SAE Aerospace
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# AEROSPACE RECOMMENDED PRACTICE

MAP1670

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## Studs, Installation Practice for Interference Fit - Metric

RATIONALE

This document has been reaffirmed to comply with the SAE 5-year Review policy.

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1. SCOPE:

1.1 Purpose:

This document provides a recommended practice for installation of interference fit studs into threaded holes in non-ferrous alloys such as aluminum or magnesium.

1.2 Application:

The practice described has been specifically developed for use with stud standards MA3379 thru MA3392. These studs have ‘MJ’ threads in accordance with MA1370 or ANSIB1.21M, except with special thread pitch diameters and tolerances.

2. APPLICABLE DOCUMENTS:

The following publications form a part of this specification to the extent specified herein.

2.1 SAE Publications:

Available from Society of Automotive Engineers, Inc., 400 Commonwealth Drive, Warrendale, Pennsylvania, 15096.

2.1.1 Aerospace Standards:

AS1310 Fastener Torque for Threaded Applications, Definition of
MA1370 Metric Screw Threads - MJ Profile
AIR1551 Torque Tightening Metric Threaded Fasteners

MA3379 thru MA3382 Stud - Straight, 2.5 Dia Engagement, Cres, MJ Metric
MA3383 thru MA3387 Stud - Stepped, 1.5 Dia Engagement, Cres, MJ Metric
MA3388 thru MA3392 Stud - Stepped, 2 Dia Engagement, Cres, MJ Metric

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2.2 American National Standards:

Available from American Standards Association, 1420 Broadway, New York, N.Y., 10018.

ANSI B1.21M - 1978 Metric Screw Threads - MJ Profile

3. DEFINITIONS:

3.1 All expressions relating to fastener torques are defined in AS1310.

3.2 Driven End:

The driven end is the threaded end on a stud that is assembled into the aluminum or magnesium component with an interference fit and remains fast.

3.3 Nut End:

The nut end is the threaded end of the stud on which a nut is normally assembled to retain a cover or other part of the component assembly.

4. REQUIREMENTS:

4.1 General:

Interference fit studs depend on an interference between the thread of the stud and the thread of the tapped hole to resist the stud backing out when the self-locking nut on the nut end of the stud is being disassembled. Care is therefore necessary to ensure the minimum torque required to assemble the stud into the component is sufficient to resist turning the stud when the nut is removed.

4.1.1 Some of the factors affecting the torque required to install the stud into the component are:

- Accuracy of the threads in the stud hole and on the stud.
- Surface texture of the threads of the stud hole and on the stud.
- Length of engagement of the stud in the component.
- Quality, thickness and type of plating applied to the stud.
- Hardness and physical properties of the stud material and the material of the component into which the stud is driven.
- Lubricant used on threads.
- Amount of material around the stud hole.

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4.2 Hole Preparation:

Recommended screw thread tolerance class for the installation hole is shown in Table I. The resultant fit when studs shown on MA3379 thru MA3392, or studs with the same thread class, are installed into the hole is also shown in Table II. However, it must be recognized that due to the several factors, given in 4.1.1 affecting driving torque, it may be necessary to selectively tap the hole to ensure the desired assembly torque is achieved.

Further, to facilitate the entry of the stud into the installation hole, a chamfer or counterbore as shown in Figure 1 and Table II, should be used. This chamfer or counterbore will assist entry of the stud and prevent bulging of surface around the hole when the stud is driven. Should bulging of surface around the installation hole occur it could interfere with the parts to be assembled on the component.

4.3 Assembly Torques:

Recommended installation torques for assembling studs into aluminum or magnesium (forged or cast) components are shown in Table III.

The stud installation torques are based on the following:

$$\text{Maximum driving torque in N.m} = \frac{\tau}{1000} \times \frac{\pi d^3}{16}$$

where:

- $\tau$ = Torsional shear stress that will be induced by the maximum stud assembly torque. Value of 440 MPa is assumed.
- $d$ = $0.5\ (d_2 + d_3)$
- $d_2$ = basic pitch diameter (PD) of nut end of stud, i.e. max. PD.
- $d_3$ = basic minor diameter of nut end of stud, i.e. max. minor dia.

Minimum driving torque = 0.6x maximum self-locking nut assembly torque.

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TABLE I

| Recommended Installation Thread Data | Minor Dia, mm | Pitch Dia, mm | | Major Dia, mm |
|---|---|---|---|---|
| | $D_1$ | $D_2$ | $TD_2$(3)* | |
| MJ6 x 1 - 3H5H | 5.026- 5.216 | 5.350- 5.421 | 0.071 | 6.000- 6.239 |
| MJ7 x 1 - 3H5H | 6.026- 6.216 | 6.350- 6.421 | 0.071 | 7.000- 7.239 |
| MJ8 X 1 - 3H5H | 7.026- 7.216 | 7.350- 7.421 | 0.071 | 8.000- 8.239 |
| MJ10 x 1,25 - 3H5H | 8.782- 8.994 | 9.188- 9.263 | 0.075 | 10.000-10.280 |
| MJ12 x 1,25 - 3H5H | 10.782-10.994 | 11.188-11.273 | 0.085 | 12.000-12.292 |

*Ref. MA1370

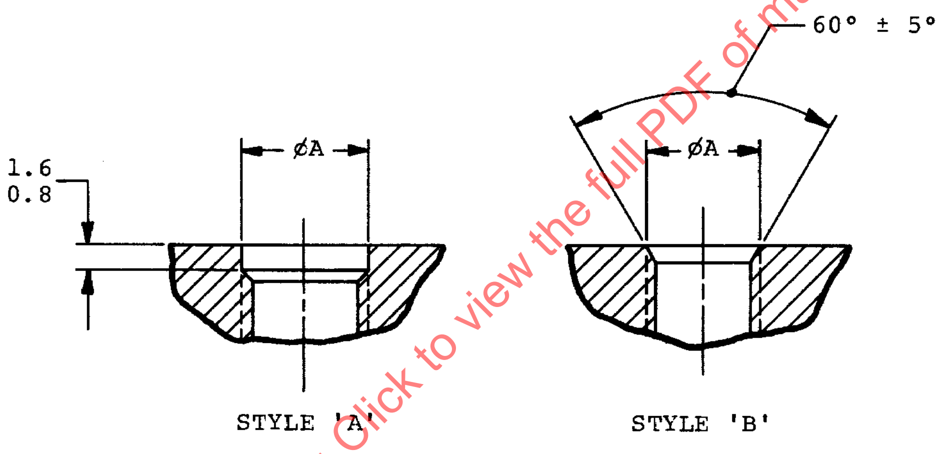


FIGURE 1

TABLE II

| Recommended Thread Tolerance for Installation Hole | Resultant Interference Fit with Studs Shown on MA3379 thru MA3392 mm | Chamfer or Counterbore Diameter (ØA). See Figure 1. mm |
|---|---|---|
| MJ6 x 1 - 3H5H | 0.025-0.121 | 6.8- 6.0 |
| MJ7 x 1 - 3H5H | 0.025-0.121 | 7.8- 7.0 |
| MJ8 x 1 - 3H5H | 0.025-0.121 | 8.8- 8.0 |
| MJ10 x 1,25 - 3H5H | 0.025-0.125 | 10.8-10.0 |
| MJ12 x 1,25 - 3H5H | 0.025-0.135 | 12.8-12.0 |

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