

RST Touch™ Series Rheometers

Touch Screen Rheometers for Controlled Rate/Stress Measurement

The RST series of touch screen rheometers represent the best that Brookfield has to offer — instruments that operate both in controlled shear rate (rpm) and controlled shear stress (torque) modes — for sophisticated rheological analysis. With automatic data collection and analysis using optional Rheo3000 software, RST Rheometers offer greater flexibility and more features than other high-end rheometers in their class — at a fraction of the cost.

RST Rheometers have a durable design with rapid bob (spindle) attachment and easy-to-clean surfaces for years of trouble-free operation. Increased measurement capabilities range from simple single-point viscosity tests to comprehensive rheological profiling. Evaluate material behavior from initial yield stress through full flow curve response at variable shear rates to relaxation, recovery and creep.

The RST touch screen series is available in three configurations and all models feature:

- Controlled stress/rate operation to analyze comprehensive flow behavior
- User friendly LCD touch screen with graphical display
- 11 memory slots for structured multi-step test programs
- Auto spindle identity recognition
- Quick connect coupling for easy spindle attachment
- Optional Rheo 3000 Software for PC control and data management
- 21 CFR compliance for controlled user access and data security

A portable version without touch screen capability (Model RS Portable) is also available.

RST Technical Specifications (all models)

Maximum Torque:	100 mNm
Torque Resolution:	0.15 μ Nm
Speed:	0.01 to 1300 rpm
Data Output:	USB, RS232
Display Units:	cP, Pa•s, dynes/cm ² , Pa, °C, °F

Some popular applications include:

ADHESIVES: RST-CPS tests a variety of silicone-based adhesives at temperatures in excess of >200°C. Advantages include small sample volume (< 2mL), rapid temperature equilibrium with Peltier plate, variable shear rate (to 7,800 sec⁻¹) to duplicate conditions for actual adhesive use, quick test time (< 2 min).

ADHESIVE INGREDIENTS: RST-CPS with Peltier control excels at rapid QC measurements at defined shear rates. Optional Peltier plate changes temperature much more quickly than bath/circulator. Test throughput increases dramatically.

BIOMASS: RST-CC with vane spindle in coax chamber measures biomass fluids used for biofuel production. Easily handles suspended solids and evaluates important flow properties by simulating what happens to the material during pumping in production.

CHOCOLATE: RST-CC is instrument of choice for select manufacturers who run 24/7 operations requiring robust, reliable performance. Choice of optional serrated bob (spindle). Conforms to DIN and ISO test methods which quantify yield stress and consistency using Casson analysis. Affordable alternative to higher priced rheometers.

DAIRY: RST-CC with double-gap geometry measures low viscosity (<0.1 Pa•s) dairy products ranging from skim milk to thicker creams.

GYPSUM: RST-SST is popular choice for measurement of joint compound manufactured by the gypsum industry in accordance with ASTM C474. Small footprint, data display in BU units, and robust design make it ideal for lab and production floor use.

PESTICIDES: RST-CC with double-gap geometry measures various low viscosity formulations (0.001 Pa•s) at shear rates up to 5,600 sec⁻¹. Provides reliable capability in a busy QC lab measuring dozens of samples each day.

PHARMACEUTICAL: RST-CPS with open plate design for easy sample placement accommodates a variety of small sample sizes (< 4mL) and rapid temperature control using the Peltier option. Produces quick profiling of flow behavior, including yield stress and creep, important properties for characterizing ointments.

PIGMENT DISPERSIONS: RST-CPS with Peltier is used by a range of industrial markets, including plastics and paints. Handles broad viscosity range from thin formulations (0.025 Pa•s) to non-flowing pastes. Broad shear rate capability simulates both processing of materials (pumping and mixing) and application of material (brushing and spraying).

SAUCES AND SYRUPS: RST-CPS with Peltier replaces traditional hour-long viscosity tests which measure product from a cooking vessel after it cools to room temperature. Peltier option cools sample to 25°C in less than 1 minute, greatly reducing test time.

SLUDGE/SLURRIES/CONCRETE: RST-SST with vane spindle geometry measures diverse mixtures with particulates ranging in concentration up to 70% solids.



RST-CPS Touch™ Rheometer

Cone/Plate & Plate/Plate Systems for small samples and wide shear rate ranges

Controlled shear stress/shear rate operation makes it easy to study material behavior from initial yield to flow curve response

User-friendly Touch Screen and graphical display for stand-alone operation

Quick Connect Coupling System for easy spindle attachment

Very Small Sample Size permits rapid test set up and clean up

Spindle Barcode for auto spindle recognition

Optional Rheo3000 Software allows for PC control and data acquisition/analysis of multiple test files

Automatic or Manual Gap Setting for quick and easy gap setting

Rapid Temperature Control of plate with Peltier option for quick profiling of viscosity vs. temperature



What's Included?

Instrument (with choice of water bath, Peltier or electric temperature control for sample plate)
Convenience Package (USB Flash Drive, Stylus, Cleaning Cloth, Screen Protector)

Optional Accessories

Choice of cone or plate spindle geometries at least one is required (p47)
Rheo3000 Software
Viscosity Standards (p53)
Water Baths (p33-35)
Solvent Trap
Choice of Thermal Barrier
- Teflon (0° - 200°C)
- Stainless Steel (7200°C)
KE Cooling Device



Choice of cone spindles and plate spindles accommodates all sample types. Plate spindles are used for highly-filled or very viscous samples.



Thermal Barrier reduces the effects of heat transfer to the environment. Two part chamber provides thermal isolation of the measurement zone.



The optional KE cooling device is required to cool viscometer bearings when testing with temperatures above 70°C.

MODEL	VISCOSITY RANGE (Pa•s)		SPEEDS
	Min.	Max.	RPM
RST-CPS Cone/Plate	0.0006	814K	0.01-1.3K
RST-CPS Plate/Plate	0.002	2.49M	0.01-1.3K

See page 47 for individual spindle (bob) ranges K = 1 thousand M = 1 million 1 Pa•s = 1000 cP (centipoise)

Temperature Control Options†		
MODEL	Description	Temperature
RST-CPS-FH	Bath	-20° to 200°C
RST-CPS-PA	Peltier Air	20° to 180°C*
RST-CPS-PO	Peltier Oil	0° to 180°C*
RST-CPS-EH	Electric	40° to 250°C

† Higher temperatures available on request. * 75mm plates cannot be used with Peltier systems. See page 47 for spindle ranges and sample volumes.

RST-CC Touch™ Rheometer

Coaxial Cylinder DIN Geometries for single point QC or full rheological profiling

Spindle Barcode
for auto spindle recognition

Controlled shear stress/shear rate
operation makes it easy to study material behavior from initial yield to flow curve response

Optional Rheo3000 Software
allows for PC control and data acquisition/analysis of multiple test files

Quick Connect Coupling
for easy bob (spindle) attachment

Rugged Design
permits use on production floor

Small sample size
facilitates rapid temperature control during testing

Temperature Control from -20°C to 180°C
Choice of
- Direct immersion in bath
- External circulation using the FTKY3 Water Jacket



Cone/Plate Accessory
provides extended range capability for shear rate and viscosity

What's Included?

Instrument with stand and adjustable height control with base
Convenience Package (USB Flash Drive, Stylus, Cleaning Cloth, Screen Protector)

Optional Accessories

- Choice of Coaxial Cylinder Bob (spindle) and Chamber at least one bob and chamber is required (p47)
- FTKY3 Water Jacket for Temperature Control
- Rheo3000 Software (p29)
- Viscosity Standards (p53)
- Cone/Plate Accessory (p27)
- KE Cooling Device (required for temperatures over 70°C)
- PT-E Immersion Temperature Sensor
- Disposable Chambers

Water Jacket



Chambers

Coaxial Cylinder Spindles



Double Gap Coaxial Cylinder for very low viscosity materials

MODEL	VISCOSITY RANGE (Pa•s)		SPEEDS
	Min.	Max.	RPM
RST-CC Coaxial Cylinder	.00005	5.41M	0.01-1.3K

See page 47 for individual bob/spindle ranges K = 1 thousand M = 1 million 1 Pa•s = 1000 cP (centipoise)

RST-SST Touch™ Rheometer

Soft Solids Tester for pastes, slurries and materials with particulates

Spindle Barcode

for auto spindle recognition

Measured Values

- Yield Stress
- Shear Modulus
- Recovery
- Creep

Optional Rheo3000 Software

allows for PC control and data acquisition/analysis of multiple test files

Quantifies meaningful properties

like stiffness, wobbliness, sloppiness, consistency and texture

Capable of measurements in BU units

for viscous materials such as joint compound

Vane Spindle Geometry

- Quick-Connect coupling
- Rapid spindle insertion without compromising sample structure
- Quick and easy test method

Coaxial Cylinders

can also be used for complete flow curve analysis



What's Included?

Instrument with base plate for sample placement and adjustable height control for rheometer head

Convenience Package (USB Flash Drive, Stylus, Cleaning Cloth, Screen Protector)

Optional Accessories

Choice of Spindle Geometries at least one is required:

- Vane (spindle)
 - Coaxial Cylinder Bob (spindle) & Chamber
- Rheo3000 Software (p29)
 Viscosity Standards (p53)
 Cone/Plate Accessory (p27)
 Thermosel System (p36-37)
 PT-E Immersion Temperature Sensor



Choice of several vane spindle options



RSS-90Y Spindle for BU measurements on joint compound and similar materials



Cone/Plate Accessory provides extended range capability for shear rate and viscosity

SHEAR STRESS (Pa)

MODEL	Min.	Max.
RST-SST Soft Solids Tester	0.2	218K

See pg. 47 for individual bob and vane spindle ranges K = 1 thousand Pa = Pascal

RST-CC & RST-SST Option Guide

choosing the correct spindles, chambers and other accessories for your application

Options for the RST-CC

Every Coaxial Cylinder system consists of the instrument, spindle and chamber. In order to assist with configuring an appropriate system, the following questions should be asked.

WHAT VISCOSITY RANGE DO YOU INTEND TO MEASURE?

Knowing the viscosity range will assist with selecting the most appropriate spindle geometry for your application.

RST Spindles		Refer to chart on page 47				
SPINDLE	VISCOSITY RANGE	Spindles				
COAXIAL	Pa•s	VISCOSITY RANGE	SHEAR RATE	MAX. SHEAR STRESS	SAMPLE VOLUME	
		Pa•s	sec ⁻¹	Pa	Pa	mL
CCT-DG	0.00005-4.07K	0.00005-4.07K	0.043-5.64K	177	15.7	
CCT-40	0.0003-27.6K	0.0003-27.6K	0.043-5.64K	79K	594	68.5
CCT-25	0.002-177K	0.002-177K	0.043-5.64K	87K	2,28K	16.8
CCT-14	0.012-1M	0.012-1M	0.043-5.64K	13K	3.4	
CCT-8	0.065-5.41M	0.065-5.41M	0.013-1.672K	69.6K	1.0	
MBT-25-1	0.005-407K	0.005-407K	0.06-7.8K	24.4K	0.1	
MBT-25-2	0.01-814K	0.01-814K	0.03-3.9K	24.4K	0.2	
RCT-50-1	0.0005-50.9K	0.0005-50.9K	0.06-7.8K	3.05K	1.0	
RCT-50-2	0.0012-101K	0.0012-101K	0.03-3.9K	3.05K	2.0	

EXAMPLE: CCT-25

HOW WILL YOU BE CONTROLLING TEMPERATURE?



MBT-25 & CCT-25

Stand-alone Chamber:

For viscosity testing at room temperature or direct immersion in temperature bath. Chamber must match the spindle.

CCT-25 Spindle:

For use with the MBT-25 chamber.



FTKY3 & MBT-25F

FTKY3 Water Jacket with chamber:

For temperature control of sample using circulating bath. MBT-25F Chamber inserts inside water jacket.

Use with CCT-25 Spindle:

Shown above.

DO YOU NEED THE DISPOSABLE CHAMBER OPTION?

Working with messy or sticky materials can be simplified by using disposable chambers. Contact Brookfield for details.

Options for the RST-SST

Every Soft Solids Tester can be used with coaxial cylinder geometries as well as with vane spindles. If using coaxial geometries, the same questions as in the prior section should be asked. The use of vane geometries does bring up additional considerations.

WHAT SHEAR STRESS RANGE IS APPROPRIATE FOR YOUR MATERIAL?

RST Vane Spindles		Refer to chart on page 47	
SPINDLE	VANE LENGTH	VANE DIAMETER	SHEAR STRESS
	mm	mm	Pa
VT-10-5	10	5	330-210K
		10	41-27K
VT-20-10	20	20	9-5.9K
		15	1.2-0.8K
VT-20-20	20	20	5.2-3.4K
		40	1.2-0.8K
VT-30-15	30	25	2.7-1.7K
		8	24-15K
VT-40-20	40	15	7-4.3K
		30	1.6-1K
VT-80-40	80	40	0.7-420
VT-80-70	80	70	0.2-120

Values based on minimum speed of 1 RPM and maximum speed of 1000 RPM. K = 1 thousand

EXAMPLE: VT-40-20 vane length = 40mm / width = 20mm

WHAT SAMPLE CONTAINER IS TO BE USED?



Container

For stand-alone testing you can use a beaker, your actual product container or any appropriately sized receptacle. Container size will impact shear rate.*

VT-40-20 Spindle:

Standard vane spindles have a long shaft.



*Our system assumes a container to Vane diameter ratio of 3 to 1 for a shear rate factor of 0.2355 sec⁻¹/rpm



MBT-25F or MBT-25

MBT-25F or MBT-25 Chamber:

Chamber may be used alone or with a water jacket and circulating bath.

VT-40-20MB Spindle:

Vane spindles with "MB" have a shorter shaft length to fit into coaxial chambers.



Rheo3000 Software

for quick and comprehensive data analysis capabilities with RST series Rheometers

Enhance your productivity

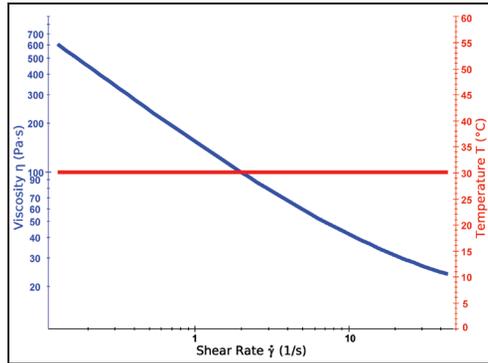
VIA PC CONTROL WHEN CHARACTERIZING MATERIAL RHEOLOGY

Your PC can do the detailed data collection and analysis work for you. Rheo3000 allows you to program the RST Rheometer and control shear stress or shear rate. Data is saved in a SQL database for easy access by multiple users on a network. Use multiple step test programs for complete characterization of material flow behavior: viscoelastic modulus, yield stress, viscosity flow curve, creep behavior, recovery. In addition, Rheo3000 provides automated analysis of fluid behavior against user-defined control limit values, resulting in better quality control. Mathematical data processing models included are: Newton, Bingham, Casson, Ostwald, Steiger-Ory, and Herschel-Bulkley. Helpful features include:

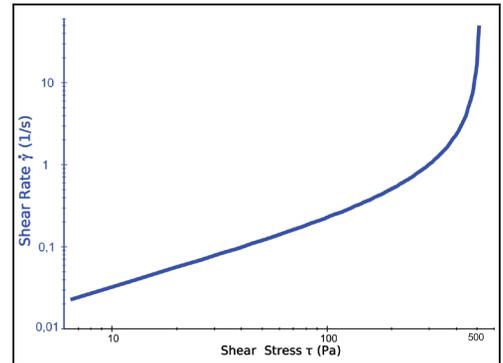
- 21 CFR compliance option for controlled user access and data security
- Active clock on screen shows test progress to completion
- Export reports in pdf format; choose parameters of interest, discard others

PC Requirements

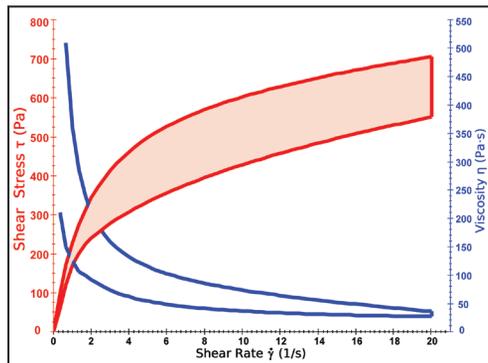
- 1.5 GHz Processor
- 1 GB System Memory
- 2.5 GB Hard Drive
- VGA Graphics Adapter (800 x 600 resolution)
- 1 USB port



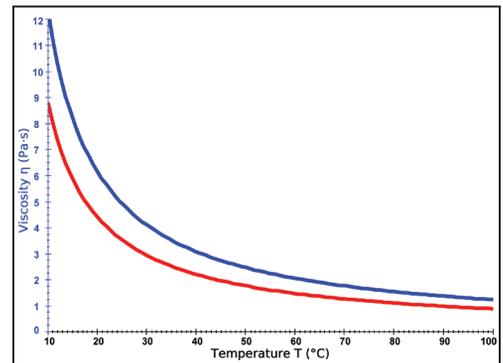
Viscosity Flow Curve: viscosity vs. shear rate graph shows pseudoplastic behavior while temperature remains constant at 30°C.



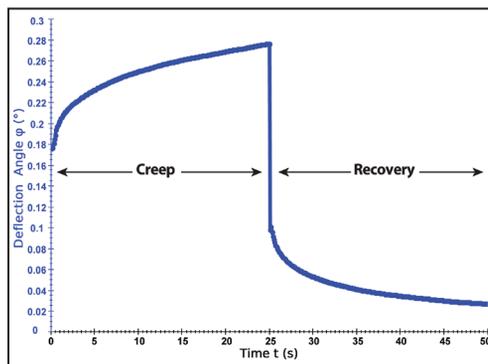
Yield Stress Determination: shear stress ramp from 0 to 1,000 Pa over 2 minutes shows yield stress values at 500 Pa.



Thixotropy Analysis: up/down shear rate ramp produces curves for shear stress vs. shear rate (red) and viscosity vs. shear rate (blue). Thixotropy calculation is the area between the red curves, approximately 2,000 Pa·s.



Viscosity vs. Temperature: viscosity is measured at constant shear rate while temperature increases from 10°C to 100°C for two test samples.



Creep /Recovery Behavior: material flow under constant stress is measured by detecting angular rotation of spindle; when constant stress is removed, recovery is measured by backward rotation of spindle.