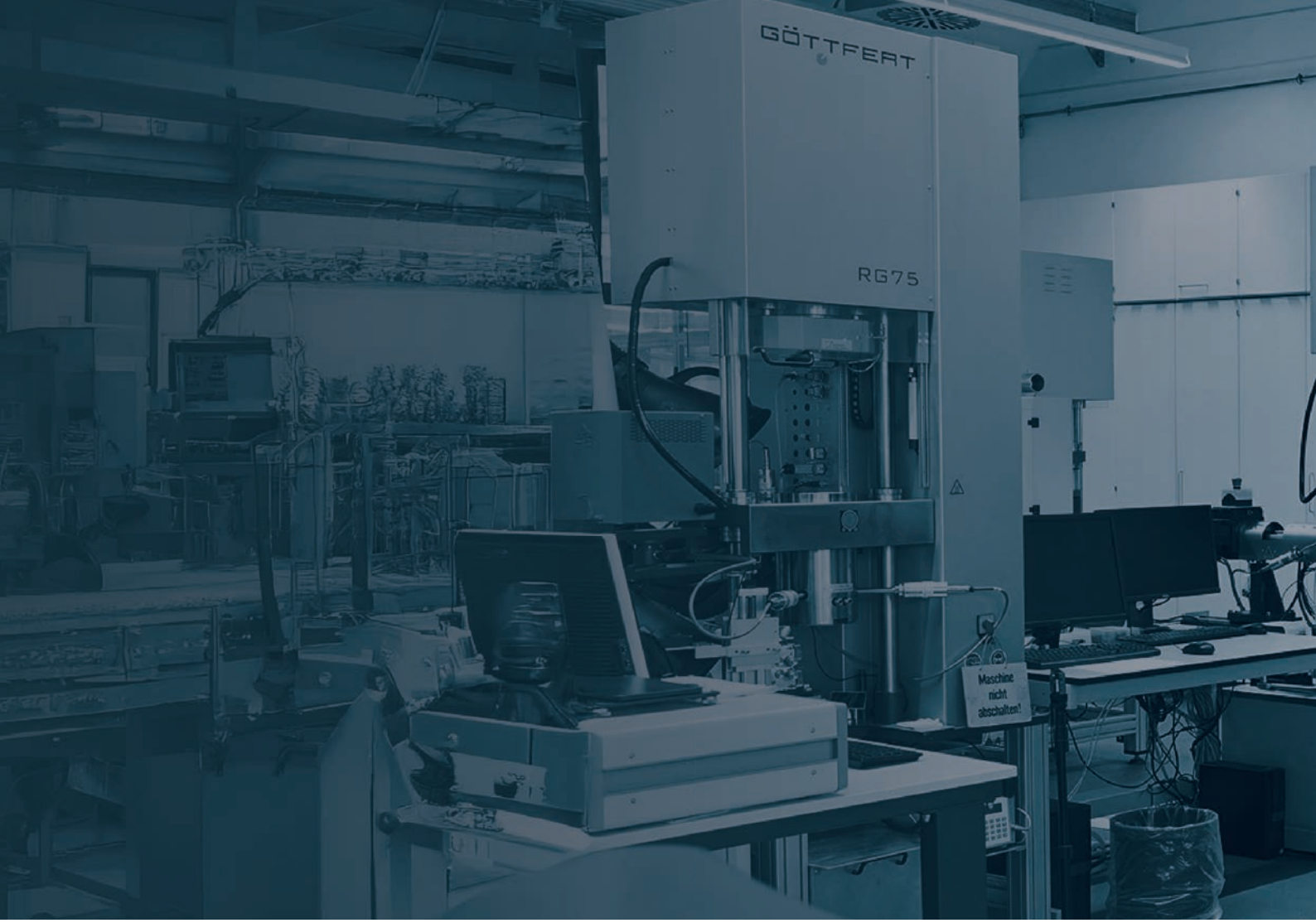
Capillary Rheometer

The basic instrument for numerous Add-ons for advanced material characterization

- PVT (Isothermal/Isobaric)
- Thermal Conductivity
- Counter Pressure Chamber
- Elongation
- Die Swell Measurement
- Shark Skin
- Normal Stress Die
- CONTIFEED

GÖTTFERT
THIS IS RHEOLOGY


GÖTTFERT
RG75
Maschine
nicht
abschalten!

Contents

High Pressure Capillary Rheometer

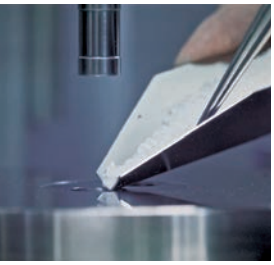
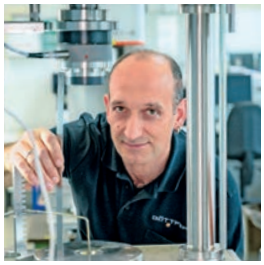
One or multi-barrels for detection of flow and viscosity

Precision through experience

Our Capillary Rheometers are based on more than 40 years of experience in the development and manufacturing of high-quality testing instruments. They combine state-of-the-art technology with ease of use and offer a wide range of shear rates as well as diverse test forces for various materials.

The instruments feature intuitive touchscreen control, automatic sensor recognition, and precise signal processing. With the script-capable LabRheo software, test procedures can be customized, measurements automated, and results efficiently evaluated.

Capillary Rheometers from GÖTTFERT thus meet the high demands of research, development, quality assurance, and incoming goods inspection – reliable, versatile, and future-proof.



TECHNOLOGY

We place great importance on developing creative and competitive products through significant investments in research and development.

QUALITY

Through in-house manufacturing, maintenance of key technologies, and spare parts service, our testing instruments are supported 100% even many years after delivery. “Made by GÖTTFERT” means taking responsibility.

SERVICE

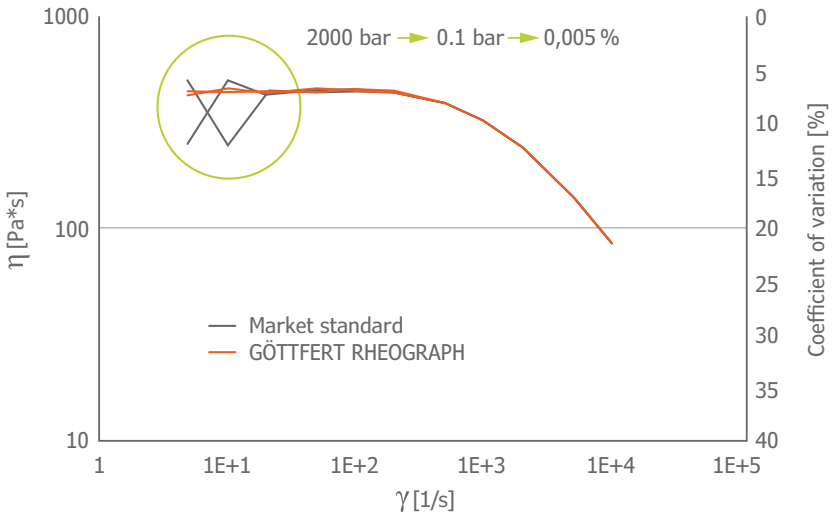
Fast worldwide service provided by our specially trained staff, in cooperation with representatives and our own subsidiaries.

Learn more **goettfert.com/capillary-rheometer**

Advanced through higher accuracy

GÖTTFERT Capillary Rheometers offer a **tenfold increase in pressure measurement accuracy** compared to the market standard.

This results in an extension of the measurement range by one decade. A 2,000 bar pressure transducer thus provides a **resolution of 0.1 bar, or 30,000 PSI > 1.5 PSI.**



ADDITIONAL INFORMATION

GÖTTFERT RheoInfos

With our white papers, we provide you with a comprehensive pool of knowledge – freely accessible and practice-oriented.

GÖTTFERT ROUNDTABLE

Fundamentals, applications, and current developments clearly explained in our YouTube series.

RHEOGRAPH 20/25/50/75/120

User friendly high pressure Capillary Rheometer
with higher shear rate range and high measuring force

HIGHLIGHTS

- 20–120 kN test force
- Single- or multi-barrel system in 9.55, 12, 15, 20, 25, or 30 mm versions – custom dimensions also available
- Speed range 0.00004–40 mm/s (1:1,000,000)
- High dynamic acceleration of the test piston (0 to 40 mm/s in 0.6 s)
- Position measurement with high-resolution encoder
- Temperature range up to 400 °C (optional 500 °C)
- Automatic signal resolution of 0.005% of the pressure transducer’s nominal value
- Extensive range of add-ons for advanced material characterization

Learn more **goettfert.com/rg-series**

RHEOGRAPH series

The established series of GÖTTFERT high-pressure Capillary Rheometers is available **with different test forces of 20, 25, 50, 75, or 120 kN, as well as various barrel diameters.** With the RG120, higher shear rates can be achieved thanks to the increased test force.

A key improvement of GÖTTFERT Capillary Rheometers was achieved through more accurate pressure measurement. This increased both reproducibility and precision of the test results by a factor of 10, thereby extending the measurement range in the lower shear rate region.

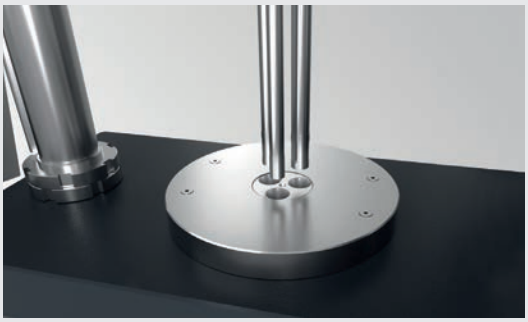
With these improvements in both the low and high shear rate ranges, GÖTTFERT has set itself significantly apart from the market standard.

FLEXIBILITY

The wide range of add-ons creates a unique platform in the field of capillary rheometry for **advanced material characterization.**

In addition to determining viscosity, modular add-ons provide significant added value in characterizing material-specific behavior.

The established single- or multi-barrel design, complemented by numerous application-specific capillaries and optional special versions, completes this capillary rheometry platform.



ADD-ON

- Normal Stress Die
- PVT (Pressure, Volume, Temperature)
- Thermal Conductivity
- Counter Pressure Chamber
- Elongation (HAUL-OFF, RHEOTENS)
- Die Swell Measurement
- Shark Skin
- Contifeed

RHEOGRAPH auto

Semi-automated Capillary Rheometer for viscosity measurements at low and high shear rates

HIGHLIGHTS

- Maximum test force 25 or 50 kN
- Single-barrel system with 12 mm or 15 mm
- Dynamic speed range 0.00004–40 mm/s (1:1,000,000)
- Position measurement with high-resolution encoder
- Automatic signal resolution of 0.005% of the pressure transducer’s nominal value
- Temperature range up to 400 °C (optional 500 °C)
- Test chamber versions with higher corrosion resistance or wear resistance

Learn more **goettfert.com/rheograph-auto**

RHEOGRAPH auto

The semi-automated Capillary Rheometer enables the user to perform automated viscosity measurements. The essential automation modules focus on barrel cleaning, die closure, and die pre-cleaning.

In addition, external cleaning modules such as piston cleaning are available for the rheological testing instrument. The Capillary Rheometer can be optionally equipped with a test force of **25 kN or 50 kN** and configured as a single-barrel system with diameters of 12 mm or 15 mm.

Various cleaning functions are available for simple and efficient operation.

The **integrated** modules provide **barrel cleaning, die closure**, and **die pre-cleaning**.

In addition, the **external** piston cleaning tool ensures quick and thorough **cleaning of the test pistons.**

ADD-ON

- Die Swell Measurement

RHEOGRAPH ⊕ Add-On

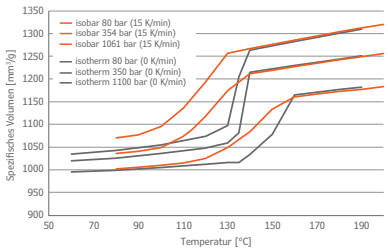
Modular platform for the extended characterization of polymers

Expand your Capillary Rheometer

With the RHEOGRAPH, we offer a flexible platform for the characterization of polymers. The Capillary Rheometer serves as the base unit to which various additional add-ons can be modularly attached.

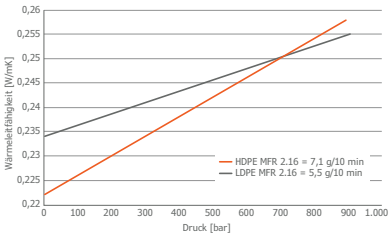
In this way, the RHEOGRAPH can be optimally adapted to the individual requirements of each specific application. In its full configuration, the processing behavior can be comprehensively characterized.

PVT (ISOBARIC & ISOTHERMAL)



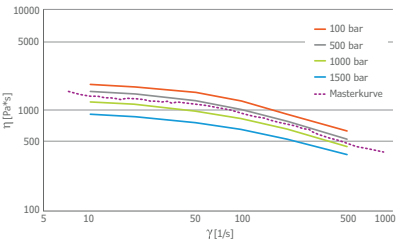
- Measuring process according to ISO 17744
- Determination of data about pressure, volume and temperature
- Measuring setting isobar and isotherm
- Variable testing body volume
- Easy handling through quick release fastener
- Illustration of PVT Diagram
- Optimization of Flow- and Shrink process
- Available with automatic process steering

THERMAL CONDUCTIVITY



- Determination of heat conductivity
- Measurement Range: Temperature up to 450°C, Pressure up to 1000bar
- Developed according to ASTM D5930
- Test sensor with integrated heat device and ability to track temperature
- Optimization of cycle time during injection molding
- No mechanical retooling necessary
- Simulation of process
- Available with automatic process steering

COUNTER PRESSURE CHAMBER*



- Determination of pressure coefficient
- Determination of critical wall shear stress wall slides
- Max pressure (Pm) 1200bar
- Temperature range up to 400 °C
- Optimization of flow process in processing machines (Injection molding, Extrusion tools with long flow paths, Melt pumps)

* Further information on page 14

Learn more **goettfert.com/rheograph-add-on**

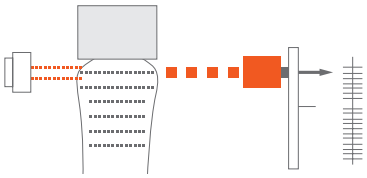
RHEOTENS

- Infinitely variable speed
- Free selection between linear and exponential acceleration
- Setting, steering of measuring process and test analysis with Windows Program RHEOTENS 97
- Different pull-off wheels – to be specified depending on usage
- Tandem pull-off wheels
- Already existing RHEOTENS machines can be upgraded with new electronic box as well as “RHEOTENS 97”

HAUL-OFF

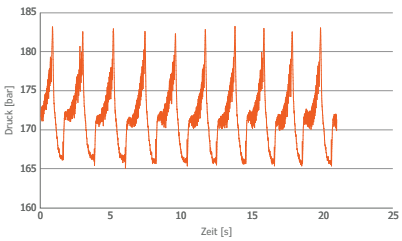
- Indefinitely variable speed of 0 - 600m/min, optional from 0 - 2000m/min
- Optional selection between linear or exponential acceleration
- Anti-adhesion surface of pull-off wheel
- Measurement range up to 1N, Resolution 0.05mN
- Software for setting, steering of measurement and analysis

DIE SWELL MEASUREMENT



- Determination of dynamic and static die swell
- Analysis of threshold profile (BASELL Method)
- Swivel with infinitely variable hight setting
- Laser measuring head in 0.1µm or 7µm edition
- Optional with automatic melt cutting device
- Application: Simulation of Material-Threshold behavior during injection molding

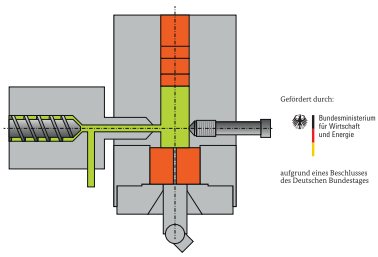
FLOW INSTABILITIES



(Shark Skin, Slip Stick,...)

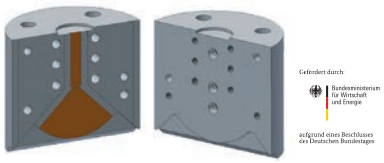
- Measuring cell for tracking of Shark Skin effect
- Consisting of slit die, three high frequency sensors (rate up to 20 kHz), as well as software package
- Determination of frequency spectrum, as well as statistical analysis of pressure signal
- Optimization of extrusion-, film and coating process

CONTIFEED



- Bubble free filling of the test channel
- Automatic loading of bulky samples possible
- Time saving up to 50% during testing process through more effective heating
- Shorter heating period for shorter material dwell time through influence of temperature
- Recognition of process relevant rheological data for injection molding
- By pre-plastification powder materials like PVC dry batches can be measured as well

NORMAL STRESS DIE



- Determination of Normal Stress at high shear rates and closer to the processing shear rates which was not possible with conventional technique
- Detection of flow instabilities at processing shear rates
- Measurement of Viscosity, elongation viscosity and Normal Stress differences

PVT500

Precise testing instrument for isobaric and isothermal PVT measurements – for detailed analysis of material-specific properties

According Standards:
ISO 17744 (PVT)
ASTM D5930 (TC)
ISO 22007

HIGHLIGHTS

- PVT measurement either isothermal or isobaric
- Thermal conductivity measurement
- Test barrel diameter 9.5 mm, maximum pressure 2500 bar
- Position measurement with high-resolution encoder (0.000053 mm)
- Integrated temperature control jacket
- Air cooling system with a cooling rate up to 30 K/min
- No liquid cooling required (optional available)
- Optimized test barrel, low heat input required
- Determination of D3 coefficient

Learn more **goettfert.com/pvt500**

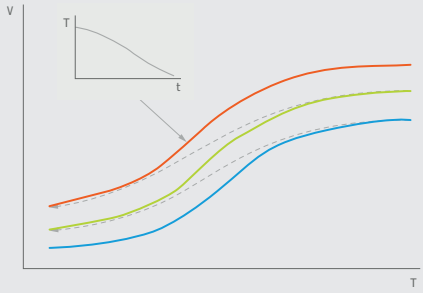
PVT500

PVT (**P**ressure **V**olume **T**emperature) measurements capture the material-specific cooling behavior and the D3 coefficient, which form a crucial basis for common simulation software.

Isothermal PVT measurement determines the material behavior at constant temperature with variable pressure, while isobaric measurement is carried out at constant pressure with varying temperature.

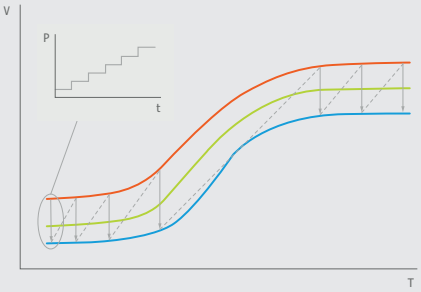
With the Capillary Rheometer Add-On PVT or the stand-alone device PVT500, GÖTTFERT offers **both methods with the highest precision**. The collected data are particularly relevant for the simulation of **injection molding processes** and also provide an accurate description of the cooling process in applications such as **extrusion.**

The PVT500 is delivered with the proven Capillary Rheometer software LabRheo. Using the integrated script generator, test parameters can be easily defined, measurements automated, and the entire process monitored in real time. Thanks to **efficient air cooling,** the instrument requires no external thermostat, saving valuable laboratory space.



PVT ISOBARIC

Isobaric PVT measurement according to ISO 17744 is carried out with instruments equipped with a test piston. In this method, the material-specific volume is determined under constant pressure and varying temperature. This allows the cooling behavior to be simulated realistically – a decisive factor for injection molding simulation.



PVT ISOTHERMAL

In isothermal PVT measurement, the material is first filled in at melt temperature and then slowly cooled to room temperature. The measurement starts at room temperature, with the pressure being gradually increased. Afterwards, the next temperature level is applied. This pressure-step cycle is repeated for all previously defined temperature levels.

ADD-ON

- Thermal Conductivity
- Additional temperature control with external thermostat
- Hybrid Tempering Option

Thermoset Capillary Rheometer

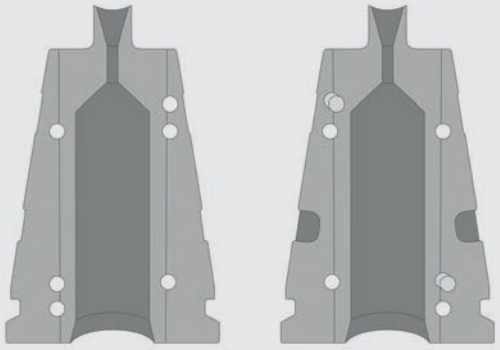
Capillary Rheometer for Thermosets

HIGHLIGHTS

- Rheological characterization of Thermosets
- Use of a spiral mold with up to 5 pressure transducers and 4 temperature gradient sensors
- Characterization of injection temperature, material flow behavior in the mold, and crosslinking behavior

Learn more **goettfert.com/tcr**

QUALITÄTSPRÜFUNG VON DUROPLASTEN



Divided capillary with test barrel

The TCR is a Capillary Rheometer designed for quality testing of thermosets. It is particularly suitable for testing and comparing material batches with respect to processing properties.

The instrument was developed on the basis of a Capillary Rheometer with 75 kN piston force and the established Capillary Rheometers for plastics and elastomers.

Thermoset Capillary Rheometer

The TCR also consists of a piston/die plate with a test barrel and a mold (flow spiral). To allow easy removal of the cured test material, the test barrel is integrated into a conical seat in the die plate, which is divisible and easily removable. The insulation of the die plate from the upper mold half enables different temperatures to be set between the mold and the die.

The instrument can measure both at constant pressure and at constant speed. It includes a temperature-controlled feed barrel, where the material is preconditioned under defined pressure and volume at a preselected temperature, and then pressed at up to 1600 bar into a flow spiral equipped with up to five pressure transducers and four temperature gradient sensors.

The TCR enables effective determination of rheological properties in the range of the injection temperature and along the flow path in the mold at crosslinking temperature.

Supported by:

Federal Ministry for Economic Affairs and Energy

on the basis of a decision by the German Bundestag

Counter Pressure Viscosimeter

Different and multiple test modes in one instrument

HIGHLIGHTS

- Constant high piston force over the entire speed range
- Speed range: 0.00004 mm/s to 40 mm/s (0.0024 mm/min – 2400 mm/min), corresponding to a ratio of 1:1,000,000
- High dynamic piston acceleration: 0–40 mm/s in 0.6 s
- Position measurement with high-resolution encoder (0.0000016 mm)
- Automatic pressure transducer recognition: Plug & Test

Learn more **goettfert.com/counter-pressure-viscosimeter**

Counter Pressure Viscosimeter

This modified Capillary Rheometer consists of **two interconnected Capillary Rheometers** and can be operated in different application-oriented test modes. Both Capillary Rheometers can also be used independently.

The Counter Pressure Viscosimeter is a rheological instrument for **determining the viscosity** of plastics and other flowable materials as a **function of counter pressure**. It consists of two Capillary Rheometers connected via a channel that act simultaneously on a melt sample. With this modified system, it is possible to determine the flow curve as a function of a precisely defined counter pressure.

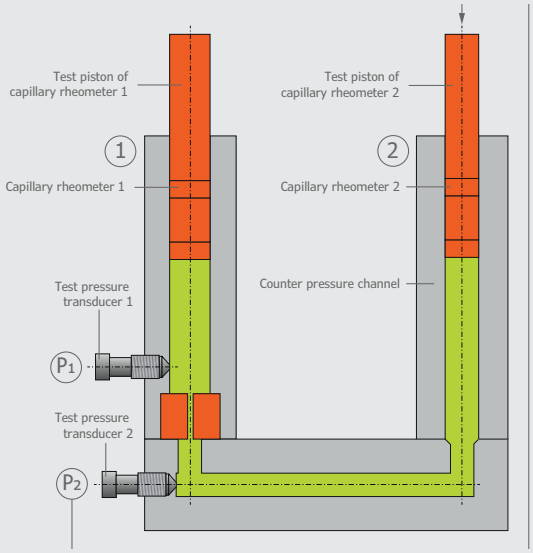
Barrel 1 **Viscosity measurements**

Barrel 2 **Regulation of counter pressure**

ACCURACY

The signal of the pressure transducers on the RG20, RG25, RG50, RG75, and RG120 can be displayed with a resolution of 0.005% of the nominal range, i.e. 0.1 bar with a 2000 bar transducer.

All GÖTTFERT pressure transducers are recalibrated using a software-controlled system to ensure the highest accuracy.



FUNCTION

The Counter Pressure Viscosimeter enables fully automatic measurement of viscosity functions under different counter pressures. Capillary Rheometer 2 controls the counter pressure. After determining a flow curve, the material is pressed from Capillary Rheometer 2 into Capillary Rheometer 1. Subsequently, another flow curve can be measured at a different counter pressure. The illustration shows a schematic example of two interconnected Capillary Rheometers.

RHEOGRAPH 25E

Clean room production of pharmaceutical implants

HIGHLIGHTS

- Complete stainless steel design for operation in clean rooms, Class A
- Piston speed from 0.00004 to 40 mm/s across the entire force measuring range of 25 kN
- Test barrel diameter: 20 mm
- Temperature control from +30 °C to +250 °C
- Measuring modes: “constant speed” or “constant force”
- Determination of piston speed, apparent and true shear stress
- Parameterization, control, and measurement with LabRheo software; analysis with WinRheo II
- SCRIPT control for freely definable measuring and production sequences

Learn more **goettfert.com/rg25e**

RHEOGRAPH 25E

The RHEOGRAPH 25E is an innovative high-pressure Capillary Rheometer designed to determine the flow behavior and viscosity of thermoplastic plastics and rubbers, as well as for the **production of pharmaceutical implants**.

In contrast to conventional screw extrusion, the RHEOGRAPH 25E applies a RAM extrusion process. The premixed compound (active ingredient and pharmaceutical excipient) is filled into a cylindrical test barrel. The piston compresses the mixture, which is then uniformly heated and melted. At a constant piston speed, the molten material is continuously extruded.

This method ensures a **homogeneous and bubble-free strand.**

ADD-ON

- Die Swell Measurement
- Melt Cutting Unit

Maintenance and calibration

of our testing instruments ensuring long service life and minimal downtime

360° SERVICE

To ensure sustainably reproducible and reliable test results, periodic maintenance of dependable testing instruments is essential. The **globally operating and highly trained team** of our service engineers ensures consistently reliable and accurate rheological test results.

Our professionally trained service team and our certified quality management system (according to the international standard DIN EN ISO 9001) **guarantee fast and reliable worldwide service.**

Mehr erfahren unter
goettfert.com/maintenance

OUR MAINTENANCE PACKAGES

We offer a range of service packages to provide the solution that best meets your needs.

SERVICE BASIC+

- ✓ Maintenance of the testing instrument using traceable measuring equipment
- ✓ Upon successful completion, a maintenance checklist (test protocol) is provided
- ✓ The test protocol does not represent an accredited test report or calibration certificate

SERVICE ISO/IEC 17025

- ✓ Maintenance and calibration of the testing instrument using traceable measuring equipment
- ✓ Specification of the smallest measurement uncertainty determined directly on the testing instrument on site
- ✓ After successful calibration, a calibration certificate/result report is issued in accordance with the ISO/IEC 17025 requirements of the DAkkS

Enhanced safety

for Melt Flow Indexers and Capillary Rheometer

WELL ADVISED

Only **regular maintenance** ensures long-term reliability. We offer you a service contract tailored to your needs.

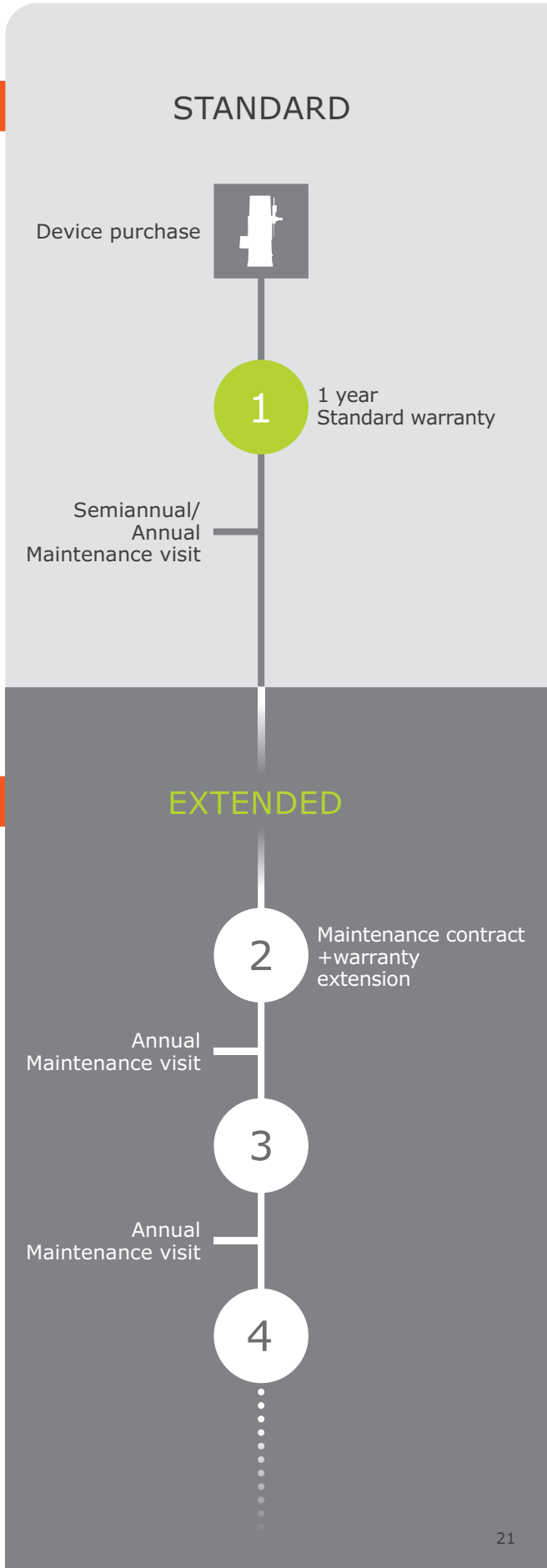
All GÖTTFERT testing instruments are delivered with a 1-year warranty. Enhanced safety extends the warranty for our manually operated Melt Flow Indexers and Capillary Rheometer **by another 12 months**, provided that a maintenance contract (duration 36 months from purchase and up to 12 months thereafter) is concluded. With semi-annual or annual maintenance visits, the reliability of the machine is ensured.

We are happy to prepare a customized offer for you, including further benefits such as SERVICE BASIC+ or SERVICE ISO 17025, **discounted spare parts**, or **prioritized processing of inquiries**. This makes budget and operating costs predictable.

YOUR BENEFITS

- Extension of warranty to 24 months
- Free updates
- 3% discount on spare parts
- 50% discount on in-house training
- Prioritized support on our service platform serviceCONNECT
- Periodic maintenance of your testing instrument
- Maintenance scheduling through service planning

Learn more
goettfert.com/service-contract



Software

Network-capable software system for parameterization, measurement and evaluation

LabRheo - flexible and user-friendly

The LabRheo software impresses with easy operation a **wide range of applications** and centralized storage of **all measurement data**.

Key features at a glance:

- Free display of raw data and evaluation graphics
- Continuous display of device status
- Automatic import of instrument information
- Self-explanatory dialogs, info fields and integrated online help
- Open platform for user-specific fields and data filters
- Selectable access rights for maximum data security
- Script-controlled test sequences for automated processes

Evaluation with WinRheo II

Our systems provide a wide range of calculations for round-hole and slit capillaries. Common corrections such as **Rabinowitsch-Weissenberg, Bagley** (linear/non-linear), **Mooney, Hagenbach** and **Gleissle** are included.

Flow curve approximation according to:

- Ostwald-De Waele (Power law)
- Carreau-Winter
- Yasuda
- Sabia
- Münstedt
- Cross

Additional functions::

- Extensional viscosity according to Cogswell
- PVT diagrams with Tait fitting
- Normal stress determination
- Temperature shift with generation of master curves from flow curves at different temperatures, determination of model coefficients, approximation according to Carreau-Winter and Cross as well as calculation of shift factors according to WLF and Arrhenius

Further evaluations include Non-Newtonian index (NNI factor), Thermal stability, Relaxation, Wall slip, Ramp tests.

Specifications

Overview of main parameters

Model	RG20	RG25	RG50	RG75	RG120
Prüfkraft	20 kN	25 kN	50 kN	75 kN	120 kN
Test barrel geometry*: 1-Barrel					
9.55 mm / 12 mm / 15 mm / 20 mm	•	•	•	•	•
9.55 mm / 12 mm / 15 mm / 20 mm / 25 mm	-	•	•	•	•
9.55 mm / 12 mm / 15 mm / 20 mm / 25 mm / 30 mm	-	-	-	•	•
Test barrel geometry*: 2-Barrel					
2x 12 mm / 2x 15 mm / 1x 12 mm + 1x 15 mm	•	•	•	•	•
2x 12 mm / 2x 15 mm / 1x 12 mm + 1x 15 mm / 2x 20 mm	•	-	-	-	•
Test barrel geometry*: 3-Barrel					
2x 12 mm + 1x 15 mm / 3x 12 mm	-	•	•	•	•
2x 12 mm + 1x 15 mm / 3x 12 mm / 3x 15 mm / 3x 20 mm	-	-	-	-	•
Temperature range: +5 °C higher than room temperature up to 400 °C (option 500 °C)	•	•	•	•	•
Temperature control algorithm, Display +/- 0.01 °C	•	•	•	•	•
Temperature control: 3x Pt100 sensor	•	•	•	•	•
5 Temperature calibration and control data set	•	•	•	•	•
Integrated timer for temperature set value	•	•	•	•	•
Servo drive, resolution 0.0000016 mm	0.000053 mm	•	•	•	•
Test piston speed range 0.00004 - 40 mm/s (0.0024 - 2400 mm/min)	0.0001 - 30 mm/s	•	•	•	•
Drive torque monitoring and display	•	•	•	•	•
Continuous variable control of test piston movement	•	•	•	•	•
Pressure transducers Accuracy of range	20 - 2000 bar 0.2%	20 - 2500 bar 0.2%			
Force transducers Accuracy class Accuracy (in range from 1 % - 100 %)	20 kN 0.02 0.4 %	25 kN 0.02 0.4 %	50 kN 0.02 0.4 %	75 kN 0.02 0.4 %	120 kN 0.02 0.4 %
Maximum number of pressure/force transducers	5/2	5/2	5/2	5/3	5/3
Automatic identification of installed pressure transducers	•	•	•	•	•
Adaptive signal processing of pressure signal	+/- 0.005 %				
Device integrated PC with 14.48 cm (5.7“) Color-QVGA-Touchscreen	•	•	•	•	•
Microsoft Windows® data base Software “LabRheo” (script capable)	•	•	•	•	•
Measuring mode constant speed or pressure/force	•	•	•	•	•
3 times overload detection	•	•	•	•	•
Power supply 3x 400 V, 3x 230 V, 50/60 Hz	1x 230 V. 50/60 Hz	•	•	•	•
Size (device) width x depth x height	850 x 635 x 1.550 mm	1.255 x 600 x 1.739 mm	1.255 x 600 x 1.739 mm	1.255 x 600 x 1.739 mm	1.255 x 600 x 1.739 mm
Size (table) width x depth x height	600 x 600 x 550 mm	790 x 600 x 620 mm	790 x 600 x 620 mm	790 x 700 x 620 mm	790 x 700 x 620 mm
Weight	Approx. 270 kg	Approx. 450 kg	Approx. 480 kg	Approx. 630 kg	Approx. 650 kg
Add-On	Bestimmung von Fließinstabilitäten (Shark Skin). Wärmeleitfähigkeit. PVT. Schwellwert. Druckabhängigkeit der Viskosität (Gegendruckkammer)				
Options*	Melt Cutting Unit, Slit Die, RHEOTENS, HAUL-OFF, Thermocouple for determining the melt temperature, External tempering of the test chamber, Corrosion- and wear-resistant test barrel system, Nitrogen purge unit, Pneumatic or battery driven cleaning device				

* Weitere Geometrien des Prüfkanales, Applikationen und Änderungen auf Anfrage

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