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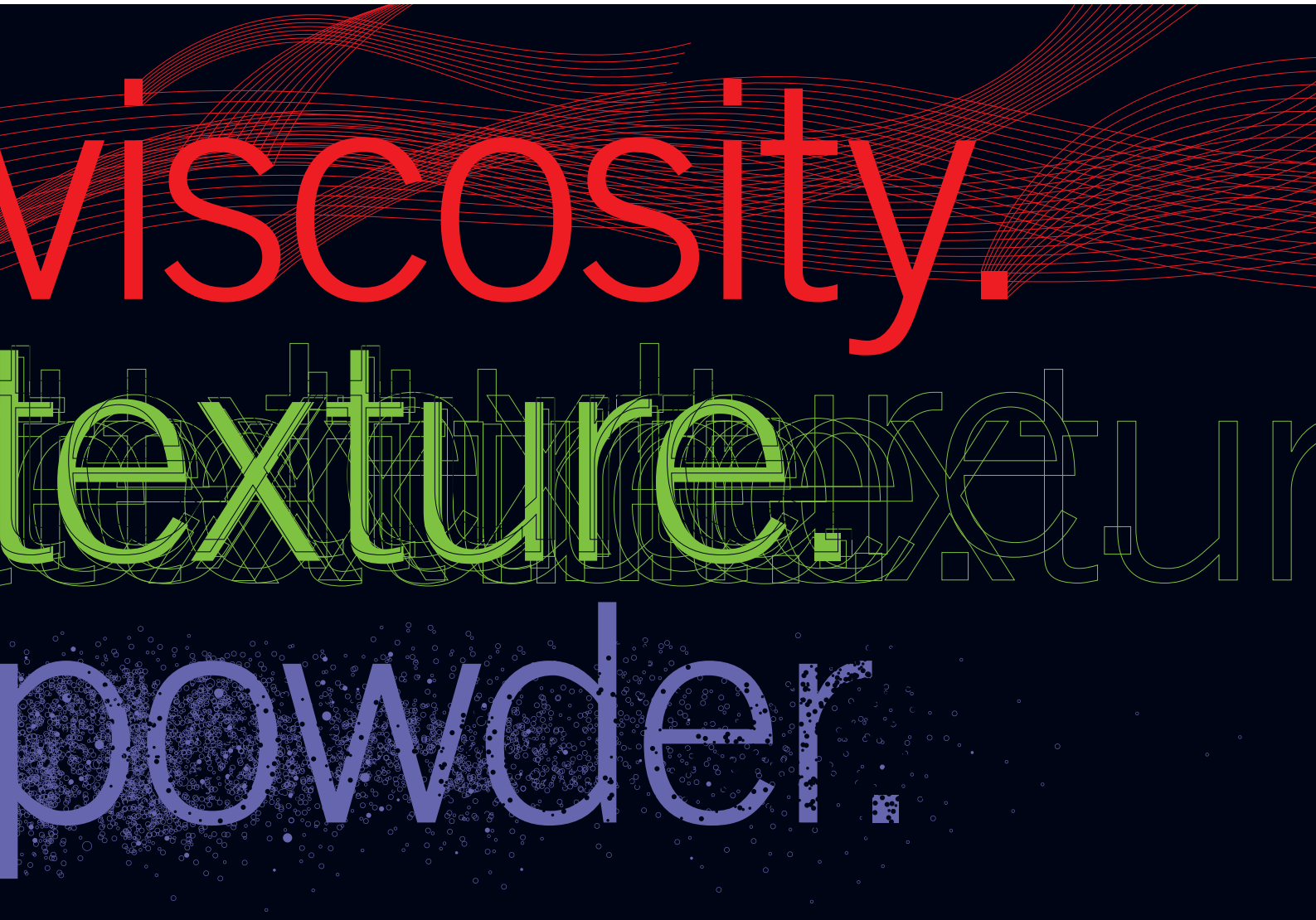
Brookfield 2011 Catalog



THINK BROOKFIELD

2011 VISCOMETERS RHEOMETERS TEXTURE ANALYZERS POWDER FLOW TESTERS

BROOKFIELD
ISO 9001 CERTIFIED

Index

To our customers,

World economics are as unpredictable as New England weather. Since we live today in a truly global economy, what happens in one major market affects all markets as never before. The financial crisis in the U.S. has had an impact across the globe that reflects this reality.

To be strong enough to survive the swings of our global economy, companies have to first be global in scope, and second, they must have the resources and stability to weather the storm. In 2009, we experienced a major recession which caused many companies, large and small, to restructure, greatly reduce staff, in some cases go bankrupt, experience huge losses, sell off major parts of the business, require government support, and so on.

Brookfield also felt the impact of the recession, but there was never any question about our position in our markets or our commitment to our customers. We continued to provide the highest quality and highest value products. We continued to give the best service and support available to our customers, and we continued to develop new and better products to address the needs of our customer base. We emerged a stronger and more dedicated supplier of scientific test equipment as a result of our world-wide efforts and our customers' loyalty to our brand and acceptance of our products.

We are not in control of world economics, but we know that to retain and enhance our reputation we are dedicated to continuing the efforts which created that reputation, regardless of the economic situation. Our customers can have the confidence and security of knowing that when they buy Brookfield products, they buy a future of service, support and quality that will always be available to them, in good times and in bad. This is our commitment to our customers, and we will work as in the past to be worthy of the support and opportunities our customers provide for us.

David Brookfield,
Chairman & CEO

TEL 800-628-8139 or 508-946-6200 **FAX** 508-946-6262 **www.brookfieldengineering.com**

This years highlights!

Small Volume Shear Cell for Powder Flow Tester

When limited sample size is an issue, use Small Volume Shear Cell which requires only 43cc of powder. Materials that are difficult or messy to handle, like inks, are also good candidates. Another advantage is the ability to generate higher consolidation stresses which simulate conditions in larger bins and silos.

New Selection of Test Fixtures for CT3 Texture Analyzer

Increased test capability for a broader range of materials is now possible with several new fixtures and probes. The baking industry will benefit from the dough stickiness and extensibility jigs as well as the FMBRA dough pot set. The dairy industry may wish to use the new curd probe. The surimi industry can take advantage of a dedicated test in the menu options in the CT3. (p60-61)

Texture Pro CT Software for CT3 Texture Analyzer

New release of this versatile software application enhances the test capabilities for surimi and gel strength, dairy products, gelatin materials and many more food industry products. Also new are tack testing calculations for pressure-sensitive adhesives. (p59)

USB for DV-III Rheometer

USB connectivity is now built into the DV-III Ultra Rheometer. Existing DV-III+ and Ultra Rheometers can be upgraded to incorporate the new USB port ; this requires service by your dealer for a nominal fee. Rheocalc and RheoLoader software have been upgraded to recognize the USB communications port. (p20)

New PFT Sieve Set

The PFT Sieve Set is custom designed to be placed on top of the Trough (choice of standard volume or small volume) and allow powder particles to flow easily into the annular space for testing. This eliminates clumps in materials to ensure reproducible test conditions.

Calibration Videos

A new series of videos covering calibration checks and how to verify accuracy are now available 24/7 in the “Support” section of Brookfield’s website: www.brookfieldengineering.com. Created by the same professional team who present our popular Practical Course seminars, these videos demonstrate the basics on how to perform calibration checks and what the results mean. (www.belusa.com)


viscome
rheome


eters
ters

Why measure viscosity?

The ability to gather data on a material's viscosity behavior gives manufacturers an important "product dimension." Knowledge of a material's rheological characteristics is valuable in predicting its pourability, its performance in a dipping or coating operation, or the ease with which it may be handled, processed, or used. The interrelation between rheology and other product dimensions often makes the measurement of viscosity the most sensitive or convenient way of detecting changes in color, density, stability, solids content, and molecular weight.

Why Choose Brookfield?

Ease of use, flexibility, reliable performance and quality of service have made Brookfield Viscometers favorites all over the world. All Brookfield Viscometers are accurate within ±1.0% of the range in use and have a reproducibility within ±0.2%. Test results can be duplicated anywhere in the world when the same model instrument is used.

Price

Choices for Instrumentation

This chart shows the Brookfield family of Laboratory Viscometers and Rheometers at a glance. This will help to give you a general idea of what is available before making a decision. The horizontal axis indicates performance capability and features while the vertical axis addresses price level.

Need to measure viscosity in-line? Brookfield also offers a complete line of process viscometers. (p78)

DV-I Prime Cone/Plate
- Torque

DV-E
- Calculates Viscosity
- Torque

DV-I Prime
- Optional Temp Probe
- Calculates Viscosity
- Torque

DV-I Prime Cone/Plate
- Small Sample Size
- Defined Shear Rate

DV-II+Pro
- Temp Probe
- RS232 (PC control)
- Calculates Viscosity
- Torque

DV-II+Pro Cone/Plate
- Small Sample Size
- Defined Shear Rate

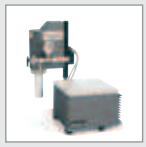
DV-III Ultra
- Stand Alone Programmable
- Temp Probe
- RS232 (PC control)
- Data Analysis
- Calculates Viscosity
- Torque
- Yield Stress

DV-III Ultra Cone/Plate
- Small Sample Size
- Defined Shear Rate

CAP 2000+ Cone/Plate
- Broad Shear Rate Range
- Peltier Plate Temp Control
- RS 232 (PC control)

R/S Coaxial Cylinder
- Controlled Stress & Rate
- Yield Stress
- Stand Alone Programmable
- Temp Probe
- RS232 (PC control)
- Calculates Viscosity
- Torque

R/S Cone/Plate
- Peltier Plate



PVS Rheometer
- Pressurized Sample Chamber
- Controlled Rate
- Temp Probe
- RS232 (PC control)
- Calculates Viscosity
- Torque

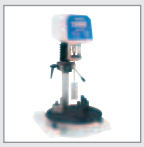
Performance

SPECIAL PURPOSE INSTRUMENTS

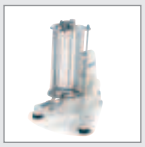
YR-1 Yield Test Rheometer
- Yield Stress

KU-2 Krebs
- KREBS Viscosity
- Required for Paint and Coatings

CAP 1000+ Cone/Plate
- Single Shear Rate
- Required for Paint and Coatings



R/S Soft Solids Tester
- Yield Stress
- Creep
- Recovery



Falling Ball Viscometer
- Viscosity
- Used for QC & Academic Institutions

Brookfield also offers several special purpose instruments which are used to perform a specific type of test or are used to evaluate certain types of materials.

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Questions to Consider

1. What is the viscosity range of your material: Low, medium, high?
2. What rotational speeds or shear rates are important?
3. How much sample is available for testing?
4. Is temperature measurement/control necessary?
5. Do you need to record the viscosity data?

The Selection Method

The Model Selection Table (shown at right) shows detailed information on standard Brookfield Viscometers/Rheometers, including the Dial Reading, DV-E, DV-I Prime, DV-II+Pro, and DV-III Ultra. The Applications Table (shown at lower right) shows information on typical applications of the standard Brookfield viscosity ranges. There may be industry or supplier/vendor specifications that you need to duplicate. Before making a final selection, we suggest that you confer with people in your industry to find out which Brookfield Viscometer they are using so that your data can be correlated. More application details may be found throughout this catalog for other Brookfield instruments on the following pages:

CAP1000+/2000+ Viscometers (p18-19)
PVS Rheometer (p22-23)
R/S Plus series Rheometers (p24-28)
YR-1 Rheometer (p30-31)
KU-2 Viscometer (p32)
Texture Analyzer (p56-61)

In addition, you may wish to call us and discuss your application or refer to our extensive library of technical papers which covers a complete spectrum of applications. We can also test your materials at Brookfield to recommend the instrument most suitable for your application.

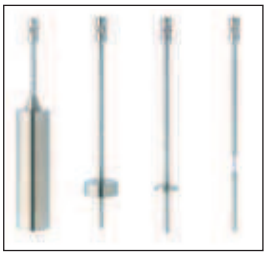
Spindles

Standard Brookfield Viscometers/Rheometers are supplied with a standard spindle set constructed of stainless steel (#302). Additional spindle options are available in #316 stainless steel or with Teflon coating for increased corrosion resistance. Other spindles and accessories are also available. (p45-48)

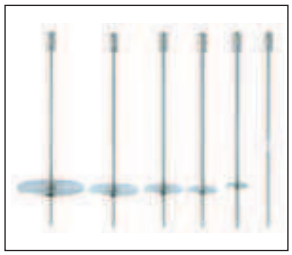
Cylindrical Spindles

Cylindrical spindles are particularly valuable when measuring non-Newtonian fluids and are applicable to any Brookfield Viscometer model with the use of appropriate range tables. Cylindrical spindles may be substituted for standard spindles upon request.

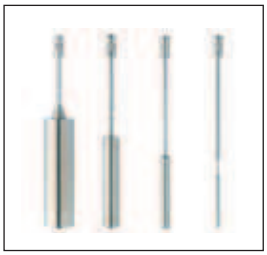
LV Spindle Set



RV/HA/HB Spindle Set



Optional Cylindrical Spindle Set



Need additional assistance? Our website, www.brookfieldengineering.com, contains additional information on the measurement selection process as well as detailed application notes.

Model Selection Table Brookfield Standard Viscometers/Rheometers

	**MODEL	Min. cP(mPa•s) VISCOSITY RANGE	Max. cP(mPa•s) VISCOSITY RANGE	NUMBER OF SPEEDS	# of Spindles Supplied
LOW VISCOSITY	**LVT**	1*	2 M	8	4
	LVDV-E	1*	2 M	18	4
	LVDV-IP	1*	2 M	18	4
	LVDV-II+P	1*	6 M	54 selectable	4
	LVDV-IIIU	1*	6 M	0.01 to 250	4
MEDIUM VISCOSITY	**RVT**	100	8 M	10	6
	RVDV-E	100	13 M	18	6
	RVDV-IP	100	13 M	18	6
	RVDV-II+P	100	40 M	54 selectable	6
	RVDV-IIIU	100	40 M	0.01 to 250	6
HIGH VISCOSITY	**HAT**	200	16 M	10	6
	HADV-E	200	26 M	18	6
	HADV-IP	200	26 M	18	6
	HADV-II+P	200	80 M	54 selectable	6
	HADV-IIIU	200	80 M	0.01 to 250	6
	HBT	800	64 M	10	6
	HBDV-E	800	104 M	18	6
	HBDV-IP	800	104 M	18	6
	HBDV-II+P	800	320 M	54 selectable	6
	HBDV-IIIU	800	320 M	0.01 to 250	6

** Standard torque range values M = 1 million
* Minimum ranges can be extended to as low as 1 cP with the use of Brookfield Accessories

Applications Table

Consider application and viscosity range when selecting model (LV, RV, HA, HB)

LV SERIES – LOW VISCOSITY

- Adhesives (solvent base)
- Biological Fluids
- Chemicals
- Cosmetics
- Dairy Products
- Hot Waxes
- Inks
- Juices
- Latex
- Oils
- Paints and Coatings
- Pharmaceuticals
- Photo Resist
- Polymer Solutions
- Rubber Solutions
- Solvents

RV SERIES – MEDIUM VISCOSITY

- Adhesives (hot melt)
- Asphalt (SHRP)
- Ceramic Slurries
- Creams
- Dairy Products
- Food Products
- Gums
- Inks (screen printing)
- Organisols
- Paints
- Paper Coatings
- Paper Pulp
- Plastisols
- Starches
- Surface Coatings
- Toothpaste
- Varnish

HA/HB SERIES – HIGH VISCOSITY

- Asphalt
- Caulking Compounds
- Chocolate
- Epoxies
- Gels
- Inks (ballpoint, offset, lithographic)
- Molasses
- Pastes
- Peanut Butter
- Putty
- Roofing Compounds
- Sealants
- Sheet Molding Compound
- Tars

DV-II+™Pro Viscometer

our most versatile continuous sensing viscometer

Displayed Info:
- Viscosity (cP or mPa•s)
- Temperature (°C or °F)
- Shear Rate/Stress
- % Torque
- Speed/Spindle

Built-in Options
- Timed Tests
- Choice of Units
- Choice of Speeds

Scroll Keys for Simple Selection of Speed & Spindle

54 selectable speeds provide superior range of viscosity/shear rate measurements

Accuracy: ±1.0% of range

Repeatability: ±0.2%

Built-in RTD Temperature Probe

Auto Range Showing
- Full Scale Range (FSR) at 100%
- Maximum viscosity measured with Spindle/Speed combination

Bi-directional RS-232 PC Interface provides optional computer control and automatic data gathering capability

Download custom test programs with DV Loader software (included with instrument)

What's Included?

Instrument
6 spindles (RV/HA/HB) (p45)
or 4 spindles (LV) (p45)
DV Loader software ▶
RTD Temperature Probe
Spindle Guard Leg*
Lab Stand (Model S) (p50)
Carrying Case
*Not applicable to HA or HB torque models

Optional Accessories

Rheocalc32 Software ▶
Wingather Software ▶
Ball Bearing Suspension (RV/HA/HB) (p50)
Viscosity Standards (p52)
RV/HA/HB-1 Spindle (p45)
EZ-Lock Spindle Coupling System (p50)
Quick Action Lab Stand (p50)
Temperature Bath (p33-35)
Small Sample Adapter (p38)
UL Adapter (p40)
Thermosel (p36)
Helipath Stand with T-bar Spindles (p42)
Spiral Adapter (p44)
DIN Adapter (p44)
Quick Connect/Extension Links (p49)
Vane Spindles (p43 & 48)
Protective Keypad Covers (p51)

	VISCOSITY RANGE cP(mPa•s)		SPEEDS	
MODEL	Min.	Max.	RPM	Number of Increments
LVDV-II+P	1†	6M	.01-200	54
RVDV-II+P	100††	40M	.01-200	54
HADV-II+P	200††	80M	.01-200	54
HBDV-II+P	800††	320M	.01-200	54

† 1 cP achieved with UL Adapter accessory. 15 cP on LV with standard spindles.
†† Minimum viscosity is achieved with optional RV/HA/HB-1 spindle.
M = 1 million cP = Centipoise mPa•s = Millipascal•seconds

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DV Loader Software Included

CREATE CUSTOM TESTS USING YOUR PC

DV Loader allows users to create repeatable custom tests with choices of parameters for speed, test duration, etc. to be downloaded from a PC to a DV-II+ Pro Viscometer. Disconnect the DV-II+Pro from the PC for secure, user-defined test methods.

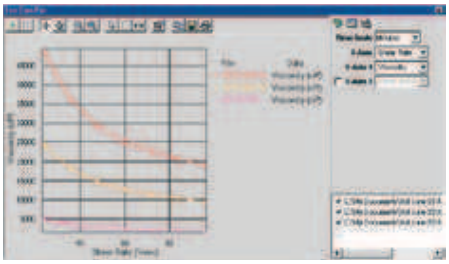
Connect DV-II+Pro to a PC to create up to 10 custom tests on your PC and then download test parameters to your viscometer

Rheocalc32 Software Optional

GET TOTAL CONTROL OF YOUR INSTRUMENT AND TEST PARAMETERS

Automatically control and collect data with Rheocalc32 and a dedicated computer. Rheocalc32 can analyze data, generate multiple plot overlays, print tabular data, run math models and perform other time-saving routines. Data can be saved in the program or exported to Excel.

- Controls test parameters with powerful scripting capabilities
- Wizard for self-guiding creation of test programs
- Looping functions for repetitive tasks
- Automates data collection to save time
- Math modeling for yield stress calculations, plastic index
- Plot up to four data sets for comparisons

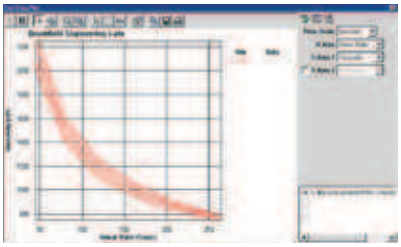


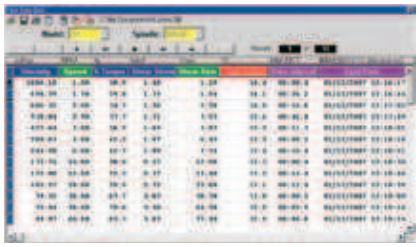
Wingather Software Optional

DATA COLLECTION SOFTWARE TO COLLECT, ANALYZE AND RECORD TEST DATA

Wingather software provides an easy way to gather data and plot graphs while creating permanent test records. Data can be saved in the program or exported to Excel.

- Automates data collection to save time
- Reduces operator error
- Math modeling for yield stress calculations, plastic index
- Plot up to four data sets for comparisons





DV-II+Pro CP

The DV-II+Pro is available in a Wells/Brookfield Cone & Plate Version

Must be ordered when instrument is first purchased. (p16)

DV-II+Pro EXTRA™ Viscometer

The “EXTRA” combines all the versatile viscosity testing capabilities of a DV-II+Pro with time and money saving features such as a durable ball bearing suspension system, EZ-Lock Spindle Coupling, Quick Action Lab Stand and FREE Rheocalc software.

DV-I™ Prime Viscometer

The only viscometer in its class to offer continuous sensing and data display!

Displayed Info:
- Viscosity (cP or mPa•s)
- % Torque
- Speed/Spindle
- Temperature (°C or °F)

  if optional RTD Temperature Probe is installed

RS-232 PC interface for use with optional Wingather Software

Analog outputs for recording torque and temperature

18 speeds
provide great range capability

Direct access to time measurement function (time to torque, time to stop)

Accuracy: ±1.0% of range

Repeatability: ±0.2%

Output connection to printer

Auto Range Showing
- Full Scale Range (FSR) at 100%
- Maximum viscosity measured with Spindle/Speed combination

Scroll Keys for Simple Selection of Speed & Spindle

Optional RTD Temperature Probe DVP-94Y
Instrument must be configured upon purchase.

Temperature off-set
capability to ±1°C

What's Included?

Instrument
6 spindles (RV/HA/HB) (p45)
or 4 spindles (LV) (p45)
Spindle Guard Leg*
Lab Stand (Model S) (p50)
Carrying Case
*Not applicable to HA or HB torque models

Optional Accessories

Wingather Software ▶
RTD Temperature Probe
Ball Bearing Suspension (RV/HA/HB) (p50)
Viscosity Standards (p52)
RV/HA/HB-1 Spindle (p45)
Quick Action Lab Stand (p50)
EZ-Lock Spindle Coupling System (p50)
Temperature Bath (p33-35)
Small Sample Adapter (p38)
UL Adapter (p40)
Thermosel (p36)
Helipath Stand with T-bar Spindles (p42)
Spiral Adapter (p44)
DIN Adapter (p44)
Quick Connect/Extension Links (p49)
Vane Spindles (p43 & 48)
Protective Keypad Covers (p51)

	VISCOSITY RANGE cP(mPa•s)		SPEEDS	
MODEL	Min.	Max.	RPM	Number of Increments
LVDV-IP	1*	2M	.3-100	18
RVDV-IP	100	13M	.3-100	18
HADV-IP	200	26M	.3-100	18
HBDV-IP	800	104M	.3-100	18

* Minimum ranges can be extended to as low as 1 cP with the use of Brookfield Accessories
** Standard torque range values
M = 1 million cP = Centipoise mPa•s = Millipascal•seconds

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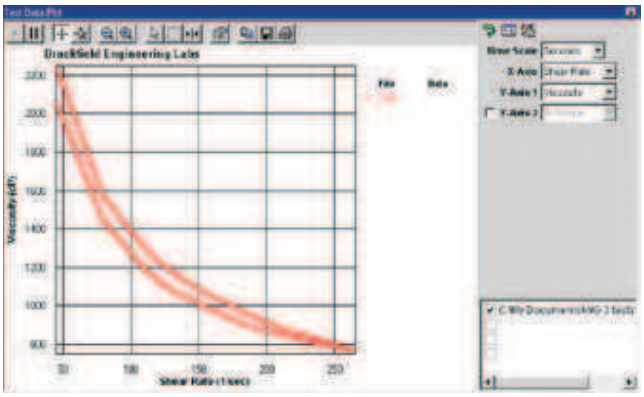
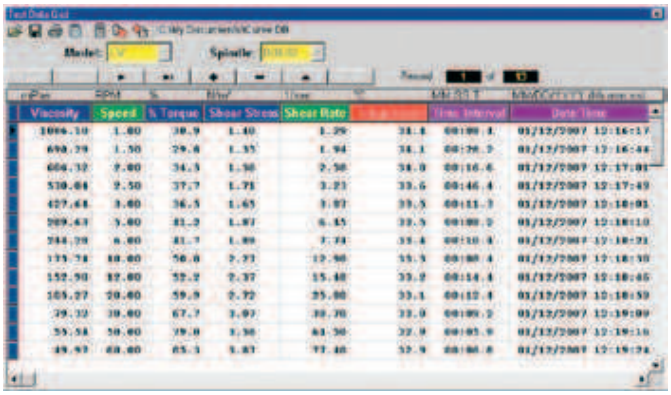
Wingather Software Optional

DATA COLLECTION SOFTWARE TO COLLECT, ANALYZE AND RECORD TEST DATA

Wingather software provides an easy way to gather data and plot graphs while creating permanent test records. Data can be saved in the program or exported to Excel.

- Automates data collection to save time
- Reduces operator error
- Math modeling for yield stress calculations, plastic index
- Plot up to four data sets for comparisons





DV-I Prime CP

The DV-I Prime is available in a Wells/Brookfield Cone & Plate Version

Must be ordered when instrument is first purchased. (p16)

DV-E™ Viscometer

our lowest cost digital viscometer

No calculations required
- Direct reading of viscosity in cP or mPa•s

Displayed Info:
- Viscosity (cP or mPa•s)
- % Torque
- Speed/Spindle

Easy-to-Use:
- Flip a switch
- Turn a knob

Spindle/Speed
Selection

Flip to "Speed"
- Turn the knob
- Choose RPM

Flip to "Spindle"
- Turn the knob
- Choose spindle

Auto Range
push for determining full scale range (FSR) viscosity

18 Speeds for complete range capability

Accuracy: ±1.0% of range

Repeatability: ±0.2%

What's Included?

Instrument
6 spindles (RV/HA/HB) (p45)
or 4 spindles (LV) (p45)
Spindle Guard Leg*
Lab Stand (Model A) (p50)
Carrying Case
*Not applicable to HA or HB torque models

Optional Accessories

Viscosity Standards (p52)
RV/HA/HB-1 Spindle (p45)
Quick Action Lab Stand (p50)
Temperature Bath (p33-35)
Small Sample Adapter (p38)
UL Adapter (p40)
Thermosel (p36)
Helipath Stand with T-bar Spindles (p42)
Spiral Adapter (p44)
DIN Adapter (p44)
Quick Connect/Extension Links (p49)
Vane Spindles (p43 & 48)

	VISCOSITY RANGE cP(mPa•s)		SPEEDS	
MODEL	Min.	Max.	RPM	Number of Increments
LVDV-E	1†	2M	.3-100	18
RVDV-E	100††	13M	.3-100	18
HADV-E	200††	26M	.3-100	18
HBDV-E	800††	104M	.3-100	18

† 1 cP achieved with UL Adapter accessory. 15 cP on LV with standard spindles.
†† Minimum viscosity is achieved with optional RV/HA/HB-1 spindle.
M = 1 million cP = Centipoise mPa•s = Millipascal•seconds

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Dial Reading Viscometer

our original...over 75 years!

The Worldwide Standard
Viscometer

Easy–to–Select Speeds

Electronic Drive
means quiet,
reliable operation

Analog display
- Shows % Torque
- Use Factor Finder to convert reading to centipoise

Simple-to-use,
easy setup

2–Year Limited Warranty

Available in explosion proof
U.L. Class 1, Group D locations
(w/o Electronic Drive)

Accuracy: ±1.0% of range

Repeatability: ±0.2%

What's Included?

Instrument
6 spindles (RV/HA/HB) (p45)
or 4 spindles (LV) (p45)
Spindle Guard Leg*
Lab Stand (Model A) (p50)
Carrying Case
*Not applicable to HA or HB torque models

Optional Accessories

Viscosity Standards (p52)
RV/HA/HB-1 Spindle (p45)
Quick Action Lab Stand (p50)
Temperature Bath (p33-35)
Small Sample Adapter (p38)
UL Adapter (p40)
Thermosel (p36)
Helipath Stand with T-bar Spindles (p42)
Spiral Adapter (p44)
DIN Adapter (p44)
Quick Connect/Extension Links (p49)
Vane Spindles (p43 & 48)

	VISCOSITY RANGE cP(mPa•s)		SPEEDS	
MODEL	Min.	Max.	RPM	Number of Increments
LVT	1†	2M	.3-60	8
RVT	100††	8M	.5-100	10
HAT	200††	16M	.5-100	10
HBT	800††	64M	.5-100	10

† 1 cP achieved with UL Adapter accessory. 15 cP on LV with standard spindles.
†† Minimum viscosity is achieved with optional RV/HA/HB-1 spindle.
M = 1 million cP = Centipoise mPa•s = Millipascal•seconds

Easy Speed Adjustment and On/Off Control

Falling Ball Viscometer

...Newtonian measurements made simple and easy!

The Brookfield Falling Ball Viscometer uses the simple — but precise — Höppler principle to measure the viscosity of Newtonian liquids by measuring the time required for a ball to fall under gravity through a sample-filled tube.

Set of six balls to test a wide variety of samples

Connection to circulating bath for temperature control of sample

Temperature Probe

Pivot bearing allows for quick and easy tube rotation for repeat test

Model KF20 (shown) variable angle allows for greater viscosity range

Model KF10 (also available) fixed angle complies with DIN 53015

Viscosity Range:
0.5 to 70,000 mPa•s (cP)

Accuracy:
0.5% to 2.0% (depending on ball used)

What's Included?

Instrument
Set of six (6) balls
Temperature Probe
Carrying Case

Optional Accessories

Temperature Bath (p33-35)
Viscosity Standards (p52)
Special Temperature Probes

Applications

Beverages
Coatings
Cosmetics
Detergents
Food
Paint
Petroleum Products
Pharmaceuticals
Polymers
Soap

TEL 800-628-8139 or 508-946-6200 **FAX** 508-946-6262 **www.brookfieldengineering.com**

How It Works

The Falling Ball Viscometer is based on the measuring principle by Höppler for simple but precise dynamic viscosity measurement of transparent Newtonian fluids. The basic concept is to measure the elapsed time required for the ball to fall under gravity through a sample-filled tube inclined at an angle*. The tube is mounted on a pivot bearing which quickly allows rotation of the tube 180 degrees, thereby allowing a repeat test to run immediately. Three measurements are taken and the average time it takes for the ball to fall is the result. A conversion formula turns the time reading into a final viscosity value.

The Falling Ball Viscometer is used for quality control in various industries as well as in academic institutions to illustrate scientific method. The ease of use and straightforward method for recording time measurements ensures meaningful test results.

*Model KF10 has a fixed angle of 80 degrees; Model KF20 can be angled at 50, 60, 70 and 80 degrees.

SPECIFICATIONS		
Viscosity Range:	0.5 mPa•s (cP) to 70,000 mPa•s (cP)	
Accuracy:	0.5% - 2.0% depending on choice of ball	
Ball set Material of Construction:		
	Balls 1 and 2:	Boron Silicate Glass
	Balls 3 and 4:	Nickel-iron
	Balls 5 and 6:	Steel
Ball Diameter:	11.0 mm to 15.81 mm	
Fall Time of Ball in Measurement:	30 to 300 seconds**	
Length of Measurement Zone in the Tube:	100 mm	
Operating Temperature Range:	-60°C to +150°C	
Sample Tube Volume:	40mL	
Viscometer Dimensions:	180 x 220 x 330 mm	

**Falling times greater than 300 seconds allow measurement of liquids above 70,000 mPa•s (cP)

Ball Set with Case

The Falling Ball Viscometer comes complete with a set of six (6) balls. See Specifications for material construction.

KF20 with Bath

Use with a Brookfield Circulating Bath permits rapid temperature control of sample for more accurate and repeatable results.

Wells/Brookfield™ Cone & Plate

for small samples

Determine absolute viscosity
of small samples (0.5 – 2.0 mL)

Available in these models
- DV-III Ultra Rheometer
- DV-II+Pro Viscometer
- DV-I Prime Viscometer

Accuracy: ±1.0% of range

Repeatability: ±0.2%

Electronic Gap Adjustment™
- Simplified setup
- Accurate
- Easy-to-use

RTD Temperature Sensor
in Sample Cup (Optional) provides direct measurement of sample temperature

Control Sample Temperature
using a Brookfield circulating water bath (p27)

Rapid temperature control
due to small sample size

Temperature Range:
- 10°C to 100°C

Precise shear rates
for determining a material's flow curve behavior

What's Included?

Instrument
Lab Stand (p50)
Choice of one Cone Spindle (p46)
Sample Cup (p46)

Optional Accessories

Embedded Temperature Probe in Sample Cup (p46)
Luer and Purge fittings
Ball Bearing Suspension (p50)
Additional Cone Spindles (p46)
Viscosity Standards (p52)
Circulating Temperature Bath (p33-35)
Rheocalc32 Software ▶ (DV-III+ Ultra & DV-II+Pro only)
Wingather Software ▶ (DV-II+Pro only)
Protective Keypad Covers (p51)

Viscosity Range* cP(mPa•s)

MODEL	Cone Spindle: CPE-40 Sample Volume: .5mL Shear Rate (sec^{-1}): 7.5N	Cone Spindle: CPE-41 Sample Volume: 2.0mL Shear Rate (sec^{-1}): 2.0N	Cone Spindle: CPE-42 Sample Volume: 1.0mL Shear Rate (sec^{-1}): 3.84N	Cone Spindle: CPE-51 Sample Volume: .5mL Shear Rate (sec^{-1}): 3.84N	Cone Spindle: CPE-52 Sample Volume: .5mL Shear Rate (sec^{-1}): 2.0N	SPEEDS RPM	SPEEDS Number of Increments
LVDV-IIIUCP	.1 - 3K	.5 - 11K	.2 - 6K	2 - 48K	3 - 92K	.01 - 250	2.6K
LVDV-II+PCP	.2 - 3K	.6 - 11K	.3 - 6K	2 - 48K	4 - 92K	.01 - 200	54
LVDV-IPCP	.3 - 1K	1 - 3K	.6 - 2K	5 - 16K	9 - 30K	0.3 - 100	18
RVDV-IIIUCP	1 - 32K	5 - 122K	2 - 64K	20 - 512K	39 - 983K	.01 - 250	2.6K
RVDV-II+PCP	1.6 - 32K	6 - 122K	3 - 64K	25 - 512K	49 - 983K	.01 - 200	54
RVDV-IPCP	3 - 10K	12 - 41K	6 - 21K	51 - 170K	98 - 327K	0.3 - 100	18
HADV-IIIUCP	2.6 - 65K	10 - 245K	5 - 128K	41 - 1M	78 - 2M	.01 - 250	2.6K
HADV-II+PCP	3 - 65K	12 - 245K	6 - 128K	51 - 1M	98 - 2M	.01 - 200	54
HADV-IPCP	6.6 - 21K	24 - 81K	12 - 42K	102 - 341K	196 - 655K	0.3 - 100	18
HBDV-IIIUCP	10.5 - 261K	39 - 982K	20 - 512K	163 - 4M	314 - 7.8M	.01 - 250	2.6K
HBDV-II+PCP	13 - 261K	49 - 982K	25.6 - 512K	204 - 4M	393 - 7.8M	.01 - 200	54
HBDV-IPCP	26 - 87K	98 - 327K	51 - 170K	409 - 1M	786 - 2.6M	0.3 - 100	18

M = 1 million K = 1 thousand cP = Centipoise mPa•s = Millipascal•seconds mL = Milliliter N = RPM e.g. Spindle CPE-40 7.50 x 10 (rpm) = 75.0 sec^{-1}

* Dependant upon cone selected.

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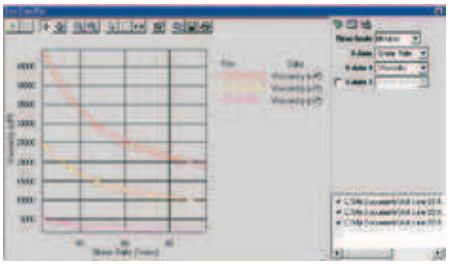
Rheocalc32 Software Optional

GET TOTAL CONTROL OF YOUR INSTRUMENT AND TEST PARAMETERS

Automatically control and collect data with Rheocalc32 and a dedicated computer. Rheocalc32 can analyze data, generate multiple plot overlays, print tabular data, run math models and perform other time-saving routines. Data can be saved in the program or exported to Excel.

- Controls test parameters with powerful scripting capabilities
- Wizard for self-guiding creation of test programs
- Looping functions for repetitive tasks
- Automates data collection to save time
- Math modeling for yield stress calculations, plastic index
- Plot up to four data sets for comparisons

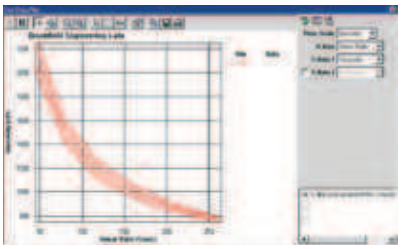


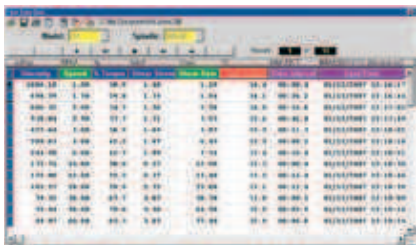
Wingather Software Optional

DATA COLLECTION SOFTWARE TO COLLECT, ANALYZE AND RECORD TEST DATA

Wingather software provides an easy way to gather data and plot graphs while creating permanent test records. Data can be saved in the program or exported to Excel.

- Automates data collection to save time
- Reduces operator error
- Math modeling for yield stress calculations, plastic index
- Plot up to four data sets for comparisons





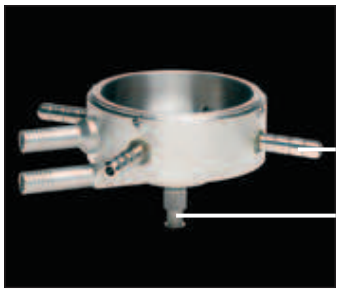
Electronic Gap LED's

Vernier Adjustment Ring

Cone Spindle

Cup

Optional Embedded Temperature Probe (not shown) for direct temperature measurement of sample



Purge Fittings

choice of 2, 3, or 4

Luer Fitting

for sample inlet

Optional Sample Cup

The Optional Sample Cup has luer and purge fittings for introducing and removing test sample while cup remains attached to instrument

CAP 1000+™ & CAP 2000+™

Cone & Plate Viscometers

Keypad for direct input of test parameters

Cone Spindle is easily removed for cleaning

Easy–to–Use Control Handle for accurate, automatic cone positioning

Designed to handle repetitive testing in production environments with easy setup and cleaning

4–Line Display allows simultaneous viewing of all test parameters

Choice of instruments:
CAP1000+ (single speed)
CAP2000+ (variable speed)

Automatic cone/gap positioning

Small sample size less than 1 mL

Built-in Peltier Plate for temperature control of sample:
L Series: 5°C — 75°C
H Series: 50°C — 235°C

What's Included?

Instrument
Choice of Torque Range:
High Torque (ICI Specification): 181,000 dyne • cm
Low Torque: 7,970 dyne • cm
Choice of One Cone Spindle (p42)
Choice of Temperature Control: L or H

Optional Accessories

CAP Viscosity Standards (p53)
Additional Cone Spindle (p46)
Capcalc32 Software ▶
Protective Keypad Covers (p51)

CAP1000+

Single speed 750 or 900 rpm instrument, ideal for QC. Optional choice of alternative speed is available upon request. See examples below at 400 rpm and 100 rpm.

CAP2000+

Variable speed 5-1000 rpm instrument ideal for R&D as well as more detailed QC testing. Automated PC control (using optional Capcalc32 software).

	VISCOSITY RANGE cP(mPa•s)		SPEEDS	
MODEL	Min.	Max.	RPM	Number of Increments
CAP 1000+	see chart on		900/750	2
CAP 2000+	(p15)		5-1K	995

* Dependant on cone selected.
M = 1 million K = 1 thousand cP = Centipoise mPa•s = Millipascal•seconds

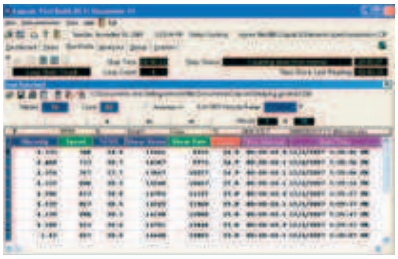
TEL 800-628-8139 or 508-946-6200 **FAX** 508-946-6262 **www.brookfieldengineering.com**

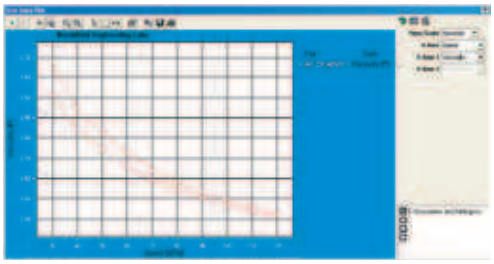
Capcalc32 Software Optional

TURN YOUR CAP2000+ VISCOMETER INTO A MORE POWERFUL RHEOMETER

Capcalc32 allows control of the CAP2000+ Viscometer while providing automatic data capture and graphical display. Automate your CAP 2000+ Viscometer and generate flow curves quickly and easily.

- Controls test parameters with powerful scripting capabilities
- Looping functions for repetitive tasks
- Automates data collection to save time
- Reduces operator error
- Math modeling for yield stress calculations, plastic index
- Plot up to four data sets for comparisons





Applications

MEDIUM VISCOSITY

Adhesives (hot melt)
Architectural Coatings
Autocoats (Hi-performance)
Creams
Food Products
Gels
Gums
Coatings
Industrial Coatings
Inks (screen printing)
Organisols
Paints
Paper Coatings
Plastisols
Resins
Starches
Surface
UV Coatings
Varnish

HIGH VISCOSITY

Adhesives
Asphalt
Compound
Chocolate
Composite Polymers
Epoxies
Gels
Inks (ballpoint, offset, lithographic)
Molasses
Pastes
Roofing Compounds
Sealants
Sheet Molding
Tars
Vinyl Esters

Perfect for Paints & Coatings

Meets Industry Standards:
ASTM D4287, ISO 2884, BS 3900
High Shear Rate Cone & Plate
(10,000 sec^{-1})

CAP Cone Viscosity Ranges (Poise)

MODEL HIGH TORQUE	Shear Rate (sec^{-1}): 13.3N Sample Volume: 67µL Cone Spindle: CAP-01	Shear Rate (sec^{-1}): 13.3N Sample Volume: 38µL Cone Spindle: CAP-02	Shear Rate (sec^{-1}): 13.3N Sample Volume: 24µL Cone Spindle: CAP-03	Shear Rate (sec^{-1}): 3.3N Sample Volume: 134µL Cone Spindle: CAP-04	Shear Rate (sec^{-1}): 3.3N Sample Volume: 67µL Cone Spindle: CAP-05	Shear Rate (sec^{-1}): 3.3N Sample Volume: 30µL Cone Spindle: CAP-06	Shear Rate (sec^{-1}): 2.0N Sample Volume: 1700µL Cone Spindle: CAP-07	Shear Rate (sec^{-1}): 2.0N Sample Volume: 400µL Cone Spindle: CAP-08	Shear Rate (sec^{-1}): 2.0N Sample Volume: 100µL Cone Spindle: CAP-09	Shear Rate (sec^{-1}): 5.0N Sample Volume: 170µL Cone Spindle: CAP-10
1000+ @750rpm	.25-2.5	.5-5	1-10	2-20	4-40	10-100	N/A	N/A	N/A	N/A
1000+ @900rpm	.2-2	.4-4	.8-8	1-16	3-33	8-83	N/A	N/A	N/A	N/A
1000+ @400rpm	.375-4.6	.75-9.3	1.5-18.7	3-37.5	6-75	15-187	.78-7.81*	3.13-31.3*	12.5-125*	1-10*
2000+ @5-1000rpm	.2-375	.4-750	.8-1.5K	1-3K	3-6K	8-15K	.78-625*	3.13-2.5K*	12.5-10K*	1-1K*
LOW TORQUE (for applications requiring low shear rates for low/medium viscosity fluids, an optional low torque 797-7,970 dyne•cm instrument can be ordered)										
1000+ @100rpm†	.2-.81	.2-1.6	.33-3.3	.65-6.5	1.3-13	3.3-33	.13-1.3	.54-5.4	2.2-22	.22-2.2
2000+ @5-1000rpm	.2-16	.2-32	.2-66	.2-130	.2-260	.2-660	.2-26	.2-108	.2-440	.2-44

µL = microLiter K = 1 thousand P = poise 1 Pa•s = 10 poise N = RPM e.g. Cone CAP-01 13.3 x 10 (rpm) = 133 sec^{-1}
*Maximum speed recommended with this spindle is 400 rpm. Viscosity range indicated is for operation at 400 rpm. †Special speed instrument.
Note: Viscosity ranges shown above are for illustration. The exact range will depend upon instrument configuration.

DV-III™ Ultra Rheometer

for measuring viscosity and yield stress

The "all-in-one" tool
to easily predict a material's complete flow behavior

Displayed Info:
- Viscosity (cP or mPa•s)
- Temperature (°C or °F)
- Shear Rate/Stress
- % Torque
- Speed/Spindle
- Step Program Status
- Math Model Calculations

2600 Speeds to characterize a wide range of flow behavior

Built-in math models for data analysis in stand-alone mode. E.g. Casson, Bingham, Power Law

Analyze characteristics such as yield stress, flow curves, (mixing, pumping, spraying), leveling and recovery

Download custom test programs with RheoLoader software (included with instrument)

Bi-directional RS-232 PC interface provides optional computer control and automatic data gathering capability

Complete computer control using optional Rheocalc32 software lets you control all aspects of rheological testing directly from the computer

Stand-alone programming:
Enter test method steps, temperature requirements, start program, see results on built-in display

Built-in RTD Temperature Probe

Accuracy: ±1.0% of range

Repeatability: ±0.2%

USB Connectivity

What's Included?

Instrument
6 spindles (RV/HA/HB) (p45)
or 4 spindles (LV) (p45)
RheoLoader software ▶
EZ-Yield Software ▶
RTD Temperature Probe
Spindle Guard Leg*
Lab Stand Base
Carrying Case
*Not applicable to HA or HB torque models

Optional Accessories

Rheocalc32 Software ▶
Ball Bearing Suspension (p50)
Viscosity Standards (p52)
RV/HA/HB-1 Spindle (p45)
EZ-Lock Spindle Coupling System (p50)
Temperature Bath (p33-35)
Small Sample Adapter (p38)
UL Adapter (p40)
Thermosel (p36)
Helipath Stand with T-bar Spindles (p42)
Spiral Adapter (p44)
DIN Adapter (p44)
Quick Connect/Extension Links (p49)
Vane Spindles (p43 & 48)
Protective Keypad Covers (p51)

	VISCOSITY RANGE cP(mPa•s)		SPEEDS	
MODEL	Min.	Max.	RPM	Number of Increments
LVDV-IIIU	1†	6M	.01-250	2.6K
RVDV-IIIU	100††	40M	.01-250	2.6K
HADV-IIIU	200††	80M	.01-250	2.6K
HBDV-IIIU	800††	320M	.01-250	2.6K
5xHBDV-IIIU	4K	1.6B	.01-250	2.6K

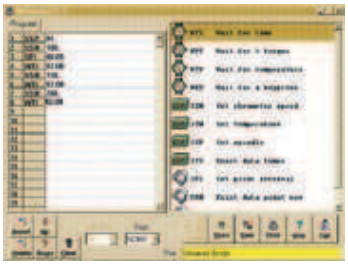
† 1 cP achieved with UL Adapter accessory. 15 cP on LV with standard spindles.
†† Minimum viscosity is achieved with optional RV/HA/HB-1 spindle.
B = 1 billion M = 1 million K = 1 thousand cP = Centipoise
mPa•s = Millipascal•seconds

TEL 800-628-8139 or 508-946-6200 FAX 508-946-6262 www.brookfieldengineering.com

RheoLoader Software Included

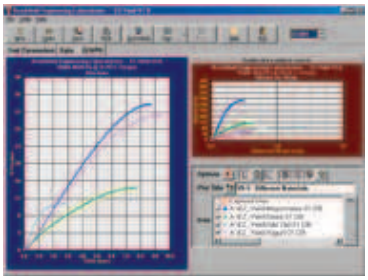
CUSTOMIZE YOUR TEST CRITERIA FOR ROUTINE PRODUCT QC

This exclusive Brookfield software allows you to create customized programs for your instrument, each with as many as 50 commands. Once a program is downloaded from a host computer, comprehensive viscosity tests can be run automatically in stand-alone mode.



EZ-Yield Software Included

Yield tests can be performed with EZ-Yield software and vane spindles.



TORQUE RANGE	SHEAR STRESS RANGE	
	Pa	dyne/cm^2
LV	Contact Brookfield	
RV	.5-100	5-1K
HA	1-200	10-2K
HB	4-800	40-8K
5xHB	20-4K	200-40K

Rheocalc32 Software Optional

GET TOTAL CONTROL OF YOUR INSTRUMENT AND TEST PARAMETERS

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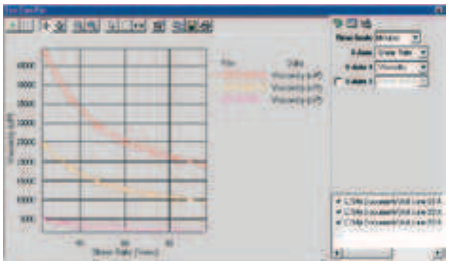


DV-III Ultra CP

The DV-III Ultra is available in a Wells/Brookfield Cone & Plate Version

Must be ordered when instrument is first purchased. (p16)

The instrument shown is a DV-III Ultra. These spindles also work well with other Brookfield Viscometers.

PVS™ Rheometer

1' x 1' x 2' instrument for portable site-to-site mobility

Robust Motor
capable of speeds up to 1000 rpm

Quick and easy setup
in minutes

Safety Relief Valve
1000psi (high pressure)

Avoids sample boil-off

Couette Geometry
Outside Cylinder Rotates, "Bob" inside remains stationary, generating shear rates up to 1700 sec^{-1}

RTD on the inner cylinder
insures accurate sample temperature measurement

Test to industry standards

Vacuum to high pressure
measurements up to 1,000 psi

Hastelloy C cup and bobs
for operation in severe field environments

Low Shear Rate Viscosity (LSRV)
measurement to .02 sec^{-1}

Temperature conditions:
from -40°C to +260°C

What's Included?

Instrument
Choice of spindle (bob) (p41)
Sample Cup (p41)
RheoVision software ▶
Carrying Case ▶

Optional Accessories

Viscosity Standards (p52)
Additional spindle (bobs) (p47)
Computer
Temperature Control Bath
Thermo Bath (shown below)

Available with triple annulus geometry for increased sensitivity when measuring low viscosity fluids

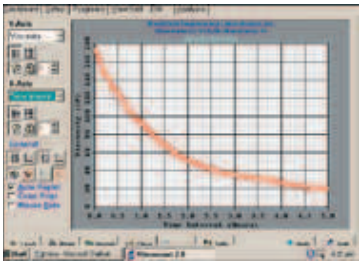
TEL 800-628-8139 or 508-946-6200 **FAX** 508-946-6262 **www.brookfieldengineering.com**

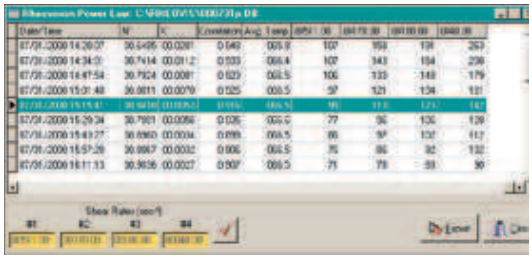
RheoVision® Software Optional

FOR AUTOMATION AND CONTROL OF ALL TEST PARAMETERS

Specifically designed for sophisticated rheological analysis, RheoVision makes viscosity measurement under pressurized and temperature controlled conditions an easy task. Powerful scripting language provides simple to complex data collection programs including automatic calculation of yield stress using Bingham, Herschel-Bulkley, Power Law equations.

- Enhanced graphing capabilities
- Instantaneous flow curves
- Built in math modeling
- User-friendly ramp wizard for quick API testing
- Seal history tracking feature





Applications

Fracturing Fluids
Petroleum Products
Drilling Muds
Black Liquor
Volatile Chemicals

PVS Rheometer Ranges

BOB/STATOR SAMPLE CUP	VISCOSITY RANGE cP(mPa•s)	SHEAR RATE (sec^{-1})	SAMPLE VOLUME (mL)*
PVS-B1-D-HC	2-5M	1.7N	23
PVS-B2-D-HC	20-36M	0.38N	40
PVS-B5-D-HC	5-10M	0.85N	30
PVS-TA5B5-D-HC	.5-1M	0.85N	175

*±1mL HC = Hastelloy C M = 1 million N = RPM mL = Milliliter

	VISCOSITY RANGE cP(mPa•s)		SPEEDS	
MODEL	Min.	Max.	RPM	Number of Increments
PVS	.5	36M	.05-1K	10K

* Ranges depend on "Bob" spindle selected.
M = 1 million K = 1 thousand cP = Centipoise mPa•s = Millipascal•seconds

Thermo Bath option

for sample heating with small space requirement. Call for details.

Carrying Case

for portability in the field

R/S Plus™ Series Rheometers

for Controlled Rate/Stress Measurement

R/S Plus Series of 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, R/S Plus Rheometers offer greater flexibility and features than other high-end rheometers in their class — at a fraction of the cost.

R/S 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 R/S Plus is available in four configurations: coaxial cylinder (Model R/S-CC), cone and plate (Model R/S-CPS), soft solids tester with vane spindles (Model R/S-SST), or portable version (Model RC-1).

Some popular applications include:

ADHESIVES: RS-CPS tests a variety of silicone-based adhesives at temperatures up to 135°C. Advantages include small sample volume (< 2mL), rapid temperature equilibrium with P1 Peltier plate, variable shear rate (to 6000 sec^{-1}) to duplicate conditions for actual adhesive use, quick test time (< 2 min).

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

GYPSUM: RS-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: RS-CC with double-gap geometry measures various low viscosity formulations (0.02 Pa-s) at shear rates up to 2500 sec^{-1}. Provides reliable capability in a busy QC lab measuring dozens of samples each day.

PHARMACEUTICAL: RS-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 (P1). Produces quick profiling of flow behavior, including yield stress and creep, important properties for characterizing ointments.

PIGMENT DISPERSIONS: RS-CPS with Peltier (P1) 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: RS-CPS with Peltier (P2) 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: RS-SST with vane spindle geometry measures diverse mixtures with particulate materials ranging in concentration up to 70%.

TEL 800-628-8139 or 508-946-6200 **FAX** 508-946-6262 **www.brookfieldengineering.com**

R/S-CPS Plus™ 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 keypad and display for stand-alone operation

Optional Software for PC control and data acquisition/analysis

Very small sample size permits rapid test set up and clean up

Precision Height Gauge for quick & easy Gap Setting

Temperature Control
Choice of
- Brookfield Bath
- Peltier Device

Rapid temperature control of plate with Peltier option provides quick profiling of viscosity vs. temperature

Quick Connect Coupling System easy spindle attachment

What's Included?

Instrument (with choice of water bath or Peltier temperature control for sample plate)

Base

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

Thermal Barrier

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.

	VISCOSITY RANGE (Pa•s)		SPEEDS	
MODEL	Min.	Max.	RPM	Number of Increments
R/S-CPS Cone/Plate	.02	3.2K	0.1-1K	>10K
R/S-CPS Plate/Plate	.02	9.9K	0.1-1K	>10K

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

Cone/Plate Temperature Control Options

MODEL	Description	Temperature
R/S-CPS	Bath	-15° to 250°C
R/S-CPS-P1	Peltier P1	0° to 135°C
R/S-CPS-P2	Peltier P2	20° to 180°C

See page 47 for spindle ranges and sample volumes.

R/S-CC Plus™ Rheometer

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

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

Optional Software for PC control and data acquisition/analysis

Temperatures from -20°C to 180°C

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
Choice of
- Direct immersion in bath
- External circulation using the FTK Water Jacket

	VISCOSITY RANGE (Pa•s)		SPEEDS	
MODEL	Min.	Max.	RPM	Number of Increments
R/S-CC Coaxial Cylinder	.001	100K	0.1-1K	>10K

See page 47 for individual bob/spindle ranges K = 1 thousand 1 Pa•s = 1000 cP (centipoise)
Practical Maximum Limit = 300 Pa•s

What's Included?

Instrument
Base

Optional Accessories

Choice of Coaxial Cylinder Geometry Bob (spindle) and Chamber
at least one bob and chamber is required (p53)
Rheo3000 Software (p29)
Viscosity Standards (p52)
Disposable Chambers
FTK Water Jacket for Temperature Control
PT-E Immersion Temperature Sensor
KE Cooling Device
(required for temperatures over 90°C)

Water Jacket

Chambers

Coaxial Cylinder Spindles

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

TEL 800-628-8139 or 508-946-6200 **FAX** 508-946-6262 **www.brookfieldengineering.com**

R/S-SST Plus™ Rheometer

Soft Solids Tester for pastes, slurries and materials with particulates

Measured Values
- Yield Stress
- Shear Modulus
- Recovery
- Creep

Quantifies meaningful properties like stiffness, wobbliness, sloppiness, consistency and texture

Capable of measurements in BU units for highly viscous materials such as joint compound for gypsum

Vane Spindle Geometry
- Quick-Connect coupling
- Easy-to-test method
- Allows spindle insertion without compromising sample structure

Coaxial Cylinders can also be used for complete flow curve analysis

Smooth Height Adjustment for easy insertion of spindle into sample without disrupting structure of sample

What's Included?

Instrument with adjustable height

Base with clamp to hold sample container

Optional Accessories

Choice of Spindle Geometries
at least one is required:
- Vane (spindle)
- Coaxial Cylinder Bob (spindle) & Chamber

Rheo3000 Software (p47)

Viscosity Standards (p53)

Choice of several vane spindle options for a wide measurement range.

RSS-90Y Spindle for BU measurements (6-2,000 BU)

	SHEAR STRESS (Pa)	
MODEL	Min.	Max.
R/S-SST Soft Solids Tester	6	109K

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

RC-1 Plus™ Portable Rheometer

...portable measurements in the lab or in the field

Our Lowest Cost R/S Rheometer
provides more capability for much less cost than others in its class.

Dual Modes of Operation
- Controlled Stress (when used with a PC)
- Controlled Rate

Displayed Information:
- Viscosity
- Temperature (with optional PT-E sensor)
- Torque
- Shear Rate
- Shear Stress

Quick Connect Coupling
for easy bob (spindle) attachment

What's Included?

Instrument
Carrying Case
Laboratory Stand
Battery Charger

Optional Accessories

Choice of Spindle Geometries
at least one is required: (p53)
- Coaxial Cylinder Bob (spindle) & Chamber
- Vane Spindle

Disposable Chambers
Rheo3000 Software (p29)
Viscosity Standard Fluids for Calibration
FTK Water Jacket for Temperature Control
Circulating Temperature Bath
PT-E Immersion Temperature Sensor

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

	VISCOSITY RANGE (Pa•s)		SPEEDS	
MODEL	Min.	Max.	RPM	Number of Increments
RC-1 Portable	.001	30K	0.7-800	>10K

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

TEL 800-628-8139 or 508-946-6200 **FAX** 508-946-6262 **www.brookfieldengineering.com**

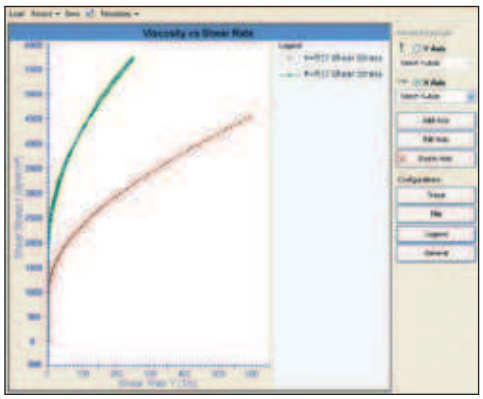
Rheo3000 Software

for increased R/S data analysis capabilities

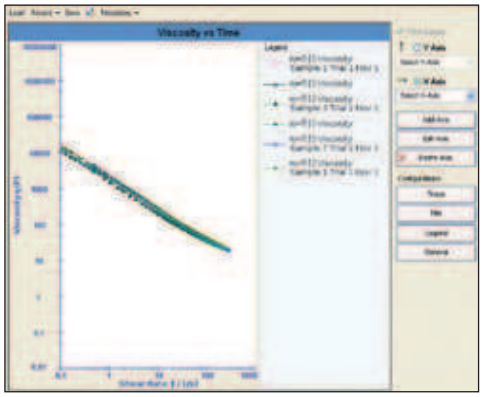
Enhance your R/S Plus Rheometer

THROUGH PROGRAMMED CONTROL AND DATA ANALYSIS

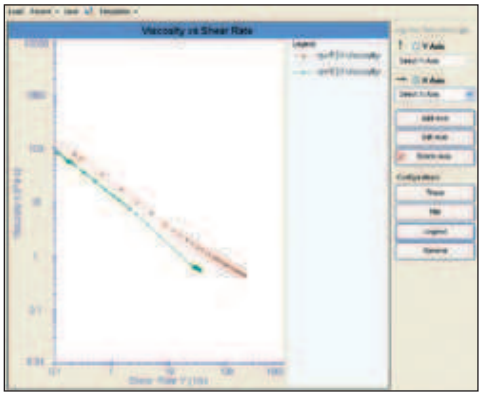
Your PC can do the detailed data collection and analysis work for you. Rheo3000 allows you to program the R/S Rheometer and control shear stress or shear rate. Data is saved in a SQL database for easy access by multiple users on a network. Use multiple step test programs to create data history and calculate average viscosity or thixotropy. 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.



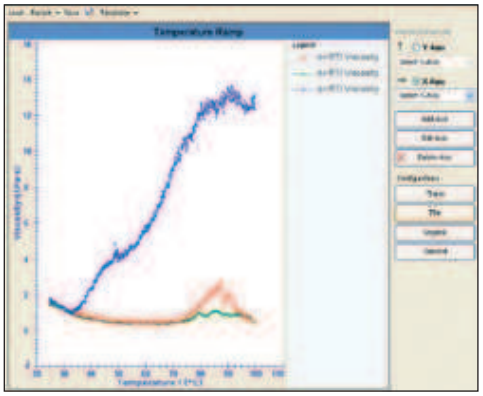
A traditional flow curve plot with the viscosity functions (shear stress and shear rate) has stress on the Y-axis (dyne/cm^2) and shear rate (sec^{-1}) on the X-axis. Shear Stress (dyne/cm^2) divided by Shear Rate (sec^{-1}) = Viscosity (in Poise).



A flow curve made with R/S-CC Plus Coaxial Cylinder Rheometer and 25 mm bob. The program ramped shear rate from 0.1 sec^{-1} to 200 sec^{-1} over 60 seconds in step one, and from 200 sec^{-1} to 0.1 sec^{-1} over 60 seconds in step two. All fluids were pseudoplastic (shear thinning) and slightly thixotropic (time dependent).



A stress ramp with R/S-CC Plus Coaxial Cylinder Rheometer and 25mm bob ramped shear stress from 0 Pa to ~550 Pa over 60 seconds in step 1, and from ~550 Pa to 0 Pa over 60 seconds in step 2. The fluid has a distinct yield value (just over 100 Pa) because in step one there was no viscosity (or shear rate) until the yield point was achieved. Note that on the down ramp (step 2) there were shear rates below 100 Pa so the fluid structure seemed to have been changed by the test.



A temperature/viscosity ramp run with R/S-CPS Plus P1 Rheometer. Temperature was ramped from 25°C to 100°C over 5 minutes. The instrument (using geometry P50; 50 mm flat plate with a gap setting of 0.5 mm) was run at a constant shear rate 100 sec^{-1}. Sample 1 (Blue) began a significant viscosity increase at ~ 32°C, Sample 2 (red) began to increase at ~72°C and Sample 3 (green) began increasing at ~75°C.

YR-1™ Yield Stress Rheometer

a low-cost QC tool to enhance material characterization

Displayed Information:
- Yield Stress (Pa or dynes/cm^2)
- % Torque

EZ-Yield Software included
for use with a PC

Temperature Probe included
(not shown)

Vane Spindle Geometry
works with thin to highly viscous materials
(Does not disturb sample during spindle insertion)

Choice of Spindle Sizes
to fit any sample container

Ideal for QC

User-friendly Keypad
and display for stand-alone operation

Simple to use

Excellent repeatability

Affordable

What's Included?

Instrument
V-72 & V-73 Vane Spindles (p43 & 48) ▶
EZ-Yield Software ▶
Lab Stand (Model S) (p50)
Carrying Case

Optional Accessories

V-71, V-74 & V-75 Vane Spindles (p43 & 48)
RTD Temperature Probe
Viscosity Standards (p52)
Temperature Bath (p33-35)
Protective Keypad Covers (p51)
Quick Action Lab Stand (p50)

Vane Spindle Ranges

SPINDLE	TORQUE RANGE	SHEAR STRESS RANGE (Pa)
V-71	1/4RV	.125-1.25
V-72	1/4RV	.5-5
V-73	1/4RV	2.5-25
V-74	1/4RV	25-250
V-75	1/4RV	10-100
V-71	RV	.5-5
V-72	RV	2-20
V-73	RV	10-100
V-74	RV	100-1K
V-75	RV	40-400
V-71	HA	1-10
V-72	HA	4-40
V-73	HA	20-200
V-74	HA	200-2K
V-75	HA	80-800
V-71	HB	4-40
V-72	HB	16-160
V-73	HB	80-800
V-74	HB	800-8K
V-75	HB	320-3.2K

Note:
1. 1 Pa = 10 dyne/cm^2
2. Viscosity Range is given at rotational speed of 10 RPM
3. 5xHB is the highest torque range available
4. Not for use with DV-E Viscometers

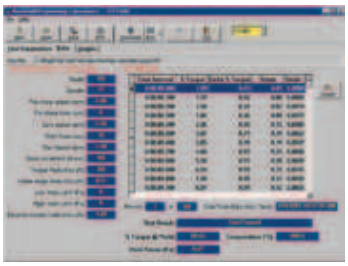
M = 1 million K = 1 thousand Pa = Pascal
cP = Centipoise mPa•s = Millipascal•seconds

TEL 800-628-8139 or 508-946-6200 **FAX** 508-946-6262 **www.brookfieldengineering.com**

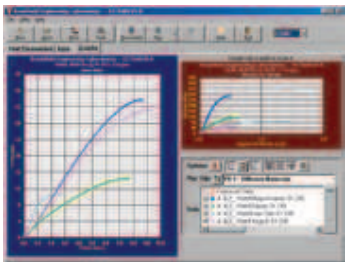
EZ-Yield Software Included

EASILY PROGRAM AND CAPTURE DATA

EZ-Yield software is included with all YR-1 Yield Stress Rheometers and allows for simple data collection on a PC. Collecting data affords you a record of all your valuable testing results.



EZ-Yield Data Collection



EZ-Yield Test Plots for Multiple Samples

EZ-Yield software features a simple parameter menu for set up of 10 different test programs. Test parameters include: test number and name, spindle #, immersion mark, pre-shear (rpm), wait time before test startup, run speed (rpm), and low & high yield control limits (Pa) for QC use.

Streaming data can be viewed and test data — torque vs. time, stress vs. strain — is displayed in both tabular and graphical formats on a PC when using EZ-Yield software.

Applications

1/4 RV SERIES — LOW YIELD

Juices
Beverages
Creams

RV SERIES — MEDIUM YIELD

Food Products
Shampoo
Gels
Yogurt
Hair Gels

HB SERIES — HIGH YIELD

Chocolate
Lotions
Food Products
Ketchup
Hand Cream
Personal Care Products
Jelly
Toothpaste

5xHB SERIES — VERY HIGH YIELD*

Adhesive Caulk
Pastes
Cheese Spread
Peanut Butter
Fruit Preserves
Shortening

*Very High Yield stress measurements require use of 5xHBDV-III Ultra Rheometer (p20)

YR-1 Vane Spindles

V-72 and V-73 vane spindles with case are supplied with YR-1.

V-71 (large), V-74 (small) and V-75 (small) vane spindles are optional.

KU-2™ Viscometer

for Paints, Coatings, and Inks

ASTM D562 Compatible
(industry specification)

Easy to use
no weights, simplifies an established test procedure

LED Display Info:
- Krebs Units
- Gram Units (Weight)
- Centipoise*

Select Krebs or Grams or Centipoise

Lock-In Test Results
with Hold Switch

Accuracy: ±1.0% of range

Repeatability: ±0.5%

Standard Krebs Spindle

Measurement range:
40 to 141 KU, 32 to 1099 gm, and 27 to 5274 cP*

Printer Connection
for automatic test documentation

Adapter provided
for 1/2 Pint, Pint, & Quart Containers

What's Included?

Instrument
Krebs-type Spindle (p48)
Communications Port for Printer
Adapter for Quart, Pint and Half-Pint Cans†

Optional Accessories

Air Purge
Paste Spindle (p48)

Applications

Paints
Coatings
Adhesives
Inks
Pastes

*Centipoise values based on the conversion from Krebs Units as defined in the ASTM D562.

†Adapters which accommodate metric size cans are available for an additional fee — contact Brookfield to discuss your requirements

TEL 800-628-8139 or 508-946-6200 **FAX** 508-946-6262 **www.brookfieldengineering.com**

Temperature Control

You need to control sample temperature during viscosity measurements

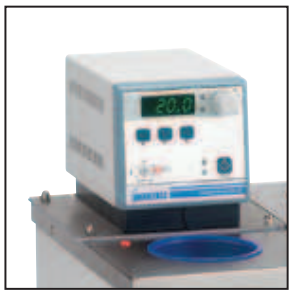
Temperature control during viscosity measurement helps insure accurate test results. The addition of a Brookfield circulating water bath is a smart investment. The Brookfield TC Series Circulating Water Baths are uniquely configured for use with your Brookfield Viscometer or Rheometer.

Full Graphic Display
Programmable
Controller shown

Programmable Controllers

offer the highest level of performance, flexibility, and control for the most demanding applications.

- Full graphic display with help menus
- Intuitive, one-touch control
- Time and temperature programming with data logging
- RS-232 Interface – Use with Rheocalc™ (p9) or RheoVision™ (p23) Software
- Built-in service reminder
- Five speed pump control



Digital Controllers

have easy-to-use controls. Just dial in your set-point and push a button, you're done!

- LED readout displays set point and fluid temperature
- 3 adjustable temperature pre-sets
- Unique rotary control allows rapid set-point adjustments
- Two speed pump

Temperature Baths

MODEL	Temperature Range Low	Temperature Range High	Controller	Cooling	Temperature Stability†	Digital Readout/ Accuracy	Reservoir Capacity	Internal Work Area DxWxH (inches)	Overall Dimensions DxWxH (inches)	Weight (Gross)
TC-602P	-20°C	+200°C	Programmable	Refrigerated	0.01°C	LCD/±.25	6.0 liters	5¼ x 5¼ x 5½	15¾ x 8¼ x 22½	70 lbs
TC-602D	-20°C	+150°C	Digital	Refrigerated	0.05°C	LED/±.5	6.0 liters	5¼ x 5¼ x 5½	15¾ x 8¼ x 22½	64 lbs
TC-502P	-20°C	+200°C	Programmable	Refrigerated	0.01°C	LCD/±.25	6.0 liters	5¼ x 5¼ x 5½	15¾ x 18¾ x 17	78 lbs
TC-502D	-20°C	+150°C	Digital	Refrigerated	0.05°C	LED/±.5	6.0 liters	5¼ x 5¼ x 5½	15¾ x 18¾ x 17	67 lbs
TC-202P*	-20°C	+150°C	Programmable	Tap Water**	0.01°C	LCD/±.25	10.0 liters	5¼ x 8½ x 7¾	15½ x 10⅞ x 14¾	39 lbs
TC-202D*	-20°C	+150°C	Digital	Tap Water**	0.05°C	LED/±.5	10.0 liters	5¼ x 8½ x 7¾	15½ x 10⅞ x 14¾	33 lbs
TC-102P*	-20°C	+200°C	Programmable	Tap Water**	0.01°C	LCD/±.25	6.0 liters	5¼ x 5¼ x 5½	14¼ x 8¼ x 14	29 lbs
TC-102D*	-20°C	+150°C	Digital	Tap Water**	0.05°C	LED/±.5	6.0 liters	5¼ x 5¼ x 5½	14¼ x 8¼ x 14	23 lbs
TC-351	-20°C	N/A	N/A	N/A	N/A	N/A	N/A	N/A	17 x 14 x 14	72 lbs

* For use at lower temperatures, use the built-in tap water cooling, or use model TC-351 Cooler for control to -20°C.
FOR TEMPERATURES HIGHER THAN 80°C, PLEASE CONTACT BROOKFIELD FOR FLUID RECOMMENDATIONS.
Note: 1. Specify voltage and frequency when ordering.

** Tap water connection required.
N/A - Not Applicable
† Temperature stability may vary depending on bath volume, surface area, insulation and type of fluid

TC-502

Circulating Water Bath Refrigerated

Available with Programmable Controller
or enhanced Digital Controller

Provides stand-alone operation
- No tap water required

Easy control of set-point

Configured to measure viscosity directly in the bath
- Accommodates 600 mL beaker

Programmable Controller version is designed to automate sample temperature control

Built-in circulator to pump to external devices

Programmable
Controller shown

TC-602

Circulating Water Bath Compact-Refrigerated

Available with Programmable Controller
or enhanced Digital Controller

Compact — small "footprint" on your lab bench,
only 8 1/4 inches wide

Specifically designed for use with water-jacketed devices
- Wells-Brookfield Cone/Plate
- Small Sample Adapter Accessory
- Ultra-Low Adapter Accessory
- R/S-CC Rheometer
- R/S-CPS Rheometer

Provides stand-alone operation – no tap water is required

Easy control of set-point

Programmable Controller version is designed to automate sample temperature control

Programmable
Controller shown

TEL 800-628-8139 or 508-946-6200 **FAX** 508-946-6262 **www.brookfieldengineering.com**

TC-102

Circulating Water Bath Non-Refrigerated

Available with Programmable Controller or enhanced Digital Controller

Compact – small "footprint"

Built-in circulator pump

Built-in tap water cooling coil

Perfect choice for use with Brookfield water-jacketed devices

- Wells-Brookfield Cone/Plate
- Small Sample Adapter Accessory
- Ultra-Low Adapter Accessory
- R/S-CC Rheometer
- R/S-CPS Rheometer

Enhanced Digital
Controller shown

TC-202

Circulating Water Bath Non-Refrigerated

Available with Programmable Controller or enhanced Digital Controller

Configured for measuring multiple samples directly in the bath

Work area accommodates 600 mL and 1000 mL beakers (cover is removable for large sample container requirements)

Built-in tap water cooling coil

Built-in circulator pump

Enhanced Digital
Controller shown

TC-351

Cooler (not shown) for use with TC-102 & TC-102

Eliminates tap water requirements on non-refrigerated baths

Increases lower range of most baths to –20°C

Water Bath Accessories

Algicide 8 oz.

TC-Fluid 1
Keeps circulator baths clean, odor free and resists black algae

Ethylene Glycol 1 gal.

TC-Fluid 2 -20°C to +100°C

Laboratory grade bath fluid

Normally mixed with water at 50:50 ratio

High Temperature Fluid 1 gal.

TC-Fluid 3 +50°C to +150°C

TC-Fluid 4 +100°C to +200°C

PVS-152 +25°C to +200°C
These heat transfer fluids provide superior thermal stability

Low Temperature Fluid 1 gal.

TC-Fluid 5 -50°C to +58°C

Excellent low temperature performance

Little or no evaporation

Bath Cleaner 8 oz.

TC-Fluid 6

Removes rust and mineral deposits

Concentrated liquid

18" Lab Stand Rod

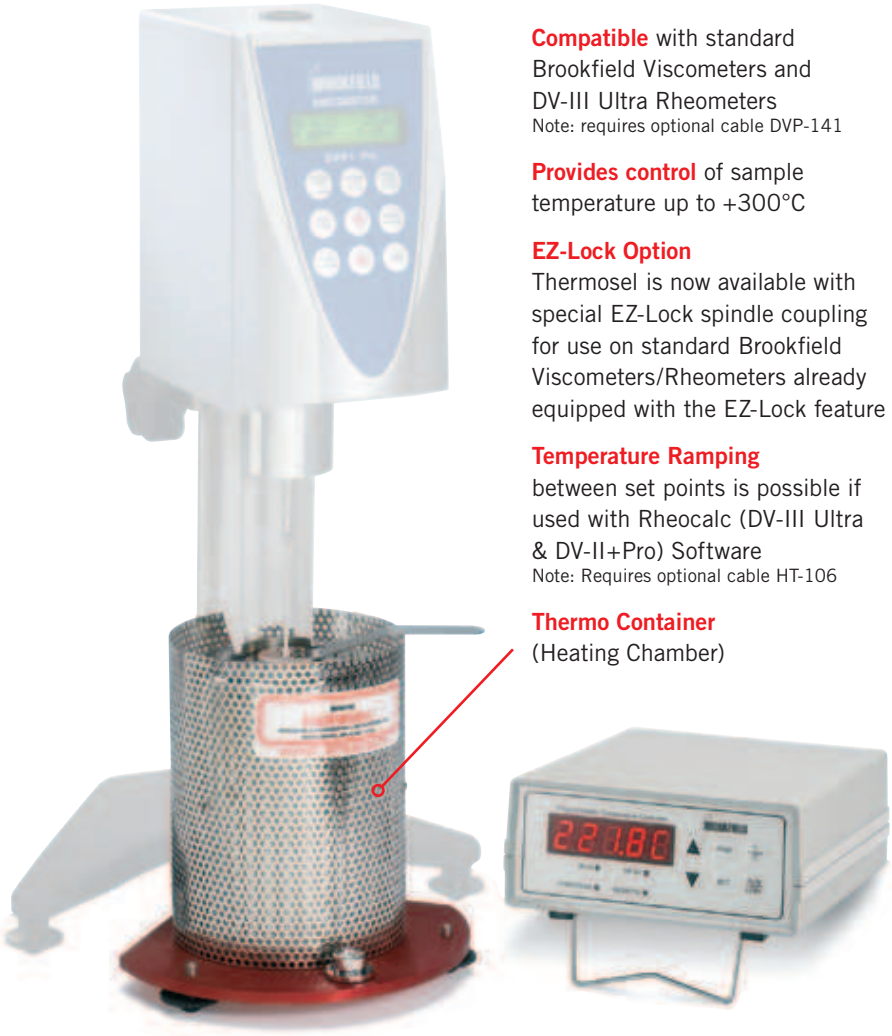
VS-CRA-18S
Designed for increasing viscometer height when measuring in a TC-102, TC-202 or TC-502 Bath

Decks, Benches, Lids

Additional deck lid covers with optional removable plugs, and benches for elevating the position of beakers are available for use with all water bath models.

Thermosel®

for Elevated Temperature Testing



Compatible with standard Brookfield Viscometers and DV-III Ultra Rheometers
Note: requires optional cable DVP-141

Provides control of sample temperature up to +300°C

EZ-Lock Option
Thermosel is now available with special EZ-Lock spindle coupling for use on standard Brookfield Viscometers/Rheometers already equipped with the EZ-Lock feature

Temperature Ramping between set points is possible if used with Rheocalc (DV-III Ultra & DV-II+Pro) Software
Note: Requires optional cable HT-106

Thermo Container (Heating Chamber)

Computer Controlled when used with DV-II+Pro or DV-III Ultra and Rheocalc32 Software

Programmable Temperature Controller offers single set point or up to 10 programmable set points.

Direct Temperature Control Possible with DV-III Ultra Rheometer. (p20)

What's Included?

Choice of one SC4 Spindle
Specify when ordering

Alignment Bracket

Thermo Container with safety guard and insulating cap

1 Removable Sample Chamber (p47)

5 Disposable Sample Chambers (p47)
Order additional chambers in quantities of 100, HT-2DB-100

18" Lab Stand Rod (p35)

Extracting Tools

Temperature Controller with an RTD probe

Applications

Hot Melts	Asphalt
Wax	Polymers

The difficulty with viscosity measurements of hot melts and liquids at elevated temperatures has been in maintaining accurate temperature control that is consistent from sample to sample so that meaningful data could be obtained.

The Brookfield Thermosel solves this problem by providing a stable, precisely controlled sample environment. This, together with the inherent accuracy of the Brookfield Viscometers, is fundamental to the Thermosel System, which produces viscosity measurements that are not only accurate but entirely reproducible.

Several factors contribute to the stable environment:

Non-fluctuating temperature control

Small sample volume and insulated sample chamber which reduces temperature gradients within the sample

The rotating spindle, which acts as a built-in stirring device

The test procedure is quite straightforward. Once familiar with the system, unskilled operators can easily produce accurate, reproducible data.

TEL 800-628-8139 or 508-946-6200 **FAX** 508-946-6262 **www.brookfieldengineering.com**

Thermosel Viscosity Ranges cP(mPa•s)								
SPINDLE SAMPLE VOLUME SHEAR RATE (sec^{-1})† MODEL	**SC4-18 8mL 1.32N**	**SC4-31 10mL .34N**	**SC4-34 9.5mL .28N**	**SC4-21 8mL .93N**	**SC4-27* 10.5mL .34N**	**SC4-28 11.5mL .28N**	**SC4-29 13mL .25N**	**HT-DIN-81** 7mL 1.29N**
LVDV-IIIU	1.2-30K	12-300K	24-600K	Not applicable for historical reasons. However, it is possible				1.0-10K
LVDV-II+P	1.5-30K	15-300K	30-600K	to use the above spindles with any of these instruments.				3.4-10K
LVDV-IP	3-10K	30-100K	60-200K	Digital Viscometers/Rheometers will automatically calculate				3.4-10K
LVDVE	3-10K	30-100K	60-200K	viscosity. Please contact Brookfield or an authorized dealer				N/A
LVT	5-10K	50-100K	100-200K	if you require information on viscosity range.				5.7-10K
RVDV-IIIU				20-500K	100-2.5M	200-5M	400-10M	14.6-10K
RVDV-II+P				25-500K	125-2.5M	250-5M	500-10M	36.5-10K
RVDV-IP				50-170K	250-830K	500-1.7M	1K-3.3M	36.5-10K
RVDVE	Not applicable for historical reasons.			50-170K	250-830K	500-1.7M	1K-3.3M	N/A
RVT	However, it is possible to use the above			50-100K	250-500K	500-1M	1K-2M	36.5-10K
HADV-IIIU	spindles with any of these instruments.			40-1M	200-5M	400-10M	800-20M	29.2-10K
HADV-II+P	Digital Viscometers/Rheometers will			50-1M	250-5M	500-10M	1K-20M	73.0-10K
HADV-IP	automatically calculate viscosity. Please			100-300K	500-1.7M	1K-3.3M	2K-6.7M	73.0-10K
HADVE	contact Brookfield or an authorized dealer if			100-300K	500-1.7M	1K-3.3M	2K-6.7M	N/A
HAT	you require information on viscosity range.			100-200K	500-1M	1K-2M	2K-4M	73.0-10K
HBDV-IIIU				160-4M	800-20M	1.6K-40M	3.2K-80M	116.8-10K
HBDV-II+P				200-4M	1K-20M	2K-40M	4K-80M	292.0-10K
HBDV-IP				400-1.3M	2K-6.7M	4K-13.3M	8K-26.7M	292.0-10K
HBDVE				400-1.3M	2K-6.7M	4K-13.3M	8K-26.7M	N/A
HBT				400-800K	2K-4M	4K-8M	8K-16M	292.0-10K

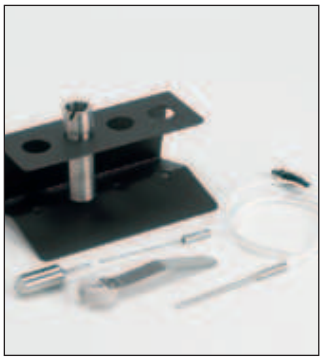
M = 1 million K = 1 thousand N = RPM † Spindle SC4-18 1.32 x 10 (rpm) = 13.2 sec-1 cP = Centipoise mPa•s = milliPascal•seconds

*Optional disposable SC4-27D spindle is available in quantities of 100, Part No. SC4-27D-100. Requires special chuck/closer, Part No. SC4-DSY, for attachment to viscometer.

**The 81 spindle, Part No. HT-DIN-81, works in an HT-2 or HT-2DB chamber.

Additional Information

Alignment Bracket ensures concentricity of spindle and sample chamber.



Other components supplied include sample chamber holder, RTD probe, insulating cap, coupling link, coupling nut and choice of SC4 spindle.

Extracting Tool enables the sample chamber to be handled easily and safely.

Option: Disposable Sample Chamber with Optional Disposable Spindle SC4-27D* is ideal for asphalts or any difficult-to-clean material.

Order disposable SC4-27D spindle in quantities of 100, Part No. SC4-27D-100.

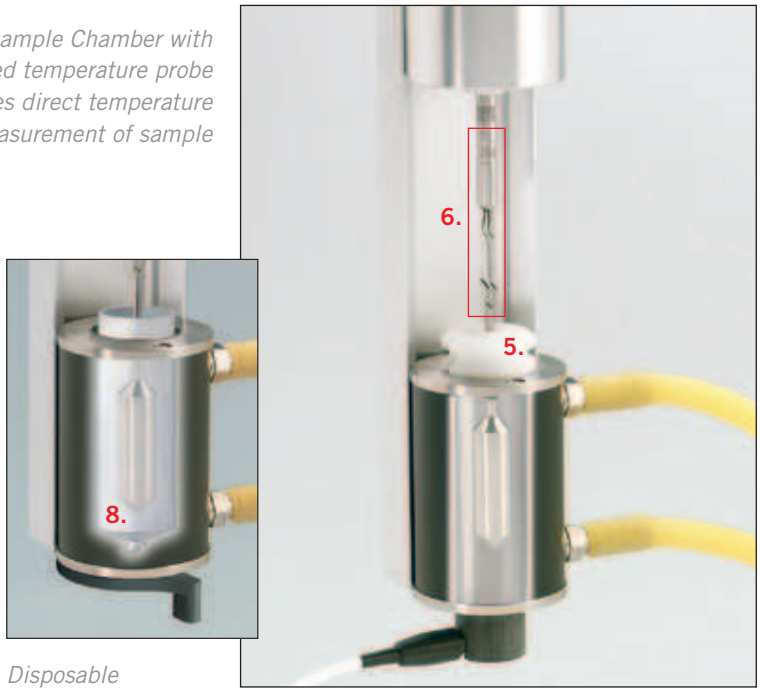
Requires special chuck/closer, Part No. SC4-DSY, for attachment to viscometer.

Order disposable HT-2DB chambers in quantities of 100, Part No. HT-2DB-100.

Small Sample Adapter™

for rheological evaluation where sample volume is limited

Standard Sample Chamber with embedded temperature probe provides direct temperature measurement of sample



Disposable Sample Chamber
(Requires SSA-DCU Water Jacket)

Complete system shows the DV-II+Pro Viscometer and Small Sample Adapter with Circulating Water Bath for temperature control.

What's Included?

1. Water Jacket
2. Locating Channel Assembly
3. Choice of one SC4 Spindle*
4. Choice of one SC4 Sample Chamber*
5. Insulating Cap
6. Extension Link with Coupling Nut

Storage Case (not shown)

*Specify when ordering

Optional Accessories

7. Embedded RTD temperature Probe in Chamber
8. SC4-13RD Disposable Sample Chambers (p48)

   Requires special water jacket
9. Temperature Bath (p33-35)

   EZ-Lock Spindle Coupling (p50)

   For more info on Small Sample Adapter Accessory Kits visit our website.

The Small Sample Adapter provides a defined geometry system for accurate viscosity measurements at precise shear rates. Consisting of a cylindrical sample chamber and spindle, the Small Sample Adapter is designed to measure small sample volumes of 2 to 16 mL, and easily attaches to all standard Brookfield Viscometers/Rheometers.

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Small Sample Adapter Viscosity Ranges cP(mPa•s)

MODEL	Spindle: SC4-18 Sample Chamber: * SC4-13R(P) Sample Volume: 6.7mL Shear Rate (sec⁻¹): 1.32N	Spindle: SC4-31 Sample Chamber: * SC4-13R(P) Sample Volume: 9.0mL Shear Rate (sec⁻¹): .34N	Spindle: SC4-34 Sample Chamber: * SC4-13R(P) Sample Volume: 9.4mL Shear Rate (sec⁻¹): .28N	Spindle: SC4-16 Sample Chamber: * SC4-8R(P) Sample Volume: 4.2mL Shear Rate (sec⁻¹): .29N	Spindle: SC4-25 Sample Chamber: * SC4-13R(P) Sample Volume: 16.1mL Shear Rate: (sec⁻¹): .22N	Spindle: SC4-21 Sample Chamber: * SC4-13R(P) Sample Volume: 7.1mL Shear Rate (sec⁻¹): .93N	Spindle: SC4-27(D) Sample Chamber: * SC4-13R(P) Sample Volume: 10.4mL Shear Rate (sec⁻¹): .34N	Spindle: SC4-15 Sample Chamber: * SC4-7R(P) Sample Volume: 3.8mL Shear Rate (sec⁻¹): .48N	Spindle: SC4-28 Sample Chamber: * SC4-13R(P) Sample Volume: 11.0mL Shear Rate (sec⁻¹): .28N	Spindle: SC4-29 Sample Chamber: * SC4-13R(P) Sample Volume: 13.5mL Shear Rate (sec⁻¹): .25N	Spindle: SC4-14 Sample Chamber: * SC4-6R(P) Sample Volume: 2.1mL Shear Rate (sec⁻¹): .40N
LVDV-IIIU	1.2-30K	12-300K	24-600K	48-1.2M	192-4.8M	Not applicable for historical reasons. However, it is possible					
LVDV-II+P	1.5-30K	15-300K	30-600K	60-1.2M	240-4.8M	to use the above spindles with any of these instruments.					
LVDV-IP	3-10K	30-100K	60-200K	120-400K	800-1.6M	Digital Viscometers/Rheometers will automatically calculate					
LVDVE	3-10K	30-100K	60-200K	120-400K	800-1.6M	viscosity. Please contact Brookfield or an authorized dealer					
LVT	5-10K	50-100K	100-200K	200-400K	800-1.6M	if you require information on viscosity range.					
RVDV-IIIU						20-500K	100-2.5M	200-5M	200-5M	400-10M	500-12.5M
RVDV-II+P						25-500K	125-2.5M	250-5M	250-5M	500-10M	625-12.5M
RVDV-IP						50-170K	250-830K	500-1.7M	500-1.7M	1K-3.3M	1.25K-4.2M
RVDVE	Not applicable for historical reasons.					50-170K	250-830K	500-1.7M	500-1.7M	1K-3.3M	1.25K-4.2M
RVT	However, it is possible to use the above					50-100K	250-500K	500-1M	500-1M	1K-2M	1.25K-2.5M
HADV-IIIU	spindles with any of these instruments.					40-1M	200-5M	400-10M	400-10M	800-20M	1K-25M
HADV-II+P	Digital Viscometers/Rheometers will					50-1M	250-5M	500-10M	500-10M	1K-20M	1.25K-25M
HADV-IP	automatically calculate viscosity. Please					100-300K	500-1.7M	1K-3.3M	1K-3.3M	2K-6.7M	2.5K-8.3M
HADVE	contact Brookfield or an authorized dealer if					100-300K	500-1.7M	1K-3.3M	1K-3.3M	2K-6.7M	2.5K-8.3M
HAT	you require information on viscosity range.					100-200K	500-1M	1K-2M	1K-2M	2K-4M	2.5K-5M
HBDV-IIIU						160-4M	800-20M	1.6K-40M	1.6K-40M	3.2K-80M	4K-100M
HBDV-II+P						200-4M	1K-20M	2K-40M	2K-40M	4K-80M	5K-100M
HBDV-IP						400-1.3M	2K-6.7M	4K-13.3M	4K-13.3M	8K-26.7M	10K-33.3M
HBDVE						400-1.3M	2K-6.7M	4K-13.3M	4K-13.3M	8K-26.7M	10K-33.3M
HBT						400-800K	2K-4M	4K-8M	4K-8M	8K-16M	10K-20M

M = 1 million K = 1 thousand N = RPM e.g. Spindle SC4-18 1.32 x 10 (rpm) = 13.2 sec-1 cP = Centipoise mPa•s = Millipascal•seconds

N/A = Not applicable for historical reasons. However, it is possible to use any spindle/chamber combination with any torque range. Digital viscometers/rheometers will automatically calculate viscosity.

* Examples

SC4-13R Sample Chamber

SC4-13RPY Sample Chamber with RTD temperature probe and cable to viscometer/rheometer

SC4-27 Stainless Steel Spindle

** Disposable chamber available in 13R size and requires SC4-45YD water jacket

SC4-13RP Sample Chamber with RTD temperature probe

SC4-13RD-100 Disposable Sample Chamber available in packages of 100

SC4-27D Disposable Spindle

Note: Hastelloy C available for some spindles/chambers - call for details

Removable Sample Chamber

The design of the Small Sample Adapter allows the sample chamber to be easily changed and cleaned without disturbing the set-up of the viscometer or temperature bath. This means that successive measurements can be made under identical conditions.

Temperature Control

The sample chamber fits into a water jacket so that precise temperature control can be achieved when the Brookfield circulating temperature bath is used. The stirring action of the rotating spindle, plus the small sample volume, helps to keep the temperature gradient across the sample to a minimum. Direct readout of sample temperature is provided using sample chambers with optional embedded RTD sensor connected to the DV-I Prime and DV-II+Pro Viscometers and the DV-III Ultra Rheometer. Working temperature range for the Small Sample Adapter is from –15°C to 100°C.

Cylindrical Geometry

The Small Sample Adapter's coaxial cylinder geometry provides extremely accurate viscosity measurements at defined shear rates.

Disposable Sample Chambers and SC4-27D Spindle

Disposable 13R chambers, for hard-to-clean materials, are available in a kit that comes complete with 100 chambers and special-sized water jacket (Part No. SSA-DCU). Additional disposable chambers can be purchased in quantities of 100 (Part No. SC4-13RD-100).

EZ-Lock Option

Small Sample Adapter is now available with special EZ-Lock spindle coupling for use on standard Brookfield Viscometers/Rheometers already equipped with the EZ-Lock feature.

Water jacket allows rapid and precise temperature control of sample

Sample chamber easily changed - slides into water jacket and locks in place

Simultaneous sample temperature measurement is possible by ordering embedded temperature probe in sample chamber

Optional disposable chamber also available

Enhanced UL Adapter™

ideal for low viscosity materials

Reduces measuring range
to as low as 1 cP, depending on viscometer used

Simple attachment
to a standard Brookfield Viscometer or DV-III Ultra Rheometer

Small sample size:
16 mL

Cylindrical geometry
provides defined shear rates for detailed product analysis

Removable cap
of low density polyethylene can be considered disposable for one-time use if required

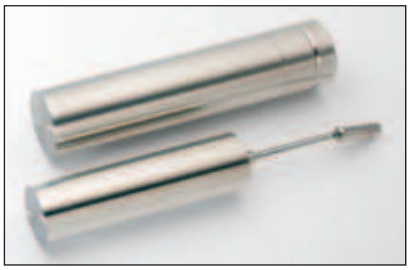
Stainless steel parts
are easily cleaned

What's Included?

Locating Channel Assembly
Spindle (304 s/s) (p46)
with universal coupling nut
Collar assembly with thumbwheel
Water Jacket
Chamber Tube
Tube End Caps (package of 6)

Optional Accessories

Closed Tube and Spindle
made from 316 s/s



Available with EZ-Lock spindle coupling (p50)

The Brookfield Enhanced UL Adapter is used with any standard Brookfield Viscometer and Rheometer to make accurate and reproducible measurements on low viscosity materials. Newtonian and non-Newtonian materials can be measured. It is most commonly used with the LV series instrument (at 60 rpm, these models have a full scale range of 1-10 cP with the UL Adapter). The UL Adapter consists of a precision cylindrical spindle rotating inside an accurately machined tube. Its rheologically correct cylindrical geometry provides extremely accurate viscosity measurements and shear rate determinations.

The tube has a removable end cap which allows the open ended tube to be used in a beaker or tank. With the cap in place, the closed tube can be immersed in a temperature bath or used with the ULA-40Y water jacket for precise temperature control. Working temperature range is from –15°C to 100°C.

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Why replace your current UL Adapter?

The new design saves a significant amount of time on set up and tear down of equipment.

The new spindle with universal connector is easier to thread onto the viscometer.

The entire assembly can remain in place between tests with only the chamber being removed to prepare the next sample for testing.

Quick & Easy Design Saves Time

Quick & easy attachment of spindle:

Longer coupling nut for better grip and twist action to connect spindle to viscometer.

Redesigned bracket for attaching ULA assembly to viscometer. Provides more clearance for finger grip on coupling nut.

Quick & easy removal of chamber:

Simply loosen thumbwheel, chamber slides down and out.

Permits rapid testing of multiple samples by swapping out chambers.

Choice of leaving spindle attached to viscometer or disconnecting spindle and removing it with chamber.

Water jacket sleeve remains in place attached to viscometer while chamber and/or spindle only are removed. Saves set up time for the operator.

Unique ULA Assembly Design Provides Multiple Benefits:

Sturdy collar attaches to locating channel assembly which is connected to viscometer pivot cup.

Sample chamber is held firmly in place by the collar which provides proper alignment for the spindle rotation within the chamber.

Universal coupling nut on spindle ensures firm connection with viscometer and automatic self-centering of spindle in chamber during rotation.

Direct immersion of chamber in temperature bath is quick and easy.

Water jacket grips slide over collar and operator manually aligns the collar/jacket assembly to allow easy insertion of chamber containing sample to be tested.

Detail of UL Adapter: 1. Locating Channel Assembly, 2. Water Jacket, 3. Chamber Tube, 4. Collar with thumbwheel, 5. Tube End Cap, 6. Spindle with universal coupling

EZ-Lock Option

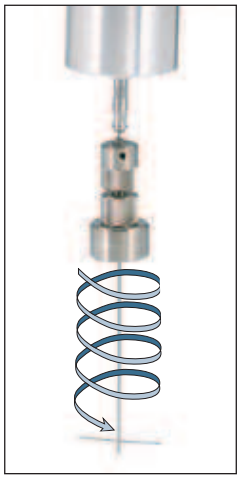
Enhanced UL Adapter is available with special EZ-Lock spindle coupling for use on standard Brookfield Viscometers/ Rheometers already equipped with the EZ-Lock feature. (p50)

UL Adapter Ranges cP(mPa•s)						
LVT, LVDV-E, LVDV-IP LVDV-II+P, LVDV-IIIU	RVT, RVDV-E RVDV-IP	RVDV-II+P RVDV-IIIU	HAT, HADV-E HADV-IP	HADV-II+P HADV-IIIU	HBT, HBDV-E HBDV-IP	HBDV-II+P HBDV-IIIU
1.0 - 2K	6.4 - 2K	3.0 - 2K	12.8 - 2K	6.0 - 2K	51.2 - 2K	24.0 - 2K

K = 1 thousand

Helipath Stand™

designed for measurement of non-flowing substances



For viscosity/consistency measurement of gels, pastes, creams, putty, gelatin and other non-flowing substances.

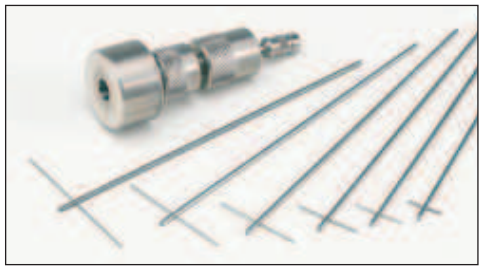
A Brookfield Viscometer or Rheometer is mounted on the Helipath drive motor and a T-bar spindle is attached to the viscometer using a special coupling. The drive motor slowly lowers or raises the viscometer so that the T-bar spindle creates a helical path through the test sample thus eliminating the problem of "channeling".

Compatible with standard Brookfield Viscometers and DV-III Ultra Rheometers

Simple to set up and clean

Provides a solution for hard-to-measure materials

Complete with drive motor, 6 T-bar spindles with coupling, case, lab stand, rod and base



The Helipath Stand can be used with any standard Brookfield Viscometer model, and is supplied complete with a set of six T-bar spindles and a special coupling.

Helipath Viscosity Ranges cP(mPa•s)			
	DIAL, DV-E, DV-IP	**DV-II+P**	**DV-IIIU**
LV Viscosity Range	156 - 3,120K	156 - 9,360K	156 - 9,360K
RV Viscosity Range	2K - 20M	2K - 100M	2K - 100M
HA Viscosity Range	4K - 40M	4K - 200M	4K - 200M
HB Viscosity Range	16K - 160M	16K - 800M	16K - 800M

** Maximum range shown is at 0.1 rpm K = 1 thousand M = 1 million cP = Centipoise mPa•s = milliPascal•seconds

EZ-Lock Option

Helipath Stand is now available with special EZ-Lock spindle coupling for use on standard Brookfield Viscometers/ Rheometers already equipped with the EZ-Lock feature. (p50)

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Vane Spindles

for foods, cosmetics, sealants...

...for use with paste-like materials, gels and fluids where suspended solids migrate away from the measurement surface of standard spindles.

Minimal disruption of sample during spindle immersion

Keeps particles in suspension during testing cycle

Viscosity data includes complete flow curve analysis when software is used

Provides information on yield behavior at low rotational speeds

Follows industry recommendations on length/diameter ratios for vane spindles

3-piece spindle set for versatile range capability

Optional V-74 and V-75 spindles for even greater range capability and immersion into small size sample containers

Vane Spindle Ranges

SPINDLE	TORQUE RANGE	SHEAR STRESS RANGE (Pa)	VISCOSITY RANGE cP(mPa•s)
V-71	NOT RECOMMENDED FOR USE ON LV TORQUE		
V-72	LV	.188-1.88	104.04-1.04K
V-73	LV	.938-9.38	502-5.02K
V-74	LV	9.38-93.8	5.09K-50.9K
V-75	LV	3.75-37.5	1.996K-19.96K
V-71	RV	.5-5	262-2.62K
V-72	RV	2-20	1.11K-11.1K
V-73	RV	10-100	5.35K-53.5K
V-74	RV	100-1K	54.3K-543K
V-75	RV	40-400	21.3K-213K
V-71	HA	1-10	524-5.24K
V-72	HA	4-40	2.22K-22.2K
V-73	HA	20-200	10.7K-107K
V-74	HA	200-2K	108.6K-1.086M
V-75	HA	80-800	42.6K-426K
V-71	HB	4-40	2.096K-20.96K
V-72	HB	16-160	8.88K-88.8K
V-73	HB	80-800	42.8K-428K
V-74	HB	800-8K	434.4K-4.344M
V-75	HB	320-3.2K	170.4K-1.704M
V-71	5xHB	20-200	10.48K-104.8K
V-72	5xHB	80-800	44.4K-444K
V-73	5xHB	400-4000	214K-2.14M
V-74	5xHB	4K-40K	2.172M-21.72M
V-75	5xHB	1.6K-16K	852K-8.52M

Note: 1. 1 Pa = 10 dyne/cm2 2. Viscosity Range is given at rotational speed of 10 RPM 3. 5xHB is the highest torque range available 4. Not for use with DV-E Viscometers

M = 1 million K = 1 thousand Pa = Pascal
cP = Centipoise mPa•s = Millipascal•seconds

Brookfield Vane Spindle Set

Includes V-71, V-72, and V-73 vane spindles. See the individual specifications in the spindle section. (p44)

Optional V-74 and V-75 spindles are smaller in size than V-73.

EZ-Lock Option

Vane Spindles are available with special EZ-Lock spindle coupling for use on standard Brookfield Viscometers/ Rheometers already equipped with the EZ-Lock feature. (p50)

DIN Adapter

Complies with DIN 53019 requirements for test geometry. DIN is the German equivalent to the U.S. ASTM Standards.

Designed to provide an alternative for those customers having limited sample volume. Requires 16 mL to 20 mL sample size.

Cylindrical geometry provides defined shear rates.

Comes with three spindles and chambers for measurement range of 1 to 50,000 cP.

DIN Adapter Set

EZ-Lock Option

DIN Spindles are available with special EZ-Lock spindle coupling for use on standard Brookfield Viscometers/ Rheometers already equipped with the EZ-Lock feature. (p50)

DIN Adapter Ranges cP(mPa•s)

LVT	LVDV-E LVDV-IP	LVDV-II+P LVDV-IIIU	RVT, RVDV-E RVDV-IP	RVDV-II+P RVDV-IIIU	HAT, HADV-E HADV-IP	HADV-II+P HADV-IIIU	HBT, HBDV-E HBDV-IP	HBDV-II+P HBDV-IIIU
1.9 - 37.9K	1.2 - 37.9K	1.0 - 50K	12.2 - 50K	5.0 - 50K	24.4 - 50K	10.0 - 50K	97.6 - 50K	40.0 - 50K

K = 1 thousand cP = Centipoise mPa•s = Millipascal•seconds

Spiral Adapter

Designed for measuring the viscosity of heavy paste-like materials such as solder paste, cosmetics, pharmaceuticals, food products and other non-flowing products. Provides variable shear rates for detecting pseudoplastic and thixotropic behavior.

The spiral adapter is mounted onto a Brookfield Viscometer; with the chamber immersed in the test sample and the motor turned on, material is “pumped thru” and reaches a steady flow rate. Shear rate is 0.677 sec^{-1} per rpm.

Compatible with standard Brookfield Viscometers & DV-III Ultra Rheometers

Compatible with electronics industry solder paste specifications

Complete with chamber, two spindles, assembly clamp and case

Note: RV/HA/HB torque ranges recommended

Spiral Adapter Set

Spiral Adapter Ranges cP(mPa•s)

LV Series	to 100K
RV Series	to 1.1M
HA Series	to 2.2M
HB Series	to 9.0M

K = 1 thousand M = 1 million cP = Centipoise mPa•s = milliPascal•seconds

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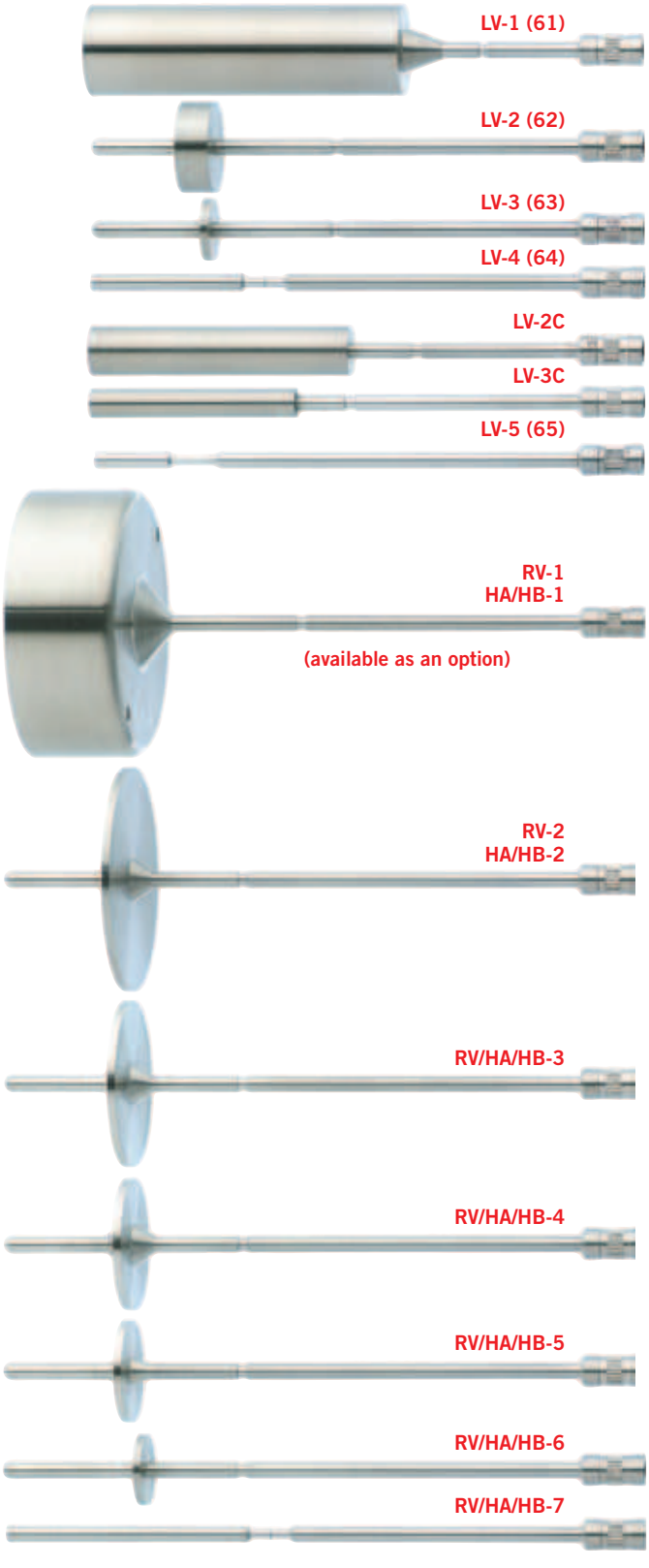
Spindles



LV Spindles cP(mPa•s)		
SPINDLE	**RANGE***	
LV-1 (61)	15 - 20K	
LV-2 (62)	50 - 100K	
LV-3 (63)	200 - 400K	
LV-4 (64)	1K - 2M	
LV-5 (65)	2K - 4M	LV-5 is an optional spindle designed to increase measuring range.
LV-2C	50 - 100K	
LV-3C	200 - 400K	

* Based on Standard LV speeds .3 - 60 rpm M = 1 million K = 1 thousand
Note: LV-1 through LV-4 are supplied with LV instruments.
LV-2C & LV-3C are optional "cylindrical spindles" offering geometry for calculating shear rates.
LV and RV/HA/HB spindles are supplied in 302 stainless steel.
Optional 316 stainless or teflon coated spindles are available

LV Spindles cP(mPa•s)			
SPINDLE	**RANGE* RV SERIES**	**RANGE* HA SERIES**	**RANGE* HB SERIES**
RV-1**	100 - 20K	200 - 40K	800 - 160K
HA/HB-1**	100 - 20K	200 - 40K	800 - 160K
RV-2	100 - 80K	200 - 160K	800 - 640K
HA/HB-2	100 - 80K	200 - 160K	800 - 640K
RV/HA/HB-3	100 - 200K	200 - 400K	800 - 1.6M
RV/HA/HB-4	200 - 400K	400 - 800K	1.6K - 3.2M
RV/HA/HB-5	400 - 800K	800 - 1.6M	3.2K - 6.4M
RV/HA/HB-6	1K - 2M	2K - 4M	8K - 16M
RV/HA/HB-7	4K - 8M	8K - 16M	32K - 64M

* Based on standard RV/HA/HB speeds .5-100 RPM. M = 1 million K = 1 thousand
Note: LV and RV/HA/HB spindles are supplied in 302 stainless steel.
Optional 316 stainless or teflon coated spindles are available
** This spindle available as an option

SPINDLE RACK
SR-23Y

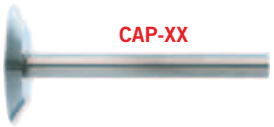
RV/HA/HB Spindle Set includes spindles #2 - #7 and is supplied with standard Brookfield Viscometers and Rheometers.

Spindle #1 is available as an option.

Spindle Rack is also available as an option with both LV and RV/HA/HB spindle sets.

Call or visit our website for more information on spindles with EZ-Lock connectors.

Spindles



Wells/Brookfield Spindles & Cups

SPINDLE	SHEAR RATE	SAMPLE VOLUME	CONE ANGLE	CONE RADIUS
CPE-40	7.50N sec^{-1}	.5mL	.8°	2.4cm
CPE-41	2.00N sec^{-1}	2.0mL	3°	2.4cm
CPE-42	3.84N sec^{-1}	1.0mL	1.5°	2.4cm
CPE-51	3.84N sec^{-1}	.5mL	1.5°	1.2cm
CPE-52	2.00N sec^{-1}	.5mL	3°	1.2cm
CUP				
CPE-44Y	Standard cup without temperature probe			
CPE-44PY	Standard cup with RTD temperature probe			
PCPE-3Y	Cup with 1 purge fitting			
PCPE-6Y	Cup with luer fitting and 1 purge fitting			
PCPE-4Y	Cup with luer fitting and 2 purge fittings			
PCPE-7Y	Cup with luer fitting and 4 purge fittings			

Note: 1. Wells-Brookfield cones and cups are calibrated at the factory.
Cones ordered after shipment require cups to be returned for calibration to new cone.
2. See page 16 for viscosity ranges

CAP Spindles

SPINDLE	SHEAR RATE	SAMPLE VOLUME	CONE ANGLE	CONE RADIUS
CAP-01	13.3N sec^{-1}	67 µL	0.45°	1.511cm
CAP-02	13.3N sec^{-1}	38 µL	0.45°	1.200cm
CAP-03	13.3N sec^{-1}	24 µL	0.45°	0.953cm
CAP-04	3.3N sec^{-1}	134 µL	1.8°	1.200cm
CAP-05	3.3N sec^{-1}	67 µL	1.8°	0.953cm
CAP-06	3.3N sec^{-1}	30 µL	1.8°	0.702cm
CAP-07	2.0N sec^{-1}	1700 µL	3.0°	2.399cm
CAP-08	2.0N sec^{-1}	400 µL	3.0°	1.511cm
CAP-09	2.0N sec^{-1}	100 µL	3.0°	0.953cm
CAP-10	5.0N sec^{-1}	170 µL	1.2°	1.511cm

Note: 1. Recommend ordering calibration fluids specific to cone for field calibration
2. See page 19 for viscosity ranges

UL Spindles & Chambers

SPINDLE	TYPE	SAMPLE VOLUME	SHEAR RATE
YULA-15(E)	Spindle - 304 stainless steel		1.224N
YULA-15(E)Z	Spindle - 316 stainless steel		1.224N
ULA-31(E)Y	Sample Chamber - 304 stainless steel	16mL	
ULA-35(E)YZ	Sample Chamber - 316 stainless steel	16mL	

Note: 1. See page 41 for viscosity ranges
2. (E) represents enhanced UL version (introduced Jan. 2006)

N = rpm

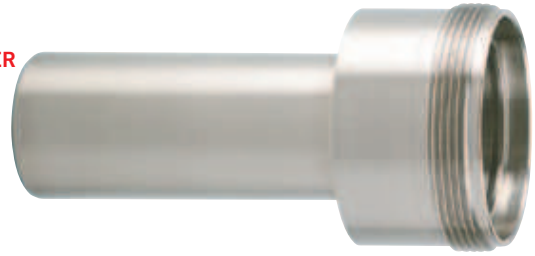
DIN Spindles

SPINDLE	SHEAR RATE	SAMPLE VOLUME
ULA-DIN-85	1.29N	17.0mL
ULA-DIN-86	1.29N	6.5mL
ULA-DIN-87	1.29N	2.0mL
HT-DIN-81 for Thermosel	1.29N	7.0mL
SC4-DIN-82 for SSA	1.29N	1.5mL
SC4-DIN-83 for SSA	1.29N	1.5mL
CHAMBER		
ULA-DIN-6Y	for use with ULA-DIN-86 and 87	
DAA-1	for use with ULA-DIN-85	

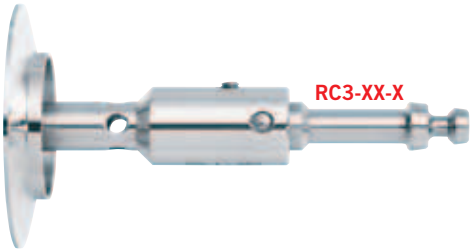
TEL 800-628-8139 or 508-946-6200 **FAX** 508-946-6262 **www.brookfieldengineering.com**

PVS SPINDLE

PVS CHAMBER



CC3-XX



RC3-XX-X

V3-80-40

SC4-XXBS SOLID SHAFT*

SC4-XX LINK HANGING

HT-2

HT-2DB-100

CHAMBER RACK HT-54

Call or visit our website for more information on spindles with EZ-Lock connectors.

PVS Spindles and Chambers

BOB	SHEAR RATE	SAMPLE VOLUME
PVS-B1-D-HC	1.70N	23mL
PVS-B2-D-HC	0.38N	40mL
PVS-B5-D-HC	0.85N	30mL
CHAMBER		
PVS-30 (standard)	for use with B1, B2 or B5 spindle	
Triple Annulus	for use with PVS - TA5 B5 - D - HC	

*±1 mL

R/S Spindle

RS Rheometers with serial numbers beginning with "302" and "303" use different spindles. Call for details.

SPINDLE COAXIAL	VISCOSITY RANGE (Pa•s)	SHEAR RATE	MAX. SHEAR STRESS	SAMPLE VOLUME
DG	0.002-19	4-4344 sec^{-1}	83 Pa	21mL
CC3-40	0.004-134	2-2148 sec^{-1}	287 Pa	45mL
CC3-25	0.026-883	1-1291 sec^{-1}	1140 Pa	17mL
CC3-14	0.151-5035	1-1291 sec^{-1}	6500 Pa	3mL
CC3-8	0.813-27111	1-1291 sec^{-1}	35000 Pa	1.2mL
CONE				
RC3-25-1	0.061-2037	6-6000 sec^{-1}	12223 Pa	0.08mL
RC3-25-2	0.122-4074	3-3000 sec^{-1}	12223 Pa	0.3mL
RC3-50-1	0.008-255	6-6000 sec^{-1}	1528 Pa	0.7mL
RC3-50-2	0.015-509	3-3000 sec^{-1}	1528 Pa	1.5mL
RC3-75-1*	0.002-75	6-6000 sec^{-1}	453 Pa	2.0mL
RC3-75-2*	0.005-151	3-3000 sec^{-1}	453 Pa	3.9mL
PLATE				
RP3-25	0.373-12450	1-1309 sec^{-1}	16297 Pa	0.5mL
RP3-50	0.023-779	3-2618 sec^{-1}	2040 Pa	2mL
RP3-75*	0.005-153	4-3927 sec^{-1}	600 Pa	4.5mL

VANE SPINDLE	VANE LENGTH	VANE DIAMETER	SHEAR STRESS
V3-80-40	80mm	40mm	6-200 Pa
V3-60-30	60mm	30mm	15-505 Pa
V3-40-20	40mm	20mm	51-1700 Pa
V3-30-15	30mm	15mm	120-4000 Pa
V3-20-10	20mm	10mm	408-13600 Pa
V3-10-5	10mm	5mm	3276-109200 Pa

*For use with water bath version only

1 Pa•s = 1,000 cP

Note: 1. Values based on minimum speed of 1 RPM and maximum speed of 1000 RPM
2. 75 mm plates cannot be used with Peltier Plate or electrically heated rheometers

Thermosel Spindles and Chambers

Link hanging configuration is standard

SPINDLE	SHEAR RATE	SAMPLE VOLUME
SC4-18	1.32N	8.0mL
SC4-31	.34N	10.0mL
SC4-34	.28N	9.5mL
SC4-21	.93N	8.0mL
SC4-27**	.34N	10.5mL
SC4-28	.28N	11.5mL
SC4-29	.25N	13.0mL
HT-DIN-81	1.29N	7.0mL

*SC4-XXBS = Solid Shaft. Not available for SC4-18 and SC4-21 spindles
**Also available as SC4-27D-100 = Disposable spindle, 100 units

CHAMBER	TYPE
HT-2	Sample Chamber - Reuseable, stainless steel
HT-2DB-100	Sample Chamber - Disposable, aluminum, 100 units

Note: See page 37 for spindle ranges

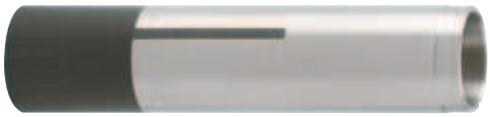
Spindles

SC4-27SD SOLID SHAFT**

SC4-27 LINK HANGING

CABLE SC4-61Y

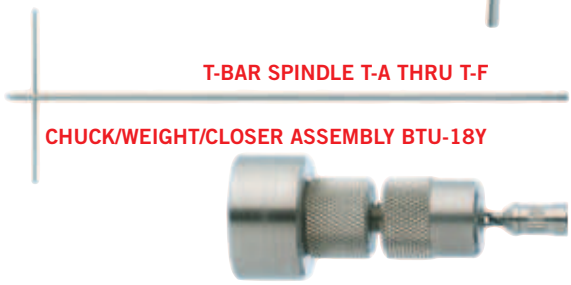
SC4-13RPY



SC4-13RD

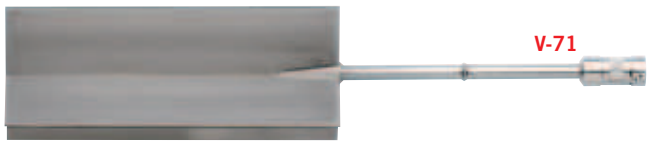
T-BAR SPINDLE T-A THRU T-F

CHUCK/WEIGHT/CLOSER ASSEMBLY BTU-18Y



SPIRAL ADAPTER SPINDLE SA-70

V-71



Small Sample Spindles and Chambers

SPINDLE	SHEAR RATE	SAMPLE VOLUME
SC4-18	1.32N	6.7 mL
SC4-31	0.34N	9.0 mL
SC4-34	0.28N	9.4 mL
SC4-16	0.29N	4.2 mL
SC4-25	0.22N	16.1 mL
SC4-21	0.93N	7.1 mL
SC4-27	0.34N	10.4 mL
SC4-15	0.48N	3.8 mL
SC4-28	0.28N	11.0 mL
SC4-29	0.25N	13.5 mL
SC4-14	0.40N	2.1 mL
SC4-DIN-82	1.29N	1.5 mL
SC4-DIN-83	1.29N	1.5 mL

CHAMBER	TYPE
SC4-13R	Sample Chamber w/o temperature probe
SC4-13RPY	Sample Chamber w/RTD temperature probe & cable
SC4-8R	Sample Chamber w/o temperature probe
SC4-8RPY	Sample Chamber w/RTD temperature probe & cable
SC4-7R	Sample Chamber w/o temperature probe
SC4-7RPY	Sample Chamber w/RTD temperature probe & cable
SC4-6R	Sample Chamber w/o temperature probe
SC4-6RPY	Sample Chamber w/RTD temperature probe & cable
SC4-13RD-100†	Sample Chamber - Disposable, aluminum, 100 units

Note:See page 39 for spindle/chamber ranges
**Solid shaft option available for spindles SC4-21 (Part No. SC4-21SD) and SC4-27 (Part No. SC4-27SD).
† Requires the use of special water jacket SC4-45YD

KU-2 Spindles

SPINDLE	TYPE
KU1-10	Standard Krebs Spindle
KU1-75Y	Optional Paste Spindle

T-Bar Spindles cP(mPa•s)

SPINDLE	LV	RV	HA	HB
T-A	156 - 62.5K	2K - 400K	4K - 800K	16K - 3.2M
T-B	312 - 124.8K	4K - 800K	8K - 6M	24K - 6.4M
T-C	780 - 312K	10K - 2M	20K - 4M	80K - 16M
T-D	1.5K - 624K	20K - 4M	40K - 8M	160K - 32M
T-E	3.9K - 1.5M	50K - 10M	100K - 20M	400K - 80M
T-F	7.8K - 3.1M	100K - 20M	200K - 40M	800K - 160M

M = 1 million K = 1 thousand

Spiral Adapter Spindle

SPINDLE	CHAMBER
SA-70	SA-1Y

Note: See page 44 for ranges

Vane Spindles

SPINDLE	VANE LENGTH (in)	VANE DIAMETER (in)
V-71	2.708	1.354
V-72	1.706	.853
V-73	.998	.499
V-74	.463	.232
V-75	.632	.316

Note: Container diameter should be twice (2x) the vane diameter when possible. See page 43 for ranges.

TEL 800-628-8139 or 508-946-6200 FAX 508-946-6262 www.brookfieldengineering.com

Options & Specialty Items

MVS-1Y Flag Impeller Spindle

Use with the Small Sample Adapter to help keep sample materials in suspension

4B2 Spindle

Required for viscosity testing in accordance with ASTM D2983 (Low Temperature Viscosity Measurement of Automotive Fluid Lubricants)

ABZ Spindle

Used for viscosity testing of thick film pastes.
Short spindle length is suitable for immersion into shallow depth containers. Sensing length of spindle is less than 1-inch.

Custom Spindles

Custom spindles can be developed to meet your particular test requirements.
Contact Brookfield or an authorized dealer for details.

Type D Extension Link	
SPINDLE	**TYPE**
YDX-1	Male coupling nut; attaches to spindle
SP1-UC-Y	Female coupling nut; attaches to viscometer
SXV-XX	Extension link; see below for lengths

Type S Extension Link
SPINDLE
Available in LV-4 and RV/HA/HB spindle configurations

Extension		
LINK	**LENGTH**	**USED WITH**
SXV-08	1"	UL Adapter
SXV-09	1.12"	Small Sample Adapter
SXV-24	3"	Thermosel
SXV-32	4"	Type D/S Extension
SXV-48	6"	Type D/S Extension
SXV-80	10"	Type D/S Extension
SXV-96	12"	Type D/S Extension

Note: Other lengths available; call for details

Quick Connect Coupling (SP-7Y)	
PART	
SP-3	Coupling to viscometer/rheometer
SP-4	Coupling to spindle
SP-5	Sleeve (to hold together)

Call or visit our website for more information on spindles with EZ-Lock connectors.

Options & Specialty Items

Model A Lab Stand: Dial, DV-E
Model S Lab Stand: DV-I Prime, DV-II+Pro, YR-1

All standard viscometers — and the YR-1 Rheometer — are supplied with either a Model A or Model S Laboratory Stand. These traditional stands move the viscometer up and down by turning the knob on the 14 inch rod* and clamp assembly. The clamp itself has been newly redesigned to allow for an easier, more ergonomic grip.

*Lab Stands with 18 inch rod assemblies are also available for testing with baths. Part Numbers for 18" stands: Model A 18, Model S 18

MODEL A LAB STAND

MODEL S LAB STAND

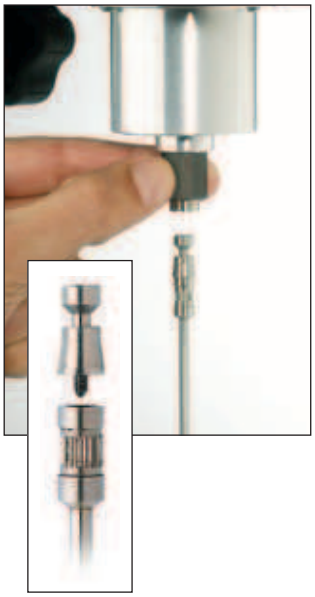
Quick Action Lab Stand:

Optional purchase for Dial, DV-E, DV-I Prime, DV-II+Pro & YR-1

MODEL Q LAB STAND

Taking measurements has never been so fast or easy! With the push of a button, the instrument moves up and down the lab stand, quicker and easier than ever before. The Quick Action Lab Stand is perfect for busy lab environments, especially those with multiple operators or multiple samples. This stand is available as an option for new Dial, DV-E, DV-I Prime and DV-II+Pro Viscometers and is also compatible with existing models.

EZ-Lock Spindle Coupling System



Quickly and more safely change spindles with this spring-loaded spindle coupling attachment. Attach the EZ-Lock Spindle Coupling to a spindle and insert the spindle into the chuck. That's it! Changing spindles has never been quicker or easier... making this the perfect option for busy labs with multiple samples to test. EZ-Lock can be purchased as an option for new DV-I Prime and DV-II+Pro Viscometers as well as the DV-III Ultra Rheometer. It can also be retrofitted to your existing DV-I and DV-II series Viscometer as well as any of your DV-III series Rheometers.

EZ-Lock is also available for use with your favorite Brookfield accessories such as the Thermosel and Helipath Stand as well as the following adapters: Small Sample Adapter, UL Adapter, Enhanced UL Adapter and DIN Adapter.*

* Special brackets may be required to accommodate the length of the EZ-Lock system; requirement can be determined at time of ordering.

Ball Bearing Option

If your viscometer or rheometer is used by multiple operators or in a busy lab environment, a more durable ball bearing suspension system may help keep your instrument in calibration longer with less "down time". This option can be ordered at the time of purchase and a retrofit to existing instruments may be available. Consult Brookfield or your local Brookfield representative for details.**

** This option is for the torque ranges of RV, HA, and HB only - it is not available for instruments in the LV torque range.

Complimentary Torque Decals

Now you can quickly identify the torque range of your standard Brookfield Viscometer/ Rheometer with easy-to-read decals. The decals provide a convenient labeling system for your lab or production personnel. The label sheet comes with pressure-sensitive decals, two large and two small for LV, RV, HA and HB torque ranges. The small decals fit on the instrument faceplate and the large decals the on the side, back or top of the instrument. These free decals are also available for CAP series Viscometers.

Protective Instrument Covers

Brookfield protective instrument covers are designed to shield your instrument from dust and dirt in the most challenging environments. These covers are also ideal in situations where sample testing materials may accidentally be spilled on the instrument and cause damage. Protective instrument covers quickly slip over the viscometer/rheometer protecting both the front and sides of the instrument. The clear, see-through material allows the use of the keypad while the cover is in place on most DV-I+/DV-II+/CAP series Viscometers and DV-III series Rheometers.

Protective Keypad Covers

Protect your keypad against dirt, scratches, spillage and dust with these “peel and stick” disposable covers. They are ideal for instruments with multiple users and for busy, high traffic work areas. These flexible protective covers are packaged in quantities of 10 and are available for most DV-I series, DV-II series, CAP series, DV-III series, YR-1, VTE series and AST-300SY touch screen controller models.

The Brookfield Website

Looking for more information? Then the Brookfield website is the place to visit. Here you can download manuals, MSDSs, article reprints, and brochures. Find representatives in your area or register your instrument online. Find out when our popular training series will be in your area or watch our, free online videos. The website is updated frequently so there’s always something new to discover at www.brookfieldengineering.com.

Viscosity Standards

Brookfield Viscosity Standards provide a convenient, reliable way to verify the calibration of your Brookfield Laboratory Viscometer/Rheometer. Brookfield Viscosity Standards are Newtonian, and they are available as either silicone or oil. Silicone fluids are less temperature sensitive than oil fluids.

Note: Brookfield recommends that all fluids be replaced annually

Silicone Viscosity Standards

These fluids are most commonly used to verify calibration of Brookfield Viscometers/Rheometers.

Accuracy: ±1% of viscosity value

Excellent temperature stability

Recommended for use with Brookfield and most other rotational viscometers

Most economical

Special viscosity values and temperature calibrations available upon request

VisCal Kit

The Brookfield VisCal Kit provides all the necessary items to verify calibration of your Viscometer/Rheometer. Includes Brookfield 600mL Beaker, 1 pint of Silicone Viscosity Standard, Dispersing Bottle for cleanup and Trapper Cleaning Agent.*

*Trapper Cleaning Agent available only in shipments within the USA

Plastic VisCal Kit

The Brookfield Plastic VisCal Kit provides all the necessary items to verify calibration of your Viscometer/Rheometer in a glass-free environment. Includes Brookfield 600mL Plastic Beaker, 1000ml of Silicone Viscosity Standard (5-12,500 cP) in a plastic bottle and a Brookfield-designed metal lid for anchoring beaker in the temperature bath.

General Purpose Silicone Fluids

Brookfield Part #	Nominal Viscosity cP (mPa•s)	Temp °C
5 cps	5	25.0°C
10 cps	10	25.0°C
50 cps	50	25.0°C
100 cps	100	25.0°C
500 cps	500	25.0°C
1000 cps	1,000	25.0°C
5000 cps	5,000	25.0°C
12500 cps	12,500	25.0°C
30000 cps	30,000	25.0°C
60000 cps	60,000	25.0°C
100000cps	100,000	25.0°C

High Temperature Silicone Fluids

Brookfield Part #	Nominal Viscosity cP (mPa•s)	Temp °C	Temp °F
HT30000	30,000	25.0°C	77°F
	9,000	93.3°C	200°F
	4,500	149.0°C	300°F
HT60000	60,000	25.0°C	77°F
	18,000	93.3°C	200°F
	9,000	149.0°C	300°F
HT100000	100,000	25.0°C	77°F
	30,000	93.3°C	200°F
	15,000	149.0°C	300°F

Special Order Silicone Fluids

For our customers needing a nonstandard viscosity or temperature range, our silicone fluids can be modified to meet most requirements.

VISCOSITY BLENDS CALIBRATED AT 25°C (77°F)

- Minimum: 5 cP (mPa•s)
- Maximum: 60,000 cP (mPa•s)
- Blends will be within ±2% of requested value

TEMPERATURE CALIBRATIONS

- Minimum: 10°C (50°F)
- Maximum: 80°C (176°F)
- Minimum temperature increment: 2°C

TEL 800-628-8139 or 508-946-6200 **FAX** 508-946-6262 **www.brookfieldengineering.com**

Oil Viscosity Standards

These fluids are used for specific instruments using cone/plate or Krebs spindle geometry. Also, certain industries may require use of oil standards.

Accuracy: ±1% of viscosity value

Appropriate for use at shear rates greater than 500 sec^{-1}

Recommended for use with cone/plate Viscometers at viscosities above 5,000 cP

Recommended for Brookfield CAP series and KU-2 Viscometers and R/S Rheometers

Brookfield oil viscosity standards are hydro-carbon based, either mineral oil or polybutenes

Note: Other oil fluids are available – call for details

Brookfield Viscosity Standards are accurate to ±1% of the stated viscosity and are certified by methods traceable to the United States National Institute of Standards and Technology (NIST). The selection of one or two fluids will normally provide sufficient measurement points to verify calibration of your instrument. All fluids are supplied in 1/2 liter (1 pint) containers complete with a certificate of calibration. CAP Oil Fluids are supplied in 150 mL (4 oz) containers

CAP Viscometer Oil Fluids

For calibrating CAP Series cones each spindle has its own fluid

	HIGH TORQUE CAP				LOW TORQUE CAP			
	Low Temp 25°C		High Temp 60°C		Low Temp 25°C		High Temp 60°C	
Cone Spindle	Brookfield Part #	Viscosity cP (mPa•s)	Brookfield Part #	Viscosity cP (mPa•s)	Brookfield Part #	Viscosity cP (mPa•s)	Brookfield Part #	Viscosity cP (mPa•s)
1	CAP1L	89	CAP1H	89	CAPOL	57	CAPOH	57
2	CAP2L	177	CAP2H	177	CAP1L	89	CAP1H	89
3	CAP3L	354	CAP3H	354	CAP2L	177	CAP2H	177
4	CAP4L	708	CAP4H	708	CAP3L	354	CAP3H	354
5	CAP5L	1,417	CAP5H	1,417	CAP4L	708	CAP4H	708
6	CAP6L	3,542	CAP6H	3,542	CAP5L	1,417	CAP5H	1,417
7	CAP7L	1,328	CAP7H	1,328	CAP1L	89	CAP1H	89
8	CAP8L	5,313	CAP8H	5,313	CAP3L	354	CAP3H	354
9	CAP9L	21,250	CAP9H	21,250	CAP5L	1,417	CAP5H	1,417
10	CAP10L	236	CAP10H	236	CAP2L	177	CAP2H	177

HOW TO SELECT A CAP FLUID

- Determine which viscometer is being used: High Torque or Low Torque.
- Determine which temperature model is being used: Low Temperature (5°C-75°C) or High Temperature (50°C-235°C)
- Determine which cone is being used.

Krebs Viscometer Oil Fluids

Brookfield Part #	Nominal Viscosity Krebs Units	Temp °C
KU61	61	25.0°C
KU73	73	25.0°C
KU87	87	25.0°C
KU99	99	25.0°C
KU106	106	25.0°C

General Purpose Oil Fluids

Brookfield Part #	Nominal Viscosity cP (mPa•s)	Temp °C
B29	29	25.0°C
B200	200	25.0°C
B600	600	25.0°C
B1060	1,060	25.0°C
B2000	2,000	25.0°C
B10200	10,200	25.0°C
B21000	21,000	25.0°C
B73000	73,000	25.0°C
B200000	200,000	25.0°C
B360000	360,000	25.0°C

R/S Rheometer Oil Fluids

Spindle	Brookfield Part #	Nominal Viscosity cP (mPa•s)	Temp °C
C25-1	B41000	41,000	25.0°C
C50-1	B10200	10,200	25.0°C
C50-2	B41000	41,000	25.0°C
C75-1	B4900	4,900	25.0°C
C75-2	B4900	4,900	25.0°C

SSB: Starch Applications

recommended viscometer choices

RVDV-II+Pro Viscometer (p8)
or RVDV-III Ultra Rheometer (p20)
Ball Bearing Suspension (p50)
TC-112P Programmable Water Bath
Small Sample Adapter (p38)
SC4-21 Spindle
SC4-13RPY Sample Chamber w/RTD probe (p48)

TT-100 Process Viscometer (p80)

The SSB (Starch System Brookfield) is designed to monitor the viscosity of industrial starches during automated quick-cook (gelatinization) and fast cool-down of starch samples. TT-100 Process Viscometer is used for real time starch measurements in paper coatings and adhesives manufacturing.

Lab FEATURES & BENEFITS

Fast, reproducible results means production adjustments can be made immediately.

Automated, easy-to-compare test results using Optional Software

Programmable temperature control +35°C to +95°C

Process FEATURES & BENEFITS

Ensures correct viscosity of end product

Controls coating thickness during application

Chocolate Applications

recommended viscometer choices

HADV-II+Pro Viscometer (p8)
or HADV-III Ultra Rheometer (p20)
Ball Bearing Suspension (p50)
TC-102 Water Bath (p35)
Small Sample Adapter (p38)
SC4-27 Spindle (p48)
SC4-13RPY Sample Chamber w/RTD probe (p48)

R/S-CC Plus Rheometer (p26)

TT-200 Process Viscometer (p81)

Measuring chocolate viscosity is important to the confectioner in order to help optimize chocolate flow properties in a melted condition for various mixing and coating applications.

Lab FEATURES & BENEFITS

Determines Casson yield and Plastic Viscosity

Conforms to NCA and Bureau of the Technical Committee Office Internationale du Cacao et du Chocolat.

Control of melting temperatures assuring reproducible comparisons

Easy to clean, easy to operate

Process FEATURES & BENEFITS

Provides real time chocolate viscosity measurement and control

TEL 800-628-8139 or 508-946-6200 **FAX** 508-946-6262 **www.brookfieldengineering.com**

Paints, Coatings & Ink Applications

recommended viscometer choices

KU-2 Viscometer (p32)

CAP 2000+ Viscometer (p18)

DV-II+Pro Viscometer (p8)

AST-100 Process Viscometer (p80)

Brookfield has viscometers that have been designed specifically for use in Paint and Coating applications. Whether your requirement is to measure in Krebs units with the KU-2, simulate flow behavior at high shear with the CAP, measure new formulations with DV-II+Pro or control viscosity with the AST-100 Viscometer, we have the solution.

Lab FEATURES & BENEFITS

Easy to clean, easy to operate

Instant results, no calculations means fewer errors

Ensure coating quality

Long term reliable performance

Economically priced

Process FEATURES & BENEFITS

Provides continuous measurement and control

Guarantees consistent coating quality

Minimize operating costs with less waste

Asphalt Applications

recommended viscometer choices

RVDV-II+Pro Viscometer (p8)
or RVDV-III Ultra Rheometer (p20)
Thermosel (p36)
SC4-27 Spindle (p47)
Programmable Controller (p36)

TT-100 Process Viscometer (p80)

Specific test methods for measuring the viscosity of highway asphalt “binders” at mixing and compacting temperatures using Brookfield’s Thermosel System have been defined by SHRP, the Strategic Highway Research Program, sponsored by the US Government. New methods are also under investigation to ensure consistent asphalt quality during processing using Brookfield’s TT-100 in-line Process Viscometer.

Lab FEATURES & BENEFITS

Adheres to ASTM Spec D4402

Ensures asphalt pumpability

Provides variable temperature and shear rate capability for complete viscosity profiles

Process FEATURES & BENEFITS

Immediate adjustment of process operations to avoid out-of-spec materials

Verify asphalt binder spec without grab samples

Personal Care Products Applications

recommended instrument choices

R/S-CPS Plus Rheometer (p25)

TT-100 Process Viscometer (80)

CT3 Texture Analyzer (p58) with Extrusion Cell

Viscosity

Shampoos and lotions need to flow easily yet retain sufficient thickness. Viscosity analysis and temperature profiling are important QC tools to use. The Brookfield R/S-CPS Rheometer is important for comprehensive data analysis while the TT-100 Process Viscometer provides in-line viscosity control during processing.

Lab FEATURES & BENEFITS

Small sample volume & rapid temperature control

Process FEATURES & BENEFITS

Correlation with lab data

Consistent product quality

Texture FEATURES & BENEFITS

The physical consistency of face creams and cosmetic ointments is one of the most important subjective characteristics. The CT3 Texture Analyzer can extrude the semi-solid gel of cream or ointment in a controlled manner, revealing the yield stress and flow characteristics of the product.

Simple, reliable operation provides information on multiple characteristics from a single test

Real-life measure of sample response

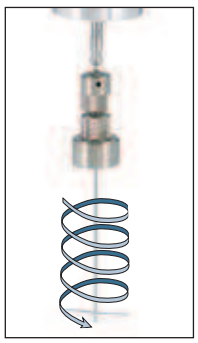
Electronics Paste Applications

recommended viscometer choices

HBDV-II+Pro Viscometer (p8)

Spiral Adapter (p44)

Ball Bearing Suspension (p50)



RVDV-I Prime Viscometer (p10)

Model D Helipath Stand (p42)

Viscosity FEATURES & BENEFITS

The rheological properties of solder paste affect behavior during application to electronic assemblies. This includes dispensing operations and flow characteristics during screen and stencil printing. The Brookfield RVDV-I Prime Viscometer with Helipath Stand and T-bar spindle provides single point viscosity measurement for QC control. The Brookfield HBDV-II+ Pro Viscometer with Spiral Adapter offers an automated test method for total flow curve evaluation.

Spindle can be inserted directly into paste container

Methods comply with IPC test specifications

TEL 800-628-8139 or 508-946-6200 **FAX** 508-946-6262 **www.brookfieldengineering.com**

Pharmaceutical Applications

recommended instrument choices

R/S-CPS Plus Rheometer (p25)

CT3 Texture Analyzer (p58) with Syringe Test Fixture

Viscosity FEATURES & BENEFITS

Most ointments need to be sufficiently thick when standing to prevent them from oozing away from the intended area of use. They also need to flow easily when applied (known as shear thinning behavior). The R/S-CPS Rheometer measures high viscosity at near zero shear rate to determine yield stress values and to create viscosity vs. shear rate flow curves which simulate rubbing and spreading.

Small sample volume

Automated test method and rapid temperature equilibration

Texture FEATURES & BENEFITS

The physical properties of tablets and capsules are a critical characteristic. The hardness of a tablet, the dissolution of a tablet or the strength of a gel capsule will have an effect on drug release rate in the body. The CT3 accommodates variable geometries while maximizing the value of data obtained.

Multiple applications with single instrument

Rapid measurement of physical properties, such as tablet hardness, dissolution and gelatin strength

Petroleum Applications

recommended viscometer choices

TT-220 Process Viscometer (p81)

TT-100 Process Viscometer (p80)

PVS Rheometer (p22)

LVDV-II+Pro Viscometer (p8)

PVS Rheometer FEATURES & BENEFITS

Fracturing fluids, drilling muds, cements and oil/water emulsions are examples of materials easily analyzed.

Viscosity measurements under pressure & at elevated temperature

Automate standard test procedures

TT-100 & TT-220 FEATURES & BENEFITS

The TT-100 in-line Viscometer provides real-time viscosity measurement of fluids in pressurized lines from storage tanks through blenders before pumping down-hole. The multiple speed TT-220 provides real-time drill mud viscosity data that allows rig operators to obtain yield point and plastic viscosity continuously.

Characterizes drilling fluid viscosity and maintains consistency

Eliminates “grab” samples, saves time, provides repeatable measurements

LVDV-II+Pro Viscometer FEATURES & BENEFITS

Ensures a quick and easy way to check fracturing fluid viscosity. Special cylindrical spindles provides capability for Low Shear Rate Viscosity Test (LSRV).

Sauces & Dressings Applications

recommended instrument choices

R/S-SST Plus Rheometer (p27)

RVDV-I Prime Viscometer (p10)

Model D Helipath Stand (p42)

CT3 Texture Analyzer (p58) with Extrusion Cell

Maintaining consistent food quality and repeatable flow behavior is imperative in the food industry — especially in sauces and dressings. Whether the product will be poured, squeezed from a bottle or used for coating, designing the right test method is key.

Lab FEATURES & BENEFITS

Multiple instrument/spindle choices to suit most applications

Economically priced to meet low budget requirements

Quick, single point viscosity tests often meet the objective

Texture FEATURES & BENEFITS

Quick, easy method to quantify flow behavior out of the bottle or tube using an Extrusion Cell Fixture

Rugged, easy-to-use instrument for use on the production floor

Use with application software for new formulation testing

Construction Materials

recommended viscometer choices

R/S-SST Plus Rheometer (p27)

Vane Spindle (p47)

RVDV-III Ultra Rheometer (p20)

Vane Spindle (p20)

RVDV-II+Pro Viscometer (p8)

Spiral Adapter (p44)

The construction industry manufactures a wide range of materials with medium to high viscosity. New methods are available with the introduction of spindle geometries that can handle the mix of product materials ranging from gypsum-based joint compounds, cements, concretes, mortars and grouts to various clay mixtures.

Lab FEATURES & BENEFITS

Multiple spindle types can be used with the same instrument minimizing investment cost

Yield stress test gives more information than traditional "slump test"

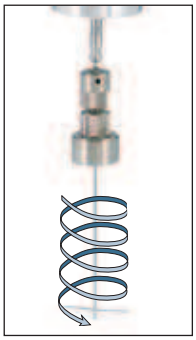
Flow curves are quickly generated to show complete shear thinning behavior for consistent quality

Special RSS-90Y Spindle for R/S-SST Plus Rheometer measures in BU units. Complies with ASTM C474.

TEL 800-628-8139 or 508-946-6200 **FAX** 508-946-6262 **www.brookfieldengineering.com**

Dairy Products Applications

recommended instrument choices



LVDV-I Prime Viscometer (p10)

UL Adapter (p40)

Model D Helipath Stand (p42)

R/S-SST Plus Rheometer (p27)

AST-100FSY Process Viscometer (p80)

CT3 Texture Analyzer (p58)

The dairy industry has a broad range of products requiring viscosity and texture measurement, from milk and creams to yogurts and butters. Brookfield offers a selection of instruments to ensure consistent product quality, flow/spread behavior, and mouth-feel.

Lab FEATURES & BENEFITS

Accommodates homogenous liquids as well as heterogeneous mixtures with particles

Guarantees customer satisfaction because quality is repeatable

Texture FEATURES & BENEFITS

Simple, easy-to-implement test methods

Wide choice of probes to simulate customer experience in handling/consumption of product

Process FEATURES & BENEFITS

3A approved designed

Real-time process control

Adhesives Applications

recommended viscometer choices

RV or HBDV-II+Pro Viscometer (p8)

Thermosel (p36)

Programmable Controller (p36)

HBDV-III Ultra CP Rheometer (p20)

RVDV-I Prime Viscometer (p10)

Model D Helipath Stand (p42)

AST-100 Process Viscometer (p80)

Adhesives can vary significantly in viscosity. In-process flow behavior during manufacturing may have lower viscosity values compared to end-point conditions. Final product viscosity can be modest with easy flow capability to paste-like consistency, requiring high force to apply to a substrate. Choosing the proper test method is critical.

Lab FEATURES & BENEFITS

Multiple choices for “best-fit” instrument and spindle

Guarantees consistent end product from batch-to-batch

Small sample size (<2mL) for high value products

Process FEATURES & BENEFITS

Continuous control of viscosity when applying to substrate

Ensures economic use of adhesives in continuous operations

process
viscome


eters

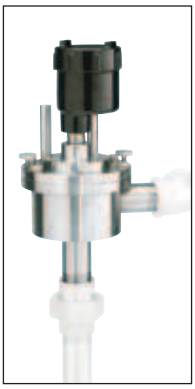
Why measure viscosity in-line?

Why Measure Viscosity In-Line?

Practical application of viscosity measurement data often leads to the need for in-process control of viscosity. The installation of viscosity control equipment on a process can provide a level of control achievable by no other means. Variations in viscosity are detected and corrected instantly before they can negatively affect product quality. Real time viscosity control can reduce downtime and material waste by ensuring that the process is operating within its specified viscosity parameters. In many cases, the savings from increased efficiency can pay back the cost of the viscometer in only a few months.

Why Choose Brookfield?

Brookfield builds its Process Control Viscometers to the same high standards of performance and value as its Laboratory Viscometers. Particular attention has been devoted to making these instruments rugged and easy to maintain for long service in demanding industrial environments.



AST-100

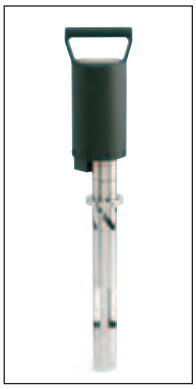
Advanced sensor technology for direct in-line viscosity measurement (p80)

TT-100

For in-line system applications requiring pipeline mounting (p80)

TT-200

For in-line system applications requiring flange mounting (p81)



TT-220 Probe

For both solvent and water based products (p81)

PV-100

In-tank, Probe Viscometer for pressurized systems (p83)

Viscosel

For systems open to the atmosphere (p82)

KV-100

Capillary Viscometer for open atmospheres (p83)

Questions to Consider

1. What is the viscosity range of your material?
2. Is your material Newtonian, Dilatant, Non-Newtonian, Thixotropic or Plastic?
3. What is the minimum, maximum and average pressure requirement of your application?
4. What is the minimum, maximum and average temperature of your application?
5. What is the minimum, maximum and average flow rate of your application?
6. Where in production would you like the viscometer: in-line, on the top of the tank or on the side of the tank?
7. What electrical code requirements do you have:
   NEMA 1 (general purpose—indoor)
   NEMA 4 (watertight/dust tight for indoor/outdoor use)
   NEMA 7 (explosion proof—Class 1, Div. 1&2, Group D)
   ATEX (explosion proof—Code: EE x d 11B T6)

The above parameters may eliminate some of the instrument models because, for example, the viscosity is higher than the range of the instrument or outside of the pressure rating of the instrument. In many cases, more than one instrument may be applicable.

Please allow us to assist you in choosing the best viscosity control system for your application.

TEL 800-628-8139 or 508-946-6200 **FAX** 508-946-6262 **www.brookfieldengineering.com**

In-Line Viscometers Provide Automatic Control of Process Fluid Viscosity

There are many ways that viscosity can be measured, such as capillary, vibration and rotational. These methods have different benefits and may work well for process monitoring or control but will likely not give the same ???? as laboratory or analytical methods. In general, laboratories require a more scientifically accurate measurement, while process control requires a stable, repeatable signal. Process measurements are made both in-line and off-line. A bench-top viscometer has often been used for off-line measurements wherein a sample of the process fluid is drawn and tested under controlled conditions (temperature, shear history, shear rate, etc.). In-line viscometers are immersed in the process stream. They measure and control continuously under process conditions helping to maintain a consistent quality product. The demands of these two environments are different, and it is unlikely the same equipment can be used for both or that the exact same results will be generated. However, if done properly, the results will follow the same trend and can be correlated to the bench top, making in-line measurement useful for ensuring consistent production quality.

WHAT ARE THE BENEFITS TO BRINGING YOUR MEASUREMENT IN-LINE?

In-line measurements give real-time, continuous readings of the fluid's viscosity during processing and consequently provide a means to automate the modification and viscosity control of the process fluid. While it is difficult to control all the factors present in the process that affect the fluids' viscosity (such as temperature, air bubbles, shear history, turbulence, pressure variations, etc.), if these factors are kept relatively constant, then good control can be achieved.

WHAT EFFICIENCIES ARE GAINED BY MEASURING IN-LINE?

Automatic control of the process fluid viscosity insures consistent product all the time and reduces or eliminates human errors and expensive sample testing. Also, it provides for a complete record of how the process varied over a span of time, instead of at just one point in time.

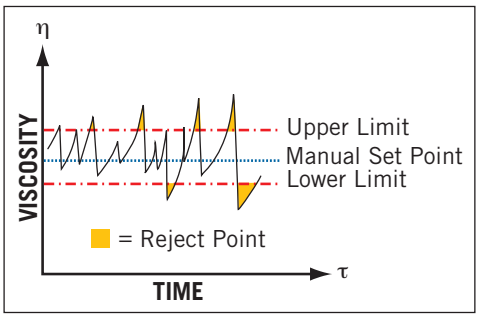
WHAT ARE THE TOP THREE FACTORS TO CONSIDER WITH CHANGING YOUR MEASUREMENT PROCESS?

For process measurements, the critical factors are stability, repeatability, and sensitivity to changes in viscosity. In the laboratory or for analysis environment controls (e.g. temperature, flow, sedimentation, air, etc.) and scientific measurements (controlled shear, geometry measurements and sample preparation) must also be included.

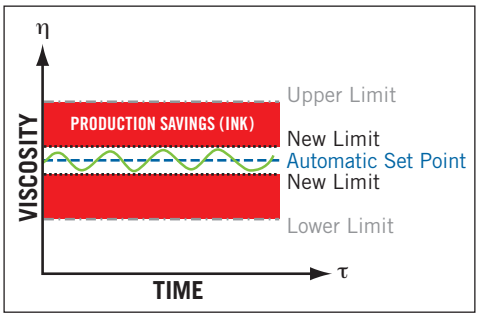
HOW DOES MONITORING THE VISCOSITY AFFECT PRODUCT QUALITY?

Most products are formulated to flow or spread in a controlled manner. Monitoring viscosity at critical shear points ensures that the product will act the same way every time the customer uses it. This is the most tangible indicator of quality.

Manual Viscosity Control



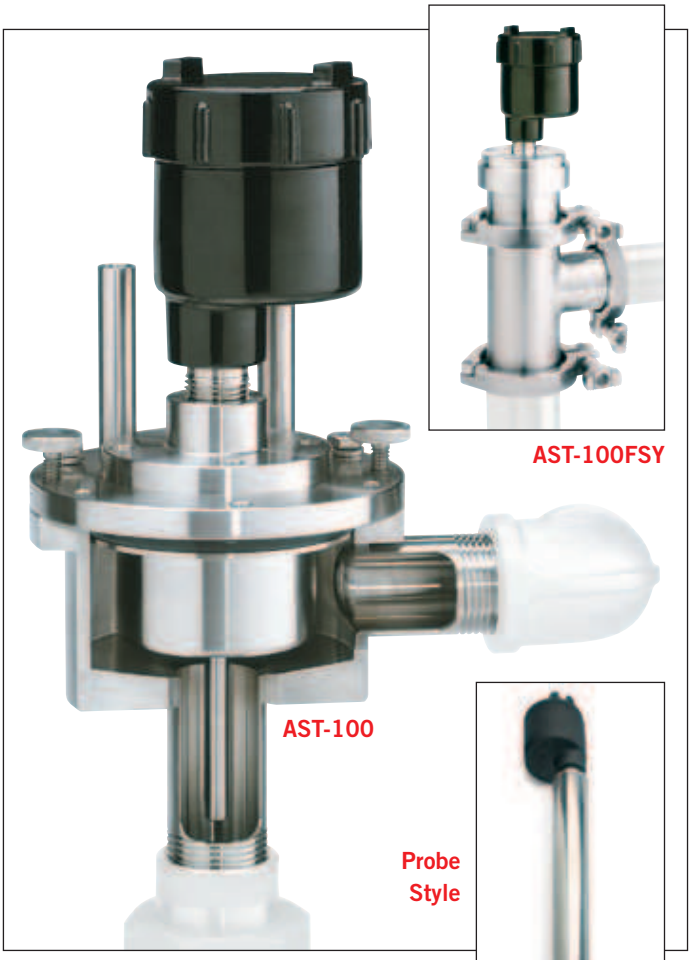
In-Line Viscosity Control



For more information, call or visit our website to request your copy of our Process Viscometers Catalog

AST-100™ Viscosity Controller

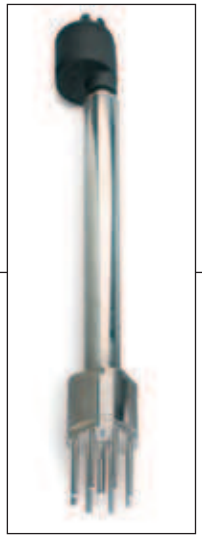
Advanced Sensor Technology for simple, direct in-line viscosity measurement



AST-100FSY

AST-100

Probe Style



What's Available?

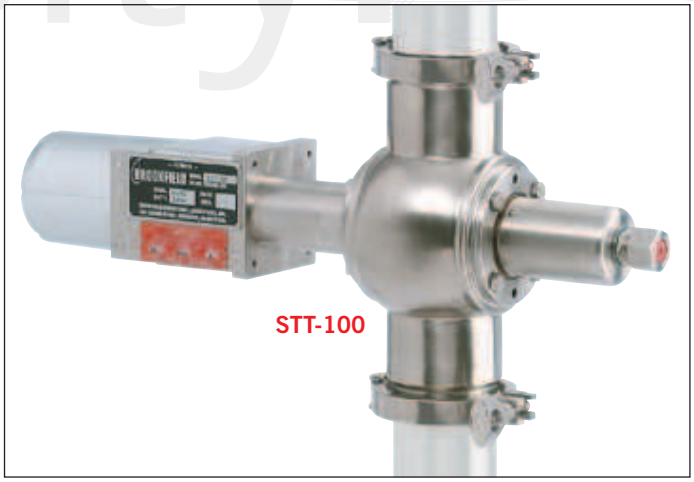
Vibrating Element Viscosity Sensor in Nema 4, Nema 7, ATEX, Sanitary or pH Control Configurations

Optional Accessories

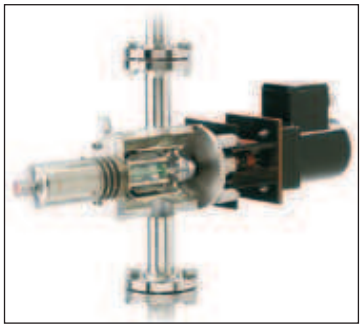
Single Station Controller
Mounting Brackets
Viscosity Standards (p52)
Multi-Station Controller
Solenoid Control Valve
Protective Covers for AST-300SY

TT-100™ Viscometer

for in-line system applications



STT-100



TT-100

TT-100VS

What's Available?

Rotational, Couette Flow Viscometer in Nema 4, Nema 7 (explosion proof Class I, Division 1 & 2, Group D design), ATEX or Sanitary Configurations

Optional Accessories

Optional 12V or 24V DC operation
Readout Indicator
Variable Speed Motor

TEL 800-628-8139 or 508-946-6200 FAX 508-946-6262 www.brookfieldengineering.com

TT-200™ Viscometer

for in-line system applications

What's Available?

Rotational Viscometer in Nema 4 or Nema 7 (explosion proof Class I, Division 1 & 2, Group D design) Configurations

Optional Accessories

Optional 12V or 24V DC operation
Readout Indicator
Variable Speed Motor

TT-220™ Probe Viscometer

for direct in-tank measurement

What's Available?

Rotational Viscometer in Nema 4 or Nema 7 (explosion proof Class I, Division 1 & 2, Group D design) Configurations

Optional Accessories

Readout Indicator/Controller

Viscosel™ Series

for systems open to the atmosphere

VTE-250™

What's Available?

VTE-250 In-Line Rotational Viscometer

Optional Accessories

Sample chambers, plastic or stainless steel
Solenoid Control Valve
Solvent Bottle
Test Stand, stationary or with wheels
Mounting Brackets
Additional Spindles
Viscosity Standards (p52)
Protective Keypad Covers (p51)

VTA-120™

What's Available?

VTA-120 In-Line Rotational Viscometer

Optional Accessories

Sample chambers, plastic or stainless steel
Solenoid Control Valve
Solvent Bottle
Test Stand, stationary or with wheels
Mounting Brackets
Additional Spindles
Viscosity Standards (p52)

TEL 800-628-8139 or 508-946-6200 FAX 508-946-6262 www.brookfieldengineering.com

PV-100™ Viscometer

for highly sensitive, in-tank control

What's Available?

PV-100 Rotational Viscometer
- Continuous, quick, linear response
- Defined shear measurement
- Continuous linear 4-20mA output

Optional Accessories

150 mm Probe Length
250 mm Probe Length
1000 mm Probe Length
1500 mm Probe Length
Special Order Probe Lengths
Bearing Treatment for Abrasive Materials

KV-100™ Viscometer

for systems open to the atmosphere

What's Available?

KV-100 Capillary Viscometer
- For continuous sensitive control of medium and low viscosity fluids

Optional Accessories

Continuous Flow Chamber
(in stainless steel or synthetic materials)
PT Temperature Sensor
Display Device for Measuring Data
Software (with temperature correction of viscosity)

Testing & Consulting

Viscosity Testing Services Available

TEST AND RECOMMEND
A simple evaluation designed to help determine the appropriate Brookfield equipment for your application.

FLUID PROFILING
Analysis testing to determine properties of your fluid sample. We will supply a complete report on the characteristics of your sample.

DISPUTE RESOLUTION
Analysis testing for mediating a resolution between producers and/or suppliers obtaining varying viscosity results of the same material.

MULTIPLE SAMPLE TEST
Expands the capability of your laboratory by utilizing Brookfield's services to accomplish testing work on a timely basis.

Viscosity Test Services are performed for a fee with the exception of "Test and Recommend".

For more information, contact our Rheology Laboratory:
Tel: 800.628.8139 or 508.946.6200, ext. 144
Fax: 508.946.6262
E-mail: testing@brookfieldengineering.com

Brookfield's state-of-the-art laboratory offers a variety of viscosity testing services capable of measuring Newtonian and non-Newtonian fluids using a wide range of spindle geometries. Detailed test results include equipment and measurement system description, viscosity data which includes appropriate tables and graphs, and any recommendations pertinent to your specific material and associated method.

Methodology Consulting Service On Viscosity Test Development*

A DETAILED REPORT WILL INCLUDE:

- Sample preparation method
- Equipment recommendations
- Controlled shear rate and shear stress tests
- Temperature profiling
- Thixotropic testing
- Material structure recovery evaluation
- Data collection and reporting
- QC viscosity control limit values

For more information, contact our Rheology Laboratory:
Tel: 800.628.8139 or 508.946.6200, ext. 144
Fax: 508.946.6262
E-mail: testing@brookfieldengineering.com

*Note: Consulting Services can also be scheduled to take place at Brookfield's facility in Middleboro, MA

The key to successful quality control is designing effective viscosity test methods. Our Methodology Consulting Service brings a Brookfield consulting engineer to your facility to review and recommend appropriate test methods for your materials. We will work with you to define acceptable viscosity behavior taking into consideration relevant shear rates, shear stresses, temperature and time sensitivity issues.

Calibration & Certification

for long life and optimal performance of your Viscometer, Rheometer, Texture Analyzer and Powder Flow Tester

Brookfield Service Center Calibration and Certification

Brookfield Engineering recommends that you return your instrument to Brookfield or an authorized dealer on an annual basis for our Calibration and Certification Service. Please call for a Return Authorization Number.

SPECIAL ARRANGEMENTS:

Loan instruments are available should you need a temporary replacement while your instrument is in for service. Contact Brookfield or an authorized dealer.

Twenty-Four and 48 hour rush service can be arranged. Call for details.

Ball Bearing Retrofit for RV/HA/HB torque range on DV-I Prime, DV-II+ or Pro and DV-III+ or Ultra

SPECIAL INSTRUMENT TESTING PER CUSTOMER SPECIFICATION

When sending your instrument to Brookfield for the Calibration and Certification Service, there may be additional tests that you would like Brookfield to perform. One example is a calibration check using a viscosity standard fluid similar to the one you use in your laboratory. This testing can be requested when the instrument is returned to Brookfield. Complete test results will be included with the instrument when you receive it back at your facility. Our standard hourly rate for lab services will apply.

Contact the Customer Service Department for complete details:
T: 800.628.8139 or 508.946.6200 E-mail: service@brookfieldengineering.com

Outside the United States, contact our authorized representatives. See Pages 89-91 for a comprehensive list.

Brookfield On-Site Service Calibration and Certification*

We now offer On-Site Calibration and Certification Service. Ideal for multiple instrument users, this service allows all your instruments to be serviced at your facility by our trained technician in one convenient visit.

BENEFITS INCLUDE:

- Minimal production disruption
- Reduced down time
- No shipping damage or costs
- Expert on-site advice in preventative maintenance

For more information, contact our Field Service Specialists:
T: 800.628.8139 or 508.946.6200 E-mail: onsite@brookfieldengineering.com

*Note: Spindle straightening not performed on-site. Spindles must be shipped to Brookfield Engineering

IQ, OQ, PQ for Brookfield Products

For those customers in specific industries who need documented validation of installed instrument systems we offer a number of approaches. Call for details or go to www.brookfieldengineering.com.

VISCOSITY STANDARDS FLUIDS should be replaced annually

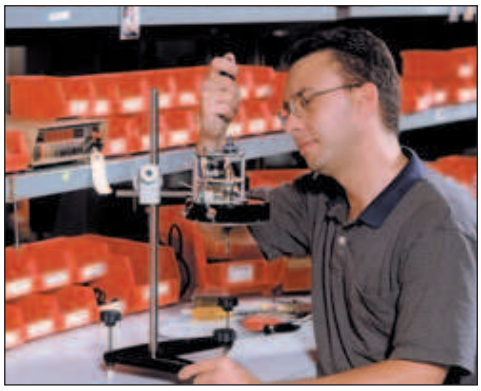
See pages 52 & 53 for details.

BALL BEARING SUSPENSION OPTION

See pages 50 for details.

EZ-LOCK SPINDLE COUPLING SYSTEM

See pages 50 for details.



For your viscometers and rheometers, we will inspect your instrument for wear, clean, adjust and lubricate the internal mechanisms, replace part of the sensing system element (the pivot support assembly and, when required, the pointer shaft), and check your spindles. Spindles that are returned to a Brookfield Service Center are also straightened if necessary. In addition to this maintenance, we calibrate and certify in writing that your instrument is operating within proper Brookfield specifications. This certification states that your instrument has been calibrated against standards which are traceable to the National Institute of Standards & Technology (NIST). This is becoming an increasingly important requirement as industry throughout the world takes steps to comply with ISO 9000 regulations.

For texture analyzers, we also inspect for wear, clean, adjust and lubricate internal mechanisms, and adjust, if necessary, the zero and span for proper load cell performance. Certified calibration weights can be purchased for your texture analyzer.

Education

Practical Course on Viscosity Measurements

A single-day course designed to address the major concerns about Brookfield rotational viscosity measurements. At this course, you will learn:

- Principle of Operation: How the viscometer makes measurements
- Calibration: The truth about calibration checks
- Rheology: Why fluids change their flow behavior and why you need to understand it
- Methodology: How to write a method everyone can live with — and use
- Data Interpretation: What all the viscosity data really means

TWO OPTIONS FOR ATTENDANCE ARE OFFERED:

Option #1: At Brookfield, Middleboro, MA

- Provides hands-on lab time, small class size and the opportunity to test your sample

Option #2: At major metropolitan areas

- Regionally located for convenience
- Limited hands-on time with your fluid

Advanced Course on Rheology Test Methods

A single day course designed to use real sample testing data to determine best methodology. At this course you will address:

- Flow behaviors and how to characterize method development
- Controlled stress vs. controlled rate measurements
- Measuring yield stress, creep and recovery of product structure after flow
- Math modeling for advanced data analysis
- Measuring viscosity on-line in your process

This course is being offered once per calendar quarter and only at Brookfield in Middleboro MA. Includes hands-on lab time working with your sample to develop best practice test methodology.

Practical Course on Texture Analysis

A single-day course designed to provide a better understanding of texture analysis as well as the practical use of Brookfield Texture Analyzers. This course addresses:

- Principles of texture analysis
- Considerations for successful instrumental measurements
- An overview of accessories and their applications
- Proper texture testing measurements
- Developing test method

Who are the instructors?

Experienced presenters from the technical staff of Brookfield Engineering Laboratories lead each seminar.

What else?

Customers are encouraged to bring samples of their material for discussion with prior approval.

Course Attendees will receive a course workbook and Brookfield Training Certificate for their training records.

Note: Classes can be presented at the customer's site. Please ask for information regarding this option.

For more information on the schedules or to register for a course, contact the Customer Training Department at Brookfield:
Tel: 800.628.8139 or 508.946.6200
Fax: 508.946.6262
E-mail: edu@brookfieldengineering.com

Help & Resources

Feeling overwhelmed? Our Customer Service or Technical Sales Departments can help guide you toward the proper instrumentation and measuring technique for your application. We also offer courses, free technical papers, and a website full of videos, application notes, and manuals.

Frequently asked questions

YOU MAY WANT TO REVIEW THESE BEFORE CALLING FOR ASSISTANCE.

I've read page 7 regarding model selection, and I've reviewed the models available to me, but I'm still unsure — can you test my product for me?

Brookfield has a test and recommend service wherein we will test your sample and make a product and method recommendation to help get you up and running. Please call us for details.

Do I need an accessory?

There are no firm rules for determining when an accessory is required. If your test method is not already established within your company, we recommend calling Brookfield so that we may review the best choices available for your specific application. As a general guideline, you may want to consider and discuss with us the accessories shown in blue if any of the following apply to your situation:

- The product is similar to the consistency of water.
  Consider: UL Adapter
- The product is similar to the consistency of peanut butter.
  Consider: Helipath Stand
- The product has suspended solids, similar to relish.
  Consider: vane spindles
- The product sample is limited.
  Consider: Small Sample Adapter accessory or Cone/Plate Viscometer
- The product must remain at a consistent temperature.
  Consider: TC series water bath
- The product is wax-like and needs to be melted at a high temperature just like asphalt
  Consider: Thermosel
- The product is very paste-like similar to solder paste.
  Consider: Spiral Adapter or R/S Rheometer

Do I need software?

Our software provides an easy way to gather data, plot graphs, export data to Excel and should be considered if detailed records are needed or if you want a more automated process. Software is also ideal for multiple operators and complex or repetitive testing.

Do I need a viscosity standard and when should it be replaced?

Yes, verification of instrument calibration with a viscosity standard should be done periodically to ensure that your instrument is in calibration and providing reliable results. We typically recommend replacement of standards every 6-12 months depending on the frequency of use and material tested.

Is verifying calibration the same as the yearly calibration service that Brookfield recommends?

No, verifying calibration is performed by you using viscosity standard fluids in accordance to the procedure outlined in the instrument's operator manual. Our Calibration & Certification Service is similar to getting your car's oil changed and a tune-up. You return your instrument to us, and we clean, adjust and lubricate the internal mechanism. We also replace part of the sensing system when necessary, and certify that the instrument is working properly in compliance with ISO 9000 regulations.

Other Educational Resources

SEMINARS

Our popular Practical Course on Viscosity Measurements seminar is ideal for someone new to viscosity. This single-day class includes an overview of viscosity, measurement method discussions and hands-on testing to demonstrate what is being learned in the classroom session. A brief overview on Brookfield Viscometers and accessories is part of the curriculum and may also be helpful to those who have yet to choose an instrument. A similar course is also offered for texture analysis.

VIDEOS, APPLICATION NOTES AND OTHER PUBLICATIONS

Online help is available 24/7 on the Brookfield website: www.belusa.com. Navigate to the EDUCATION tab for a more in-depth discussion on viscosity, rheology, texture and powder flow as well as helpful videos, more frequently asked questions, product instruction manuals, a calibration template and many other technical publications.

3A
A US industrial standard for process equipment design; required certification for clean-in-place capability.

Absolute Viscosity
The viscosity value associated with a Newtonian material

Angle of Wall Friction
Represents the friction between the sliding powder and the wall of the hopper or chute at the onset of flow

Arching Dimension
Minimum hopper outlet size needed to insure that the powder will discharge in Mass Flow instead of forming a stable arch arcross the opening.

ASTM
American Society of Testing and Materials

Autorange
Maximum viscosity value that can be measured using a specific spindle at a designed rpm.

Bob
spindle used with PVS and R/S series rheometers; also referred to as "bob/stator" because it does not rotate on this instrument. The sample cup rotates instead, causing the shearing action.

Bulk Density
The mass of the powder divided by its total volume

Cohesion
A measure of the strength retained by a powder after it has been compacted to a given consolidation level

Concentric Cylinder
A cylinder within a cylinder. For viscosity measurement, a cylindrical spindle rotates within a cylindrical chamber. Also known as "Coaxial Cylinder" because both cylinders have the same center line.

Consolidation
The process of applying a normal and a shear stress to a bulk solid to move the particles together in order to observe any increases in its cohesion, bulk density, etc.

Core-Flow
A first in-last out discharge pattern where the powder flows from the top of the vessel through a vertical channel above the outlet. Powder that is near the walls of the vessel remain stagnant until the level descends to the point where the powder is at the top surface.

dyne•cm
A unit of measurement for torque.

Gap
The distance between the spindle and the chamber or cup in which the spindle is rotating.

Hopper Half Angle
Maximum angle of the converging hopper wall (from the vertical axis) to insure mass flow. Angles greater (shallower) than this will produce core flow.

In-line
Process viscometer placement in a pipe.

Loose Fill Density
The bulk density of the powder in the trough before any stress is applied.

Mass Flow
A first in-first out discharge pattern where the powder flows at the vessel walls and all the material is in motion.

NIST
National Institute of Standards and Technology. US Government organization for test standards.

Newtonian
a material whose viscosity value is the same at all shear rates (e.g. water, honey).

Non-Newtonian
A material whose viscosity changes as shear rate changes (shampoo, mayonnaise).

On-line
Use of a process viscometer to provide continuous viscosity measurement of a material.

Pneumatic
Air operated

PP
Plate and plate geometry.

Rathole Diameter
Minimum outlet diameter of a core flow hopper needed to insure that the powder will flow instead of forming a stable rathole.

Relative Viscosity
The viscosity value of a non-Newtonian material at a defined shear rate.

RPM
Rotations per minute; a unit of measurement for spindle speed.

RTD
Resistance thermal detector; type of sensor for measuring temperature

sec^{-1}
The scientific unit of measurement for shear rate; expressed as "reciprocal seconds" or "inverse seconds."

Shear Rate
The velocity gradient in a flowing material; the shape and rotational speed of the spindle rotating in a chamber or cup are used to calculate shear rate.

Shear Stress
The force per unit area used to move a material.

Spindle Geometry
The shape of a spindle. Brookfield spindles supplied with standard Viscometers/Rheometers (Dial Reading, DV-E, DV-I Prime, DV-II+Pro, DV-III+) are disc type. Other choices include Cylindrical, Cone, Plate, KREBS, etc.

Torque Range
The torque measurement capability of a Brookfield Viscometer/Rheometer measured in dyne•cm; designations such as LV, RV, HA or HB are used to define the Torque Range for a specific instrument.

Torque %
The amount of torque resistance measured by a rotating spindle immersed in a material.

Yield Stress
The amount of force required to cause a material to flow.

Conversion Tables

Viscosity

1 cP	=	1 mPa•s
1 P	=	100 cP
1 Pa•s	=	1,000 mPa•s

Sample Volume

1 L	=	1000 mL
1 mL	=	1000 µL
1 gal	=	8 pt. = 3.7 L
1 pt	=	16 oz.

Torque Range

LV	=	673.7 dyne•cm
RV	=	7,187 dyne•cm
HA	=	14,374 dyne•cm
HB	=	57,496 dyne•cm
5xHB	=	287,480 dyne•cm
1N•m	=	10^7 dyne•cm

Temperature

°C = $\frac{5}{9}$ (°F-32)

Texture

1 Kg	=	1000 g
1 Kg	=	9.8 N
1 inch	=	2.54 cm
1 cm	=	10 mm

Please refer to Brookfield's publication "More Solutions to Sticky Problems" for a detailed explanation of viscosity and Brookfield methodology for making measurements.

TEL 800-628-8139 or 508-946-6200 **FAX** 508-946-6262 **www.brookfieldengineering.com**