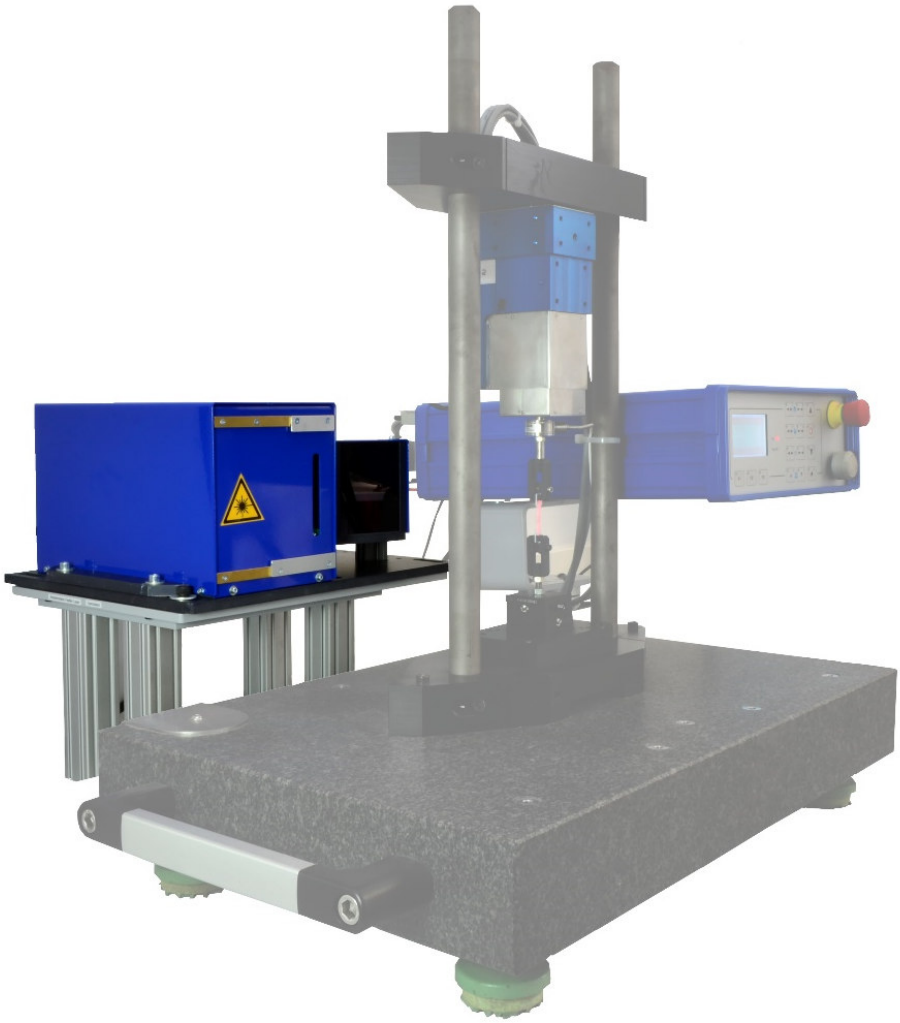
Hegewald & Peschke
Meß- und Prüftechnik GmbH

Product Information

Laser extensometer P-50, P-100

Parallel scanner



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Scope of application:

The laser extensometers P-50 and P-100 are used for non-contact measurement of strain or compression of specimens under uniaxial load. Due to their high accuracy they are especially suitable for materials with low strains such as metals, ceramics, concrete or composite materials. The parallel beam path of the laser facilitates its application through windows of temperature control equipment, making it particularly suitable for measurements in temperature chambers and high temperature furnaces.

Before the test, the specimen is provided with at least two measuring marks. This can be done by means of adhesive tape (fast method), permanent markers, ink jet printing (follows the specimen deformation well) or airbrush. Airbrush with e.g. titanium dioxide, is particularly recommended for higher test temperatures in climate chambers or furnaces up to 2,000 °C. The laser extensometer scans the measuring range with a visible laser beam and automatically determines the reference length. The positions of the measuring marks are recorded during the entire experiment. Depending on the model, the parallel scanner is available in accuracy classes 1; 0.5 and 0.2 according to DIN EN ISO 9513. A resolution of 0.1 µm or 0.25 µm allows a precise measurement over the entire measuring range.

Due to the wavelength and the parallel laser beam path, the laser extensometer is extremely insensitive, even to small deviations of the working distance during the experiment.

The measuring system can be optimally integrated into test systems from Hegewald & Peschke.

Operating principle:

A laser beam is directed onto a rotating plane-parallel glass plate. This causes the laser to be deflected in parallel: As it enters and exits the plate, the beam is refracted at two opposite surfaces of the plate, resulting in equal angles of refraction. By rotating the plane-parallel plate, the laser beam is deflected parallel to itself and overflows the specimen (Fig. 1).

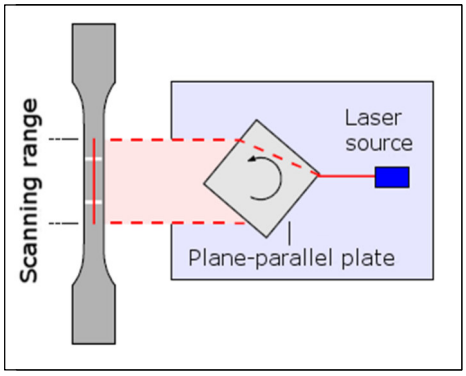

Fig. 1: Operating principle of parallel scanner

The laser light is diffusely reflected by the stripes on the specimen. The receiver evaluates the backscattered light and converts the signals into digital pulses. From the time course of these signals the software calculates the individual strip positions and, in the course of the experiment, the length change and elongation (Fig. 2).

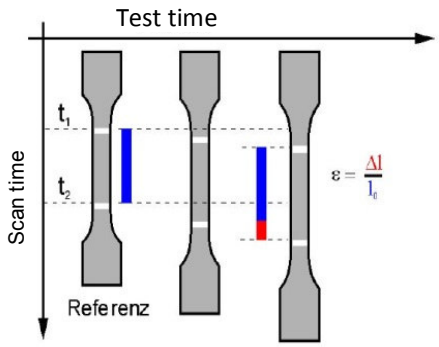

Fig. 2: Change in length as a function of time

The laser extensometer records the strain during the entire test up to the specimen break.

It offers a very good accuracy in the elastic range and can also handle large deformations up to breakage.

Advantages:

- Determination of the local strain or strain distribution
- Selection of one or many measuring ranges on the test specimen
- Reliable finding of the measuring markings even under changing conditions
- Enables measurements up to 2.000 °C
- High measuring rates 200-1,600 Hz
- Very good accuracy:
  Accuracy classes 0.2; 0.5 and 1
- No additional lighting necessary
- Lower susceptibility to external influences, e.g. ambient light conditions
- Non-contact measurement with measuring marks
- Individualised adhesive marking, Airbrush, Edding
- No influence of any kind on the specimen, e.g. by transducers
- Easy to integrate into testing machine software
- Suitable for the evaluation of smallest strains, for micro specimens, for static and cyclic tests

Technical data:

	P-50	P-100
Measuring range	50 mm (≤ 55 mm)	100 mm (≤ 106 mm)
Minimum measuring length	0.5 mm	1 mm
Working distance	100 – 300 mm	
Measuring rates	200 Hz up to 1.600 Hz possible	
Measuring time per scan	5 ms	
Weight	approx.13 kg	approx. 15 kg
Size Scanner (LxWxH)	280x160x175 [mm]	460x160x200 [mm]
Size Receiver	LxWxH: 200x140x120 [mm]	
Resolution	0.10 µm	0.25 µm
Accuracy class	1; 0.5; 0.2	1; 0.5; 0.2
Scanning speed	10 m/s	20 m/s
Specimen surface	even and structured	
Laser protection class	2M (no protective measures necessary)	
Options	Second longitudinal axis or transverse scanner on request	

Application examples:

The P-50 and P-100 are used for testing microfibers, 3D components, microelectronics, medical technology, but also for testing steel, glass fibers and other materials. They are used for example for plastic and metal tensile tests, as well as bending and compression tests.

Fig. 3: Application P-50 with universal testing machine inspekt table 250kN for metal tensile test

Measurements in temperature/climate chambers

The scanner is mounted on the side of the climate chamber. The scanning beam reaches the test specimen through a slot in the side wall through a vacuum tube. This ensures that air turbulence in the chamber does not affect the accuracy. The receiver is attached to the door and detects the scanning process on the test specimen through the viewing window (Fig. 4).

Measurements in high temperature furnace

The laser extensometers are offered in two operating modes for measuring longitudinal strain at extreme temperatures:

- In reflection mode the furnace must be provided with an opening into which the laser beam enters (up to 1,300 °C).
- In shadow mode, the furnace must be provided with an entrance and an exit opening (up to 1,700 °C).

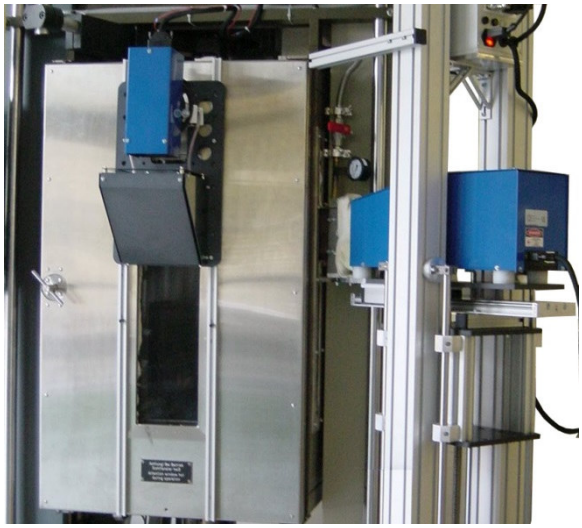

Fig. 4: Strain measurement on metals with a parallel scanner P-100 in a climatic chamber up to 650°C with vacuum channel

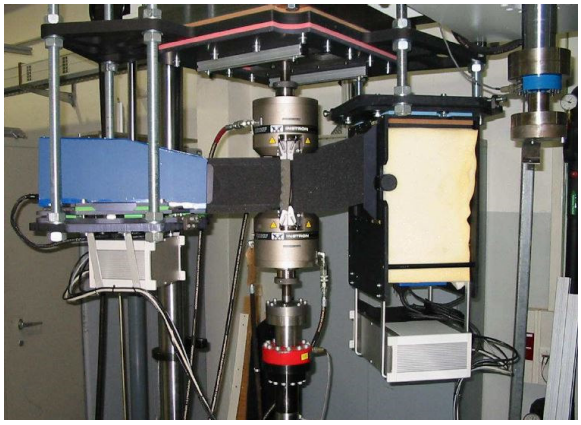

Fig. 5: Measurement of longitudinal and lateral strain with foam tunnel to avoid air turbulence