Product Information
laserXtens 2-120 HP/TZ - the high-temperature specialist for all specimens

Range of application
The laserXtens 2-120 HP/TZ delivers non-contact measurement of deformations on a range of materials in varied environmental conditions. The measuring principle eliminates the need to apply specimen marks, giving laserXtens 2-120 HP/TZ a wide range of application:
- Tensile, compression and flexure tests
- Tests on specimens where specimen contact is undesirable or not possible due to specimen condition or properties
- Deformation measurements on specimens prone to whipping at break which might damage a contact-type measuring system
- Tests at ambient temperature
- Tests in temperature chambers
- Tests at high temperature
  - furnaces up to 1,600°C
  - induction up to 1,600°C
  - vacuum up to 2,000°C
- 1 extensometer for all environmental conditions

High precision and resolution
- The laserXtens 2-120 HP/TZ features high precision in the micro and macro measurement ranges.
- Resolution is 0.11 µm.
- Gauge lengths from 1.5 mm up to 120 mm can be tested with high precision.
- The laserXtens 2-120 HP/TZ satisfies the requirements of class 0.5 according to ISO 9513 (ASTM E83 class B2).

No specimen contact - no specimen marking
The laserXtens 2-120 HP/TZ has no mechanical contact with the specimen and possesses the following advantages:
- The specimen is not affected by the laser light.
- Sensitive specimens are not influenced by the extensometer, even at elevated temperatures.
- Maintenance-free - no fragile sensor arms.
- Temperature chambers and high-temperature furnaces can remain completely closed. Openings are thermally sealed via glass windows.
- Specimen marks are not required. This has several advantages:
  - saves time, especially with high specimen throughput, e.g. with carousel solutions
  - initial gauge length easily adjusted in the testing software.

Outstanding functions and options
- The laserXtens 2-120 HP/TZ can be used for tests to ISO 6892-2 (high temperature) and ISO 6892-1 (ambient temperature).
- Pretests are required for strain-controlled tests (see Page 3).
- Measurement of transverse strains and deflection without additional markings; no hardware expansion required (software option).
- Different gauge lengths can be set motorized.
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**Description of operation**
The specimen is illuminated with laser light, generating a speckle pattern on the surface.

The specimen surface plus speckle patterns are recorded by one or two full-frame digital cameras. Two evaluation fields are positioned within the camera images (= fields of view) and two part-patterns defined for tracking. The initial gauge length is defined by the distance of the green evaluation fields.

The displacement of each speckle pattern is calculated using a sophisticated correlation algorithm. Displacement measurement is performed in each evaluation field for the speckle pattern located in the field. Specimen strain is calculated from the difference between these displacement measurements.

Each evaluation field tracks the displacement of its originally selected part-pattern. This process is known as speckle tracking.

Two additional evaluation fields can optionally be positioned for simultaneous local measurement of transverse strain.

With laserXtens 1-32 HP/TZ (one camera) the two evaluation fields appear in a single image. In this case the initial gauge length must not exceed the size of the field of view.

With laserXtens 2-120 HP/TZ (two cameras) each evaluation field has its own separate image. In this case the initial gauge lengths are set by the camera separation (with motorized adjustment).

The entire measuring system can either track at half-speed via a mechanical connection to the crosshead or have a fixed mounting. Tracking keeps the extensometer in the center of the specimen and extends the measuring range.
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High-temperature version - optical tunnel
When laserXtens 2-120 HP/TZ is used in conjunction with temperature chambers and high-temperature furnaces it should be noted that a change in optical conditions may have a negative effect on the measurement signal. This basically relates to air swirls inside the temperature chamber / furnace and outside on the viewing port / furnace slot. The optical tunnel minimizes these influences.
The laserXtens 2-120 HP/TZ is therefore equipped with an adjustable tunnel with an optical-quality glass pane, together with an adapter plate including a rope seal which fits snugly against the temperature chamber glass pane or the slot of the high-temperature furnace.

Illumination
Green laser diodes are used with laserXtens 2-120 HP/TZ. The lenses are equipped with interference filters which only allow the green laser light through, blocking interfering red light from a glowing specimen, for example. This enables measurements at very high temperatures also.

Important
To ensure reliable operation of the laserXtens 2-120 HP/TZ certain conditions must be observed, including those listed below.
• The specimen surface must be suitable for reflecting laser light. This can be assumed to be the case with metallic and ceramic surfaces.
• A low-vibration environment is necessary for reliable, accurate operation (laboratory conditions).
• As high-temperature materials sometimes display non-linear strain increases, we recommend performing pretests for high-temperature tensile tests according to ISO 6892-2 using Method A1 (closed loop).

If the customer requires, the conditions referred to above will be verified via pretests, ensuring reliable operation of laserXtens 2-120 HP/TZ.

Telecentric lenses
Telecentric lenses mean that laserXtens 2-120 HP/TZ is not affected by changes in the distance between lens and specimen. In the case of temperature chambers and high-temperature furnaces, rods are used to apply the force to the specimen. If these rods are not exactly aligned or if they employ self-aligning (spherical) mounting, there will be alignment movements at the start of the test, causing the distance from the specimen to the lens to change. With ordinary lenses these movements result in measuring errors. The telecentric lenses used with laserXtens 2-120 HP/TZ have a tolerance range of approximately ±1.5 mm.

Non-contact measurement under extreme temperatures with laserXtens 2-120 HP/TZ on a high-temperature furnace

Stress-strain diagram: strain-controlled tensile test to ISO 6892-2, Method A1 (closed loop)

Stress in MPa
Strain in %
F/dL

Strain rate in mm/s
Time (s)

Strain rates: tensile test to ISO 6892-2 Method A1 (closed loop) within the required tolerance of ±20%
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<table>
<thead>
<tr>
<th>Description</th>
<th>Item No.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Basic package for laserXtens</strong></td>
<td>Various</td>
</tr>
<tr>
<td>The basic package contains a multilingual workstation, optionally with Windows 10 64-bit, 23&quot; TFT monitor and operating instructions in English or German.</td>
<td></td>
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<tr>
<td><strong>Mounting kit</strong> for installation at front left (measurement front center)</td>
<td>1064713</td>
</tr>
<tr>
<td><strong>Software options</strong></td>
<td></td>
</tr>
<tr>
<td>Second measurement axis for simultaneous determination of longitudinal strain and local transverse strain.</td>
<td>011069</td>
</tr>
<tr>
<td>Measurement of deflection in 3 and 4-point flexure tests in test axis</td>
<td>077071</td>
</tr>
<tr>
<td>Strain distribution: determination of local strains at multiple measuring-points</td>
<td>077063</td>
</tr>
<tr>
<td><strong>Hardware option</strong></td>
<td></td>
</tr>
<tr>
<td>The videoXtens AddOn allows laserXtens 2-120 HP/TZ to be switched to videoXtens functionality. Specimens which do not reflect laser light adequately (transparent, semi-transparent, absorbent and porous specimens) can be marked and tested in videoXtens mode.</td>
<td></td>
</tr>
<tr>
<td><strong>Stand-alone operation</strong></td>
<td>021661</td>
</tr>
<tr>
<td>High-resolution AD/DA converter, 4 inputs, 2 outputs</td>
<td></td>
</tr>
<tr>
<td>High-resolution D/A converter, 4 outputs</td>
<td>032319</td>
</tr>
</tbody>
</table>

All data at ambient temperature. We reserve the right to make technical changes in the course of ongoing development.