Bulletin
TD2012

Tinius Olsen

Video Extensometers

Single Camera System

Tinius Olsen's Video Extensometer uses a high resolution monochrome camera, advanced high speed image processing, and cool lighting such that the point to point real-time video processing technology is capable of achieving, and exceeding, ASTM E83 Class B1 and ISO 9513 Class 0.5 accuracy. With continuous measurement through tensile break or compressive rupture, this Video Extensometer is perfect for the precise, non-contact measurement of specimen strain.

Key Features:

- Non contacting strain measurement
- High resolution with better than 1/100,000 of lens FOV
- High accuracy of 0.5% - compliant with ISO 9153 grade 0.5 and ASTM E83 Class B1
- Simple, fast, specimen preparation
- Compact, cool, specimen lighting included
- "Letter box" test specimen for memory conservation
- Capable of tracking multiple longitudinal and transverse gauge lengths
- Supports "remote" witness testing real time

The Video Extensometer is available in different versions, namely one suitable for low extension materials, and one suitable for high extension materials. The fundamental difference between the two is the selection of lens for the video extensometer. The high resolution, low extension version of the video extensometer is supplied with a small field of view lens designed specifically for low strain measurement, whereas the high extension version is supplied with a general purpose lens, giving a field of view of up to 1,000 mm. This range of technology provides video extensometry solutions for almost every type of application, including, but not limited to:

- Composites
- Metals (including thin wire)
- Elastomers
- Textiles
- Plastics

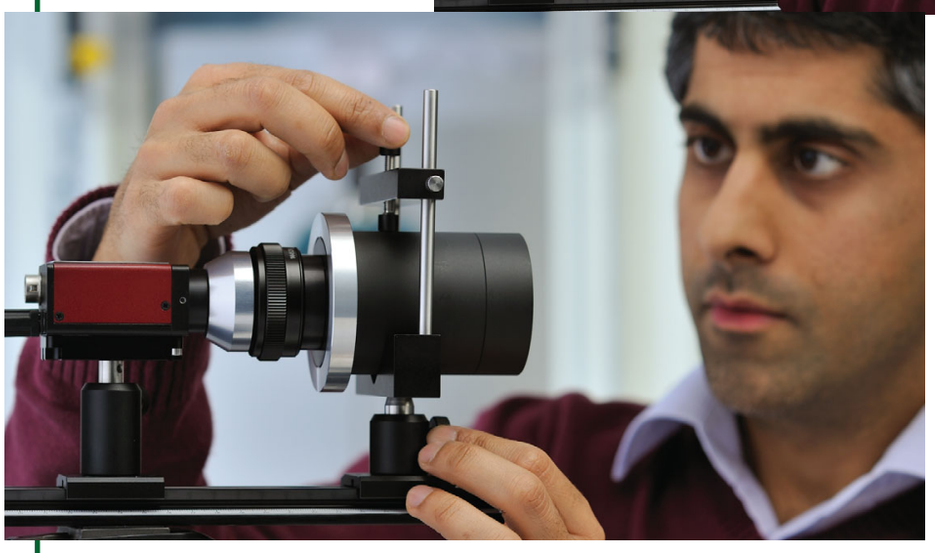


Figure 1. Video camera shown with high resolution materials testing lens.

The Video Extensometer is also supplied with cool lighting. The extensometer is more than capable of following chosen targets in regular daylight conditions, however using this lighting prevents any tracking loss of target as a result of changes to ambient lighting conditions.

Any visible marking can be used for pattern recognition, and these can be natural patterning on the specimen surface, pen marks, blob markers, punched gauge marks or a spray paint speckle pattern. The pattern recognition algorithms work on identification of unique small facets in the video image, so the more inconsistent the pattern, the more accurate and precise the pattern recognition.

The way in which the system works is that the image is acquired and the pattern recognition technology locks on to two targets, which equate to a gauge length. These two targets can be defined by the user, allowing the user to set these to any gauge length as required. As the specimen is tested, the software tracks the point to point movement of the two targets from camera frame to frame, and the strain data is calculated in real time. Multiple gauge lengths are possible in both longitudinal and transverse directions, allowing the determination of r and N values. The high system resolution required to calculate these results is achieved using sub-pixel interpolation algorithms and with which the system can resolve to micron levels of movement.

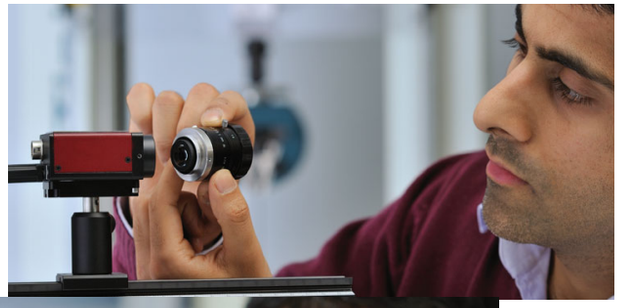


Figure 2. Video camera lens being switched to a general purpose lens to allow testing of more elastic materials.

All the measurements and outputs from the Video Extensometer are time stamped and can be archived for later reference. Additionally the uncompressed video output from the camera can be recorded for post-test measurements and analysis.

Multi Camera System

The Video Extensometer can be further enhanced by using multiple cameras with the software. The most typical multi camera configuration consists of two cameras; one with a materials testing lens to track the material during the initial, proportional region of the material's stress strain graph, and a second camera with a general purpose lens to track the material during the plastic portion of the material's stress strain graph. This capability makes the multi camera system a perfect choice for demanding applications, including Metals (including thin wire) and Composites. The software can track patterns from up to eight individual cameras, with eight different lenses.

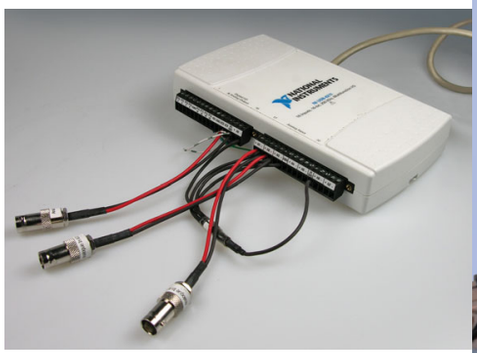


Figure 3. Standard Input/Output box allows data to be taken from multiple sources and channels and supports data transfer to and/or from the Video Extensometer application software.

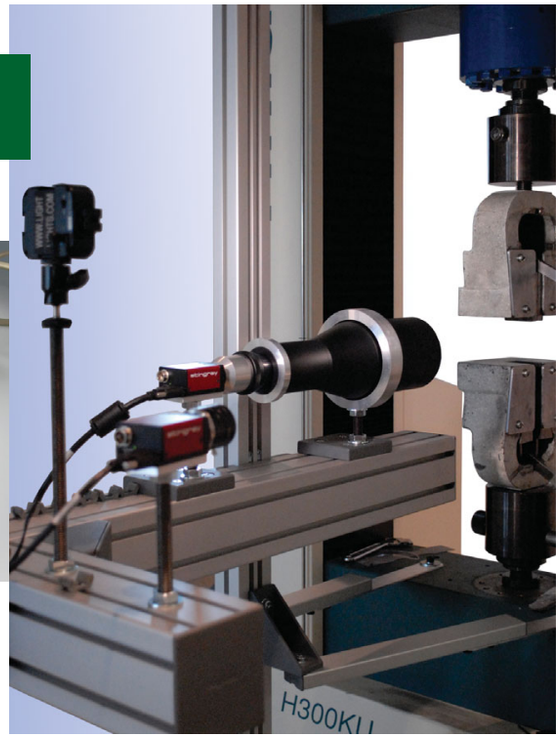


Figure 5. Dual camera setup, one camera with materials testing lens and the other camera with a general purpose lens; also showing mounting bracket and light source (if required).

Figure 4. Sample of general purpose lenses.

Key Features of Multi Camera System:

- Perfect for both low and high strain applications
- Recall tests and "re-run" to calculate different results
- Works on both tension and compression tests
- Perfect for r and N value determinations
- Multiple longitudinal and transverse gauge lengths are possible
- Portable across testing machines
- Can be used with any manufacturer's testing machine and software
- View and measure strain of test specimen from multiple sides

Possible Configurations:

- Single camera with materials testing lens
- Single camera with general purpose lens
- Multiple cameras with materials testing and general purpose lenses
- Multiple cameras, with different lenses and stitched data

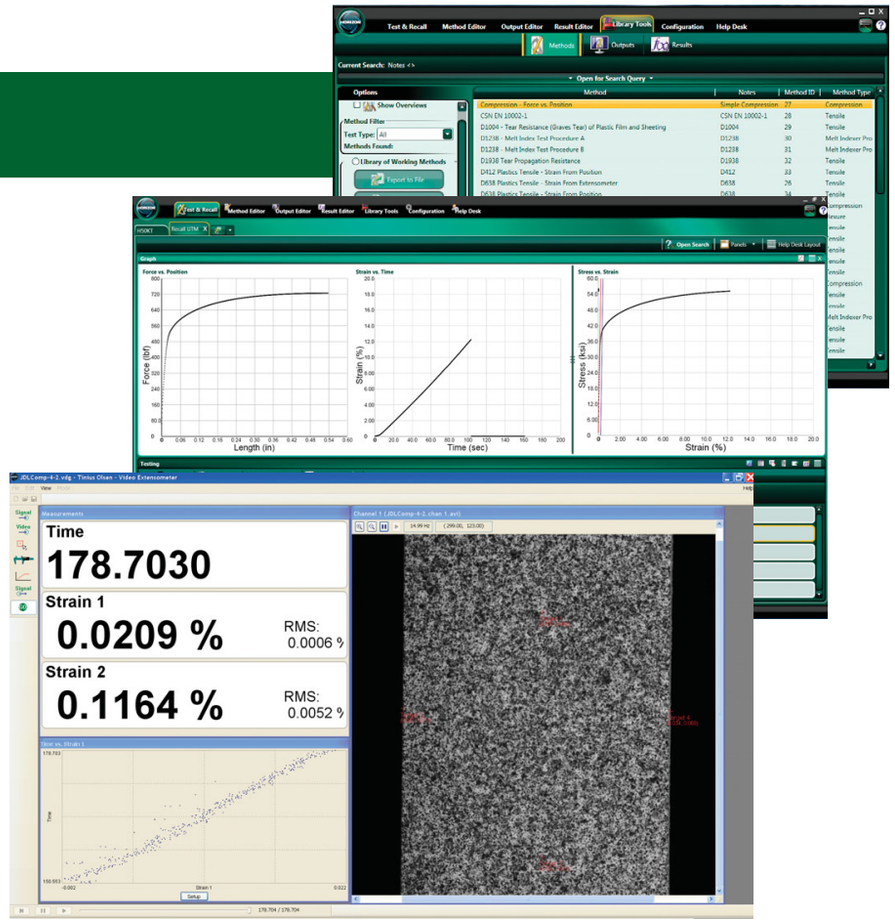
The Video Extensometer is supplied with application software that allows stand alone functionality and data transfer to or from a testing machine, Tinius Olsen or other. When Tinius Olsen's Horizon materials testing software is used, the video extensometer application software runs in the background and all control, data capture and analysis is maintained through Horizon.

In the case of a dual camera video extensometer setup, the Video Extensometer application software captures data from both cameras simultaneously but it is the Horizon software that uses data from the camera with the materials testing lens for the initial linear section of the stress/strain graph, then switches to the camera with a general purpose lens for the rest of the test. This ensures the highest quality data is used.

Specifications of our most popular lenses

LENS	Focal Length (mm)	Field of View (mm)	Working Distance (mm)
90004968	N/A	2.4	86
90004986	N/A	20	70
90004986	N/A	25	70
90004890	N/A	51	307
90004890	N/A	68	307
90004984	25	100	500
90004983	16	150	500
90004984	25	250	1051
90004982	8	300	500
90004983	16	500	1345
90004982	8	1000	1345

Software



Tinius Olsen has built upon its long history of providing solutions to an enormous variety of testing problems to develop Horizon, a comprehensive software program that makes testing simple, precise, and efficient. Whether the test sample is metal, paper, composite, polymer, rubber, textile, or a micro component, Tinius Olsen's Horizon software goes far beyond data collection and presentation. It will help you automate your operations, from R&D to the charting and analysis of QC testing.

Horizon provides a library of standard, specific, and application-focused test routines that have been developed in close cooperation with our customers around the world and to the standards they are using.

Among the many valuable features offered by Horizon are: a test routine library; simultaneous multiple machine control; test, output, method, and result editors; and multilayered security. This software is designed for data acquisition, data analysis, and closed loop control of nearly all Tinius Olsen testing machines.

Horizon also includes the following:

- Generation of user customized reports
- Standard SPC programs for X-bar, R, and frequency distributions/histograms
- Ability to recall, replot and rescale test curves
- Recall of data that spans different test modules
- User-configurable machine parameter and control settings
- Multilingual capabilities

Horizon is rich with capabilities that improve productivity and enable you to build, access, and use a modern, powerful materials testing database.

It employs the latest Windows environments to create an intuitive user experience. Built-in tutorials, on-line help, and help desk access provide additional user support.

Our Video Extensometer software monitors the object under test. By fitting an appropriate lens to the high resolution cameras, the Video Extensometer will measure objects smaller than 1 mm to larger than 100 m.

The Video Extensometer software uses patented technology to precisely measure the 2D position of targets in images from the video camera; special targets are NOT required. The user identifies these targets to the system simply by using the mouse to drag a bounding box around them. The system then precisely measures the position of each target in every image from the video camera. Up to 100 targets can be measured in real-time at 15 Hz. From the measured positions of these targets, the system can calculate:

- Displacement
- Velocity
- Acceleration
- Angular Rotation
- 2D Strain

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