Shorter Nominal Lengths, Y [Note (5)]	Half Dog Point [Notes (5), (11)]				Shortest Optimum Nominal Length to Which T_H Applies, B [Notes (4), (5), (10)]			Shortest Optimum Nominal Length to Which T_S Applies, B_1 [Notes (4), (5), (10)]		
										Diameter, P		Length, Q							
				Hex Socket, T_H	Spline Socket, T_S	Max.	Min.			Max.	Min.	Max.	Min.	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
0 (0.0600)	...	0.028	4 (0.033)	0.050	0.026	0.033	0.027	0.045	0.09	0.040	0.037	0.017	0.013	0.13	0.13	0.13	0.06	0.13	0.13
1 (0.0730)	...	0.035	4 (0.033)	0.060	0.035	0.040	0.033	0.055	0.09	0.049	0.045	0.021	0.017	0.13	0.19	0.13	0.13	0.19	0.13
2 (0.0860)	...	0.035	4 and 6 (0.048) [Note (12)]	0.060	0.040	0.047	0.039	0.064	0.13	0.057	0.053	0.024	0.020	0.13	0.19	0.19	0.13	0.19	0.19
3 (0.0990)	...	0.050	4 and 6 (0.048) [Note (12)]	0.070	0.040	0.054	0.045	0.074	0.13	0.066	0.062	0.027	0.023	0.19	0.19	0.19	0.13	0.19	0.19
4 (0.1120)	...	0.050	6 (0.060)	0.070	0.045	0.061	0.051	0.084	0.19	0.075	0.070	0.030	0.026	0.19	0.19	0.19	0.13	0.19	0.19
5 (0.1250)	1/16	0.062	4 (0.069)	0.080	0.055	0.067	0.057	0.094	0.19	0.083	0.078	0.033	0.027	0.19	0.19	0.19	0.13	0.19	0.19
5 (0.1250)	1/16	0.062	6 (0.072) [Note (12)]	0.080	0.055	0.067	0.057	0.094	0.19	0.083	0.078	0.033	0.027	0.19	0.19	0.19	0.13	0.19	0.19
6 (0.1380)	1/16	0.062	6 (0.072)	0.080	0.055	0.074	0.064	0.104	0.19	0.092	0.087	0.038	0.032	0.19	0.25	0.19	0.13	0.25	0.19
6 (0.1380)	1/16	0.062	4 (0.076) [Note (10)]	0.080	0.055	0.074	0.064	0.104	0.19	0.092	0.087	0.038	0.032	0.19	0.25	0.19	0.13	0.25	0.19
8 (0.1640)	5/64	0.078	6 (0.096)	0.090	0.080	0.087	0.076	0.123	0.25	0.109	0.103	0.043	0.037	0.19	0.25	0.25	0.19	0.25	0.25
10 (0.1900)	3/32	0.094	6 (0.111)	0.100	0.080	0.102	0.088	0.142	0.25	0.127	0.120	0.049	0.041	0.19	0.25	0.25	0.19	0.25	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	0.156	0.149	0.067	0.059	0.25	0.31	0.31	0.25	0.31	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	0.203	0.195	0.082	0.074	0.31	0.44	0.38	0.31	0.44	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	0.250	0.241	0.099	0.089	0.38	0.44	0.44	0.38	0.44	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	0.297	0.287	0.114	0.104	0.44	0.63	0.50	0.44	0.63	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	0.344	0.334	0.130	0.120	0.50	0.63	0.63	0.50	0.63	0.63
5/8 (0.6250)	5/16	0.312	6 (0.372)	0.312	0.312	0.371	0.347	0.469	0.75	0.469	0.456	0.164	0.148	0.63	0.88	0.88	0.63	0.88	0.88
3/4 (0.7500)	3/8	0.375	6 (0.454)	0.375	0.375	0.450	0.425	0.562	0.88	0.562	0.549	0.196	0.180	0.75	1.00	1.00	0.75	1.00	1.00
7/8 (0.8750)	1/2	0.500	6 (0.595)	0.500	0.500	0.530	0.502	0.656	1.00	0.656	0.642	0.227	0.211	0.88	1.00	1.00	0.88	1.25	1.00
1 (1.0000)	9/16	0.562	...	0.562	...	0.609	0.579	0.750	1.13	0.750	0.734	0.260	0.240	1.00	1.25	1.25	...	...	...
1 1/8 (1.1250)	9/16	0.562	...	0.562	...	0.689	0.655	0.844	1.25	0.844	0.826	0.291	0.271	1.25	1.50	1.25	...	...	...
1 1/4 (1.2500)	5/8	0.625	...	0.625	...	0.767	0.733	0.938	1.50	0.938	0.920	0.323	0.303	1.25	1.50	1.50	...	...	...
1 3/8 (1.3750)	5/8	0.625	...	0.625	...	0.848	0.808	1.031	1.63	1.031	1.011	0.354	0.334	1.50	1.75	1.50	...	...	...
1 1/2 (1.5000)	3/4	0.750	...	0.750	...	0.926	0.886	1.125	1.75	1.125	1.105	0.385	0.365	1.50	2.00	1.75	...	...	...
1 3/4 (1.7500)	1	1.000	...	1.000	...	1.086	1.039	1.312	2.00	1.312	1.289	0.448	0.428	1.75	2.25	2.00	...	...	...
2 (2.0000)	1	1.000	...	1.000	...	1.244	1.193	1.500	2.25	1.500	1.474	0.510	0.490	2.00	2.50	2.50	...	...	...

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Table 5A Dimensions of Hexagon and Spline Socket Set Screws (Cont'd)

GENERAL NOTE: For additional requirements, refer to Notes (4) through (17) and section 2, General Data, of this Standard.

NOTES:

(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.

(3) *Standard Lengths*. Standard length increments for set screws shall be as tabulated below.

Nominal Screw Length	Standard Length Increment
0.13 through 0.19*	0.03
0.19 through 0.50	0.06
0.50 through 1.00	0.13
1.00 through 2.00	0.25
2.00 through 6.00	0.50
Over 6.00	1.00

*A nominal screw length of 0.13 through 0.19 is applicable only to nominal sizes 0 (0.060 in.) through 3 (0.099 in.), inclusive.

(4) *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 this Table, columns B and B_1, or screws 0.250 in. diameter or greater, with a national coarse thread, including lengths longer than listed in this Table, columns B and B_1, chamfering shall be at the option of the manufacturer. If chamfered, the chamfer angle V shall not exceed 45 deg.

(5) *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.

(6) *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.

(7) *Cone Point Configuration*. The apex of the cone may be flatted or rounded to the extent of 10% of the basic diameter of the screw.

(8) *Hexagon Sockets*. See Table 6 for hexagon socket dimensions and Mandatory Appendix I for gaging of hexagon sockets.

(9) *Spline Sockets*. See Table 7 for spline socket dimensions and Mandatory Appendix I for gaging of spline sockets.

(10) *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 this Table, 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.

(11) *Half Dog Point Runout*. The runout of the half dog point shall not exceed 3% of the nominal size and shall not exceed 0.010 FIM for nominal sizes up to and including $^3/_4$ in. diameter and 0.020 FIM for nominal sizes over $^3/_4$ in. diameter.

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) Where both six and four splines are available, six splines will be supplied unless four splines are ordered.

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Table 5A Dimensions of Hexagon and Spline Socket Set Screws (Cont'd)

(13) *Tolerance on Length.* Tolerance on length of set screws shall be as tabulated below.

Nominal Screw Length	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

(14) *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.

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 7 pitch lengths.

For all set screws equal or shorter than 7 pitch lengths, thread acceptability will be based on System 21, ASME B1.3M. The chart below shows the lengths equal to 7 pitch lengths.

Threads/in.	7 Pitch Lengths	Threads/in.	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	$4\frac{1}{2}$	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 undersized pitch diameter to accommodate the plating. When plated products are required, it is recommended that they be procured from the manufacturer (see para. 1.10, Introductory Notes).

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

(15) *Material*

(a) Steel, Alloy. Socket set screws shall be fabricated from alloy steel and shall conform in all respects to ASTM F 912.

(b) Steel, Corrosion-Resistant. Socket set screws shall be fabricated from austenitic corrosion-resistant steel and shall conform in all respects to ASTM F 880.

(16) *Flat Point.* The plane of the end on the flat point shall be perpendicular to the axis of the thread within 2 deg obtained by holding the screw on the major thread diameter near the flat point, and inspecting on an optical comparator or comparable inspection equipment.

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Table 5A Dimensions of Hexagon and Spline Socket Set Screws (Cont'd)

(17) *Dimensional Conformance*. Socket set screws shall have the following designated characteristics inspected to ASME B18.18.2M to Inspection Level C:
- *(a)* threads
- *(b)* minimum key engagement
- *(c)* socket size (gaged)
- *(d)* length

(18) *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, $\frac{1}{4}$-20 × $\frac{1}{4}$, Alloy Steel

Spline Socket Set Screw, Flat Point, ASME B18.3, 0.112-40 × 0.125, Alloy Steel, Zinc Plated. (For plated products, see para. 1.7, Introductory Notes.)

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.

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Table 5B Hexagon Key Engagements for Short Length Set Screws

Nominal Size (Basic Screw Diameter)	Nominal Hexagon Socket Size, *J*		Nominal Screw Lengths, *L*	Minimum Key Engagement, T_H		
				Cup [Note (1)] and Flat Points	118 deg Cone and Oval Points	Half Dog Point
0 (0.0600)	...	0.028	0.06	0.030	0.028	Note (2)
			0.09	0.040	0.040 [Note (3)]	0.028
1 (0.0730)	...	0.035	0.06	0.030	0.029	Note (2)
			0.09	0.040	0.040 [Note (3)]	0.040
2 (0.0860)	...	0.035	0.06	0.030	0.029	Note (2)
			0.09	0.040	0.040	0.035
3 (0.0990)	...	0.050	0.09	0.040	0.039	Note (2)
			0.13	0.055	0.040 [Note (3)]	0.045
4 (0.1120)	...	0.050	0.09	0.045	0.039	Note (2)
			0.13	0.060	0.045	0.045
5 (0.1250)	1/16	0.062	0.09	0.040	0.039	Note (2)
			0.13	0.060	0.045	0.045
6 (0.1380)	1/16	0.062	0.09	0.040	0.039	Note (2)
			0.13	0.060	0.045	0.045
			0.16	0.070	0.065	0.065
8 (0.1640)	5/64	0.078	0.13	0.060	0.050	0.045
			0.16	0.070	0.060	0.060
			0.19	Note (4)	0.065	0.065
10 (0.1900)	3/32	0.094	0.13	0.060	0.042	0.042
			0.19	Note (4)	0.060	0.060
1/4 (0.2500)	1/8	0.125	0.19	0.090	0.065	0.055
			0.25	Note (4)	0.110	0.090
5/16 (0.3125)	5/32	0.156	0.25	0.125	0.099	0.090
			0.31	Note (4)	0.140	0.105
3/8 (0.3750)	3/16	0.188	0.25	0.110	0.090	0.075
			0.31	0.140	0.115	0.105
			0.38	Note (4)	0.165	0.155
7/16 (0.4375)	7/32	0.219	0.38	0.160	0.125	0.125
			0.44	Note (4)	0.160	0.160
1/2 (0.5000)	1/4	0.250	0.38	0.175	0.130	0.130
			0.44	0.215	0.155	0.155
			0.50	Note (4)	0.195	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	0.255	0.190	0.190
			0.75	Note (4)	0.325	0.295
7/8 (0.8750)	1/2	0.500	0.75	0.330	0.255	0.255
			0.87	Note (4)	0.419	0.330
1 (1.0000)	9/16	0.562	0.75	0.280	0.175	0.175
			0.87	0.380	0.280	0.280
			1.00	Note (4)	0.380	0.380

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Table 5B Hexagon Key Engagements for Short Length Set Screws (Cont'd)

GENERAL NOTES:

(a) 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.

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

NOTES:

(1) Cup angle may be 118 deg or 130 deg, +5 deg, depending upon screw length and manufacturing process.

(2) These sizes are impractical to manufacture because of point configuration and short length.

(3) Cone point angle for these lengths shall be 90 deg; see column Y of Table 5A.

(4) These screws are covered in Table 5A.

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Table 5C Dimensions of Optional Cup Points

Nominal Size (Basic Screw Diameter)	Point Diameter, C_1		Point Diameter, C_2		Point Length, S	
	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	...	...	...	...

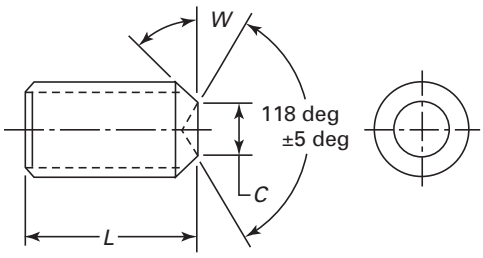
GENERAL NOTES:

(a) 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.

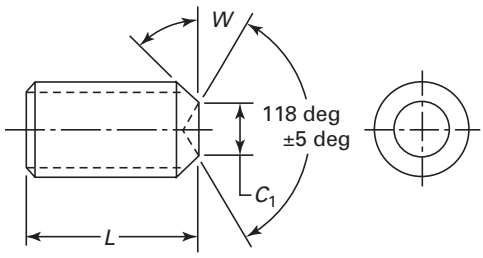
(b) For dimensions not shown above, refer to Table 5A.

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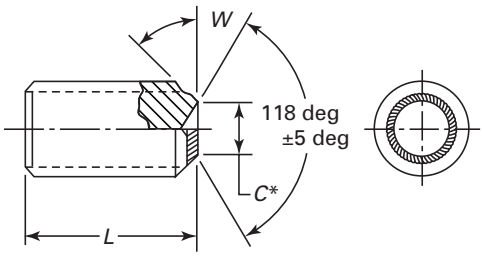
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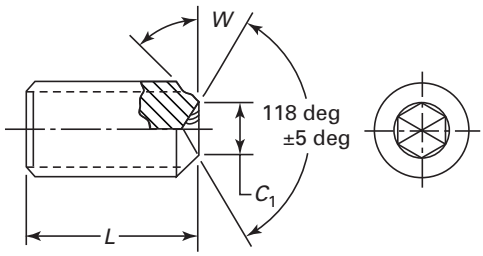
Type A



Type B

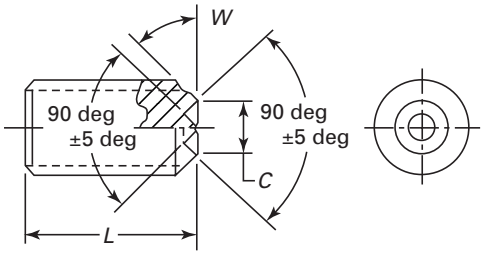


Type C

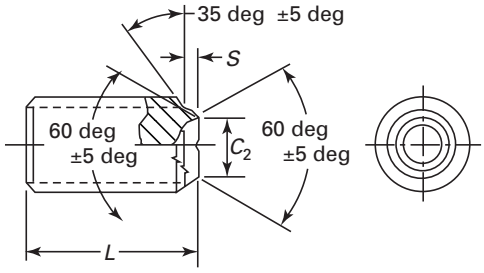


Type D

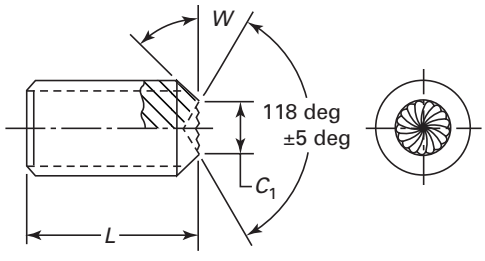
*This diameter may be counterbored.



Type E



Type F



Type G

Fig. 1 Optional Types of Cup Points

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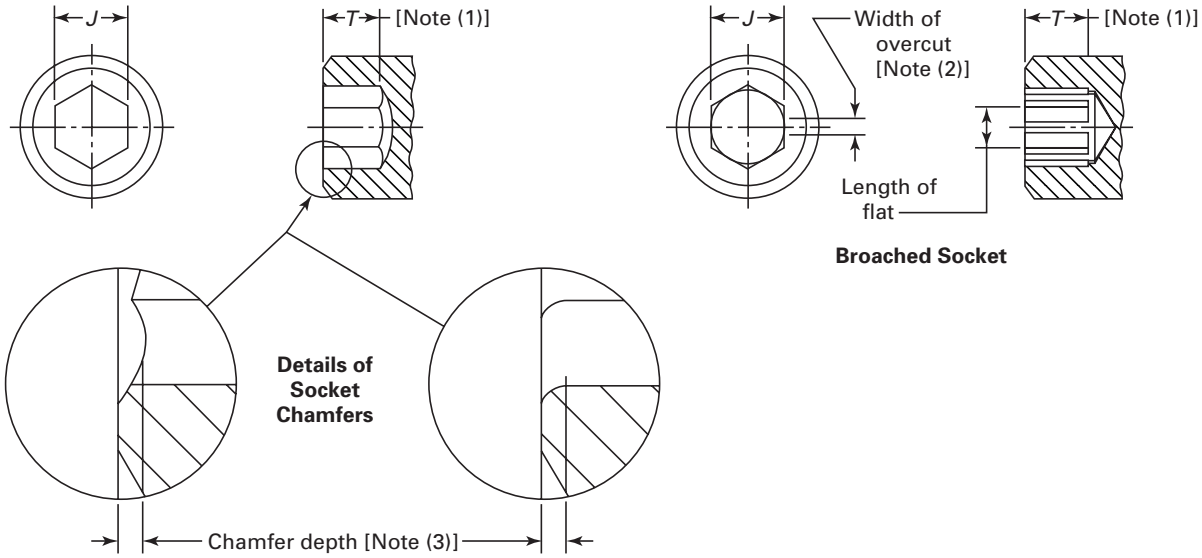


Table 6 Dimensions of Hexagon Sockets

Nominal Socket Size	Socket Width Across Flats, J Max.	Socket Width Across Flats, J Min.	Nominal Socket Size	Socket Width Across Flats, J Max.	Socket Width Across Flats, J Min.	Nominal Socket Size	Socket Width Across Flats, J Max.	Socket Width Across Flats, J 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	...	...	...

GENERAL NOTES:

(a) Sockets up to and including 1 in. nominal size shall be checked in accordance with the hexagon socket gages and gaging specified in Mandatory Appendix I. Suitability of larger sockets shall be determined by means of direct measurement for various technical and economic reasons.

(b) Dimensions of sockets apply before plating. When plated, see para. 2.1, Sockets, for gaging. (For plated products, see para. 1.7, Introductory Notes.)

(c) Broach petals at the bottom of the socket are permissible.

(d) For additional requirements, refer to section 2, General Data, of this Standard.

NOTES:

(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% flat length reduction in the maximum dimension across flat hexagon for socket sizes up to and including 1 in., and 30% for larger sockets. The maximum overcut on any one of the six flats shall not exceed a 40% reduction in flat length for any size socket.

(3) Where hexagon sockets are chamfered, the depth of chamfer shall not exceed 10% of the nominal socket size for sizes up to and including 1/16 in., and 7.5% 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 Mandatory Appendix I.

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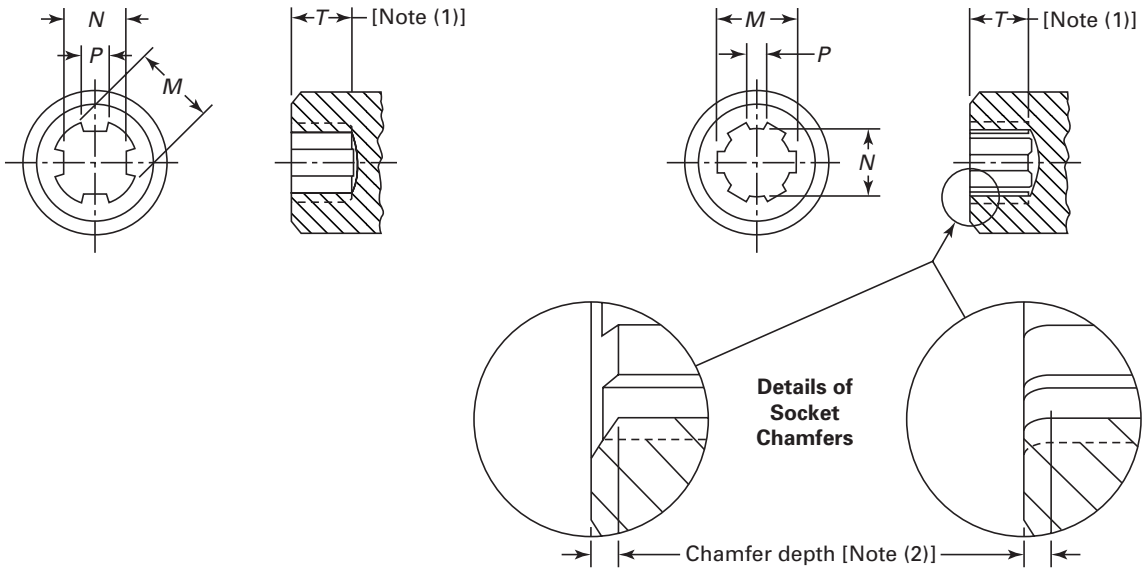


Table 7 Dimensions of Spline Sockets

Nominal Socket and Key Size	Number of Teeth	Socket, Major Diameter, *M*		Socket, Minor Diameter, *N*		Width of Tool, *P*	
		Max.	Min.	Max.	Min.	Max.	Min.
0.033	4	0.035	0.034	0.0275	0.0260	0.0120	0.0115
0.048 [Note (3)]	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 [Note (3)]	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 [Note (3)]	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

GENERAL NOTES:

(a) For additional requirements, refer to section 2, General Data, of this Standard.

(b) Broach petals at the bottom of the socket are permissible.

NOTES:

(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% of the nominal socket size for sizes up to and including 0.060 in., and 7.5% for larger sizes. For chamfered sockets, it is permissible for the NOT GO socket gage to enter to the depth of chamfered as specified in Mandatory Appendix I.

(3) Where both six and four splines are available, six splines will be supplied unless four splines are ordered.

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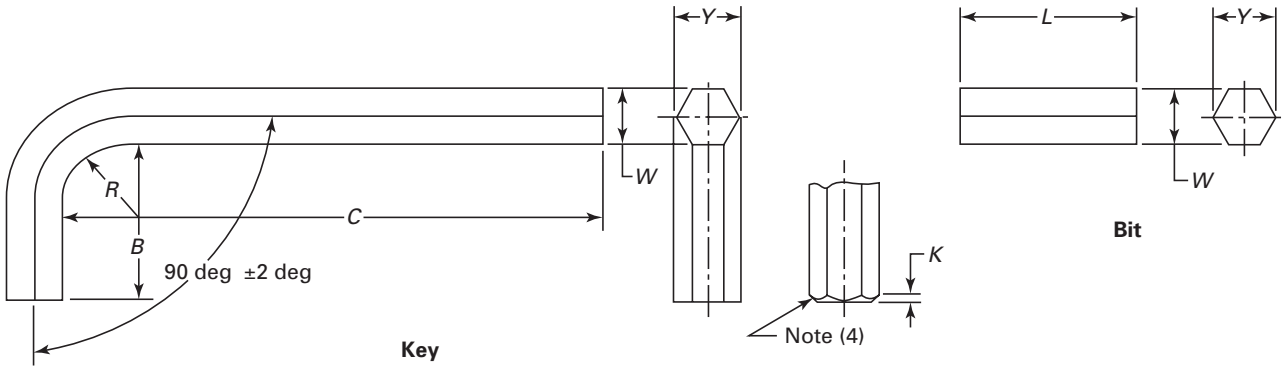


Table 8 Dimensions of Hexagon Keys and Bits

Nominal Key or Bit and Socket Size		Hexagon Width Across Flats, *W*		Hexagon Width Across Corners, *Y* [Note (2)]		Length, *B*		Length, *C*				Minimum Radius of Bend, *R*	Length of Bit, ±0.062, *L* [Note (3)]	Maximum Chamfer, *K* [Note (4)]
								Short Series		Long Series				
		Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.			
...	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

GENERAL NOTE: For additional requirements, refer to Notes (4) through (6).

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Table 8 Dimensions of Hexagon Keys and Bits (Cont'd)

NOTES:

(1) Hexagon Keys are furnished as Short Arm Series or Long Arm Series.

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

(3) 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.

(4) 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.

(5) *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 ensure that the specified minimum hardness of 48 HRC at the surface for nominal sizes up to and including $\frac{3}{8}$ in., and 45 HRC for nominal sizes over $\frac{3}{8}$ in., is met when hexagon keys and bits are hardened by quenching from the austenitizing temperature and tempered.

(6) 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.

(7) For applicability of keys and bits to various socket screw types and sizes, see Nonmandatory Appendix B, Table B-1.

(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, $\frac{1}{8}$ Short Arm Series
Hexagon Key, ASME B18.3, $\frac{1}{8}$ Long Arm Series, Nickel Plated. [See Note (6).]
Hexagon Key Bit, ASME B18.3, $1\frac{1}{2}$ Hex

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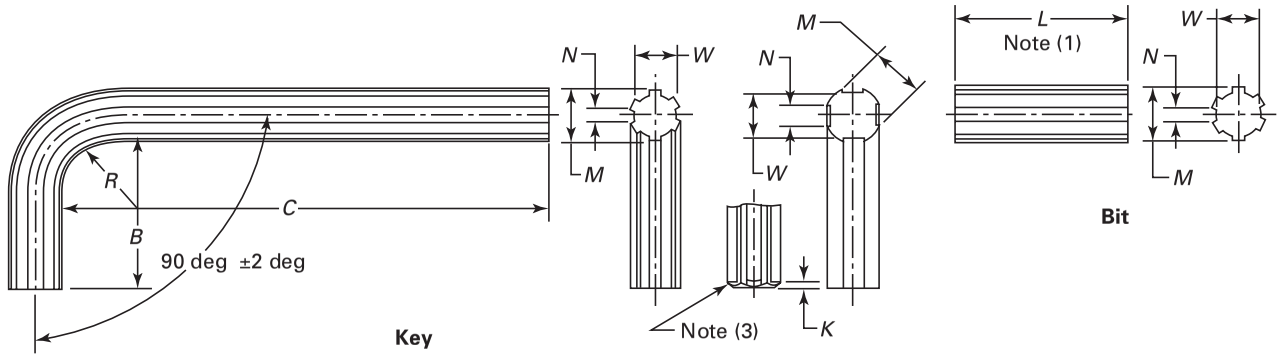


Table 9 Dimensions of Spline Keys and Bits

Nominal Key or Bit and Socket Size	Major Diameter, *M*		Minor Diameter, *W*		Number of Spline	Width of Space, *N*		Length, *B*		Length, *C*				Minimum Radius of Bend, *R*	Maximum Chamfer, *K* [Note (3)]
										Short Series		Long Series			
	Max.	Min.	Max.	Min.		Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.		
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	2.657	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

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Table 9 Dimensions of Spline Keys and Bits (Cont'd)

GENERAL NOTE: For additional requirements, refer to Notes (3) through (5) below.

NOTES:

(1) Bits are available, but lengths have not been standardized.

(2) Spline Keys are furnished as Short Arm Series or Long Arm Series.

(3) 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.

(4) *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 ensure that the specified minimum hardness of 48 HRC at the surface for nominal sizes up to and including 0.372 in., and 45 HRC for nominal sizes over 0.372 in., is met when spline keys are hardened by quenching from the austenitizing temperature and tempered.

(5) For plated keys, 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 to various socket screw types and sizes, see Nonmandatory Appendix B, Table B-2.

(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. [See Note (5).]

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MANDATORY APPENDIX I
GAGES AND GAGING FOR HEXAGON AND SPLINE SOCKETS

I-1 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 I-1 and I-2.

I-2 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 $\frac{1}{8}$ in. and larger, and the hexagonal NOT GO gage member shall not enter the socket for nominal socket sizes smaller than $\frac{1}{8}$ in.

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

I-3 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% of the nominal socket size for nominal socket sizes up to and including 0.060 in., and to 7.5% of the nominal socket size for larger sockets.

I-4 GAGES

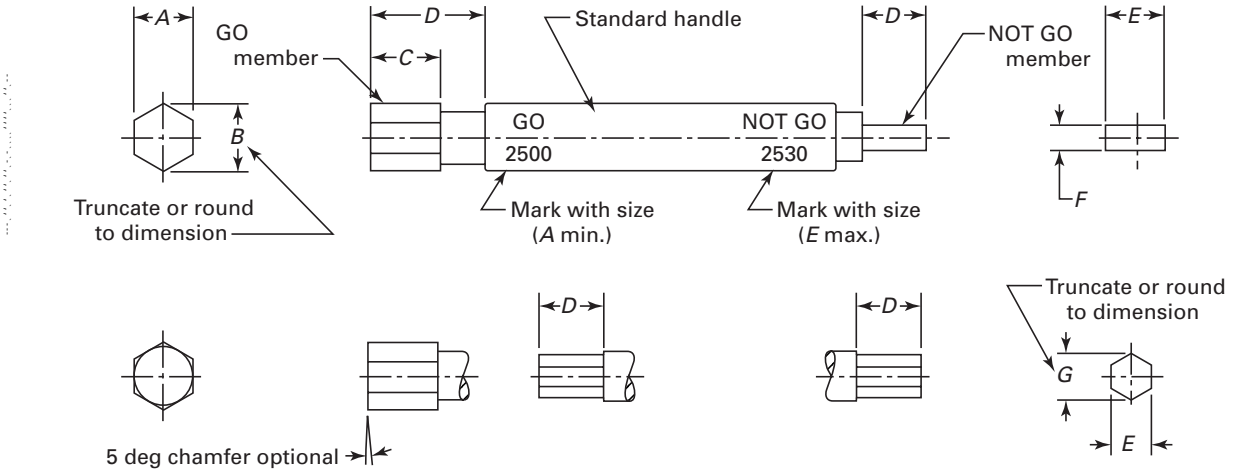
Gages shall be made from any grade of steel, through-hardened and tempered to 60 HRC minimum.

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 μin. (arithmetical average) maximum. See ASME B46.1, Surface Texture.

The gage handles shall conform to ASME B47.1, Gage Blanks.

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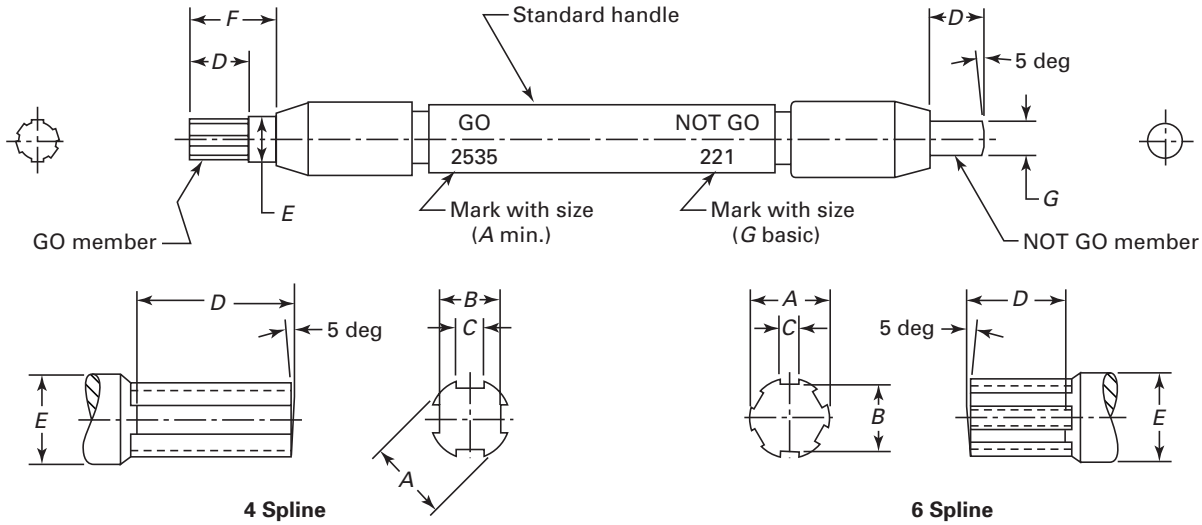
GO Member
Optional Construction for Small Sizes

NOT GO Member
Construction for Small Sizes

Table I-1 Dimensions of Gages for Hexagon Sockets

Nominal Socket Size		GO Gage Width Across Flats, *A*		GO Gage Width Across Corners, *B*		Minimum GO Gage Length, *C*	Minimum Usable Gage Length, *D*	NOT GO Gage Width, *E*		NOT GO Gage Thickness, *F*		NOT GO Gage Width Across Corners, *G*	
		Max.	Min.	Max.	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	1.0200	1.0198	0.489	0.487	...	...

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Details of GO Gage Members

Table I-2 Dimensions of Gages for Spline Sockets

Nominal Socket Size	Number of Splines	GO Gage Major Diameter, *A*		GO Gage Minor Diameter, *B*		GO Gage Space Width, *C*		Minimum Gage Length, *D*	Shoulder Diameter, ±0.0020, *E*	Minimum Length, *F*	Basic NOT GO Gage Diameter, *G* [Note (1)]
		Max.	Min.	Max.	Min.	Max.	Min.				
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 plus gage tolerances shall apply.

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MANDATORY APPENDIX II
PROTRUSION GAGING OF FLAT COUNTERSUNK HEADS

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 in Fig. II-1.

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 C 60 (60 HRC).

If heads meet the original flushness requirements in a flushness gage, as established by ASME B18.3-1986 and prior, they are acceptable and 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 informational purposes only (see Nonmandatory Appendix C).

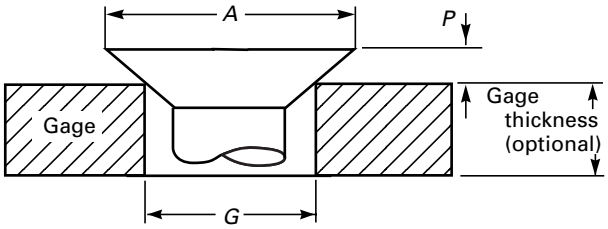


Fig. II-1 Protrusion Gage

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MANDATORY APPENDIX III
STRAIGHTNESS GAGE AND GAGING

All screws shall be gaged by use of the adjustable rail gage that shall be adjusted to provide a parallel space between the rails equal to D_e (from Table 1E) by obtaining common readings on both micrometer heads. The adjustable rail shall then be locked in place by tightening securing screws. See Fig. III-1.

The product shall then be inserted between rails, excluding a length equal to two diameters under the head. The product shall be rotated by hand a full 360 deg. Any interference occurring between the product and the gage that is sufficient to prevent rotation shall indicate excessive camber.

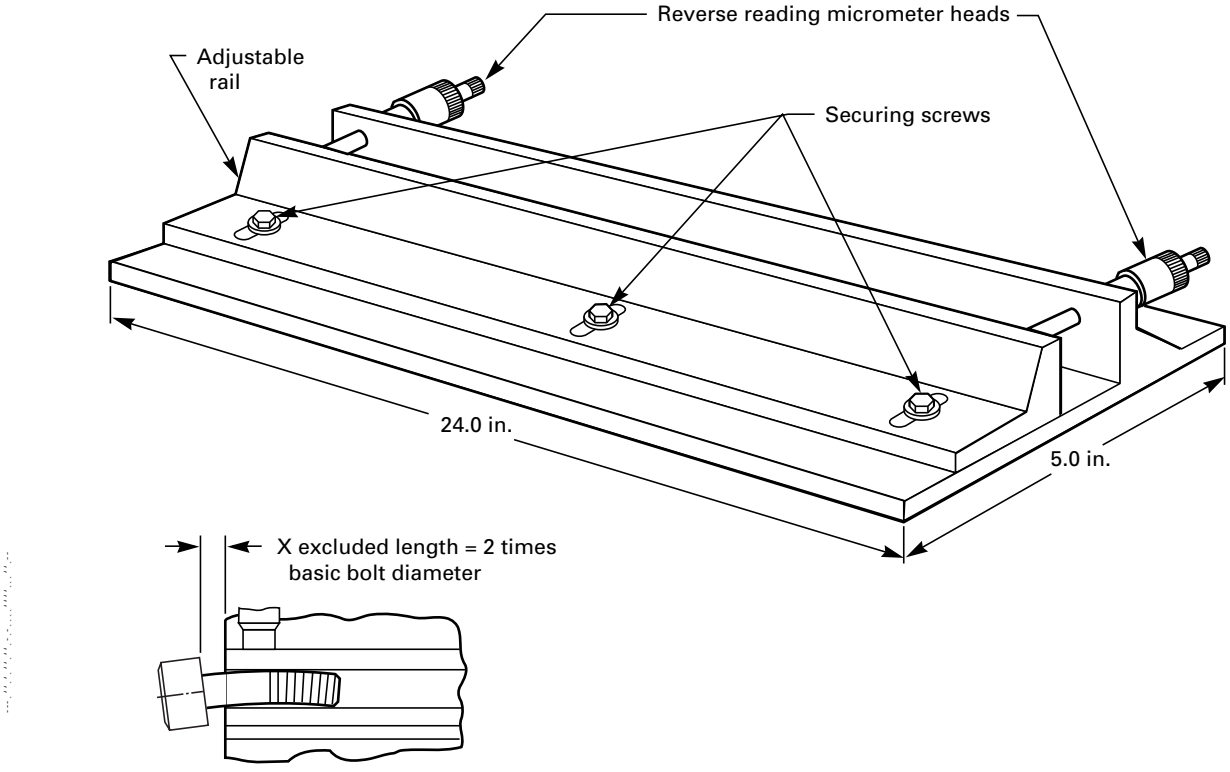


Fig. III-1 Typical Straightness Gage

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NONMANDATORY APPENDIX A
DRILL AND COUNTERBORE SIZES FOR SOCKET HEAD CAP SCREWS

Table A-1 appears on the following page.

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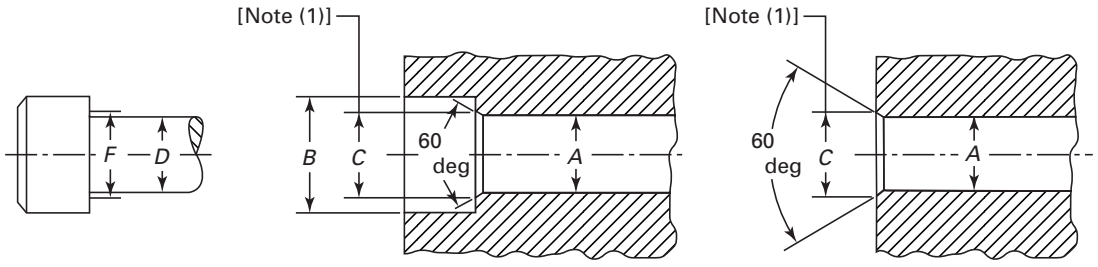


Table A-1 Drill and Counterbore Sizes for Socket Head Cap Screws

Nominal Size (Basic Screw Diameter)	Nominal Drill Size, *A* — Close Fit [Note (2)] Number or Fractional Size	Close Fit [Note (2)] Decimal Size	Normal Fit [Note (3)] Number or Fractional Size	Normal Fit [Note (3)] Decimal Size	Counterbore Diameter, *B*	Countersink, *C* [Note (1)]
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

NOTES:

(1) *Countersink.* It is considered good practice to countersink or break the edges of holes that are smaller than *F* (max.) (see Tables 1B-1 and 1B-2) 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 insure that the fillet on the screw is cleared. Normally, the diameter of countersink does not have to exceed *F* (max.) (see Tables 1B-1 and 1B-2). Countersinks or corner reliefs in excess of this diameter reduce the effective bearing area and introduce the possibility of imbedment 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.

(2) *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.

(3) *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.

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

Table B-1 Applicability of Hexagon Keys and Bits

Nominal Key or Bit Size		Nominal Screw Sizes					
		Cap Screws	Flat Countersink Head Cap Screws	Button Head Cap Screws	Shoulder Screws	Set Screws	Low Head Cap Screws
...	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	...	...	...	...	...

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Table B-2 Applicability of Spline Keys and Bits

Nominal Key Size	Nominal Screw Sizes			
	Cap Screws	Flat Countersunk Head Cap Screws	Button Head Cap Screws	Set Screws
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	...	...	...

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NONMANDATORY APPENDIX C
FORMULAS FOR DIMENSIONS

C-1 HEXAGON AND SPLINE SOCKET HEAD CAP SCREWS

(a) Body Diameter, D, Table 1A

D (max.) = basic or nominal size (see Table 1A for values)

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

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

(b) Head Diameter, A, Table 1A

A (max.) = see Table 1A for value for sizes 0 through 10

= 1.50D (max.) for sizes $\frac{1}{4}$ in. through 4 in.

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

(c) Head Height, H, Table 1A

H (max.) = D (max.)

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

(d) Key Engagement, T, Table 1A

T (min.) = 0.50H (max.) – 0.005

(e) Wall Thickness, G, Table 1A

G (min.) = 0.34H (max.) for sizes 0 through 10

= 0.38H (max.) for sizes $\frac{1}{4}$ in. through 4 in.

C-2 HEXAGON AND SPLINE SOCKET FLAT COUNTERSUNK HEAD CAP SCREWS

(a) Body Diameter, D, Table 2A

D (max.) = basic or nominal size (see Table 2A for values)

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

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

(b) Head Diameter, A, Table 2A

A (max.)

Theor. Sharp = no formula for sizes 0 through 3 (see Table 2A for values)

= 2D (max.) + 0.031 for sizes 4 through $\frac{3}{8}$ in.

= 2D (max.) – 0.031 for $\frac{7}{16}$ in. size

= 2D (max.) – 0.062 for sizes $\frac{1}{2}$ in. through $1\frac{1}{2}$ in.

(c) Maximum Head Height, H, Table 2A

$$H_{\max}\ (\text{ref.}) = \frac{A\ (\text{max.}) - D\ (\text{max.})}{2} \cot 41\ \text{deg}$$

(d) Head Protrusion, Table 2A. No formula (See Table 2A for values).

(e) Original Flushness Tolerance. Prior to ASME B18.3-1998:

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

(f) Key Engagement, T (min.), Table 2A

T (min.) = 0.68H – 0.005 for sizes 0 through 3

= 0.68H for sizes over 3 through $\frac{5}{8}$ in.

= 0.53H approximately for sizes $\frac{3}{4}$ in. through $1\frac{1}{2}$ in.

C-3 HEXAGON AND SPLINE SOCKET BUTTON HEAD CAP SCREWS

(a) Head Diameter, A, Table 3

A (max.)[1] = 1.90D for sizes 0 through 10

= 1.75D for sizes $\frac{1}{4}$ in. through $\frac{1}{2}$ in.

= 1.60D for $\frac{5}{8}$ in. size

[1] Where D is the basic diameter of screw.

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

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

C-4 HEXAGON SOCKET HEAD SHOULDER SCREWS

(a) *Shoulder Diameter, D, Table 4*
D (max.) = nominal size – 0.002
D (min.) = D (max.) – 0.002

(b) *Head Diameter, A, Table 4*
A (max.) = no formula (see Table 4 for values)
A (min.) = no formula (see Table 4 for values)

(c) *Head Height, H, Table 4*
H (max.) = 0.50 (nominal size) + 0.0625 for sizes $\frac{1}{4}$ in. through $\frac{5}{8}$ in.
= 0.50 (nominal size) + 0.125 for sizes $\frac{3}{4}$ in. through $1\frac{1}{4}$ in.

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

C-5 HEXAGON AND SPLINE SOCKET SET SCREWS

(a) *Key Engagement, T_H and T_S, Table 5A*
T_H (min.) = no formula for sizes 0 through 10 (see Table 5A for values)
= J (nom.) for sizes $\frac{1}{4}$ in. through 2 in.
T_S (min.)[1] = no formula for sizes 0 through 10 (see Table 5A for values)
= 0.50D for sizes $\frac{1}{4}$ in. through $\frac{3}{4}$ in.
= 0.573D for $\frac{7}{8}$ in. size

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

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

(d) *Half Dog Point Diameter, P, Table 5A*
P (max.)[1] = 0.667D for sizes 0 through 10
= 0.75D – 0.031 for sizes $\frac{1}{4}$ in. through $\frac{1}{2}$ in.
= 0.75D for sizes $\frac{5}{8}$ in. through 2 in.

C-6 HEXAGON KEYS

Radius of Bend, R, Table 8
R (min.) = no formula (see Table 8 for key sizes 0.028 through 0.050)
= W (max.) for key sizes $\frac{1}{16}$ in. through 1 in.

C-7 SPLINE KEYS

Radius of Bend, R, Table 9
R (min.)[2] = no formula (see Table 9 for key sizes 0.033 through 0.133 and 0.168)
= 0.50D for key sizes 0.145, 0.183 through 0.454, and 0.620 through 0.790
= 0.50D + 0.062 for 0.595 key size

[2] Where D is the basic diameter of set screw in which socket size is used.

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

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.

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AMERICAN NATIONAL STANDARDS FOR BOLTS, NUTS, RIVETS, SCREWS, WASHERS, AND SIMILAR FASTENERS

Small Solid Rivets B18.1.1-1972 (R2001)
Large Rivets B18.1.2-1972 (R2001)
Metric Small Solid Rivets B18.1.3M-1983 (R2001)
Square and Hex Bolts and Screws (Inch Series) B18.2.1-1996
Square and Hex Nuts (Inch Series) B18.2.2-1987 (R1999)
Metric Hex Cap Screws B18.2.3.1M-1999
Metric Formed Hex Screws B18.2.3.2M-1979 (R1995)
Metric Heavy Hex Screws B18.2.3.3M-1979 (R2001)
Metric Hex Flange Screws B18.2.3.4M-2001
Metric Hex Bolts B18.2.3.5M-1979 (R2001)
Metric Heavy Hex Bolts B18.2.3.6M-1979 (R2001)
Metric Heavy Hex Structural Bolts B18.2.3.7M-1979 (R2001)
Metric Hex Lag Screws B18.2.3.8M-1981 (R1999)
Metric Heavy Hex Flange Screws B18.2.3.9M-2001
Square Head Bolts (Metric Series) B18.2.3.10M-1996 (R2003)
Metric Hex Nuts, Style 1 . . . . . B18.2.4.1M-2002
Metric Hex Nuts, Style 2 . . . . . B18.2.4.2M-1979 (R1995)
Metric Slotted Hex Nuts B18.2.4.3M-1979 (R2001)
Metric Hex Flange Nuts B18.2.4.4M-1982 (R1999)
Metric Hex Jam Nuts B18.2.4.5M-1979 (R2003)
Metric Heavy Hex Nuts B18.2.4.6M-1979 (R2003)
Fasteners for Use in Structural Applications B18.2.6-1996 (R2004)
Metric 12-Spline Flange Screws B18.2.7.1M-2002
Clearance Holes for Bolt Screws and Studs B18.2.8-1999
Socket Cap, Shoulder, and Set Screws, Hex and Spline Keys (Inch Series) B18.3-2003
Socket Head Cap Screws (Metric Series) B18.3.1M-1986 (R2002)
Metric Series Hexagon Keys and Bits B18.3.2M-1979 (R2003)
Hexagon Socket Head Shoulder Screws (Metric Series) B18.3.3M-1986 (R2002)
Hexagon Socket Button Head Cap Screws (Metric Series) B18.3.4M-1986 (R2002)
Hexagon Socket Flat Countersunk Head Cap Screws (Metric Series) B18.3.5M-1986 (R2002)
Metric Series Socket Set Screws B18.3.6M-1986 (R2002)
Round Head Bolts (Inch Series) B18.5-1990 (R2003)
Metric Round Head Short Square Neck Bolts B18.5.2.1M-1996 (R2003)
Metric Round Head Square Neck Bolts B18.5.2.2M-1982 (R2000)
Round Head Square Neck Bolts With Large Head (Metric Series) B18.5.2.3M-1990 (R2003)
Wood Screws (Inch Series) B18.6.1-1981 (R1997)
Slotted Head Cap Screws, Square Head Set Screws, and Slotted Headless Set Screws B18.6.2-1998
Machine Screws and Machine Screw Nuts B18.6.3-2003
Thread Forming and Thread Cutting Tapping Screws and Metallic Drive Screws (Inch Series) B18.6.4-1998
Metric Thread-Forming and Thread-Cutting Tapping Screws B18.6.5M-2000
Metric Machine Screws B18.6.7M-1999
General Purpose Semi-Tubular Rivets, Full Tubular Rivets, Split Rivets and Rivet Caps B18.7-1972 (R2001)
Metric General Purpose Semi-Tubular Rivets B18.7.1M-1984 (R2000)
Clevis Pins and Cotter Pins (Inch Series) B18.8.1-1994 (R2000)
Taper Pins, Dowel Pins, Straight Pins, Grooved Pins, and Spring Pins (Inch Series) B18.8.2-1995
Spring Pins: Coiled Type, Spring Pins: Slotted, Machine Dowel Pins: Hardened Ground, and Grooved Pins (Metric Series) B18.8.100M-2000
Cotter Pins, Headless Clevis Pins, and Headed Clevis Pins B18.8.200M-2000
Plow Bolts (Inch Series) B18.9-1996 (R2003)
Track Bolts and Nuts B18.10-1982 (R2000)
Miniature Screws B18.11-1961 (R2000)
Glossary of Terms for Mechanical Fasteners B18.12-2001
Screw and Washer Assemblies — Sems (Inch Series) B18.13-1996 (R2003)
Screw and Washer Assemblies: Sems (Metric Series) B18.13.1M-1998 (R2003)
Forged Eyebolts B18.15-1985 (R2003)

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Metric Lifting Eyes B18.15M-1998 (R2004)
Prevailing-Torque Type Steel Metric Hex Nuts and Hex Flange Nuts B18.16M-2004
Mechanical and Performance Requirements for Prevailing-Torque Type
Steel Metric Hex Nuts and Hex Flange Nuts B18.16.1M-1979 (R2001)
Torque-Tension Test Requirements for Prevailing-Torque Type
Steel Metric Hex Nuts and Hex Flange Nuts B18.16.2M-1979 (R2001)
Dimensional Requirements for Prevailing-Torque Type Steel
Metric Hex Nuts and Hex Flange Nuts B18.16.3M-1998
Inspection and Quality Assurance for General Purpose Fasteners B18.18.1M-1987 (R1999)
Inspection and Quality Assurance for High-Volume Machine Assembly Fasteners B18.18.2M-1987 (R1999)
Inspection and Quality Assurance for Special Purpose Fasteners B18.18.3M-1987 (R1999)
Inspection and Quality Assurance for Fasteners for Highly Specialized
Engineered Applications B18.18.4M-1987 (R1999)
Inspection and Quality Assurance Plan Requiring In-Process Inspection and Controls. B18.18.5M-1998 (R2003)
Quality Assurance Plan for Fasteners Produced in a Third Party Accreditation System B18.18.6M-1998 (R2003)
Quality Assurance Plan for Fasteners Produced in a Customer Approved Control Plan B18.18.7M-1998 (R2003)
Lock Washers (Inch Series) B18.21.1-1999
Lock Washers (Metric Series) B18.21.2M-1999
Metric Plain Washers. B18.22M-1981 (R2000)
Plain Washers B18.22.1-1965 (R2003)
Part Identifying Number (PIN) Code System Standard for B18 Externally
Threaded Products. B18.24.1-1996
Part Identifying Number (PIN) Code System Standard for B18 Internally
Threaded Products. B18.24.2-1998 (R2003)
Part Identifying Number (PIN) Code System Standard for B18 Nonthreaded Products. B18.24.3-1998 (R2003)
Square and Rectangular Keys and Keyways. B18.25.1M-1996 (R2003)
Woodruff Keys and Keyways B18.25.2M-1996 (R2003)
Square and Rectangular Keys and Keyways: Width Tolerances and
Deviations Greater Than Basic Size B18.25.3M-1998 (R2003)
Tapered and Reduced Cross Section Retaining Rings (Inch Series) B18.27-1998
Helical Coil Screw Thread Inserts (Inch Series) — Free Running and Screw Locking. B18.29.1-1993 (R2002)
Open-End Blind Rivets With Break Mandrels (Metric Series) B18.30.1M-2000

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