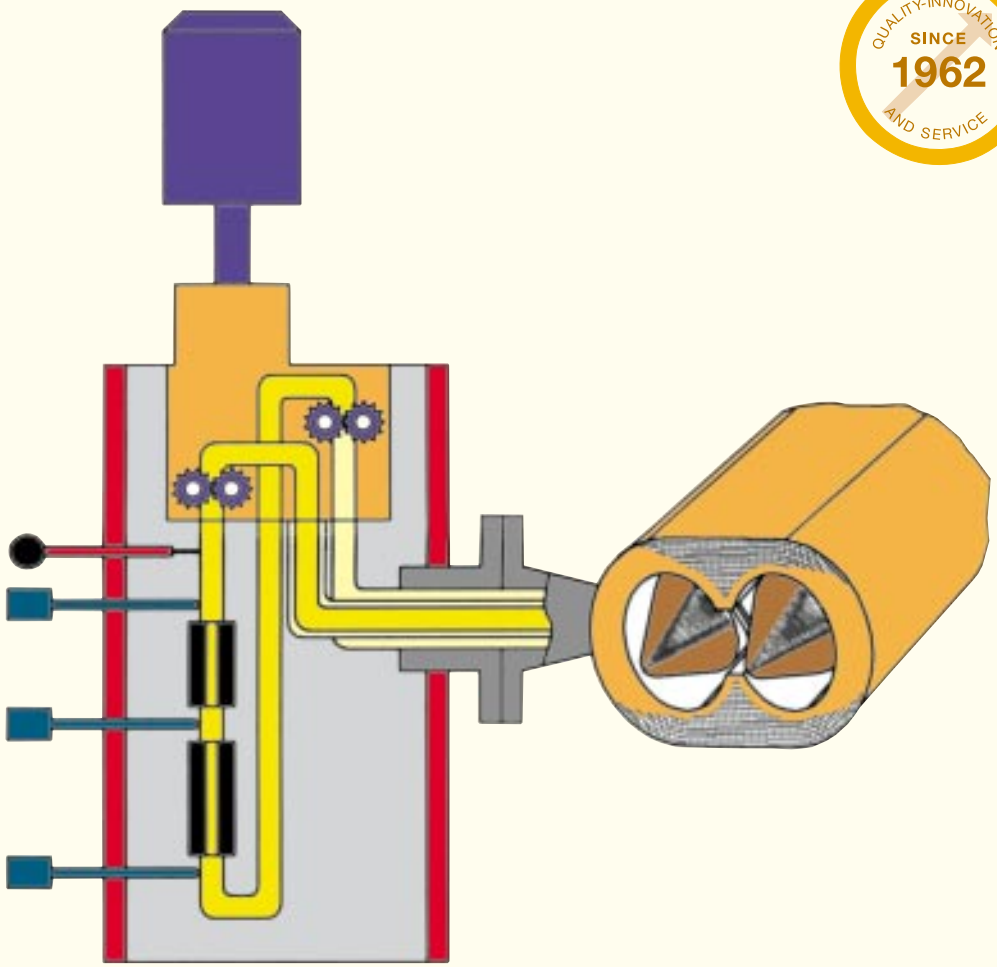


SIDE-STREAM-RHEOMETER SSR

The melt return on-line rheometer with its unique annular transfer line for one port hole installation

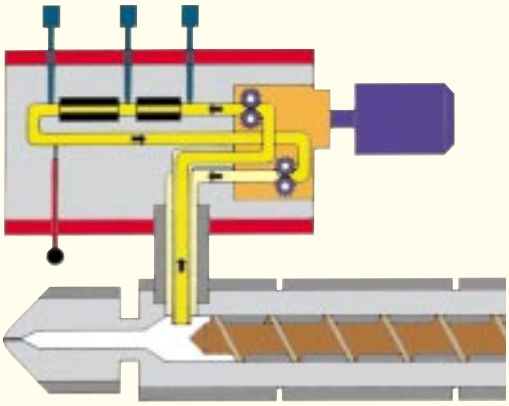
GÖTTFERT®

certified according to DIN EN ISO 9001

GFT019.11.0-9-02

SIDE-STREAM-RHEOMETER SSR

The SSR is based on the first melt return on-line capillary rheometer developed by GOETTFERT many years ago. The new SSR uses the same annular melt transfer line as the old (the advantage is that only one port hole is needed, making installation simple) and no waste stream is generated because the tested material is returned.



SSR mounted horizontally

SSR mounted vertically

Features

- The SSR's annular melt transfer line adapter readily attaches to existing standard M18 and x1.5 ports, often used for pressure, temperature and other transducers.

- The convenient installation means money savings in the planning, design and execution stages, because no flanges need to be fitted, holes drilled, or modification made to extruders.

- The compact design makes it possible to mount the instrument vertically as well as horizontally.

- The SSR is available in single or dual (two dies in series) die design. A dual point measurement provides enough information to not only measure viscosity (or indicate melt index), but also simultaneously the flow exponent, which is an important indicator of change in the molecular weight distribution.

- Our new SSR benefits from many years of experience with our Windows® software ROSWin designed for use with our other on-line rheometer systems RTR-RTS and MBR. With this stable platform it is possible to run melt flows in the range of 0.1-1700 g/10min without changing dies.

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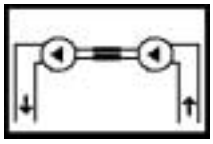
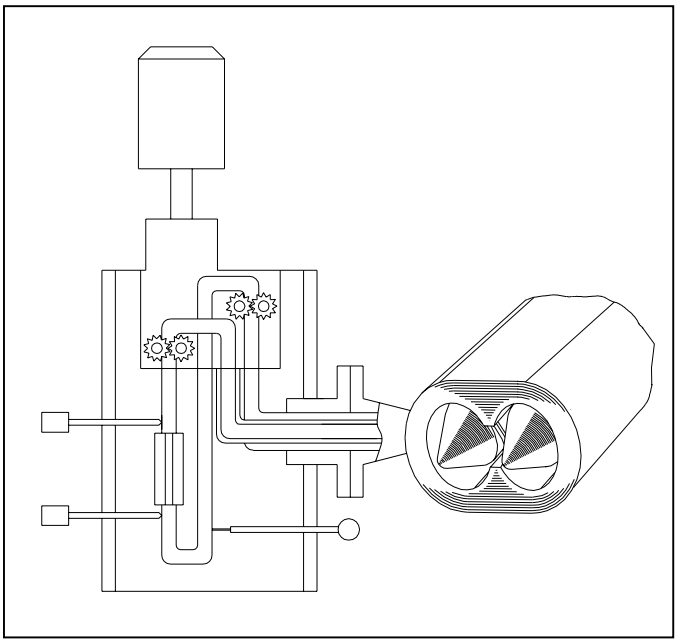
GÖTTFERT®
WERKSTOFF-PRÜFMASCHINEN GMBH



SIDE-STREAM RHEOMETER SSR

The SIDE STREAM RHEOMETER SSR is a continuously measuring capillary rheometer for application in on-line quality control. It is used particularly in manufacturing and in compounding.

The SSR supplies real time data of the rheological characteristics for the evaluation of the polymer for full automatic process control.



The compact construction of the SSR allows easy mounting of the measuring head.

The SIDE STREAM RHEOMETER returns the melt taken out of the product line back to the process after the measurement.

Figure: Measuring principle SSR

The SSR measuring head is mounted directly to the process line. Control electronics is located in a separate control cabinet set apart from the measuring head. The system is operated by a personal computer or an industrial workstation.

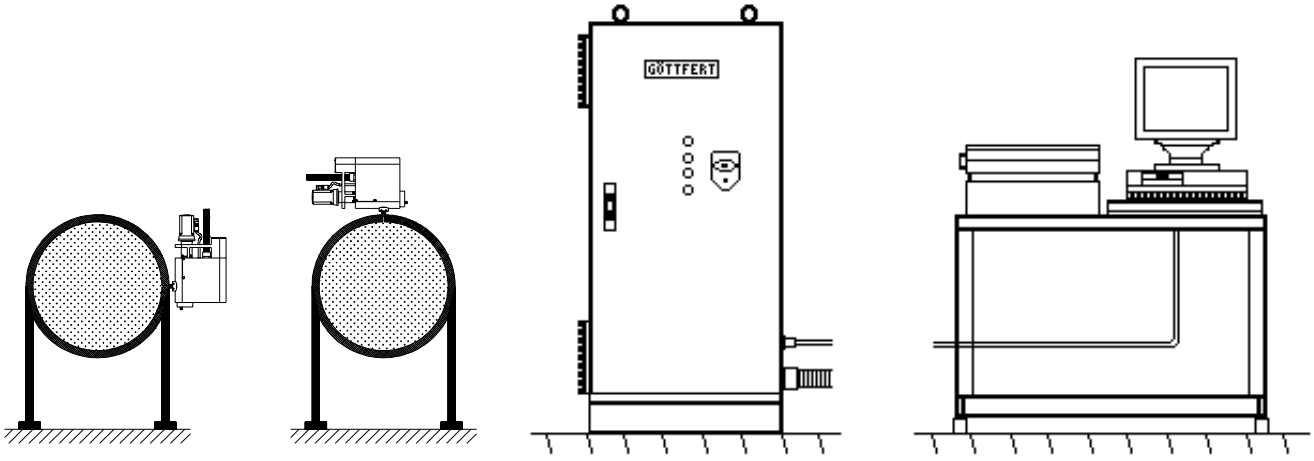


Figure: Overall view of SSR with PC, printer and special table

Characteristic features of the SIDE-STREAM RHEOMETER:

- Measuring head may be mounted horizontally or vertically directly to the product line, separate control electronics
- Compact Design
- Wide measuring range
- System can be operated at a constant speed (shear rate) or constant pressure (shear stress)
- Two components-pump for maximum stability and process isolation
- Operation is made via a personal computer, a built in industrial workstation or from the user side via a process control system
- The following test results are supplied depending on the selected operating mode:
  - Melt index MFR or melt volume index MVR with or without temperature-compensation
  - FRR (Flow Rate Ratio), ratio of 2 consecutive MFR/MVR measurements which correspond to laboratory tests with different weights
  - apparent shear stress, -shear rate and -viscosity
- The test results can be:
  - displayed in color on the PC screen
  - output in the form of a test-data log on a printer
  - supplied via analog outputs 4...20mA (see options)
  - requested via a host computer connected via serial interface (see options)
  - database access via network (to be realized by the customer)

THE SIDE STREAM RHEOMETER SSR consists of the following components: **SSR measuring head**, **control electronics** and **operating software**.

SSR-Measuring Head which consists of the following

Frame housing
complete with terminal box, lifting frame and protective cover. Housing, frame and cover are made out of acid resistant stainless steel.

Channel block
with melt connections for installation of capillary, pressure transducer and thermocouple. Also fitted with a purge valve in the inlet line to flush melt in the inlet pipe or to reduce the residence time, and a purge valve in the melt return for the flushing of the melt lines.

Heating
2 electrical cylinder heaters with temperature sensors Pt 100, accuracy 1/3 DIN

Melt pump
Precision gear pump with two pairs of gear wheels, one to supply melt to the die and the other to return the melt to the process

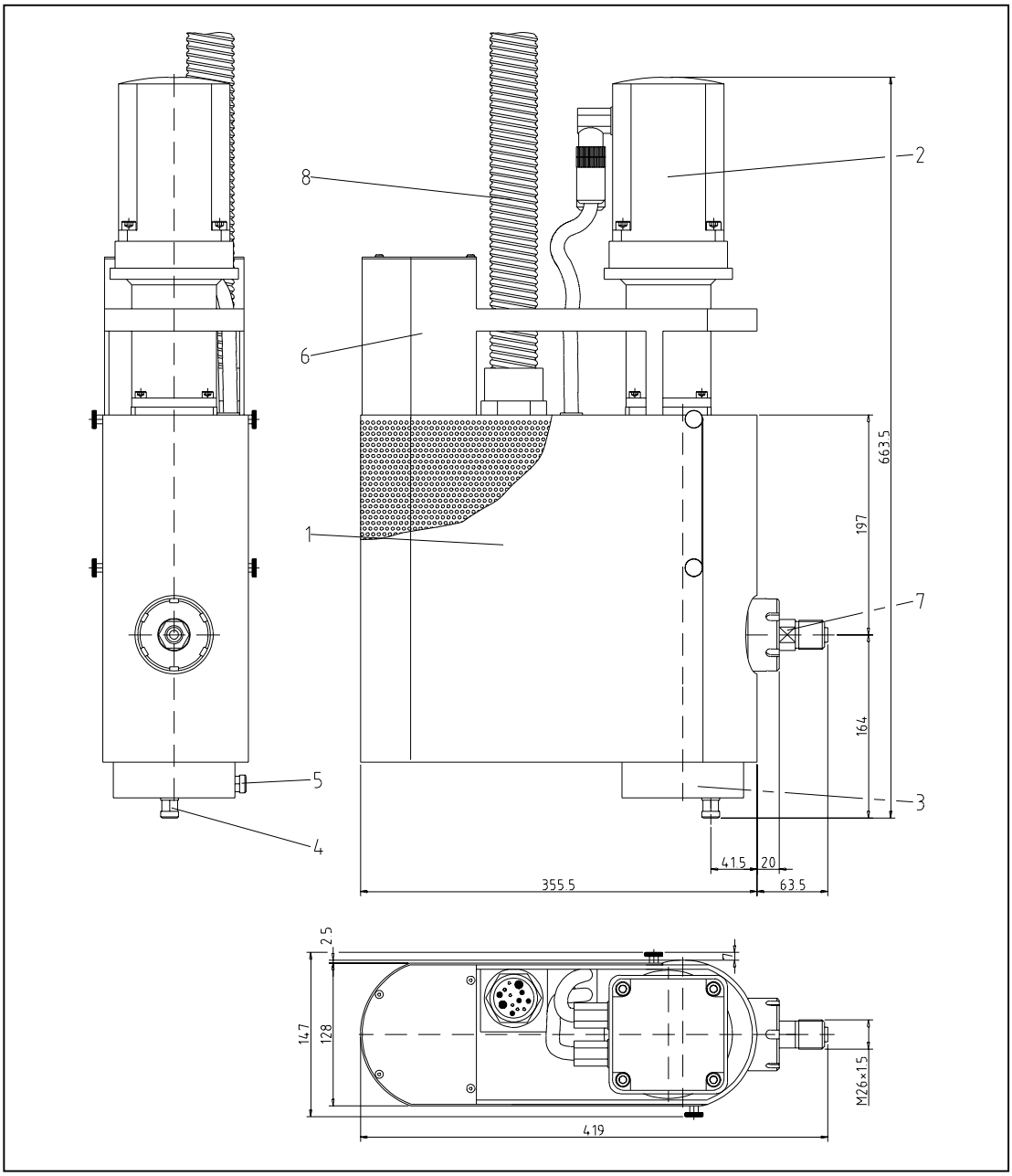
Drive
brushless servo gear motor for driving the melt pump

Thermocouple
for measuring the melt temperature in the melt stream, Fe-CuNi, accuracy 1/2 DIN, IEC 584 type ‘JJ’

Melt connection
by means of threaded nozzle with at least thread M18 x 1,5

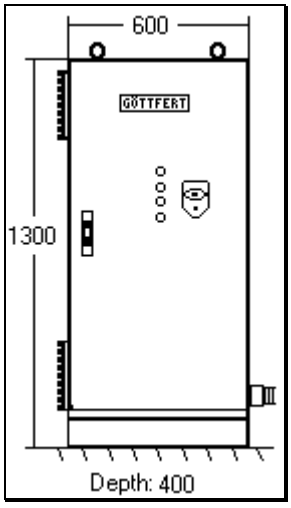
The measuring head must be supplied with capillary and pressure transducer. The customer must specify these (see options). Customer specific designed melt flanges and adapters are available as options.

Dimension drawing SSR - Measuring head



1. Frame housing
2. Drive
3. Channel block with melt pump and capillary
4. Bypass valve (inlet)
5. Bypass Valve (outlet)
6. Insulated pressure transducer housing
7. Melt connection
8. Connecting cable for
   Control Electronics

SSR-Control Electronics



Picture: Control cabinet standard (option) with control electronics

The Control Electronics is located in a separate control cabinet and comprises of following components:

Test-data processor

The electronics is microprocessor (slave) controlled and performs the basic measuring and open-loop/closed-loop control functions for the measuring head. The microprocessor

- **communicates** with the operation PC (master)
- **records test data** by means of sampling and digital filtering
- **linearizes** the thermovoltage (melt temperature)
- **controls pressure** by means of digital PID control algorithm
- **monitors pressure** and temperature limit values
- performs **watchdog** functions for monitoring the test data processor

Pressure amplifier

with electronic calibration unit for connecting the pressure transducer

Thermovoltage amplifier

with integrated reference junction for connecting the melt- temperature transducer (Fe-CuNi).

Temperature controller

microprocessor-controlled multi channel temperature controller

Servo-amplifier

for the servo-drives of the melt pump

Control inputs

via external contacts the following functions are available:
start standby mode, start test mode, stop test mode, stop drives

Control outputs potential-free

Alarm: Watchdog, excessively high temperature
Limit value: Watchdog, excessively high temperature and pressure

Serial interface

for communicating with the PC or Device Control System DCS (see options).

Power supply

the Control Electronics must be supplied with the power supply according to customers specification (see options).

SSR operation modes

Together with the Operation Software, the SSR can be operated in various modes and can perform various evaluations in order to determine the melt viscosity, melt index and melt volume index by means of single-point measurements and viscosity functions by means of multi-point measurements.

Single-point measurement with constant pressure:
The SSR is operated in the 'constant pressure' mode with one measuring point. The following variables are determined in this mode:

- melt index MFR(TM), temperature-compensated melt index MFR(T0)
- melt volume index MVR(TM), temperature-compensated melt volume index MVR(T0)
- apparent shear rate, apparent shear stress and apparent viscosity.

Multi-point measurement with constant pressure:
The SSR is operated in the 'constant pressure' mode. Several pressure steps are executed consecutively in this mode. The following are determined in addition to the variables mentioned above:

- FRR (Flow Rate Ratio), ratio of 2 consecutive MFR/MVR measurements which correspond to laboratory tests with different weights

Single-point measurement with constant speed:
The SSR is operated in the 'constant speed' (shear rate) mode with one measuring point. The following variables are determined in this mode:

- apparent shear rate, apparent shear stress and apparent viscosity

Multi-point measurement with constant speed:
The SSR is operated in the 'constant speed' (shear rate) mode. Several speed steps are executed consecutively in this mode.

Alternating test cycles:
In this mode the rheometer alternates between 2 independent test cycles. It is thus possible, for example, to perform a 'constant pressure' cycle in order to determine the melt index and a 'constant speed' cycle to determine the melt viscosity. 1 - 8 speed or pressure steps can be selected per test cycle.

Automatic MFR-adjustment:
After having started the machine and manually set MFR-values (lab-values), it is possible to run an automatic adjustment as much as one likes MFR(TM)-, MFR(T0)-, MVR(TM)- or MVR(T0)-steps, depending on the selected operation mode.

Technical Data – measuring head

Measuring pump:	Type:	2 – components pump
	Speed range:	0.1 - 100 rpm
	Accuracy:	+/- 0.1 rpm
	Torque:	45 Nm
	Spec. capac.:	0.372 cm^3/revolution
	MVR Range:	0.06 – 60 cm^3/10 min
Material impurities:	≤8µm Impurities larger than 8 µm can destroy the gear pumps	
Overload protection:	Electronic via torque limit	
Operation Temperature:	max. 350 °C	
Process-side Pressure:	max. 300 bar	
Pressure transducer: (option)	Quality Class I:	combined error ± 0.5 % FSO
	Temperature:	max. 400 °C (diaphragm)
	Thread:	1/2"-20 UNF-2A
	Flexible Stem:	length = 18"
Temperature sensor:	Pt 100 1/3 DIN IEC 751 for temperature control	
Thermocouple:	Fe-CuNi 1/2 DIN, IEC 584 type 'JJ' for measuring the melt temperature	
Miscellaneous:	Dimensions:	H = 664 mm, W = 147 mm, D = 361 mm
	Finish:	Drive mat black Frame and side panels polished stainless steel
	Weight:	approx. 30 kg.
Environ. conditions:	Temp. range:	0 °C - 50 °C
	Temp. changes:	max. +/-10 °C
	Rel. humidity:	90 % without condensation
	Protection:	IP 54

Technical data SSR - Control Electronics

Temperature control:	Sensor:	Pt 100 1/3 DIN IEC 751
	Connection:	Three-wire switch
	Temp. range:	60 °C - 350 °C
	Resolution:	+/- 0.1 °C for setpoint and actual value
	Accuracy:	+/- 1 °C
Analog Outputs: (option)	**Two programmable analog outputs**, all real time test values are selectable via menu (pressure, speed, temperature, melt- and volume indices, apparent shear stress, shear speed, viscosity) **Note**: programmable output 1 will be used for option ETA/MFR display. **Hard wired analog outputs** for P1, P2, TM1 (not linearized) Indicating range for P1, P2: 0 - Pnominal	

		TM1: 0 - 480°C
	For all outputs applies:	
	Output:	4 - 20mA, potential free
	Output load:	0 - 600 Ohm
	Tolerance	< 0.08 % from limit value (isolation amplifier)
	Connection:	connection to the version 19-pin circular connector outside of control cabinet or terminals inside of cabinet, shielded signal line, the max. length of the cable depends on the cross section of the used cable.
Control inputs:	4 functions can be controlled via external inputs:	
	Start Standby:	Start standby mode
	Start Test:	Start test mode, from standstill or standby
	Stop Test:	Stop test mode, meas. head changes to standby mode
	Stop Drives:	Stop drives, from test or standby mode
	Wiring of control inputs:	
	Relay contact:	make contact on customer side, potential free
	Voltage:	min. 15 V
	Current:	min. 100 mA
	Connection:	dependent to the version 19-pin circular connector outside of control cabinet or terminals inside of cabinet, shielded signal line, max. 100 m
Control outputs:	Alarm and overload message	
	Potential free outputs, wiring:	
	Relay contact:	opening contact in failsafe version
	Voltage:	max. 24 V
	Current:	max. 100 mA
	Connection:	dependent to the version 19-pin circular connector outside of control cabinet or terminals inside of cabinet, shielded signal line, max. 100 m
Digital outputs: (option)	(8 outputs) For End of Analysis Signal - EOAS (use of the first digital output), Automatic Range Selection - ARS of Programmable Analog Outputs and User Defined Limit Value messages: relay contact, potential free.	
	Voltage:	max. 230V ac/dc
	Current:	max. 0.25 A
Serial interface: (option)	For connection of:	
	• Control electronics - PC • Single Board Computer (SBC) or Industrial Workstation (IWS) (IWS+SBC into control cabinet) - Distributed Control System (DCS) • PC - Distributed Control System (DCS)	
	In RS 232, RS 485 or 20mA-TTY design	
	Connection:	dependent to the version 7-pin circular connector outside of control cabinet or terminals inside of cabinet, shielded signal line
	Configuration for connection control electronics - PC:	
	Baud rate:	9600 baud
	Data format:	8 data bits, 1 stop bit, no parity

Cable specification for serial interface:

	Standard length:	3 m (in basic version)
	Max. length:	RS 232 interface: 12 m (optional) RS 485 and 20mA interface: 1000 m (optional)
	Design:	RS 232: data cable min. 6 x 0,14mm², shielded RS 485: data cable min. 4 x 2 x 0,34mm², Twisted pairs, shielded 20mA-TTY: data cable min. 4 x 0,5mm², shielded

Connecting cable measuring head - Control Electronics:

	in protective sheath, plug-in connectors or terminals at measuring head and at control cabinet.	
	Standard length:	3 m (in basic version)
	Max. length:	200 m (optional)

Environ. conditions:	Temp. range:	0 °C - 40 °C
	Rel. humidity:	90 % without condensation
	Protection:	IP 54

Miscellaneous:

Control Cabinet Standard:	Dimensions:	H=1300mm with base, W=600mm, D=400mm
Control Cabinet PS 4606:	Dimensions:	H=2000mm without base, W=600mm, D=600mm
Control Cabinet PS 4808: (options)	Dimensions:	H=2000mm without base, W=800mm, D=800mm
	Finish:	Pebble grey RAL 7032
	Weight:	Approx. 170 kg

As operation software the Rheo Online Software for Microsoft® Windows NT® operation system is used . About this see the attached product description ‚RHEO ONLINE SOFTWARE for WINDOWS NT®‘.

Windows NT® is a registered trademark of Microsoft Corporation.

Hardware Requirements for the PC

The operation Software runs on a IBM AT-compatible PC with the following requirements:

Processor Pentium II or higher
Minimum clock frequency of 350 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’ or three serial Interfaces if the option ‘Remote Access’ is ordered
Parallel interface PRN1 for connecting the printer
MF keyboard
Mouse
At least two free IPCI-bus slots (if required for PC interface cards)

Operation system: Windows NT® Workstation 4.0 or Windows 2000®.

The PC itself is not included

In case the customers themselves provide the required PC following has to be considered:

The PC must be sent to Goettfert prior to final inspection/despatch of the rheometer system. The final inspection test in-house Goettfert of the relevant rheometer will be performed only with the customer PC, which will be used onsite for operation, to guarantee a trouble free 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 Goettfert 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 troublefree 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.

- **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 Microsoft® Windows NT® 4.0 or Windows 2000® printer driver.

Supplied accessories

1 Tool set for the assembly and maintenance
1 Anti- Seize paste
1 Set of shear pins
1 Set of filter mats
1 Set of fuses
1 Plug set for the connection of analogue outputs and external control signals
1 User information either in German or English language

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

Preconditions for a troublefree operation of the SSR

In order to guarantee a troublefree operation of the rheometer when being connected to a production extruder or a polymer line, the following conditions have to be fulfilled by the customer at the connection point:

- ❑ melt must be free from dirt particles (particle size ≤ 8µm)
  Applications with dirt particles > 8µm are possible and successful at use. It has to be considered that dependent on the material to be tested an increased wear of the spinning pump may be possible.
- ❑ sufficient constant process pressure has to be available (if possible non-pulsing)
  Note: Constant pressure is of course dependent on what type of material is being used and the length of the adapter. According to our experience when PE is used without adapter, we recommend the following pre pressures as guide values:
- ❑ MFR (190/2.16) = 0.46 g/10': minimum pressure approx. 30 bar
- ❑ MFR (190/2.16) = 7 g/10': minimum pressure approx. 20 bar
- ❑ MFR (190/2.16) = 22 g/10': minimum pressure approx. 15 bar

Please note that the unit is fitted with microprocessors. The power supply must be free of any interference in order to guarantee trouble-free operation.

SSR basic model
SIDE STREAM RHEOMETER

consisting of Measuring Head, Control Electronics, Operation Software, Connection Cable Control Electronics - Measuring Head in the protective sheath (standard length 3m) and Accessories corresponding to the present product description.

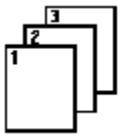
Order number.....5.42.200

To complete the SSR, the basic model must be customized with the following optional units:

- ❑ 1 capillary insert with one capillary for the single die design
- ❑ 2 pressure transducers
- ❑ German or English version selection
- ❑ Control cabinet
- ❑ Power supply
- ❑ Personal Computer or Industrial Workstation or Single-Board-Computer
- ❑ Serial interface to PC or Device Control System: RS 232 or RS 485 or 20mA

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

Subject to change due to technical developments



Optional Units

Language versions and user information:

German version SSR
Control cabinet lettering and user information in German.
Order number.....5.42.220

English version SSR
Control cabinet lettering and user information in English.
Order number.....5.42.221

User Information SSR German
Additional set of user information.
Order number.....5.42.222

User Information SSR English
Additional set of user information.
Order number.....5.42.223

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

Capillary Die

Into the SSR measuring head may be inserted a capillary die unit with an overall length of 112mm. With regard to the products to be tested and to the measuring range the appropriate capillaries can be selected from the following:

Capillary Die L/D = 60/4
For a MVR - range from approximately 0.6 - 60 cm^3/10 min.
Order number.....4.23.485

Capillary Die L/D = 60/2
For a MVR - range from approximately 5 - 500 cm^3/10 min.
Order number.....4.23.491

Melt connection

The melt connection on the SSR measuring head has an inlet bore of 8 mm; the melt return is accomplished through an annular gap line. This means that the user must supply only a single tapped hole as a melt connection. The standard connection has a connecting thread of size M26 x 1.5. Using this connector, the SSR does not require any additional support.
If the smallest connection (thread of M18 x 1.5) is used, then the user must provide additional mounting support for the SSR measuring head.

Standard Melt Connection M26 x 1,5

Order Number 5.42.215

We can manufacture other melt connections on request according to your specifications.

Pressure Transducers

For the measurement of the melt pressure drop across the inlet and discharge of the capillary die, two pressure transducers are required. A third transducer is necessary if the dual die design is chosen. The connection from transducer stem to transducer head is equipped with a flexible insulating covering. The transducer head is placed in an insulated housing.
Please note with the selection of pressure transducer, that you get the highest possible accuracy between 10% and 90% of the nominal values of pressure transducers.

Test Pressure transducers

The following applies for all pressure transducers:

Quality Class I:	combined error ± 0.5 % FSO
Temperature:	max. 400 °C (diaphragm)
Thread:	1/2"-20 UNF-2A
Flexible Stem:	length = 18", insulated

Test Pressure transducer 50 bar

Order number 5.40.670

Test Pressure transducer 100 bar

Order number 5.40.671

Test Pressure transducer 200 bar

Order number 5.40.672

Executions of Control cabinet

Electronics Cabinet Standard

for installation of control electronics. The connection cable from the measuring head to the control cabinet is lead into the control cabinet on the right side.

Dimensions: W = 600mm, D = 400mm, H = 1300mm, with base
Finish: Pebble grey RAL 7032
Order number.....5.41.220

Alternatively to the control cabinet standard, the control electronics can be installed in one of the following cabinets:

Electronics Cabinet PS 4606

for installation of control electronics.

Dimensions: W = 600mm, D = 600mm, H = 2000mm, without base
Finish: Pebble grey RAL 7032
Order number.....5.37.307

Electronics Cabinet PS 4808

for installation of control electronics.

Dimensions: W = 800mm, D = 800mm, H = 2000mm, without base
Finish: Pebble grey RAL 7032
Order number.....5.37.257

Base 100mm for Electronics Cabinet PS 4606

Order number.....8.50.346

Base 200mm for Electronics Cabinet PS 4606

Order number.....8.50.367

Base 100mm for Electronics Cabinet PS 4808

Order number.....8.50.350

Base 200mm for Electronics Cabinet PS 4808

Order number.....8.50.368

The following options can only be used in connection with the high control cabinets PS 4606 and PS 4808:

By standard, the connection cable from the measuring head to control cabinet is lead into the control cabinet on the right side. Furthermore the following versions are applicable:

Version of control cabinet

with cable bushing from **below** into the control cabinet. Installation of fan and filter in the front door, the left and right side wall of control cabinet are kept free.
Order number.....5.36.086

Version of control cabinet

with cable bushing from **the top** into the control cabinet. Installation of fan and filter in the front door, the left and right side wall of control cabinet are kept free.
Order number.....5.36.150

By standard, the connection cables of measuring head sensors are connected in the control cabinet by means of plug-in units. For this purpose following alternative is also applicable:

Connection of the sensors via terminal strips

Order number 5.41.341

Select one of the following **Power Supplies** for the SSR:

Power Supply 207…253V~, 1L+N+PE / 50Hz

Voltage: 207…253V, single-phase operation
Permissible voltage fluctuations: ± 0 %
Frequency: 50 Hz ± 1%
Power consumption: Approx. 3.2 kW
Order number.....5.41.005

Power Supply 360…440V~, 3L+N+PE / 50Hz

Voltage: 3 x 360…440V, three-phase four-wire system
Permissible voltage fluctuations: ± 0 %
Frequency: 50 Hz ± 1%
Power consumption: Approx. 3.2 kW
Order number.....5.41.025

Power Supply 360…440V~, 3L+PE / 50Hz

Voltage: 3 x 360…440V, three-phase three-wire system
Permissible voltage fluctuations: ± 0 %
Frequency: 50 Hz ± 1%
Power consumption: Approx. 3.2 kW
Order number.....5.41.026

Power Supply 207…253V~, 3L+PE / 60Hz

Voltage: 3 x 207…230V, three-phase three-wire system
Permissible voltage fluctuations: ± 0 %
Frequency: 60 Hz ± 1%
Power consumption: Approx. 3.2 kW
Order number.....5.41.006

The Power Supplies must be executed with a fixed connection and an additional protective conductor (10mm² CU) in accordance DIN VDE 0160 because of an increased stray current. The only application of the FI-protection circuit is not allowed.

Other power supply voltages available on request.

Computer Configuration

The rheometer 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 Rheometer
- ❑ Stand alone mode with Host Connection: manual operation at the rheometer and test data transmission to a process control system
- ❑ Remote mode: Host Connection, controlling and test date processing via a process control system

Adjusted to the requirements of the user and the desired control concept, different computer configurations are possible:

- ❑ Desktop Personal Computer stand alone or remote mode possible
- ❑ Industrial Workstation integrated in the control cabinet: stand alone or remote mode possible
- ❑ Single-Board-Computer integrated in the control cabinet: only usable in remote mode

Personal Computer

If the rheometer should be operated via a PC, please see the necessary hardware requirements as listed on page 9 of this product description.
If Goettfert should supply the operation PC, please contact us for a suitable offer which fulfills these requirements.

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

Industrial Workstation

with integrated color display and membrane keypad, installed in the door of control cabinet, for operating the rheometer in stand alone mode or optionally with Host Connection, equipped with:

- Processor P233, 64MB RAM, 4 ser. + 1 parallel interface, ISA VGA graphic
- Hard disk 3 GByte, 3.5" FDD in the front panel, lockable
- IMOLA Front panel with color display, membrane keypad and mouse sensor
- With UPS (uninterruptible power supply) 24V/100W
- 12.1" color TFT display
- MF2-keyboard
- Windows NT® Workstation 4.0 with Service Pack 5 in English or German

The previous listed equipment may vary depending on the application.
The Industrial Workstation can be used only together with the high built cabinets, Option 5.37.307 or 5.37.257.

Industrial Workstation, English Version

Order Number: 5.40.695

Industrial Workstation, German Version

Order Number: 5.40.694

Single Board Computer

A single board computer (SBC) can be used to control the test device alternatively to a desktop PC or an industrial workstation.
The SBC can be installed in a standard control cabinet and works without display and keyboard. All operation functions have to be taken over by the DCS. It is not possible to operate and control the rheometer via the control cabinet.
For commissioning and servicing purposes it is possible to connect a monitor and a keyboard.

Since the controlling of the single board of computer takes place from the process control system, the software - interface between SBC and process computers (Modbus or another protocol) must be specified.

The single board computer can be supplied only in connection with the operating system MS - DOS and the Rheo on-line software for DOS!

Please contact us for an actual offer about a Single Board Computer.

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, one serial interface card for PCI-bus (only by PC and IWS) 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
Order Number 5.40.308
German version of the remote control software
Order Number 5.40.319

Remote Access for Industrial Workstation / IWS

English version of the remote control software
Order Number 5.40.321
German version of the remote control software
Order Number 5.40.320

Remote Access for Single-Board-Computer / SBC

English version of the remote control software
Order Number 5.40.323
German version of the remote control software
Order Number 5.40.322

Serial Interfaces

For detailed information on the available serial interfaces and their intended application – please refer to page 22 ‘Application of Serial Interfaces’.

For connecting the **control electronics** to the operating **PC** following serial interfaces are available:

RS 232 Interface
With connection cable to the PC with connection at the standard RS232 PC-interface.
Order Number 5.39.179

RS 485 Interface with PC plug in card
With interface in the control cabinet, connection cable and PC plug in card, opto-isolated.
Order Number 5.39.193

RS 485 Interface with interface at the PC
With interface in the control cabinet, connection cable and RS 485 <> RS 232 interface to connect at the standard RS 232 PC-interface, opto-isolated. The connection of the interface at the PC is executed as 25-poles socket or via an adapter as 9-poles socket (female).
Order Number 5.39.171

20mA Interface (TTY)
With interface in the control cabinet, connection cable and PC plug in card, opto-isolated.
Order Number 5.39.172

For connecting the **PC** and the **Device Control System (DCS)** the following serial interfaces are available:

RS 232 Interfaces
With connection cable from the standard RS 232 PC-interface to the DCS.
Order Number 6.82.506

RS 485 Interfaces with PC plug in card
With PC plug in card and connection cable from PC to the DCS, opto-isolated.
Order Number 5.39.194

RS 485 Interfaces with interface at the PC
With RS 485 <> RS 232 interface at the standard RS 232 PC-interface and connection cable from PC to the DCS, opto-isolated.
Order Number 5.39.177

20mA Interfaces (TTY)

With PC plug in card and connection cable from PC to the DCS, opto-isolated.
Order Number 5.39.178

If the PC is provided by the customer we recommend the serial interface configuration 'RS 485 Interfaces with interface at the PC'. By this implementation you have not to make changes in your PC-hardware to realize a RS485 connection.

The standard scope of supply includes a 3m connection cable, which is delivered together with your ordered serial interface. If you require a longer connection cable, you have to order the additionally required length (see options 'cable extension of interfaces' on page 22).

For Connecting the **Industrial Workstation (IWS)** or **Single Board Computer (SBC)** to the **Device Control System (DCS)** following serial interfaces are available:

RS 232 Interfaces

With connection cable from control cabinet to the DCS.
Order Number 5.39.173

RS 485 Interfaces

With RS 485 <> RS 232 interface in the control cabinet and connection cable from the control cabinet to the DCS, opto-isolated.
Order Number 5.39.174

20mA Interfaces

With 20mA <> RS 232 interface in the control cabinet and connection cable from control cabinet to the DCS, opto-isolated.
Order Number 5.39.175

The standard scope of supply includes a 3m connection cable, which is delivered together with your ordered serial interface. If you require a longer connection cable, you have to order the additionally required length (see options 'cable extension of interfaces' on page 21)

The standard connection cable to the DCS is executed for connection to terminal strips. If required, the connection cable at DCS connection side can be additionally equipped by a plug connector with shielded housing:

Connection 9-polig Socket (female) DSUB

Order Number 5.39.181

Connection 9-polig Plug (male) DSUB

Order Number 5.39.182

Connection 25-polig Socket (female) DSUB

Order Number 5.39.183

Connection 25-polig Plug (male) DSUB

Order Number 5.39.184

Cable extensions of the interfaces

To the extension of the serial connection of:

- ❑ Electronic and PC or
- ❑ PC and Device Control System or
- ❑ Industrial Workstation or Single Board Computer and Device Control System

The standard connection cable and the respective extension are supplied as one unit.

Cable extension of RS 232 interface

The connecting cable can be extended to a maximum of 12 m. Please specify the cable extension (m) when placing the order.

Order Number 5.39.159

Cable extension of RS 485 interface

The connecting cable can be extended to a maximum of 1000 m. Please specify the cable extension (m) when placing the order.

Order Number 5.39.195

Cable extension of 20mA interface

The connecting cable can be extended to a maximum of 1000 m. Please specify the cable extension (m) when placing the order.

Order Number 5.39.180

Application of Serial Interfaces

RS 232: for short distances (max. 12m) between operation PC and rheometer – for example for laboratory applications.

RS 485: for larger distances (up to 1000m) for production applications, not sensitive by suppression of common-mode interference's, BUS system, high data transmission rate (up to 100 kBaud).

20 mA: for larger distances (up to 1000m) for production applications, safe data transfer by transmission via impressed current, low data transmission rate (normally max. 9600 Baud).

Analog test data output

There are 2 programmable analog outputs available in addition to the preassigned outputs listed below.

Both **programmable analog outputs** are configured separately via a menu in the Rheo Online Software. One measured or calculated signal of the single-point measurement can be selected for each programmable analog output ordered:

- speed-, pressure-, melt temperature- and steel temperature values
- melt index MFR(TM), temperature compensated melt index MFR(T0)
- melt volume index MVR(TM), temperature compensated melt volume index MVR(T0)
- apparent viscosity, apparent shear stress and apparent shear rate

The output range of the two programmable analog outputs can be set in two ways:

- manually firm adjustable ranges.
- automatic range selection between several free defined ranges. The indication of the active ranges is given via digital outputs.

The following values apply for all analog outputs:

Output:	4 - 20 mA, potential free
Load:	0 - 600 ohms
Accuracy:	< 0.08 % from the limit value

Programmable analog output 1

Output current 4 - 20 mA

Order number.....5.42.001

Programmable analog output 2

Output current 4 - 20 mA

Order number.....5.42.002

Analog output pressure P1

Output current 4 - 20 mA corresponding 0 - Pnom.

Order number.....5.42.003

Analog output pressure P2

Output current 4 - 20 mA corresponding 0 - Phnom.

Order number.....5.42.004

Analog output melts temperature TM

Output current 4 - 20 mA corresponding 0 - 480°C, non-linearized

Order number.....5.42.006

Digital Outputs

The option digital output contains 8 potential free relay-outputs. Output 1 is realized as a change-over contact and the outputs 2-8 are realized as closing contacts.
For technical data see 'Technical Data Control Electronics'.

The digital outputs are individually configured in the Rheo On-line Software for Windows NT/2000.

Following signals can be given out via digital outputs:

- **EOAS - End of Analysis Signal**
  To find out, in connection with the analog outputs, when a test point was taken, there is given a pulse over a digital output. The signal can be realized as an opening or closing contact.
  The first digital output will be designated.

- **Limit Value Indicator**
  The operation program supports user defined limit values for all measured and calculated values. If the limit of a value is exceeded, a signal can be output digitally.
  For each limit value you need one digital output.

- **Operation state**
  Following states are given out:
  - motors in operation
  - test active
  - standby mode active
  - error active

  One digital output is required for one status signal.

- **Automatic Range Switching - ARS**
  For the options „programmable analog outputs": The automatic range switching can be used for improvement of the resolution range, when a connection to the DCS is made via the programmable analog outputs. That means there are several ranges defined for a value to be measured, between which the rheometer can switch automatically. The indication of the active measuring range is coded via digital outputs.

  The quantity of possible measuring ranges is calculated out of the equation 2 raised to n, where n is the amount of digital outputs, which are applicable for this analog output. Please see the below table:

Max. quantity of applicable measuring ranges	Required digital outputs
2	1
4	2
8	3
16	4

Digital Outputs

8 potential-free relay contacts (the first is a change-over contact and the other 7 are closing contacts)

Order Number 5.40.328

Start/Stop at the extruder

Separate console with emergency stop switch and two start/stop buttons with following functions:

Start Standby:	the pumps are started in standby mode
Start test:	the test is started from standstill or standby mode
Stop test:	the test is finished and the pumps work in standby mode
Stop Drives:	the test is finished and the pumps are switched off, the heating remains in operation.

We recommend that this console should be used if the PC is not positioned in the immediate vicinity of the measuring head.

The console must be mounted by the customer. The connection on the console is made via the supplied cable with connector. The standard cable length is made up of a 3m cable from the control electronics to the measuring head and a 3m cable from the console to the measuring head.

Order number.....5.41.015

Cable extension Start/Stop - control electronics

The connecting cable is made up of the cable extension between control electronics and measuring head and the cable extension between measuring head and console. Please specify the cable extension (m) when placing the order.

Order number.....5.40.211

ETA/MFR display at the extruder

4-digit digital display which indicates the viscosity or the MFR value. This display uses **programmable analog output 1**. Therefore there is only one other programmable analog output available.

The digital display must be mounted by the customer. The connection on the display ensues via the supplied cable with connector. The standard cable length is made up of a 3m cable from the control electronics to the measuring head and a 3m cable from the console to the measuring head.

Order number.....5.40.214

Cable extension ETA/MFR display - control electronics

The connecting cable is made up of the cable extension between control electronics and measuring head and the cable extension between measuring head and console. Please specify the cable extension (m) when placing the order.

Order number.....5.40.213

Cable extension measuring head - control electronics

The connecting cable between the measuring head and Control Electronics can be extended up to 200m. The cable extension has a 3m protective sheath at either end.
Please specify the cable extension (m) when placing the order.

Order number.....5.41.342

Engineering Support

On request, Goettfert can provide special engineering assistance to our customers. This support would cover following:

- ❑ Customer will be provided with detailed plans, drawings for adaptation of the rheometer on customer site
- ❑ A dummy model of the rheometer (dimensional accordance to original rheometer) for evaluation of the space requirements on extruder side
- ❑ Negotiations and discussions for the best solution with the extruder manufacturer to optimize spool piece and rheometer adapter as well as joint supply of both parts
- ❑ Definition of optimal test parameters for the customer material grades in Goettfert's lab to optimize the calibration of the rheometer at customer site

Order number.....9.01.557

The Side-Stream Rheometer SSR can also be supplied in explosion-proof design.

❑

Subject to change due to technical developments

SIDE-STREAM RHEOMETER SSR

Short text for quotation, confirmation, delivery note and bill

Order number	Naming

5.42.200 **SSR basic model**
consisting of measuring head, control electronics, Rheo-Online Software and accessories.

Options:

5.42.220 **German Version SSR**
Control cabinet lettering and user information in German.

5.42.221 **English Version SSR**
Control cabinet lettering and user information in English.

5.42.222 **Operation manual SSR German**

5.42.223 **Operation manual SSR English**

4.23.485 **Capillary die L/D = 60/4**

4.23.491 **Capillary die L/D = 60/2**

5.42.215 **Melt Connection Standard M26 x 1,5**

5.40.670 **Test Pressure transducer 400°C, 0-50bar**
Thread: 1/2"-20UNF-2A
Class I: ±0.5% of nominal value
Insulated cable

5.40.671 **Test Pressure transducer 400°C, 0-100bar**
Thread: 1/2"-20UNF-2A
Class I: ±0.5% of nominal value
Insulated cable

5.40.672 **Test Pressure transducer 400°C, 0-200bar**
Thread: 1/2"-20UNF-2A
Class I: ±0.5% of nominal value
Insulated cable

5.41.220 **Electronics Cabinet Standard**
Width:600mm, depth:400mm, height:1300mm

5.37.307 **Electronics Cabinet PS 4606**
Width:600mm, depth:600mm, height:2000mm

5.37.257 **Electronics Cabinet PS 4808**
Width:800mm, depth:800mm, height:2000mm

8.50.346 **Base 100mm for Electr. Cabinet PS4606**

8.50.367 **Base 200mm for Electr. Cabinet PS4606**

8.50.350 **Base 100mm for Electr. Cabinet PS4808**

8.50.368 **Base 200mm for Electr. Cabinet PS4808**

5.36.086 **Version of Control cabinet**
with cable bushing from below into control cabinet

5.36.150 **Version of Control cabinet**
with cable bushing from the top into control cabinet

5.41.341 **Connection of the sensors via terminal strips**

5.41.005 **Power supply 207…253V, 1L+N+PE, 50Hz**
single-phase operation.

5.41.025 **Power supply 360…440V, 3L+N+PE, 50Hz**
three-phase four-wire system.

5.41.026 **Power supply 360…440V, 3L+PE, 50 Hz**
three-phase three-wire system.

5.41.006 **Power supply 207…253V, 3L+PE, 60Hz**
three-phase three-wire system.

5.13.300 **Special table**
Width:1100mm, depth:750mm, height:720mm

5.40.695 **Industrial Workstation**
English Version

5.40.694 **Industrial Workstation**
German Version

5.40.308 **Remote Access for PC (desktop)**
English Version

5.40.319 **Remote Access for PC (desktop)**
German Version

5.40.321 **Remote Access for IWS**
English Version

5.40.320 **Remote Access for IWS**
German Version

5.40.323 **Remote Access for SBC**
English Version

5.40.322 **Remote Access for SBC**
German Version

5.39.179 **RS 232 interface (Electr.-PC)**

5.39.193 **RS 485 interface (Electr.-PC)**
With interface in the control cabinet
and PC card

5.39.171 **RS 485 interface (Electr.-PC)**
With interface in the control cabinet
and RS485<>RS232 interface at the PC

5.39.172 **20mA interface (TTY) (Electr.-PC)**
With interface in the control cabinet
and PC card

6.82.506 **RS 232 interface (PC-PLS)**

5.39.194 **RS 485 interface (PC-PLS)**
With PC card and connection cable to the
DCS

5.39.177 **RS 485 interface (PC-PLS)**
With RS485<>RS232 interface at the PC
and connection cable to the DCS

5.39.178 **20mA interface (TTY), (PC-PLS)**
With PC card and connection cable to the
DCS

5.39.173 **RS 232 interface (IWS,SBC-PLS)**
With connection cable to the DCS

5.39.174 **RS 485 interface (IWS,SBC-PLS)**
With interface in the control cabinet
and connection cable to the DCS

5.39.175 **20mA interface (TTY), (IWS,SBC-PLS)**
With interface in the control cabinet and connection cable to the DCS

5.39.181 **Connection 9-polig socket DSUB**
for connection cable PC, IWS, SBC - PLS

5.39.182 **Connection 9-polig plug DSUB**
for connection cable PC, IWS, SBC - PLS

5.39.183 **Connection 25-polig socket DSUB**
for connection cable PC, IWS, SBC - PLS

5.39.184 **Connection 25-polig plug DSUB**
for connection cable PC, IWS, SBC - PLS

5.39.159 **Cable extension of RS232 interface**
Specify the cable extension (m) when placing the order.

5.39.195 **Cable extension of RS485 interface**
Specify the cable extension (m) when placing the order.

5.39.180 **Cable extension of 20mA interface**
Specify the cable extension (m) when placing the order.

5.42.001 **Programmable analog output 1**
for all test values of single point measurement, output 4 - 20 mA

5.42.002 **Programmable analog output 2**
for all test values of single point measurement, output 4 - 20 mA

5.42.003 **Analog output pressure P1**
Output current 4 - 20 mA

5.42.004 **Analog output pressure P2**
Output current 4 - 20 mA

5.42.006 **Analog output melt temperature TM**
Output current 4 - 20 mA, non-linearized

5.40.328 **Digital Outputs**
8 potential-free relay contacts

5.41.015 **Start/Stop at extruder**
console with emergency stop and start/ stop buttons, mounted by the customer.

5.40.211 **Cable extension Start/Stop-Control**

Electronics, specify the cable extension (m) when placing the order (max. 17m)

5.40.214 ETA/MFR display at the extruder
4-digit digital display for viscosity or MFR, mounted by the customer

5.40.213 Cable extension ETA/MFR displ.-Control
Electronics, specify the cable extension (m) when placing the order (max. 17m)

5.41.342 Cable extension meas.head-Control Elect.
Specify the cable extension (m) when placing the order

9.01.557 Engineering Support
engineering assistance to our customers

❑