ASTM A370 Mechanical Testing of Steel Products - ***Bolt Tension***

TECHNOTEs for ASTM A370 Tension, Bend & Round Wire Tension are also available.

MTS Criterion® & MTS Exceed®
Electromechanical Universal Test Systems

MTS Landmark®
Servohydraulic Test Systems

MTS ReNew™
Upgrade for Hydraulic & Electromechanical Test Systems

TEST METHOD SUMMARY

ASTM A370 defines test methods and definitions for mechanical testing of steel products. Bolt Tensile testing of steel products per ASTM A370 is used to determine the proof load. The proof load is the maximum tensile force that can be applied to the bolt without causing plastic deformation.

The standard supports either the preferred length measurement method, during which the bolt is stressed with a specified tensile load for 10 seconds and then it is checked, if the bolt wasn't plasticly deformed. Or the yield strength method, during which the bolt is stressed and the elongation of the bolt is measured. The tensile load or stress that produces 0.2% plastic deformation must be equal to or larger than the specified value in the product specification.

Please refer to the standard for more detailed information about the other test setups and for testing tubular and round wire products.

Solutions for ASTM A370 Bolt Tension typically include these types of components:

LOAD FRAME OPTIONS*

MTS offers electromechanical Criterion® and Exceed® universal test systems and dynamic servohydraulic Landmark® test systems that are ideal for performing accurate and repeatable monotonic bolt tensile testing per ASTM A370.

MTS Criterion universal testing systems are engineered to support the needs of advanced Research & Development. MTS Exceed universal testing systems are best suited for Quality Control testing by delivering the reliable performance needed to meet the uptime demands of high-volume production environments. MTS offers frame models that address the force requirements for testing various bolt sizes.

The MTS Criterion and the MTS Exceed universal testing machines range from tabletop to floor-standing electromechanical models with force ratings of up to 600 kN / 135 kip. Many of the models have dual-zone test spaces to reduce set-up times if you frequently change test requirements.

The MTS Landmark dynamic servohydraulic test system with its superior stiffness and alignment capabilities, is an ideal choice if additional fatigue and fracture testing capabilities are required. Systems are available in highly configurable floor-standing and tabletop models with force ratings from 5 kN / 1 kip to 500 kN / 110 kip.

As an alternative to a new load frame, you can replace outdated controls / hydraulics of existing MTS or another manufacturer's electromechanical, servohydraulic or custom test systems, including: **Instron®, **Zwick®, **Tinius Olsen™, **SATEC®, **Baldwin® and more with an MTS ReNew™ Upgrade.
***Trademark owned by their respective owners, not affiliated with MTS Systems Corporation.*

EXTENSOMETRY OPTIONS*

ASTM A370 refers to ASTM E8/E8M for the testing equipment requirements. ASTM E8/E8M requires that extensometers conform to ASTM E83. MTS offers a variety of extensometer types, ranging from clip-on, automatic to non-contacting optical and video extensometers, that meet or exceed requirements for calibration according to ASTM E83 Class B1 and ISO 9513 Class 0.5 standards. Factors like the specimen material, shape and dimension, the requirements for test efficiency and budget need to be considered when choosing the appropriate strain measurement solution.

		
Clip-on Extensometers	**Automatic Extensometer**	**Non-Contacting Extensometer**
» Most commonly used economical strain measurement solution » Provide reliable, repeatable means to accurately measure axial strain for testing round or flat specimen geometries	» Automatic specimen attachment and self-adjusting gage length positioning ensures test consistency and supports high-volume testing by eliminating the need for operator intervention	» The MTS Advantage™ Video Extensometer is just one of many non-contacting strain solutions available for tension testing of metals » Potential options for analyzing all critical tensile properties include 1D, 2D, and 3D measurements, real-time display, post-test analysis, video replay, specimen reanalysis, and more

GRIP OPTIONS*

Nut & Bolt Grips

» Used for tensile, load holding and wedge loading tests of bolts
» Available with various thread adapters to meet a wide range of bolt thread sizes

SOFTWARE & CONSULTING OPTIONS*

About MTS TestSuite™ TW

The efficient MTS TestSuite TW software provides the versatility required to address unique and complex testing requirements.

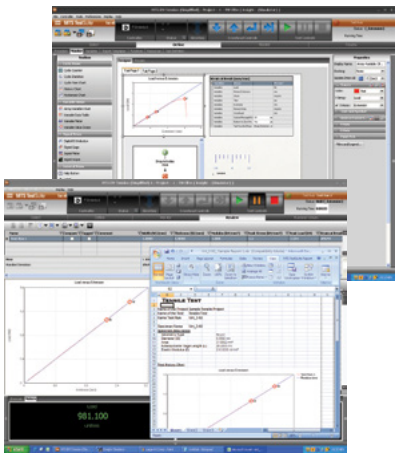
twe TestSuite TW Elite includes all the test definition capacity and flexibility test designers need to create and edit custom test sequences while accommodating the specific runtime needs of lab personnel.

twx TW Express is designed for the test operator and is used to run tests created with TW Elite and can be used without fear of inadvertently modifying the Test Method. This application allows the operator to easily execute even the most complex tests and monitor data or calculated values in runtime views that can be tailored by both test designers and operators.

ASTM A370 Bolt Tension Test Method Template

To simplify testing to ASTM A370, MTS has developed a TestSuite TW test method template that will set-up and run the recommended tensile tests.

» Crosshead/actuator or extensometers can be used for strain measurement and control
» Post-test review tab and reports show data in stress-strain plots and highlight calculated values such as yield strength, yield point elongation, tensile strength, elongation, and more
» Raw data can be exported in many formats including CSV and TXT
» Test methods, calculations, review displays, and report layouts can be customized by the user



MTS Consulting Can Enable LIMS Integration & Other Lab Efficiency Enhancements

MTS consultants are available to support seamless data integration from your TestSuite test templates to your laboratory information management system (LIMS). Lab Efficiency Enhancements could include:

» Integrating bar code scanners, reading data from micrometers and calipers, capturing video via webcam
» Automating the interface of two-way communications between TestSuite and virtually any LIMS system

*NOTE: This technical note is intended to show some of the more common solutions used for this particular application. Most often, additional options are available and necessary to accomplish more comprehensive test objectives.

APPENDIX - TEST SPECIMEN DETAIL

ASTM A370 recommends that full size bolts are tested to determine the proof load. Please refer to the standard for recommended specimen dimensions, when a full size bolt can't be tested and machining is required.

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ISO 9001 Certified QMS

100-565-985b ASTM A370 Bolt Tension • Printed in U.S.A. • 08/23