

**ASME B18.2.3.3M-2007**  
**[Revision of ANSI B18.2.3.3M-1979 (R2001)]**

# **Metric Heavy Hex Screws**

**REAFFIRMED 2014**

FOR CURRENT COMMITTEE PERSONNEL  
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**AN AMERICAN NATIONAL STANDARD**



**The American Society of  
Mechanical Engineers**

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# **Metric Heavy Hex Screws**

**AN AMERICAN NATIONAL STANDARD**



**The American Society of  
Mechanical Engineers**

**Three Park Avenue • New York, NY 10016**

Date of Issuance: October 31, 2007

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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 Mechanical 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.

At its meeting on December 4, 1974, Committee B18 authorized preparation of a series of standards for metric fasteners. Subcommittee 2 was assigned responsibility for developing standards for metric hex bolts, screws, and nuts.

At a meeting on September 22, 1976, Subcommittee 2 organized the contents of a standard covering eight different hex head screw and bolt products. Actual drafting was postponed until ISO/TC2 could reach final decisions relating to basic dimensions and characteristics of hex bolts, screws, and nuts. At ISO/TC2 meetings held in April 1977, final actions were taken. Committee B18 affirmed the TC2 decisions at a meeting on June 29, 1977, and drafting of this Standard was started.

In February 1978, Committee B18 established a cooperative program with the Department of Defense to draft American National Standards for metric fasteners in such a way that they could be used directly by the Government for procurement purposes. The Department of Defense requested that each of the eight products be covered in separate standards, and Subcommittee 2 accepted this approach at its meeting on June 27, 1978.

The 1979 Edition was approved by ballot of Committee B18 on September 15, 1978, and was subsequently approved by the secretariat and submitted to the American National Standards Institute for designation as an American National Standard. This was granted on March 26, 1979.

This revision was approved by the American National Standards Institute (ANSI) on July 11, 2007.



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## 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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**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  
Three Park Avenue  
New York, NY 10016-5990

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

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

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

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

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

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, which are open to the public. Persons wishing to attend any meeting should contact the Secretary of the B18 Standards Committee.



# METRIC HEAVY HEX SCREWS

## 1 INTRODUCTORY NOTES

### 1.1 Scope

**1.1.1** This Standard covers the complete general and dimensional data for metric heavy hex screws recognized as American National Standard.

**1.1.2** 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 sizes.

### 1.2 Comparison With ISO Standards

**1.2.1** ISO has not yet initiated development of an ISO standard for heavy hex screws. However, nominal diameters and thread pitches, body diameters, widths across flats, bearing surface diameters, head heights, thread lengths, thread dimensions, and nominal lengths are in accord with ISO standards for related hex head screws and bolts.

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

### 1.3 Terminology

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

### 1.4 Dimensions

**1.4.1** All dimensions in this Standard are in millimeters, unless stated otherwise.

**1.4.2** Symbols specifying geometric characteristics are in accord with ASME Y14.5M.

### 1.5 Referenced Standards

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

ASME B1.3M, Screw Thread Gaging Systems for Dimensional Acceptability — Inch and Metric Screw Threads

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

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

ASME B18.12, Glossary of Terms for Mechanical Fasteners

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

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

ASME B18.24, Part Identifying Number (PIN) Code System Standard for B18 Fastener Products

ASME Y14.5M, Dimensioning and Tolerancing

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

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

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

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

ASTM F 1941M, Electrodeposited Coatings on Threaded Fasteners (Metric)

Publisher: ASTM International (ASTM), 100 Barr Harbor Drive, West Conshohocken, PA 19428

## 2 GENERAL DATA

### 2.1 Heads

**2.1.1 Top of Head.** The top of head shall be full form and chamfered or rounded. The diameter of the chamfer circle or the start of rounding shall be equal to the maximum width across flats within a tolerance of  $-15\%$ .

**2.1.2 Head Height.** The head height is the distance, as measured parallel to the axis of the screw, from the top of the head to the plane of the bearing surface.

**2.1.3 Wrenching Height.** The wrenching height is the distance, measured at a corner of the hex, from the plane of the bearing surface to the last plane of full formed hex, i.e., the plane closest to the top of head at which the width across corners of the hex is within its specified limits.

**2.1.4 Corner Fill.** The rounding due to lack of fill at the six corners of the head shall be reasonably uniform.

**2.1.5 True Position of Head.** At maximum material condition, the axis of the hex head shall be located at true position with respect to the axis of the screw (determined over a distance under the head equal to one screw diameter) within a tolerance zone of diameter specified in Table 1.

**2.1.6 Bearing Surface.** The bearing surface shall be flat and washer-faced. Diameter of bearing surface shall not exceed the width across flats nor be less than the specified minimum washer face diameter. For referee purposes, measurement of bearing surface diameter shall be taken at 0.1 mm above the bearing surface. The plane of the bearing surface shall be perpendicular to the axis of the body within the circular runout specified in Table 2. The measurement of bearing face runout shall be made as close to the periphery of the washer face as possible, while the screw is held in a collet or other gripping device at a distance equal to one screw diameter from the underside of the head.

**2.1.7 Underhead Fillet.** The fillet configuration at the junction of the head and shank shall be as shown in Figs. 1 and 2, and shall have limits as specified in Table 3. The fillet shall be a smooth and continuous curve fairing smoothly into the underhead bearing surface and the shank within the limits specified. No radius in the fillet contour shall be less than  $R$  minimum.

## 2.2 Body Diameter

The diameter of the body on screws that are not threaded full length shall be within the limits specified in Table 2. For screws threaded full length, the diameter of the unthreaded shank under the head shall not exceed the specified maximum body diameter, nor be less than the minimum body diameter specified in Table 1.

## 2.3 Screw Length

The length of the screw shall be measured parallel to the axis of the screw from the underhead bearing surface to the extreme end of the shank. Tolerances for screw lengths are given in Table 4.

## 2.4 Points

The end of the screw shall be chamfered from a diameter equal to or slightly less than the thread root diameter to produce a length of chamfer or incomplete thread within the limits for  $U$  specified in Table 5. 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 5.

## 2.5 Straightness

At maximum material condition, the axes of the screw body and thread major diameter shall be within a

**Table 1 Tolerance Zone**

Nominal Screw Diameter and Thread Pitch, $D$	Head True Position Tolerance Zone Diameter	Minimum Body Diameter for Product Threaded to Head, $D_{sl}$	Position of Body to Thread
M12 $\times$ 1.75	0.84	10.68	0.70
M14 $\times$ 2	0.98	12.50	0.70
M16 $\times$ 2	1.12	14.50	0.70
M20 $\times$ 2.5	1.40	18.16	0.84
M24 $\times$ 3	1.68	21.80	0.84
M30 $\times$ 3.5	2.10	27.46	0.84
M36 $\times$ 4	2.52	33.12	1.00

straightness tolerance diameter equal to  $0.006L$  for nominal screw lengths,  $L$ , 300 mm or shorter and  $0.008L$  for screws having nominal lengths,  $L$ , over 300 mm through 600 mm. A gage and gaging procedure to check straightness is given in Nonmandatory Appendix A.

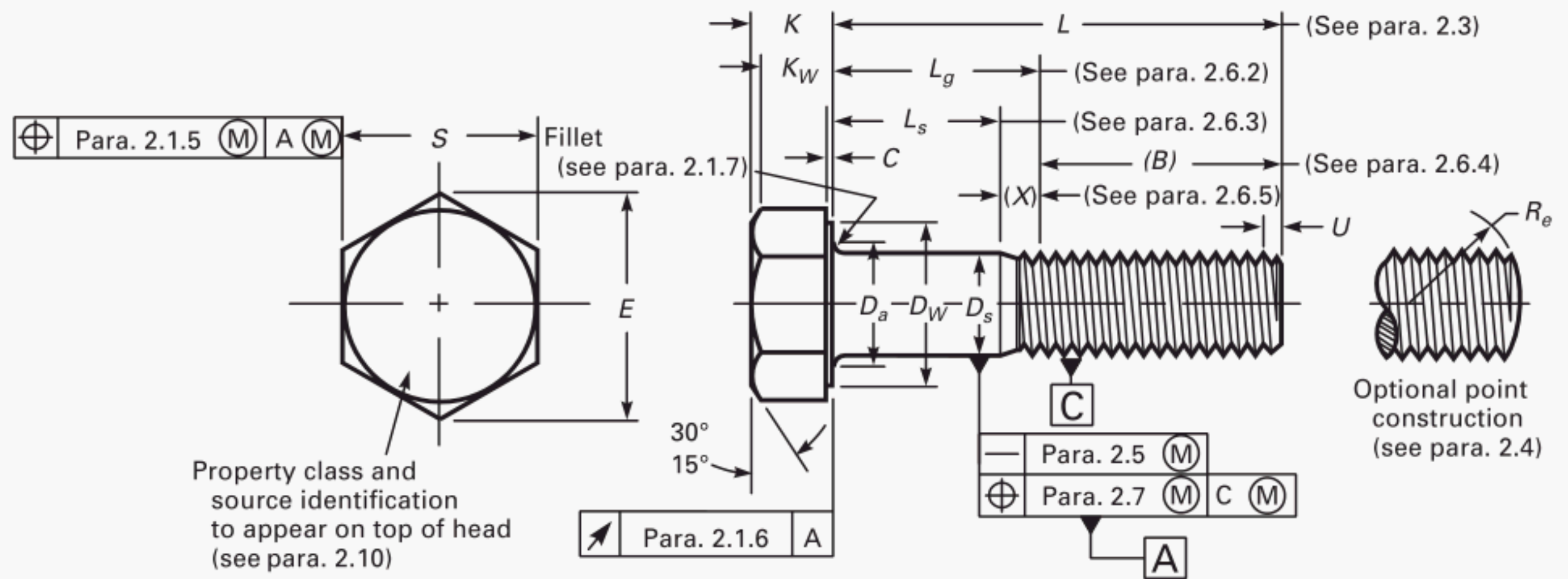
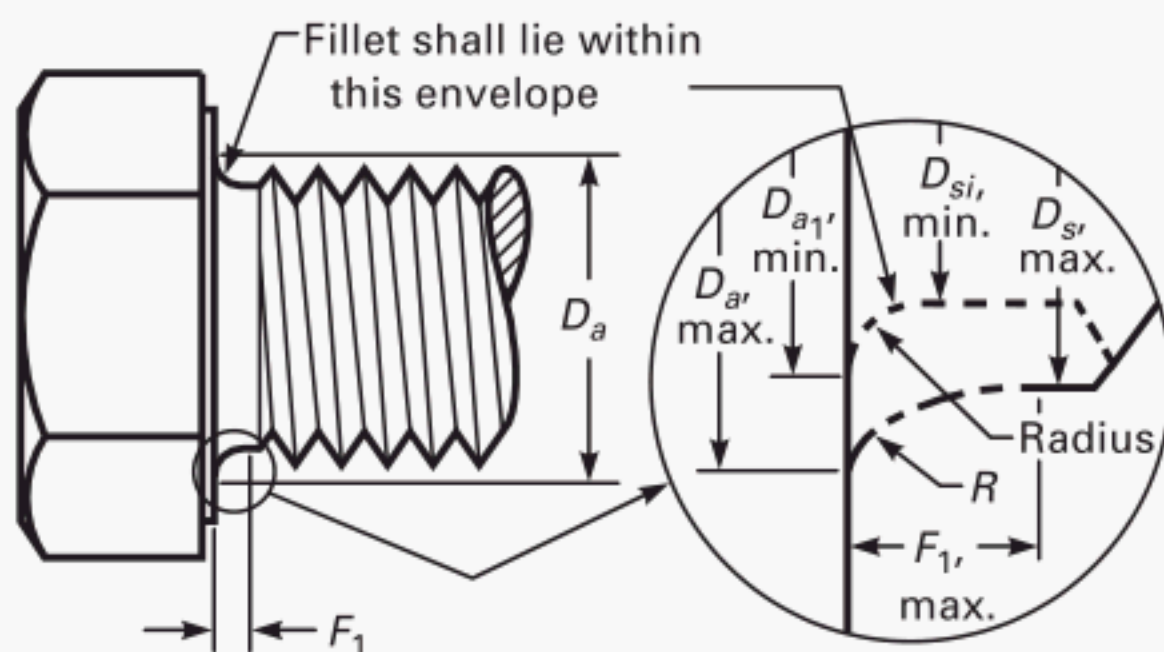
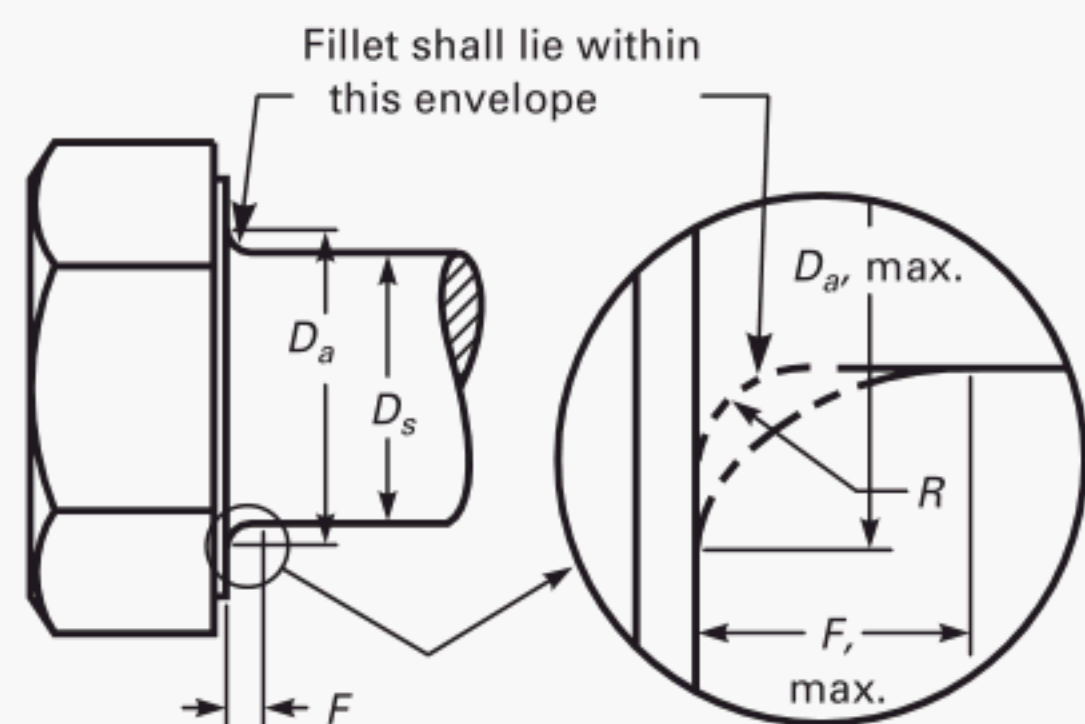
## 2.6 Thread Length

**2.6.1** 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. 2.6.2 through 2.6.5.

**2.6.2** Grip gaging length,  $L_g$  maximum, is the distance measured parallel to the axis of the screw, from the underhead bearing surface of the face of a 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  $L_g$  maximum are specified in Table 6. For diameter-length combinations not listed in Table 6, 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 thread length,  $B$ , as specified in Table 1 ( $L_g \text{ max.} = L - B$ ).  $L_g$  maximum shall be used as a criterion for inspection.

**2.6.3** Body length,  $L_s$  minimum, is the distance, measured parallel to the axis of the screw, from the underhead bearing surface to the last scratch of thread or top of the extrusion angle, whichever is closest to the head. For standard diameter-length combinations of screws, the values of  $L_s$  minimum are specified in Table 6. For diameter-length combinations not listed in Table 6, 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 as specified in Table 7 ( $L_s \text{ min.} = L_g \text{ max.} - X \text{ ref.}$ ).  $L_s$  minimum shall be used as a criterion for inspection. Screws of nominal lengths equal to or less than the length,  $L_u$ , as specified in Table 7 shall be threaded full length. For screws that are threaded full length, the distance from the underhead



**Table 2 Dimensions of Heavy Hex Screws****Fig. 1 Fillet Detail for Short Screws****Fig. 2 Fillet Detail for Long Screws**

**Table 3 Dimensions of Underhead Fillets**

Nominal Screw Diameter and Thread Pitch	Fillet Transition Diameter		Fillet Length		Fillet Radius
	For Short Screws, $D_{a1}$	For Short and Long Screws, $D_a$	For Long Screws, $F$	For Short Screws, $F_1$	For Short and Long Screws, $R$
	Min.	Max.	Max.	Max.	Min.
M12 × 1.75	12.2	13.7	3.0	1.3	0.6
M14 × 2	14.1	15.7	3.0	1.4	0.6
M16 × 2	16.5	17.7	3.0	1.6	0.6
M20 × 2.5	20.7	22.4	4.0	2.1	0.8
M24 × 3	24.5	26.4	4.0	2.3	0.8
M30 × 3.5	30.8	33.4	6.0	3.0	1.0
M36 × 4	36.6	39.4	6.0	3.1	1.0

## GENERAL NOTES:

- (a) Short screws are screws that are threaded full length.  
 (b) Values of  $D_{st}$  are given in Table 1.

**Table 4 Length Tolerances**

Nominal Length	Nominal Screw Diameter		
	M12 Through M16	M20 and M24	M30 and M36
To 10 mm	±0.3	...	...
Over 10 mm to 18 mm	±0.4	...	...
Over 18 mm to 30 mm	±0.4	±0.7	...
Over 30 mm to 50 mm	±0.8	±1.3	±1.5
Over 50 mm to 80 mm	±1.0	±1.5	±1.8
Over 80 mm to 120 mm	±1.1	±1.8	±2.0
Over 120 mm to 180 mm	±1.3	±2.0	±2.3
Over 180 mm to 240 mm	±2.3	±2.3	±3.0
Over 240 mm	±3.0	±3.0	±3.0

GENERAL NOTE: All tolerances are plus and minus.

**Table 5 Dimensions of Points**

Nominal Screw Diameter and Thread Pitch	Approx. Point Radius, $R_e$ [Note (1)]	Point Length, $U$ [Notes (2), (3)]	
		Max.	Min.
M12 × 1.75	16.8	3.50	0.88
M14 × 2	19.6	4.00	1.00
M16 × 2	22.4	4.00	1.00
M20 × 2.5	28.0	5.00	1.25
M24 × 3	33.6	6.00	1.50
M30 × 3.5	42.0	7.00	1.75
M36 × 4	50.4	8.00	2.00

## NOTES:

- (1)  $R_e$  = 1.4 times thread major diameter  
 (2)  $U$  max. = 2.0 times thread pitch  
 (3)  $U$  min. = 0.5 times thread pitch

**Table 6 Maximum Grip Gaging Lengths and Minimum Body Lengths**

Nominal Length, <i>L</i>	Nominal Diameter and Thread Pitch													
	M12 × 1.75		M14 × 2		M16 × 2		M20 × 2.5		M24 × 3		M30 × 3.5		M36 × 4	
	<i>L<sub>g</sub></i> Max.	<i>L<sub>s</sub></i> Min.	<i>L<sub>g</sub></i> Max.	<i>L<sub>s</sub></i> Min.	<i>L<sub>g</sub></i> Max.	<i>L<sub>s</sub></i> Min.	<i>L<sub>g</sub></i> Max.	<i>L<sub>s</sub></i> Min.	<i>L<sub>g</sub></i> Max.	<i>L<sub>s</sub></i> Min.	<i>L<sub>g</sub></i> Max.	<i>L<sub>s</sub></i> Min.	<i>L<sub>g</sub></i> Max.	<i>L<sub>s</sub></i> Min.
20	2.6		3.0											
25	4.4		3.0		3.0									
30	4.4		5.0		3.0		3.8							
35	4.4		5.0		5.0		3.8		7.5					
40	4.4		5.0		5.0		3.8		7.5		8.8			
45	15.0	6.2	5.0		5.0		6.2		7.5		8.8		10.0	
50	20.0	11.2	16.0	6.0	5.0		6.2		7.5		8.8		10.0	
(55)	25.0	16.2	21.0	11.0	17.0	7.0	6.2		7.5		8.8		10.0	
60	30.0	21.2	26.0	16.0	22.0	12.0	6.2		7.5		8.8		10.0	
(65)	35.0	26.2	31.0	21.0	27.0	17.0	19.0	6.5	7.5		8.8		10.0	
70	40.0	31.2	36.0	26.0	32.0	22.0	24.0	11.5	7.5		8.8		10.0	
(75)	45.0	36.2	41.0	31.0	37.0	27.0	29.0	16.5	7.5		8.8		10.0	
80	50.0	41.2	46.0	36.0	42.0	32.0	34.0	21.5	26.0	11.0	8.8		10.0	
(85)	55.0	46.2	51.0	41.0	47.0	37.0	39.0	26.5	31.0	16.0	8.8		10.0	
90	60.0	51.2	56.0	46.0	52.0	42.0	44.0	31.5	36.0	21.0	8.8		10.0	
100	70.0	61.2	66.0	56.0	62.0	52.0	54.0	41.5	46.0	31.0	34.0	16.5	10.0	
110	80.0	71.2	76.0	66.0	72.0	62.0	64.0	51.5	56.0	41.0	44.0	26.5	32.0	12.0
120	90.0	81.2	86.0	76.0	82.0	72.0	74.0	61.5	66.0	51.0	54.0	36.5	42.0	22.0
130			90.0	80.0	86.0	76.0	78.0	65.5	70.0	55.0	58.0	40.5	46.0	26.0
140			100.0	90.0	96.0	86.0	88.0	75.5	80.0	65.0	68.0	50.5	56.0	36.0
150					106.0	96.0	98.0	85.5	90.0	75.0	78.0	60.5	66.0	46.0
160					116.0	106.0	108.0	95.5	100.0	85.0	88.0	70.5	76.0	56.0
(170)							118.0	105.5	110.0	95.0	98.0	80.5	86.0	66.0
180							128.0	115.5	120.0	105.0	108.0	90.5	96.0	76.0
(190)							138.0	125.5	130.0	115.0	118.0	100.5	106.0	86.0
200							148.0	135.5	140.0	125.0	128.0	110.5	116.0	96.0
220									147.0	132.0	135.0	117.5	123.0	103.0
240									167.0	152.0	155.0	137.5	143.0	123.0
260											175.0	157.5	163.0	143.0
280											195.0	177.5	183.0	163.0
300											215.0	197.5	203.0	183.0

## GENERAL NOTES:

- (a)  $L_g$  is grip gaging length;  $L_s$  is body length.
- (b) Diameter-length combinations between the dashed lines and the heavy solid lines are recommended. Lengths in parentheses are not recommended.
- (c) Screws with lengths above the heavy solid line are threaded full length.
- (d) For screws with lengths longer than the lower dashed lines,  $L_g$  and  $L_s$  values shall be computed from equations as given in para. 2.6 of General Data.



**Table 7 Thread Lengths**

Nominal Screw Diameter and Thread Pitch	Thread Length, $B$ , Ref.			Transition Thread Length, $X$ Ref.	Screws Threaded Full Length, $L_u$				
	Screw Lengths $\leq 125$	Screw Lengths $>125$ and $<200$	Screw Lengths $\geq 200$		Screw Lengths to and Incl.	Maximum $L_g$	Screw Lengths		Maximum $L_g$
							Over	To and Incl.	
M12 $\times$ 1.75	30	36	49	8.8	24	2.6	24	40	4.4
M14 $\times$ 2	34	40	53	10.0	28	3.0	28	45	5.0
M16 $\times$ 2	38	44	57	10.0	32	3.0	32	50	5.0
M20 $\times$ 2.5	46	52	65	12.5	40	3.8	40	60	6.2
M24 $\times$ 3	54	60	73	15.0	...	...	...	75	7.5
M30 $\times$ 3.5	66	72	85	17.5	...	...	...	90	8.8
M36 $\times$ 4	78	84	97	20.0	...	...	...	100	10.0

bearing surface to the face of a noncounterbored or non-countersunk standard GO thread ring gage assembled by hand as far as the thread will permit shall not exceed the length,  $L_g$ , as specified in Table 7.

**2.6.4 Thread length,  $B$ ,** as specified in Table 7 is a reference dimension intended for calculation purposes only, and is the distance measured parallel to the axis of the screw, from the extreme end of the screw to the last complete (full form) thread.

**2.6.5 Transition thread length,  $X$ ,** as specified in Table 7 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, no radius of which shall be less than the specified minimum radius at the root of the full-form thread.

## 2.7 Position of Body-to-Thread

For products with cut threads at maximum material condition, the axis of the screw body,  $D_s$ , over a length equal to the nominal screw diameter from the last scratch of thread, shall be within the positional zone diameter specified in Table 1, with respect to the axis of the thread, over a length equal to the nominal screw diameter from the last complete thread. A gage and gaging procedure for checking body position is given in Nonmandatory Appendix B.

## 2.8 Screw Threads

**2.8.1 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 plated or coated screw threads, Class 6h tolerance high limit (GO) and Class 6g tolerance low limit (NOT GO) shall apply.

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

## 2.9 Material and Mechanical Properties

**2.9.1 Carbon and Alloy Steel.** Materials and property class shall conform to ASTM F 568M.

**2.9.2 Corrosion-Resistant Steels.** Unless otherwise specified, corrosion-resistant screws shall conform to the requirements of ASTM F 738M.

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

## 2.10 Identification Symbols

Identification marking symbols shall be on top of the screw heads and shall be raised or indented at the manufacturer's option, unless otherwise specified at the time of order. Markings shall be legible to the unaided eye with the exception of corrective lens. Minimum height of property class symbols shall be 3.2 mm for M12 and M14 screws, and 4.0 mm for M16 and larger screws. When raised, markings shall project not less than 0.1 mm for M12 and M14 screws, and 0.3 mm for M16 and larger screws above the surface of the head. Total head height (head plus markings) shall not exceed the specified maximum head height plus 0.3 mm for M12 and M14 screws, and 0.4 mm for M16 and larger screws.

**2.10.1 Property Class Symbols.** Each screw shall be marked in accordance with the requirements of the applicable specification for its chemical and mechanical requirements.

**2.10.2 Source Symbols.** Each screw shall be marked to identify its source, manufacturer, or private label distributor.



## 2.11 Finish

Unless otherwise specified, screws shall be supplied with a natural (as processed) finish, unplated or uncoated in a clean condition and lightly oiled.

## 2.12 Workmanship

Screws shall not contain an excess of surface imperfections that might affect their serviceability, such as burrs, seams, laps, loose scale, and other irregularities.

## 2.13 Inspection and Quality Assurance

Unless otherwise specified, acceptability of screws shall be determined in accordance with ASME B18.18.1.

## 2.14 Dimensional Conformance

Products shall conform to the specified dimensions.

### 2.14.1 Inspection of Designated Characteristics.

Unless otherwise specified, the following provisions shall apply for inspection of dimensional characteristics. The designated characteristics are defined within the following table and shall be inspected in accordance with ASME B18.18.2 to the inspection level shown:

Characteristic	Inspection Level
Thread acceptability	C
Body diameter, $D_s$	C
Head width across corners, $E$	C
Grip length, $L_g$ max.	C
Screw length, $L$	C
Visual inspection [Note (1)]	C

NOTE:

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

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

**2.14.2** For nondesignated characteristics, the provisions of ASME B18.18.1 shall apply.

## 2.15 Clearance Holes

The recommended sizes of clearance holes in material to be assembled using heavy hex screws are the normal series given in Table 3 of ASME B18.2.8.

## 2.16 Designation

Heavy hex screws shall be designated by the following data, preferably in the sequence shown: product name, identification of the standard, nominal diameter and thread pitch, nominal length, steel property class or material identification, and 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., M20 is M20  $\times$  2.5.

EXAMPLES:

- (1) Heavy hex screw, ASME B18.2.3.3M, M36  $\times$  4  $\times$  180, Class 8.8; zinc plated, ASTM F 1941M, Fe/Zn 3C
- (2) Heavy hex screw, ASME B18.2.3.3M, M16  $\times$  2  $\times$  80, silicon bronze, ASTM F 468M Grade 651

## 2.17 Part Identifying Number

For a part identifying number, refer to ASME B18.24.

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## NONMANDATORY APPENDIX A

### SCREW STRAIGHTNESS

### GAGE AND GAGING PROCEDURE

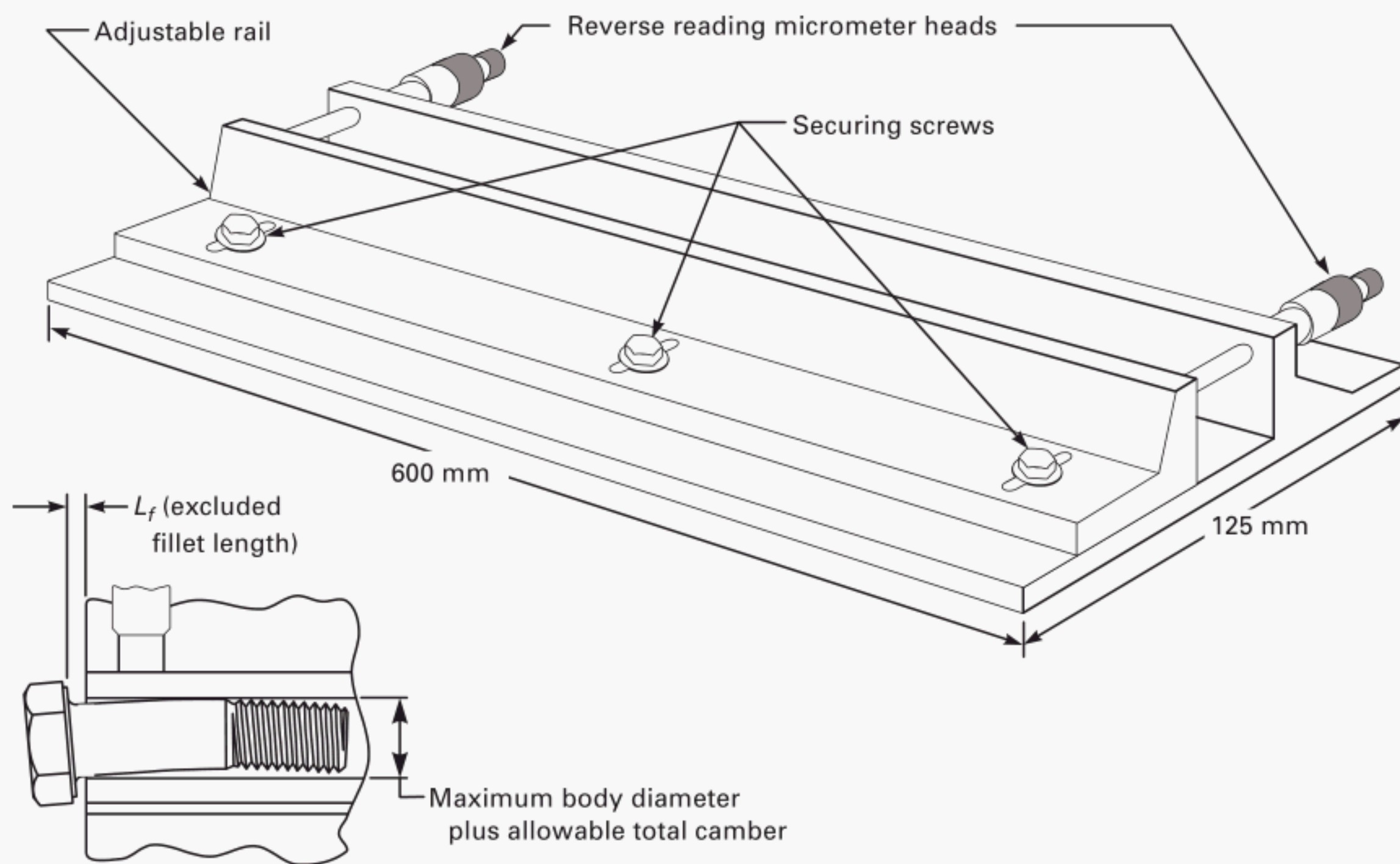
The conformance of screws to shank straightness or camber limitations set forth in para. 2.5 shall be checked by using the gage illustrated in Fig. A-1 in accordance with the following procedure.

Allowable total camber on the product to be inspected shall be calculated in accordance with para. 2.5. The total camber thus derived shall be added to the specified maximum body diameter, and the movable 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 movable rail shall then 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 that is sufficient to prevent rotation shall indicate excessive camber.

**Fig. A-1 Typical Straightness Gage**





## NONMANDATORY APPENDIX B

### BODY POSITION GAGES AND GAGING PROCEDURES

Gages that may be used for checking position of the screw body with respect to the thread are illustrated below in Fig. B-1.

In the lower construction, GO thread ring gage, *A*, is centered on sleeve, *B*, by means of the positioning plug, *E*, and is secured in position by attachment screws, *C*. The ring gage is set to the maximum pitch diameter of the screw thread Class 6h.

For position of body-to-thread per para. 2.7, gage length,  $L_h$ , is equal to the nominal screw diameter,  $D$ , plus the transition thread length,  $X$ ; that is

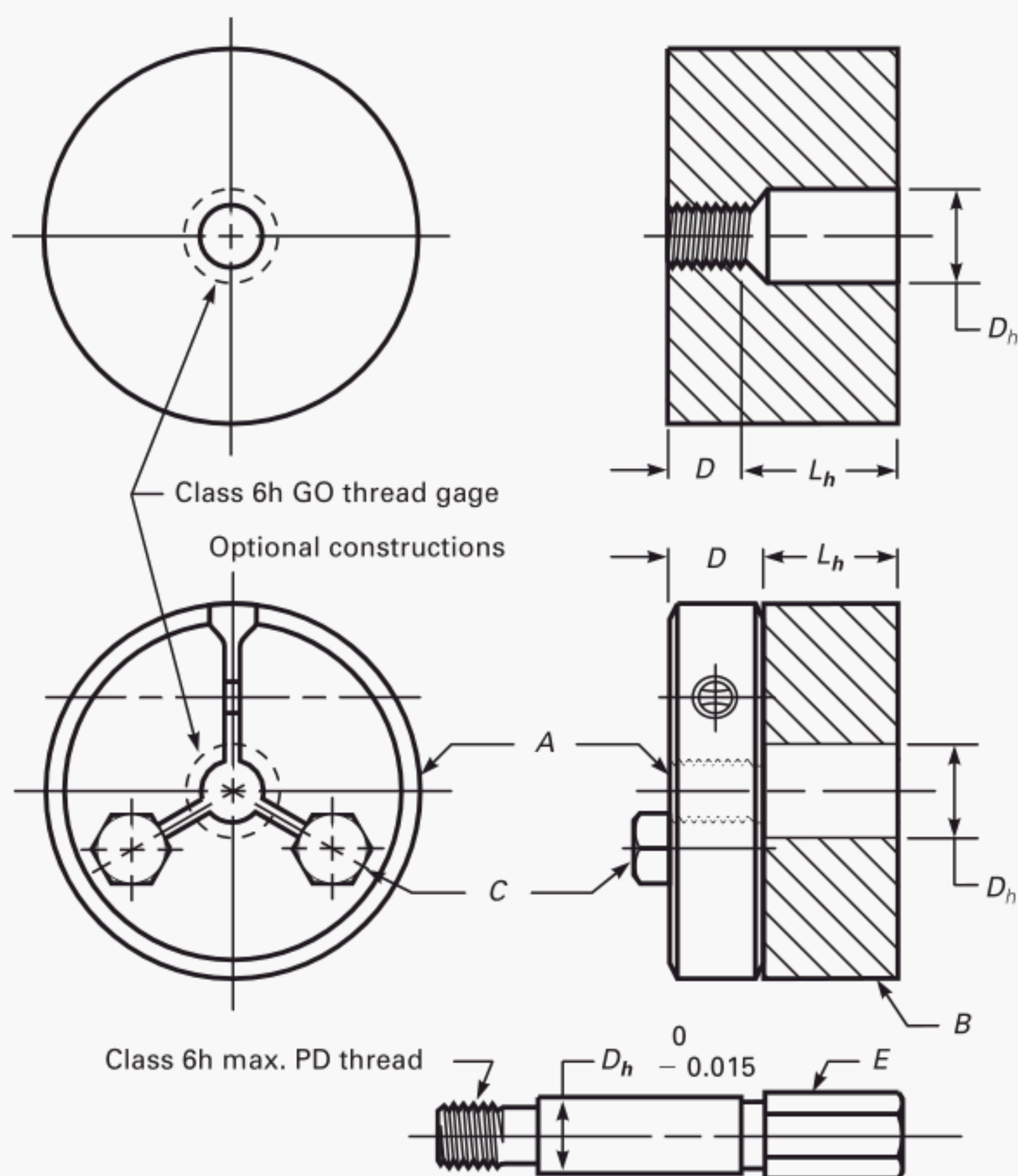
$$L_h = D + X$$

Diameter,  $D_h$ , of the counterbore or hold in sleeve(s), equals the nominal screw diameter,  $D$ , plus the positional tolerance,  $T_2$  (see Table 1); that is

$$D_h = D + T_2$$

The screw is screwed by hand into the GO thread gage for the full length of the thread.

**Fig. B-1 Typical Gage**



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