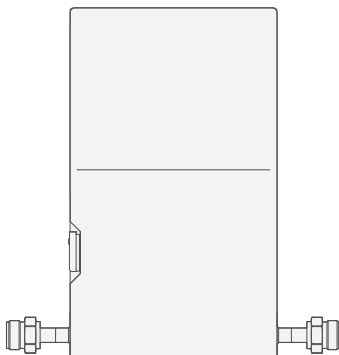


CORI-FLOW™ MN-series

MN-15ST, MN-16ST, MN-25ST
MN-54ST, MN-55ST
Coriolis Mass Flow Meters



Installation Manual

English

IMPORTANT!

Read carefully before use.
Keep for future reference.

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1 Safety information

1.1 Symbols and signal words in this document

The following symbols and signal words are used to indicate the type and severity level of the risk.

Warnings



DANGER

Signal word used to indicate an imminently hazardous situation which, if not avoided, will result in death or serious injury.



WARNING

Signal word used to indicate a potentially hazardous situation which, if not avoided, could result in death or serious injury.



CAUTION

Signal word used to indicate a potentially hazardous situation which, if not avoided, could result in minor or moderate injury.



NOTICE

Signal word used to indicate a potential risk of damage to the product.

Important information and recommendations



Important information where there is no risk to people or product.

1.2 General safety instructions

Please read this document and all other applicable documents carefully before installing and operating the product.

- All instructions, including applicable federal and national installation codes and regulations, must be observed. Failure to comply with the instructions can result in material damage and personal injury, including danger to life.
- These instructions are applicable to the products stated on the front cover of this manual only.
- If in any doubt, please contact Bronkhorst. For contact information, see the back cover of this manual.

Intended use

The product has been developed to measure mass flow rates of clean gas or liquid flows in a fluid system. The product is suited for general-purpose indoor (dry) applications, like laboratories and machine enclosures. Any other use is considered unintended.

- Observe the details on the serial number label and the information provided in this manual to ensure correct use of the product.

Notices for the user

The user is considered to have professional experience level and knowledge about installation, operational requirements for its industry and type of application and national requirements according to relevant standards and regulations.

Process fluid

To ensure safe and intended use:

- ▶ Make sure that the process fluid used is compatible with all wetted materials, including seals.
- ▶ If in any doubt about fluid compatibility, get in contact with Bronkhorst.
- ▶ For contact details, scan the QR code (Contact) on the back cover of this manual.

The user is responsible for taking the necessary safety measures to prevent damage and/or injury while working with the product and process fluid.

- ▶ Please refer to the on-site available safety data sheet (SDS) of the process fluid before working on the product.

System pressure

The maximum permissible pressure (pressure rating) is indicated on the product's serial number label. Exceeding this value can result in product damage or leakage.

- ▶ Make sure that the pressure rating of the product is equal to or greater than the system's process conditions.

Modifications

Do not disassemble or modify the product in any way. Unauthorized modifications can undo safety features, compromise system specifications and cause failure to comply with applicable laws, regulations and directives.

Any unauthorized modification will be considered unintended and improper use.

Electrical work

Electrical connections must be made by or under supervision of a qualified electrician.

- ▶ Before working on the product or system: de-energize the product before connecting or disconnecting electrically.
- ▶ Refer to the manufacturer's instructions when installing non Bronkhorst® components to the product.

Electrostatic discharge

The product contains electronic components that are susceptible to electrostatic discharge (ESD).

- ▶ Take appropriate measures to prevent electrostatic discharge while working with the product.

Installation and maintenance

Installation, commissioning, and maintenance must be performed in accordance with the following instructions:

- ▶ Observe all applicable safety regulations regarding the process fluid used.
- ▶ Only use original replacement parts.
- ▶ Check for fluid leakage after working with the product.

Hot surfaces

The product can become hot during operation depending on process fluid and ambient temperature.

- ▶ Let the product cool down before carrying out any work.
- ▶ If necessary, wear protective gloves.

2 Product information

2.1 About this document

Illustrations used

The illustrations in this document serve to provide general notices regarding correct operation. The illustrations are simplified representations of the actual situation.

Document validity

Documents are updated regularly. The most recent version is available online.

- Prior to work, check whether a newer version of this document is available on the Bronkhorst website.
- Scan the QR code (Downloads) on the back cover of this manual to visit the website.

2.2 Product types

This document only applies to the product types shown on the front cover of this manual.

Product types	Fluid type	Meter	Controller ¹⁾
MN-15ST, MN-16ST, MN-25ST, MN-54ST, MN-55ST	Gas	■	Actuator out
MN-15ST, MN-16ST, MN-25ST, MN-54ST, MN-55ST	Liquid	■	Actuator out

Tab. 1. Product types

2.2.1 Product naming

The product name consists of three main parts:

Product series : MN-series

Nominal flow : first digit $\times 10^{\wedge}(\text{second digit})$

Model : ST

Example: MN-25ST

MN : MN-series

25 : $2 \times 10^5 = 200,000 \text{ g/h} = 200 \text{ kg/h}$

ST : Stacked type

2.3 Measuring principle

A Coriolis mass flow meter uses vibrating tubes to measure mass flow. The fluid flow causes a phase shift in the vibration due to its inertia. Phase shift measurement provides accurate and repeatable mass flow results independent of fluid properties, while density is derived from frequency shift and temperature is measured using an integrated resistor.

1 Controller functionality available with compatible Bronkhorst® valves (accessory) using the actuator out.

2.4 Product overview

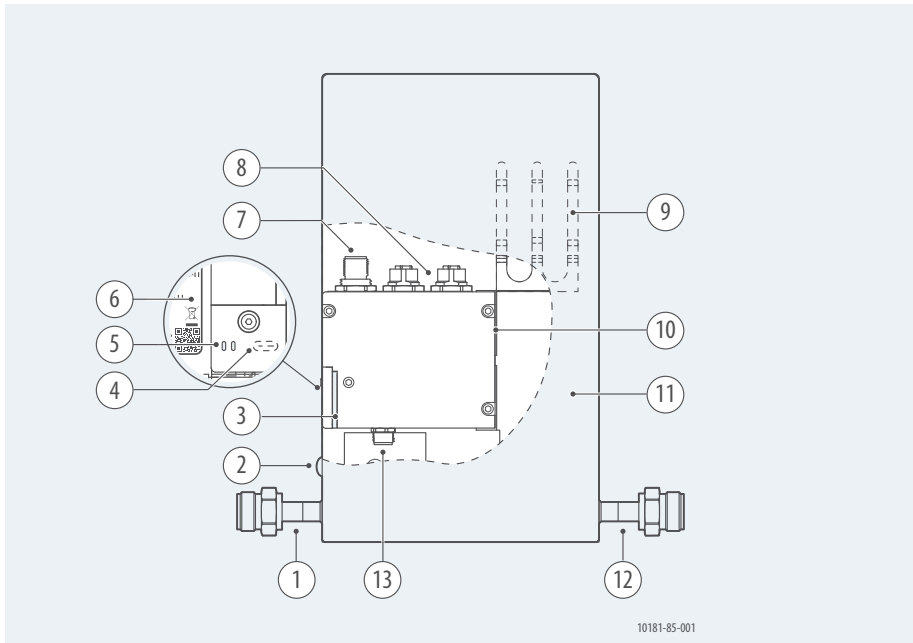


Fig. 1. Product overview CORI-FLOW™ MN-xxST

- | | |
|---------------------------|-----------------------------------|
| 1. Fluid inlet | 8. Fieldbus connectors (optional) |
| 2. Locking screw | 9. Cable guide |
| 3. Status LED | 10. Breather plug |
| 4. USB-C port (concealed) | 11. Front cover |
| 5. Fieldbus LEDs | 12. Fluid outlet |
| 6. Serial number label | 13. Actuator connector |
| 7. Main connector | |

2.4.1 Breather plug

The electronics housing features an integrated breather plug that vents into the gap between the electronics housing and the sensor housing. Its functions are to:

- Let clean air enter the enclosure and block contaminants, such as dust, dirt, and moisture.
- Balance the pressure inside the enclosure with the external environment.
- Prevent condensation inside the enclosure caused by changes in external temperature.

2.5 Accessories

A wide range of accessories is available for the product. Examples include shielded cables, in-line filters, and software tools. An overview is available on the website, or contact Bronkhorst for more information.

- Scan the QR code (Contact) on the back cover of this manual to visit the website.

2.5.1 Software tools

Several software tools for the product are available on the Bronkhorst website.

- Scan the QR code (Downloads) on the back cover of this manual to visit the website.

Bronkhorst FlowSuite

Bronkhorst FlowSuite provides a user interface to easily configure and control Bronkhorst® products. Bronkhorst FlowSuite is not intended to control critical processes but can be used to control and monitor research and pilot setups. For critical processes, it is recommended to use a dedicated process controller such as a PLC.

2.6 Product labeling

2.6.1 Serial number label

The serial number label can be found on the product and shows the serial number (SN) and other product specific information.

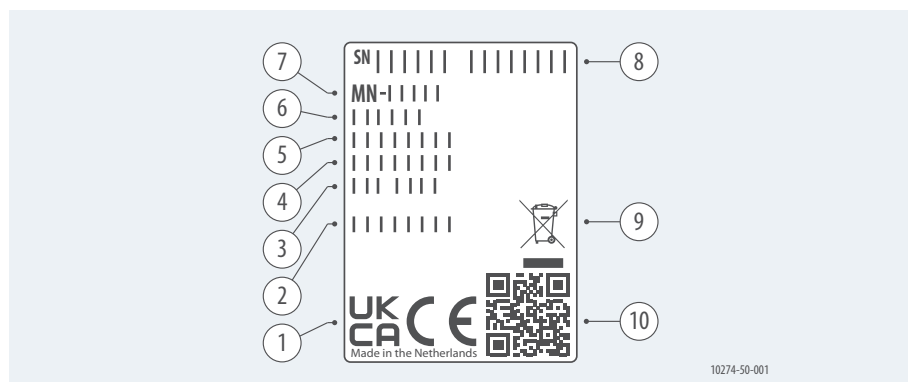


Fig. 2. Overview serial number label

- | | |
|------------------------|------------------|
| 1. Conformity markings | 6. Maximum flow |
| 2. Interface | 7. Product type |
| 3. Pressure rating | 8. Serial number |
| 4. Fluid temperature | 9. WEEE symbol |
| 5. Ambient temperature | 10. QR code |

2.6.2 Year of production

The year of production is specified as 2 digits, the 2nd and 3rd characters of the serial number (SN). The serial number is located on the serial number label.

2.6.3 Additional labels

Based on the product configuration, additional labels are added:

- Bluetooth certification label
- MAC address label

2.7 Product storage

To maintain product quality and reliability during storage:

- ▶ Store the product in its original packaging in a climate-controlled location.
- ▶ Make sure that the storage location meets the specified conditions (» par. 13.1, page 34).

2.8 Default valve state

When a product is not powered or cannot communicate with the fieldbus network, all electrical valves operated by the product automatically return to their default valve state:

- Closed - for 'normally closed' valves (N.C.)
 - Fully open - for 'normally open' valves (N.O.)
- ▶ Check the labeling on the connected valve to see which default valve state is used.

2.9 Bronkhorst fieldbus files

A Bronkhorst fieldbus file (e.g. GSD or EDS file) can be used for the product and network configuration. The files are available at the Bronkhorst® website.

- ▶ For download information, scan the QR code (Downloads) on the back cover of this manual.

2.10 Calibration

By following strict calibration standards, it is ensured that each product performs accurately. Bronkhorst is accredited to perform product calibrations to key industry benchmarks (e.g. NIST, VSL).

3 Unpacking

It is important to carefully inspect the product upon receipt.

- ▶ Make sure that the products are free from damage or defects.
- ▶ Install only undamaged products to ensure correct operation and safety.
- ▶ If the product is damaged, get in contact with Bronkhorst.
- ▶ Scan the QR code (Contact) on the back cover of this manual to visit the website.

3.1 Scope of delivery

The scope of product delivery varies with each order.

- ▶ Check the delivery for completeness against the packing list.
- ▶ If the delivery is incorrect or incomplete, get in contact with Bronkhorst.
- ▶ Scan the QR code (Contact) on the back cover of this manual to visit the website.

4 Installation



WARNING

Risk of danger due to fluid escaping!

Exceeding the pressure rating or using incompatible fluids can cause the sensor tube to fail. Using hazardous fluids can result in personal injury.

- ▶ Make sure that the pressure rating of the product is higher than the process conditions.
- ▶ Use only fluids that are compatible with the wetted materials, including seals.
- ▶ Do a compatibility check before installation.



NOTICE

Product damage due to electrostatic discharge (ESD)!

The product contains electronic components that are susceptible to electrostatic discharge which can damage the circuit board.

- ▶ Take appropriate measures to prevent electrostatic discharge during mounting.



NOTICE

Product failure due to contamination in the system!

Contamination can cause blockage, which can make the measurement unreliable or cause the product to fail.

- ▶ Make sure that the system is clean before mounting the product.

4.1 Installation preconditions



Products calibrated for use with liquids may contain test water.

- ▶ Make sure to purge the product during commissioning to remove unwanted moisture.

Before installing the product:

- ▶ Remove any protective caps from the process connections.
- ▶ Make sure that the product is sufficiently clean for its intended use.
- ▶ Make sure that the environmental conditions meet the specifications (» par. 13.1, page 34).
- ▶ Check the product specifications on the serial number label (» par. 2.4, page 7).
- ▶ Check that the fluid is compatible for use with the wetted materials, including seals.

If the product specifications do not match the system requirements:

- ▶ Get in contact with Bronkhorst.
- ▶ Scan the QR code (Contact) on the back cover of this manual to visit the website.

4.2 Mounting location

For reliable measurements, it is important to choose a correct mounting location. For optimal performance, observe these guidelines:

- ▶ Mount the product in an up-right position.
- ▶ Install the product on a flat, rigid, and clean surface [1].
- ▶ Avoid a mounting location close to mechanical vibration and magnetic field sources [2].
- ▶ Avoid a mounting location close to heat sources [3].

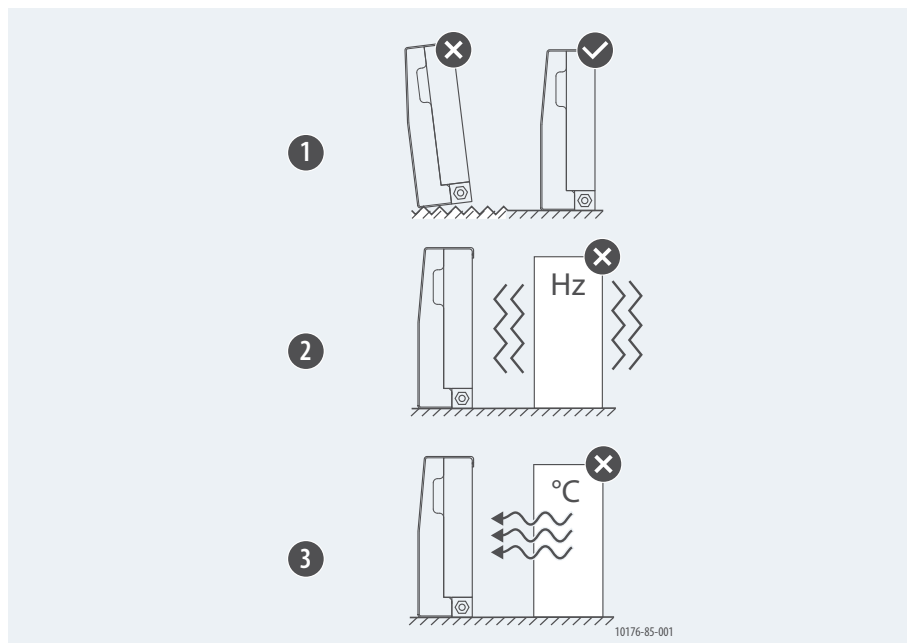


Fig. 3. Mounting location guidelines

- ▶ Mount the product to a rigid construction using the mounting holes at the bottom of the base.
- ▶ Tighten the bolts to the specified torque (» Tab. 2).
- ▶ Refer to the dimensional drawings for details .
- ▶ For download information, scan the QR code (Downloads) on the back cover.

Bolt size	M5
Torque [Nm]	2.4

Tab. 2. Tightening torque

4.2.1 Minimum clearance

The advised clearance depends on the installation location, product configuration, and use.

► Take the specified minimum clearance into account for these conditions:

- Opening and closing the front cover.
- Opening and closing the USB cover.
- Connecting the product electrically.
- Servicing.

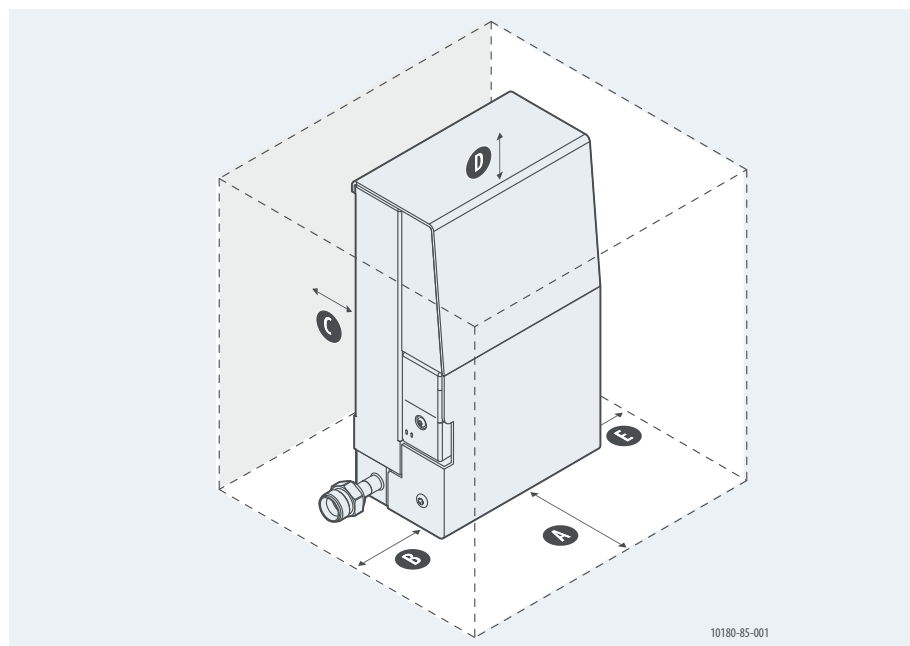


Fig. 4. Minimum clearance [mm]

- A. 150
- B. 100
- C. 10

- D. 75
- E. 30

4.2.2 Ambient conditions



NOTICE

Product damage due operating outside temperature limits!

Exposure to ambient or liquid temperatures above the specified limits can cause overheating and permanent damage to internal components.

- Make sure that the product is operated within the specified limits (» par. 13.1, page 34).
- Check temperature limits after installation, cleaning, and process changes.

For reliable measurements, it is important to maintain stable ambient conditions. For optimal performance, observe the following guidelines:

- ▶ Make sure that the ambient temperature is stable.
- ▶ Avoid temperature shocks: the heating or cooling rate must not exceed 1 °C per second.

4.3 Media preconditions

4.3.1 Condensation in gas media

Condensation can negatively affect measurement accuracy and can occur in a gas media. Ambient conditions and gas quality considerations can reduce condensation:

- ▶ Make sure that the ambient temperature is stable and above dew point.
- ▶ Use a clean and dry gas.
- ▶ Keep temperature differences between the fluid and the ambient temperature at a minimum (e.g., increase the length of the upstream tube to achieve this).
- ▶ Mount the product in a location where condensation cannot accumulate in the product.

4.3.2 Clean fluid

Contamination from particles in the fluid can negatively affect product reliability (clogging).

- ▶ Use a clean fluid.
- ▶ Mount the product in a location where solid particles cannot accumulate in the product.
- ▶ Use a filter to prevent particles from entering the product.

4.4 In-line filters (accessory)

For reliable performance a filter can be used to keep the fluid stream clean. When selecting a filter, consider factors such as flow rate, pore size, and allowable pressure drop.

- ▶ Refer to the additional accessory information on the Bronkhorst website.
- ▶ Scan the QR code (Downloads) on the back cover of this manual to visit the website.

4.4.1 Backflow

Backflow of a fluid can cause product contamination and can lead to clogging.

- ▶ If backflow can occur, use a check valve to prevent back flow.

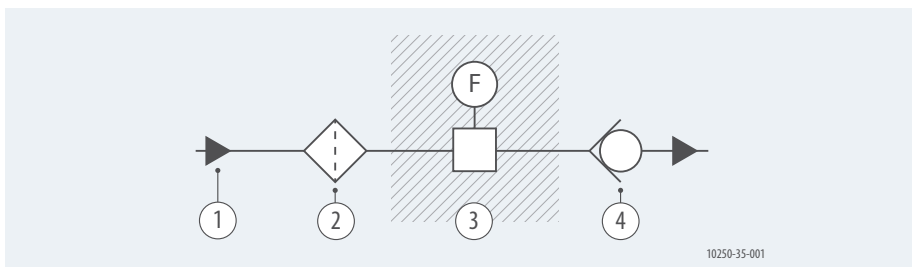


Fig. 5. System schematic

- | | |
|---------------------|----------------|
| 1. Flow direction | 3. Flow meter |
| 2. (In-line) filter | 4. Check valve |

4.5 Mounting position



In case the valve is fitted with a purge adapter:

- Make sure that the position of the purge adapter enables easy degassing.

For gas applications:

If there is a chance of condensation or if the gas stream can contain solid particles, mounting the product at the lowest point of a tube segment [4] is thus not advisable.

- Mount the product in a location where condensate or particles cannot accumulate inside the product [1,2,3,5].

For liquid applications:

If there is a risk of expansion of dissolved gas in the fluid system, mounting the product at the highest point of a tube segment [2] is thus not advisable.

- Mount the product in a location where gas bubbles cannot accumulate inside the product [1,3,4,5].

Fluid type	Product type	1	2	3	4	5
Gas	MN-15ST, MN-16ST, MN-25ST, MN-54ST, MN-55ST	ok	ok	ok	x	ok
Liquid	MN-15ST, MN-16ST, MN-25ST, MN-54ST, MN-55ST	ok	x	!*)	ok	ok

Tab. 3. Mounting positions

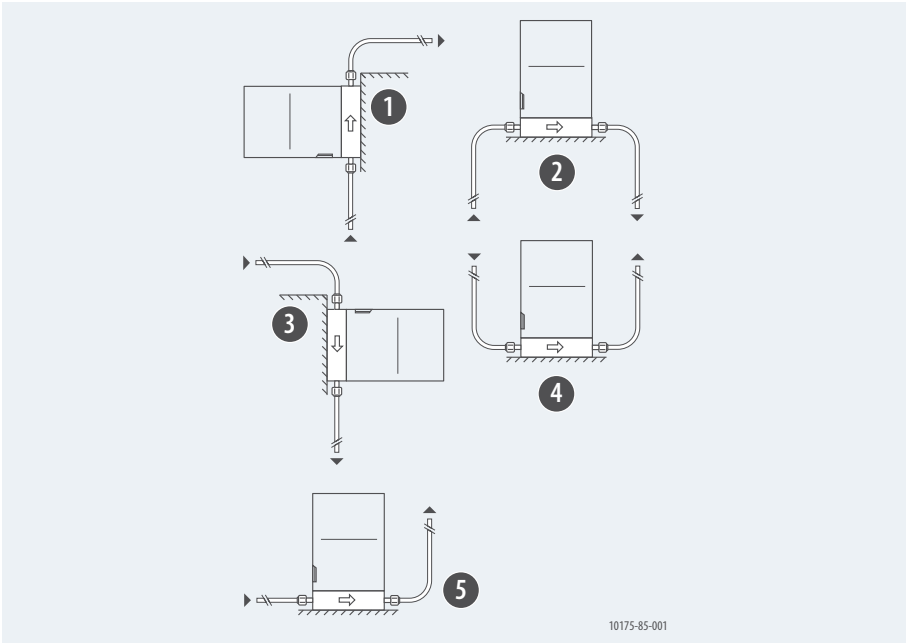


Fig. 6. Product location in a tube segment

- 1 Risk of tubing running dry, which can cause the product to malfunction.

4.6 Process connections



CAUTION

Risk of personal injury due to loose process connections!

Loose connections and fittings can lead to fluid leakage which can cause severe injury depending on the type of medium and applied system pressure.

- ▶ Do a check for loose connections before applying fluid pressure.
- ▶ Do a check for loose connections after first use.



CAUTION

Risk of fluid leakage due to unsuitable tubing materials!

Unsuitable tubing material can lead to fluid leakage and severe injury.

- ▶ Use tubing that is suitable for the operating conditions of the system.



NOTICE

Product damage due to hydraulic shocks!

Quick pressure changes from fast start or stop of fluid cause hydraulic shock. Hydraulic shock can cause product damage and leakage.

- ▶ Prevent quick fluid acceleration and deceleration.
 - ▶ Make sure tube diameter transitions are as small as possible.
 - ▶ If needed, install an accumulator to reduce the acceleration and deceleration of the fluid flow
- ▶ Use tubing materials appropriate for the system and fluid.
 - ▶ Use tubing with an inside diameter that matches that of the process connections.
 - ▶ Avoid abrupt angles or any objects directly on inlet and outlet of the product
 - ▶ Cut the tubes/tubing squarely.
 - ▶ Make sure the tubing is clean and deburred.
 - ▶ Connect the tubing to the process connections without stress.
 - ▶ Tighten the process connections according to the manufacturer's instructions.
 - ▶ Clean all fittings and tubing from dirt and debris.

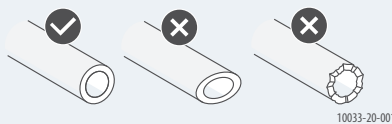


Fig. 7. Tube cutting and deburring

5 Electrical connection



NOTICE

Product damage due to electrostatic discharge!

The product contains electronic components that are susceptible to electrostatic discharge (ESD).

- Take appropriate measures to prevent electrostatic discharge while working with the product.



NOTICE

Product damage due to insufficient ingress protection!

The product is shipped with caps on all electrical connections. To maintain the level of ingress protection:

- Remove caps only from connections that will be connected.

5.1 Opening the front cover

To access the connectors for connecting the product electrically, the front cover must be removed.

- Loosen the locking screw [1].
- Slide the front cover to the left to unlock [2].
- Remove the front cover [3].

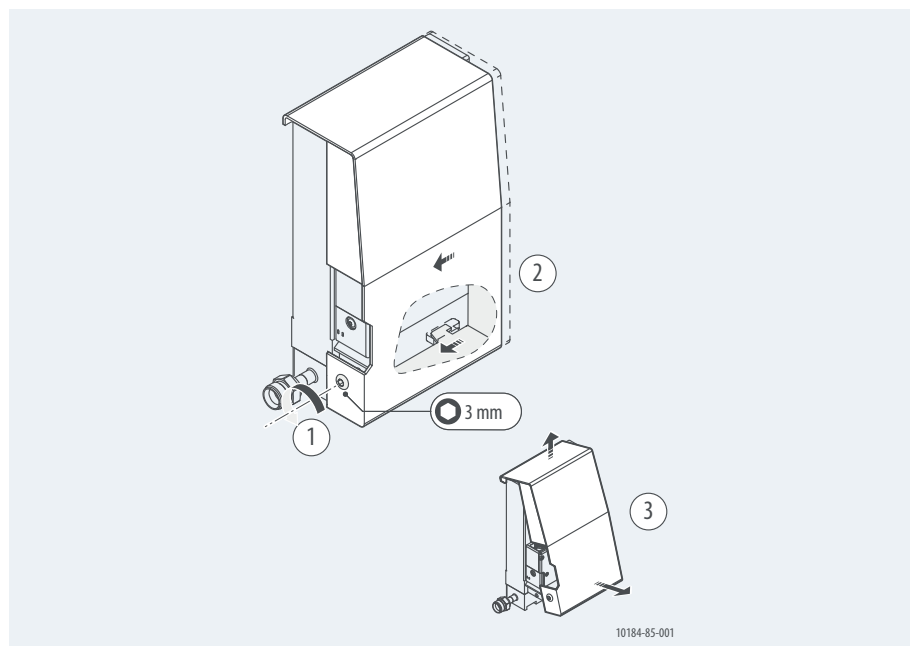


Fig. 8. Opening the front cover

5.2 Electrical connections

The product comes with different connections depending on its configuration.

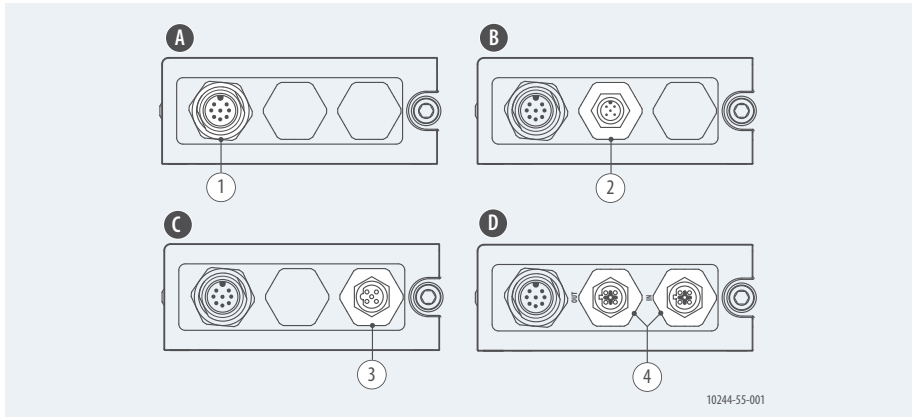


Fig. 9. Electrical connections

- A. Analog/RS232
- B. FLOW-BUS, Modbus, DeviceNet, CANopen
- C. PROFIBUS DP
- D. Ethernet based¹⁾

- 1. M12-A 8 pin male
- 2. M12-A 5 pin male
- 3. M12-B 5 pin female
- 4. M12-D 4 pin female

¹ PROFINET, POWERLINK, EtherCAT, EtherNet/IP, Modbus TCP/IP

5.3 Opening the USB cover

The USB connection can be used to connect a Windows PC via a USB-C cable. This allows the product to be monitored and configured using Bronkhorst FlowSuite.

- ▶ Loosen the screw [1].
- ▶ Rotate the USB cover counter clockwise [2].
- ▶ Connect the USB-C cable to the USB port [3].

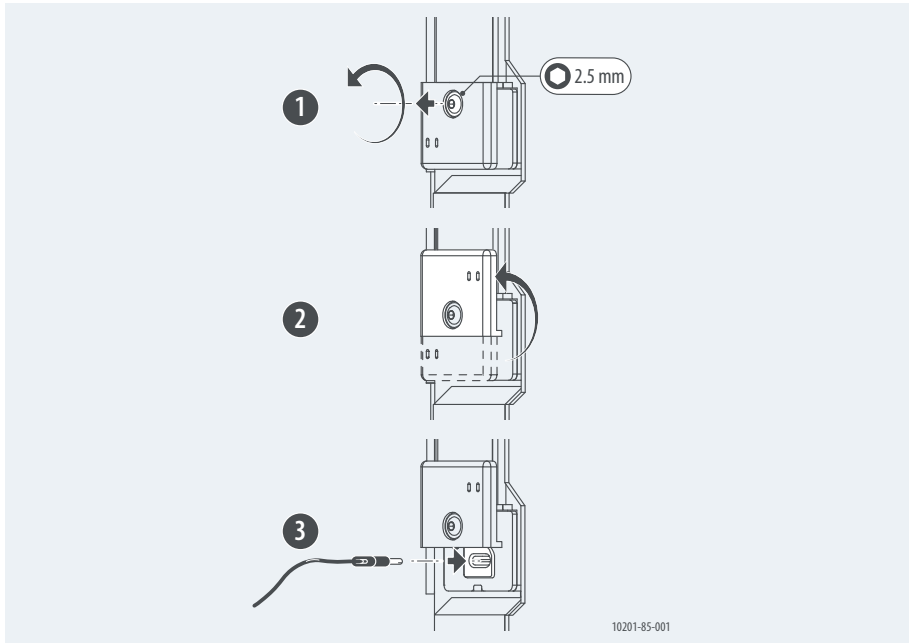


Fig. 10. Opening the USB cover

5.4 Cable selection



Electromagnetic compatibility (EMC) can only be guaranteed by applying appropriate cables and connectors.

When selecting cables and connectors, observe the following:

- Select cable wire diameters that are sufficient to carry the supply current and minimize voltage loss.
- Use cables and connectors that are suitable for the operating conditions of the application.

5.4.1 Shielding

For reliable measurements, it is important to reduce outside noise interference on the signals, and to maintain the integrity of the shielding when connecting the system to other products.

- ▶ Use shielded cables and dedicated connectors.
- ▶ Make sure all electrical components are grounded to earth.
- ▶ Follow the guidelines provided by the connectors' manufacturer when using non-Bronkhorst cables.

- ▶ Keep cable lengths at a minimum.
- ▶ Route cables as closely as possible alongside metal structures or components.

5.5 Cable connections



NOTICE

Product damage due to incorrect cable routing!

The cable guide securely routes cables through the front cover opening. Failing to use the cable routing option can damage the cables and even cause electrical damage to the product.

- ▶ Run all cables through the cable guide.

- ▶ Refer to the pinout diagram(s) to connect the required signals (» par. 13.3, page 36).
- ▶ Tighten all connectors hand-tight.
- ▶ Run all cables through the cable guide.

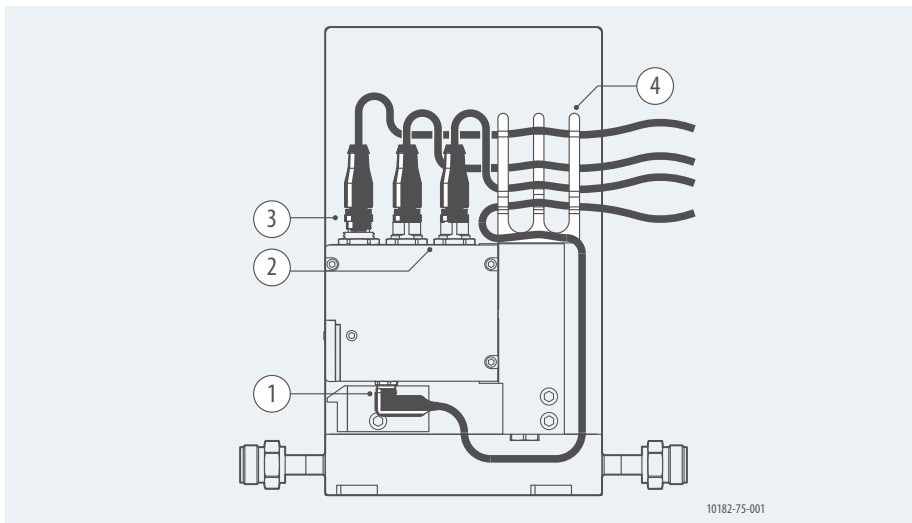


Fig. 11. Using the cable guide

- | | |
|--------------------------|-------------------|
| 1. Actuator connector | 3. Main connector |
| 2. Fieldbus connector(s) | 4. Cable guide |

5.5.1 Actuator connection



To ensure the actuator cable runs freely, it is necessary to use a right-angle actuator connector [1].



Only connect a valve to the product if the valve's default state matches the product's configured valve state. The valve's default state can be N.O. or N.C.

The product can be configured as a controller by using the actuator connector to connect and control a Bronkhorst® valve (» Fig. 11). An overview of available valves is provided on the website.

- ▶ Scan the QR code (Contact) on the back cover of this manual to visit the website.

5.5.2 Digital RS232 connection

Connecting to a Windows PC

- Connect the product to PC by using a USB-C cable.

To supply power:

- Connect a PiPS-IN-M12 power supply to the product.
- or -
- Connect the fieldbus using a cable with a M12-A female connector.

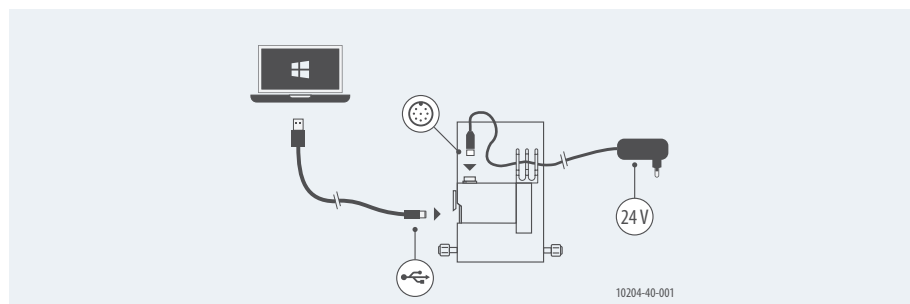


Fig. 12. Connecting to a Windows PC

Connecting to a Bronkhorst E-8000

- Connect the product to the Bronkhorst E-8000 unit by using a T-part M12/SubD-9 cable.

The product is powered through the E-8000.

5.6 Power supply



NOTICE

Product damage due to improper powering!

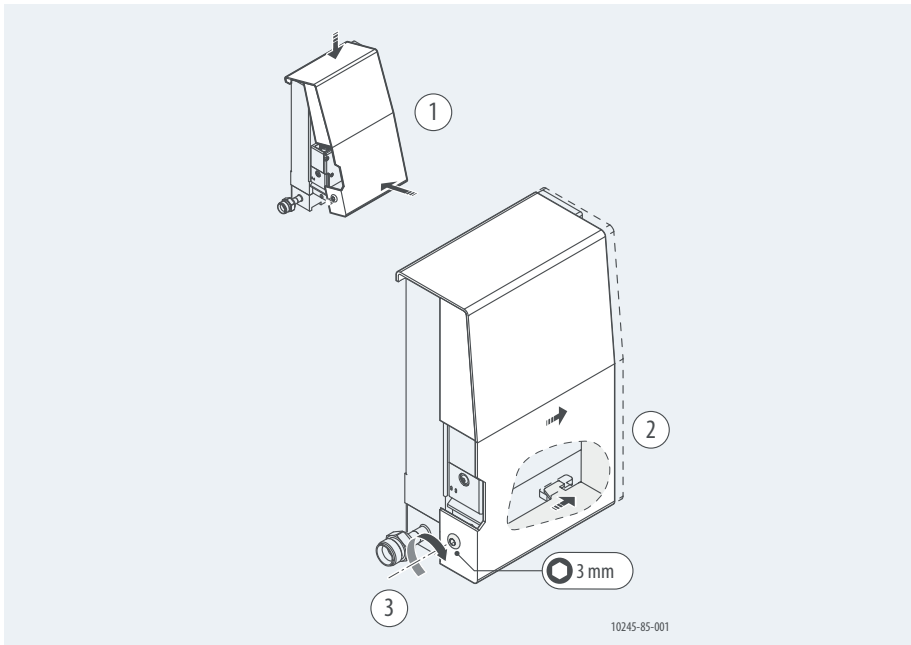
Connecting the product to more than one power supply simultaneously (e.g. fieldbus and Plug-in Power Supply) will damage the product.

- Make sure that the product is connected to a single power supply before switching on the power supply.
- Make sure that the power supply matches the power rating of the product (» par. 13.1, page 34).
- Use the M12-A 8 pin connector to power the product.
- or -
- Use the M12-A 5 pin connector in case of a FLOW-BUS, Modbus, DeviceNET or CANopen system.

5.7 Closing front cover

The front cover is part of the product and must be closed and locked before operating the product.

- Place the front cover over the product [1].
- Slide the front cover right to lock [2].
- Lock the cover by tightening the screw [3].



Tab. 4. Closing the front cover

6 Commissioning



CAUTION

Risk of personal injury due to fluid leakage!

Incorrect mounting or incorrect placement of seals will cause fluid leakage.

- ▶ Check for fluid leakage directly after pressurizing the product.
- ▶ Shutdown the product before opening or loosening fluid connections.



NOTICE

Product damage due to rapid temperature changes!

Rapid temperature changes can cause measurement errors and can cause product damage.

- ▶ Keep temperatures stable during operation.
- ▶ Limit temperature changes at a rate of no more than 1 °C per second.



After switching on the power supply, a connected control valve will go to the default valve state or to its latest given setpoint. The valve stays in this position until the product receives a (new) setpoint.

Before powering up the product:

- ▶ Make sure that the product has been installed and configured by an authorized engineer.
- ▶ Make sure that the installation is approved for use.
- ▶ Check cabling for proper connection.
- ▶ Switch on the power supply.

After initialization the product is ready for use (static green status LED).

- ▶ Fill the product homogeneously with the fluid.
- ▶ Pressurize the system. Check for fluid leakage.

6.1 Warm-up time

- ▶ Warm up the product for at least 30 minutes before starting measurement.
If the product has been purged, the purging time can be counted as part of the required warm-up time.

6.2 Adjusting zero point (auto-zero)



For the correct adjustment of the zero point, it is essential that the flow through the product is blocked. Performing the procedure while there is a flow, will lead to incorrect measurement results.

Zero point is the signal that indicates the absence of a flow, measured by the product. To correct measurements, adjust zero point in these situations:

- Before first use.
- After remounting.
- After significant changes in process conditions.

The auto-zero procedure can be started using Bronkhorst FlowSuite or via digital communication.

Before adjusting zero point

- ▶ Make sure that the ambient conditions (temperature, pressure) match the operating environment.
- ▶ Pressurize the product with the media according to the process conditions.
- ▶ Make sure that all flow is blocked, preferably by closing an upstream and downstream valve.

6.2.1 Adjusting zero point via Bronkhorst FlowSuite

To adjust zero point using Bronkhorst FlowSuite:

- ▶ Connect the product to the Windows PC.
- ▶ Switch on the power supply.
- ▶ Open Bronkhorst FlowSuite on the PC.
- ▶ Select the product in the left pane.
- ▶ Go to the Actions menu.
- ▶ Press the button Auto Zero.
- ▶ Follow the on-screen instructions.

6.2.2 Adjusting zero point via digital communication

To adjust the zero point using digital communication:

- ▶ Follow the action steps to do an auto-zero.

Action	Parameter	Value
▶ Stop Flow	Fsetpoint	0
▶ Unlock secured parameters	Init Reset	64
▶ Enable calibration mode	Control Mode	9
▶ Reset calibration mode	Calibration mode	0
▶ Start zeroing	Calibration mode	9

Tab. 5. Auto-zero action steps

The zeroing procedure will start and a blue status LED blinks. The zeroing procedure waits for a stable signal. A static green status LED indicates the procedure is finished and a new zero point is set. At the same time:

- Parameter Control Mode returns to its initial value.
- Parameter Calibration Mode changes to 0 (idle).

After performing the auto-zero procedure:

Action	Parameter	Value
▶ Lock secured parameters	Init Reset	82

Tab. 6. Locking secured parameters

7 Operation



CAUTION

Risk of personal injury due to hot surfaces!

The product can become hot during operation, depending on the process media and temperature.

- ▶ Allow the product to cool down before carrying out any work.
- ▶ If necessary, wear protective gloves.



All information related to the fieldbus and fieldbus LED indications is available on the website.

- ▶ Scan the QR code (Downloads) on the back cover of this manual to visit the website.

7.1 Normal operation mode

The product is equipped with 3 LEDs. In normal operating mode, the product works correctly and the status LED is green.

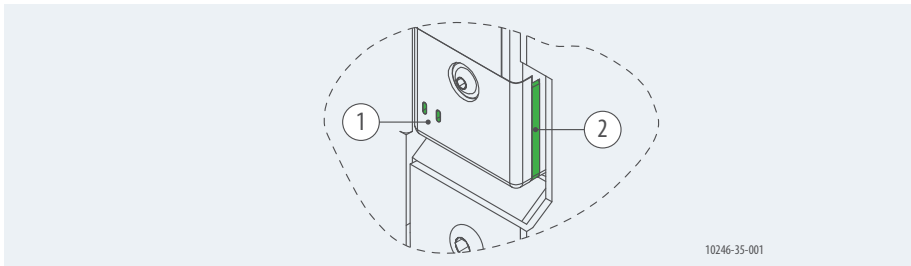


Fig. 13. Status LEDs

1. Fieldbus LED indication

2. Status LED indication

7.2 Activating Bluetooth®

- ▶ Connect the product to the PC by using a USB cable.
- ▶ Open Bronkhorst FlowSuite on the PC.
- ▶ Go to the settings menu.
- ▶ Use the toggle to activate Bluetooth.
- ▶ Set a unique six-digit passkey.

7.2.1 Pairing a Bluetooth® device

Any device running the Android or iOS Bronkhorst FlowSuite app can pair with the product.

- ▶ Make sure the device is in Bluetooth range.
- ▶ Add the product to the devices as a new Bluetooth device.
- ▶ The product is discoverable by its serial number.
- ▶ When prompted: give the unique six-digit passkey

7.3 Basic measurement procedure



For more information, refer to the comprehensive online parameter manual for the relevant fieldbus.

- Scan the QR code (Downloads) on the back cover of this manual to visit the website.

The basic measurement procedure is performed by configuring a set of parameters in the PLC or control software connected to the product.

- Before starting the measurement, make sure that all parameters are entered correctly and correspond to the actual process conditions.
- Make sure that all process conditions (fluid, pressure, temperature) are within specified limits.

7.3.1 Instrument Identification

- Check and record the serial number on the product.

Serial Number

Type	Access	Pro.Par	Function
UInt8 [20]	R	113.3	Shows the product serial number.
Range			Description
--			Product serial number

Tab. 7. Parameter Serial Number

7.3.2 Instrument Configuration

Fluid Name

- Make sure that the configured fluid matches the actual process medium.

Type	Access	Pro.Par	Function
UInt8 [10]	RW	1.17	Shows the name of the selected fluid at parameter Fluid Set Index.
Range			Description
--			Name of the pre-configured fluid name.

Tab. 8. Parameter Fluid Name

Capacity Unit

- Select the required capacity unit for the measurement.

Type	Access	Pro.Par	Function
UInt8 [7]	RW	1.31	Shows the unit in which Full Scale is expressed.
Range			Description
--			Default = kg/h

Tab. 9. Parameter Capacity Unit

7.3.3 Instrument measurement data

Fmeasure

- Read out the actual flow value.

Type	Access	Pro.Par	Function
Float	R	33.0	The actual flow rate in the selected capacity unit.
Range			Description
-3.4e+38...3.4e+38			Measured flow rate expressed in the selected capacity unit.

Tab. 10. Parameter Fmeasure

Temperature

- Read out the process temperature

Type	Access	Pro.Par	Function
Float	R	33.7	The fluid temperature.
Range			Description
-250...500			Fluid temperature in °C.

Tab. 11. Parameter Temperature

Density Actual

- Read out the actual density.

Type	Access	Pro.Par	Function
Float	R	116.15	The actual density of the fluid.
Range			Description
0...3.4e+38			Density in kg/m³.

Tab. 12. Parameter Density Actual

Instrument NAMUR Status

- Follow the product status during the measurement.

Type	Access	Pro.Par	Function
UInt8	R	118.0	The current NAMUR status
Range			Description
0			Normal operation
1			Maintenance required
2			Out of specification
4			Check function
8			Failure

Tab. 13. Parameter Instrument NAMUR Status

8 Decommissioning

8.1 Shutdown procedure

- ▶ Depressurize the system gradually to avoid shocks.
- ▶ Switch off the power supply.
- ▶ Disconnect the product electrically.

8.2 Remove from system



Depending on the properties of the process fluid and the time until the next use, it is advisable to purge the system with a clean, dry, inert gas after use to remove any contamination or moisture.

For safe removal of the product from the system:

- ▶ Depressurize the system gradually to avoid shocks.
- ▶ Clear the fluid lines of the process medium.
- ▶ Switch off the power supply.
- ▶ Disconnect the product electrically.
- ▶ Disconnect the product from the fluid lines.
- ▶ Remove the product from the system.

9 Inspection and maintenance



CAUTION

Risk of personal injury due to fluid leakage!

Loosening the process connections during operation will cause fluid leakage.

- ▶ Shut down the product before loosening the process connections.



CAUTION

Risk of personal injury due to hot surfaces!

The product can get hot during operation depending on process media and ambient temperature.

- ▶ Allow the product to cool down before carrying out any work.
- ▶ If necessary, wear protective gloves.



NOTICE

Product damage due to electrostatic discharge!

The product contains electronic components that are susceptible to electrostatic discharge (ESD).

- ▶ Take appropriate measures to prevent electrostatic discharge while working with the product.

Although routine maintenance is not required, perform regular visual inspections to ensure the product works correctly and safely.

9.1 Visual inspection

To maintain a safe working area, the product and its connections should be periodically checked, and prior to each use:

- ▶ Check cables for proper connections, damage, and wear.
- ▶ Check fluid lines and connections for leaks, damage and wear.
- ▶ Carry out repairs immediately.

In case of leakage tracks on the product:

- ▶ If the product is damaged, get in contact with Bronkhorst.
- ▶ Scan the QR code (Service & Support) on the back cover of this manual to visit the website.

9.2 Adjusting zero point

Zero point is the signal that indicates the absence of a flow, measured by the product.

- ▶ Only adjust the zero point before first use, after remounting, or after significant changes in process conditions.

9.3 Calibration

Recalibration or verification of the product accuracy can be performed at the accredited laboratory of Bronkhorst.

- ▶ For more information about calibration or to start the RMA process, scan the QR code (Service & Support) on the back cover.

9.4 Cleaning

Exterior:



NOTICE

Product damage due to improper cleaning!

Liquid or water can enter the housing of the product and causing damage to the internal electrical parts.

- ▶ Clean the product with a dry or damp anti-static cloth.
- ▶ Avoid using abrasive or aggressive cleaning agents.

Interior (wetted materials):

In case of clogging or contamination of the fluid path, purging the product and fluid lines can solve the issue.

- ▶ Purge the fluid path with a clean, dry and inert gas.
- ▶ If contamination persists, purge the fluid path with a suitable solvent compatible with the wetted materials, seals, and the previously used fluid.
- ▶ If the product is still contaminated, return the product for service.

9.4.1 High-temperature cleaning



NOTICE

Product damage due to exceeding cleaning conditions!

High-temperature cleaning can overheat internal components. This may result in permanent damage to sensor tubes, seals, and electronics.

- ▶ Keep the temperature within the specified cleaning zone.
- ▶ Limit a high-temperature cleaning cycle to a maximum of 30 min.

The product can be cleaned in place by flushing with process-compatible liquids.

- ▶ Disconnect the product electrically.
- ▶ Make sure that the system pressure is not exceeded during the cleaning procedure.
- ▶ Make sure that temperature limits are within the allowed temperature zone [1].

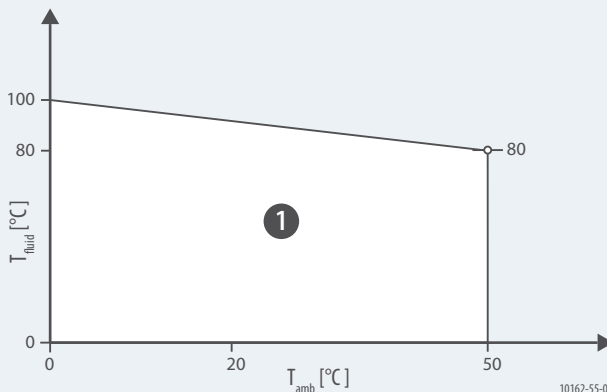


Fig. 14. High-temperature cleaning zone

10 Troubleshooting and diagnostics



Error and warning information can also be found by connecting the product to Bronkhorst® FlowSuite using the USB port.

10.1 Status LED indication

The status LED uses different colors to reflect the current status of the instrument:

- Bluetooth status - when active, flashes blue every 3 sec. When connected, flashes blue every 2 sec.
- Auto-zero - Adjusting zero point active, flashes blue every second
- NAMUR status - static color, » Tab. 14.

NAMUR NE107 standard defines five status signals, using specific colors to indicate the status of the product. It provides an additional diagnostic layer in addition to the fieldbus LEDs.

Icon ¹⁾	Color	Product status
	Green	Normal operation - valid output signal
	Blue	Maintenance required - output signal still valid
	Yellow	Out of specification - signal out of specific range
	Orange	Check function - output signal temporarily non-valid
	Red	Critical failure - non-valid output signal

Tab. 14. NAMUR LED colors

10.2 Troubleshooting

- ▶ Restart the product to trace down electronic problems.
- ▶ If the product starts up normally, apply fluid pressure to check the measurement and control behavior.

To locate fluid system problems:

- ▶ Remove the suspected product from the process line (» par. 8.2, page 27).
- ▶ Check fluid lines and connections for dirt or clogging.

10.2.1 Faults and errors

Fault or Error	Cause	Measure
Red LED glows continuously, display shows no flow	Hardware error	▶ Contact Bronkhorst.
No (fieldbus) communication	No power supply	▶ Check power supply. ▶ Check cable connection. ▶ Check cable hook-up.
	Invalid node address	▶ Change node address.
	Other	▶ Reset product and/or restart master. If problem persists: ▶ Contact Bronkhorst.

¹ The icons correspond to the icons used in Bronkhorst FlowSuite

Fault or Error	Cause	Measure
No output signal	No power supply	▶ Check power supply. ▶ Check cable connection. ▶ Check cable hook-up.
	Sensor failure	▶ Contact Bronkhorst.
Control behavior unstable, red LED blinks or flashes irregularly	Inlet pressure unstable (flow rate pulsating)	▶ Reduce pressure fluctuations (e.g. install a pressure regulator).
	Wrong controller settings	▶ Adjust settings (e.g. with Bronkhorst FlowSuite)
No flow (sending a setpoint has no effect)	No fluid supply	▶ Check upstream components for obstruction (e.g., fluid lines, valves, filters)
	Inlet pressure or differential pressure out of bounds	▶ Set inlet pressure to a value within specifications
Flow rate or pressure rises, but never reaches setpoint	Tubing, filters and/or control valve clogged or blocked	▶ Clean fluid system ▶ For external proportional control valves: ▶ Supply 0...15 Vdc and operational inlet pressure to valve and slowly increase voltage. ▶ If valve does not open, clean parts and re-adjust valve.
	Inlet pressure too low	▶ Increase inlet pressure
	Outlet pressure too high	▶ Check/decrease outlet pressure
	Process outlet blocked	▶ Check process outlet and downstream tubing
Measured value or output signal (much) lower than setpoint	Inlet pressure or differential pressure too low	▶ Increase inlet pressure. ▶ Use the product in conditions it was designed for.
	Process gas condensation	▶ Decrease inlet pressure or increase gas temperature
	Tubing or filters blocked or contaminated	▶ Clean fluid system
	Supplied fluid type does not match configured fluid type	▶ Supply equipment with other fluid or change fluid type in the product configuration
Measured value or output signal indicates a flow, while there is none	Product not mounted horizontally or ambient conditions differ significantly	▶ Follow mounting instructions ▶ Use the product in conditions it is designed for ▶ Adjust zero point
	System leakage	▶ Check the system for leakage. Follow vendor instructions when installing third party components (e.g. adapters, tubing, valves)
Continuous maximum measured value or output signal	Inlet pressure too high	▶ Check inlet pressure
	Sensor failure	▶ Contact Bronkhorst

Tab. 15. Faults and error handling

10.2.2 Additional Information

If a problem persists, or more information is needed in solving the issue, contact Bronkhorst:

- ▶ Scan the QR code (Service) on the back cover to go to Service web page.

10.3 Factory reset



Communication settings are retained after a factory reset.
Changes made to network settings are cleared during a factory reset.

In case changes to the product configuration leads to non-recoverable erroneous behavior, the factory settings can be restored using Bronkhorst FlowSuite.

To perform a factory reset:

- ▶ Connect the product to the Windows PC (« par. 5.5.2, page 20).
- ▶ Switch on the power supply.
- ▶ Open Bronkhorst FlowSuite on the PC.
- ▶ Select the product in the left pane.
- ▶ Go to the Settings menu.
- ▶ Go to General.
- ▶ Press the button System.
- ▶ Press the button Advanced system settings.
- ▶ Press the button Restore to factory settings.
- ▶ Confirm the reset by pressing the button Restore.

11 Warranty and returns

11.1 Warranty

For information about the warranty and the general terms of delivery, please visit the Bronkhorst website: www.bronkhorst.com/terms-and-conditions/.

11.2 Returns

In case the product needs to be returned (e.g. for calibration, repair), please refer to Bronkhorst website for information on the online product return process (RMA).

- ▶ Scan the QR code (Service & Support) on the back cover of this manual.
- ▶ Follow the on-screen instructions to return the product.

12 Disposal (end of lifetime)

 This symbol means that the product must not be disposed of with other waste, and instead must be returned (WEEE). Bronkhorst will take care of proper dismantling, recycling and/or reuse. By ensuring  this product is disposed of correctly, you will help prevent potential negative consequences for the environment caused by inappropriate waste handling of this product.

Within the EU:

- ▶ Return the item(s) following the return instructions.
- ▶ Mention during the return process that the product is being returned for disposal.

Outside the EU:

The disposal of electrical and electronic equipment (EEE) can be subject to local or national directives and/or legislation.

- ▶ Contact your local or national authorities to learn how to properly dispose of EEE in your area.

13 Technical specifications

13.1 Technical specifications

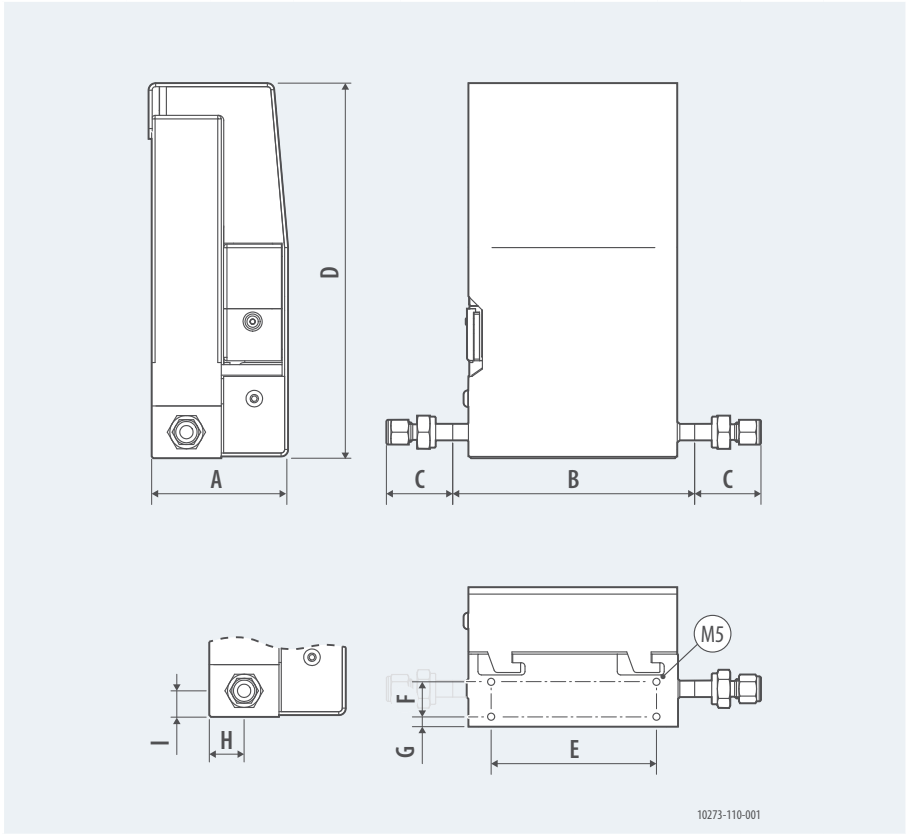
Description	Unit	MN-54ST	MN-15ST	MN-25ST	MN-55ST	MN-16ST
Nominal flow	kg/h	50	100	200	500	1000
	lb/h	110	220	441	1102	2204
Operating pressure						
Max. operating pressure	bar(g)	120	120	120	120	120
	psi(g)	1740	1740	1740	1740	1740
Environmental conditions						
Temperature	°C (°F)	0...50 (32...122)				
Max. relative humidity	%	80				
Max. altitude	m (ft)	2000 (6560)				
Fluid conditions						
Temperature	°C (°F)	0...50 (32...122)				
Max. service temperature	°C (°F)	80 (176)				
Storage conditions						
Temperature	°C (°F)	0...50 (32...122)				
Max. relative humidity	%	80				
Electrical						
Supply voltage ± 10 %	Vdc	15...24				
Max. power cons. @ 15 V	mA	160				
Max. power cons. @ 24 V	mA	100				
Actuator out cons. @ 15 V	mA	250				
Ingress protection		IP54				
Main connector		M12-A 8 pin (male)				
Actuator connector		M8-A 4 pin (female)				
General data						
Warm-up time	min.	30				
Sensor type		Dual-tube				
Sealing material (wetted)		FFKM				
Bluetooth						
Bluetooth LE version		5.1				
Frequency band	MHz	2402...2480				
Bluetooth power	dBm	< 8				
Bluetooth range (line-of-sight)	m (ft)	≤ 10 (33)				

Tab. 16. Technical specifications

13.2 Product dimensions

Detailed product dimensions are available on the product’s website.

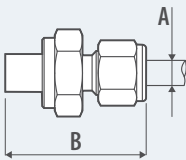
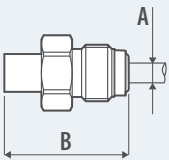
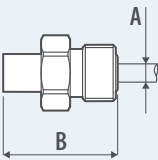
- Scan the QR code (Downloads) on the back cover of this manual to visit the website.



Product	A	B	C	D	E	F	G	H	I
MN-54ST	78.5	139	» Tab. 18	215.5	95	20	4	20	15
MN-15ST	78.5	155		232	95	20	4	20	15
MN-25ST	78.5	155		232	95	20	4	20	15
MN-55ST	78.5	155		232	95	20	4	20	15
MN-16ST	96.5	183		267	95	20	13	29	20

Tab. 17. Product dimensions [mm]

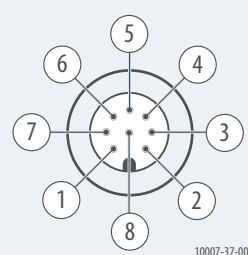
13.2.1 Weld adapter dimensions

 1  2  3				
10272-35-001				
			MN-15, MN-25, MN-54, MN-55	MN-16
	Process connection	A	B [mm]	B [mm]
1	Compression type	6 mm	38.5	--
		10 mm	39.7	--
		12 mm	42.2	36.5
		1/4"	38.5	--
		1/2"	42.4	36.5
2	Face seal male	1/4"	33.0	--
		1/2"	37.6	37.6
3	O-ring face seal	1/4"	29.8	--
		1/2"	--	32.6

Tab. 18. Weld adapter dimensions

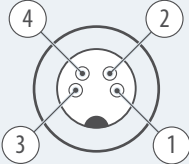
13.3 Pinout

Pinout M12-A 8 pin connector (main connector)

 10007-37-002				
Pin			Pin	
1	TX-RS232		5	Custom
2	Analog output		6	RX-RS232
3	Analog input		7	+Us (15...24 Vdc)
4	0 V power		8	0 V sense

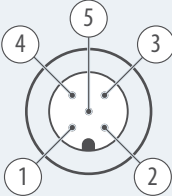
Tab. 19. Pinout M12-A 8 pin connector

Pinout M8-A 4 pin connector

			
10007-37-002			
Pin		Pin	
1	+Us out	3	Actuator out
2	Custom 2	4	0 V power

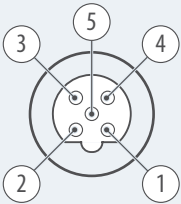
Tab. 20. Pinout M8-A 4 pin connector

Pinout M12-A 5 pin connector

				
10007-37-002				
Pin	FLOW-BUS	Modbus	DeviceNet™	CANopen
1	Shield	Shield	Shield	Shield
2	+Us	+Us	+Us	+Us
3	0 Vdc	0 V / Modbus common	0 Vdc	0 Vdc
4	RS485-A	D1 Modbus (B/B')	CAN-H	CAN-H
5	RS485-B	D0 Modbus (A/A')	CAN-L	CAN-L

Tab. 21. Pinout M12-A 5 pin connector

Pinout M12-B 5 pin connector (female)

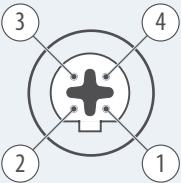


10007-37-002

Pin	PROFIBUS DP	Pin	
1	Data Power (5 V)	4	Data B
2	Data A	5	--
3	Data GND		

Tab. 22. Pinout M12-B 5 pin connector female

Pinout M12-D 4 pin connector (female)



10007-37-002

Pin	EtherCAT ¹⁾	EtherNet-IP	Modbus-TCP	POWERLINK	PROFINET ¹⁾
1			TxD +		
2			TxD -		
3			RxD +		
4			RxD -		

Tab. 23. Pinout M12-D 4 pin connector

13.4 Pressure drop

The pressure drop of the product can be calculated using FLUIDAT on the Net.

- ▶ Go to <https://www.fluidat.com/>
- ▶ Follow the on-screen instructions to calculate the pressure drop.

¹ EtherCAT and PROFINET use a dedicated IN port and OUT port. Both ports have identical pinning and are marked IN and OUT.

13.5 Declaration of Conformity

CE The CE mark on the product indicates that it complies with requirements imposed by the European Union, including electromagnetic compatibility (EMC).

UK CA The UKCA mark on the product indicates that it complies with requirements imposed by Great Britain, including electromagnetic compatibility (EMC).

Hereby, Bronkhorst High-Tech B.V. declares that the radio equipment type CORI-FLOW™ is in compliance with Directive 2014/53/EU. The full text of the EU declaration of conformity is available at the following internet address: <https://www.bronkhorst.com/downloads>

All applicable declarations can be downloaded from the Bronkhorst website.

- ▶ Scan the QR code (Downloads) on the back cover of this manual to visit the website.

13.6 Bluetooth certification

FCC (USA): R7T1101102

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

The enclosed device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:

- (i.) This device may not cause harmful interference and
- (ii.) this device must accept any interference received, including interference that may cause undesired operation.

ISED (Canada): 5136A-1101102

This device contains licence-exempt transmitter(s)/receiver(s) that comply with Innovation, Science and Economic Development Canada's licence-exempt RSS(s). Operation is subject to the following two conditions:

- This device may not cause interference.
- This device must accept any interference, including interference that may cause undesired operation of the device.

ETA-WPC (India): ETA-SD-20230302018 Date:06-04-2023

NCC (Taiwan): CCAF23Y10120T9

13.7 Software licenses

BSD-3-Clause license

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9.17.217A • 2026-05



Service & Support



Contact



Downloads



Bronkhorst High-Tech B.V.
Nijverheidsstraat 1a
NL-7261 AK Ruurlo, The Netherlands

+31 573 45 88 00
info@bronkhorst.com
www.bronkhorst.com