NETZSCH

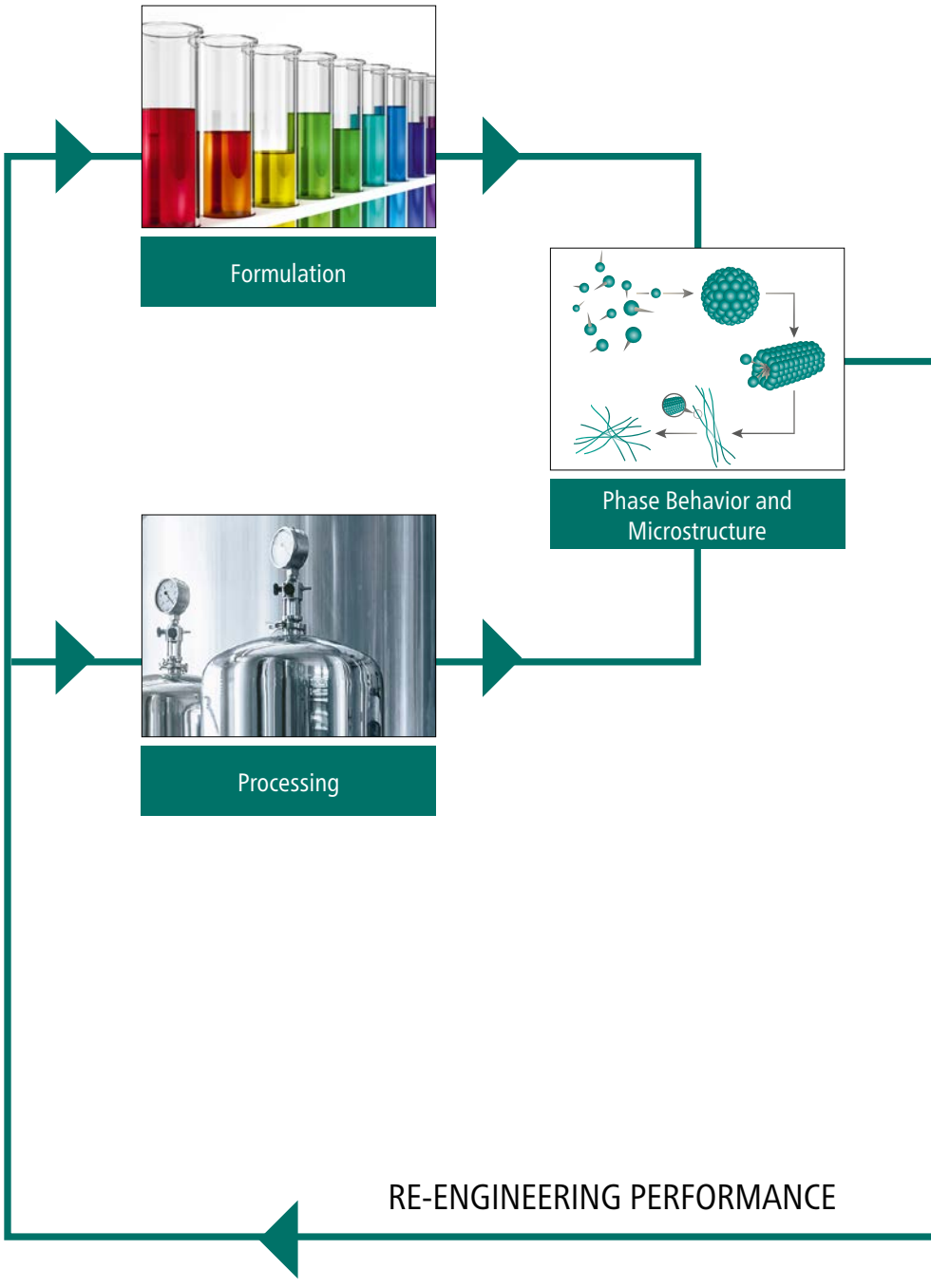
Proven Excellence.

Kinexus Series

Redefining Rheometer Capabilities

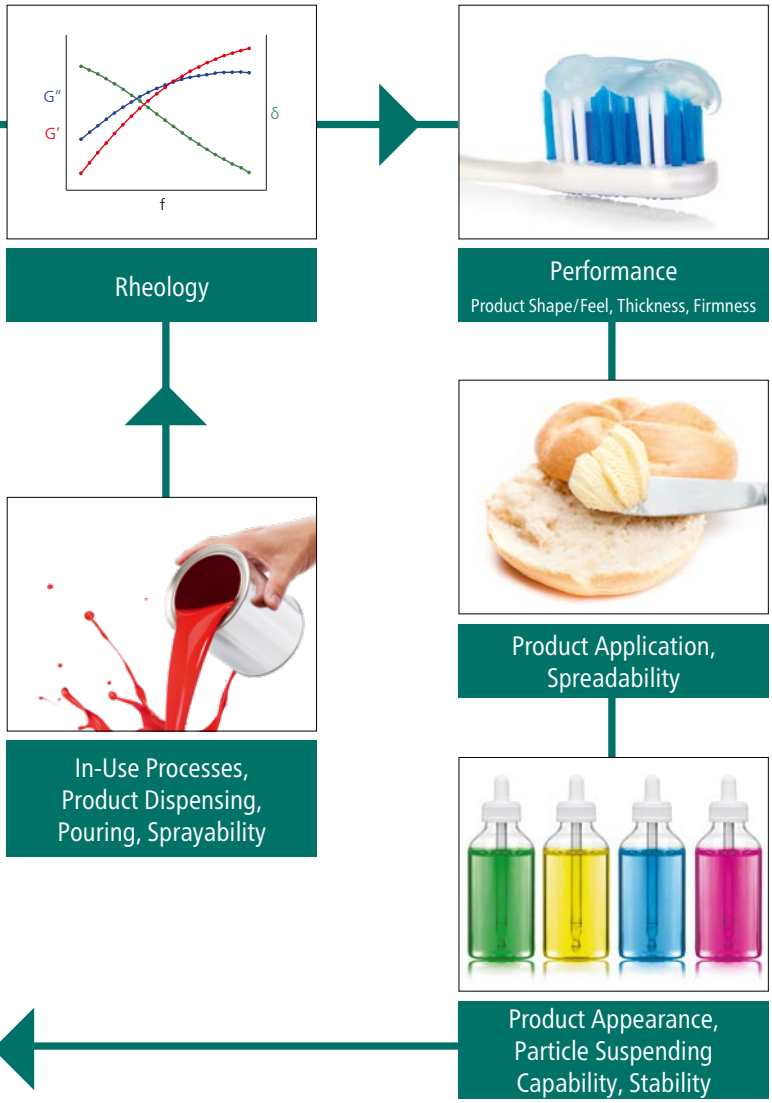
Analyzing & Testing

FROM FORMULATION AND PROCESSING TO END-USE
The Importance of Rheology



PRODUCT PERFORMANCE

Rheology provides an important link between product microstructure and performance. A formulators' goal is to produce a product which meets the desired performance criteria by controlling its microstructure and ultimately its rheology.



The Kinexus rheometer helps you define and understand material characteristics – from viscosity to viscoelasticity – and solve material problems at all stages of the product life cycle:

- As part of the manufacturing process
- Over a particular time scale or a particular temperature range
- With a particular sample batch
- With a change in formulation
- With packaging and transportation of the material
- With product stability or storage shelf-life
- With aspects of end-use performance
- With consumer acceptance of a product
- With comparison to other products available in the marketplace

Kinexus Series

Redefining Rheometer Capabilites for Characterizing Dispersed Systems and Polymers

The Kinexus isn't just a rheometer – it is redefined the way it interacts with you. Kinexus is the next generation rotational rheometer platform that's been developed from extensive market feedback, integrating innovative instrument design with a revolutionary software interface, to deliver a solution that will exceed your rheological expectations.

A modular rheometer with true *plug and play* functionality for all measuring systems and environmental control units, Kinexus enables pioneering Standard Operating Procedure (SOP) driven rheological testing.

Targeted at the characterization of dispersions, polymers, complex fluids and solids, the Kinexus rheometer has unprecedented dual-action capabilities for both shear and vertical (or axial) testing.

Environmental cartridges are easily interchangeable within seconds without the need to connect hoses or control cables

- Supports all basic rheological tests – shear stress and shear rate controlled viscometry (transient and steady-state), shear stress and shear strain controlled oscillation rheometry, creep test/creep recovery and stress relaxation
- Exceptional vertical travel and gapping capabilities with ultra-responsive and highly sensitive Normal Force for class-leading performance
- Unique rSpace software interface that offers total flexibility of set-up – from sequence-driven Standard Operating Procedure (SOP)-type funcionality to fully customizable test design for advanced capabilities in research & development
- Wide variety of measurement geometries optimized for rheological characterization of complex fluids and soft solids, including dispersions, emulsions, polymer melts, polymer and surfactant solutions, pastes and gels
- Intelligent geometry recognition with full auto-configuration and user feedback on system status to guarantee robust data for all measurements
- Complete sample history from the point of loading onto the rheometer available in data file as standard – because ensuring reliable rheology data for complex non-Newtonian materials actually starts before a measurement takes place!
- Unique *plug and play* cartridge system for all environmental controllers – all mechanical, power, communication and fluid connections made in one simple action
- Multifunctional accessory design – plate cartridges with interchangeable lower plates for a cost-effective solution addressing the widest application coverage

Key Benefits of Kinexus Rheometers

Unprecedented Dual-Action Capabilities

A Revolution in Shear and Vertical (Axial) Test Control

The unique combination of Kinexus hardware technology and rSpace software gives the user the ability to configure three critical rheometer functions independently:

- Rotational (shear) control: torque, speed and position
- Vertical (axial) control: gap and normal force
- Temperature control (isothermal, ramp or table)

Offering the ultimate in rheological test flexibility for both industry and academia, Kinexus enables:

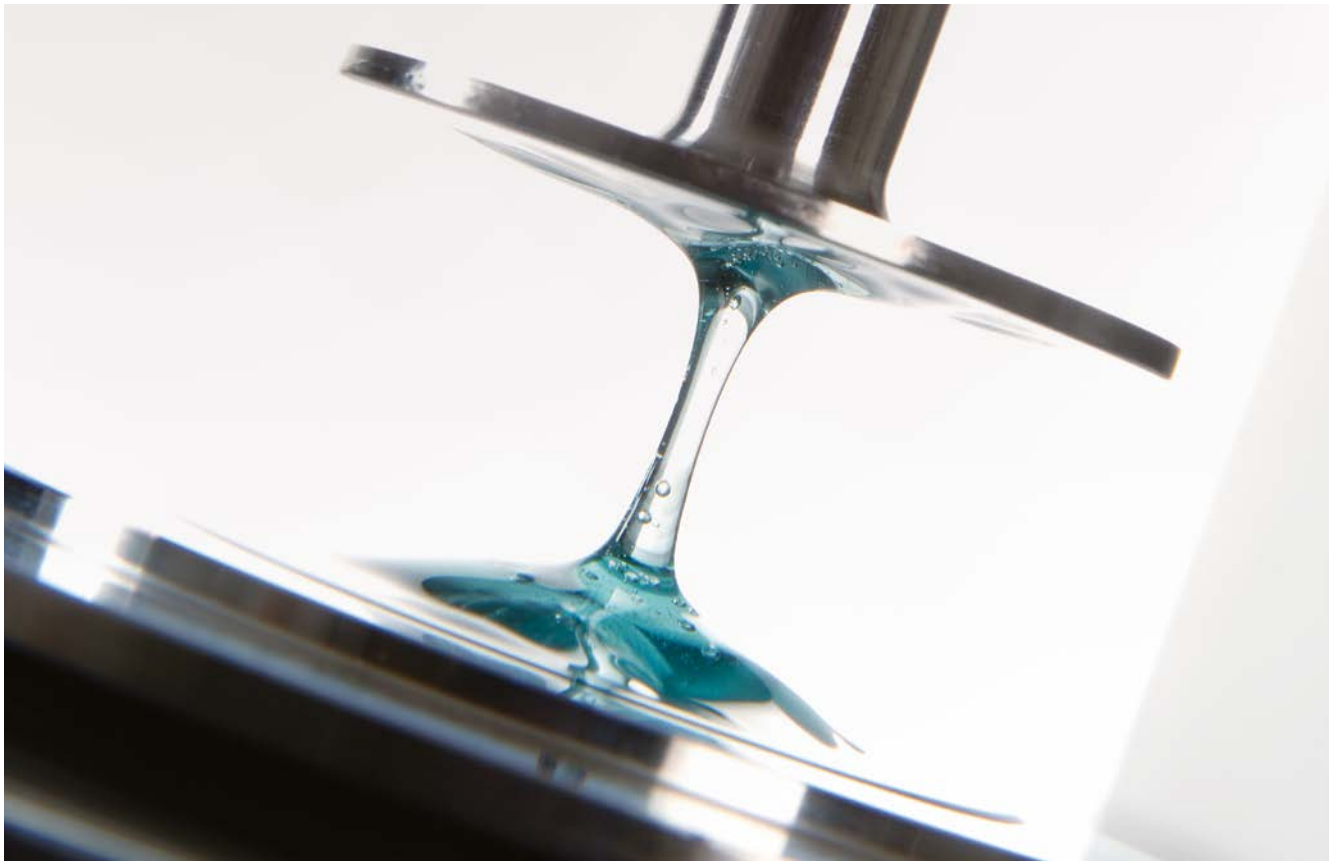
- All rotational shear-based testing
- Advanced vertical (axial) testing including squeeze flow and tack testing
- A combination of shear and vertical actions for revolutionary process-relevant measurements: Tngential and normal forces can be applied to the sample at the same time.

High lift speed

Ultrafine resolution gap control

Ultra-responsive normal force control

Innovative sample loading and measurement capabilities



Unprecedented Dual-Action Capabilities

Using Synchronized Torque, Displacement, Gap and Normal Force Data at Ultra-High Rates

Gap Control

- Exceptional vertical travel range of 230 mm for maximum user access and flexibility of the test setup
- Unmatched vertical speed range from 0.1 µm/s to a maximum of 35 mm/s
- Controllable speed and normal force profiles over full range of vertical travel – linear, exponential and max/min limited
- Gap measured to a resolution of 0.1 µm over full range
- Optimal sample loading for all material types – from sensitive strain-critical structures to rapid curing systems

Normal Force

- High sensitivity and rapid response times from a novel strain gauge design of the normal force option
- Ultra-fast, constant streaming data update rate of 5 kHz for all instrument variables, including gap and normal force – synchronized with rotational and temperature data

MEASURING SYSTEMS AND ACCESSORIES

Measuring systems

- Quick-connect geometries with intelligent auto-recognition
- Geometry constants and test preferences automatically configured
- Lock-down tests to specify geometry to minimize operator errors
- Automated geometry lock via software for ease of trimming
- Various material and surface finish options
- Solvent trap compatible
- Disposable options
- Coaxial cylinders (cup and bob) to DIN standard
- Coaxial double gap geometry and vane tool options
- Geometry adapter allows use of custom geometries

Environmental Controllers

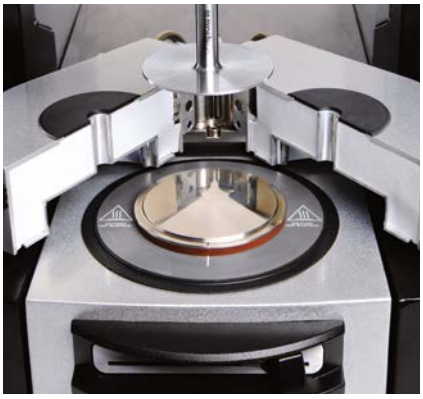
- Exclusive *plug and play* cartridge design
- Quick, easy and robust insertion
- All mechanical, power, communication and fluid connections made in one action
- Automatic cartridge recognition and configuration
- Peltier-based systems provide high heating and cooling rate with excellent temperature stability
- High-accuracy temperature sensor in close proximity to the sample
- Temperature resolution to 0.01°C
- Easy-to-clean designs
- Efficient solvent trap design for accurate measurement of samples with volatile components and to minimize sample drying

Peltier-Plate Cartridge (-40°C to 200°C)

Environmental controller for cone-plate and plate-plate measuring systems

- Interchangeable lower plates enable optimal geometry choice, e.g., match lower pedestal diameter for self-supporting samples, without compromising thermal performance. No screws are needed to fix the lower pedestal plate within seconds.
- Disposable plate option for curing materials

Peltier-Plate Cartridge with Active Hood (-40°C to 150°C)



Environmental controller with minimized thermal gradients for cone-plate and plate-plate measuring systems

- Applicable to the measurement of highly thermally-sensitive samples, and for temperature-critical testing where the temperature range is significantly above or below ambient
- Components with low heat capacity for high heating and cooling rates
- Inlet for inert gas feed into sample environment

Peltier-Cylinder Cartridge (-30°C to 200°C)

Environmental controller with concentric cylinder-type measuring systems

- Twin Peltier design for rapid temperature change and quick adjustment of thermal equilibrium as well as minimized thermal gradients
- Interchangeable lower cups with removable plate for ease of cleaning
- Cups with fill-up mark for easier sample loading
- Plate insert for *universal Peltier option* allows for the use of upper cone and plate geometries at the Peltier cylinder cartridge

High-Temperature Cartridge HTC (0°C to 350°C)

Environmental controller for cone-plate and plate-plate measuring systems

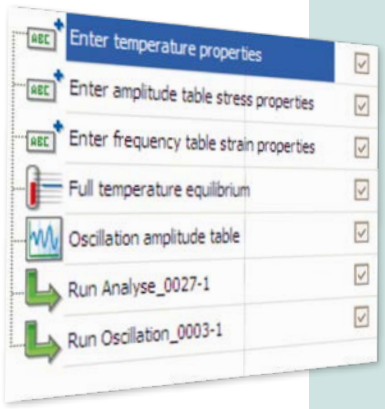
- Particularly for polymer melt testing
- Inlet for inert gas feed into sample environment

Designed for Rheological Testing of Complex Fluids, Polymers and Soft Solids

rSpace Software

Experience the Ultimate in Test Flexibility with Sequence-Driven Rheometer Control

With its unique sequence-based rSpace software, the Kinexus combines the requirements of quality assurance according to standardized test procedures (SOPs) and the requirements in university and industrial research for completely open programming and access to raw data.



The rSpace software is driven by *sequences* – which consist of fundamental rheological actions (or test building blocks) that can be linked together with other test actions, such as user feedback and choices, calculate value, loops and triggers, in order to build *intelligent* tests.

Program Sequence in Kinexus

- *Drag and Drop* actions and *Import subsequence* functionality
- Include user choices, calculate values, loops, triggers
- Include specific user inputs and instructions as required

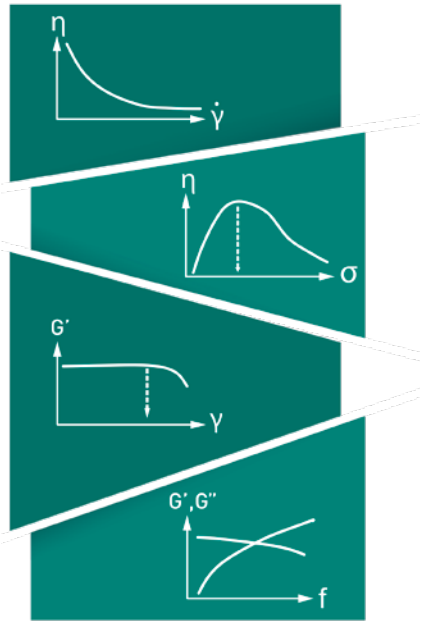
Standard Operating Procedure (SOP)-Driven Tests for Reliable Rheological Measurements

The Standard Operating Procedure (SOP) approach to material testing is now available for the first time on a rheometer system.

- Continuous feedback and user guidance
- Available for use company-wide
- Consistent and reliable measurements

Rheology Toolkit

- Series of fundamental rheological tests available in rSpace at the click of a mouse
- Get started with reliable rheology testing
- Fully configured SOP-driven tests with associated test description



Use Toolkit Tests to Solve Your Material Puzzles:

- Build up a *picture* of overall rheology of a material
- Find an answer to material formulation, application or process problems
- Targeted optimization of a key material characteristic, or implementation of a critical diagnostic test

Technical Specifications

Kinexus			
	ultra+	pro+	lab+
Rheometer platform	High-end rheometer for highest demands	For research and development	Quality control with SOP [4]
Operating modes	Direct strain control, shear rate control, shear stress control		
Torque range – viscometry [1]	1.0 nNm - 250 mNm	5.0 nNm - 225 mNm	10 nNm - 200 mNm
Torque range – oscillation [2]	0.5 nNm - 250 mNm	1.0 nNm - 225 mNm	5.0 nNm - 200 mNm
Torque resolution	0.05 nNm	0.1 nNm	0.1 nNm
Position resolution	< 10 nrad	< 10 nrad	< 10 nrad
Angular velocity range	1 nrads^{-1} to 500 rads^{-1}	1 nrads^{-1} to 500 rads^{-1}	10 nrads^{-1} to 325 rads^{-1}
Frequency range	6.28 µrads^{-1} to 942 rads^{-1} (1 µHz to 150 Hz)	6.28 µrads^{-1} to 942 rads^{-1} (1 µHz to 150 Hz)	6.28 µrads^{-1} to 628 rads^{-1} (1 µHz to 100 Hz)
Motor inertia	12 µN·m.s^2	12 µN·m.s^2	12 µN·m.s^2
Normal force range	0.001 N - 50 N	0.001 N - 50 N	0.001 N - 50 N
Normal force resolution	0.5 mN	0.5 mN	0.5 mN
Normal force response time	< 10 ms	< 10 ms	< 10 ms
Vertical lift speed	0.1 µms^{-1} to 35 mms^{-1}	0.1 µms^{-1} to 35 mms^{-1}	0.1 µms^{-1} to 35 mms^{-1}
Vertical lift range (measurable)	230 mm	230 mm	230 mm
Gap resolution[3]	0.1 µm	0.1 µm	0.1 µm
Fully configurable vertical profiles	By speed and Normal Force		
Raw instrument variables	5 kHz constant streaming data		
Complete sample history	Acquisition of raw data from loading to unloading as standard		
Interface	USB2 – plug and play		
rSpace software	Sequence-driven user interface enabling Standard Operating Procedure (SOP)-type test functionality and fully customizable test designs		
Dimensions and weights	D x W x H (weight): 485 mm x 490 mm x 680 mm (47 kg)		
Power supply	1 phase, 230 V, 16 A		

1) Shear rate and shear stress controlled
2) Shear strain and shear stress controlled
3) Specification of accuracy over full vertical list range
4) Standard Operating Procedures

Understanding the application under consideration, and the associated rheological test requirements, is a key factor in selecting the most appropriate rheometer system.

If you are unsure as to specifying an appropriate rheometer model for your application, we recommend contacting us for further advice and/or a sample test and evaluation report.

Kinexus			
	ultra+	pro+	lab+
Measuring geometries			
Quick-connect geometries	Plug and Play; auto-recognition and configuration by the software		
Material	Stainless Steel 316 (British Steel BS) as standard Other options are available, e.g., for chemical compatibility (titanium or Hastelloy)		
Plate and cone diameter	20 mm throughout 60 mm as standardized range – other diameters on request Plates with 4 mm, 8 mm and 25 mm specifically designed for asphalt testing		
Cone angle	Variants with 0.5°, 1°, 2° and 4° – other angles on request		
Interchangeable lower plates	Varying diameters and surface finishes (to match upper geometries)		
Concentric cylinders	C14 (DIN), C25 (DIN), C34 as standard		
Interchangeable cups	Quick release/engage mechanism, optional with removable base and fill-up mark		
Surface finish option	Smooth, sand blasted, serrated, splined or grooved		
Vane tools	Type C14 and C25		
Disposable option	Upper and lower disposable plates for the investigation of curing materials		
Environmental controllers			
Quick-Connect cartridge system	Plug and play; auto-recognition and configuration by the software		
Peltier-plate cartridge	Temperature range: -40°C to 200°C Maximum heating rate*: 30°C/minute Maximum cooling rate*: 30°C/minute		
Peltier-plate cartridge with active hood	Temperature range: -40°C to 150°C Maximum heating rate*: 30°C/minute Maximum cooling rate*: 20°C/minute		
Peltier-cylinder cartridge	Temperature range: -30°C to 200°C Maximum heating rate*: 15°C/minute Maximum cooling rate*: 15°C/minute		
HTC	Temperature range: 0°C to 350°C		
Temperature resolution	0.01°C		
Temperature stability	Better than ± 0.1°C		

* Temperature range dependent

NOTE: Specifications have been obtained under conditions as stated in the Installation and Site Requirements for Kinexus rheometers


NETZSCH Thermokinetics
Curing of Epoxy Resin
Heat flow rate/(W/g)
0
-0.5
-1.0
-1.5
-2.0
-2.5
20.4 K/min
10.1 K/min
5.0 K/min
150
Temperature/°C

Expertise in Service

Our Expertise – Service

All over the world, the name NETZSCH stands for comprehensive support and reliable service, before and after sale. Our qualified personnel from the technical service and application departments are always available for consultation.

In special training programs tailored for you and your employees, you will learn to tap the full potential of your instrument.

To maintain and protect your investment, you will be accompanied by our experienced service team over the entire life span of your instrument.

Our Expertise – Application Laboratories

The NETZSCH Thermal Analysis applications laboratories are a proficient partner for nearly any thermal analysis and rheological issue. Our involvement in your projects begins with proper sample preparation and continues through meticulous examination and interpretation of the measurement results. Our diverse methods and over 30 different state-of-the-art measuring stations will provide ready-made solutions for all your thermal needs.

Within the realm of thermal and rheological analyses and the measurement of thermophysical properties, we offer you a comprehensive line of the most diverse analysis techniques for materials characterization.

Measurements can be carried out on samples of the most varied of geometries and configurations. You will receive high-precision measurement results and valuable interpretations from us in the shortest possible time. This will enable you to precisely characterize new materials and components before actual deployment, minimize risks of failure, and gain decisive advantages over your competitors.

TECHNICAL SERVICE

- Maintenance and Repair
- Software Updates
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- IQ/OQ Documents
- Calibration Service
- Spare Part Service
- Moving Service

TRAINING

- Training
- Comprehensive Instrument and Method Training

LABORATORY

- Application Service and Contract Testing

The NETZSCH Group is an owner-managed, international technology company with headquarters in Germany. The Business Units Analyzing & Testing, Grinding & Dispersing and Pumps & Systems represent customized solutions at the highest level. More than 3,800 employees in 36 countries and a worldwide sales and service network ensure customer proximity and competent service.

Our performance standards are high. We promise our customers Proven Excellence – exceptional performance in everything we do, proven time and again since 1873.

When it comes to Thermal Analysis, Calorimetry (adiabatic & reaction), the determination of Thermophysical Properties, Rheology and Fire Testing, 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.

Proven Excellence.

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