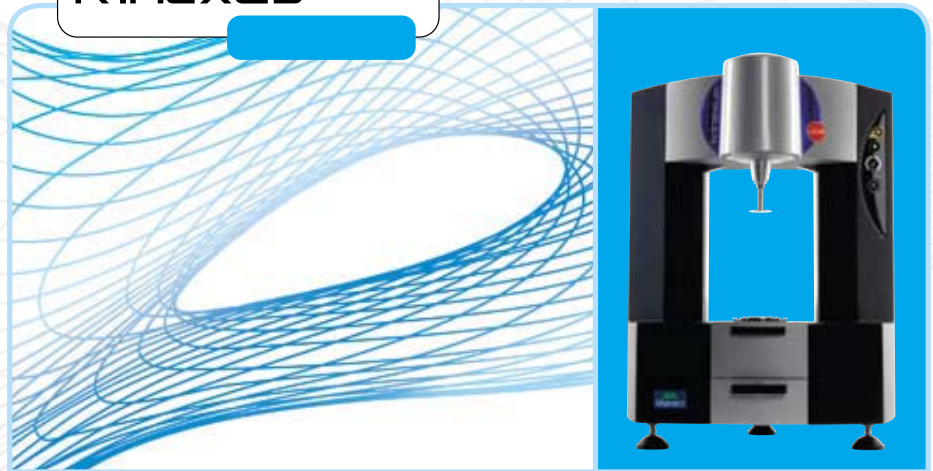


Rheological properties



kinexus



kinexus

More rheology, less effort

### Rheology redefined:

We've developed our new rotational rheometer **around you**

At Malvern, we haven't just redesigned a rheometer– we've redefined the way it interacts with **you**. Kinexus is a totally new rotational rheometer platform that's been developed from extensive, global market feedback, integrating innovative instrument design with a revolutionary software and support system to deliver a 'one stop' solution that will exceed your rheological expectations.

Based on a comprehensive understanding of real market needs, Kinexus is the first modern rheometer system to have been designed from the ground up.

This revolutionary new concept has pushed instrument performance criteria way beyond conventional limits and truly redefines 'ease of use'.

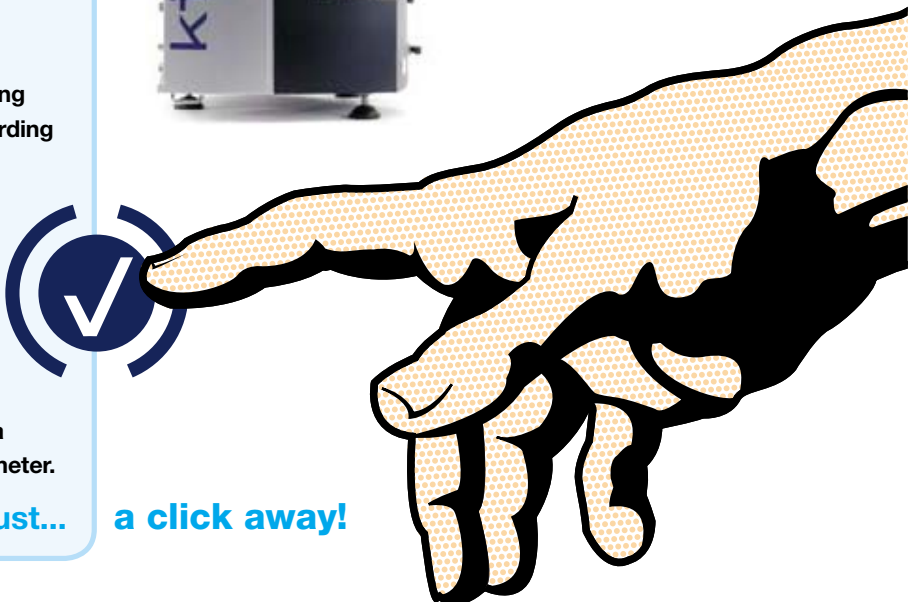
Our ground-breaking user interface assures intuitive operation at all times delivering consistent, accurate and precise measurement of the samples **you** have, using the applications **you** choose, in the way **you** want.

### More rheology, less effort

The adaptive intelligence that lies at the heart of Kinexus means you will spend less time learning how to master the system and more time investigating the ways to characterize and enhance your material's performance. Because Kinexus provides such a flexible and intelligent interface, it can be easily configured around your measurement, sample, or application, to deliver accurate and repeatable results for all users and applications from QC to academic research. Kinexus takes the effort out of setting up measurement, loading a sample, and recording results, whilst assuring optimal rheological performance for your testing.

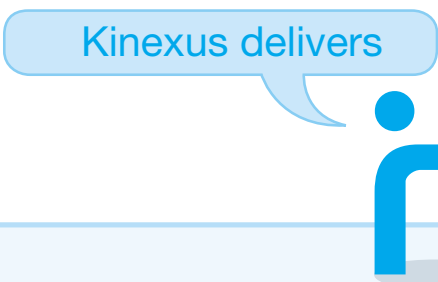
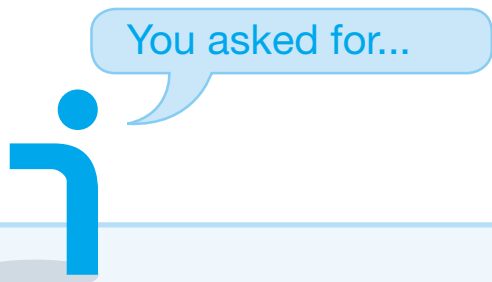
The software actively guides the user through setting up the correct system configuration – from measurement hardware to test parameters to sample loading to data collection and analysis - providing intelligent feedback at all stages via unique 'one click' user operation at the rheometer.

The future of rheology *really* is just... **a click away!**



## Exceeding expectation

For every instrument and system we develop at Malvern, we continuously strive for improvement. Consequently, we think it's better to ask our customers what they need before turning those wishes into reality.



**A rheometer that's easy to set up for my measurement**

A set up procedure that has never been easier. All measurement geometries and accessories are auto-recognized and auto-configured. Tests are based around the most important rheological component – your sample. Intelligent advice then defines the most appropriate rheological approach, providing all necessary feedback to get you the required results.

**An easy-to-load sample process**

The sample loading process is critical to obtain accurate and error-free rheological results. The unique Kinexus interface removes the guesswork from this fundamental step and guides you through best practice for loading your samples. Achieve reliable, rapid and reproducible sample loading – every time.

**Reassurance of instrument operating to specification**

We know that your samples, your data, and your time are highly valuable. By integrating user-friendly software with cutting edge hardware, we provide complete test solutions that allow you to verify instrument functionality whenever you want. Have total confidence in your data.

**Rheology help for my samples or my application**

Get the help you need at the rheometer when you're measuring your samples. Intelligent sample and application-based guidance helps you to optimize geometry selection, environmental control, test selection and measurement parameters. We provide built-in rheological experience to allow you to generate the best rheological data.

**Easy to interpret results in context**

We help you understand rheological results by ensuring that data analysis for your sample, your application, or your measurement is relevant to your starting proposition. Understand where and how rheological data can help you solve your material or your process problems.

**A complete 'one stop' solution**

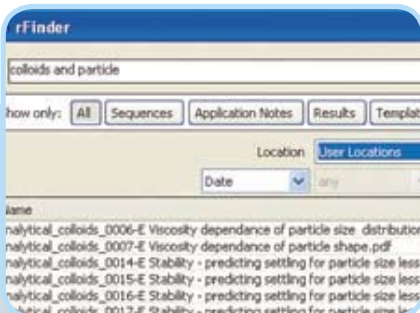
Complete rheological solutions via our unique and flexible software interface. Kinexus can be configured to meet your needs - from solving applications-led problems to providing consistent sample testing for your organization worldwide; from fully defined user instructions for QC operation to fully flexible test configurations for novel research. Make rheology work for you.

**A system that's simple to upgrade**

Kinexus is highly flexible and easy to expand, ready for further evolution as new applications emerge. The open frame design provides maximum space for integrating accessories; exclusive modular 'plug and play' cartridge systems for switching environmental controllers; intelligent communication ports for controlling accessories – Kinexus has been designed to make it the ultimate upgradeable platform.

## Intelligent operating procedure for ultimate flexibility

Malvern's Standard Operating Procedure (SOP) approach to material testing has been a corner stone to all our technologies, and has now been enhanced in the Kinexus system. A true applications-led interface revolutionizes and simplifies user interaction, bringing 'expert system' guidance and SOP-driven processes to rheological measurement.



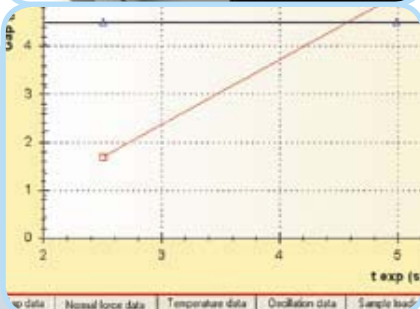
1

**Setting up the test.** The Kinexus platform is much more than a high performance rheometer – it's a fully integrated information system based around applications solutions. Use our intelligent search engine (**rFinder**) to choose the ideal solution to your rheological problem. 'Double click' on the appropriate test and you're ready to start - intelligent defaults set up appropriate test parameters for your sample.



2

**Preparation and loading the sample.** Intuitive 'one click' operation at the rheometer at all stages, aligned with continuous feedback and guidance, allows you to confidently prepare your sample for testing using best rheological practice that is designed to make the process robust and consistent for accurate, repeatable results. Kinexus will even recommend the correct geometries to use for a particular sample.



3

**Data and feedback during the test.** Live data and user feedback during the test can be presented in the way you want such that you always understand what's going on at any point in the measurement or analysis procedures. Intelligent functionality can provide user instructions at the appropriate time as required, or test data can be analyzed and the outputs used to make further decisions on tests or control parameters automatically.

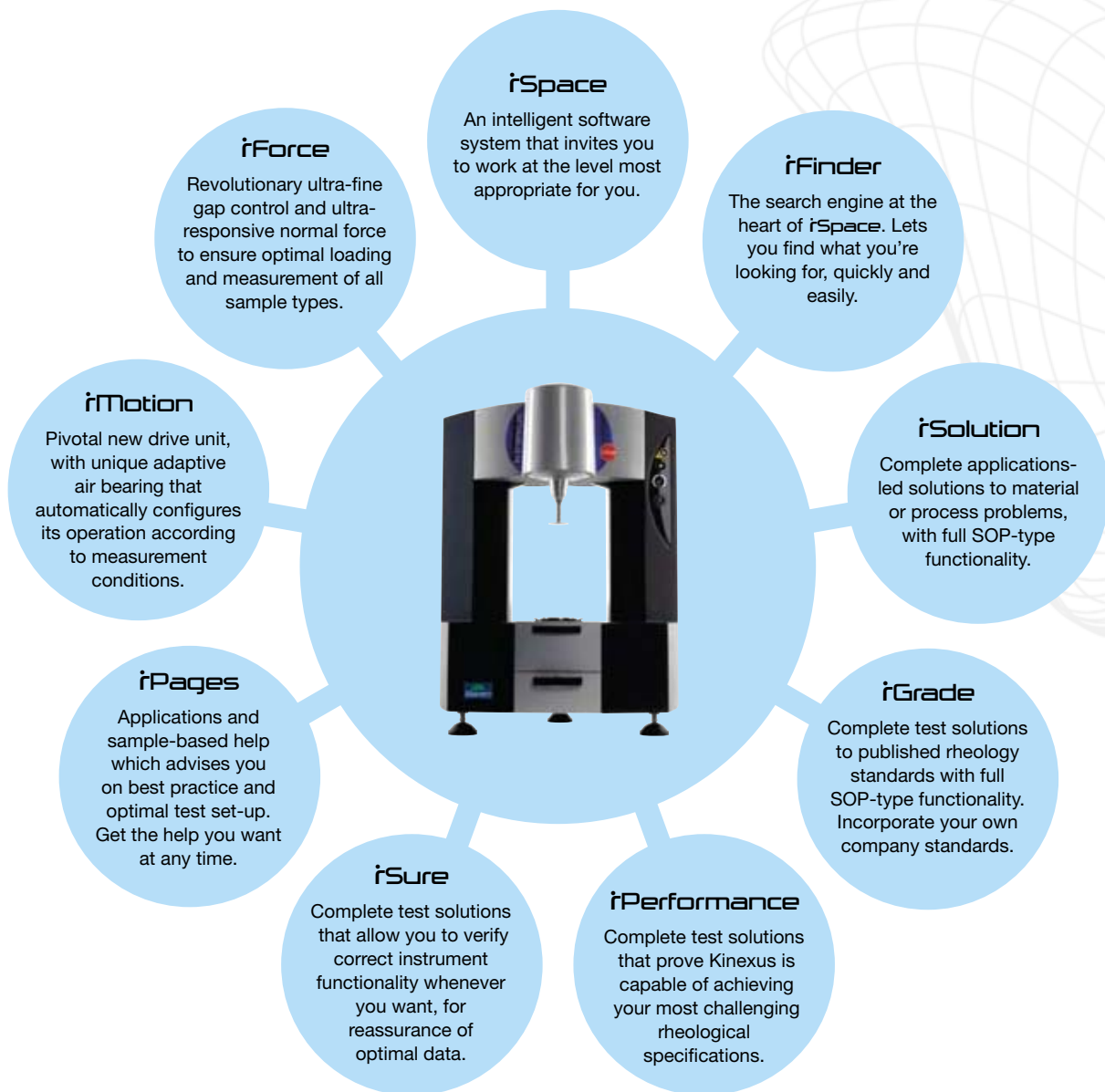


4

**View the results the way you want to present them.** Automated results presentation and analysis is provided relevant to your starting proposition, so that you can understand how rheological data can help you solve your material or your process problem. 'Cradle to grave' data collection provides a complete history of your sample from loading to unloading to ensure that every aspect of your rheology testing can be verified for consistency and provide maximum confidence in your results.

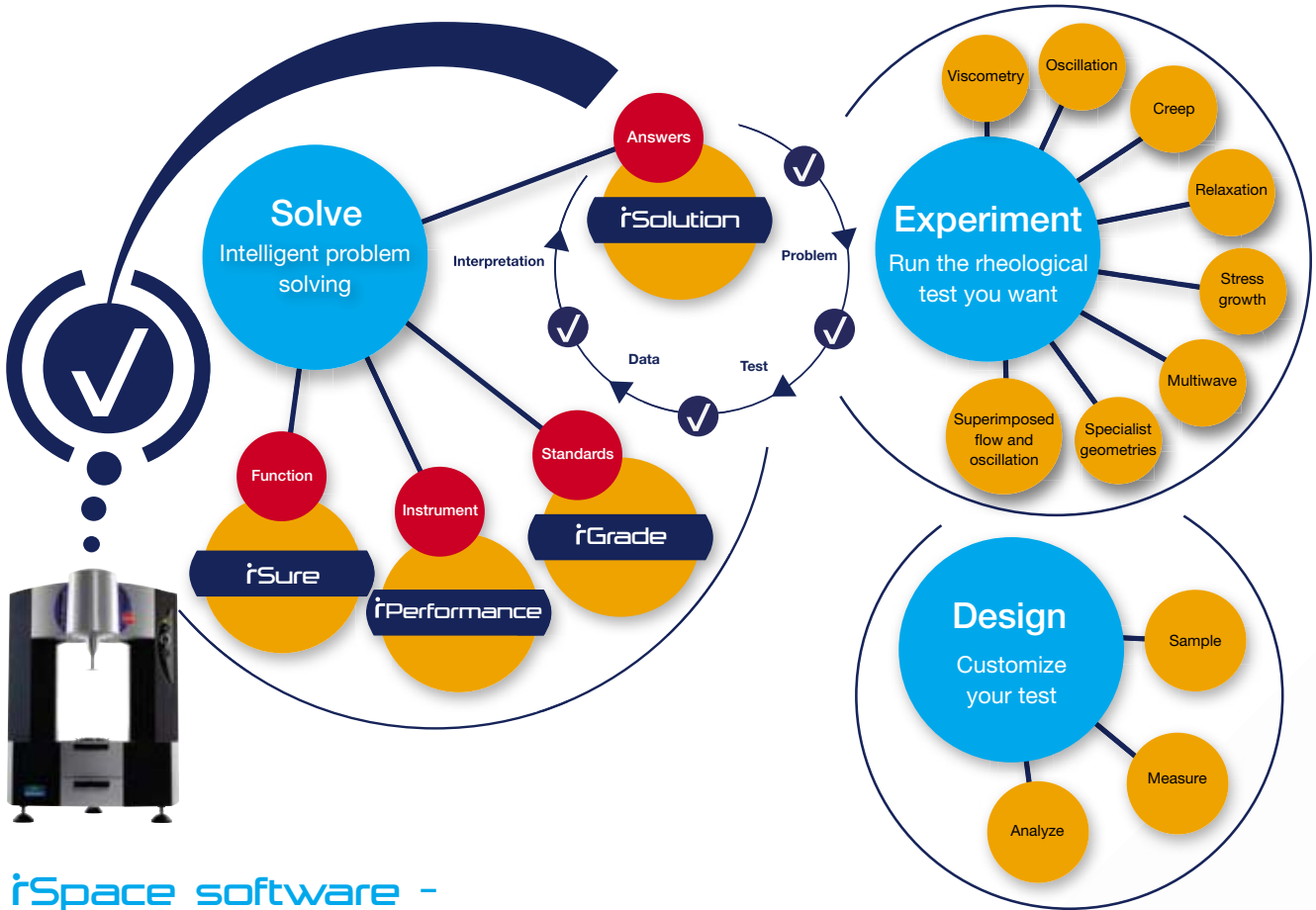
**kinexus defines a whole new world - iWorld**

Kinexus isn't just a highly accurate, intelligent, and robust instrument. It sits at the hub of a linked system of novel features and innovative technology that improve and redefine the user/instrument relationship like you've never before experienced. Unique to Malvern, we call this rheological universe 'iWorld'.



**kinexus**  
more than just a rheometer

**Malvern**  
a driving force for rheology



**iSpace software - the intelligence at the heart of kinexus**

Central to Kinexus is **iSpace**, an intelligent software system based on one flexible interface that can be configured for you and your rheological requirements. Much more than an advanced technical instrument interface, **iSpace** is a fully integrated information system based around complete applications solutions and intelligent sequence-driven (Standard Operating Procedure (SOP)-type) test functionality. Simply use the search engine, **iFinder**, to locate relevant information and appropriate tests for your rheological problem or starting point.

The unique **iSpace** interface invites you to work at the level most appropriate to your rheological requirements. This might be to

**solve** a material or process problem with an application-led approach, **experiment** using a library of established rheological methodologies, or **design** or customize tests for the ultimate flexibility in rheological measurement and analysis.

Kinexus and **iSpace** software will ensure that your standards are met for rheology testing throughout your organization. From a QC laboratory through to an R&D environment, from inexperienced operatives running defined tests to researchers demanding full control of tests, Kinexus and **iSpace** software is a rheometer system that can be configured for you.

iSpace software – Solve

Intelligent problem solving to deliver a rheological solution for you

**Solve** level is a problem-led approach to rheology, and provides complete test solutions with intelligent sequence-driven (Standard Operating Procedure (SOP)-type) test functionality.

- **For a material or process problem or query – iSolution** is a true applications led interface that gives you the results you need in the context of your application. Search the iSpace resource, identify and run an appropriate test with full guidance and the results are automatically analyzed in the industrially accepted and rheologically proper manner to give you relevant answers
- **For published rheology standards (ASTM, DIN, AASHTO, etc.) – iGrade** provides user-driven testing and results as defined by the requirements of the standard. Include your own company standard tests with operator instructions for total consistency throughout your organization
- **For absolute instrument performance – iPerformance** provides tests that prove Kinexus is capable of achieving your most challenging rheological specifications
- **For verification of instrument functionality – iSure** provides tests that allow you to verify correct system functions whenever you want, for reassurance of optimal data



## iSpace software – Experiment

### Set up and run the rheological test you want quickly and easily

**Experiment** level incorporates an extensive array of traditional rheology tests and analyses that are pre-configured as sequences.

User input for test parameter set-up is minimized by the use of automated intelligent defaults for advanced parameters, to allow you to configure rheology tests quickly and easily. For full flexibility, advanced control of all test parameters is available.

Kinexus offers a simple approach, without compromising flexibility.



iSpace software - Design

Customize tests to meet your requirements with minimum effort

**Design** level allows you complete flexibility to customize test sequences to meet your exact rheological requirements.

Test sequences for Kinexus are built up from a series of fundamental elements or building blocks. You can add functionality to existing sequences such as additional:

- **Sample** steps for instrument set-up and sample loading functionality
- **Measure** steps for rheological measurement functionality
- **Analyze** steps for data analysis functionality

Incorporate these building blocks in any order you desire to meet your test requirements. Sequences come with instructions on what they do and how to change them. 'Drag and drop' functionality makes the interaction familiar and user friendly, avoiding the need to master complex programming steps.

Kinexus offers a simple approach, without compromising flexibility.



## kinexus revolutionizes the way a rheometer interacts with you

Setting up a rheometer to meet your test requirements has never been easier. Built-in adaptive intelligence defines the most appropriate rheological approach and guides **you** through **your** instrument set-up, **your** sample loading, **your** measurement and analysis. Optimal feedback at all times allows you to configure the complete rheometer system and generate the results you seek.

Intuitive 'one click' operation at the rheometer at all stages, aligned with continuous feedback and guidance, allows you to confidently prepare your sample for testing.

Interacting with a rheometer has never been more inviting, more informative, or more precise.

### Instrument control panel



- Revolutionary interface with unique functionality and simple intuitive operation
- Communicate directly with the software through 'one click' operation!
- No loss of functionality or flexibility
- Optimal feedback provided via the software at all times for all user interactions
- Ensure consistent methodology to obtain the most reliable and reproducible data

### Robust ergonomic design



- Open frame design with optimized access for all key user interactions - sample loading, geometry and accessory interchange, and cleaning
- Twin pillar, single casting design - robust enough to meet all measurement needs
- Fully integrated power and control electronics - one complete system
- Efficient use of bench space - no cables
- Maximized space for accessory integration including open base

### Communications



- USB2 interface - easy to set up, just 'plug and play'!
- One cable link from PC to instrument
- High speed data streaming of all instrument variables available at a constant rate of 5kHz
- Programmable devices downloadable from software for the latest upgrades
- Dedicated user and expansion ports for intelligent control of measurement accessories

kinexus revolutionizes the way a rheometer interacts with you



**Geometries**

- New quick-connect geometries with intelligent auto-recognition
- Positive and reliable geometry engagement
- All geometry constants uploaded
- Your optimal working set-up can be defined and uploaded
  - minimize operator error
- Automated geometry lock via software



**Environmental Controllers**

- Exclusive 'plug and play' cartridges
- One easy, fast and robust connection provides:
  - Positive, high precision locking to required rheological tolerances
  - All power, communication, and fluid connections
  - Automatic recognition and configuration

- Consistent, repeatable, and accurate – even switching between different instruments
- Cartridges are a unique and integral design feature for all Kinexus accessories



**Plate Environmental Controller**

- Incorporates interchangeable lower plates
- Designed with multi-functionality in mind - allows optimal measurement of different sample types
- Easy interchange to match geometry sizes or geometry finishes
  - Smooth, sandblasted, serrated, customizable
- Easy to clean
- Consistent, repeatable, and accurate mechanical alignment whilst maintaining thermal performance

**Thermal Performance**

- Modelled and designed for
  - Thermal stability
  - Temperature ramp performance
  - Minimized thermal gradients
  - Temperature resolution to 0.01°C
- Dedicated heat exchanger designed for plate controller
  - Intelligent control
  - Maximum efficiency

## Advanced technology to advance your rheology

Kinexus incorporates technological innovations in the most critical areas of rheometer design. Just as intelligence has been built into the software functionality, the design aim for the hardware was to ensure that the superior performance available from advanced technology was accessible to all users - to extend your rheological test capabilities and deliver to you accurate and reliable data every time.

### Flexibility and precision of control

There are three critical systems to a rheological instrument

1. **Motor system** (rotational control of torque, speed and position)
2. **Gap and normal force system**
3. **Temperature system**



In Kinexus, these three systems are **independently configurable and controllable**.

- Combine control of these three systems together in any way you want
- For the ultimate in test flexibility
- For test capability that is process relevant
- For test functionality designed to be capable of meeting your future rheological requirements

### iMotion - Motor and air bearing system for Kinexus

Pivotal to the innovative technology integrated throughout the Kinexus is the **iMotion** drive. A new motor has been optimized for dynamic rheological performance, in conjunction with unsurpassed air bearing technology and further improved high resolution position sensors. This enables Kinexus systems to provide the widest continuous torque range available with the highest levels of control and responsiveness. Across all material types, **iMotion** allows Kinexus to capture the true material properties of your sample.

- Exclusive to the Kinexus platform is an adaptive bearing design that **automatically configures for optimal operation** depending on **your** measurement range - minimize data corrections and maximize robustness for all rheometer operations. Ground-breaking technology that allows all users to access the highest rheological performance whilst maintaining ease of use
- New motor drive optimized for torque range, efficiency, inertia, and transient response
- Higher torque capabilities whilst maintaining exceptional low torque performance in one continuous range – measure low viscosity, weakly-structured or low volume samples without compromise
- Unsurpassed air bearing technology for minimum torque bias and more detailed mapping to minimize data corrections
- All motor drive and bearing components designed from the outset to minimize system inertia without compromising system compliance – assurance of reliable rheological data across all material types from low viscosity liquids to high modulus solids

## Advanced technology to advance your rheology

### iForce Gap and normal force system for Kinexus

The Kinexus system combines high speed and ultra-fine resolution gap control with high sensitivity and ultra-responsive normal force control for truly innovative measurement and sample loading capabilities - from sensitive structures to rapid curing systems. Allied to 'cradle to grave' data collection providing a complete history of your sample from loading to unloading, every aspect of your sample testing can be optimized and verified for consistency, to provide maximum confidence in your rheological results.



#### Gap Control

- Unprecedented vertical travel range for maximum user access and flexibility of test set-up: 230mm between end stops
- Unmatched vertical speed range: max 35mm/s – min 0.1µm/s
- Controllable speed and normal force profiles over full range of vertical travel: linear, exponential and max/min limited profiles
- Gap measured to 0.1µm over full range of vertical travel for consistent and reproducible measurements
- Optimal sample loading for all material types – from sensitive structures to rapid curing systems to materials with critical strain history e.g. low structure foams
- Highly controllable axial test capabilities: squeeze flow e.g. foods; tack tests e.g. adhesives

#### Normal Force

- High sensitivity and rapid response times from a novel strain gauge design and mount
- More controllable and reactive system designed to capture transient material responses
- Ultra-fast and constant streaming data update rate of 5kHz available for all instrument variables, including gap and normal force, as standard
- Normal force data captured from sample loading process – ensure your loading process is consistent and repeatable and is not affecting the measured rheology of your sample

## kinexus – making rheology work for you

### Models available to meet your application and measurement needs

#### kinexus **pro**

A high-end rheometer system comprising cutting-edge hardware design, innovative technology, and intelligent and flexible software to meet, and surpass, your research and development requirements.

- A software interface that can be configured to your requirements - from complete applications solutions and sequence-driven (Standard Operating Procedure (SOP)-type) test functionality to fully customizable test designs for your exact rheology needs
- Revolutionary user interaction with the rheometer that redefines ease of use – full flexibility of control with maximum feedback at all times and simple, intuitive ‘one click’ operation
- Dynamically-optimized motor system designed for the fastest transient responses with the highest level of control for pure rheological performance without compromise
- Class-leading gap and normal force capabilities
- Ultra-high streaming data rates available for all instrument variables as standard
- A modular system designed to expand to meet your rheology requirements now and in the future

#### kinexus **ultra**

The flagship Kinexus model that takes rheological characterization and test capabilities to a new level. Including all innovative features and technology provided throughout the Kinexus platform, Kinexus ultra further offers the widest continuous torque range available.

**rMotion ultra** provides a unique adaptive bearing design that automatically configures for optimal operation depending on measurement range. An instrument that truly offers the ultimate in rheological capabilities - ideal for even the most demanding low torque applications, such as weakly-structured and small volume sample measurements, yet robust and exact enough to accurately measure high speed processes or high modulus systems - in one continuous measurement range without any user interaction.

Whatever your measurement requirements, the adaptive bearing design exclusive to Kinexus ultra minimizes data corrections and maximizes data quality and integrity.



## Kinexus – ready to make a difference

### Future proofing your investment

Kinexus lies at the hub of a ground-breaking modular rheometer system that can be dynamically adapted for you. This modern concept is designed to meet your current **and future** rheological needs. Hardware and software connectivity and expansion options ensure that new test capabilities and upgrade paths can be seamlessly added.

- Unique cartridge design and associated mechanical alignment mechanism allows accessories and specialist measurement options to be integrated with simple ‘plug & play’ ease
- Open frame designed to maximize space and flexibility for integrating custom components without compromising the rheology:
  - Open base for integrating options below the instrument
  - Large vertical lift range for integrating options above standard working height
- Dedicated user and expansion ports
  - Intelligent control of accessories and data acquisition
  - CAN bus for processor-level communications protocol
- Modular test control architecture in the software allows complete flexibility for designing new rheological tests
  - Configure rotational, axial, and temperature test functionality independently and in any way you like

### Those small things that *really* make a difference



1. Integrated power drive for all environmental controllers – no external boxes or cables
2. Integrated leak-proof valves throughout the system
3. Safe and informative interaction for all procedures
4. Kinexus even has new feet for improved stability and an optimized angular adjustment range making levelling easier



More rheology, less effort

## Product specification

	kinexus ultra 	kinexus pro 
Direct strain, rate and stress control	✓	✓
Torque range - viscometry	0.01µNm to 250mNm (continuous)	0.05µNm to 200mNm (continuous)
Torque range - oscillation	0.003µNm to 250mNm (continuous)	0.05µNm to 200mNm (continuous)
Torque resolution	0.1nNm	0.1nNm
Intelligent adaptive air bearing - automatic optimization of bearing configuration	✓	-
Position resolution	<10nrad	<10nrad
Angular velocity range	10nrad/s to 500rad/s	10nrad/s to 500rad/s
Step change in strain	<10ms	<10ms
Frequency range	6.28µrad/s to 942rad/s (1µHz to 150Hz)	6.28µrad/s to 942rad/s (1µHz to 150Hz)
Motor inertia	13µN.m.s	13µN.m.s
Normal force range	0.001N to 20N (50N optional)	0.001N to 20N (50N optional)
Normal force response time	<10ms	<10ms
Vertical lift speed	0.1µm/s to 35mm/s	0.1µm/s to 35mm/s
Vertical lift range (measurable)	230mm	230mm
Gap resolution (over full range)	0.1µm	0.1µm
Fully configurable vertical profiles	By speed and normal force	By speed and normal force
Raw instrument variables	5kHz constant streaming data	5kHz constant streaming data
Complete sample history	Data available from loading to unloading	Data available from loading to unloading
USB2 instrument interface	Plug & play	Plug & play
Quick-connect geometries	Plug & play; auto-configuration	Plug & play; auto-configuration
Cartridge environmental controllers	Plug & play; auto-configuration	Plug & play; auto-configuration
Plate environmental controller	-40 to 200°C (0.01°C resolution)	-40 to 200°C (0.01°C resolution)
Interchangeable lower plates	Varying diameters & surface finishes	Varying diameters & surface finishes
Cylinder environmental controller	-30 to 200°C (0.01°C resolution)	-30 to 200°C (0.01°C resolution)
Universal cell environmental controller	-150 to 550°C (0.01°C resolution)	-150 to 550°C (0.01°C resolution)
Open frame and open base design	Maximum space for accessory integration	Maximum space for accessory integration
Instrument dimensions and weight	490mm(w)×680mm(h) ×485mm(d); 47kg	490mm(w)×680mm(h) ×485mm(d); 47kg

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detailed specifications at  
[www.malvern.com](http://www.malvern.com)

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