INPUT SIGNALS

Standard Voltage (0-5 Vdc) Input Signal

The standard analog input signal is 0-5 Vdc. Apply the 0-5 Vdc input signal to pin 4, with common ground on pin 8.

RS-485 Digital Input Signal

To use the RS-485 signals, connect the RS-485A (+) Signal (Pin 5), the RS-485B (-) Signal (Pin 3), and Ground (Pin 8 or 9) to your computer serial port.

OUTPUT SIGNALS

Standard Voltage (0-5 Vdc) Output Signal

The standard analog output signal is 0-5 Vdc, available on Pin 6. This voltage is usually in the range of 0.010 Vdc for zero flow and 5.0 Vdc for full-scale flow. The output voltage is linear over the entire range. Ground for this signal is common on Pin 8.

RS-485 Digital Signals

To use the RS-485 signals, connect the RS-485A (+) Signal (Pin 5), the RS-485B (-) Signal (Pin 3), and Ground (Pin 8 or 9) to your computer serial port.

DO NOT CONNECT THIS DEVICE TO "LOOP POWERED"" SYSTEMS, AS THIS WILL DESTROY PORTIONS OF THE CIRCUITRY. IF YOU MUST INTERFACE WITH EXISTING LOOP POWERED SYSTEMS, ALWAYS USE A SIGNAL ISOLATOR AND A SEPARATE POWER SUPPLY.

RS-485 Communication

Configuring HyperTerminal®:

1. Open HyperTerminal® RS-485 terminal program (installed under the "Accessories" menu on all Microsoft Windows® operating systems prior to Windows Vista®).
2. Select "Properties" from the file menu.
3. Click on the "Configure" button under the "Connect To" tab. Be sure the program is set for: 38,400 baud (or matches the baud rate of the device; 38,400 is default) and an 8-N-1-None (8 Data Bits, No Parity, 1 Stop Bit, and no Flow Control) protocol.
4. Under the "Settings" tab, make sure the Terminal Emulation is set to ANSI or Auto Detect.
5. Click on the "ASCII Setup" button and be sure the "Send Line Ends with Line Feeds" box is not checked and the "Echo Typed Characters Locally" box and the "Append Line Feeds to Incoming Lines" boxes are checked. Other settings not mentioned here are normally okay in the default position.
6. Save the settings, close HyperTerminal® and reopen it.

Changing the Baud Rate:

#	Baud Rate
0	4,800
1	9,600
2	19,200
3	38,400

To determine the device's current baud rate, type *RB or ARB (if A is the device address) followed by <Carriage Return>. The computer will respond by reading the current value, either 4,800, 9,600, 19,200, or 38,400 baud. To change the baud rate, type the device address, followed by WB=, then the number of the desired baud rate on the table below, and hit <Carriage Return>. The device will respond with the new baud rate. For example, if the address of the device is B, and the desired baud rate is 19200, it would be selected by typing: BWB=2 followed by <Carriage Return>.

Note: When changing the device's baud rate, your COM port must change its own baud rate in time to successfully receive the response confirming the new baud rate.

Polling the Device:

The unit measures the flow normally, but only sends a line of data when it is "polled". Each unit can be queried by its own unique identifier or *. (* is the universal identifier that will address all connected devices.)

Unless otherwise specified, each unit is shipped with a default address of A. Other valid addresses are B thru Z.

Poll the unit by typing the unit's address (A thru Z) or * followed by <Carriage Return>. This does an instantaneous poll of the unit and returns the values once. You may type the unit's address (A thru Z) or * and <Carriage Return> as many times as you like.

To assign the unit a new address, type *@=New Address followed by <Carriage Return>, e.g. *@=B followed by <Carriage Return>.

Care should be taken not to assign an address to a unit if more than one unit is on the RS-485 line, as all of the addresses will be reassigned. Instead, substitute * with the specific device's old address, e.g. A@=B followed by <Carriage Return> if the address of the device you wish to change is A.

Choosing the Set-Point Source:

To determine the device's current set-point source, type *RS or ARS (if A is the device address) followed by <Carriage Return>. The computer will respond by stating if the current set-point source is analog or digital.

To change the set-point source to analog, type *WS=A or AWS=A (if A is the device address) followed by <Carriage Return>. To change the set-point source to digital, type *WS=D or AWS=D (if A is the device address) followed by <Carriage Return>.

In both cases, the computer will respond by acknowledging that the set-point source has been changed to analog or digital.

Sending a Set-point via RS-485:

To send a set-point via RS-485, type in the device address followed by a number between 0 and 4095 (2% over range), where 4000 denotes full-scale flow rate, and hit <Carriage Return>. The set-point column and flow rates should change accordingly. If they do not, try hitting <Carriage Return> a couple of times and repeating your command.

The formula for performing a linear interpolation is as follows:

(Desired Set-point X 4000) / Full Scale Flow Range = Value

For example, if your device is a 1000 sccm full-scale unit and you wish to apply a set-point of 250 sccm you would enter the following value:

(250 sccm X 4000) / 1000 sccm = 1000

If the address of the device is D, the set-point above would be sent by typing:

D1000 followed by <Carriage Return>

Changing the Gas

Units calibrated with Air have built-in correction equations that allow you to use the gas select command to switch to Argon, Carbon Dioxide, Nitrogen, Oxygen, or Nitrous Oxide.

To change the gas, type in the device address, followed by $$G, then the number of the desired gas on the table below, and hit <Carriage Return>. The device will respond with the device address, the selected gas number, and the gas abbreviation.

For example, if the address of the device is C, and the desired gas is Oxygen, it would be selected by typing: C$$G4 followed by <Carriage Return>.

Note: Units calibrated with Hydrogen or Helium can function only with that gas.

Note: BC-C1000 units that are set to Carbon Dioxide or Nitrous Oxide are limited to a maximum flow rate of 750 SCCM instead of 1000 SCCM due to the correction factor equations used for these gases.

Adjusting the Proportional and Derivative (P&D) terms via RS-485:

The "P" term controls how quickly the unit goes from one set-point to the next, and the "D" term controls how quickly the signal begins to "decelerate" as it approaches the new set-point (controls the overshoot).

To adjust the "P" or proportional term of the PD controller, type *RP or ARP (if A is the device address) followed by <Carriage Return>.

The computer will respond by reading the current value for the "P" term between 0-9999. It is good practice to write this value down so you can return to the factory settings if necessary.

Enter the value you wish to try by writing the new value using the correct serial command. For example, if you wished to try a "P" term of 220, you would type *WP=220 or AWP=220 (if A is the device address) followed by <Carriage Return>.

The computer will confirm that P=220.

To adjust the "D" or derivative term of the PD controller, type *RD or ARD (if A is the device address) followed by <Carriage Return>.

The computer will respond by reading the current value for the "D" term between 0-9999. It is good practice to write this value down so you can return to the factory settings if necessary.

Enter the value you wish to try by writing the new value using the correct serial command. For example, if you wished to try a "D" term of 25, you would type *WD=25 or AWD=25 (if A is the device address) followed by "Enter" .

#	GAS	
0	Air	Air
1	Argon	Ar
2	Carbon Dioxide	CO2
3	Nitrogen	N2
4	Oxygen	O2
5	Nitrous Oxide	N2O
6	Hydrogen	H2
7	Helium	He

The computer will confirm that D=25.

Test your settings for a step change by changing the set-point. To do this, type A2000 (A is the default single unit address; if you have multiple addressed units on your RS-485 line, the letter preceding the value would change accordingly,) followed by <Carriage Return> to give the unit a ½ full scale set-point. Monitor the unit's response to the step change to ensure it suits your needs.

Adjusting the Valve Offset Value:

The valve offset value determines how much the valve initially opens after a set-point change from zero to any set-point greater than zero. The appropriate value would allow the device to respond quickly to a set-point change from zero to a non-zero set-point without a large overshoot.

The inlet pressure is the main factor in determining the appropriate valve offset value, as higher inlet pressures will require a higher valve offset value.

To adjust the offset value of the valve, type *RO or ARO (if A is the device address) followed by <Carriage Return>.

The computer will respond by reading the current value for the valve offset between 0-9999. It is good practice to write this value down so you can return to the factory settings if necessary.

Enter the value you wish to try by writing the new value using the correct serial command. For example, if you wished to try an offset value of 2500, you would type *WO=2500 or AWO=2500 (if A is the device address) followed by <Carriage Return>.

The computer will confirm that Offset=2500.

Test your settings for a step change by changing the set-point. To do this, type A0 (A is the default single unit address; if you have multiple addressed units on your RS-485 line the letter preceding the value would change accordingly,) followed by <Carriage Return> to give the unit a zero set-point.

Then type A60 followed by <Carriage Return> to give the unit a 1.5% full scale set-point. Monitor the unit's response to the step change to ensure it suits your needs.

Maintenance and Recalibration

BC-Series Flow Controllers require minimal maintenance. The single most important thing that affects the life and accuracy of these devices is the quality of the gas being measured. The controller is designed to measure CLEAN, DRY, NON-CORROSIVE gases. Line filters are available from Alicat. BC-Series Flow Controllers require no periodic cleaning. If necessary, the outside of the controller can be cleaned with a soft dry cloth. Avoid excess moisture or solvents. For repair, recalibration or recycling of this product, contact Alicat.

SERIAL COMMAND RESPONSE EXAMPLES

Baud Rate:
Send – ARB<CR> (Device ID + R + B + Carriage Return)
Response – BAUD=38400<CR>
Send – AWB=1<CR> (Device ID + W + B + = + Baud[0 – 3] + Carriage Return)
Response – BAUD=9600<CR>

Polling the device:
Send – A<CR> (Device ID + Carriage Return)
Response – A 17.8C 0000.0SCCM 0000.0SP Air<CR>
(Device ID + Temperature + Mass Flow + Setpoint + Gas + Carriage Return)

Setpoint Source:
Send – ARS<CR> (Device ID + R + S + Carriage Return)
Response 1 – ANALOG<CR>
Response 2 – DIGITAL<CR>
Send – AWS=A<CR> (Device ID + W + S + = + A + Carriage Return)
Response – ANALOG<CR>
Send – AWS=D<CR> (Device ID + W + S + = + D + Carriage Return)
Response – DIGITAL<CR>

Setting Setpoint:
Send – A4000<CR> (Device ID + Setpoint[0 – 4095] + Carriage Return)
Response – SP=1000.0SCCM<CR>

Change Device ID:
Send - *@=B<CR> (Device ID + @ + = + New Device ID + Carriage Return)
Response – B 18.0C 0000.0SCCM 0000.0SP Air<CR>
(Device ID + Temperature + Mass Flow + Setpoint + Gas + Carriage Return)

P Gain:
Send – ARP<CR> (Device ID + R + P + Carriage Return)
Response – P=0125<CR>
Send - AWP=150<CR> (Device ID + W + P + = + Pgain[0 – 9999] + Carriage Return)
Response – P=0150<CR>

D Gain:
Send – ARD<CR> (Device ID + R + D + Carriage Return)
Response – D=0425<CR>
Send - AWD=300<CR> (Device ID + W + D + = + Dgain[0 – 9999] + Carriage Return)
Response – D=0300<CR>

Valve Offset:
Send – ARO<CR> (Device ID + R + O + Carriage Return)
Response – Offset=4000<CR>
Send - AWO=4150<CR> (Device ID + W + O + = + Offset[0 – 9999] + Carriage Return)
Response – Offset=4150<CR>

Gas Select:
Send – A$$G2<CR> (Device ID + $ + $ + G + Gas ID Number + Carriage Return)
Response – A G02 CO2<CR>

Conformity / Supplemental Information:

The product complies with the requirements of the Low Voltage Directive 2006/95/EC and the EMC Directive 2004/108/EC and carries the CE Marking accordingly. Contact the manufacturer for more information.

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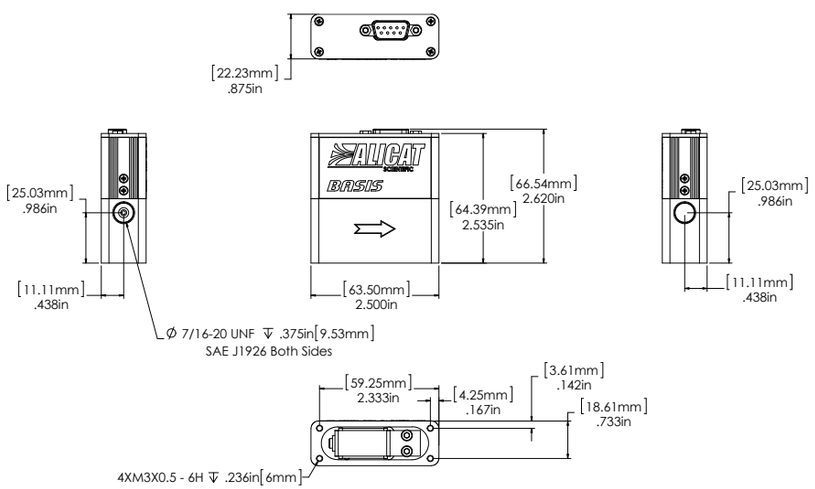
BASIS (BC-Series) Mass Flow Controller Technical Specifications

Performance	
Accuracy at Calibration Conditions	± (1.5% of Reading + 0.5% of Full Scale)
Repeatability	25% - 100% Set-point: ± 0.5% Reading 0% - 25% Set-point: 0.125% Full Scale
Zero Shift and Span Shift	0.05% Full Scale / Year
Operating Range / Turndown Ratio	BC-C0100: 1.0% to 100% Full Scale/100:1 Turndown BC-C1000: 0.5% to 100% Full Scale/200:1 Turndown
Maximum Controllable Flow Rate	102% Full Scale
Typical Response Time	100 ms
Warm-up Time	70 ms to full scale accuracy
Operating Temperature	0 to +50 ºCelsius
Calibration Conditions	25°C, 14.696 psia

Full Scale Ranges	Pressure Drop (mbar) at FS Flow venting to atmosphere	Mechanical Dimensions	Process Connections
BC-C0100	10	2.6"H x 2.5"W x 0.9"D	7/16 - 20 SAE thread, J1926 port
BC-C1000	10		



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A HALMA COMPANY

BASIS Mass Flow Controller Operating Bulletin

Thank you for purchasing an Alicat BASIS Mass Flow Controller.

Please take the time to read the information contained in this bulletin. This will help to ensure that you get the best possible service from your device

Please contact Alicat at 1-888-290-6060 or info@alicat.com if you have any questions regarding the use or operation of this device.

MOUNTING

BASIS (BC-Series) Mass Flow Controllers have holes on the bottom for mounting to flat panels. The thread size is M3.

No straight runs of pipe are required upstream or downstream of the controller.

PLUMBING

Make sure that the gas will flow in the direction indicated by the flow arrow.

The inlet and outlet port sizes (process connections) are 7/16 - 20 SAE thread, J1926 port.

These fittings have an o-ring and do not require the use of Teflon tape.

Do not use pipe dopes or sealants on the process connections as these compounds can cause permanent damage to the controller should they get into the flow stream.

When changing fittings, carefully clean any debris from the ports.

PRESSURE

Maximum operating line pressure is 145 psig (1 MPa).

If the line pressure is higher than 145 psig (1 MPa), use a pressure regulator upstream of the flow controller to reduce the pressure to 145 psig (1 MPa) or less.

POWER AND SIGNAL CONNECTIONS

Power must be supplied to your controller through the 9-pin D-Sub connector.
BC-Series controllers require a 10-30 Vdc power supply capable of supplying 200 mA.

Pin	Function	Alicat DB9 cable color
1	Not Connected	Black
2	Not Connected	Brown
3	Serial RS-232 RX or RS-485B (-) Signal	Red
4	0-5 Vdc Analog Set-Point Input	White
5	Serial RS232 TX or RS-485A (+) Signal	Yellow
6	0-5 Vdc Analog Output Signal	Green
7	Power In (as described above)	Blue
8	Ground (common for power, communications, and analog signals)	Orange
9	Ground (common for power, communications, and analog signals)	Orange

DO NOT CONNECT POWER TO PINS 3 THROUGH 6 AS PERMANENT DAMAGE CAN OCCUR!

The Fastest Flow Controller Company in the World!