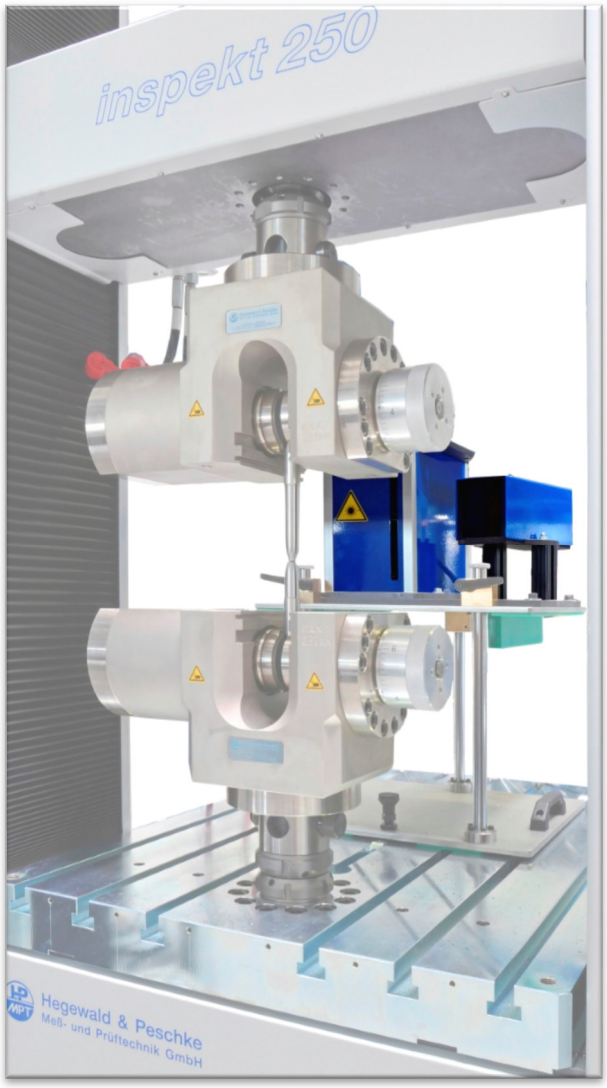
Hegewald & Peschke
Meß- und Prüftechnik GmbH

Product Information

Laserextensometer SWS - 300

Stereo angle scanner for one-dimensional measurements



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Scope of application:

Laser extensometers are used for non-contact strain measurement in materials testing.

The SWS-300 is a deformation measuring instrument for all materials. Its high accuracy enables non-contact strain measurements from the elasticity range to elongation at break. It is particularly suitable for measurements with larger strains, for the determination of strain distributions at room temperature and in combination with temperature chambers and climatic cabinets as well as high temperature furnaces and vacuum chambers.

Due to its high data acquisition rates, the laser angle scanner is not only suitable for strain measurement but also for strain-controlled tensile and compression tests.

Principle of operation:

After the measuring element has been provided with measuring marks, two laser beams scan the specimen surface. A high-contrast marking is necessary to record the measuring range. This can be done by means of adhesive tape (fast method), permanent marker, inkjet printing (follows the specimen deformation well) or airbrush. The airbrush with e.g. titanium dioxide is particularly recommended for higher test temperatures in climatic chambers or furnaces.

The extensometer records the position of the measuring marks during the entire test and determines the deformation of the test specimen from this. The marking strips applied to the specimen reflect the laser light diffusely. The receiver evaluates the scattered light and converts the signals into digital pulses. The strip positions and the associated length change and elongation are determined from the time course of these signals.

At SWS-300 stereo angle scanner, a laser beam is directed via a rotating mirror onto two deflection mirrors.

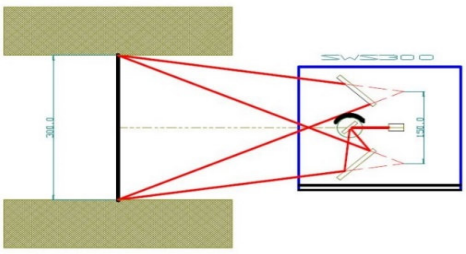

Fig. 1: Operating principle SWS-300

Thus, the laser is deflected over the specimen from two viewing angles one after the other from above and below (see Fig. 1).

With short specimens, it should be noted that if the distance between the clamping devices is less than 150 mm, part of the laser beam is shaded by the edge of the body. In this case, an adapted version of the SWS-300 with more closely positioned deflecting mirrors can be used (see Fig. 2).

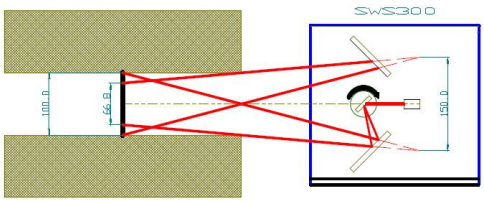

Fig. 2: Operating principle SWS-300 for short specimens

New deflection systems inside allow the SWS-300 to measure distance changes between scanner and specimen. The working distance influences the operating principle and resolution.

Marking quality

The marking enables strain measurement with high accuracy:

- Local strain distribution
- Selection of one or many measuring ranges on the test specimen
- Reliable finding of the measuring ranges even under changing conditions
- Enables measurements up to 2.000°C

Correct application of the measuring markings provides optimum measuring results. The strips should be applied parallel to each other (green in Fig. 3) and perpendicular to the scan line (red in Fig. 3). A straight edge of the measuring marks is also important (see Fig. 3).

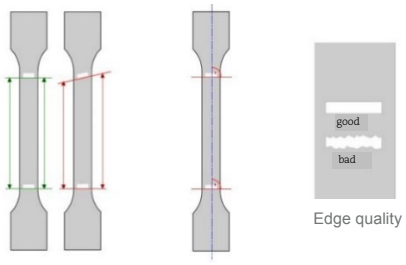

Fig. 3: Marking quality

Advantages:

- Highest precision with large measuring range of 300 mm
- Accuracy class 0.5 and 1 according to ISO 9513
- Stable measuring signal with defined measuring marks, important especially for cyclic experiments, physical tests and especially suitable for long-term experiments
- No additional lighting necessary
- Lower susceptibility to external influences, e.g. changes in ambient light conditions
- Maintaining accuracy when the working distance changes (within a tolerance of ±25 mm)
- Non-contact measurements with measuring marks
- Individualised adhesive marking or marking via air-brush/edging possible
- No influence of any kind on the specimen, e.g. by transducer
- Easy integration into testing machine software
- Measurement in tensile, compression and bending tests
- Measurement in the range of smallest to largest elongations
- Also measures distances between laser extensometer and specimen (out-of-plane deformation) in the scan plane (measurement of specimen movements to measuring device or away from the measuring device)
- Supports several measuring lengths in the measuring range, locally resolved strain measurement is possible (strain distribution)
- Stable expansion control possible
- E-modulus determination without additional transducer or changeover

Optional extensions:

- Magnification of the measuring path
- Entire test procedure traceable on screen
- Strain-controlled test execution possible
- Spatial resolution for measurements of the elongation at break on welds and joining components
- Force acquisition with evaluation software for determination of characteristic values
- Climate chamber adaptation

Technical data:

	Class 1	Class 1 / 0,5
Measuring range	300 mm (variable on request)	220 mm
Accuracy class	Class 1 at 25 Hz measuring rate (according to DIN EN ISO 9513)	Class 0,5 at 100 Hz Class 1 at 25 Hz (according to DIN EN ISO 9513)
Resolution	1 µm	
Smallest measuring length	2 mm	
Dimensions/Weight	310 mm x 240 mm x 250 mm / 8 kg	
Measuring path = Working distance	300 mm (distance scanner - specimen)	
Measuring rate	100 Hz	
Number of strips	2 / optionally spatially resolved	
Laser protection class	2M (no protective measures necessary)	

Application examples:

Laser extensometers measure deformations without touching the specimen. They are used in quality assurance as well as in research and development and can therefore cover a wide range of applications:

- Testing in temperature chambers and high temperature furnaces
- Tensile, compression and bending tests on metals and plastics
- Experiments on specimens, if no specimen contact should take place or is not possible due to the nature of the specimen
- Use in automated test systems

Of particular interest is the integration of a laser measurement system into automated test systems (see Fig. 4).

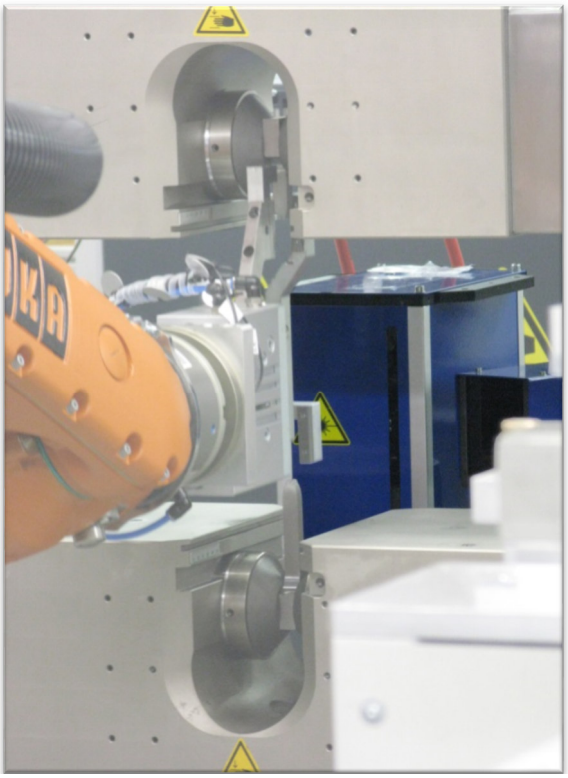

Fig. 4: Use of the SWS-300 in automated test system for metal tensile tests

If the laser extensometer SWS-300 is used in connection with temperature chambers or high temperature furnaces, for example, air turbulence can occur which influences the measurement. These effects can be reduced to a minimum by using a vacuum tube (see Fig. 5).

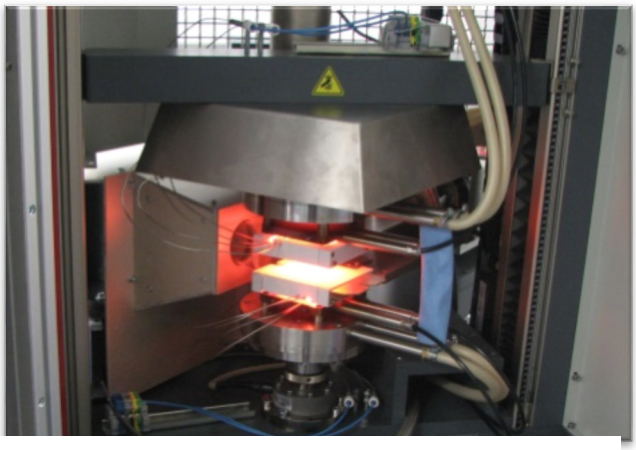

Fig. 5: Use of a vacuum tube for cyclic high-temperature strain measurement on insulation material for catalyst blocks

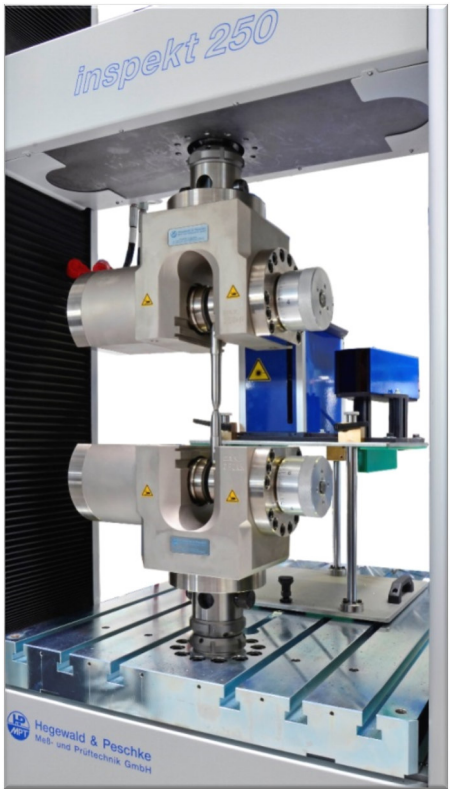

Fig. 6: SWS-300 for metal tensile test