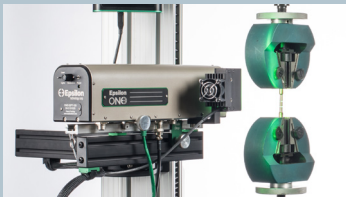


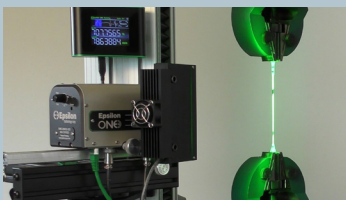
Breakthrough Performance • Easy to Use • Interfaces With Any Test Machine

Epsilon ONE high-precision optical extensometers measure axial strain with industry-leading resolution, accuracy, and speed. Innovative Instant Reset and Laser Alignment features maximize ease of use and testing throughput. $\pm 10V$ output is compatible with any testing system.

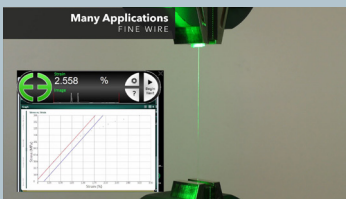
Applications



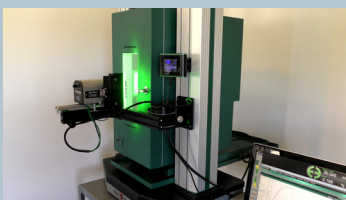
Composites, Metals, Ceramics



Plastics, Elastomers

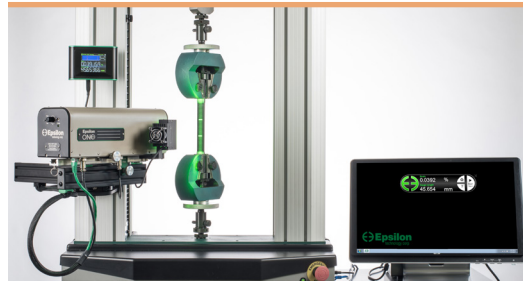


Foil, Wire, Polymer Films



Non-Contact Strain Measurement with an Environmental Chamber

Many more...



Epsilon ONE - Model ONE-78PT-System with carbon fiber composite specimen

Epsilon ONE optical non-contact extensometers perform high-accuracy, high-resolution, non-contacting axial strain and displacement measurement. These extensometers are suitable for testing high-modulus materials such as metals and composites, high-elongation materials, thin

or delicate specimens, cyclic fatigue, strain controlled testing, deflectometer applications, and measuring crack opening displacements. Strain or extension is measured and output in real time.

Epsilon ONE's high resolution and ISO 0,5 / ASTM B-1 accuracy classes make it suitable for non-contact measurement of a wide range of strain values, from very small strains required to measure modulus of metals, composites, ceramics and CMCs through elastomers and everything in between.

Class-leading accuracy and resolution are achieved by Epsilon's comprehensive optical path optimization, a unification of several optical technologies and signal processing algorithms. Ultra-high camera resolution, real-time data rates up to 3000 Hz, minimization of optical error sources, and signal processing techniques provide high strain resolution and accuracy with the lowest noise. No other system on the market combines all of these technologies.

The Laser-Assist Alignment System provides an instant alignment and distance spot check. Epsilon ONE will project pre-aligned laser lines on the specimen before the test, revealing any misalignment. During the test, high precision telecentric lenses on the PT models eliminate errors due to out-of-plane movements – a common source of errors for many video extensometers. Epsilon ONE arrives factory calibrated – there are no calibration grids or gauge length bars, saving a great deal of time.

The system sets up for new specimen types in minutes and requires very little training or skill to use. The desktop user interface software and optional Touch Interface provide continuous digital readouts and status information.

Epsilon ONE was designed for the fastest specimen cycle times. Auto-start repetitive tests without any software interaction; Epsilon ONE is always running, and its Instant Reset and Automatic Mark Detection eliminate software start/stop interactions common with video extensometers.

Epsilon ONE fits all types of materials testing machines. The system may be used with environmental chambers that are equipped with a window – contact Epsilon.

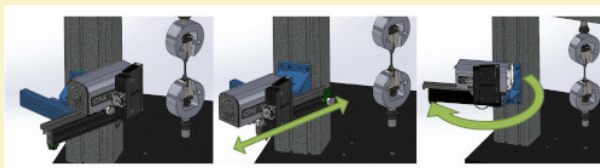


See Epsilon ONE extensometer videos

Features

- Always on, always ready: Unlike DIC systems, software interactions are unnecessary when running repetitive tests.
- Always real-time: Post-processing is never required, even at the highest data rates.
- Faster throughput with Instant Reset: Auto-start repetitive tests without touching the extensometer or software.
- Reliable, automatic mark detection: Robust tracking of bright or dark marks beyond 1000% strain and speeds >1500 mm/second.
- Laser Assist Alignment System: Provides an instant visual spot-check for specimen alignment and optics positioning.
- Precision Telecentric Design: Epsilon ONE's telecentric lenses prevent common sources of error. *See the Tech Note at www.epsilonotech.com*
- Fully factory calibrated: Epsilon calibrates using the industry's most comprehensive process to correct for scaling, skew, lens distortion, and uneven lighting. A2LA accredited factory calibration, traceable to the SI; no grids or bars are required for calibration.
- Cleaner workspace: No need for an additional computer and monitor; the included Software User Interface has very low resource requirements and can run on the test machine's computer.
- Optional Touch Interface: Access and control the Epsilon ONE without a computer.
- Retractable high-stiffness mounting: Industry-leading ease-of-use while maintaining maximum dynamic range and vibration rejection.
- Selectable multi-line specimen marking: Automatically identify and report the region of highest strain concentration, in real time.
- Wide range of selectable filter and optical settings enable high performance with many different materials and specimens.
- Faster Testing: Save time with industry-leading 200+ Hz dynamic range and automatic gain compensation filters.
- Admin/User Modes: Define, save and reload settings for specific specimens and test methods, then lock them in User Mode.
- Real-time digital output: High-speed data stream including APIs for control and status, and examples for automation and integration.
- Better Strain Control: Built-in high speed 16-bit analog output; not susceptible to unpredictable cyclic bias errors typical of DIC systems.
- Versatile Output Modes: output $\pm 10V$ as % Strain, Length (mm), or Elongation (mm).
- Applicable for testing with many ISO and ASTM standards, including:
 - ISO 6892-1, 527-2, 527-4, 527-5
 - ASTM E8, E9, D3039, D638, A370, D3552, E646
- Turn-key: Each base package includes
 - Optics Package with laser-assist alignment system
 - Lighting Module
 - Sensor Controller
 - Mounting Interface Subassembly
 - Specimen Marking Kit
 - Cables and software
- Patented design
- Includes high quality foam lined case.

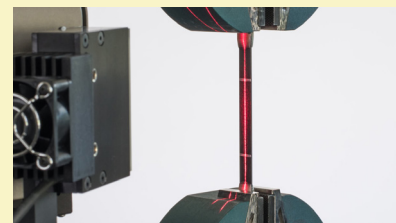
Ease of Use is Designed In



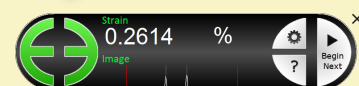
Rigid Load Frame Mounting
Linear Retraction and Swing Away features



Instant Reset
Always On, Always Real Time
Automatic Mark Detection



Laser Assist Alignment System
• Specimen alignment spot check
• Eliminates calibration grids and bars



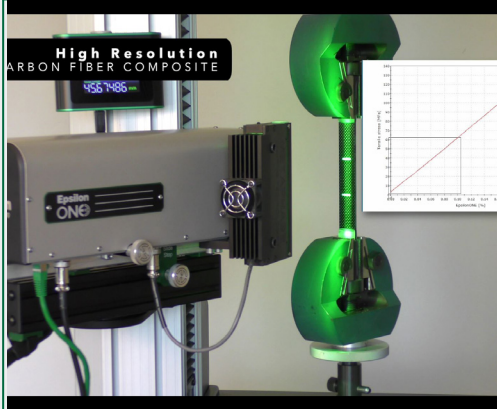
Simple User Interfaces
• Software User Interface
• Touch Interface

Epsilon ONE[®] Optical Non-Contact Extensometers, continued

ADVANTAGES

What sets Epsilon ONE[®] apart?

Resolution, Accuracy, Speed



Epsilon ONE's performance is a result of optics and algorithm technologies that combine for high resolution, data rates and accuracy:

Resolution: $<0.5 \mu\text{m}$ quasistatic, $<2.5 \mu\text{m}$ dynamic, $<0.1 \mu\text{m}$ creep; Typical RMS resolution at typical settings.

Real time data rate: 300-3000 Hz

Extensometer Accuracy Class: ISO 9513 Class 0,5 and ASTM E83 Class B-1 or better, typical, for gauge lengths $\geq 10 \text{ mm}$

As a result, Epsilon ONE is equipped with the accuracy and fine resolution required to measure modulus, offset yield, stress-strain curves, and strain at failure for all high-modulus materials.

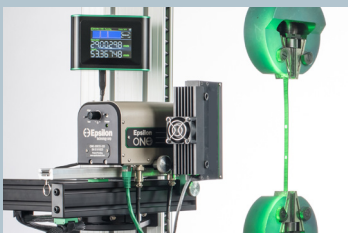
Optics Packages



ONE-78PT-System
Premium Precision Telecentric Optics



ONE-52PT-System
Precision Telecentric Optics



ONE-200CE-System
Conventional Entocentric Optics

Specimen Marking



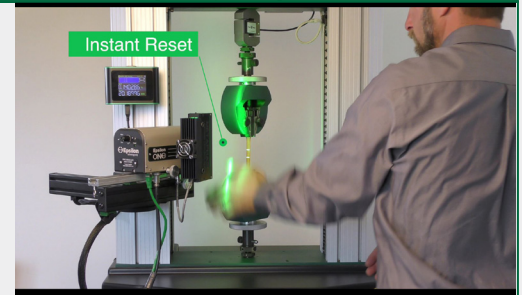
Specimen marking is simple and fast. Templates and paint pens are included with every Optics Package



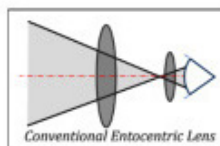
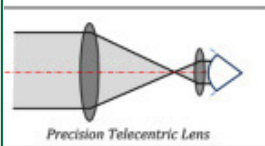
See Epsilon ONE extensometer videos

Always On, Always Real Time

Epsilon ONE overcomes one of the biggest barriers to widespread use of non-contact extensometers: too many steps when using them. Epsilon ONE is always running and measuring strain or searching for marks using its Automatic Mark Detection. As soon as marks are detected, Epsilon ONE is measuring strain in real time. Epsilon ONE doesn't have to be started and stopped for each specimen like most video extensometers and DIC systems, and strain output is always in real time at data rates up to 3000 Hz.



Telecentric Design



Many applications involve specimens that straighten or grips that are free to align under tensile loading. Unlike conventional lenses, telecentric lenses are insensitive to potential inaccuracies caused by these out-of-plane motions. With a telecentric lens, the image of the test specimen seen by the camera's sensor is the same size even if the specimen moves closer to the Optics Package or further away.

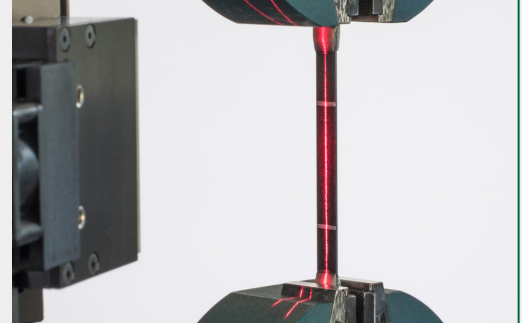
The benefit: full strain measurement accuracy is maintained even if the specimen or grips move out of the testing axis ("out of plane") during the test. Conventional entocentric lenses, which are widely used by other manufacturers of non-contact extensometers, cannot match this performance.

Laser Assist Alignment System

Setup is faster and more robust with the Laser Assist Alignment System. Epsilon ONE's built-in factory aligned lasers provide two functions:

- Spot-checking specimen alignment
- Setting distance to the specimen - eliminates the need for calibration grids or gauge length bars

Epsilon ONE is factory calibrated - just set the distance to the specimen, set your controller to take Epsilon ONE's calibrated $\pm 10\text{V}$ input, and start testing.



SPECIFICATIONS

<i>Field of View:</i>	50-500 mm. See specific optics packages; contact Epsilon for other options.
<i>Real-Time Data Rate:</i>	300-3000 Hz, >2000 Hz typical; includes image frame rate, analysis, analog output, and digital output
<i>Strain Outputs:</i>	Analog Output: $\pm 10V$, short-protected, selectable units and range; includes 2.4 m (8 ft) shielded output cable Digital Output: 16-64 bit typical over RS232; includes 1.8 m (6 ft) shielded null modem cable
<i>Resolution:</i>	<0.5 μm quasistatic, <2.5 μm dynamic, <0.1 μm creep; <i>Typical RMS resolution at typical settings. Resolution is a function of the optics and filter settings. See www.epsilontech.com for further details.</i>
<i>Extensometer Accuracy Class:</i>	ISO 9513 Class 0,5 and ASTM E83 Class B-1 or better typical at ≥ 10 mm gauge length
<i>Absolute Accuracy:</i>	PT models: $\leq \pm 1 \mu m$ or 0.5% of value, not exceeding $\pm 30 \mu m$ typical CE models: $\leq \pm 1 \mu m$ or 0.5% of value
<i>Minimum Specimen Size:</i>	< $\varnothing 20 \mu m$ (0.001")
<i>Gauge Length:</i>	2 mm minimum, $\geq 4 \times$ specimen width or diameter recommended; for gauge lengths <10 mm contact Epsilon
<i>Maximum Elongation:</i>	>1000%, limited by field of view and gauge length
<i>Maximum Tracking Speed:</i>	>1500 mm/second (90,000 mm/minute)
<i>Cyclic Testing:</i>	>100 Hz typical cyclic test frequency, waveform independent
<i>Strain Control:</i>	Suitable for monotonic and cyclic strain control applications
<i>Out-of-Plane Sensitivity*:</i>	Allowable out-of-plane motion for ISO 9513 Class 0,5 @15 mm gauge length and ASTM E83 Class B-1: <1000 μm (0.040") for ONE-PT-xx <25 μm (0.001") for ONE-CE-xx *Understand this specification before you purchase any optical extensometer – see the Tech Note at www.epsilontech.com
<i>Power Supply:</i>	100-240 VAC, 50-60 Hz, 100W, IEC 320 C14 receptacle. Specify plug type when ordering.
<i>System Environment:</i>	10-40°C (50-100°F), for use and storage; 20-80% relative humidity non-condensing environments
<i>Host PC (optional):</i>	Requires PC with Windows 7 or later, 900x550 minimum display, one serial or USB port

OPTIONS

- Mounting Systems for testing machine base mount, T-slot column mount, or cylindrical column mount
- ONE-TI-1 Touch Interface
- ONE-BIS Barrier Interlock Systems for setups where Epsilon ONE is installed behind the test area (opposite the test machine operator)
- Customized specimen marking templates
- Connectors to interface to nearly any brand of test equipment



Epsilon ONE[®] Optical Non-Contact Extensometers, continued

ORDERING INFORMATION

The Epsilon ONE[®] system includes an Optics Package, lighting, Laser Assist Alignment System, Sensor Controller, cables, mounting interface, standard specimen marking kit and software. The included user interface software will run on your testing machine's existing computer.

Select an Optics Package that meets your range of gauge length and elongation requirements. Start with the largest gauge length that you will need and determine which Optics Packages have enough elongation range for that gauge length. Repeat this process for the smaller gauge lengths in your range of applications. Telecentric lenses are superior to conventional lenses, especially for applications involving strain measurements $< \sim 2\%$. Learn more about telecentric lenses at www.epsilontech.com.

Epsilon ONE will work with any gauge length that is within the stated range for the Optics Package. Maximum strain values in the tables below are estimates for tensile specimens with a reduced cross-sectional area in the gauge section. When using straight-sided specimens, see the Epsilon ONE web page for recommended estimating methods.

Touch Interface (Optional)

The optional full-color Touch Interface provides all functions necessary to set up and use an Epsilon ONE system. May be mounted on the column of the testing machine near the Epsilon ONE.

Model Number: **ONE-TI-1**

 See a Touch Interface demo



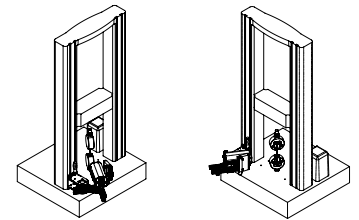
High-Stiffness Mounting Systems

Epsilon ONE is a high-precision optical extensometer and requires rigid load frame mounting. Other configurations than the ones shown below are available – contact Epsilon. Further details are in the Epsilon ONE Mounting System Selection Guide at www.epsilontech.com.

Model Number **ONE-MS-01**

For testing machines with integral T-slots on the column:

- Mounts to the vertical T-slots of the testing machine
- Provides rigid mounting for any Epsilon ONE Optics Package
- Swing-away and retraction features make it easy to move the Epsilon ONE out of the way when not in use or between tests
- Repeatable placement provided by reference stops

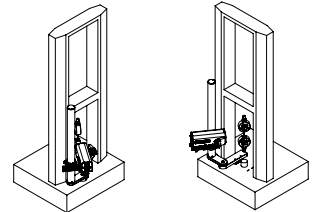


MODEL ONE-MS-01

Model Number **ONE-MS-02**

Universal base mounting for all testing machines:

- Mounts to the horizontal surface of the stationary baseplate / lower crosshead on most any testing machine
- Provides rigid mounting for any Epsilon ONE Optics Package
- Swing-away and retraction features make it easy to move the Epsilon ONE out of the way when not in use or between tests
- Repeatable placement provided by reference stops
- Includes design by an Epsilon engineer to ensure that ONE-MS-02 fits your specific testing machine

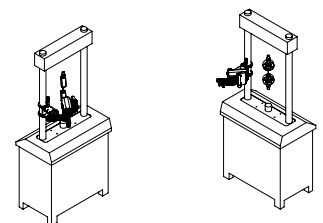


MODEL ONE-MS-02

Model Number **ONE-MS-03**

For servohydraulic or electrodynamic testing machines with cylindrical columns:

- Mounts to a cylindrical column on a servohydraulic, electrodynamic or static hydraulic testing machine
- Provides very rigid mounting for any Epsilon ONE Optics Package
- Swing-away and retraction features make it easy to move the Epsilon ONE out of the way when not in use or between tests
- Repeatable placement provided by reference stops

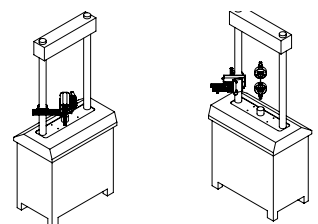


MODEL ONE-MS-03

Model Number **ONE-MS-04**

For servohydraulic or electrodynamic testing machines with cylindrical columns (no swing-away feature):

- Mounts to a cylindrical column on a servohydraulic, electrodynamic or static hydraulic testing machine
- Provides rigid mounting for any Epsilon ONE Optics Package
- Retraction feature makes it easy to move the Epsilon ONE out of the way when not in use or between tests
- Designed to put the Epsilon ONE in a fixed position; this model does not have the swing-away feature and only mounts Epsilon ONE in an angled orientation

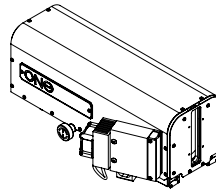


MODEL ONE-MS-04

Epsilon ONE Optical Extensometer Systems

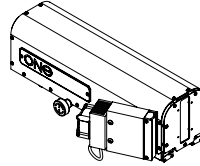
Model Number ONE - 78PT - SYSTEM

- Premium performance, precision telecentric lens
- 78 mm field of view and 200 mm working distance
- Any gauge length between 10 mm and 65 mm



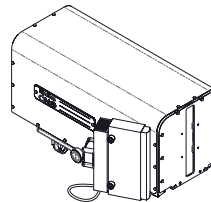
Model Number ONE - 52PT - SYSTEM

- Precision telecentric lens
- 52 mm field of view and 150 mm working distance
- Any gauge length between 10 mm and 40 mm



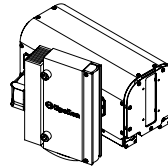
Model Number ONE - 130PT - SYSTEM

- Precision telecentric lens
- 130 mm field of view and 210 mm working distance
- Any gauge length between 10 mm and 110 mm



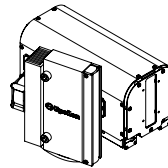
Model Number ONE - 200CE - SYSTEM

- Conventional entocentric lens – recommended for high elongation applications and for measuring strain values of ~2% or greater; suitable for smaller strains in some applications
- 200 mm field of view and 220 mm working distance
- Any gauge length between 10 mm and 180 mm



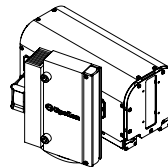
Model Number ONE - 250CE - SYSTEM

- Conventional entocentric lens – recommended for high elongation applications and for measuring strain values of ~2% or greater; suitable for smaller strains in some applications
- 250 mm field of view and 280 mm working distance
- Any gauge length between 10 mm and 200 mm



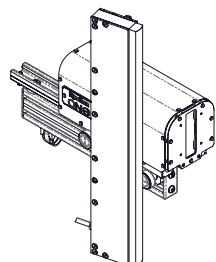
Model Number ONE - 300CE - SYSTEM

- Conventional entocentric lens – recommended for high elongation applications and for measuring strain values of ~2% or greater; suitable for smaller strains in some applications
- 300 mm field of view and 340 mm working distance
- Any gauge length between 10 mm and 250 mm



Model Number ONE - 350CE - SYSTEM

- Conventional entocentric lens – recommended for high elongation applications and for measuring strain values of ~2% or greater; suitable for smaller strains in some applications
- 350 mm field of view and 400 mm working distance
- Any gauge length between 10 mm and 300 mm



Model Number ONE - 500CE - SYSTEM

- Conventional entocentric lens – recommended for high elongation applications and for measuring strain values of ~2% or greater; suitable for smaller strains in some applications
- 500 mm field of view and 270 mm working distance
- Any gauge length between 10 mm and 400 mm

Range of Gauge Lengths and Maximum % Strain

Gauge Length	Maximum Strain	Maximum Elongation
10 mm	580%	58 mm
12 mm	470%	56 mm
25 mm	170%	43 mm
50 mm	35%	18 mm
65 mm	5%	3 mm

Range of Gauge Lengths and Maximum % Strain

Gauge Length	Maximum Strain	Maximum Elongation
10 mm	320%	32 mm
12 mm	250%	30 mm
25 mm	65%	17 mm
40 mm	5%	2 mm

Range of Gauge Lengths and Maximum % Strain

Gauge Length	Maximum Strain	Maximum Elongation
10 mm	>1000%	110 mm
25 mm	380%	95 mm
50 mm	140%	70 mm
75 mm	60%	45 mm
100 mm	20%	20 mm

Range of Gauge Lengths and Maximum % Strain

Gauge Length	Maximum Strain	Maximum Elongation
10 mm	>1000%	180 mm
25 mm	660%	165 mm
50 mm	280%	140 mm
100 mm	90%	90 mm
180 mm	5%	10 mm

Range of Gauge Lengths and Maximum % Strain

Gauge Length	Maximum Strain	Maximum Elongation
10 mm	>1000%	230 mm
25 mm	860%	215 mm
50 mm	380%	190 mm
100 mm	140%	140 mm
200 mm	20%	40 mm

Range of Gauge Lengths and Maximum % Strain

Gauge Length	Maximum Strain	Maximum Elongation
10 mm	>1000%	280 mm
25 mm	>1000%	265 mm
50 mm	480%	240 mm
250 mm	16%	40 mm

Range of Gauge Lengths and Maximum % Strain

Gauge Length	Maximum Strain	Maximum Elongation
10 mm	>1000%	330 mm
25 mm	>1000%	315 mm
50 mm	580%	290 mm
300 mm	13%	40 mm

Range of Gauge Lengths and Maximum % Strain

Gauge Length	Maximum Strain	Maximum Elongation
10 mm	>1000%	480 mm
25 mm	>1000%	465 mm
50 mm	880%	440 mm
100 mm	390%	390 mm
200 mm	145%	290 mm
400 mm	23%	90 mm