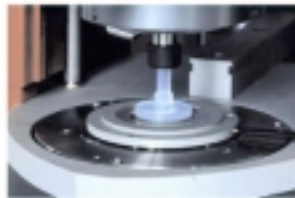


Comprehensive Rheology Solutions



Servicing and supporting every stage of your research.



Rheometers from REOLOGICA Instruments represent the latest technology in controlled strain and stress rheometers. Designed for research, yet with ease of use allowing for routine testing, all instruments feature ultra low position resolution using our proprietary sensor technology which can measure speeds continuously from micro rad/s up to 320 rad/s. A wide torque range is made possible through the use of a low compliance, diffusion air bearing manufactured in house to exacting standards. Our air bearing design provides not only position independent offset torque, but also good mechanical stability at high speeds, for superior high rate performance.

Quantitative normal force capability using the Differential Pressure Normal Force (DPNF) sensor patented by REOLOGICA, is used for normal force controlled sample loading on all systems. The RheoExplorer™ software interface was designed to operate in Windows 2000 and XP, utilizes mouse control and features multitasking, help screens, well known Windows menus, and data files transferable to other applications like Excel. Creep, relaxation and dynamic oscillation testing modules complement the viscometry measuring mode. Samples can range from low viscosity fluids to high modulus solid materials.

All Systems Include:

- ▼ Automatic gap setting for controlled reproducible sample loading
- ▼ Automatic compensation for thermal expansion of measuring systems
- ▼ Built in communication port for remote control operation, remote service diagnostics, and software updates
- ▼ Automatic Inertia Compensation

Each instrument is built around a dedicated, on board 64-bit computer with high performance open source instrument control software, for unprecedented performance, versatility, and reliability. Remote control operation, remote diagnostics, and service are available via a modem

VISCOTECH

Research Rheometer Performance on a QC Rheometer Budget

This system features a robust, high performance air bearing and drive system with modular software to meet the needs of routine testing. As with all REOLOGICA instruments, it uses the same modular thermal chambers and RheoExplorer™ software to make it easy to take analytical methods developed with the VISCOANALYSER, DYNALYSER, or NOVA systems into the standard testing laboratory.

All VISCOTECH rheometers can be upgraded to include dynamic oscillatory capability, and can perform the full suite of RheoExplorer tests, i.e., steady shear, oscillation, creep, relaxation, etc.



VISCOANALYSER

The Rheometer for Any Budget



The VISCOANALYSER Rheometer system comes standard with the full suite of RheoExplorer test methods, and can be upgraded to include full NOVA performance with quantitative normal force measurements in steady shear.

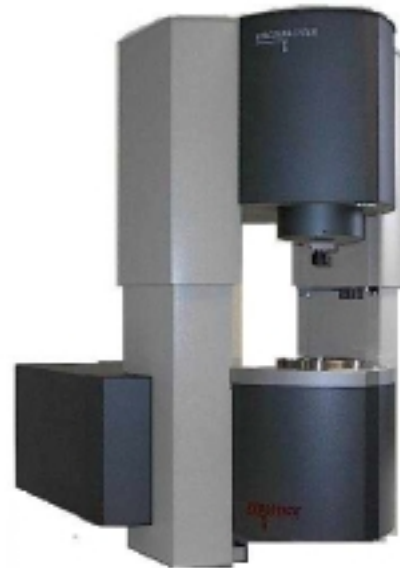
The rheometer offers specialized testing capabilities such as parallel superposition and fast oscillation, as well as creep, relaxation, oscillation and flow curves in either stress or strain controlled mode.

VISCOANALYSER is available with the full REOLOGICA range of temperature control systems, including, CTU, ETC, CCE, UV, RheoPolymer, and PEL thermal controllers. The picture above shows the VISCOANALYSER DSR Rheometer configured with the ETC-3 chamber for testing according to AASHTO T315-04, while the picture at right shows the VISCOANALYSER configured with the CCE controller for testing with cone/plate/cylinders.

The MELTS (ETC-3) configuration includes independently regulated upper and lower resistive heaters with cooling via Joule-Thomson Effect vortex coolers down to -20°C or, for the most rapid cooling, liquid nitrogen cooling down to -180°C . Heating and cooling rates in excess of $20^{\circ}\text{C}/\text{minute}$ are possible up to a maximum of 550°C .

The CCE configuration features resistive heating and Joule-Thomson or LN2 cooling for concentric cylinders, with a maximum temperature of 350°C and minimum of -100°C . Included with the CCE is an upper thermal enclosure to minimize heat loss to the surroundings.

The CCE configuration also accepts a lower plate so that both cup/bob and cone/plate measurements are possible with the CCE. For the most precise measurements with the CCE at elevated temperatures, the upper heater assembly from the ETC-3 Melts option can be configured for use with the CCE, virtually eliminating temperature gradients.



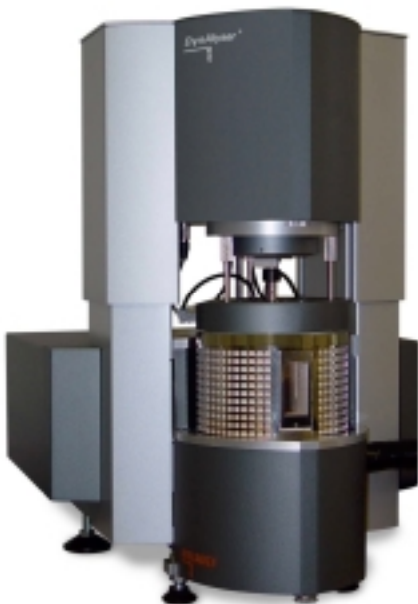
DYNALYSER

The Complete Rheological Characterization System

The most popular of REOLOGICA'S research rheometers, DYNALYSER features nanoradian position resolution and sub-microNewton-meter torque sensitivity. DYNALYSER also offer specialized testing capabilities such as parallel superposition, squeeze flow, and fast oscillation, as well as creep, relaxation, oscillation and flow curves in either stress or strain controlled mode.

DYNALYSER comes standard with REOLOGICA's patented Differential Pressure Normal Force (DPNF) sensor. This Normal Force sensor is non-interactive, independent of the torque signal or angular position. The DPNF sensor has a wide dynamic range and excellent transient response and can be used for quantitative Normal Force measurements in shear or normal stress relaxation. The DPNF sensor coupled with the high bandwidth vertical servo drive also enables measurements such as squeeze flow.

DYNALYSER is available in 100 & 200 mNm maximum torque models.



NOVA

The New Star of Rheometers

The flagship of REOLOGICA, NOVA, features a unique "**Net-Zero**" bias bearing system. This null balance system allows for Nano-Torque and Nano-Strain measurement control and analysis.

Also featured is an innovative, low inertia Drag Cup Motor utilizing novel "**Feed Forward**" strain and speed control. The Torque Range is from 3 nNm to 200 mNm. It is possible to extend this to 1 nNm on the low end and 230 mNm at the high end for certain test parameters. Strain Resolution is 0.01 μ rad.

Additional features include "Auto-Detect" Measuring Systems, Video & Image Software, and High Performance Open-Source Instrument Control Software, patented Differential Pressure Normal Force (DPNF) sensor, a Camera Viewer, Ethernet Communications, High-Speed USB port and RheoExplorer V6 Software. Specialized testing capabilities such as parallel superposition, squeeze flow, and fast oscillation, are available as well as creep, relaxation, oscillation and flow curves in either strain or stress controlled mode.

RheoExplorer V6 Software

RheoExplorer® V6 is an advanced, robust, 32-bit user interface designed exclusively for Windows™ 2000, and XP. The software has been designed and written to provide unprecedented performance, ease of use, and customization.

Measurement programs for viscometry, strain- and stress- controlled oscillation, fast oscillation, parallel superposition, constant shear rate, shear rate sweep, yield stress, creep/recovery, stress relaxation and process control are available. Unlimited numbers of temperature steps, profiles, and combinations of frequencies, stresses, and strains can be programmed.

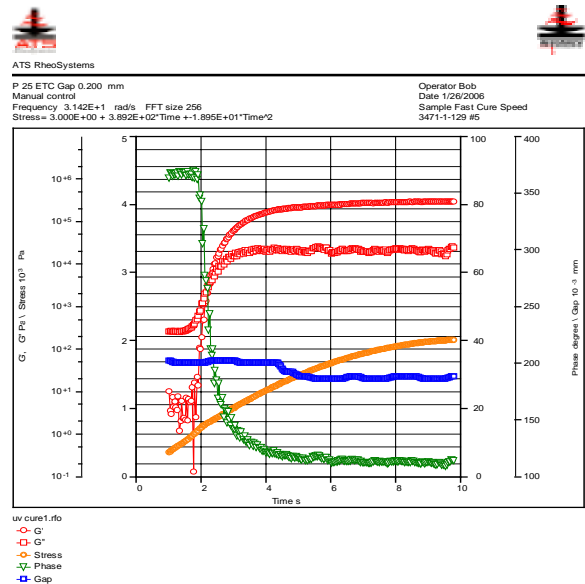
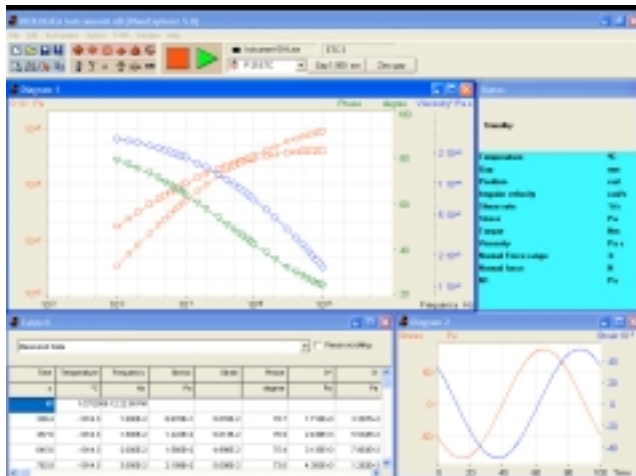
Scripting allows experiments to be set up and run in a fully automated “project” mode. User-definable end conditions provide decision making for experiment termination and automated re-configuration to another set of test conditions.

The fully customizable Graphical User Interface allows generation of reference curves from previously acquired data.

An unlimited number of previous results can be superimposed on the real-time data graph to facilitate quick and easy comparisons between data sets.

RheoExplorer also offers unique features in terms of data acquisition and analysis. In oscillation, you can select the number of points used in the FFT, the number of integration periods, as well as the delay period for each data point.

Fast Oscillation is a hybrid data collection and analysis version of the normal oscillation program available in RheoExplorer. The Fast Oscillation program is used to measure rapid, transient changes in a material. It works under the same principle where a sinusoidally varying forcing function is applied to the sample and the equally varying sample response is measured. A continuous stream of raw data is collected and then evaluated by one of several sampling methods selected by the user. The number of measurement points to be presented and saved can be set by the user, with data sampling rates greater than 200 points/s.



Accessories

All REOLOGICA Instruments accommodate a variety of different measuring systems and accessories. Examples of measuring systems include; concentric cylinders, double gap, cone/plate, parallel plate, and customized measuring systems on request. VISCOANALYSER can be upgraded with patented Differential Pressure Normal Force Sensor.

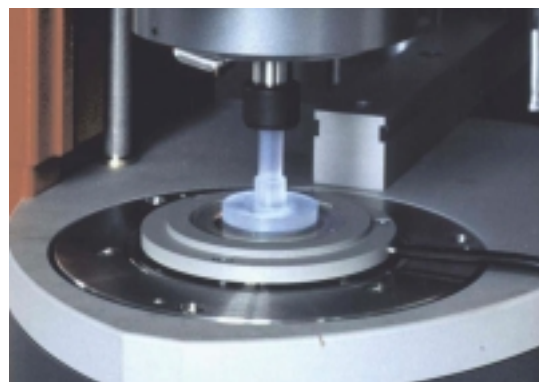
Additional accessories include options for characterizing real time UV Curing, Dynamic Mechanical Thermal Analysis (DMTA) on solid bars, films, and fibers, Electrorheology, and several elevated pressure cells for testing up to 15,000 psig and 400 °C.



The Sealed Cell

The patented Sealed Cell measuring system allows dynamic oscillatory along with low torque steady shear rheological measurements on samples above their boiling point. This allows aqueous samples like dough and gelatins, along with solvent-based systems like magnetic tape to be measured without loss of the continuous phase above their boiling point. The cell employs a patented, non-contacting air bearing seal, rather than standard o-rings and magnetic couplings. The air bearing seal is effectively frictionless, and permits dynamic testing throughout the frequency range of the rheometer. Additionally, the low-end torque in viscometry is not effected by drag due to jeweled bearings and contacting seals found on other “pressurized” measuring systems. Temperatures between -20 and 350°C are possible with maximum vapor pressure of 90

psig. Both concentric cylinder and parallel plate measuring systems are supported



The UV Cell

The UV Cell is used to monitor changes in material properties as a result of exposure to ultraviolet or other wavelength radiation. The cell has a temperature range from -20 to 350°C. The innovative design allows the plates to be easily removed to facilitate working with vitrified samples.

The UV Cell is equipped with a lower plate made of UV transmittable material beneath which a suitable light source can be mounted for irradiation of the test sample. The upper measuring system can be made of any machinable material, including steel, titanium, glass, polycarbonate, etc.

The Sealed and UV Cells are two in a series of “**Application Specific**” accessories for the NOVA, DYNALYSER and VISCOANALYSER Rheometers. Based on our **Plug and Test Technology**, all cell calibrations are stored in the instrument’s firmware, and are downloaded to the cell upon selection by the user. The lower plate is heated and cooled by forced air separated from the sample area to avoid any disturbance to the material or measurement. The upper measuring system is radiantly heated by an independently controlled clamshell furnace. Shrinkage of the sample volume due to crosslinking is compensated by automatically controlling the normal force on the upper plate. For environmentally sensitive samples, the UV

Cell is equipped with a preheated inert gas inlet.



- ▼ Fibers
- ▼ Films
- ▼ Surface roughened systems
- ▼ Custom tooling with user defined materials

Temperature Control Units

All REOLOGICA rheometers feature user changeable modular temperature control systems. Each system is designed to offer superior performance in a given measuring configuration. Each system is designed to eliminate temperature gradients in a measuring configuration, and to provide outstanding transient response to temperature changes. Systems include:

- ▼ CTU - Fluid circulating control for cone/plate/cylinders -40 to 200°C
- ▼ ETC/CCE - Joule-Thomson high temperature cells for plate/cone/cylinder -20 to $550/300^{\circ}\text{C}$, extendable to -180°C
- ▼ RheoPolymer - Joule-Thomson high temperature cell for parallel plate and rectangular/cylindrical torsion, and fiber/film -20 to 550°C , extendable to -180°C
- ▼ DAR - Convection/radiation heating/cryogenic cooling for plate/cone/torsion -180 to 550°C
- ▼ PEL - Peltier plate for cone/plate -50 - 150°C

The rheometers can perform tests in constant temperature, temperature gradient, and stepped temperature profiles.

The ER Cell

In the ER Cell, an electric field is applied between the two measurement surfaces by means of a high voltage power supply. To the upper, moving measurement system, the voltage is transmitted through a conductive liquid so as not to affect the measurement results.

The voltage range, and therefore the field strength, depends on the material that is analyzed. For silica gel suspensions the field strength of approximately of 3 kV/mm is recommended.

The ER Cell is available in both concentric cylinder and plate-plate/cone-plate measuring systems. These different measurement systems are easily interchangeable with each other and all other REOLOGICA Rheometer accessories.

Available Measuring systems include:

- ▼ Cones
- ▼ Plates
- ▼ Concentric cylinders
- ▼ Dual Concentric cylinders
- ▼ Disposable plates
- ▼ Disposable cylinders
- ▼ Vaned cylinders
- ▼ Rectangular torsion
- ▼ Cylindrical torsion

Thermal Chamber Specifications

Thermal Chamber	Temperature Range °C	Heating Rate °C/Min	Cooling Rate °C/Min	Isothermal Stability +/- °C	Measuring systems*
ETC-2 Lower Heated Plate/Upper Enclosure (Joule-Thomson Effect)	-20 to 400	>20	>20	0.1	CP, PP
ETC-3 Upper/Lower Actively Heated Chamber (Joule-Thomson Effect)	-20 to 550	>20	>20	0.1	CP, PP, F
ETC-3 with LN2 Option	-180 to 550	>20	>30	0.1	CP, PP, F
CCE Electrically Heated Couette (Joule-Thomson Effect)	-20 to 350	>20	>20	0.1	CP, PP, CC
CCE with LN2 Option	-100 to 350	>20	>30	0.1	CP, PP, CC
Fluids Circulating Bath	-40 to 200	>2	>2	0.03	CP, PP, CC
RheoPolymer with Vortex Cooling	-20 to 550	>20	>20	0.1	CP, PP, T, R, F
RheoPolymer with LN2 Option	-180 to 550	>20	>30	0.1	CP, PP, T, R, F
Sealed Cell	-20 to 350	>20	>20	0.1	PP, CC
High Pressure Cell with Electric Heating/Air cooling	RT to 400	>25	>3	0.1	CC
High Pressure Cell with Electric Heating/Fluid cooling	-20 to 400	>25	>7	0.1	CC
DAR 2000 with Resistance/Convective Heating/LN2 cooling	-180 to 550	>20	>25	0.1	CP, PP, T, R, F
UV Cell with Upper/Lower Chamber	-20 to 350	>40	>20	0.1	CP, PP
UV Cell with Upper/Lower Chamber, LN2 Option	-150 to 350	>40	>30	0.1	CP, PP
Peltier	-50 to 150	>50	>50	0.1	CP, PP

* CP=Cone/Plate; PP=Parallel plate; CC=Concentric Cylinders; T=Rectangular Bar Torsion; R=Cylindrical Rod Torsion; F=Fibers/Films

Rheological Training and Seminars

Become a “RHEOLOGICAL TOP GUN” with ATS RheoSystems’ and REOLOGICA Instruments’ World Class Training. Our expert instrument operational training and rheological consultations are designed to transform the everyday user into a serious rheologist. Let us assist you in getting the most out of your rheometer(s) investment.

Maximize the utility of The World’s Finest Research Rheometers with The World’s Finest Training. Provided by an engineering staff with over 350 man-years of theoretical and practical rheological expertise, ATS RheoSystems’/REOLOGICA Instruments’ provides a variety of outstanding training options to our customers. Benefit from our experience in working with and instructing users of all levels, from the novice to the expert rheologist.

Operational Training

At ATS RheoSystems/REOLOGICA Instruments our mission is to maximize the results you obtain from your rheometer(s). With each instrument, we provide two full days of personalized, one-on-one training with one of our highly skilled, results-oriented staff rheologists. The commissioning of the instrument(s) includes the following:

- ▼ Setup and confirmation of normal operation of your new rheometer
- ▼ A hardware overview, including detailed review of the advanced features and routine maintenance of the instrument
- ▼ Demonstration of the software, including how to set up and run simple experiments, and presentation of the data
- ▼ Conduct experiments with customer samples and saving of test protocols for later use

- ▼ Interpretation of common experimental data

This training is intended to indoctrinate the user with the rheometer and provide them with the knowledge necessary to start running the instrument. It also establishes the groundwork for additional, more advanced training available on site at ATS RheoSystems/REOLOGICA Instruments, or in house at the client’s site.

Rheology Seminars

Formal group seminars covering a wide variety of subjects and levels are available at the customer’s site. Some examples include:

- ▼ Principles of Rheology
- ▼ Introduction to Viscoelasticity
- ▼ Rheometer design, performance features, and instrument comparisons and benchmark data

Advanced Instrument Training and Test Method Development

ATS RheoSystems/REOLOGICA Instruments’ training courses are designed to familiarize the user with the theory and application of rheology. These courses are one on one, allowing the participants to benefit from the full attention of our experienced rheologists. We combine the theoretical background of rheology and appropriate measurement principles, with our hands on application workshop, providing a world class training opportunity. This training is available at ATS RheoSystems/REOLOGICA Instruments in New Jersey or can be conducted at the customer’s site.

Customized, One on One Consultations

Since different customers have varying experimental needs, we also provide personalized consulting. Customized courses and workshops are tailored to the customer’s research requirements, whether it be theoretical or practical. This option is ideal for customers with more challenging applications, allowing our staff rheologist(s) to focus their training efforts and deliver the appropriate solution.

E-Training Seminars

ATS RheoSystems/REOLOGICA Instruments offers a variety of courses via the Internet. From the convenience of home or office, the customer can log in on a computer and take advantage of The World's Finest Training. E-Training opportunities include the following:

Quick Start e-Training Courses

Quick Start e-Training Courses are designed to teach a new user how to set up and conduct an experiment on their ATS RheoSystems/REOLOGICA Instruments' rheometer system.

- ▼ A basic understanding of the instrument
- ▼ Instructions on set-up, running, and analyzing data for a typical experiment

Advanced e-Training Courses

- ▼ Theory
- ▼ Method development, sample preparation, and calibration
- ▼ Data analysis and interpretation

Rheological Consulting And Testing

ATS RheoSystems/REOLOGICA Instruments provide full rheological and mechanical property testing capability including controlled strain and controlled stress deformation measurements, heat, time and/or radiation cure monitoring, experiments at high pressure, and quantitative normal force measurements. Both transient and periodic measurements are supported in the temperature range from -180 to 550°C. Samples can range from low viscosity fluids, through semi-solids and solids. In addition, thermal analysis testing including DSC, TGA, TMA, DMTA, and DTA along with Contact Angle and Surface Tension measurements are available. Both hourly and project rates are available. Contact us for a free consultation.

ATS RheoSystems/REOLOGICA Instruments Offers Its Customers

- ▼ A Highly Skilled, Experienced, and Enthusiastic Technical Team
- ▼ State of The Art Instrumentation
- ▼ Complete Turnkey Solutions

Consulting Services Include (but not limited to)

- ▼ Application laboratory demonstrations and applications training tailored to customer unique requirements.
- ▼ Rheological consulting services, and expert data analysis and interpretation
- ▼ In-house rheology training courses, and instrument operation seminars
- ▼ Third party on call service, service agreements, preventive maintenance and calibration programs
- ▼ Stay ahead of your competition. Benefit from the caliber of our technical staff, the breadth and depth of our expertise, and the superiority of our instrumentation

Technical Service and Support

Customized technical support in terms of service agreements, preventive maintenance and calibration coverage, and on-call service and repairs is available for all REOLOGICA Rheometers, along with rheometers from Bohlin, Haake, Rheometrics, and Polymer Laboratories. We are routinely called upon to service other manufacturers' rheometers when they either cannot, or will not, address the problem to the satisfaction of the customer. We are successful because most instrument companies see technical support and service as a necessary obligation, an offshoot of their core business, selling instruments. They perform these services only because they have to. We perform these services because they are essential concerns to our customers.

Our mission is to meet the specialized needs and individual requirements of rheological instrumentation users. It is inevitable that companies will face increased competitive challenges and pressures in the next decade. As a comprehensive rheological instrumentation, consulting and training, and technical support and service company specializing in material characterization instrumentation, REOLOGICA Instruments focuses exclusively on rheometers, rheology, and rheological consulting.

COMPREHENSIVE RHEOLOGY SOLUTIONS

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