



**When user-friendliness and reliability matter**  
**Thermo Scientific Viscometers**

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## Basic principles in rheology

### Selecting a viscometer

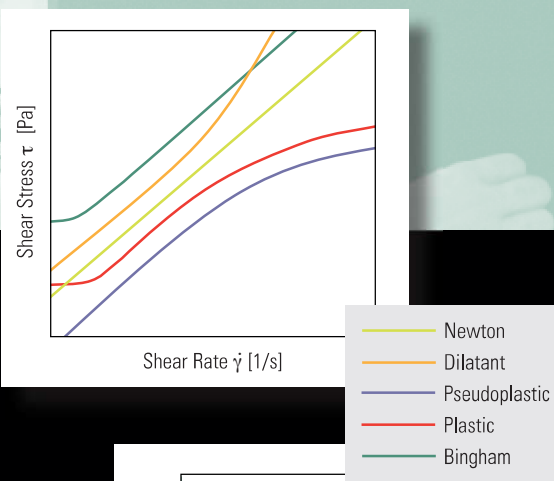
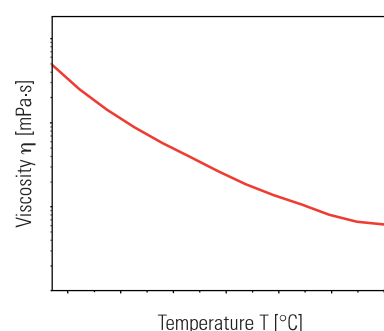
#### Viscometry

Viscometers determine the flow behavior of fluids. Viscosity describes a material property which is dependent on different parameters such as mechanical stress and strain, time as well as temperature and other ambient conditions.

#### Flow behavior

In rheology we differentiate between so-called Newtonian and non-Newtonian materials. Newtonian materials are characterized by a viscosity which may depend on temperature but is independent of the shear rate (and shear stress). Yet the viscosity of non-Newtonian materials depends on the shear rate. For most non-Newtonian materials the viscosity decreases with increasing shear rate. This behavior is called shear-thinning, or pseudoplastic. A material in which viscosity increases at increasing shear rates is called shear-thickening or dilatant.

Materials that do not flow until the applied shear stress surpasses a certain value are said to have a yield-stress.



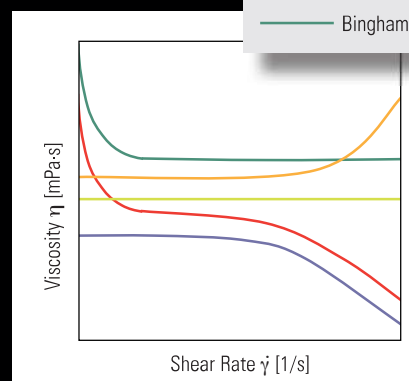
#### Rotational viscometers

Using a rotational viscometer, the viscosity is calculated from the measured torque and rotational speed as well as the dimensions of the measuring geometry. If the measuring geometry fulfils certain requirements (e.g. small gap), which is the case for coaxial cylinder, plate/plate and cone/plate measuring geometries (DIN 53018, DIN 53019...), the absolute value of the viscosity can be calculated.

If the dimensions of the measuring geometry are not well defined, only a relative value for the viscosity can be determined. In this case, the measured viscosity value not only depends on the ambient conditions, but also on the test method, i.e. the measuring geometry.

#### Falling ball viscometers

The falling ball viscometer is a conventional and highly accurate instrument for the determination of the absolute value of the viscosity of a Newtonian material. The viscosity can be calculated from the falling time of the ball, the density of the ball as well as the diameter of the tube and the ball.



## THERMO SCIENTIFIC HAAKE VISCOTESTER E, D AND C

### Application

The Thermo Scientific HAAKE Viscotester E, D and C units can be used for tests and comparative measurements for quality control according to recognized standards.

### Measuring principle

The HAAKE Viscotester E, D and C are classical rotational viscometers that measure the resistance of a test substance against a preset speed. The resulting torque or resistance measures the viscosity of the fluid. The higher the torque, the higher the viscosity. Due to the type of standardized geometries, the shear rates generated can only be determined precisely for Newtonian substances.

### Compatibility

The basic ISO 2555 standard describes the design and the characteristic measuring technique of a viscosity measuring instrument (torque, speed, rotor geometry). If rotational viscometers meet these requirements, results comply.

### Common features of the HAAKE Viscotester E, D and C

- Ready to go package – unpack, switch on and start measuring viscosity
- Digital display of viscosity, % torque, speed, spindle, upper viscosity limit, temperature (optional), in selectable units
- Integrated automatic diagnostic functionality
- Visual and acoustic signals at critical measuring conditions
- Easy viscosity and temperature (optional) calibrations
- 10 user interface languages
- 2 years warranty

### Standards

The HAAKE Viscotester E, D and C meet the following standards:

**BS:** 6075, 5350; **ISO:** 2555, 1652

**ASTM:** 115, 789, 1076, 1084, 1286, 1417, 1439, 1638, 1824, 2196, 2336, 2364, 2393, 2556, 2669, 2849, 2983, 2994, 3232, 3236, 3716

### Technical data

- Viscosity range: depending on version (L or R)
- Accuracy:  $\pm 1\%$  FSD
- Reproducibility: 0.2 %
- Supplied at 100–240 V/50–60 Hz







#### HAAKE Viscotester E – The expert model

For automatic flow curve measurements with full PC control.

Additional features:

- 6 line LCD display with 12 keys
- Display of sample temperature, shear rate and shear stress for coaxial spindles, routine parameters, etc.
- Internal memory for 9 advanced measuring routines
- Routine programming functions
- USB for software control
- Rotational speeds: 54 between 0.01 rpm and 200 rpm
- Viscosity range:  
R-Version: 100 mPas – 40.000.000 mPas  
L-Version: 15 mPas – 6.000.000 mPas

Optional:

- One hand quick fit coupling for spindles
- HAAKE RheoWin measuring and evaluation software

#### Order No. Description

399-0500	HAAKE Viscotester E (R-version) Base unit with stand, spindles R2 to R7, rack, spindle guard, Pt 100 in a carrying case
399-0510	HAAKE Viscotester E (R-version) 399-0500 with quick fit coupling
399-0501	HAAKE Viscotester E (L-version) Base unit with stand, spindles L1 to L4, rack, spindle guard, Pt 100 in a carrying case
399-0511	HAAKE Viscotester E (L-version) 399-0501 with quick fit coupling



#### HAAKE Viscotester D – The distinct model

For routine viscosity measurements with data transfer.

Additional features:

- 6 line LCD display with 6 keys
- Internal memory for 9 basic measuring routines
- USB interface for data transfer to PC
- Rotational speeds:  
21 between 0.1 rpm and 200 rpm
- Viscosity range:  
R-Version: 100 mPas – 13.000.000 mPas  
L-Version: 15 mPas – 2.000.000 mPas

Optional:

- Temperature sensor Pt 100
- Display of sample temperature
- One hand quick fit coupling for spindles
- HAAKE RheoWin data evaluation software

#### Order No. Description

399-0400	HAAKE Viscotester D (R-version) Base unit with stand, spindles R2 to R7, rack, spindle guard in a carrying case
399-0410	HAAKE Viscotester D (R-version) 399-0400 with quick fit coupling
399-0401	HAAKE Viscotester D (L-version) Base unit with stand, spindles L1 to L4, rack, spindle guard in a carrying case
399-0411	HAAKE Viscotester D (L-version) 399-0401 with quick fit coupling
222-2003	Temperature sensor Pt 100



#### HAAKE Viscotester C – The convenient model

For easy, fast and accurate manual viscosity measurements.

Additional features:

- Simple and intuitive operation
- 4 line LCD display with 6 keys
- Rotational speeds:  
21 between 0.1 rpm and 200 rpm
- Viscosity range:  
R-Version: 100 mPas – 13.000.000 mPas  
L-Version: 15 mPas – 2.000.000 mPas

#### Order No. Description

399-0300	HAAKE Viscotester C (R-version) Base unit with stand, spindles R2 to R7, rack, spindle guard and carrying case
399-0301	HAAKE Viscotester C (L-version) Base unit with stand, spindles L1 to L4, rack and spindle guard and carrying case

**Helipath**

for comparative measurements on high viscous samples such as creams, pastes and gels

The up and down movement of the measuring head allows the needle spindle to cut into fresh material tracing a helical path through the sample

**Order No. Description**

222-1380 Motor-driven Helipath stand to continuously penetrate fresh sample material; incl. 6 T-shaped spindles and carrying case (100 V–240 V/50 Hz–60 Hz)

**Low viscosity adapter**

allows reproducible and accurate measurements of the viscosity from 1.0\* mPas for L-models and 5 mPas for R-models

(\* Taylor vortices may result in additional errors.)

**Technical data:**

- Sample volume: 16 ml –18 ml
- Flow jacket for temperature control: -10 °C –100 °C
- Pt 100 (optional)

**Order No. Description**

222-1379 Adapter for low-viscous samples, which extends the measuring range down to lower viscosities, incl. cylindrical spindle and carrying case

222-2001 Pt 100 for low viscosity adapter

**Small sample adapter**

for viscosity measurements of small volumes

**Technical data:**

- Sample volume: 8 ml –13 ml
- Flow jacket for temperature control: -10 °C –100 °C
- Pt 100 (optional)

**Order No. Description**

222-1378 Adapter for small sample volumes incl. carrying case, spindles supplied separately

222-1397 Set of spindles for L-version of the viscotester

222-1387 Set of spindles for R-version of the viscotester

222-2002 Pt 100 for small sample adapter

**HAAKE RheoWin software for HAAKE Viscotester E and D**

Highly customizable and extremely easy to use software for both beginners and professionals consisting of:

- JobManager for fully automated measuring and analysis routines (for HAAKE Viscotester E only)
- DataManager for data analysis and creating reports
- User Manager for user access control and assignment of specific access rights

**Order No. Description**

098-5059 HAAKE RheoWin software for HAAKE Viscotester D software for data collection and evaluation

098-5060 HAAKE RheoWin software for HAAKE Viscotester E measuring and evaluation software

098-5039 HAAKE RheoWin software module: FDA 21 CFR part 11



The HAAKE Viscotesters E, D and C are supplied as a complete measuring unit consisting of a basic instrument with stand and a set of spindles with a storage rack – all in a carrying case with multilingual documentation.

### About Thermo Fisher Scientific

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### Customer Services

We are committed to customer support, including specific service products, short response times, and customer-specific solutions. To quickly and flexibly meet our customer's requirements, we offer a comprehensive range of services.

### Application Laboratories and Support

Our fully equipped laboratories reflect our application expertise and commitment to innovation. Our laboratories are in constant demand for testing customer samples and developing and optimizing pioneering applications. We also provide a broad range of product and application solutions and our application specialist team is on hand to answer your questions.

### Trainings Courses, Seminars and Webinars

We offer our customers a comprehensive training program and selected courses in our international training center in Karlsruhe, Germany. Basic and advanced rheology seminars and training on special applications are held worldwide. In-house seminars are also offered to our customers. Webinars on a regular base extend our training program.

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