

**1.0 Scope.**

**1.1 Scope.** This standard covers a test procedure to qualify metric series screws which have an anti-cross thread feature intended to facilitate the free assembly with the mating internal thread in assembly applications.

**2.0 Applicability.**

The performance test results obtained by following the procedures included in this standard apply only to the combination of laboratory conditions described in the testing procedures. If other conditions are found in an actual service application, values used for test purposes may only be determined through testing in the specific application.

**3.0 Terminology.**

**3.1 Anti-cross Threading Feature:** A geometric feature(s) generated during manufacturing which enhances the screw point, lead threads, or other feature to facilitate alignment with the mating internal thread.

**3.2 No Start:** A condition when the screw spins freely failing to engage its mating thread.

**3.3 Start:** A condition where the screw engages its mating thread enabling run down to clamp load.

**3.4 Cross Thread:** A condition which occurs when the screw stops rotation and seizes in the mating thread, due to misalignment.

**4.0 Referenced Standards.**

**4.1** American Society of Mechanical Engineers, Three Park Avenue, New York, NY 10016-5990, U.S.A.  
B1.13M – *Metric Screw Threads - M Profile*

**4.2** Society of Automotive Engineers, 400 Commonwealth Drive, Warrendale, PA 15096-0001, U.S.A.  
J1199 – *Mechanical and Material Requirements for Metric Externally Threaded Steel Fasteners*

**4.3** American Society for Testing and Materials, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959  
F568M – *Carbon and Alloy Steel Externally Threaded Metric Fasteners*  
F1470 – *Fastener Sampling for Specified Mechanical Properties and Performance Inspection*

**5.0 Screws to be Tested.**

**5.1 Basic Designs.**

There are a number of anti-cross threading designs, including several proprietary designs, which may be generally classified as variations from standard point designs or those which have a definite formed shape to ramp or leverage the screw into alignment with its mating thread.

**5.2 Finish.**

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| IFI<br>STANDARD ®                                                                    | <b>A STANDARD TEST PROCEDURE<br/>FOR QUALIFICATION OF ANTI-CROSS<br/>THREADING SCREWS – METRIC SERIES</b> | <b>IFI-554</b><br>Page 1 of 4     |
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Screws, test plates, and test nuts may be plain (bare metal) or with a protective coating. Certain coatings may not provide acceptable repeatability.

### 5.3 Mechanical Requirements.

All screws to be tested for anti-cross threading capability shall have a property class as defined by ASTM F568M or SAE J1199.

The test nut shall have a specified proof stress equal to or greater than the specified minimum tensile strength of the screw.

A test plate having tapped holes may be substituted for a test nut. The threads shall be metric with class 6H tolerances in accordance with ASME B1.13M. The hardness of the test plate may not be less than 20 percent below the hardness of the test screw and may not exceed the maximum specified hardness of the test screw.

### 6.0 Test Fixture.

The test fixture shall include a variable speed electric motor which drives a shaft having a chuck suitable for socket insertion which holds the fastener head in place. The variable speed electric motor shall be capable of achieving a maximum shaft speed of 840 rpm.

The test equipment shown in Fig. 1 is typical of a bench mounted manually operated drill press. However, based on the test equipment requirements, the test procedure, and the test parameters given in Table 1 and Table 2, automated equipment would be required. At the present time there is no known commercially manufactured equipment of this type available. Any test equipment used will therefore have to be designed and built by the organization manufacturing or testing these fasteners.

The test fixture's electric drive system should be capable of reversing its direction of rotation. The test fastener shall be held firmly in the socket by magnetization or by a mechanical retaining means. The drive system which governs the force applied to the screw during the test shall be hydraulic, pneumatic, mechanical, or gravity driven to assure uniformity and repeatability.

The base of the test fixture, Fig. 1A, shall provide for a plate or nut holder which shall serve as the threaded test hole. This base shall provide an alignment arm containing a weight whose position on the arm will vary the force required to align the plate or nut holder with the test screw in accordance with Table 1. The tapped hole shall be located in the platen as shown in Fig. 2. The approach speed and axial force applied by the screw to the base of the test fixture shall be in accordance with Table 2 based on 840 rpm. For alternate test speeds the approach speed may be calculated as approach speed =  $\frac{\text{rpm} \times \text{pitch}}{60}$ .

It should be noted that the approach speed is a function of pitch and not screw size.

### 7.0 Test Procedure.

The test screw is inserted into the socket. The base of the test fixture is set at a prescribed angle to the axis of the test screw. A plate or nut is then inserted into the platen which is set at the prescribed angle. For test purposes the angle shall be 10 degrees  $\pm$  1/2 degree. Alternatively, a 5 degree or 15 degree angle may be selected for test based upon agreement between purchaser and manufacturer. The moment arm length shall be adjusted as specified in Table 1. The screw point shall be positioned a maximum distance of 50 mm above the nut or test plate hole. The test screw shall then be rotated at a speed of 800 rpm  $\pm$  5 percent. The approach speed and axial loading specified in Table 2 shall apply. When the test screw encounters the test nut or test plate hole, the platen will be rotated to a position such that the test hole is aligned with the anti-cross thread screw feature. The screw will then start within 5 seconds, cross thread or no start. All no starts shall be discarded, except they shall not exceed 3 pieces or 10 percent, whichever is greater, of the sample size. If cross threading occurs then a new sample size of two times level B as in ASTM F1470 shall apply for retest. If cross threading occurs during retest the disposition of the lot shall be in accordance with the provisions of ASTM F1470.

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