Erratum
to
ASME B18.2.7.1M-2002
Metric 12-Spline Flange Screws

On page 6, angle in right figure to Table 4 revised. The complete table appears on the overleaf.

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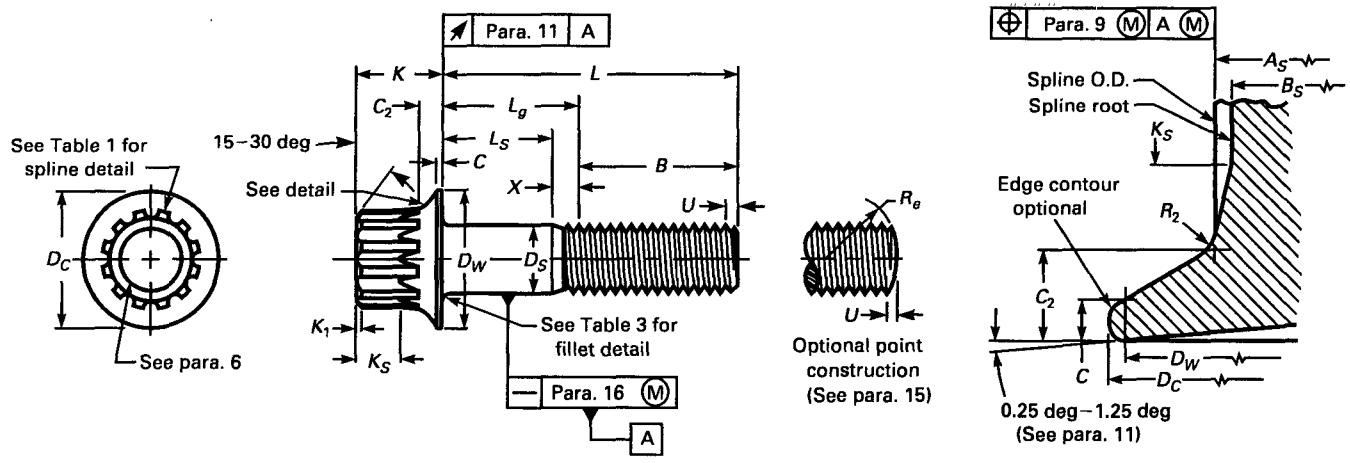
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12-Spline Flange Screws

TABLE 4 DIMENSIONS OF 12-SPLINE FLANGE SCREWS

Nominal Screw Size & Thread Pitch	Spline Size [Note (1)]	Body Diameter, D_s [Note (2)] Max.	Body Diameter, D_s [Note (2)] Min.	Max. Flange Diameter, D_c [Note (3)]	Min. Bearing Circle Diameter, D_w [Note (4)]	Min. Flange Edge Thickness, C [Note (5)]	Min. Flange Height, C_2	Min. Spline Height, K_s [Note (6)]	Max. Head Height, K [Note (7)]	Max. Chamfer Height, K_1 [Note (8)]	Min. Spline Junction Radius, R_2	Thread Length, B, Reference: For Screw Length ≤ 125 mm [Note (9)]	Thread Length, B, Reference: For Screw Lengths > 125 mm and ≤ 200 mm [Note (9)]	Thread Length, B, Reference: For Screw Lengths > 200 mm [Note (9)]	Transition Thread Length, X, Reference [Note (9)]
M5 × 0.8	5	5.00	4.82	9.4	8.4	1.0	1.7	1.8	5.0	0.6	0.4	16.0	22.0	35.0	4.0
M6 × 1	6	6.00	5.82	11.3	10.2	1.2	2.1	2.2	6.0	0.7	0.5	18.0	24.0	37.0	5.0
M8 × 1.25	8	8.00	7.78	15.0	13.7	1.5	2.7	3.0	8.0	1.0	0.6	22.0	28.0	41.0	6.2
M10 × 1.5	10	10.00	9.78	18.6	17.1	2.0	3.4	3.8	10.0	1.2	0.7	26.0	32.0	45.0	7.5
M12 × 1.75	12	12.00	11.73	22.8	21.2	2.3	4.1	4.5	12.0	1.5	0.8	30.0	36.0	49.0	8.8
M14 × 2	14	14.00	13.73	26.4	24.5	2.7	4.8	5.4	14.0	1.8	0.9	34.0	40.0	53.0	10.0
M16 × 2	16	16.00	15.73	30.3	28.1	3.2	5.7	5.8	16.0	2.1	1.0	38.0	44.0	57.0	10.0
M20 × 2.5	20	20.00	19.67	37.4	34.9	4.1	7.2	7.2	20.0	2.5	1.2	46.0	52.0	65.0	12.5

GENERAL NOTE: All dimensions are in millimeters.

NOTES:
(1) See para. 5.
(2) See para. 13.
(3) See para. 10.
(4) See para. 11.
(5) See para. 10.
(6) See para. 8.
(7) See para. 7.
(8) See para. 6.
(9) See para. 17.

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METRIC 12-SPLINE FLANGE SCREWS

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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, Inc.), with the Society of Automotive Engineers and the American Society of Mechancial Engineers as joint sponsors. Subcommittee 2 was subsequently established and charged with the responsibility for technical content of standards covering wrench head bolts and nuts.

In 1971, the ANSI Special Study Committee began an investigation of optimum head designs for metric fasteners. A new head configuration which would have superior performance capabilities when compared to a standard hexagon head design was envisioned. These studies led to the development of a 12-spline flanged screw which was determined to have the following advantages:

(a) Lower nominal bearing pressures

(b) Flange protection of assembled surfaces against abrasion due to wrenching tools

(c) Lower stress concentration factors in head-to-shank fillets

(d) Significant savings in raw material, about 30% in smaller sizes and 10% in intermediate sizes

A detailed analysis is included in "Transition of Technical Conference on Metric Mechanical Fasteners", ANSI SR17 or ASTM STP 587.

Published originally as IFI-511 in 1976, the standard was withdrawn in 1986 because of relatively small demand. However, B18 has reviewed this standard and felt that it offers significant product advantages which may encourage its increased acceptance. Subcommittee 2 of B18 was assigned the responsibility of developing this new consensus standard. Beginning in 1996, this standard was completed and approved by the B18 Standards Committee on May 1, 2001.

This Standard was approved by the American National Institute on January 24, 2002.

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

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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.

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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.

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METRIC 12-SPLINE FLANGE SCREWS

1 GENERAL DATA

1.1 Scope

(a) This Standard covers the complete general and dimensional data for metric 12-spline flange screws recognized as American National Standard.

(b) The inclusion of dimensional data in this Standard is not intended to imply that all of the sizes in conjunction with the various options described herein are stock items. Consumers should consult with suppliers concerning lists of stock production 12-spline flange screws.

(c) The wrenching configuration is defined in SAE AS1325.

2 COMPARISON WITH ISO STANDARDS

(a) At this time no ISO standard for spline drive screws exists, except those for aerospace fasteners included in ISO 9254 and ISO 9255. Further, no work within ISO is expected for some time. These splines are not interchangeable with the aerospace ISO spline designs.

(b) Letter symbols designating dimensional characteristics are in accord with those used in ISO standards, except where capitals have been used instead of lower case letters used in ISO standards.

3 REFERENCED STANDARDS

Unless otherwise specified, the standard(s) referenced shall be the most recent issue at the time of order placement.

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

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

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

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

ASME Y14.5M, Dimensioning and Tolerancing

Publisher: 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 F 468M, Standard Specification for Nonferrous Bolts, Hex Cap Screws, and Studs for General Use (Metric)

ASTM F 568M, Standard Specification for Carbon and Alloy Steel Externally Threaded Metric Fasteners

ASTM F 738M, Standard Specification for Stainless Steel Metric Bolts, Screws and Studs

ASTM F 788/F 788M, Standard Specification for Surface Discontinuities of Bolts, Screws, and Studs, Inch and Metric Series

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

SAE AS1325, Wrench Configuration, 12 Lobed Drive

Publisher: Society of Automotive Engineers (SAE), 400 Commonwealth Drive, Warrendale, PA 15096-0001

ISO 9254, Aerospace—Bolt, Normal Spline Head, Normal or Pitch Diameter Shank, Long Length MJ Threads, Metallic Material, Coated or Uncoated, Strength Classes Less Than or Equal to 1100 MPa—Dimensions

ISO 9255, Aerospace—Bolts, Normal Spline Head, Normal Shank, Short or Medium Length MJ Threads, Metallic Material, Coated or Uncoated, Strength Classes Less Than or Equal to 1100 MPa—Dimensions

Publisher: International Organization for Standardization (ISO), 1 rue de Varembé, Case Postale 56, CH-1211, Genève 20, Switzerland/Suisse

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4 DIMENSIONS

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

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

5 SPLINE

Dimensions of the spline are given in Table 1.

6 TOP OF HEAD

The top of head shall be either full form or indented, at manufacturer's option. Top of head shall be chamfered or rounded, and the minimum diameter of chamfer circle or start of rounding shall be the minimum O.D. of spline, A_s min., minus 2 times the maximum chamfer height, K_1. For indented heads, the indent shall have a maximum diameter equal to 0.75 times the minimum root of spline, B_s min., and a depth not to exceed the maximum chamfer height, K_1.

7 HEAD HEIGHT

The head height, K, is the distance, as measured parallel to the axis of the screw, from the top of the head, excluding raised markings, to the plane of the bearing circle diameter.

8 SPLINE HEIGHT

The spline height, K_s, is the distance from the top of the head to the end of the full form spline; i.e., the intersection of the top of the extrusion angle with the spline root.

9 POSITION OF HEAD

At maximum material condition, the axis of the outside diameter of the spline, A_s, shall be within a positional tolerance zone of the diameter specified in Table 2 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 pitch diameter, not including the thread runout or the underhead fillet.

10 FLANGE

The top surface of the flange shall be conical or slightly rounded and the periphery shall be round within the specified maximum flange diameter and a tolerance of minus 5 percent. The contour of edge at flange periphery shall be optional, provided the minimum flange thickness is maintained at the minimum bearing circle diameter.

11 BEARING SURFACE

The bearing surface shall be conical 0.75±0.50 deg concave from the plane formed by the bearing circle diameter. The plane formed by the bearing circle shall be perpendicular to the axis of the shank, over a length under the head equal to the nominal screw diameter D, within the circular runout specified in Table 2. The measurement of bearing face runout shall be made at the actual bearing circle; i.e., at the line of highest points on any radial line e.g., by use of a straight edge anvil. 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 pitch diameter, not including the thread runout or the underhead fillet.

12 FILLET

The fillet configurations at the junction of the head and shank shall be either Style A or Style B (Table 3), at the option of the manufacturer, unless the fillet style is specified by the purchaser.

NOTE: Analytical research conducted in the design of the fillet concluded that the maximum stress concentration factors occurring with Styles A and B configurations were essentially the same.

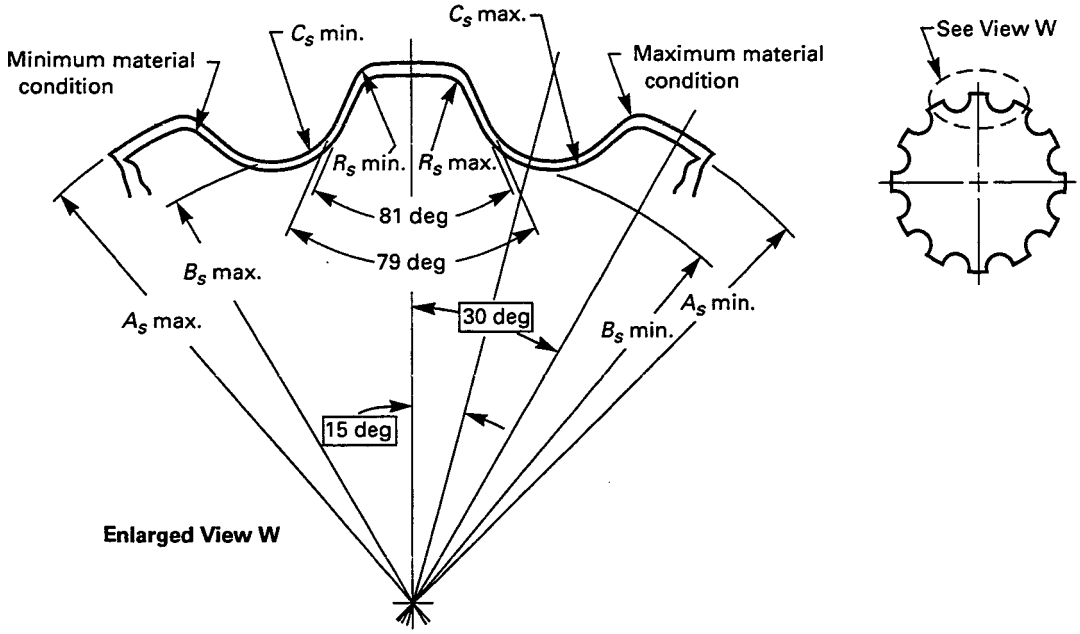
The fillet shall be a smooth and continuous curve fairing smoothly into the underhead bearing surface and the shank within the limits specified in Table 3.

13 BODY DIAMETER

The diameter of the body on screws which are not threaded full length shall be within the limits specified for D_s in Table 4. For screws threaded full length, the diameter of the unthreaded shank under the head shall not exceed the specified maximum body diameter, D_s, in Table 4, nor be less than the minimum body diameter given in Table 2.

Screws of nominal lengths equal to or greater than the shortest nominal lengths specified in Table 5 may

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12-Spline

TABLE 1 WRENCHING CONFIGURATIONS FOR 12-SPLINE FLANGE SCREWS

	Max. Material Condition				Min. Material Condition			
Spline Size	Max. Diameter, A_s	Max. Diameter, B_s	Min. Radius, C_s	Min. Radius, R_s	Min. Diameter, A_s	Min. Diameter, B_s	Max. Radius, C_s	Max. Radius, R_s
5	5.86	5.22	0.55	0.13	5.71	5.07	0.70	0.26
6	7.02	6.26	0.61	0.13	6.82	6.06	0.76	0.26
8	9.37	8.34	0.75	0.23	9.17	8.14	0.90	0.39
10	11.70	10.42	0.95	0.23	11.50	10.22	1.10	0.39
12	14.04	12.50	1.10	0.36	13.84	12.30	1.25	0.52
14	16.29	14.59	1.30	0.48	16.06	14.36	1.45	0.64
16	18.71	16.66	1.40	0.48	18.48	16.43	1.55	0.64
20	23.40	20.83	1.75	0.74	23.17	20.60	1.90	0.90

GENERAL NOTES:
(a) All dimensions are in millimeters.
(b) See paras. 5 and 6.

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 5. 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 5.

14 LENGTH

The length of the screw shall be measured parallel to the axis of the screw from the plane formed by the underhead bearing circle diameter to the extreme end of the shank. Tolerances for screw lengths are given in Table 6.

15 POINT

Point shall be chamfered or rounded at manufacturer's option from approximately 0.40 mm below the minor diameter of the thread. The first full formed thread is located a distance no greater than two times the pitch measured from the end of the screw. The distance is to be determined by measuring how far the point enters into a cylindrical NOT GO major diameter ring gage.

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TABLE 2 POSITION TOLERANCE, CIRCULAR RUNOUT, AND MINIMUM BODY DIAMETER

Nominal Screw Size	Position of Head-to-Shank Tolerance Zone Diameter at MMC [Note (1)]	Circular Runout of Bearing Circle FIM [Note (2)]	Min. Body Diameter for Screws Threaded to Head [Note (3)]
M5 × 0.8	0.35	0.15	4.38
M6 × 1	0.44	0.18	5.28
M8 × 1.25	0.44	0.24	7.07
M10 × 1.5	0.54	0.30	8.89
M12 × 1.75	0.54	0.37	10.71
M14 × 2	0.54	0.43	12.54
M16 × 2	0.66	0.49	14.54
M20 × 2.5	0.66	0.61	18.20

GENERAL NOTE: All dimensions are in millimeters.
NOTES:
(1) See para. 9.
(2) See para. 11.
(3) See para. 13.

When supplied, the point radius, R_e, and maximum point length, U, shall be specified in Table 7.

16 STRAIGHTNESS

At maximum material condition, the axes of the screw body and thread major diameter shall be within a straightness tolerance diameter equal to 0.006 times the nominal product length, L, expressed as a two-place decimal. A gage and gaging procedure for checking screw straightness is given in Nonmandatory Appendix A.

17 THREAD LENGTH

The length of thread on screws shall be controlled by the maximum grip gaging length, L_g, and the minimum body length, L_s, as set forth in paras. 17.2 through 17.5. For standard diameter-length combinations of screws, the values for $L_g$max. and $L_s$min. are specified in Table 8.

NOTE: Incorporation of a common L_g and L_s length for adjacent bolt lengths allows the manufacturer to use fewer tools and reduce set-up time when making these products. When this concept does not suit the intended application, the required L_g and L_s dimensions may be calculated using the formulas given in paras. 17.2 and 17.3.

17.1 Grip Gaging Length, $L_g$max.

Grip gaging length, $L_g$max., is the distance, measured parallel to the axis of the screw, from the plane formed by the bearing circle diameter to the face of a noncounterbored or noncountersunk standard GO thread ring gage assembled by hand as far as the thread will permit. For standard diameter-length combinations of screws, the values for $L_g$max. are specified in Table 8. For diameter-length combinations not listed in Table 8, the maximum grip gaging length, as calculated and rounded to one decimal place, shall be equal to the nominal screw length, L, minus the reference nominal thread length, B, as specified in Table 4.

$$L_g \text{ max.} = L - B$$

$L_g$max. shall be used as a criterion for inspection.

17.2 Body Length, L_s min.

Body length, L_s min., is the distance, measured parallel to the axis of the screw, from the plane formed by the bearing circle diameter to the last scratch of thread or the top of the extrusion angle, whichever is closest to the head. For standard diameter-length combinations of screws, the values of L_s min. are specified in Table 8. For diameter-length combinations not listed in Table 8, the minimum body length, as calculated and rounded to one decimal place, shall be equal to the maximum grip gaging length (as computed) minus the reference transition thread length, X, as given in Table 4.

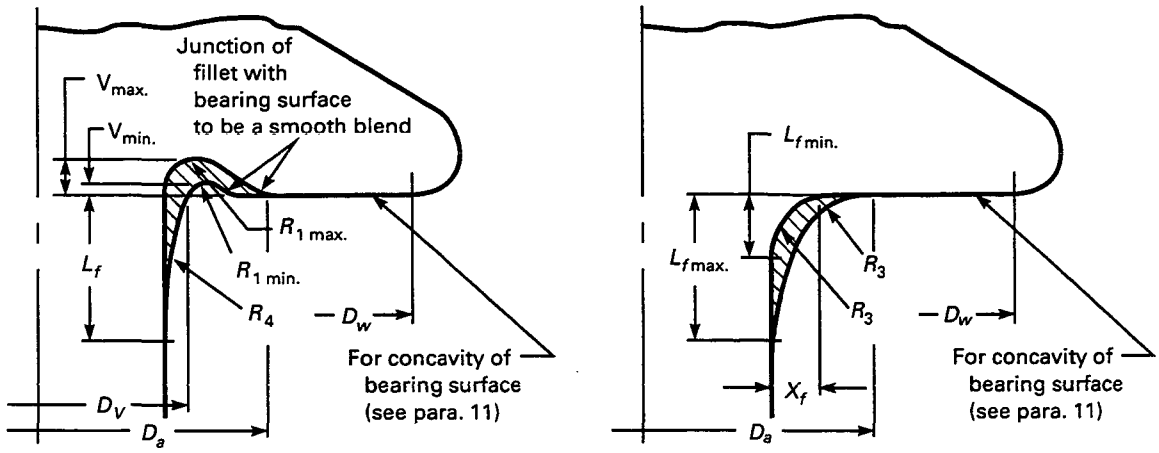
$$L_s \text{ min.} = L_g \text{ max.} - X$$

$L_s$min. shall be used as a criterion for inspection. Screws of nominal lengths which have a calculated L_s min. value equal to or less than 2.5 times the thread pitch shall be threaded full length. For screws which are threaded full length, the distance from the plane formed by the bearing circle diameter to the face of a noncounterbored or noncountersunk standard GO thread ring gage assembled by hand as far as the thread will permit shall not exceed a length equal to 3.0 times the thread pitch.

17.3 Nominal Thread Length, B

Nominal thread length, B, as specified in Table 4 is a reference dimension intended for calculation purposes only, and is the distance, measured parallel to the axis

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Fillets

TABLE 3 FILLET CONFIGURATION DIMENSIONS

	Style A								Style B				
			V			R_1					L_f		
Nominal Screw Size	Max. D_a	Max. D_v	Max.	Min.	Max. L_f	Max.	Min.	Reference, R_4	Max. D_a	Min. X_f	Max.	Min.	Min. R_3
M5 × 0.8	6.1	5.5	0.15	0.05	1.4	0.25	0.10	4.05	5.6	0.20	1.4	0.7	0.15
M6 ×1	7.4	6.6	0.18	0.07	1.6	0.29	0.12	4.60	6.7	0.25	1.6	0.8	0.18
M8 × 1.25	10.1	8.8	0.24	0.11	2.1	0.36	0.16	5.71	9.0	0.35	2.1	1.0	0.25
M10 × 1.5	12.5	10.8	0.31	0.13	2.1	0.45	0.20	5.71	11.0	0.35	2.1	1.0	0.25
M12 × 1.75	15.7	12.8	0.37	0.16	2.1	0.54	0.24	5.71	13.0	0.35	2.1	1.0	0.25
M14 × 2	18.1	14.8	0.43	0.19	2.1	0.63	0.28	5.71	15.0	0.35	2.1	1.0	0.25
M16 × 2	20.5	17.2	0.51	0.23	3.2	0.72	0.32	8.83	17.5	0.55	3.2	1.6	0.37
M20 × 2.5	26.1	21.6	0.65	0.29	4.2	0.90	0.40	11.42	22.0	0.80	4.2	2.1	0.50

GENERAL NOTES:
(a) All dimensions are in millimeters.
(b) See para. 12.

of the screw, from the extreme end of the screw to the last complete (full form) thread.

17.4 Transition Thread Length, *X*

Transition thread length, *X*, as specified in Table 4 is a reference dimension intended for calculation purposes only. It includes the length of incomplete threads and tolerances on grip gaging length and body length. The transition from full 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. For screws of Property Class 10.9 and higher strength materials (tensile strength 1040 MPa and higher), the transition threads shall have a rounded root contour.

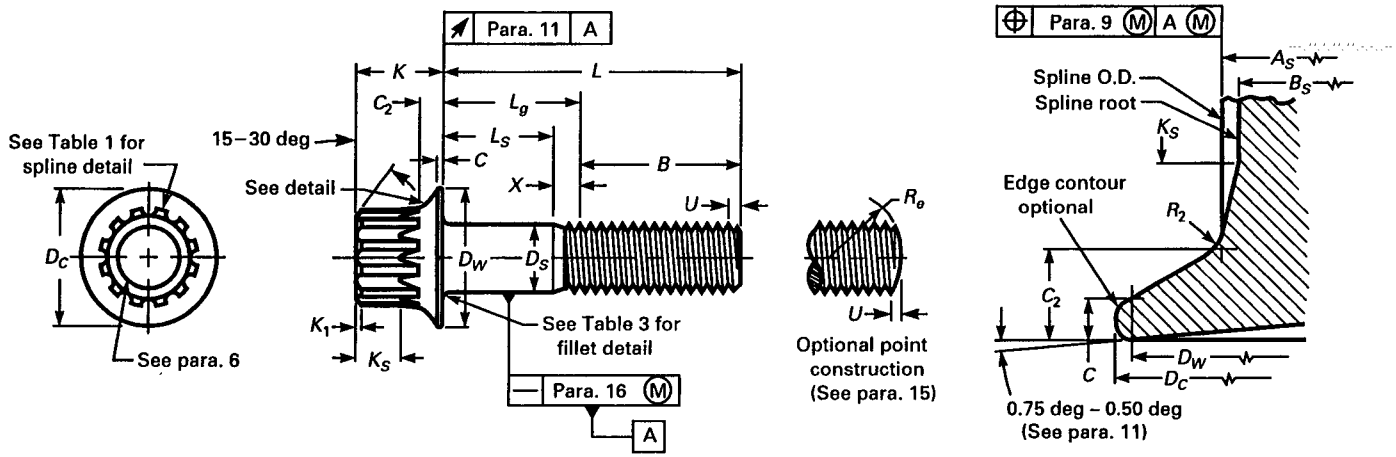
18 THREADS

18.1 Thread Series and Tolerance Class

Threads shall be metric coarse thread series conforming to dimensions for general purpose external threads given in ASME B1.13M, unless otherwise specified by the purchaser. The Class 6g tolerance shall apply to plain finish (unplated or uncoated) screws and to plated or coated screws before plating or coating. For screws with additive finish, the 6g diameters may be exceeded by the amount of the allowance; i.e., the basic diameters shall apply to screws after plating or coating and acceptance shall be determined on the basis of a 6h GO gage. Threads shall be rolled unless otherwise agreed between manufacturer and purchaser.

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12-Spline Flange Screws

TABLE 4 DIMENSIONS OF 12-SPLINE FLANGE SCREWS

Nominal Screw Size & Thread Pitch	Spline Size [Note (1)]	Body Diameter, D_s [Note (2)] Max.	Body Diameter, D_s [Note (2)] Min.	Max. Flange Diameter, D_c [Note (3)]	Min. Bearing Circle Diameter, D_W [Note (4)]	Min. Flange Edge Thickness, C [Note (5)]	Min. Flange Height, C_2	Min. Spline Height, K_s [Note (6)]	Max. Head Height, K [Note (7)]	Max. Chamfer Height, K_1 [Note (8)]	Min. Spline Junction Radius, R_2	Thread Length, B, Reference: For Screw Length ≤ 125 mm [Note (9)]	Thread Length, B, Reference: For Screw Lengths > 125 mm and ≤ 200 mm [Note (9)]	Thread Length, B, Reference: For Screw Lengths > 200 mm [Note (9)]	Transition Thread Length, X, Reference [Note (9)]
M5 × 0.8	5	5.00	4.82	9.4	8.4	1.0	1.7	1.8	5.0	0.6	0.4	16.0	22.0	35.0	4.0
M6 × 1	6	6.00	5.82	11.3	10.2	1.2	2.1	2.2	6.0	0.7	0.5	18.0	24.0	37.0	5.0
M8 × 1.25	8	8.00	7.78	15.0	13.7	1.5	2.7	3.0	8.0	1.0	0.6	22.0	28.0	41.0	6.2
M10 × 1.5	10	10.00	9.78	18.6	17.1	2.0	3.4	3.8	10.0	1.2	0.7	26.0	32.0	45.0	7.5
M12 × 1.75	12	12.00	11.73	22.8	21.2	2.3	4.1	4.5	12.0	1.5	0.8	30.0	36.0	49.0	8.8
M14 × 2	14	14.00	13.73	26.4	24.5	2.7	4.8	5.4	14.0	1.8	0.9	34.0	40.0	53.0	10.0
M16 × 2	16	16.00	15.73	30.3	28.1	3.2	5.7	5.8	16.0	2.1	1.0	38.0	44.0	57.0	10.0
M20 × 2.5	20	20.00	19.67	37.4	34.9	4.1	7.2	7.2	20.0	2.5	1.2	46.0	52.0	65.0	12.5

GENERAL NOTE: All dimensions are in millimeters.

NOTES:
(1) See para. 5.
(2) See para. 13.
(3) See para. 10.
(4) See para. 11.
(5) See para. 10.
(6) See para. 8.
(7) See para. 7.
(8) See para. 6.
(9) See para. 17.

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TABLE 5 DIMENSIONS OF REDUCED BODY DIAMETER (TYPE R)

Nominal Screw Diameter and Thread Pitch	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 × 0.8	30	4.54	4.36	5.00	4.82	3.5	2.5
M6 × 1	35	5.39	5.21	6.00	5.82	4.0	3.0
M8 × 1.25	40	7.26	7.04	8.00	7.78	5.0	4.0
M10 × 1.5	45	9.08	8.86	10.00	9.78	6.0	5.0
M12 × 1.75	50	10.95	10.68	12.00	11.73	7.0	6.0
M14 × 2	55	12.77	12.50	14.00	13.73	8.0	7.0
M16 × 2	60	14.77	14.50	16.00	15.73	9.0	8.0
M20 × 2.5	65	18.49	18.16	20.00	19.67	11.0	10.0

GENERAL NOTE: All dimensions are in millimeters.
NOTE:
(1) Shoulder is mandatory. See para. 13.

TABLE 6 SCREW LENGTH TOLERANCES

Nominal Length	Nominal Size of Screw		
	M5 Thru M8	M10 Thru M16	M20
To 10 mm, incl	± 0.3	± 0.3	...
Over 10 to 18 mm, incl.	± 0.4	± 0.4	...
Over 18 to 30 mm, incl.	± 0.4	± 0.4	± 0.6
Over 30 to 50 mm, incl.	± 0.5	± 0.8	± 1.3
Over 50 to 80 mm, incl.	± 0.6	± 1.0	± 1.5
Over 80 to 120 mm, incl.	± 0.7	± 1.1	± 1.7
Over 120 to 180 mm, incl.	± 1.3	± 1.3	± 2.0
Over 180 to 240 mm, incl.	± 2.3	± 2.3	± 2.3

TABLE 7 POINT RADIUS

Nominal Screw Size	Approx. Point Radius, R_e	Max. Point Length, U
M5 × 0.8	7.0	1.6
M6 × 1	8.4	2.0
M8 × 1.25	11.2	2.5
M10 × 1.5	14.0	3.0
M12 × 1.75	16.8	3.5
M14 × 2	19.6	4.0
M16 × 2	22.4	4.0
M20 × 2.5	28.0	5.0

GENERAL NOTES:
(a) All dimensions are in millimeters.
(b) R_e equals 1.4 times nominal screw diameter.
(c) U max. equals 2 times thread pitch.

18.2 Acceptability

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

19 MATERIAL AND MECHANICAL PROPERTIES

19.1 Steel

Unless otherwise specified, steel screws shall conform to the requirements as specified in ASTM F568M.

19.2 Corrosion-Resistant Steels

Unless otherwise specified, screws made of corrosion-resistant steels shall conform to the requirements of ASTM F 738M.

19.3 Nonferrous Metals

Unless otherwise specified, nonferrous screws shall conform to the requirements of ASTM F 468M.

20 FINISH

Unless otherwise specified, screws shall be supplied with a plain (as processed) finish, unplated or uncoated.

21 IDENTIFICATION SYMBOLS

Markings shall be raised or recessed on the top of the head or raised on the top of the flange unless

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TABLE 8 MAXIMUM GRIP GAGING LENGTHS, L_g, AND MINIMUM BODY LENGTHS, L_s, FOR 12-SPLINE FLANGE SCREWS

	Nominal Screw Size															
	M5 × 0.8		M6 × 1		M8 × 1.25		M10 × 1.5		M12 × 1.75		M14 × 2		M16 × 2		M20 × 2.5	
L Nominal	L_g Max.	L_s Min.	L_g Max.	L_s Min.	L_g Max.	L_s Min.	L_g Max.	L_s Min.	L_g Max.	L_s Min.	L_g Max.	L_s Min.	L_g Max.	L_s Min.	L_g Max.	L_s Min.
8																
10																
12																
14																
16																
20																
25	9.0	5.0														
30	9.0	5.0	12.0	7.0												
35	19.0	15.0	17.0	12.0	13.0	6.8										
40	19.0	15.0	17.0	12.0	13.0	6.8	14.0	6.5								
45	29.0	25.0	27.0	22.0	23.0	16.8	19.0	11.5	15.0	6.2						
50	29.0	25.0	27.0	22.0	23.0	16.8	19.0	11.5	15.0	6.2	16.0	6.0				
(55)			37.0	32.0	33.0	26.8	29.0	21.5	25.0	16.2	21.0	11.0	17.0	7.0		
60			37.0	32.0	33.0	26.8	29.0	21.5	25.0	16.2	21.0	11.0	17.0	7.0		
(65)					43.0	36.8	39.0	31.5	35.0	26.2	31.0	21.0	27.0	17.0	19.0	6.5
70					43.0	36.8	39.0	31.5	35.0	26.2	31.0	21.0	27.0	17.0	19.0	6.5
(75)					53.0	46.8	49.0	41.5	45.0	36.2	41.0	31.0	37.0	27.0	29.0	16.5
80					53.0	46.8	49.0	41.5	45.0	36.2	41.0	31.0	37.0	27.0	29.0	16.5
(85)							59.0	51.5	55.0	46.2	51.0	41.0	47.0	37.0	39.0	26.5
90							59.0	51.5	55.0	46.2	51.0	41.0	47.0	37.0	39.0	26.5
100							74.0	66.5	70.0	61.2	66.0	56.0	62.0	52.0	54.0	41.5
110									80.0	71.2	76.0	66.0	72.0	62.0	64.0	51.5
120									90.0	81.2	86.0	76.0	82.0	72.0	74.0	61.5
130											90.0	80.0	86.0	76.0	78.0	65.5
140											100.0	90.0	86.0	88.0	88.0	75.5
150													106.0	96.0	98.0	85.5
160													116.0	106.0	108.0	95.5
(170)															118.0	105.5
180															128.0	115.5
(190)															138.0	125.5
200															148.0	135.5
220																
240																

GENERAL NOTES:
(a) All dimensions are in millimeters.
(b) L_g is the grip gaging length and L_s is the body length.
(c) Diameter-length combination between the dashed lines are recommended. Lengths if parentheses are not recommended.
(d) Screws with lengths above the thick solid stepped line are threaded full length.
(e) For screw length longer than the lower dashed lines, L_g and L_s values should be computed. See para. 17.

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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_{max}, 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 chemistry and mechanical properties.

21.2 Source Symbols

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

22 OPTIONS

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

23 TERMINOLOGY

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

24 WORKMANSHIP

Screws shall be free from surface imperfections such as burrs, seams, laps, loose scale, and other surface irregularities which could affect serviceability, and shall conform to ASTM F 788/F 788M.

25 CLEARANCE HOLES

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

26 DESIGNATION

(a) 12-spline flange screws shall be designated by the following data, in the sequence shown:

(1) product name
(2) designation of the Standard
(3) nominal diameter and thread pitch
(4) nominal length
(5) property class or material identification
(6) protective coating, if required.

NOTE: It is common practice in ISO standards to omit thread pitch from the product size designation when screw threads are the metric coarse thread series, e.g., M10 is M10 × 1.5.

EXAMPLES:

(1) 12-spline flange screw, ASME B18.2.7.1M, M10 × 1.5 × 50, Class 9.8, zinc plated per ASTM F 871M and ASTM B 633 Fe/Zn 5 Type II

(2) 12-spline flange screw, ASME B18.2.7.1M, M20 × 2.5 × 100, Class 8.8

(b) For a recommended part number (PIN) system for metric 12-spline flange screws, see ASME B18.24.1.

27 INSPECTION AND QUALITY ASSURANCE

Unless otherwise specified, acceptability shall be based on conformance with the requirements specified in ASME B18.18.1M, with inspection level B for thread acceptability.

28 DIMENSIONAL CONFORMANCE

(a) Unless otherwise specified, the following designated dimensional characteristics shall be inspected to the inspection levels shown according to ASME B18.18.2M, and shall be within their specified limits.

Characteristic	Inspection Level
Thread Acceptability	C
Body Diameter, D_s	C
Grip Length, L_g max.	C
Screw Length, L	C
Visual Inspection [Note (1)]	C

NOTE:

(1) Visual inspection shall include property-class marking, source marking, fillet, and workmanship.

If verifiable in-process inspection is used, inspection sample sizes and reporting shall be in accordance with the applicable ASME, ASTM, or SAE quality system consensus standard.

(b) For nondesignated dimensional characteristics, the provisions of ASME B18.18.1M shall apply. Should a nondesignated dimension be determined to be outside its specified limits, it shall be deemed conforming to this Standard if the user, who is the installer, accepts the dimension, based on form, fit, and function considerations.

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NONMANDATORY APPENDIX A
SCREW STRAIGHTNESS AND GAGING PROCEDURE

The conformance of screws to shank straightness or camber limitations set forth in section 16 may be checked by using the gage illustrated below in accordance with the following procedure.

Allowance total camber on the product to be inspected shall be calculated in accordance with section 16. The total camber thus derived shall be added to the specified maximum body diamter and the moveable rail of gage shall be adjusted to provide a parallel space between the rails equal to this distance by obtaining common readings on both micrometer heads. The moveable rail shall be locked in place by tightening securing screws.

The product shall then be inserted between rails, and shall be rotated by hand through full 360 deg. Any interference occurring between the product and the gage which is sufficient to prevent rotation shall indicate excessive camber.

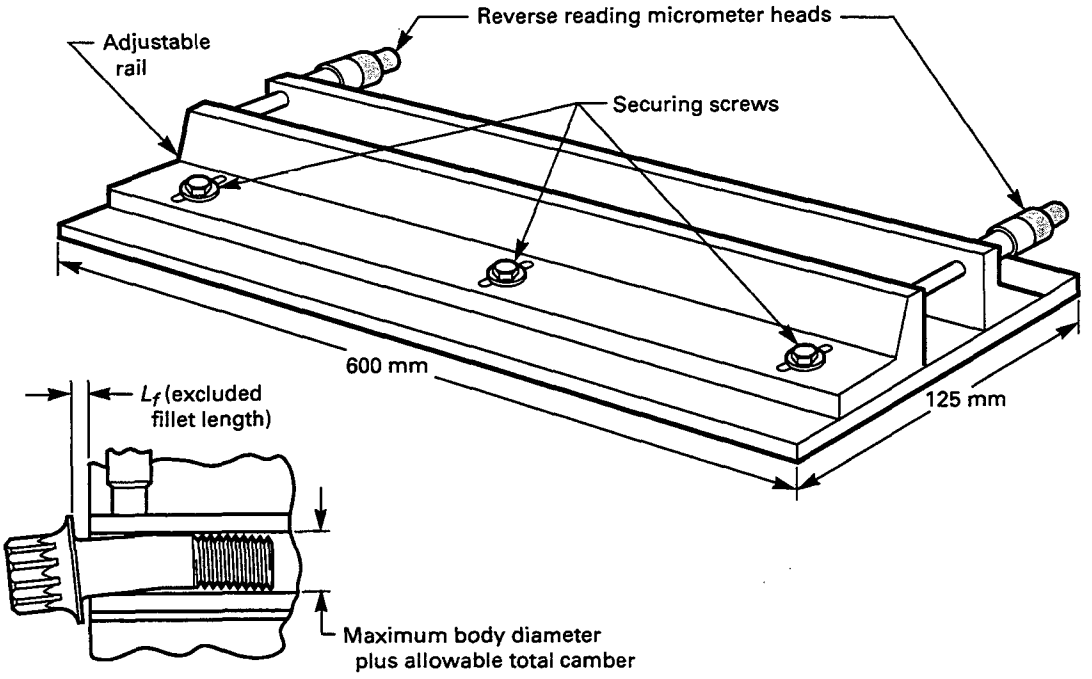


FIG. A1 TYPICAL STRAIGHTNESS GAGE

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