

# Datasheet ML120V21

## Low Flow Coriolis Mass Flow Controller

### > Introduction

Bronkhorst® model ML120V21 **mini CORI-FLOW™** Mass Flow Controllers (MFCs) for gases and liquids are precise and compact instruments, based on the Coriolis measuring principle, designed to cover the needs of the low flow market. The MFCs offer “multi-range” functionality: factory calibrated ranges can be rescaled by the user, maintaining the original accuracy specs. The MFC contains a microprocessor based pc-board with signal and fieldbus conversion and a PID controller for mass flow control by means of the integrated piezoelectric control valve. The mass flow is provided as analog signal or digitally via RS232 or optional fieldbus. The flow range and wetted materials are determined depending of the type of fluid and the process conditions of the application.



### > Technical specifications

#### Flow ranges

Minimum full scale	: 5 g/h
Nominal flow	: 100 g/h
Maximum full scale	: 200 g/h
Minimum flow	: 50 mg/h
Rangeability MFC	: $\geq 1:100$

#### Performance

Mass flow accuracy	: Gas: $\pm 0,5\%$ of rate; Liquid: $\pm 0,2\%$ of rate
Repeatability	: $\pm 0,05\%$ of rate $\pm \frac{1}{2}(ZS^* \times 100/\text{flow})\%$ based on digital output
Warm-up time	: > 30 minutes after power up for optimum performance
Zero stability (ZS)*	: $< \pm 10$ mg/h
Density accuracy	: $< \pm 5$ kg/m <sup>3</sup>
Temperature accuracy	: $\pm 0,5$ °C
Temperature effect**	: on zero: $< 3$ mg/h/°C; on span: $< 0,005\%$ Rd/°C; self heating (at zero flow): $< 10$ °C
Mounting***	: Any position, attitude sensitivity negligible
Device temperature	: 0...70°C;
Settling time, controller (<2% of setpoint)	: 1 s

\* Guaranteed at constant temperature and for unchanging process and environment conditions.

\*\* Depends on flow rate, heat capacity fluid, T<sub>amb</sub>, T fluid and cooling capacity.

\*\*\* To be rigidly bolted to a stiff and heavy mass or construction for guaranteed zero stability. External shocks or vibrations should be avoided.

Although all specifications in this datasheet are believed to be accurate, the right is reserved to make changes without notice or obligation.

### mini CORI-FLOW Coriolis Mass Flow Controller model ML120V21

#### Mechanical parts

Material (wetted parts)	: Stainless steel 316L or comparable
Sensor	: Single tube, DN 0.25; frequency 170 Hz $\pm 20$ Hz
Process connections (welded)	: Compression type or face seal couplings
Seals	: Kalrez™
Valve	: Piezoelectric + metal plunger
Ingress protection (housing)	: IP40
Leak integrity	: Outboard $< 2 \times 10^{-8}$ mbar l/s He
Pressure rating	: 5 bara (higher on request)

#### Electrical properties

Power supply	: +15...24 Vdc $\pm 10\%$ Max. ripple recommended: 50 mV tt
Power consumption	: max. 3 W
Analog output	: 0...5 (10) Vdc, min. load impedance $> 2$ k $\Omega$ ; 0 (4)...20 mA (sourcing), max. load impedance $< 375$ $\Omega$
Analog setpoint	: 0...5 (10) Vdc, min. load impedance $> 100$ k $\Omega$ ; 0 (4)...20 mA, load impedance $\sim 250$ $\Omega$
Digital communication	: Standard RS232; Options: PROFIBUS DP, DeviceNet™, Modbus RTU/ASCII, FLOW-BUS, EtherCAT™, PROFINET

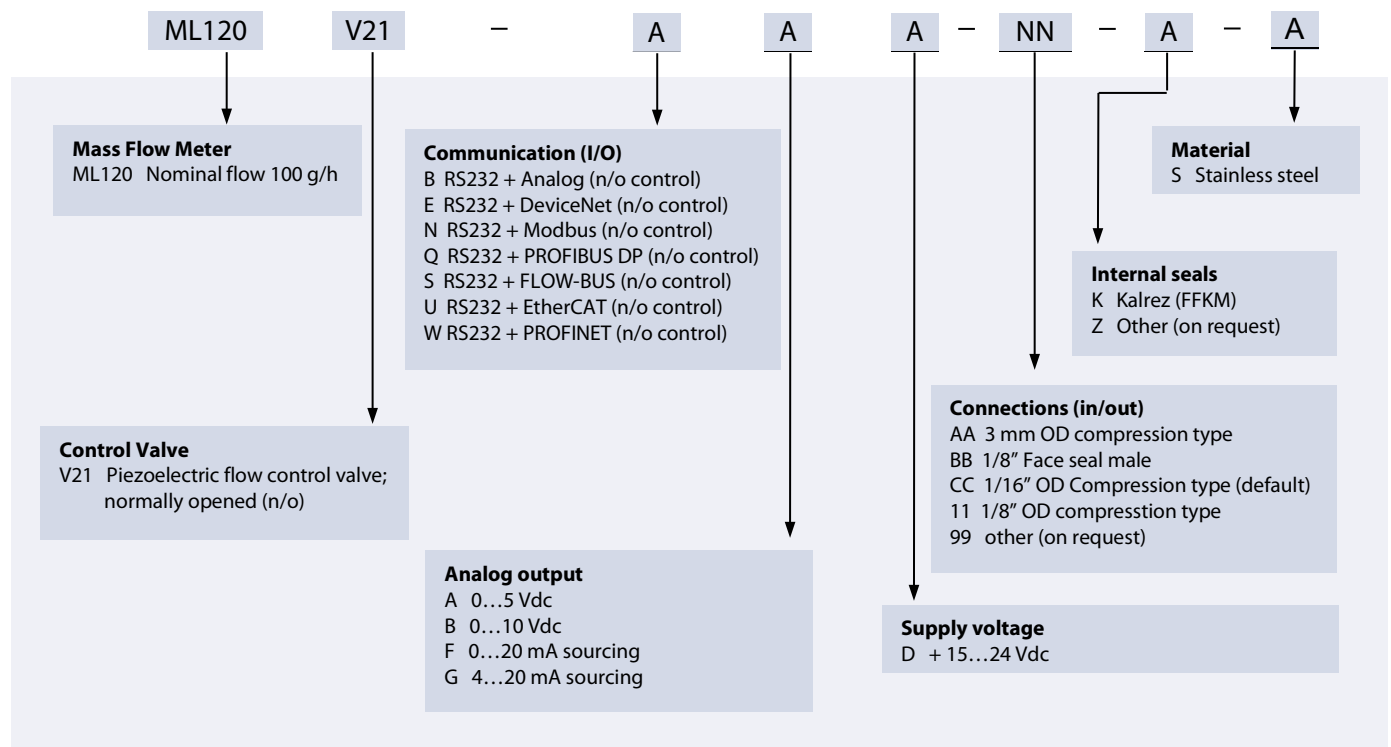
#### Electrical connections

Analog/RS232	: 9-pin D-connector (male)
PROFIBUS DP	: bus: 9-pin D-connector (female); power: 9-pin male D-connector (male)
DeviceNet™	: 5-pin M12 connector (male)
Modbus RTU/ASCII/FLOW-BUS	: RJ45 modular jack
EtherCAT™ / PROFINET	: 2 x RJ45 modular jack (in/out)



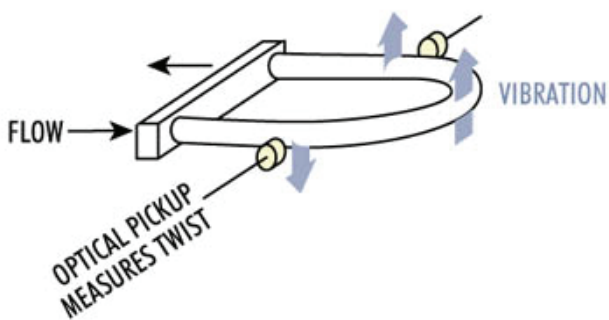
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## > Model number identification



## > Coriolis principle of operation

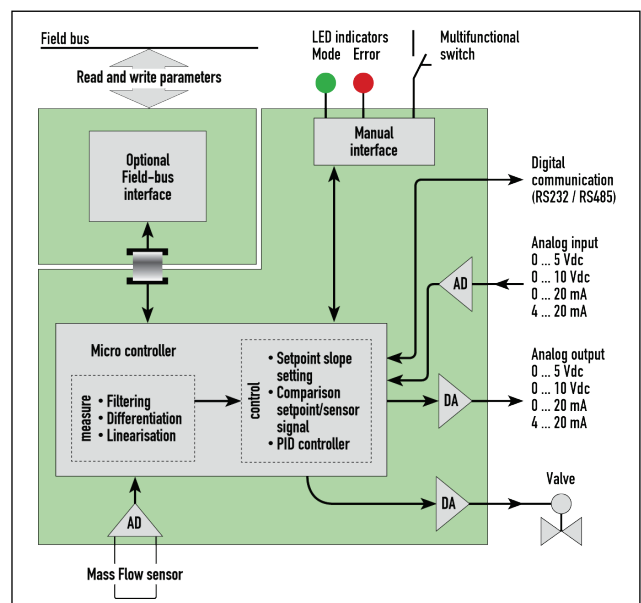
Instruments of the **mini CORI-FLOW™** series are based on the *Coriolis effect*: a fluid flows through a uniquely shaped, single loop sensor tube, forming part of an oscillating system. Coriolis forces cause a variable phase shift, which is detected by sensors and fed into the integrally mounted pc-board. The resulting output signal is strictly proportional to the real mass flow rate. Coriolis mass flow measurement is fast, accurate and inherently bi-directional. The **mini CORI-FLOW™** features density and temperature of the fluid as secondary outputs.



Schematic of a Coriolis flow sensor

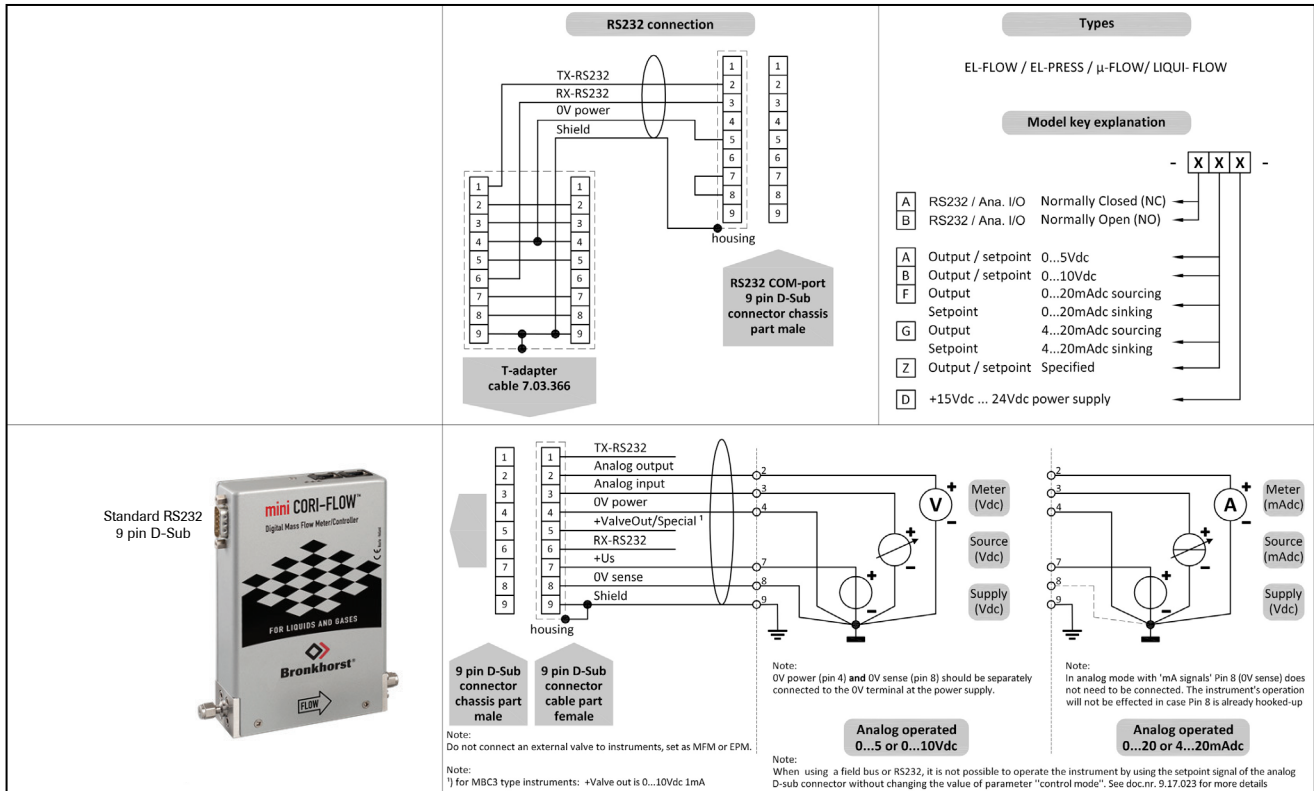
## > State of the art digital design

**mini CORI-FLOW™** series are equipped with a digital pc-board, offering high accuracy, excellent temperature stability and fast response. The basic digital pc-board contains all of the general functions needed for measurement and control. In addition to the standard RS232 output the instruments also offer analog I/O. Furthermore, an integrated interface board provides DeviceNet™, PROFIBUS DP, Modbus RTU/ASCII, EtherCAT™, PROFINET or FLOW-BUS protocols.



Functional scheme of the digital PC-board

## > Hook-up diagram for analog or RS232 communication



## > Hook-up diagrams for fieldbus communication

For the available fieldbus options we refer to the various hook-up diagrams as indicated below. If you are viewing this datasheet in digital format, you may use the hyperlink to each of the drawings. Otherwise please visit the download section on [www.bronkhorst.com/en/downloads](http://www.bronkhorst.com/en/downloads) or contact our local representatives.

Analog/RS232 [Doc. 9.16.132](#)

**FLOW-BUS** [Doc. 9.16.133](#)

**PROFI-BUS** [Doc. 9.16.134](#)

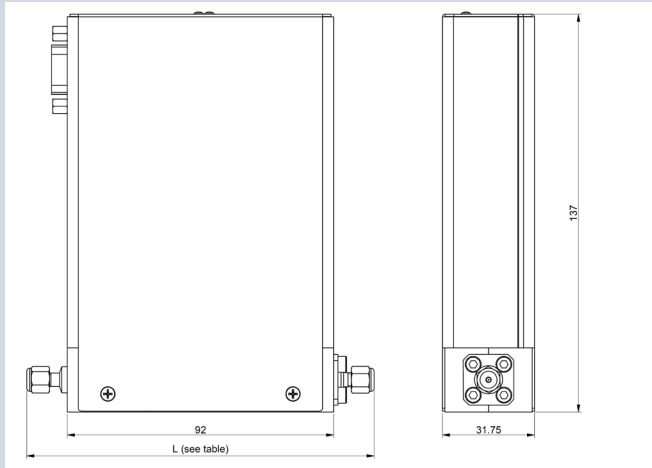
**DeviceNet** [Doc. 9.16.135](#)

**Modbus** [Doc. 9.16.136](#)

**EtherCAT** [Doc. 9.16.137](#)

**PROFI-NET** [Doc. 9.16.146](#)





## > Dimensions (mm)





Length (L)  
incl. adapters

OD Compression type	Size L
1/16 inch	120
other	on request

## > Options and accessories

- Free software support for operation, monitoring, optimizing or to interface between digital instruments and windows software.	
- BRIGHT compact local Readout/Control module - E-8000 Power Supply Readout/Control units	
- Interconnecting cables for power and analog/digital communication - PiPS Plug-in Power Supply	
- Heavy mass body and vibration-dampeners	

## > Alternatives

- Model ML120V00 <b>mini CORI-FLOW™</b> Mass Flow Meter (flow rates from 0,05 up to 200 g/h)	
- Model M12V10I <b>mini CORI-FLOW™</b> Mass Flow Controller (flow rates from 0,1 up to 200 g/h) for gases; class IP65 - Model M13V10I <b>mini CORI-FLOW™</b> Mass Flow Controller (flow rates from 1 up to 2000 g/h) for gases; class IP65 - Model M12V14I <b>mini CORI-FLOW™</b> Mass Flow Controller (flow rates from 0,1 up to 200 g/h) for liquids; class IP65 - Model M13V14I <b>mini CORI-FLOW™</b> Mass Flow Controller (flow rates from 1 up to 2000 g/h) for liquids; class IP65	



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