

ASME B18.2.5M-2013

(Revision of ASME B18.2.5M-2009)

Metric 12-Point Flange Head Screws

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Date of Issuance: May 22, 2013

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FOREWORD

The ASME B18 Standards Committee 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, Inc.), with the Society of Automotive Engineers and the American Society of Mechanical Engineers (ASME) as joint sponsors. In subsequent years, the Committee came under the sole sponsorship of ASME.

Subcommittee 2 was established and charged with the responsibility for technical content of standards covering wrench head bolts and nuts. In the late 1980s, a draft of B18.2.5M was created and revised for approval. However, in April of 1995, efforts to finalize a draft of this Standard were abandoned. At its meeting on November 28, 2006, Subcommittee 2 again took to the development of this Standard, which was the result of those efforts.

During 2011, a number of issues that needed correcting were brought to the attention of the B18.2 Subcommittee, resulting in this revision. The changes that were made to this Standard conform with other B18 Standards and improve the quality assurance of ASME B18.18.4 through B18.18.

Additionally, the material references for steel screws were changed from ASTM F568M (which has been withdrawn) to ISO 898-1, and the reference for stainless steel was changed from ASTM F738M to ISO 3506-1. The drawings associated with Tables 1 and 2, and the L_G and L_S dimensions for M36 in Table 9, were corrected.

Suggestions for improvement of this Standard are welcome. They should be sent to The American Society of Mechanical Engineers; Attn: Secretary, B18 Standards Committee; Two Park Avenue; New York, NY 10016-5990.

This Standard was approved as an American National Standard on March 13, 2013.



ASME B18 COMMITTEE

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

(The following is the roster of the Committee at the time of approval of this Standard.)

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CORRESPONDENCE WITH THE B18 COMMITTEE

General. ASME Standards are developed and maintained with the intent to represent the consensus of concerned interests. As such, users of this Standard may interact with the Committee by requesting interpretations, proposing revisions, and attending Committee meetings. Correspondence should be addressed to:

Secretary, B18 Standards Committee
The American Society of Mechanical Engineers
Two Park Avenue
New York, NY 10016-5990
<http://go.asme.org/Inquiry>

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.

Proposing a Case. Cases may be issued for the purpose of providing alternative rules when justified, to permit early implementation of an approved revision when the need is urgent, or to provide rules not covered by existing provisions. Cases are effective immediately upon ASME approval and shall be posted on the ASME Committee Web page.

Requests for Cases shall provide a Statement of Need and Background Information. The request should identify the Standard, the paragraph, figure or table number(s), and be written as a Question and Reply in the same format as existing Cases. Requests for Cases should also indicate the applicable edition(s) of the Standard to which the proposed Case applies.

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 that 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.

ASME procedures provide for reconsideration of any interpretation when or if additional information that might affect an interpretation is available. Further, persons aggrieved by an interpretation may appeal to the cognizant ASME Committee or Subcommittee. ASME does not "approve," "certify," "rate," or "endorse" any item, construction, proprietary device, or activity.

Attending Committee Meetings. The B18 Standards Committee regularly holds meetings that are open to the public. Persons wishing to attend any meeting should contact the Secretary of the B18 Standards Committee.



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METRIC 12-POINT FLANGE HEAD SCREWS

1 SCOPE

This Standard covers the complete dimensional and general data for coarse thread metric series 12-point flange screws recognized as American National Standard. The inclusion of dimensional data in this Standard is not intended to imply that all products described are stock production items.

2 COMPARISONS WITH ISO STANDARDS

Letter symbols designating dimensional characteristics are in accord with ISO 225, except where capital letters instead of lowercase letters have been used in the ISO standards.

3 REFERENCED STANDARDS

The following is a list of publications referenced in this Standard. Unless otherwise specified, the standard(s) referenced shall be the most recently issued at the time of order placement.

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

ASME B1.13M, Metric Screw Threads — M Profile

ASME B18.2.8, Clearance Holes for Bolts, Screws, and Studs

ASME B18.2.9, Straightness Gage and Gaging for Bolts and Screws

ASME B18.12, Glossary of Terms for Mechanical Fasteners

ASME B18.18, Quality Assurance for Fasteners

ASME B18.24, Part Identifying Number (PIN) Code System Standard for B18 Externally Threaded Fasteners

ASME Y14.5, Dimensioning and Tolerancing

Publisher: The American Society of Mechanical Engineers (ASME), Two Park Avenue, New York, NY 10016-5990; Order Department: 22 Law Drive, Box 2900, Fairfield, NJ 07007-2900 (www.asme.org)

ASTM F468M Standard Specification for Nonferrous Bolts, Hex Cap Screws, and Studs for General Use

ASTM F788/F788M, Standard Specification for Surface Discontinuities of Bolts, Screws and Studs, Inch and Metric Series

Publisher: American Society for Testing and Materials (ASTM International), 100 Barr Harbor Drive, P.O. Box

C700, West Conshohocken, PA 19428-2559 (www.astm.org)

ISO 225, Fasteners — Bolts, screws, studs, and nuts — Symbols and descriptions of dimensions

ISO 898-1, Mechanical properties of fasteners made of carbon steel and alloy steel — Part 1: Bolts, screws and studs with specified property classes — Coarse thread and fine pitch thread

ISO 3506-1, Mechanical properties of corrosion-resistant stainless steel fasteners — Part 1: Bolts, screws and studs

Publisher: International Organization for Standardization (ISO), 1 ch. de la Voie-Creuse, Case postale 56, CH-1211 Genève 20, Switzerland/Suisse (www.iso.org)

4 TERMINOLOGY

For definitions of terms relating to fasteners or features thereof used in this Standard, refer to ASME B18.12.

5 DIMENSIONS

(a) All dimensions in this Standard are given in millimeters (mm), and apply before any coating, unless stated otherwise.

(b) Symbols specifying geometric characteristics are in accordance with ASME Y14.5.

6 TOP OF HEAD

The top of head shall be chamfered or rounded with diameter of chamfer circle or start of rounding being equal to maximum width across flats within a tolerance of $\pm 15\%$ of maximum width across flats.

7 HEAD HEIGHT

The head height, K , is the distance, parallel to the axis of the screw, from the plane of the bearing circle to the top of the head, not including any raised markings (see section 21).

8 WRENCHING HEIGHT

Corners of the 12 points shall be fully formed and reasonably uniform over the wrenching height, K_w .



Head drive root radius, R_4 , applies to the entire length of the wrenching height, K_w (see Table 1).

9 GAGING OF 12-POINT FLANGE HEAD

The head shall be gaged using two ring gages, A and B , to demonstrate the coincidental acceptability of wrenching height, corner fill, and width across corners. Gage A shall be placed over the head and shall seat on the flange. Gage B shall be placed on the top of the head normal to the screw axis. The two gages shall not be in contact (see Table 2).

10 POSITION OF HEAD

At maximum material condition, the axis of the 12 points of the head shall be within a positional tolerance zone whose diameter is equivalent to 2% of the maximum across flats regardless of feature size as specified in Table 3 with respect to the axis of the shank over a distance under the head equal to the nominal screw diameter, D . The datum shall be as close to the head as practicable, but within $0.5D$ from the head, and shall be either wholly plain body or wholly the thread major diameter, not including the thread runout or the underhead fillet.

11 FLANGE

The top surface of the flange shall be conical or slightly rounded (convex). Radius, R_2 , applies both at the corners and at the flats of the 12-point. The contour of edge at flange periphery, between the maximum flange diameter, D_c maximum, and the minimum bearing circle diameter, D_w minimum, shall be optional provided that the minimum flange edge thickness, C minimum, is maintained at the minimum bearing circle diameter, D_w minimum.

12 BEARING SURFACE

Runout of the bearing surface with respect to the axis of the body shall be within the specified FIM limits in Table 3. Measurement of FIM shall be made as close to the periphery of the bearing surface as possible while the screw is held in a collet or other gripping device at a distance of one-half of the screw diameter from the underside of the head and screw is rotated at least 360 deg.

13 FILLET

The fillet configuration at the junction of the head and shank shall conform to either Type F, as shown in Table 4, which also specifies limits, or Type U, as shown in Table 5, at the option of the manufacturer unless the fillet type is specified by the purchaser. The fillet shall

be a smooth and continuous curve fairing smoothly into the bearing surface and the shank within the limits specified. For Type F, no radius in the fillet contour shall be less than R_1 minimum specified in Table 4.

14 BODY DIAMETER

The diameter of the body, D_s , on screws that are not threaded full length shall be within the limits specified in Table 1, unless the purchaser specifies screws with reduced diameter body. For screws threaded full length, the diameter of the unthreaded shank under the head shall neither exceed the maximum body diameter, D_s maximum, specified in Table 1, nor be less than the minimum body diameter, D_s minimum, specified in Table 5. Screws of nominal lengths equal to or greater than the shortest nominal lengths specified in Table 6 may be obtained with reduced diameter body, if so specified. Where reduced diameter body (or "Type R") is specified, the body diameter, D_2 , shall be within the limits specified in Table 6. The screw shall have a shoulder under the head. The diameter, D_s , and length, L_2 , of the shoulder shall be as specified in Table 6.

15 LENGTH

The length of the screw is the distance, parallel to the axis of the screw, from the plane formed by the underhead bearing circle diameter to the extreme end of the screw. Tolerances for screw lengths are specified in Table 7.

16 POINTS

The end of the screw shall be chamfered or rounded at the manufacturer's option from approximately 0.40 mm below the minor diameter of the thread. The length of the point to the first full-formed thread at major diameter, as determined by the distance the point enters into a cylindrical NOT GO major diameter ring gage, shall not exceed U maximum, specified in Table 8. The end of the screw shall be reasonably square with the axis of the screw, and where pointed blanks are used, the slight rim or cup resulting from roll threading shall be permissible. At the manufacturer's option, the end of the screw may have a rounded point of radius, R_e , as specified in Table 8.

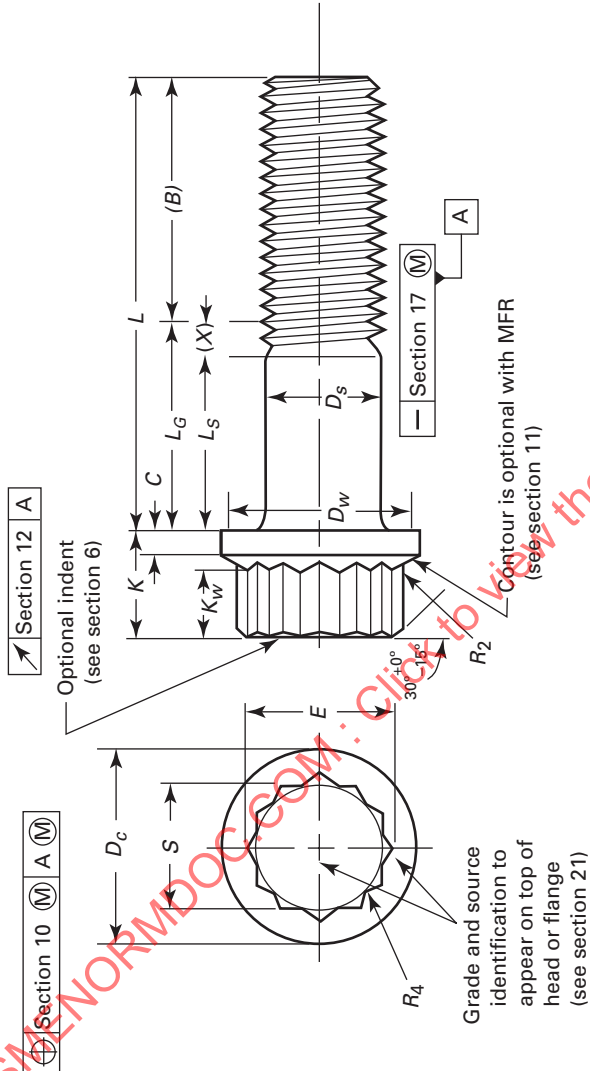
17 STRAIGHTNESS

At maximum material condition, the derived median line of the screw body and thread major diameter shall be within a straightness tolerance zone of a diameter equal to 0.006 times length, expressed as a two-place decimal.

A gage and gaging procedure for checking screw straightness are given in ASME B18.2.9.

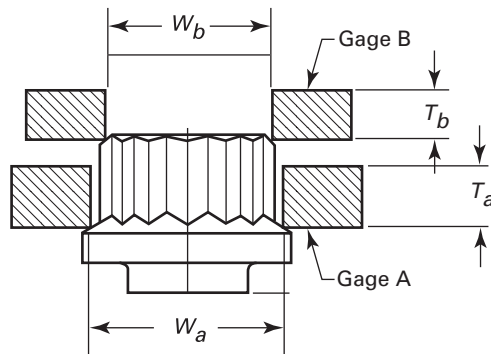


Table 1 Dimensions



Nominal Screw Diameter and Thread Pitch	Body Diameter, D_s		Width Across Flats, S		Minimum Width Across Corners, E	Flange Diameter, D_c		Minimum Bearing Circle Diameter, D_w	Flange Edge Thickness, C		Head Height, K		Minimum Wrenching Height Ref, K_w	Maximum Flange Top Fillet Radius, R_2	Maximum Head Drive Root Radius, R_4
	Max.	Min.	Nom.	Max.	Min.	Max.	Min.		Max.	Min.	Max.	Min.			
M5 x 0.8	5	4.82	5	5.00	4.79	8.72	8.27	8.03	2.25	2.00	5.00	4.88	2.63	0.5	0.3
M6 x 1.0	6	5.82	6	6.00	5.79	10.22	9.77	9.38	2.70	2.45	6.00	5.82	3.12	0.5	0.4
M8 x 1.25	8	7.78	8	8.00	7.78	13.27	12.72	12.33	3.60	3.35	8.00	7.78	4.18	0.5	0.4
M10 x 1.5	10	9.78	10	10.00	9.78	16.27	15.69	15.33	4.50	4.13	10.00	9.78	5.28	0.5	0.5
M12 x 1.75	12	11.73	12	12.00	11.79	18.27	17.67	17.23	5.40	5.03	12.00	11.73	6.33	0.5	0.5
M14 x 2	14	13.73	14	14.00	13.79	21.33	20.67	20.17	6.30	5.93	14.00	13.73	7.43	0.5	0.7
M16 x 2	16	15.73	16	16.00	15.81	24.33	23.62	23.17	7.20	6.83	16.00	15.73	8.53	0.5	0.7
M20 x 2.5	20	19.67	20	20.00	19.82	30.33	29.55	28.87	9.00	8.50	20.00	19.67	10.67	0.5	0.8
M24 x 3	24	23.67	24	24.00	23.75	36.39	35.52	34.81	10.80	10.30	24.00	23.67	12.87	0.5	0.8
M30 x 3.5	30	29.67	30	30.00	29.72	45.39	44.52	43.61	13.50	13.00	30.00	29.67	16.17	0.5	1
M36 x 4	36	35.61	36	36.00	35.70	54.46	52.75	52.54	16.20	15.60	36.00	35.57	19.37	0.5	1.3
See sections	14	14	11	11	11, 12	11	11	7, 21	7, 21	7, 8, 9	11	...



Table 2 Gaging

Nominal Screw Diameter and Thread Pitch	Gage A				Gage B		
	Inside Diameter, W_a		Thickness, T_a		Inside Diameter, W_b		Minimum Thickness, T_b
	Max.	Min.	Max.	Min.	Max.	Min.	
M5 × 0.8	5.79	5.78	1.86	1.85	5.59	5.58	3.0
M6 × 1	6.94	6.93	2.20	2.19	6.69	6.68	3.0
M8 × 1.25	9.25	9.24	2.96	2.95	8.99	8.98	4.0
M10 × 1.5	11.56	11.55	3.75	3.74	11.19	11.18	4.0
M12 × 1.75	13.87	13.86	4.50	4.49	13.49	13.48	5.0
M14 × 2	16.18	16.17	5.29	5.28	15.79	15.78	5.0
M16 × 2	18.49	18.48	6.09	6.08	17.99	17.98	6.0
M18 × 2	20.80	20.79	6.87	6.86	20.38	20.37	6.0
M20 × 2.5	23.11	23.10	7.62	7.61	22.49	22.48	7.0
M24 × 3	27.73	27.72	9.21	9.20	26.99	26.98	8.0
M30 × 3.5	34.66	34.65	11.59	11.58	34.29	34.28	9.0
M36 × 4	41.59	41.58	13.88	13.87	41.19	41.18	11.0

GENERAL NOTES:

- (a) Dimensions are in millimeters.
 (b) Refer to section 9.

Table 3 Tolerance Zones

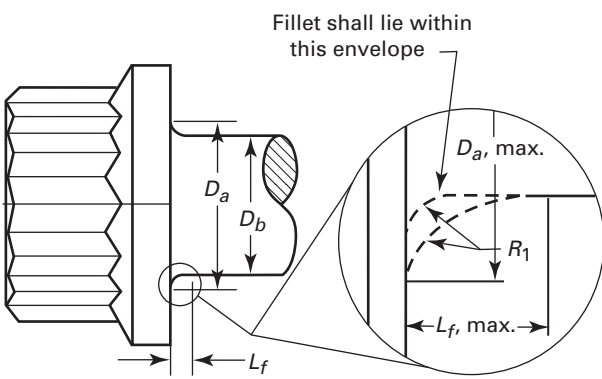
Nominal Screw Diameter and Thread Pitch	Position of Head-to-Shank Tolerance Zone Diameter at MMC	Circular Runout of Bearing Circle to Shank FIM [Note (1)]
M5 × 0.8	0.15	0.14
M6 × 1	0.12	0.16
M8 × 1.25	0.16	0.22
M10 × 1.5	0.20	0.27
M12 × 1.75	0.24	0.30
M14 × 2	0.28	0.35
M16 × 2	0.32	0.40
M20 × 2.5	0.40	0.50
M24 × 3	0.48	0.61
M30 × 3.5	0.60	0.76
M36 × 4	0.72	0.92

GENERAL NOTE: Dimensions are in millimeters.

NOTE:

- (1) Circular runout of bearing circle to shank is based on 1 deg and the minimum bearing circle diameter, D_w min.



Table 4 Dimensions of Type F Underhead Fillets


Nominal Screw Diameter and Thread Pitch	Maximum Fillet Transition Diameter, D_a	Maximum Fillet Length, L_f	Minimum Fillet Radius, R_1	Minimum Wire Diameter, D_s PD-6g
M5 × 0.8	5.7	0.6	0.2	4.36
M6 × 1	6.8	0.68	0.25	5.21
M8 × 1.25	9.2	1.02	0.4	7.04
M10 × 1.5	11.2	1.02	0.4	8.86
M12 × 1.75	13.7	1.87	0.6	10.68
M14 × 2	15.7	1.87	0.6	12.5
M16 × 2	17.7	1.87	0.6	14.5
M20 × 2.5	22.4	2.04	0.8	18.16
M24 × 3	26.4	2.04	0.8	21.8
M30 × 3.5	33.4	2.89	1	27.46
M36 × 4	39.4	2.89	1	33.12

GENERAL NOTE: Dimensions are in millimeters.

18 THREADS

18.1 Thread Series and Tolerance Class

Screw threads shall be coarse pitch general-purpose metric screw threads with tolerance Class 6g conforming to ASME B1.13M, unless otherwise specified by the purchaser. For screws with additive finish, size limits for tolerance Class 6g apply before coating, and the thread profile after coating is subject to acceptance using a 6h GO thread gage and tolerance Class 6g thread NOT GO thread gage.

18.2 Thread Gaging

Unless otherwise specified, dimensional acceptability of screw threads shall be determined based on System 21, ASME B1.3M.

19 LENGTH MEASUREMENTS

The length of thread on screws is controlled by the maximum grip length, L_g maximum, and the minimum body length, L_s minimum, as set forth in paras. 19.1 through 19.4.

19.1 Grip Length, L_g

The grip length, L_g , is the distance, measured parallel to the axis of the screw, from the plane of the bearing circle diameter to the face of a noncountersunk, non-countersunk GO thread ring gage assembled by hand as far as the thread will permit. For standard diameter length combinations of screws, the values for L_g maximum are specified in Table 9. For diameter-length combinations not listed in Table 9, the maximum grip length for long screws that are not threaded full length is equal to the nominal screw length, L , minus the reference thread length, B , as specified in Table 10.

$$L_g \text{ maximum} = L \text{ nominal} - B$$

For short screws of nominal lengths, L , that are shorter than the lengths specified in Table 10 for screws threaded full length,

$$L_g \text{ maximum} = A \text{ maximum}$$

as specified in Table 10.

19.2 Body Length, L_s

Body length, L_s , on long screws that are not threaded full length is the distance, parallel to the axis of the screw, from the plane of the bearing circle to the last scratch of thread or top of the extrusion angle, whichever is closer to the head. For standard diameter-length combinations of screws, the values for L_s minimum are specified in Table 9. For diameter-length combinations not listed in Table 9, the minimum body length on screws that are not threaded full length is equal to the maximum grip length, as determined above, minus the transition thread length, X , as specified in Table 10.

$$L_s \text{ minimum} = L_g \text{ maximum} - X$$

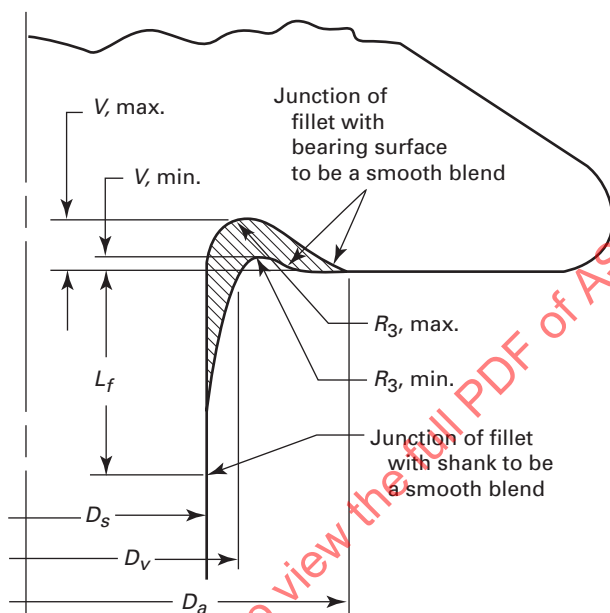
19.3 Thread Length, B

The thread length, B , specified in Table 10, is a reference dimension intended for calculation purposes only, and is the distance, parallel to the axis of the screw, from the extreme end of the screw to the last complete (full-form) thread.

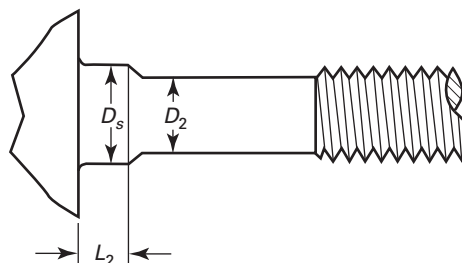
19.4 Transition Thread Length, X

The transition thread length, X , specified in Table 10, is a reference dimension intended for calculation purposes only. It includes the length of incomplete threads and tolerances on grip length and body length. The transition from full-form thread to incomplete thread shall be smooth and uniform. The major diameter of the incomplete threads shall not exceed the actual major diameter of the complete (full-form) threads. The transition threads shall have a rounded root contour.



Table 5 Dimensions of Type U Underhead Fillets

Nominal Screw Diameter	Maximum Undercut Diameter, D_a	Maximum Fillet Diameter, D_v	Minimum Body Diameter for Short Screws, D_s	Maximum Fillet Length, L_f	Undercut Radius, R_3		Undercut Depth, V	
					Max.	Min.	Max.	Min.
M5	6.2	5.5	4.36	1.4	0.25	0.10	0.15	0.05
M6	7.5	6.6	5.21	1.6	0.26	0.11	0.20	0.05
M8	10.0	8.8	7.04	2.1	0.36	0.16	0.25	0.10
M10	12.5	10.8	8.86	2.1	0.45	0.20	0.30	0.15
M12	15.2	12.8	10.68	2.1	0.54	0.24	0.35	0.15
M14	17.7	14.8	12.50	2.1	0.63	0.28	0.45	0.20
M16	20.5	17.2	14.50	3.2	0.72	0.32	0.50	0.25
M20	25.5	21.2	18.07	3.2	0.89	0.40	0.62	0.31
M24	30.7	25.4	21.75	3.2	1.07	0.48	0.75	0.39
M30	38.5	31.7	27.26	4.5	1.33	0.61	0.93	0.49
M36	46.2	38.0	32.77	4.5	1.60	0.73	1.12	0.60

Table 6 Dimensions of Reduced Body Diameter (Type R)

Nominal Screw Diameter	Shortest Nominal Screw Length, L	Reduced Body Diameter, D_2		Shoulder Diameter, D_s [Note (1)]		Shoulder Length, L_2 [Note (1)]	
		Max.	Min.	Max.	Min.	Max.	Min.
M5	30	4.54	4.36	5	4.82	3.5	2.5
M6	35	5.39	5.21	6	5.82	4.0	3.0
M8	40	7.26	7.04	8	7.78	5.0	4.0
M10	45	9.08	8.86	10	9.78	6.0	5.0
M12	50	10.95	10.68	12	11.73	7.0	6.0
M14	55	12.77	12.50	14	13.73	8.0	7.0
M16	60	14.77	14.50	16	15.73	9.0	8.0
M20	70	18.44	18.16	20	19.67	11.0	10.0
M24	80	22.11	21.80	24	23.67	13.0	12.0
M30	100	27.78	27.46	30	29.67	16.0	15.0
M36	115	33.45	33.12	36	35.61	19.0	18.0

GENERAL NOTE: Dimensions are in millimeters.

NOTE:

(1) Shoulder is mandatory (see section 14).

Table 7 Length Tolerances, L , mm

Nominal Lengths, L , mm	Length Tolerances
Over 6 through 10	± 0.29
Over 10 through 18	± 0.35
Over 18 through 30	± 0.42
Over 30 through 50	± 0.50
Over 50 through 80	± 0.60
Over 80 through 120	± 0.70
Over 120 through 180	± 0.80
Over 180 through 250	± 0.92
Over 250 through 315	± 1.05
Over 315 through 400	± 1.15
Over 400 through 500	± 1.25

Table 8 Dimensions of Points

Nominal Screw Diameter	Approximate Point Radius, Reference	Maximum Point Length, U
M5	7	1.6
M6	8.4	2
M8	11.2	2.5
M10	14	3
M12	16.8	3.5
M14	19.6	4
M16	22.4	4
M20	28	5
M24	33.6	6
M30	42	7
M36	50.4	9

GENERAL NOTE: Dimensions are in millimeters.

Table 10 Thread Lengths

Nominal Screw Diameter and Thread Pitch	Thread Length, Basic, <i>B</i> (Reference)				Screws Threaded Full Length				
	Screw Length, <i>L</i> ≤ 125	Screw Length, <i>L</i> > 125 and ≤ 200	Screw Length, <i>L</i> > 200	Transition Thread Length, <i>X</i> (Reference)	Screw Length, <i>L</i> Under	Maximum Unthreaded Length Under Head, <i>A</i>	Screw Length, <i>L</i>		Maximum Unthreaded Length Under Head, <i>A</i>
							At Least	Under	
M5 × 0.8	16.00	22.00	35.00	4.00	10.00	1.20	10.00	25.00	2.40
M6 × 1	18.00	24.00	37.00	5.00	12.00	1.50	12.00	30.00	3.00
M8 × 1.25	22.00	28.00	41.00	6.25	16.00	1.90	16.00	40.00	4.00
M10 × 1.5	26.00	32.00	45.00	7.50	20.00	2.20	20.00	45.00	4.50
M12 × 1.75	30.00	36.00	49.00	8.75	24.00	2.60	24.00	55.00	5.30
M14 × 2	34.00	40.00	53.00	10.00	28.00	3.00	28.00	60.00	6.00
M16 × 2	38.00	44.00	57.00	10.00	32.00	3.30	32.00	65.00	6.00
M20 × 2.5	46.00	52.00	65.00	12.50	40.00	3.90	40.00	80.00	7.50
M24 × 3	54.00	60.00	73.00	15.00	48.00	4.50	48.00	90.00	9.00
M30 × 3.5	66.00	72.00	85.00	17.50	60.00	5.40	60.00	110.00	10.50
M36 × 4	...	84.00	97.00	20.00	72.00	6.30	72.00	140.00	12.00

20 MATERIALS AND MECHANICAL PROPERTIES

20.1 Steel

Unless otherwise specified, steel screws shall conform to the requirements of ISO 898-1, Property Class 12.9.

20.2 Corrosion-Resistant Steels

Unless otherwise specified, corrosion-resistant steel screws shall conform to the requirements of ISO 3506-1 for the specified property class.

20.3 Nonferrous Metals

Unless otherwise specified, nonferrous screws shall conform to the requirements of ASTM F468M or the specified property alloy.

21 IDENTIFICATION SYMBOLS

Markings shall be raised or recessed on the top of the head or raised on the top of the flange unless otherwise specified by the purchaser. Markings shall be legible to the unaided eye with the exception of corrective lenses. When raised, markings shall project not less than 0.1 mm for M14 and smaller screws, and 0.3 mm for M16 screws, above the top surface of the head or flange; and total head height (head plus markings) shall not exceed the specified maximum head height, *K* maximum, plus 0.1 mm for M5 and M6 screws, 0.2 mm for M8 and M10 screws, 0.3 mm for M12 and M14 screws, and 0.4 mm for M16 screws.

21.1 Property Class Symbols

Each screw shall be marked in accordance with the requirements of the applicable specification for its material and mechanical properties.

21.2 Source Symbols

Each screw shall be marked to identify its source (manufacturer or private label distributor).

22 FINISH

Unless otherwise specified, screws shall be furnished with one of the following "standard surfaces as manufactured," at the option of the manufacturer:

- (a) bright uncoated
- (b) thermal black oxide
- (c) chemical black oxide

Hydrogen embrittlement tests shall not be required for screws furnished in these conditions.

For other protective finishes specified with an applicable finish specification, precautions to minimize embrittlement shall be exercised.

23 WORKMANSHIP

Screws shall be free from surface imperfections such as burrs, seams, laps, loose scale, and other surface irregularities that could affect serviceability.

24 INSPECTION AND QUALITY ASSURANCE

Unless otherwise specified, acceptability of screws shall be determined in accordance with ASME B18.18.

25 CLEARANCE HOLES

The recommended sizes of clearance holes in material to be assembled using 12-point flange screws are the normal series given in ASME B18.2.8.

