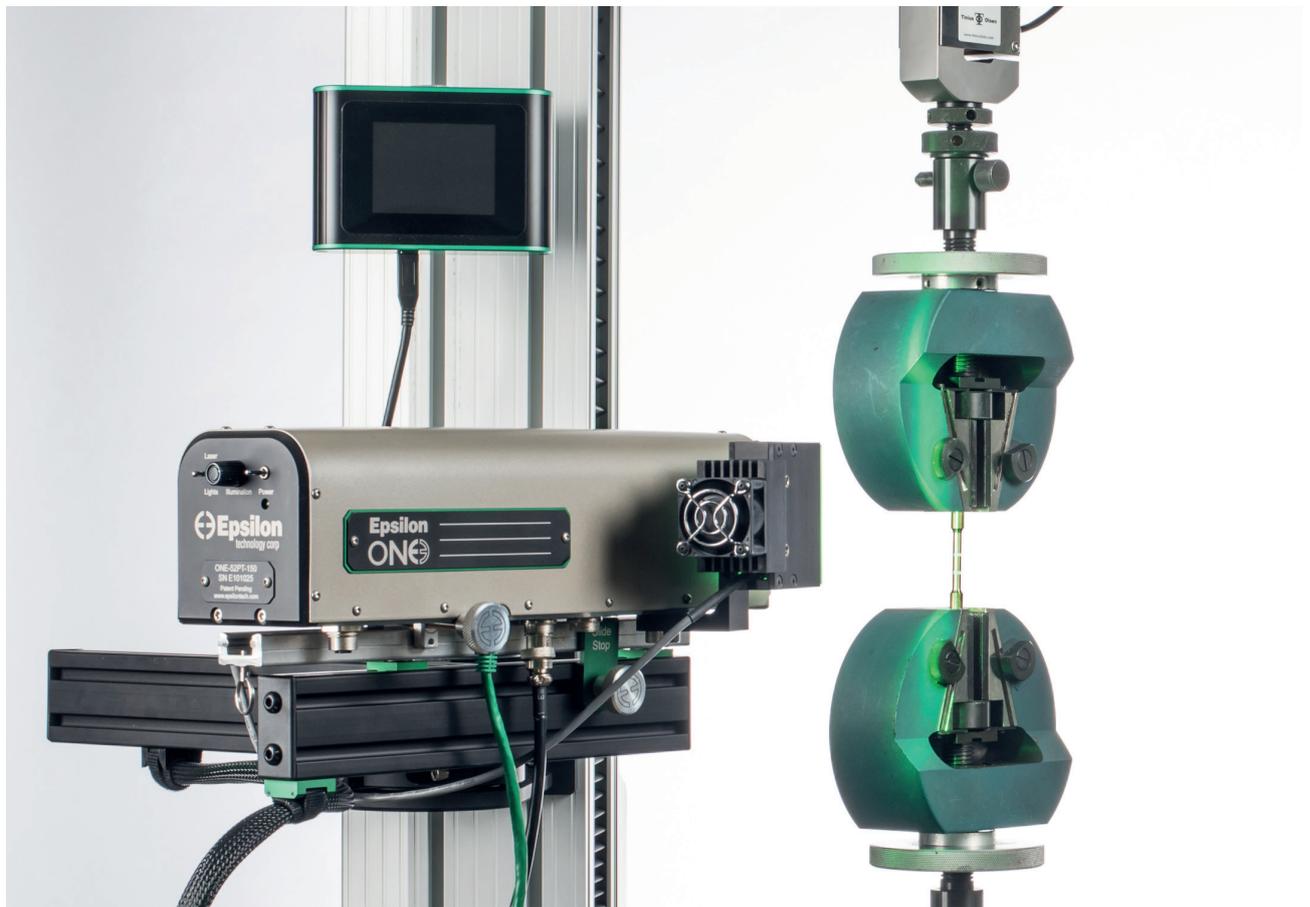


Epsilon ONE

Video non-contact extensometer



Breakthrough performance • Easy to use • Works with any material testing machine





Epsilon ONE

Epsilon ONE high-precision optical extensometers measure axial strain with industry-leading resolution, accuracy, and speed.

Innovative Instant Reset, Always On and Laser Alignment features maximize performance and increase testing throughput.

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 3000Hz, 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.



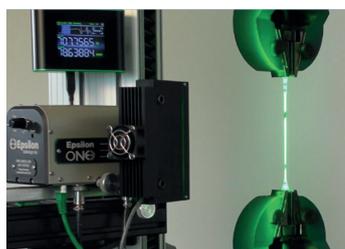
Epsilon ONE - Model ONE-78mm FoV System with carbon fiber composite specimen

APPLICATIONS

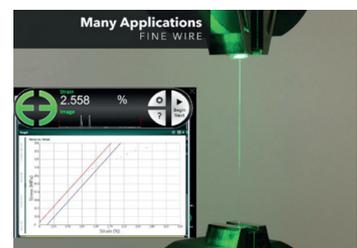
Composites,
Metals, Ceramics



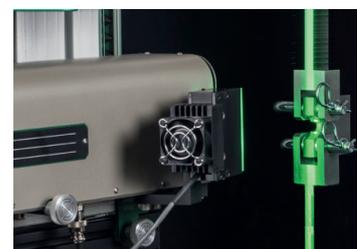
Plastics,
Elastomers



Foil, Wire, Polymer
Films



Non-Contact COD
Gage





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 eliminate errors due to out-of-plane movements – on low strain materials and components. Epsilon ONE arrives factory calibrated – there are no calibration grids or gage 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 Tinius Olsen.

Key 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.
- **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.



Advantages

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 gage lengths ≥ 10 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.



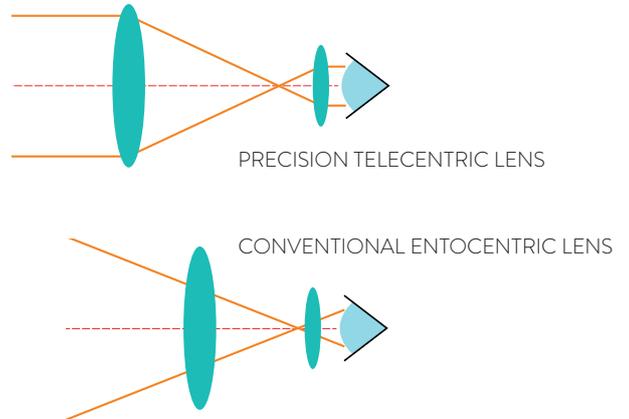
Always On, Always Real Time

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 3000Hz.

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.



OPTICS PACKAGES

ONE-78mm FoV System
Premium Precision
Telecentric Optics



ONE-200mm FoV System
Conventional Entocentric
Optics



ONE-52mm FoV System
Precision Telecentric Optics



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



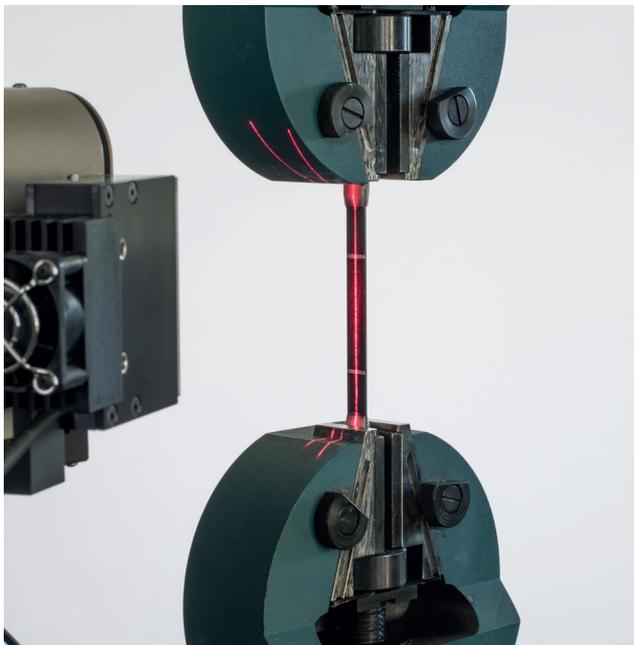


Advantages continued

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:

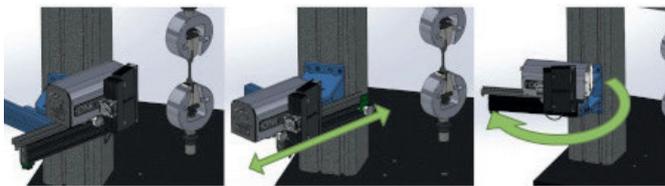
- **Spot-checking specimen alignment**
 - **Setting distance to the specimen** - eliminates the need for calibration grids or gage length bars
- Epsilon ONE is factory calibrated - just set the distance to the specimen, set your controller to take Epsilon ONE's calibrated $\pm 10V$ input, and start testing.



Key Features (cont.)

- **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 AP Is 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
- Includes high quality foam lined case.
- Patented design.

EASE OF USE DESIGNED IN



Rigid load frame mounting

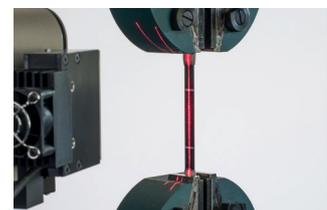
Linear retraction and swing away features



Instant Reset

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 interface

Software interface
Touch interface





SPECIFICATION	
Field of View:	50 -1000 mm FoV Optics Packages; other ranges available – contact Tinius Olsen
Real-Time Data Rate:	300-3000 Hz, >2000 Hz typical; includes image frame rate, analysis, analog output, and digital output
Strain Outputs:	Analog Output: $\pm 10V$, short-protected, selectable units and range; includes 2.4 m (8 ft) shielded output cable Digital Output: 16-64 bit over RS232; includes 1.8 m (6 ft) shielded null modem cable
Resolution:	<0.5 μm quasistatic, <2.5 μm dynamic, <0.1 μm creep; <i>Typical RMS resolution at typical settings.</i> Resolution is a function of the data rate and filter settings
Extensometer Accuracy Class:	ISO 9513 Class 0,5 and ASTM E83 Class B-1 or better typical at ≥ 10 mm gage length
Absolute Accuracy:	*PT : < $\pm 1 \mu m$ or 0.5% of value, not exceeding $\pm 30 \mu m$ typical *CE : < $\pm 1 \mu m$ or 0.5% of value
Minimum Specimen Size:	< $\varnothing 20 \mu m$ (0.001")
Gage Length:	2 mm minimum, $\geq 4x$ specimen width or diameter recommended; for gage lengths <10 mm contact Epsilon
Maximum Elongation:	>1000%, limited by field of view and gage length
Maximum Tracking Speed:	>1500 mm/second (90,000 mm/minute)
Cyclic Testing:	>100 Hz cyclic test frequency, waveform independent
Strain Control:	Suitable for monotonic and cyclic strain control applications
Out-of-Plane Sensitivity*:	Allowable out-of-plane motion for ISO 9513 Class 0,5 @15 mm gage length and ASTM E83 Class B-1: <1000 μm (0.040") for Precision Telecentric Optics <25 μm (0.001") for Conventional Entocentric Optics *Understand this specification before you purchase any optical extensometer
Power Supply:	100-240 VAC, 50-60 Hz, 100W, IEC 320 C14 receptacle. Specify plug type when ordering.
System Environment:	10-40°C (50-100°F), for use and storage; 20-80% relative humidity non-condensing environments
Host PC (optional):	Requires Windows 7 or 10 PC, 900×550 minimum display, one serial or USB port
OPTIONS	
	Mounting Systems for testing machine base mount, T-slot column mount, or cylindrical column mount
	EPONE-000-0006 Touch Interface
	Light Beam Interlock
	Customized specimen marking templates
	Connectors to interface to nearly any brand of test equipment

* PT : Precision telecentric lens

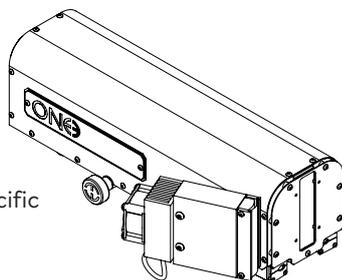
* CE : Conventional entocentric lens



Epsilon ONE Optical Extensometer Systems

Model Number EPONE-000-0000

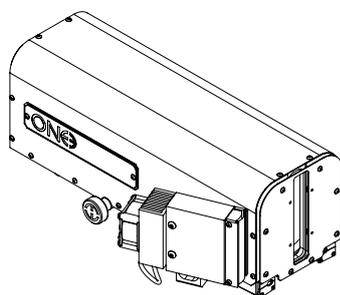
- Premium performance, precision telecentric lens
- 78mm field of view and 200mm working distance
- Any gage length between 10mm and 65mm - see table for the estimated maximum tensile elongation for a specific gage length



Range of Gage Lengths and Maximum % Strain		
Gage Length	Maximum Strain	Maximum Elongation
10mm	580%	58mm
12mm	470%	56mm
25mm	170%	43mm
50mm	35%	18mm
65mm	5%	3mm

Model Number EPONE-000-0002

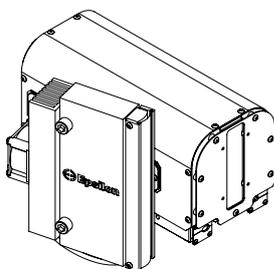
- Precision telecentric lens
- 52mm field of view and 150mm working distance
- Any gage length between 10mm and 40mm - see table for the estimated maximum tensile elongation for a specific gage length



Range of Gage Lengths and Maximum % Strain		
Gage Length	Maximum Strain	Maximum Elongation
10mm	320%	32mm
12mm	250%	30mm
25mm	68%	17mm
40mm	5%	2mm

Model Number EPONE-000-0003

- Conventional entocentric lens – suitable for high elongation applications and for measuring strain values of ~2% or greater; suitable for smaller strains in some applications
- 200mm field of view and 220mm working distance
- Any gage length between 10mm and 180mm - see table for the estimated maximum tensile elongation for a specific gage length



Range of Gage Lengths and Maximum % Strain		
Gage Length	Maximum Strain	Maximum Elongation
10mm	>1000%	180mm
25mm	660%	165mm
50mm	280%	140mm
100mm	90%	90mm
180mm	5%	10mm

Model Number EPONE-000-0012

- Precision telecentric lens
- 130mm field of view and 210mm working distance
- Any gage length between 10 mm and 100mm - see table for the estimated maximum tensile elongation for a specific gauge length

Range of Gage Lengths and Maximum % Strain		
Gage Length	Maximum Strain	Maximum Elongation
10mm	>1000%	110mm
12mm	900%	108mm
25mm	380%	95mm
50mm	140%	70mm
75mm	60%	45mm
100mm	20%	20mm



Epsilon ONE Optical Extensometer Systems cont.

Model Number EPONE-000-0031

- Conventional entocentric lens
- 500mm field of view and 270mm working distance
- Any gage length between 10 mm and 400mm - see table for the estimated maximum tensile elongation for a specific gage length

Range of Gage Lengths and Maximum % Strain		
Gage Length	Maximum Strain	Maximum Elongation
10mm	>1000%	480mm
25mm	>1000%	465mm
50mm	880%	440mm
100mm	390%	390mm
200mm	145%	290mm
400mm	23%	90mm

Model Number EPONE-000-0032

- Conventional entocentric lens
- 250mm field of view and 280mm working distance
- Any gage length between 10 mm and 200mm - see table for the estimated maximum tensile elongation for a specific gage length

Range of Gage Lengths and Maximum % Strain		
Gage Length	Maximum Strain	Maximum Elongation
10mm	>1000%	230mm
25mm	860%	215mm
50mm	380%	190mm
100mm	140%	140mm
200mm	20%	40mm

Ordering information

- Full-color touch interface
EPONE-000-0006

- Precision telecentric lens, 78mm FoV
EPONE-000-0000

- Mounting system for T-slots
EPONE-000-0004



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: EPONE-000-0006

High-Stiffness Mounting Systems

Epsilon ONE is a high-precision optical extensometer and requires rigid load frame mounting.

Model Number EPONE-000-0004 High stiffness mounting system for T-slotted ST series testing machine frame

Model Number EPONE-000-0005 Universal base mounting system for SL testing machine frames

Example: **EPONE-000-0000**, **EPONE-000-0004** and **EPONE-000-0006** = Precision Telecentric Lens, 78mm Field of View, mounting for T-slots on the column of an ST testing machine frame and the Touch Interface.



Epsilon ONE Optical Extensometer Systems cont.

The following models require consultation with our technical experts before ordering because they have specific application uses.

Model Number EPONE-000-0009

- Conventional entocentric lens
- 300mm field of view and 340mm working distance
- Any gage length between 10 mm and 200mm - see table for the estimated maximum tensile elongation for a specific gage length

Range of Gage Lengths and Maximum % Strain		
Gage Length	Maximum Strain	Maximum Elongation
10mm	>1000%	280mm
25mm	>1000%	265mm
50mm	480%	240mm
100mm	190%	190mm
200mm	45%	90mm

Model Number EPONE-000-0010

- Conventional entocentric lens
- 400mm field of view and 460mm working distance
- Any gage length between 25 mm and 300mm - see table for the estimated maximum tensile elongation for a specific gage length

Range of Gage Lengths and Maximum % Strain		
Gage Length	Maximum Strain	Maximum Elongation
25mm	1460%	365mm
50mm	680%	340mm
100mm	290%	290mm
200mm	95%	190mm
300mm	30%	90mm

Model Number EPONE-000-0011

- Conventional entocentric lens
- 500mm field of view and 580mm working distance
- Any gage length between 10 mm and 400mm - see table for the estimated maximum tensile elongation for a specific gage length

Range of Gage Lengths and Maximum % Strain				
Gage Length	Maximum Strain*	Maximum Elongation*	Maximum Strain**	Maximum Elongation**
10mm	>1000%	480mm	>1000%	220mm
25mm	>1000%	465mm	860%	220mm
50mm	880%	440mm	410%	200mm
100mm	390%	390mm	180%	180mm
200mm	145%	290mm	67%	134mm
400mm	23%	90mm	10%	42mm

* Estimated for 'dogbone' specimens.

** Estimated for straight-sided specimens with a ratio of gauge length / grip separation = 3.

Model Number EPONE-000-0040

- Conventional entocentric lens
- 1000mm field of view and 580mm working distance
- Any gage length between 50 mm and 700mm - see table for the estimated maximum tensile elongation for a specific gage length

Range of Gage Lengths and Maximum % Strain				
Gage Length	Maximum Strain*	Maximum Elongation*	Maximum Strain**	Maximum Elongation**
50mm	>1000%	940mm	870%	440mm
100mm	890%	890mm	410%	410mm
200mm	395%	790mm	180%	370mm
300mm	230%	690mm	110%	320mm
500mm	98%	490mm	45%	230mm
700mm	41%	290mm	20%	130mm

* Estimated for 'dogbone' specimens.

** Estimated for straight-sided specimens with a ratio of gauge length / grip separation = 3.

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