Datasheet M15

Coriolis Mass Flow Meter for Liquids and Gases

Bronkhorst® Coriolis Mass Flow Meter model M15

> Introduction

Bronkhorst® **mini CORI-FLOW™** model M15 Mass Flow Meters (MFMs) are precise and compact instruments, based on the Coriolis measuring principle, designed to cover the needs of the low flow market. The MFMs offer "multi-range" functionality: factory calibrated ranges can be rescaled by the user, maintaining the original accuracy specs. The instruments are equipped with a robust IP65 weatherproof housing and are optionally available with ATEX approval for use in Zone 2 hazardous areas. The MFM contains a microprocessor based pc-board with signal and fieldbus conversion and a PID controller for optional mass flow control by means of a separately mounted control valve or pump. 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 sensor rates

Minimum full scale	: 5 kg/h
Nominal flow	: 100 kg/h
Maximum full scale	: 300 kg/h
Recommended min. flow	: 0,2 kg/h
Zero stability	: < ±0,050 kg/h

Performance

Accuracy liquid	: 0,2% of rate
Accuracy gas	: 0,5% of rate
Repeatability	: ±0,05% of rate + [ZS x 100/flow]%
(based on digital output)	(ZS = Zero Stability)
Turndown	: 1:100
Response time sensor	: < 200 msec
Temperature effect	: on zero: < 0,5 g/h/°C; on span: < 0,001% Rd/°C; self heating (at zero flow): ≤ 10°C
Temperature accuracy	: ±5 °C
Density accuracy	: < ±5 kg/m^3
Mounting position	: in any position (attitude sensitivity negligible); external shocks or vibrations to be avoided

Mechanical parts

Material (wetted parts)	: stainless steel 316L or comparable; other materials on request
Housing	: stainless steel 430F
Sensor	: single tube, DN 3.1
Process connections (welded)	: Compression type or face seal couplings
Ingress protection (housing)	: IP65 (weatherproof)
Leak integrity	: < 2 x 10^{-9} mbar l.s^{-1} He
Pressure rating	: 100 bar; higher on request
Temperature range	: 0...70°C; for ATEX Cat.3, Zone 2 max. 50°C

Electrical properties

Power supply	: +15…24 Vdc ±10% Max. ripple recommended: 50 mV tt
Power consumption	: meter: max. 3 W; controller: max. 7 W
Analog output	: 0…5 (10) Vdc, min. load impedance > 2 kΩ; 0 (4)…20 mA (sourcing), max. load impedance < 375 Ω
Analog setpoint	: 0…5 (10) Vdc, min. load impedance > 100 kΩ;
(for MFM + control valve/pump)	0 (4)…20 mA, load impedance ~250 Ω
Digital communication	: Standard RS232; Options: PROFIBUS DP, DeviceNet™, Modbus-RTU, FLOW-BUS

Electrical connections

Analog/RS232	: male, 8-pin Amphenol for power, analog I/O and RS232
PROFIBUS DP	: bus: 5-pin M12 female; power: 8-pin DIN male
DeviceNet/Modbus/FLOW-BUS	: 5-pin M12 male

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> Model number identification

M15 – A A A – NN – A A

Mass flowmeter
M15 Nominal flow 50 kg/h

Communication (I/O)
A RS232 + Analog (n/c control)
B RS232 + Analog (n/o control)
D RS232 + DeviceNet (n/c control)
E RS232 + DeviceNet (n/o control)
M RS232 + Modbus (n/c control)
N RS232 + Modbus (n/o control)
P RS232 + PROFIBUS DP (n/c control)
Q RS232 + PROFIBUS DP (n/o control)
R RS232 + FLOW-BUS (n/c control)
S RS232 + FLOW-BUS (n/o control)

Analog output
A 0…5 Vdc
B 0…10 Vdc
F 0…20 mA sourcing
G 4…20 mA sourcing

Supply voltage
D +15…24 Vdc

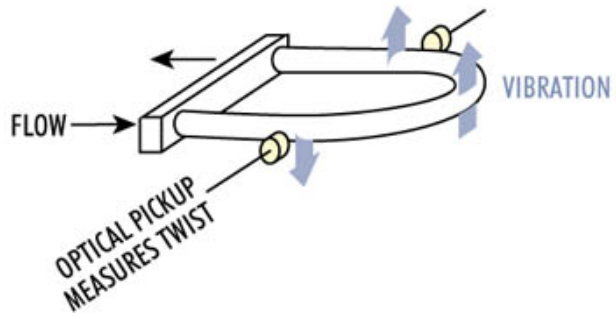
Connections (in/out)
11 1/8" OD compression type
22 ¼" OD compression type
33 6 mm OD compression type
44 12 mm OD compression type
55 ½" OD compression type
77 ¼" Face seal female
88 ¼" Face seal male
99 other

Internal seals
O None (sensors)
V Viton (valves for gas)
E EPDM
K Kalrez-6375

Material
S Stainless steel

> Measuring principle

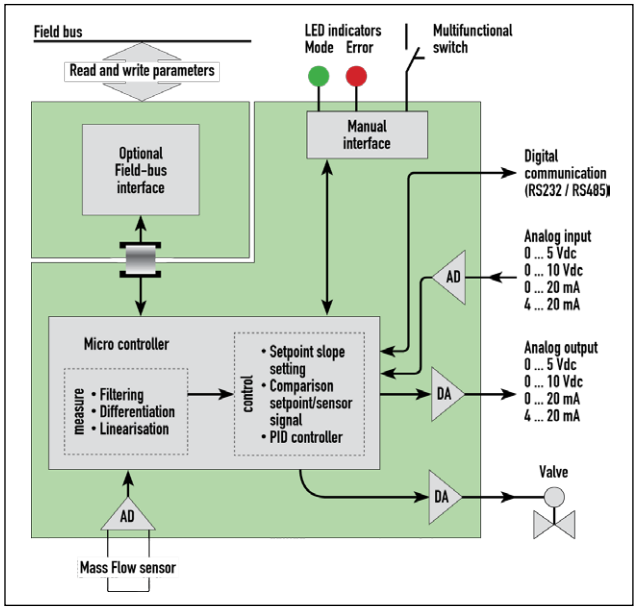
Instruments of the **mini CORI-FLOW™** series are based on the *Coriolis effect:* a fluid flows through a uniquely shaped, single loop sensor tube, forming part of an oscillating system. Coriolis forces cause a variable phase shift, which is detected by sensors and fed into the integrally mounted pc-board. 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

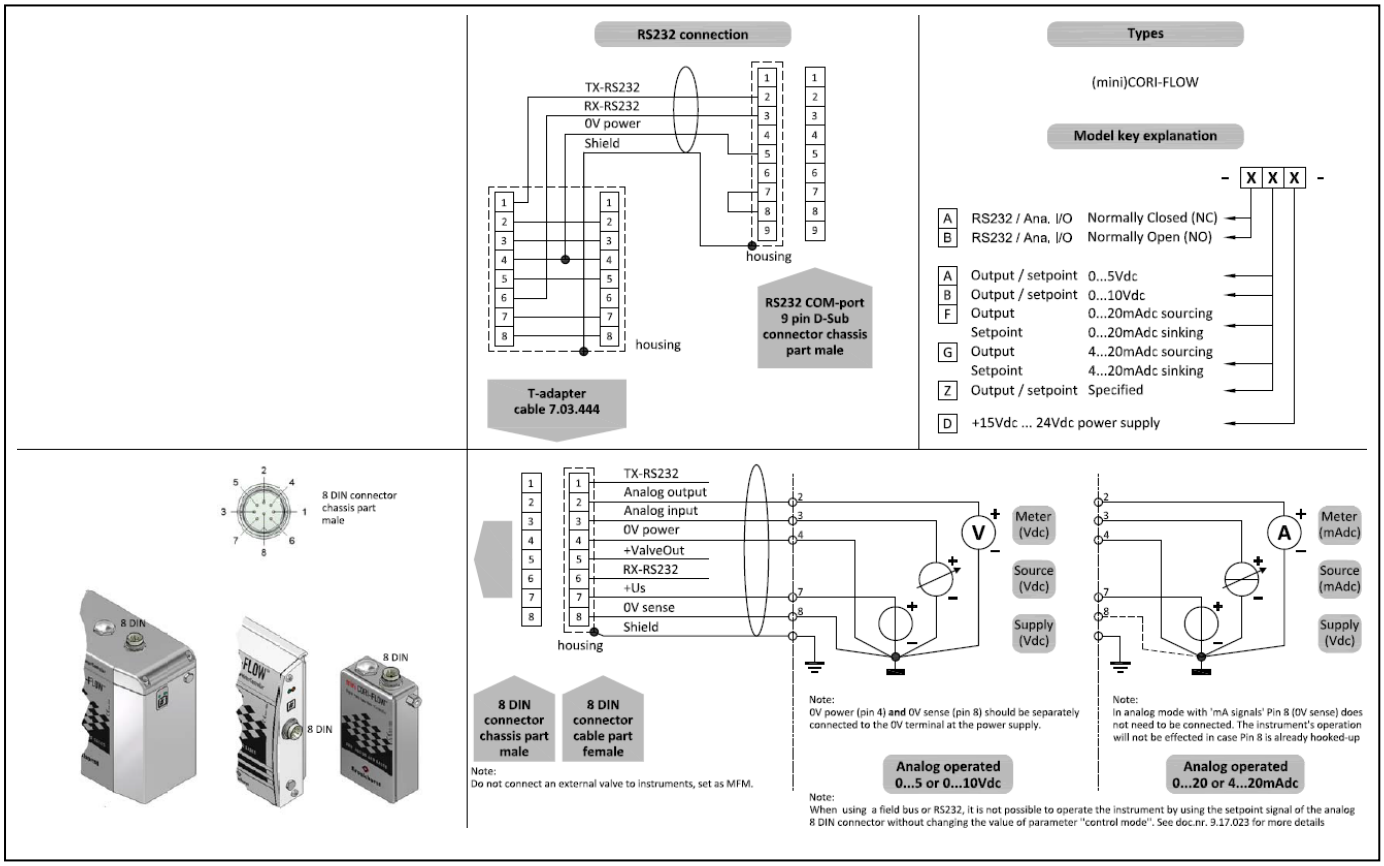
> State of the art digital design

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 or FLOW-BUS protocols.



Functional scheme of the digital PC-board

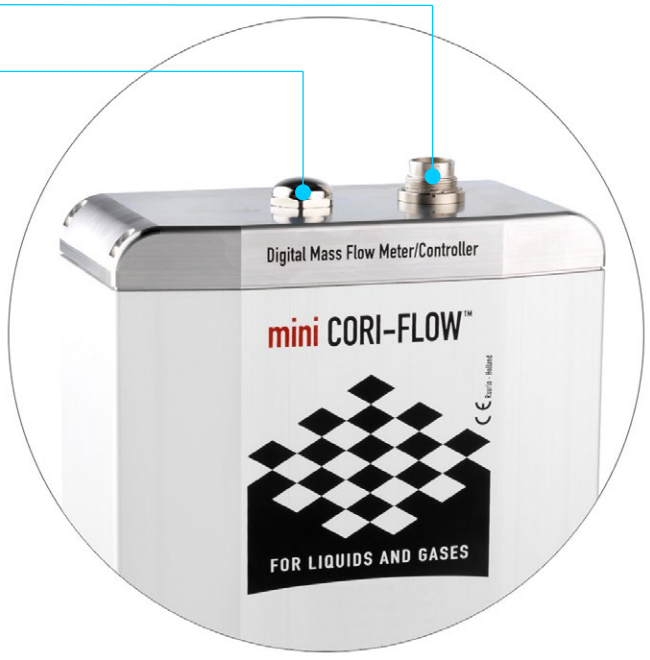
> Hook-up diagram for analog or RS232 communication



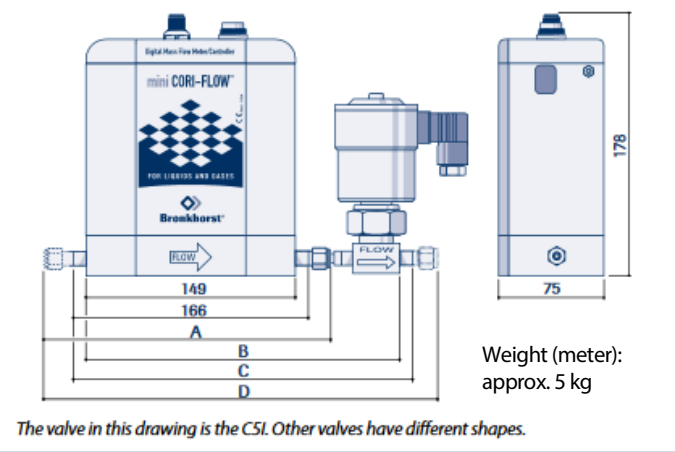
> Hook-up diagrams for fieldbus communication

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 http://www.bronkhorst.com/en/downloads or contact our local representatives.

Analog/RS232	Doc. 9.16.044
FLOW-BUS	Doc. 9.16.048
PROFIBUS	Doc. 9.16.049
DeviceNet	Doc. 9.16.050
Modbus	Doc. 9.16.066



> Dimensions (mm) and weight (kg)



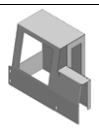
Weight (meter): approx. 5 kg

The valve in this drawing is the C5I. Other valves have different shapes.

Model (values in mm)	A	B	C	D
M15 (¼" OD)	204	-	-	-
M15 (¼"VCR)	203	-	-	-
M15+C0I (¼" OD)	204	219	236	274
M15+C0I (¼"VCR)	203	219	236	271
M15+C2I (¼" OD)	204	219	236	274
M15+C2I (¼"VCR)	203	219	236	271
M15+C5I (¼" OD)	204	219	236	274
M15+C5I (¼"VCR)	203	219	236	271
M15+F033CI (1/4" OD)	204	283	n/a	338
M15+F004AI (¼" OD)	204	270	n/a	326
M15+F004AI (¼"VCR)	203	270	n/a	319

For other models contact factory.

> 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	
- Interconnecting cables for power and analog/digital communication - PiPS Plug-in Power Supply	
- Impact protection cover for ATEX Zone 2 applications	

> Alternatives

- Model M15+ C5I mini **CORI-FLOW™** Mass Flow Controller (flow rates up to 300 kg/h)	
- Model M14 mini **CORI-FLOW™** Mass Flow Meter (flow rates from 0,03 up to 30 kg/h)	
- M54 or M55 **CORI-FLOW™** Mass Flow Meter models (flow rates up to 600 kg/h)	

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