

FCR-R Series

FLOW CHARACTERIZATION RHEOMETER
FOR SYNTHETIC FIBER APPLICATIONS



Description

Specifically designed for the synthetic fiber production industry, the Dynisco FCR-R series can be configured to measure a range of apparent shear viscosities, dual melt flow rate, simultaneous melt flow rate and extensional viscosities using the Cogswell Equations.

The FCR-R system consists of two parts: a rheometer head and a rheometer control unit (RCU). The rheometer head is connected directly to the process which samples, conditions, and measures the melt viscosity of the molten resin through two separate dies. The RCU controls the rheometer test parameters (temperature, pressure and rate) and takes in data from the measurement head as well as provides outputs of computed results.

Features

- On-line apparent viscosities over a broad shear rate range
- Unique dual capillary design with return stream
- On-line measurements of polymer extensional properties
- Data exchange by analog and digital input/outputs
- Simple calibration

The Flow Characterization Rheometer

The measurement head samples molten polymer from the process through a heated transfer line. A three gear metering pump then drives the polymer melt through two separate capillary dies at a precisely controlled rate.

When the system is run at constant pressure (stress) and the flow rate is determined, continuous measurements of the MFR or MFR/viscosity may be obtained. When it is run at constant rate the simultaneous calculation of apparent viscosities at different shear rates are possible. Extensional viscosities can be obtained when a "zero length" die is used as one of the capillaries.

Options

- Various Capillaries
- Process Isolation Valve
- Standing Console or Wall Mount for RCU
- Additional I/O
- Heated Transfer Section
- Modbus RTU or TCP, Profibus, Profinet, Open TCP
- Hazardous location
- NEMA 4X
- Simple calibration

Rheometer Control Unit

The Rheometer Control Unit is contained in a NEMA 4 (IP 54) box that may be located in the control room or on the process floor. Programming of the control functions and output displays are achieved via a local color display with a touch screen interface. The RCU can communicate with a Distributed Control System (DCS) through its analog and serial outputs. The RCU operates independently and will continue its control and analysis functions in the event of a DCS failure.



Azurr-Technology, s.r.o.

Dolní Bečva 579 Tel.: +420 571 647 228
756 55 Tel.: +420 571 647 310
Česká republika Email: info@azurr-tech.cz
www.azurr-tech.cz



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Performance Characteristics	
Melt Flow Index:	0.02 – 5000 g/10 min
Viscosity Range:	10 -10 ⁵ Pas
Shear Stress:	150 - 1.5 x 10 ⁵ Pa
Shear Rate:	1 – 5000 s ⁻¹ (standard die) max. 50,000 s ⁻¹ (special die)
Dies:	
Viscosity:	1 – 5mm, 10 to 30:1 L/D
Melt Flow Index:	3.8182:1 L/D
Special Dies:	Upon request
Temp. Range:	40 – 80°C
Pressure Range:	3 x 10 ⁵ – 3.5 x 10 ⁷ Pa
Metering Pump:	0.30 cm ³ / RPM (standard) Optional pumps available
Pump Speed:	2 – 40 RPM
Polymer Flow:	680 g/hour (average)
Measurement and Control Functions	
Test Modes:	
Shear Stress Mode:	
Set point:	Pressure
Measurement:	Melt Flow Index
Shear Rate Mode:	
Set point:	Pump Speed
Measurement:	Apparent Viscosity
Temperature control:	2 Heating Zones Pump and Capillaries

RCU Specifications	
Electrical Cabinet:	NEMA 4 (IP 54)
CPU:	S7-300
Operator Interface:	Touch screen display
Analog Outputs: (4 – 20 mA Standard)	
Temperature:	Pump Temperature Capillary Temperature Melt 1 & 2, Average, Aux
Pressure:	Transducer 1,2,3 Delta Pressure 1,2
Rheological:	MFR, Shear Rate, Shear Stress, Melt Viscosity, Relative Viscosity, Intrinsic Viscosity
Digital Inputs: (NO/NC Dry Contacts)	
Test (motor):	on/ off
Heat:	on / off
Mode:	pressure / speed
Digital Outputs: (NO/NC)	
Fault	
Alarm	
Local/ Remote	
Motor on/ off	
Material in range	
Electrical Specifications	
System Voltage:	220-240V Single Phase 50/60 Hz
Power:	2000 W (max)



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