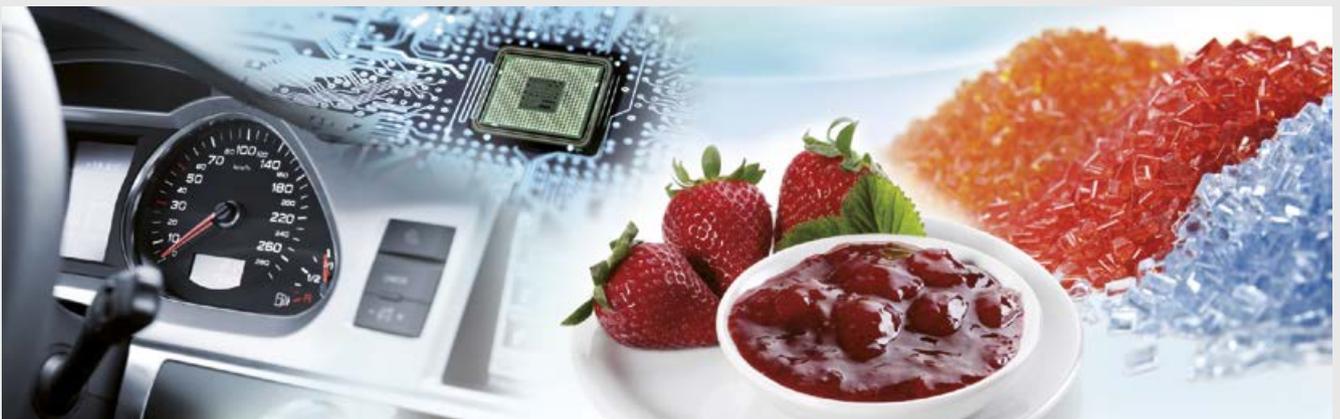


Comprehensive Material Characterization



Comprehensive Material Characterization

What is Comprehensive Material Characterization?

By combining the Thermo Scientific lab mixer and extruder or rheometer and viscometer portfolio and NETZSCH's analyzing and testing solutions for Thermal Analysis, we enable our customers to gain access to an unmatched range of instruments for a truly comprehensive material characterization. Understanding your material's performance in every stage of your process chain, starting from raw materials all the way to your final product, is your key to success.

We offer you the analytical tools, as well as the expertise for answering even the most challenging questions regarding thermal and rheological properties. You can rely on us as your partners, who enable you to gather the most reliable data, making your process as effective as possible, thus resulting in excellent products for your customers, no matter which industry you belong to: Comprehensive Material Characterization – for every step of your workflow!

Pharmaceuticals
Coatings

Polymers

Petrochemicals

Comprehensive Material Characterization

Adhesives

Cosmetics

Food

Let us help you improve your process chain, from raw material to your final product.



Research and Development – Substances, Components

Understand how thermal and rheological properties of your basic components influence the quality of your finished product.



DSC 204 F1 Phoenix®

The versatile Differential Scanning Calorimeter (DSC), with a temperature range from -180°C to 700°C , includes high sensitivity heat features, an automatic sample changer and a gas-tight design for the extension to a triggered UV lamp.



TG 209 F1 Libra®

The vacuum-tight, top-loading Thermogravimetric Analyzer (TGA) with automatic sample changer is ideal for coupling to QMS, FT-IR and/or GC-MS for the compositional analysis of advanced materials. It can cover temperatures of up to 1100°C .



HAAKE MARS

The Thermo Scientific HAAKE MARS is one of the most modular and versatile rheometers in the market. It is designed to meet even the most challenging demands in research and development, today and tomorrow.



HAAKE MiniLab

The versatile Thermo Scientific HAAKE MiniLab micro-compounder combines compounding and viscosity tests for small-volume samples (5g or 7cm^3).

Comprehensive Material Characterization

Quality Control and Process

Granulates, Solvents, Additives – Identify raw material and check your quality criteria



HAAKE RheoStress 6000

Due to its wide measuring range and its modularity, Thermo Scientific HAAKE RheoStress 6000 research-grade rheometer can test everything from water to polymer melt.



DSC 214 Polyma

The *Polyma* with automatic sample changer is focused on quality control and failure analysis for the polymer processing industry. The Differential Scanning Calorimeter works in a temperature range from -170°C to 600°C.



Thermo Scientific Viscometers

Our viscometers can test a wide range of fluids. Rotational measurements can be done in absolute fashion, according to the Höppler method, invented by us, or in the rotational, method as well according to ISO 2555.



Extrusion, Injection Molding, Coating

Determine optimum processing parameters



HAAKE PolyLab OS

The Thermo Scientific HAAKE PolyLab OS torque rheometer system includes all functionality to drive and control “intelligent” measuring sensors, i. e. mixers, extruders and compounders.



HAAKE MiniJet

The Thermo Scientific HAAKE MiniJet II system allows you to optimize your development process by producing test specimens from as little as 5g of material. This system offers a complementary

solution to product development investigations when coupled with the HAAKE MiniLab micro-compounder, Thermo Scientific HAAKE MARS, or HAAKE RheoStress 6000 rheometers.



DEA 288 Epsilon

The modular design of the Dielectric Analyzer (DEA) features multi-channel and multiple-frequency operation at high data-acquisition rates – even in-process. The main focus is cure monitoring of thermosetting resins, besides studying the dielectric properties of organic substances from -150°C to 400°C.



HAAKE MARS with Controlled Test Chamber

The HAAKE MARS delivers the answers for your process optimization challenges: Viscoelastic, as well as extensional properties, can be determined easily, enabling you to choose the right processing parameters.



Comprehensive Material Characterization

Quality Assurance – Finished Goods

Identify raw material and check your quality criteria



DMA 242 E

Various deformation modes, such as bending, tension, shearing and compression/penetration, frequency scans, stress/strain sweeps, creep and relaxation, are ideal for measuring the viscoelastic properties of polymers and composites by Dynamic Mechanical Analysis (DMA) from -170°C to 600°C .



HAAKE MARS

The HAAKS MARS makes sure that your product is delivered according to your high-quality standards, whether you want to qualify a low-viscosity fluid or a high-viscoelastic solid, you will always get precise and reliable results.



TMA 402 F1 Hyperion®

The wide temperature range from -150°C to 1550°C of the Thermo-mechanical Analyzer (TMA) is covered by two furnaces. The target is the determination of the coefficient of thermal expansion at a function of load or oscillating force and frequency for the **F1** model.



LFA 467 HyperFlash

The Light/Laser Flash Analyzer (LFA) is designed for the fast and contact-less measurement of thermal diffusivity and conductivity of polymers, composites and other materials. The integrated sample changer and functional software guarantee the highest effectiveness for routine applications up to 300°C .



Material Properties and Main Measuring Methods

	DSC	TGA	TMA	DMA	Rheology
Glass transition	✓		✓	✓	✓
Specific heat	✓				
Melting temperature	✓				✓
Heat of fusion	✓				
Degree of crystallinity	✓				(✓)
Polymorphism	✓				
Purity determination	✓				
Oxidative stability	✓	✓			✓
Aging influence	✓	✓		✓	✓
Heat of crystallization	✓				
Thermal stability	(✓)	✓		(✓)	(✓)
Chemical stability	✓	✓			
Compositional analysis	✓	✓			
Decomposition kinetics	(✓)	✓			
Catalyst activity	✓	✓			
Polymer compatibility	✓		(✓)	✓	
Heat of reaction	✓				
Degree of curing	✓			(✓)	(✓)
Curing kinetics	✓			(✓)	✓
Gelation	(✓)			(✓)	✓
Moisture/water content		✓			
Plasticizer/solvent content		✓			
Polymer content	(✓)	✓			
Filler content	(✓)	✓			
Ash content		✓			
Corrosion studies		✓			
Coefficient of thermal expansion			✓	(✓)	(✓)
Heat deflection temperature			(✓)	✓	(✓)
Modulus (stiffness)			(✓)	✓	(✓)
Viscosity				(✓)	✓
Extensional viscosity					✓
Damping behavior (tan δ)				✓	✓
Molecular weight distribution	(✓)			(✓)	✓
Anisotropy			✓	✓	(✓)
Thixotropy					✓
Viscoelastic properties				✓	✓
Creep/relaxation				✓	✓

(✓) limited

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About NETZSCH

The NETZSCH Group is a mid-sized, family-owned German company engaging in the manufacture of machinery and instrumentation with worldwide production, sales, and service branches. The three Business Units – Analyzing & Testing, Grinding & Dispersing and Pumps & Systems – provide tailored solutions for highest-level needs. Over 3,000 employees at 163 sales and production centers in 28 countries across the globe guarantee that expert service is never far from our customers.

When it comes to Thermal Analysis, Calorimetry (adiabatic & reaction) and the determination of Thermophysical Properties, NETZSCH has it covered. Our 50 years of applications experience, broad state-of-the-art product line and comprehensive service offerings ensure that our solutions will not only meet your every requirement but also exceed your every expectation.

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About Thermo Fisher Scientific

Thermo Fisher Scientific Inc. is the world leader in serving science. Our mission is to enable our customers to make the world healthier, cleaner and safer. With revenues of \$17 billion, we have approximately 50,000 employees and serve customers within pharmaceutical and biotech companies, hospitals and clinical diagnostic labs, universities, research institutions and government agencies, as well as in environmental and process control industries. We create value for our key stakeholders through three premier brands, Thermo Scientific, Fisher Scientific and Unity™ Lab Services, which offer a unique combination of innovative technologies, convenient purchasing options and a single solution for laboratory operations management. Our products and services help our customers solve complex analytical challenges, improve patient diagnostics and increase laboratory productivity. Visit www.thermofisher.com.

Thermo Fisher Scientific, one of the pioneers in rheology, successfully supports a wide range of industries with its comprehensive Thermo Scientific material characterization solutions. Material characterization solutions analyze and measure viscosity, elasticity, processability and temperature-related mechanical changes of plastics, food, cosmetics, pharmaceuticals and coatings, chemical or petrochemical products, plus a wide variety of liquids or solids. For more information, please visit www.thermoscientific.com/mc.