



Non-metallic Locking Element Type Prevailing Torque Requirements

1 Introduction

Note: Nothing in this standard supercedes applicable laws and regulations.

Note: In the event of conflict between the English and domestic language, the English language shall take precedence.

1.1 Purpose. This standard establishes engineering design and conformance test procedures for the locking ability performance of prevailing torque type lock bolts and nuts that utilize a non-metallic locking element (hereinafter called "lock bolt" or "lock nut").

1.2 Applicability. This procedure applies to externally and internally threaded fasteners with non-metallic locking elements.

1.3 Remarks. "Lock" is a generic term used to identify the threaded products covered in this standard. The terms "lock" and "locking" are not intended to imply a permanent bond between fasteners.

2 References

Note: Only the latest approved standards are applicable unless otherwise specified.

2.1 External Standards/Specifications.

ASME B1.1 ASME B18.2.2 ISO 4033

2.2 GM Standards/Specifications.

GMW3059 GMW16551

3 Requirements

3.1 Purpose.

3.1.1 General. The prevailing torque values given in this standard are conformance requirements for lock bolts and nuts and apply only to the combination of test conditions described in 3.7.2.2 or 3.7.2.3. If the conditions of the actual service application differ from those of 3.7.2.2 or 3.7.2.3 (e.g., internally threaded hole in a different material, length of thread engagement, class of internal thread tolerance, speed of driving, different plating or coating on mating part), the prevailing torque values may differ. Such values can only be determined through testing the non-metallic locking element in its application.

3.1.2 Restrictions. This standard is not concerned with dimensional features such as head styles or with other mechanical or performance capabilities such as strength properties, corrosion resistance, sealing, suitability for use in low temperatures, or temperatures above 125 °C, and/or consistency of torque-to-tension relationships during assembly. Such features and properties are covered in other standards and specifications and must be referenced when specifying a lock bolt/nut to assure that all of the service conditions of the particular engineering application are properly met.

3.1.3 Applicability. A prevailing torque lock bolt or nut is a threaded fastener which is frictionally resistant to rotation due to a self-contained prevailing-torque feature, and not because of a compressive load developed against the underhead bearing surface of the bolt or a tensile load developed in the shank of the bolt.

3.2 Material. Non-metallic locking element type prevailing torque lock fasteners are metallic fasteners to which a polyamide (nylon), polyester or similar non-metallic locking element has been inserted in or bonded or fused to the threads.

3.3 Surface Treatment. Lock bolts and nuts shall be furnished plain or with a protective coating, as specified by the purchaser. When authorized by purchaser, lock bolts may be provided with a supplementary lubricant.

3.4 Thread.

3.4.1 Thread Tolerances. Threads of metric lock bolts or nuts shall comply with GMW16551. Unified threaded lock bolts shall have class 2A tolerance, as specified in ASME B1.1. Unified threaded lock nuts shall have class 2B tolerance, as specified in ASME B1.1. However, the length of the thread containing the locking element need not conform to thread gaging requirements, unless the locking element is removed.

3.4.2 Thread Start. The locking bolts or nuts shall have a minimum of one (1) full thread free of locking element so that the fastener can be finger started into any mating component having threads that conform to the referenced documents in 3.4.1.

3.5 Locking Element.

3.5.1 Other than a pelletized or strip locking element, the effective length of the locking element shall be a minimum of 1.2 times the lock bolt/nut's nominal diameter with flash on one (1) thread permissible on both ends.

3.5.2 Other than a pelletized or strip locking element, the width of the locking element normally shall cover between 60 degrees and 180 degrees of the lock bolt's or nut's circumference. When authorized by the purchaser, wider locking elements up to full circumference (360 degrees) may be used, provided the torque requirements listed in Appendix A, Tables A1 and A2 are met.

3.6 Locking Ability.

3.6.1 The prevailing torque of lock bolts or nuts occurring during any installation shall not exceed the maximum prevailing torque specified in Appendix A, Tables A1 and A2 when tested as specified in 3.7.2.2 or 3.7.2.3. In addition, the prevailing torque developed by lock bolt/nuts during first and fifth removals shall not be less than the minimum first and fifth removal torques, respectively, as specified in Appendix A, Tables A1 and A2 when tested in accordance with 3.7.2.2 or 3.7.2.3. At no time shall the minimum prevailing torque developed by lock bolts/nuts during fifth removal be zero.

3.6.2 Lock bolts that are too short or have thread lengths too short to permit testing in accordance with 3.7.2.2 or 3.7.2.3 shall have their prevailing torque requirements and test procedure established by agreement between the purchaser and manufacturer.

3.7 Acceptability.

3.7.1 Each material must be initially approved by GM Materials Engineering to comply with this specification. Subsequent testing shall be periodically performed to insure conformance.

3.7.2 Locking Ability Test.

3.7.2.1 Test Procedure A is applicable to nylon type patching elements, and Test Procedure B is applicable to all other types of patching elements.

3.7.2.2 Test Procedure A. The lock bolt/nut shall be assembled with a mating fastener until the locking element is at the edge of engagement. The test nut/bolt shall then be tightened five (5) full turns with a torque measuring device. During the first tightening, the maximum prevailing torque (first on torque) occurring while the lock bolt/nut or test nut/bolt is in motion shall be measured. The test nut/bolt shall then be backed off. The minimum torque (first removal torque) occurring while the lock bolt/nut or test nut/bolt is being backed off throughout the first 360 degrees of rotation shall be measured. The lock bolt/nut or test nut/bolt shall then be backed off until the locking element is disengaged. The lock bolt/nut and test nut/bolt shall be disassembled and then reassembled four (4) more times using the same method. During the fifth removal, the minimum torque (fifth removal torque) occurring while the lock bolt/nut or test nut/bolt is being backed off throughout the first 360 degrees of rotation shall be measured.

If the removal torque drops to zero at any time during the fifth removal, the locking element failed.

During the four (4) additional installations and removals, the prevailing torque shall not exceed the minimum prevailing torque specified in Appendix A, Tables A1 and A2.

Note: The intent of this requirement is to demonstrate that galling between the sample lock bolt and test nut has not occurred. With certain designs of lock bolts there may be an increase in the prevailing torque during the five (5) assembly cycles and, in rare instances, the specified maximum prevailing torque may be exceeded. In such instances the manufacturer, when requested, shall give evidence that galling was not a contributing factor.

Note: Sufficient time shall elapse between torquing cycles to prevent overheating of the test assembly.