ASME B1.21M-1997

METRIC SCREW THREADS: MJ PROFILE

(Revision of ANSI B1.21M-1978)

REAFFIRMED 2018

AN AMERICAN NATIONAL STANDARD

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ASME B1.21M-1997
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This Standard will be revised when the Society approves the issuance of a new edition. There will be no addenda or written interpretations of the requirements of this Standard issued to this edition.

The American Society of Mechanical Engineers
345 East 47th Street, New York, NY 10017

FOREWORD

(This Foreword is not part of ASME B1.21M-1997.)

This Metric Screw Thread Standard, MJ Profile, is a hard metric version similar to the UNJ Inch ASME B1.15 and MIL-S-8879 Standards which have a $0.15011P$ to $0.18042P$ controlled radius root in the external thread and the internal thread minor diameter truncated to accommodate the external thread maximum root radius. This metric thread is recommended for use in high temperature or high fatigue applications.

Tolerance Class 4H5H/4h6h is approximately equivalent to a Class 3A/3B Inch J Thread and is intended for aerospace applications.

Tabulated data has been provided for Tolerance Class 4g6g and 4G6G/4G5G for commercial applications or when the standard reduction for coating or plating provided in this Standard is not adequate for the coating thickness required.

Table 6 in this issue has been added to define limiting dimensions for Tolerance Class 6g/6H for commercial producers and users of this class. Tolerance Class 6g/6H is intended for use only in commercial applications.

This metric Standard has as its original basis the work done under the direction of the SAE E21/E25 Metric Thread Panel, which developed and published SAE Aerospace Standard AS 1370. A replica of AS 1370 was ballot circulated in American National Standards Institute Committee B1 as ANSI B1.21.

Since the UNJ inch screw thread is predominantly used in aerospace designs, the aerospace industry decided to produce a hard metric version for aerospace metric design. The MJ screw thread project was initiated by SAE Committee E21, which was responsible for aerospace propulsion design standards. At the Committee's October 25, 1971 meeting, Project E21-122 was established to develop metric screw thread requirements for metric aerospace fasteners and threaded parts.

A metric thread panel was organized to include representation from throughout the aerospace industry. Participating organizations included the following:

SAE/E21 — Aerospace Propulsion Design Standards
SAE/E25 — Aerospace Propulsion Utility Parts Standards
AIA/NASC — National Aerospace Standards Committee (airframe)
ATA — Air Transport Association
SBAC — Society of British Aircraft Constructors
ALMA — American Locknut Manufacturers Association
APFA — Aerospace Precision Fastener Association
ASD/WPAFB — Aeronautical Systems Division, U.S. Air Force
NAPTC — Naval Air Propulsion Test Center, U.S. Navy
Liaison representation from ANSI/OMFS

This Panel took into account the activities of ANSI/OMFS, SBAC, ATA, AECMA, ISO/TC 20/SC 4, and ISO/TC 1/SC 5 in order to reflect agreements compatible with international and U.S. aerospace metric screw thread requirements, as well as coordinating with ANSI/OMFS requirements.

Much work was done in developing surveys and drafts which were ballot circulated throughout the aerospace industry for resolving the thread design elements and involved the following:

(a) metric diameter/pitch combinations for aerospace fasteners,

(b) metric diameter/pitch combinations for other aerospace parts,

(c) thread design form, and

(d) thread tolerance class and formulae.

After fourteen meetings of the Metric Thread Panel, including special meetings with OMFS and the military, the aerospace industry ballot circulated the AS 1370 MJ Metric Screw Thread Standard for approval. In May 1976, it was approved and published by the SAE Aerospace Council. In addition, two preliminary documents were also published. AS 1337, published in March 1974, lists the aerospace diameter/pitch combinations for threaded fasteners, and AS 1338, published in February 1976, documents the MJ profile requirements and tolerance class. Following the publication of AS 1370, an additional standard, AS 1421 — listing aerospace diameter/pitch combinations for shaft or bearing retaining screw threads — was published in August 1976.

The International Organization for Standardization Subcommittee for Aerospace Bolts and Nuts, ISO/TC 20/SC 4, has accepted the MJ metric thread profile for aerospace metric threaded fasteners. AS 1370 is serving as the basis for establishing the ISO International Standard for MJ metric screw threads.

Upon publication of AS 1370, SAE agreed to submit this Standard to ANSI Committee B1 for approval as the American National Standard for MJ metric screw threads. ANSI B1.21 was approved by American National Standards Committee B1 on February 23, 1977.

The proposed Standard was submitted by Standards Committee B1 to the Secretariat and ANSI. It was approved and formally designated an American National Standard on November 21, 1978.

This issue updates the 1978 issue and includes:

(a) the addition of Tolerance Class 4G6G and 4G5G/4g6g to be comparable with ASME B1.15, Unified Inch Screw Threads (UNJ Thread Form), which includes Class 2 UNJ Threads;

(b) the addition of Tolerance Class 6H/6g to provide a Metric J profile comparable with ASME B1.13M, Metric Screw Threads — M Profile, for use in general applications; and

(c) changes in rounding procedures which follow the principles of ASME B1.30M.

Suggestions for improvement of this Standard are welcome. They should be sent to Secretary, ASME B1 Standards Committee, 345 East 47th Street, New York, NY 10017.

ASME B1.21M-1997 was approved as an American National Standard on December 9, 1997.

ASME STANDARDS COMMITTEE B1
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: MJ PROFILE

1 GENERAL

1.1 Scope

This Standard establishes the basic triangular profile for the MJ thread form; provides a system of designations; lists the standard series of diameter/pitch combinations for diameters from 1.6 to 200 mm; and specifies limiting dimensions and tolerances.

It specifies the characteristics of the MJ metric series of threads having a minimum $0.15011P$ radius at the root of the external thread, and also having the minor diameter of the external and internal threads increased above the ASME B1.13M thread form to accommodate the external thread root radius.

1.2 Field of Application

The MJ screw thread is designed for use on highly stressed applications requiring high fatigue strength. For aerospace applications, except for fluid fittings, Tolerance Classes 4H5H or 4G6G and 4h6h should be used. These classes approximate Classes 3B/3A in the inch system. Aerospace fluid fittings use Classes 4H5H or 4H6H and 4g6g.

Tolerance Classes 4G5G or 4G6G and 4g6g are provided for use when thread allowances are required. These classes result in a slightly tighter fit than the inch Classes 2B/2A at minimum material condition.

Additional Tolerance Classes 6H/6g are included in this Standard to provide appropriate product selection based on general applications. These classes and the selection of standard diameter/pitch combinations are the same as those provided for the M profile metric screw threads in ASME B1.13M. Classes 6H/6g result in a slightly looser fit than inch Classes 2B/2A at minimum material condition.

1.3 Assembly

Threads conforming to the M profile (ASME B1.13M) and the MJ profile are not interchangeable because of possible interference between the MJ external thread minor diameter and the B1.13M internal thread minor diameter. However, the MJ internal thread will assemble with the B1.13M external thread.

1.4 Federal Government Use

When this Standard is approved by the Department of Defense and Federal Agencies and is incorporated into FED-STD-H28/21, Screw Thread Standards for Federal Services, Section 21, the use of this Standard by the Federal Government is subject to all the requirements and limitations of FED-STD-H28/21.

1.5 References

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

American National Standards

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

ANSI/ASME B1.7M, Nomenclature, Definitions, and Letter Symbols for Screw Threads

ASME B1.10M, Unified Miniature Screw Threads

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

ASME B1.15, Unified Inch Screw Threads (UNJ Thread Form)

ANSI/ASME B1.22M, Gages and Gaging Practice for MJ Series Metric Screw Threads

ASME B1.30M, Screw Threads — Standard Practice for Calculating and Rounding Dimensions

ISO Standards

ISO 261, ISO General Purpose Metric Screw Threads — General Plan

ISO 965-1, ISO General Purpose Metric Screw Threads — Part 1 Principles and Basic Data

ISO 5855-1-2-3, Aerospace MJ Threads

2 PROFILE OF THREAD

2.1 Basic Profile

The basic profile is the theoretical profile corresponding to the basic dimensions of the thread major diameter,