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LIQUI-FLOW™_{mini}

Digital Mass Flow Meters for Liquids

Quick Installation Guide

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Start-up LIQUI-FLOW™_{mini} in 10 steps

SCOPE OF THIS MANUAL

LIQUI-FLOW **mini** instruments are one of the smallest micro fluidic Mass Flow Meters (MFM) of its kind. The instruments are capable of measuring ultra low flow rates in ranges starting from 1.5...30 mg/h up to 12...600 mg/h, based on water. The straight, duplex steel sensor tube (W1.4462) has an internal volume of less than 1 mm³ and operates on the thermal measuring principle. Due to its high pressure rating of max. 1233 bar (17900 psi) the MFM is suited for HPLC systems. The instruments are equipped with a microprocessor-based printed circuit board, offering high accuracy and excellent temperature stability. The RJ45 connection is used for power supply and for both analog and digital (RS232) communication.

This manual covers the short-form instructions for LIQUI-FLOW **mini** mass flow instruments regarding:

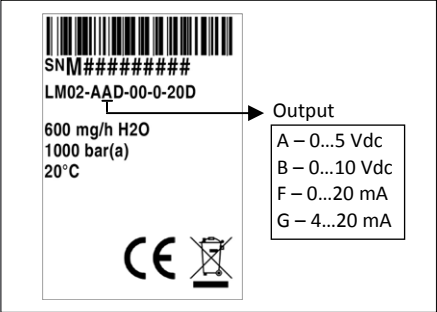

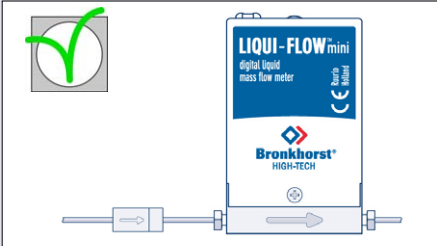
- start-up
- mounting
- zeroing
- operation

This manual will help you start-up your LIQUI-FLOW **mini** in only 10 steps. More detailed information can be found in documents listed below:

- Instruction manual LIQUI-FLOW **mini** series (document nr. 9.17.065)
Consists information for basic and advanced operation, more detailed product information and instructions for troubleshooting
- FlowPlot Manual (document nr. 9.17.030)
- Hookup diagram LIQUI-FLOW **mini** (document nr. 9.16.097)

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

Starting-up

	<p>1. Check LIQUI-FLOW mini properties: Before installing your Mass Flow Meter it is important to read the attached label and check:</p> <ul style="list-style-type: none"> - Flow rate - Fluid to be measured - Pressure - Output signal - Temperature 	
	<p>2. Check test-pressure: Check the red-coloured sticker and make sure the test-pressure is in accordance with normal safety factors for your application. LIQUI-FLOW mini instruments are tested up to the pressure indicated on the red sticker.</p>	
	<p>3. Check if system piping is clean: For reliable measurement always make sure the fluid stream is clean.</p> <p>Use filters to assure a particle-free liquid stream. Recommended pore-size: 2 µm.</p> <p>If back flow can occur, a downstream filter is recommended too.</p>	

4. Mount/install instrument properly:

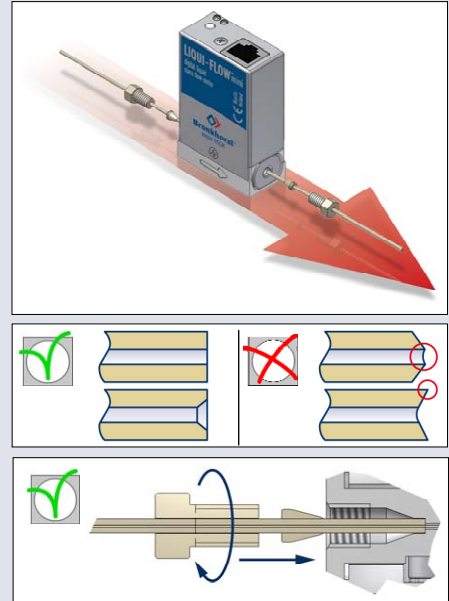
Install the LIQUI-FLOW **mini** Meter in the line, in accordance with the direction of the FLOW arrow. The arrow for flow direction is indicated on the body of the instrument.

Make sure to use 10-32 UNF fittings (ferrules/nuts) and tubing suitable for the maximum applied system pressure.



Only use 1/16" tubing with a straight and clean cut without burrs to ensure leak tightness. Preferably deburr the tubing prior to installation. A new ferrule connection must be made for each new adapter to ensure leak-tightness and minimum dead volume, due to variances in the adapter dimensions.

Tighten the 10-32 UNF fittings according to the instructions of the supplier of the fittings.



Location:

Install the instrument on a stable position and assure that mechanical vibration, heat source influence and draft are reduced to a minimum.



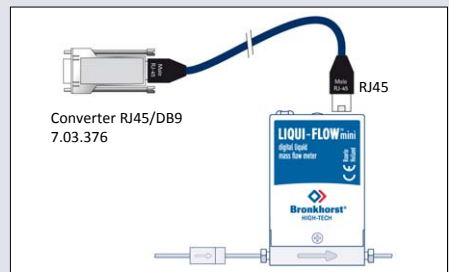
5. Leak check:

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



6. Electrical connection:

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



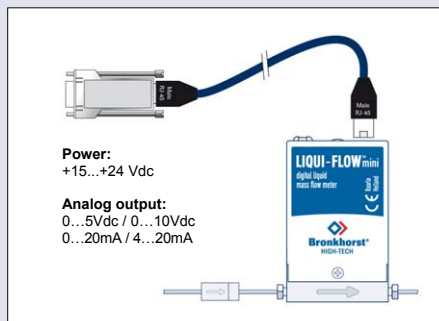
IP40:

Please note that a LIQUI-FLOW **mini** instrument is dustproof according to IP40, implying that the electronics housing and electrical connection do not offer any protection against moist environments.

7a. Analog/Local operation:

Connect the LIQUI-FLOW **mini** to the power supply/readout unit using an RJ45 cable connector, with converter to 9-pin sub-D.

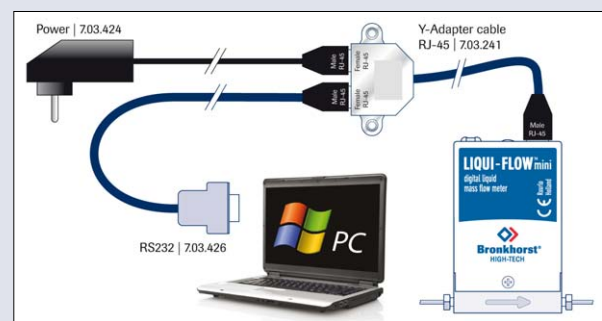
Example:



7b. Digital operation:

For this procedure see description for RS232 operation. RS232 connection cable 7.03.426 enables to use (free) Bronkhorst tooling programs for Windows.

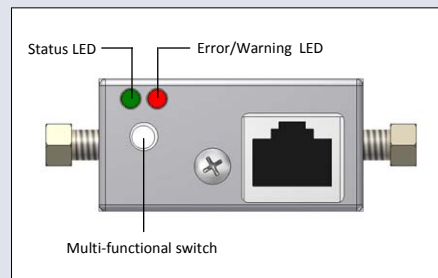
Example:



8. Multi-functional switch operation:

Using the two colored LEDs and the switch on the LIQUI-FLOW **mini**, several actions can be monitored and started. The green LED is used for status indication. The red LED is used for errors/warnings/messages.

The switch can be used to start several actions, such as auto-zero, restore factory settings and bus-initialization actions, if applicable. See specific *zero-procedure* below (10) or see 'Instruction Manual LIQUI-FLOW **mini** series' for more details.



9. Purging:

Purge the system with a non-reactant liquid prior to use. Especially in systems for use with corrosive or reactive fluids, purging for at least 30 minutes with a non-reactant liquid is absolutely necessary before use. Purge the system until all gas bubbles have disappeared and avoid the creation of gas bubbles in the system through expansion or dead volumes. The measurement stability is greatly influenced by the presence of gas bubbles in the system. After use with corrosive or reactive fluids, complete purging is also required before exposing the system to air.



Waste fluid:

Make sure not to spill fluid on the instrument while purging. Always keep the sensor exterior dry.



Warm-up time:

Let LIQUI-FLOW **mini** warm-up for at least 10 minutes for best accuracy.



10. Zeroing (optional):

The zero-point of each instrument is factory adjusted. If so required the zero point may be re-adjusted over RS232 or by means of using the micro switch. Procedure for zeroing by micro switch:

- ◆ Warm-up, pressure up the system and fill the instrument according to the process conditions.
- ◆ Make sure no flow is going through the instrument by closing valves near the instrument.
- ◆ The sensor signal should be stable; any unexpected sensor instability may be caused by leaks or trapped gas bubbles.
- ◆ Press micro switch and hold it. After a short time the red LED will go ON and OFF, then the green LED will go ON. At that moment release the micro switch.
- ◆ The zeroing procedure will start at that moment and the green LED will blink fast. The zeroing procedure waits for a stable signal and saves the zero. If the signal is not stable, zeroing will take long and the nearest point to zero is accepted. The procedure will take approx. 10 seconds.
- ◆ When the indication is showing 0% signal and the green indication LED is burning continuously again, then the zeroing action was successful.



Ready:

Your LIQUI-FLOW **mini** Mass Flow Meter is now ready for operation.

