ASME B1.13M-2005
(Revision of ASME B1.13M-2001)

REAFFIRMED 2020

Metric Screw Threads: M Profile

AN AMERICAN NATIONAL STANDARD

The American Society of Mechanical Engineers

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Three Park Avenue • New York, NY 10016

Date of Issuance: March 10, 2006

The next edition of this Standard is scheduled for publication in 2010. There will be no addenda or written interpretations of the requirements of this Standard issued to this edition.

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

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Nonmandatory Appendices

FOREWORD

In 1966, ANSI Standards Committee B1 — Standardization and Unification of Screw Threads — started preparation of a document for ISO Metric Screw Threads based on the current ISO recommendations and draft documents. Since there were some uncertainties as to the acceptance of this thread by American industries, the information was published in August 1967 with the title, "Interpretative Document Metric Screw Threads B1.13." This document was never approved as an ANSI standard.

A revision of the information based on the then current ISO standards and recommendations was published in April 1972 with the title "B1 Report — ISO Metric Screw Threads." Again, the document was never approved as an ANSI standard. The document number was therefore removed and the status changed to a report.

Interest in metric screw threads has grown at a rapid pace over the past several years with the advent of greater import and export business. The American National Standards Institute, in April 1971, established a committee, ANSI Special Committee to Study Development of an Optimum Metric Fastener System (OMFS). Included in the scope was metric screw threads. Recommendations were submitted to a joint ISO/TC1/TC2 working group established in September 1973 to study the OMFS proposals.

An ISO/TC1/TC2 Ad Hoc Advisory Panel meeting in April 1975 in Munich reached a compromise between the OMFS recommendations and the existing ISO screw thread system. This compromise was approved, in the main, by the ISO/TC1 in its eleventh plenary meeting in Stockholm, June 1976.

(a) The first issue of this Standard, designated ANSI B1.13M, was approved as an American National Standard on February 12, 1979. It provided a system of metric screw threads for general fastening purposes in mechanisms and structures and was in basic agreement with ISO screw thread standards and resolutions current at that time. It featured detailed information for diameter-pitch combinations selected as preferred standard sizes.

(b) The 1983 issue of this Standard was designated ANSI/ASME B1.13M-1983 and was approved as an American National Standard on August 5, 1983. It updated the 1979 issue to include

(1) the addition of the new ISO tolerance position *f*

(2) the addition of a section on dimensional accommodation of coating or plating

(3) the addition of a section on lead and flank angle tolerances

(c) The 1995 issue of this Standard was designated ASME B1.13M-1995 and was approved as an American National Standard on February 20, 1995. It updated the 1983 issue to include

(1) the addition of an 8 mm pitch series

(2) the addition of standard size M10 × 1

(3) the provision for adjustment of internal thread tolerance class for short and long lengths of thread engagement, which may be used instead of external thread class adjustment

(4) changes in rounding procedures that follow the principles of ASME B1.30M

(d) The 2001 issue of this Standard was designated ASME B1.13M-2001 and was approved as an American National Standard on May 22, 2001. It updated the 1995 issue to include

(1) incorporation of changes made in the 1998 issue of ISO 261, including addition of diameters 125, 130, and 140 in the 8 mm pitch series; and changing of the 7 mm diameter from 3rd to 2nd choice in Table 6.

(2) recognition of changes made in the 1998 issue of ISO 965-1, including the stating of when International practice permits thread designation without thread class (not USA practice); and modifying the designation of multiple lead threads to be more in line with ISO practice.

(3) incorporation of the new 1998 International Standard, ISO 965-5, by adding Nonmandatory Appendix E for Class AX threads.

(4) minor changes in some thread root diameters due to modified calculation and rounding procedures added in ASME B1.30. ASME B1.30 uses rounding upward when the digit following

the last rounded place is a 5 followed by zeros. Prior to issue of ASME B1.30, rounding was to the nearest even digit. Tabulated values appearing in ISO Standards are not subject to rounding rules of ASME B1.30.

(5) changes in Circular Runout tolerances.

(6) other required updates and corrections.

(e) This issue updates the 2001 edition and includes

(1) addition of a new Nonmandatory Appendix F to provide a new tolerance position *E*

(2) addition of tolerance class 6h as a preferred class

(3) addition of M8 x 1.25 – 6AX to Nonmandatory Appendix E

(4) revision of section 8 on "Dimensional Accommodation of Coating or Plating..." to include allowances at thread roots and to expand the information on internal threads

(5) revision of section 7 to provide thread designations in accordance with ASME Y14.6-2001

(6) revision of some tabulated inch translation values in Nonmandatory Appendix C and the examples of calculation of thread size values in para. 9.4, in accordance with ASME B1.30-2002

(7) addition of para. 7.9 for designation of a thread with adjusted size limits

(8) other required editorial updates and corrections

Suggestions for improvement of this Standard are welcome. They should be sent to Secretary, ASME B1 Standards Committee, Three Park Avenue, New York, NY 10016-5990.

This revision was approved as an American National Standard on September 29, 2005.

ASME B1 COMMITTEE
Standardization and Unification of Screw Threads

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

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METRIC SCREW THREADS: M PROFILE

1 GENERAL

1.1 Scope

This Standard contains general metric standards for a 60 deg symmetrical screw thread with a basic ISO 68-1 profile designated M profile. The M profile threads of tolerance class 6H/6g are intended for metric applications where inch class 2A/2B have been used. At the minimum material limits, the 6H/6g results in a looser fit than the 2A/2B. Tabular data is also provided for a tighter tolerance fit external thread of class 4g6g, which is approximately equivalent to the inch class 3A but with an allowance applied. Formulation and tolerancing data is included for applications requiring other fits.

NOTE: A 4H5H/4h6h is approximately equivalent to a class 3A/3B fit in the inch system.

1.2 Interchangeability

Threads produced to this Standard are fully interchangeable with threads conforming to other National Standards that are based on ISO 68-1 basic profile and ISO 965-1 tolerance practices.

1.2.1 Assembly. Threads produced in accordance with M profile and MJ profile (ASME B1.21M) design data will assemble with each other. However, external MJ threads will encounter interference on the root radii with internal M thread crests when both threads are at maximum material condition.

1.3 References

The latest issues of the following documents form a part of this Standard to the extent specified herein.

ASME B1.3, Screw Thread Gaging Systems for Dimensional Acceptability — Inch and Metric Screw Threads (UN, UNR, UNJ, M, and MJ)
ASME B1.7M, Nomenclature, Definitions, and Letter Symbols for Screw Threads
ASME B1.16M, Gages and Gaging for Metric M Screw Threads
ASME B1.21M, Metric Screw Threads: MJ Profile
ASME B1.30, Screw Threads — Standard Practice for Calculating and Rounding Dimensions
ASME B47.1, Gage Blanks
ASME Y14.5, Dimensioning and Tolerancing
Publisher: The American Society of Mechanical Engineers (ASME), Three Park Avenue, New York, NY 10016-5990; Order Department: 22 Law Drive, Box 2900, Fairfield, NJ 07007-2900

ASTM F568M, Standard Specification for Carbon and Alloy Steel Externally Threaded Metric Fasteners
Publisher: The American Society for Testing and Materials (ASTM), 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959

ISO 3, Preferred Numbers — Series of Preferred Numbers
ISO 68-1, ISO General Purpose Screw Threads — Basic Profile — Part 1: Metric Screw Threads
ISO 261, ISO General Purpose Metric Screw Threads — General Plan
ISO 724, ISO Metric Screw Threads — Basic Dimensions
ISO 898-1, Mechanical Properties of Fasteners — Part 1: Bolts, Screws, and Studs
ISO 965-1, ISO General Purpose Metric Screw Threads — Tolerances — Part 1: Principles and Basic Data
Publisher: International Organization for Standardization (ISO), 1 rue de Varembé, Case Postale 56, CH-1211, Genève 20, Switzerland/Suisse

SAE J1199, Mechanical and Material Requirements for Metric Externally Threaded Steel Fasteners
Publisher: Society of Automotive Engineers (SAE), 400 Commonwealth Drive, Warrendale, PA 15096-0001

1.4 Acceptability

Acceptability of product threads shall be in accordance with ASME B1.3. Gages and gaging are in accordance with ASME B1.16M.

1.5 Reference Temperature

The reference temperature is 20°C for dimensions defined by this system.

1.6 General Symbols

The general symbols used to describe the metric screw thread forms are shown in Table 1.

1.7 Units

All dimensions and all values in the formulas are expressed in millimeters unless otherwise noted. Values in terms of sharp vee-thread height (height of fundamental triangle), H, are used to be consistent with ISO Standards, but actual formulations and calculations are based on values of pitch, P. See Table 2.

1.8 Federal Government Use

When this Standard is approved by the Department of Defense and Federal Agencies and is incorporated