

820 Series Dilatometer

Linearity, Sensitivity, True Differential/Accuracy

DIL 820 Series operate in a vertical orientation, making it uniquely set up for the analysis of sintering, studies in Rate Controlled Sintering (RCS) mode and the determination of dilatometric parameters of samples otherwise difficult to be analyzed on classic dilatometers with horizontal design. Available in four different version, the product family comprises two single-mode models (DIL 821 and DIL821HT), and two equipped with the unique True Differential technology (DIL 822 and DIL 822HT). All four units feature the new optical encoder with 1nm resolution. That when combined with the True Differential of the DIL822, the result is simply the best possible sensitivity and CTE accuracy on the market. DIL 820 Series' linear motor generates a constant force throughout the experiment, ensuring that contact with sample is maintained linearly and with the lightest possible force regardless of the dimensional change.

Measuring Principle

Unlike in horizontal dilatometry the vertical design does not require the sample to be supported. The specimen stands free with its lower tip resting on the bottom plate and the pushrod is loaded on its upper tip. The vertical configuration is particularly well suited for sinterization studies and for all those sample that result difficult if not impossible to be measured with horizontal pushrod dilatometers, like for instance powder samples and samples that during the test develop a vitreous phase. That would lead the sample to interact with the sample holder hence generate friction. A major source of errors in the measurement of dilatometric parameters.

Also, the vertical orientation prevents the measuring systems and furnace tubes from sagging when used over long test periods at high temperatures, resulting in extended operational life.

The incremental optical encoder delivers a linear resolution of 1 nm over a wide measuring range. This allows for the option of using smaller samples that results in significantly better test measurements due to the reduced thermal gradient. Additionally the linear actuator produces a very precise and truly constant sample load ranging from 0,01 to 1 N.

Sample Environment

The new design of the furnaces on all the DIL 820Series models enable a zero-gradient across the sample over the entire analytical range, and a variation of temperature in the measuring head housing lower than 1°C. That, thanks to the low-expansion materials used, translate in a perfectly stable detection system that leads to 820Series' best-in-class accuracy of CTE measurements.

To complete the attention to sample environment control, the DIL 820 product family can operate under inert gas, vacuum and air.

The system is extremely versatile and available with a number of different furnaces with temperature ranged varying from RT-1500°C up to 300°C - 2300°C.



True Differential Measuring System

Vertical Dilatometer

Applications

The combination of the innovative techniques and design of the DIL 820 series makes TA's vertical dilatometers the ideal instruments for high sintering rate measurements and experiments with specimens with high shrinkage.

As an example, WinTA software's new T-RCS (True-Rate Controlled Sintering) functionality automatically corrects the heating profile to achieve a constant sintering rate (shrinkage per time) of a ceramic green body. The true shrinkage of the sample has to be recorded and interpreted in real time. In this case, the True Differential system of the DIL 822 and DIL 822HT becomes the perfect solution. In another example, the use of an alumina disc under and on top of the sample allows the user to run experiments up to the sample's softening point without damaging the measuring system. A key advantage of the vertical design is it does not require the sample be placed on a support. This eliminates friction during the shrinkage/expansion preventing any and all of the possible related measurement errors, as well as damages to the measuring systems. Additionally, fragile, powdery or softening samples can be measured easily as the vertical design and precise force control prevent specimens from collapsing or sagging.

Specification	DIL 821 DIL 821HT	DIL 822 DIL 821HT
Measuring system	Vertical single pushrod	Vertical differential pushrod
Temperature range	RT - 1700°C RT - 2300°C	RT - 1700°C RT - 2300°C
Furnace	RT-1100°C, RT-1500°C, 100-1700°C RT - 2000°C, 300 - 2300°C	RT-1100°C, RT-1500°C, 100-1700°C RT - 2000°C, 300 - 2300°C
Sample holder	Fused silica or alumina Graphite	Fused silica or alumina Graphite
Sample dimension	Length: 0 - 25mm, Ø up to 10mm	Length: 0 - 25mm, Ø up to 5mm
Measuring range	5mm	5mm
Resolution	1nm	1nm
Force	0.01 - 1 N	0.01 - 1 N
Gas atmosphere	10 ⁻² vacuum, inert, air 10 ⁻² vacuum, inert	10 ⁻² vacuum, inert, air 10 ⁻² vacuum, inert

