

## HAAKE MARS

An innovative  
rheometer concept



Analyze • Detect • Measure • Control™

**Thermo**  
ELECTRON CORPORATION

## Application dynamics in harmony with a rheometer

**PETROCHEMISTRY** | In the petrochemical industry, in addition to general quality assurance, great importance is attached to the simulation of pump characteristics and measurements related to oils and drilling fluids under pressure. The HAAKE MARS rheometer platform offers a reliable, user-friendly solution that evaluates fluids under realistic conditions of high pressure (up to 400 bar) and high temperature (up to 300°C) in the laboratory.

**POLYMERS** | The HAAKE MARS rheometer platform delivers the essential data required to develop innovative structural and functional material compounds and polymers. From diluted polymer solutions to molten and solid plastics, in temperature capabilities from -150 to 600°C, the system provides the industry with new possibilities and approaches. In addition to high-performance equipment, a comprehensive software package with master curves, spectra and molecular weight distribution simplifies daily work in research & development.

New definition of scope for rheometer movement



## Secured future and safety of investment

**PAINTS AND DIES** | Innovative paints and dies demand extensive and precise rheological measurements. This begins with reliable quality control of raw materials and products and continues in the research and development of new formulations. Stability, time dependence, process characteristics when spraying or coating, and structural properties of these products can be derived in the early stages of development with HAAKE MARS measurement data.



**PHARMACEUTICALS & COSMETICS** | The pharmaceutical and cosmetics industries must fully understand the processability, consistency, time- and temperature-dependend properties of raw materials and end products in order to develop innovative and successful products. With the new generation of HAAKE MARS rheometers, Thermo Electron Corporation offers a wide range of functions that are tailored to the special needs of these industries. For example structural properties can be analyzed by means of simultaneously examining rheological characteristics and macroscopic structure. IQ/OQ support for our rheometers ensures the reliability and traceability of measurement results. Special tools, such as the FDA 21 CFR Part 11 tool, help to ensure compliance with the highest legal requirements. All these benefits are standard with HAAKE MARS systems.

From diluted samples to solids – measure everything with one rheometer





**FOOD** | In the food industry, the focus is on the quality control of raw materials and end products, processability and taste. A wide range of measurement geometries covers the diverse requirements of testing such different products as milk, dairy products, fats, chocolate, ketchup and even jellies by using one instrument platform, the HAAKE MARS.

**THERMO** is a pioneer in the field of rheology. Our significant milestones include:

- The invention of the falling ball viscometer (1932)
- The construction of the world's first commercially-available rotational rheometer (1954: HAAKE RotoVisco)
- The first computer-controlled rotational viscometer (1978) and
- CS (controlled stress) rotational rheometer with automatic lift (1992: HAAKE RheoStress 100)
- The first extensional rheometer for fluids and pastes (2002: HAAKE CaBER 1).

Through the new generation of HAAKE MARS rheometers, Thermo is building on the technical foundation of previous models and setting new standards in rheology.



The modular HAAKE MARS rheometer has been designed for flexible use in daily R&D work and can be adjusted quickly and easily to new requirements. Temperature control units ensure reliable operation at temperatures from -150 to 600°C. Special measurement equipment can also be integrated, including pressure cells up to 400 bar, a UV cell for measuring UV-hardened materials, and an optical module for the synchronous analysis of rheological properties and the microscopic structure of a sample. A spectrum of applications covers an entire range of measurement geometries: coaxial cylinders, plates and spheres, as well as single-use and custom versions.

Thermo's objective is not only to provide our customers with state-of-the-art research technology, but also to protect their equipment investment well into the future. We guarantee this by ensuring compatibility with modules from the HAAKE RheoStress series. The rheometer's robust stand is manufactured with a precision cast with optimum powerflow. Its generous dimensions allow for exceptionally easy handling, and optional adjustments on the stand allow for individual modules to be added for combined measurement methods.

The HAAKE MARS features a VC motor that ensures short response times. The rheometer's low mass moment of inertia, combined with the lightweight titanium rotors allows measurements to be performed on diluted samples even at the lowest of torque levels. The motor is configured to allow solids to be deformed in a precise manner. The functions of the HAAKE MARS cover all rheological measurements in CR (controlled rate), CS (controlled stress) and CD (controlled deformation) mode, in rotation and oscillation, in any combination. A normal force sensor extends the measurement range to include the measurement of negative normal stress, allowing the rheometer to perform tensile tests. The ethernet interface (TCP/IP) guarantees high-speed data transfer rates. The integrated web server provides the option of remote servicing and operation. Measurements in progress can be reviewed quickly either over the Internet or Intranet so that the operator can work on other tasks during testing.



The HAAKE MARS platform is designed to allow all application-related assemblies, including the measuring head and electronics systems, to be interchanged. This gives a new dimension to the concept of 'modularity'. This flexible concept not only allows the rheometer to be adapted to individual requirements, it also allows new technological developments to be used in a rapid, cost-effective manner – without the high cost commitments involved in purchasing new equipment. This simultaneously protects customer investment and secures the system's future.

The HAAKE MARS platform has the capacity to grow both with customer needs and with developments in technology. In addition to our range of user-friendly instruments and software solutions, we offer our customers an extensive array of service options. Choose from seminars and training programs, warranty extensions and premium service packages all tailor-made to specific requirements.



#### About Thermo Electron Corporation

Thermo Electron Corporation is the world leader in analytical instruments. Our instrument solutions enable our customers to make the world a healthier, cleaner and safer place. Thermo's Life and Laboratory Sciences business provides analytical instruments, scientific equipment, services, and software solutions for life science, drug discovery, clinical, environmental, and industrial laboratories. Thermo's Measurement and Control business is dedicated to providing analytical instruments used in a variety of manufacturing processes and in-the-field applications including those associated with safety and homeland security. Based near Boston, Massachusetts, Thermo has revenues of more than \$2 billion, and employs approximately 10,000 people in 30 countries. For more information, visit [www.thermo.com](http://www.thermo.com).

#### About Thermo Electron Corporation – Material Characterization

The Material Characterization business of Thermo Electron Corporation is headquartered in Karlsruhe, Germany and operates worldwide through offices in the USA, China, France, Great Britain and the Netherlands. Thermo offers a comprehensive range of material characterization products that analyze and process materials for rheological and thermal properties. These instruments analyze and measure viscosity, elasticity, processability and temperature-related mechanical changes of plastics, foods, adhesives, coatings, and a wide variety of liquids or solids. Thermo provides innovative solutions for material characterization in the Food and Beverage industry, the Pharmaceutical and Cosmetic sector, and for Polymer and Plastic process manufacturing. For more information, visit [www.thermo.com/mc](http://www.thermo.com/mc).



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