632.17 Averaging Axial Extensometer

Now Simultaneously Measure Axial Deflection On Opposite Sides Of The Specimen With A Single Extensometer

An Overview Of The 632.17 Averaging Axial Extensometer

The Series 632.17 Averaging Axial Extensometer is designed to simultaneously measure the axial deflection on opposite sides of the specimen. The Extensometer is typically used to perform testing on solid or tubular composite or metal specimens.

The Extensometer consists of two sensor units, one on either side of the specimen. The sensor units (refer to the parts identification drawing, Figure 1) measure the axial deflection over the gage length of the specimen. Two contact points, connected to each sensor unit assembly, contact the specimen. The contact points are made of hardened steel or (as an option) carbide. Both materials are available with conical point contact ends or vee-chisel contact ends.

The 632.17 Advantage

- ***Simultaneously Measures Axial Deflection On Opposite Sides Of The Specimen***
  Standard configuration (averaged output - option 001) joins the output from each sensor unit to provide a single, averaged output.
  Alternate configuration (individual outputs - option 002) keeps the output of each sensor unit separate.

- ***Patented Support System[1]***
  Securely attaches the Extensometer to the specimen while providing the necessary degrees of freedom to allow the Extensometer to conform to changes in the specimen's shape during testing without slippage or distortion of the output.

- ***Cross-flexure Design***
  Provides low activation force which allows the contact force between the contact points and the specimen to be reduced without extensometer slippage. The reduced contact force in turn minimizes induced specimen damage which can lead to premature failure at the contact points during fatigue testing and inaccurate test results. Each sensor unit uses a unique cross-flexure design to provide high accuracy, reliability and linearity with low activation force.

[1] *Covered by U.S. Patent No. 4,527,335*

Flexibility

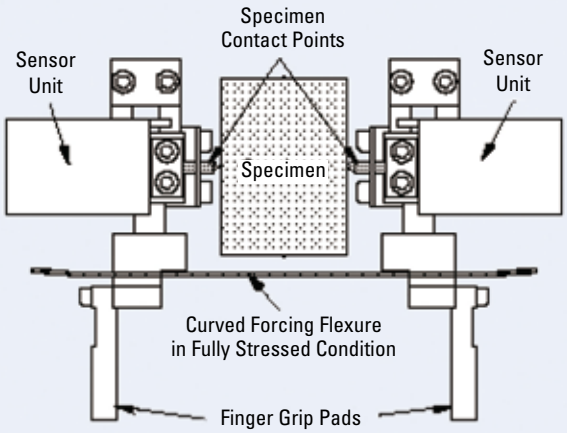
Mounting

- A patented support system consisting of flexures strategically located on the Extensometer securely attaches the Extensometer to the specimen.
- A curved forcing flexure connected to the two sensor unit assemblies holds the Extensometer in place even under acceleration loads, such as those that occur during dynamic testing.
- Flexures attached to the specimen contact assemblies allow the contact points freedom of movement without providing erroneous strain input to the Extensometer.
- This freedom of movement allows the Extensometer to conform to the specimen shape during testing (such as bending or twisting) without slippage, or distortion of the output.
- The Extensometer is positioned on the specimen by pressing on the finger grip pads to separate the contact points and placing them against the specimen.
- The two sensor unit assemblies can be repositioned along the forcing flexure to accommodate specimens of different dimensions.

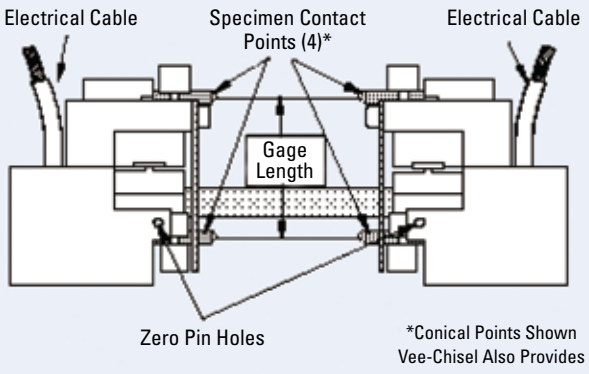
Signal Output

- The output cable from each sensor unit may be joined at the connector and then connected to a single specified dc controller or dc conditioner located in the system console to provide an averaged output (option 001) of the two sensor units.
- The output cable from each sensor unit may have an individual connector which is then connected to separate specified dc controllers or dc conditioners for individual outputs (option 002) from each sensor unit.

Figure 1
Model 632.17
Parts Identification



Bottom View



Front View

Performance

Accuracy

The 632.17 Averaging Axial Extensometer is designed for extremely accurate strain measurements (refer to the specification table). Exceptional accuracy and linearity are provided by the cross flexure design, which ensures true center-point bending throughout the entire travel range of the Extensometer.

- Nonlinearity is 0.15% of the travel range or less (typically 0.10% of this range). Maximum hysteresis is within 0.10% of the maximum travel range.
- The cross-flexure design provides very good lateral stability, requires low activation force and helps maintain Extensometer calibration over long periods of use.

Conditioning Electronics

The Extensometer is used with MTS conditioning electronics or other conditioning electronics capable of providing an excitation voltage of 8 volts (not to exceed 12 volts). The Extensometer output is approximately 3.4 millivolts per volt of excitation. Bridge resistance is 500 ohms for option 001 (averaged output) and 1000 ohms for option 002 (individual output).

Calibration

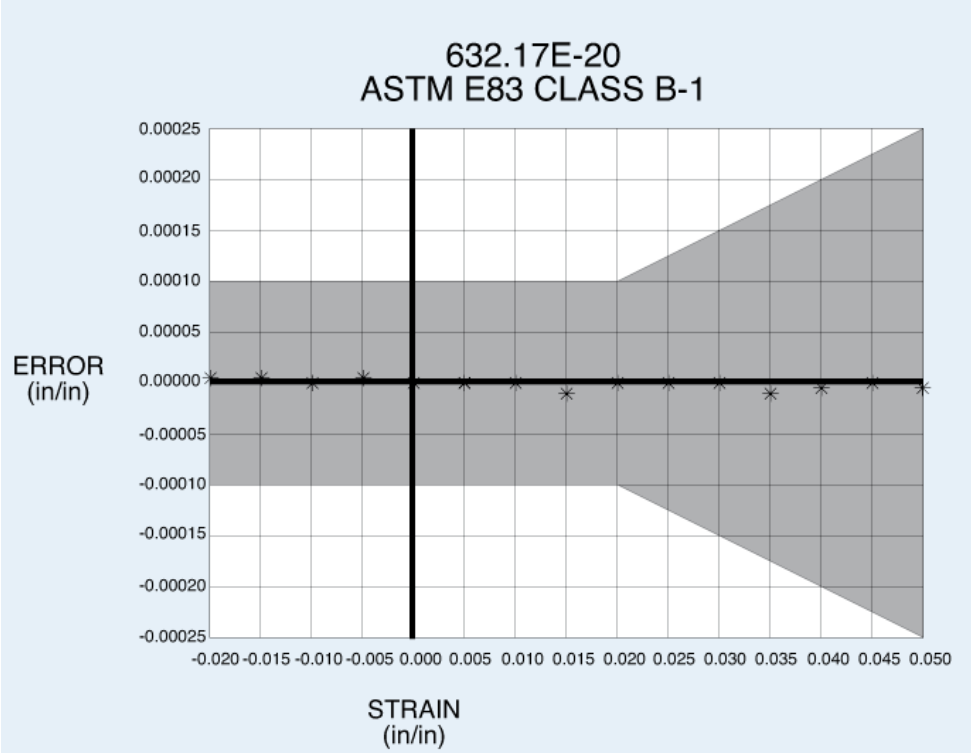
The graphs on the opposite page illustrate actual data collected during calibration. The asterisks are the actual data points collected.The shaded areas illustrate the permissible variation as defined by the ASTM or ISO standard.

MTS offers an in-plant, automated calibration service which uses calibration standards traceable back to the U.S. National Institute of Standards and Technology.

- Calibration is performed at room temperature.
- Typical calibration ranges are 100%, 50%, 20% and 10% of the maximum travel range.
- The Extensometer and associated conditioning electronics may be recalibrated on-site by the customer or by trained MTS field service engineers, using a separately ordered Model 650.03 Calibrator with appropriate fixturing, or they may be returned to MTS for recalibration.

When required, calibration in accordance to ASTM E83-90 and ISO 9513: 1989(E) is available. However, for full compliance with these standards, calibration must be performed using customer's conditioning electronics and readout device(s).

To schedule on-site calibration by an MTS field service engineer for this or any other MTS extensometer contact MTS using one of the 800 numbers listed in the back of this document or by contacting your local MTS representative.


632.17E-20
ASTM E83 CLASS B-1
ERROR
(in/in)
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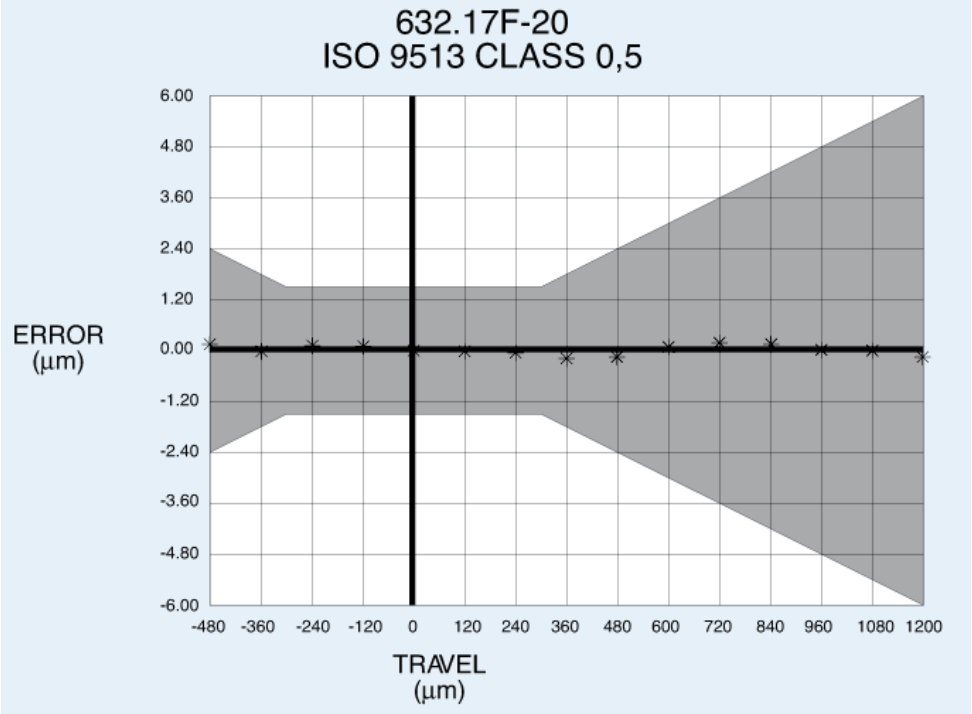
0.00020
0.00015
0.00010
0.00005
0.00000
-0.00005
-0.00010
-0.00015
-0.00020
-0.00025
-0.020 -0.015 -0.010 -0.005 0.000 0.005 0.010 0.015 0.020 0.025 0.030 0.035 0.040 0.045 0.050
STRAIN
(in/in)


632.17F-20
ISO 9513 CLASS 0,5
ERROR
(µm)
6.00
4.80
3.60
2.40
1.20
0.00
-1.20
-2.40
-3.60
-4.80
-6.00
-480 -360 -240 -120 0 120 240 360 480 600 720 840 960 1080 1200
TRAVEL
(µm)

Specifications

(U.S. Customary)[1]

	Model 632.17E-20	Model 632.17E-30
Gage length	1.000 in	0.500 in
Maximum travel range	+0.050 in -0.020 in	+0.050 in -0.020 in
Maximum strain[1]	+5% -2%	+10% -4%
Maximum nonlinearity	0.15% of range	0.15% of range
Typical nonlinearity	0.10% of range	0.10% of range
Maximum hysteresis	0.10% of maximum travel range	0.10% of maximum travel range
Typical hysteresis	0.05% of maximum travel range	0.05% of maximum travel range
Temperature range[2]	-150° to +300°F	-150° to +300°F
Immersibility[3]	yes	yes
Maximum operating frequency[4] (with negligible distortion)	50 Hz	30 Hz
Contact force of each contact with sensor units parallel	700 g	700 g
Extensometer weight (without cable and connector)	127 g	120 g
Net weight	1.8 lb	1.8 lb

[1] *Strain is the deflection per unit of gage length (inches/inch, millimeters/millimeter).*

[2] *Extensometer may be used 50°F (25°C) higher for short durations (under 24 hours).*

[3] *The Extensometer may be immersed in most electrically non-conductive fluids used for specimen heating and cooling. Acceptable fluids include water-free alcohol, acetone and silicone fluids.*

[4] *Operation at this frequency is possible only at small displacements. There may also be certain discrete frequencies below the specified frequency where operation is not possible.*

Specifications are subject to change without notice. Contact MTS for specifications critical to your needs.

Specifications

(SI)[1]

	Model 632.17F-20	Model 632.17F-40
Gage length	25 mm	10 mm
Maximum travel range	+1.20 mm -0.50 mm	+1.20 mm -0.50 mm
Maximum strain[1]	+4.8% -2%	+12% -5%
Maximum nonlinearity	0.15% of range	0.15% of range
Typical nonlinearity	0.10% of range	0.10% of range
Maximum hysteresis	0.10% of maximum travel range	0.10% of maximum travel range
Typical hysteresis	0.05% of maximum travel range	0.05% of maximum travel range
Temperature range[2]	-100° to +150°C	-100° to +150°C
Immersibility[3]	yes	yes
Maximum operating frequency[4] (with negligible distortion)	50 Hz	25 Hz
Contact force of each contact with sensor units parallel	700 g	700 g
Extensometer weight (without cable and connector)	127 g	120 g
Net weight	0.8 kg	0.8 kg

[1] Strain is the deflection per unit of gage length (inches/inch, millimeters/millimeter).

[2] Extensometer may be used 50°F (25°C) higher for short durations (under 24 hours).

[3] The Extensometer may be immersed in most electrically non-conductive fluids used for specimen heating and cooling. Acceptable fluids include water-free alcohol, acetone and silicone fluids.

[4] Operation at this frequency is possible only at small displacements. There may also be certain discrete frequencies below the specified frequency where operation is not possible.

Specifications are subject to change without notice. Contact MTS for specifications critical to your needs.

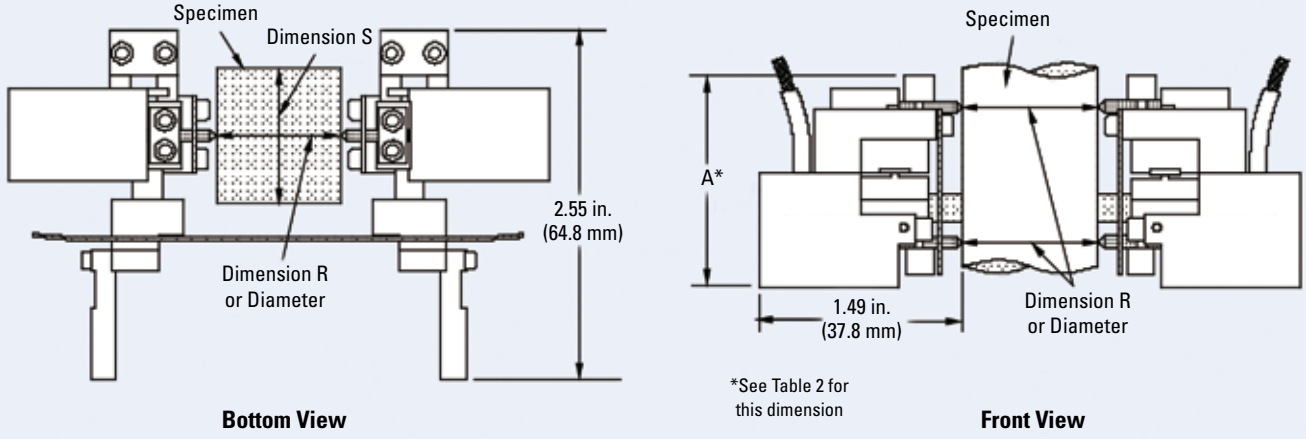
Dimensions

Specimen Dimensions Table 1

Contact Type	Flat Specimen		Round Specimen
	Dimension R	Dimension S	Diameter
Conical Point	0.02 to 2.00 in (0.5 to 51 mm)	1.26 in (32 mm) maximum	0.12 to 1.26 in (3.0 to 32 mm)
Vee Chisel[1]	0.02 to 2.00 in (5.0 to 51 mm)	0.02 to 0.06 in (0.5 to 1.5 mm)	NA

[1] *The ratio of dimension R to dimension S when using vee-chisel type contacts must be at least 6:1 to maintain mounting stability.*

Figure 2
Model 632.17
Dimensions



Model Specific Dimensions Table 2

Model	Dimension A
632.17E/F-20	1.54 in (39.1 mm)
632.17E-30	1.12 in (28.5 mm)
632.17F-40	1.02 in (25.9 mm)

The Model 632.17 Averaging Axial Extensometer is provided with two types of contacts: conical points (for flat or round specimens) and vee-chisel (for thin, flat specimens). Table 1 lists the specimen dimension range for each contact type. Both types of contacts are available in hardened steel or carbide.

What's Included In The Basic Extensometer Package

In addition to the options and accessories ordered you get:

- The Extensometer in a high-impact carrying case.
- Eight hardened steel conical point contacts - four installed and four spares.
- Six hardened steel vee-chisel contacts.
- Curved forcing flexures. One 2.6 in (66 mm) long for specimens with dimension R (see Figure 2 and Table 1) up to 1.0 in (25 mm) and one 3.7 in (94 mm) long for specimens with dimension R up to 2.0 in (50 mm).
- A tool kit containing the tools needed to change the contact points and adjust the position of the sensor unit assemblies on the forcing flexure.
- A product manual and appropriate installation drawings and, if the Extensometer is calibrated by MTS, a calibration data sheet.

Options

The following options are available for the 632.17 Averaging Axial Extensometer. Options must be selected at the time of order.

- *Option 001*
  The output cable of each sensor unit is connected to a single PT connector to provide an averaged output to a dc controller or dc conditioner. One dc controller or dc conditioner is required for this option.
- *Option 002*
  The output cable of each sensor unit is connected to a separate PT connector. Each output cable is connected to a separate dc controller or dc conditioner. Two dc controllers or dc conditioners are required for this option.
- *Cable lengths*
  The Extensometer comes with a 22 inch (55 centimeter) cable. Optional cable lengths of 60, 80, or 100 inches (1.5, 2.0, or 2.5 meters) are available.
- *Cable insulation*
  Fiberglass braid is available to electrically isolate the outside shielding of the cable.
- *Radiation protection*
  The Model 632.17 Averaging Axial Extensometer can be provided with radiation resistant coating and cable insulation.
- Vacuum applications
  The Model 632.17 Averaging Axial Extensometer can be configured for use in vacuum environments to 10^{-6} torr.

Accessories

The following accessories are available for use with the 632.17 Averaging Axial Extensometer.

- *Additional contact points*
  Hardened steel vee-chisel or conical point contacts, or
  Additional carbide vee-chisel or conical point contacts.
- *Curved forcing flexures*
  Two lengths are available: 2.6 in (66 mm) for specimens with dimension R (see Figure 2 and Table 1 on page 6) up to 1.0 in (25 mm) and 3.7 in (94 mm) for specimens with dimension R up to 2.0 in (50 mm).
- *Mating connector (PT06A-10-6S)*
  The mating connector may be ordered separately or with an extension cable. One mating connector is necessary if the unit is configured for option 001. Two mating connectors are necessary if the unit comes configured for option 002.
- *Extension cables with mating connectors on both ends.*
  The extension cables are used with MTS conditioning electronics and extend from the Extensometer cable connector(s) to the electronics console connector(s).
- *Model 650.03 Calibrator*
  The Calibrator comes in its own carrying case with the necessary fixtures to calibrate the Extensometer. Micrometer head is available in U.S. customary or SI versions. Refer to the Model 650.03 Extensometer Calibrator product specification for additional information.
- *Model 605.30 Compression Fixture*
  The extensometer can be used with the compression fixture to provide direct strain measurements on advanced composite materials being tested according to ASTM D695.

Services

- At the customer's request each Extensometer ordered can be calibrated by MTS using our automated calibration system.
- In addition, the Extensometer and associated conditioning electronics may be returned to MTS for repair and recalibration for a moderate fee.

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632.17 Part Number 300023-37A
PRINTED IN U.S.A. 12/1992