



GR-02

Thermal Mass Flowmeter and Controller for Gases



Features

/ Insensitive to pressure and temp.

/ Short response times

/ Highly accurate and dynamic

/ Low pressure drop

/ Serial interface

Description:

The GR-02 series of mass flowmeter for gases has a CMOS flow sensor that is capable of measuring at very high accuracy according to the thermal principle that applies to gas flow. The measurement pick-up is located directly within the gas flow and detects the quantum of heat that the passing gas molecules carry off a heating element. With its significantly small dimensions and direct contact to the medium, the GR-02 is capable of measuring at extremely fast speeds of response time. The measuring tube can be delivered in aluminium or stainless steel where the measuring chamber is always made of plastic. This limits its use to non-hostile gases or gaseous mixtures with only low hostile content. A major advantage of the thermal measuring principle is that the volume flow can be measured and put out under standard conditions, largely independent of the process pressure and the gas temperature. Selectively, the GR-02 can be supplied as a mere flowmeter with analogue output signal or as flowmeter and controller with integrated regulating valve. In the version with valve, the flow of gas volume is regulated proportionally to an analogue input signal while this unit can also be seen as a „constant gas source“. The parameters of the PI-controller, the operating range settings, selection of media and many other features can be verified and modified through suitable Windows software over the serial RS-485 interface.

Application:

The GR-02 series represents the new generation of thermal mass flowmeters for gases. The extremely cost-effective CMOS technology combines a dependable accuracy of up to $\pm 0.3\%$ of the full scale value + $\pm 0.5\%$ of measured value, fast response times and excellent dynamics to a flowmeter and controller that offers maximum operational convenience. Considering the advantages like modular construction of the measuring system, its assembly in any position and the convenience of cleaning the measuring pick-up without elaborate recalibration, the GR-02 can be deployed in various applications



Electrical Specifications:

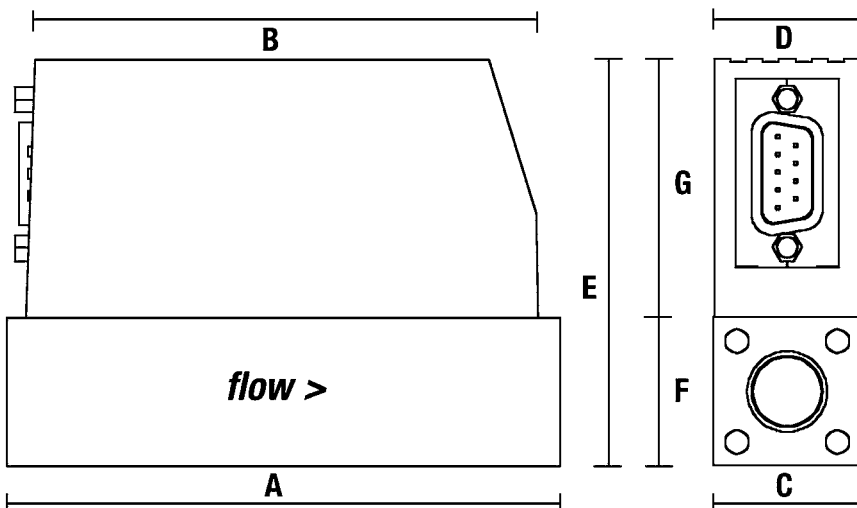
Supply voltage /	24 VDC (18-30 VDC) (15 VDC on request)
Power consumption /	meter max. 100 mA controller max. 250 mA
Electr. connection /	D-Sub plug 9-pole
Output signals analogue /	4...20 mA, 0...10 VDC, 0...5 VDC, 1...5 VDC, 2...10 VDC or 0...20 mA
Output signals digital /	RS-485; Modbus RTU (Slave); Lab View-VI's available; optional: Profibus DP-V0, DP-V1
Set point value input for regulator /	4...20 mA, 0...10 VDC, 0...5 VDC, 1...5 VDC, 2...10 VDC or 0...20 mA
Starting time /	<1 sec.
EMC /	EN 61326-1
Protection class /	IP 50
Software /	<ul style="list-style-type: none"> - Reading of actual values for flow and temperature. - Specification of set point values - Entering regulator parameters - Changing gases - Optional recording of measuring data through logging function

Technical Specifications:

Measuring medium /	dry, non-hostile gases (see also listing in the Ordering codes)
Accuracy /	
GR-02.x.1:	± 1.0 % of full scale value
GR-02.x.2:	± 0.3 % of full scale value + ± 0.5% of full measured value
Pressure sensitivity /	< 0.2 % per bar (typically N2)
Repeatability /	± 0.2 % of full scale value
Dynamics /	
GR-02.x.1:	1:50
GR-02.x.2:	1:100
Response time /	80 ms; controller 500 ms
In- and outflow lines /	none
Pressure /	0.2...11 bar a (controller max. 8 bar)
Temperature /	0...50°C
Temp.-sensitivity /	< 0.025% per °C
Materials /	aluminium anodized, optional stainless steel electropolished
Seals /	Viton, EPDM, optional FFKM
Mounting position /	any (above 5 bar horizontal)
Gas connection /	G 1/4"-female up to 60 NI/min, above G 1/2"-female
Testing pressure /	16 bar a
Longterm stability /	< 1% measured value / year
Leakage rate /	< 1x 10 ⁻⁶ mbar l/s He

Dimensions in mm:

Sizes	A	B	C	D	E	F	G
GR-02.1, 1/4"	94	87	25	25	69	25	44
GR-02.1, 1/2"	145	87	35	25	79	35	44
GR-02.2, 1/4"	124	117	25	25	69	25	44
GR-02.2, 1/2"	170	117	35	25	79	35	44





Versions:

GR-02 Thermal Mass Flowmeter & Controller

The GR-02 is supplied as a mere flowmeter or as a flow controller with integrated regulating valve. The meter estimates the current volume flow and transmits it in the form of an analogue signal at the output. The controller functions like a „constant gas source“. The device measures the volume flow as the actual value and transmits it as analogue output. At the same time, the set point value is fed to the input of the GR-02 in the form of another analogue signal. The electronics estimate the difference in the regulation and adjust the integrated valve by means of an interface-programmable PI controller.

Accuracy and span: There are two versions of accuracies available. The more affordable standard variant measures at an accuracy of $\pm 1.0\%$ of full scale value and has a measuring span of 1:50. The more accurate version has an accuracy of $\pm 0.3\%$ of full scale value + $\pm 0.5\%$ of measured value at a span of 1:100.

Basic body and seals: The measuring tube of the GR-02 is made of aluminium or stainless steel. The CMOS sensor is however, always made of plastic and constantly wetted. The standard sealing material is Viton; optionally also EPDM is available.

Output signals: The signal pattern over which the measured volume flow can be tapped at the output of the GR-02, is either 4...20 mA, 0...20 mA, 0...5 VDC, 1...5 VDC, 0...10 VDC or 2...10 VDC.

Set point value signal for controlling function: If the GR-02 is designed as a flowmeter and controller, the set point value of the flow must be set as an analogue signal. This is either 4...20 mA, 0...20 mA, 0...5 VDC, 1...5 VDC, 0...10 VDC or 2...10 VDC. The mere flowmeter version of the GR-02 has no set point value input.

Pressure ratios in regulating function: The integrated regulating valve of the GR-02.2 as a flowmeter and controller must be set for inlet and outlet pressure. For this reason, both these values must be specified as absolute pressure in [bar].

Medium: As measuring media all non-hostile, dry gases can be considered. Gases that are not listed in the Ordering codes but comply with the requirements can be ordered as special type medium. All devices are supplied ex factory with real gas calibration.

Operating range: There are various operating ranges from 0-25 Nml/min up to 0-450 NI/min available. Customer-specific full scale values are available on request.

Ordering Codes:

Order no.	GR-02.	1.	2.	1.	1.	1.	P.	□
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GR-02 Thermal Mass Flowmeter & Controller for Gases

Version /

- 1 = flowmeter
- 2 = flowmeter & controller

Accuracy & span /

- 1 = $\pm 1.0\%$ full scale value, span 1:50 (standard)
- 2 = $\pm 0.3\%$ full scale value + $\pm 0.5\%$ of measured value, span 1:100

Basic body and seals /

- 1 = aluminium with Viton (standard I)
- 2 = aluminium with EPDM
- 3 = stainless steel with Viton (standard II)
- 4 = stainless steel with EPDM

Output signals /

- 1 = current 4...20 mA
- 2 = current 0...20 mA
- 3 = voltage 0...5 VDC
- 4 = voltage 1...5 VDC
- 5 = voltage 0...10 VDC
- 6 = voltage 2...10 VDC

Set point value input signal for controlling function /

- 0 = no set point value input for meter only (GR-02.1)
- 1 = current 4...20 mA
- 2 = current 0...20 mA
- 3 = voltage 0...5 VDC
- 4 = voltage 1...5 VDC
- 5 = voltage 0...10 VDC
- 6 = voltage 2...10 VDC

Medium /

- L = air
- N = nitrogen
- O = oxygen
- HE = helium
- AR = argon
- C = carbon dioxide
- P = propane (80NI/min max.)
- B = butane
- H = hydrogen
- M = methane
- 7 = please specify special type medium in detailed text

End value for measuring range /

- = Please specify. Possible values from 0...50 Nml/min to 450 NI/min (air). From 60 NI/min on, the gas-connector is G 1/2" female

