Manual

FLOW CONTROL 2000

V2.x

The specialist in safe & clean swimming pool water

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Flow Control 2000

V2.x

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Contents

0. Points to note during installation

Points to note to rectify / prevent possible malfunctions in a Flow Control 2000:

1. Read the handbook through carefully before commencing installation.
2. Check whether the pipe diameter setting is correct.
3. Attach the sensor to a straight run of pipe, leaving 10 x the pipe diameter before the sensor and 3 x the pipe diameter after the sensor. Avoid placing the sensor shortly after bends, valves or adapter rings or in dirty water.
4. Make sure that no air can accumulate around the sensor.
5. When pre-setting dosing pump switches: set the actuation point for the switching point to the correct value (approx. 40% of the nominal flow rate).
6. Check the sensor for contamination and make sure the rotor is able to spin freely.

1. General

- The SEM Flow Control 2000 measures the flow (volume per unit of time) through a pipe. This flow is expressed in m^3/h on a display.
- Two different types of sensor can be connected to the SEM Flow Control 2000: pulse frequency sensors to input sensor 1 and mA sensors to input sensor 2. Both sensors are attached to the pipe using a standard saddle clamp (1 1/4") and an adapter.
  - SEM 8020 paddlewheel sensor (0-300Hz = 0- 10m/s)
  - Supplied as standard: a sensor that generates a pulse frequency of 0-200Hz for a flow of 0-10 m/s (Bürkert 8020). This sensor is linear between 0.3 and 10 m/s, but the measuring range is limited to 5 m/s by the readout unit. Under 0.3 m/s the sensor is not linear (so not usable) and the readout unit will give a reading of 0.0 m^3/h. This sensor operates on the basis of a rotor (referred to as the paddle wheel) that is caused to spin by the flow of water.
  - SEM 8030 inline paddlewheel sensor (0-300Hz = 0-10 m/s)
  - Optionally available: inline 8030 sensor. This sensor is made for the following pipe sizes: 20, 25, 32, 40 and 50 mm. This sensor comprises housing and a measuring module. Special software required!
  - SEM 8040 magnetic inductive flow sensor (0-240Hz= 0-10 m/s)
  - Optionally available: magnetic inductive 8040 sensor. This sensor has the advantage that it has no moving parts and is therefore suitable for use in slightly contaminated water (e.g. measurement before the filter rather than after the filter). This sensor fits in the same adapter as the 8020 and the electrical connections are also the same.
  - Special software required! (Flow v2.0 8040) This sensor is linear between 0.3 and 10 m/s, but the measuring range is limited to 5 m/s by the readout unit. Under 0.3 m/s the sensor is not linear (so not usable) and the readout unit will give a reading of 0.0 m^3/h.
  - SEM SN10350 calorific flow sensor (4-20mA = 0.05-3.0 m/s)
  - Optionally available: SN10350 sensor. This sensor has no moving parts and is easy to mount using a standard 1/2" saddle clamp.

8020 sensor

8040 sensor

SEM SN10350 sensor

8030 sensor

The SEM Flow Control 2000 can be set for the following pipe sizes (diameters): 50, 63, 75, 90, 110, 125, 140, 160, 200, 225, 250 mm (other sizes available on request). The table below shows the flow for standard pipe diameters at a flow rate of 1 m/s.

Diameter	Flow m^3/h (where v=1m/s)
50	6.0
63	9.5
75	13.5
90	19.4
110	29.0
125	37.4
140	46.9
160	61.3
200	95.7
225	121.2
250	149.8

Table 1: Flow rate of 1 m/s.

- The SEM Flow Control 2000 has an adjustable actuation point with two changeover contacts of 250VAC/2A. When the flow rate rises above the actuation point, the relay is triggered and the "**Flow OK**" indicator turns green. When the flow rate falls below the actuation point, the relay is de-energised and the "**Flow OK**" indicator turns red.
  - The 2 green LEDs (D7 and D8, under the cover of the terminal strip) covey the signals from the sensor. When sensor inlet 1 is in use, D7 will start blinking as soon as the flow sensor rotor begins to spin. If the LED stays on, it means the rotor is not moving. The LED blinks in time with the pulse frequency of the sensor. As long as the LED is blinking, the sensor is functioning properly. If the LED stays on continuously or goes out altogether, this indicates a malfunction in the sensor or the wiring. The most common problem is the jamming of the paddle wheel.

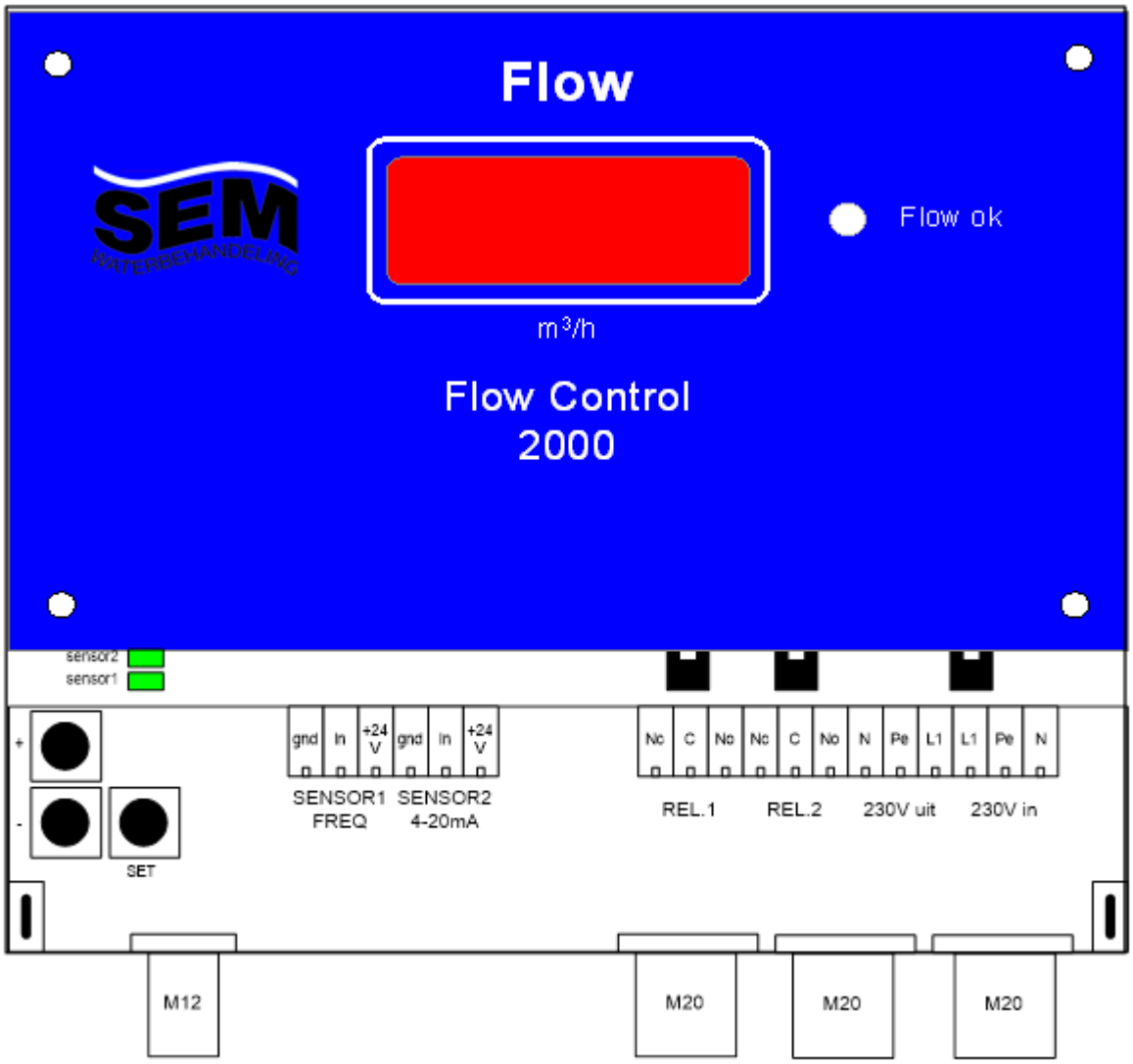


Figure 1: SEM Flow Control 2000

2. Installation

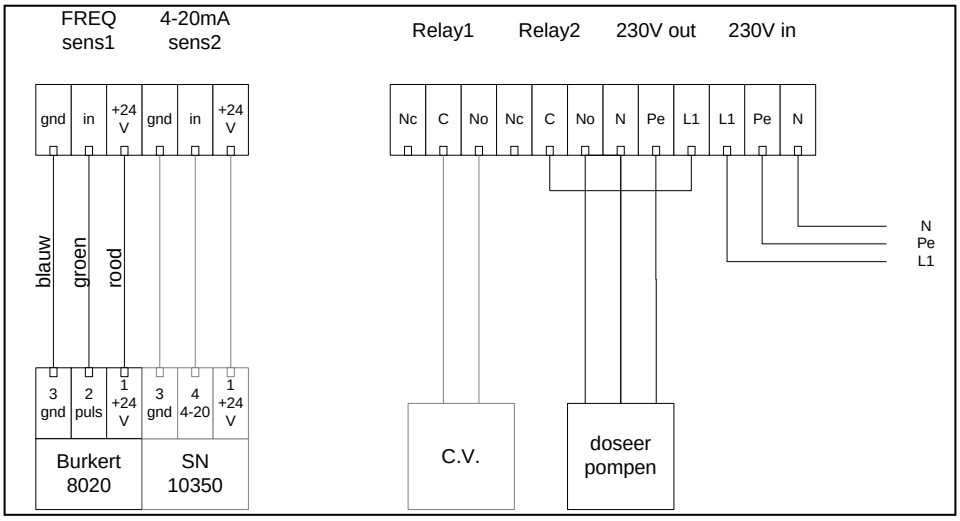
This chapter outlines the installation of the SEM Flow Control 2000 itself and the installation of the sensor in the pipe. Given that the accuracy of the measurement depends to a large extent on optimal sensor placement, a number of illustrations have been included to help clarify how exactly the sensor should be installed.

2.1 Installing SEM Flow Control 2000

The SEM Flow Control 2000 must be mounted to a flat wall. The mounting holes are located under the cover of the terminal strip (2 slotted holes) and on the back of the housing (1 keyhole slot). Recommended screw size: 4mm x 40 mm.

The SEM Flow Control 2000 is equipped with an M12 swivel for the sensor cable and 3 M20 swivels for the power supply. There are also break-outs for an additional M12 swivel. Swivels that are not in use should be kept capped.

Below is an electrical wiring diagram:



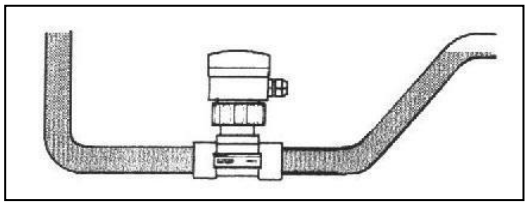
- The power supply (230Vac) is connected to the **N**, **Pe**, **L1** of the **230V input** terminals. The **230V output** terminals are connected in parallel with the 230V input terminals, so that voltage can be removed or transferred as necessary.
- The Bürkert 8020/8030/8040 sensor is connected to the **Sens1 input**, **gnd**, **in** and **+24V** of the **FREQ** terminals. These terminals are for a sensor with a pulse frequency of 0-300Hz.
- The SN10350 is connected to the **sens2 input gnd**, **in** and **+24V** of the **4-20mA** terminals. These terminals are for a sensor with a 4-20mA output.
- The 24VDC power supply for the sensors is protected against short-circuits and provides a maximum of 100mA.
- Various devices can be connected to both relay outputs (rel.1 and rel.2). The example shows a circuit with dosing pumps. The 230V power supply to the pumps is switched on by relay 1 when the flow is greater than the set value. Another example would be the connection of a potential-free contact to a central heating system.
- Both contacts are switched simultaneously and are fitted with a fuse F1 and F2 (2A/250V slow blow)
- Fuse F3 protects the Flow Control power supply (100mA/250V slow blow).

2.2 Installing the sensor (8020, 8030, 8040)

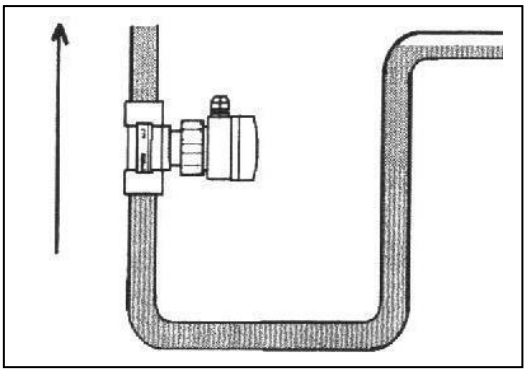
The sensor must be installed on a straight run of pipe. Installation just before or just after a bend, T-piece, any widening or narrowing or a valve will affect the accuracy of the measurement. The sensor must always be in the liquid. It is therefore important to ensure that air cannot accumulate around the sensor. The Bürkert 8020 must always be installed after the filter because it has a paddle wheel in the pipe. This could jam if there is any contamination in the water. The 8040 and SN10350 are suitable for use in slightly contaminated water, since they do not have any moving parts in the pipe. **Important**: The 8040 and SN10350 sensors require an acclimatization time of 12 hours. Only after 12 hours the measurement is completely reliable.

The illustrations below show how to mount the sensor.

Horizontal attachment

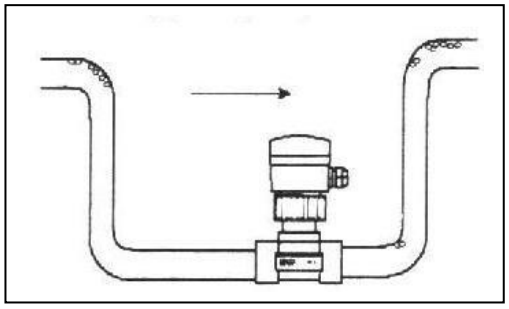


Vertical attachment

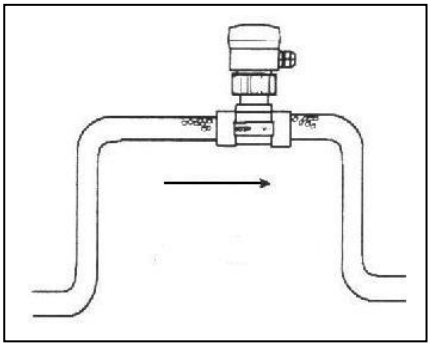


If the sensor is attached vertically, the flow direction must always be upward.

correct

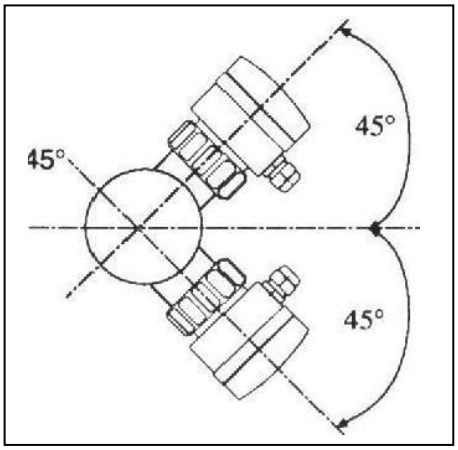


incorrect



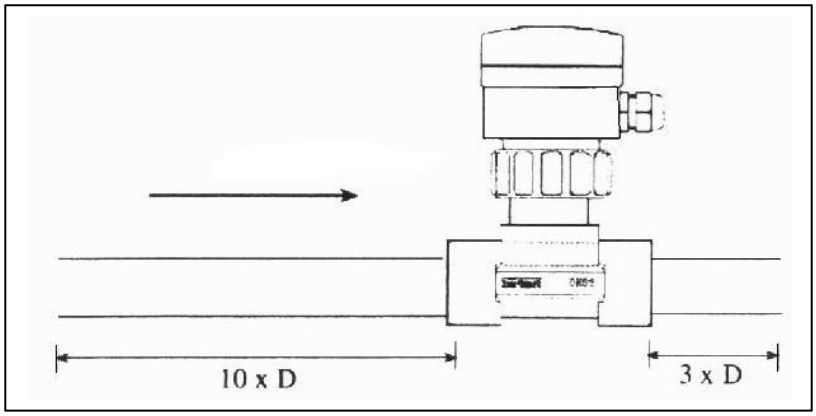
Always place the sensor below the water level where no air bubbles can form.

We recommend that you attach the sensor at an angle of 45° to the horizontal centre line of the pipe. See illustration, right.



Recommended length of straight run of pipe before and after sensor:

Before	10 x inside diameter of pipe
After	3 x inside diameter of pipe



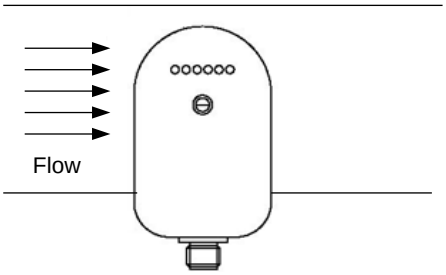
IMPORTANT!
Do not dispense/inject aggressive substances just before the sensor. Chlorine and acid should be dispensed well before – or preferably after - the sensor.

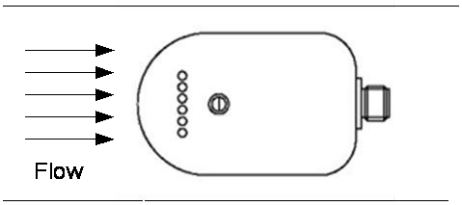
2.3 Installing the sensor (SN10350)

The SN10350 flow sensor can be attached to the pipe using a standard 1/2" saddle clamp. The saddle clamp should be ordered separately (see fittings and accessories).

For pipes larger than 125mm, use a standard 1 1/4" saddle clamp with a special 1 1/4" to 1/2" adapter ring (see fittings and accessories):

Using Teflon tape, screw the sensor as far into the saddle clamp as possible. The sensor should always be mounted at right angles to or parallel to the pipe (see illustrations below).

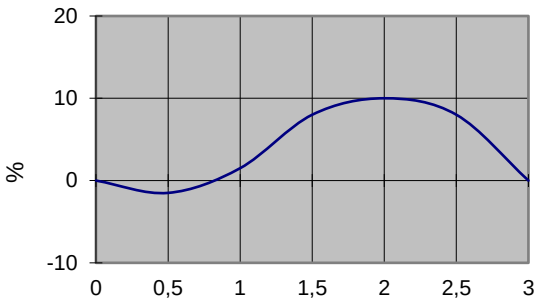




Adjustment of settings:

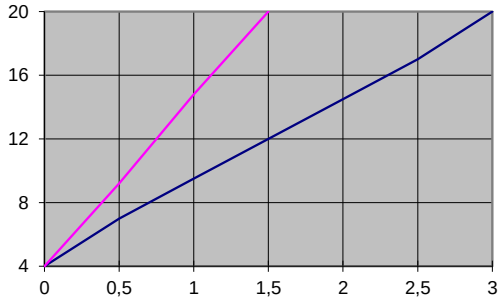
The flow sensor SN10350 is pre-set to a measuring range of 5cm/s to 300cm/s (this corresponds to 4-20mA). This setting gives the smallest linearity error (see graph below). Use the built-in multi-turn potentiometer to adjust the measuring range. To use the potentiometer, you will first need to remove the white cover screw. If you turn the potentiometer clockwise, the sensor will deliver a higher output current at a lower flow rate. The minimum setting is 5cm/s to 150cm/s (this corresponds to 4-20mA). See graph below. Use the blue screwdriver supplied to adjust the potentiometer.

Linear discrepancy



Flow rate (m/s, water 20°C)

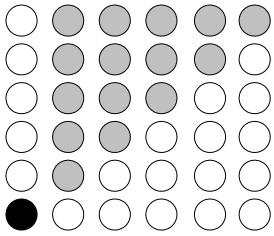
Output signal (mA)



Flow rate (m/s, water 20°C)

LED display:

The LED display shows the output signal of the sensor. See illustration below for a more detailed explanation.



3. Setup and operation

The SEM Flow Control 2000 is easy to set up ready for operation. It is now simply a question of setting the sensor choice and pipe size and configuring the actuation point.

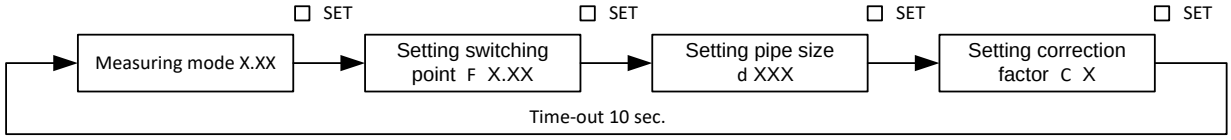
3.1 Setting the sensor choice

This happens automatically. The Flow Control itself selects the input to which the sensor is connected.

- **Sens1:** Bürkert 8020/8030/8040 pulse frequency sensors
- **Sens2:** SN10350 4-20 mA sensor

3.2 Setting the parameters

Use the ☐**SET** button and the ☐**+ and** ☐**-** keys to set the switching point, the correct pipe size and a correction factor. Use the ☐**SET** button to select the correct parameter and the ☐**+ and** ☐**-** keys to change the X value.



Setting the switching point
Press the ☐**SET** button once. An "F" will appear on the display. The numbers after the "F" show the desired switching point in m³/h. Use the ☐**+ and** ☐**-** keys to adjust this value upwards or downwards.

Setting the pipe size
Press the ☐**SET** button again. A "D" will appear on the display. The numbers after the "D" show the desired pipe size in mm (outside diameter). Use the ☐**+ and** ☐**-** keys to adjust this value upwards or downwards.

Setting the correction factor
Press the ☐**SET** button again. A "C" will appear on the display. The numbers after the "C" show the desired correction factor in %. The measured value will be increased or reduced by this percentage. This facilitates the precise calibration of the Flow Control. For example: at a flow rate of 5.0 m³/hour and a correction of 10%, the flow on the display will be 5.5 m³/hour.

The table below gives an overview of all settings:

F	0.00 to 300 m³
D	50 63 75 90 110 125 140 160 200 225 250
C	-50 to +50 %

Table 2: Setting of parameters

3.3 Explanatory notes relating to use of 8040 Sensor

- **SEM 8040 magnetic inductive flow sensor (0-240Hz = 0-10 m/s)**
  The magnetic inductive 8040 sensor is available as an optional extra. The advantage of this sensor is that it has no moving parts, so it is also suitable for use in slightly contaminated water (e.g. measuring can take place before the filter rather than after it). This sensor fits in the same adapter as the 8020 and the electrical connections are also the same.
  Important: You need to install special software for this sensor! (Flow v2.0 8040) This sensor is linear between 0.3 and 10 m/s, but the measuring range is limited to 5 m/s by the readout unit. Under 0.3 m/s the sensor is not linear (so not usable) and the readout unit will give a reading of 0.0 m^3/h.

When using the 8040 sensor, you should be aware of the following:

SEM Waterbehandeling has already adjusted the sensor to the correct settings.

All selection switches are located under the two sealing caps.

- The following settings should be used:
  SW1-1: frequency: 50Hz
  SW1-2: filter function: fast
  SW1-3 and SW1-4: measuring range: 0-10 m/s

dipswitch	1	2	3	4
setting	on	on	on	on

- switch SW2: this should be set to the left, i.e. towards the push button (NPN).

Calibration of the sensor:

Before the sensor is used for the first time, the 'zero flow' point must be calibrated, as follows:

- Fill the pipe with water and stop the flow (zero flow);
- Make sure there are no air bubbles in the pipe;
- Press the push button and hold it down for 2 seconds: the green and red LED lights will now come on. The sensor will now automatically measure the 'zero flow' point over a period of several seconds. Once measurement is complete, the green LED will start blinking once every 1.5 seconds.

For more detailed information, see the Bürkert operating manual.

4. Technical specifications

Flow Control 2000:	
Supply voltage:	230Vac
Power consumption:	7.5VA (fuse: 100mA slow blow)
Sensor supply voltage:	24Vdc max. 100mA (electronically protected)
Relay: 2 changeover contacts:	2A/250Vac (fuse 2A T) fitted with overvoltage protection
Tolerance:	min. 2.5%
Measuring range:	0.3 – 5.0 m/s (with Bürkert 8020/8030/8040 sensor 0-300Hz)
Housing:	BXHxD:185mmx165mmx135mmm IP65

The table below shows the measuring range and the resolution of the SEM Flow Control 2000.

Diameter (mm)	Flow measuring range (m^3/hour)	Flow reading on display	Actuation point range (m^3/hour)	Actuation point accuracy (m^3/hour)
50	1.8 – 29.5	XXX.X	0.0 –300	0.1
63	2.9 – 47.5	XXX.X	0.0 –300	0.1
75	4.0 – 67.0	XXX.X	0.0 –300	0.1
90	5.8 – 96.5	XXX.X	0.0 –300	0.1
110	8 – 144	XXXX	0.0 –300	0.1
125	11 – 186	XXXX	0.0 –300	0.1
140	14 – 234	XXXX	0.0 –300	0.1
160	18 – 306	XXXX	0.0 –300	0.1
200	28 – 478	XXXX	0.0 –300	0.1
225	36 – 605	XXXX	0.0 –300	0.1
250	44 – 745	XXXX	0.0 –300	0.1

Table 3: Measuring range with the Bürkert 8020/8030/8040 sensor.

Diameter (mm)	Flow measuring range (m^3/hour)	Flow reading on display	Actuation point range (m^3/hour)	Actuation point accuracy (m^3/hour)
50	1.8 – 12.0	XXX.X	0.0 – 11.0	0.1
63	2.9 – 18.9	XXX.X	0.0 – 19.0	0.1
75	4.0 – 26.9	XXX.X	0.0 – 26.0	0.1
90	5.8 – 38.8	XXX.X	0.0 – 38.0	0.1
110	8 – 57	XXXX	0 – 57	0.1
125	11 – 74	XXXX	0 – 74	0.1
140	14 – 93	XXXX	0 – 93	0.1
160	18 – 122	XXXX	0 – 122	0.1
200	28 – 191	XXXX	0 – 190	0.1
225	36 – 242	XXXX	0 – 240	0.1
250	44 – 298	XXXX	0 – 298	0.1

Table 4: Measuring range with the SN10350 sensor.

Fittings and accessories:

Article	Description	Article no.
	Saddle clamp with adapter 50mm	2522050
	Saddle clamp with adapter 63mm	2522063
	Saddle clamp with adapter 75mm	2522075
	Saddle clamp with adapter 90mm	2522090
	Saddle clamp with adapter 110mm	2522110
	Saddle clamp with adapter 125mm	2522125
	Saddle clamp with adapter 140mm	2522140
	Saddle clamp with adapter 160mm	2522160
	Saddle clamp with adapter 200mm	2522200
	Saddle clamp with adapter 225mm	2522225
	Saddle clamp with adapter 250mm	2522250
	End cap for adapter	2515618
	Flow Control Sensor 8020	3119010
	SEM Flow Sensor SN10350	3897500
	Plug for flow sensor SN10350 M12	3804510
	Cable (2m) with M12 plug for flow sensor 1/2" SN 10350	3879502
	Saddle clamp 50 x 1/2"F	0911548
	Saddle clamp 63 x 1/2"F	0911563
	Saddle clamp 75 x 1/2"F	0911575
	Saddle clamp 90 x 1/2"F	0911590
	Saddle clamp 110 x 1/2"F	0911609
	Saddle clamp 125 x 1/2"F	0911624
	Adapter ring 1 1/4"M-1/2"F PVC for flow sensor SN10350	2516125

Notes: