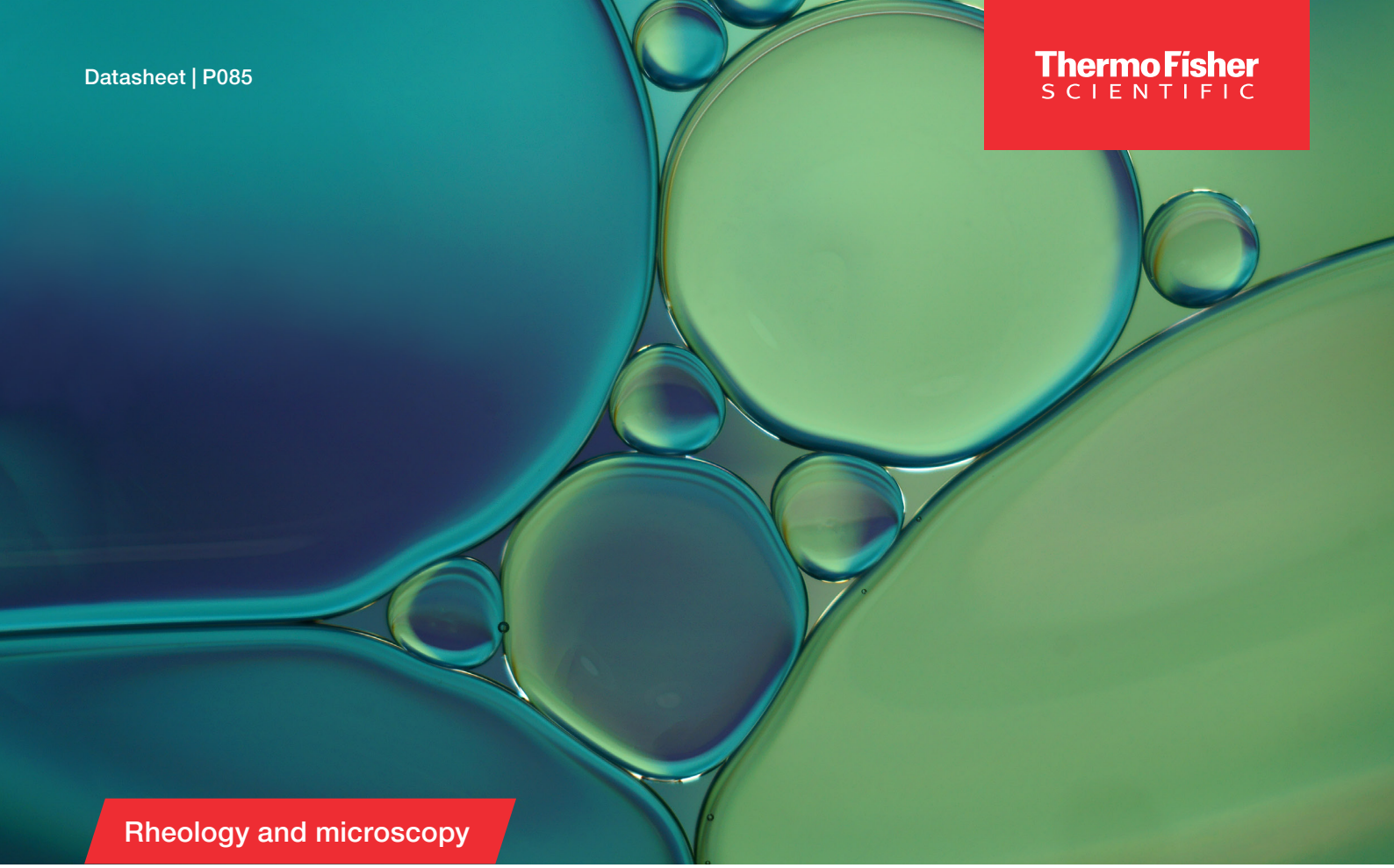
Datasheet | P085



Rheology and microscopy

HAAKE RheoScope Module for HAAKE MARS Rheometers

Rheological measurement with simultaneous optical analysis

Authors
Cornelia Küchenmeister-Lehrheuer,
Fabian Meyer
Thermo Fisher Scientific,
Karlsruhe, Germany

Keywords
HAAKE MARS Rheometer, RheoScope, simultaneous optical analysis, microscopic structure

Introduction

The Thermo Scientific™ HAAKE RheoScope™ Module for the Thermo Scientific™ HAAKE™ MARS™ Rheometers enables the simultaneous measurement of rheological properties and the detection of changes in the microscopic structure of an analyzed sample. The results enable researchers to accelerate formulation development, process optimization, and product processing.

Rheology and simultaneous microscopy

The HAAKE RheoScope module simultaneously records rheological properties and changes in the microscopic structure of a tested material. A deeper understanding of microstructures and their changes enables researchers to better understand the mechanical properties of a product and identify correlations.

Examples of potential applications:

- **Food:** Swelling and dissolution of starch granules in water when heated
- **Personal care:** Orientation and stability of foam bubbles under shear
- **Petrochemical:** Temperature-dependent occurrence of wax deposits in crude oil
- **Polymers:** Crystallization of semi-crystalline thermoplastics on cooling

The HAAKE RheoScope Module consists of an optical microscope, a digital video camera and a temperature controller combined in a compact unit that is used in conjunction with the HAAKE MARS Rheometers.

The Thermo Scientific™ HAAKE™ RheoWin™ Software, which is used to control the rheometer, also positions the lens, focuses the image, and controls the built-in polarization filter of the HAAKE RheoScope Module. Further image adjustments such as brightness, contrast, and illumination time are also adjusted directly via the HAAKE RheoWin Software. Simultaneously-generated rheological data and microscopic images can thus be viewed side by side. In addition, data and images can be saved in various formats for further analysis or for export to external databases. The design of the HAAKE RheoScope Module enables quick adaptation to customer-specific configurations and can work within a temperature range from -5 °C to 300 °C. Delivered contents also include a Ronchi ruling for length calibration and cleaning tissues for optical components.

Other accessories such as a holder for inserting additional optical elements (filters)[1] into the light beam are also available for the HAAKE RheoScope Module.

Samples beyond the limits of classical optical microscopy?

Easily and rapidly transform a “classical’’ optical microscopy setup into a transmission microscopy solution using a transparent glass rotor and sample cover combined with a light source from the top. This setup enables reliable characterization of opaque samples, highly concentrated dispersions, and narrow particle size distributions — significantly expanding microscopic analysis capabilities for advanced material research.

Figure 1. HAAKE RheoScope Module close-up.

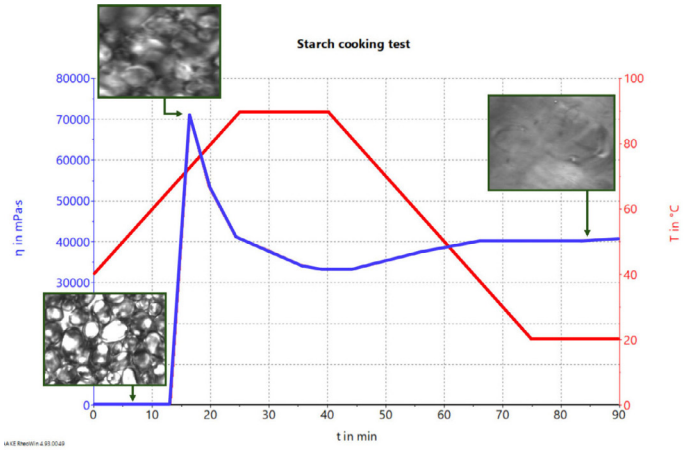


Figure 2. Temperature ramp measured on potato wild type starch in water.

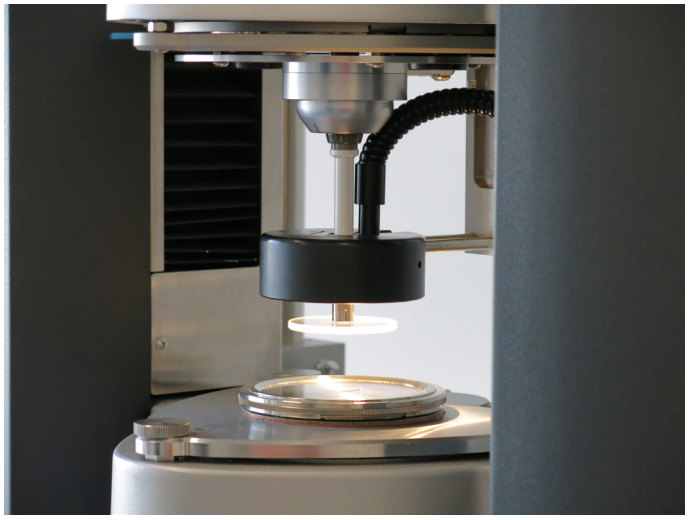
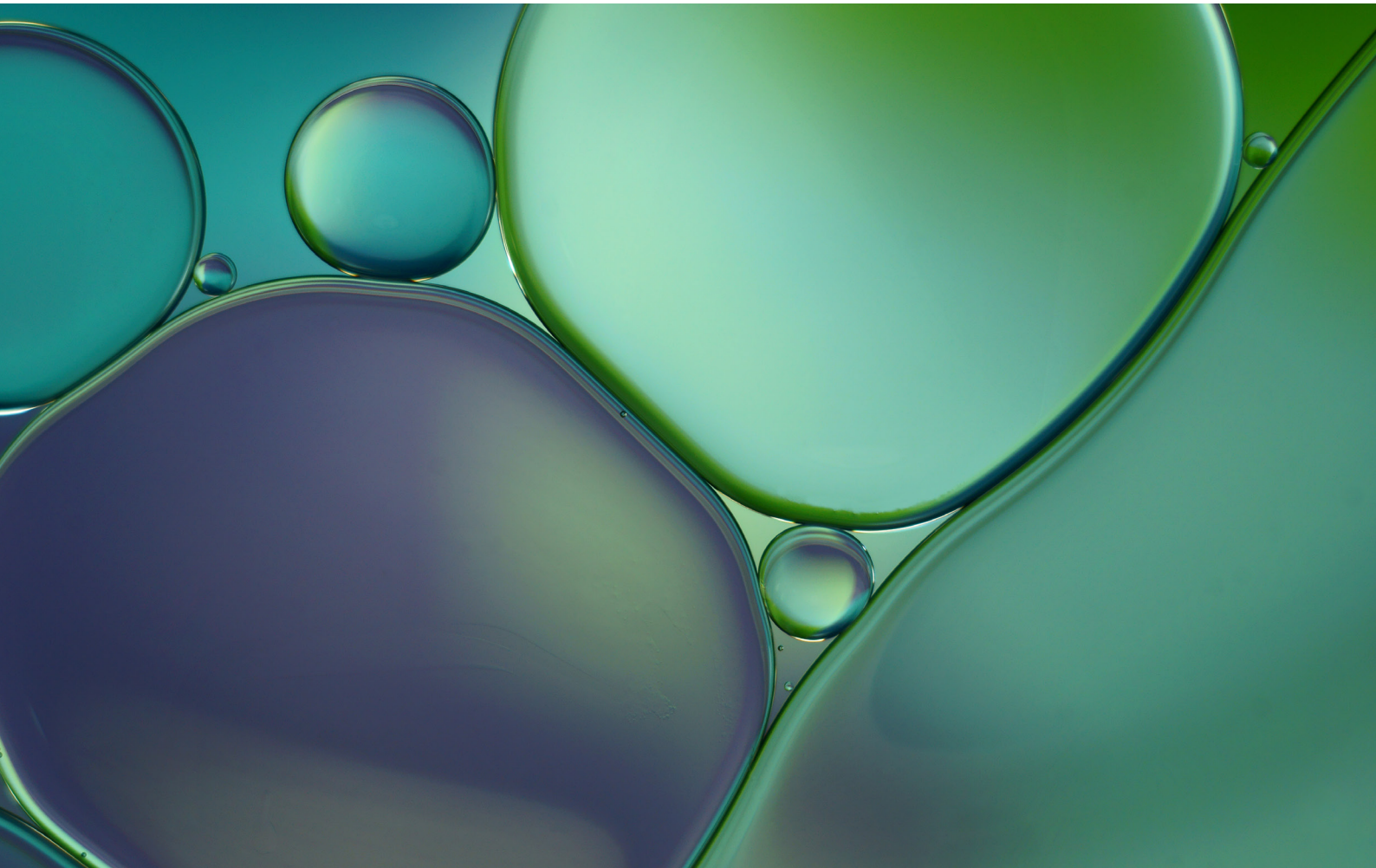


Figure 3. Transmission microscopy configuration close-up.

Product specifications

Specification	Description
Optic	
Microscope	Servo motor-driven focus and position adjustments controlled via software
Lenses[1]	Magnification: 5x, 10x, 20x and 50x
Light source[1]	150 W, 12 V, wavelength range: 380 – 750 nm
Resolution	1 µm (20x lenses)
Field depth	5 µm (20x lenses)
Polarization filter	Motor-driven, remote controlled by HAAKE RheoWin Software
Camera[1]	Progressive-scan CCD camera with 1600 x 1200 pixels (UXGA) with C-Connection and USB 3.0 B interface, monochrome or color versions available
Data acquisition and storage	
Frames per second	Up to 30 images per second[2] for live image in HAAKE RheoWin Software (manual operation mode and during measurement)
Data storage	Maximum 15 images/second in HAAKE RheoWin data format
Image formats	Tagged Image File (.TIF), Windows Bitmap (.BMP), LuraWave (.LWF), Joint Photographic Experts Group (.JPG), Portable Network Graphics (.PNG). Image conversion to video available in Audio Video Interleave (.AVI) or Windows Media Video (.WMV) format with user-definable data compression
Temperature range	
Temperature range	-5 °C[3] – 300 °C[4]
Measuring geometries	
Measuring geometries	A range of plate and cone rotors made of titanium and polished surface finish are available (P60, C60 1°, P35, C35 2°, C35 1°, other diameters and cone angles are available upon request). All rotors are equipped with ceramic shaft and “Connect Assist” technology (quick-coupling with automatic recognition). Bottom glass plates are available with smooth or sandblasted surfaces finish.

[1]Components with standard interfaces are used, individual components can be adapted upon request
[2]Depending on the specifications of the computer used
[3]Depending on the specifications of the circulator used for cooling
[4]For temperatures above 70 °C the use of an additional upper temperature module is required



Ordering information

Description	Cat. No
HAAKE RheoScope Module for HAAKE MARS Rheometer (models 40, 60, MARS iQ, MARS iQ Air): Temperature range -5 °C to 300 °C Minimal configuration requires: • Power supply • Camera with connecting cable • Lens • Measuring geometry (lower plate and rotor)	222-1912
Power supply	222-1897
Camera for HAAKE RheoScope Module: compact camera (monochrome) with USB 3.0 interface	222-2342
Camera for HAAKE RheoScope Module: compact camera (color) with USB 3.0 interface	222-2343
Connecting cable for camera models 222-2342 and 222-2343	222-2344
Lens with 5-fold magnification for HAAKE RheoScope Module	222-1815
Lens with 10-fold magnification for HAAKE RheoScope Module	222-1816
Lens with 20-fold magnification for HAAKE RheoScope Module	222-1817
Lens with 50-fold magnification for HAAKE RheoScope Module	222-1818
Measuring plate MP60 glass 1 mm (sand blasted), D=60 mm for HAAKE RheoScope / RheoRaman Module	222-1830
Measuring plate MP60 glass 1 mm (transparent), D=60 mm for HAAKE RheoScope / RheoRaman Module	222-1831
Exchange kit glass plates 1 mm (sand blasted) for RheoScope / RheoRaman Module (5 pcs.)	222-1832
Exchange kit glass plates 1 mm (transparent) for HAAKE RheoScope / RheoRaman Module (5 pcs.)	222-1833
Rotor P60/Ti/PO polished with "Connect Assist" and ceramic shaft	222-2108
Rotor C60 1°/Ti/PO polished with "Connect Assist" and ceramic shaft	222-2119
Rotor P35/Ti/PO polished with "Connect Assist" and ceramic shaft	222-2109
Rotor C35 2°/Ti/PO polished with "Connect Assist" and ceramic shaft	222-2121
Rotor C35 1°/Ti/PO polished with "Connect Assist" and ceramic shaft	222-2120
Box with cleaning tissues	222-1597
For high temperature applications	
For HAAKE MARS 40/60 upper electrical temperature module TM-EL-H; required accessories: 222-1902 holder for guide bar and 222-1897 power supply	222-2172
For HAAKE MARS iQ Rheometers upper electrical temperature module TM-EL-H; required accessories: 222-2348 holder for guide bar	222-2253
For transmission setup	
For HAAKE MARS 40/60 Rheometers the upper hood TM-OM-H and 222-1902 holder for guide bar is required	222-2631
For HAAKE MARS iQ Rheometers the upper hood TM-OM-H and 222-2384 holder for guide bar is required	222-2630
Schott CV-LS LED light source with light guide	222-2636
P40/GI Plate rotor, 40 mm diameter, glass plate	222-2638
P50/GI Plate rotor, 50 mm diameter, glass plate	222-2639

References

1. Küchenmeister-Lehrheuer C. and Meyer F., Thermo Scientific HAAKE RheoScope: Universal Holder for optical components for contrast enhancement and customized set-ups, Thermo Fisher Scientific Product information P042.

Learn more at **thermofisher.com/rheometers**