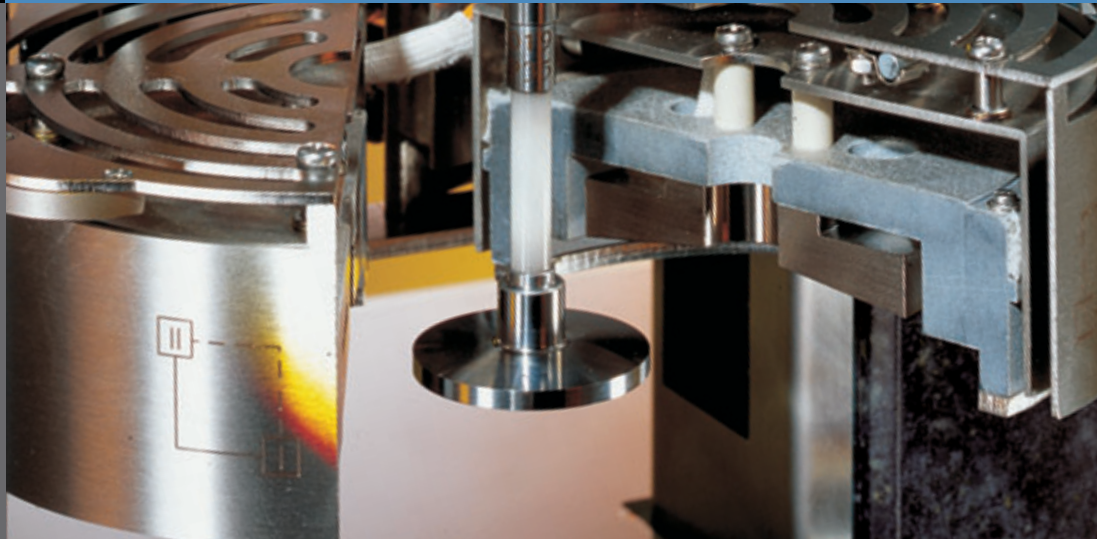


HAAKE Series 1

The versatile
rheometer concept



Application oriented instruments

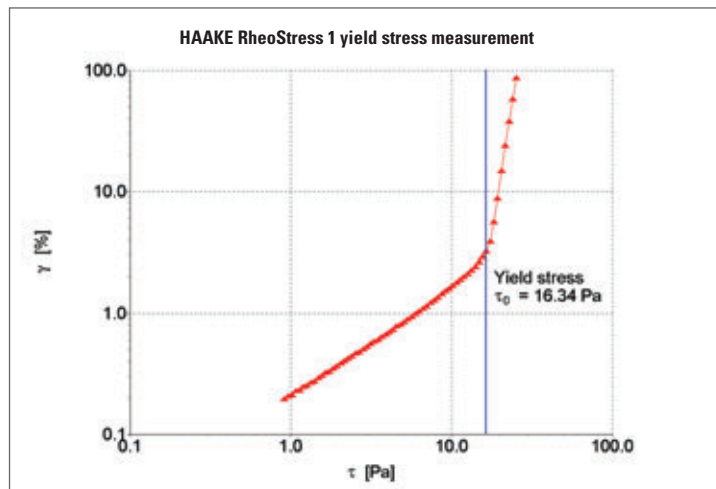
HAAKE RheoStress 1

The HAAKE RheoStress 1 is a universal laboratory rheometer with 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 adaptative control loops used in the HAAKE RheoStress 1, allow all types of measurements in CS, CR and CD-mode in rotation and oscillation.

Typical test methods:

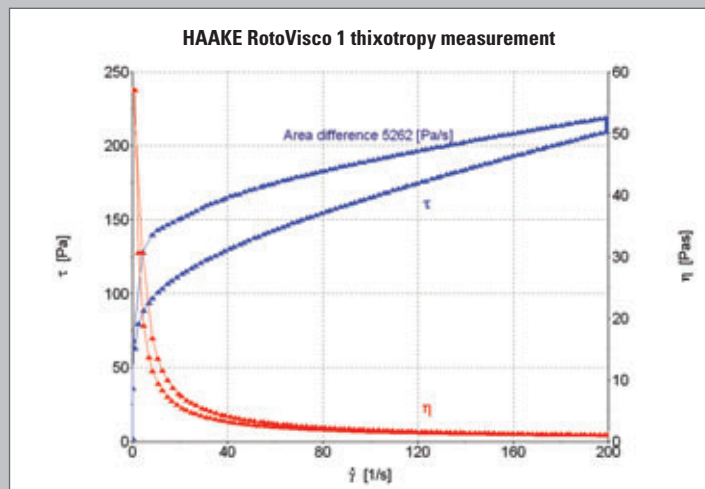
Flow curves, time and temperature dependent properties, yield point determination, creep/recovery, multiwave acquisition, etc.



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

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 HAAKE 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.



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 uses 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 these 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.

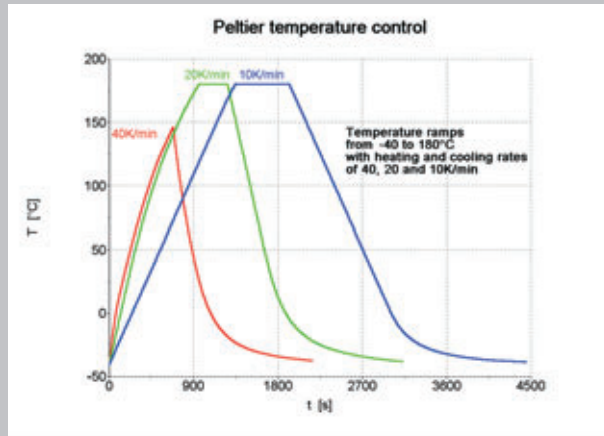
Temperature control units

TCL/Z

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

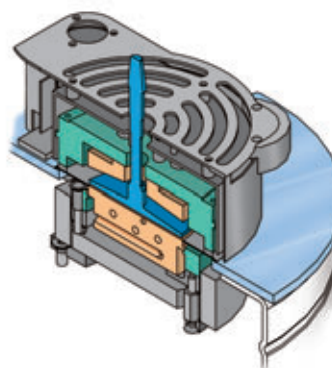
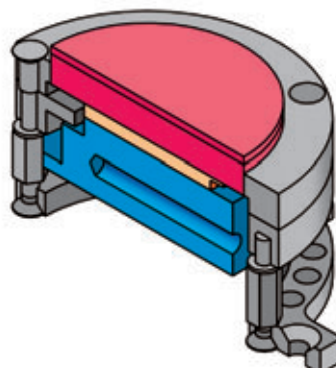
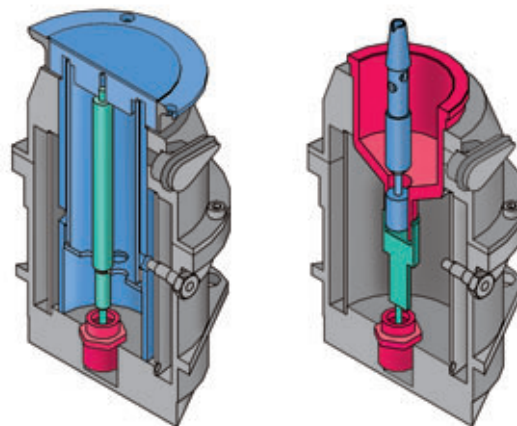
TCP/P

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 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.



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.



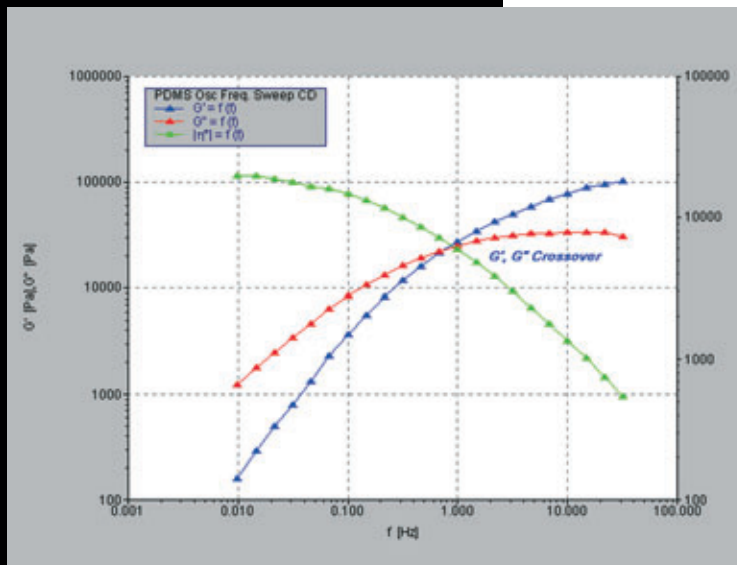
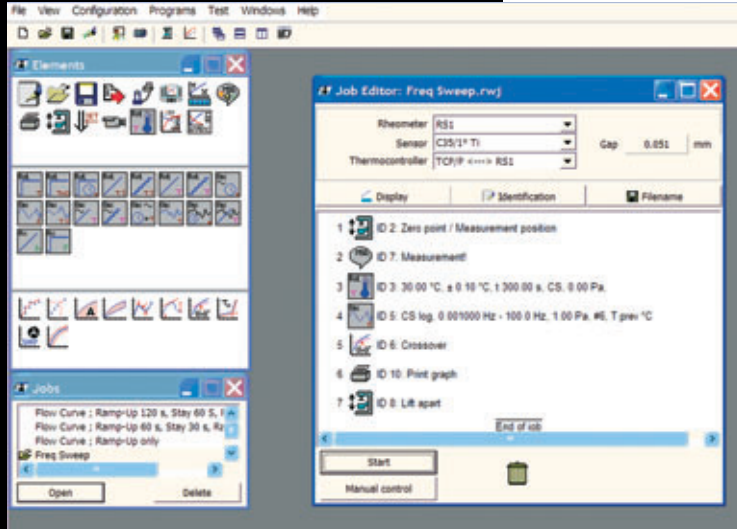


Measuring geometries

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.

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

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



Software

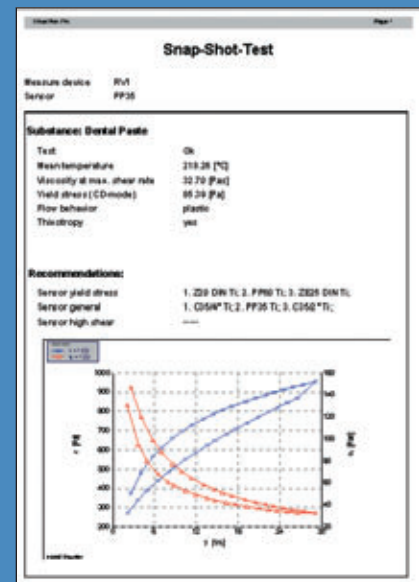
HAAKE RheoWin is a complete measuring and evaluation software package for all measuring modes. It controls the HAAKE Series 1 instruments and handles the measured data.

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® 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
- Polymer tools (TTS – Time Temperature Superposition, relaxation time spectra, molecular weight distribution)

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



Rheometer specifications

Model	HAAKE RotoVisco 1	HAAKE RheoStress 1
Angular resolution (μ rad)	5	0.3
Rotational speed CR-mode (min^{-1})	0.0125 – 1000	0.025 – 1200
Rotational speed CS-mode (min^{-1})	--	0.001 – 1200
Torque (mNm)	0.1 – 50 ⁽¹⁾	0.0005 – 100
Oscillation frequency (Hz)	--	0.00001 – 100 ⁽²⁾
Multiwave (Hz)		0.01 – 10
Drehwinkel (°)	360	360
Lager Typ	mechanical bearing	air bearing
Motor type	micro stepper motor	drag cup motor
Optional high shear	--	0.025 – 3200 rpm

⁽¹⁾ The highest torque is not reached at the highest rotational speed.

⁽²⁾ The highest torque is not reached at the highest oscillation frequency.



Temperature control options for HAAKE RotoVisco 1 and HAAKE RheoStress 1

Model	Temperature range
Thermal fluid cylinder system TCL/Z	-20 – 200°C
Thermal fluid cone & plate system TCL/P	-20 – 300°C
Electrically heated cone & plate system TCE/P	-20 – 250°C, 350°C ¹⁾
Peltier controlled cone & plate system TCP/P	-40 – 180°C

1) With upper electrical heating system.





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