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AEROSPACE STANDARD

AS 1370

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Revised

SCREW THREADS, CONTROLLED ROOT RADIUS (J THREADS) - METRIC SERIES

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1. PURPOSE

This standard specifies the characteristics of the J metric series of threads that have a controlled radius at the root of the external thread and with the minor diameter of the external and internal threads increased above the ISO 68 thread form to accommodate the external thread root radius.

2. SCOPE

This standard establishes the basic triangular profile for the J form thread; gives a system of designating; lists the standard series threads for aerospace screws, bolts and nuts; lists the standard series of diameter-pitch combinations for diameters from 1.6 to 200 mm; and specifies limiting dimensions and tolerances.

3. APPLICATION

This standard is intended for the threads of metric series aerospace fasteners and other aerospace threaded parts.

4. PROFILE OF THREAD

4.1 Thread profiles in this standard conform with AS1338.

4.2 Basic Profile: The basic profile is the theoretical profile corresponding to the basic (without tolerance) dimensions of the thread major diameter, pitch diameter and minor diameter. The deviations are applied from the basic dimensions. For basic profile, see Figure 1.

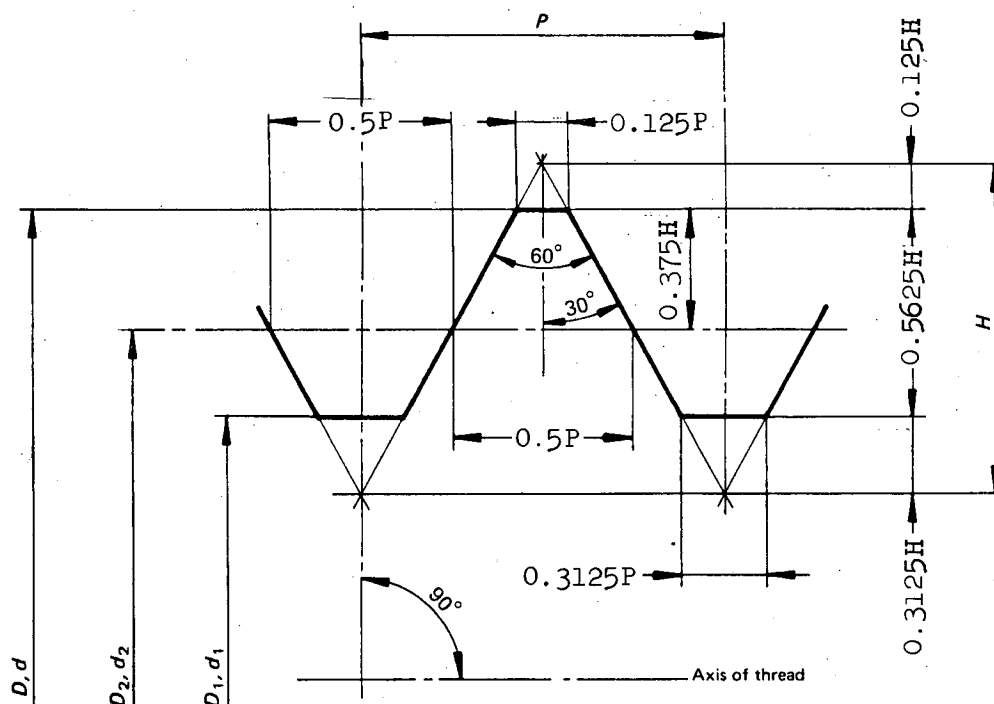


FIGURE 1 - Basic profile

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4.3 Basic Thread Profile Symbols: The symbols used in the basic profile shown in Figure 1 represent the following:

- D = Basic major diameter of internal thread
- D_2 = Basic pitch diameter of internal thread
- D_1 = Basic minor diameter of internal thread
- d = Basic major diameter of external thread
- d_2 = Basic pitch diameter of external thread
- d_1 = Basic minor diameter of external thread
- H = Height of the fundamental triangle
- P = Pitch

4.4 Design Profiles: The design profile for the internal thread at maximum material condition is the same as the basic profile, see Figure 2. The design profile for the external thread at maximum material condition is the basic profile with a root radius as shown in Figure 3 for the upper limit profile.

5. SERIES OF THREADS

This standard includes a selected series of diameter-pitch combinations of threads extracted from ISO 261. Also, it includes the standard series of diameter-pitch combinations listed in AS1337 for aerospace screws, bolts and nuts. See Tables 2 and 3.

6. THREAD CLASSES (TOLERANCES)

6.1 Length of Thread Engagement: The pitch diameter tolerances specified herein are based on a length of thread engagement onto the GO gaging member for nine pitches or for a length equal to the basic major diameter, whichever is the smaller. The actual thread engagement of the product threads are applicable for lengths of engagement up to 1.5 diameters for those thread sizes based on 1 diameter gaging length and up to 15 pitches for those thread sizes based on 9 pitches of gaging length. Where the length of thread engagement exceeds that for which these standard tolerances are applicable, refer to paragraph 7.4, Special Lengths of Thread Engagement, for pitch diameter tolerance increase.

6.2 Tolerance System: The thread tolerance system is based on the International Standard ISO 965/I metric screw thread system of tolerance positions and grades using where applicable tolerances included in ISO 965/III.

6.2.1 The tolerance classes selected for this standard conforms with AS1338.

6.3 External Thread Class: One class of threads is specified in this standard for all sizes of external threads after all processing, including coating or plating, has been completed as follows:

Tolerance Class 4h6h

The tolerance position h provides no allowance, the pitch diameter tolerance is grade 4, and the major diameter tolerance is grade 6. The limits of size for tolerance class 4h6h external threads are in Table 6.

6.3.1 For coated or plated external threads having pitches 2 mm and smaller, the tolerance class before the processing has been applied is as follows:

Tolerance Class 4g6g

The tolerance position g provides an allowance for coating or plating. The amount of allowance for each thread pitch is specified in Table 5. This allowance is the amount of reduction permitted below the limits of size for diameters d , d_2 and d_3 specified in Table 6. For pitches larger than 2 mm, use the allowances specified in paragraph 7.2.1.

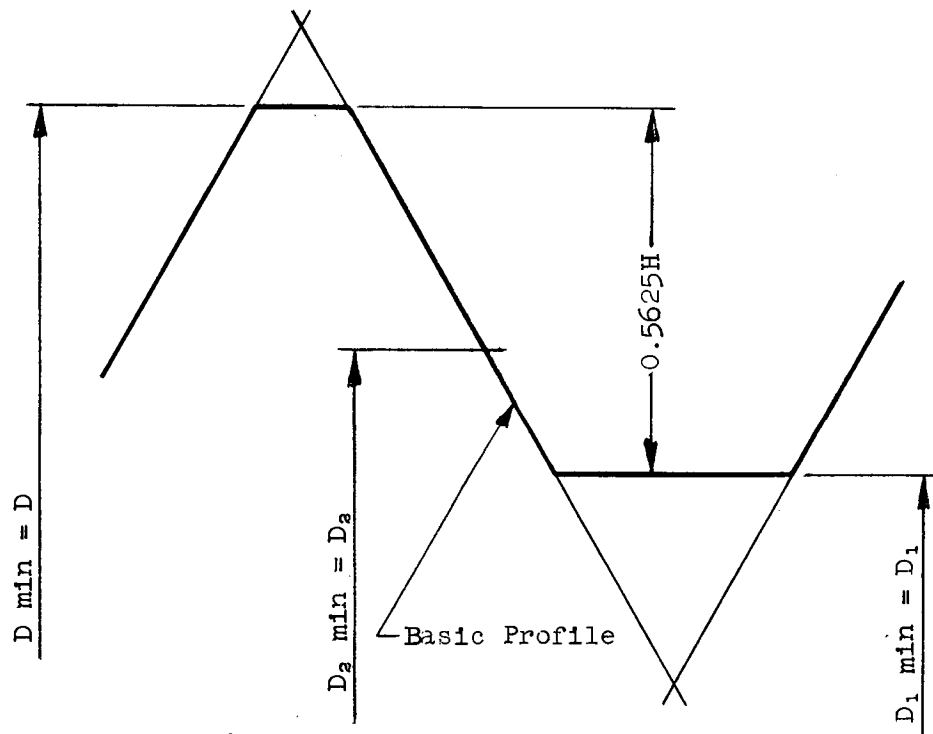


FIGURE 2 - Internal Thread Design Profile

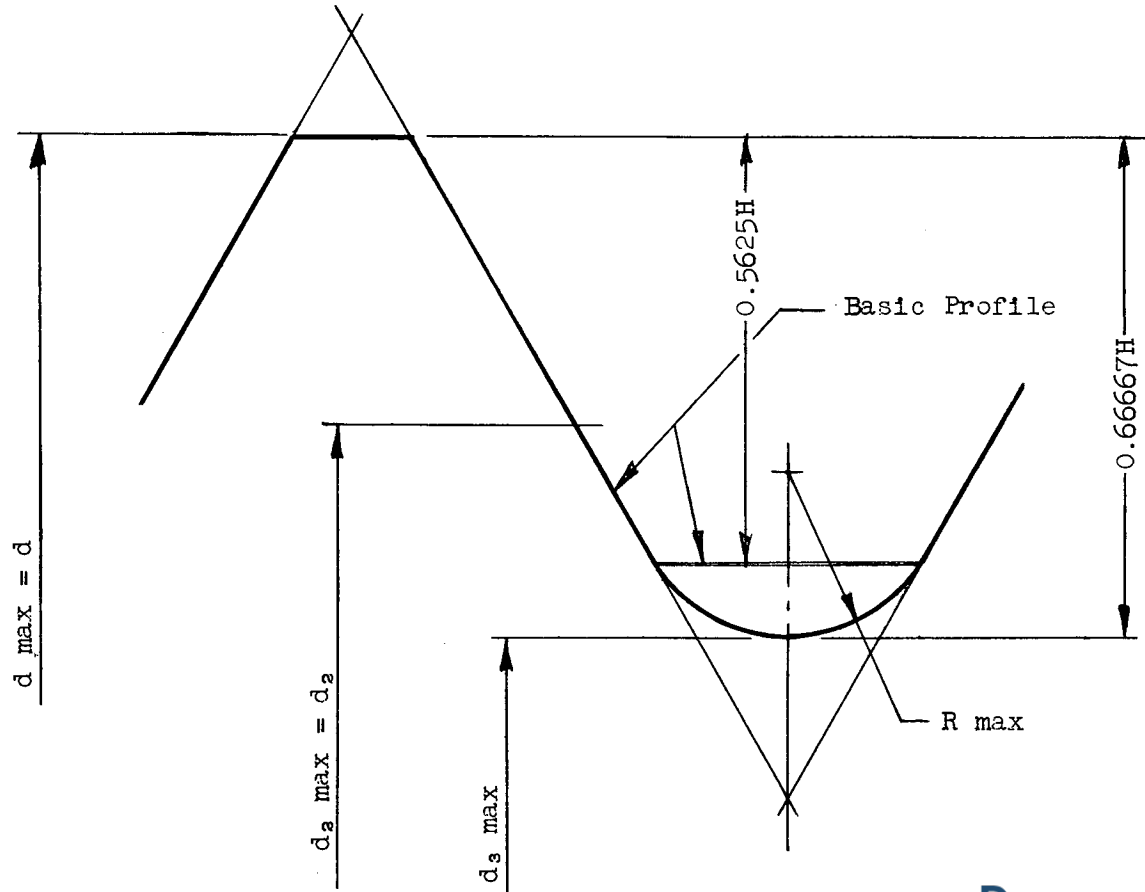


FIGURE 3 - External Thread Design Profile

- 6.4 Internal Thread Class: The following classes of threads are specified in this standard for internal threads after all processing, including coating or plating, has been completed:

Tolerance Class 4H6H for 1 thru 5 mm sizes

Tolerance Class 4H5H for 6 mm and larger sizes

The tolerance position H provides no allowance, the pitch diameter tolerance is grade 4 for all sizes, and the minor diameter tolerance is grade 6 for 5 mm size & smaller and grade 5 for 6 mm size & larger. The limits of size for these tolerance class threads are in Table 6.

- 6.4.1 For coated or plated internal threads having pitches 2 mm and smaller, the tolerance class before the processing has been applied is as follows:

Tolerance Class 4G6G for 1 thru 5 mm sizes

Tolerance Class 4G5G for 6 mm and larger sizes

The tolerance position G provides an allowance for coating or plating. The amount of allowance for each thread pitch is specified in Table 5. This allowance is the amount of increase permitted above the limits of size for diameters D , D_1 and D_2 specified in Table 6. For pitches larger than 2 mm, use the allowances specified in paragraph 7.2.1.

- 6.5 Position of Tolerances: The class tolerances are positive for internal threads and negative for external threads, that is, in the direction of the minimum material. See Figures 4 and 5.
- 6.6 Cumulative Form Tolerance: Within the pitch diameter limits of size, the sum of the pitch diameter equivalents of variation in lead (pitch), helix, flank angle, taper, roundness and other form errors of the thread shall not exceed the cumulative form tolerance of 0.5 times the pitch diameter tolerance.
- 6.7 Concentricity: The major diameter of the external thread and the minor diameter of the internal thread shall each be concentric with the axis of their respective pitch cylinders within a diametral tolerance zone equal to the pitch diameter tolerance.
- 6.8 Profile Dimensions and Tolerances: The thread profile data is given in Table 1. The profile dimensions and tolerances (T) shown in Figures 4 & 5 and their values specified in Table 6 have been calculated to the following formulae:

- 6.8.1 External Thread:

$$d_{\max} = d$$

$$d_{\min} = d_{\max} - T_d(6) \\ \text{where } T_d(6) = 0.180 \sqrt[3]{P^2} - 0.00315 \times 1/\sqrt{P} \quad (\text{see Table 8})$$

$$d_2_{\max} = d_{\max} - 0.64952P \quad (\text{see Table 1})$$

$$d_2_{\min} = d_2_{\max} - T_{d_2}(4) \\ \text{where } T_{d_2}(4) = 0.63 \times 0.090P^{0.4}d^{0.1} \quad (\text{see Table 10})$$

$$d_3_{\max} = d_2_{\max} - 0.50518P \quad (\text{see Table 1})$$

$$d_3_{\min} = d_2_{\min} - 0.56580P \quad (\text{see Table 1})$$

$$d_3_{\max} - d_3_{\min} = T_{d_3}$$

$$R_{\max} = 0.18042P \quad (\text{see Table 4})$$

$$R_{\min} = 0.15011P \quad (\text{see Table 4})$$

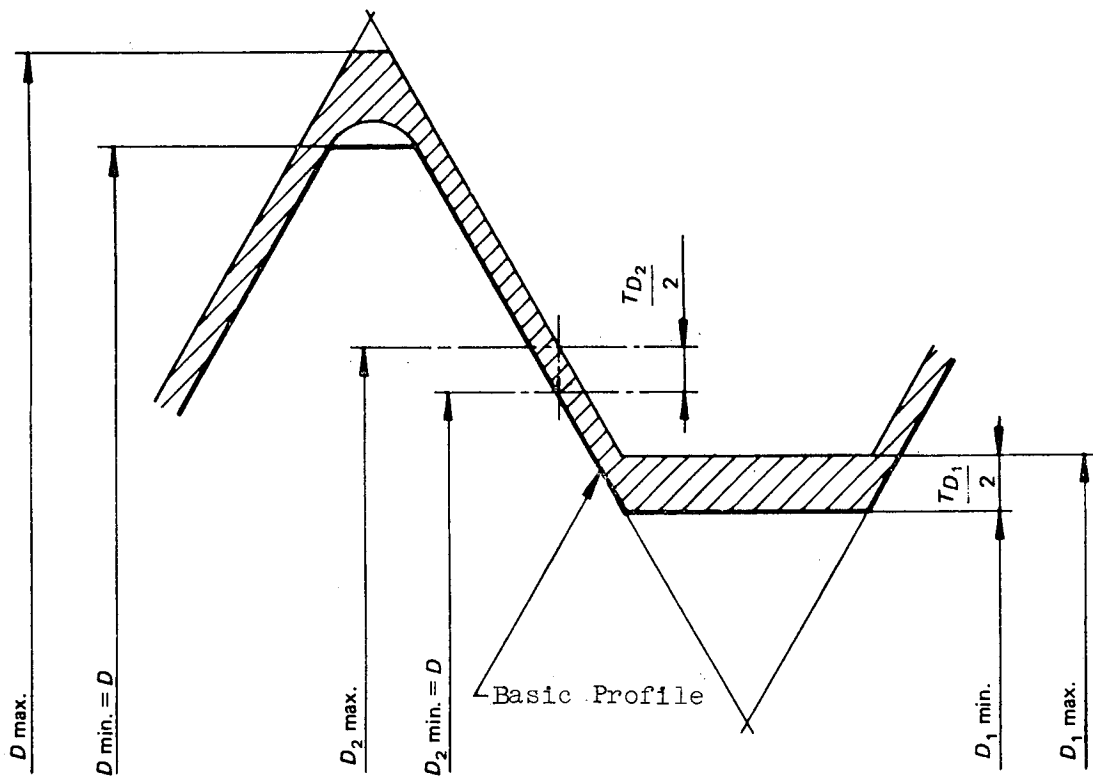


FIGURE 4 - Internal Thread Tolerances

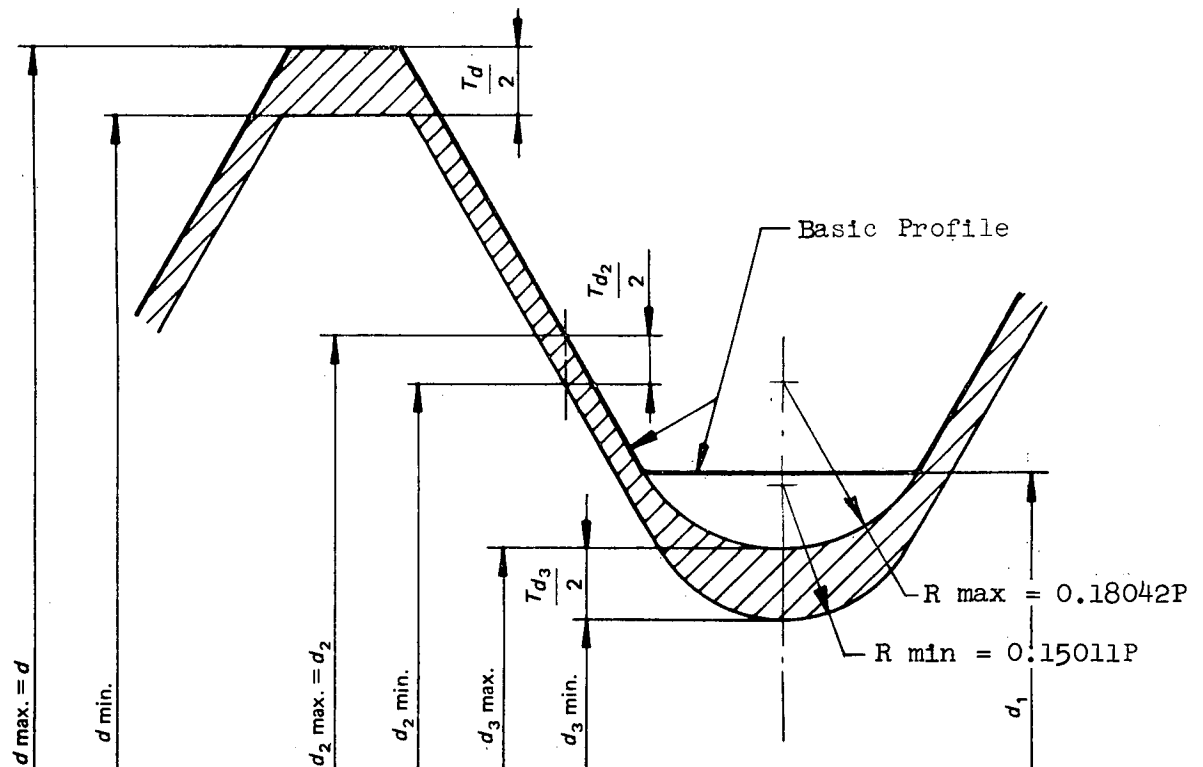


FIGURE 5 - External Thread Tolerances

6.8.2 Internal Thread:

$$D_{\min} = D$$

$$D_{\max} = D_2_{\max} + 0.79386P \text{ (see Table 1)}$$

$$D_2_{\min} = D_{\min} - 0.64952P \text{ (see Table 1)}$$

$$D_2_{\max} = D_2_{\min} + TD_2(4) \\ \text{where } TD_2(4) = 0.85 \times 0.090P^{0.4}d^{0.1} \text{ (see Table 10)}$$

$$D_1_{\min} = D_{\min} - 0.97428P \text{ (see Table 1)}$$

$$D_1_{\max} = D_1_{\min} + TD_1(6) \text{ for 1 thru 5 mm sizes} \\ \text{where } TD_1(6) = 0.433P - 0.190P^{1.22} \text{ for pitches 0.2 to 0.8 mm}$$

$$D_1_{\max} = D_1_{\min} + TD_1(5) \text{ for 6 mm sizes \& larger} \\ \text{where } TD_1(5) = 0.8 \times 0.230P^{0.7} \text{ (see Table 9)}$$

6.9 Pitch and Flank Angle Variation: For the maximum permissible pitch and flank angle deviation, the following formulae and their values in the Appendix, Table 7, are provided for reference only. (The flank half-angle $\alpha = 30^\circ$).

6.9.1 External Thread:

$$\text{Pitch Variation, } \delta P = \delta d_2 / \text{ctn } \alpha = 0.3TD_2/1.7321$$

$$\text{Flank Half-Angle Variation, } \delta \alpha = \tan^{-1} 0.3TD_2/1.125P$$

6.9.2 Internal Thread:

$$\text{Pitch Variation, } \delta P = \delta D_2 / \text{ctn } \alpha = 0.3TD_2/1.7321$$

$$\text{Flank Half-Angle Variation, } \delta \alpha = \tan^{-1} 0.3TD_2/1.125P$$

6.10 Root Radius of the Thread:

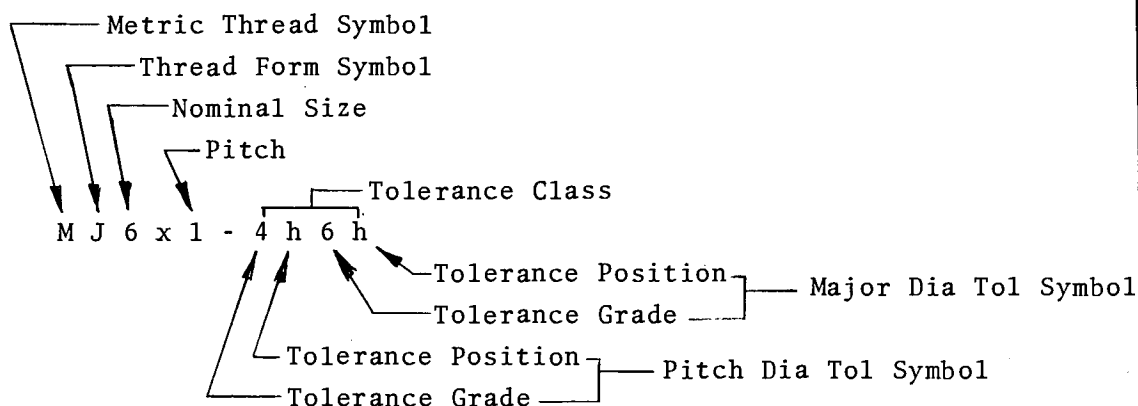
6.10.1 Internal Thread: For internal threads the profile of the actual root of the thread shall at no point be below the basic profile or above the maximum major diameter, $D_{\max}$. No specific root radius specified.

6.10.2 External Thread: For external threads the profile of the actual root of the thread shall lie within the root radius tolerance zone shown in Figure 5. The limit values of the root radius R are specified in Table 4. The profile shall be a continuous smoothly blended curve no part of which shall have a radius of less than $0.15011P$ and which is tangential to the thread flanks at not less than $0.5625H$ thread depth. The profile may comprise tangent flank radii that are joined by a tangential flat at the root provided that the minor diameter is within the zone established by the formulae in 6.8.1.

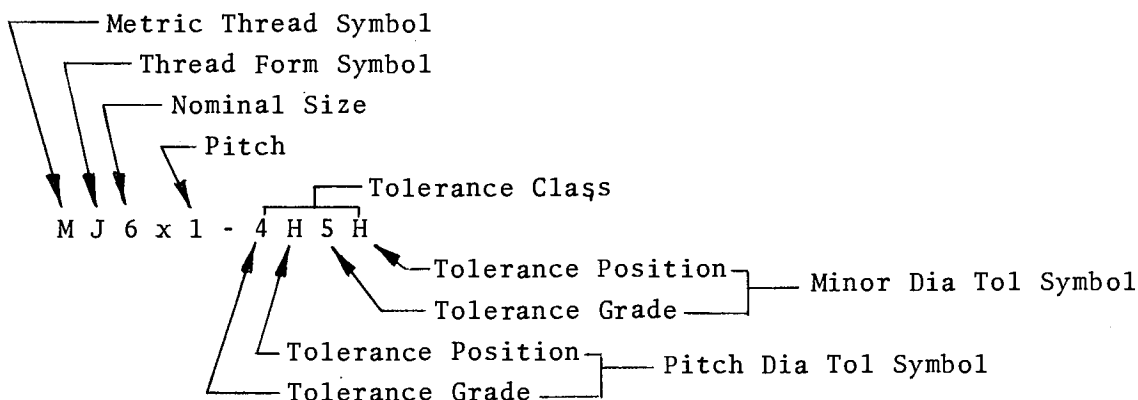
7. DESIGNATION OF THREADS

7.1 Basic Designation: ISO Metric threads are identified by the letter "M" in the thread designation. This aerospace metric screw thread is designated by the letters "MJ" to identify the metric J thread form, followed by the nominal size and the pitch in millimetres (separated by the sign "x"), and followed by the tolerance class (separated by a dash from the pitch). Unless otherwise specified in the designation, the screw thread helix is right hand.

Example: External Thread, Right Hand:



Internal Thread, Right Hand:



External Thread, Left Hand (LH):

M J 6 x 1 - 4 h 6 h LH

7.2 Designation of Coated Threads: For coated (or plated) threads, the designation of the threaded part shall specify the thread tolerance class before and after coating where the standard allowances g and G are adequate relief for the applied coating.

Example:

MJ6 x 1 - 4h6h AFTER COATING

MJ6 x 1 - 4g6g BEFORE COATING

7.2.1 Special Coating Allowances: Where the standard coating allowances g and G are insufficient relief for the applied coating, the coating allowance should be established by altering the dimensions of the standard thread as follows:

a. External threads, before coating limits.

Max major dia - decreased 6 times min coating thickness
Max pitch dia - decreased 6 times min coating thickness
Min major dia - decreased 4 times min coating thickness
Min pitch dia - decreased 4 times min coating thickness

b. Internal threads, before coating limits.

Min minor dia - increased 6 times min coating thickness
Min pitch dia - increased 6 times min coating thickness
Max minor dia - increased 4 times min coating thickness
Max pitch dia - increased 4 times min coating thickness