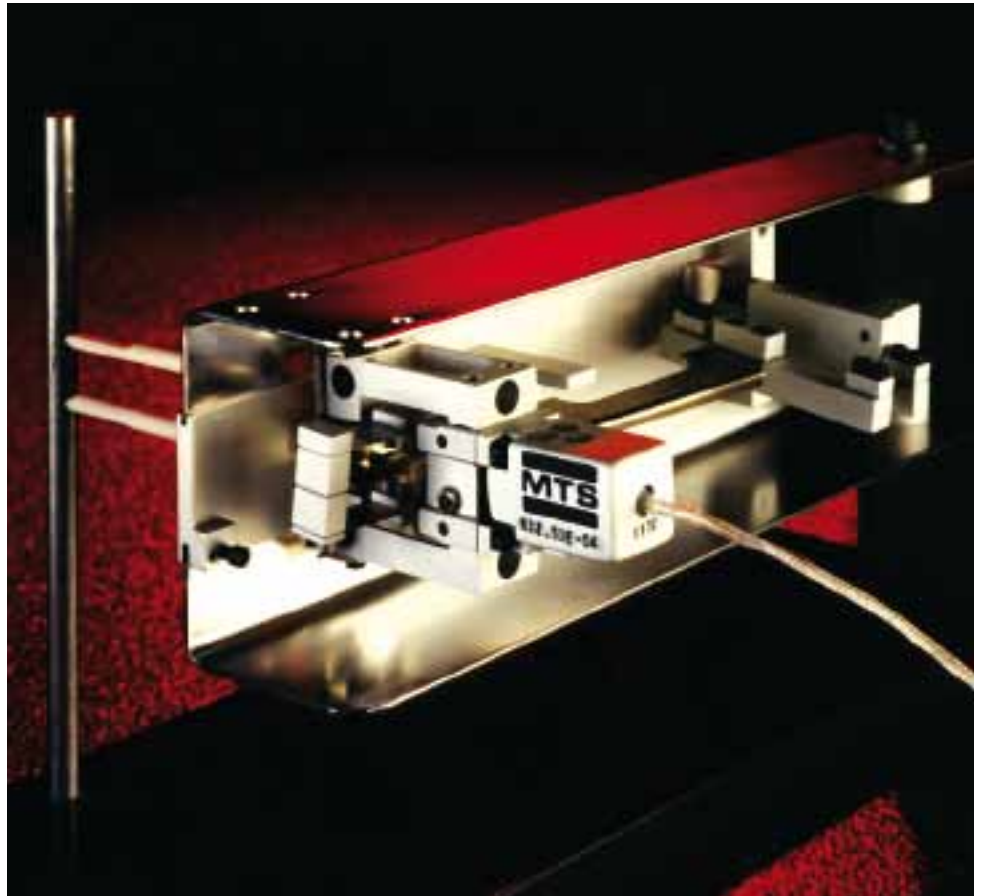




632.53 High-Temperature Axial Extensometer



**Measure Strain With Specimens At
Temperatures Up To 1200°C (2200°F)**

An Overview Of The 632.53 High-Temperature Axial Extensometer

The Model 632.53 High-Temperature Axial Extensometer is a non-cooled or air-cooled Extensometer. This Extensometer is used for measuring strain in high-temperature tension, compression and through-zero fatigue testing applications. Both versions use precision ground ceramic extension rods to extend between the induction heating coils surrounding the specimen or into the hot zone of the furnace. Air-cooling is necessary when testing at temperatures above 650°C (1200°F).

The 632.53 Advantage

- ◆ **Ideal For High-Temperature Applications**
For use with specimens at temperatures up to 650°C (1200°F) without air cooling; 1200°C (2200°F) with air cooling.
- ◆ **Low Specimen Contact Force**
A contact force of 300 grams per extension rod minimizes the possibility of damage to the specimen which may cause premature failure.
- ◆ **Cross Flexure Design**
The sensor unit uses a unique cross-flexure design to provide a very durable sensing structure while maintaining high accuracy, reliability and linearity.

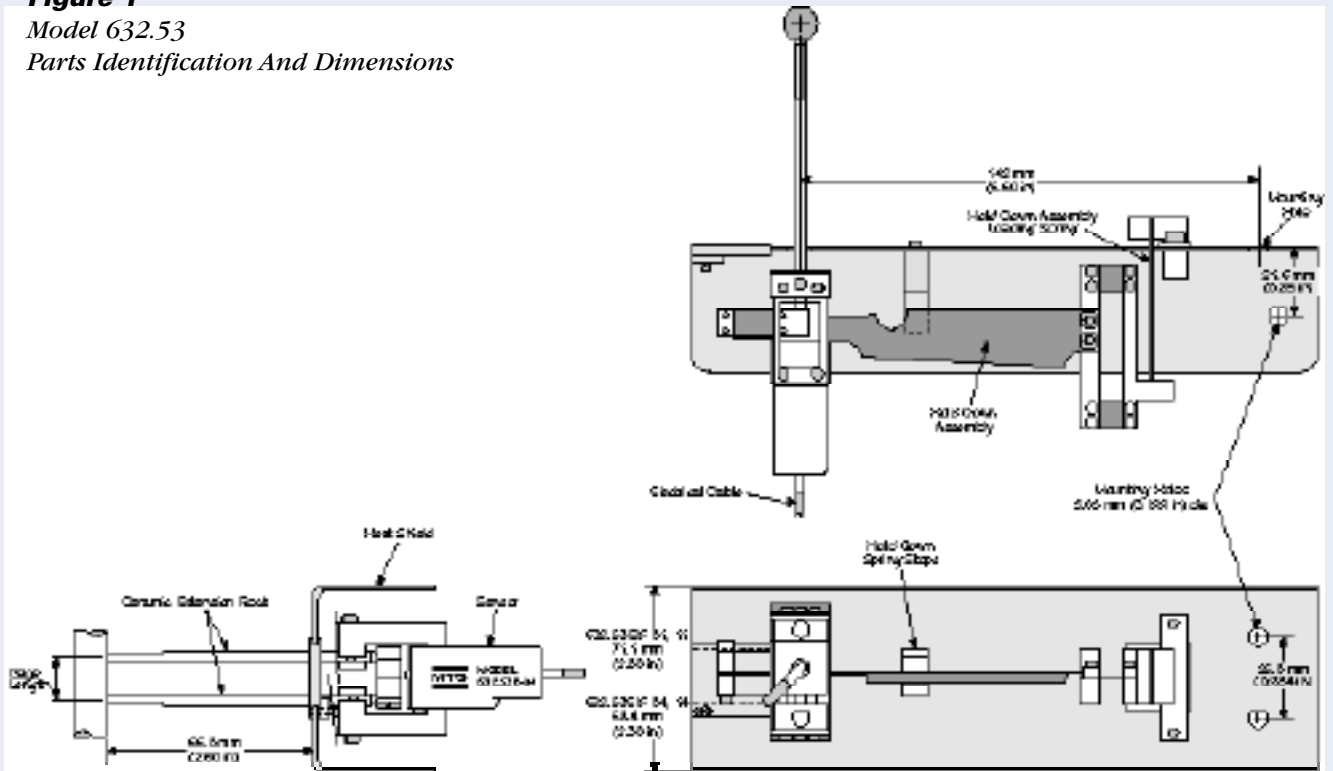
This cross-flexure design also provides a very low activation force which allows the contact force against the specimen to be minimized without extensometer slippage.
- ◆ **Minimal Drift, Excellent Linearity, And Low Hysteresis**
Provides extremely accurate strain measurement for control or readout.
- ◆ **Common Mode Insensitivity**
The linear movement of the entire test specimen due to load unit compliance (which is common with all types of load units) has minimal effect on test accuracy.
- ◆ **Precision Ground Ceramic Extension Rods With Vee-chisel Contact Edge**
Provides for a determinate attachment to the specimen for limited slip, low creep, and low hysteresis operation.

Vee-chisel contact edges provide side-to-side stability to minimize cosine errors due to angular misalignment

Figure 1

Model 632.53

Parts Identification And Dimensions



Performance

Accuracy

The Model 632.53 Extensometer is designed for extremely accurate strain measurements (refer to the specification tables). Exceptional accuracy is provided by the cross-flexure design which ensures true center-point bending throughout the entire travel range of the Extensometer. The cross-flexure design also provides very good lateral stability and requires very low activation force.

- Excellent linearity and low hysteresis yields accurate measurement and control from specimen to specimen and test after test.
- Very low creep provides for accurate results even with very low specimen contact force.

Conditioning Electronics

The Extensometer is used with MTS conditioning electronics or other conditioning electronics capable of providing an excitation voltage of 10 volts (not to exceed 12 volts).

The Extensometer output is approximately 2.3 millivolts per volt of excitation. Bridge resistance is 1000 ohms.

Calibration

The figure on the opposite page illustrates actual data collected during calibration. The asterisks are the actual data points collected. The unshaded areas illustrate the permissible variation.

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 strain range.
- The Extensometer and associated conditioning electronics may be recalibrated on-site by the customer or by trained MTS field service engineers or they may be returned to MTS for recalibration.

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

Application

Mounting

The Extensometer, with the extension rod ends contacting the specimen, is held in position by a spring-loaded hold-down assembly. This hold-down assembly secures the Extensometer while allowing full movement of the rods.

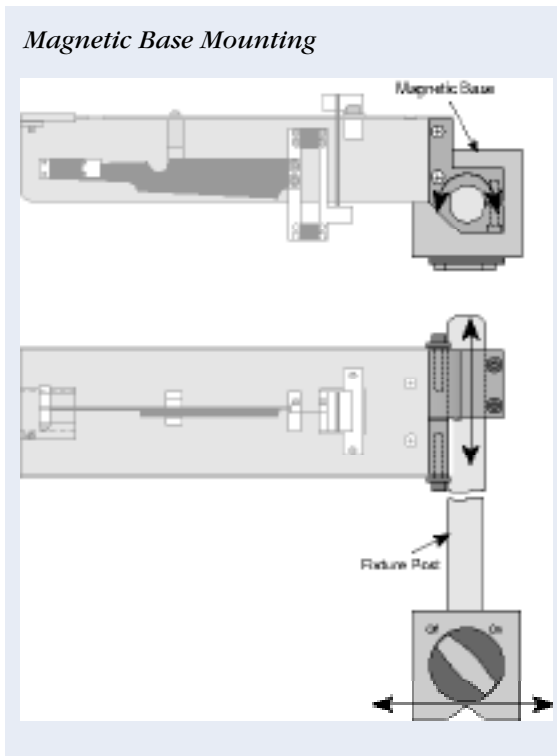
A mounting fixture supports the Extensometer assembly and heat shield to provide quick and easy installation and adjustment of the extensometer onto the test fixture.

Two styles of mounting fixtures (shown below) are available:

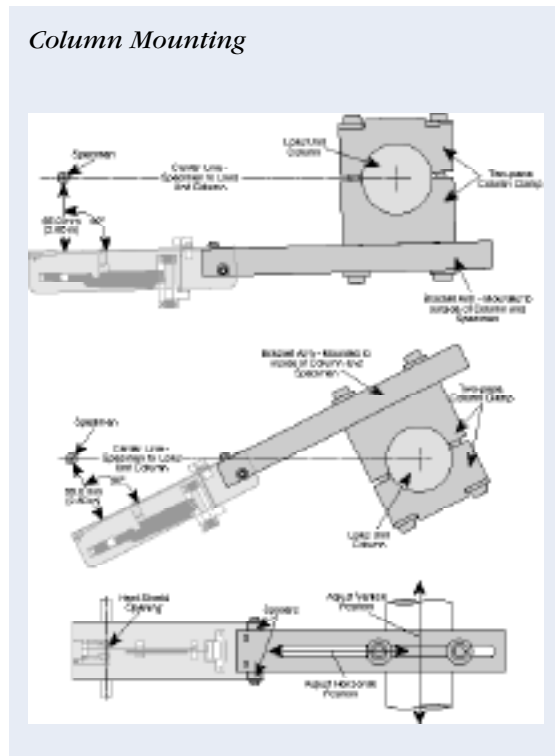
- a simple magnetic base mounting fixture, or
- a column mounted fixture which attaches to the column of the load unit.

Both styles allow for vertical and horizontal adjustment of the Extensometer/heat shield assembly.

Magnetic Base Mounting



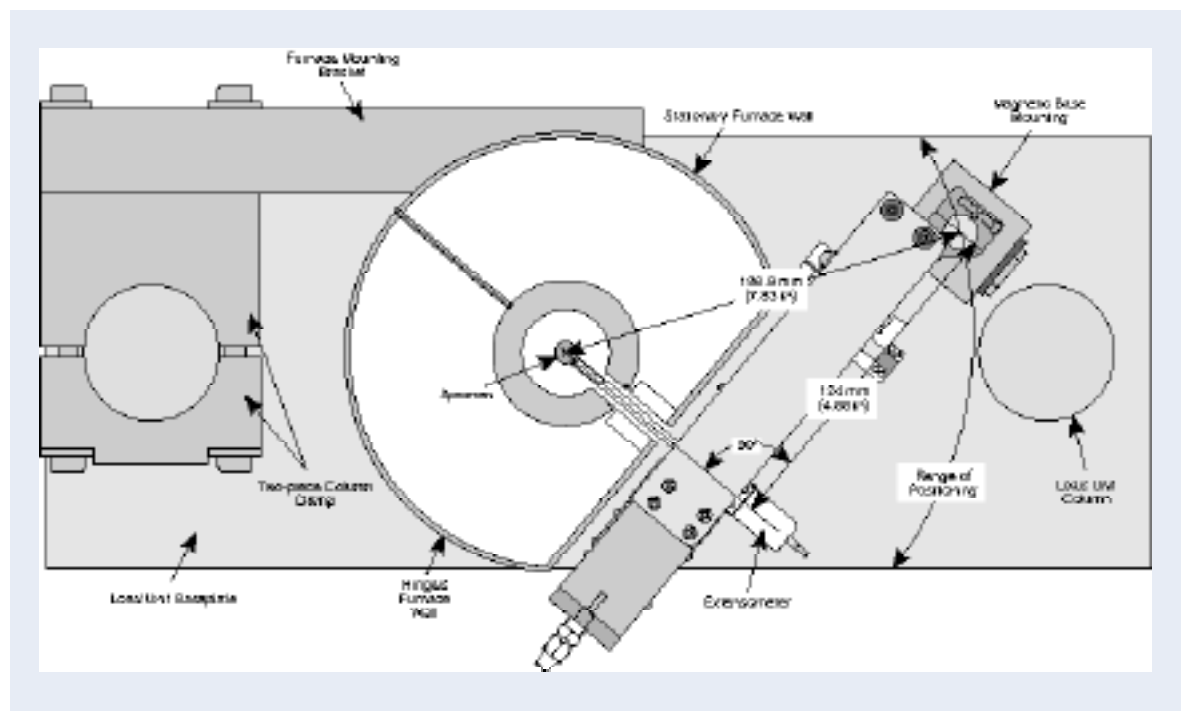
Column Mounting



The figure below illustrates the distances from the center of the specimen to the center of the magnetic base mounting post and the center line of the extension rods to the center of the magnetic base mounting post. The arc illustrates the range of positioning for the magnetic base on the load unit base plate.

When selecting the magnetic base mounting configuration keep in mind:

- the distance between the specimen and columns
- the width of the load unit base plate
- if a furnace is used as shown below, the angle of the flat face of the furnace



Extension Rods For Use With Induction Heating Coils

The Extensometer uses 3.50 mm (0.138 in) diameter ceramic extension rods. The rods have a vee-chisel edge which will accept specimen diameters of up to 10 mm (0.40 in).

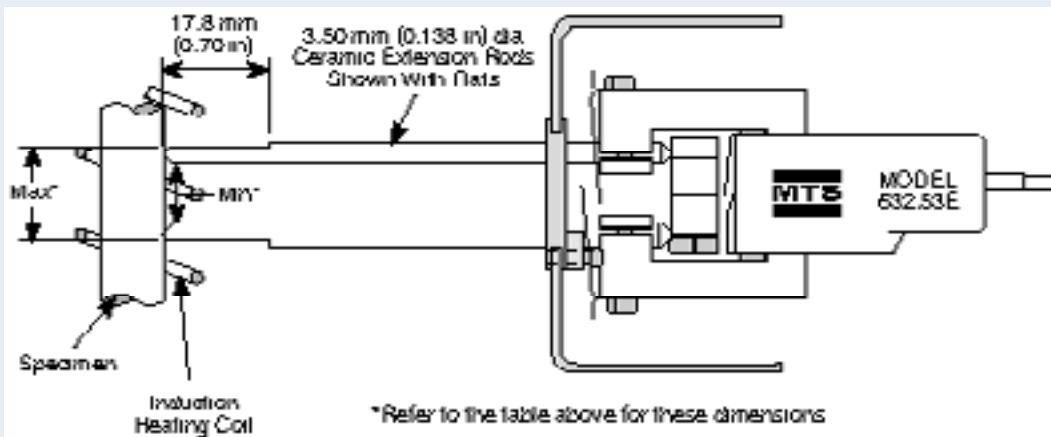
The ceramic extension rods are designed to extend through the induction heating coil and contact the specimen. Flats are machined on the specimen end (as shown below) to minimize the opening required between the induction heating coils. The table on the right indicates the maximum distance between the flats at full extension

(typically positive travel) and the minimum distance between the inside rod surfaces at full compression (typically negative travel).

Distance Between Rod Surfaces At Full Travel		
Gage Length	Max	Min
25.00 mm	29.02 mm	20.25 mm
1.000 in	1.160 in	0.812 in
12.00 mm	16.02 mm	7.30 mm
0.500 in	0.660 in	0.312 in

Model 632.53

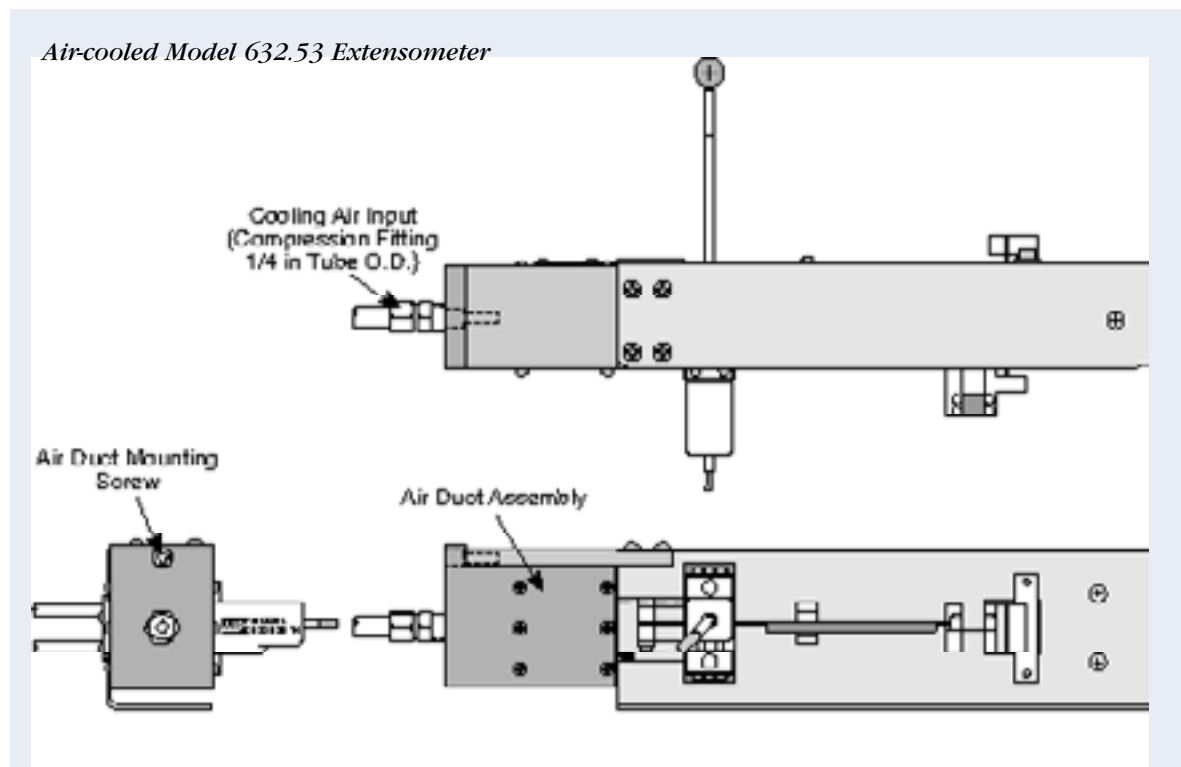
Extensometer Extension Rod Dimensions For Induction Coil Heating



Air Cooling

Air-cooled Models have an air duct assembly (shown below) attached to the end of the Extensometer heat shield. The air duct assembly has a 1/4 in outside diameter tubing compression fitting for the air input connection. The end of the air duct assembly nearest the Extensometer is filtered and has a diffuser plate to ensure clean, even air distribution across the Extensometer. To make installation and removal of the Extensometer sensor easier, the air duct can be removed by removing a single socket head cap screw.

Also provided as part of the air cooling system is a column mounted regulator/filter assembly (not shown). The filter cleans the air, as well as, removes moisture from the air. The regulator allows the shop air to be adjusted to the required 0.07 MPa (10 psi) pressure. The assembly input has a connector for a standard quick disconnect hose coupling (the hose coupling is not included). The required shop air flow rate is 90 l/min (3.2 ft³/min). Two column clamps are provided to mount the assembly: one for 63.5 mm (2.5 in) diameter columns and one for 76.2 mm (3.0 in) diameter columns.



Specifications

Parameter	Specifications			
	Model 632.53E-01 ¹	Model 632.53F-01 ¹	Model 632.53E-11 ¹	Model 632.53F-11 ¹
Gage Length	1.000 in	25.00 mm	1.000 in	25.00 mm
Maximum travel	+0.100,-0.050 in	+2.50,-1.25 mm	+0.100,-0.050 in	+2.50,-1.25 mm
Maximum strain ²	+10%,-5%	+10%,-5%	+10%,-5%	+10%,-5%
Typical nonlinearity	0.1%	0.1%	0.1%	0.1%
Maximum nonlinearity	0.15%	0.15%	0.15%	0.15%
Typical hysteresis	0.07%	0.07%	0.07%	0.07%
Maximum hysteresis ³	0.1%	0.1%	0.1%	0.1%
Contact force against specimen	300 grams per rod	300 grams per rod	300 grams per rod	300 grams per rod
Maximum operating frequency	2 Hz	2 Hz	2 Hz	2 Hz
Maximum (specimen) temperature	1200°F	650°C	2200°F	1200°C
Bridge resistance	1000 Ω	1000 Ω	1000 Ω	1000 Ω
Extensometer weight (sensor unit with extension rods only)	60 g	60 g	60 g	60 g
Shipping weight	3.6 lb	1.6 kg	6.4 lb	2.9 kg

¹ The Model 632.53E Extensometer is in U.S. customary units. The Model 632.53F Extensometer is in SI units. The Model 632.53-01 is a non-cooled unit. The Model 632.53-11 has the air-cooling option. If the air-cooling is not used the maximum specimen temperature is 1200°F (650°C).

² Strain is the deflection per unit of gage length (inches/inch or millimeters/millimeters).

³ Hysteresis is measured over the ± maximum travel range and is specified as a percent of this full range.

Parameter	Specifications			
	Model 632.53E-04 ¹	Model 632.53F-04 ¹	Model 632.53E-14 ¹	Model 632.53F-14 ¹
Gage Length	0.500 in	12.00 mm	0.500 in	12.00 mm
Maximum travel	+0.100,-0.050 in	+2.40,-1.20 mm	+0.100,-0.050 in	+2.40,-1.20 mm
Maximum strain ²	+20%,-10%	+20%,-10%	+20%,-10%	+20%,-10%
Typical nonlinearity	0.1%	0.1%	0.1%	0.1%
Maximum nonlinearity	0.15%	0.15%	0.15%	0.15%
Typical hysteresis	0.07%	0.07%	0.07%	0.07%
Maximum hysteresis ³	0.1%	0.1%	0.1%	0.1%
Contact force against specimen	300 grams per rod	300 grams per rod	300 grams per rod	300 grams per rod
Maximum operating frequency	2 Hz	2 Hz	2 Hz	2 Hz
Maximum (specimen) temperature	1200°F	650°C	2200°F	1200°C
Bridge resistance	1000 Ω	1000 Ω	1000 Ω	1000 Ω
Extensometer weight (sensor unit with extension rods only)	60 g	60 g	60 g	60 g
Shipping weight	3.6 lb	1.6 kg	6.4 lb	2.9 kg

¹ The Model 632.53E Extensometer is in U.S. customary units. The Model 632.53F Extensometer is in SI units. The Model 632.53-04 is a non-cooled unit. The Model 632.53-14 has the air-cooling option. If the air-cooling is not used the maximum specimen temperature is 1200°F (650°C).

² Strain is the deflection per unit of gage length (inches/inch or millimeters/millimeters).

³ Hysteresis is measured over the ± maximum travel range and is specified as a percent of this full range.

What's Included In The Basic Extensometer Package

In addition to the accessories ordered you get:

- The Extensometer and heat shield (with hold-down assembly already mounted) packaged in a high-impact carrying case.
- Air cooled Models include the air duct assembly and an air regulator/filter assembly.
- A tool kit which contains everything needed to set up the Extensometer for operation.
- A spare set of vee-chisel extension rods and an installation gage.
- Appropriate installation drawings and, if the Extensometer is calibrated by MTS, a calibration data sheet.

Extensometer Accessories

The following accessories are not included as part of the Extensometer package but may be ordered separately.

- Mating connector (PT06A-10-6S)
The mating connector may be purchased alone if you want to build your own interface cable.
- Interface cable
This interface cable comes with a mating connector on both ends. The end with the PT06A-10-6S mating connector attaches to the connector on the extensometer cable. The other end connects to the MTS conditioning electronics.
- Mounting alternatives
A simple magnetic base mounting fixture to support the Extensometer assembly and to provide quick and easy installation and adjustment of the extensometer onto the test fixture.

A load unit column mounting fixture to support the Extensometer assembly and to provide simple, accurate and repeatable alignment with the specimen.
- Extension rods

Replacement ceramic extension rods may be purchased in sets of 2. Besides the standard vee-chisel a variety of other end geometries are available.

- conical point for specimens which can tolerate a dimpled indent. A punch fixture is required to establish the gage length.
- convex chisel for larger diameter round specimens or flat specimens.
- straight chisel
- Air-cooling kit
Air cooling can be added to the Models 632.53E/F-01 and -04 Extensometers. The air cooling kit includes the air duct assembly (which connects to the heat shield) and a regulator/filter assembly. The regulator/filter assembly includes column clamps for mounting to load units with 63.5 mm (2.5 in) and 76.2 mm (3.0 in) diameter columns.

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.



REGIONAL BUSINESS CENTERS

THE AMERICAS

MTS Systems Corporation
14000 Technology Drive
Eden Prairie, MN 55344-2290

USA

Telephone: 1-952-937-4000
Toll Free: 1-800-328-2255
Fax: 1-952-937-4515
E-mail: info@mts.com
Internet: www.mts.com

EUROPE

MTS Systems France
BAT EXA 16
16/18 rue Eugène Dupuis
94046 Créteil Cedex
France
Telephone: 33-1-58 43 90 00
Fax: 33-1-58 43 90 01
E-mail: contact.france@mts.com

MTS Systems GmbH
Hohentwielsteig 3
14163 Berlin
Germany
Telephone: +49-30-81002-0
Fax: +49-30-81002-100
E-mail: euroinfo@mts.com

MTS Systems S.R.L. socio unico
Corso Cincinnato, 228/b -10151
Torino
Italy
Telephone: 011 45175.11 sel. pass.
Fax: 011 45175.00-01
E-mail: mtstorino@mts.com

MTS Systems Norden AB
Södra Långebergsgatan 16
SE-421 32 Västra Frölunda
Sweden
Telephone: 46-31-68-6999
Fax: 46-31-68-6980
E-mail: norden@mts.com

MTS Systems Ltd. UK
Brook House
Sommerford Court
Sommerford Road
Cirencester GL7 1TW
Glos. -United Kingdom
Telephone: +44-1285-648800
Fax: +44-1285-658052
E-mail: mtsuksales@mts.com

ASIA/PACIFIC

MTS Japan Ltd.
ArcaCentral Bldg.8F
1-2-1 Kinshi, Sumida-ku
Tokyo 130-0013
Japan
Telephone: 81-3-6658-0901
Fax: 81-3-6658-0904
E-mail: mts-j-info@mts.com

MTS Korea, Inc.
5th Floor, Core Building
8-1 Sunae-Dong, Bundang-Gu
Seongnam City,
Gyeonggi-Do 463-825,
Korea
Telephone: 82-31-714-7151
Fax: 82-31-714-7198
E-mail: mtsk-info@mts.com

MTS Systems (China) Co., Ltd.
Building 23, No.481,
Guiping Road,
Shanghai 200233,
P.R.China
Tel: 86-21-5427 1122
Fax: 86-21-6495 6330
E-mail: info@mtschina.com

MTS Systems Corporation
14000 Technology Drive
Eden Prairie, MN 55344-2290 USA

ISO 9001 CERTIFIED QMS
<http://www.mts.com/en/ContactUs>

632.53-1 Part Number 300023-45A
PRINTED IN U.S.A. 3/1994
©COPYRIGHT, MTS SYSTEMS CORPORATION