

## Thermo Scientific HAAKE PolyLab QC

**More IQ for your QC**



Consistent quality is basic to the industry. Consequently, simplified quality control procedures that can be done within an increasingly shorter period of time are highly demanded by innovative and successful companies.

The Thermo Scientific HAAKE PolyLab QC is a new measuring mixer & extruder system that meets today's – and future – quality control (QC) needs. The modular torque rheometer can be connected to an interchangeable mixer, single-screw extruder, or conical twin-screw extruder. Combining proven technology and state-of-the-art hardware and software with an easy-to-use interface – that's the future of QC, today.

## More IQ for your QC Intelligent Measuring Mixer and Extruder System Simplifies Your Quality Control

The HAAKE PolyLab QC is offered as a bench and floor model that best fits into a customer's lab environment. The optional rack (floor model) allows moving the instrument away or even storing it if needed. Benefit from flexibility in footprint and weight!

Based on the system's backwards compatibility, even existing measuring mixers and extruders can be connected. Most of the connections are almost at the same place as they used to be and can be connected either directly or with an optional adapter available from our support team. Protect your investments, save time and be familiar with the system when using it the first time!

Connected devices like mixers or extruders are automatically recognized through the plug & play software concept. Individual limits of the measuring systems, such as torque, speed and temperature, are identified by the software and set as alarm values to minimize errors. Simplify trials and increase precision and standardization of measurements in QC!

Experience the intelligence inside the base unit when standard CAN open bus components such as pressure or temperature sensors are connected. These components are recognized and listed in the software display. Sensors or controllers without CAN Open bus can be hooked up using the



optional Bi-CAN converter. Upgrade analog accessories to today's level in material characterization – now!

Safety regulations on mixers and extruders are becoming more stringent to protect users. The new HAAKE PolyLab QC devices meet the latest safety regulations. Existing accessories may need to be upgraded if the same protection level is desired. Protect your QC staff with the latest safety standards!

## More IQ for your QC – benefit from the difference!

### Concept

- Modular torque rheometer with interchangeable mixer, single-screw extruder, conical twin-screw extruder
- Bench or floor model
- Control via HAAKE PolySoft software

### Backwards Compatibility

- Hardware compatible with old mixers, extruders
- Existing accessories can still be used
- Data compatibility (importing of old data)

### Specifications

- Torque range: 0 - 300Nm
- Speed range: 0 - 200 rpm
- Temperature control zones: 5
- Temperature reading channels: 4

### Interfaces/Communication:

- CAN open control communication with temperature, motor controller
- CAN open data communication for pressure and remote signals
- USB interface to host computer (LAN as option)

HAAKE PolyLab OS  
HAAKE PolyLab QC



The system is controlled by the Thermo Scientific HAAKE PolySoft software in the look and feel of Microsoft® Office, which speeds up learning. A USB PC interface or optional LAN are available for data collection and control by a host PC. Measuring data from older torque rheometers can be imported into the new system. Due to the fact that

existing measuring mixers or extruders can still be used, new and old measuring results can be correlated. Automated software projects and pre-programmed test run templates are started by pressing just one button. Data will be printed out as a report. Save time and increase repeatability of measuring results!

## Intelligence can be inherited

Based on our well-established, high end measuring mixer & extruder system, the Thermo Scientific HAAKE PolyLab OS, we now can transfer powerful material characterization from research & development (R&D) into quality control. As the OS system's little "sibling", the HAAKE PolyLab QC offers comprehensive mixing, compounding and extrusion options focused on quality control needs.

The QC system's mechanical and electronic parts, as well as the drive motor, CAN motor and CAN temperature controller, correspond to the high end system's components – but are arranged in a more compact design to fit into quality control environments. As part of the PolyLab family, the QC system is controlled by the HAAKE PolySoft application software.

Material characterization with torque rheometers is a relative measurement as geometries do not allow absolute viscosity calculations. Thus it is mandatory to employ the same design and geometry of mixers and extruders if R&D data needs to be compared to QC results. Therefore, the HAAKE PolyLab QC backwards compatibility allows existing mixers and extruders from 1978 and onwards to be connected to the system.

Make the best link between research and quality control. Benefit now from the HAAKE PolyLab QC.

### HAAKE PolyLab QC – a new member in the PolyLab family

- Same application software
- Same device handling concept
- Same mechanical geometries of mixers and extruders guarantee same results
- Same accessory can be used as for Thermo Scientific HAAKE Rheocord 90 and S40.

## HAAKE PolyLab QC Measuring Mixers



We offer a comprehensive range of Thermo Scientific measuring mixers compatible with the HAAKE PolyLab QC to support our customers' individual application needs.



# Learn with any mixture

## Intelligent measuring mixers simplify your quality control

A typical mixer test is run at a defined rotor speed (shear rate). The material's response to the shear is recorded as torque and displayed versus time.

As a material's properties are very sensitive to temperature, the mixer chamber is separated into different sections. These are individually temperature-controlled by the HAAKE PolyLab QC. Optimum temperature control quality can be achieved by an automated recognition of the connected mixer.

Although the temperature of the mixing chamber is constantly controlled, the material's melt temperature during a test may rise due to the shear introduced. The melt temperature is also recorded during the test by a separate thermocouple. The recorded "Rheogram" (torque and melt temperature vs. time at constant speed) is characteristic for different material types and blends. It can be used as a fingerprint in quality control for outgoing and incoming product inspections. As changes in torque

are related to structural changes in the material, a Rheogram can be used to investigate and verify reactions of different additive types or concentrations on the sample's melting behavior.

### Typical Investigations

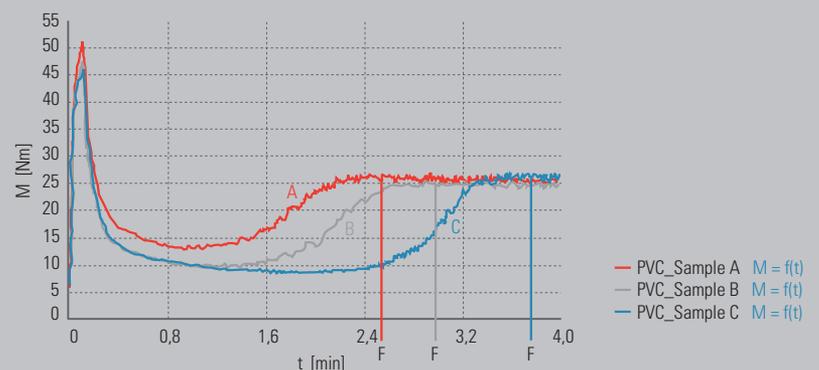
- Testing the melting and degradation behavior of polymer melts
- Quantifying viscosity when adding nano particles or other additives
- Testing gelation and plastification behavior of PVC dry-blends
- Measuring the flow and curing behavior of thermosetting plastics
- Characterizing the influence of different additives such as carbon black, fillers, lubricants, accelerators and sulfur for rubber mixtures
- Recording the masticating and vulcanizing behavior of elastomers
- Measuring oil absorption of carbon black
- Quantifying the absorption of DOP for PVC dry-blends

- Measuring the stable torque in regard to individual and combined influences of fillers and additives such as stabilizers, lubricants and color pigments
- Testing high performance plastics to check processability
- Performing electric conductivity measurements for rubber mixtures.

Due to the backwards compatibility of the mechanical and electrical interfaces of the HAAKE PolyLab QC, existing mixing equipment can be used with a state-of-the-art torque rheometer that is equipped with reliable digital controls and operated using the modern, user-friendly Thermo Scientific HAAKE PolySoft software package.

### Mixer Software

Small laboratory mixers are traditionally used to mix and/or measure the viscosity of a 40-70 g mixture as a function of time and temperature with different shaped rotors. Typical examples are PVC dry blend mixing, PVC degradation test, rubber/carbon black mastication, cross linking of polymers, curing of resins and thermosetting properties.



**HAAKE PolyLab OC**  
Single & Twin-Screw  
Extruders



# Steady quality is the reward

## Powerful extruders continuously control your quality

### Single-screw extruder

The most common methods in processing polymers are screw plastification and injection molding. For testing quality and processability of those materials, the single-screw laboratory extruder 19/25 QC-B is a proven tool. With over 35 years of expertise, we've developed a wide variety of different screw designs that are guaranteed to provide the best performance. Special solutions such as chemical or wear resistance are also available to extrude harsh materials. To shape a polymer for further processes and tests, different dies can be adapted to the extruder. Rod dies and water bath for strand extrusion, sheet and ribbon dies in various dimensions to produce bands or cast films, and blown film dies and take off tower complete the testing equipment. Besides the standardized filter test (EN 13900-5), comprehensive rheological studies can be conducted.

### Applications

- Testing of the plasticizing behaviour
- Testing the performance of additives and fillers
- Measuring of the melt temperature and pressure along the barrel to optimize process parameters
- Provide a homogeneous and constant flow melt
- Production of strands, sheets, cast and blown films
- Extrusion of ceramics and feed stock
- Melt rheology

The gentle but intensive dispersing capabilities are ideal to mix additives and pigments. Dies and downstream ancillaries are compatible with the 19/25 QC-D single-screw extruder

### Applications

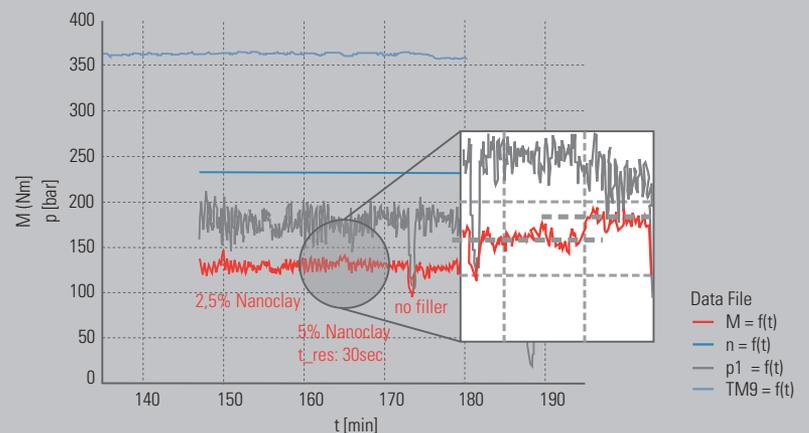
- Extrusion of thermally critical materials such as PVC
- Compounding of fillers and reinforcing materials
- Blending of polymers
- Pilot plant production of master batches
- Continuous mixing of recycling materials
- Mixing of nano clays and carbons
- Discharge for further process states

### Conical twin-screw extruder

For continuous compounding and plasticising, the Thermo Scientific HAAKE CTW 100 QC is the ideal extruder in the HAAKE PolyLab QC system. This is a counter rotating conical twin-screw compounder, with intermeshing screws, that will give well-defined residence time for faultless production of process-critical polymers.

### Compatibility of existing extruders

Single-screw extruders and conical twin-screw extruders that are operated with the driving unit HAAKE Rheocord 90 or 9000, HAAKE Rheodrive 5000 or System 40 are compatible to the HAAKE PolyLab QC. Laboratory extruders from other manufacturers can be adapted, too.



## HAAKE PolyLab QC Measurements



### Measuring Methods Using HAAKE PolyLab QC

- gas flow
- electric conductivity
- capillary viscosity

# Applications driven by intelligence

## Measuring options provided by the HAAKE PolyLab QC

### Mixing, Kneading, Compounding and Plasticizing

In conjunction with measuring mixers, the HAAKE PolyLab QC offers a wide range of different applications. A typical mixer test is run at a defined speed (shear rate) versus time, and the material's response is recorded as torque. This "Mixer-Rheogram" (torque, melt temperature vs. time at constant speed) is characteristic for different materials or blends and is often used as a "fingerprint" in quality control for incoming or outgoing product inspection.

### Typical Investigations

- Testing the melting and degradation behaviour of polymer melts
- Quantifying viscosity when adding nano-particles and other additives

- Testing the gelation and plasticizing behaviour, as well as the thermal stability of PVC dry-blends
- Measuring the flow and curing behaviour of thermosetting compounds
- Recording the masticating and vulcanizing behaviour of elastomers
- Performing electric conductivity measurements during the mixing process

### Melting, Conveying, Compressing, Compounding

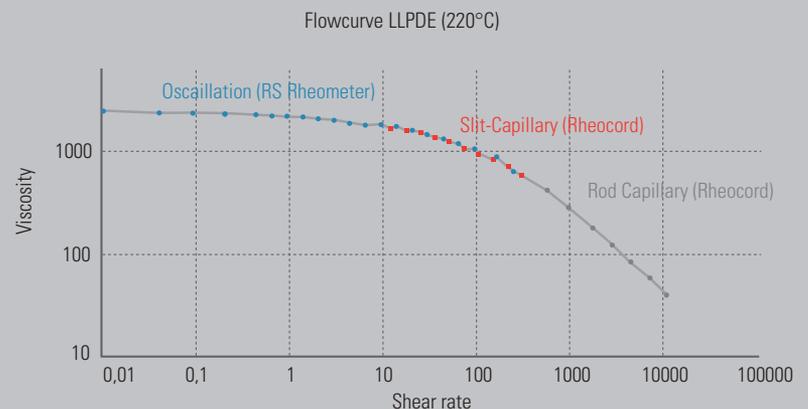
Extruders are melting, conveying and compounding polymers under temperature, pressure and shear. The extruded polymer is pressed through a die to form a solid material such as a profile, sheet, film, strand or fibre. The extrusion process is characterized by monitoring processing power (torque), temperature, pressure and throughput. Special rheological dies (slit, rod) allow the determination of shear viscosity at defined shear rates.

### Typical Measurements

- Simulation of production processes like blown film, wire coating, profile extrusion
- Testing individual and combined influences of additives (stabilizer, lubricant) and functional additives (antioxidation, UV-stabilizers, pigments and fillers)
- Investigating the extrudability of newly developed materials
- Manufacturing films, sheets, strands and profiles for optical, mechanical and weathering tests
- Measuring rheological behaviour (dynamic viscosity)
- Compounding and blending of polymers, fillers and additives
- Dispersion and exfoliation of nano-fillers in a polymer matrix
- Small scale production

### Flowcurve LLPDE

Online capillary rheology with HAAKE PolyLab QC is performed using a well defined die geometry (slit or capillary) on an extruder. The shear stress is derived from the pressure drop in the die (CAN pressure transducer signals) and the shear rate from the weight of the extrudate in a defined period of time.



## Customer Support

We have many years of experience in developing and manufacturing comprehensive material characterization solutions. Our customers can benefit from our broad knowledge and expertise in the fields of polymers, ceramics and food processing.

Our services for you start before any purchasing action is taken:

- Analyzing application or processing problems
- Sample testing
- Consulting to gain a better insight in processes & testing methods
- Education by seminars and literature to learn more about material characterization

During the purchasing process we can assist you with:

- Customized finance models
- Thermo Fisher Scientific lease options
- Rental agreements followed by a purchase

Benefit from our broad service portfolio after having purchased:

- Installation services wherever you are with your team or trained personnel
- User training - get the best out of your new devices
- Validation with IQ/OQ to meet GMP regulations
- Periodical calibration with national traceable standards
- Remote diagnose and remote service
- On-site bench repair or maintenance
- Software updates provided on [thermo.com/mc](http://thermo.com/mc)

These services are offered globally to preserve your investment.

Feel welcomed in our global community.

## About Thermo Fisher Scientific

Thermo Fisher Scientific Inc. (NYSE: TMO) is the world leader in serving science, enabling our customers to make the world healthier, cleaner and safer. With an annual revenue rate of more than \$9 billion, we employ 30,000 people and serve over 350,000 customers within pharmaceutical and biotech companies, hospitals and clinical diagnostic labs, universities, research institutions and government agencies, as well as environmental and industrial process control settings. Serving customers through two premier brands, Thermo Scientific and Fisher Scientific, we help solve analytical challenges from routine testing to complex research and discovery. Thermo Scientific offers customers a complete range of high-end analytical instruments as well as laboratory equipment, software, services, consumables and reagents to enable integrated laboratory workflow solutions. Fisher Scientific provides a complete portfolio of laboratory equipment, chemicals, supplies and services used in healthcare, scientific research, safety and education. Together, we offer the most convenient purchasing options to customers and continuously advance our technologies to accelerate the pace of scientific discovery, enhance value for customers and fuel growth for shareholders and employees alike. Visit [www.thermofisher.com](http://www.thermofisher.com).

## Thermo Scientific solutions for Material Characterization

Thermo Fisher Scientific successfully supports a wide range of industries with its comprehensive Thermo Scientific solutions for Material Characterization. Material Characterization products analyze and measure viscosity, elasticity, processability and temperature-related mechanical changes of plastics, food, cosmetics, pharmaceuticals and coatings, plus a wide variety of liquids or solids. Detailed information is provided at [www.thermo.com/mc](http://www.thermo.com/mc).

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### Process Instruments

#### Benelux

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

#### China

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

#### France

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

#### India

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

#### United Kingdom

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

#### USA

Tel. 603 436 9444  
[info.mc.us@thermofisher.com](mailto:info.mc.us@thermofisher.com)

#### International/Germany

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

[www.thermo.com/mc](http://www.thermo.com/mc)

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