

**SPLINE WRENCHING SYSTEM, EXTERNAL,
METRIC FASTENERS, PERFORMANCE REQUIREMENTS FOR,**
1. SCOPE:

- 1.1 **Type:** This standard establishes the means of assessing the performance of external spline drive wrenching systems for fasteners.
- 1.2 **Application:** The standard defines the Design, Performance and Test Requirements for metric spline drive fastener external wrenching systems. The spline wrench shall be capable of torque loading hexagonal, bi-hexagonal and spline drive fasteners. Fasteners having the spline wrenching configuration shall not be capable of being wrenching with hexagonal and bi-hexagonal wrenches.

This standard is based on but not limited to the following external spline wrenching system:

- MA 1549 - WRENCHING CONFIGURATION, 12 SPLINE, FOR METRIC THREADED FASTENERS
- MA 1586 - WRENCH CONFIGURATION, 12 SPLINE DRIVE, METRIC

2. **APPLICABLE DOCUMENTS:** The following publications form a part of this Specification to the extent specified herein. The latest issue of Aerospace Material Specifications (AMS) and Aerospace standards (MA) shall apply. The applicable issue of other documents shall be as specified in AMS 2350.

- 2.1 **SAE Publications:** Available from SAE, 400 Commonwealth Drive, Warrendale, PA 15096.

- 2.1.1 **Aerospace Material Specifications:**

AMS 2350 - Standards and Test Methods

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2.1.2 Aerospace Standards:

MA 1549 - WRENCHING CONFIGURATION, 12 SPLINE, FOR METRIC THREADED FASTENERS

MA 1586 - WRENCH CONFIGURATION, 12 SPLINE DRIVE, METRIC

MA 1518 - BOLTS, SCREWS AND NUTS, EXTERNAL WRENCHING, METRIC THREADS DESIGN PARAMETERS FOR

2.2 International Standards Publications: Available from American National Standards Institute, Inc., 1430 Broadway, New York, NY 10018.

2.2.1 International Standards:

ISO 1174 - Assembly tools for bolts and screws - Driving squares for power socket wrenches and hand socket wrenches.

ISO 4095 - Fasteners for aerospace construction - Bi-hexagonal wrenching configuration.

3. TECHNICAL REQUIREMENTS:

3.1 Design Performance Parameters:

3.1.1 Torque Capability Criteria: The wrenching system shall be capable of operating without failure on (i) fasteners of high strength level - 1800 MPa and (ii) fasteners of lower strength level - 900 MPa which have been exposed to temperature conditions resulting in thread and bearing surface seizure which can cause removal torques up to 5 times assembly torque.

3.1.2 Durability Criteria: The spline drive in the wrench shall be capable of 2000 cycles in each direction (assembly and removal) using the durability torques in Table II and the splined mandrels to 3.2.4.

3.1.3 The requirements of 3.1.1 and 3.1.2 shall apply with a length of spline engagement representative of that available on spline drive bolts and not exceeding the values of column 5 Table II. The torque loading shall not affect wrench integrity.

3.1.4 Torque loading shall not cause either 'cam-out' or the need for an end load to keep wrenching system engaged.

3.1.5 Wrench outside diameter shall be as specified in Figure 1.

3.1.6 Drive shall be square and size compatible with strength requirements for spline drive. Sizes shall be selected from Table I. These sizes are in accordance with ISO 1174 - Assembly Tools for Bolts and Screws - Driving Squares for Power Socket Wrenches and Hand Socket Wrenches.

- 3.1.7 Wrench system shall allow wrenches to transmit torques in restricted spaces with 30° angular movement.
- 3.1.8 Cadmium plated finishes can cause contamination of materials and shall not be used, e.g., the cadmium is transferred, during the wrenching operation, to fasteners or components being secured.
- 3.1.9 Wrenches shall fit onto the comparable bi-hexagon or hexagon wrenching configuration listed in Column 2 Table II.
- 3.1.10 The spline wrenching configuration element shall not permit the assembly of bi-hexagonal wrenches.

TABLE I SQUARE DRIVE SIZES (ISO 1174)

1 NOMINAL DRIVE SIZE	2 3	
	DIMENSIONS (mm)	
	MAX	MIN
.250 INCH 6.35 mm	6.495	6.405
.375 INCH 9.525 mm	9.670	9.580
.500 INCH 12.7 mm	12.865	12.755
.750 INCH 19.05 mm	19.235	19.105
1.000 INCH 25.4 mm	25.585	25.455
1.500 INCH 38.1 mm	38.350	38.190

3.2 Product performance:

3.2.1 Dimensions: The wrenches shall be within the dimensions specified in Figure 1.

3.2.2 Durability test: Prior to the proof test the wrenching system shall withstand 2000 cycles in each direction (assembly and removal) of the torque loads specified in Table II, Column 3, when engaged with splined mandrels as specified in 3.2.4.

3.2.3 Proof test: After completing the test requirements in 3.2.2 the wrenching system shall withstand in each direction (assembly and removal) the torque loads specified in Table II, Column 4 when engaged with each of the mandrels specified in 3.2.4. The wrench shall show no signs of damage or permanent deformation that would affect its reusability.

3.2.4 Test Mandrels: Test mandrels simulating the wrenching feature on a seized fastener shall be used to assess the wrenches in 3.2. Mandrels shall be hardened to 50-54 HRC or equivalent and mandrel engagement shall be to the dimensions in Table II.

The splined mandrels shall be to the minimum material dimensions specified for the wrenching system.

The bi-hexagonal mandrels shall be to the minimum material dimensions specified in ISO 4095.

The hexagonal mandrels shall be to the minimum material dimensions specified in MA1518.

3.2.5 Compatibility test: The splined mandrel shall not be capable of being wrenched by standard hexagonal and bi-hexagonal wrenches.

3.2.6 The torque wrench or equipment used for measuring the torque values shall be accurate to within $\pm 2\%$.

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