



Rheometer and extruder solutions for the food industry

Food Rheology

Are these food analysis areas important to you?

- Interested in optimizing your food product and processing chain for pumping, mixing, coating, filling or extrusion?
- Need to understand gelification and emulsification behavior under various processing conditions?
- Investigating oral processing behavior to optimize texture, mouthfeel, swallowing behavior and tackiness?
- Optimizing final product properties such as spreadability or shelf life?

Rheology is critical to food production, processing and final product properties. Controlling and adjusting rheological properties like viscosity, yield stress, and viscoelasticity ensures smooth processing and a high quality product.

Thermo Scientific™ rheometer solutions are ideal for the characterization of food products because they are both flexible and easy to operate.

Food Design using Twin-Screw Extrusion

Interested in enhancing these food applications?

- Starch-based products such as cereals and snack foods
- Encapsulation of flavors
- Extrusion cooking
- Pet food and animal feed products

Food extrusion is a well-known technique that enables continuous and cost-efficient manufacturing of food and feed products, ensuring shape flexibility and consistent product quality.

Thermo Scientific™ extruder solutions, ranging from modular small-scale benchtop extruders to pilot-scale production or small-volume manufacturing systems, give you choices for all the applications outlined above.

Extruders

Small – simple – scalable – benchtop extruders for food design

Food extrusion is a continuous, cost-efficient manufacturing method.

Food scientists and engineers often require small-scale studies during product development and process optimization. Certain extruder features are key to such studies: flexible for small throughput volumes, easy to clean and intuitive operation.

The Thermo Scientific™ Process 11 Hygienic Extruder mimics a complete compounding line, including feeding systems and downstream equipment for developing industrial processes on a laboratory scale. It can handle as little as 20 g of material per hour up to a throughput of 2.5 kg per hour.



Our smallest of co-rotating parallel twin-screw extruder, the Process 11 Hygienic instrument offers full production potential. After a new food is successfully developed on the laboratory scale, scale up quickly and easily to pilot-scale or high volume production with minimal parameter changes. We offer a comprehensive range of Thermo Scientific™ co-rotating twin-screw extruders for scale up.

Count on Thermo Scientific™ extrusion solutions for your food design applications. All extruders feature:

- Precise temperature control for gelatinization processes using 8 independently controlled temperature zones
- Protein denaturation with process-specific shear stress profiles from the flexible screw design
- Short residence times for mild product treatment
- Easy access and fast cleaning due to the split barrel design
- A small footprint to save floor space

Rheometers

Compact and easy-to-operate quality control rheometers

Single point viscosity measurements or extended flow characterization of food formulations

The Thermo Scientific™ HAAKE™ Viscotester™ iQ rheometer series is designed for all rheological demands in quality control. It offers convenient operation and a broad range of accessories. This makes it easy to find the best configuration for almost any food formulation, and it guarantees easy setup changes to respond to changing requirements.



HAAKE Viscotester iQ rheometers are ideal for:

- Measuring the flow properties of even low viscous samples such as juices or dairy products
- Testing the flowability, pourability or spreadability of medium to high viscous fluids, creams and pastes
- Static yield stress measurements of highly sensitive structures such as set-style yogurt or cream cheese, and of products that contain larger particles like fruit pulp or cereals

Versatile and ultra-precise rotational rheometers

Complete rheological characterization over the broadest measuring range for R&D or advanced quality control



Thermo Scientific™ HAAKE™ MARS™ instruments are high-end rotational rheometers for extended material characterization, including the analysis of viscous or viscoelastic properties in rotation or oscillation modes. In addition, MARS rheometers offer normal force capabilities that enable squeeze, penetration and tack measurements of liquid or solid food products.

Many accessories are available for analyzing foods:

- Simultaneous rheological and microscopic analysis for investigating the crystallization of fats or starches
- Tribology measuring cell for testing lubrication properties and optimizing mouthfeel
- Interfacial rheology setups for investigating the effect of surfactants on food emulsions
- Pressure cells to simulate cooking processes and avoid sample evaporation

Extensional rheometer for low or medium viscosity fluids

Investigating the extensional flow properties of low to medium viscous food formulations.



The Thermo Scientific™ HAAKE™ CaBER 1 instrument is the only commercially available extensional rheometer for low and medium viscous fluids. Extensional flow fields occur in many food processing steps such as filling, spraying or coating. Extensional properties

of food formulations also affect consumer perception and mouthfeel properties. Knowing and understanding the rheological behavior of food will help to optimize processing steps and achieve the best consumer experience for the final product.

The HAAKE CaBER 1 rheometer offers several accessories for further extensional characterization:

- Stickiness and tackiness of stiffer creams and pastes can be tested with a normal force sensor
- Investigating the extensional behavior of yield stress fluids for full contour analysis of the thinning fluid filament
- Temperature sensitive samples can be tested with a special temperature control chamber



Viscometers

Quick, reliable rotational viscometers for quality control

Viscometers for quality control, from raw material acceptance through in-process evaluation.

Fast, reliable viscosity measurements are needed for speedy acceptance tests of newly delivered raw materials or stop/go decisions during cooking processes. The Thermo Scientific™ HAAKE™ Viscotester™ 1 Plus and 2 Plus Viscometers combine portability and easy handling to deliver reliable measurements for quality and process control.

The flexible Thermo Scientific™ HAAKE™ Viscotester™ E, D, and C Benchtop Viscometers offer multiple speeds and rotational spindles to comply with several ISO and ASTM standards including ISO 2555.



Customer Service

We are committed to delivering top-notch customer support, including tailored service products and fast response times. We offer a comprehensive range of services that can quickly and flexibly respond to various service needs and requests.

Application Laboratories and Support

Our fully equipped application 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 team of application specialists is on hand to answer your questions.

Seminars and Training Courses

You will find comprehensive training programs, in-house seminars, and practical rheology and extrusion courses in various locations around the world.

Food Rheology and Extrusion on the Web

Learn more about food rheology and extrusion on our website. You'll find application information, videos and more to help food engineers and scientists in their daily work.

Find out more at

www.thermofisher.com/foodrheology or www.thermofisher.com/foodextrusion