



AEROSPACE STANDARD

AS8879™**REV. D**

Issued	1996-10
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Reaffirmed	2024-04

Superseding AS8879C

Screw Threads - UNJ Profile, Inch
Controlled Radius Root with Increased Minor Diameter

RATIONALE

AS8879D has been reaffirmed to comply with the SAE Five-Year Review policy.

FOREWORD

This standard was generated to provide an alternative to the inactive government specification MIL-S- 8879 for screw threads - UNJ profile, inch.

This standard has been revised to focus on the design requirements for screw threads – UNJ profile, inch. Procurement information not directly related to the design standard, such as product acceptance and quality assurance, have been removed.

A whitepaper has been developed to provide some history on the development of screw thread standards (MIL-S-8879 and AS8879) and the rationale for the content of AS8879 Revision C. This whitepaper will be published in the future by the SAE as an Aerospace Information Report (AIR5926).

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Documents

Standard Sharing Hub

1. SCOPE:

This SAE Aerospace Standard (AS) specifies the characteristics of screw threads - UNJ profile inch series, including a mandatory controlled radius as specified in Table 1 at the root of the external thread. The minor diameter of both external and internal threads provides a basic thread height of .5625H to accommodate the external thread maximum root radius. The following detailed design requirements are included:

- a. Screw threads - UNJ basic profile and design profiles.
- b. Standard series of diameter-pitch combinations for nominal thread diameters from 0.060 to 6.000 inches.
- c. Standard thread classes and form tolerances.
- d. Formulae for thread dimensions and tolerances.
- e. Method of designating UNJ threads.
- f. Tables for selected diameter-pitch combinations for close tolerance mechanical thread applications.
- g. Tables for screw thread - UNJ profile thread limit dimensions.

1.1 Purpose:

This document specifies the geometric design for each characteristic of screw threads - UNJ profile inch series and the conformance requirements. In addition, the purpose of this standard is to:

- a. Define the geometric requirements for a selected series of Unified Screw Threads, modified to provide a radius at the external thread root.
- b. Establish requirements for a continuous radius at the root of the external threads.
- c. Establish requirements for an increase in the minor diameter of both internal and external threads to accommodate the external thread root radius.

2. REFERENCES:

2.1 Applicable Documents:

The following publications form a part of this document to the extent specified herein. The applicable issue of all publications shall be the issue in effect on the date of the purchase order. In the event of conflict between the text in this document and the references cited herein, the text in this document takes precedence. Nothing in this document, however, supersedes applicable laws and regulations unless a specific exemption has been obtained.

- 2.1.1 ASME Publications: Available from the American Society of Mechanical Engineering (ASME) through the web at <http://www.asme.org> or in writing at ASME, 22 Law Drive, Box 2900, Fairfield, NJ 07007-2900.

ASME B1.1	Unified Inch Screw Threads (UN and UNR Thread Form)
ASME B1.2	Gages and Gaging for Unified Inch Screw Threads
ASME B1.3	Screw Thread Gaging System for Dimensional Acceptability - Inch and Metric Screw Threads (UN, UNR, UNJ, M, and MJ)
ASME B1.7	Nomenclature, Definitions, and Letter Symbols for Screw Threads
ASME B46.1	Surface Texture (Surface Roughness, Waviness and Lay)
ASME B47.1	Gage Blanks

- 2.1.2 Government Publications: Available from The Department of Defense Single Stock Point for Military Specifications, Standards and Related Publications (DODSSP) through the web at <http://www.dodssp.daps.mil> or in writing at DODSSP, Building 4 / Section D, 700 Robbins Avenue, Philadelphia, PA 19111-5098.

FED-STD-H28/6	Gages and Gaging for Unified Screw Threads – UN and UNR Thread Forms
FED-STD-H28/20	Inspection Methods for Acceptability of UN, UNR, UNJ, M and MJ Screw Threads

3. DESIGN REQUIREMENTS:

Threads produced in accordance with this design standard shall be within the basic design profile, dimensional limits and tolerances specified in Tables 1 through 7, and Table 9. (See Figures 1, 2 and 3 for illustrations of thread characteristics.)

3.1 Thread Series:

This standard defines two series of threads, standard UNJ and special UNJ.

3.1.1 Standard UNJ Series: The standard UNJ series of threads consists of three series with graded pitches (coarse, fine, and extra fine) and three series with constant pitches (8, 12, and 16 threads per inch). Standard UNJ threads shall be selected from those with diameter-pitch combinations listed in Tables 2 through 7.

3.1.2 Special UNJ Series: The special UNJ series of threads consists of all controlled root radius threads with combinations of diameter and pitch that are not included in the standard UNJ series.

3.2 Thread Characteristics:

3.2.1 General Data:

3.2.1.1 Basic Thread Data: The basic thread data for threads with standard pitches is shown in Table 1. This table is provided for engineering reference only.

3.2.1.2 Standard UNJ Thread Data: Thread dimensions are specified in Tables 2 through 7 for the diameter-pitch combinations shown herein. Dimensions include pitch diameter, major diameter, minor diameter, and external thread root radius. Functional diameter (Maximum Material) shall be within pitch diameter limits.

3.2.1.3 Special UNJ Thread Data: Dimensions for threads of special diameter-pitch combinations shall be computed from the formulas in Table 9. Functional diameter (Maximum Material) shall be within pitch diameter limits.

3.2.2 External threads: External threads shall be of Unified form, in accordance with ASME B1.1 (Class 3A), altered at the root so that the flanks of the adjacent threads are joined by one continuous smoothly blended curve tangent to the flanks. The root radius (radius of curvature) tangent to the flanks shall be within the values given in Tables 2 through 7 (see Figures 1 and 3).

3.2.3 Internal Threads: The internal threads shall be of the Unified form, in accordance with ASME B1.1 (Class 3B), modified at the minor diameter (truncated to 5H/16) to the values given in Tables 2 through 7 (see Figures 2 and 3).

3.3 Thread Categories:

This standard defines design requirements for two thread categories. Several characteristics, which are provided as reference-only for Category 1 threads, are design requirements for Category 2 threads. However, the basic design profile and dimensions specified in Tables 2 through 7 and Table 9 are the same for both thread categories. Thread category shall be determined and specified with the thread designation on the drawing or referenced specification for threaded product in accordance with this standard. When a thread category is not specified, Category 1 design requirements shall apply.

3.3.1 Category 1 Threads: The design characteristics for Category 1 threads are specified in Table 8. Several design characteristics are reference-only for Category 1 threads.

3.3.2 Category 2 Threads: The design characteristics for Category 2 threads are specified in Table 8.

3.4 Limits of Size:

Category 1 and Category 2 threads shall be within the limits of size specified in Tables 2 through 7.

3.4.1 Variations, Category 1 Threads: Lead, flank angle, circularity (roundness), taper, and runout are reference-only dimensions for Category 1 threads. Note: Establishing conformance of a product thread for maximum and minimum material also establishes that the combined effects of these variations are within limits.

3.4.2 Variations, Category 2 Threads: Lead, flank angle, circularity (roundness), taper, and runout are design requirements for Category 2 threads. The combined effect of variations in these characteristics are satisfactory when the difference between functional diameter and pitch diameter is less than, or equal to, 40% of the pitch diameter tolerance. This requirement applies only to full form threads. If the difference between functional diameter and pitch diameter exceeds 40% pitch diameter tolerance, then the following requirements apply individually.

3.4.2.1 Lead: The lead is the number of thread starts divided by the number of threads per inch. The variation in the lead (including helix variation) measured over a distance not less than the go ring gage blank (as defined in ASME B 47.1) shall not exceed a value equivalent to 40% of the pitch diameter tolerance. Where product full form thread length is less than the gage blank length, the product thread lead variation is acceptable when functional diameter is within limits.

3.4.2.2 Flank Angle: The flank angle shall be 30 degrees. Flank angle variation shall not exceed a value equivalent to 40% of the pitch diameter tolerance.

- 3.4.2.3 Circularity (Roundness): The pitch diameter shall be circular within one-half the pitch diameter tolerance where pitch diameter tolerance is less than 0.004 inch. Where pitch diameter tolerance is 0.004 inch or larger, the pitch diameter shall be circular within 0.002 inch. When circularity is checked using pitch diameter indicating gage segments or rolls, the circularity value is equal to one-half the difference between maximum and the minimum pitch diameter readings. Threads 1.5000 inches and larger with 16 threads per inch or less may exceed the tolerance by 0.002 inch over a maximum arc of 15 degrees, in the direction of minimum material in this area provided that this overcut does not result in raised material on the thread flanks or roots. Circularity shall fall within the pitch diameter tolerance except above the 15 degree arc.
- 3.4.2.4 Taper: Taper of the pitch diameter based on the length of engagement in 6.3 shall be within 0.4 of the pitch diameter tolerance.
- 3.4.2.5 Runout: The circular runout of the external thread major diameter cylinder and the internal thread minor diameter cylinder with respect to the pitch diameter cylinder shall not exceed twice the pitch diameter tolerance.

3.5 Incomplete Threads:

- 3.5.1 Incomplete Runout Threads: Unless otherwise specified, threads on externally threaded parts shall terminate between one and two pitches from the start of the unthreaded section, end of full form thread, or fillet radius, as applicable. The root radius of the incomplete thread shall be greater than or equal to the minimum root radius listed in Table 1 and shall transition gradually onto the unthreaded portion. There is no upper limit on root radius of incomplete threads as long as all other requirements are met. For parts with internal through threads, the incomplete runout threads shall not exceed 2 incomplete pitches.
- 3.5.2 Incomplete Lead Threads: Unless otherwise specified, the entering end of external threads and internal threads may be outside the specified limits of size for a length not to exceed two pitches, including chamfer. In no case shall the lead threads exceed the specified maximum material condition.

3.6 Surface Roughness:

On certain parts, it may be necessary to control the surface roughness of the thread flanks, roots, or crests. This requirement shall be specified, if necessary, on the part drawing or specification. Surface roughness specifications should be commensurate with a realistic assessment of current production capabilities. For Category 1 and 2 threads, unless otherwise specified, the surface roughness of the thread flanks and the roots shall be no greater than 63 $\mu\text{in Ra}$ for external threads and 100 $\mu\text{in Ra}$ for internal threads in accordance with ASME B46.1.

3.7 Material Limits for Coated or Plated Threads:

- 3.7.1 External threads: Unless otherwise specified, when externally threaded parts are to be coated/ plated, the minimum major diameter and minimum minor diameter may be reduced by 2 times the minimum plating or coating thickness. The minimum pitch diameter before coating may be reduced by no more than 0.001 inch for threads with pitch diameter tolerance not exceeding 0.0035 inch. For threads with pitch diameter tolerance greater than 0.0035 inch, the minimum pitch diameter may be reduced by an amount equal to 0.3 times the pitch diameter tolerance but not more than 0.0015 inch. Unless otherwise specified, all external thread characteristics shall be within the adjusted dimensional requirements before coating or plating. After coating or plating, the threads shall not exceed maximum material limits.
- 3.7.2 Internal Threads: Unless otherwise specified, the minor diameter of internal threads to be coated or plated may be increased by 2 times the minimum plating or coating thickness. The maximum pitch diameter requirement may be increased by the same values as the reductions allowed for external threads. Unless otherwise specified, all internal thread characteristics shall be within the adjusted dimensional requirements before coating or plating. After coating or plating, the threads shall not exceed maximum material limits.
- 3.7.3 Coating threads with Solid Film Lubricant: An adjustment of pitch diameter to accommodate the thickness of solid film lubricant is not in addition to that specified in 3.7.1 and 3.7.2. The product thread, before application of solid film lubricant, shall comply with AS8879 dimensions.

4. DIMENSIONAL CONFORMANCE:

4.1 Dimensional Conformance:

Unless otherwise specified on drawings or product specifications, threads shall conform to the design requirements of this standard as specified in Table 8.

4.2 Methods of Inspection:

All methods of inspecting the dimensional characteristics of thread forms presented in FED-STD- H28/20, ASME B1.3, and new, or more effective methods are acceptable so long as they have been demonstrated to show and assure conformance of the threads to the requirements of this standard and drawings, product specifications, or specification sheets supporting or derived from this standard. Gages shall meet the requirements of FED-STD-H28/6, ASME B1.2, and FED-STD-H28/ 20; new, or more effective methods are acceptable.

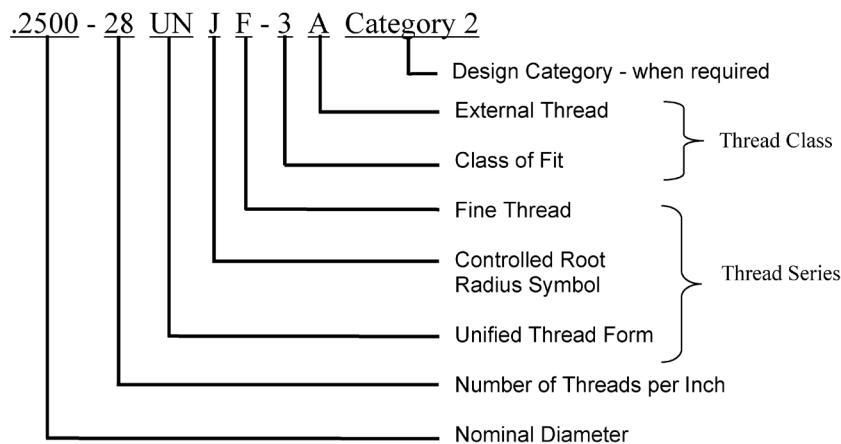
- 4.2.1 Evaluating Threads After Alteration: For configuration changes to the threads such as self-locking features, castellations, keyways, cotter pin holes and similar features; care must be exercised to inspect undistorted, uninterrupted, full form threads. When maximum and minimum material conformity cannot be accomplished on a completed screw thread product because of a configuration change to the threads (e.g., deformation, slots, self-locking devices), the product screw threads shall be inspected for conformance at a point of manufacture prior to the configuration change.

5. THREAD DESIGNATION:

5.1 Thread Designation:

The threads described herein shall be designated in the following manner indicating the nominal diameter, number of threads per inch, thread series symbol (that is, thread form, controlled root symbol and thread series), and thread class including the external "A" or internal "B" thread symbol. Specify design category 1 or 2 when required. Omitting a category designation defaults to design category 1.

- 5.1.1 Standard UNJ Thread Designations: Threads selected from the standard UNJ series shall be specified as shown in the following examples.



Example 1. Category 1 Threads.

External Thread:

.2500 - 28 UNJF-3A thread per AS8879

Internal Thread:

.2500 - 28 UNJF-3B thread per AS8879

Example 2. Category 2 Threads.

External Thread:

.2500 - 28 UNJF-3A category 2
thread per AS8879

Internal Thread:

.2500 - 28 UNJF-3B category 2
thread per AS8879