

Type 8745 Industrial Ethernet Analogue

Mass Flow Meter (MFM) / Mass Flow Controller (MFC)

Massendurchflussmesser (MFM) / Massendurchflussregler (MFC)

Débitmètre massique (MFM) / Régulateur de débit massique (MFC)



Operating Instructions

Bedienungsanleitung

Manuel d'utilisation

We reserve the right to make technical changes without notice.
Technische Änderungen vorbehalten.
Sous réserve de modifications techniques.

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Operating Instructions 2206/03_EU-ML_00569558 / Original EN

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1 THE OPERATING INSTRUCTIONS

The Operating Instructions describe the entire life cycle of the product. Please keep the Operating Instructions in a safe place, accessible to all users and any new owners.

Important safety information.

- ▶ Read the Operating Instructions. If you do not understand the content of the Operating Instructions, contact Bürkert.
- ▶ Pay particular attention to the chapter [3 Basic safety information](#) and to the chapter [2 Intended use](#).

1.1 Definition of the term product

The term "product" as used in the Operating Instructions refers to one or several of the following devices:

- a Mass Flow Meter (MFM) Type 8745 Ethernet
- a Mass Flow Meter (MFM) Type 8745 Analogue
- a Mass Flow Controller (MFC) Type 8745 Ethernet
- a Mass Flow Controller (MFC) Type 8745 Analogue

1.2 Definition of the term Industrial Ethernet

The term "Industrial Ethernet" as used in the Operating Instructions, refers to devices that communicate with the fieldbus protocols PROFINET, EtherNet/IP, EtherCAT or Modbus TCP.

1.3 About NAMUR and the NAMUR Recommendation NE 107

Standards committee for measurement and control technology (NAMUR) is an international association of users of automation systems for the process industry.

NAMUR recommendation (NE) 107: self-monitoring and diagnosis of field devices.

1.4 Symbols used



DANGER

Warns of an immediate danger.

- ▶ Failure to observe the warning results in death or in serious injuries.



WARNING

Warns of a potentially dangerous situation.

- ▶ Failure to observe the warning can result in serious injuries or in death.



CAUTION

Warns of a possible danger.

- ▶ Failure to observe the warning can result in moderate or minor injuries.

NOTICE

Warns of damage to property.

- ▶ Failure to observe the warning may result in damage to the product or system.



Indicates important additional information, tips and recommendations.



Refers to information in the Operating Instructions, or in other documents.

- ▶ Designates an instruction for risk prevention.
- Designates a work step that you must carry out.



Indicates a result.

Menu Designates a text of a user interface.

2 INTENDED USE

Improper use of the product may be a hazard to people, nearby equipment and the environment.

MFM Type 8745 Ethernet or MFM Type 8745 Analogue is used exclusively to measure the mass flow rate of clean and dry gases.

MFC Type 8745 Ethernet or MFC Type 8745 Analogue is used to measure and regulate the mass flow rate of clean and dry gases.

- ▶ Observe the data that is given in the contract documents, the Operating Instructions, on the Type label and on the calibration plate:
 - additional data
 - operating conditions
 - service conditions
- ▶ Only use the product for the fluids that are indicated on the Type label and in the calibration protocol.
- ▶ Only use the product indoors.
- ▶ Only use the product up to an altitude of 2000 m.
- ▶ Only use the product with external instruments that the product manufacturer recommends.
- ▶ Only use the product with components that the product manufacturer recommends.
- ▶ Operate the product carefully and ensure regular and professional maintenance.
- ▶ Operate the product only in perfect working order. Ensure appropriate storage, transport, installation and use.
- ▶ Only use the product for its intended purpose.

3 BASIC SAFETY INFORMATION

This safety information does not take into account any contingencies or occurrences that may arise during installation, use and maintenance of the product.

The operating company is responsible for the respect of the local safety regulations including for the personnel safety.



Risk of injury that is due to pressure in the installation or in the product.

- ▶ Before working on the installation or product, cut the pressure. Vent and drain the pipes.

Risk of injury from electric shocks.

- ▶ Before working on the installation or product, switch off the power supply. Make sure that nobody can switch the power supply on.
- ▶ Observe all applicable accident protection and all applicable safety regulations for electrical equipment.

Burn hazard and fire hazard that are due to hot surface of the product.

- ▶ Do not touch the hot surface with bare hands.
- ▶ Wear safety gloves to touch the product.
- ▶ Keep the product away from any highly flammable materials or fluids.

Risk of injury that is due to escape of the fluid.

- ▶ Observe all applicable accident protection and all applicable safety regulations relating to the operating fluid used.

Various dangerous situations.

To avoid personal injury, obey the following instructions:

- ▶ Do not operate the product without its mesh filter.
- ▶ Only operate the product in the installation position given on the calibration plate.
- ▶ Make sure that the operating pressure of the MFM is not higher than the maximum calibration pressure that is given on the calibration plate.
- ▶ Make sure that the operating pressure of the MFC is not higher than the tight sealing pressure of the control valve.
- ▶ Only use the product for the fluid specified as the operating fluid in the calibration protocol.
- ▶ Only use agents that are stable with the product materials for cleaning and decontamination
Find the compatibility chart on our homepage:
country.burkert.com.
In the event of any ambiguity please contact your local sales office.
- ▶ Do not make any modifications to the product and do not subject the product to mechanical stress.
- ▶ Protect the installation and the product from accidental actuation.
- ▶ Only trained personnel may perform installation work and maintenance work.
- ▶ After an interruption in the electrical supply or in the fluid supply, ensure a controlled restart of the process.
- ▶ Observe best industry practice.

NOTICE

Components or assemblies at risk from electrostatic charges.

The product contains electronic components which are susceptible to electrostatic discharge (ESD). Contact with electrostatically charged persons or objects endangers these components. In the worst case, they will become defective immediately or will fail when energised.

- To minimise or even avoid any damage caused by an electrostatic discharge, take all the precautions described in the EN 61340-5-1.
- Do not touch any of the live electrical components.

4 GENERAL INFORMATION

4.1 Contact

The name of the manufacturer is displayed as inset writing on the cover and the housing of the product.

To contact the manufacturer of the product, use the following address:

Bürkert SAS
Rue du Giessen
F-67220 TRIEMBACH-AU VAL

The addresses of our international sales offices are available on the internet at: country.burkert.com.

4.2 Warranty

The warranty is conditional on compliant use of the product in observance of the operating conditions specified in the Operating Instructions.

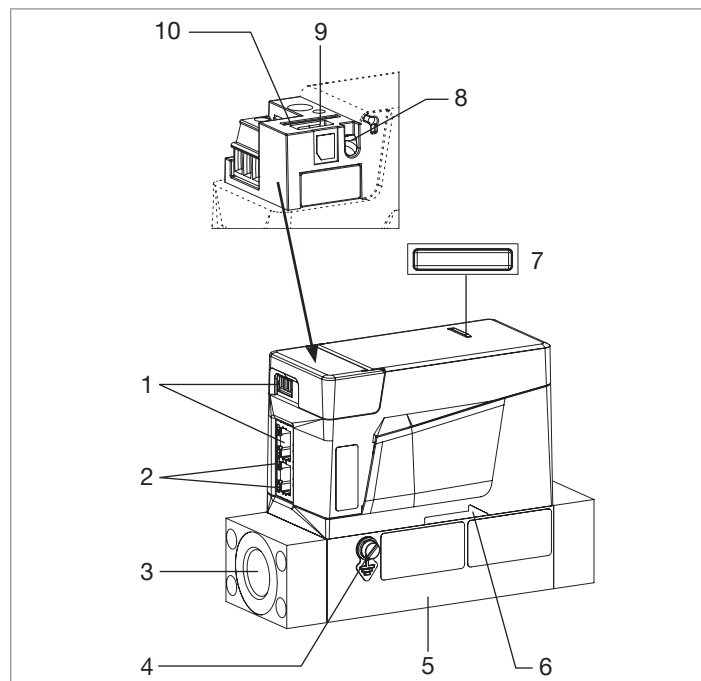
4.3 Information on the Internet

Operating Instructions and datasheets for the product can be found online at: country.burkert.com.

5 DESCRIPTION

5.1 Product variants

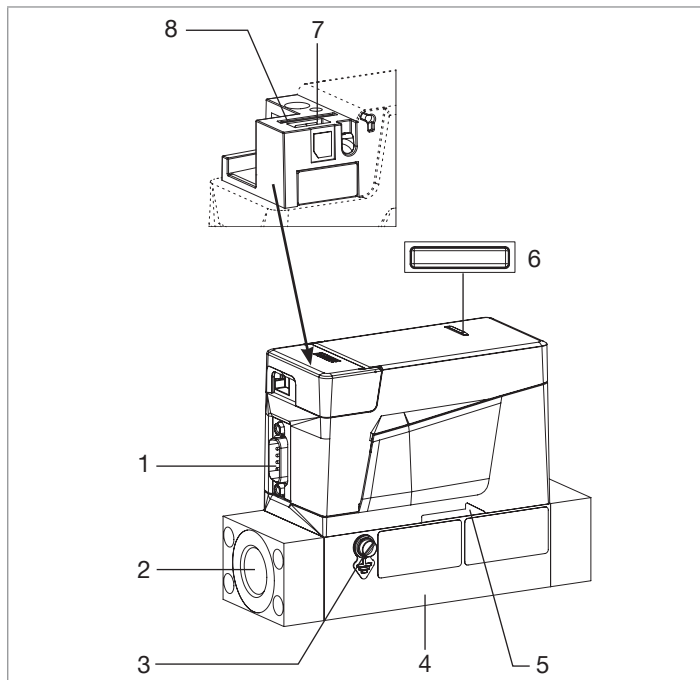
5.1.1 MFM Ethernet



1. Electrical connections:
 - 3 removable terminal connections that are delivered with the product
 - 2x RJ45 ports
2. Status LEDs for the connection to the Ethernet network
3. Possible fluid connections:
 - G-internal-threaded connections according to DIN ISO 228/1
 - NPT-internal-threaded connections according to ASME/ANSI B 1.20.1
 - Flange connection
4. M4 screw for functional earth connection
5. Base block
6. Flow direction
7. Product status indicator. The indicator operates according to NAMUR NE 107.
8. Status LED for the fieldbus communication
9. büS interface for the Bürkert Communicator software
10. Slot for the memory card

Fig. 1: Product variants of an MFM Ethernet

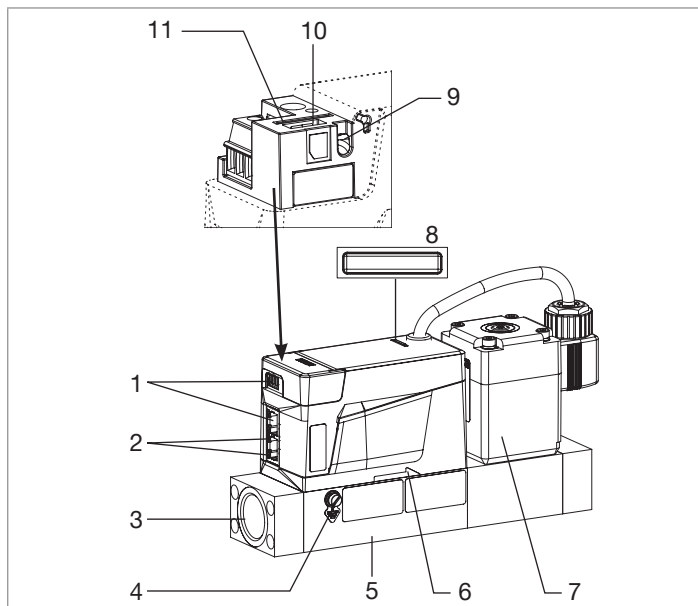
5.1.2 MFM Analogue



1. Possible electrical connection:
 - D-sub DE-9 male connector
 - 6 removable terminal connections that are delivered with the product
2. Possible fluid connections:
 - G-internal-threaded connections according to DIN ISO 228/1
 - NPT-internal-threaded connections according to ASME/ANSI B 1.20.1
 - Flange connection
3. M4 screw for functional earth connection
4. Base block
5. Flow direction
6. Product status indicator. The indicator operates according to NAMUR NE 107.
7. büS interface for the Bürkert Communicator software
8. Slot for the memory card

Fig. 2: Product variants of an MFM Analogue

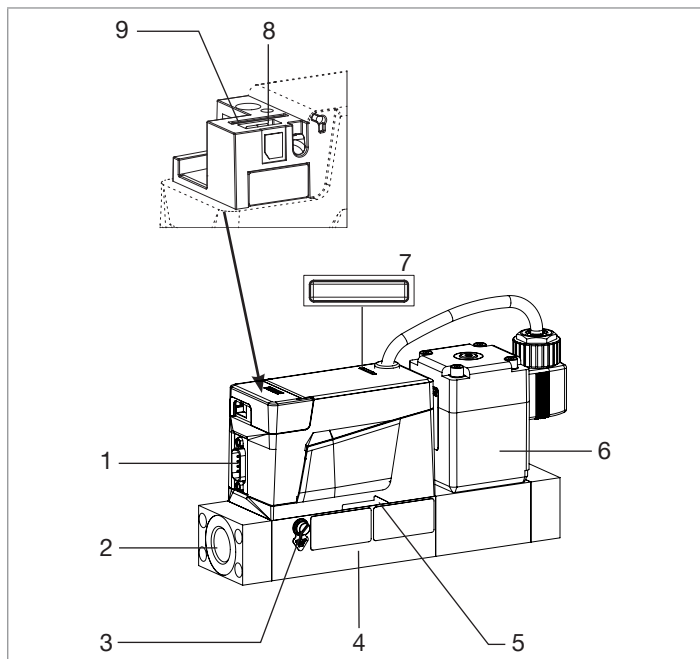
5.1.3 MFC Ethernet with proportional valve



1. Electrical connections:
 - 3 removable terminal connections that are delivered with the product
 - 2x RJ45 ports
2. Status LEDs for the connection to the Ethernet network
3. Possible fluid connections:
 - G-internal-threaded connections according to DIN ISO 228/1
 - NPT-internal-threaded connections according to ASME/ANSI B 1.20.1
 - Flange connection
4. M4 screw for functional earth connection
5. Base block
6. Flow direction
7. Proportional valve
8. Product status indicator. The indicator operates according to NAMUR NE 107.
9. Status LED for the fieldbus communication
10. bÜS interface for the Bürkert Communicator software
11. Slot for the memory card

Fig. 3: Product variants of an MFC Ethernet with proportional valve

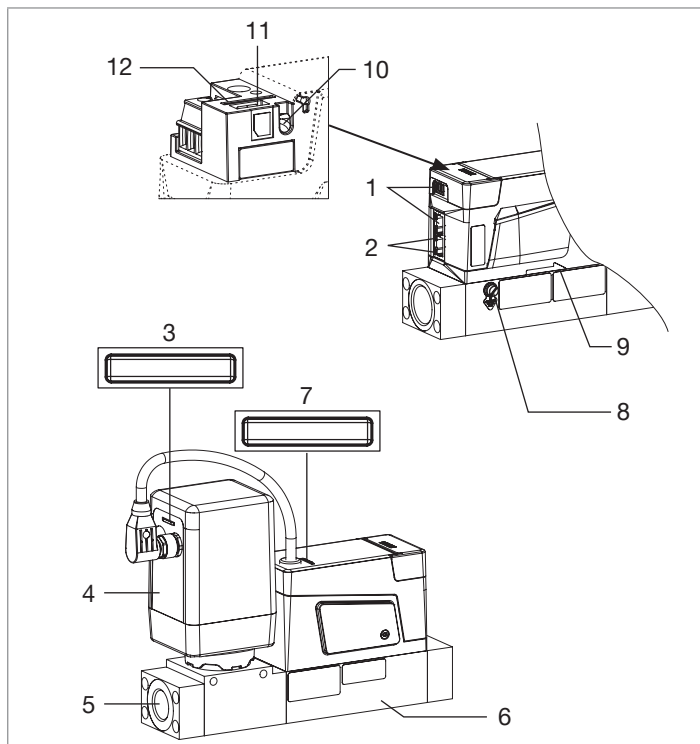
5.1.4 MFC Analogue with proportional valve



1. Possible electrical connection:
 - D-sub DE-9 male connector
 - 6 removable terminal connections that are delivered with the product
2. Possible fluid connections:
 - G-internal-threaded connections according to DIN ISO 228/1
 - NPT-internal-threaded connections according to ASME/ANSI B 1.20.1
 - Flange connection
3. M4 screw for functional earth connection
4. Base block
5. Flow direction
6. Proportional valve
7. Product status indicator. The indicator operates according to NAMUR NE 107.
8. büS interface for the Bürkert Communicator software
9. Slot for the memory card

Fig. 4: Product variants of an MFC Analogue with proportional valve

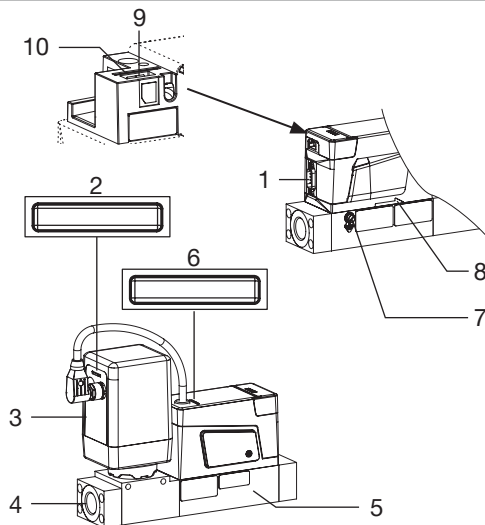
5.1.5 MFC Ethernet with motor valve



1. Electrical connections:
 - 3 removable terminal connections that are delivered with the product
 - 2x RJ45 ports
2. Status LEDs for the connection to the Ethernet network
3. Status LED of the motor valve
4. Motor valve
5. Possible fluid connections:
 - G-internal-threaded connections according to DIN ISO 228/1
 - NPT-internal-threaded connections according to ASME/ANSI B 1.20.1
 - Flange connection
6. Base block
7. Product status indicator. The indicator operates according to NAMUR NE 107.
8. M4 screw for functional earth connection
9. Flow direction
10. Status LED for the fieldbus communication
11. büS interface for the Bürkert Communicator software
12. Slot for the memory card

Fig. 5: Product variants of an MFC Ethernet with motor valve

5.1.6 MFC Analogue with motor valve



1. Possible electrical connection:
 - D-sub DE-9 male connector
 - 6 removable terminal connections that are delivered with the product
2. Status LED of the motor valve
3. Motor valve

4. Possible fluid connections:
 - G-internal-threaded connections according to DIN ISO 228/1
 - NPT-internal-threaded connections according to ASME/ANSI B 1.20.1
 - Flange connection
5. Base block
6. Product status indicator. The indicator operates according to NAMUR NE 107.
7. M4 screw for functional earth connection
8. Flow direction
9. büS interface for the Bürkert Communicator software
10. Slot for the memory card

Fig. 6: Product variants of an MFC Analogue with motor valve

5.2 Product status indicator

The product status indicator changes its colour based on the NAMUR recommendation NE 107. The colour of the product status indicator gives the following pieces of information:

- Whether product diagnostics are active or not. Diagnostics are active on the product and cannot be deactivated.
- If product diagnostics are active, then the product status indicator shows whether diagnostics events have been generated or not. If several diagnostics events have been generated, then the product status indicator shows the diagnostics event with the highest priority. Refer to [Tab. 1](#).

If the product status indicator flashes, then the product is selected in a man-machine interface such as the Bürkert Communicator software.

Tab. 1: Product status indicator in accordance with NAMUR NE 107, edition 2006-06-12, for active diagnostics

Colour according to NE 107	Colour code (for a PLC)	Diagnostics event according to NE 107	Meaning
Red	5	Failure, error or fault	MFM: Due to a malfunction of the product or its periphery, the measured values are not valid. MFC: Due to a malfunction of the product or its periphery, the measured values are not valid and the product cannot regulate any more.
Orange	4	Check function	The product is being worked on. <ul style="list-style-type: none"> • MFM: The output signal is temporarily not valid. • MFC: The product cannot regulate temporarily.
Yellow	3	Out of specification	The ambient conditions or process conditions for the product are outside the specified ranges. Product internal diagnostics point to problems in the product or with the process properties.
Blue	2	Maintenance required	→ Do the required maintenance operation. MFM: The product continues to measure. MFC: The product continues to regulate, but a function is temporarily restricted.
Green	1	-	Diagnostics are active and no diagnostics event has been generated. The MFC product variant operates in the normal operating mode or in Stored set-point value operating mode. Refer to chapter 10.7 Normal operating mode (MFC) and chapter 10.9 Choose the source giving the set-point value (MFC) .

→ To solve a problem that is indicated by the product status indicator, refer to chapter [12.1](#).

5.3 Motor valve status LED

The colour and status of the motor valve status LED give the following pieces of information:

- Whether the motor valve faces a problem or not.
- Whether the motor valve is completely open or closed.

Tab. 2: Status of the motor valve depending on the colour of the status LED

Colour of the LED	Status of the LED	Status of the motor valve
-	LED out	Motor valve is not energised
white	LED lit	Motor valve operates normally
yellow	LED lit	Motor valve is completely open
	LED flashing. The colour alternates with the colour that indicates the position of the motor valve.	The ambient conditions or the process conditions for the motor valve are outside the specified ranges. The ambient conditions or the process conditions for the motor valve are outside the specified ranges.
green	LED lit	Motor valve is closed
red	LED flashing. The colour alternates with the colour that indicates the position of the motor valve.	Error

5.4 Status LEDs specific to a product variant Ethernet

5.4.1 Status LEDs for the connection to the Ethernet network

Each RJ45 port of a product variant Ethernet variant has 2 LEDs to show the status of the connection to the network.

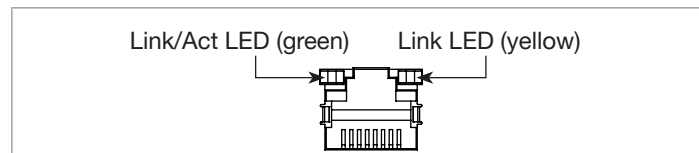


Fig. 7: Location of the LEDs for the connection to the Ethernet network

Tab. 3: Description of the Link/Act LED

Link/Act LED	Meaning
ON, fast flashing	Connection to the parent protocol layer is established. Data is being exchanged.
ON, slow flashing	No connection to the protocol layer. Happens about 20 seconds after restart of the product.
OFF	No connection to the network.

Tab. 4: Description of the Link LED

Link LED	Meaning
ON	Connection to the network is established.
OFF	No connection to the network.

5.4.2 Status LED for the fieldbus communication (product variant Ethernet)

A product variant Ethernet has an LED to show the status of the communication between the product and the PLC (Programmable Logical Controller).

Tab. 5: Description of the communication LED

Communication LED	Description	Meaning
Green	RUN	Cyclic data is being exchanged between the product and the fieldbus master
Red	ERROR	No cyclic data is being exchanged between the product and the fieldbus master

5.5 Memory card

NOTICE

If the memory card is defective or lost, buy a new memory card at your Bürkert sales office.

The product is delivered with a memory card that is inserted in the product.

When the product is energised, there are two possibilities:

- If product-specific data is stored on the inserted memory card, the product adopts the data. At product delivery, the memory card contains product-specific data. To get a list of the stored data, refer to the Help for the Initiation file that can be downloaded from country.burkert.com.
- If the inserted memory card is empty, the product loads its own data on the memory card. A new memory card is empty.

The data on the memory card can be transferred to another product with the same article number. For example, the data can be transferred from a defective product to a new product.

5.6 büS-interface

The büS-interface is used for short-term servicing of the product with the Bürkert Communicator software.

→ To connect the product to the Bürkert Communicator software, refer to chapter [10.4](#).

5.7 Control valve of an MFC

The MFC is equipped with one of the following control valve types:

- A direct acting, normally-closed proportional valve.
- A motor-driven valve that is called motor valve. If de-energised, the motor valve remains in its latest position.

The control valve provides the sealing function when the following conditions are met:

- The product is used within the specified pressure range.
- The product is equipped with a valve seat seal that is made of a soft material such as FKM or EPDM.

NOTICE

If the valve seat seal is made of a hard material such as PCTFE, then the control valve may not be tight.

Products with a nominal valve diameter of 0.05 mm or 0.1 mm have a valve seat seal made of a hard material.

6 TECHNICAL DATA

6.1 Conformity

The product complies with the EU directives according to the EU declaration of conformity (if applicable).

6.2 Standards

The applied standards, which verify conformity with the EU directives, can be found on the EU type examination certificate and/or the EU declaration of conformity (if applicable).

6.3 Operating conditions



WARNING

Risk of injury from malfunction due to outdoor use.

- ▶ Do not use the product in outdoor areas.



WARNING

Risk of injury caused by pressure, fluid escape.

Important product-specific data is indicated on the Type label and calibration plate.

- ▶ Only use the product for the specified operating fluid.
- ▶ Do not exceed the specified calibration pressure.

6.3.1 MFM Analogue

Tab. 6: Operating conditions of an MFM Analogue

Ambient temperature	–10 °C...+50 °C
Fluid temperature	<ul style="list-style-type: none"> • –10 °C...+70 °C • –10 °C...+60 °C for oxygen
Ambient humidity	< 95 %, non-condensing
Protection class according to EN 60529	IP20 ¹⁾ If the following conditions are met: <ul style="list-style-type: none"> • Cables must be connected. • Mating connectors must be plugged in and tightened.
1) The IP-Code is determined by Bürkert. The IP-Code is not evaluated by UL.	
Operating pressure	Max. 22 bar

6.3.2 MFM Ethernet

Tab. 7: Operating conditions of an MFM Ethernet

Ambient temperature	–10 °C...+50 °C The maximum temperature depends on the distance between 2 products. If the distance between 2 products is smaller than 30 mm, then contact Bürkert.
Fluid temperature	<ul style="list-style-type: none"> • –10 °C...+70 °C • –10 °C...+60 °C for oxygen
Ambient humidity	< 95 %, non-condensing
Protection class according to EN 60529	IP20 ²⁾ If the following conditions are met: <ul style="list-style-type: none"> • Cables must be connected. • Mating connectors must be plugged in and tightened.
2) The IP-Code is determined by Bürkert. The IP-Code is not evaluated by UL.	
Operating pressure	Max. 22 bar

6.3.3 MFC Analogue with proportional valve

Tab. 8: Operating conditions of an MFC Analogue with proportional valve

Ambient temperature	<ul style="list-style-type: none"> • -10 °C...+50 °C • UL-certified product variant: -10 °C...+40 °C
Fluid temperature	<ul style="list-style-type: none"> • -10 °C...+70 °C • -10 °C...+60 °C for oxygen
Ambient humidity	< 95 %, non-condensing
Protection class according to EN 60529	<p>IP20³⁾</p> <p>If the following conditions are met:</p> <ul style="list-style-type: none"> • Cables must be connected. • Mating connectors must be plugged in and tightened.
3) The IP-Code is determined by Bürkert. The IP-Code is not evaluated by UL.	
Operating pressure	<p>Max. 10 bar</p> <p>Depends on the nominal diameter of the proportional valve</p>

6.3.4 MFC Ethernet with proportional valve

Tab. 9: Operating conditions of an MFC Ethernet with proportional valve

Ambient temperature	<ul style="list-style-type: none"> • -10 °C...+50 °C • UL-certified product variant: -10 °C...+40 °C <p>The maximum temperature depends on the distance between 2 products. If the distance between 2 products is smaller than 30 mm, then contact Bürkert.</p>
Fluid temperature	<ul style="list-style-type: none"> • -10 °C...+70 °C • -10 °C...+60 °C for oxygen
Ambient humidity	< 95 %, non-condensing
Protection class according to EN 60529	<p>IP20⁴⁾</p> <p>If the following conditions are met:</p> <ul style="list-style-type: none"> • Cables must be connected. • Mating connectors must be plugged in and tightened.
4) The IP-Code is determined by Bürkert. The IP-Code is not evaluated by UL.	
Operating pressure	<p>Max. 10 bar</p> <p>Depends on the nominal diameter of the proportional valve</p>

6.3.5 MFC Analogue with motor valve

Tab. 10: Operating conditions of an MFC Analogue with motor valve

Ambient temperature	<ul style="list-style-type: none"> • -10 °C...+50 °C • UL-certified product variant: -10 °C...+40 °C
Fluid temperature	<ul style="list-style-type: none"> • 0 °C...+70 °C • 0 °C...+60 °C for oxygen
Ambient humidity	< 95 %, non-condensing
Protection class according to EN 60529	IP20 ⁵⁾ If the following conditions are met: <ul style="list-style-type: none"> • Cables must be connected. • Mating connectors must be plugged in and tightened.
5) The IP-Code is determined by Bürkert. The IP-Code is not evaluated by UL.	
Operating pressure	Max. 22 bar Depends on the nominal diameter of the motor valve

6.3.6 MFC Ethernet with motor valve

Tab. 11: Operating conditions of an MFC Ethernet with motor valve

Ambient temperature	<ul style="list-style-type: none"> • -10 °C...+50 °C • UL-certified product variant: -10 °C...+40 °C <p>The maximum temperature depends on the distance between 2 products. If the distance between 2 products is smaller than 30 mm, then contact Bürkert.</p>
Fluid temperature	<ul style="list-style-type: none"> • 0 °C...+70 °C • 0 °C...+60 °C for oxygen
Ambient humidity	< 95 %, non-condensing
Protection class according to EN 60529	IP20 ⁶⁾ If the following conditions are met: <ul style="list-style-type: none"> • Cables must be connected. • Mating connectors must be plugged in and tightened.
6) The IP-Code is determined by Bürkert. The IP-Code is not evaluated by UL.	
Operating pressure	Max. 22 bar Depends on the nominal diameter of the motor valve

6.4 Markings



WARNING

Risk of injury caused by pressure, fluid escape.

Important product-specific data is indicated on the Type label and the calibration plate.

- ▶ Only use the product for the specified operating fluid.
- ▶ Do not exceed the specified calibration pressure.

6.4.1 Calibration plate

1	Mass Flow Controller
2	Medium 1
3	P1: 1,00 barg
4	Mounting: horizontal upright
5	Id: 00***** QC passed: ____ . ____ . ____
6	

1. Product variant
2. Calibration fluid
3. Calibration pressure
4. Installation position
5. Product article number
6. Calibration date

Fig. 8: Description of the calibration plate


6.4.2 Type label

1	874x 24V ~ 11W [7,5W]	2	IP20 NEC Class 2 only	3	5,0 NI/min Air	4	Warning symbol
16	10,0 NI/min Air	15	Profinet 10/100Mbit/s	14	GR:1 KL:A Ta=-10°C..+50°C	13	S/N 1000 W41ME PS=100barg EPDM
12	00*****	11		10		9	
8		7					

1. Type of the product
2. Supply voltage, direct current
3. Consumption according to UL 61010-1 [proportional valve: typical consumption ¹⁾; motor valve: power consumption ¹⁾ to hold the position of the motor valve]
- ¹⁾ Conditions: ambient temperature 23 °C, nominal flow rate 100 %, regulation for 30 minutes
4. Warning symbol: Observe the Operating Instructions that are delivered with the product.
5. Ambient temperature
6. Sealing material
7. Burst pressure
8. Manufacturing code
9. Class of the control valve according to the DVGW (Deutscher Verein des Gas- und Wasserfaches)

10. Product article number
11. Serial number
12. Category of the product
13. Product variant Ethernet: communication interface Product variant Analogue: input and output
14. Nominal flow rate (Qnominal), units and operating gas 2
15. Nominal flow rate (Qnominal), units and operating gas 1
16. IP-Code

Fig. 9: Description of the Type label (example)

 Find the description of the older markings on the product in the supplement at country.burkert.com.

6.4.3 Conformity marking, certification marking

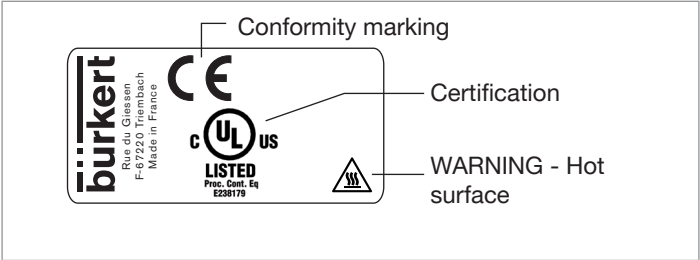


Fig. 10: CE marking and UL-certification

6.4.4 Markings specific to a product variant Ethernet

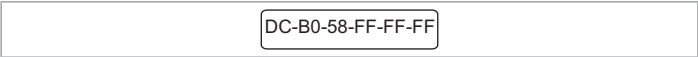


Fig. 11: Marking with the MAC address (example)

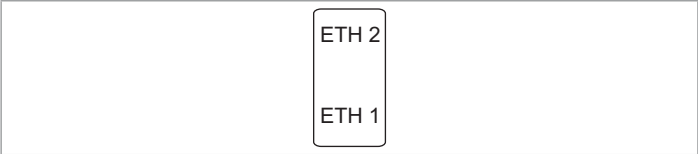


Fig. 12: Marking with the Ethernet ports

6.5 Product materials

Tab. 12: Product materials common to all product variants Analogue

Product part	Material
Base block	<ul style="list-style-type: none">AluminiumStainless steel 1.4305
Housing	Polycarbonate (PC) and aluminium
Seal	Refer to the Type label
Product status indicator	PMMA
Parts in contact with the fluid (sensor)	1.4404, Al ₂ O ₃ , PPS GF40, epoxy resin, silicon, silicon nitride

Tab. 13: Product materials common to all product variants Ethernet

Product part	Material
Base block	<ul style="list-style-type: none"> Aluminium Stainless steel 1.4305
Housing	Polycarbonate (PC)
Seal	Refer to the Type label
Product status indicator	PMMA
Parts in contact with the fluid parts (sensor)	1.4404, Al ₂ O ₃ , PPS GF40, epoxy resin, silicon, silicon nitride

Tab. 14: Specific materials of an MFC with proportional valve

Parts in contact with the fluid parts	1.4310, 1.4113, 1.4305
---------------------------------------	------------------------

Tab. 15: Specific materials of an MFC with motor valve

Parts in contact with the fluid parts	1.4310, 1.4305, Al ₂ O ₃ , PPS GF40, PEEK
---------------------------------------	---

6.6 Dimensions, weight

→ Refer to the data sheet of the related product.

6.7 Fluid data

6.7.1 Mass Flow Meter

Tab. 16: Fluid data, MFM

Calibration fluid	Air or operating fluid
Mass flow-rate range (reference to N ₂ (I _N /min))	20...2500 I _N /min
Exact range depends on the product base-block size and on the gas used. Refer to the datasheet related to the product Type.	
Measuring range	1:50 Larger measuring range available on request.
Repeatability	±0.1 % of the full scale
Operating fluid	See Type label
Measurement accuracy, after 15 minute warm-up time and with the calibration fluid	±1.5 % ⁷⁾ of the measured value ±0.3 % ⁷⁾ of the full scale
Response time	< 500 ms

7) If the operating fluid is different from the calibration fluid, the actual measurement accuracy might vary from the value stated in the data sheet. If the operating fluid is natural gas, the measurement accuracy depends on the composition of the natural gas, which can vary depending on the origin and season.

6.7.2 Mass Flow Controller with proportional valve

Tab. 17: Fluid data, MFC with proportional valve

Calibration fluid	Air or operating fluid
Mass flow-rate range (reference to N ₂ (I _N /min))	20...1500 I _N /min
Exact range depends on the product base-block size and on the gas used. Refer to the datasheet related to the product type.	
Measuring range	1:50 Larger measuring range available on request.
Repeatability	±0.1 % of the full scale
Operating fluid	See Type label
Measurement accuracy, after 15 minute warm-up time and with the calibration fluid	±1.5 % ⁹⁾ of the measured value ±0.3 % ⁹⁾ of the full scale
Settling time	< 500 ms

8) If the operating fluid is different from the calibration fluid, the actual measurement accuracy might vary from the value stated in the data sheet. If the operating fluid is natural gas, the measurement accuracy depends on the composition of the natural gas, which can vary depending on the origin and season.

6.7.3 Mass Flow Controller with motor valve

Tab. 18: Fluid data, MFC with motor valve

Calibration fluid	Air or operating fluid
Mass flow-rate range (reference to N ₂ (I _N /min))	20...2500 I _N /min
Exact range depends on the product base-block size and on the gas used. Refer to the datasheet related to the product Type.	
Measuring range	1:50 Larger measuring range available on request.
Repeatability	±0.1 % of the full scale
Operating fluid	See Type label
Measurement accuracy, after 15 minute warm-up time and with the calibration fluid	±2 % ⁹⁾ of the measured value ±0.5 % ⁹⁾ of the full scale
Settling time	< 5 s

9) If the operating fluid is different from the calibration fluid, the actual measurement accuracy might vary from the value stated in the data sheet. If the operating fluid is natural gas, the measurement accuracy depends on the composition of the natural gas, which can vary depending on the origin and season.

6.7.4 Quality of the operating fluid

Use the operating fluid that is given on the product Type-label. The operating fluid must be clean and dry.



The gas or gas mixture must obey the quality criteria in [Tab. 19](#). The quality criteria are given in standard ISO 8573-1, Compressed Air - Part 1: Contaminants and purity classes. The operating gas must obey the quality criteria to obey the following requirements:

- the necessary measurement accuracy of the product
- to meet the safety requirements
- to meet the closed-loop control accuracy of an MFC

For further information on the quality criteria, refer to ISO 8573-1.

Tab. 19: Quality criteria of the fluid

Criteria	Quality class	Value
Maximum particle size	2	1 µm
Maximum particle density	2	1 mg/m ³
Maximum dew point under pressure	4	3 °C
Maximum oil concentration	1	0.01 mg/m ³

6.8 Pressure loss (MFM)

A Mass Flow Meter has a pressure loss that depends on the following parameters:

- the flow rate value
- the size of the product fluid-connections
- the type of the product fluid-connections
- the size of the product base-block
- the type of operating gas

→ Determine the pressure-loss value depending on whether the operating fluid is air or a gas other than air.

6.8.1 Operating gas is air

If the operating gas is air, then read the pressure-loss value directly from the diagrams in [Fig. 13](#) or in [Fig. 14](#).

For example, if the flow rate through an MFM with 1/2" threaded fluid-connections is 1400 l_N/min then the pressure loss for air, as given in [Fig. 13](#), is 140 mbar.

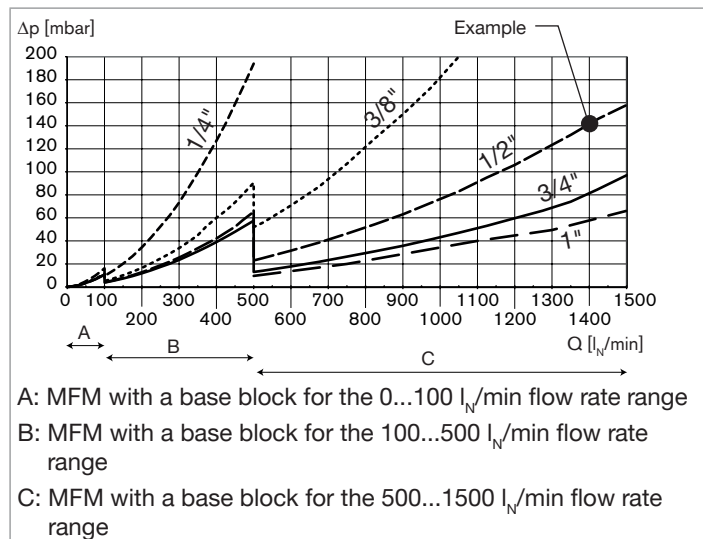


Fig. 13: Pressure loss diagram for air, MFM with a 250-μm mesh filter, flow rate ranges 0...100 l_N/min, 100...500 l_N/min, 500...1500 l_N/min

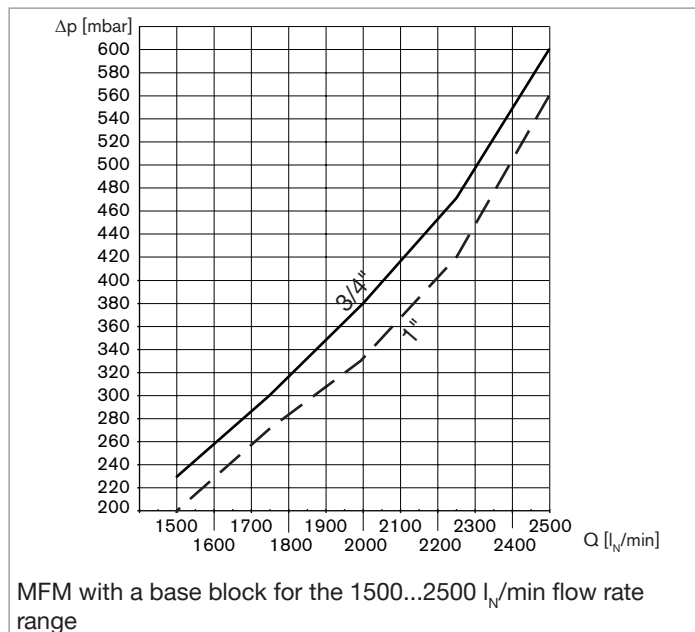


Fig. 14: Pressure loss diagram for air, MFM with a 250-μm mesh filter, flow rate range 1500...2500 l_N/min

6.8.2 Operating gas is not air

If the operating gas is not air, determine the pressure loss as follows:

1. Read the air pressure-loss Δp_{air} from the diagrams in [Fig. 13](#) or in [Fig. 14](#).
2. Calculate the pressure loss Δp_{gas} with the formula that is given in [Fig. 15](#).

$$\Delta P_{\text{Gas}} = \Delta P_{\text{air}} \cdot \sqrt{\frac{\rho_N^{\text{Gas}}}{\rho_N^{\text{air}}}}$$

ΔP_{Gas} = pressure loss of the operating gas

ΔP_{air} = pressure loss of air

ρ_N^{Gas} = density of the operating gas at the standard conditions according to DIN 1343 ($P_N = 1013.25 \text{ mbar}$, $T_N = 273.15 \text{ K}$)

ρ_N^{air} = density of air at the standard conditions according to DIN 1343 ($P_N = 1013.25 \text{ mbar}$, $T_N = 273.15 \text{ K}$)

Fig. 15: Formula to calculate the pressure loss in an MFM

Example for argon gas that flows through an MFM with 1/2" threaded fluid-connections:

1. If the flow rate is $1400 \text{ l}_N/\text{min}$ then the air pressure-loss Δp_{air} as given in [Fig. 13](#) is 140 mbar.
2. The pressure loss for argon gas at a flow rate of $1400 \text{ l}_N/\text{min}$ is 164.4 mbar as given by the calculation in [Fig. 16](#).

$$\Delta P_{\text{argon}} = 140 \text{ mbar} \cdot \sqrt{\frac{1.784}{1.294}} = 164.4 \text{ mbar}$$

Fig. 16: Calculation of the pressure loss for argon gas

6.9 Electrical data

6.9.1 Product variant Ethernet

Tab. 20: Electrical data of an MFM

Operating voltage	24 V DC ± 10 %
Maximum power consumption	4 W
Communication interface	PROFINET, EtherNet/IP, EtherCAT, Modbus TCP

Tab. 21: Electrical data of an MFC

Operating voltage	24 V DC ± 10 %; residual ripple < 2 %
Maximum power consumption	Refer to the Type label
Communication interface	PROFINET, EtherNet/IP, EtherCAT, Modbus TCP

6.9.2 Product variant Analogue

Tab. 22: Electrical data of an MFM with D-sub DE-9 male connector

Operating voltage	24 V DC ± 10 % (15 V DC ± 10 % on request)
Maximum power consumption	2 W
Digital input	
• 0...0.2 V	• to activate level 1
• 1...4 V or open	• to activate level 2
• 5...28 V	• to activate level 3
Set-point analogue output	
• 0/4...20 mA	• Maximum loop impedance: 600 Ω at an operating voltage of 24 V DC (200 Ω at an operating voltage of 15 V DC); Resolution: 20 μ A
• 0...5/10 V	• Maximum current: 20 mA Resolution: 10 mV
Relay output	Normally closed contact (break contact), free of potential

Tab. 23: Electrical data of an MFM with 6 removable terminal connections

Operating voltage	24 V DC ± 10 % (15 V DC ± 10 % on request)
Maximum power consumption	2 W
Set-point analogue output	
• 0/4...20 mA	• Maximum loop impedance: 600 Ω at an operating voltage of 24 V DC (200 Ω at an operating voltage of 15 V DC); Resolution: 20 μ A
• 0...5/10 V	• Maximum current: 20 mA Resolution: 10 mV

Tab. 24: Electrical data of an MFC with D-sub DE-9 male connector

Operating voltage	24 V DC ± 10 % (15 V DC ± 10 % on request); residual ripple < 2 %
Maximum power consumption	Refer to the Type label
Set-point analogue input	
• 0/4...20 mA	• Maximum input impedance: 200 Ω Resolution: 5 μ A
• 0...5/10 V	• Minimum input impedance: 20 k Ω Resolution: 2.5 mV

Set-point analogue output

• 0/4...20 mA	• Maximum loop impedance: 600 Ω at an operating voltage of 24 V DC (200 Ω at an operating voltage of 15 V DC); Resolution: 20 μ A
• 0...5/10 V	• Maximum current: 20 mA Resolution: 10 mV

Digital input

• 0...0.2 V	• to activate level 1
• 1...4 V or open	• to activate level 2
• 5...28 V	• to activate level 3

Relay output	Normally closed contact (break contact), free of potential
--------------	--

Tab. 25: Electrical data of an MFC with 6 removable terminal connections

Operating voltage	24 V DC ± 10 % (15 V DC ± 10 % on request); residual ripple < 2 %
Maximum power consumption	Refer to the Type label
Set-point analogue input	
• 0/4...20 mA	• Maximum input impedance: 200 Ω Resolution: 5 μ A
• 0...5/10 V	• Minimum input impedance: 20 k Ω Resolution: 2.5 mV

Set-point analogue output

• 0/4...20 mA	• Maximum loop impedance: 600 Ω at an operating voltage of 24 V DC (200 Ω at an operating voltage of 15 V DC); Resolution: 20 μ A
• 0...5/10 V	• Maximum current: 20 mA Resolution: 10 mV

6.10 Communication interface (product variant Ethernet)

Tab. 26: Modbus TCP data

Transmission speed	10 and 100 Mbit/s
Data transport layer	Ethernet II, IEEE 802.3
Modbus Function Codes	1, 2, 3, 4, 6, 15, 16, 23
Mode	Message Mode: Server

Tab. 27: EtherNet/IP data

Address Conflict Detection (ACD)	Supported
DHCP	Supported
BOOTP	Supported
CIP Reset services	Type 0 and 1 for the Identity object
Transmission speed	10 and 100 Mbit/s
Duplex transmission	Half-duplex, duplex, auto-negotiation
Data transport layer	Ethernet II, IEEE 802.3
DLR (ring topology)	Supported

MDI modes	MDI, MDI-X, Auto-MDIX
Predefined standard objects	<ul style="list-style-type: none"> • Identity (0x01) • Message Router (0x02) • Assembly (0x04) • Connection Manager (0x06) • DLR (0x47) • QoS (0x48) • TCP/IP Interface (0xF5) • Ethernet Link (0xF6)

Tab. 28: PROFINET data

Additional supported features	DCP, VLAN priority tagging, Shared Device
Transmission speed	100 Mbit/s
Data transport layer	Ethernet II, IEEE 802.3
IRT	not supported
MRP	MRP Client is supported
Minimum cycle time	1 millisecond
AR (Application Relations)	Simultaneous processing of up to 2 IO AR's, 1 Supervisor AR and 1 Supervisor-DA AR
PROFINET IO specification	V2.3
Topology recognition	LLDP, SNMP V1, MIB2, Physical Device Record Object

Tab. 29: EtherCAT data **EtherCAT®**

Industrial Ethernet interface X1, X2	<ul style="list-style-type: none"> • X1: EtherCAT IN • X2: EtherCAT OUT
Maximum number of cyclic input data and cyclic output data	512 bytes in total
Maximum number of cyclic input data	1024 bytes
Maximum number of cyclic output data	1024 bytes
Acyclic communication (CoE)	<ul style="list-style-type: none"> • SDO • SDO master-slave • SDO slave-slave (depends on master capacity)
Type	Complex slave
Fieldbus Memory Management Units (FMMUs)	8
Sync Managers	4
Transmission speed	100 Mbit/s
Data transport network	Ethernet II, IEEE 802.3

EtherCAT® is a registered trademark and patented technology, licensed by Beckhoff Automation GmbH, Germany

7 FLUID INSTALLATION

7.1 Safety instructions



DANGER

Risk of injury that is due to pressure in the installation or in the product.

- Before working on the installation or product, cut the pressure. Vent and drain the pipes.

Risk of injury from electric shocks.

- Before working on the installation or the product, switch off the power supply. Make sure that nobody can switch the power supply on.
- Observe all applicable accident protection and all applicable safety regulations for electrical equipment.

Risk of injury that is due to fluid escape.

- Observe all applicable accident protection and all applicable safety regulations relating to the operating fluid used.



WARNING

Risk of injury that is due to improper installation.

- Only trained personnel can carry out the installation. Personnel must use suitable tools.
- Secure the installation against unintentional actuation.
- Ensure a controlled restart after installation.

NOTICE

Risk of breakage of a product with motor valve.

- Do not use the actuator housing of the motor valve as a lever arm.



Vibrations have an unwanted effect on the control valve of the MFC.

- ▶ Avoid severe vibrations.

7.2 Installation steps

1. Do the fluid installation into the pipe depending on the fluid connections. Refer to the relevant chapter:
 - chapter [7.3 Product variant with G-internal-threaded connections](#)
 - chapter [7.4 Product variant with NPT-internal-threaded connections](#)
 - chapter [7.5 Product variant with flange connections](#).
2. Do the electrical installation. Refer to chapter [8](#).
3. Commission the product. Refer to chapter [9 Commissioning](#).

7.3 Product variant with G-internal-threaded connections



WARNING

Risk of injury that is due to leakage.

- ▶ At a low mass flow rate and a high pressure, make sure that the installation is tight. The tightness prevents incorrect measurements or the leakage of the operating fluid.

To make sure that the installation is tight, observe the following instructions:

- ▶ Use compression fittings. Mount the compression fittings, in a way that they are not subject to any stresses.
- ▶ Use pipes with a diameter that is adapted to the fluid connection of the product, and with a smooth surface.



If the compression fittings are not delivered with the product, then choose pipe fittings from another manufacturer. The pipe fittings must be adapted to the fluid connection of the product. Compression fittings for G-internal-threaded connections are available as accessories, see [Tab. 30](#). Also buy the seal for each fluid connection.

Tab. 30: Stainless steel compression fittings and related seals

Product internal-threaded connection in accordance with DIN ISO 228/1	Pipe diameter	Article number	
		Stainless steel compression-fitting	Seal (1 piece)
G 1/4	6 mm	901538	901575
G 1/4	8 mm	901540	
G 1/4	1/4"	901551	901579
G 1/4	3/8"	901553	
G 3/8	8 mm	901542	901576
G 3/8	10 mm	901544	
G 3/8	1/4"	901555	901580
G 3/8	3/8"	901556	
G 1/2	10 mm	901546	901577
G 1/2	12 mm	901548	
G 1/2	1/2"	901557	901581
G 1/2	3/4"	901558	
G 3/4	12 mm	901549	901578
G 3/4	3/4"	901559	901582
G 1	On request		

Installation procedure



The procedure is given for the compression fittings available from Bürkert.

- If you use pipe fittings from another manufacturer, obey the instructions from this manufacturer.

No inlet section is required.

The connection to the pipe is explained for one side of the product. The same procedure applies on the other side of the product.

- Remove all dirt from the pipes and from the fluid carrying components of the installation.
- Cut the pipe squarely [1] and deburr [2]. See Fig. 17.

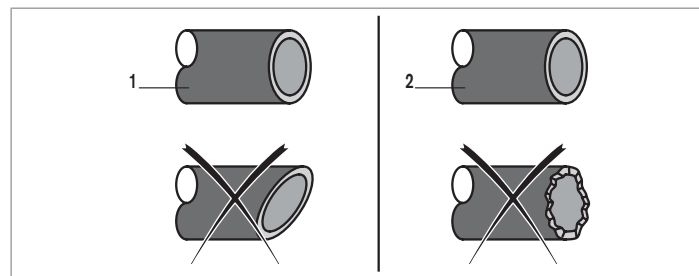


Fig. 17: Pipe cut and deburred

NOTICE

Malfunction that is due to contamination.

- If a contaminated operating fluid is used, then install a filter upstream of the product. The filter mesh-size must be smaller than 25 µm. The filter ensures problem-free functioning of the product. See chapter 6.7 Fluid data.

- Remove the protective cap that closes the threaded connection.
- Observe the installation position that is given on the calibration plate or in the calibration protocol.

→ Slide the nut [A] and then the ferrule onto the pipe. See [Fig. 18](#).

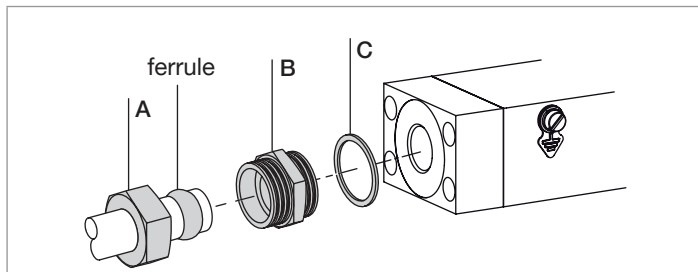


Fig. 18: Nut and ferrule on the pipe

→ Place the seal [C] on the product fluid-connection.

→ Screw the compression-fitting body [B] in the fluid connection. Tighten to a torque of 25...28 Nm, that is 18.44...20.65 lbf-ft. See [Fig. 19](#).

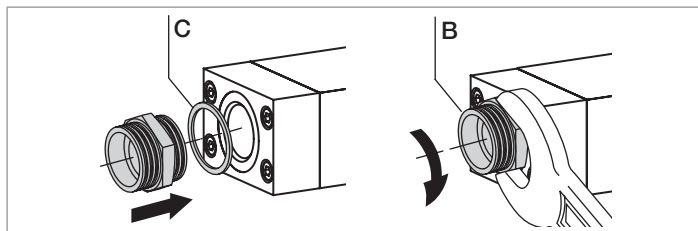


Fig. 19: Screw on the compression-fitting body

→ Insert the pipe in the compression-fitting body. Tighten the nut [A] by hand. See [Fig. 20](#).

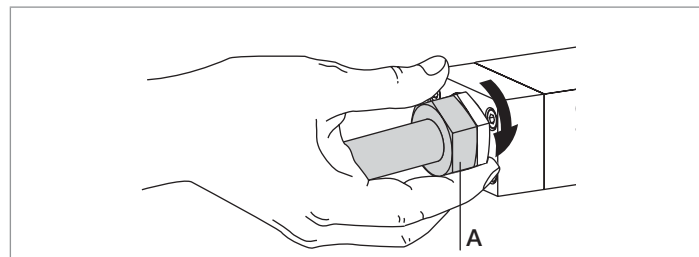


Fig. 20: Nut screwed by hand

→ Tighten the nut with an open-end spanner to a torque of 25...28 Nm, that is 18.44...20.65 lbf-ft. See [Fig. 21](#).

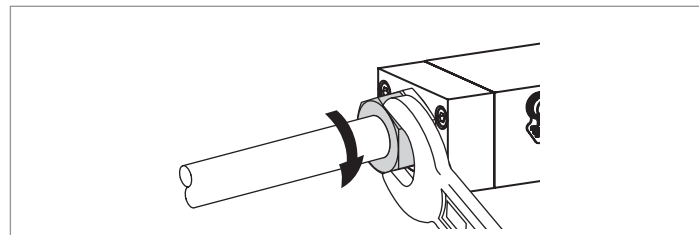


Fig. 21: Nut tightened with an open-end spanner

→ Do the fluid connection on the other side of the product in the same way.

7.4 Product variant with NPT-internal-threaded connections



WARNING

Risk of injury that is due to leakage.

- At a low mass flow rate and a high pressure, make sure that the installation is tight. The tightness prevents incorrect measurements or the leakage of the operating fluid.

To make sure that the installation is tight, observe the following instructions:

- Use compression fittings. Mount the compression fittings, in a way that they are not subject to any stresses.
- Use pipes with a diameter that is adapted to the fluid connection of the product, and with a smooth surface.

No inlet section is required.

- Remove all dirt from the pipes and from the fluid carrying components of the installation.
- Cut the pipe squarely [1] and deburr [2]. See Fig. 22.

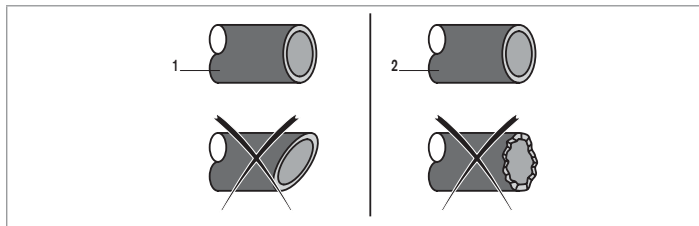


Fig. 22: Pipe cut and deburred

NOTICE

Malfunction that is due to contamination.

- If a contaminated operating fluid is used, then install a filter upstream of the product. The filter mesh-size must be smaller than 25 µm. The filter ensures problem-free functioning of the product. See chapter 6.7 Fluid data.

- Observe the installation position that is given on the calibration plate or in the calibration protocol.
- Remove the protective cap that closes the threaded connection.
- Do the fluid connection on one side of the product.
- Obey the instructions that are given by the manufacturer of the fitting used.
- Obey the torques that are given by the manufacturer of the fitting used.
- Do the fluid connection on the other side of the product in the same way.

7.5 Product variant with flange connections



WARNING

Risk of injury that is due to leakage.

At a low mass flow rate and a high pressure, make sure that the installation is tight. The tightness prevents incorrect measurements or the leakage of the operating fluid.



Vibrations have an unwanted effect on the control valve of the MFC.

► Avoid severe vibrations.

A product variant with flange connections is mounted on a process connection plate by the manufacturer. The process connection plate is fitted with fluid connections of various types:

- Internal-threaded connections
- External-threaded connections
- Clamp connections
- ...

→ Install the product depending on the fitted fluid connections.

8 ELECTRICAL INSTALLATION

8.1 Safety instructions



DANGER

Risk of injury from electric shocks.

- Before working on the installation or the product, switch off the power supply. Make sure that nobody can switch the power supply on.
- Observe all applicable accident protection and all applicable safety regulations for electrical equipment.



WARNING

Risk of ignition and risk of fire that are due to electrostatic discharge.

An electrostatic discharge of the product can ignite combustible gas vapours.

- To avoid a build up of electrostatic charge, connect the housing to the functional earth (FE). Use a green-and-yellow cable that is as short as possible. And the cable cross-section must be at least equal to the cross section of the power supply cable.



WARNING

Risk of injury from electromagnetic fields.

If the functional earth (FE) is not attached, then the requirements of the EMC directive are not met.

- ▶ Connect the housing to the functional earth (FE). Use a green-and-yellow cable that is as short as possible. And the cable cross-section must be at least equal to the cross section of the power supply cable.

NOTICE

UL approved versions must be supplied in one of the following ways:

- ▶ "Limited Energy Circuit" (LEC), according to UL / IEC61010-1
- ▶ "Limited Power Source" (LPS), according to UL / IEC60950
- ▶ SELV / PELV with UL-approved overcurrent protection, designed according to UL / IEC61010-1, Table 18 (e.g. Block PM-0124-020-0)
- ▶ NEC Class 2 power supply unit

8.2 Additional documentation

8.2.1 Product variant Analogue

- Product-specific help in the Bürkert Communicator software.

8.2.2 Product variant Ethernet

- Product-specific help in the Bürkert Communicator software.
- Product description file and object description for the related product Type must be downloaded from country.burkert.com.

MAN 1000338841_EN Version: CStatus: RL (released | freigegeben) printed: 15.09.2022

8.3 Wire the product variant Ethernet

NOTICE

Requirements for the proper function of the product.

- ▶ Use only Industrial Ethernet shielded cables with a category CAT-5e or higher.
- ▶ Use a power supply with sufficient power.
- ▶ For an MFC pay attention to the maximum permissible residual ripple on the operating voltage (residual ripple < 2 %).

→ Connect the power supply cable according to [Fig. 23](#).

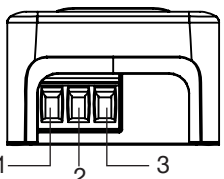
Connection terminals	Assignment
	1 FE (functional earth)
	2 DGND
	3 +24 V

Fig. 23: Assignment of the connection terminals

→ To connect the functional earth, use a green-and-yellow cable that is as short as possible. And the cable cross-section must be at least equal to the cross section of the power supply cable. Alternatively to the connection to terminal 1, you can attach the functional-earth cable to the product M4-screw. Refer to chapter [8.7](#).

→ Tighten the screws of the connection terminals to a torque of 0.22...0.25 Nm, that is 0.16...0.18 lbf-ft.

- Do the functional earthing of the product. Refer to chapter 8.7.
- Connect the product to the Industrial Ethernet network:
 - If the EtherCAT protocol is used, then plug the incoming Ethernet cable (coming from the PLC) into the ETH1-port and plug the outgoing Ethernet cable into the ETH2-port.
 - If a protocol other than EtherCAT is used, plug an Ethernet cable in any or both ports.

Both RJ45 ports have the same pin assignment. Refer to Fig. 24.



The cable shield is connected by the housing of the RJ45 ports.

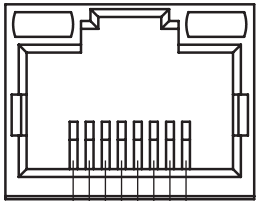
RJ45 port		Assignment
	1	TX+
	2	TX-
	3	RX+
	4	Not used
	5	Not used
	6	RX-
	7	Not used
	8	Not used
	Housing	FE

Fig. 24: Pin assignment of an RJ45 port

- Change the network parameters. To change the network parameters, you can use one of the following means:
 - Bürkert Communicator software. Refer to chapter 8.4.
 - Product web-server. You can only use the web server if the protocols Modbus TCP or Ethernet/IP are active on the product. Refer to chapter 8.4.
 - The BOOTP protocol or the DHCP protocol, but only if the product uses the Ethernet/IP protocol. You must first activate the feature on the product with the Bürkert Communicator software.
 - Any other tool that is connected to the Industrial Ethernet network. The tool must be compatible with the protocol that is active on the product.
- After the parameters have been changed, restart the product to take the new parameters into account. To restart the product, de-energise and energise again the product.

8.4 Change the network parameters



All the product variants Ethernet have the same default IP address: 192.168.1.000

- Before commissioning the product, change its network parameters.
- If several products must be connected to the same Industrial Ethernet network, then connect one product at a time and change its network parameters.

8.4.1 Over the product web-server

NOTICE

Security risk due to default passwords.

Unauthorised persons can log in to the web server and change the product parameters.

- ▶ Change default passwords.
- ▶ If the web server is not needed, then disable access with the Bürkert Communicator software. Refer to chapter [10.3.2](#).

Prerequisites:

- Digital device (PC, tablet, ...) with a web browser.
- Possibly, a USB-Ethernet adapter.

Procedure:

1. Connect the product to the digital device with an Ethernet cable. Alternatively, you can connect the product to the PC over a USB-Ethernet adapter.
 2. Energise the digital device and the product.
 3. If you have connected the product to the digital device over a USB-Ethernet adapter, then configure the IP address of the USB-Ethernet adapter. Else, configure the IP address of the network card of the digital device.
→ Change the IP address to 192.168.1.xxx, where xxx is different from 100.
 4. Open the web browser. In the address bar of the web browser, enter 192.168.1.100.
- ✓ The home page of the product web server opens. You can read some product data.

5. To configure the network parameters of the product, open a web server session.
→ If you are not automatically invited to log in, choose **Login**.
→ **User name**: enter admin
→ **User password**: enter admin
→ Click **Login**.
6. Change the default passwords with customized passwords.
7. Change the network parameters of the product.
→ Go to **Industrial communication** -----> **Configuration**
→ Change the parameters.
→ To save the changes, choose **Apply**.
→ To update the parameters in the product, choose **Restart**.

✓ The product restarts.

✓ The network parameters of the product are changed.

8.4.2 Over the Bürkert Communicator software

Procedure:

1. Connect the product to the Bürkert Communicator software. Refer to chapter [10.4](#).
 2. Change the network parameters of the product.
→ Go to **Industrial communication** -----> **Parameter**
→ Change the parameters.
→ To update the parameters in the product, restart the product.
- ✓ The product restarts.
- ✓ The network parameters of the product are changed.

8.5 Wire a product variant Analogue with D-sub DE-9 male connector

NOTICE


Requirements for the proper function of the product.

- ▶ Use shielded cables only.
- ▶ Connect each cable end to the functional earth.
- ▶ Use a power supply with sufficient power.
- ▶ For an MFC pay attention to the maximum permissible residual ripple on the operating voltage (residual ripple < 2 %).

NOTICE

Risk of faulty operation of the product if the GND signals are bridged on the product.

- ▶ Individually connect the GND or earth connections of all the signals to the product.



The cable shield is connected by the housing of the D-sub DE-9 male connector.

→ If your product is an MFM, wire a D-sub DE-9 female connector according to the pin assignment in [Fig. 25](#).

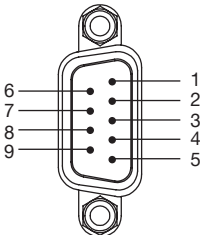
D-sub DE-9 male connector	Pin	Assignment
	1	Digital input
	2	GND for the digital input and the power supply
	3	+24 V DC
	4	Relay - Normally closed contact (Break contact)
	5	Relay - Reference contact
	6	Not used
	7	Not used
	8	Analogue output for the measured value
	9	GND for the analogue output
	Housing	FE

Fig. 25: MFM Analogue: Pin assignment of the D-sub DE-9 male connector

→ If your product is an MFC, wire a D-sub DE-9 female connector according to the pin assignment in [Fig. 26](#).

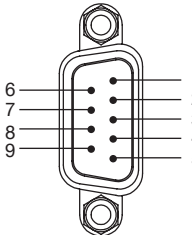
D-sub DE-9 male connector	Pin	Assignment
	1	Digital input
	2	GND for the digital input and the power supply
	3	+24 V DC
	4	Relay - Normally closed contact (Break contact)
	5	Relay - Reference contact
	6	Set-point input
	7	GND for the set-point input
	8	Analogue output for the measured value
	9	GND for the analogue output
	Housing	FE

Fig. 26: MFC Analogue: Pin assignment of the D-sub DE-9 male connector

- To get more information on the digital input, refer to chapter [8.5.1](#).
- To get more information on the relay output, refer to chapter [8.5.2](#).
- Connect the D-sub DE-9 female connector to the D-sub DE-9 male connector.

→ Tighten the screws to a torque of 0.5...0.6 Nm, that is 0.37...0.44 lbf-ft.

→ Do the functional earthing of the product. Refer to chapter [8.7](#).

8.5.1 Digital input

The D-sub DE-9 male connector has a digital input. A digital input is used to remotely trigger a function. The following functions are some examples of the available functions:

- MFC: Start the function autotune,
- MFC: Trigger the remote control of the actuator or trigger the control of the actuator by the product.
- MFM or MFC: Reset the totaliser for the active gas,
- MFM or MFC: Select which gas is active among 3 gases

[Tab. 31](#) shows the function that is assigned by default to the digital input of the D-sub DE-9 male connector of an MFM or an MFC.

Tab. 31: Default assignment of the digital input of the D-sub DE-9 male connector

Product variant Analogue	Default assignment
MFM	No assignment
MFC	Start autotune

→ To choose the function to be remotely triggered over the digital input, use the Bürkert Communicator software. To connect the product to the Bürkert Communicator software, refer to chapter [10.4](#). Only one of the available functions can be associated to the digital input.

A function has 1, 2 or 3 possible switching levels. If a function has several switching levels, then each switching level triggers another action. [Tab. 32](#) gives the actions that are associated to the switching levels, and shows how each level is activated.

Tab. 32: Actions triggered by the switching levels

Function	Action depending on the activated switching level		
	Level 1	Level 2	Level 3
	Activation: Short-circuit the digital input with the digital-input ground	Activation: 1...4 V DC (alternatively: not connected)	Activation: 5...28 V DC
MFC: Start autotune	Triggers the function	Not used	Not used
MFC: Actuator control	Triggers the closing of the actuator	Triggers the normal operating mode	Triggers the opening of the actuator
MFM or MFC: Reset totalizer	Triggers the function	Not used	Not used
MFM or MFC: Gas selection	Changes to gas number 2	Changes to gas number 1	Changes to gas number 3

8.5.2 Relay output

The D-sub DE-9 male connector has a relay output. The switching of the relay can show the following events:

- MFC: The set-point value cannot be reached.
- MFC: The product is doing an Autotune.
- MFC: The **Set-point value source** has changed.
- MFM or MFC: A warning message has been generated. For example if the supply voltage is too high, then a warning message is generated.
- MFM or MFC: A failure message has been generated. For example if a sensor failure is detected, then a failure message is generated.

[Tab. 33](#) shows the event that is assigned by default to the relay output of the D-sub DE-9 male connector of an MFC or an MFC.

Tab. 33: Default assignment of the relay output of the D-sub DE-9 male connector

Product variant Analogue	Default assignment
MFM	No assignment
MFC	The set-point value cannot be reached

→ To choose the events that are assigned to the relay output, use the Bürkert Communicator software. To connect the product to the Bürkert Communicator software, refer to chapter 10.4. Several events can be associated to the relay output.

8.6 Wire a product variant Analogue with 6 terminal connections

NOTICE

Requirements for the proper function of the product.

- ▶ Use shielded cables only.
- ▶ Connect each cable end to the functional earth.
- ▶ Use a power supply with sufficient power.
- ▶ For an MFC pay attention to the maximum permissible residual ripple on the operating voltage (residual ripple < 2 %).

NOTICE

Risk of faulty operation of the product if the GND signals are bridged on the product.

- ▶ Individually connect the GND or earth connections of all the signals to the product.

- Loosen the screws of the removable terminal connections.
- If your product is an MFM, wire the removable terminal connections according to the pin assignment in Fig. 27

Terminal connections	Assignment
1	+24 V DC
2	GND for the power supply
3	Not used
4	Not used
5	Analogue output for the measured value
6	GND for the analogue output

Fig. 27: MFM Analogue: Pin assignment of the terminal connections

- If your product is an MFC, wire the removable terminal connections according to the pin assignment in Fig. 28.

Terminal connections	Assignment
1	+24 V DC
2	GND for the power supply
3	Set-point input
4	GND for the set-point input
5	Analogue output for the measured value
6	GND for the analogue output

Fig. 28: MFC Analogue: Pin assignment of the terminal connections

- Tighten the screws of the removable terminal connections to a torque of 0.5...0.6 Nm, that is 0.37...0.44 lbf-ft.
- Connect the terminal connections to the product.
- Connect the cable shielding to the M4 screw.
- Do the functional earthing of the product. Refer to chapter 8.7.

8.7 Connecting the functional earth

To do the functional earthing of the product, obey the following instructions:

1. Use a green-and-yellow cable that is as short as possible. And the cable cross-section must be at least equal to the cross section of the power supply cable.
2. With a flat screwdriver of size 6.5 mm, loosen the M4 screw. See Fig. 29.

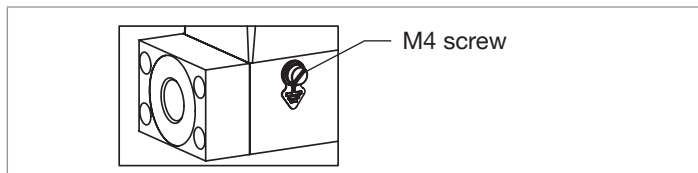


Fig. 29: Location of the M4 screw for the connection of the functional-earth cable and the connection of the cable shielding

3. Attach the functional-earth green-and-yellow cable to the M4 screw with a cable lug.
4. Tighten the M4 screw to a torque of 1.8 Nm...2 Nm, that is 1.33 lbf-ft...1.47 lbf-ft.

9 COMMISSIONING

9.1 Safety instructions



WARNING

Risk of injury from improper commissioning and operation.

Improper commissioning and operation can lead to injuries and damage to the product and its environment.

- Before commissioning, make sure that the operating personnel are familiar with, and fully understand the content of the Operating Instructions.
- Observe the safety information and the intended use.
- Only properly trained personnel may commission the installation and the product.
- Only properly trained personnel may do the settings with the help of the Bürkert Communicator software.

9.2 Commissioning steps

1. Pressurise the pipes with operating fluid
 2. Flush the pipes with operating fluid at the calibration pressure.
 3. Vent the pipes completely.
 4. Energise the product.
- ✓ If product-specific data is stored on the inserted memory card, then the product adopts the data. To get a list of the stored data at product delivery, refer to the Help for the Initiation file that can be downloaded from country.burkert.com.
- ✓ If the inserted memory card is empty, then the product loads its own data on the memory card. Possible problems related to the memory card are given in chapter [12.3.4](#) and chapter [12.3.5](#).

NOTICE

If the memory card is defective or lost, then buy a new memory card from your Bürkert sales office.

5. If the product is an MFC, and the operating fluid is not the calibration fluid or the pressure conditions have changed, then run the Autotune function. See chapter [10.8 Optimise the closed-loop control parameters \(MFC\)](#).
- ✓ The product operates normally.

10 SETTING AND OPERATION

10.1 Safety instructions



DANGER

Risk of injury that is due to pressure in the installation or in the product.

- ▶ Before working on the installation or product, cut the pressure. Vent and drain the pipes.

Risk of injury from electric shocks.

- ▶ Before working on the installation or product, switch off the power supply. Make sure that nobody can switch the power supply on.
- ▶ Observe all applicable accident protection and all applicable safety regulations for electrical equipment.

Burn hazard and fire hazard that are due to hot surface of the product.

- ▶ Do not touch the hot surface with bare hands.
- ▶ Wear safety gloves to touch the product.
- ▶ Keep the product away from any highly flammable materials or fluids.

Risk of injury that is due to escape of the fluid.

- ▶ Observe all applicable accident protection and all applicable safety regulations relating to the operating fluid used.



WARNING

Risk of injury that is due to improper operation.

Improper operation can lead to injuries and damage to the product and its environment.

- ▶ The operating personnel must have read and understood the content of the Operating Instructions.
- ▶ Observe the safety information and the intended use.
- ▶ Only properly trained personnel may operate the installation and the product.
- ▶ Only properly trained personnel may do the settings with the help of the Bürkert Communicator software.

10.2 Functions

10.2.1 Zero-point shut-off (MFC)

A zero-point shut-off ensures the sealing function of the control valve. The zero-point shut-off is activated if the following conditions occur simultaneously:

1. Set-point value $< 2\%$ of nominal flow rate Q_{nominal} (with measuring range 1:50)
2. Measured value $< 2\%$ of nominal flow rate Q_{nominal} (with measuring range 1:50)

✓ If the zero-point shut-off is active, then the PWM signal is set to 0% so that the control valve is completely closed.

10.2.2 Flush mode (MFC Ethernet)

NOTICE

If the control valve is fully open, then the internal product temperature increases. And if the internal product temperature increases, then the product can be damaged.

- Do not let the control valve fully open for more than 10 minutes.

To open the control valve completely, send one of the following commands to the product:

- an acyclic command
- a cyclic command with the double nominal flow rate

10.3 Tools for doing settings



The MassFlowCommunicator is another PC software that is not compatible with the product. You cannot use the MassFlowCommunicator software to configure or operate the product.

10.3.1 Product variant Analogue

Settings can be done with the Type 8920 Bürkert Communicator software.

- To connect the product to the Bürkert Communicator software, refer to chapter [10.4](#).
- For general information about the Bürkert Communicator software, refer to the Type 8920 Operating Instructions.

10.3.2 Product variant Ethernet

- All the product settings, including network parameters, can be made with the Type 8920 Bürkert Communicator software.
- To connect the product to the Bürkert Communicator software, refer to chapter [10.4](#).
- To get general information about the Bürkert Communicator software, refer to the Operating Instructions for the Type 8920.
- The network parameters of the product can be set with the product web server. The product web server can be used for the following protocols:
 - EtherNet/IP
 - Modbus TCP
- To connect the product to the Bürkert web server and change the network parameters of the product, refer to chapter [8.4](#).
- The web server is enabled upon product delivery. To disable web server access, use the Bürkert Communicator software and go to the menu **Web server** -----> **Parameter** -----> **Activate web server**.
- Network parameters of the product can be set with any other tool that is connected to the Industrial Ethernet network. The tool must be compatible with the protocol that is active on the product.

10.4 Connect the product to the Bürkert Communicator software

To do the settings with the Type 8920 Bürkert Communicator software, do the following steps:

- Buy the USB-büS-interface set with article number 00772551 from Bürkert.
- Download the latest version of the Type 8920 Bürkert Communicator software from country.burkert.com.
- Install the Bürkert Communicator software on a PC. During installation, the büS stick must not be inserted at the PC.
- Assemble the parts of the USB-büS-interface set. Refer to [Fig. 30](#).

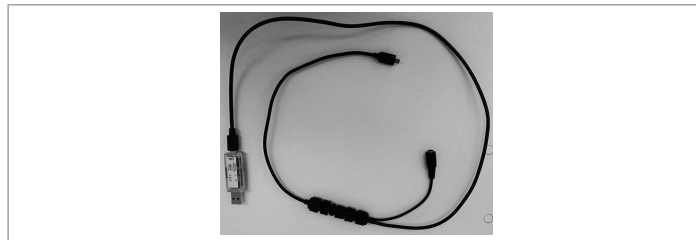



Fig. 30: Assembled parts of the USB-büS-interface set with article number 00772551

- Set the termination-resistance switch of the büS stick to ON.
- Insert the büS stick into a USB port of the PC.
- Energise the product. Refer to chapter [8 Electrical installation](#).

- Insert the micro-USB connector into the bÜS-interface for the Bürkert Communicator software. The location of the bÜS-interface on the product is given in chapter [5.1](#).
- Wait until the Windows pilot of the bÜS stick has been completely installed on the PC.
- Start the Bürkert Communicator software.
- Click on  in the Bürkert Communicator software to establish the communication between the Bürkert Communicator software and the product. A window opens.
- Select **bÜS stick**.
- Choose the port **Bürkert USB bÜS Stick**, click on **Finish** and wait until the product symbol appears in the list of devices.
- In the list of devices, click on the symbol related to the product. The menu structure for the product is displayed.

10.5 User-defined adjustment

At delivery the product is calibrated by the manufacturer.

With the Bürkert Communicator software, you can define an adjustment procedure with up to 32 calibration points.

The user-defined adjustment procedure is described in the product-specific Help of the Bürkert Communicator software.

- To connect the product to the Bürkert Communicator software, refer to chapter [10.4](#).

10.6 Operating modes of an MFC

When energising the product for the first time, the product enters a short initialisation phase and then switches to the normal operating mode. The normal operating mode is described in chapter [10.7](#).

The possible operating modes are described in [Tab. 34](#).

Tab. 34: Names of the operating modes of an MFC in the Bürkert Communicator software

Operating mode	Description
Product variant Ethernet: Automatic	Refer to chapter 10.7
Product variant Analogue: Analog set-point value	Refer to chapter 10.7
Manual set-point value	Refer to chapter 10.9
Stored set-point value	Refer to chapter 10.9
Open-loop control mode	Refer to chapter 10.9
Analyze system	Refer to chapter 10.9

- To change the operating mode, change the source for the set-point values. Refer to chapter [10.9](#).

The operating mode is kept after a product restart, except when the product performs the function **Analyze system**.

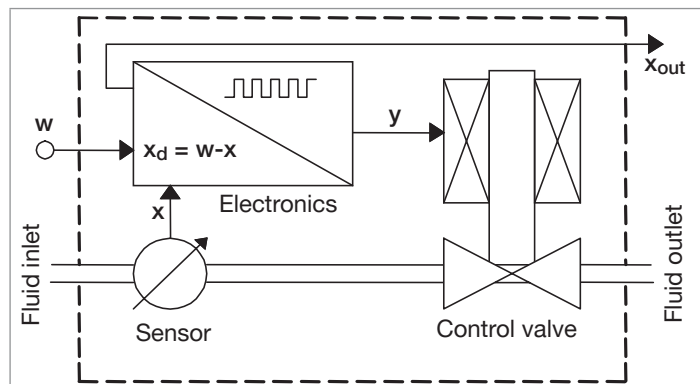
10.7 Normal operating mode (MFC)

The normal operating mode is active when energising the product for the first time. [Fig. 31.](#) shows the normal operating mode of an MFC.

NOTICE

If the valve seat seal is made of a hard material such as PCTFE, then the control valve may not be tight.

Products with a nominal valve diameter of 0.05 mm or 0.1 mm have a valve seat seal made of a hard material.



w = set-point value of the mass flow rate

x = measured value of the mass flow rate

y = set-point position of the control valve

Fig. 31: Function diagram of the MFC

The sensor measures the mass flow rate and compares the measured value x with the set-point value w . Then the product calculates the set-point position value y of the control valve. The set-point position value y determines the opening of the control valve. For example, if the set-point position value y is equal to 10 %, then the opening of the control valve is 10 %.

The transmission means of the set-point value w and the measured value of the flow rate depends on the product. Refer to chapter [10.7.1 Product variant Ethernet](#) or to chapter [10.7.2 Product variant Analogue](#).

- If the operating fluid is not the calibration fluid then run the Autotune function. Refer to chapter [10.8 Optimise the closed-loop control parameters \(MFC\)](#).
- If the pressure conditions have changed, then run the Autotune function. Refer to chapter [10.8 Optimise the closed-loop control parameters \(MFC\)](#).
- To change the operating mode, change the source for the set-point values. Refer to chapter [10.9](#).

10.7.1 Product variant Ethernet

After applying the operating voltage, the product enters a short initialisation phase and then switches to the normal operating mode. The normal operating mode of a product variant Ethernet is the **Automatic** operating mode. The set-point value is set via the fieldbus.

10.7.2 Product variant Analogue

After applying the operating voltage, the product enters a short initialisation phase and then switches to the normal operating mode.

The normal operating mode of a product variant Analogue is the **Analog set-point value** operating mode.

- The set-point value w is transmitted over the set-point analogue input according to the ranges in [Tab. 35](#).
- The measured value of the flow rate is transmitted over the analogue output according to the ranges in [Tab. 35](#).

Tab. 35: Analogue input ranges and analogue output ranges

Analogue output range	Minimum value of the input ranges and output ranges	Maximum value of the input ranges and output ranges
4...20 mA	4 mA, $w = 0 \%$	20 mA, $w = 100 \%$
0...20 mA	0 mA, $w = 0 \%$	
0...5 V	0 V, $w = 0 \%$	5 V, $w = 100 \%$
0...10 V		10 V, $w = 100 \%$

10.8 Optimise the closed-loop control parameters (MFC)

The product is calibrated at the factory with the calibration fluid under the pressure conditions that are specified on the calibration protocol.

If the operating fluid is not the calibration fluid or if the pressure conditions have changed, then the closed-loop control parameters must be optimised. The function Autotune adapts the product to the new operating conditions.

When the Autotune is running:

- Do not interrupt the power supply to the MFC.
- Keep the supply pressure constant.



WARNING

Risk of injury from flowing gas.

While the Autotune function is running, the gas flow can be higher than the nominal flow.

- ▶ Before running the Autotune function, make sure no danger can occur if the gas flow increases.

→ Trigger the Autotune function with one of the following means:

- Over the fieldbus (product variant Ethernet)
- Over the digital input (product variant Analogue)
- With the Bürkert Communicator software. To connect the product to the Bürkert Communicator software, refer to chapter [10.4](#).

- ✓ The Autotune runs and the product status indicator is orange.
- ✓ The MFC temporarily stops regulating the flow rate in the pipe.
- ✓ When the function is completed, the product returns to its previous operating mode.
- ✓ If the function is completed successfully, then the optimised closed-loop control parameters are transferred to the hard memory of the product.

10.9 Choose the source giving the set-point value (MFC)

The process set-point value can be set by different sources. You can choose which source is active at a time. The source for the set-point value can be changed during operation.

If you change the source for the set-point value, then the operating mode of the MFC is changed.

To change the source for the set-point value, change the setting of the parameter **Set-point value source** with the Bürkert Communicator software. To connect the product to the Bürkert Communicator software, refer to chapter 10.4.

On a product variant Ethernet you can alternatively change the related object. Refer to the related procedure in the product-specific help in the documentation of the initiation files. Download the initiation files and the related documentation at country.burkert.com.



The setting of the parameter **Set-point value source** is kept after a restart, except when the product performs the function **Analyze system**.

The possible choices for the parameter **Set-point value source** are:

- Product variant Ethernet: **Automatic**: the set-point value is set via the fieldbus.
- Product variant Analogue: **Analog set-point value**: the set-point value is set via the analogue input.
- **Manual set-point value**: to manually give in a set-point value for testing purposes or to make sure that the set-point value is not overwritten by other fieldbus participants.

- **Stored set-point value**: to use a fixed set-point value (w). If the product is restarted, then the fixed set-point value remains active.
- **Open-loop control mode**: to directly set the set-point position (y) to the control valve. The value given in the menu **Actuator** ----> **Parameter** ----> **Actuating variable** is the set-point position (y) that is used. A restart of the product sets the set-point position (y) to zero.
- **Analyze system**: the product operates in the normal operating mode, but according to a predefined chronological sequence with set-point values. Use the resulting diagram in combination with the graphical representation of process values to analyse the system with the Bürkert Communicator software.

10.10 Set-point values without communication (MFC Ethernet)

The function makes it possible to specify the set-point values of an MFC even if the communication with the external set-point value provider (for example a PLC) is broken. If the function is used, then the set-point is kept constant.



By using the function, the fluid can continue to flow even if the communication is broken.

- Make sure that the process is safe when you use the function.

→ To use the function, refer to the related procedure in the product-specific help in the documentation of the initiation files. Download the initiation files and the related documentation at country.burkert.com.

11 MAINTENANCE

If no heavily contaminated fluids are used and if the product is operated according to the Operating Instructions, then the product is maintenance-free.

11.1 Maintenance for operation with heavily contaminated fluids



DANGER

Risk of injury that is due to pressure in the installation or in the product.

- ▶ Before working on the installation or product, cut the pressure. Vent and drain the pipes.

Risk of injury from electric shocks.

- ▶ Before working on the installation or product, switch off the power supply. Make sure that nobody can switch the power supply on.
- ▶ Observe all applicable accident protection and all applicable safety regulations for electrical equipment.

Burn hazard and fire hazard that are due to hot surface of the product.

- ▶ Do not touch the hot surface with bare hands.
- ▶ Wear safety gloves to touch the product.
- ▶ Keep the product away from any highly flammable materials or fluids.

Risk of injury that is due to fluid escape.

- ▶ Observe all applicable accident protection and all applicable safety regulations relating to the operating fluid used.



WARNING

Risk of injury that is due to improper maintenance work.

- ▶ Only trained personnel can do the maintenance work. Personnel must use suitable tools.
- ▶ Secure the installation against unintentional actuation.
- ▶ Ensure a controlled restart after maintenance.



WARNING

If you open the housing, risk of injury from malfunction and risk of product failure.

Sensitive product parts are used to measure the flow rate and to regulate the flow.

- ▶ Do not open the product housing.
- ▶ Only carry out the cleaning work and maintenance work on the product that are described in the Operating Instructions.
- ▶ Only the manufacturer can carry out further work and calibration.

If a heavily contaminated operating fluid is used, then do the following maintenance operations:

- At regular intervals inspect the stainless steel mesh-filter for contamination. Refer to chapter [11.1.1](#).
- If the stainless steel mesh-filter is contaminated, then clean or replace the stainless steel mesh-filter with a new one, as described in chapter [11.1.1](#). If you need spare parts, refer to chapter [13 Accessories, Spare Parts](#).

11.1.1 Inspect and clean the stainless steel mesh-filter

The inspection and possibly cleaning of the stainless steel mesh-filter must be done at regular intervals. The inspection frequency and cleaning frequency depend on the measured fluid.

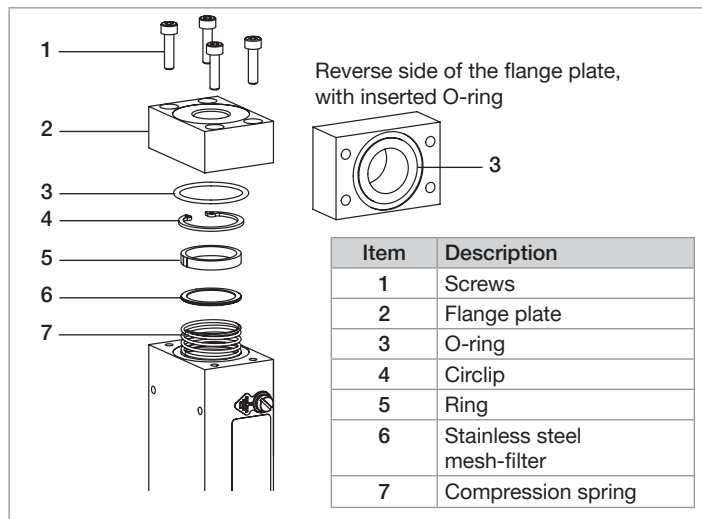




Fig. 32: Exploded view – Parts in contact with the operating fluid

To inspect and clean the mesh filter, do the following steps:

→ Position the product upright with the fluid inlet at the top.

- With an hexagon key of size 3 mm, loosen the screws [1] and remove the flange plate [2]. The O-ring [3] remains in the groove on the rear side of the flange plate.
- With a pair of tweezers, carefully remove the circlip [4] because the mesh filter [6] and the ring [5] will be pushed out by the compression spring [7].

-  Do not clean the mesh filter with tap water.
- Clean the stainless steel mesh-filter [6] with acetone, isopropanol or compressed air.
- Dry the mesh filter.
-  Before mounting the parts back, make sure that the fine side of the mesh filter [6] faces the flange plate [2]
- Push back the compression spring [7] together with the mesh filter [6] into the base block and secure them with the circlip [4].
- Make sure that the mesh filter and the O-ring are seated flat and not tilted.
- Insert the flange plate [2] and the screws [1].
- Tighten the screws to a torque of 2.8 Nm, that is 2.06 lbf-ft.

11.2 Cleaning and recalibration at the factory

If the product sensor is contaminated or damaged by operation, then the measured mass flow rate could no longer correspond to the actual mass flow rate.

- Send the product back to the manufacturer because the sensor must be replaced and recalibrated. Observe the return procedure given in chapter [17 Returning the product](#).

11.3 Replace the memory card

To replace the memory card on the product, do the following:

- De-energise the product.
- With tweezers slightly push the memory card to the stop in the product and release. The old memory card comes out.
- Pay attention to the insertion direction of the memory card. Refer to [Fig. 33](#).

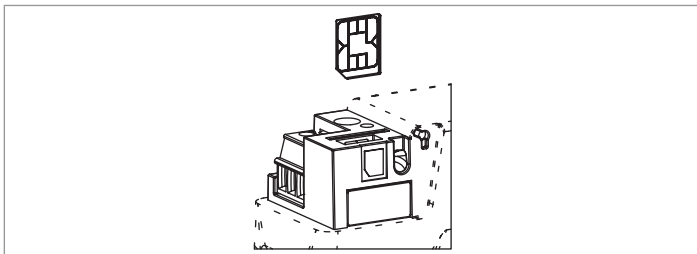


Fig. 33: Insertion direction of the memory card

- Push the new memory card in the slot until you hear a locking noise. If the memory card comes out, the locking failed.

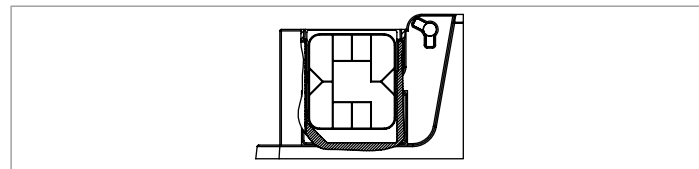


Fig. 34: Inserted memory card

- Restart the product to write the product data on the new memory card. Possible problems related to the memory card are given in chapter [12.3.4](#) and chapter [12.3.5](#).

12 TROUBLESHOOTING

12.1 Problems shown by the product status indicator

The product status indicator changes its colour based on the NAMUR recommendation NE 107 to show diagnostics events. If several diagnostics events have been generated, then the product status indicator shows the diagnostics event with the highest priority.

If the product is connected to a fieldbus, then the codes that are related to the product states are transmitted on the fieldbus. Refer to chapter [5.2](#).

12.1.1 Product status indicator is red (MFM Analogue)

Identify the cause to solve the problem:

1. The supply voltage is out of the error range. The product can be damaged.
 2. Operate the product within the specifications. If the product status indicator is still red, then send the product back to Bürkert. The sensor, the internal memory or the product is defective.
- Contact the manufacturer, because maintenance is needed.

12.1.2 Product status indicator is red (MFM Ethernet)

Identify the cause to solve the problem:

1. The supply voltage is out of the error range. The product can be damaged.
→ Operate the product within the specifications. If the product status indicator is still red, then send the product back to Bürkert.
2. The product variant Ethernet is not correctly connected to the PLC.
→ Check the wiring.
→ Check the PLC status.
→ If the EtherCAT protocol is used, make sure the incoming cable (reception from the PLC) is inserted in the ETH1 port and the outgoing cable is inserted in the ETH2 port.
3. The sensor, the internal memory or the product is defective.
→ Contact the manufacturer, because maintenance is needed.

12.1.3 Product status indicator is red (MFC Analogue)

Identify the cause to solve the problem:

1. The supply voltage is out of the error range. The product can be damaged.
→ Operate the product within the specifications. If the product status indicator is still red, then send the product back to Bürkert.

2. Incorrect Autotune or Autotune aborted.
 - Make sure that the fluid flows through the product.
 - Do the Autotune again.
3. The sensor, the internal memory or the product is defective.
 - Contact the manufacturer, because maintenance is needed.

12.1.4 Product status indicator is red (MFC Ethernet)

Identify the cause to solve the problem:

1. The supply voltage is out of the error range. The product can be damaged.
 - Operate the product within the specifications. If the product status indicator is still red, then send the product back to Bürkert.
2. Incorrect Autotune or Autotune aborted.
 - Make sure that the fluid flows through the product.
 - Do the Autotune again.
3. The product is not correctly connected to the PLC.
 - Check the wiring.
 - Check the PLC status.
 - If the EtherCAT protocol is used, make sure the incoming cable (reception from the PLC) is inserted in the ETH1 port and the outgoing cable is inserted in the ETH2 port.
4. The sensor, the internal memory or the product is defective.
 - Contact the manufacturer, because maintenance is needed.

12.1.5 Product status indicator is orange (MFM Analogue)

A calibration procedure is in progress.

- Wait until the calibration procedure is completed.

12.1.6 Product status indicator is orange (MFM Ethernet)

Identify the cause:

1. A calibration procedure is in progress.
 - Wait until the calibration procedure is completed.
2. If the PROFINET protocol is used, then the PLC is in Stop mode.

12.1.7 Product status indicator is orange (MFC Analogue)

Identify the cause:

1. A calibration procedure is in progress.
 - Wait until the calibration procedure is completed.
2. The Autotune is in progress.
 - Wait until the Autotune is completed.
3. The parameter **Set-point value source** is set to one of the following choices:
 - **Open-loop control mode**
 - **Manual set-point value**
 - **Analyze system**

12.1.8 Product status indicator is orange (MFC Ethernet)

Identify the cause:

1. A calibration procedure is in progress.
→ Wait until the calibration procedure is completed.
2. The Autotune is in progress.
→ Wait until the Autotune is completed.
3. The parameter **Set-point value source** is set to one of the following choices:
 - **Open-loop control mode**
 - **Manual set-point value**
 - **Analyze system**
4. If the PROFINET protocol is used, then the PLC is in Stop mode.

12.1.9 Product status indicator is yellow (MFM Analogue)

One of the following values is out of specification. The sensor or the product can be damaged.

- the fluid temperature
 - the product temperature
 - the supply voltage
- Operate the product within the specifications. If the product status indicator is still yellow, then send the product back to Bürkert.

12.1.10 Product status indicator is yellow (MFM Ethernet)

Identify the cause:

1. One of the following values is out of specification. The sensor or the product can be damaged.
 - the fluid temperature
 - the product temperature
 - the supply voltage

→ Operate the product within the specifications. If the product status indicator is still yellow, then send the product back to Bürkert.
2. The Ethernet protocol is being changed.
→ Wait until the change of protocol is completed. This can take up to 1 minute.

12.1.11 Product status indicator is yellow (MFC Analogue)

Identify the cause:

1. One of the following values is out of specification. The sensor or the product can be damaged.
 - the fluid temperature
 - the product temperature
 - the supply voltage

→ Operate the product within the specifications. If the product status indicator is still yellow, then send the product back to Bürkert.

2. The set-point position for the control valve has (almost) reached 100 %. The set-point value cannot be reached.
 - Increase the inlet pressure or decrease the back pressure.
 - If the pressure drop in the pipe is too high, reduce the pressure drop.
 - If the filters that are installed in the pipe are dirty, clean the filters.

12.1.12 Product status indicator is yellow (MFC Ethernet)

Identify the cause:

1. One of the following values is out of specification. The sensor or the product can be damaged.
 - the fluid temperature
 - the product temperature
 - the supply voltage
 - Operate the product within the specifications. If the product status indicator is still yellow, then send the product back to Bürkert.
2. The set-point position for the control valve has (almost) reached 100 %. The set-point value cannot be reached.
 - Increase the inlet pressure or decrease the back pressure.
 - If the pressure drop in the pipe is too high, reduce the pressure drop.
 - If the filters that are installed in the pipe are dirty, clean the filters.

3. The Ethernet protocol is being changed.
 - Wait until the change of protocol is completed. This can take up to 1 minute.

12.1.13 Product status indicator is blue

There is an internal memory error.

- Contact the manufacturer, because a maintenance operation is needed.

12.2 Problems shown by the status LED of the motor valve

12.2.1 LED is red and flashes, LED is red and ON

Identify the cause:

1. The fluid temperature or the ambient temperature is too high.
 - Respect the maximum ambient temperature and the maximum fluid temperature.
 - Restart the product to turn off the red flashing LED. To restart the product, de-energise then energise the product again.
2. A cable is broken.
 - Make sure that the electrical connections between the product housing and the motor valve are not loose.

12.2.2 LED is yellow and flashes

The ambient conditions or the process conditions for the motor valve are outside the authorized range.

→ Operate the product in the authorized range.

12.3 Miscellaneous problems

12.3.1 Product status indicator is off

If the product status indicator is off, then the product is not energised. To solve this issue, do the following:

- Make sure that the product is correctly wired.
- Make sure that the voltage supply is 24 V DC.
- Make sure that the power supply source is working properly.

12.3.2 Product status indicator flashes

If the product status indicator flashes, then the product is selected in the Bürkert Communicator software.

After 10 seconds, the product automatically returns to the previous status.

12.3.3 Product status indicator goes out periodically

Identify the cause to solve the problem:

1. The power supply is intermittently dropping and the product restarts.
- Use a power supply with sufficient power output.

2. The voltage drop in the connecting cable is too high.

- Increase the cross-section of the cable
- Reduce the cable length.

12.3.4 Replacement product adopts none of the values from the defective product

Identify the cause to solve the problem:

1. The article number of the replacement product is different from the article number of the defective product.
- Use a replacement product that has the same article number than the defective product. Values can only be transferred between products with the same article numbers.
2. The memory card is defective. The product could not write any values to the memory card.
- Replace the memory card. Refer to chapter [11.3](#).

12.3.5 Replacement product does not adopt all of the values from the defective product

The product description of the replacement product is different from the product structure of the defective product. Only the existing values of the defective product can be adopted by the replacement product.

- Use the Bürkert Communicator software to configure the new values of the replacement product. To connect the product to the Bürkert Communicator software, refer to chapter [10.4](#).

12.3.6 No mass flow rate (MFM)

The pipes are too large or not yet fully vented.

- Vent the pipes.
- Change the pipe diameter.

12.3.7 No mass flow rate (MFC)

Identify the cause to solve the problem:

1. The product is possibly running one of the functions described in chapter [10.9 Choose the source giving the set-point value \(MFC\)](#). The product is not in the normal operating mode. Refer to chapter [10.7](#).
 - Wait until the product goes back to the normal operating mode.
2. The pipes are too large or not yet fully vented.
 - Vent the pipes.
 - Change the pipe diameter.
3. The set-point value is lower than the zero-point shut-off limit.
 - Increase the set-point value until it is higher than 2 % of the nominal flow rate.

12.3.8 Unstable measured value (MFM)

You have not connected the functional earth (FE) properly.

- To connect the functional earth, use a green-and-yellow cable that is as short as possible. And the cable cross-section must be at least equal to the cross section of the power supply cable. Refer to chapter [8.7](#).

12.3.9 Unstable measured value (MFC)

Identify the cause to solve the problem:

1. You have not connected the functional earth (FE) properly.
 - To connect the functional earth, use a green-and-yellow cable that is as short as possible. And the cable cross-section must be at least equal to the cross section of the power supply cable. Refer to chapter [8.7](#).
2. The residual ripple on the voltage supply is too high.
 - Use a supply voltage that conforms to the technical data given in chapter [6.9 Electrical data](#).
3. The product must compensate for irregularities in an unstable pressure supply caused, for example, by pumps.
 - Install a suitable pressure regulator in front of the product.
 - Install a buffer tank to absorb the pressure fluctuations.

12.3.10 Set-point value at 0 %, but operating fluid still flows (MFC)

The operating pressure is above the tight sealing pressure of the control valve.

- Reduce the operating pressure.
- To eliminate the defect, return the product to the manufacturer.

12.3.11 Set-point value at 0 %, control valve is closed, no mass flow, but a non-zero mass flow rate is measured (MFC)

Identify the cause to solve the problem:

1. The installation position of the product is incorrect.
 - Install the product in the position indicated on the calibration plate or in the calibration protocol.
 - Run the Autotune function to adapt to the operating conditions.
2. The operating fluid is different from the fluid specified during the calibration.
 - Use the specified operating fluid or send the product to the manufacturer for calibration with the new operating fluid.

12.3.12 Set-point value is not reached (MFC)

Identify the cause to solve the problem:

1. The mesh filter is clogged.
 - Clean or replace the mesh filter.
 - Run the Autotune function to adapt to the operating conditions.
2. The inlet pressure is too low.
 - Increase the inlet pressure to the calibration pressure value.
3. The outlet pressure is too high.
 - If the fluid connection pipes after the product are dirty, then clean them.

13 ACCESSORIES, SPARE PARTS



CAUTION

Risk of injury and risk of material damage that are due to unsuitable parts.

Incorrect accessories and unsuitable replacement parts can cause injuries and damage to the product and its environment.

- Only use original accessories and original spare parts from Bürkert.

13.1 Electrical accessories

Tab. 36: Electrical accessories, product variant Analogue with D-sub DE-9 male connector

Item	Article number
D-sub DE-9 female connector with 5 m cable, with stripped end	580 882
D-sub DE-9 female connector with 10 m cable, with stripped end	580 883

Tab. 37: Electrical accessories, all product variants

Item	Article number
büS stick set (without power supply)	772 551
Memory card	On request

→ For further accessories, refer to the product datasheet.

13.2 Compression fittings for a product with G-internal-threaded connections

The threaded pipe-connection plates of the product obey standard DIN ISO 228/1. If the pipe fittings are not delivered with the product, then choose pipe fittings that are adapted to the fluid connection of the product. Also order the seal depending on the fluid connection and the pipe diameter.

Tab. 38: Stainless steel compression fittings and related seals

Product inter- nal-threaded connec- tion in accordance with DIN ISO 228/1	Pipe diameter	Article number	
		Stainless steel compression fitting	Seal (1 piece)
G 1/4	6 mm	901 538	901 575
G 1/4	8 mm	901 540	
G 1/4	1/4"	901 551	901 579
G 1/4	3/8"	901 553	
G 3/8	8 mm	901 542	901 576
G 3/8	10 mm	901 544	
G 3/8	1/4"	901 555	901 580
G 3/8	3/8"	901 556	
G 1/2	10 mm	901 546	901 577
G 1/2	12 mm	901 548	
G 1/2	1/2"	901 557	901 581
G 1/2	3/4"	901 558	
G 3/4	12 mm	901 549	901 578
G 3/4	3/4"	901 559	901 582
G1	On request		

13.3 Mesh filters

Tab. 39: Spare parts – Mesh filters

Item	Article number
Stainless steel mesh-filter, mesh size 250 µm	on request

13.4 Additional documentation and software

Tab. 40: Documentation and software

Product variant Ethernet: product description file and object description file	Download from country.burkert.com
Bürkert Communicator software	Download from country.burkert.com

14 DECOMMISSIONING

14.1 Safety instructions



DANGER

Risk of injury that is due to pressure in the installation and in the product.

- ▶ Before working on the installation or product, cut the pressure. Vent and drain the pipes.

Risk of injury from electric shocks.

- ▶ Before working on the installation or the product, switch off the power supply. Make sure that nobody can switch the power supply on.
- ▶ Observe all applicable accident protection and all applicable safety regulations for electrical equipment.



WARNING

Risk of injury from improper dismantling.

- ▶ Dismantling must only be performed by trained personnel using suitable tools.

Risk of injury from dangerous fluids.

- ▶ Before you disconnect pipes or valves, flush out dangerous fluids, release pressure in the pipes and drain.
- ▶ Observe the applicable accident protection and observe safety regulations relating to the operating fluid used.

14.2 Dismantling the product

- Relieve the operating fluid pressure in the installation.
- Flush the product with a neutral fluid (for example nitrogen)
- Relieve the flushing fluid pressure in the installation.
- De-energise the product.
- Remove the electrical wiring.
- Disconnect the fluid connections.
- Remove the product.

15 TRANSPORT

NOTICE

Transport damage.

If the product is not protected in transport, then the product can be damaged.

- Remove cables, connectors, product-external filters and installation equipment.
- Protect the electrical interfaces with protective plugs.
- Clean and vent contaminated products.
- Close the fluid connections with protective caps. Protective caps ensure protection and sealing.
- Pack the product in two suitable zip lock bags, to avoid any contamination during the transport.
- Transport the product in an impact-resistant package, protected from moisture and dirt.
- Avoid storage above or below the recommended storage temperature.

16 STORAGE, DISPOSAL

NOTICE

Incorrect storage can cause damage to the product.

- Close fluid connections with protective caps.
- Store the product dry and dust-free in sealed zip-lock bags.
- Storage temperature: -10 °C...+70 °C.

Environmental damage that is due to parts contaminated by fluids.

- Dispose of the product and its packaging in an environmentally-friendly manner.
- Comply with applicable environmental and disposal regulations.

17 RETURNING THE PRODUCT



No work or tests will be carried out on the product until a valid Contamination Declaration has been received.



To return a used product, a returns number is required.

To return a used product to Bürkert, contact your Bürkert sales office.

www.burkert.com