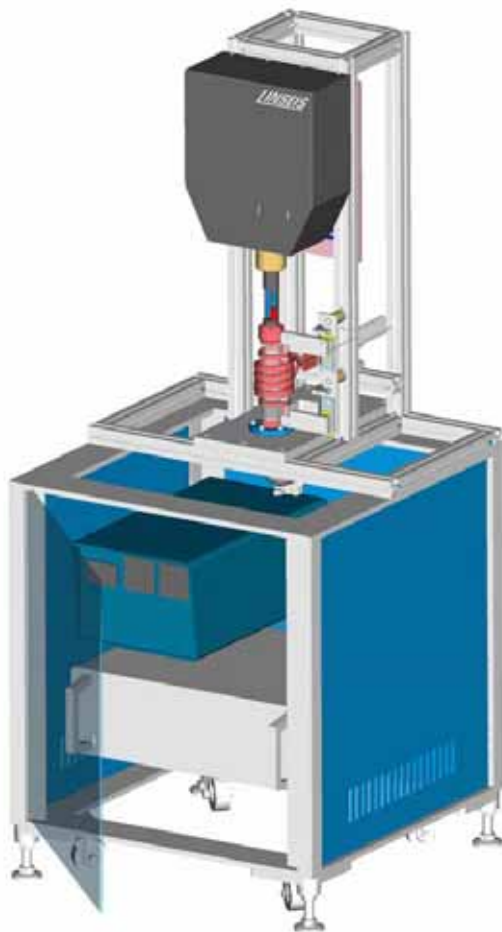


# LINSEIS Laser Dilatometer Pico - series 0,3nm



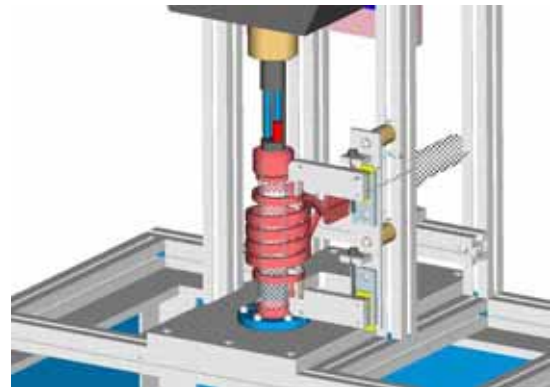
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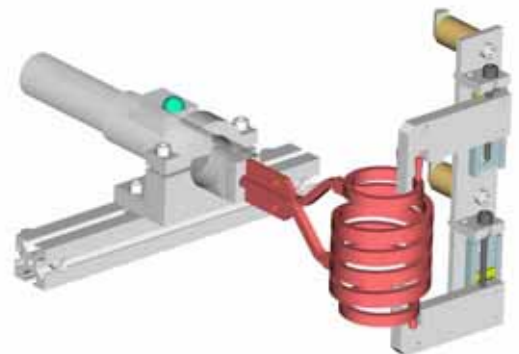
Normally available dilatometers of the series L75 which use the push rod principle of measurement are successfully available in the market since 1957. As a further total new development Linseis is now offering a Laser Dilatometer built after the Michelson-Interferometer principle.

The original push rod dilatometer is based on a development made by Dr. Max Linseis in the early 1950<sup>th</sup>. In those days the principle used was the same as today, using a measuring tube in which the sample is placed. The expansion signal of the sample is transmitted through a push rod onto a LVDT sensor (linear variable differential transformer). This sensor has theoretically an indefinite resolution. Together with other system components and the following evaluation electronics a maximum resolution of 10nm can be obtained.

The push rod, which transmits expansion signal from the sample to the sensor, always covers a temperature gradient of up to 1600°C from end to end, sometimes even up to 2400°C. It is understandable that these high temperatures differences on these short



dimensions makes it very important for good reproducible results, to insure very good thermal conditioning of the push rod / measuring system. If this expansion



transmitting part will see a different thermal history from run to run, the reproducibility can not be best. In order to get best results, identical conditions from run to run are a must.

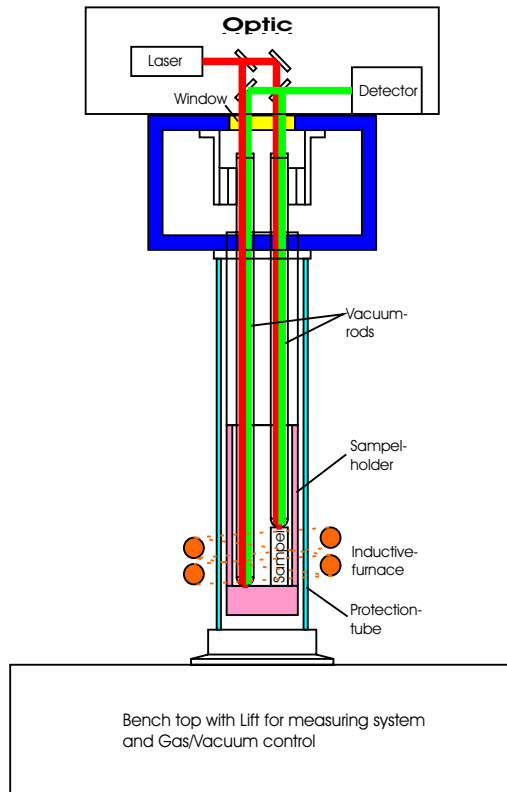
For example the room temperature, the start temperature, the heat up speed and the used sample atmosphere etc. have all to be identical.

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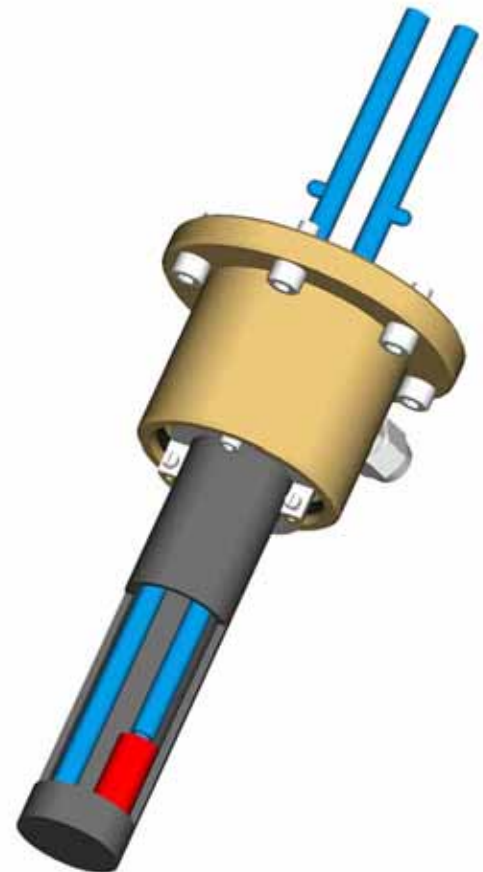
# LINSEIS Laser Dilatomter Pico - series 0,3nm



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These problems are somewhat better when a dual push rod dilatometer is used, whereby a sample is always measured against a known reference. As this is always done simultaneously, the above mentioned errors can be eliminated through a subtraction of the measuring results of the sample minus the results of the reference. This leads to a further increase of the absolute accuracy, where even smallest expansions, smaller than the expansion of quartz (e.g. cordierit), in the order of  $10E-8$  can be measured.



A further increase of resolution, as well of the absolute accuracy is now also possible through the new development of the Linseis Laser

Dilatometer of the Pico-series. As the name indicates already the resolution goes up to Picometers ( $0,3nm = 300$  Picometer). That means resolutions can be obtained which are up to a factor 33,33 higher as the resolution that were possible up to date. On top the principle of interference measurement give the possibility for much higher accuracy's, especially as some special computer calibrations are used. Up to now absolute accuracy's of 1% were normal, with best accuracy's up to 100nm. The new method allows accuracy's up to 30nm.

# LINSEIS Laser Dilatometer Pico - series 0,3nm



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## Technical specifications Laser Dilatometer

Range:	20mm
Resolution:	+/- 1nm, (+/-0.3nm typical)
Accuracy:	+/- 50nm
Reproducibility:	+/- 10nm
Wave length:	632.8nm
Ambient temperature:	10..30°C
Sample holder:	Fused silica
Push rod:	Fused silica, evacuated
Heating:	Inductive
Frequency range Generator:	150..400kHz
Temperature range:	RT...1000°C
Thermocouple:	Type-K (NiCr/Ni), welded to sample
Heating/Cooling rate:	0.1..99.9K/s 0.1..99.9K/min
Dwell time:	0...3000s 0...3000min
Acquisition rate:	max. 1000 readings/s
Power requirements:	230VAC, 16A, 50..60Hz
Power consumption Generator:	3.5kVA
Cooling water:	2l/min, 5 Bar
Sample-/Cooling gas:	Inert gas, 10l/min max. at 1 Bar max.