

LINSEIS

pushing boundaries

DIL L74 HM/OD

Dilatometry

**Heating Microscope
Optical Dilatometer**



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Since 1957 LINSEIS Corporation has been delivering outstanding service, know-how and leading innovative products in the field of thermal analysis and thermo-physical properties.

Customer satisfaction, innovation, flexibility, and high quality are what LINSEIS represents. Thanks to these fundamentals, our company enjoys an exceptional reputation among the leading scientific and industrial organizations. LINSEIS has been offering highly innovative benchmark products for many years.

The LINSEIS business unit of thermal analysis is involved in the complete range of thermoanalytical equipment for R&D as well as quality control. We support applications in sectors such as polymers, chemical industry, inorganic building materials, and environmental analytics. In addition, thermophysical properties of solids, liquids, and melts can be analyzed.

Rooted in a strong family tradition, LINSEIS is proudly steered into its third generation, maintaining its core values and commitment to excellence, which have been passed down through the family leadership. This generational continuity strengthens our dedication to innovation and quality, embodying the essence of a true family-run business.

LINSEIS provides technological leadership. We develop and manufacture thermoanalytic and thermophysical testing equipment to the highest standards and precision. Due to our innovative drive and precision, we are a leading manufacturer of thermal analysis equipment.

The development of thermoanalytical testing machines requires significant research and a high degree of precision. LINSEIS Corp. invests in this research to the benefit of our customers.

C L A U S L I N S E I S
C E O D I P L . P H Y S .



To strive for the best due diligence and accountability is part of our DNA. Our history is affected by German engineering and strict quality control.

We want to deliver the latest and best technology for our customers. LINSEIS continues to innovate and enhance our existing thermal analyzers. Our goal is to constantly develop new technologies to enable continued discovery in science.



Engineering & Innovation

Linseis Service



Customized Solutions - The Linseis Advantage

At Linseis, we believe that every measurement challenge is unique — and so should be your instrument.

While many suppliers rely on standardized configurations, Linseis distinguishes itself through exceptional flexibility and the capability to deliver customer-specific adaptations in record time.

Our experienced engineering teams work hand in hand with you to design and implement fully customized solutions that meet your precise application requirements — whether that means a unique sensor configuration, an extended temperature range, or a specialized software integration.

With decades of experience and a modular product architecture, we turn customization into a standard service — fast, efficient, and reliable.

Choose Linseis and experience what true flexibility in thermal analysis and material characterization means.

Contact form





Service & Support

Redefining Ownership

When investing in analytical instrumentation, long-term value matters just as much as precision. That's why Linseis systems are engineered to deliver the lowest **Total Cost of Ownership** in their class — combining reliability, efficiency, and flexibility in every detail.

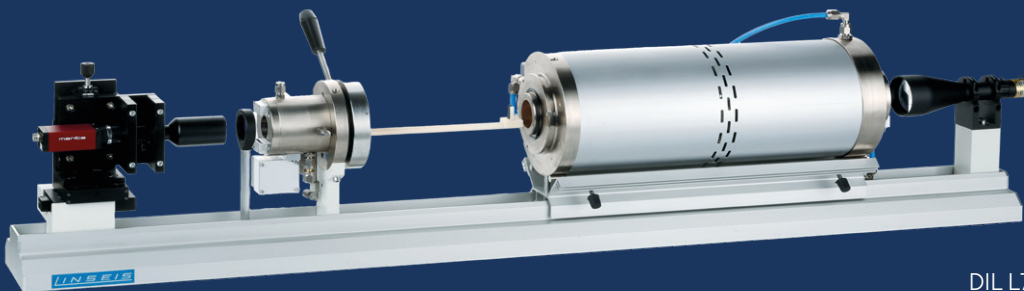
Our instruments are built with robust, high-quality components designed for longevity and minimal maintenance. This means fewer service interventions, shorter downtimes, and reduced operating costs over the entire product lifetime. Intelligent software updates and remote support further ensure that your system remains state-of-the-art, even years after installation.



Optical Dilatometer

The L74 Optical Research Dilatometer was developed for demanding applications in the glass, ceramics, metal and energy industries. A high-resolution CCD camera enables real-time visual analysis of sample expansion, either as a single frame or as a video sequence.

The major advantage of this method is that no force is applied to the sample. This is particularly useful for soft samples or samples that melt during the measurement, as it ensures the results are not distorted by contact pressure.



DIL L74 OD/HM

DSC Option

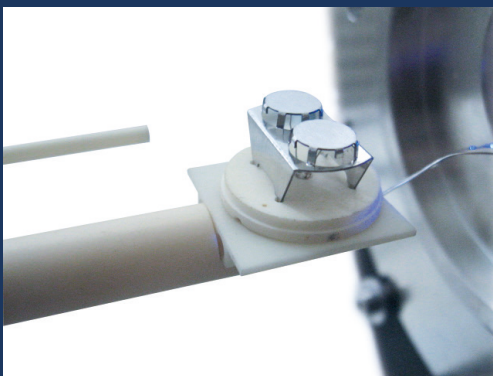


Fig. 1: DSC Option Instrument

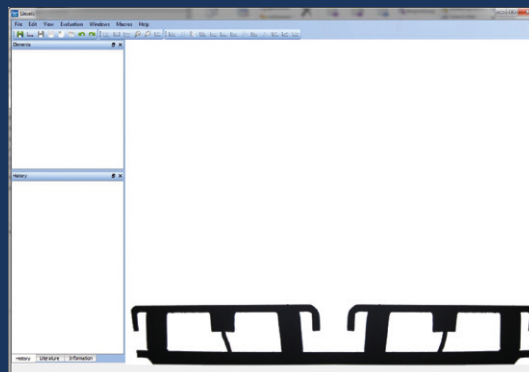


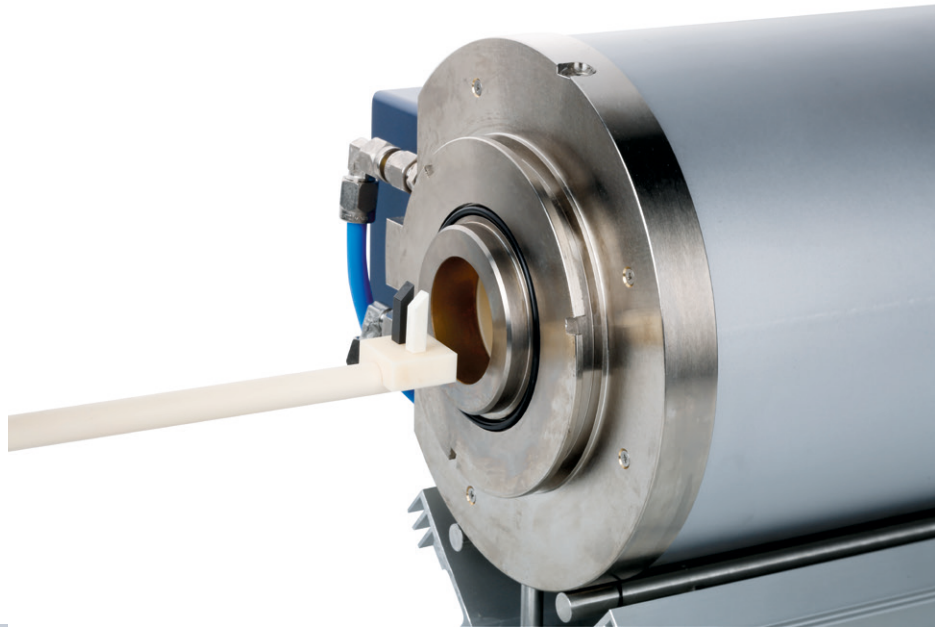
Fig. 2: DSC Option Software

The LINSEIS Evaluation Software incorporates several correction and analysis features. The unique horizontal design enables the most demanding of applications.

The special solid-liquid adapter allows expansion/volume measurements of solids, liquids, and solid-liquid phase transitions. A special sample holder for measuring rigid foils is also available, which avoids measurement errors due to pushrod forces, as experienced with a classical dilatometer.

Industries

- Glass
- Metal
- Enamel coatings
- Ceramics
- Energy



Applications

- | | | |
|-------------------------------------|--------------------------------------|-----------------------------------|
| • Sintering behavior and kinetics | • Softening and melting behavior | • Melt infiltration behavior |
| • Thermal expansion and CTE | • Corrosion behavior | • Melt filtration |
| • Wetting and spreading behavior | • Ash melting behavior | • Brazing and soldering behavior |
| • Coating behavior | • Glass viscosity | • Glass-metal and ceramic sealing |
| • Contact angle and surface tension | • Sintering warpage and co-sintering | |

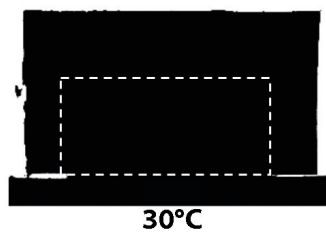


**Linseis WIKI
Push Rod Dilatometer**

Sintering

Investigating sintering processes using pushrod dilatometers has one disadvantage: There is always a force in the z-direction that can cause sintering to occur in a certain direction. In contrast, the optical dilatometer can measure the sintering process completely contact-free, ensuring that it can take place without any influence. Comparing the results of sintering the same substance on an optical dilatometer and a pushrod dilatometer can reveal significant differences due to this effect.

Sintering behavior of ceramic tapes (ZrO_2)



30°C



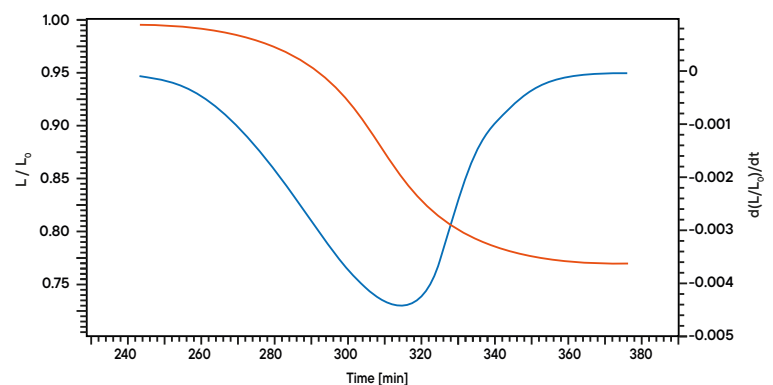
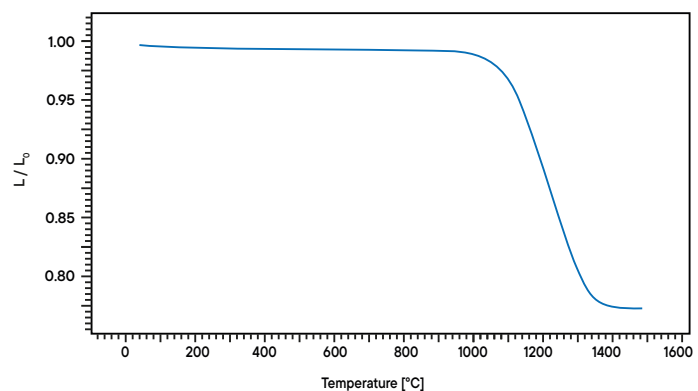
1200°C



1300°C



1377°C



Heating Microscope

Solid ash fuels consist of inorganic compounds such as silicon oxide and alkali oxides. Due to the high diversity of ash compositions, it is almost impossible to define a universal or fuel-specific melting point. The melting behaviour of ashes depends heavily on their chemical composition. The melting process of ashes takes place over a broader temperature range.

Although the slagging problems of power plants differ, the melting behaviour of ashes can be used to qualitatively analyse the slagging behaviour of different coals, providing a result that can be applied to the corresponding boiler. The ash melting behaviour of coals is determined according to DIN 51730; for biomass, the pre-norm DIN CEN/TS 15730 can also be used. This defines four characteristic temperatures in an oxidising atmosphere.

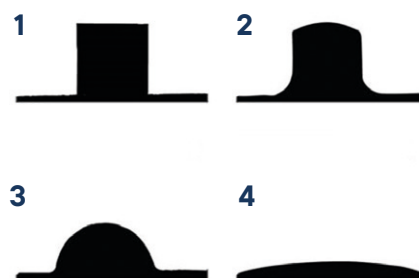
Functional Principle

The principle of determining the ash melting behaviour is based on melting a sample under defined temperature ramps.

Melting temperatures for stone coal are up to 1600°C; for biomass and wood, they are around 1200°C to 1300°C; and for biomass-containing culm, they are even lower.

Evaluation is automatic according to DIN 51730, involving monitoring of a shadow profile of the sample to document changes in geometry. The resulting characteristic temperatures can be determined by means of operating geometric factors and used for comparing different coal qualities.

Example: Ash melting of a coal



- 1 Softening temperature = edges are getting round
- 2 Spheric temperature = round shape of height that is as big as its baseline
- 3 Half sphere temperature = half sphere shape of height that is half the size of its baseline
- 4 Flow temperature = sample is nearly liquid, has only one third of the size of half sphere point

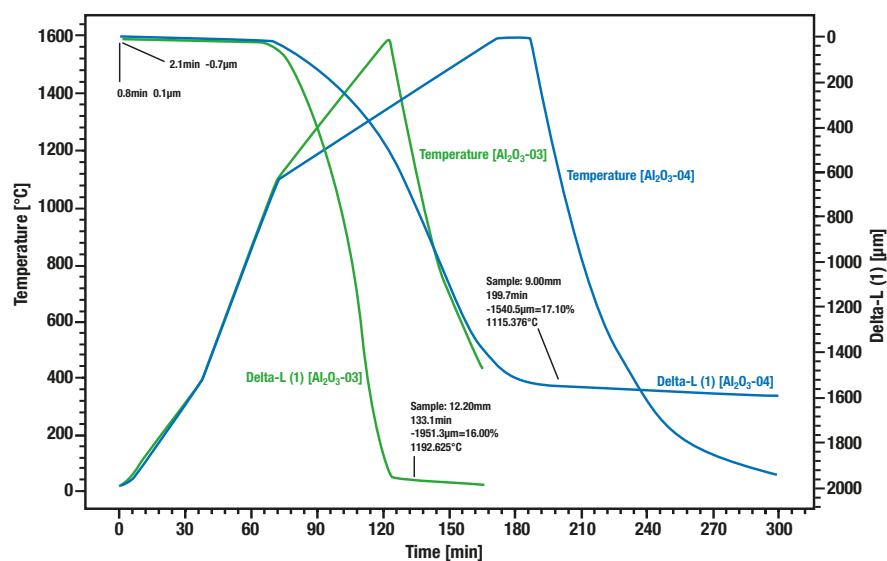
Technical Specifications

	DIL L74
Temperature range	-100 °C up to 500 °C -150 °C up to 500 °C RT up to 500 °C/ 1000 °C/ 1500°C/ 2000 °C
Max. Furnace temperature	RT up to 1600 °C/ 1800°C/ 2000 °C
Temperature at specimen	RT up to 1550 °C/ 1700°C/ 2000 °C
Heating rate	0.01 up to 100 °C/min (depends on furnace)
Temperature resolution	0.2 °C
Sample dimensions (WxHxD)	24 x 22 x 40 mm
Resolution	up to 10 ⁻⁵ mbar (depends on pump and furnace)
Hydrogen atmosphere	optional hydrogen safety system available
Measuring range contact angle	0... 180 ° (+/- 0.1 °)
Calibration standards	calibration standard with table included
Detection Modes	Sintering, Softening point, Deformation point, Sphere, Half-sphere, Melting Point, CTE coefficient of thermal expansion, Linear and Volumetric thermal expansion, Contact Angle, Surface tension, Volume, Symmetry, Asymmetry, Height, Width Ration, many others
International Standards	ASTM C372, ASTM D1857, CEN/TR 15404, BS 1016: Part 15, CEN/TS 15370-1, DIN 51730, IS 12891, ISO 540, NF M03-048



Applications

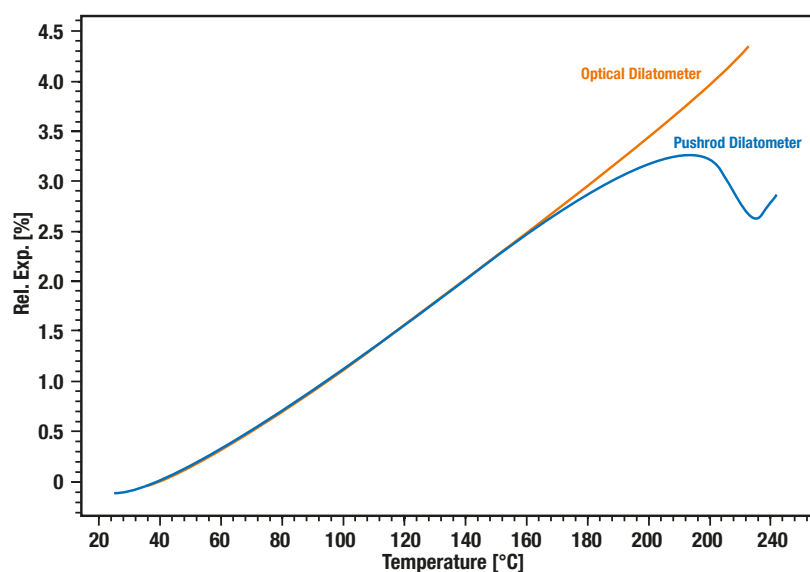
Sintering of Alumina Oxide (Al_2O_3)



No sintering behaviour could be detected in either sample up to a temperature of 1100°C.

With a slower heating rate and a 15-minute dwell time at 1600°C, sample two (blue curve) shows a 17.11% shrinkage.

Conventional vs. Optical Dilatometer



Comparison between Conventional and Optical Dilatometer when evaluating the expansion of an epoxy resin into the melting stage.

Software

Features

Numerous different mathematical functions can be selected for thermal and mechanical sample treatment.

- User-friendly
- Multi-methods analysis (DSC TG, TMA, DIL, etc.)
- Zoom function
- Online help menu
- Report generator
- Data export to MS Excel
- Export and import of data ASCII
- Program capable of text editing
- Data security in case of power failure
- Thermocouple break protection
- Repetition measurements with minimum parameter input
- Evaluation of current measurement
- Curve comparison up to 32 curves
- Storage and export of evaluations
- Programmable gas control
- Statistical evaluation package
- Smoothing of total or partial measurement
- Tangent intersection determination (automatic or manual)
- Free scaling

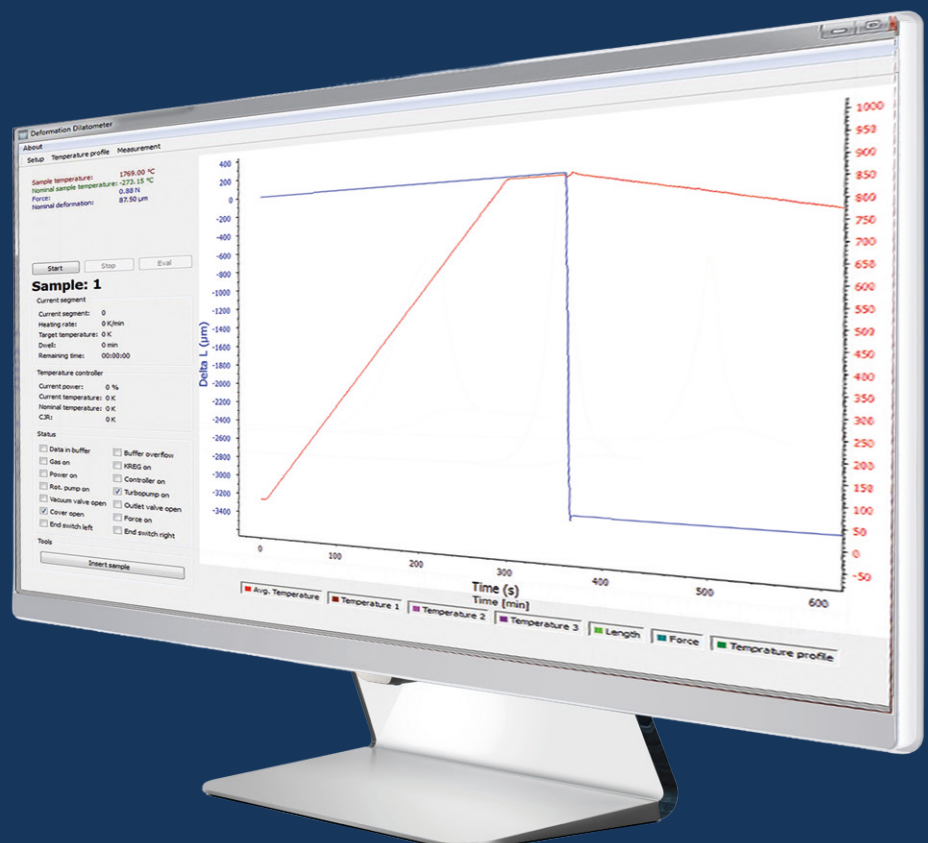
Software Options

- Specific Heat determination (Cp)
- Rate Controlled Sintering (RCS)
- Calculated-DTA
- Quenching Dilatometer Software
- CHT / CCT / DCCT / TTT Diagrams
- Thermo Kinetics Software

Control & Evaluation Software

- Software package, compatible with Windows 11 and earlier versions
- Software for creation of CHT, CCT, DCCT and TTT diagrams
- All necessary measuring parameters are included in the menu structure
- Unlimited number of forming steps during measurement
- Free choice of all control parameters
- Specification of temperature-time force-gradient and strain rate and deformation degree
- Control rate input by user or selection of industry parameter, i.e. quenching rates based on $T_{8/5}$ times
- Automatic force control on the basis of user defined functions
- Individual commentaries
- Heat up and cool down speeds
- End of the heating curve as well as duration of holding temperature
- Programmable heating / cooling and isothermal segments
- Function menus are easy to handle
- Graphical evaluation software with many functions to get complete results of all measured data

- Free assignment of axes
- The evaluation software includes freely scalable isothermal and continuous diagrams
- Manual entry of transition points
- Correction of individual data points
- Insertion of text
- Calculation of Delta L, Alpha physical, Alpha technical (CTE)
- Mathematical calculation of curves
- Statistical evaluation of curves with mean and confidence interval
- Print out of the results as curve or table
- Evaluation can be done simultaneously to an ongoing measurement / multi tasking
- Measuring data will be corrected using correction curves.



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