mini CORI-FLOW™

Compact Coriolis Mass Flow Meters & Controllers for
Liquids and Gases

Quick Installation Guide

Doc nr.: 9.17.052H Date: 10-12-2015

Start-up mini CORI-FLOW™ in 10 steps

Bronkhorst®

SCOPE OF THIS GUIDE

mini CORI-FLOW™ instruments are highly accurate instruments for measuring and controlling the mass flow rate of liquids and/or gases, independent of fluid properties. These smart Coriolis instruments offer multiple process values as input- or output parameters. Many parameters can be read and/or changed using analog or digital interfaces.
Output parameters are: mass flow, density, temperature, totalized mass flow, alarms.
Input parameters are: setpoint (desired mass flow rate for controllers), reset alarm/counter.

This manual will help you start-up your **mini CORI-FLOW™** in only 10 steps and contains:

1. Instrument functional properties
2. Check safety properties
3. Check piping
4. Mount/install instrument
5. Leak check
6. Electrical connection
7. Operation
8. Multi-functional switch
9. Purging
10. Zeroing

mini CORI-FLOW™ instruments have modular instruction manuals consisting of:

- Instruction manual **mini CORI-FLOW™** (document nr. 9.17.050)

Info about e.g. : sensors, valves, liquid dosing systems, maintenance, tooling, calibration, Kv-value calculation, troubleshooting.

- Operation instructions digital instruments (document nr. 9.17.023)
- Hookup diagram **mini CORI-FLOW™** and **CORI-FLOW™** (general) (document nr. 9.16.044)
- FlowPlot Manual (document nr. 9.17.030)

Depending on optional fieldbus interface:

Fieldbus/interface description	Manual	Hookup diagram
- RS232 Interface with FLOW-BUS protocol	9.17.027	9.16.044
- FLOW-BUS Interface	9.17.024	9.16.048
- PROFIBUS DP Interface	9.17.025	9.16.049
- DeviceNet™ Interface	9.17.026	9.16.050
- Modbus interface	9.17.035	9.16.066

These documents can be downloaded from the website:
http://www.bronkhorst.com/qrcoriolis *or can be sent by e-mail on request.*

Notes for temperature considerations

*After having used the **mini CORI-FLOW™** the first time at low temperature tighten the fluid adaptor screws again in order to prevent any leakage! Please note: if you do not tighten, the leaking adaptor / fitting can cause damage!*
After the first shrinking and tightening of the screws, no further precaution is necessary.

*Note that the maximum temperature in the housing of the **mini CORI-FLOW™** is 70 °C.*
To check this, the internal temperature sensor can be used. Temperature can be readout digitally via FLOW-DDE/ E-8000 (FlowDDE par. 142) or BRIGHT (local readout/control module).
Make sure the temperature value readout here (=actual temperature in housing) will not exceed 70 °C.

STARTING-UP

1 **Check mini CORI-FLOW™ functional properties**

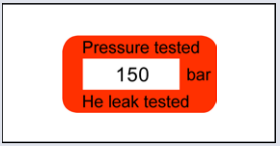
Before installing your Mass Flow Meter/Controller it is important to read the attached label and check:

- Flow rate
- Fluid to be measured
- Up- and downstream pressures
- Input/output signal
- Temperature
- Valve type *(if controller)*

2

Check test-pressure

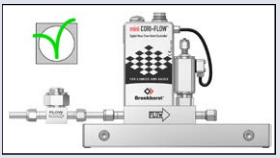
The tested pressure is stated on the instrument with a red-coloured sticker. Before installation, make sure that the test pressure is in accordance with normal safety factors for your application. If there is no Pressure Testing Sticker on the device or if the test pressure is incorrect, the instrument should **not** be mounted in the process line and be returned to the factory.



3

Check if system piping is clean

For reliable measurement always make sure the fluid stream is clean. Use filters to assure a particle free liquid stream or a moisture- and oil-free gas stream. Recommended pore-size: 10...40 µm. If back flow can occur, a downstream filter and a check valve are recommended too. For high flow rates select a suitable filter size, to avoid too high pressure drop or cavitation.



Warning!

During the manufacturing process, the instruments have been tested with water. Despite the fact that the instruments have been purged thoroughly afterwards, we cannot guarantee that the delivered instruments are absolutely free from water droplets. Bronkhorst strongly recommends performing an additional, adequate drying procedure for those applications where remaining water particles may cause undesired reactions such as corrosion.

4.1

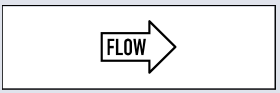
Mount/install instrument properly

Install the **mini CORI-FLOW™** Meter/Controller in the line and tighten the fittings according to the instructions of the supplier of the fittings. Mount the **mini CORI-FLOW™** instrument, with screws in the body, to a rigid, stiff base body or heavy mass, such as a wall, heavy rig or stable steel construction. This is essential to achieve optimal accuracy with the **mini CORI-FLOW™** instrument.

4.2

Flow direction

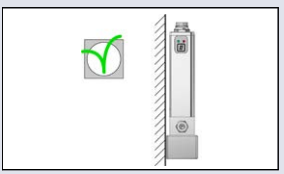
Install the **mini CORI-FLOW™** in accordance with the direction of the FLOW arrow. The arrow for flow direction is indicated on the **mini CORI-FLOW™**, between process fittings.



4.3

Base mounting

Mount the **mini CORI-FLOW™** instrument, with screws in the body, to a rigid, stiff base body or heavy mass on a vibration-free position, such as a wall, heavy rig or stable construction. This is essential to achieve optimal accuracy with the **mini CORI-FLOW™** instrument.



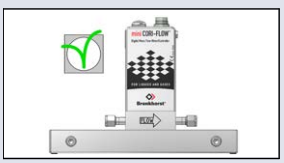
By default the **mini CORI-FLOW™ M12, M13** and **M14** will be delivered on a special mounting block for achieving optimal accuracy.This mounting block has a mass and stiffness precisely tuned for the specific model.

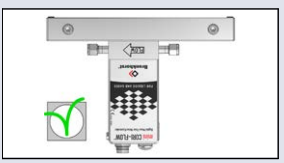
Removing the mounting block will cause inaccuracy unless the instrument is firmly mounted on a stiff and rugged surface.

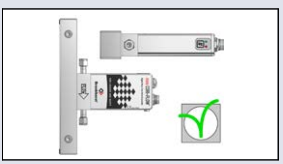
4.4

Mounting position general

For gas and liquid **mini CORI-FLOW™** meters can be mounted in any position for a proper measurement.

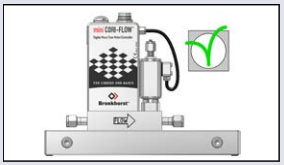
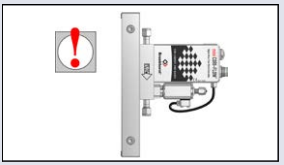
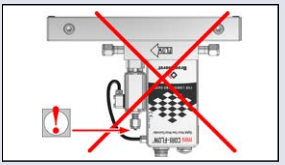






4.5 **Mounting position (integrated) valve with purge connector**

Only for **mini CORI-FLOW™** instruments with (integrated) liquid valve with purge adaptor, mounting position can be critical for a good quality of de-gassing.

Please consult the Instruction Manual for additional information on mounting the mini CORI-FLOW instruments. This document can be found in the download section of our website: **coriolis.bronkhorst.com/en/downloads/instruction_manuals/**

Liquid purging

In order to remove gas bubbles during start-up, flushing with relatively high flow rate of liquid for some minutes is recommended.

Gas purging

In order to remove condensation drops during start-up, flushing with dry gas for some minutes with high flow rate is recommended.

Leak tightness

Verification of leaks is required prior starting up of the process.

5 **Leak check**

Check the system for leaks before applying (fluid) pressure. Especially if toxic, explosive or other dangerous fluids are used!

Gas tight is not the same as liquid tight

Please note that connections which are tight for liquid, could still be untight for gas. This can result in Air enclosure in the liquid, e.g. when using pumps, which might lead to errors in measurement.

6 **Electrical connection**

Electrical connections must be made with a standard cable or according to the **mini CORI-FLOW™** hook-up diagram.

mini CORI-FLOW™ instruments have a IP65 ingress protection rating.

Optional mini CORI-FLOW™ instruments can be ATEX Zone 2 protected. For ATEX Zone 2 applications, all (optional) connectors and the impact protection cover must be mounted on the instrument.

7.1 **Analog/Local operation**

Connect the **mini CORI-FLOW™** to the power supply/readout unit with the 8-pin cable at the circular connector. The two examples below have the following electrical properties:

Power : +15...+24 Vdc

Analog output : 0...5 Vdc / 0...10 Vdc
0...20 mA / 4...20 mA

Analog input *(controller)* : 0...5 Vdc / 0...10 Vdc
0...20 mA / 4...20 mA

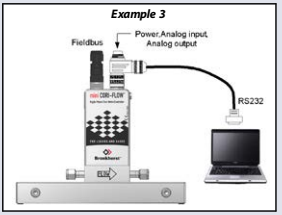
Example 1

Example 2

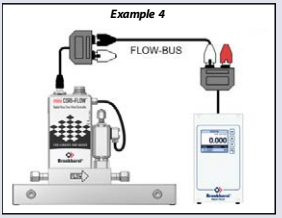
7.2 BUS/digital operation

For this procedure see description for RS232 operation or specific (optional) fieldbus.
RS232 connection cable 7.03.444 enables to use (free downloadable) tooling programs for Windows.

Example 3

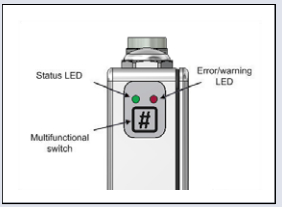


Example 4



8 Multi-functional switch operation

Using the 2 colored LEDs and the switch on the **mini CORI-FLOW™**, several actions can be monitored and started. The green LED is used for status indication. The red LED is used for errors/warnings. The switch can be used to start several actions, such as auto-zero, restore factory settings and bus-initialization actions. See specific zero-procedure part in this manual or see 'General instructions for **mini CORI-FLOW™**' for more details.



Important warning! When red LED blinks shortly: measuring signal is unstably or noisy: instrument is possibly exposed to vibrations or pulsating flow.

9 Purging

In systems for use with corrosive or reactive fluids, purging with an inert gas is absolutely necessary before use. After use with corrosive or reactive fluids, complete purging is also required before exposing the system to air. Purge the **mini CORI-FLOW™** with actual fluid to get rid of all the Air/gas in the tubes (for liquids) or to remove all possible condensation drops (for gases).

Special control mode for purging

In case of a **mini CORI-FLOW™** controller give setpoint = 100 % to control the valve or the pump. It is also possible to use special control mode = 8 to fully open the valve or set the pump at max. rpm, using a digital interface. This will bypass the PID-controller and might be usefull when having the **mini CORI-FLOW™** set to a low capacity. It will ensure you to get the highest possible flow for purging.

Warm-up time

Let the **mini CORI-FLOW™** warm-up for at least 30 minutes for best accuracy.

10 Zeroing

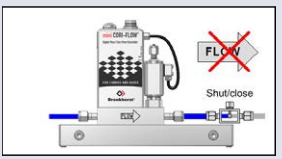
Before first use, when process conditions change significantly (especially temperature) or when the instrument has been re-mounted (e.g. after servicing) it is recommended to perform an automatic zero action with the **mini CORI-FLOW™**. This action can be started manually (as described below) or via a digital interface (see document Operation instructions digital instruments: 9.17.023). Under normal (constant) conditions it will not be necessary to zero before each application start-up.

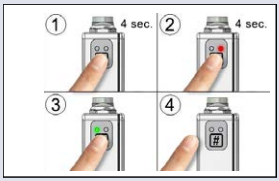
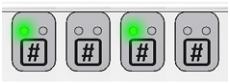
10.1 Set process conditions

After warming-up, pressuring and purging the system, including the **mini CORI-FLOW™**, prepare the **mini CORI-FLOW™** for actual process conditions.

10.2 Stop flow

Make sure there is no flow through the **mini CORI-FLOW™** by closing a shut-off valve (in front of and) after the instrument. At least one (shut-off) valve after the **mini CORI-FLOW™** is required. High quality up- and downstream shut-off valves are recommended for proper zero point calibration.



10.3	**Start Auto-Zero**	With no flow, use the push-button switch (#) on the **mini CORI-FLOW™** to start the zero adjustment procedure (LEDs first will go off). (1), (2) and (3): Press the push-button (#) and hold it for 8..12 seconds (each 4 seconds the LED-indication will change). (4): Release the push-button (#) when the green LED is on.	
10.4	**Zeroing procedure**	The zeroing procedure will start now and the green LED will blink fast. The procedure will take at least 45 sec. When the signal is not stable the procedure will take longer (max. 6 retries will be performed). The red LED will blink when signal is unstable/noisy. Make sure that there is no flow through the **mini CORI-FLOW™** when performing the zeroing procedure and avoid vibrations !	 **45 sec.**
10.5	**Ready**	When indication is showing 0% signal and the green indication LED is continuously on, then zero has been performed well. Instrument is in normal operation mode now and ready for use.	

Measurement check
For a controller: send a setpoint to the **mini CORI-FLOW™** and check the measured value.
Make sure the **mini CORI-FLOW™** indicates 0% at zero flow.

Your **mini CORI-FLOW™** is now ready for operation.