BOHLIN INSTRUMENTS

RH7-D & RH10-D CAPILLARY RHEOMETERS

RH7-D and RH10-D Advanced, pow suitable for res

Since its launch, the Rosand RH7 has set new standards in research level capillary rheometry. Today, the Rosand RH7 is used in several hundred research laboratories around the world for a range of applications including polymers, foods, coatings and ceramics. Bohlin Instruments has continuously developed the original RH7 design and its operating software to produce a new generation of floor standing capillary units with market leading performance characteristics and capabilities. The RH7-D and RH10-D retain the robust 'H' frame design principle, which lies at the heart of the instruments' ability to operate under high loading conditions. A new digital drive system, gives the RH7-D and the RH10-D unsurpassed performance in terms of speed control, accuracy, and dynamic operating range. This new hardware is supported by the latest generation of 32 bit Windows™ based software, Flowmaster™, with many new experimental possibilities.

RH7 shown with Haul Off & Die Swell

Key Features and Benefits

Rosand Twin Bore Principle

Rosand was the first manufacturer to introduce the twin bore measurement principle in a commercially available rheometer unit. Simultaneous measurements can therefore be made on both long and short dies to determine the inlet pressure drop at the die, and therefore absolute viscosity, using the Bagley method. More commonly, Rosand 'zero length' dies are used to directly measure the inlet pressure drop and measure the extensional viscosity using the Cogswell method. The twin bore technique gives obvious experimental advantages including improved throughput since both experiments are preheated simultaneously. Alternatively, the software can be configured to run a two material test, thus measuring the apparent viscosity of two different materials simultaneously.

Rigid 'H' frame design

The 'H' frame design principle gives a vertical frame stiffness well in excess of that achievable with cantilever or 'C' frame designs. The frame design is effectively rigid at loads many times in excess of the 100kN measurement limit. This is an important consideration in transient tests such as PVT, which rely upon compliance free measurement for accurate volume determination.

Bi-Modal speed control

Bohlin has developed a bespoke bi-modal digital speed control technology to control the latest generation of capillary rheometers. The technology uses different speed control algorithms suited to high and low speed operation in order to optimise performance. This gives the rheometer units an impressive dynamic range in speed control. In practice, the lower limit is determined only by long experimental times at low shear rates but a dynamic range in speed of in excess of 400:000:1 is available if required. This greatly enhances the system's flexibility and means that a greater range of shear rates can be covered using a particular die.

Integral fume chamber with extraction

For operator safety, the RH7-D and RH10-D are equipped with a safety interlocked fume chamber with fan extraction of the gases to a vent at the back of the rheometer unit.
An extractor fan is also situated below the rheometer barrel.

Floor standing design

The floor standing design affords the rheometers with an open architecture below the barrel and heater assembly. This space can be used to accommodate other experimental options such as die swell measurement, a slot die, haul-off (melt strength) and a haul-off (post-extrusion) oven.

Specifications

	RH7-D
Maximum Force	50 kN
Maximum Speed	600 mm/m
Dynamic Range in Speed	>400,000:
Speed Uncertainty	Better tha
Temperature Range	Ambient t (500ºC op
Temperature Range[2)]	-40ºC to 2
Temperature Control	Up to 4 zo
Temperature Control	<+/-0.1ºC

1) Optional 2,400 mm/min at 50kN force 2) With

verful floor standing capillary rheometers
earch and product development

	RH10-D
	100 kN
nin	1200 mm/min [1]
1	>400,000:1
n 0.1%	Better than 0.1%
o 400ºC tional)	Ambient to 400ºC (500ºC optional)
50ºC	-40ºC to 250ºC
ones, PID	Up to 4 zones, PID
	<+/-0.1ºC

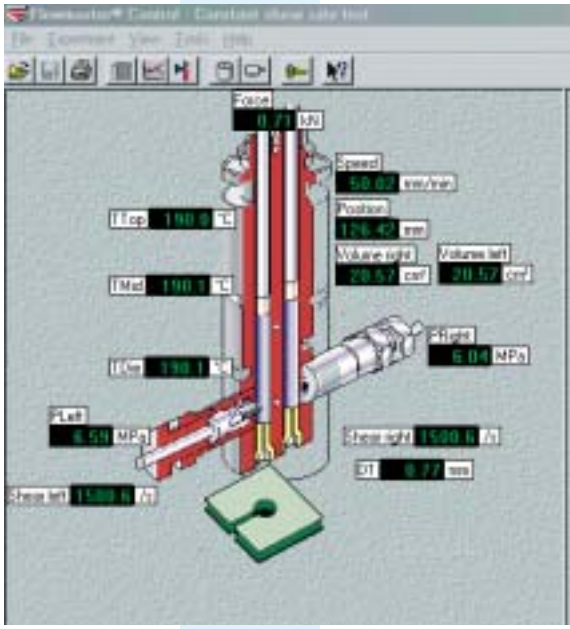
n Low Temperature option

32 bit Flowmaster™ Software

Bohlin has continuously developed the Rosand Flowmaster™ software which represents a very comprehensive data acquisition and analysis package with a wide range of measurement options.

Software modules available include:

- Manual Control
- Constant Shear Test
- Extensional Test
- Die Swell Measurement
- Flow/No Flow
- Melt Fracture/Flow Instability
- Material Degradation/Thermal Stability
- Low Speed Degradation
- Relaxation Test
- Data Export Utility
- Low Level Scripting
- Wall Slip Analysis



Flowmaster™ software graphic image of barrel with measured parameters

Where appropriate, the Rabinowitsch, Bagley, and Hagenbach corrections are available within the Flowmaster™ software. The Cogswell convergent flow model is used to determine the extensional viscosity.

Options

Barrel Materials and Dimensions

For aqueous or aggressive materials, stainless steel or Hastalloy barrels are available in place of the standard Nitrided version. The wide dynamic range in speed means that the standard 15mm diameter barrel is suitable for the vast majority of testing applications. However, barrels are available with 9.5mm, 12mm, 19mm and 24mm bores as an option.

Low Temperature

For applications that require sub-ambient measurements, a special low temperature option is available which utilises liquid nitrogen.

Accessories

Several accessories are available to suit particular applications or enhance the testing capability of the base units. The main accessories are listed below (see separate Capillary Accessories brochure):

- Alternative test dies
- Nitrogen purge
- 'Tragethon' haul-off (melt strength)
- Haul-off (post-extrusion) oven
- Laser die swell measurement
- Slot die assembly
- PVT test
- Die and melt cutters

YOUR PARTNER IN RHEOLOGY

The flow of matter is created by Force, Deformation and Time. The Symbol of Bohlin Instruments represents this infinite process as the three links of a chain, just as our quality, service and support are invaluable to materials testing. The competitive edge which Rheology offers industry is the driving force for Bohlin innovation. As more and more industrial applications demand the information which only rheology and rheological measurements can provide, Bohlin Instruments responds with the knowledge and experience to offer practical rheology solutions.

Bohlin Instruments' Rheology Support Package

Bohlin Instruments has direct sales and service facilities in the USA, the UK, Germany and France, as well as a global network of distributors. To ensure that customers get the most from their instrumentation, Bohlin offers rheometer and viscometer usage training, contract testing, consultancy, applications advice, seminars, application notes, service support and guaranteed response service contracts.

Rotational Rheometers
Capillary Rheometers
Viscometers

Contract Testing
Consultancy
Training

BOHLIN INSTRUMENTS

Bohlin Instruments Ltd
The Corinium Centre
Cirencester
Gloucestershire GL7 1YJ
England
Phone: +44 (0)1285 644407
Fax: +44 (0)1285 644314
e-mail: sales@bohlin.co.uk
Internet: www.bohlin.com

Bohlin Instruments GmbH
Wittumstrasse 10
Pforzheim
D-75181
Germany
Phone: +49 (0)7231 580360
Fax: +49 (0)7231 580 3629
e-mail: info@bohlin.de
Internet: www.bohlin.de

Bohlin Instruments France
Villantipolis No 7
473 route des Dolines
06560 Sophia Antipolis
France
Phone: +33 493 000 171
Fax: +33 493 000 868
e-mail: info@bohlin.fr
Internet: www.bohlin.fr

Bohlin Instruments Inc
Suite I
11 Harts Lane
East Brunswick NJ 08816
USA
Phone: +1 732 254 7742
Fax: +1 732 254 1577
e-mail: sales@bohlinusa.com
Internet: www.bohlinusa.com

BOHLIN INSTRUMENTS

RH2000 SERIES CAPILLARY RHEOMETER

The RH2000 Series - RH2100 & RH220

Advanced bench-top, capillary rheometers suitable for research, prod

The RH2000 series of bench top capillary rheometers are compact systems capable of most testing requirements encountered in capillary rheometry. The series is available in both single bore or twin bore configurations in the form of the RH2100 and the RH2200. Both versions of Rosand's bench top rheometer incorporate many of the features and attributes found in the floor standing models. A new digital drive system, gives the RH2000 series unsurpassed performance in terms of speed control, accuracy, and dynamic operating range. This new hardware is supported by the latest generation of 32 bit Windows™ based software, Flowmaster™, with many new experimental possibilities.

Applications

Polymers
Foods
Ceramics
Coatings
Pharmaceuticals

Key Features and Benefits

Rigid frame design

The RH2000 series mechanics are contained within a rigid one-piece housing which gives the cantilever design extreme strength and stiffness. This is an important consideration in transient tests such as PVT, which rely upon compliance free measurement for accurate volume determination.

Swivel head design

A unique, safety interlock protected, swivel design means that the actuated part of the rheometer can be moved to one side giving complete ease of access for cleaning and sample loading.

Bi-Modal speed control

Bohlin has developed a bespoke bi-modal digital speed control technology to control the latest generation of capillary rheometers. The technology uses different speed control algorithms suited to high and low speed operation in order to optimise performance. This gives the rheometer an impressive dynamic range in speed control. In practice, the lower limit is determined only by long experimental times at low shear rates but a dynamic range in speed of in excess of 200,000:1 is available if required. This greatly enhances the system's flexibility and means that a wider range of shear rates can be covered using a particular die.

Rosand Twin Bore Principle (RH2200 model)

Rosand was the first manufacturer to introduce the twin bore measurement principle in a commercially available rheometer unit. Simultaneous measurements can therefore be made on both long and short dies to determine the inlet pressure drop at the die, and therefore absolute viscosity, using the Bagley method. More commonly, Rosand 'zero length' dies are used to directly measure the inlet pressure drop and measure the extensional viscosity using the Cogswell method. The twin bore technique gives obvious experimental advantages including improved throughput, since both experiments are preheated simultaneously. Alternatively, the software can be configured to run a two material test, thus measuring the apparent viscosity of two different materials simultaneously.

32 bit Flowmaster™ Software

Bohlin has continuously developed the Rosand Flowmaster™ software which represents a very comprehensive data acquisition and analysis package with a wide range of measurement options.

0

luct development and quality control

Software modules available include:

- Manual Control
- Constant Shear Test
- Extensional Test
- Die swell measurement
- Flow/No Flow
- Melt Fracture/Flow Instability
- Wall Slip Analysis
- Material Degradation/Thermal Stability
- Low Speed Degradation
- Stress Relaxation Test
- Data Export Utility
- Low Level Scripting

Where appropriate, the Rabinowitsch, Bagley, and Hagenbach corrections are available within the Flowmaster™ software. The Cogswell convergent flow model is used to determine the extensional viscosity.

Options

High Force

Extends the maximum force (summed over both barrels if applicable) to 20kN.

High Speed

Extends the upper speed limit of the unit to 1200mm/min for high shear rate measurement with no loss in speed sensitivity or available force. The high speed option is fully compatible with the high force option.

Barrel Materials and Dimensions

For aqueous or aggressive materials, stainless steel or Hastalloy barrels are available in place of the standard Nitrided version. The wide dynamic range in speed means that the standard 15mm diameter barrel is suitable for the vast majority of testing applications. However, barrels are available with 9.5mm, 12mm, 19mm and 24mm bores as an option.

Low Temperature

For applications that require sub-ambient measurements, a special low temperature option is available which utilises liquid nitrogen.

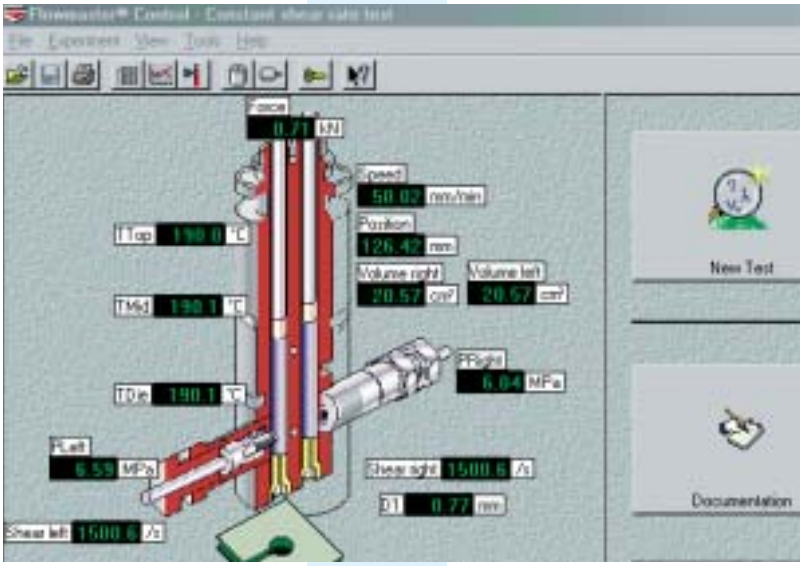
Accessories

Several accessories are available to suit particular applications or enhance the testing capability of the base units. The main accessories are listed below (see separate Capillary Accessories brochure) :

- Alternative test dies
- Nitrogen purge
- Die and melt cutters
- Laser die swell measurement
- Slot die assembly
- PVT test

Measured Properties

Shear Viscosity	Die Swell
Extensional Viscosity	Wall Slip
Melt Strength	PVT



Flowmaster™ software graphic image of barrel with measured parameters

Specifications

	RH2100	RH2200
No. of bores	Single	Double
Maximum Force	12 kN [1]	12 kN [1]
Maximum Speed	600 mm/min [2]	600 mm/min [2]
Dynamic Range in Speed	>200,000:1 [3]	>200,000:1 [3]
Speed Uncertainty	Better than 0.1%	Better than 0.1%
Temperature Range	Ambient to 400ºC (500ºC optional)	Ambient to 400ºC (500ºC optional)
Temperature Range [4]	-40ºC to 250ºC	-40ºC to 250ºC
Temperature Control	Up to 4 zones, PID	Up to 4 zones, PID
Temperature Control	<+/-0.1ºC	<+/-0.1ºC

1) **High force option: 20kN**
2) **High speed option: 1200mm/min**
3) **>400,000:1 with high speed option**
4) **With LN2 cooling option**

YOUR PARTNER IN RHEOLOGY

The flow of matter is created by Force, Deformation and Time. The Symbol of Bohlin Instruments represents this infinite process as the three links of a chain, just as our quality, service and support are invaluable to materials testing. The competitive edge which Rheology offers industry is the driving force for Bohlin innovation. As more and more industrial applications demand the information which only rheology and rheological measurements can provide, Bohlin Instruments responds with the knowledge and experience to offer practical rheology solutions.

Bohlin Instruments' Rheology Support Package

Bohlin Instruments has direct sales and service facilities in the USA, the UK, Germany and France, as well as a global network of distributors. To ensure that customers get the most from their instrumentation, Bohlin offers rheometer and viscometer usage training, contract testing, consultancy, applications advice, seminars, application notes, service support and guaranteed response service contracts.

Rotational Rheometers
Capillary Rheometers
Viscometers

Contract Testing
Consultancy
Training

BOHLIN INSTRUMENTS

Bohlin Instruments Ltd
The Corinium Centre
Cirencester
Gloucestershire GL7 1YJ
England
Phone: +44 (0)1285 644407
Fax: +44 (0)1285 644314
e-mail: sales@bohlin.co.uk
Internet: www.bohlin.com

Bohlin Instruments GmbH
Wittumstrasse 10
Pforzheim
D-75181
Germany
Phone: +49 (0)7231 580360
Fax: +49 (0)7231 580 3629
e-mail: info@bohlin.de
Internet: www.bohlin.de

Bohlin Instruments France
Villantipolis No 7
473 route des Dolines
06560 Sophia Antipolis
France
Phone: +33 493 000 171
Fax: +33 493 000 868
e-mail: info@bohlin.fr
Internet: www.bohlin.fr

Bohlin Instruments Inc
Suite I
11 Harts Lane
East Brunswick NJ 08816
USA
Phone: +1 732 254 7742
Fax: +1 732 254 1577
e-mail: sales@bohlinusa.com
Internet: www.bohlinusa.com