

NETZSCH

Proven Excellence.



Accessories for Rosand Rheometers

Dies, Pressure Transducers, Pistons, Tools and Special Accessories

Analyzing & Testing

Introduction

Rosand Rheometer Series

The Rosand series of high pressure capillary rheometers are class-leading instruments, providing robust research for high force conditions. The wide range of shear rates these instruments can apply, enables correlation with material processing conditions, from research through to quality control applications.

Accessories for the Rosand Rheometer Series

The Rosand range of capillary rheometers can be easily adapted and configured to provide insight into different material properties, with an extensive range of dies, transducers, pistons and accessories, addressing a wide variety of applications.

The large selection of dies and accessories are optimized for rheological characterization of complex fluids and soft solids, including dispersions, emulsions, polymer and surfactant solutions, pastes, adhesives and inks.



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Dies and Die Nuts

- Tungsten carbide dies for high precision, accurate dimensions better than ISO standard requirements on diameter (+/- 5 microns*, ISO is 7 microns) and length (+/- 25 microns).
- Extensive range of die lengths, entry angles and diameter options to cover a wide range of sample types and shear rates
- Robust steel die nuts provide cost saving solutions for multi-die usage
- Temperature range: 5°C to 500°C
- Dies: Material options of tungsten carbide, corrosion resistant tungsten carbide, hastelloy and other materials are available on request

* up to a die diameter of 0.25 mm the die accuracy may deviate from the above mentioned values

Material options of tungsten carbide, corrosion resistant tungsten carbide, hastelloy and other materials are available on request



Capillary and zero-length orifice dies

Capillary Dies

Capillary Dies and Die Nuts					
Name and Diameter x Length (mm)	Material	Die Entry Angle (°)	L/D Ratio	Barrel Diameter (mm)	Order Number
Capillary Die 0.25 x 8	Tungsten carbide die and steel nut	180	32	15	DA-0.25-8-180-15
Capillary Die 0.5 x 8	Tungsten carbide die and steel nut	180	16	15	DA-0.5-8-180-15
Capillary Die 1.0 x 10	Tungsten carbide die and steel nut	180	10	15	DA-1.0-10-180-15
Capillary Die 1.0 x 16	Tungsten carbide die and steel nut	180	16	15	DA-1.0-16-180-15
Capillary Die 1.0 x 20	Tungsten carbide die and steel nut	180	20	15	DA-1.0-20-180-15
Capillary Die 1.0 x 60	Tungsten carbide die and steel nut	180	60	15	DA-1.0-60-180-15

Capillary Dies and Die Nuts

Name and Diameter x Length (mm)	Material	Die Entry Angle (°)	L/D Ratio	Barrel Diameter (mm)	Order Number
Capillary Die 1.5 x 24	Tungsten carbide die and steel nut	180	16	15	DA-1.5-24-180-15
Capillary Die 2.0 x 32	Tungsten carbide die and steel nut	180	16	15	DA-2.0-32-180-15
Conical Capillary Die 0.5 x 8	Tungsten carbide die and steel nut	90	16	15	DA-0.5-8-90-15
Conical Capillary Die 1.0 x 16	Tungsten carbide die and steel nut	90	16	15	DA-1.0-16-90-15
Conical Capillary Die 1.5 x 24	Tungsten carbide die and steel nut	90	16	15	DA-1.5-24-90-15
Conical Capillary Die 2.0 x 32	Tungsten carbide die and steel nut	90	16	15	DA-2.0-32-90-15

Alternative material, length and die diameter options are available. Including options for barrel diameters of 9.5, 12, 19 and 24 mm

Long and Zero-Length Die Package
Bagley Correction and Uniaxial Extensional Viscosity

Package Comprises of:	Material	Die Entry Angle (°)	Barrel Diameter (mm)	Order Number
Orifice Die 1.0 x 0.25	Tungsten carbide die and steel nut	180	15	DA-1.0-0.25-180-15
Capillary Die 1.0 x 16	Tungsten carbide die and steel nut	180	15	DA-1.0-16-180-15

ISO11443

To determine the true shear rate and true shear stress, capillary dies of the same diameter and inlet angle, and having at least two different L/D ratios selected from the recommended series L/D = 0.25 to 1, 5, 10, 16, 20, 30 and 40 are required.

Historical Bagley method

ISO11443 Die Package

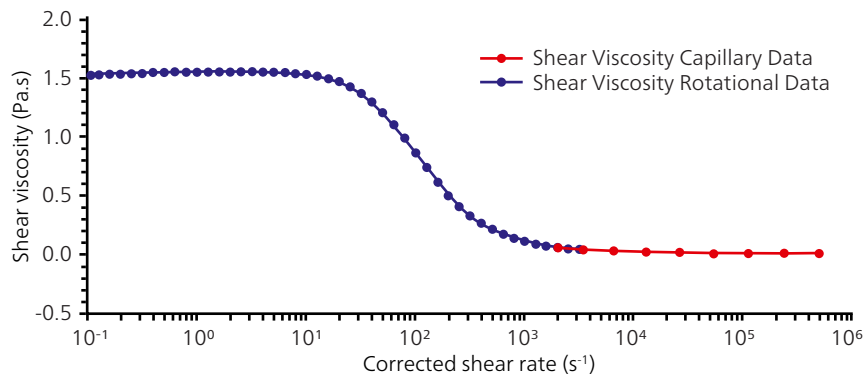
Package Comprises of:	Material	Die Entry Angle (°)	L/D Ratios	Barrel Diameter (mm)	Order Number
Capillary Die 1.0 x 10 Capillary Die 1.0 x 16 Capillary Die 1.0 x 20	Tungsten carbide die and steel nut	180	10 16 20	15	ROS4014

Orifice Dies

Orifice Dies				
Name and Diameter (mm)	Material	Die Entry Angle (°)	Barrel Diameter (mm)	Order Number
Orifice Die 0.25	Tungsten carbide die with integrated steel nut	90	15	DA-0.25-0.25-90-15
Orifice Die 0.5	Tungsten carbide die with integrated steel nut	90	15	DA-0.5-0.25-90-15
Orifice Die 1.0	Tungsten carbide die with integrated steel nut	90	15	DA-1.0-0.25-90-15
Orifice Die 1.5	Tungsten carbide die with integrated steel nut	90	15	DA-1.5-0.25-90-15
Orifice Die 2.0	Tungsten carbide die with integrated steel nut	90	15	DA-2.0-0.25-90-15
Orifice Die 0.25	Tungsten carbide die with integrated steel nut	180	15	DA-0.25-0-180-15
Orifice Die 0.5	Tungsten carbide die with integrated steel nut	180	15	DA-0.5-0.25-180-15
Orifice Die 0.75	Tungsten carbide die with integrated steel nut	180	15	DA-0.75-0.25-180-15
Orifice Die 1.0	Tungsten carbide die with integrated steel nut	180	15	DA-1.0-0.25-180-15
Orifice Die 1.5	Tungsten carbide die with integrated steel nut	180	15	DA-1.5-0.25-180-15
Orifice Die 2.0	Tungsten carbide die with integrated steel nut	180	15	DA-2.0-0.25-180-15

Orifice dies are also available in alternative material options and for barrel diameters of 9.5, 12, 19 and 24 mm. Please contact your local sales representative for the order numbers.





Viscosity measurement of a shower gel at room temperature over a wide shear rate range utilizing both a Rosand capillary rheometer as well as a Kinexus rotational rheometer



FreeFlow Dies

Uniaxial and Planar Extensional Viscosity

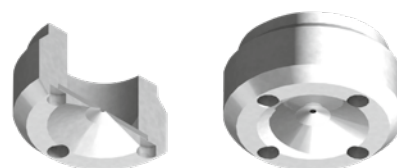
- Extensional viscosity (η_e) represents one of the key rheological properties that has a strong influence on the processability of polymer melts, the mechanical properties of final products and the efficiency of manufacturing processes.
- Determining η_e is therefore essential for achieving ecological, energy and resource efficiency.
- The unique *FreeFlow* dies have been optimized to allow precise determination of uniaxial and planar extensional viscosity.

FreeFlow dies are also available in other dimensions. Please contact your local sales representative for special orders.

FreeFlow Circular Dies

FreeFlow Circular Orifice Dies				
Name	Diameter x Length (mm)	Die Entry Angle (°)	Remarks	Order Number
Orifice Die 0.5	0.5 mm x 0.25 mm	180	These dies avoid the sticking of the material in the downstream region after the material leaves the die (die exit). It ensures the accurate determination of the entrance pressure drop and of the uniaxial extensional viscosity. These dies are suitable for a barrel diameter of 15 mm.	Contact your local sales representative
Orifice Die 1.0	1.5 mm x 0.25 mm	180		
Orifice Die 1.5	1.5 mm x 0.25 mm	180		
Orifice Die 2.0	2.0 mm x 0.25 mm	180		

FreeFlow dies are also available in alternative material options, die diameters, lengths and for barrel diameters of 9.5, 12, 19 and 24 mm. Please contact your local sales representative for the order numbers.



FreeFlow Rectangular Dies

FreeFlow Rectangular Orifice Dies				
Name	Gap (Thickness) x Width x Length (mm)	Die Entry Angle (°)	Remarks	Order Number
Orifice Die 0.5	0.5 mm x 10 mm x 0.25 mm	180	These dies avoid the sticking of the material in the downstream region after the material leaves the die (die exit). It allows the accurate determination of the entrance pressure drop and of the planar extensional viscosity. These dies are suitable for a barrel diameter of 15 mm.	Contact your local sales representative
Orifice Die 1.0	1.0 mm x 10 mm x 0.25 mm	180		Contact your local sales representative
Long Die 0.5	0.5 mm x 10 mm x 16 mm	180	These dies avoid the sticking of the material in the downstream region after the material leaves the die (die exit). It allows the determination of the rheological properties at low shear rates and of the planar extensional viscosity. These dies are suitable for a barrel diameter of 15 mm.	Contact your local sales representative
Long Die 1.0	1.0 mm x 10 mm x 16 mm	180		Contact your local sales representative

FreeFlow rectangular dies are available down to 78.5 microns in gap and 120 microns in length.



Pressure Transducers

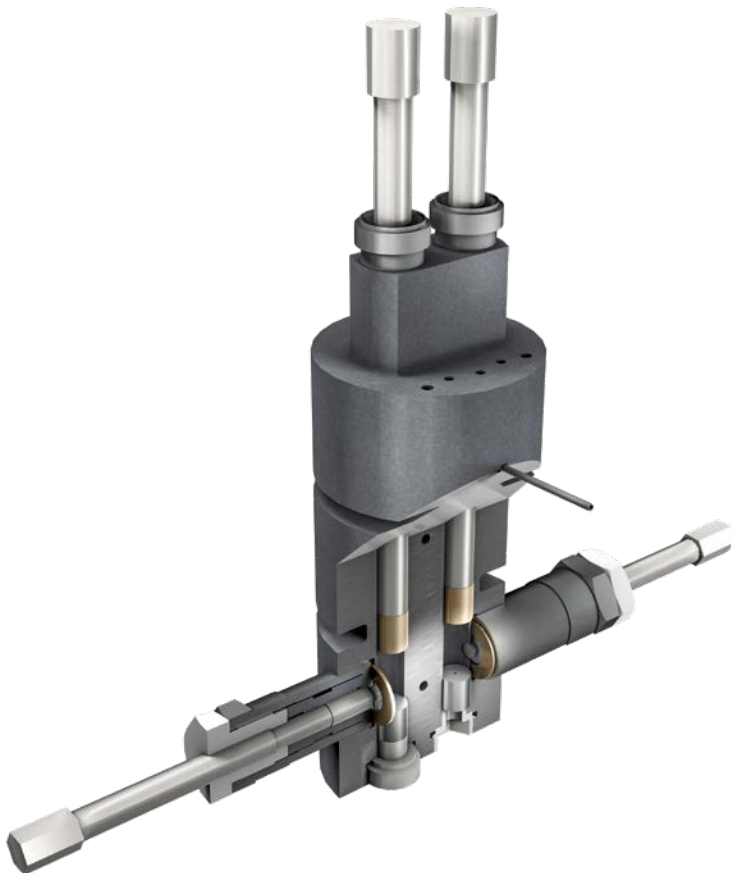
- Automatic connection detection
- Special, high accuracy pressure sensors for low stress measurements
- RoSH compliant up to 1600 bar, mercury filled for high temperature and high pressure applications up to 2000 bar
- Extensive selection of pressure options suitable for measurements of a wide variety of materials and viscosities

Transducers			
Name	MPa	Remarks	Order Number
250 PSI	1.72	maximum working temperature 500°C accuracy +/- 0.25% FSO*	ROS0491
500 PSI	3.45	maximum working temperature 400°C accuracy +/- 0.5% FSO	ROS0436
35 Bar	3.5	maximum working temperature 500°C accuracy +/- 0.5% FSO	ROS0510
35 Bar	3.5	maximum working temperature 500°C accuracy +/- 0.25% FSO	ROS0511
1,000 PSI	6.89	maximum working temperature 400°C accuracy +/- 0.5% FSO	ROS0437
70 Bar	7.00	maximum working temperature 500°C accuracy +/- 0.5% FSO	ROS0520
70 Bar	7.00	maximum working temperature 500°C accuracy +/- 0.25% FSO	ROS0521
1,500 PSI	10.34	maximum working temperature 400°C accuracy +/- 0.25% FSO	ROS0438
100 Bar	10.00	maximum working temperature 500°C accuracy +/- 0.25% FSO	ROS0530
3,000 PSI	20.68	maximum working temperature 400°C accuracy +/- 0.25% FSO	ROS0439
200 Bar	20.00	maximum working temperature 500°C accuracy +/- 0.25% FSO	ROS0540

* FSO (Full Scale Output)

Transducers

Name	MPa	Remarks	Order Number
5,000 PSI	34.47	maximum working temperature 400°C accuracy +/- 0.25% FSO	ROS0440
350 Bar	35.00	maximum working temperature 500°C accuracy +/- 0.25% FSO	ROS0550
10,000 PSI	68.95	maximum working temperature 400°C accuracy +/- 0.25% FSO	ROS0441
700 Bar	70.00	maximum working temperature 500°C accuracy +/- 0.25% FSO	ROS0560
15,000 PSI	103.42	maximum working temperature 500°C accuracy +/- 0.25% FSO	ROS0457
1000 Bar	100.00	maximum working temperature 500°C accuracy +/- 0.25% FSO	ROS0570
1600 Bar	160.00	maximum working temperature 300°C accuracy +/- 0.5% FSO	ROS0580
30,000 PSI	206.84	maximum working temperature 440°C accuracy +/- 0.25% FSO NOTE: This component contains mercury (40 mm ³)	ROS0488
2000 Bar	200.00	maximum working temperature 440°C accuracy +/- 0.25% FSO NOTE: This component contains mercury (40 mm ³)	ROS0590

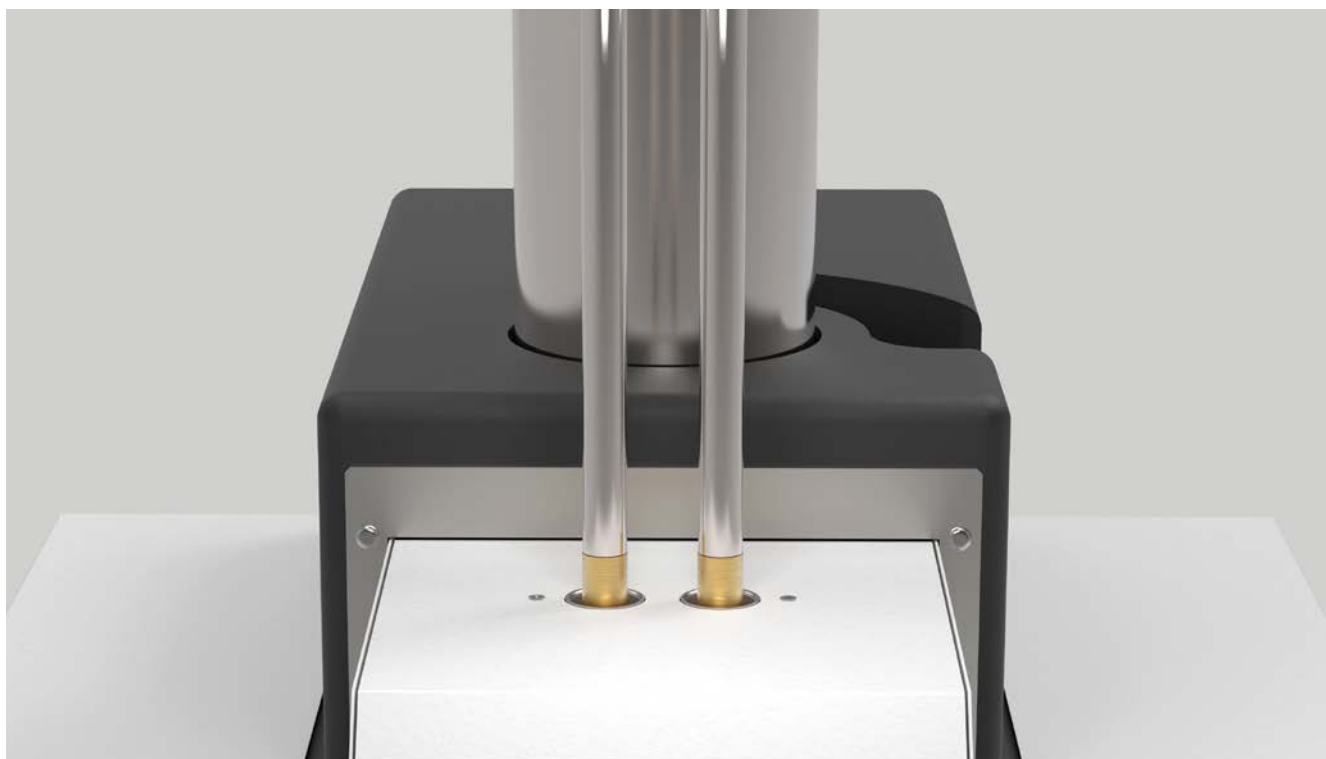


Pistons and Piston Tips

- Temperature range: 5°C to 500°C
- Cleaning pistons available for easier cleaning
- High temperature and fluid piston tip options
- Material options for piston tips are available on request

Pistons

Pistons				
Name	Barrel (mm)	Material	Remarks	Order Number
Piston	15	High Tensile Steel	For RH7/10	RH9-110-006
Cleaning Piston Set	15	Stainless Steel	For RH2000	ROS0435
Cleaning Piston Set	15	Stainless Steel	For RH7/10	ROS0051
Piston Cleaning Tool	-	Hastelloy	For RH2000	ROS0486



Piston Tips

Piston Tips				
Name	Barrel (mm)	Material	Remarks	Order Number
Piston Tip	9.5	Phosphor Bronze	For RH2000	RH2000-100-501
Piston Tip	12	Phosphor Bronze		RH9-110-008
Piston Tip	15	Phosphor Bronze		RH9-110-009
Piston Tip	19	Phosphor Bronze		RH9-110-010
Piston Tip	15	PEEK		ROS0044
Fluid Piston Tip	9.5	Phosphor Bronze		RH7-013-095
Fluid Piston Tip	12	Phosphor Bronze		RH7-013-012
Fluid Piston Tip	15	Phosphor Bronze		RH7-013-015
Fluid Piston Tip	19	Phosphor Bronze		RH7-013-019
Fluid Piston Tip	24	Phosphor Bronze		RH9-110-060
High Temperature Piston Tip	15	Phosphor Bronze		ROS0040
High Temperature Piston Tip	15	Phosphor Bronze	For RH2000	ROS0039
Piston Tip with Pressure Lip	12	PEEK		ROS0183
Piston Tip with Pressure Lip	9.5	PEEK		ROS0419
Piston Tip with Pressure Lip	15	PEEK		ROS0179
Piston Tip with Pressure Lip	24	PEEK		ROS0038



Tools

- Go no-go gauges for checking die diameter and wear
- Die cleaners for efficient cleaning of inside the die
- Brushes for external cleaning of pistons, dies and rheometer parts

Cleaning Tools

Cleaning Tools		
Name	Material / Remarks	Order Number
Piston and Die Cleaning Brush	Brass Wire	NGB824831
Brush Adapter Auto Cleaning Tool		ROS0008
Tool Box for RH2000	Mirror, sample loading funnel, cleaning brushes, heat resistant gloves	RH2000-095-201
Tool Box for RH7/10	Mirror, sample loading funnel, cleaning brushes, heat resistant gloves	RH7-095-201



Die Cleaners and Go No-Go Gauges

Die Cleaners and Go No-Go Gauges			
Name	For Die Diameter (mm)	Remarks	Order Number
Die Cleaner	0.25		RH10-110-090
Die Cleaner	0.5		RH10-110-091
Die Cleaner	1.0		RH10-110-092
Die Cleaner	1.5		RH10-110-093
Die Cleaner	2.0		RH10-110-094
Die Cleaner	2.5		RH10-110-095
Die Cleaner	3.0		RH10-110-096
Go No-Go Gauge	0.5	0.495-0.505 mm Tolerances: Go: +/-1.5-1.0 µm No-go: +/- 1.0 µm	RH9-200-081
Go No-Go Gauge	1.0	0.995-1.005 mm Tolerances: Go: +/-1.5-1.0 µm No-go: +/- 1.0 µm	RH9-200-082
Go No-Go Gauge	1.5	1.495-1.505 mm Tolerances: Go: +/-1.5-1.0 µm No-go: +/- 1.0 µm	RH9-200-083
Go No-Go Gauge	2.0	1.995-2.005 mm Tolerances: Go: +/-1.5-1.0 µm No-go: +/- 1.0 µm	RH9-200-084
Go No-Go Gauge	2.5	2.495-2.505 mm Tolerances: Go: +/-1.5-1.0 µm No-go: +/- 1.0 µm	RH9-200-068
Go No-Go Gauge	3.0	2.995-3.005 mm Tolerances: Go: +/-1.5-1.0 µm No-go: +/- 1.0 µm	RH9-200-062
Go No-Go Gauge	4.0	3.995-4.005 mm Tolerances: Go: +/-1.5-1.0 µm No-go: +/- 1.0 µm	RH9-200-070



Special Accessories



Die Swell – Single or Dual Axis

- Direct measurement of sample elasticity during the extrusion process
- Measurement of the thickness of the extrudate
- Material is extruded through a die of a known diameter, the diameter of the extrudate will depend on the material
- The result is dependent on the shear rate, residence time in the die and indirectly the extensional viscosity
- Run at the same time as a shear viscosity experiment
- Laser measurement system, with an option of:
 - Number of axis (single or double)
 - Number of extrudates (single or dual)
 - Resolution (10 μm or 1 μm)

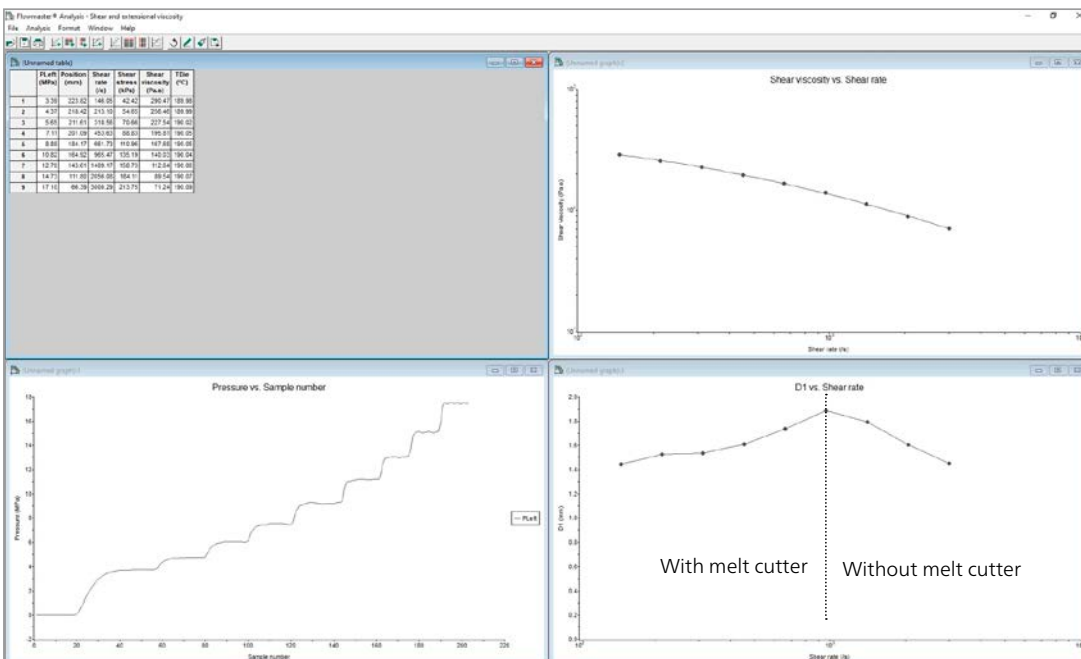
Die Swell			
Name	Instrument Compatibility	Remarks	Order Number
Single Extrudate Single Axis Die Swell	RH7 and 10	Measurement in one direction For left bore 1 micron resolution	RH7-011-003
Single Extrudate Dual Axis Die Swell	RH7 and 10	Measurement in two directions For left bore 1 micron resolution	RH7-011-004
Twin Extrudate Single Axis Die Swell	RH7 and 10	Measurement in one direction For left and right bore 1 micron resolution	RH7-011-018
Single Extrudate Single Axis Die Swell	RH2000	Measurement in one direction For left bore 1 micron resolution	RH2000-011-015
Twin Extrudate Single Axis Die Swell	RH2000	Measurement in one direction For left bore 1 micron resolution	RH2000-011-018

Die Swell with Melt Cutters

- Melt cutters ensure that elongation of extrudate due to tension under gravity does not cause thinning of the strand.
- The unit allows tension-controlled die swell measurements to be made.
- Incorporates electromechanical scissor-cutter that automatically cuts the stand when it reaches the sensor below the cutter blade.

Please contact your local sales representative to determine suitability for melt cutter and your sample.

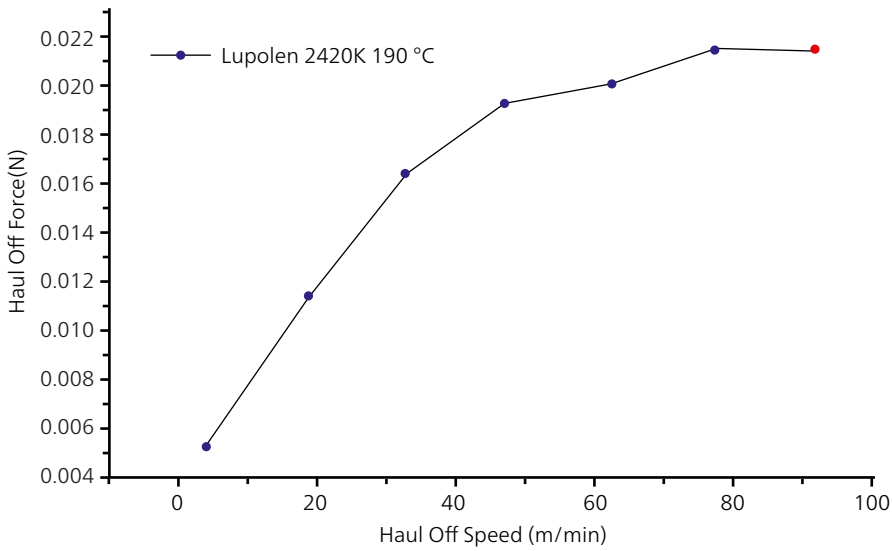
Die Swell with Melt Cutters			
Name	Instrument Compatibility	Remarks	Order Number
Single Extrudate Single Axis Die Swell with Melt Cutters	RH7 and 10	Die to cut distance: 100 to 160 mm Max shear rate: 1000 s ⁻¹ 1 micron resolution	RH7-015-003
Single Extrudate Dual Axis Die Swell with Melt Cutters	RH7 and 10	Die to cut distance: 100 to 160 mm Max shear rate: 1000 s ⁻¹ 1 micron resolution	RH7-015-004
Twin Extrudate Single Axis Die Swell with Melt Cutters	RH7 and 10	Die to cut distance: 100 to 160 mm Max shear rate: 1000 s ⁻¹ 1 micron resolution	RH7-015-002
Single Extrudate Single Axis Die Swell with Melt Cutters	RH2000	Die to cut distance: 100 to 160 mm Max shear rate: 1000 s ⁻¹ 1 micron resolution	RH2000-015-003
Single Extrudate Single Axis Die Swell with Die Cutters	RH2000	Die to cut distance: 0 mm Max shear rate: 1000 s ⁻¹ 1 micron resolution	RH2000-014-001



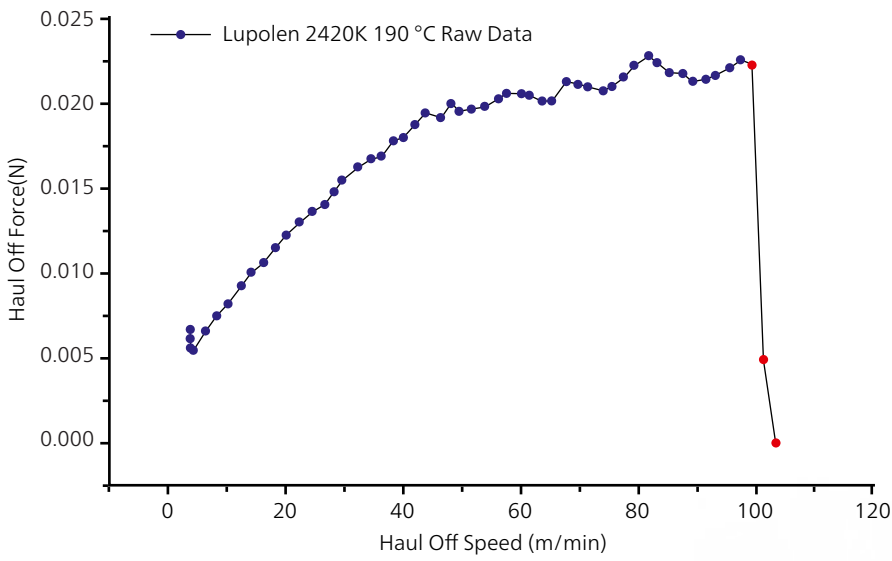
Haul-Off and Melt Strength

- For determination of melt strength

Haul Off			
Name Diameter x Length	Bore Diameter (mm)	Remarks	Order Number
Haul-Off Unit	12	For RH7 and RH10 only	RH10-010-012
Haul-Off Unit	15	For RH7 and RH10 only	RH10-010-015
Haul-Off Unit	19	For RH7 and RH10 only	RH10-010-019
Die and Nut Set 2 x 20 mm	9.5	RH9-190-007 tool is required for assembling	RH7-011-095
Die and Nut Set 2 x 20 mm	12	RH9-190-007 tool is required for assembling	RH7-011-012
Die and Nut Set 2 x 20 mm	15	RH9-190-007 tool is required for assembling	RH7-011-015
Die and Nut Set 2 x 20 mm	19	RH9-190-007 tool is required for assembling	RH7-011-019
Haul-Off Die Spanner			RH9-190-007
Haul-Off Precision Balance			NGB826511
Take Up Drum		125 mm PTFE Coated Aluminium	RH10-174-015
Take Up Drum and Clamp Assembly		125 mm and 5 Disposable Cardboard Drums	RH10-110-230
Take Up Drum and Clamp Assembly		76 mm and 5 Disposable Cardboard Drums	RH10-110-240
Disposable Cardboard Drums		125 mm Pack of 20	520115-20
Disposable Cardboard Drums		76 mm Pack of 20	520116-20



Haul off force vs. speed for HDPE at 190°C



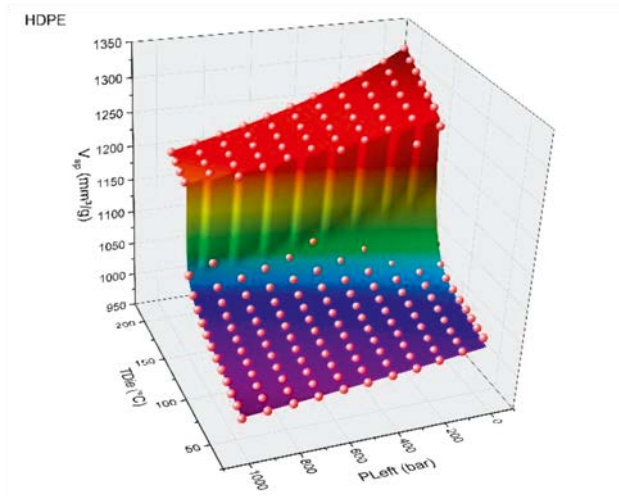
Raw data plot of haul off force vs. speed for HDPE at 190°C



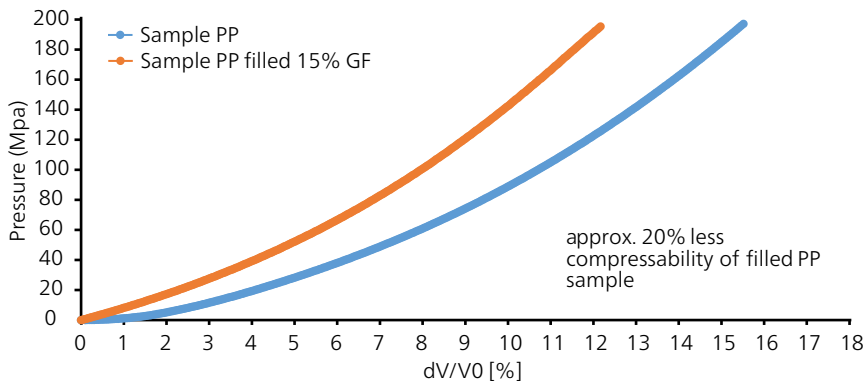
pVT – Pressure, Volume, Temperature

- For determination of pressure, volume and temperature dependent properties of materials under isothermal measurement conditions
- Pressure dependent specific volume and density

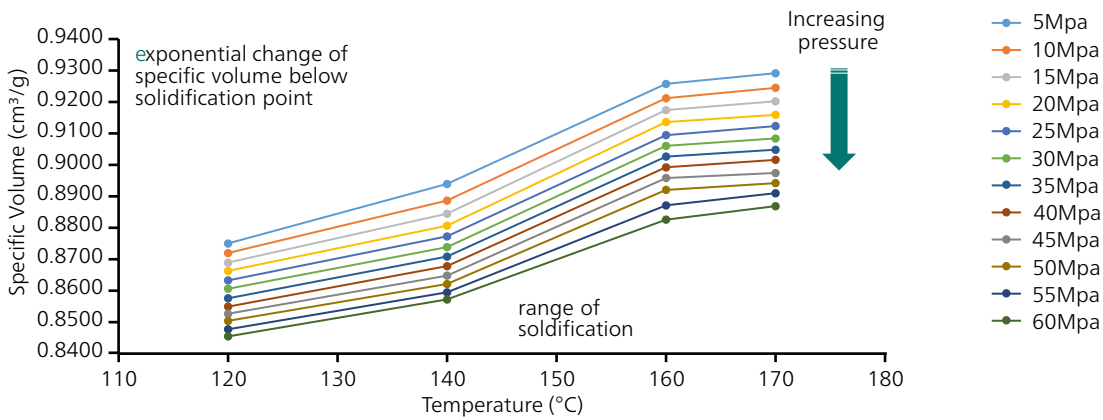
pVT			
Name	Bore Diameter (mm)	Remarks	Order Number
		For RH7 and RH10 only	
pVT System	9.5	For mounting, a torque spanner (NGB824798) and special tool (RH9-190-007) is required Includes: 10 seals for use up to 250°C 10 seals for use up to 300°C	RH10-012-095
		For RH7 and RH10 only	
pVT System	12	For mounting, a torque spanner (NGB824798) and special tool (RH9-190-007) is required Includes: 10 seals for use up to 250°C 10 seals for use up to 300°C	RH10-012-012
		For RH7 and RH10 only	
pVT System	15	For mounting, a torque spanner (NGB824798) and special tool (RH9-190-007) is required Includes: 10 seals for use up to 250°C 10 seals for use up to 300°C	RH10-012-015
		For RH7 and RH10 only	
pVT System	19	For mounting, a torque spanner (NGB824798) and special tool (RH9-190-007) is required Includes: 10 seals for use up to 250°C 10 seals for use up to 300°C	RH10-012-019
		For RH7 and RH10 only	
pVT System	24	For mounting, a torque spanner (NGB824798) and special tool (RH9-190-007) is required Includes: 10 seals for use up to 250°C 10 seals for use up to 300°C	RH10-012-024



Pressure-specific volume-temperature diagram of HDPE
(third party software employed for analysis)



Change of volume as a function of pressure of PP filled and unfilled at 200°C



Change of specific volume as a function of pressure and temperature of PP

Slot Die

- Direct measurement of pressure drop along the length of the die
- Pressure transducers along the die record the pressure of the material as it approaches the exit of the die
- Removes the entrance and exit pressure effects
- Allows the pressure to be monitored along the length of the die

Slot Die			
Name	Width (mm)	Remarks	Order Number
Mounting Fixture		Enables secure installation of the slot die	RH7-008-008
Slot Die Insert	0.5		RH9-142-012
Slot Die Insert	0.75		RH9-142-017
Slot Die Insert	1.0		RH9-142-013
Slot Die Insert	1.5		RH9-142-014
Slot Die Insert	2.0		RH9-142-015
Slot Die Insert	2.5		RH9-142-018

Barrel Extension

Please contact your local sales representative as a special order

- For dies with a total length of more than 36 mm, a barrel extension is required

Barrel Extension			
Name	Instrument Compatibility	Remarks	Order Number
25 mm Heated Barrel Extension	RH2000	For 15 mm barrel. Maximum temperature is 350°C	RH9-145-900
25 mm Heated Barrel Extension	RH7/10	15 mm barrel. Maximum temperature is 350°C	RH9-145-100

Nitrogen Purge

- Suitable for materials prone to oxidative degradation
- Enables the steady flow of nitrogen at the entrance of the barrel

Nitrogen Purge		
Name	Instrument Compatibility	Order Number
Nitrogen Purge	RH7 and 10	RH7-007-001
Nitrogen Purge	RH2000	RH2000-007-001



The owner-managed NETZSCH Group is a leading global technology company specializing in mechanical, plant and instrument engineering.

Under the management of Erich NETZSCH B.V. & Co. Holding KG, the company consists of the three business units Analyzing & Testing, Grinding & Dispersing and Pumps & Systems, which are geared towards specific industries and products. A worldwide sales and service network has guaranteed customer proximity and competent service since 1873.

When it comes to Thermal Analysis, Calorimetry (adiabatic & reaction), the determination of Thermophysical Properties, Rheology and Fire Testing, NETZSCH has it covered. Our 60 years of applications experience, broad state-of-the-art product line and comprehensive service offerings ensure that our solutions will not only meet your every requirement but also exceed your every expectation.

Proven Excellence. ■

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