ASME B18.13-2017
[Revision of ASME B18.13-1996 (R2013)]
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Screw and Washer Assemblies – SEMS (Inch Series)

AN AMERICAN NATIONAL STANDARD

The American Society of Mechanical Engineers

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FOREWORD

American National Standards Committee B27 for the standardization of plain and lock washers was organized in March 1926 as Sectional Committee B27 under the aegis of the American Standards Association (later 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. (Since 1950, this Committee has also been assigned responsibility for standardization of washers and machine rings.) The Committee was reorganized in May 1928, at which time two subcommittees were established to carry on development work: Subcommittee 1[1] on plain washers and Subcommittee 2 on lock washers.

In 1940 the B27 Committee was reactivated and Subcommittee 2 proceeded to draft a proposal covering helical spring lock washers. It was further amended in 1943 and, following approval by the B27 Committee and sponsor organizations, accepted as an American Standard under the designation ASA B27.1-1994.

A draft proposal completed by Subcommittee 2 in September 1949 incorporated requirements applicable to helical spring lock washers made from materials other than carbon steel and included specifications for tooth lock washers, both helical spring and tooth lock washers, and machine screw assemblies. Subsequent to approval by the B27 Committee and sponsors, this proposal was forwarded to the American Standards Association and declared an American Standard on May 22, 1950.

During the years 1951 through 1956, Subcommittee 2 considered numerous refinements to the coverage for helical spring lock washers and heat treated machine screw and lock washer assemblies. A formal draft dated June 1957 was approved by letter ballot of the B27 Committee and the sponsor organizations and submitted to the American Standards Association for designation as an American Standard. This was granted on November 3, 1958.

In 1961 a study group comprised of members of the B18 and B27 Committees recommended that the screw and washer assemblies, commonly known as SEMS, be published as a separate document under the jurisdiction of the B18 Committee, but subject to approval of both Sectional Committees and the affected subcommittees thereof. This recommendation was accepted by the B27 and B18 Committees, respectively, on the 28th and 30th of November 1961. Subcommittee 27[2] of Committee B18 was subsequently appointed.

At the initial meeting of Subcommittee 27 on February 1, 1962 a proposal was submitted consisting of pertinent data for lock washer SEMS, extracted from ASA B27.1-1958 and for plain washer SEMS proposed for inclusion in ASA B27.2, plus information gleaned from SAE Standard J773, Conical Spring Washers. It was agreed that the proposal should be extended to include tapping screw SEMS. Consequently, additional meetings of the subcommittee were held at which new drafts incorporating data for these products were reviewed and further changes and corrections were recommended. On February 15, 1963, a formal proposal was circulated for comment to Subcommittees 3, 9, and 27 of the B18 Committee, and Subcommittees 1 and 2 of the B27 Committee. On November 15, 1963, a revised draft incorporating resolutions to the comments received and additional refinements was letter balloted to Sectional Committees B18 and B27. The resulting comments and disapprovals were resolved at a meeting of Sectional Committee B18 on June 4, 1964, and by circulation of the recommended dispositions to Sectional

[1] As of April 1, 1966, Subcommittee 1 was redesignated Subcommittee 2 on plain washers; Subcommittee 2 was redesignated Subcommittee 1 on lock washers under American National Standards Committee 27. As of March 16, 1972, Subcommittees 1 and 2 became Subcommittees 22 and 21, respectively, of American National Standards Committee B18.

[2] As of April 1, 1966, Subcommittee 3 was redesignated Subcommittee 6, Subcommittee 9 was redesignated Subcommittee 3, and Subcommitteee 27 was redesignated Subcommittee 13 of American National Standards Committee B18.

Committee B27 on February 12, 1965. Subsequent to approval by the sponsor organizations and the American Standards Association, the document was formally designated an American Standard, ASA B18.13-1965, on September 29, 1965.

Over the next 18 years attempts were made to update and refine the document. However, due to extended vacancies in the chairmanship and continual shifts in membership of Subcommittee 13, none of these efforts proved successful and the standard was reaffirmed for three review periods. At the December 5, 1984, meeting of Subcommittee 13, it was agreed the standard should be revised to incorporate those changes necessary to bring it into agreement with the latest versions of the referenced B18 document covering the screw and washer components and for possible additional refinements. Recommendations for changes were reviewed and discussed further at a meeting held on May 18, 1985, and task groups were established to prepare detailed proposals relative to specific product lines. A proposed revision was drafted that relegated the coverage for round and truss head SEMS and Type A and Type C tapping screw SEMS to appendices under "Not recommended for new design" status. The revision included dimensional coverage for smaller sizes where applicable, changes to the helical spring lock washer sections and hardness, plus other technical and editorial updating previously accepted. This proposal was reviewed at the December 3, 1985, meeting of Subcommittee 13. Numerous editorial refinements were considered and adopted.

A formal proposal dated February 1986 was circulated to Subcommittees 3, 6, 13, 21, and 22 of the B18 Committee. A revised proposal incorporating resolutions to the comments received was given letter ballot approval by Standards Committee B18 in March 1987. Following its acceptance by ASME and the American National Standards Institute, this revision was granted recognition as an American National Standard on January 12, 1996.

At the 2014 Fall meeting of Subcommittee 13 a vote was taken and approved to revise the Standard to incorporate the new material regarding SEMS manufacturing that was introduced in the recent revision of ASME B18.13.1M and to update the format to be consistent with the other recently revised B18 standards.

The scope of the Standard was revised to more clearly reflect what is covered by the Standard and the previously included reference standards were moved out of the scope and into a separate Reference Standards sections as in all other B18 standards.

In particular, information was added to this Standard to more thoroughly explain that there are two distinctly different means of manufacturing SEMS products depending on the characteristics of the washer and screw being combined during manufacturing. One method is to assemble screws and washers and heat treat them as a unit after assembly and the other method is to heat treat the washer and screw separately and then assemble them together.

The referenced quality section was updated to remove the previous section listing specific fastener characteristics and sampling levels and to simply refer to the requirements in ASME B18.18 as is now done in all B18 standards.

This revision was approved as an American National Standard on January 3, 2017.

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

ASME B18 COMMITTEE
Standardization of Bolts, Nuts, Rivets, Screws, Washers, and Similar Fasteners

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

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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 or a case, and attending Committee meetings. Correspondence should be addressed to:

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

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

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

Proposing a Case. Cases may be issued to provide 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 and 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.

Requests for interpretation should preferably be submitted through the online Interpretation Submittal Form. The form is accessible at http://go.asme.org/InterpretationRequest. Upon submittal of the form, the Inquirer will receive an automatic e-mail confirming receipt.

If the Inquirer is unable to use the online form, he/she may e-mail the request to the Secretary of the B18 Standards Committee at the above address. 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 in one or two words.
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. Please provide a condensed and precise question, composed in such a way that a “yes” or “no” reply is acceptable.
Proposed Reply(ies):	Provide a proposed reply(ies) in the form of “Yes” or “No,” with explanation as needed. If entering replies to more than one question, please number the questions and replies.
Background Information:	Provide the Committee with any background information that will assist the Committee in understanding the inquiry. 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 the format described above 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 and/or telephone conferences that are open to the public. Persons wishing to attend any meeting and/or telephone conference should contact the Secretary of the B18 Standards Committee. Future Committee meeting dates and locations can be found on the Committee Page at go.asme.org/B18committee.

SCREW AND WASHER ASSEMBLIES — SEMS (INCH SERIES)

1 INTRODUCTION

1.1 Scope

This Standard covers general and dimensional data pertinent to the various types of screw and captive washer assemblies, otherwise known as *SEMS*. SEMS products may include screws, tapping screws, or bolts in sizes No. 0 through ½ in. diameters in various grades and materials. The word SEMS is recognized in the United States as a generic term applicable to screw and washer assemblies. Also included in this Standard is Nonmandatory Appendix A illustrating the relative proportions of plain and conical washer SEMS.

NOTE: The word lock, which appears in the names of products in this Standard, is a generic term historically associated with their identification and is not intended to imply an indefinite fixity in attachments where the fasteners are used.

1.2 Use and Application

The SEMS covered by this Standard are general purpose fasteners intended for mass production and other assembly operations where speed and convenience are paramount factors. Further attributes of the various washers, recognized herein, are given in detail for each type of SEMS. Products having washers of styles and shapes not shown in this Standard may be considered SEMS; however, these products must be covered by the purchaser's drawing, standard, or the supplier's standards.

1.3 Types of SEMS

Included in this Standard are SEMS comprised of the following types of screws and washers:

(a) Helical Spring Lock Washers
- *(1)* socket head cap screws (see Table 1)
- *(2)* hex cap screws (see Table 2)
- *(3)* machine screws (see Tables 2 and 3)
- *(4)* tapping screws (see Tables 2 and 3)

(b) Tooth Lock Washers
- *(1)* machine screws (see Tables 4 and 5)
- *(2)* tapping screws (see Tables 4 and 5)
- *(3)* hex cap screws (see Tables 4 and 5)

(c) Conical Spring Washers
- *(1)* hex cap screws (see Table 6)
- *(2)* machine screws (see Table 6)
- *(3)* tapping screws (see Table 6)

(d) Plain Washers
- *(1)* machine screws (see Table 7)
- *(2)* tapping screws (see Table 7)
- *(3)* hex cap screws (see Table 7)

(e) Products having washers of styles and shapes not shown in this Standard may be considered SEMS; however, these products must be covered by the purchaser's drawing or standard.

1.4 Screw Heads

1.4.1 Head Styles. The head styles applicable to the various types of SEMS shall be as depicted in the illustrations and designated in the tables for each type. Where only the slotted head SEMS are illustrated, it should be understood that this Standard also applies to the corresponding cross-recessed head.

1.5 Dimensions

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

1.6 Options

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

1.7 Responsibility for Modification

Parts made to this Standard can be subject to the effects of hydrogen embrittlement, either from electroplating operations or exposure in the environment. The manufacturer shall not be held responsible for modifications, such as plating (done by the purchaser to unplated SEMS supplied in the original order), when these modifications are not made by the manufacturer.

1.8 Terminology

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

1.9 Reference Standards

The following is a list of publications referenced in this Standard. The latest edition shall apply.

ASME B18.2.1, Square, Hex, Heavy Hex, and Askew Head Bolts and Hex, Heavy Hex, Hex Flange, Lobed Head, and Lag Screws (Inch Series)

ASME B18.3, Socket Cap, Shoulder, Set Screws, and Hex Keys (Inch Series)

ASME B18.6.3, Machine Screws, Tapping Screws, and Metallic Drive Screws (Inch Series)