EN

Baumer

PF20x-xx0xx

Flow Sensor with 2 Analog Outputs



Operating Instructions

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1. General

1.1 Information Concerning these Instructions

- These instructions apply to the product with ID code PF20x-xx0xx.
- They make it possible to use the product safely and efficiently.
- These instructions are an integral part of the product and must be kept on hand for the entire duration of its service life.
- Local accident prevention regulations and national work safety regulations must be complied with as well.
- The product is subject to further technical development, and thus the information contained in these operating instructions may also be subject to change. The current version can be found at www.baumer.com in the product's separate download area.



NOTE!
The operating instructions must be read carefully before using the product and must be kept on hand for later reference!

1.2 Explanations of Symbols

- Safety precautions and warnings are emphasized by means of symbols and attention-getting words.
- Safe use of the product is only possible if these safety precautions and warnings are adhered to.
- The safety precautions and warnings are laid out in accordance with the following principle:



Attention-Getting Word
Type and Source of Danger!
Possible consequences in the event that the hazard is disregarded.
- Measures for averting the hazard.

The meanings of the attention-getting words, as well as the scope of the associated hazards, are listed below.



DANGER!
This word indicates a hazard with a high degree of risk which, if not avoided, results in death or severe injury.



WARNING!
This word indicates a hazard with a medium degree of risk which, if not avoided, may result in death or severe injury.



CAUTION!
This word indicates a hazard with a low degree of risk which, if not avoided, may result in minor or moderate injury.

ATTENTION!
This word draws attention to a potentially hazardous situation which, if not avoided, may result in property damage.

NOTE!
A note draws attention to useful tips and suggestions, as well as information regarding efficient, error-free use.

1.3 Limitation of Liability

- The product has been developed in consideration of the current state-of-the-art and applicable standards and guidelines. Subject to change without notice. A valid declaration of conformity can be accessed at www.baumer.com in the product's separate download area.
- Baumer Electric AG (hereinafter referred to as "Baumer") excludes all liability in the event of:
    - Non-compliance with the instructions
    - Use of the product for purposes other than those intended
    - Use by untrained personnel
    - Use of unapproved replacement parts
    - Unapproved modification of products
- These operating instructions do not include any guarantees from Baumer with regard to the described procedures or specific product characteristics.
- Baumer assumes no liability for printing errors or other inaccuracies contained in these operating instructions, unless Baumer was verifiably aware of such errors at the point in time at which the operating instructions were prepared.

1.4 Copyrights

- The contents of these instructions are protected by copyright law.
- All rights are reserved by Baumer.
- Commercial reproduction or any other commercial use of the provided content and information, in particular graphics and images, is not permitted without previous written consent from Baumer.

2. For Your Safety

2.1 Use for Intended Purpose

The product is based on the following functional principle:

Flow Sensor
The Flow Sensor measures the flow rates of oily and aqueous media in closed piping systems.
The Baumer Flow Sensor functions in accordance with the calorimetric measuring principle. This makes it possible to monitor the temperature of the medium in addition to the flow rate. The sensor detects changes to both characteristic process values and converts them into an electrical signal.
The sensor is equipped with 2 analog outputs (4 ... 20 mA).

This product can be used in the following industry sectors:

- Special machinery manufacturing
- Heavy machinery manufacturing
- Logistics
- Automotive industry
- Food industry
- Packaging industry
- Pharmaceuticals industry
- Clothing industry
- Plastics industry
- Woodworking industry
- Consumer goods industry
- Paper industry
- Electronics industry
- Glass industry
- Steel industry
- Printing industry
- Construction industry
- Chemicals industry
- Agriculture industry
- Alternative energy
- Raw materials extraction

2.2 Use for Other than the Intended Purpose

- Not a safety component in accordance with 2006/42/EC (Machinery Directive).
- The product is not suitable for use in potentially explosive atmospheres.
- The product may only be used with accessories supplied or approved by Baumer, or in combination with approved products. A list of approved accessories and combination products can be accessed at www.baumer.com on the product detail page.



DANGER!
Risk of personal injury or property damage in case of use for other than the intended purpose!
Use for other than the intended purpose may lead to hazardous situations.
- Instructions regarding use for intended purpose must be observed.

2.3 Personnel Qualifications

- Suitable technical training is a prerequisite.
- In-house electronics training is required.
- Trained personnel must have uninterrupted access to the operating instructions.



DANGER!
Risk of personal injury or property damage in case of incorrect initial start-up and maintenance!
Personal injury and damage to equipment may occur.
- Adequate training and qualification of personnel.

2.4 Modification of Products



DANGER!
Risk of personal injury or property damage if the product is modified!
Personal injury and damage to equipment may occur. Non-observance may result in loss of the CE marking and the guarantee may be rendered null and void.
- Modification of the product is impermissible.

2.5 General Safety Precautions

NOTE!

- These instructions are an integral part of the product and must be kept on hand for the entire duration of its service life.
- In the event of possible changes, the respectively current version of the operating instructions can be accessed at www.baumer.com in the product's separate download area.
- Read the operating instructions carefully before using the product.
- Protect the sensor against contamination and mechanical influences.
- Installation and removal of the product are only permissible in pressure-free piping systems which have been allowed to cool down.

2.6 Approvals and IP Protection

3. Technical Data

Order Number / Technical Data	PF20x-xx0xx
Sensor-Specific Data Flow	
Flow measuring range within a medium temperature range of −25…125° C	10 ... 400 cm/s
Medium	Water
Flow measurement error	2 %
Reaction time in case of abrupt temperature change	< 10 s
Sensor-Specific Data Temperature	
Temperature measuring range	−25 … 150° C
Medium	Water
Temperature measurement error	± 1° C
Step response time T90	< 5 s
Ambient Conditions	
Ambient temperature	−25…80 °C
Media temperature	−25…125 °C
Storage and transport temperature	−25…80 °C
Relative humidity	100%
EMC	EN 61326-1
Shock resistance per DIN EN 60068-2-27	50 g / 11 ms
Vibration resistance per DIN EN 60068-2-6	20 g (10 … 2000 Hz)
Electrical Data	
Supply power	12…32 V DC
Current consumption (Uo = 24 V)	≤ 45 mA
Short-circuit proof	Yes
Reverse polarity and overload-proof	Yes
Analog output	4 ... 20 mA
Output load resistance	$< \frac{(U_b - U_{min})}{20\ mA}$
Protection class	III
Operating delay time	< 10 s
Mechanical Data	
Housing material	Stainless steel 1.4404
Media contacting materials	Stainless steel 1.4404
Protection	IP68, IP69K
Connector Type	M12×1, 4-pin
Process connection	See data sheet
Process connection length PCL	See data sheet

Probe length PL	See data sheet
Rod diameter	6 mm
Connection cable length	up to 30 m
Output Function	
Analog flow rate output	Pin 2
Analog temperature output	Pin 4

The following table specifies the tightening torques of the plugs and mounting options in order to assure compliant, error-free operation:

Connector Type	Tightening Torque (Nm)
M12	0,4



CAUTION!

- Pressure resistance specified in the data sheet always makes reference to the sensor rod.
- Amongst other factors, the system's pressure resistance is also dependent on the utilized mounting components (adapters), and is only as high as the pressure resistance of the weakest component.

3.1 Permissible Flow Rate

Maximum permissible flow rate depending on the temperature of the medium, pressure and probe length:

Pressure	Probe Length					Medium Temperature
	10 mm	50 mm	100 mm	150 mm	200 mm	
PN25 (25 bar)	400 cm/s	400 cm/s	400 cm/s	400 cm/s	400 cm/s	20° C
						60° C
						100° C
						150° C
PN40 (40 bar)	400 cm/s	400 cm/s	400 cm/s	400 cm/s	400 cm/s	20° C
						60° C
						100° C
					350 cm/s	150° C
PN64 (64 bar)	400 cm/s	400 cm/s	400 cm/s	400 cm/s	200 cm/s	20° C
					150 cm/s	60° C
						100° C
						150° C
PN100 (100 bar)	400 cm/s	400 cm/s	400 cm/s	400 cm/s	Not permissible	20° C
				350 cm/s		60° C
						100° C
				300 cm/s		150° C

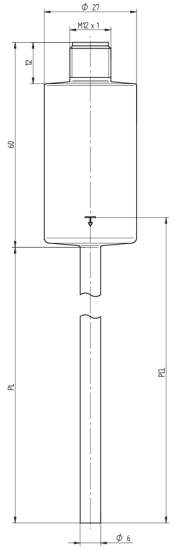
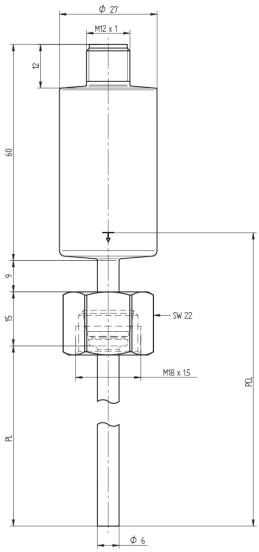
3.2 Volumetric Flow

The Flow Sensor measures the flow rate at the tip of the sensor.
The pipe's inside diameter and the flow rate must be known in order to determine volumetric flow within a piping system. A volumetric flow calculator can be downloaded from www.baumer.com.

Nominal Size / Inside dia. / Flow Rate	DN25	DN40	DN65	DN100
	28.5 mm	43.1 mm	70.3 mm	107.1 mm
100 cm/s	33 l/min	80 l/min	220 l/min	521 l/min
150 cm/s	50 l/min	120 l/min	330 l/min	782 l/min
200 cm/s	66 l/min	160 l/min	441 l/min	1043 l/min
250 cm/s	83 l/min	200 l/min	551 l/min	1303 l/min
300 cm/s	100 l/min	239 l/min	661 l/min	1564 l/min
350 cm/s	116 l/min	279 l/min	771 l/min	1824 l/min
400 cm/s	133 l/min	319 l/min	881 l/min	2085 l/min

3.3 Housing Dimensions

Overall housing dimensions are included in the respective data sheet.

Cutting/Locking Ring	M18 × 1 Sealing Cone
	

Process connection length PCL in the case of a cutting/locking ring = probe length PL + 9 mm
Process connection length PCL in the case of an M18×1 sealing cone = probe length PL + 32 mm

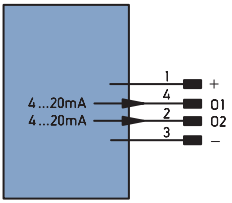
NOTE!

- There's a marking on the sensor's sleeve (see figure).
- This is a reference point (starting point) relative to the length of the process connection (see data sheet or instructions), and provides assistance in correctly positioning the sensor within the piping system.



3.4 Wiring Diagram

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Legend

+	Supply Voltage +	
–	Supply Voltage 0 V	
~	Supply Voltage (AC Voltage)	
A	Switching Output	(NO)
Ā	Switching Output	(NC)
V	Contamination/Error Output	(NO)
V̄	Contamination/Error Output	(NC)
E	Input (analog or digital)	
T	Teach Input	
Z	Time Delay (activation)	
S	Shielding	
RxD	Interface Receive Path	
TxD	Interface Send Path	
RDY	Ready	
GND	Ground	
CL	Clock	
E/A	Output/Input programmable	
	IO-Link	
PoE	Power over Ethernet	
IN	Safety Input	
OSSD	Safety Output	
Signal	Signal Output	
Bl_D+/-	Ethernet Gigabit bidirect. data line (A-D)	
EN0 RS422	Encoder 0-pulse 0-0̄ (TTL)	
PT	Platinum measuring resistor	
nc	not connected	
U	Test Input	
Ū	Test Input inverted	
W	Trigger Input	
O	Analog Output	
O–	Ground for the Analog Output	
BZ	Block Discharge	
AMV	Valve Output	
a	Valve Control Output +	
b	Valve Control Output 0 V	
SY	Synchronization	
E+	Receiver-Line	
S+	Emitter-Line	
⏚	Grounding	
SnR	Switching Distance Reduction	
Rx+/–	Ethernet Receive Path	
Tx+/–	Ethernet Send Path	
Bus	Interfaces-Bus A(+)/B(–)	
La	Emitted Light disengageable	
Mag	Magnet activation	
RES	Input confirmation	
EDM	Contactor Monitoring	
ENA RS422	Encoder A/Ā (TTL)	
ENB RS422	Encoder B/B̄ (TTL)	
ENA	Encoder A	
ENB	Encoder B	
AMIN	Digital output MIN	
AMAX	Digital output MAX	
AOK	Digital output OK	
SY In	Synchronization In	
SY OUT	Synchronization OUT	
OLT	Brightness output	
M	Maintenance	

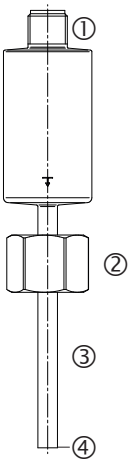
Wire Colors according to DIN IEC 757

BK	Black
BN	Brown
RD	Red
OG	Orange
YE	Yellow
GN	Green
BU	Blue
VT	Violet
GY	Grey
WH	White
PK	Pink
GNYE	Green/Yellow

3.5 Accessory Products

Baumer can provide you with suitable connection technology for your product. The products can be found at www.baumer.com.

3.6 Layout



① = plug connector
② = process connection
③ = sensor rod
④ = measuring probe

3.7 Scope of Delivery

- PF20x-xx0xx Flow Sensor
- Quick-start guide

4. Transport and Storage

4.1 Transport

Upon receipt of shipment, inspect the goods for damage in transit. In the case of damage, conditionally accept the package and notify the manufacturer of the damage. Then return the device, making reference to damage in transit.

4.2 Storage

The following points must be taken into condition with regard to storage:

- Do not store the product outdoors.
- Store the product in a dry, dust-free place.
- Protect the product against mechanical impacts.



ATTENTION!
Risk of property damage in case of improper storage!
The product may be damaged.
- Comply with storage instructions.

5. Installation and Electrical Connection

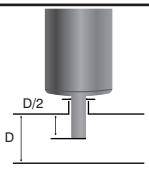
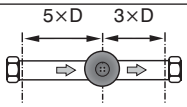
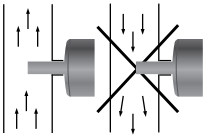
5.1 System Overview

Matching products for your device can be found at www.baumer.com.

5.2 Installation

- Protect the product from contamination during installation.
- Observe all applicable electrical and mechanical regulations, standards, and safety rules.
- Protect the product against mechanical influences.
- Make sure that the sensor is mounted in a mechanically secure fashion.
- Specified torque values must be complied with (see „3. Technical Data“ on page 9)

Mounting
Conditions for correct detection of the flow rate:

In order to correctly detect the flow rate, the tip of the sensor is positioned ideally in the middle of the pipe.	
Adequate distance from pipe bends and points at which cross-sections change must be maintained in order to correctly detect the flow rate.	
Install sensors in closed systems and riser pipes because detection of the flow rate is faulty in pipes which are open at the bottom.	

ATTENTION!
Risk of property damage in case of improper installation!
The product may be damaged.
- Comply with installation instructions.

CAUTION!
Risk of personal injury or property damage during installation!
Personal injury and damage to the product may occur.
- Ensure a safe installation environment.

5.3 Electrical Connection

• Connect the sensor to 12 to 32 V DC (see „3.4 Wiring Diagram“ on page 13)

DANGER!
Risk of personal injury or property damage due to electric current!
Voltage conducting parts may cause personal injury or damage to equipment.
• The electric device may only be connected by appropriately qualified personnel.

5.4 Diagnostics

Required action in case of fault:

NOTE!
• Shut down the machine.
• If the error cannot be eliminated, please contact Baumer’s support department.
• Do not operate in case of indeterminate malfunctioning.
• The machine must be shut down if the error cannot be unequivocally clarified or reliably eliminated.

DANGER!
Risk of personal injury or property damage in case of non-compliance!
The system’s safety function is disabled. Personal injury and damage to equipment.
• Required action as specified in case of fault.

6. Maintenance Instructions

NOTE!
• This Baumer sensor is maintenance-free.
• Cleaning and inspection of the plug connections at regular intervals is advisable.
• Do not clean the sensor with solvents or cleansers which could damage the product.
• The product must be protected against contamination during initial start-up.
• Contamination which adheres to the measuring probe distorts the measured value for flow rate.

7. Returns

Due to legal regulations and for the protection of employees, Baumer Electric AG requires a signed declaration of decontamination before your order can be processed. The corresponding form is available at www.baumer.com.

8. Proper Disposal

Baumer Electric AG does not accept the return of unusable or irreparable products. Respectively valid national waste disposal regulations apply to product disposal.

9. Appendix

9.1 EU Declaration of Conformity

The EU declaration of conformity can be found on our website at www.baumer.com in the product's separate download area.