

ASTM E9 Compression Testing of Metallic Materials (room temperature)

TEST METHOD SUMMARY

Compression testing of metallic materials per ASTM E9 is used to determine mechanical material property data. Uniaxial compression force is applied to solid cylindrical or thin-sheet material specimens to investigate the stress/strain behavior and critical material properties including modulus of elasticity, yield strength and compressive strength.

Solutions for ASTM E9 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 tensile testing of metallic materials per ASTM E9.

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. Due to the large variety of metals and specimen dimensions that can be tested per ASTM E9, the required force capacities can differ significantly. MTS offers frame models that address the smaller force requirements for testing thin-sheet specimens up to high-force requirements for testing solid cylindrical specimens with a large diameter.

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As an alternative to a new load frame, you can replace outdated controls / hydraulics of existing MTS or another manufacturer's static-hydraulic, electromechanical, servohydraulic or custom test systems, including: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 E9 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.






MTS Criterion® & MTS Exceed®
Electromechanical Universal Test Systems



MTS Landmark®
Servohydraulic Test Systems



MTS ReNew™
Upgrade for Hydraulic & Electromechanical Test Systems

		
Clip-on Extensometers	Automatic Extensometer	Non-Contacting Extensometer
<ul style="list-style-type: none"> » Most commonly used economical strain measurement solution » Provide reliable, repeatable means to accurately measure axial strain for testing round or flat specimen geometries 	<ul style="list-style-type: none"> » Automatic specimen attachment and self-adjusting gage length positioning ensures test consistency and supports high-volume testing by eliminating the need for operator intervention » Optional transverse strain measurement to support the calculation of the plastic strain ratio "r-value" for sheet metals 	<ul style="list-style-type: none"> » The MTS Advantage™ Video Extensometer is just one of many non-contacting strain solutions available for compression testing of metals » Potential options for analyzing all critical compression properties include 1D, 2D, and 3D measurements, real-time display, post-test analysis, video replay, specimen reanalysis, and more

GRIP OPTIONS*

		
<p>Room Temperature Testing</p>	<p>Temperature Testing</p>	<p>Thin-Sheet Specimen Anti-Buckling Fixture</p>
<p>» Compression platens include spherical seats on upper / fixed seats on lower platen for improved alignment » Platen faces with concentric rings or cross-line grooves enable the specimen to be centered visually for accurate and repeatable test results</p>		<p>» Side-support plates prevent buckling and provide minimal interference with axial deformation of the thin-sheet specimen » Factors like specimen material, material thickness, testing temperature and testing frequency for cyclic applications need to be considered when selecting / designing the fixture</p>

SOFTWARE & CONSULTING OPTIONS*

<p>About MTS TestSuite™ TW</p>	<p>ASTM E9 Compression Testing of Metallic Materials Test Method Template</p>
<p>The efficient MTS TestSuite TW software provides the versatility required to address unique and complex testing requirements.</p> <p>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.</p> <p>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.</p>	<p>To simplify testing to ASTM E9, MTS has developed a TestSuite TW test method template that will set-up and run the recommended compression tests.</p> <p>» 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 modulus of elasticity, yield strength, compression strength, 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</p>



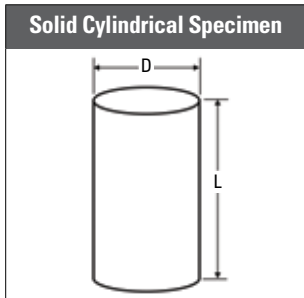
<p>MTS Consulting Can Enable LIMS Integration & Other Lab Efficiency Enhancements</p>
<p>MTS consultants are available to support seamless data integration from your TestSuite test templates to your laboratory information management system (LIMS). Lab Efficiency Enhancements could include:</p> <p>» Integrating 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</p>

*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 E9 supports solid cylindrical or thin-sheet material specimens. The width and length of thin-sheet specimens depend upon the dimensions of the anti-buckling fixture. Please consult ASTM E9 for more detailed information about the supported specimen geometries.

Cylindrical Specimen Type	Diameter (D)		Length	
	in	mm	in	mm
Short	1.12	30	1.00	25
	0.50	13		
Medium	0.50	13	1.50	38
	0.80	20	2.38	60
	1.00	25	3.00	75
	1.12	30	3.38	85
Long	0.80	20	6.38	160
	1.25	32	12.50	320



MTS Systems
 14000 Technology Drive
 Eden Prairie, MN 55344-2290 USA
 Telephone: 1-952-937-4000
 Toll Free: 1-800-328-2255
 E-mail: info@mts.com
 www.mts.com

ISO 9001 Certified QMS

MTS, MTS Criterion, MTS Exceed and MTS Landmark are registered trademarks, and MTS TestSuite, MTS ReNew and MTS Advantage are trademarks of MTS Systems within the United States. These trademarks may be protected in other countries. RTM No. 211177.

© 2021 MTS Systems
 100-538-185a ASTM E9 • Printed in U.S.A. • 09/21