AT-LINE Rheometer

Continuous measurement for monitoring of polymerization processes

- **Mini-Bypass-Rheograph (MBR)**
- **Side-Line-Rheometer (SSR)**
- **Real-Time-Rheometer (RTR/RTS)**
- **Rotational Online-Rheometer (ROR)**

GÖTTFERT

THIS IS RHEOLOGY

AT-LINE Station

Individually configurable and flexibly adaptable to your process

AT-LINE Rheometer

AT-LINE Rheometer enable the continuous measurement of powder, grit, or granulate for monitoring polymerization processes. For fully automated process control, the system provides rheological parameters for polymer evaluation in real-time operation.

The complete line initially consists of a combination of Online-Rheometer such as MBR, SSR, or RTR/RTS-TD and a preceding EXTRUSIOMETER, which serves as the melt feeder. With an optionally self-operating material feed (Online-Sampler), reliable continuous operation is ensured.

The open platform also offers numerous expansion options for targeted analysis of each customer-specific application.

The **RTR/RTS-TD** measuring head enables precise determination of rheological properties such as MFR, MVR, or viscosity directly in the process. Thanks to its modular design, it can be flexibly adapted to different requirements.

- Interchangeable capillaries (various L/D ratios)
- Volumetric flow control via high-performance gear pumps
- Stepless speed control by servo motor
- Accurate melt temperature measurement by thermocouples
- Operation and visualization via ROSWin
- Customer-specific adaptations possible

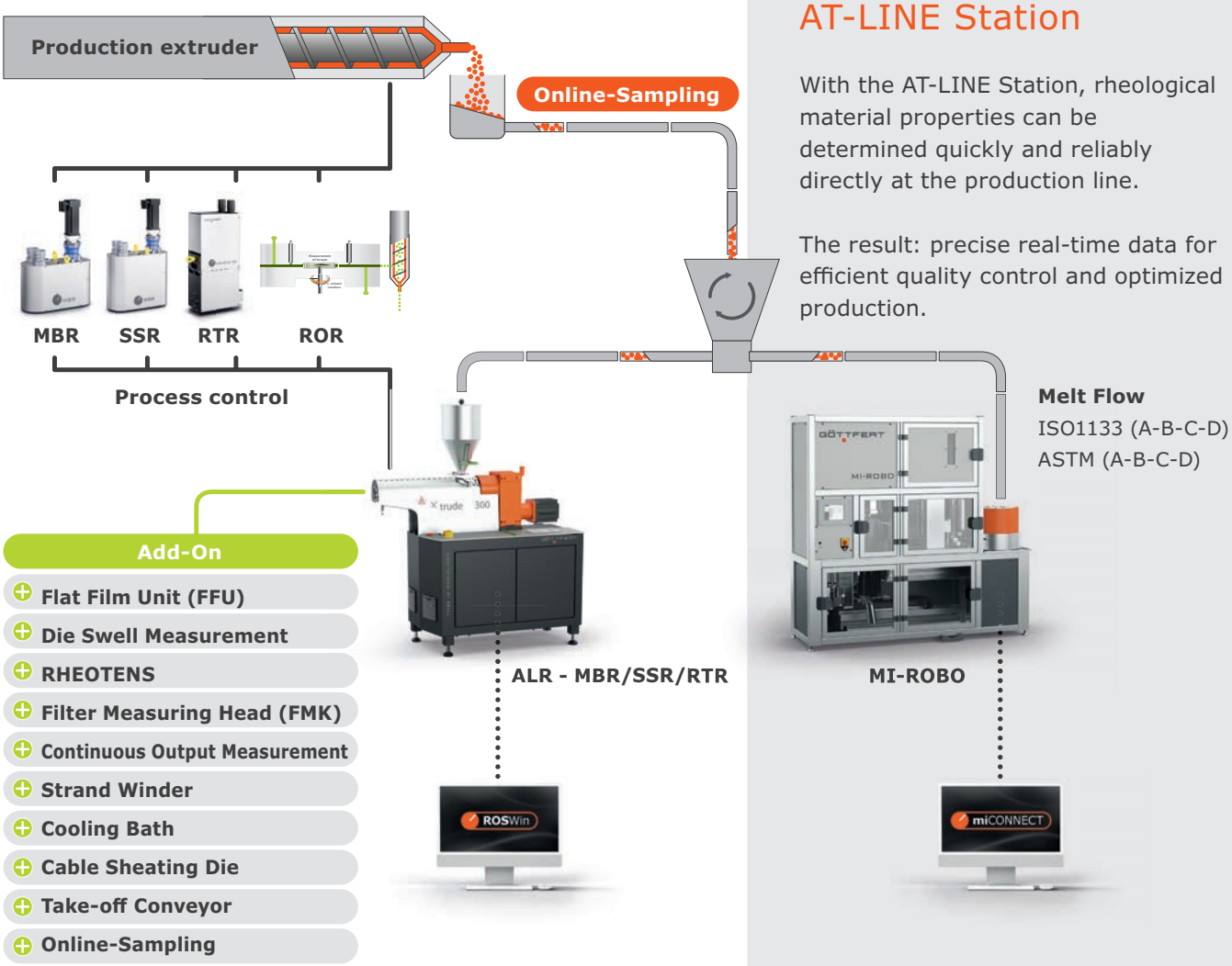
The RTR/RTS-TD is the ideal solution for the rheological characterization of polymer melts.

The EXTRUSIOMETER **X-trude 1400** combines precise drive technology with flexible equipment for reliable material preparation. With steplessly adjustable speeds up to 120 rpm and torques up to 1400 Nm, it is designed for a wide range of applications.

- Single barrel with variable screw geometry
- Fast product changeovers through screw purging in the feed zone
- High-precision melt pressure sensors with temperature stability
- Accurate melt temperature measurement by thermocouples
- Innovative bus technology for control
- Clear visualization with ROSWin
- Application-specific adaptations possible at any time

The X-trude 1400 offers maximum flexibility, short changeover times, and precise process control – ideal for a wide variety of applications.

Learn more **goettfert.com/at-line**



AT-LINE Station

With the AT-LINE Station, rheological material properties can be determined quickly and reliably directly at the production line.

The result: precise real-time data for efficient quality control and optimized production.

Melt Flow
ISO1133 (A-B-C-D)
ASTM (A-B-C-D)

MATERIAL FEEDING ONLINE-SAMPLER

Granulate, powder, grit, and more reliably from A to B

To ensure fully automated operation of the AT-LINE Station, the system can be configured either with material feeding from a silo or with direct extraction from the product pipe.

In both applications, a sample is taken by the sending station and conveyed to the receiving station by an inert gas (e.g., nitrogen) as the carrier medium.

- For long transport distances, signal amplifiers may be used to ensure continuous material conveying.
- Precise adjustment of the overall system to local conditions during commissioning guarantees smooth continuous operation.
- A wide range of hardware and software settings always allows optimal configuration, even in the case of product changes or later modified operating conditions.

Rheometer measuring heads and Online-Sampler systems are also available in explosion-proof design!

Laboratory extruder

Not only melt feeders, but also standalone measuring instruments – that is why EXTRUSIOMETER.

HIGHLIGHTS

- Completely newly developed torque ranges
- Various barrel and screw designs
- Up to 16 heating and 3 cooling zones
- 0–350 °C temperature curve with 0.1 °C resolution and calibration accuracy below 0.4%
- Pressure transducer measuring ranges: 0–100, –200, –500, –1000 bar with a deviation of ±0.5% of the set value
- Control via external PC, industrial workstation, or optionally with integrated touch panel
- Visualization through “ROSWin” software
- User-specific adaptations possible

Learn more **goettfert.com/laboratory-extruder**

EXTRUSIOMETER SERIES

Almost five decades of experience in rheological extrusion technology are incorporated into our EXTRUSIOMETER series.

The series impresses with maximum flexibility: different barrel diameters and lengths, custom-designed barrel systems, freely selectable pressure transducer positions, and precise melt temperature measurement are just some of the features. An integrated water cooling system reliably prevents plastification of the material in the feed zone. In addition, torque measurement enables a wide range of further testing tasks.

During operation, shear rate, shear stress, and viscosity are continuously displayed. In the X-trude series, models with torque extensions of 300, 600, and 1400 Nm are available. Combined with downstream systems, they form an open platform for rheological Online analysis.

VERSATILITY

The X-trude series consists of compact laboratory extrusion systems for the testing and processing of polymers.

The range of applications extends from simple melt feeders for Online-Rheometers (e.g., for determining melt index, MVR, or viscosity) to downstream units such as the film analysis system (ALS), and up to the fully automated rheological measuring extruder (ALR) with continuous material feeding via Online-Sampler.

- Variable use of available components
- Optimization and coordination of drive data, barrel system, and options according to customer requirements

X-trude 300
Efficient extrusion testing

X-trude 600
Extended capabilities

X-trude 1400
Maximum performance

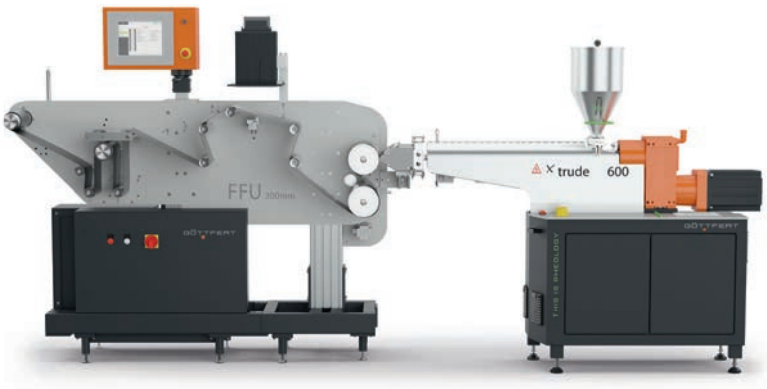
Flat Film Unit (FFU)

Unit for take-off, cooling, and winding of flat films made of PE, PP, and other plastics

HIGHLIGHTS

- Flat die 170/320/420 mm
- Film width up to 400 mm
- Take-off speed 0–50 m/min
- Take-off roll diameter max. 600 mm
- Stepless height adjustment
- Controllable shaft for coreless winding

Learn more **goettfert.com/ffu**



FFU 150/300/400

The FFU is a compact unit for take-off, cooling, and winding of flat films made of PE, PP, and other plastics. It is used for testing and monitoring flat films, e.g., as a small-scale production unit or for the development of new polymer blends.

FIELDS OF APPLICATION

Production control
The EXTRUSIOMETER series is ideally suited for quality control in ongoing production. They enable reliable verification of dispersing performance in batch processing with extruders and kneaders, as well as incoming inspection of color and speck distribution.

Development
The X-trude series also provides valuable support in material and product development. It is used to determine the maximum drawability of a polymer and to test the suitability of polymers or polymer blends in laboratory applications.

Production
In addition, the system allows the economical production of small flat films, for example for the packaging and food industries, where the use of a large-scale production line would not be cost-effective.

OPTIONS

- Flat film unit on roll platform or rail system
- Air knife for film cooling
- Heating/cooling thermostat for take-off rolls
- Edge trimming device
- Optical film analysis (contaminations and inhomogeneities)
- Thickness measurement
- Gloss measurement
- Transparency (haze)

Extruder ⊕ Add-On

Modular platform for advanced characterization of polymers

Expand your Extruder

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

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

FLAT FILM UNIT

- Flat die 70 / 120 / 150 / 220 / 320 / 420 mm
- Film width up to 400 mm (greater widths on request)
- Take-off speed 0–50 m/min
- Take-off roll diameter max. 600 mm
- Infinitely adjustable height setting
- Controllable shaft for coreless winding

FILTER MEASURING HEAD

- Reduced downtime through preheating of the subsequent filters
- Measurement in accordance with DIN EN 13900-5
- Fast filter change without stopping the extruder and melt pump
- Analysis of purity and homogeneity
- Quantitative determination of the concentration of contaminants and viscosity inhomogeneities affecting quality
- Multi-layer, replaceable filter discs
- Operation at constant rotational speed (shear rate)
- Compact design

CONTINUOUS OUTPUT MEASUREMENT

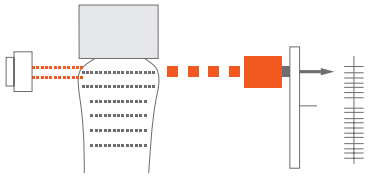
- The melt strand is guided to the outside through a deflection head or an MBR rheometer measuring head
- Below the capillary, the strand enters a collecting container positioned on a balance
- The balance continuously determines the weight and transmits it at precise time intervals to the evaluation software
- Extension of the operating program for connection of a laboratory balance
- Supplied with collecting container and connection cable from the balance to the EXTRUSIOMETER

Learn more **goettfert.com/alr**

RHEOTENS

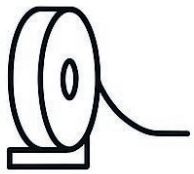
- Infinitely variable speed
- Free selection between linear and exponential acceleration
- Setting, steering of measuring process and test analysis with Windows Program RHEOTENS 97
- Different pull-off wheels – to be specified depending on usage
- Tandem pull-off wheels
- Already existing RHEOTENS machines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

DIE SWELL MEASUREMENT



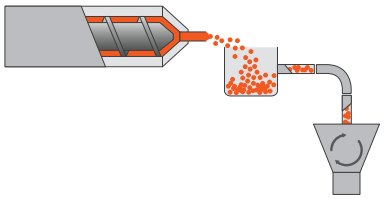
- Determination of dynamic and static die swell
- Analysis of threshold profile (BASELL Method)
- Swivel with infinitely variable hight setting
- Laser measuring head in 0.1µm or 7µm edition
- Optional with automatic melt cutting device
- Application: Simulation of Material-Threshold behavior during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

STRAND WINDER



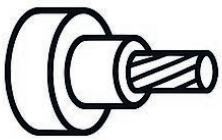
- Winding of the cooled melt strand
- Force- and speed-controlled drive
- Guidance via cooling bath and deflection roller
- Rubber/stainless steel rollers for reliable transfer
- Automatic full signal with shutdown

ONLINE-SAMPLING



- System suitable for conveying granulate, grit, and powder
- Adjustment of conveying rate depending on the application
- Long distances achievable by using signal amplifiers
- Conveying medium (carrier substance): air, nitrogen, …
- No electrostatic charging of the material
- Fast material change by sampler emptying down to the extruder screw
- Reliable prevention of material bridging
- Reference material feeding
- Automatic cleaning functions (self-cleaning, …)
- Automatic waste handling
- Sampler available in Ex or non-Ex version

DEFLECTION HEAD



- 90° melt diverting head with spacer and die nut
- Connection at the barrel end, e.g., for continuous melt elongation measu-rement
- Can be equipped with various dies
- Bores for a pressure transducer and a melt temperature sensor

COOLING BATH

- Water bath for cooling an extruded strand

Software

Multifunctional software system for complete control of all Online-Rheometers, Extrusiometers, and downstream units

ROSWin – intuitive and powerful

The Windows software is the **central operation and visualization platform** for continuously measuring Online-Rheometers and Extrusiometers. Downstream units can also be integrated without difficulty.

Advantages at a glance:

- Stable on all Windows operating systems
- Continuously tested in-house
- Smooth operation in a wide range of customer applications
- Easy operation and flexible visualization
- Open interfaces (analog, Modbus RTU/ASCII, Profibus DP, OPC server)

From measurement to evaluation

In addition, ROSWin includes a **comprehensive evaluation package**. For rheological post-processing of measurement data, the proven WinRheo II software can also be used.

- **Configuration** of the Rheometer for different measurement sequences via parameter sets
- **Storage** of all parameters and measurement data in databases
- **Rheological evaluation** of measurement values (extended evaluation with WinRheo II)
- **Display** of measured variables in tabular form as well as in diagrams and trends
- **Report printout** of measurement values, alarms, and parameter files – freely definable
- **Access rights** and freely definable window arrangements for individual visualization
- **Automatic calibration** of the Rheometer to predefined MFR/MVR target values
- **Limit values** adjustable for all measured variables
- **Digital output** of operating states
- Network connection

Specifications

Overview of main parameters

Model	X-trude 300	X-trude 600	X-trude 1400
Power output	5.18 kW	9.42 kW	16.59 kW
Maximum torque*	300 Nm	600 Nm	1400 Nm
Screw speed*	0 to 120 min^{-1}		
Screw geometry	20 mm. 1“. 30 mm. u.a.	20 mm. 1“. 30 mm. 2x 35 mm. u.a.	45 mm. u.a.
Screw back pressure	350 bar (optional 600 bar)	350 bar optional 600 bar)	750 bar
Exchangeable bushing for powder/fine granules	•	•	•
Rubber cylinder	•	•	•
Cylinder tempering	60 ... 350 °C (+/- 0.5 °C)		
Variable number of pressure transducers*	•	•	•
Variable number of heating/cooling zones	•	•	•
Variable number of melt temperature sensors	•	•	•
Torque measurement	•	•	•
Measuring mode: constant speed/pressure	•	•	•
Microsoft Windows® Software “ROSWin“	•	•	•
Optional add-on and Downstream units			
Fully automated material feeding for pellets, fine granules or powders (Online-Sampler)			
Metering unit with agitation and tamping mechanism			
Round hole die, slit die, wide slit die			
Analog/digital signals, OPC, Profibus, Modbus interfaces for coupling to higher level IT systems			
Adapters for cable coatings, pipes and deflection head			
Filter measuring head			
Filter, pelletizer, roll-up, cooling bath			
Continuous extrusion measurement			
Online-Rheometer (RTR/RTS-TD, MBR, SSR) with FTNIR measurement			
Melt extension (Online-RHEOTENS, HAUL-OFF), die swell measurement, counter pressure chamber			
Flat film unit (150, 220, 300, 400 mm)			
Camera system (for detecting inhomogeneities and contamination)			
Film analysis: Gloss measurement, film thickness, haze and color			
Remote maintenance			

Further applications and modifications on request, subject to technical changes.

* Maximum deviation from end value 0.2 %

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