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AN AMERICAN NATIONAL STANDARD

Metric Series Socket Set Screws

ASME/ANSI B18.3.6M-1986

(REVISION OF ANSI B18.3.6M-1979)

Government Key Words:
Setscrew, Hexagon,
Socket — Metric

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FOREWORD

(This Foreword is not part of ASME/ANSI B18.3.6M-1986.)

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 was established in April 1929 to undertake the development and oversee the maintenance of standards covering socket head cap screws and set screws. In line with a general realignment of the subcommittee structure on April 1, 1966, Subcommittee 9 was redesignated Subcommittee 3. Over the intervening years this activity has produced several versions of American National Standards covering inch series socket cap, shoulder, and set screws bearing the B18.3 designation.

At the December 4, 1974 meeting of American National Standards Committee B18, Subcommittee 3 was assigned the task of preparing standards for metric series socket screw products paralleling that contained in the latest ANSI B18.3 document. The Subcommittee was also instructed to continue coordinating that activity with the International Standards Organization, ISO Technical Committee 2, and Working Group 3, and, to the extent possible, to keep the proposals for metric standards under development in conformance with agreements reached therein.

Subsequent meetings of Subcommittee 3, held in February 1975 and January 1976, resulted in general agreement on the following basic principles to be considered in developing the metric version of the standard.

(*a*) To assure consumers continuity of performance integrity consistent with inch socket screw products, the metric standards should maintain the same quality levels as their inch counterparts.

(*b*) To facilitate and expedite the processing, acceptance, and adoption of the metric versions, proposals for the various product categories should be prepared as separate and complete product standards.

(*c*) To promote understanding and assimilation during the transition to metric, the dimensional symbols, designations, terminology, and basic formats of the metric standards should be kept similar to that used in the ANSI B18.3 document.

At the November 10, 1976 meeting of Subcommittee 3, it was agreed that the socket screw industry document covering metric series hexagon socket set screws should be circulated for subcommittee consideration as a proposed standard. It was noted that there were some dimensional differences between this document and the recently published ISO standards, namely, in the details of some of the points and the thread fit. The ISO standards specify tolerance class 5g6g, whereas the socket screw industry document requires 4g6g, consistent with past practices. Also, the physical and mechanical requirements contained in the referenced documents in the ISO standard were somewhat less stringent. Subcommittee acceptance of the content ensued and the document, modified to more closely suit the ANSI format, was approved by letter ballot to American National Standards Committee B18.

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Following approval by the sponsor organizations, the proposal was submitted to the American National Standards Institute and granted recognition as an American National Standard on August 14, 1979.

A periodic review of the standard, undertaken by the Subcommittee in 1985, resulted in agreement that the document should be revised to clarify the dimensions of spline socket sizes, to incorporate by reference the appropriate ASTM specifications for the mechanical and chemical properties, and to upgrade thread gaging. A proposal containing these changes, as well as editorial corrections, was prepared for 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 October 16, 1986.

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CONTENTS

Foreword iii
Standards Committee Roster v

1 General 1
2 Dimensional Characteristics 2
3 Materials, Processing, and Mechanical Properties 9

Figure
1 Socket Edge Detail 2

Tables
1 Dimensions of Metric Socket Set Screws 3
2 Dimensions of Points for Metric Socket Set Screws 4
3 Dimensions of Metric Hexagon Sockets 5
4 Dimensions of Metric Spline Sockets 6
5 Dimensions of Metric Hexagon Socket Gages 7
6 Dimensions of Metric Spline Socket Gages 8

Appendices
I Formulas for Dimensions 11
II Government Standard Items and Part Numbering System 12
III Dimensions of Metric Threads for Socket Screw Products 15

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METRIC SERIES SOCKET SET SCREWS

1 GENERAL

1.1 Scope

1.1.1 This Standard contains complete general and dimensional requirements for metric series socket set screws of nominal sizes from 1.6 mm to 24 mm recognized as American National Standard. Also included are appendices covering formulas for dimensions (Appendix I), part numbering system and preferred sizes for government use (Appendix II), and thread dimensions (Appendix III).

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 Interchangeability With ISO Set Screws

Socket set screws produced to this Standard will interchange functionally with screws conforming to the dimensions presently documented in international standards on hexagon socket set screws with flat point, cone point, dog point, and cup point: ISO 4026, ISO 4027, ISO 4028, and ISO 4029-1977, respectively.

1.3 Dimensions

All dimensions in this Standard are given in millimeters (mm) and apply before plating unless stated otherwise.

1.4 Options

Options, where specified, shall be at the discretion of the manufacturer unless agreed upon otherwise by manufacturer and purchaser.

1.5 Responsibility for Modification

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.

1.6 Terminology

For definitions of terms relating to fasteners or to component features thereof used in this Standard, refer to ANSI B18.12, Glossary of Terms for Mechanical Fasteners.

1.7 Designation

Metric socket set screws conforming to this Standard shall be designated by the following data in the sequence shown:

(*a*) Specification (ASME/ANSI document) number followed by a dash;

(*b*) Nominal size of screw;

(*c*) Thread pitch, preceded by ×;

(*d*) Nominal screw length, preceded by ×;

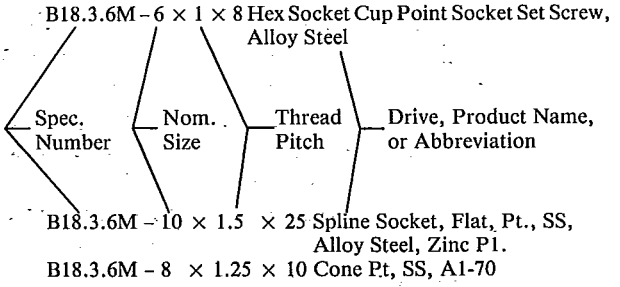
(*e*) Drive: Unless specified otherwise, hexagon socket will be supplied.

(*f*) Point style and product name. Product name may be abbreviated SS. Point may be pt.

(*g*) Material and property class. Alloy steel screws shall be as specified in ASTM F 912M. Corrosion-resistant steel screws shall be as specified in ASTM F 880M (see para. 3.1).

(*h*) Protective finish, if required (see para. 3.1).

Examples:



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1.8 Part Numbering System

For users who need a definitive part numbering system, one is suggested in Appendix II.

2 DIMENSIONAL CHARACTERISTICS

The following requirements supplement the dimensional data presented in Tables 1, 2, and 3 and shall apply to the respective features of set screws.

2.1 Face

The face is the flat surface on the socket end of the screw, bounded by the thread and the socket.

2.1.1 Face Angularity. The plane of the face shall be approximately perpendicular to the axis of the screw.

2.1.2 Face Chamfer. The face on screws having a nominal length longer than the nominal screw diameter shall be chamfered. The chamfer angle V shall be between 30 deg. and 45 deg. The chamfer shall extend slightly below the root of the thread, and the edge between the face and chamfer may be slightly rounded.

For screws having a nominal length equal to the nominal diameter or shorter, chamfering shall be at the option of the manufacturer. If chamfered, the chamfer angle V shall not exceed 45 deg.

2.2 Sockets

2.2.1 Socket Size. Hexagon sockets shall be of nominal size J specified in Table 1, and shall conform to the dimensions given in Table 3, with gaging in accordance with para. 2.2.3.

Spline sockets shall be of nominal size M as specified in Table 1, and shall conform to the dimensions given in Table 4, with gaging in accordance with para. 2.2.3.

2.2.2 Key Engagement. For screws of nominal lengths exceeding those listed in Table 1, the minimum key engagement T for the longest length shown shall apply. They represent the minimum key engagement depth necessary to develop the full functional capability of keys conforming to ANSI B18.3.2M, Metric Series Hexagon Keys and Bits. Compliance with minimum depth requirements shall be determined by gaging in accordance with para. 2.2.3.

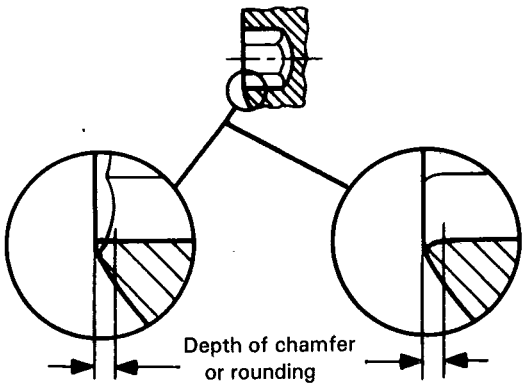


FIG. 1 SOCKET EDGE DETAIL

CAUTION: The use of set screws having a key engagement shallower than the deepest listed in Table 1 for the respective screw size can result in failure of the socket, key, or mating threads during tightening because the key engagement and thread length are less than optimum. It is, therefore, strongly recommended that longer screw lengths having deepest minimum key engagements be used wherever possible.

2.2.3 Socket Gaging. Acceptability of hexagon sockets shall be determined by the use of the hexagon socket gages specified in Table 5. The hexagon sockets shall allow the GO member of the gage to enter freely to the minimum key engagement depth (para. 2.2.2). The NOT GO gage member shall be permitted to enter only to a depth equivalent to 10% of the nominal size for nominal socket sizes up to and including 1.5 mm, and to 7.5% of the nominal socket size for larger sizes.

Acceptability of spline sockets shall be determined by the use of the spline socket gages specified in Table 6. The spline sockets shall allow the GO member of the gage to enter freely to the minimum key engagement depth (para. 2.2.2). The NOT GO 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 1.52 mm, and to 7.5% of the nominal socket size for larger sizes.

To determine the acceptability of sockets in plated products after plating, a GO gage identical in design and tolerances to that shown in Table 5, except having a maximum width across flats dimension equal to the nominal key size, shall be employed.

To determine the acceptability of spline sockets in plated products after plating, a GO gage identical in design and tolerances to that shown in Table 6, except having a maximum major diameter dimension equal to the nominal key size, shall be employed.

2.2.4 Edge of Socket. The edge at the junction of the socket with the face may be broken (rounded or chamfered) as depicted in Fig. 1 or sketch (b) of Table

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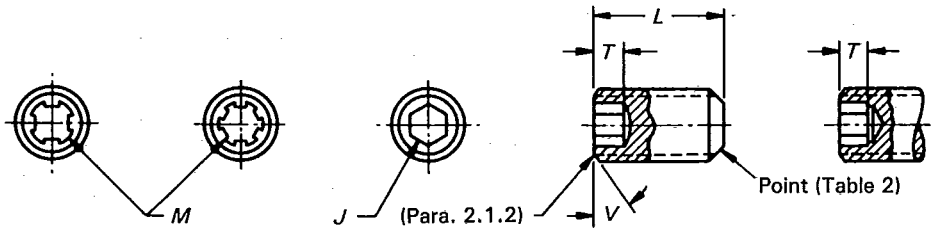


TABLE 1 DIMENSIONS OF METRIC SOCKET SET SCREWS

D		J	M	L	T					
					Minimum Key Engagement					
					Cup and Flat Points		Cone and Oval Points		Half Dog Points	
Nominal Size or Basic Screw Diameter	Thread Pitch	Hexagon Socket Size	Spline Socket Size	Nominal Screw Lengths	Hex. T_h	Spl. T_s	Hex. T_h	Spl. T_s	Hex. T_h	Spl. T_s
		Nom.	Nom.		Min.	Min.	Min.	Min.	Min.	Min.
1.6	0.35	0.7	0.84	1.5	0.6	0.6	0.6	0.6	...	...
				2	0.8	0.7	0.8	0.7	0.6	0.6
				2.5	1.0	0.7	1.0	0.7	0.7	0.7
				3	1.25	0.7	1.25	0.7	1.25	0.7
2	0.4	0.9	0.84	1.5	0.6	0.6	0.6	0.6	...	...
				2	0.8	0.7	0.8	0.7	...	...
				2.5	1.0	0.7	1.0	0.7	0.8	0.7
				3	1.2	0.7	1.2	0.7	1.2	0.7
				4	1.5	0.7	1.5	0.7	1.5	0.7
2.5	0.45	1.3	1.22	2	0.7	0.7	0.7	0.7	...	...
				2.5	1.1	1.0	1.0	1.0	0.9	0.9
				3	1.5	1.0	1.3	1.0	1.2	1.0
				4	1.8	1.0	1.8	1.0	1.8	1.0
3	0.5	1.5	1.52	2	0.6	0.6	...	...	...	...
				2.5	1.1	1.1	0.7	0.7	...	...
				3	1.5	1.2	1.0	1.0	1.0	1.0
				4	2.1	1.2	1.5	1.2	2.0	1.2
				5	2.1	1.2	2.1	1.2	2.1	1.2
4	0.7	2	2.44	2.5	1.0	1.0	...	...	...	...
				3	1.3	1.3	1.0	1.0	1.0	1.0
				4	1.8	1.8	1.5	1.5	1.5	1.5
				5	2.3	2.0	2.0	2.0	2.0	2.0
				6	2.3	2.0	2.3	2.0	2.3	2.0
5	0.8	2.5	2.82	3	1.2	1.2	...	...	...	...
				4	2.0	2.0	1.2	1.2	...	...
				5	2.7	2.3	1.7	1.7	2.0	2.0
				6	2.7	2.3	2.0	2.0	2.5	2.3
				8	2.7	2.3	2.7	2.3	2.7	2.3
See para.		2.2.1	2.2.1		2.2.2					

D		J	M	L	T					
					Minimum Key Engagement					
					Cup and Flat Points		Cone and Oval Points		Half Dog Points	
Nominal Size or Basic Screw Diameter	Thread Pitch	Hexagon Socket Size	Spline Socket Size	Nominal Screw Lengths	Hex. T_h	Spl. T_s	Hex. T_h	Spl. T_s	Hex. T_h	Spl. T_s
		Nom.	Nom.		Min.	Min.	Min.	Min.	Min.	Min.
6	1	3	3.68	4	1.8	1.8	...	...	...	...
				5	2.5	2.5	1.8	1.8	1.5	1.5
				6	3.0	3.0	2.7	2.7	2.0	2.0
				8	3.0	3.0	3.0	3.0	3.0	3.0
8	1.25	4	4.65	5	1.8	1.8	...	...	...	...
				6	2.5	2.5	2.3	2.3	1.8	1.8
				8	4.0	4.0	3.5	3.5	3.0	3.0
				10	4.0	4.0	4.0	4.0	4.0	4.0
10	1.5	5	5.49	6	2.0	2.0	...	...	...	...
				8	3.6	3.6	3.0	3.0	2.5	2.5
				10	5.0	5.0	4.0	4.0	4.0	4.0
				12	5.0	5.0	5.0	5.0	5.0	5.0
12	1.75	6	6.38	8	3.0	3.0	...	...	...	...
				10	4.5	4.5	3.8	3.8	3.5	3.5
				12	6.0	6.0	5.0	5.0	5.0	5.0
				16	6.0	6.0	6.0	6.0	6.0	6.0
16	2	8	9.45	10	3.0	3.0	...	...	...	...
				12	4.8	4.8	3.0	3.0	3.0	3.0
				16	8.0	8.0	6.0	6.0	6.0	6.0
				20	8.0	8.0	8.0	8.0	8.0	8.0
20	2.5	10	11.53	12	...	...	...	...	...	...
				16	6.0	6.0	5.0	5.0	5.0	5.0
				20	9.0	9.0	8.0	8.0	8.0	8.0
				25	10.0	10.0	10.0	10.0	10.0	10.0
24	3	12	15.11	16	5.0	5.0	...	...	...	...
				20	8.0	8.0	7.0	7.0	6.0	6.0
				25	12.0	12.0	10.0	10.0	10.0	10.0
				30	12.0	12.0	12.0	12.0	12.0	12.0
See para.		2.2.1	2.2.1		2.2.2					

GENERAL NOTE:
For additional requirements, refer to Table 2 and Sections 2 and 3.

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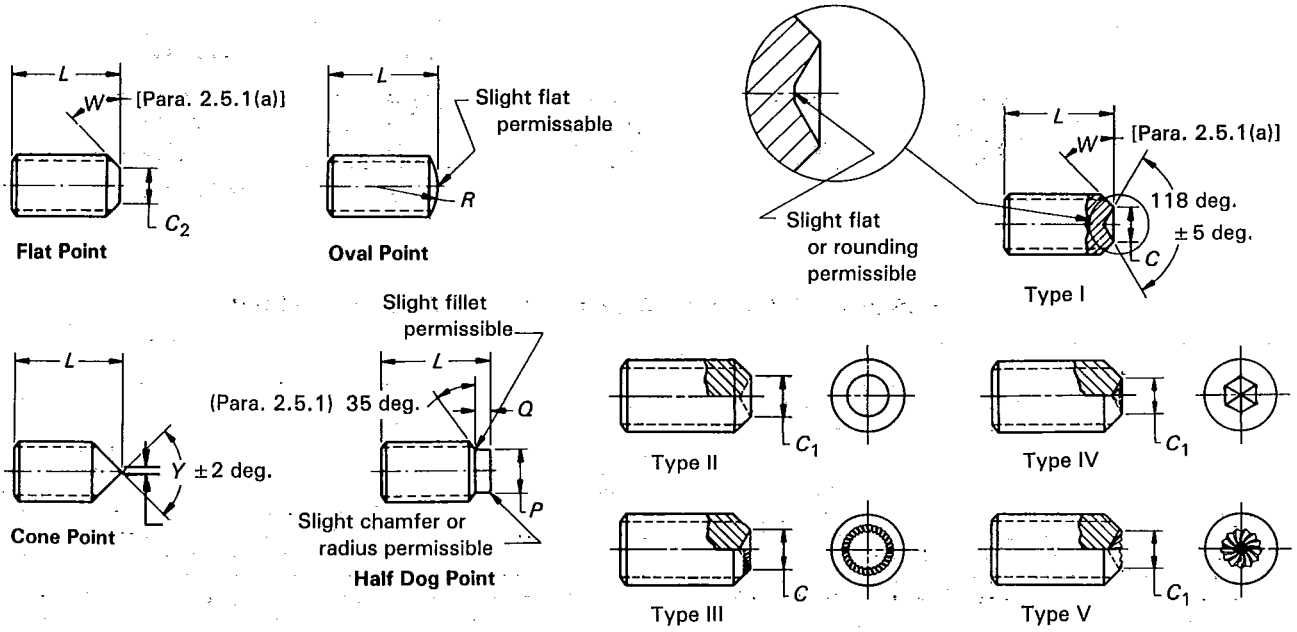
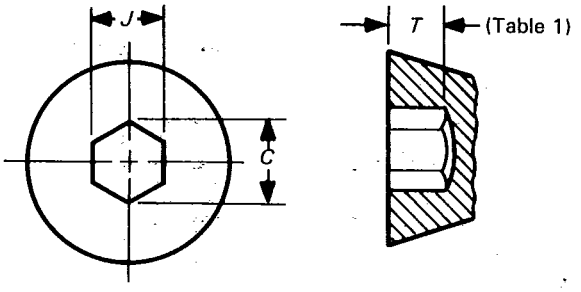


TABLE 2 DIMENSIONS OF POINTS FOR METRIC SOCKET SET SCREWS

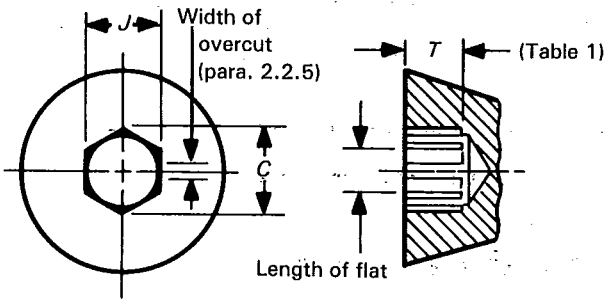
D	*C*		C_1		C_2		*R*		*Y*	*A*		*P*		*Q*	
Nominal Size or Basic Screw Diameter	Cup Point Diameter for Types I and III		Cup Point Diameter for Types II, IV, and V		Flat Point Diameter		Oval Point Radius		Cone Point Angle 90 deg. for These Lengths and Over; 118 deg. for Shorter Lengths	Flat of Truncation on Cone Point		Half Dog Point			
												Diameter		Length	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.		Max.	Min.	Max.	Min.	Max.	Min.
1.6	0.80	0.55	0.80	0.64	0.80	0.55	1.60	1.20	3	0.16	0	0.80	0.55	0.53	0.40
2	1.00	0.75	1.00	0.82	1.00	0.75	1.90	1.50	3	0.20	0	1.00	0.75	0.64	0.50
2.5	1.20	0.95	1.25	1.05	1.50	1.25	2.28	1.88	4	0.25	0	1.50	1.25	0.78	0.63
3	1.40	1.15	1.50	1.28	2.00	1.75	2.65	2.25	4	0.30	0	2.00	1.75	0.92	0.75
4	2.00	1.75	2.00	1.75	2.50	2.25	3.80	3.00	5	0.40	0	2.50	2.25	1.20	1.00
5	2.50	2.25	2.50	2.22	3.50	3.20	4.55	3.75	6	0.50	0	3.50	3.20	1.37	1.25
6	3.00	2.75	3.00	2.69	4.00	3.70	5.30	4.50	8	1.50	1.2	4.00	3.70	1.74	1.50
8	5.00	4.70	4.00	3.65	5.50	5.20	6.80	6.00	10	2.00	1.6	5.50	5.20	2.28	2.00
10	6.00	5.70	5.00	4.60	7.00	6.64	8.30	7.50	12	2.50	2.0	7.00	6.64	2.82	2.50
12	8.00	7.64	6.00	5.57	8.50	8.14	9.80	9.00	16	3.00	2.4	8.50	8.14	3.35	3.00
16	10.00	9.64	8.00	7.50	12.00	11.57	12.80	12.00	20	4.00	3.2	12.00	11.57	4.40	4.00
20	14.00	13.57	10.00	9.44	15.00	14.57	15.80	15.00	25	5.00	4.0	15.00	14.57	5.45	5.00
24	16.00	15.57	12.00	11.39	18.00	17.57	18.80	18.00	30	6.00	4.8	18.00	17.57	6.49	6.00
See para.	2.5.2				2.5.5				2.5.3			2.5.4			

GENERAL NOTE:
For additional requirements, refer to Table 1 and Sections 2 and 3.

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(a) Forged Hexagon Socket



(b) Broached Socket

TABLE 3 DIMENSIONS OF METRIC HEXAGON SOCKETS

Nominal Socket Size	J		C
	Dimensions Across Flats		Dimensions Across Corners
	Max.	Min.	Min.
0.7	0.724	0.711	0.803
0.9	0.902	0.889	1.003
1.3	1.295	1.270	1.427
1.5	1.545	1.520	1.730
2	2.045	2.020	2.300
2.5	2.560	2.520	2.870
3	3.071	3.020	3.440
4	4.084	4.020	4.580
5	5.084	5.020	5.720
6	6.095	6.020	6.860
8	8.115	8.025	9.150
10	10.127	10.025	11.500
12	12.146	12.032	13.800

4 provided the depth of chamfer or rounding will not violate the NOT GO gage penetration limits specified in para. 2.2.3.

2.2.5 Broached Sockets. For hexagon broached sockets at or near the maximum size limit, the overcut resulting from drilling shall not exceed 20% of the length of any flat of the socket. [See Table 3, sketch (b).]

2.2.6 Socket True Position. The axis of the socket shall be located at true position relative to the axis of the screw within a tolerance zone having a diameter of 0.25 mm, regardless of feature size.

2.3 Length

2.3.1 Measurement. The length of the screw shall be measured overall, parallel to the axis of screw.

2.3.2 Tolerance on Length. The tolerance on screw length shall be as tabulated below:

Nominal Screw Length, mm	Tolerance on Length, mm
Up to 12, incl.	±0.3
Over 12 to 50, incl.	±0.5
Over 50	±0.8

2.3.3 Standard Lengths. The standard nominal screw lengths are 1.5, 2, 2.5, 3, 4, 5, 6, 8, 10, 12, 16, 20, 25, 30, 35, 40, 45, 50, 55, 60, 70, 80, 90, and 100 mm. The minimum practical screw length for the respective screw sizes and point styles is represented by the shortest lengths listed in Table 1 for which T values are shown.

2.4 Threads

2.4.1 Thread Series and Form. Unless specified otherwise, threads shall be the metric coarse series in accordance with ANSI/ASME B1.13M, Metric Screw Threads — M Profile.

2.4.2 Thread Tolerance Class. Threads shall be ISO tolerance class 4g6g. For plated screws, the allowance "g" may be consumed by the thickness of plating so that the maximum size limit after plating shall be that of tolerance class 4h6h. Thread limits shall be in accordance with ANSI/ASME B1.13M. See Appendix III, wherein the limiting dimensions applicable to threads up to 4 mm before and after plating are given for reference purposes. The allowance "g" shown therein for these sizes has been increased over that specified for corresponding sizes in ANSI/ASME B1.13M to better accommodate plating requirements.

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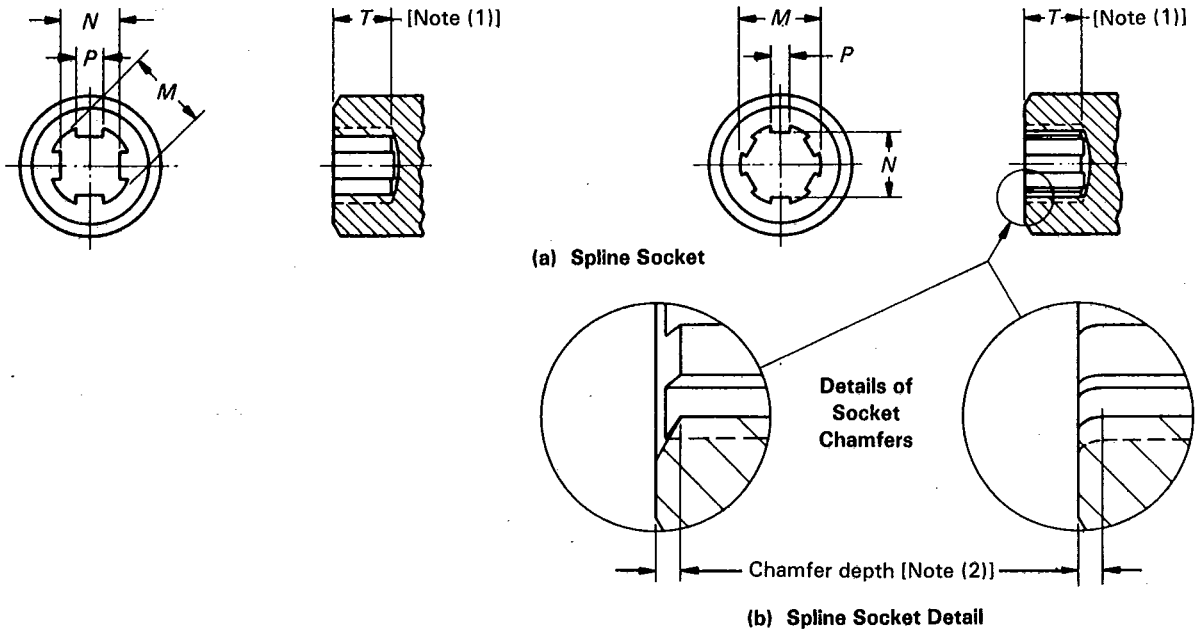


TABLE 4 DIMENSIONS OF METRIC SPLINE SOCKETS

Nom. Spline Socket Size	Number of Teeth	*M* Socket Major Diameter		*N* Socket Minor Diameter		*P* Width of Tooth	
		Max.	Min.	Max.	Min.	Max.	Min.
0.84	4	0.889	0.864	0.660	0.648	0.305	0.292
1.22	6	1.270	1.245	1.041	1.016	0.279	0.254
1.52	6	1.575	1.549	1.295	1.270	0.356	0.330
2.44	6	2.489	2.464	2.083	2.032	0.559	0.533
2.82	6	2.921	2.870	2.489	2.438	0.635	0.584
3.68	6	3.785	3.734	3.251	3.200	0.813	0.762
4.65	6	4.775	4.724	4.140	4.089	0.991	0.940
5.49	6	5.613	5.563	4.826	4.775	1.270	1.219
6.38	6	6.502	6.452	5.613	5.563	1.524	1.473
9.45	6	9.652	9.576	8.103	8.026	2.337	2.261
11.53	6	11.760	11.684	9.804	9.728	2.845	2.769
15.11	6	15.342	15.265	12.929	12.852	3.505	3.404

NOTES:
(1) The tabulated dimensions represent direct metric conversions of the equivalent inch size spline sockets shown in ASME/ANSI B18.3, Socket Cap, Shoulder, and Set Screws (Inch Series). Therefore, the spline keys and bits shown therein are applicable for wrenching the corresponding size metric spline sockets.
(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 1.52 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.

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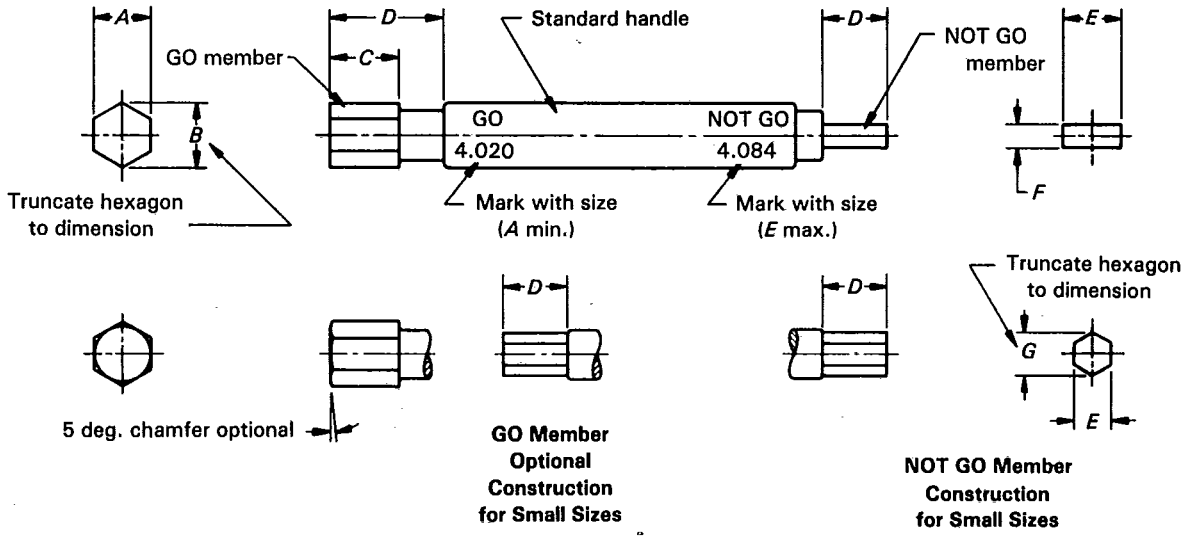


TABLE 5 DIMENSIONS OF METRIC HEXAGON SOCKET GAGES

Nominal Socket Size	A		B		C	D	E		F		G	
	GO Gage Width Across Flats		GO Gage Width Across Corners		GO Gage Length	Usable Gage Length	NOT GO Gage Width		NOT GO Gage Thickness		NOT GO Gage Width Across Corners	
	Max.	Min.	Max.	Min.	Min.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
0.7	0.714	0.711	0.803	0.798	1.5	1.5	0.724	0.721	...	...	0.782	0.770
0.9	0.892	0.889	1.003	0.998	2.4	2.4	0.902	0.899	...	...	0.980	0.968
1.3	1.273	1.270	1.427	1.422	4.7	4.7	1.295	1.293	...	...	1.397	1.384
1.5	1.523	1.520	1.730	1.725	5.0	5.0	1.545	1.542	...	...	1.68	1.66
2.0	2.023	2.020	2.300	2.295	5.0	5.0	2.045	2.042	...	...	2.23	2.21
2.5	2.525	2.520	2.870	2.865	7.0	7.0	2.560	2.555	...	...	2.79	2.77
3.0	3.025	3.020	3.440	3.435	7.0	7.0	3.071	3.066	...	...	3.35	3.33
4.0	4.025	4.020	4.580	4.575	7.0	7.0	4.084	4.079	1.80	1.75	...	...
5.0	5.025	5.020	5.720	5.715	7.0	7.0	5.084	5.079	2.30	2.25	...	...
6.0	6.025	6.020	6.860	6.855	8.0	12.0	6.095	6.090	2.80	2.75	...	...
8.0	8.030	8.025	9.150	9.145	8.0	16.0	8.115	8.110	3.80	3.75	...	...
10.0	10.030	10.025	11.500	11.495	12.0	20.0	10.127	10.122	4.80	4.75	...	...
12.0	12.037	12.032	13.800	13.795	12.0	24.0	12.146	12.141	5.75	5.70	...	...

GENERAL NOTES:

(a) Gages shall be made from steel, hardened and tempered to a hardness of HRC 60 minimum. They shall be thermally stabilized and given suitable surface treatment to obtain maximum abrasion resistance.

(b) The form of hexagonal gage members shall be within the tolerance zone specified. See ANSI Y14.5M, Engineering Drawing and Related Documentation Practices, Dimensioning and Tolerancing.

(c) The surface roughness on hexagonal flats shall be 0.2 μm (arithmetical average) maximum. See ANSI/ASME B46.1, Surface Texture.

(d) The gage handles shall conform to ANSI B47.1, Gage Blanks.

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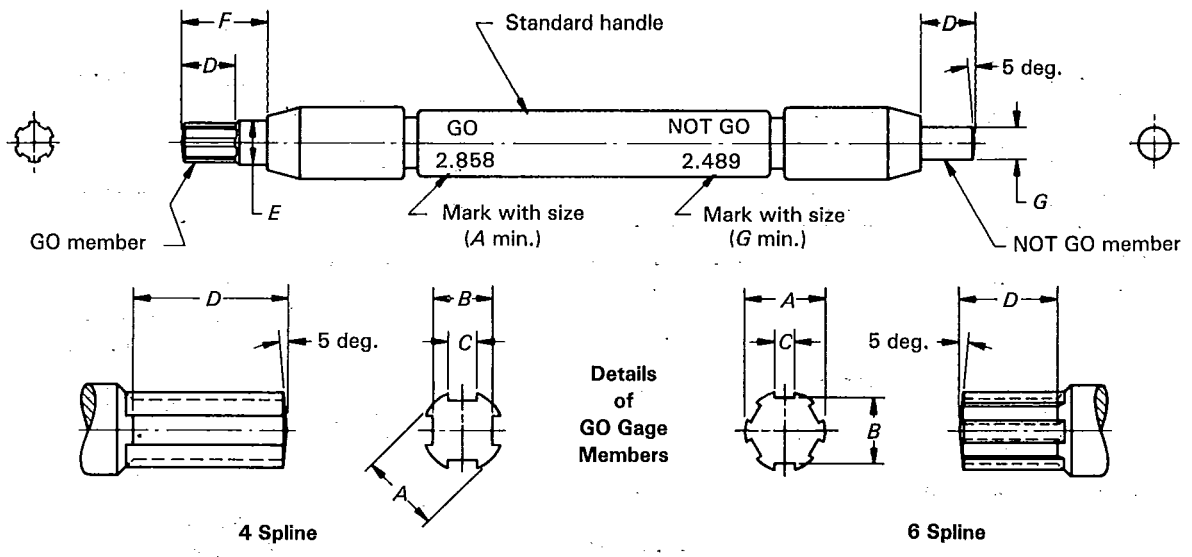


TABLE 6 DIMENSIONS OF METRIC SPLINE SOCKET GAGES[1]

Nominal Socket Size	Number of Splines	A		B		C		D	F	G	
		GO Gage Major Diameter		GO Gage Minor Diameter		GO Gage Space Width		Gage Length	Length	NOT GO Gage Diameter	
		Max.	Min.	Max.	Min.	Max.	Min.	Min.	Min.	Max.	Min.
0.84	4	0.856	0.851	0.640	0.635	0.318	0.313	1.5	3.0	0.662	0.660
1.22	6	1.237	1.232	1.008	1.003	0.292	0.287	1.5	3.0	1.043	1.041
1.52	6	1.542	1.537	1.262	1.257	0.368	0.363	1.5	3.0	1.297	1.295
2.44	6	2.456	2.451	2.024	2.019	0.572	0.567	2.5	5.0	2.085	2.083
2.82	6	2.863	2.858	2.431	2.426	0.648	0.643	3.0	6.0	2.491	2.489
3.68	6	3.726	3.721	3.193	3.188	0.826	0.821	4.0	8.0	3.253	3.251
4.65	6	4.717	4.712	4.082	4.077	1.003	0.998	5.0	10.0	4.142	4.140
5.49	6	5.555	5.550	4.768	4.763	1.283	1.278	5.5	11.0	4.828	4.826
6.38	6	6.444	6.439	5.555	5.550	1.537	1.532	6.0	12.0	5.615	5.613
9.45	6	9.568	9.563	8.019	8.014	2.350	2.345	9.0	18.0	8.105	8.103
11.53	6	11.676	11.671	9.721	9.716	2.858	2.853	11.0	22.0	9.806	9.804
15.11	6	15.258	15.253	12.845	12.840	3.518	3.513	13.0	26.0	12.931	12.929

GENERAL NOTES:

(a) Gages shall be made from steel, hardened and tempered to a hardness of HRC 60 minimum. They shall be thermally stabilized and given suitable surface treatment to obtain maximum abrasion resistance.

(b) The form of hexagonal gage members shall be within the tolerance zone specified. See ANSI Y14.5M, Engineering Drawing and Related Documentation Practices, Dimensioning and Tolerancing.

(c) The surface roughness on hexagonal flats shall be 0.2 μm (arithmetical average) maximum. See ANSI/ASME B46.1, Surface Texture.

(d) The gage handles shall conform to ANSI B47.1, Gage Blanks.

NOTE:

(1) The tabulated dimensions represent direct metric conversions of the equivalent inch size spline socket gages shown in ASME/ANSI B18.3, Socket Cap, Shoulder and Set Screws (Inch Series). Therefore, the spline socket gages shown therein are applicable to gaging of the corresponding size metric spline sockets.

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However, because the minimum limits are unchanged, the screws will be totally interchangeable.

2.4.3 Thread Gaging. Acceptability of screw threads shall be determined based upon System 22 of ANSI/ASME B1.3M.

As standard gages provide only for engagement lengths up to the equivalent of 1.5 times the thread diameter, changes in pitch diameter of either or both external and internal thread may be required for longer lengths of engagement.

2.5 Points

As specified by the purchaser, screws shall have cone, cup, flat, oval, or half dog points conforming to the dimensions given in Table 2 and the following requirements.

2.5.1 Point Angles. The point angles specified shall apply only to those portions of the angles that lie below the root diameter of the thread, it being recognized that the angle may vary in the threaded portion due to manufacturing processes.

The point angle *W* for flat and cup points shall be 45 deg., plus 5 deg., minus 0 deg., for screws of length equal to the nominal screw diameter and longer, and 30 deg. minimum for shorter screws.

2.5.2 Cup Points. Cup points are produced by the various manufacturers with variations in configuration as depicted in Types I through V of the illustrations for Table 2. Where a particular point type is required by a customer, the manufacturer shall have the option of supplying any of the types shown.

2.5.3 Cone Point Configuration. For nominal screw sizes up to and including 5 mm, the apex of the cone point may be sharp, rounded, or flatted to the maximum extent specified in Table 2. For nominal sizes 6 mm and larger, the apex of the cone shall be flatted within the limits listed in Table 2.

2.5.4 Half Dog Points. Half dog points shall conform to the following limitations on concentricity and squareness.

(*a*) *Concentricity.* The axis of half dog points shall be concentric with the axis of the thread within a total indicator reading equivalent to 6% of the nominal screw diameter, but shall in no case exceed 0.25 mm for nominal sizes up to and including 16 mm, nor 0.5 mm for larger sizes.

(*b*) *Squareness.* The plane of the end of the half dog point shall be perpendicular to the axis of the thread within 2 deg.

2.5.5 Flat Points. The plane of the end on flat points shall be perpendicular to the axis of the thread within 2 deg.

3 MATERIALS, PROCESSING, AND MECHANICAL PROPERTIES

Socket set screws shall conform to the following requirements pertaining to materials, processing, mechanical and physical properties, and testing and sampling procedures.

3.1 Materials

3.1.1 Alloy Steel. Alloy steel metric socket set screws shall be fabricated from an alloy steel, and physical properties of screws, fabrication processes, and testing requirements shall conform to ASTM Specification F 912M, Alloy Steel Metric Socket Screws.

3.1.2 Corrosion-Resistant Steel. Corrosion-resistant steel metric socket screws shall be fabricated from austenitic corrosion-resistant steel, and physical properties of screws, fabrication processes, and testing requirements shall conform to ASTM Specification F 880M, Stainless Steel Socket Set Screws. Unless specified otherwise, the property class shall be A1-70.

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APPENDIX I

FORMULAS FOR DIMENSIONS

(This Appendix is not part of ASME/ANSI B18.3.6M-1986, and is included here for information purposes only.)

Cup Point Diameter, Table 2

Types I and III C

C (max.) = No formula; see Table 2

C (min.) = C (max.) — h14 tolerance[1]

Types II, IV, and V C_1

C_1 (max.) = $0.50D$

C_1 (min.) = C_1 (max.) $- 0.125\sqrt{D}$

Flat Point Diameter C_2, Table 2

C_2 (max.) = No formula; see Table 2

C_2 (min.) = C_2 (max.) — h14 tolerance[1]

Oval Point Radius R, Table 2

R (max.) = R (min.) + 0.40 for sizes 1.6 through 3 mm

= R (min.) + 0.80 for sizes 4 mm and larger

R (min.) = $0.75D$

Cone Point Flat A, Table 2

A (max.) = $0.10D$ for sizes 1.6 through 5 mm

= $0.25D$ for sizes 6 mm and larger

A (min.) = 0 for sizes 1.6 through 5 mm

= A (max.) $- 0.05D$ for sizes 6 mm and larger

Half Dog Point Diameter P, Table 2

P (max.) = No formula; see Table 2

P (min.) = P (max.) — h14 tolerance[1]

Half Dog Point Length Q, Table 2.

Q (max.) = No formula; see Table 2

Q (min.) = $0.25D$

NOTE: D is the basic diameter of the screw.

[1]Tolerances from International Standard, System of Limits and Fits, Part 1: General, Tolerances and Deviations, ISO R286-1962.

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APPENDIX II
GOVERNMENT STANDARD ITEMS AND PART NUMBERING SYSTEM

(This Appendix is not part of ASME/ANSI B18.3.6M-1986, and is included here for information purposes only.)

NOTE: The government encourages the general use of this Appendix to achieve maximum parts standardization.

This Appendix establishes standard items for Government application, selected from the possible variations of items within the scope of this Standard, and provides a part numbering system for identification and application in engineering documents.

The following variations are standard:

(*a*) Diameter/Thread Pitch and Length Combinations — as specified in Table II-1

(*b*) Material (Alloy Steel, or Corrosion-Resistant Steel, Property Class A1-70) — as coded in Part Numbering System

(*c*) Finish (Cadmium Plating for Alloy Steel; Cleaning, Descaling, and Passivation for Corrosion-Resistant Steel) — as coded in Part Numbering System

(*d*) Point — Cup, Cone, or Flat Style

(*e*) Special Features — self locking if specified

(*f*) Socket Type — hexagon

The part number shall consist of the following element codes in the order shown:

(*a*) Document identifier — ASME/ANSI Standard number less decimal points

(*b*) Material and finish

(*c*) Nominal diameter

(*d*) Nominal length

(*e*) Point style

(*f*) Special features

(*g*) Socket type

NOTE: The Part Numbering System may also be used for nonstandard diameter and length combinations.

Quality Assurance Provisions. Quality assurance provisions shall be in accordance with ANSI B18.18.1M. Inspection Level B shall apply for thread acceptability.

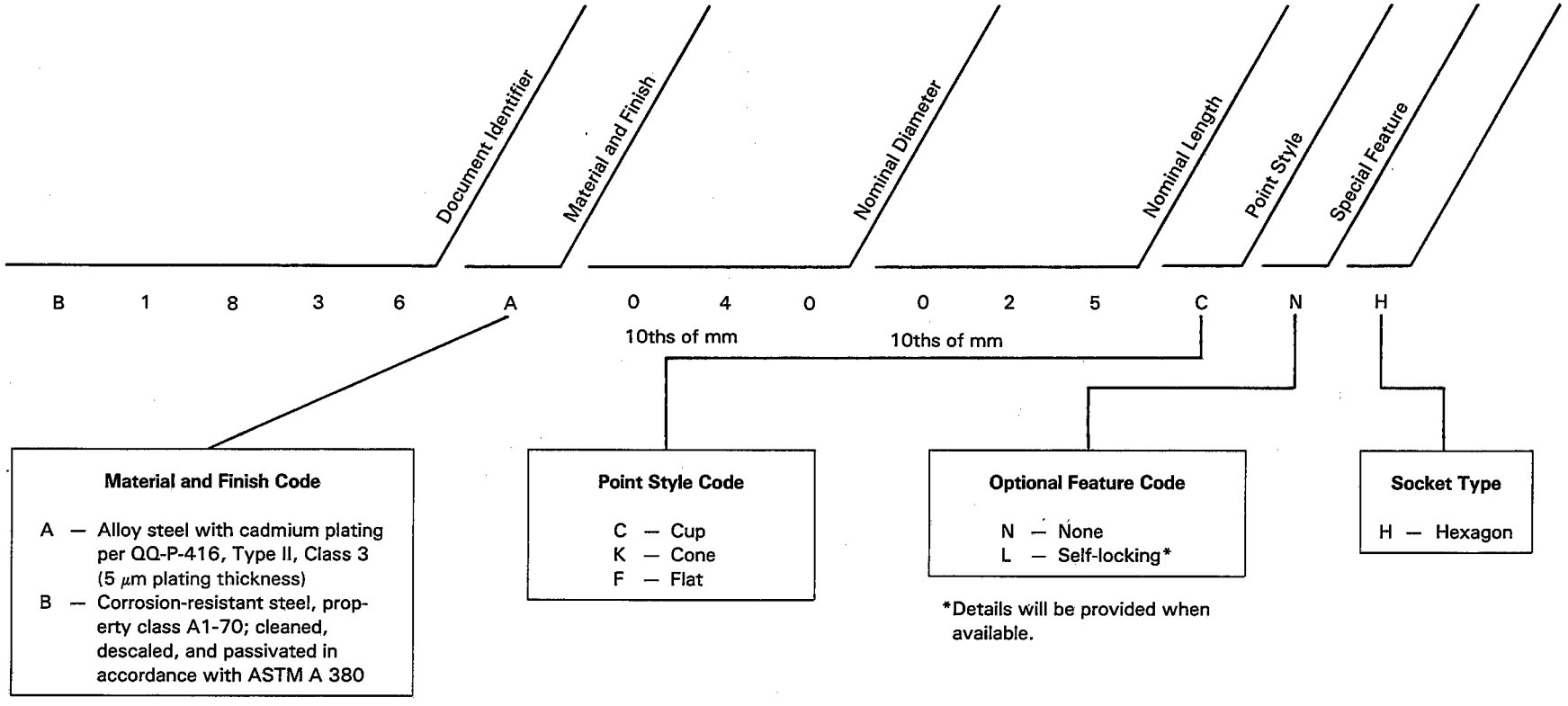
Packaging. Packaging shall be in accordance with ASTM D 3951.

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PART NUMBERING SYSTEM COVERING STANDARD ITEMS FOR GOVERNMENT USE

NOTE: THE GOVERNMENT ENCOURAGES THE GENERAL USE OF THIS SYSTEM TO ACHIEVE MAXIMUM PARTS STANDARDIZATION.



EXAMPLE: B1836A040025CNH indicates a set screw, hexagon socket (metric) made of cadmium plated alloy steel, 4 mm in diameter, 2.5 mm in length, with cup point style, and no special feature.

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ASME B18.3.6M 86 ■ 0759670 0043529 2 ■

TABLE II-1 METRIC HEXAGON SOCKET SET SCREW — STANDARD SIZES FOR GOVERNMENT USE

Nominal Length	Nominal Diameter and Thread Pitch							
	2 × 0.4	3 × 0.5	4 × 0.7	5 × 0.8	6 × 1	8 × 1.25	10 × 1.5	12 × 1.75
1.5	020015							
2		030020						
2.5			040025					
3				050030				
4	020040				060040			
5		030050				080050		
6			040060				100060	
8								120080
10				050100	060100	080100		
12							100120	
16								120160

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APPENDIX III

DIMENSIONS OF METRIC THREADS FOR SOCKET SCREW PRODUCTS

(This Appendix is not part of ASME/ANSI B18.3.6M-1986, and is included here for information purposes only.)

Nominal Size or Basic Thread Diameter	Pitch	Tolerance Class 4g6g [Note (1)]						Tolerance Class [Note (2)]		
		Major Diameter 6g		Pitch Diameter 4g		Allowance g	Root Radius	Major Diameter 6h	Pitch Diameter 4h	GO Gage Minor Diameter
		Max.	Min.	Max.	Min.		Min.	Max.	Max.	
1.6	0.35	1.576	1.496	1.349	1.314	0.024	0.050	1.600	1.373	1.221
2	0.4	1.976	1.886	1.716	1.679	0.024	0.050	2.000	1.740	1.567
2.5	0.45	2.476	2.380	2.184	2.143	0.024	0.050	2.500	2.208	2.013
3	0.5	2.976	2.874	2.651	2.607	0.024	0.062	3.000	2.675	2.459
4	0.7	3.976	3.838	3.521	3.467	0.024	0.088	4.000	3.545	3.242

NOTES:
(1) Applies to unplated or uncoated screws and plated or coated screws before plating or coating.
(2) Applies to plated or coated screws after plating or coating.

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

Small Solid Rivets B18.1.1-1972 (R1983)
Large Rivets B18.1.2-1972 (R1983)
Metric Small Solid Rivets B18.1.3M-1983
Square and Hex Bolts and Screws — Inch Series B18.2.1-1981
Square and Hex Nuts B18.2.2-1972 (R1983)
Metric Hex Cap Screws B18.2.3.1M-1979
Metric Formed Hex Screws B18.2.3.2M-1979
Metric Heavy Hex Screws B18.2.3.3M-1979
Metric Hex Flange Screws B18.2.3.4M-1984
Metric Hex Bolts B18.2.3.5M-1979
Metric Heavy Hex Bolts B18.2.3.6M-1979
Metric Heavy Hex Structural Bolts B18.2.3.7M-1979
Metric Hex Lag Screws B18.2.3.8M-1981
Metric Heavy Hex Flange Screws B18.2.3.9M-1984
Metric Hex Nuts, Style 1 . . . . . B18.2.4.1M-1979
Metric Hex Nuts, Style 2 . . . . . B18.2.4.2M-1979
Metric Slotted Hex Nuts B18.2.4.3M-1979
Metric Hex Flange Nuts B18.2.4.4M-1982
Metric Hex Jam Nuts B18.2.4.5M-1979
Metric Heavy Hex Nuts B18.2.4.6M-1979
Socket Cap, Shoulder and Set Screws (Inch Series) B18.3-1982
Socket Head Cap Screws (Metric Series) B18.3.1M-1986
Metric Series Hexagon Keys and Bits B18.3.2M-1979 (R1986)
Hexagon Socket Head Shoulder Screws (Metric Series) B18.3.3M-1986
Hexagon Socket Button Head Cap Screws (Metric Series) B18.3.4M-1986
Hexagon Socket Flat Countersunk Head Cap Screws (Metric Series) B18.3.5M-1986
Metric Series Socket Set Screws B18.3.6M-1986
Round Head Bolts (Inch Series) B18.5-1978
Metric Round Head Short Square Neck Bolts B18.5.2.1M-1981
Metric Round Head Square Neck Bolts B18.5.2.2M-1982
Wood Screws B18.6.1-1981
Slotted Head Cap Screws, Square Head Set Screws, and Slotted Headless Set Screws B18.6.2-1972 (R1983)
Machine Screws and Machine Screw Nuts B18.6.3-1972 (R1983)
Metric Thread Forming and Thread Cutting Tapping Screws B18.6.5M-1986
Metric Machine Screws B18.6.7M-1985
Thread Forming and Thread Cutting Tapping Screws and Metallic Drive Screws (Inch Series) B18.6.4-1981
General Purpose Semi-Tubular Rivets, Full Tubular Rivets, Split Rivets and Rivet Caps B18.7-1972 (R1980)
Metric General Purpose Semi-Tubular Rivets B18.7.1M-1984
Clevis Pins and Cotter Pins B18.8.1-1972 (R1983)
Taper Pins, Dowel Pins, Straight Pins, Grooved Pins, and Spring Pins (Inch Series) B18.8.2-1978
Plow Bolts B18.9-1958 (R1977)
Track Bolts and Nuts B18.10-1982
Miniature Screws B18.11-1961 (R1983)
Glossary of Terms for Mechanical Fasteners B18.12-1962 (R1981)
Screw and Washer Assemblies — Sems B18.13-1965 (R1983)
Forged Eyebolts B18.15-1985
Mechanical and Performance Requirements for Prevailing-Torque Type Steel Metric Hex Nuts and Hex Flange Nuts B18.16.1M-1979 (R1986)
Torque-Tension Test Requirements for Prevailing-Torque Type Steel Metric Hex Nuts and Hex Flange Nuts B18.16.2M-1979 (R1986)
Dimensional Requirements for Prevailing-Torque Type Steel Metric Hex Nuts and Hex Flange Nuts B18.16.3M-1982
Wing Nuts, Thumb Screws, and Wing Screws B18.17-1968 (R1983)
Inspection and Quality Assurance for General Purpose Metric Fasteners B18.18.1M-1982
Inspection and Quality Assurance for High-Volume Machine Assembly Metric Fasteners B18.18.2M-1982
Inspection and Quality Assurance for Special Purpose Metric Fasteners B18.18.3M-1982
Inspection and Quality Assurance for Highly Specialized Engineered Applications — Metric Fasteners B18.18.4M-1982
Lock Washers B18.21.1-1972 (R1983)
Metric Plain Washers B18.22M-1981
Plain Washers B18.22.1-1965 (R1981)
Beveled Washers B18.23.1-1967 (R1975)

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