

## Type 406020

### Paddle-wheel flow sensor



## Operating instructions

Specifications are subject to change without notice.

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# 1. INTRODUCTION

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## 1.1. Symbol used



Always follow instructions. Failure to follow instructions may endanger the user and/or be detrimental to the functionality of the instrument.

## 1.2. Safety instructions



Read these operating instructions as well as all other relevant documentation before installing and using the instrument. This is the only way to ensure you are using all the features the instrument offers.

- Please check to ensure the instrument is complete and not damaged.
- The customer is responsible for selecting the suitable sensor and ensuring it is installed and maintained correctly.
- The customer is responsible for ensuring that the instrument materials are chemically compatible with the liquid and cleaning agents.
- This instrument should only be installed or repaired by qualified specialists using adequate tools in accordance with the standards and regulations in force in the relevant country.
- Precautions appropriate for the process in use must be taken before the instrument is disconnected.
- Please observe the relevant safety requirements for operation, maintenance and repair of the instrument.
- Always make certain that the power supply is interrupted before making manual changes to the instrument / system.
- This instrument is sensitive to electrostatic discharge. The requirements of EN 61340-5-1 and 5-2 must be met to minimize or eliminate the possibility of damage caused by electrostatic discharge.
- Protect the instrument against electromagnetic interference, UV radiation and the effects of weather for outdoor applications.
- If these instructions are not followed and the instrument is not used according to directions, the manufacturer shall assume no liability and the warranty shall be voided.

### 1.3. Layout and principle of measurement

Sensor type 406020 is used for flow rate measurements of neutral or slightly aggressive but particle-free liquids.

The instrument consists of a measuring transducer and a measurement sensor fitted with an impeller. Four magnets are used in the impeller.

The impeller is set in motion by the flow of liquid, thereby generating a measurement frequency  $f$  in the measuring transducer proportional to the flow rate  $Q$ .

The conversion factor is the K factor of the fitting that is used, which is specific to each nominal width and workpiece. K factors are listed in the operating instructions.

The following versions are available:

- with 2 pulse outputs (Hall effect sensor with 2 transistor outputs, NPN and PNP)
- with one pulse output (low power Hall effect sensor, transistor output NPN)
- with one sine output (coil output)

The electrical connection is via an EN 175301-803 instrument connector.

## 2. INSTALLATION

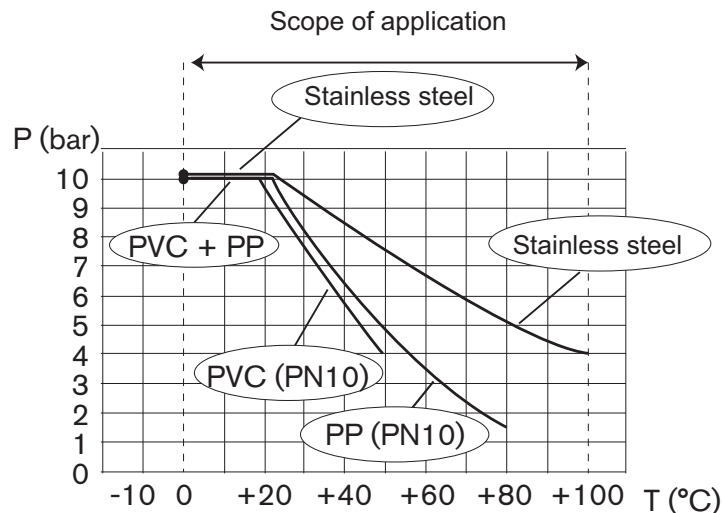
### 2.1. General information



Please follow the installation instructions for the fitting given in the operating instructions.

#### 2.1.1. Temperature/pressure diagram

The diagram shows the application range of the sensor+fitting combination for different fitting materials:



#### Caution during disassembly:

Precautions appropriate for the process in use must be taken before the sensor is dismantled (aggressive liquids, high liquid pressure and temperature, etc.).

### 2.2. Installing the sensor in the fitting

The 406020 flow rate sensor can be mounted in pipelines with specially developed 406090 fittings.

The flow rate sensor can be installed in either horizontal or vertical pipelines .

- When installing the sensor 5 (see Figure 1), follow the installation instructions given in section 2.1 and in the operating instructions.
- Push the union nut 3 onto the fitting 5 and allow the plastic ring 2 to engage in the guide bush 4.
- Carefully push the sensor into the fitting. If the sensor is correctly installed, it cannot be turned.



The union nut must only be tightened finger-tight!

- Screw the sensor housing together with the union nut 3 on the fitting.

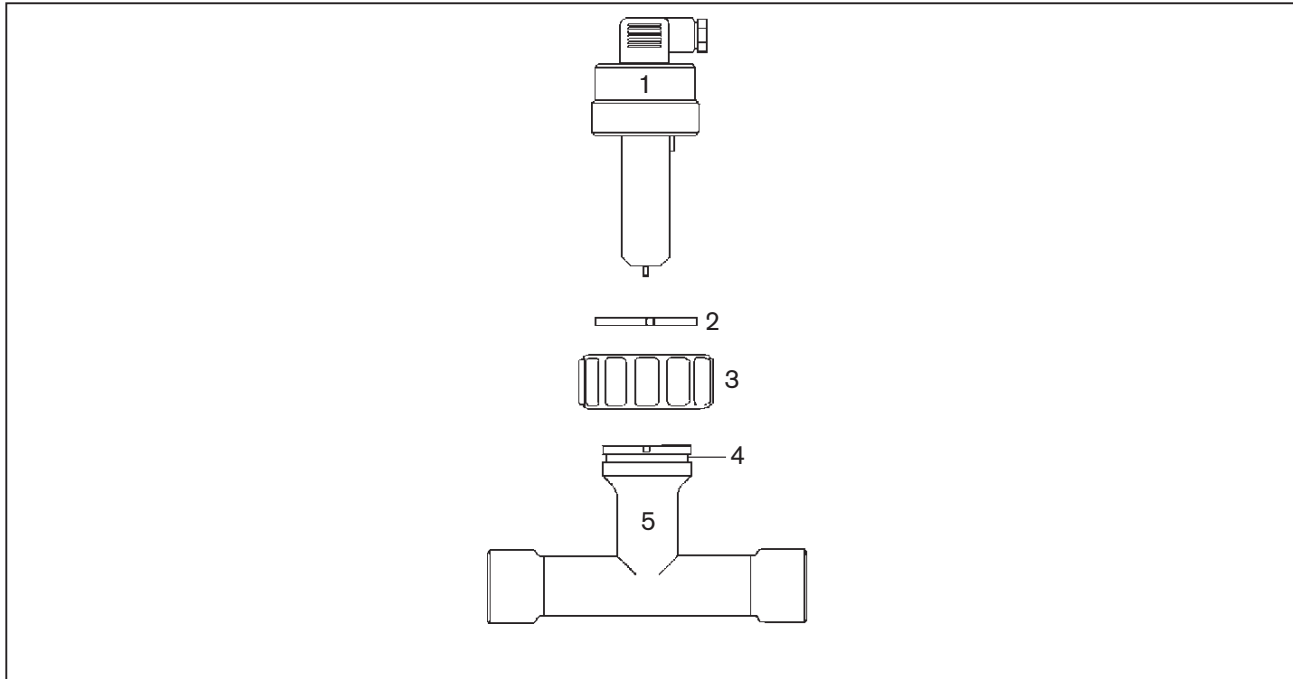


Figure 1: *Installing the sensor in the fitting*

### 2.3. Notes about the electrical connection

- Use only cable with temperature resistance to at least 80°C.
- Under normal operating conditions, the measurement can be transferred via a shielded cable with a cross-section of 0.75 mm<sup>2</sup>.
- The cable must not be installed in contact with lines conducting current at a higher voltage or frequency.
- If a combined installation is unavoidable, a minimum distance of 30 cm should be maintained.
- Use a filtered and regulated power supply.

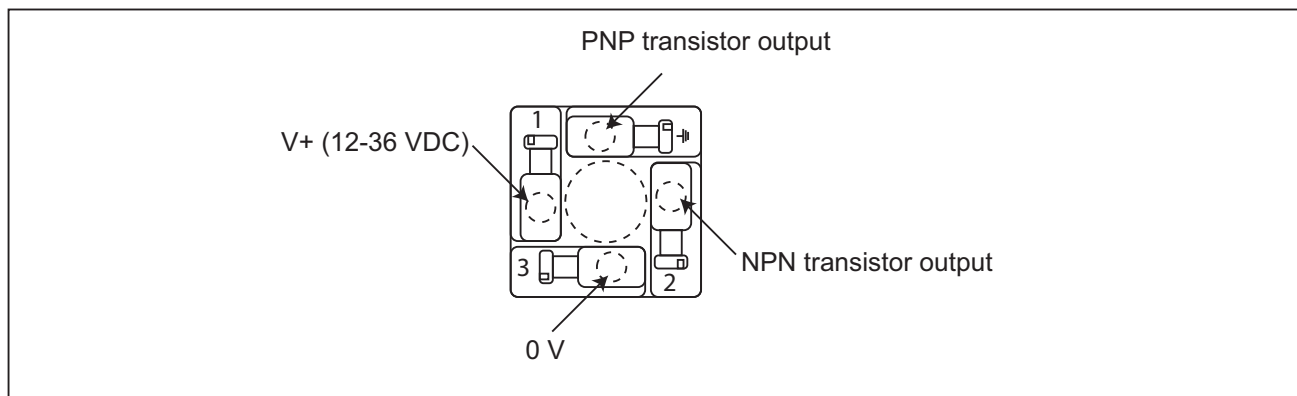
### 2.3.1. Assembly of socket type 2508

	<ul style="list-style-type: none"> <li>→ Unscrew the nut [1] on the cable gland.</li> <li>→ Remove the screw terminal strip [3] from the housing [2].</li> <li>→ Guide the cable through the nut [1] and then the seal [4], then through the cable gland and finally through the housing [2].</li> <li>→ Make the connections on the screw terminal strip [3] (see section 2.3.2, 2.3.3 or 2.3.4).</li> <li>→ Position the terminal strip [3] as desired in increments of 90° and then insert it in the housing [2] again by pulling lightly on the cable to minimize the length of the cable in the housing.</li> <li>→ Tighten the nut [1] on the cable gland.</li> </ul>
	<ul style="list-style-type: none"> <li>→ Insert the seal [5] between the socket and the EN175301-803 instrument connector and then connect the socket type 2508 in the instrument connector.</li> <li>→ Insert the screw [6] and tighten it to ensure a proper electrical contact and good seal.</li> </ul>

Figure 2: Assembly of socket type 2508 (included with delivery)

### 2.3.2. Wiring of the Hall effect version fitted with 2 pulse outputs

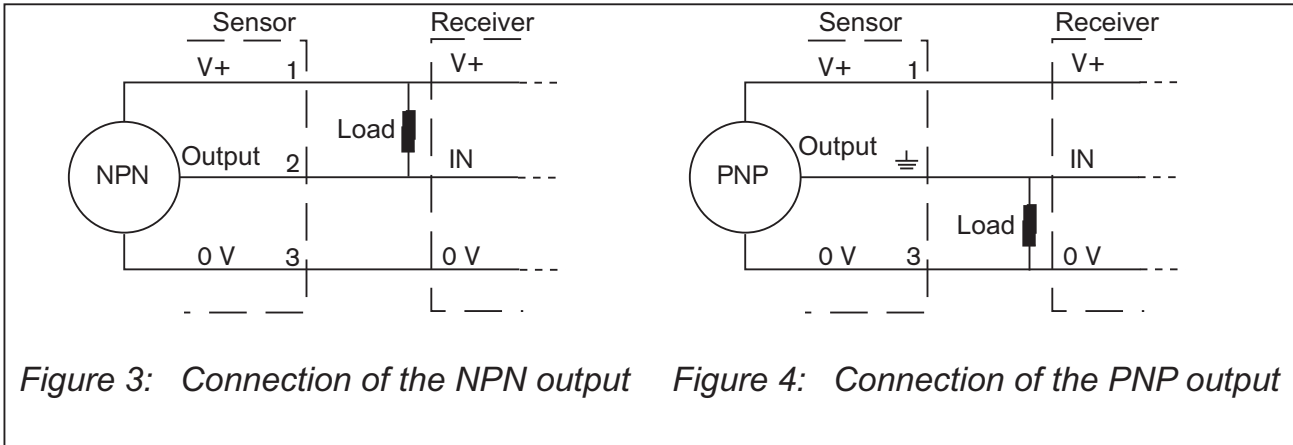
This version has an NPN transistor output and a PNP transistor output.



The max. cable length is 50 meters.

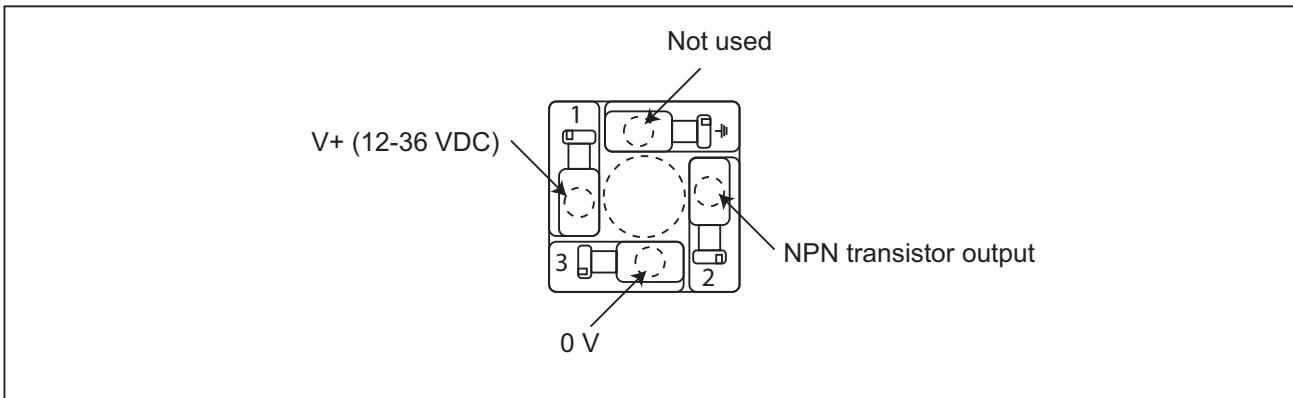
### Electrical connection of the NPN or PNP pulse output to a PLC

Depending on the PLC type, wire either the PNP output or the NPN output.



### 2.3.3. Wiring of the low power Hall effect version fitted with 1 pulse output

This version has an NPN transistor output.



The max. cable length is 50 meters.

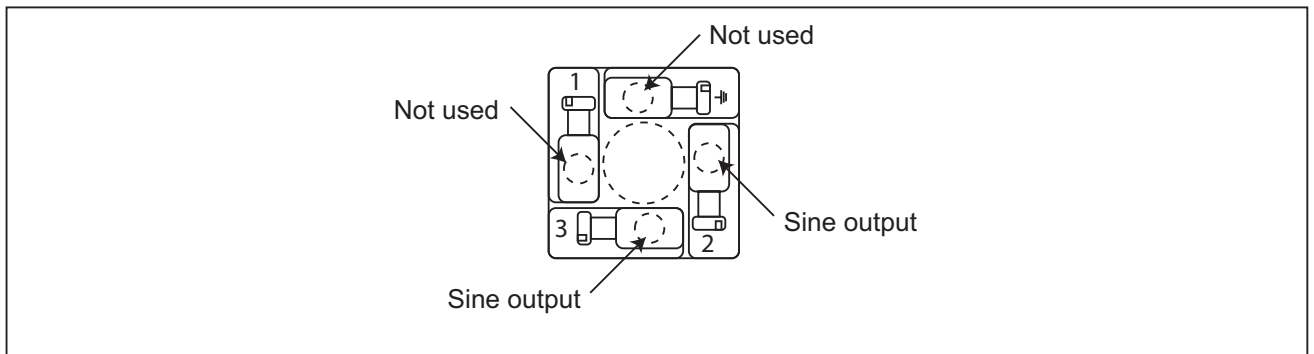
### Electrical connection of the NPN pulse output to a PLC

The NPN pulse output of the low power Hall effect version is wired like the NPN output of the Hall effect version (see section 2.3.2).



### 2.3.4. Wiring of the sine output of a coil version

This version has a sine output.



The max. cable length is 10 meters.

### Electrical connection of the sine output to a PLC

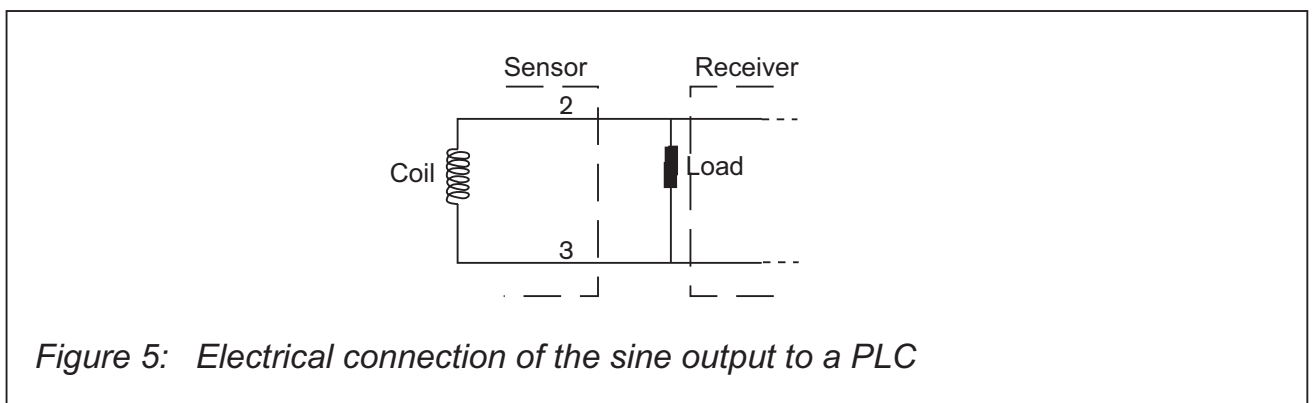


Figure 5: Electrical connection of the sine output to a PLC

### 3. TECHNICAL DATA

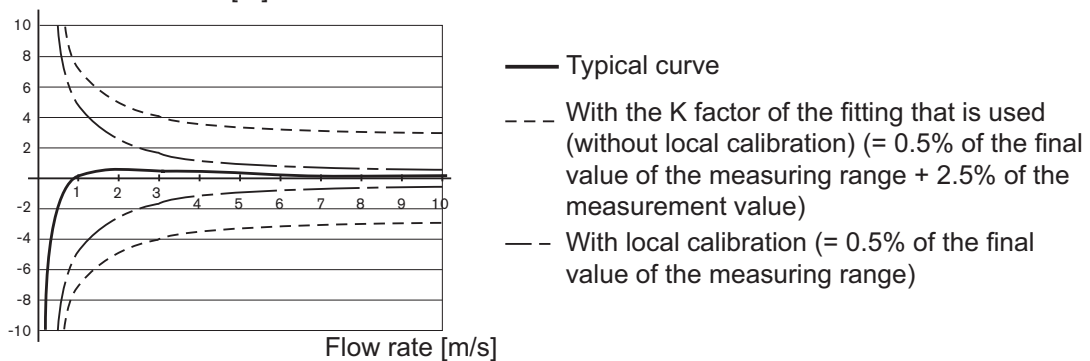
#### 3.1. Environment

Ambient temperature (operation and storage)	-15°C to +60°C
Relative humidity	< 80%, non-condensing
Enclosure protection class	IP65, with instrument connector inserted and screwed on tight

#### 3.2. General data

Tubing diameter	DN15 to DN400; use the flow rate speed diagrams in the appendix to select the suitable tubing diameter.
Max. liquid temperature	Depends on the workpiece of the fitting.
Liquid pressure	Depends on the workpiece of the fitting; see the temperature/pressure diagram (section 2)
Viscosity of the liquid	300 cSt max.
Solid content	1% max.
Measuring range	<ul style="list-style-type: none"> <li>• Pulse version</li> <li>• Sine version</li> </ul>
	<ul style="list-style-type: none"> <li>• 0.3 m/s to 10 m/s</li> <li>• 0.5 m/s to 10 m/s</li> </ul>
Linearity 1)	±0.5% of the final value of the measuring range
Repeatability 1)	0.4% of the measured value
Accuracy 1)	<ul style="list-style-type: none"> <li>• ±0.5% of the final value of the measuring range, with local calibration</li> <li>• ± (0.5% of the final value of the measuring range + 2.5% of the measured value), with standard K factor</li> </ul>

Max. measurement error [%]



<sup>1)</sup> These values have been defined under the following reference conditions: Liquid = water, water and ambient temperature of 20°C, consideration of minimum intake and outlet distances, adjusted tubing dimensions.

### 3.3. Electrical data

#### 3.3.1. Sine version

Supply voltage	None
Output data	Up to 300 Hz, peak-to-peak voltage of approximately 2.8 mV / Hz with a burden of 50 k $\Omega$ (frequency = K factor x flow rate; the value of the K factor is listed in the operating instructions for the fitting)
Cable length	max. 10 m, shielded
Cable cross-section	max. 1.5 mm <sup>2</sup>

#### 3.3.2. Hall effect pulse version

Power supply	DC 12-36 V, filtered and regulated
Power consumption	$\leq 50$ mA
Protection against reverse polarity	Provided
Protection against peak voltages	Provided
Output data	NPN and PNP transistors, open collector, 100 mA max., NPN output: 0.2-36 VDC and PNP output: supply voltage; frequency up to 300 Hz, clock ratio 1/2 $\pm$ 10% (frequency = K factor x flow rate; the value of the K factor is listed in the operating instructions for the fitting)
Short-circuit protection	Provided
Cable length	Max. 50 m, shielded (up to 500 m, depending on the cable impedance and power consumption)

#### 3.3.3. Low power Hall effect pulse version

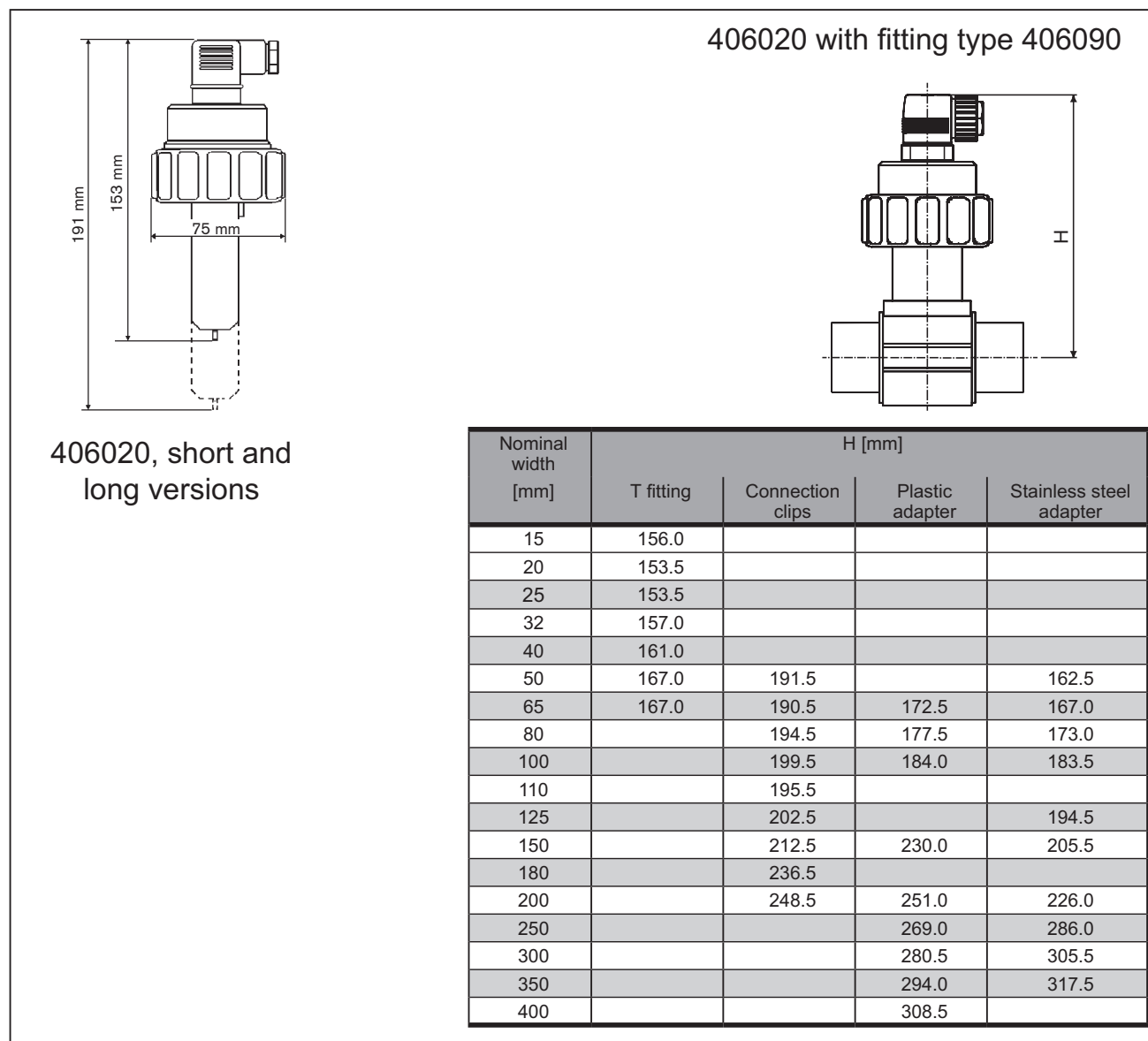
Power supply	DC 12-36 V, filtered and regulated, via the transmitter
Power consumption	$\leq 0.8$ mA
Protection against reverse polarity	Provided
Protection against peak voltages	Provided

Output data	NPN transistor, open collector, 10 mA max, frequency up to 300 Hz, clock ratio 1/2 ±10% (frequency = K factor x flow rate; the value of the K factor is listed in the operating instructions for the fitting)
Short-circuit protection	Provided
Cable length	max. 50 m shielded
Cable cross-section	max. 1.5 mm <sup>2</sup>

### 3.4. Materials

Enclosure	PE-HD
Union nut	PC
Instrument connector to EN175301-803 and socket type 2508	PA (contacts made of electro-silver plated brass)
Sensor fitting, paddle-wheel	PVDF
Axle and bearing	Ceramic
Seal	FKM, standard (EPDM on request)

### 3.5. Dimensions



### 3.6. References to standards

Electromagnetic compatibility (EMC)	EN 610006-2, EN 610006-3
Vibration	EN 60068-2-6
Impact	EN 60068-2-27

## 4. MAINTENANCE

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### 4.1. Care and cleaning

The instruments are maintenance-free if they are installed correctly and used under proper operating conditions. If impurities or clogging nevertheless occur in operation, the measurement sensor (paddle-wheel, bearing and axle) can be cleaned. Normally this is done with water or a cleaning agent that is compatible with PVDF.

### 4.2. Spare parts and accessories

→ If spare parts or accessories are needed, they can be obtained from Jumo.

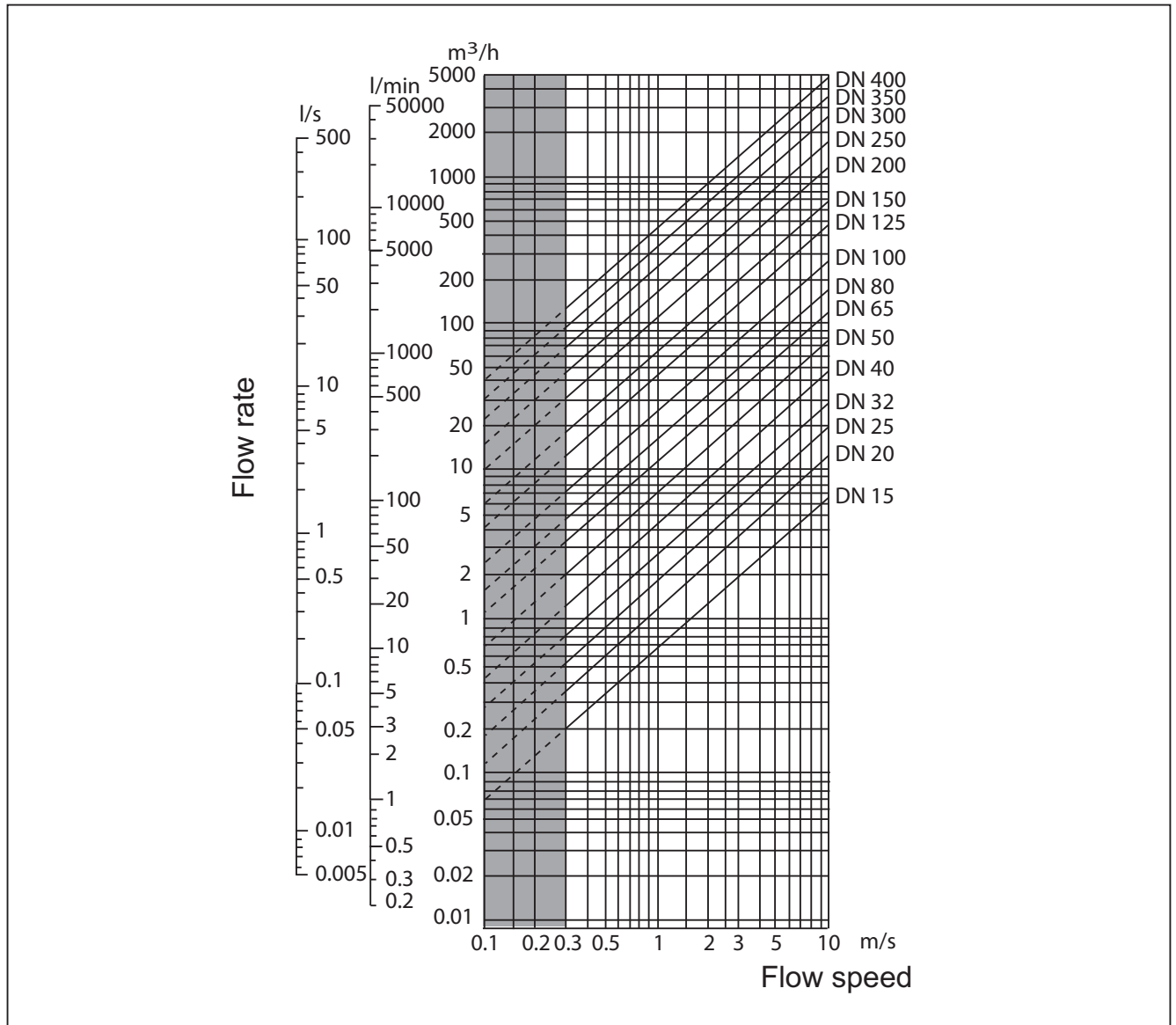
Designation
O-ring set (1 made of FKM + 1 of EPDM)
EN175301-803 socket with cable gland (type 2508)
EN175301-8031/2 socket with NPT-1/2" reduction (type 2509)

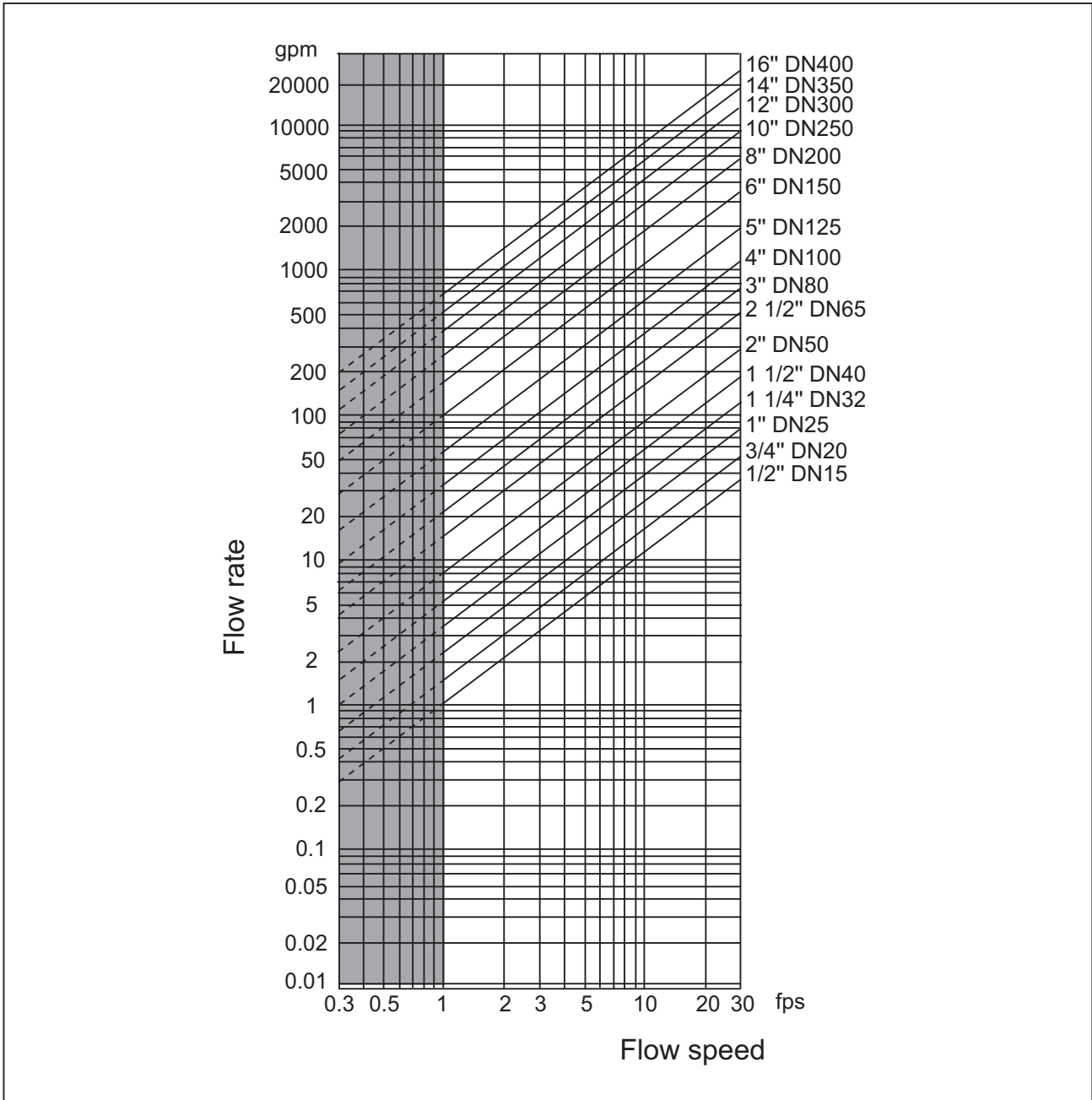
### 4.3. Available versions of the sensor

Supply voltage	Seal	Sensor
12-36 VDC	FKM	Hall effect, short version
12-36 VDC	FKM	Hall effect, long version
Via the transmitter	FKM	Low power Hall effect, short version
Via the transmitter	FKM	Low power Hall effect, long version
Without	FKM	Coil, short version
Without	FKM	Coil, long version

## 5. APPENDIX

### 5.1. Selection of fitting / nominal tube width









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