



When user-friendliness and reliability matter
Thermo Scientific Viscometers

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Basic principles in rheology

Selecting a viscometer

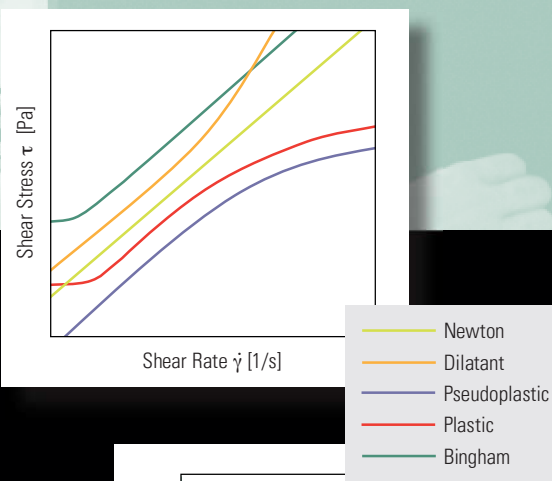
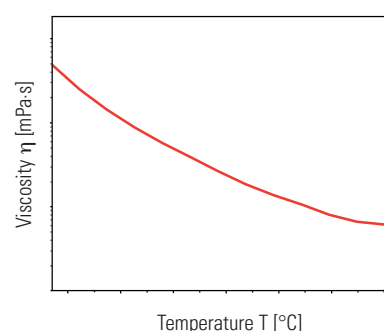
Viscometry

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.



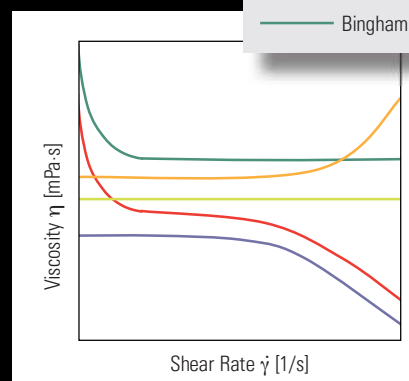
Rotational viscometers

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.



Application

The Thermo Scientific HAAKE Falling Ball Viscometer type C provides a very accurate way of measuring the viscosity of transparent Newtonian liquids and gases. It meets the requirements of the German DIN 53015 as well as ISO 12058 standard and it is accepted as an official reference instrument. Its measuring accuracy when supported with the precise temperature control of a circulator is among the highest available in any type of viscometer.

- Chemical industry
(polymer solutions, solvents, inks)
- Pharmaceutical industry
(raw materials, glycerine)
- Food industry
(gelatin, sugar solutions)
- Mineral oil industry
(oils, liquid hydrocarbons)

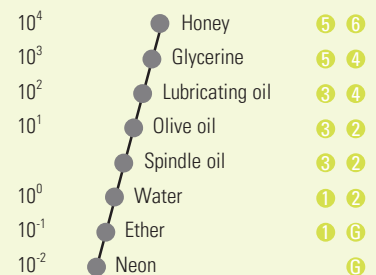


Measuring principle

The time for rolling and sliding movements of a ball through the sample liquid in an inclined cylindrical measuring tube is measured. The sample viscosity is correlated with the time needed by a ball to traverse a definite distance.

By turning the measuring tube upside down again the return of the ball may also be used for an additional measurement. The test results are given as dynamic viscosity in the internationally standardized, absolute units of milli Pascal seconds (mPas).

Viscosity η 20 °C (mPas) Ball(s)



Technical data

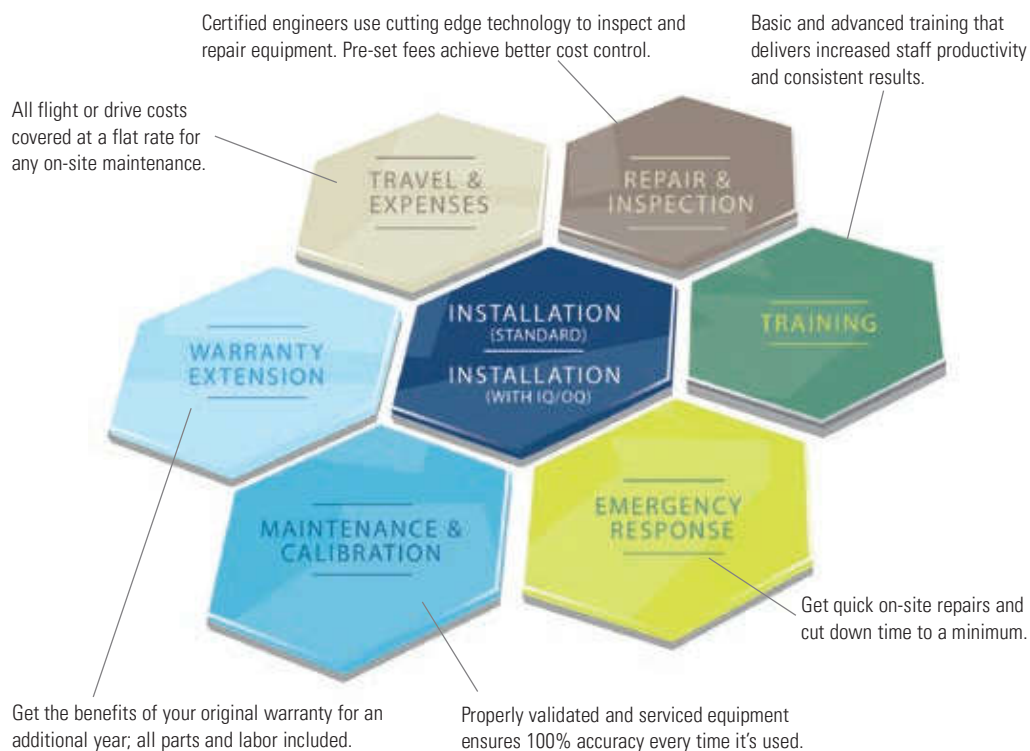
- Viscosity range: 0.5 mPas – 10⁵ mPas (cP)
- Temperature range: -20 °C to +150 °C
- Reproducibility: < 0.5 %
- Comparability: < 1 %
- Material: Falling tube, balls 1, 2 and G, borosilicate glass; balls 3, 4, 5 and 6, Nickel iron alloy

Order information

Order No.	Description
356-0001	Falling Ball Viscometer type C including 6 balls, instrument case, thermometer -1 °C up to 26 °C (0.1 °C divisions), cleaning tools, calibration sheet, instruction manual
800-0176	Stopwatch, LCD-Display up to 9 h, 59 minutes, 59.99 seconds
800-0009	Ball G for gas measurements
333-0639	Pt 100 temperature sensor for falling ball - DC50 circulator

Select only the service modules you want. Add modules at the time of equipment purchase, during warranty, or after. Combine modules. Or create a customized service plan that matches your unique requirements. We can offer comprehensive consultation to help choose the right options.

And if you require services not described here, please call us. We'll develop customized solutions for you. Visit www.thermo.com/mc_service for more detailed information. And then phone your Thermo Fisher Scientific sales representative to arrange for your free service assessment.



We supply liquids with different qualities:

Order information

Order No.	Type	Description	η (20 °C)
082-5303	100BW	Standard liquid 100 ml	100 mPas*
082-5304	2000AW	Standard liquid 100 ml	2000 mPas*
082-5305	10 000BW	Standard liquid 100 ml	10 000 mPas*
082-5042	E7	Test fluid 100 ml	5 mPas
082-5043	E200	Test fluid 100 ml	120 mPas
082-5044	E2000	Test fluid 100 ml	1900 mPas
082-5046	E6000	Test fluid 100 ml	6000 mPas
082-5336	E15 000	Test fluid 100 ml	15 000 mPas
082-5335	E40 000	Test fluid 100 ml	40 000 mPas

* Additional certified viscosity values available at temperatures: 23, 25, 30, 40 and 100 °C.

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Benelux

Tel. +31 (0) 76 579 55 55
info.mc.nl@thermofisher.com

China

Tel. +86 (21) 68 65 45 88
info.mc.china@thermofisher.com

France

Tel. +33 (0) 1 60 92 48 00
info.mc.fr@thermofisher.com

India

Tel. +91 (22) 27 78 11 01
info.mc.in@thermofisher.com

Japan

Tel. +81 (45) 453-9167
info.mc.jp@thermofisher.com

United Kingdom

Tel. +44 (0) 1785 82 52 00
info.mc.uk@thermofisher.com

USA

Tel. +1 866 537 0811
info.mc.us@thermofisher.com

International/Germany

Dieselstr. 4
76227 Karlsruhe
Tel. +49 (0) 721 4 09 44 44
info.mc.de@thermofisher.com

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