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AMERICAN NATIONAL STANDARD

Metric Hex Lag Screws

ANSI B18.2.3.8M - 1981

(REVISION OF ANSI B18.2.3.8M-1979)

Government Key Words:
Screw, Lag, Hex Head – Metric

REAFFIRMED 1999

FOR CURRENT COMMITTEE PERSONNEL
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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 American 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.

This standard was approved by letter 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 May 17, 1979.

At its meeting on October 22, 1980, Subcommittee 2 approved two technical revisions to the 1979 issue. The 14 mm screw size was discontinued and thread dimensions were modified to improve lag screw performance and to economize production tooling. This revised standard was approved by letter ballot of Committee B18 on November 25, 1980, and was approved by the secretariat and submitted to the American National Standards Institute which granted it recognition as an American National Standard on June 16, 1981.

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AMERICAN NATIONAL STANDARD

METRIC HEX LAG SCREWS

GENERAL DATA

1. Scope

1.1 This standard covers the complete general and dimensional data for metric hex lag screws recognized as "American National Standard."

1.2 The inclusion of dimensional data in this standard is not intended to imply that all sizes in conjunction with the various options described herein are stock production items. Consumers are requested to consult with manufacturers concerning lists of stock production hex lag screws.

1.3 Hex lag screws purchased for Government use shall conform to this standard, and additionally to the requirements of Appendix I.

2. Comparison With ISO Standards

2.1 ISO has not yet initiated development of an ISO standard for hex lag screws. However, the nominal diameters, body diameters, widths across flats, head heights, and nominal lengths are in accord with ISO standards for related hex head screws and bolts.

2.2 Letter symbols designating dimensional characteristics are in accord with those used in ISO standards, except capitals have been used for data processing convenience instead of lower case letters used in ISO standards.

3. Dimensions

3.1 All dimensions in this standard are in millimeters, unless stated otherwise.

3.2 Symbols specifying geometric characteristics are in accord with American National Standard, Dimensioning and Tolerancing, ANSI Y14.5-1973.

4. Surface Condition. Screws need not be finished on any surface except the threads.

5. Top of Head. The top of head shall be either full form or indented, at manufacturer's option. The top of head shall be 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 minus 15 percent.

6. 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 under head bearing surface.

7. 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.

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

9. True Position of Head. 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 equal to 6 percent of the specified maximum width across flats.

10. Bearing Surface. The bearing surface shall be reasonably flat. However, a die seam across the bearing face shall be permissible. Bearing surface shall be perpendicular to the axis of the body within a tolerance of 3 deg. Angularity measurement shall be taken at a location to avoid interference from a die seam.

11. Body Diameter

11.1 Screws shall be furnished with a full diameter body within the limits specified in Table 1 or shall be threaded to the head unless the purchaser specifies screws with "reduced diameter body" (11.3).

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11.2 There may be a reasonable swell, fin, or die seam on the body adjacent to the underside of head not to exceed the nominal screw diameter by the following:

0.50 mm for size 5 mm
0.65 mm for size 6 mm
0.75 mm for sizes 8 thru 12 mm
1.25 mm for size 16 mm
1.50 mm for sizes 20 and 24 mm

11.3 Screws may be obtained with "reduced diameter body" if so specified. Where "reduced diameter body" is specified, the body diameter may be reduced to the blank diameter before threading. The screw shall have a shoulder under the head. The diameter and length of the shoulder shall be as specified in Table 3.

12. Fillet. The fillet at junction of head and shank shall be a smooth concave curve within the radius limits specified in Table 1.

13. Length. The length of the screw shall be measured parallel to the axis of the screw from the underside of head to the extreme end of the shank. Tolerances for screw lengths are specified in Table 4. Recommended diameter-length combinations are given in Table 2.

14. Thread Length. The minimum thread length shall be equal to one-half of the nominal screw length plus 12 mm, or 150 mm, whichever is shorter. Screws too short for the formula thread length shall be threaded as close to the head or shoulder as practicable.

15. Thread Formulas. Thread formulas are as follows:

Flat at root (V) = 0.4305 P
Depth of thread (T) = 0.385 P
Root dia (D_1) = D - 2T

16. Material. Chemical and mechanical requirements shall be as agreed upon by purchaser and manufacturer.

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

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

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

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

21. Designation

21.1 Hex lag screws shall be designated by the following data, preferably in the sequence shown: product name, nominal diameter, nominal length, material, and protective coating, if required.

Examples:

Hex lag screw, 10 x 50, steel, zinc galvanized

Hex lag screw, 6 x 35, silicon bronze

21.2 The Government part numbering system for metric hex lag screws is given in Appendix I.

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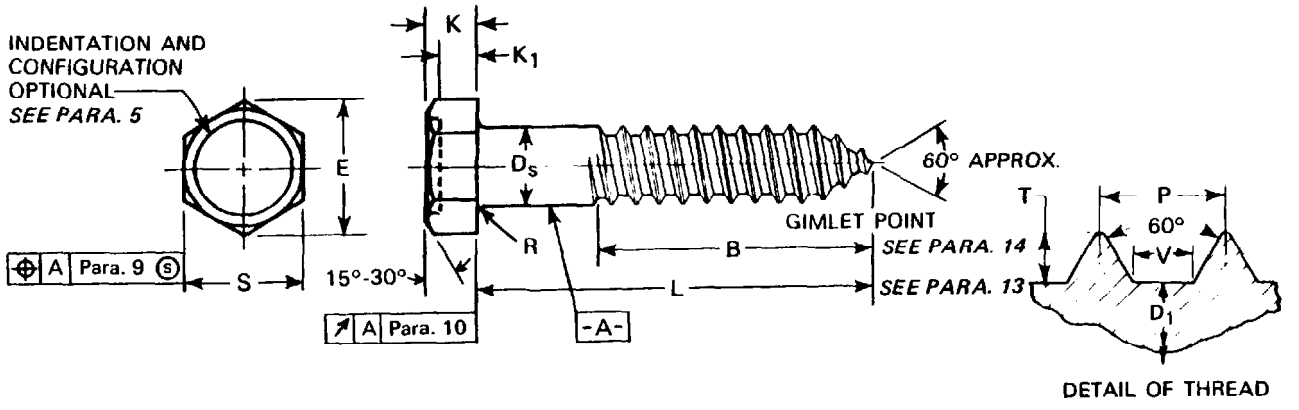

Table 1 Dimensions of Hex Lag Screws

D	Ds		S		E		K		K_1	R		P	V	T	D_1
Nominal Screw Dia	Body Diameter		Width Across Flats		Width Across Corners		Head Height		Wrenching Height	Radius of Fillet		Thread Dimensions			
												Thread Pitch	Flat at Root	Depth of Thread	Root Dia
mm	Max	Min	Max	Min	Max	Min	Max	Min	Min	Max	Min				
5	5.48	4.52	8.00	7.64	9.24	8.63	3.9	3.1	2.4	0.6	0.2	2.3	1.0	0.9	3.2
6	6.48	5.52	10.00	9.64	11.55	10.89	4.4	3.6	2.8	0.9	0.3	2.5	1.1	1.0	4.0
8	8.58	7.42	13.00	12.57	15.01	14.20	5.7	4.9	3.7	1.2	0.4	2.8	1.2	1.1	5.8
10	10.58	9.42	16.00	15.57	18.48	17.59	6.9	5.9	4.5	1.2	0.4	3.6	1.6	1.4	7.2
12	12.70	11.30	18.00	17.57	20.78	19.85	8.0	7.0	5.2	1.8	0.6	4.2	1.8	1.6	8.7
16	16.70	15.30	24.00	23.16	27.71	26.17	10.8	9.3	7.0	1.8	0.6	5.1	2.2	2.0	12.0
20	20.84	19.16	30.00	29.16	34.64	32.95	13.4	11.6	8.8	2.4	0.8	5.6	2.4	2.2	15.6
24	24.84	23.16	36.00	35.00	41.57	39.55	15.9	14.1	10.5	2.4	0.8	7.3	3.1	7.5	18.1
See Para.	11				7.8		6		7	12		15			

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Table 2 Recommended Diameter-Length Combinations

Nominal Screw Length	Nominal Screw Dia							
	5	6	8	10	12	16	20	24
8	x							
10	x	x						
12	x	x	x					
14	x	x	x					
16	x	x	x	x				
20	x	x	x	x	x			
25	x	x	x	x	x	x		
30	x	x	x	x	x	x	x	
35	x	x	x	x	x	x	x	x
40	x	x	x	x	x	x	x	x
45	x	x	x	x	x	x	x	x
50	x	x	x	x	x	x	x	x
60		x	x	x	x	x	x	x
70			x	x	x	x	x	x
80			x	x	x	x	x	x
90				x	x	x	x	x
100				x	x	x	x	x
110					x	x	x	x
120					x	x	x	x
130						x	x	x
140						x	x	x
150						x	x	x
160						x	x	x
180							x	x
200							x	x
220								x
240								x
260								x
280								x
300								x

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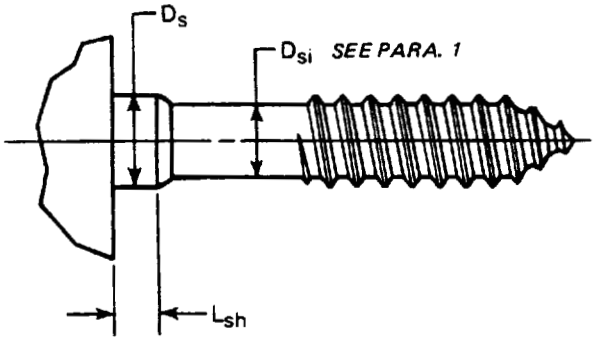

Table 3 Dimensions of Reduced Body Diameter

Nominal Screw Dia	D_s		L_{sh}	
	Shoulder Diameter		Shoulder Length	
mm	Max	Min	Max	Min
5	5.48	4.52	3.5	2.5
6	6.48	5.52	4.0	3.0
8	8.58	7.42	5.0	4.0
10	10.58	9.42	6.0	5.0
12	12.70	11.30	7.0	6.0
16	16.70	15.30	9.0	8.0
20	20.84	19.16	11.0	10.0
24	24.84	23.16	13.0	12.0

1. Body diameter is the blank diameter before threading.
2. Shoulder is mandatory.

Table 4 Length Tolerances

Nominal Length	Nominal Screw Dia		
	5 thru 8	10 thru 16	20 and 24
to 50 mm	± 1.0	± 1.6	± 2.5
over 50 to 150 mm	± 2.5	± 2.5	± 4.0
over 150 mm	± 6.0	± 6.0	± 6.0

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APPENDIX I

Government Standard Items and Part Numbering System

Note

The Government encourages the general use of this appendix to achieve maximum parts standardization.

This appendix establishes the standard items for Government application selected from the possible variations of items within the scope of the 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 5.

b. Material–Steel

c. Finish–Plain finish or zinc plating as coded in Part Numbering System.

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

a. Document Identifier – ANSI Standard Number less decimal points.

b. Material and Finish

c. Nominal Diameter

d. Nominal Length

Note

The Part Numbering System may also be used for non-standard diameter and length combinations.

Quality Assurance Provisions: Quality assurance provisions shall be in accordance with FF-B-561 Bolts, (Screw) Lag.

Packaging: Packaging shall be in accordance with PPP-H-1581, Hardware (Fasteners and Related Items), Packaging and Packing for Shipment and Storage of.

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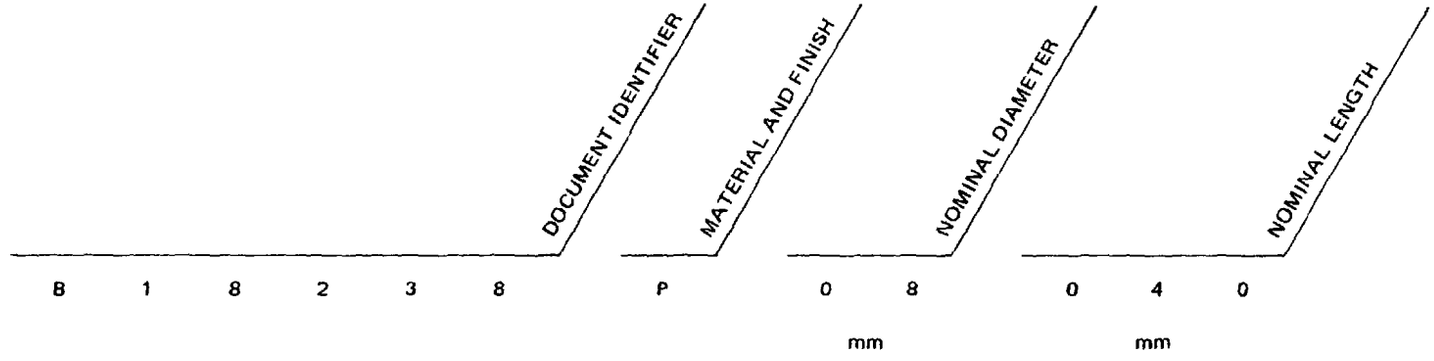
PART NUMBERING SYSTEM COVERING STANDARD ITEMS FOR GOVERNMENT USE

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



MATERIAL AND FINISH CODE

P — Steel, Plain Finish

B — Steel w/Zinc Plating per QQ-Z-325, Type II, Class 3 (5.1μm Plating Thickness)

EXAMPLE: B18238P08040 *indicates a screw, lag, hex head-metric, made of plain finish steel, 8 mm in diameter, and 40 mm in length.*

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Table 5 Metric Hex Head Lag Screws—Standard Sizes for Government Use

Nominal Length	Nominal Diameter							
	5	6	8	10	12	16	20	24
8	05008							
10		06010						
12			08012					
14								
16				10016				
20					12020			
25						16025		
30	STANDARD						20030	
35								24035
40		DIAMETER AND						
45				LENGTH COMBINATION				
50	05050							
60		06060						
70								
80			08080					
90								
100				10100				
110								
120					12120			
130								
140								
150								
160						16160		
180								
200							20200	
220								
240								
260								
280								
300								24300

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