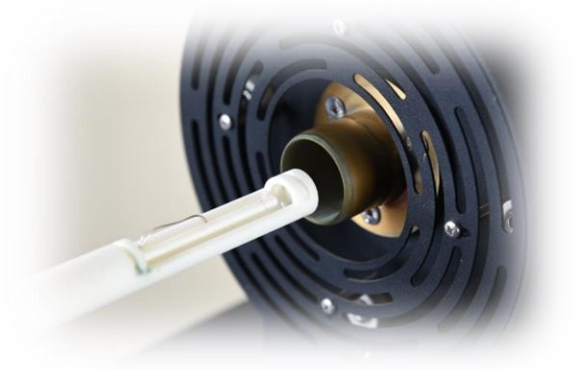
DAMA PAJOUH ARVIN Co.

Innovative Engineering Solutions

GENERAL CATALOGUE

Analyzing Instruments

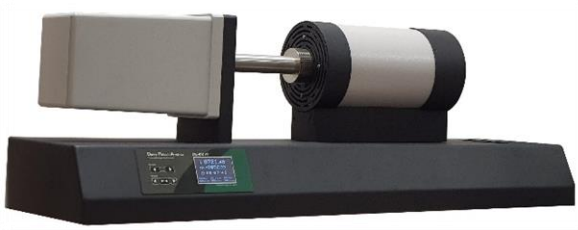
About Us



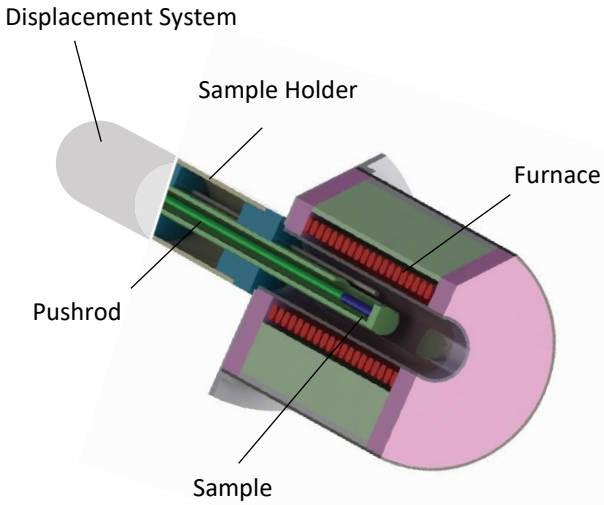
Dama Pajouh Arvin Co. as the first and largest knowledge-based company in the field of design and production of thermal analysis Instruments has started its activities since 2013 and with its specialists and experienced staff has been able to supply its advanced instruments such as **Dilatometer, DSC, TGA, STA, HSM** to the costumers at different temperatures.

Our Products

Dilatometer



DPA dilatometers yield precise information on the expansion or shrinkage during thermal treatment providing insights into the behavior of ceramics, glasses and building materials. Specifically the knowledge of binder burnout during the firing process, sintering behavior, and influence of additives in the sintering process is required when producing ceramic materials. Even the development of glazes, e.g., for porcelain products, demands precise knowledge of the dimensional changes of the products in contact during firing. Changes in the composition of glasses can be simply and quickly determined by measurement of the expansion coefficients or determination of the glass transition temperature. In various cases, it is important to match the thermal expansion behavior of different glasses that are in contact with one another in order to avoid stresses and possible cracking. Moisture and phase transitions influence the expansion and shrinkage behavior of building materials, e.g., concrete. These can significantly influence the static reliability and durability of the systems they are used in. The investigation of dimensional changes such as expansion, shrinkage including volume changes is provided by dilatometry. All our dilatometers are based on, e.g. DIN EN 821, DIN 51045, ASTM E831, and ASTM E228.



	DIL 102 LT	DIL 102 HT
Temperature range	RT to 1100 °C	RT to 1500 °C
Measuring range	± 2500 µm	± 2500 µm
Heating Rate	1 -20 °C/min	1 -20 °C/min
Resolution	2 nm/digit	2 nm/digit
Sample Length	0 - 50 mm	0 - 50 mm
Sample Diameter	0.5 up to 9 mm	0.5 up to 9 mm

Information from DIL measurements:

- Linear thermal expansion
- Coefficient of thermal expansion (CTE)
- Volumetric expansion
- Shrinkage steps
- Softening point
- Glass transition temperature
- Phase transitions
- Sintering temperature and step
- Density change
- Influence of additives and raw materials
- Decomposition temperature of e.g., organic binders
- Anisotropic behavior
- Optimization of firing process
- Caloric effects by using c-DTA

Differential Scanning Calorimetry (DSC)

Three types of DPA DSC instruments are operated in accordance with the heat flow principle. They are characterized by a three-dimensional symmetrical design with homogeneous heating. Sensors with high calorimetric sensitivity, short time constants and a condensation-free sample chamber in the DSC cell ensure high detection sensitivity.

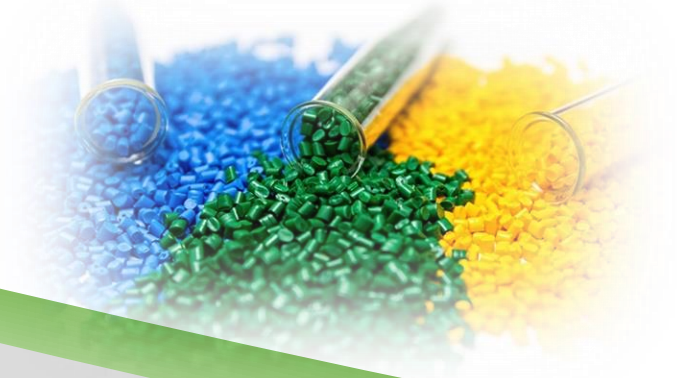
	DSC 301 LT/A	DSC 301 LT/S	DSC 301 HT
Temperature range	RT to 400 °C	-170 to 600 °C	RT to 1450 °C
Measuring range	± 10 mW	± 10 mW	± 10 mW
Heating Rate	0.1 -100 °C/min	0.1 -100 °C/min	0.1 -100 °C/min
Resolution	1 µW	1 µW	1 µW
Enthalpy Precision	± 0.2% for Indium		
Gas Atmosphers	Inert, Oxidizing, Static and Dynamic		

Thermal Characteristics Which Can Typically Be Detected by Using DSC

- Melting temperatures and enthalpies (heats of fusion)
- Crystallization temperatures and enthalpies
- Glass transition temperatures
- Oxidative-induction time (OIT) and oxidative-onset temperature (OOT)
- Degree of crystallinity
- Reaction temperatures and enthalpies
- Cross-linking reactions (curing)
- Degree of curing
- Specific heat capacity
- Distribution of crystal molecular weight (qualitative, via peak shape)

Low-Mass Furnace for Fast Heating and Cooling Better Replicates Polymer

DPA DSC is equipped with the new furnace, the fastest furnace available for a heat flux DSC. It can heat at up to 100 K/min and cool at 50 K/min over a wide measurement range. This even allows for the measurement of isothermal crystallization or isothermal curing for kinetic studies where it is necessary to reach equilibrium conditions as quickly as possible. It is thus possible to replicate real processing conditions very closely in your DSC experiments. Additionally, one can speed up the measurements and thus save working time.



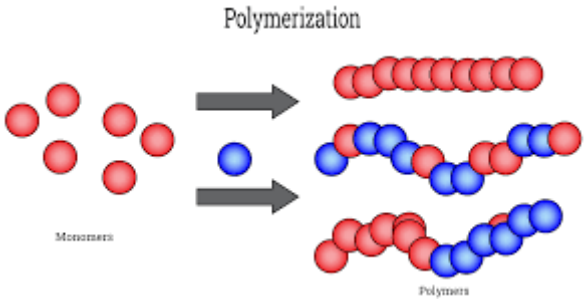
Thermogravimetric Analysis (TGA)

Thermogravimetry (TG) or Thermogravimetric Analysis (TGA) is a well-proven method to answer questions like these. TGA is increasingly used for the quality control and assurance of raw materials and incoming goods as well as for failure analysis of finished parts, especially in the polymer processing industry.

Two types of DPA TGA 601 LT and TGA 601 HT instruments are equipped with digital balances and are vertically designed, featuring a top-loading sample arrangement and direct temperature measurement at the sample.

Principle of Operation

A thermobalance is used to measure the mass change of a sample as a function of temperature or time, under a defined and controlled environment with respect to heating rate, gas atmosphere, flow rate, crucible type, etc. Various international standards describe the general principles of thermogravimetry for polymers (ISO 11358) or other specific applications, such as compositional analysis for rubber (ASTM D6370) and evaporation loss of lubricating oils (ASTM D6375).



TGA Specification	TGA 601 LT	TGA 601 HT
Temprature range	RT to 1000 °C	RT to 1500 °C
Heating range	0.1 – 25 k/min	0.1 – 25 k/min
Resolution	0.1 µg	0.1 µg
Cooling Time	25 min	25 min
Caloric effects	Endothermal and Exothermal	Endothermal and Exothermal
Thermocouple type	K	s
Crucibles	Pt, Al2O3, Au, SiO2, Ag, ZrO2, Al, etc.	

TGA Information

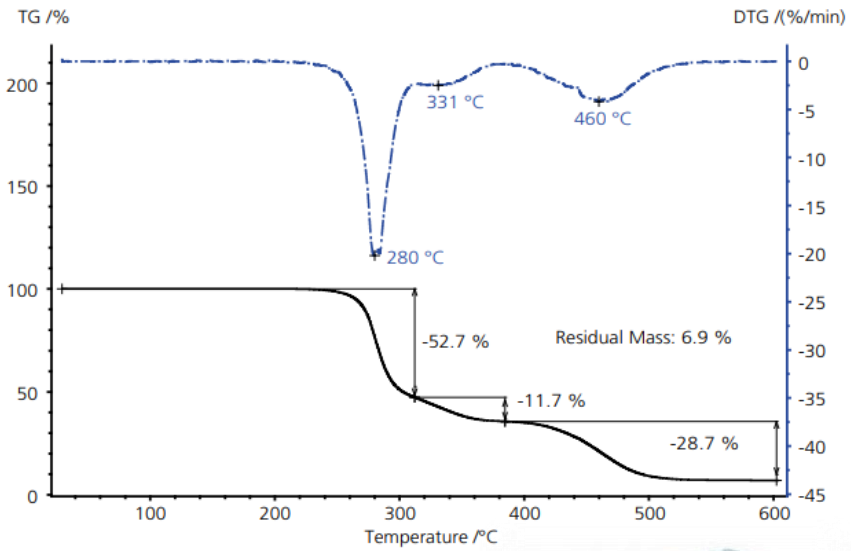
- Mass changes
- Identification
- Compositional analysis
- Decomposition
- Oxidation
- Thermal stability
- Reduction behavior
- Corrosion studies
- Determination of filler content
- Influence of aging
- Determination of plasticizer content and other additives
- Determination of moisture content
- Determination of added carbon black
- Determination of ash content
- Curie temperatures
- Reaction kinetics
- Purity Determination

Crucible Types for Various Applications

Application	Material	Diameter / Height	Volume
Standard TGA tests	Al2O3	6.8 mm/4 mm	85 µl
Standard TGA tests, high sample mass or volume	Al2O3	8.0 mm/8 mm; 9.0 mm/7 mm	300 µl; 350 µl
Especially for c-DTA; high sample mass or volume	Pt/Rh (80/20)	6.8 mm/2.7 mm; 6.8 mm/6 mm	85 µl; 190 µl
Especially for c-DTA, Up to max. 600°C	Al (99.5%)	6.7 mm/2.7 mm	85 µl

Thermal Stability of a Modified Rigid PVC-U Profile

The decomposition of a PVC-U sample can be followed by means of a TGA measurement in an N2 atmosphere. This plot shows several mass-loss steps between room temperature and 600°C. The first two mass changes (DTG peaks at 280°C and 331°C) are due to the release of chlorinated components. The subsequent cracking of the hydrocarbon backbone can be observed at 460°C (DTG peak). The residue of 6.9% at 600°C can be attributed to pyrolytic carbon and an inorganic filler.



Simultaneous Thermal Analysis (STA)

STA generally refers to the simultaneous application of Thermogravimetry (TGA) and Differential Scanning Calorimetry (DSC) to one and the same sample in a single instrument. The advantages are obvious: The test conditions are perfectly identical for the TGA and DSC signals (same atmosphere, gas flow rate, vapor pressure on the sample, heating rate, thermal contact to the sample crucible and sensor, radiation effect, etc.). Furthermore, sample throughput is improved as more information can be gathered from each test run.

Two types of DPA STA instruments are operated in accordance with the heat flow principle. They are characterized by a three-dimensional symmetrical design with homogeneous heating. Sensors with high calorimetric sensitivity, short time constants and a condensation-free sample chamber in the DSC cell ensure high detection sensitivity.

DSC Test

- Melting/crystallization behavior
- Solid-solid transitions
- Degree of crystallinity
- Glass transitions
- Cross-linking reactions
- Oxidative stability
- Purity Determination
- Specific heat capacity
- Thermokinetics

STA Specification	STA 601 HT
Temperature range	RT to 1500 °C
Heating range	0.1 – 25 k/min
Measuring range	Up to 30 gr
Resolution	1/10 µg
Caloric effects	Endothermal and Exothermal
Thermocouple type	E, K, S, R
Crucibles	Pt, Al2O3, Au, ZrO2, Al

TGA Test

- Mass changes
- Temperature stability
- Oxidation/reduction behavior
- Decomposition
- Corrosion studies
- Compositional analysis
- Thermokinetics

Standard	Description
ISO 11358	Plastics – Thermogravimetry (TG) of Polymers
ASTM E793	Standard Test Method for Enthalpies of Fusion and Crystallization by Differential Scanning Calorimetry
DIN 51004	Thermal Analysis; Determination of Melting Temperatures of Crystalline Materials by Differential Thermal Analysis
DIN 51006	Thermal Analysis (TA); Thermogravimetry (TG); Principles
DIN 51007	Thermal Analysis; Differential Thermal Analysis; Principles