

ONLINE ANALYSIS

AT-LINE STATION

Extrusion Testing Platform

real-time compliant material characterization



Multifunctional

- Melt index / Viscosity
- Optical film inspection
- Haze, Gloss
- Film thickness
- Continuous measurement of the extrusion process
- Die swell measurement, melt tension

since 1962

The At-Line Rheometer makes it possible to have continuous control of the polymerization process of pellets, fine granules or powder.

Key rheological process information is generated continuously for possible close loop process automation based on the rheological characterization of material.

This concept line consists of a combination of Online Rheometer, such as the MBR, SSR or RTR/RTS-TD and our EXTRUSIOMETER, that generates the melt.

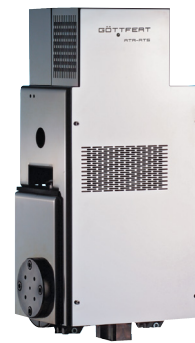
An optional raw-material feeding system (Online Sampler) ensures consistent material flow to the measurement apparatus to support the continuous process control.

Our flexible platform offers many choices for optimization and specialization depending on customer's needs

Measuring Head for the rheological characterization

- Determination of rheological values, such as MFR, MVR or viscosity
- Exchangeable capillaries with different dimensions
- Adjustable flow-through-put with high power gear pumps
- Variable servo-motor speeds for pump control
- Melt temperature measurement via thermocouple
- Visualization Software "ROSWin"
- User defined modifications possible
- Additional details on Rheometers please see the separate brochure „Online Rheometer“

Measuring Head, e.g. here
RTR/RTS-TD
for rheological characterization of materials



EXTRUSIOMETER

- Variable drive systems from 0 to 120 rpm
- Available torque up to 1400 Nm
- Single or dual screw cylinder systems
- Screw geometries in different dimensions
- Very quick product changes by screw purging (feeding zone)
- Melt pressure transducers with high accuracy and temperature stabilized
- Melt temperature measured with thermocouples
- Bus technology used to run the complete system
- Visualization with Software "ROSWin"
- User defined modifications possible

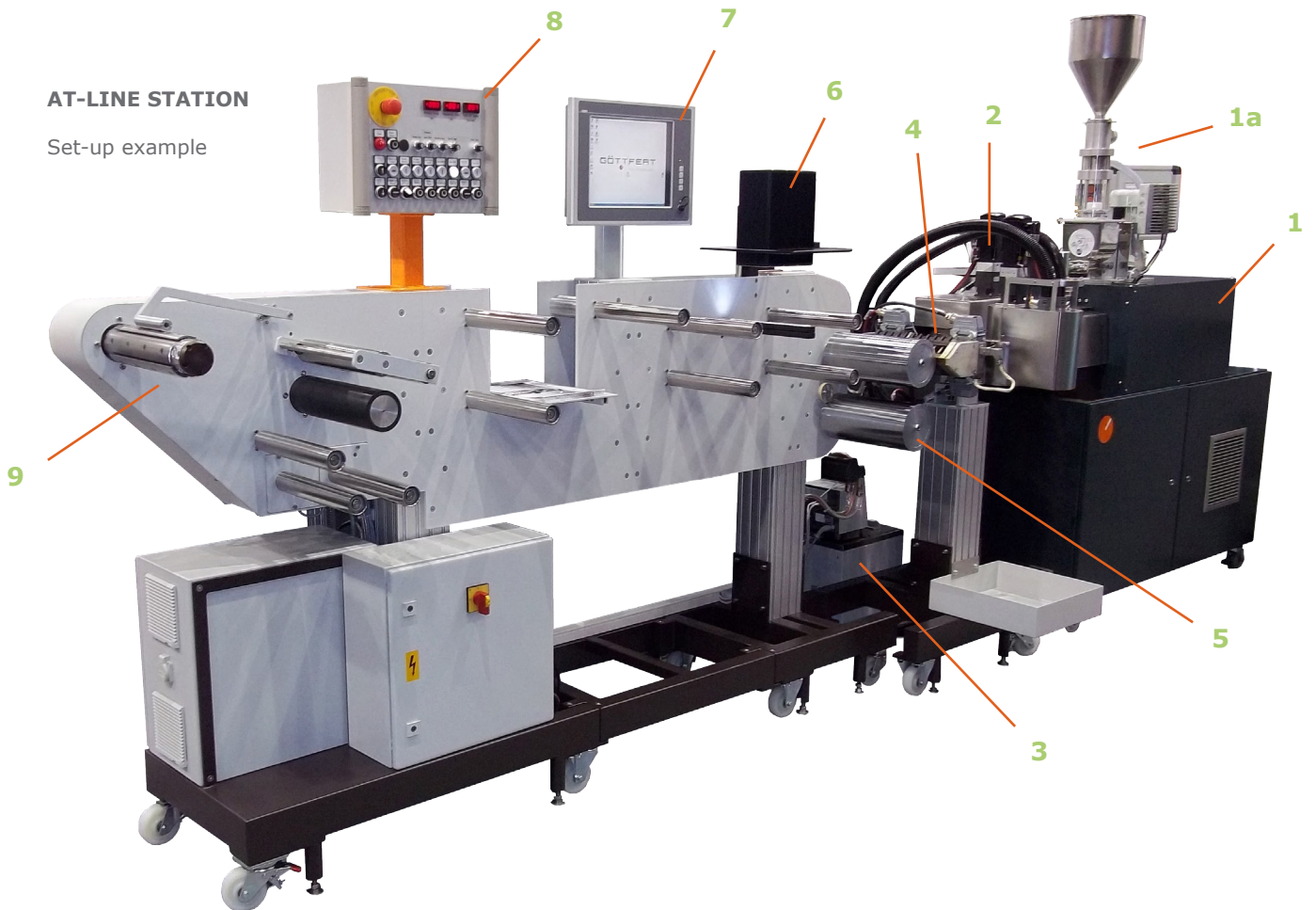
Melt Feeder, e.g. here
EXTRUSIOMETER X-trude 1400



Film Testing Station for all applications

AT-LINE STATION

Set-up example



Structure

1. EXTRUSIOMETER with Online-Sampler and Dosing Unit (1a)
2. Measuring Head (RTR/RTS-TD, MBR, SSR) for determination of MFR, MVR, viscosity, ...
3. External thermostat (temperature control) to regulate rolls from
4. Coat hanger dies for films up to 400 mm
5. 2-fold deflection rolls for smoothing or calender (3 rolls), roll width up to 420 mm
6. Camera system to detect inhomogeneity and contamination
7. Colour touch screen with operating Software „ROSWin“ for standalone usage
8. Control and display draw off speed, draw off force as well as further functions
9. Film winding unit with controlled roll-up force to keep the film under constant load and high speed

Optional:

Film thickness, film gloss, decoupling unit, film edge cutter and air knife



Colour touch screen for control and display of basic functions (8.)

Lab-Extruder

GOETTERT Lab-Extruders are stand-alone measurement instruments - that is why we call them EXTRUSIOMETER!

More than a half century of experience and continuous development with rheological analysis are incorporated in our line of extruders and rheological testing equipment. Different standard sizes are available, as well as user specified cylinder systems.

The EXTRUSIOMETER may be equipped with multiple pressure transducers and temperature sensors, just one of the many important characteristics of the device. The liquid cooling system avoids the plastification of the test material in the feeding zone. The torque measurement greatly enhance the range of measurements possible. Shear rate, shear stress and viscosity are continuously displayed.

The new **X-trude Series** comes with the torque extensions ([Nm])...

... **X-trude 300, 600 and 1400**

as well as the twin screw system

... **MP35D** with 850 Nm

All components can be combined with each other. Discuss your applications with our experts. Our quotes include detailed information on recommended options to address your wants and needs.

EXTRUSIOMETER X-trude
here as an example with RTR measuring head, Industry Workstation and waste handling system (AT-LINE-RHEOMETER - ALR)



EXTRUSIOMETER MP35D
Twin screw system, base instrument with coupling, material feeding and tamping (e.g. for poorly-flowing dry blend)



„Reflections“ on Rheology - transparent or maybe not...

The continuous measurement of film thickness, gloss and detection of spots

Film Thickness

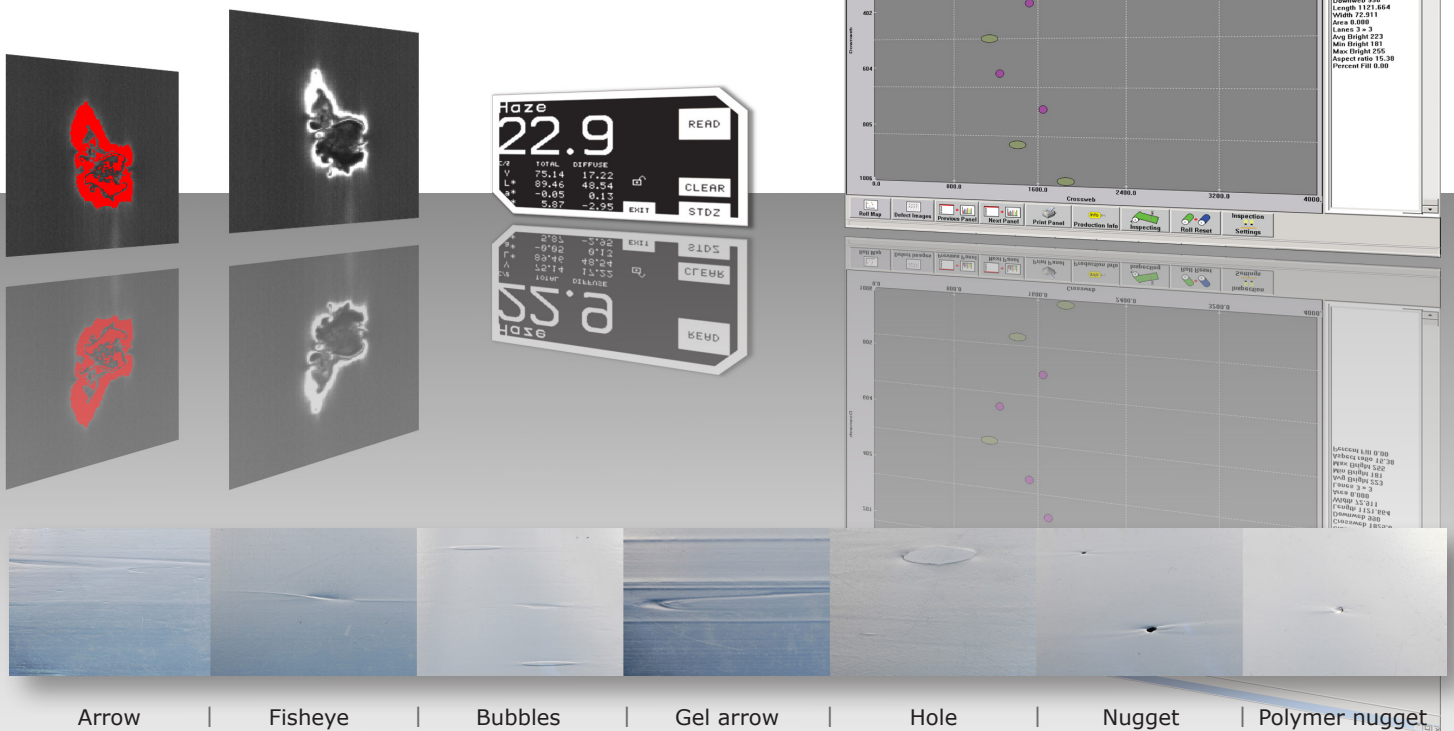
The laser distance measurement head operates with high precision, covering all the adjustable range. Its set-up can be optimized to cover a wide range of materials and surfaces. A simple Good/Bad analysis is available, also advanced functions, such as statistical analysis with averaging, min/max values and excentricity.

Film Gloss

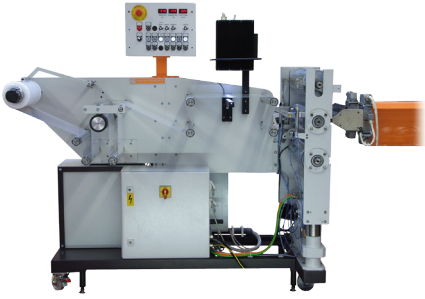
Via the multi-angle gloss measurement, we cover the range from dull to high gloss. Using intelligent calibration and continuous self-diagnostics, long-term stability and precision of measurement data is assured. Continuous gloss statistics, the display of geometrical shapes, averages, min/max values or deviation are part of the package.

Spot detection

The gapless detection of irregularities in the film analysis is essential to ensure the homogeneous quality in the production. The laboratory system runs parallel to the process either with the same material or in pilot-plant procedure.



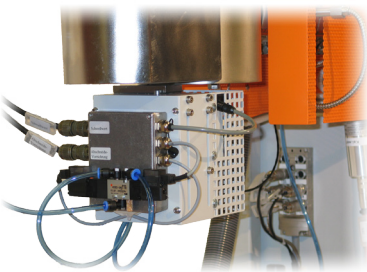
AT-LINE STATION



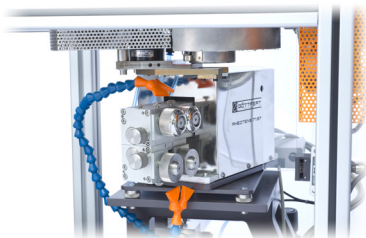
Flat Film Unit
optional with film analysis



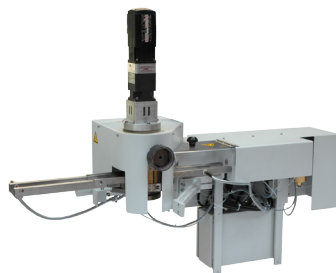
Blown Film Unit
optional with film analysis



Die Swell Measurement
optional with melt cutting unit



Melt Tensile Measurement
(RHEOTENS Online)



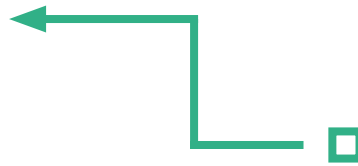
Filter Measuring Head

Rheometer Measuring Head



RTR / RTS-TD

Follow up Units



EXTRUSIOMETER
X-trude Series or
Twin screw system

As well as...

- Continuous output measurement
- Pelletizer
- Strand Winder
- Cooling Bath
- Cable Sheathing Die



Open Platform for rheological Online Analysis

One System > Various Solutions!



MBR

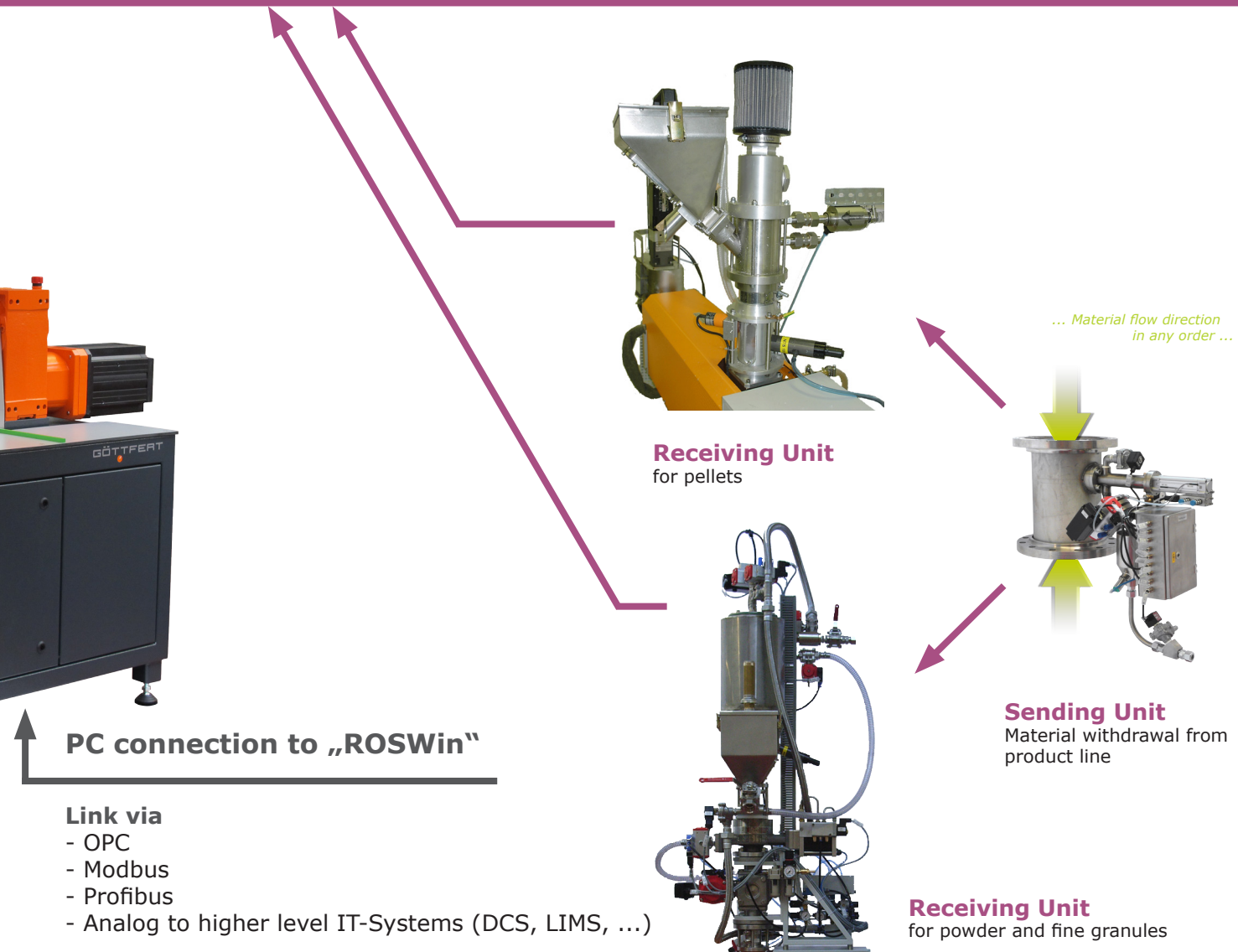


SSR



Rheometer Measuring Heads and Online Sampler Systems are also available in explosion proof design.

Online Sampler



AT-LINE Station - Downstream system options

The **Blown Film Station** is a compact unit to blow, cool, draw-out and to wind up the extruded tubes. Primarily used in production quality control to measure how well the dispersion works in batches run on extruders and kneaders; in incoming quality control for color and spot distribution; in the development to find and control the max. draw-out of the polymer and to test the suitability of polymers and compounds used. Alternatively to produce small film tubes in different thicknesses, for applications mainly found in the packaging or food industry, where the use of large-scale extruders makes little sense.

Key functions and data

The blown film head / die is mounted to the EXTRUSIOMETER with a cross head die. Using a long die land, the melt while being transported, is sufficiently homogenized. An air-cooling ring with one or two precisely controlled outlets offers perfectly distributed cooling power. This feature ensures that thickness tolerances can be held small. The instrument frame is not only extremely stable, but on wheels and movable, or totally locked down and has a centrally mounted telescopic tower. Cooling ring, film layering, and height are all adjustable and guarantee pull-off speeds up to 50 m/min.

Additional technical features:

- Flat film width up to 550 mm
- Die diameter 30/50/60 mm
- Controlled pull-off force 50 N
- Wind-up diameter up to 600 mm

Optional:

- Dual lip cooling
- Core-less, force controlled wind-up unit
- Film rip control
- Film border cutting
- More options on request

Blown Film Unit BFU 400
with EXTRUSIOMETER X-trude 1400



Pellets, fine granules, powder, ... - steady from A to B!

To ensure fully automated measurements of the AT-LINE STATION, the system can be designed by feeding out of a silo or hooked directly to the production. In both application cases a sample is taken by the Sending Unit and transferred by a carrier inert gas (e.g. nitrogen) to the Receiving Unit.

Amplifier stations are available to make sure no material is stuck, if distances become too large. During the startup an optimization at site it is made sure that it runs perfectly year in, year out. Many soft- and hardware adjustments are possible to give users ample possibilities to adjust the system to new materials, or changes process conditions.



Example:
ALR-M with double Receiving Unit
and reference sample tank

One Software for all applications!

ROSWin - multi functional Software for the control of all online measuring systems

Rheo Online Software for Windows, in short ROSWin, is the user interface and visualization Software for all continuously working Online Rheometers and for the EXTRUSIOMETER. Attachable options are easily integrated.

ROSWin runs on MS Windows® operating systems and is a stable platform for all our Online Rheometers and their options. Continuous development and testing in our R&D department, together with its numerous installations by customers world-wide, demonstrate how robust the system is. Simple to use, yet sophisticated in its application. With its flexible display of data and open communications, ROSWin is the standard in Online rheology. Signal transfer is available via analog and digital data transmission, Modbus RTU/ASCII, Profibus DP as well as OPC-Server.

Our Rheo Online Software already comes with a pre-packaged evaluation software. "WinRheo II" can be used in addition, to work with the rheological data after the fact.

Additional highlights of ROSWin:

- Configuration of the Rheometer for different applications via parameter sets
- Database holds all parameters and measurement results
- Rheological analysis of test data (detailed analysis with WinRheo II)
- Results displayed in graphics or in tables, with diagrams and trending
- User defined print-out of results, alarms and parameter sets
- User controlled access and freely defined windows for individualized display of data
- Automated calibration of the Rheometer to set MFR/MVR values
- Adjustable limit values for all measurements
- Digital output of the instrument status
- Network capable



SPECIFICATIONS



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	0 to 120 min ⁻¹	0 to 120 min ⁻¹
Cylinder geometries	20 mm, 1", 30 mm, and other	20 mm, 1", 30 mm, 2x 35 mm, and other	45 mm, and other
Screw back pressure	350 bar (optional 600 bar)	350 bar (optional 600 bar)	750 bar
Exchangeable bushing for powder and granules	Yes	Yes	Yes
Rubber cylinder	Yes	Yes	Yes
Cylinder tempering	60 ... 350°C (+/- 0,5°C)		
Variable numbers of pressure transducers *	Yes	Yes	Yes
Variable numbers of heating/cooling zones	Yes	Yes	Yes
Variable numbers of melt temperature sensors	Yes	Yes	Yes
Torque measurement	Yes	Yes	Yes
Measure mode: constant speed / constant pressure	Yes	Yes	Yes
Microsoft Windows® Software "ROSWin"	Yes	Yes	Yes

Optional Add-On Systems and Follow Up Units

- Fully automated material feeding (for powders, pellets or fine granules (Online-Sampler)
- Metering, agitation and tamping mechanism
- Round hole die, Slit die, Coat hanger die
- Analog / digital Signals, OPC-, Profibus-, Modbus-interfaces for coupling to higher level IT Systems
- Adaptors for blown film, Cable coatings, Pipes and Crosshead die
- Filter measuring head
- Filter, Pelletizer, Roll-up, Cooling bath
- Continuous extrusion measurement
- Online Rheometer (RTR/RTS-TD, MBS, SSR) with FTNIR measurement
- Melt extension (Online-RHEOTENS, HAUL-OFF), Die swell measurement, Counter pressure chamber
- Flat film unit (150, 220, 300, 400 mm)
- Blown film system (up to 550 mm), Calender stack
- Camera analyzer (for inhomogeneous materials and contaminates)
- Online film quality test System: Gloss measurement, Film thickness, Haze and color
- Remote control / Service

Further options as well as applications and adaptations on request, improvements due to technical developments reserved

* Maximum deviation from range 0,2%

WE TAKE CARE OF OUR INSTRUMENTS; YOU TAKE CARE OF ITS MEASUREMENTS.
OUR REPUTATION IN EACH OTHER'S HANDS.

THIS IS RHEOLOGY

since 1962

13. Aug. 2014

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