

Labsys™ TMA



Labsys™ TMA/dilatometry
+20°C

+1400°C

Measurement of the change in the dimension of a sample when it is subjected to a thermal cycle

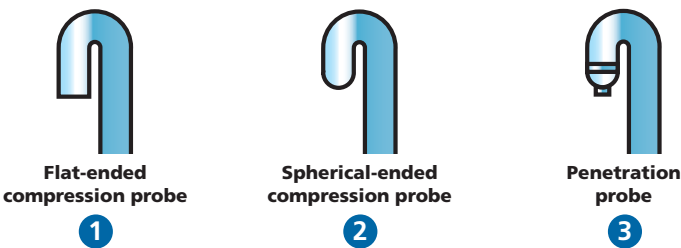
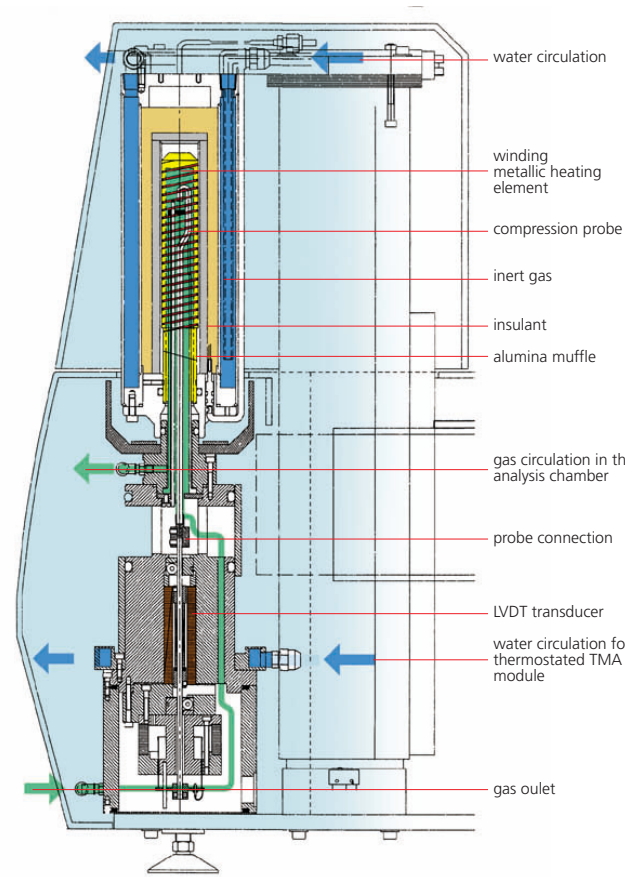
The transducer

Of vertical construction, the Labsys TMA allows working on a sample without stress being applied to it (from only 0.02 N i.e. 2 g). The displacement probe of the Labsys TMA allows you to obtain a resolution of up to 15 nanometres. An electronic device permits automatic control of the force applied on the sample up to 1.5 N (150 g). The probe setting and that of the force control are managed automatically by the computer. The value of the force applied on the sample can be modified during analysis according to the application to be tested.

The probes

The Labsys TMA has two types of probe, depending on its utilization. Up to 1000°C, the probes are made of silica while they are made of alumina for temperatures above 1000°C. Several types of probe are available according to the measurement to be carried out:

- the "compression" probe with a flat (1) or spherical end (2) for compression measurements. It is useful for measuring expansion, since does not apply any force on the sample.
- the "penetration" probe with a narrow cross section (3) is used when high stress loading must be applied to the sample.
- the "traction" probe (4), composed of an upper clamp fixed to the measuring tube and a lower clamp fixed to the probe, is used for studying fibres and films under traction (limited to 600°C).
- the "3 point bending" probe (5) is composed of a base with two blades and a rod forming the third blade.



Labsys™ Technical Characteristics

Labsys	DTA	DSC	TGA	TMA
Furnace	metal resistor			
Furnace temperature range	ambient to 1600°C (1400°C nominal)			
Scanning rate	0.01 à 49.99 °C.min ⁻¹			
Temperature range of modules (°C)	amb/1200 amb/1600	amb/800 amb/1600	amb/1600	amb/1000 amb/1400
Resolution	-	0.4 µW	0.4 µg	1.6 nm
Noise RMS	-	16 µW	1.6 µg	3.3 nm
Specific noise RMS	-	0.16 µW.µl ⁻¹	3.2 µg.ml ⁻¹	0.33. 10 ⁶
Measuring range	-	-	± 1 g	± 5 mm
Max. size of the sample	-	-	-	10 mm

SETARAM'S Labsys analyzers are equipped with SETSOFT 2000, the thermal analysis software from SETARAM.



Excellence in thermal analysis and calorimetry
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Labsys™ DTA, DSC, TGA, TMA

Step into SETARAM world



Technical specifications are given as indications only and are not contractual.
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Labsys™ a full range of thermal analyzers

SETARAM offers you LABSYS, a full range of thermal analyzers designed to satisfy the needs of analysis and control laboratories, schools and universities

• **Performance**
As with all SETARAM's thermal analyzers, Labsys analyzers (DTA, DSC, TGA and TMA) result from its leading edge technology. With 7,000 systems installed around the world, what better proof of measurement quality can one ask for?

• **Simplicity of use**
With emphasis given to their ergonomic design, Labsys analyzers have been developed to simplify the operations carried out by the user. They are run by SETSOFT 2000, SETARAM's thermal analysis software, which provides a wide range of procedure automation options.

• **Low purchasing and maintenance costs**
They have been specially developed for laboratories wishing to equip themselves with highly sensitive devices at low cost.



	DTA (T)	DSC (T, H)	TGA (Δm)	TMA (Δl)
Physical properties				
Glass transition	+	++		+
Melting	++	++		+
Purity		++		
Evaporation	+	++	+	
Sublimation	+	++	+	
Phase transition	++	++		+
Crystallinity rate	+	++		
Softening				++
Pyrolysis	+	+	++	
Curie Point	+	+		
Thermodynamics				
Heat capacity (Cp)		+		
Thermal expansion coefficient				++
Chemical properties				
Corrosion		+	++	
O.I.T. (Oxygen Induction Time)		++	+	
Adsorption / Desorption		+	++	
Loss of mass			++	
Loss of solvent			++	
Hydration / Dehydration	+	+	++	
Oxidation / Reduction	+	+	++	
Decomposition	+	+	++	
Combustion	+	+	+	
Thermal stability	+	+	+	+
Polymerization		++		
Kinetics		++	+	
Carbon black			++	
Sintering				++

T: temperature measurement – H: enthalpy measurement
– Δm : mass variation measurement - Δl : dimension variation measurement
+ : the technique permits measuring this property
++ : ++: the technique is particularly well adapted for measuring this property.

Labsys™ DTA-DSC-TGA

Labsys™ DTA and DSC

The structure housing the DTA, DSC, TGA and TMA analyzers is built around a metal element heated furnace with a temperature range from ambient to 1600°C.

Gas scanning (inert or reactive) is ensured in the experiment chamber. The sweeping gas can also be changed during an experiment by a software controlled electrovalve.

DTA 1200°C and 1600°C

Measurement of the difference in temperature between a sample and a reference when they are subjected to a thermal cycle.

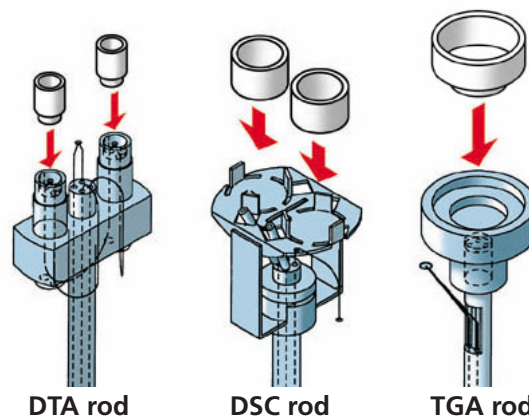
Differential thermal analysis, DTA, remains the basic technique for the thermal characterization of materials, especially at high temperature.

Two types of DTA detectors are available for the Labsys line. They both have good selectivity and thus permit efficient identification and separation of the thermal transformations observed.

• **Labsys DTA 1200:** Platinel transducer (ambient to 1200°C)

• **Labsys DTA 1600:** platinum-rhodium transducer (ambient to 1600°C)

The crucibles used are made of aluminum (160 μl), alumina or platinum (20 μl and 100 μl).



DSC 800°C and 1600°C

Measurement of the difference in heat flow between a sample and a reference when they are subjected to a thermal cycle.

Plate type DSC rods give good quantitative measurements of thermal effects with low variation in sensitivity as a function of the measurement temperature.

Composed by a metal frame with two housings for the crucibles, the rod provides excellent thermal contact between the crucible and the sensor.

Two types of rods are available:

• **Labsys DSC 800:** E type thermocouples (Ni-Cr/Cu-Ni) (ambient to 800°C)

• **Labsys DSC 1600:** S type thermocouples (PtRh 10%/Pt) (ambient to 1600°C)

The crucibles have a capacity of 100 μl and are made of aluminum, alumina or platinum.



Labsys™ TGA and simultaneous TGA-DTA/DSC

TGA up to 1600°C

Measurement of the mass variation of a sample when it is subjected to a thermal cycle. The TGA measurement can be linked to a DTA or DSC measurement: this is known as a simultaneous TGA-DTA or TGA-DSC measurement.

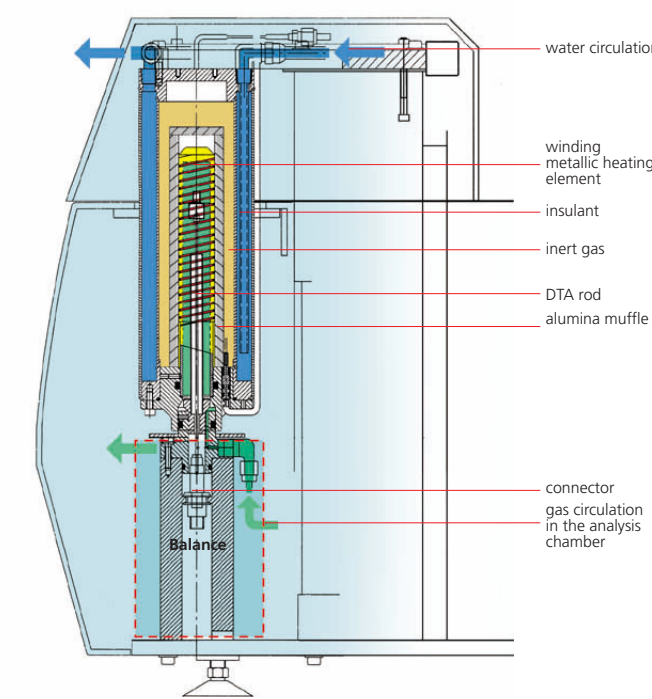
The top loading balance of the Labsys TGA uses the technique of a beam articulated around a torsion band. The balance is adapted to the analysis of quantities ranging from a few mg to samples with larger volumes.

In the thermogravimetry-alone version, the sample is analyzed in a crucible available in alumina or platinum (capacity 400 μl).

Simultaneous TGA-DTA or TGA-DSC measurements

The DTA and DSC rods can be connected directly to the balance, making it possible to run simultaneous measurements on the same sample. Thermal effects associated with mass variations can thus be detected as well as those not characterized by mass variations.

Simultaneous TGA-DTA and TGA-DSC measurements can be made throughout the whole range of temperature, from ambient to 1600°C.



TGA – Gas analyzer coupling

Coupled thermogravimetric and gas analysis measurements can be made by using a connection between a gas analyzer and the Labsys TGA, i.e. mass spectrometry or Fourier transform infra-red spectroscopy.

Coupling is done by a heated capillary which directly takes samples of the gas emitted in the TGA analysis chamber.

