 RHEOLOGICAL PROPERTIES

# ROSAND RH7 & RH10

RHEOLOGICAL INSTRUMENTS BACKED WITH **RHEOLOGICAL EXPERIENCE**

# ADVANCED, POWERFUL FLOOR STANDING CAPILLARY RHEOMETERS FOR RESEARCH AND PRODUCT DEVELOPMENT



Since its launch, the Rosand RH7 has set new standards in research level capillary rheometry. Today, the Rosand RH7 is used in hundreds of research laboratories around the world for a range of applications including polymers, foods, coatings and ceramics.

Continuous development of the original RH7 design and its operating software has produced a new generation of floor standing capillary units with market leading performance characteristics and capabilities.

The current RH7 and RH10 models 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 and RH10 unsurpassed performance in terms of speed control, accuracy, and dynamic operating range. This new hardware is supported by the latest generation of Windows™ based software, Flowmaster™, with many new experimental possibilities.



# KEY FEATURES AND BENEFITS

## Rosand twin bore principle

Rosand capillary rheometers were the first to introduce the twin bore measurement principle to the commercial market. Simultaneous measurements can 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 offers obvious experimental advantages including improved throughput since both experiments are preheated simultaneously. Alternatively, the software can be configured to run a two material test, thereby measuring the viscosity of two different materials simultaneously.



## Rigid 'H' frame design

The 'H' frame design principle provides a vertical stiffness well in excess of that achievable with cantilever or 'C' frame designs. The frame is effectively rigid at loads well 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

Bi-modal digital speed control technology has been developed for the latest generation of Rosand capillary rheometers. The technology uses different speed control algorithms suited to high and low speed operation to optimize performance. This gives the instrument a wide 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 speeds in excess of 200,000:1 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

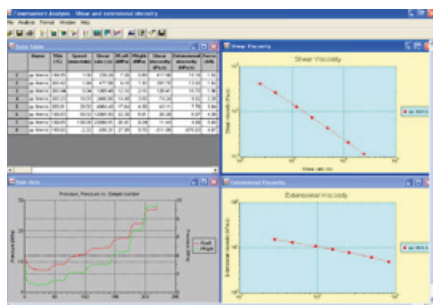
For operator safety, the RH7 and RH10 are equipped with a safety interlocked fume chamber with fan extraction of the gases to a vent at the back of the rheometer unit. An extractor fan is also situated below the rheometer barrel.

## Floor standing design

The floor standing design allows for 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 and haul-off (melt strength).

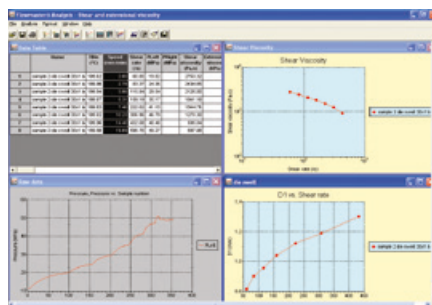
# FLOWMASTER™ SOFTWARE

Continuous development of the Rosand Flowmaster™ software has produced a comprehensive data acquisition and analysis package with a wide range of measurement options and an extensive help system.



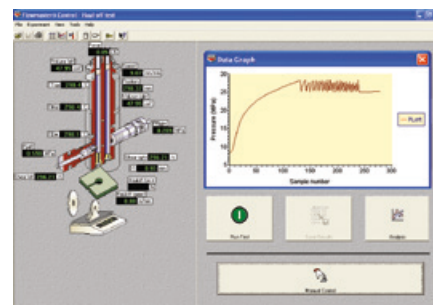
## Constant shear and extensional tests

Measurement of shear or extensional stress and shear or extensional viscosity as a function of shear rate. Extensional tests are carried out with an orifice die.



## Die swell

Measurement of the extrudate diameter close to the die exit. Directly interfaced with the control software and die swell is stored as part of the measurement data file.



## Melt fracture/flow instability

Accelerated shear rate ramp with continuous monitoring of the pressure to detect flow instabilities, such as melt fracture which may occur during flow through a capillary die.

## Software modules and analysis functions include:

- Constant shear test
- Extensional test
- Manual control
- Flow/no flow
- Non-Newtonian index
- Bagley correction by orifice die and extrapolation methods
- Rabinowitsch correction
- Hagenbach correction for fluid inertia
- Cogswell convergent flow model and extensional viscosity assessment
- Extensive plot and print options
- Data export

## Software options

- Wall slip analysis
- Melt fracture/flow instability
- Die swell
- Material degradation/thermal stability
- Low speed degradation
- Eta-0 (Intrinsic Melt Viscosity)
- Stress relaxation
- Low level scripting

# OPTIONS

The Rosand RH7 and RH10 capillary rheometers can be configured with a variety of options to provide complete measurement solutions across all applications.

## Barrel Materials and Dimensions

For aqueous or aggressive materials, stainless steel or Hastelloy barrels are available in place of the standard Nitrided steel 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 cooling coil option is available.



## Accessories.

Several accessories are available to suit particular applications or enhance the testing capability of the base units.

The main accessories are listed below:

- Alternative test dies
- Alternative pressure transducers
- Nitrogen purge
- 'Tragethon' haul-off (melt strength)
- Melt tension apparatus with automatic spooling
- Laser die swell measurement
- Slot die assembly
- PVT test
- Die and melt cutters

# APPLICATIONS

POLYMERS

COATINGS

CERAMICS

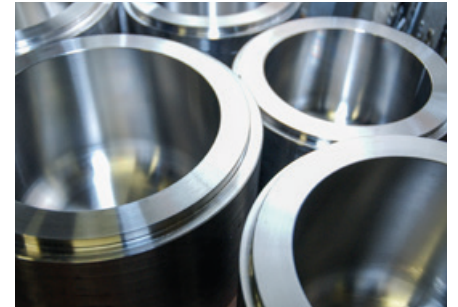
METALS

PHARMACEUTICALS

SEALANTS

FOODS

INKS



- Characterization of polymer or suspension rheology across a range of shear rates and temperatures
- Simulation of extensional viscosity dominated processes such as fibre spinning, blow moulding, film blowing and thermoforming
- Assessment of extrusion behaviour for processes such as injection moulding and hot melt extrusion
- Evaluation of material behaviour at process relevant shear rates such as high speed coating and printing applications
- Detection of polymer instabilities such as melt fracture and thermal degradation
- Measurement of material elasticity and related properties such as die swell

# RHEOMETER SPECIFICATIONS

Overview Rosand RH7&10 Comprehensive rheological analysis	
Maximum force	50kN (RH7) 100kN (RH10)
Frame stiffness	250kN
Maximum speed	600mm/min (RH7) 1200mm/min
Dynamic range in speed	240,000:1
Speed uncertainty	<0.1%
Temperature range	Ambient to 400°C (500°C optional) 5°C to 200°C (Low temperature cooling coil option)
Temperature control	<±0.1°C
Bore diameter	15mm standard (9.5, 12, 19 and 24mm bore options)
Barrel bore length	290mm
Barrel material	Nitrided steel standard (Hastelloy or stainless steel options)
Pressure transducer ranges	30000, 20000, 10000, 5000, 1500 or 500psi
Pressure transducer accuracy	<0.5%
Dies	Tungsten carbide, precision ±5µm
Die diameter	0.5 to 2mm (in 0.5mm increments) and 3mm standard (other diameters, including fine bore dies, available to special order)
Height	2.45m
Width	0.7m (without accessories)
Depth	0.58m (without accessories)
Weight	350kg (without accessories)
Power requirements	3 phase 220V/415V 16A

## Rheological support made easy.

Every Rosand RH7&10 from Malvern is backed with the technical and sales support of Malvern Instruments, the only material characterization company with the resources and equipment to measure particle size and shape, zeta potential and molecular weight as well as the expertise to advise on how these parameters influence rheological properties.



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