



## **Rheology Solutions**

*Rheology Solutions is the sole Australian distributor of this product range and we welcome the opportunity of discussing your application requirements.*

*We hope the information you are seeking is contained within this file.  
If you have any questions, or require further information please contact us.  
We look forward to being of further service.*

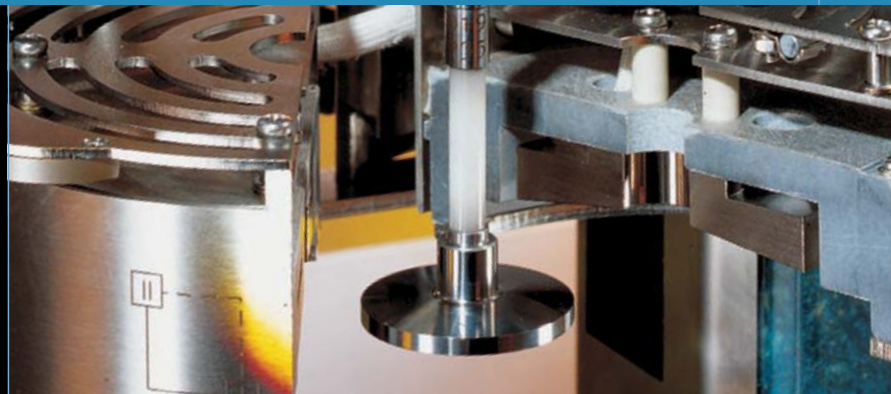
*Regards from the Team at Rheology Solutions.*

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**HAAKE Series 1**



**The versatile  
rheometer concept**

Analyze • Detect • Measure • Control™

**Thermo**  
ELECTRON CORPORATION

## Three Instruments...

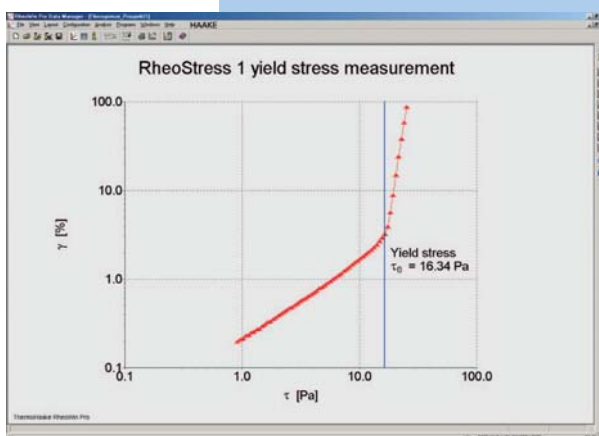
### HAAKE RheoStress 1

The HAAKE RheoStress 1 is a universal laboratory rheometer with the features of a research grade instrument.

These excellent capabilities are realized by the use of a 4th generation air bearing and Digital Signal Processor (DSP) technology. The fast digital adaptive control loops used in the HAAKE RheoStress 1, allow all type of measurements in CS, CR and CD-mode in rotation and oscillation.

#### Typical test methods:

Flow curves, time and temperature dependent properties, yield point determination, creep/recovery, multiwave acquisition, etc.



### HAAKE RheoScope 1

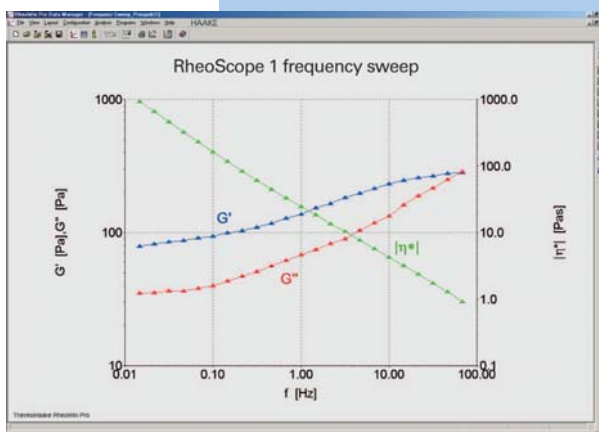
The HAAKE RheoScope 1 is a unique combination of optics and rheology. This new instrument is equipped with an optical microscope and a digital video camera integrated underneath the temperature controlled base plate of a universal cone and plate rheometer.

It allows the synchronous recording of both the rheological properties and the changes in the microscopic structure of the sample tested.



#### Typical test methods:

Flow curves, time and temperature dependent properties, yield point determination, creep/recovery, multiwave acquisition, etc.





### HAAKE RotoVisco 1

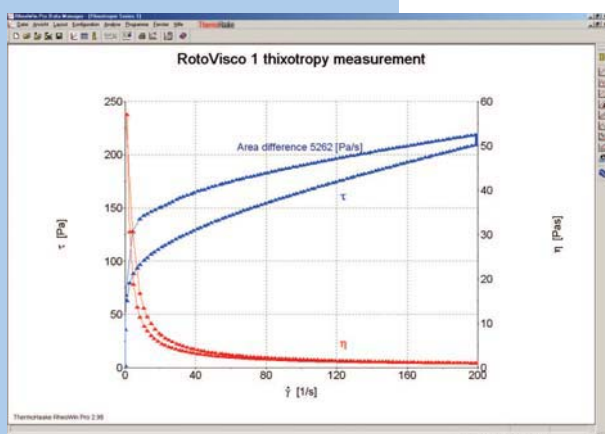
The HAAKE RotoVisco 1 is a classical rotational rheometer. The use of a true CR motor in combination with a frictionless torque measurement system makes the instrument precise and reliable.

It can be equipped with all the HAAKE Series 1 temperature control systems and the whole range of measurement geometries, making this rheometer a truly versatile instrument.

Featuring an automatic lift system with auto-zero and thermo-gap functions, the RotoVisco 1 is unique in its class.

#### Typical test methods:

Flow curves, time and temperature dependent properties, yield point determination for high viscous materials, etc.



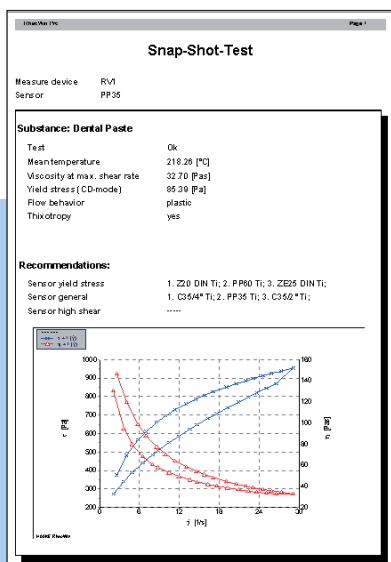
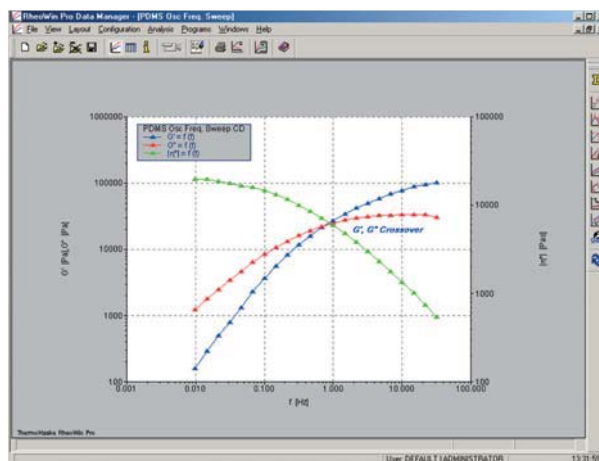
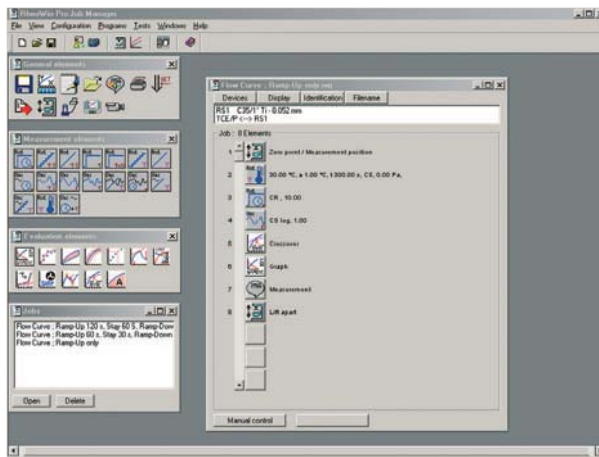
### Instruments overview

	Measurement of	Test methods	Motor / Bearing technology
<b>HAAKE RotoVisco 1</b>	Viscous properties	Rotation: CR	Stepper motor / frictionless torque measurement
<b>HAAKE RheoStress 1</b>	Viscous properties Viscoelastic properties	Rotation: CS, CR, CD Oscillation: CS, CD	Drag cup motor / air bearing
<b>HAAKE RheoScope 1</b>	Viscous properties Viscoelastic properties	Rotation: CS, CR, CD Oscillation: CS, CD	Drag cup motor / air bearing

- More detailed information about the HAAKE RheoScope 1 can be found in a separate brochure
- CS = Controlled Stress, CR = Controlled Rate, CD = Controlled Deformation

## ... One Concept

The aim of HAAKE Series 1 is to offer a panel of application oriented rheometers dedicated to be used in different industrial and scientific fields but based on a common set of features.



### Software

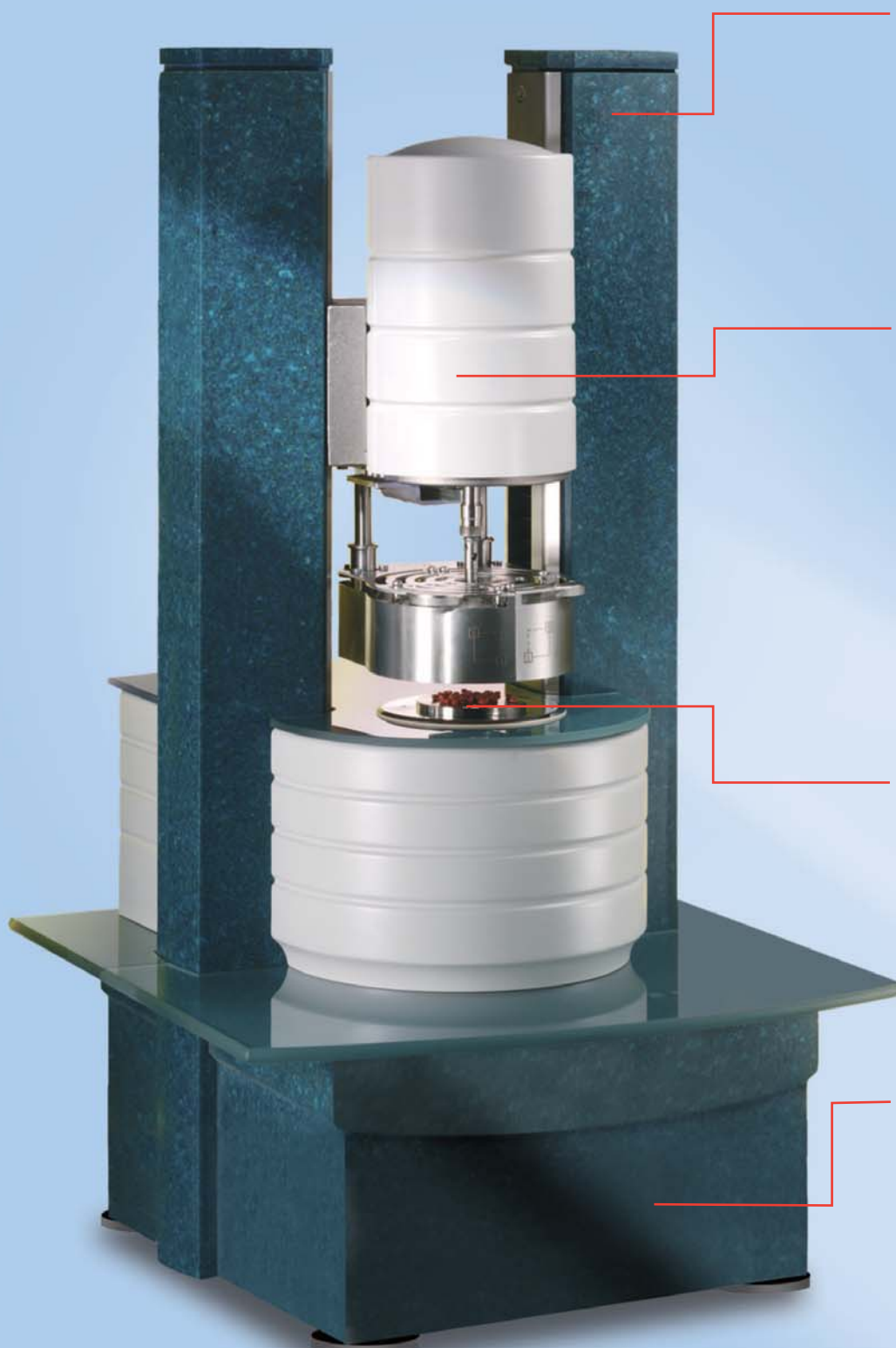
HAAKE RheoWin is a complete measuring and evaluation software package for all measuring modes. It controls the HAAKE Series 1 instruments and handles the measured data.

#### Some highlights are :

- Definition of measuring and evaluation sequences ("Jobs") using Drag & Drop
- Fully automated measurement and evaluation in one job
- Broad selection of rheological evaluation methods
- Freely configurable ASCII data export
- Intermediate saving of measured data
- Real multitasking; simultaneous measurements with multiple rheometers
- Real 32-bit application for Windows® 95/98/Me and NT/2000/XP
- Password protected user-levels
- 12 operating languages available
- Tools for complying with the FDA 21 CFR part 11 requirements
- HAAKE RheoWizard; the expert system for creating new jobs

HAAKE RheoWin can be adapted to suit individual user requirements via special modules:

- Snap-Shot for quick characterization of an unknown sample
- Barcode control for workflow optimization (GLP)
- SAP interface for data exchange
- Automatic comparisons with reference data / master curves
- Polymer software RheoSoft (WLF, Relaxation time spectra, molecular weight distribution)
- Image analysis software RheoSizer to handle RheoScope measurements



### **Automatic lift**

The correct geometry of the sample to be characterized is essential for performing a reliable rheological measurement. For this reason, the HAAKE Series 1 is equipped with an automatic lift which guarantees a reproducible and highly accurate positioning of the measuring geometries.

### **Motor technology**

The different motor technologies used for the HAAKE Series 1 devices are specially adapted to the specific application fields of each of the three instruments. The HAAKE RheoStress 1 and HAAKE RheoScope 1 use a state of the art drag-cup motor to satisfy the requirements of research applications. The HAAKE RotoVisco 1 motor is based on an extremely precise rate controlled actuation with a choice of 100 tabulated pre-defined shear-rates.

### **Temperature control**

The HAAKE Series 1 is factory modular regarding the temperature control systems. Each of the three instruments is available with a large variety of devices, ranging from liquid temperature controlled cylinder systems to Peltier temperature controlled parallel or cone and plate systems.

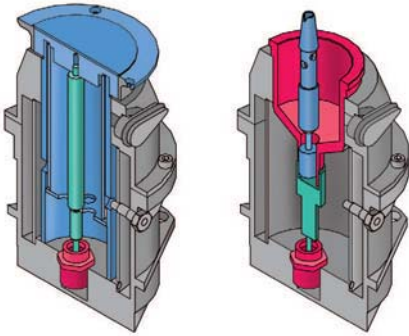
### **Design and materials**

The HAAKE Series 1 is a combination of an outstanding design and modern industrial manufacturing. The frame of the HAAKE Series 1 is made from polymer concrete, a compound which guarantees high mechanical stiffness, high vibration damping, fast temperature equilibration and good resistance against solvents. This material allowed the renowned design studio ID-design to create original and functional volumes.



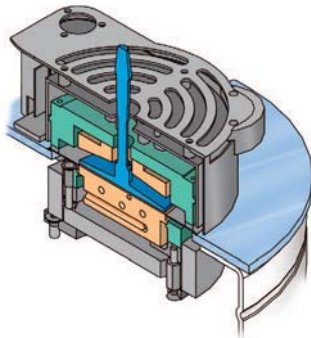
## TCL/Z

Liquid temperature controlled receptacle for cylinder measuring systems or plate insert MP61, with direct contact of the thermal fluid from -20 up to 200°C. An external circulator is required.



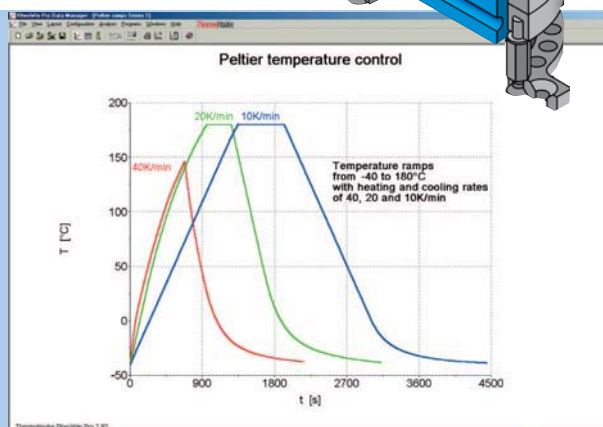
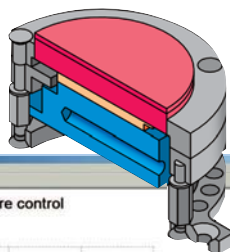
## TCE/PC

Electrically temperature controlled measuring plate with active cone heater for parallel plate or cone & plate sensors in the range from 30°C up to 350°C. With a cooling circulator the range can be extended down to -20°C.



## TCP/P

Peltier temperature controlled measuring plate for parallel plate or cone & plate sensors in the range from -40 °C up to 180 °C. An external cooling unit or tap water is required.



## Rheometer specifications

Model	HAAKE RotoVisco 1	HAAKE RheoStress 1	HAAKE RheoScope 1
Angular resolution ( $\mu$ rad)	5	0.3	0.3
Rotational speed CR-mode ( $\text{min}^{-1}$ )	0.0125 – 1000	0.025 – 1200	0.025 – 1200
Rotational speed CS-mode ( $\text{min}^{-1}$ )	--	0.001 – 1200	0.001 – 1200
Torque (mNm)	0.1 – 50 <sup>(1)</sup>	0.0005 – 100	0.0005 – 100
Oscillation frequency (Hz)	--	0.0001 – 100 <sup>(2)</sup>	0.0001 – 100 <sup>(2)</sup>
Multiwave (Hz)	--	0.01 – 10	0.01 – 10
Torsional movement ( $^{\circ}$ )	360	360	360
Bearing	mechanical bearing	air bearing	air bearing
Motor type	micro stepper motor	drag cup motor	drag cup motor
Optional high shear	--	0.025 – 3200 rpm	0.025 – 3200 rpm

<sup>(1)</sup> The highest torque is not reached at the highest rotational speed.

<sup>(2)</sup> The highest torque is not reached at the highest oscillation frequency.

## Temperature Control Options

Model	HAAKE RotoVisco 1	HAAKE RheoStress 1	HAAKE RheoScope 1
Thermal fluid cylinder system	-20 – 200°C	-20 – 200°C	–
Thermal fluid cone & plate system	-20 – 300°C	-20 – 300°C	5 – 95°C
Electrically heated cylinder system	-20 – 200°C	-20 – 200°C	–
Electrically heated cone & plate system	-20 – 350°C	20 – 350°C	–
Peltier controlled cone & plate system	-40 – 180°C	-40 – 180°C	–

## Display and control unit

The display and control unit of the HAAKE Series 1 is used for manual operation of the lift and the gap setting. It also allows to set pre-selected shear rates and to intervene in PC-controlled measurements. The color display monitors freely selectable rheological and instrument-specific data on-line. Data can be displayed numerically as well as graphically. Complex measuring sequences are carried out "at the touch of a button", without using a PC.



## Measuring geometries

The HAAKE Series 1 instruments are compatible with a whole range of sensor systems made from titanium for the rotating part and stainless steel for the stationary part.

Aluminum is used for the disposable systems. For high temperature applications the geometries are equipped with a ceramic shaft to prevent excessive heat loss.

## Typical Sensor Systems

Model	HAAKE RotoVisco 1 <sup>1)</sup>		HAAKE RheoStress 1 <sup>1)</sup>	
	Shear Rate (1/s)	Viscosity (mPas)	Shear Rate (1/s)	Viscosity (mPas)
<b>Typical Sensor Systems</b>				
Double gap cylinder system DG43	0.5 – 3300	0.1 – 3.8E+05	0.08 – 3900	0.002 – 4.6E+06
Cylinder Ø 34 mm ISO 3219 Z34 DIN	0.2 – 1300	0.7 – 2.4E+06	0.03 – 1500	0.01 – 2.8E+07
Cylinder Ø 20 mm ISO 3219 Z20 DIN	0.2 – 1300	3.7 – 1.2E+07	0.03 – 1500	0.06 – 1.5E+08
Cylinder Ø 10 mm ISO 3219 Z10 DIN	0.2 – 1300	30 – 1.0E+08	0.03 – 1500	0.5 – 1.2E+09
Cylinder Ø 41 mm DIN 53018 Z41	0.3 – 2300	0.3 – 9.6E+05	0.06 – 2800	0.005 – 1.2E+07
Cylinder Ø 38 mm DIN 53018 Z38	0.15 – 900	0.9 – 3.0E+06	0.02 – 1100	0.015 – 3.6E+07
Cylinder Ø 31 mm DIN 53018 Z31	0.07 – 440	2.7 – 8.9E+06	0.01 – 530	0.045 – 1.1E+08
Profiled cylinder Ø 38 mm Z38/S	0.15 – 900	0.9 – 3.0E+06	0.02 – 1100	0.015 – 3.6E+07
Disposable cylinder Ø 41 mm Z41DIN/E	0.3 – 2300	0.3 – 9.6E+05	0.06 – 2800	0.005 – 1.2E+07
High shear cylinder 25 µm gap HS25	6.9 – 4.6E+04	0.2 – 5.8E+05	1.2 – 5.5E+04	0.003 – 7.0E+06
High shear cylinder 100 µm gap HS100	1.8 – 1.2E+04	0.8 – 2.5E+06	0.3 – 1.4E+04	0.013 – 3.0E+07
Cone Ø 60 mm, 1° angle C60/1	0.9 – 6000	0.3 – 9.8E+05	0.15 – 7200	0.005 – 1.2E+07
Cone Ø 35 mm, 1° angle C35/1	0.9 – 6000	1.5 – 4.9E+06	0.15 – 7200	0.025 – 5.9E+07
Cone Ø 20 mm, 1° angle C20/1	0.9 – 6000	8.0 – 2.7E+07	0.15 – 7200	0.13 – 3.2E+08
Plate Ø 60 mm PP60	0.47 – 3100	0.75 – 2.5E+06	0.079 – 3800	0.013 – 3.0E+07
Plate Ø 35 mm PP35	0.27 – 1800	6.5 – 2.2E+07	0.046 – 2200	0.11 – 2.6E+08
Plate Ø 20 mm PP20	0.16 – 1000	61 – 2.0E+08	0.026 – 1300	1.0 – 2.4E+09
Plate Ø 35 mm serrated PP35/S	0.27 – 1800	6.5 – 2.2E+07	0.046 – 2200	0.11 – 2.6E+08
Plate Ø 20 mm serrated PP20/S	0.16 – 1000	61 – 2.0E+08	0.026 – 1300	1.0 – 2.4E+09
Starch Rotor Ø 40, 2 wings ST40	--	10 – 100 000	--	10 – 100 000
Vane rotor Ø 40 mm, 5 wings FL40	--	5.6 – 1.9E+07	--	0.093 – 2.2E+08
Vane rotor Ø 22 mm, 5 wings FL22	--	54 – 1.8E+08	--	0.9 – 2.2E+09
	<b>HAAKE RheoScope 1<sup>2)</sup></b>			
<b>Polished Sensor Systems</b>	Plate Ø 35 mm	Plate Ø 60 mm		
	Cone Ø 35 mm 1° angle	Cone Ø 60 mm 1° angle		

1) Lowest viscosity at lowest shear stress and highest shear rate  
Highest viscosity at highest shear stress and lowest shear rate

2) Standard parallel plate or cone and plate geometries also usable



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