INSTALLATION & OPERATION BAC RANGE



Power Supply Power Consumption BACnet (BAC range only)

Analogue Outputs

Thermistor Output

CO2 Output Scaling

CO2 Display Resolution

CO2 Typical Sensor Life

Temp Display Resolution

RH Display Resolution

Operating Conditions

Sampling Method

Warm-up Time

Colour

Approval

CO2 Sensing Method

VFC Output

CO2 Range

CO2 Accuracy

Temp Range

RH Range

RH Accuracy

Temp Accuracy

24V AC/DC ±10% 50Ma Max MS/TP over RS485 Baud: 9k6, 19k2, 38k4 or 76k8 127 Address (1/10th Load) 3x 0-10V 10K3A1 SPST - 100mA @ 24V Max 0 - 10,000ppm 0 - 2,000 / 5,000ppm ±40 ppm +3% @ NTP 1ppm Non Dispersive Infra-red (NDIR) 10+ Year 0 - 50°C ±0.3°C @ 25°C 0.1°C 0 - 100% ±2% @ 20 - 80% 0.1% 0 - 50°C Temp 0 - 95% (NC) Humidity Diffusion 30 Seconds Wall - Pure White (RAL9010) Duct - Black/Clear CE, UKCA

IMPORTANT – Please read carefully:

- 1. This product must be installed by a competent/qualified person in accordance with all relevant regulations and legislations.
- This product must be mounted flush to the wall (or similar) using secure fixings to prevent access to the rear.
- The sensors must be continuously powered to allow the CO2 auto-calibration to take place (every 7 days).
- 4. The use of solvents, cleaning fluids or fine dusts near to the unit can damage the sensing elements.
- 5. If there is any question over the application, please contact to discuss.
- 6. If this equipment is used in a manner not specified by the manufacturer, protection provided may be impaired.
- 7. This product is designed for indoor use with standard atmospheric conditions.
- 8. When the sensor is used as part of a Gas Safety system, please ensure the correct program is used.

MOUNTING LOCATION

Application specific mounting positions should be considered, however the below guidance will be suitable for most installations.

Although CO2 is heavier that air, for most HVAC applications the sensors should be mounted at head height. For applications where there are stored concentrations of CO2 please refer to the Gas Detector/Sensor range.

Typical Mounting Heights:

Application	Mounting Height
General Areas	1500mm Above Finished Floor Level
Science Classrooms	1500mm Above Finished Floor Level
Food Tech Rooms	2500mm Above Finished Floor Level (not within 100mm of ceiling)
Kitchens	2500mm Above Finished Floor Level (not within 100mm of ceiling)

Important Notes:

- Do not install directly above any appliance or burner.
- Do not install in high velocity air streams (near an air Inlet/Outlet).
- Do not install next to doors or opening windows.
- Do not install in direct sunlight.



INSTALLATION

All installation details shown on the wiring diagram should be followed carefully, failure to do so could result in irreparable damage to the unit.

Screened cable should be used at all times. Any voltage induction can result in corruption of the BACnet interface or irreparable damage to the sensor.

The connection details for the Wall and Duct mount units are the same, the only difference is the mounting.

Wall Mount Enclosure

The wall mount enclosure is designed to fit on a standard single gas junction box or conduit box. Please take care when tightening fixing screws as overtightening can distort the plastic.

To open/close:

- 1. Remove securing screw from the bottom of the enclosure.
- 2. Insert a flat screwdriver into the slot behind the screw and apply pressure until the bottom of the enclosure releases.
- 3. Pull the front of the enclosure outward from the bottom then up to release hooks securing the top.
- 4. When closing, hook the clips into place, then push the bottom until the securing clip fully engages.

Duct Mount Enclosure

The duct mount enclosure is IP66 external to the duct and although a foam gasket is provided, additional sealant may be required to maintain the integrity of the duct (the use of solvent based sealant may damage the sensing elements).

To open/close:

- 1. Remove securing screw from the lid of the enclosure.
- 2. Press on both securing clips simultaneously to release then simply open using the hinge mechanism.

OPERATION

On power up, the LCD will cycle through Green, Amber, Red then White with all segments lit to prove the correct operation of the display. During this warm-up, the volt free contact will be in the default position for the selected programme and the analogue outputs will provide 6V.

Once the warm-up is complete, the LCD will display the levels for any connected sensors, provide a traffic light indication based on live CO2 level, the relay output will change to the correct position for the programme and the voltage outputs will reflect relevant levels.

If no CO2 sensor is present, the relay will be in an alarm state.

MAINTENANCE

Due to the Automatic Background Calibration (ABC) algorithm, the sensor is effectively maintenance free. Some applications may require this to be disabled – please contact Flamefast for further details. To allow calibration to take place, the sensor must be exposed to atmospheric levels (400ppm) at least once every 8 days.

If the sensor is installed as part of a Gas Safety system, the sensor should be 'bump' tested by applying a CO2 test gas, although the same result can be achieved by breathing on the sensor.

TROUBLESHOOTING

If you are having any issues, please contact Flamefast to discuss.

CONNECTION DETAILS BAC RANGE



BACNET CONFIGURATION

Label	Configuration	Setting
1	MAC Address	Max = 127
2	Sum of 1, 2, 4, 8, 16, 32 & 64	
4		
8	Example 1+4 ON	Address = 5
16	Example 4 + 16 ON	Address = 20
32	Example 32 + 64 ON	Address = 96
64		
B1	B1 OFF / B2 OFF	9600
B2	B1 OFF / B2 ON	19200
	B1 ON / B2 OFF	38400
	B1 ON / B2 ON	76800
EOL	End of Line Termination	

PROGRAMMING SWITCHES

Program Switch	1	2	3	4
055	Backlight	PPM Readout	CO2 0-10V	Ventilation
OFF	On	(see Diagram 1)	0-2,000ppm	Program
	Backlight	Display 'CO2'	CO2 0-10V	Gas Safety
UN	Off	(see Diagram 2)	0-5,000ppm	Program





concentration will be displayed

display 'CO2'

	Ventilation (DIP 4 OFF)	Gas Safety (DIP 4 0N)
Green to Yellow	1,000ppm	1,500ppm
Yellow to Red	1,500ppm	2,800ppm
Relay Position	Normally Open	Normally Closed
Relay Setpoint	1,000ppm	4,500ppm
	There is a 50pm hysteresis on all downward status changes.	

WIRING TO GG/SG



WHEN CONNECTED TO A GAS SAFETY SYSTEM THE GAS SAFETY PROGRAM MUST BE USED

TEMPERATURE CONFIGURATION

WARNING - whist the unit is able to operate on 24V +10%, anything over 24V may adversely affect the temperature reading due to the additional heat generated by the voltage regulators.

The BAC range has an installer selectable 0-10V or 10K3A1 Thermistor output. This is done by moving the Output Select Jumpers between 'V' and 'T'. Please note that both jumpers must be on the corresponding positions and should only be moved with the unit powered down:

- T = Thermistor
- 0-10V V =

Whilst the BAC range has a thermistor output, this cannot be used if the BACnet interface is required. This simply requires jumpers fitted to positions ${}^\prime V{}^\prime$ and ${}^\prime B{}^\prime.$



BACNET SPECIFICATION BAC RANGE

This document is intended to provide details on BACnet functionality of the Flamefast BACnet Sensor Range (BAC), and It is assumed that anyone installing or configuring the sensor have at least a basic understanding of the BACnet protocol.

If the sensor forms part of a safety system (such as a Gas Interlock) then no associated parameters shall be changed.

BACnet Interoperability Building Blocks Supported (Annex K)

Description	BIBB	Comments
Read Property	DS-RP-B	
Read Property Multiple	DS-RPM-B	
Write Property	DS-WP-B	
Dynamic Device Binding	DM-DDB-B	Execute Who-Is, Initiate I-Am
Dynamic Object Binding	DM-DOB-B	Execute Who-Has, Initiate I-Have
Device Comm Control	DM-DCC-B	
Reinitialize Device	DM-RD-B	

BACnet Standard Object Types Supported

Object	No Of Instance	Instance Assignments
Device Object	1	
Analog Input	3	AI-1 CO2
		AI-2 Temperature
		AI-3 Relative Humidity
Analog Output	3	AO-1 Voltage output 1
		AO-2 Voltage output 2
		AO-3 Voltage output 3
Analog Value	5	AV-1 CO2 offset
		AV-2 Temp offset
		AV-3 RH offset
		AV-4 Amber set point
		AV-5 Red set point
Binary Output	1	BO-1 Relay

Device Object Properties (Required Object Properties)

Property Name /ID	Default	R/W
Object Identifier	1090000 + MAC_Address	R/W
Object Name	"FFBAC_XXX", XXX = MAC address	R/W
Object Type	2	R
System Status	OPERATIONAL	R
Vendor Name	Flamefast (UK) Ltd	R
Vendor Identifier	1090	R
Model Name	FFBAC	R
Location	Location	R/W
Description	Flamefast Smart Sensor	R/W
Application Software Revision	1.00	R
Protocol Version	1	R
Protocol Revision	10	R
Protocol Services Supported		R
Object List		R
Max APDU Length	480	R
Segmentation Support	NONE	R
APDU Timeout	3000 ms	R
Number APDu Retries	3	R
MaxMaster	127	R
Max_Info_Frames	1	R
Database Revision	0	R

Proprietary Properties

Certain functions can be configured over the network by altering the below properties. These are located within the Device Object Properties table. AO-1,2,3 and BO-1 are only writable if Proprietary Properties 1000-1003 are set to '0'.

Property ID	Description		Range
1000	Analogue Output 1	(Default 1)	0 = Network Writable
1001	Analogue Output 2	(Default 2)	1 = AI-1 CO2 2 = AI-2 Temperature
1002	Analogue Output 3	(Default 3)	3 = AI-3 Relative Humidity
1003	Relay Activation	(Default 1)	0 = Network Writable 1 = Al-1 CO2 2 = Al-2 Temperature 3 = Al-3 Relative Humidity
1004	Relay set point		1000.0 (depends on program)
1005	Relay hysteresis		50.0
1006	Reserved		
1007	Reserved (AC)		
1008	Reserved (C)		
1009	Factory Reset		

flamefast Gas SAFETY

Analog Input Objects

Property Name /ID	Comments/Default Value	R/W
Object Identifier	OBJECT_ANALOG_INPUT:X	R
Object Name	AI-1 CO2	R
	AI-2 Temperature	
	AI-3 Relative Humidity	
Object Type	0	R
Present Value	REAL	R/W
Status Flag	0000	R
Event State	NORMAL	R
Out-Of-Service	FALSE	R/W
Units	AI-1 PART-PER-MILLION	R
	AI-2 DEGREES-CELSIUS	
	AI-3 PERCENT-RELATIVE-HUMIDITY	
Min Pres Value	Al-1 0 (0 to 10000)	R/W
	AI-2 0.0 (0.0 to 50.0)	
	AI-3 0.0 (0.0 to 100.0)	
Max Pres Value	Al-1 5000 (0 to 10000)	R/W
	AI-2 50.0 (0.0 to 50.0)	
	AI-3 100.0 (0.0 to 100.0)	
Resolution	Al-1 1	R
	AI-2 0.1	
	AI-3 0.1	

Analog Output Objects

Property Name /ID	Default	R/W
Object Identifier	OBJECT_ANALOG_OUTPUT:X	R
Object Name	AO-1 Voltage output 1	R/W
	AO-2 Voltage output 2	
	AO-3 Voltage output 3	
Object Type	1	R
Present Value	REAL	R/W
Status Flag	0000	R
Event State	NORMAL	R
Out-Of-Service	FALSE	R/W
Units	VOLTS	R
Min Pres Value	AO-1 0.0 (0.0 to 10.0)	R/W
	AO-2 0.0 (0.0 to 10.0)	
	AO-3 0.0 (0.0 to 10.0)	
Max Pres Value	AO-1 10.0 (0.0 to 10.0)	R/W
	AO-2 10.0 (0.0 to 10.0)	
	AO-3 10.0 (0.0 to 10.0)	
Resolution	0.001	R

Analog Value Objects

Property Name /ID	Default	R/W
Object Identifier	OBJECT_ANALOG_VALUE:X	R
Object Name	AV-1 CO2 offset	R
	AV-2 Temp offset	
	AV-3 RH offset	
	AV-4 Amber set point	
	AV-5 Red set point	
Object Type	2	R
Present Value	AV-1 0 (-1000 to 1000)	R/W
	AV-2 0 (-20.0 to 20.0)	
	AV-3 0 (-50.0 to 50.0)	
	AV-4 1000.0 (0.0 to 10000.0)	
	AV-5 1500.0 (0.0 to 10000.0)	
Status Flag	0000	R
Event State	NORMAL	R
Out-Of-Service	FALSE	R/W
Units	AV-1 PART-PER-MILLION	R
	AV-2 DEGREES-CELSIUS	
	AV-3 PERCENT-RELATIVE-HUMIDITY	
	AV-4 PART-PER-MILLION	
	AV-5 PART-PER-MILLION	

Binary Output Objects

Property Name /ID	Default	R/W
Object Identifier	OBJECT_BINARY_OUTPUT:X	R
Object Name	BO-1 Relay	R/W
Object Type	4	R
Present Value	0 = OFF	R/W
	1 = ON	
Polarity	0 = Normal	R/W
	1 = Reverse	
Status Flag	0000	R
Event State	NORMAL	R
Out-Of-Service	FALSE	R/W

For further information on the BACnet protocol, please visit www.bacnet.org

