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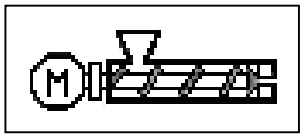
GÖTTFERT®
WERKSTOFF-PRÜFMASCHINEN GMBH



LABORATORY EXTRUDER

The Laboratory Extruder is a fully instrumented lab extruder with integrated data acquisition. It is the result of more than 30 years experience in the field of lab scale extrusion.

The Goettfert Laboratory Extruder has a compact modular construction, including the driving unit, **speed range: 0-130rpm, max. torque: 270Nm** and the control electronics. The intelligent modular construction allows the use of **cylinder systems with 20mm, 1" or 30mm** diameter.

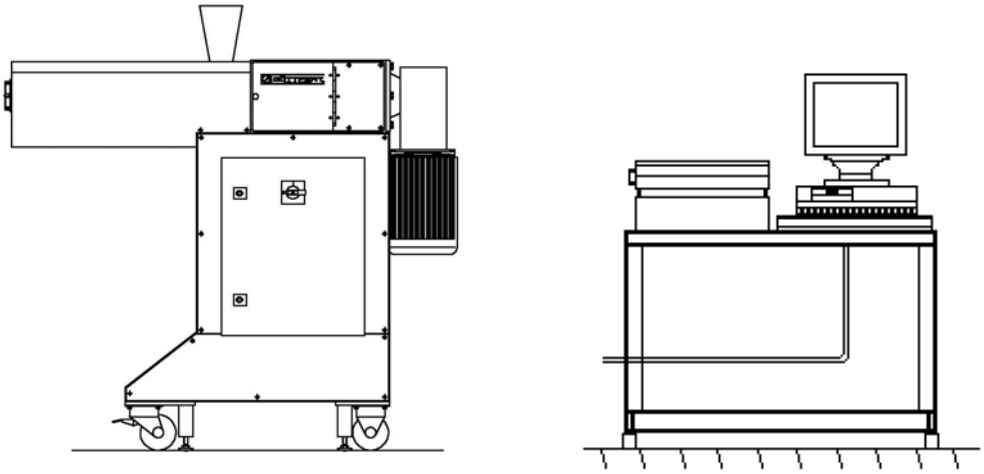
With the plenty of options the basic model can be extended to **complete lab systems** for different test applications. The following available product descriptions show our wide product range:

- ❑ **CYLINDER SYSTEMS D = 20mm**
- ❑ **CYLINDER SYSTEMS = 1"**
- ❑ **CYLINDER SYSTEMS D = 30mm**
  cylinder length 20 D and 25 D, degassing cylinder, cylinder with feeding bushings, caoutchouc cylinder, screws, flap flange, measuring ring, rheometric die, dies
- ❑ **Slit die, ribbon die, blow film head, deflection head**
- ❑ **Tubing head, cable sheathing head**
- ❑ **Combined flat and blow film unit, calender roll unit**
- ❑ **Filter measuring head, spinning head**
- ❑ **Laboratory pelletizer**

In it's complete extension the Laboratory Extruder can be equipped by the following **measuring elements**, that will be introduced in this product description:

- ❑ melt pressures
- ❑ melt temperatures
- ❑ continuous output measurement
- ❑ continuous die swell measurement

The LABORATORY EXTRUDER consists of a machine body with control electronic and a PC with operation software.



Laboratory Extruder Personal Computer

*Overall picture of the **Laboratory Extruder** with cylinder, PC, printer and special table*

Machine body
in a compact movable construction serves for installation of:

Drive
A gear motor for driving the screw with a motor controller which is mounted directly at the motor.

Cylinder bearing
For mounting of cylinder and screw.
Optional at the diameters 20mm or 1“ or 30mm

Control electronics
Installed in the machine body in two small controll cabinets for the EMV separation of the power circuits- and electronics equipments. The control electronics contains in the basic model the following components:

- **Test-data processor**
  A process computer that controls and monitors the Laboratory Extruder hardware. The process computer sets as slave the control signals of the operation PC to the internal CAN-BUS and transmits the status reports as well as the test data to the operation PC.
- **CAN-bus**

A serial bus, which connects the operation components of the control electronics as well as the PC, temperature controller, motor controller, pressure transducer and the input/output components.

- ❑ **Temperature controller**
  Microprocessor-controlled multi channel temperature controller, for 2 and 3 point-control zones.
- ❑ **Motor controller**
  Microprocessor-controlled variable-frequency inverter.

Control Signals

For the external control of the machine following signals are available:

Output signal	- Alarm:	Fail-safe, active by machine failures and when limits are exceeded	potential free opening-relay contact, which is opened by a trouble-free operation
Input signals:	- Stop	Stops the drive	Potential-free optocoupler-input
	- Start	Starts the drive	Potential-free optocoupler-input

For technical data see „Technical Data Connections“ on page 6.

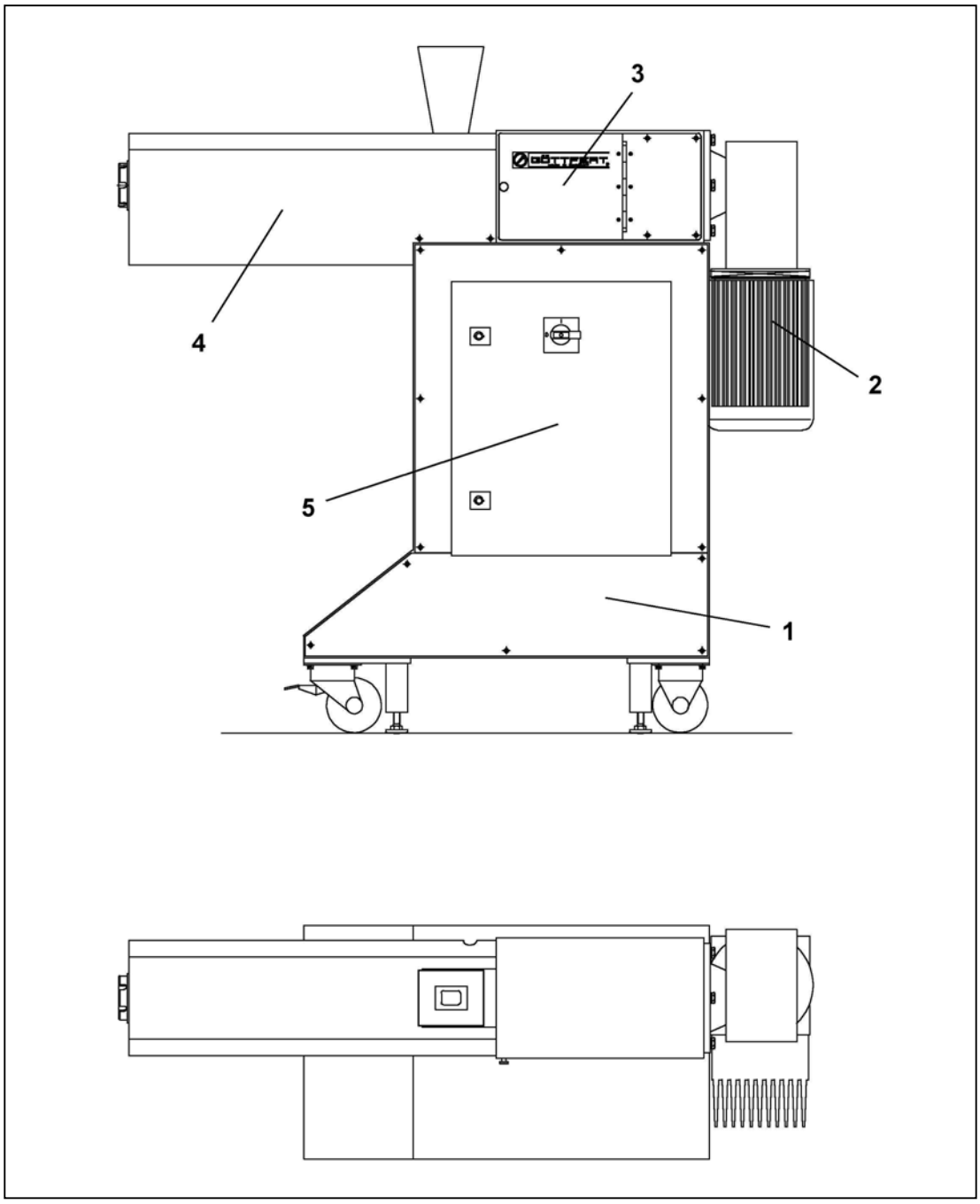
Power supply

The Control Electronics must be supplied with the power supply according to customers specification.
(optional unit)

Operation PC

For controlling of Laboratory Extruder and displaying the measurement results via the operation software.
(optional unit)

Drawing Laboratory Extruder



*Overall picture of the **Laboratory Extruder** with cylinder*

1. Machine body
2. Drive
3. Cylinder bearing
4. Cylinder with protection hood and feed hopper
5. Control electronics

Technical Data basic model

Drive:	Speed range:	0 - 130 min^{-1}
	Torque:	274 Nm in the speed range 0 .. 73 min^{-1} higher than 73 min^{-1} the max. torque is reduced down to 153 Nm at the max. speed of 130 min^{-1} Value between e.g.: 195 Nm at the speed = 100 min^{-1}
Drive details:	Type:	Motor with bevel gear
	Speed range motor:	0 - 1400 rpm
	Power motor:	2.2 kW, 100 % ED
	Gear transmission:	i = 19.216
Temperature control:	Type:	microcomputer controlled multiple channel controller with 2-point or 3-point control zones
	Heating circuits:	max. 8 (1-3 standard, 4-8 optional units)
	Cooling circuits:	max. 2 (optional units)
	Temp. sensor:	Pt 100 DIN IEC 751
	Temp. range:	0 °C – 400 °C
	Resolution:	0.1 °C for set and actual value
	Accuracy:	Calibration accuracy < 0.4% Temperature drift < 0.2%/10K
	Temp. controlling:	Max. ± 2°C, typical ± 0.2°C
Test pressure transducer: (options)	Type:	DMS, flexible stem , quality class I
	Number:	max. 3
	Screw:	1/2"-20 UNF-2A
	Test range:	0 - 100, -200, -500, -1000 bar
	Accuracy:	+/- 0.5% from final value
	Temperature:	Max. 400°C (membrane)
Temperature feeler:	Pt 100 1/3 DIN B IEC 751 for heating temperature control	
Thermocouple:	Fe-CuNi Typ“J“, class „1“ accord.to IEC584 part 2, for measuring of the melt temperature	
Temperature:	Max. 350°C	
Pressure:	Max. 1000 bar	
Dimensions:	Total height with Standard funnel	= 1252 mm
	Extrusions height	= 1000 mm
	Length with cylinder D 1 inch/20D	= 1267 mm
	Depth	= 480 mm
Weight:	230 kg	
Protection class:	IP 54 IP 40 by the version as 3 point heating zones with fan cooling	
Finish:	Frame and cover plates beige mat, similar RAL 7035	

Environ. conditions:	Temperature range:	+10 °C bis 35 °C
	Rel.humidity:	90 % without condensation
	Ambient air:	non aggressive dustfree installation place

Technical Data Connections

Control inputs potential free:	2 functions can be controlled via external inputs	
	- Stop:	Stop drive
	- Start:	Start drive
	Implementation:	
	Opto coupler-inputs:	Input voltage: 15-30V, input current: 10mA typical.
	Wiring of the inputs:	
	Measures on customer side:	Providing a 24 V supply voltage and switching of the inputs via a make contact.
	Connection:	Terminals in the machine, shielded signal line, the max. length of the cable depends on the cross section of the used cable
Control output potential free:	Alarm: becomes active at machine failures and exceeding of limits	
	Implementation:	
	Relay contact:	opening contact in failsafe version
	Voltage:	max. 30V ac/dc
	Current:	max. 0.5 A
	Connection:	Terminals in the machine, shielded signal line, the max. length of the cable depends on the cross section of the used cable
Power supply:	See options	
Power consumption:	approx. 8kW	Depends of the numbers of the installed heatings
Main fuse:	3 x 25 A slow-blow	**The fuse protection has to be realized by the customer!**

As operation software the `Rheo Online Software ROS Win` is used . About this see the attached product description ‚RHEO ONLINE SOFTWARE ROS Win.

As evaluation software the „WinRHEO II“ Software operating system is used. About this see the attached product description ‚WinRHEO II.

Hardware Requirements for the PC

The Rheo Online Software runs on an IBM AT-compatible PC with the following requirements:

Processor Pentium III or higher
Minimum clock frequency of 500 MHz
Min 64 MB RAM
Min. 1 disk drive 3,5" 1,44 MB
CD-ROM drive
Min 2 GB hard disk
VGA color monitor, 1024x768, 17”
VGA graphic card with at least 4 MB RAM
Two serial interfaces, the configuration depends on the option ‘Serial Interfaces’
USB- or parallel interface PRN1 for connecting the printer, USB interface: if the option ‘Remote Access’ is ordered
MF keyboard
Mouse
At least two free PCI-bus slots (if required for PC interface cards)
Operating system: Windows® 2000 or Windows® XP

The PC itself is not included.

Windows® 2000 and Windows® XP are registered trademarks of Microsoft Corporation.

In case the required PC is provided by the customer itself following has to be considered:

The PC must be sent to Göttfert prior to final inspection/dispatch of the rheometer system. The final inspection test in house Göttfert of the relevant rheometer will be performed only with the customer PC, which will be used onsite for operation, to guarantee a troublefree operation of the total system. In order to being able to prepare the PC best possible for operation with the rheometer, please make sure that the PC is sent to Göttfert on time.

Göttfert GmbH provides full warranty for machines that have been supplied as complete system that means with PC and printer by Göttfert. PC means generally the complete system comprising of PC, monitor, keyboard, interfaces, mouse and if applicable joysticks.
Principally, we do not give a functioning guarantee for connecting externally supplied PCs and printers (non-Göttfert supply).
If the customer provides the PC by himself, Göttfert cannot guarantee the trouble free functioning of PC and Göttfert unit.

Service work, which will be essential due to appearing problems in regard to configuration, serial interfaces, connection cables, communication etc. do not belong to the warranty obligations and will therefore be invoiced on an actual expense basis.
Due to the various printer executions that are available on the market, we do not give any function guarantee for printers not supplied by Göttfert. Support for possible adjustments will be charged on an actual expense basis.

Supported Printers

In general following 3 printer types are applicable:

- *Needle printer*: Usable for endless paper printing; low maintenance requirement; printer cartridges are less cost extensive; poorer printing quality than with inkjet or laser printer; noisy incomparison to inkjet printers; cheap
- *Inkjet printer:* low cost inkjet printers support only single sheet prints, whereas the paper magazine is limited to about 100 sheets; only with restrictions suitable for protocol prints due to single sheet printing; low printing noise color prints possible; relatively high costs for printer cartridge; expensive
  Inkjet printer are also available with tractor feeder that means printing on endless paper is possible, and therefore, suitable for protocol printing. As color prints are possible also suited for graphic print outs, expensive
- *Laser printer:* proper and clear print, faster printout, no color prints, single sheet feeding, low maintenance requirements, favorable operation costs, expensive

As the printer models change quite fast, we indicate only possible printer types as quite data. On request, we can quote at that time current printers meeting the necessary requirements.
Please specify the necessary side voltage 100/110 V or 230V absolutely when placing the order.

- **Needle Printer Epson 24 needles, endless paper feed, black/white prints**
- **Inkjet Printer Epson Stylus Color Series/ Canon BJC Series, color prints, single sheet feeding with paper magazine**
- **Inkjet Printer for endless sheet prints Epson Stylus Color Series / Canon BJC Series, color print, single sheet feeding or endless paper feeding**
- **Laser Printer HP Laserjet-Series, black/white print, single sheet feeding**

The **Rheo Online Software** supports all printer models that own a Windows® 2000 or Windows® XP printer driver.

Supplied accessories

1 Tool set for installation and maintenance
1 Anti-Seize grease
1 Set shearing pins
1 User information optional in English or German language

The included documentation is delivered only in English or German language.

LABORATORY EXTRUDER

Basic model

consisting of machine body with operation PC, drive, cylinder bearing and control electronics.
Technical data and accessories corresponding to the present product description
Order number 5.80.100

To get a fully functioning LABORATORY EXTRUDER the basic model must be completed by the following optional components:

- ❑ English or German version
- ❑ Power supply
- ❑ Cylinder, screw and die, see product description **cylinder systems**
- ❑ Shear bearing according to cylinder
- ❑ Data acquisition, test pressure transducer, test temperature sensor
- ❑ Personal Computer
- ❑ Serial interface to the PC or device control system DCS
- ❑ Special table for PC and printer if necessary

The options for the basic model follow on the next pages.

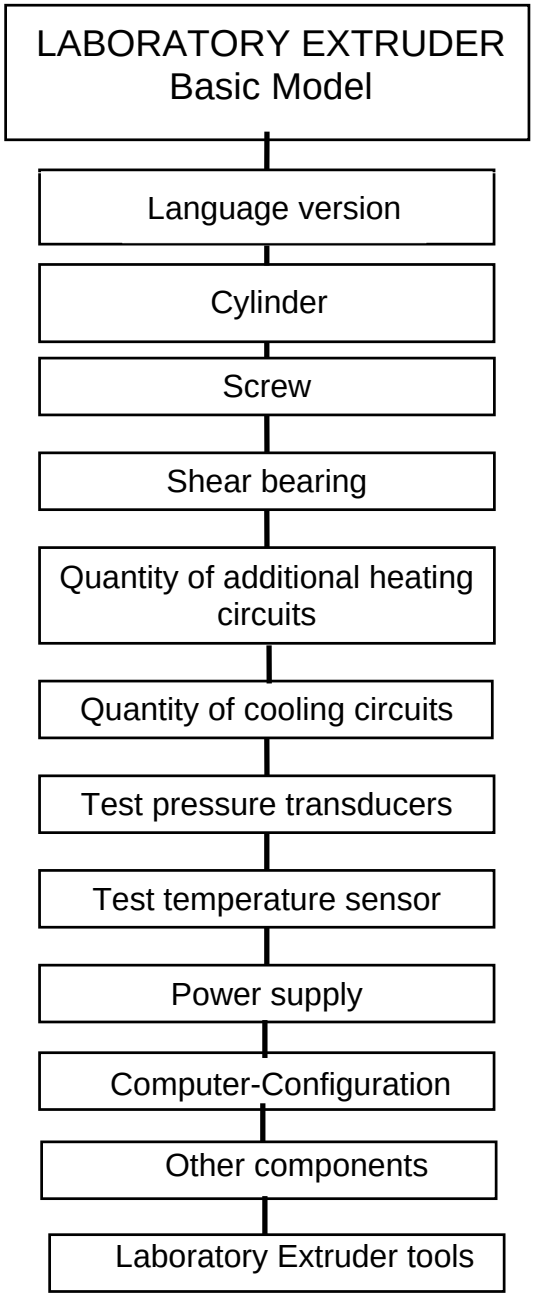
For the further components of the **LABORATORY EXTRUDER -System** the following product descriptions are available:

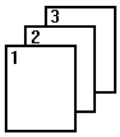
- ❑ **CYLINDER SYSTEMS D = 20mm**
- ❑ **CYLINDER SYSTEMS D = 1"**
- ❑ **CYLINDER SYSTEMS D = 30mm**
  Cylinder length 20 D and 25 D, degassing cylinder, cylinder with feed bushings, caoutchouc cylinder, screws, flap flange, measuring ring, rheometric die, dies
- ❑ **Slit die, ribbon die, blow film head, deflection head**
- ❑ **Combined flat and blow film unit**
- ❑ **Filter measuring head, spinning head**
- ❑ **Laboratory pelletizer**

Additional application-specific options are listed in this product description.

Subject to technical modification due to new development.

The LABORATORY EXTRUDER Concept





Optional units

Optional units for the LABORATORY EXTRUDER basic model, for material dosing and data acquisition:

Language version and User Information

German Version LABORATORY EXTRUDER

Lettering and user information in German.
Order number 5.80.110

English Version LABORATORY EXTRUDER

Lettering and user information in English.
Order number 5.80.111

User Information LABORATORY EXTRUDER German

Additional manual to the manual supplied with the basic model.
Order number 5.80.112

User Information LABORATORY EXTRUDER English

Additional manual to the manual supplied with the basic model.
Order number 5.80.113

The user information consists of operating manual, technical documentation, program documentation and calculation basis.

Cylinder and Screws

The Laboratory Extruder must be supplied with a **Cylinder** and a **Screw**.

Cylinder 1" Standard

diameter 1", length 20 D, water-cooled feed zone, with every one bore-hole at the screw end for one pressure- and one temperature transducer, 3 heating zones with electrically cylinder heaters, 3 temperature feelers Pt 100 1/3 DIN B for temperature control

Order number 5.88.062

Cylinder 1" to attach the SSR-Measuring Head

diameter 1", length 20 D, water-cooled feed zone, with every one bore-hole at the screw end for one pressure- and one temperature transducer and with a lateral melt drilling for the SSR-Measuring Head, 3 heating zones with electrically cylinder heaters, 3 temperature feelers Pt 100 1/3 DIN B for temperature control

Order number 5.80.041

Three-Zone-Screw 1"

depth ratio 1:3, diameter 1", length 20 D, with uniform thread depth in the feed zone, made of material 1.4122, grounded and polished in the channels, transmissible torque 220 Nm

Order number 5.97.402

Cylinder 20

diameter 20 mm, length 20 D, water-cooled feed zone, with every one bore-hole at the screw end for one pressure- and one temperature transducer, 3 heating zones with electrically cylinder heaters, 3 temperature feelers Pt 100 1/3 DIN B for temperature control

Order number 5.96.167

Screw 20

depth ratio 1:3, diameter 20mm, length 20D, with uniform thread depth in the feed zone, made of material 1.4122, grounded and polished in the channels, transmissible torque 140 Nm

Order number 5.97.109

Other cylinders and screws on request.

Shear bearing

The different cylinders and screw diameters respectively need different shear bearings. A shear bearing includes a shearing pin to protect the screw.

Shear bearing for cylinder D = 20mm and kneader adapter

Order number: 5.80.057

Shear bearing for cylinder D = 1“
Order number: 5.80.030

Shear bearing for cylinder D = 30mm
Order number: 5.80.061

Heating circuits
The basic machine is equipped with three heating circuits. Depending on the cylinder selection and on the additional tools, the required quantity of heating circuits has to be determined. For the number of used heating circuits, see the description for cylinder and tools. In addition to the required heating circuits, it is possible to extend the heating for subsequent installation by means of spare heating circuits.
There is the possibility to add upto five additional heating circuits.
1 additional heating circuit:
Order number: 5.80.016

Cooling circuits
The basic machine is not equipped with cooling circuits. Depending on the cylinder selection and on the additional extruder tools, the required quantity of cooling circuits has to be determined. The required quantities can be taken from the relevant descriptions of the cylinder/tools.
There is the possibility to add upto two additional cooling circuits.
1 cooling circuit:
Order number: 5.80.017

Dosing Feeder
for continuously feeding the Laboratory Extruder with material. The apparatus is equipped with a **storage tank** with an integrated **stirrer** and one pair **double screw**:

storage tank:	made of stainless and acid resistant steel (1.4301), with stirrer and protective grating
drive:	DC-motor, thyristor controlled, steplessly variable
dosing range:	adaptable with different double screw profiles

In case of order please kindly indicate the bulk material and the bulk density. With help of this information the necessary double screw profiles will be determined.

Dosing Double Screw Feeder with storage tank, approx. 10 l capacity
Order number 5.90.912
Dosing Double Screw Feeder with storage tank, approx. 30 l capacity
Order number 5.90.918
Dosing Double Screw Feeder with storage tank, approx. 60 l capacity
Order number 5.90.919

Together with the **Level Controller** and the **Stirrer with Level Monitor** a **fully automatic dosing unit** is possible:

Level Controller

for the storage tank of dosing double screw feeder. With the help of 2 limit indicators the minimum and maximum level of the storage tank will be indicated. For switching the conveyor equipment on customer side a potential free contact is available.

Order number 5.90.920

Stirrer with Level Monitor

with hopper for attaching on the Laboratory Extruder cylinder. The stirrer avoids bridge forming. The torque of the stirrer monitors the filling level in the hopper. For processing powder or granules 2 torque limits are selectable. For switching the dosing double screw feeder a potential free contact is available.

Order number 5.90.913

Test pressure measurement

For the measuring of the test pressure inside the cylinder and tools following options are needed:

1 Test pressure transducer
1 Cylinder bore at requested position
1 Connection test pressure transducer

One bore-hole at the screw end for one pressure transducer is made in the basic model. When ordering further test pressure transducers the requested testing positions (cylinder or tool) have to be indicated.

The Laboratory Extruder can be equipped with maximum 3 test pressure transducers.

Test pressure transducer

For measured value transmission all test pressure transducers are equipped with a CANBus measuring amplifier, which is located into the pressure transducer housing.

Please note at the selection of pressure transducer, that you get the highest possible accuracy between 10% and 90% of the nominal values of pressure transducers.

Technical data applying for all test pressure transducers:

Class I:	combined error ± 0,5% FSO
Temperature:	max. 400 °C (diaphragm)
Thread:	1/2”–20 UNF-2A
Flexible stem:	length = 18"

Test pressure transducer 100 bar

Order number 8.81.192

Test pressure transducer 200 bar

Order number 8.81.193

Test pressure transducer 500 bar
Order number 8.81.191

Test pressure transducer 1000 bar
Order number 8.81.190

Connection Test pressure transducer
For each measuring point 1x required. Max. 3 connections are available.
Order number 5.80.018

Test temperature measurement

Thermocouple for cylinder
Complete with electric connection equipment for measuring the melt temperature inside the cylinder.

One bore-hole at the screw end for one thermocouple is made in the basic model.

Type:	Fe-CuNi Typ“J“, class „1“ acc. to IEC584 part 2
Measurement:	at cylinder
Design:	90° bent, 046.1
Measurement range:	room temp. - 400 °C
Thread:	½” UNF

Order number 5.80.062

The cylinder can be extended with further thermocouples on request.

Power supply

Power supply 400V, 3L+N+PE / 50Hz

Voltage:	3x 360...440V, 4- three-phase four-wire system
Permissible voltage fluctuations:	± 0%
Frequency:	50 Hz ± 1%
Power consumption:	approx. 8kW, main fuse 3 x 25A slow blow
Connection:	terminals, cable length 3m

Order number 5.80.058

Power supply 400V, 3L+PE / 50Hz

Voltage:	3x 360...440V, three-phase three-wire system
Permissible voltage fluctuations:	± 0%
Frequency:	50 Hz ± 1%
Power consumption:	approx. 8kW, main fuse 3 x 25A slow blow
Connection:	terminals, cable length 3m

Order number 5.80.059

Power supply 230V, 3L+PE / 60Hz

Voltage:	3x 207...253V, three-phase three-wire system
Permissible voltage fluctuations:	± 0%
Frequency:	60 Hz ± 1%
Power consumption:	approx. 8kW, main fuse 3 x 25A slow blow
Connection:	terminals, cable length 3m

Order number 5.80.060

Other power supply voltages available on request.

Computer Configuration

The Laboratory Extruder will be operated via the Rheo Online Software, which runs on an AT-compatible PC. Different operation modes are possible:

- ❑ Stand alone mode: manual operation at the Laboratory Extruder
- ❑ Stand alone mode with Host Connection: manual operation at the Laboratory Extruder and test data transmission to a process control system

Personal Computer

If the Laboratory Extruder should be operated via a PC, please see the necessary hardware requirements as listed on page 7 of this product description.
If the operation PC should be supplied by Göttfert, please contact us for a suitable offer, which fulfills these requirements.
Informations about the equipment features of the PC, you will find in the separate product description " Visualization – PC ".

Special table

for the Personal Computer and printer.
With multiple socket outlet (x6) for 230-V power supply.
Width: 1100 mm, depth: 750 mm, height: 720 mm
Order number 5.13.300

Other components for the basic model

Cleaning compound

for cleaning cylinder, screw and back-up units.
Packages of 5 kilos.
Order number: 5.90.902

Continuous output measurement

Software tool for the PC-operation program for connection of a laboratory balance, with waste container and connection cable from the balance to the Laboratory Extruder, however, without laboratory balance.
The connection of the balance is happened via Mettler-Toledo Local CAN interface. Our software supports the MT-SICS Protocol from Mettler-Toledo.
Order number: 5.94.220

Laboratory balance

Mettler-Toledo PG 6100-S (max. capacity: 6kg; readability: 0.01g) for continuous output measurement. With integrated calibration and Local CAN interface for the data transmission to the Laboratory Extruder.

Order number: 5.95.354

Die swell measuring head with cutting unit and support

consisting of:

Software tool:	for the PC-operation program for measuring of the static and dynamic die swell
Laser measuring head:	(class 2,630 - 680 nm, < 1mW) for measurement of the extrudate diameter
Cutting unit:	for cutting of the extrudate, electrically driven, manual release
Support:	for reception of the laser measuring head and the cutting unit

Order number: 5.95.555

Remote Access

To help you with problems with the operating software or with the handling of the machine we recommend to use a remote control software. This will enable our service technicians to control your machine from our company remotely. Its also possible to install program updates and to fix configuration problems.

We strongly recommend the usage of the option “Remote Access”

Option “Remote Access” contains the remote control software, a modem and the needed cable material. The connections for the analogue telephone lines are realized as terminal strips.

Remote Access for personal computers / PC (desktop)

English version of the remote control software PC-Anywhere
Order number 5.80.114

German version of the remote control software PC-Anywhere
Order number 5.80.115

Remote Access for Industrial Workstation / IWS

English version of the remote control software PC-Anywhere
Order number 5.42.332

German version of the remote control software PC-Anywhere
Order number 5.42.333

❑

Subject to change due to technical developments.

LABORATORY EXTRUDER

Short text for quotation, confirmation, delivery note and bill

Order number	Naming

5.80.100 **Laboratory Extruder basic model**
consisting of machine body with
operation PC, drive, cylinder bearing
and control electronics

Optional units:

5.80.110 **German version LABORATORY EXTRUDER**
Lettering and user manual in German

5.80.111 **English version LABORATORY EXTRUDER**
Lettering and user manual in English

5.80.112 **User manual German**
Laboratory Extruder

5.80.113 **User manual English**
Laboratory Extruder

5.88.062 **Cylinder 1" Standard**
with 3 heating circuits, D=1", L=20D

5.80.041 **Cylinder 1" for attach the SSR-Measuring Head**
with 3 heating circuits, D=1", L=20D

5.97.402 **Three Zone Screw 1"**
depth ratio 1:3, D=1", L=20D
accd. to drawing 015.01.0.05.008.1

5.96.167 **Cylinder 20**
with 3 heating circuits, D=20mm, L=20D

5.97.109 **Screw 20**
depth ratio 1:3, D=20mm, L=20D

5.80.057 **Shear bearing for cylinder D = 20mm**
also usable for kneader

5.80.030 **Shear bearing for cylinder D = 1"**

5.80.061 **Shear bearing for cylinder D = 30mm**

5.80.016 **1 Heating circuit, equipped**
3 includes in the basic model, max. 8

5.80.017 **1 Cooling circuit, equipped**
max. 2

5.90.912 **Dosing Feeder**
with Dosing Double Screw and stirrer,
storage tank approx. 10 l

5.90.918 **Dosing Feeder**
with Dosing Double Screw and stirrer,
storage tank approx. 30 l

5.90.919 **Dosing Feeder**
with Dosing Double Screw and stirrer,
storage tank approx. 60 l

5.90.920 **Level Controller**
for the storage tank of dosing feeder

5.90.913 **Stirrer with Level Monitor**
with hopper for attaching on the
cylinder of Laboratory Extruder

8.81.192 **Test Pressure transducer 400°C,**
0-50 bar
Thread ½"UNF
Class I: ±0.5% of nominal value

8.81.193 **Test Pressure transducer 400°C,**
0-200 bar
Thread ½"UNF
Class I: ±0.5% of nominal value

8.81.191 **Test Pressure transducer 400°C,**
0-500 bar
Thread ½"UNF
Class I: ±0.5% of nominal value

8.81.190 **Test Pressure transducer 400°C,**
0-1000 bar
Thread ½"UNF
Class I: ±0.5% of nominal value

5.80.018 **Connection Test pressure transducer**
For each measuring point 3x required.

5.80.062 **Thermocouple for cylinder**

Fe-CuNi, with electric connection equipment

5.80.058 Power supply 400V, 3L+N+PE / 50Hz
4 three-phase four wire system

5.80.059 Power supply 400V, 3L+PE / 50Hz
three-phase three wire system

5.80.060 Power supply 230V, 3L+PE / 60Hz
three-phase three wire system

Other components for the basic model

5.90.902 Cleaning compound
for cylinder, screw and back-up units

5.94.220 Continuous output measurement
Software tool for the PC-operation program

5.95.354 Laboratory balance

5.95.555 Die swell measuring head with cutting unit and support

5.80.114 Remote Access for PC
German version of remote control software PC-Anywhere

5.80.115 Remote Access for PC
English version of remote control software PC-Anywhere

5.80.332 Remote Access for IWS
German version of remote control software PC-Anywhere

5.80.333 Remote Access for IWS
English version of remote control software PC-Anywhere

❑