







### Mass Flow Meter for Gases (MFM)

- Nominal flow ranges from 0.010 I<sub>N</sub>/min to 80 I<sub>N</sub>/min
- High accuracy
- Very fast response times
- Optional: Fieldbus interface



Product variants described in the data sheet may differ from the product presentation and description.

#### Can be combined with

	<b>Type 8611</b> eCONTROL - Universal controller	▶
	<b>Type 0330</b> Direct-acting 2/2 or 3/2 way pivoted armature valve	▶
	<b>Type 8619</b> multiCELL - Multi-channel and multi-function transmitter/controller	▶
	<b>Type 6027</b> Direct-acting 2/2 way plunger valve	▶

#### Type description

The mass flow meter (MFM) type 8701 is suited for measuring the mass flow of gases over a big flow range. The thermal MEMS sensor is located directly in the gas stream and therefore reaches very fast response times. Type 8701 can optionally be calibrated for two different gases; the user can switch between these two gases. As electrical interfaces both, analog standard signals and fieldbuses are available.

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## 1. General Technical Data

Product properties	
<b>Material</b>	
Block	Aluminium or stainless steel
Body	PC (Polycarbonate) or metal
Seal	FKM, EPDM
Dimensions	Detailed information can be found in chapter "3. Dimensions" on page 5.
Total weight	approx. 500 g (Aluminium)
LED display	Indication for power, limit (with analogue signals) / communication (with fieldbus) and error
Performance data	
Nominal flow range ( $Q_{Nom}$ ) <sup>1,2)</sup>	10 ml <sub>N</sub> /min...80 l <sub>N</sub> /min (N <sub>2</sub> ) Detailed information can be found in chapter "6.2. Flow characteristic" on page 9.
Measuring range	1:50 (2...100 %), higher measuring range on request
Max. operating pressure	10 bar (145 psi)
Measuring accuracy	±0.8 % o. R. ±0.3 % F. S. (after 15 min. warm up time)
Repeatability	±0.1 % F. S.
Response time (t95 %)	<300 ms
Electrical data	
Operating voltage	24 V DC
Power consumption <sup>1)</sup>	2.5 W / 5 W (with fieldbus)
Voltage tolerance	±10 %
Residual ripple	<2 %
Electrical connection	D-Sub plug 15 pin with PROFIBUS-DP: Socket M12 5 pin with CANopen: Socket M12 5 pin
Medium data	
Operating medium	Neutral, or aggressive gases others on request
Calibration medium	Operating gas or air with conversion factor
Medium temperature	-10 °C...+70 °C (-10 °C...+60 °C for oxygen)
Process/Port connection & communication	
Port connection	NPT ¼, G ¼, screw-in fitting or sub-base, others on request
Fieldbus option	PROFIBUS-DP, CANopen
Digital outputs	One relay-output for: 1. Limit (process value close to $Q_{Nom}$ ) Current output: 25 V, 1 A, 25 VA
Digital inputs	Two 1. Not assigned 2. Not assigned
Digital (communication) interface	RS232, Modbus RTU (via RS-Adapter) RS485, RS422 or USB (see "7.4. Ordering chart accessories" on page 10)
Analogue interfaces	4...20 mA, 0...20 mA, 0...10 V or 0...5 V Input impedance >20 kΩ (Voltage) resp. <300 Ω (Current) Max. load: 10 mA (Voltage output); max. load: 600 Ω (Current output)
Environment and installation	
Installation position	Horizontal or vertical
Ambient temperature	-10 °C...+50 °C
Degree of protection	IP40
Accessories	
Software-Tool	Mass Flow Communicator

1.) The nominal flow value is the max. flow value calibrated which can be measured.

The nominal flow range defines the range of nominal flow rates (full scale values) possible.

2.) Index N: Flow rates referred to 1.013 bar and 0 °C. Alternatively there is an

Index S available which refers to 1.013 bar and 20 °C.

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## 2. Materials

### 2.1. Chemical Resistance Chart – Bürkert resistApp



#### Bürkert resistApp – Chemical Resistance Chart

You want to ensure the reliability and durability of the materials in your individual application case? Verify your combination of media and materials on our website or in our resistApp.

[Start Chemical Resistance Check](#)

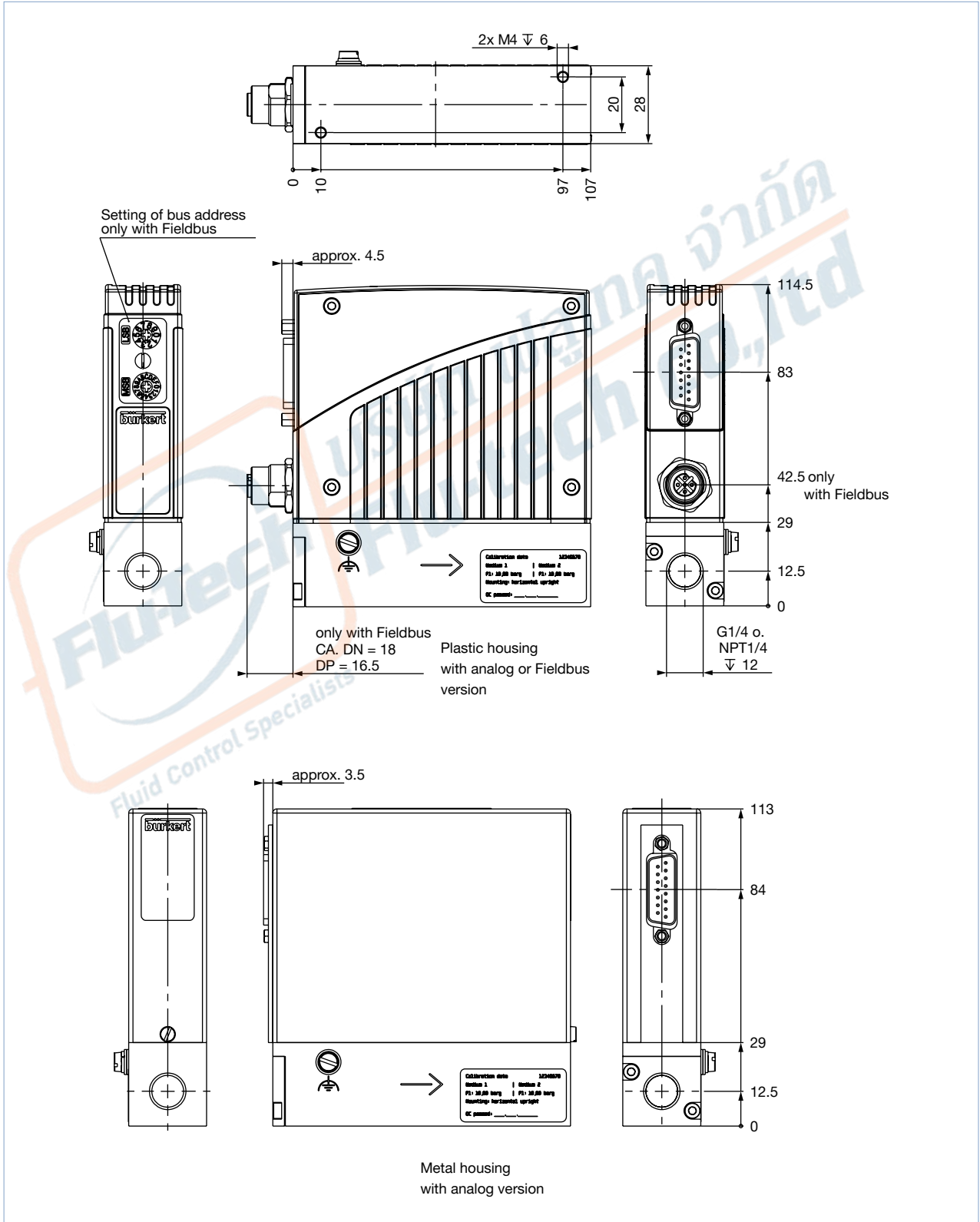


### 3. Dimensions

#### 3.1. Standard version

**Note:**

Dimensions in mm

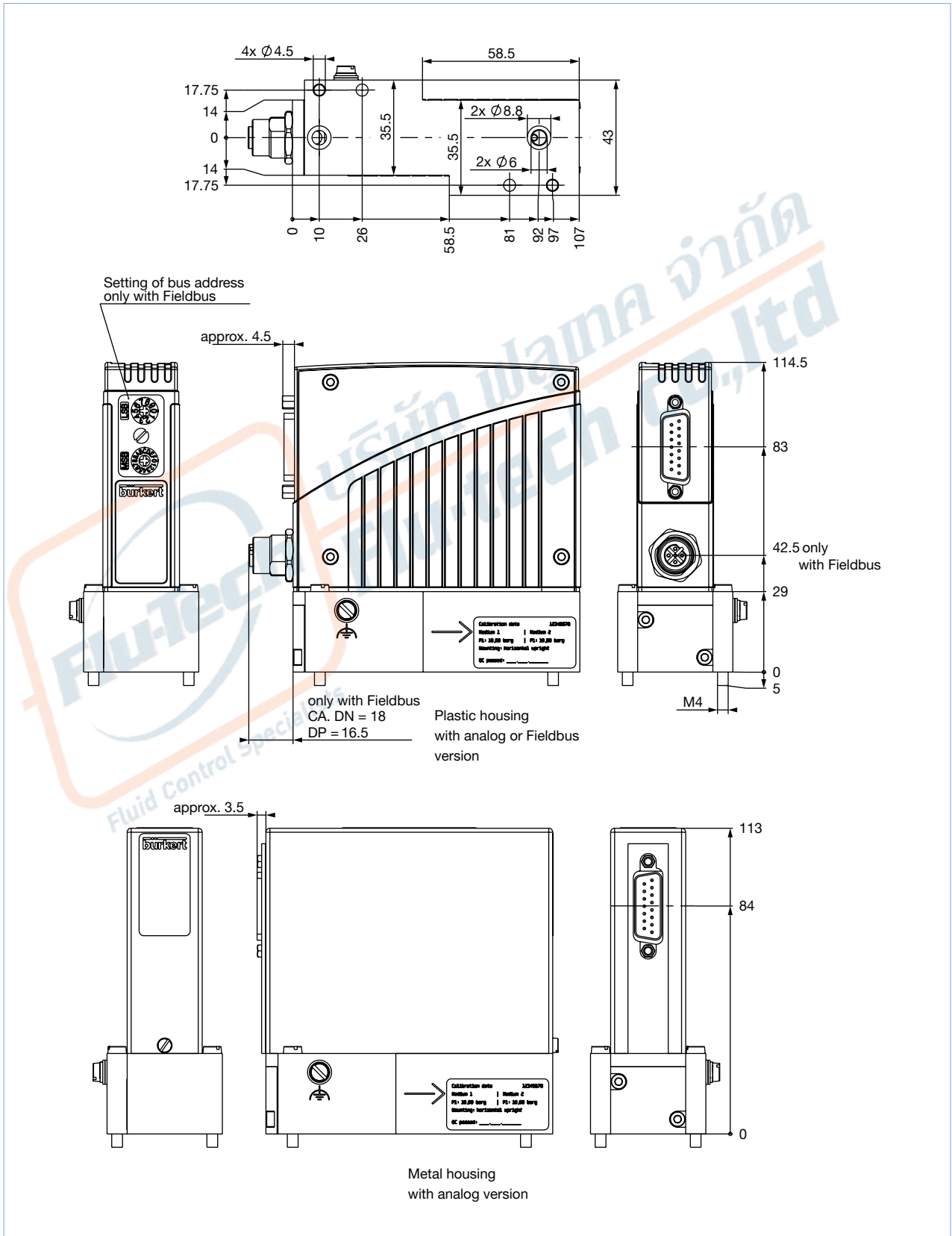


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3.2. Sub-base version

Note:

Dimensions in mm



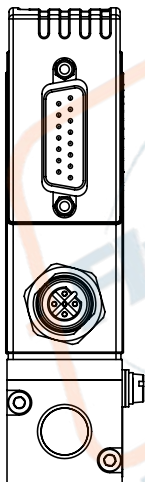
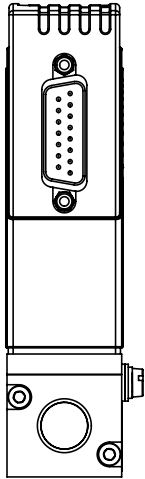
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## 4. Device/Process connections

### 4.1. Analogue version/Fieldbus version

**Note:**

- Optional Pin 7 and 8 with bus version as transmitter input possible.
- The cable length for RS232/actual value signal is limited to 30 meters.



**Analogue version**

Plug D-Sub, 15 pin	Pin	Assignment	
		Analogue control unit	Bus actuation
	1	Relay – normally closed	
	2	Relay – normally open	
	3	Relay – middle contact	
	4	GND for 24 V-supply and binary inputs	
	5	24 V-supply +	
	6	Only for internal company use	
	7	Not connected	Not connected
	8	Not connected	Not connected
	9	Actual value output GND	Not connected
	10	Actual value output +	Not connected
	11	DGND (for RS232) <sup>1.)</sup>	
	12	Binary input 1	
	13	Binary input 2	
	14	RS232 RxD (without driver) <sup>1.)</sup>	
	15	RS232 TxD (without driver) <sup>1.)</sup>	

1.) Driving RS232 interface only by RS232 adapter including an adaption of TTL levels

**Fieldbus version**

PROFIBUS DP – socket B-coded M12 (DPV1 max. 12 MBaud)	Pin	Assignment
	1	VDD (only for termination resistor)
	2	RxD/TxD – N (A-Line)
	3	DGND
	4	RxD/TxD – P (B-Line)
	5	Not connected

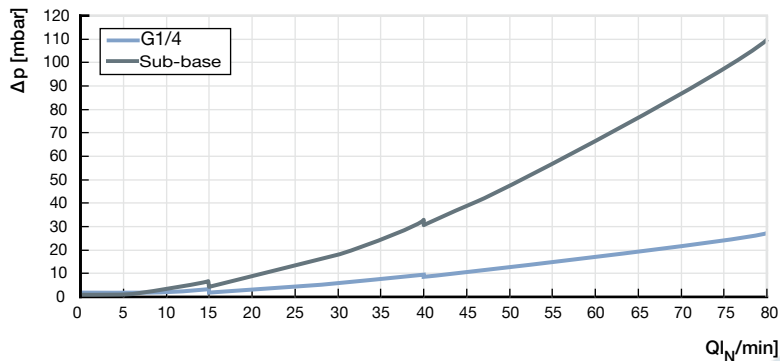
CANopen – Plug M12	Pin	Assignment
	1	Shield
	2	Not connected
	3	DGND
	4	CAN_H
	5	CAN_L

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## 5. Performance specifications

### 5.1. Pressure loss diagram of MFMs

The diagram shows exemplarily the pressure loss characteristics when air flowing through. To determine the pressure loss of another gas, it must first be converted to the corresponding air flow.

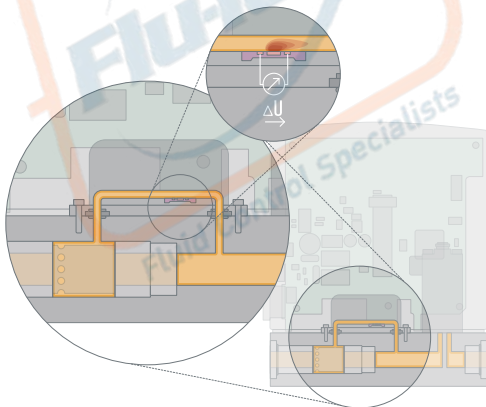


## 6. Product operation

### 6.1. Measuring principle

The mass flow sensor operates according to a thermal principle which has the advantage of providing the mass flow which is independent on pressure and temperature.

A small part of the total gas stream is diverted into a small, specifically designed bypassing channel which ensures laminar flow conditions. The sensor element is a chip immersed into the wall of this flow channel. The chip, produced in MEMS technology, contains a heating resistor and two temperature sensors (thermopiles) which are arranged symmetrically upstream and downstream of the heater. The differential voltage of the thermopiles is a measure of the mass flow rate passing the flow sensor. The calibration procedure effectuates a unique assignment of the sensor signal to the total flow rate through the device.





## 6.2. Flow characteristic

### Nominal flow range of typical gases

#### Note:

- $Q(\text{Gas}) = f \times Q(\text{N}_2)$
- When using the gas factors, measurement errors may occur that are outside the data sheet specification. For applications requiring high accuracy, calibration under field conditions is recommended.
- Furthermore, the media compatibility of the sealing materials of the MFM should be checked before use with another gas.

Gas	Min. $Q_{\text{Nom}}$ [l <sub>N</sub> /min]	Max. $Q_{\text{Nom}}$ [l <sub>N</sub> /min]
Argon	0.01	80
Helium	0.01	500
Carbon dioxide	0.02	40
Air	0.01	80
Methane	0.01	80
Oxygen	0.01	80
Nitrogen	0.01	80
Hydrogen	0.01	500

## 7. Ordering information

### 7.1. Bürkert eShop – Easy ordering and quick delivery



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### 7.2. Recommendation regarding product selection

#### Note:

The „**Product Enquiry Form**“ at the end of this document contains the relevant fluid specification. Using the experience of Bürkert engineers already in the design phase provide us with a copy of the request containing the necessary data together with your inquiry or order.

For the proper choice of the actuator orifice within the MFM, not only the required maximum flow rate  $Q_{\text{Nom}}$ , but also the pressure values directly before and after the MFM ( $p_1$ ,  $p_2$ ) at this flow rate  $Q_{\text{Nom}}$  should be known. In general, these pressures are not the same as the overall inlet and outlet pressures of the whole plant, because usually there are additional flow resistors (tubing, additional shut-off valves, nozzles etc.) present both before and after the controller.

Please use the „**Product Enquiry Form**“ at the end of this document to indicate the pressures directly before and after the MFM. If these are unknown or not accessible to a measurement, estimates are to be made by taking into account the approximate pressure drops over the flow resistors before and after the MFM, respectively, at a flow rate of  $Q_{\text{Nom}}$ . In addition, please quote the maximum inlet pressure  $p_{1 \text{ max}}$  to be encountered. This data is needed to make sure the actuator is able to provide a close-tight function within all the specified modes of operation.

Visit product website ►

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### 7.3. Bürkert product filter



#### Bürkert product filter – Get quickly to the right product

You want to select products comfortably based on your technical requirements? Use the Bürkert product filter and find suitable articles for your application quickly and easily.

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### 7.4. Ordering chart accessories

#### Note:

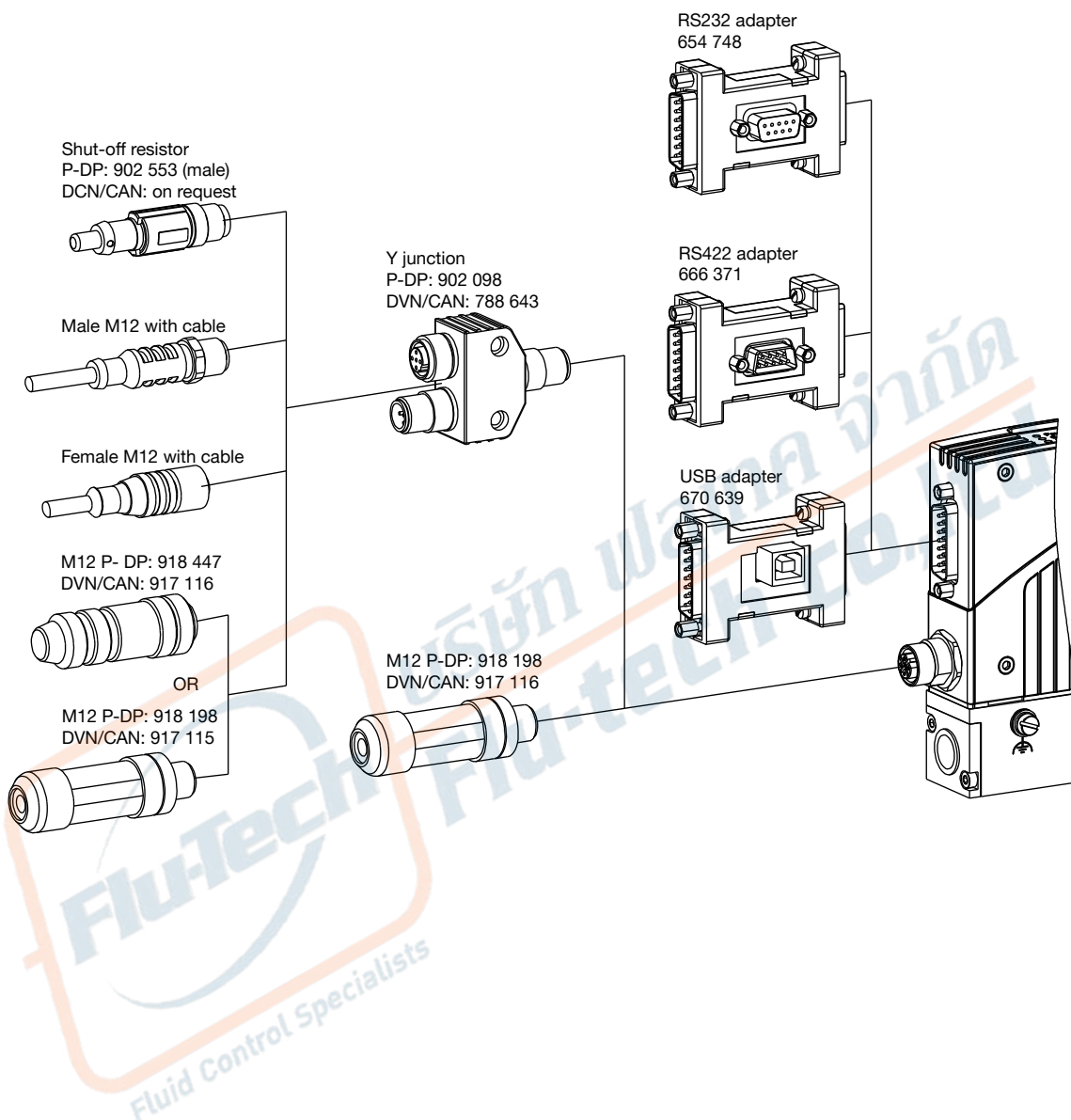
The adapters serve mainly for initial operation or diagnosis. Those are not obligatory for continuous operation.

Description	Article no.
<b>Connections/Cables</b>	
Socket D-Sub 15 pin solder connection	918274
Hood for D-Sub socket, with screw locking	918408
Socket D-Sub 15 pin with 5 m cable	787737
Socket D-Sub 15 pin with 10 m cable	787738
<b>Adapters</b>	
RS232 adapter	654748
PC extension cable for RS232 9 pin socket/plug 2 m	917039
RS422 adapter (RS485 compatible)	666371
USB adapter (Version 1.1, USB socket type B)	670639
USB connection cable 2 m	772299
Communication software Mass Flow Communicator	<b>LINK ▶</b>
<b>Accessories for Fieldbus</b>	
<b>PROFIBUS-DP (B-coded)</b>	
Plug M12 <sup>1.)</sup>	918198
Socket M12 (coupling) <sup>1.)</sup>	918447
Y-junction <sup>1.)</sup>	902098
Termination resistor	902553
GSD-File (PROFIBUS), EDS-File (CANopen)	<b>LINK ▶</b>
<b>CANopen (A-coded)</b>	
Plug M12 <sup>1.)</sup>	917115
Socket M12 (coupling) <sup>1.)</sup>	917116
Y-junction <sup>1.)</sup>	788643
Termination resistor	On request
GSD-File (PROFIBUS), EDS-File (CANopen)	<b>LINK ▶</b>

1.) The adapters serve mainly for initial operation or diagnosis. Those are not obligatory for continuous operation.

2.) The M12 single connectors as listed here are not suitable for their simultaneous use with the Y-piece for reasons of space. Please always use at least one commercially available overmoulded cable whose connector is usually smaller.

7.5. Adapter sketch



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