

**ASME B18.6.3-2010**  
[Revision and Consolidation of ASME  
B18.6.3-2003 (R2008) and B18.6.4-2009]

# Machine Screws, Tapping Screws, and Metallic Drive Screws (Inch Series)

---

**AN AMERICAN NATIONAL STANDARD**



The American Society of  
Mechanical Engineers

Copyright © 2011 by the American Society of Mechanical Engineers.  
No reproduction may be made of this material without written consent of ASME.



INTENTIONALLY LEFT BLANK



**ASME B18.6.3-2010**  
[Revision and Consolidation of ASME  
B18.6.3-2003 (R2008) and B18.6.4-2009]

# Machine Screws, Tapping Screws, and Metallic Drive Screws (Inch Series)

---

**AN AMERICAN NATIONAL STANDARD**



**The American Society of  
Mechanical Engineers**

Three Park Avenue • New York, NY • 10016 USA

Copyright © 2011 by the American Society of Mechanical Engineers.  
No reproduction may be made of this material without written consent of ASME.



Date of Issuance: June 30, 2011

This Standard will be revised when the Society approves the issuance of a new edition. There will be no addenda issued to this edition.

ASME issues written replies to inquiries concerning interpretations of technical aspects of this Standard. Periodically certain actions of the ASME B18.6.4 Committee may be published as Cases. Cases and interpretations are published on the ASME Web site under the Committee Pages at <http://cstools.asme.org> as they are issued.

ASME is the registered trademark of The American Society of Mechanical Engineers.

This code or standard was developed under procedures accredited as meeting the criteria for American National Standards. The Standards Committee that approved the code or standard was balanced to assure that individuals from competent and concerned interests have had an opportunity to participate. The proposed code or standard was made available for public review and comment that provides an opportunity for additional public input from industry, academia, regulatory agencies, and the public-at-large.

ASME does not “approve,” “rate,” or “endorse” any item, construction, proprietary device, or activity.

ASME does not take any position with respect to the validity of any patent rights asserted in connection with any items mentioned in this document, and does not undertake to insure anyone utilizing a standard against liability for infringement of any applicable letters patent, nor assumes any such liability. Users of a code or standard are expressly advised that determination of the validity of any such patent rights, and the risk of infringement of such rights, is entirely their own responsibility.

Participation by federal agency representative(s) or person(s) affiliated with industry is not to be interpreted as government or industry endorsement of this code or standard.

ASME accepts responsibility for only those interpretations of this document issued in accordance with the established ASME procedures and policies, which precludes the issuance of interpretations by individuals.

No part of this document may be reproduced in any form,  
in an electronic retrieval system or otherwise,  
without the prior written permission of the publisher.

The American Society of Mechanical Engineers  
Three Park Avenue, New York, NY 10016-5990

Copyright © 2011 by  
THE AMERICAN SOCIETY OF MECHANICAL ENGINEERS  
All rights reserved  
Printed in U.S.A.



# CONTENTS

Foreword .....	v
Committee Roster .....	vii
Correspondence With the B18 Committee .....	viii
<b>1 Introductory Notes</b> .....	<b>1</b>
<b>2 General Data for Machine Screw and Tapping Screw Heads</b> .....	<b>1</b>
<b>3 General Data for Machine Screws</b> .....	<b>3</b>
<b>4 General Data for Tapping Screws</b> .....	<b>4</b>
<b>5 General Data for Metallic Drive Screws</b> .....	<b>9</b>
<b>Figures</b>	
1 Types A, AB, B, BF, BP, and BT .....	6
2 Types C, D, G, T, and TRS .....	6
3 Type F .....	6
4 Typical Torsional Strength Test Fixture .....	9
<b>Tables</b>	
1 Dimensions of Slotted Flat Countersunk Head Screws .....	11
2 Recess Dimensions for Flat Countersunk Head Screws .....	13
3 Dimensions of Slotted 100-deg Flat Countersunk Head Screws (Machine Screws Only) .....	15
4 Recess Dimensions for 100-deg Flat Countersunk Head Screws (Machine Screws Only) .....	16
5 Dimensions of Slotted Close Tolerance 100-deg Flat Countersunk Head Screws (Machine Screws Only) .....	17
6 Recess Dimensions for Close Tolerance 100-deg Flat Countersunk Head Screws (Machine Screws Only) .....	18
7 Dimensions of Slotted Oval Countersunk Head Screws .....	19
8 Recess Dimensions for Slotted Oval Countersunk Head Screws .....	21
9 Dimensions of Slotted Undercut 82-deg Flat Countersunk Head Screws .....	23
10 Recess Dimensions for Undercut 82-deg Flat Countersunk Head Screws .....	24
11 Dimensions of Slotted Undercut Oval Countersunk Head Screws .....	25
12 Recess Dimensions for Undercut Oval 82-deg Countersunk Head Screws .....	27
13 Dimensions of Flat Countersunk Trim Head Screws .....	28
14 Recess Dimensions for Flat Countersunk Trim Head Screws .....	29
15 Dimensions of Oval 82-deg Countersunk Trim Head Screws .....	30
16 Recess Dimensions for Oval 82-deg Countersunk Trim Head Screws .....	33
17 Head Dimensions for Slotted Pan Head Screws .....	34
18 Dimensions of Type I Cross Recessed Pan Head Screws .....	35
19 Recess Dimensions for Pan Head Screws (Types IA, III, and VI) .....	36
20 Recess Dimensions for Combination Slotted-Pan Head Screws .....	37
21 Dimensions of Slotted Fillister Head Screws .....	39
22 Recess Dimensions for Fillister Head Screws .....	40
23 Dimensions of Slotted Drilled Fillister Head Screws (Machine Screws Only) .....	42
24 Dimensions of Slotted Truss Head Screws .....	43
25 Recess Dimensions for Truss Head Screws .....	44
26 Dimensions of Combination Slotted Truss Head Screws .....	46
27 Dimensions of Slotted Binding Head Screws (Machine Screws Only) .....	48
28 Recess Dimensions for Binding Head Screws (Machine Screws Only) .....	49



29	Dimensions of Plain (Unslotted) and Slotted Regular and Large Hex Head Screws .....	50
30	Recess Dimensions for Indented Regular and Large Hex Head Screws .....	52
31	Recess Dimensions for Type I Nonindented Regular and Large Hex Head Screws .....	53
32	Dimensions of Plain and Slotted Hex Washer Head Screws .....	54
33	Recess Dimensions for Indented Hex Washer Head Screws .....	56
34	Recess Dimensions for Combination Slotted Type I Indented Hex Washer Head Screws .....	57
35	Dimensions of Slotted Round Head Screws .....	58
36	Recess Dimensions for Round Head Screws .....	59
37	Recess Dimensions for Combination Slotted Round Head Screws .....	60
38	Dimensions of Slotted Round Washer Head Screws .....	62
39	Recess Dimensions for Round Washer Head Screws .....	63
40	Dimensions of Threads and Points for Types AB and ABR Thread-Forming Tapping Screws .....	64
41	Dimensions of Threads and Points for Types B and BP Thread-Forming Tapping Screws .....	65
42	Dimensions of Threads and Points for Type A Thread-Forming Tapping Screws .....	66
43	Dimensions of Threads and Points for Types BF and BT Thread-Cutting Tapping Screws .....	67
44	Dimensions of Threads and Points for Types D, F, G, and T Thread-Cutting Tapping Screws .....	68
45	Dimensions of Type TRS Tapping Screws .....	70
46	Thread Lengths for Types A, AB, B, BF, BP, and BT Tapping Screws .....	71
47	Thread Lengths for Types C, D, F, G, and T Tapping Screws .....	72
48	Standard Test-Plate Thickness and Hole Sizes for Drive-Test Inspection of Tapping Screws .....	73
49	Maximum Drive Torque for Type TRS Tapping Screws .....	74
50	Torsional Strength Requirements for Tapping Screws .....	75
51	Dimensions of Round Head Type U Metallic Drive Screws .....	76
<b>Mandatory Appendices</b>		
I	Protrusion Gaging of Flat Countersunk Heads .....	77
II	Across-Corners Gaging of Hex Heads .....	78
III	Gaging of Recessed Heads, Types I, IA, and III .....	79
IV	Wobble Gaging of Recessed Heads .....	85
V	Dimensions for No. 0000, No. 000, and No. 00 Thread Sizes .....	88
VI	Dimensions of Type C Tapping Screws .....	90
VII	Type VI Recess Gage Requirements .....	92
<b>Nonmandatory Appendices</b>		
A	Dimensions of Header Points for Machine Screws Before Threading .....	95
B	Determination of Maximum Effective Design Grip Lengths .....	97
C	Formulas for Dimensions .....	99
D	Approximate Hole Sizes for Tapping Screws .....	108
E	Wrench Openings for Hex Head Screws, and Square and Hex Nuts .....	130



# 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 3<sup>1</sup> was subsequently established and charged with the responsibility for technical content of standards covering slotted and recessed head screws.

An American Standard setting forth slotted head proportions was approved and published in April 1930. Over the years following the issuance of this document, the need for standards more comprehensive than head configurations became apparent. At a meeting held on April 14, 1942, Subcommittee 3<sup>1</sup> was reorganized and enlarged, and the following operating scope was established:

The scope of Subcommittee 3<sup>1</sup> shall consist of the development and promulgation of American Standards embracing screw products variously known as machine screws, wood screws, tapping screws, slotted head cap screws, slotted headless set screws, and machine screw nuts. The standards shall comprise complete product standards covering all dimensions and tolerances required for the specification and production of the products. Details shall include boundary dimensions, such as nut width and thickness; screw head dimensions; slot and recess dimensions; body dimensions; thread classification or thread detail, as required; thread length; point design; chamfers; underhead fillets; and supporting general specifications covering the quality, finish, and the acceptable tolerances and limits as well as any information that may be necessary to ensure satisfactory application of the products.

Several meetings of the Subcommittee over the ensuing 3 years resulted in the development and acceptance of a proposed revision containing complete product standards coverage for slotted and recessed head machine, tapping and wood screws; slotted and hexagon head cap screws; and slotted headless set screws. Following approval by the B18 Committee and sponsor organizations, this proposal was forwarded to the American Standards Association and declared an American Standard, ASA B18.6, on April 12, 1947.

Recognizing the need for further refinements, Subcommittee 3<sup>1</sup> at a meeting held on February 1, 1951, established three standing working subgroups: one to develop details pertinent to tapping screw threads; a second to review, revise, and develop head dimensions and tolerances; and a third to correlate and edit the technical information emanating from the other two groups. Also at this meeting, numerous suggested changes were reviewed and assigned to the respective subgroups for further development. Additional meetings of the Subcommittee were held on October 9, 1952; October 29, 1953; and April 1 and 2, 1954. Between each of these meetings the subgroups held numerous working sessions and carried on technical development in cooperation with the technical committees of the U.S. Machine Screw and Tapping Screw Service Bureaus.

At the April 1954 meeting, Subcommittee 3,<sup>1</sup> contemplating a partial revision of the ASA B18.6 document, recommended the publication of standards for wood screws, cap and set screws, machine screws, and tapping and drive screws in four separate documents, each of which would consist of a complete product specification. This approach was confirmed by the B18 Committee with the further stipulation that the coverage for hexagon head cap screws, square head set screws, and machine screw nuts from the ASA B18.2 standard be transferred to the documents covering cap and set screws and machine screws, respectively. It was understood that jurisdiction over the square head set screws and hexagon head cap screws would remain with Subcommittee 2 and that Subcommittee 3<sup>1</sup> would retain responsibility for machine screw nuts. Following this

---

<sup>1</sup> As of April 1, 1966, Subcommittee 3 was redesignated Subcommittee 6.



confirmation and additional direction, the preparation of proposals for the new documents was undertaken.

The proposed standard covering slotted and recessed head machine screws and machine screw nuts was approved by Subcommittee 3<sup>1</sup> at a meeting held on December 6, 1955. After being circulated to industry for comment, it was revised and subsequently approved by letter ballot of the B18 Committee in March of 1958. The proposal was, however, redrafted to incorporate additional revisions and refinements adopted by Subcommittee 3<sup>1</sup> at meetings held on October 30, 1958 and September 17, 1959. The revised proposal was recirculated to the B18 Committee and was approved by the sponsor organizations and the American Standards Association and formally designated an American Standard, ASA B18.6.3, on February 12, 1962.

Following issuance of the 1962 document, Subcommittee 3<sup>1</sup> and the working subgroups continued to develop revisions and refinements reflecting changes in industry practices and technical improvements. Work over the intervening years culminated in the Subcommittee 6 acceptance of a draft dated November 1969, incorporating revisions in the following areas: inclusion of Type IA cross recess data; addition of the No. 0000, No. 000, and No. 00 sizes to most slotted head styles; extensions of size coverage for 100 deg flat countersunk heads and binding heads in smaller sizes, and for pan heads in larger sizes; redimensioning of flat and oval countersunk heads; revision of thread lengths; inclusion of appendices for wobble gaging of recessed heads and wrench sizes for square and hex products; and a complete revamping of the format.

This revision was approved as an American National Standard on May 22, 2003.

In late 2008 the ASME B18.6 Subcommittee undertook a revision of B18.6.3. The first major decision was to combine B18.6.3 and B18.6.4 into one standard for all types of screws, machine and tapping. This was decided since over 50% of both standards were identical and they both contained essentially the same head and recess data.

The Type VI recess design, having six internal lobes, was introduced into this standard because of its wide use. The Type I recess was removed from the standard because there is no documented use of this design today. A grade of hardened steel machine screw was added to the standard along with references to stainless steel and nonferrous materials. The thread Type TRS, for thread rolling screws, was added in the tapping screw section. The Type A thread type was moved back into the body of the standard from the Appendix because it is still in high use in several industries. The Type ABR thread, a Type AB with a radius point, was also introduced. Machine screw nuts were moved to ASME B18.2.2.

This revision was approved as an American National Standard on September 8, 2010.



# 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.)

### STANDARDS COMMITTEE OFFICERS

**J. Greenslade**, *Chair*  
**D. S. George**, *Vice Chair*  
**R. D. Strong**, *Vice Chair*  
**C. J. Gomez**, *Secretary*

### STANDARDS COMMITTEE PERSONNEL

<b>V. Cartina</b> , Autocraft Industrial	<b>W. H. Kopke</b> , Consultant
<b>D. A. Clever</b> , Consultant	<b>W. J. Lutkus</b> , Emhart Technologies
<b>A. P. Cockman</b> , Ford Motor Co.	<b>A. D. McCrindle</b> , Canadian Fasteners Institute
<b>C. A. Dugal de la Garza</b> , TSP, Inc.	<b>M. D. Prasad</b> , <i>Contributing Member</i> , Global M&F Solutions, Inc.
<b>D. S. George</b> , Ramco Specialties	<b>S. Savoji</b> , ITW Medalist
<b>C. J. Gomez</b> , The American Society of Mechanical Engineers	<b>W. Schevey</b> , <i>Contributing Member</i> , BGM Fastener Co., Inc.
<b>J. Greenslade</b> , Industrial Fasteners Institute	<b>Q. M. Smith III</b> , Oregon Department of Transportation
<b>J. J. Grey</b> , <i>Contributing Member</i> , Fastener Consulting Services, Inc.	<b>W. R. Stevens</b> , Ramco
<b>B. Hasiuk</b> , <i>Contributing Member</i> , Defense Supply Center — Philadelphia	<b>R. D. Strong</b> , Consultant
<b>A. Herskovitz</b> , Consultant	<b>S. W. Vass</b> , Consultant
<b>J. Hubbard</b> , Leland-Powell Fasteners, Inc.	<b>C. B. Wackrow</b> , MNP Corp.
<b>J. Jennings</b> , <i>Contributing Member</i> , Naval Surface Warfare Center	<b>W. K. Wilcox</b> , Consultant
<b>W. H. King</b> , Porteous Fastener Co.	<b>C. B. Williamson</b> , Fastenal Co.
<b>J. F. Koehl</b> , <i>Contributing Member</i> , Spirol International Corp.	<b>C. J. Wilson</b> , Consultant
	<b>R. B. Wright</b> , <i>Contributing Member</i> , Wright Tool Co.
	<b>J. G. Zeratsky</b> , National Rivet and Manufacturing Co.

### SUBCOMMITTEE 6 — SLOTTED AND RECESSED HEAD SCREWS

<b>R. D. Strong</b> , <i>Chair</i> , Consultant	<b>M. Keller</b> , Consultant
<b>J. Hubbard</b> , <i>Vice Chair</i> , Leland-Powell Fasteners, Inc.	<b>R. W. Kerr</b> , Kerr Lakeside, Inc.
<b>G. M. Simpson</b> , <i>Vice Chair</i> , Semblex Corp.	<b>W. H. King</b> , Porteous Fastener Co.
<b>A. L. Guzman</b> , <i>Secretary</i> , The American Society of Mechanical Engineers	<b>M. Levinson</b> , ITW Shakeproof Industrial Products
<b>D. A. Clever</b> , Consultant	<b>J. F. McCarrick</b> , Defense Supply Center — Philadelphia
<b>M. A. Elmi</b> , Caterpillar	<b>R. B. Meade</b> , Atrona Material Testing Laboratories, Inc.
<b>J. S. Foote</b> , Trade Association Management, Inc.	<b>S. Savoji</b> , ITW Medalist
<b>D. S. George</b> , Ramco Specialties	<b>D. J. Soscia</b> , General Dynamics Electric Boat Corp.
<b>J. Greenslade</b> , Industrial Fasteners Institute	<b>K. Westphal</b> , Kamax
<b>A. Herskovitz</b> , Consultant	<b>W. K. Wilcox</b> , Consultant
<b>M. W. Holubecki</b> , Electric Boat Corp.	<b>C. B. Williamson</b> , Fastenal Co.
	<b>C. J. Wilson</b> , Consultant



## 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  
Three 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 Standards Committee will render an interpretation of any requirement of the Standard. Interpretations can be rendered only 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 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.



# MACHINE SCREWS, TAPPING SCREWS, AND METALLIC DRIVE SCREWS (INCH SERIES)

## 1 INTRODUCTORY NOTES

### 1.1 Scope

This Standard is intended to cover the complete general and dimensional data for the various types of slotted and recessed head machine screws, tapping screws, and metallic drive screws recognized as American National Standard. Also included are appendices that provide specifications and instructions for the protrusion gaging of flat countersunk head screws; across-corners gaging of hex head screws; penetration gaging and wobble gaging of recessed head screws; approximate hole size for tapping screws; wrench openings for hex and square products; thread dimensions for the No. 0000, No. 000, and No. 00 sizes; means for determining effective grip lengths on screws; documentation for screw types and head types relegated to not-recommended or limited-usage status; and formulas on which dimensional data are based. It shall be understood, however, that where questions arise concerning acceptance of product, the dimensions in the tables shall govern over recalculation by formula.

The inclusion of dimensional data in this Standard is not intended to imply that all of the products described are stock production sizes. Consumers should consult with suppliers concerning the availability of products.

### 1.2 Dimensions

All dimensions in this Standard are given in inches, unless stated otherwise.

### 1.3 Options

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

### 1.4 Responsibility for Modification

The manufacturer shall not be held responsible for malfunctions of product determined to be due to plating or other modifications when such plating or modification is not accomplished under the manufacturer's control or direction.

### 1.5 Terminology

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

### 1.6 Comparison With ISO

This Standard has no ISO counterpart.

### 1.7 Referenced Standards

Unless otherwise specified, the standards referenced shall be the most recent at the time of order placement.

ASME B1.1, Unified Inch Screw Threads (UN and UNR Thread Form)

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

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

ASME B18.12, Glossary of Terms for Mechanical Fasteners

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

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

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

ASTM F 1941, Specification for Electrodeposited Coatings on Threaded Fasteners [Unified Inch Screw Threads (UN/UNR)]

Publisher: American Society for Testing and Materials (ASTM International), 100 Barr Harbor Drive, P.O. Box C700, West Conshohocken, PA, 19428-2959 ([www.astm.org](http://www.astm.org))

SAE J423, Methods of Measuring Case Depth

Publisher: SAE International, 400 Commonwealth Drive, Warrendale, PA 15096-0001 ([www.sae.org](http://www.sae.org))

### 1.8 Inspection and Quality Assurance

Unless otherwise specified, acceptability to this Standard shall be determined in accordance with ASME B18.18.2.

## 2 GENERAL DATA FOR MACHINE SCREW AND TAPPING SCREW HEADS

### 2.1 Heads

**2.1.1 Head Height.** All dimensions pertaining to head height specified in the dimensional tables shall be

