



WZ 100

Steel Metric Threaded Fasteners Torque/Clamping Force Performance

1. SCOPE.

1.1 This Worldwide Standard specifies the torque/clamping force performance requirement for ISO Metric coarse threaded steel fasteners tested at room temperature as specified in ISO 1.

- (a) With thread sizes M3 to M39 inclusive.
- (b) With strength requirements in accordance with WA 950, WE 950 or WE 952 as appropriate.
- (c) With dimensions as specified in the Worldwide Product Standards.

Unless stated otherwise, all references to nuts and bolts in this Worldwide Standard are to both flanged and non-flanged products.

1.2 EXCEPTIONS. Bolts, screws and nuts with performance specifications containing torque/clamping force requirements are excluded from the provisions of this specifications.

2. REFERENCES.

ISO 1	-	Standard Reference Temperature for Industrial Length Measurement.
ISO 1302	-	Technical Drawing - Method of Indicating Surface Texture on Drawings.
ISO 965/1	-	General Purpose Metric Screw Threads - Tolerances - Part 1: Principles and Basic Data.
WA 950	-	Material Requirements and Mechanical Properties of Bolts, Screws, Studs and Screw and Washer Assemblies.
WE 950	-	Prevailing Torque-Type Steel Hexagon Nuts and Hexagon Flange Nuts - Mechanical and Performance Properties.
WE 952	-	Mechanical Properties of Nuts with Specified Proof Load Values.
WX 100	-	Finish Specifications.
WSD-M13P7-A	-	Torque/Clamping Force Control.
WSS-M99P9999-A	-	Substance Use Restrictions.

3. DEFINITIONS.

3.1 CLAMPING FORCE. The clamping force is that force which applied by the bearing face of the fastener against a mating component after application of a specified tightening torque.

4. FINISH. The performance of fasteners which are supplied with a protective coating and/or lubricant shall not deteriorate when the fasteners are stored indoors for a period of six months. The storage temperature shall be within the range -5°C to +40°C. Packaging shall be in accordance with Q101.

Lubricant when used shall be in accordance with the requirements of WSD-M13P7-A.

NOTE: Fasteners which are specified unlubricated by the user may not satisfy the requirements of this specification unless lubrication is an integral property of a specified coating.

Substance restrictions imposed by law, regulations or Ford, apply to the materials addressed by this document. The restrictions are defined in Engineering Material Specification WSS-M99P9999-A1.,

5. PERFORMANCE REQUIREMENTS.

5.1 TORQUE/CLAMPING FORCE. The torque necessary to develop the clamping force specified in Table 1 shall be measured as specified in Clause 6 and must meet the applied torque specified in Table 1.



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- 5.2 PARTS UNSUITABLE FOR TESTING. Parts with configurations or dimensions which are infeasible to test to the requirements of Clause 6 shall be assessed by testing suitable fasteners coated by the same process in the same production run.

For initial sample and referee purposes screw or nut and washer assemblies shall be tested for compliance with Clause 6 with the washer removed. For general control purposes the performance may be assessed using suitable fasteners coated by the same process in the same production run.

NOTE: While not mandatory, M10 coarse thread hexagon head bolts 50 to 60mm in length have proved to be suitable surrogate parts to process in the production run.

6. TORQUE/CLAMPING FORCE TEST. The torque/clamping force test shall be conducted at room temperature (See ISO 1) using a clamping force measuring device (Clause 6.2). For referee purposes the torque measuring device (Clause 6.1) must not exceed 30 r.p.m.

A test bolt or nut (Clauses 6.3 and 6.4) shall be inserted in the clamping force measuring device and a test washer (Clause 6.5) placed under the clamping face of the fastener to be tested. Tightening may be either manually with a torque wrench (a recommended technique is described in Appendix A), or with an equivalent torque sensing power device (Clause 6.1).

The fastener to be tested shall be tightened until the clamping force specified in Table 1 appropriate to the property class of the fastener is achieved. The applied torque must be within the values specified in Table 1.

For referee purposes, an automatic torque sensing device shall be used and rotation shall continue until the specified clamping force is exceeded. A continuous record of torque and clamping force shall be evaluated to determine the torque for the clamping force specified in Table 1. The applied torque must be within the values specified in Table 1.

- 6.1 TORQUE MEASURING DEVICE. The torque measuring device (torque wrench or power device) shall be accurate to $\pm 2\%$ of the torque specified for the fastener to be tested. For referee purposes, the measuring device shall be chosen so that all readings fall within the upper half of its torque range.

- 6.2 CLAMPING FORCE MEASURING DEVICE. The force measuring device shall be an instrument capable of measuring the actual clamping force generated as the fastener is tightened. The device shall be accurate to within 3% of the test clamping force requirement. The bolt clearance hole in the backing plate shall be the same diameter and tolerance as the test washer. The face against which the test washer bears shall be smooth, flat within 0.1/100 and square with the axis of the test bolt within a tolerance of 0.1/100. The axis of the test bolt and test washer must be aligned so as to avoid contact between the fillet radius of the bolt and the inside diameter of the washer.

- 6.3 TEST BOLT FOR NUT TESTING. Threads shall be in accordance with ISO 965/1 within a tolerance of class 6g min. to 4h max. Threads on all test bolts shall be produced by rolling. Test bolt length shall be such that a minimum of two thread pitches as measured from the end of the test bolt will protrude through the nut when the nut is seated against the test washer. Thread length shall be such that a minimum of two full threads are within the grip after the nut is seated.

The test bolt shall have a point which is flat and chamfered. The thread surface shall be free of burrs or other contamination that might affect an accurate determination of the performance of the nut.

The test bolt shall have an ultimate strength related to the specified property class of the nut to be tested and the properties shall be in accordance with WA 950.

A new test bolt shall be used for testing each nut.