TRANSMITTER RANGE
CO2, TEMP & RH (24V AC/DC)

| OVERVIEW |

The Flamefast Transmitter range can be supplied with any combination of Carbon Dioxide (CO2), Temperature & Relative Humidity. With three 0-10V outputs, an on board relay and the ability to select between Analogue or Thermistor temperature output, our transmitter range is one of the most versatile units available.

With the optional signature Flamefast traffic light display, the sensor can provide a clear, bold indication of the air quality in the monitored space.

This cost effective sensor range is ideal for any application, including natural and demand controlled ventilation as well as for integrating with our range of gas safety systems.

| KEY FEATURES |

- 24V AC/DC Power Supply
- Pluggable terminal block for ease of installation
- Optional traffic light readout
- 3x 0-10V outputs
- Selectable Temperature output (0-10V or 10K3)
- Volt free contact output
- Typical 10+ year life expectancy
- Self-calibrating CO2 sensor
- Mounts onto any standard single gang junction box or conduit box
- **UK MANUFACTURED**

Dimensions

Height 125mm | Width 86mm | Depth 36mm

Technical Specification

Power Supply	24V AC/DC ±10%	
Power Consumption	50Ma Max	
Analogue Outputs	3x 0-10V	
Thermistor Output	10K3A1	
VFC Output	SPST - 100mA @ 24V Max	
CO2 Range	0 - 2,000 ppm	
CO2 Accuracy	±40 ppm +3% @ NTP	
CO2 Display Resolution	1ppm	
CO2 Sensing Method	Non Dispersive Infra-red (NDIR)	
CO2 Typical Sensor Life	10+ Years	
Temp Range	0 - 50°C	
Temp Accuracy	±0.3°C @ 25°C	
Temp Display Resolution	0.1°C	
RH Range	0 - 100%	
RH Accuracy	±2% @ 20 - 80%	
RH Display Resolution	0.1%	
Operating Conditions	Temp	0 - 50°C
	Humidity	0 - 95% (NC)
Sampling Method	Diffusion	
Warm-up Time	30 seconds	
IP Rating	IP40	
Housing Material	Flame Retardant ABS	
Colour	Pure White (RAL9010)	
Approval	CE	

Installer Selectable Options

- 0-10V or Thermistor Temp output (only one used at any time)
- Traffic light and relay set points (see below)

The unit has two user selectable programmes to control the traffic light and volt free contact set points depending on the application.
These are as follows:

Programme	Ventilation	Gas Safety
Green - Yellow	1,000 ppm	1,500 ppm
Yellow - Red	1,500 ppm	2,800 ppm
Relay Position	Normally Open	Normally Closed
Relay Set Point	1,000 ppm	4,500 ppm

Part Numbers & Options/Accessories

Part No	Description
TR-CO2T	Transmitter - CO2 & Temp
TR-CO2TH	Transmitter - CO2, Temp & RH
TR-TH	Transmitter - Temp & RH
TR-T	Transmitter - Temp
TR- CO2TL	Transmitter - CO2 & Temp c/w LCD
TR-CO2THL	Transmitter - CO2, Temp & RH c/w LCD
TR-THL	Transmitter - Temp & RH c/w LCD
TR-TL	Transmitter - Temp c/w LCD

flamefast | GAS SAFETY
Gas Proving, Detection & CO2 Monitoring

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INSTALLATION & OPERATION
BAC & TR RANGE

TECHNICAL SPECIFICATION

Power Supply	24V AC/DC ±10%
Power Consumption	50Ma Max
BACnet (BAC range only)	MS/TP over RS485
	Baud: 9k6, 19k2, 38k4 or 76k8
	127 Address (1/10th Load)
Analogue Outputs	3x 0-10V
Thermistor Output	10K3A1
VFC Output	SPST – 100mA @ 24V Max
CO2 Range	0 - 10,000ppm
CO2 Output Scaling	0 - 2,000 / 5,000ppm
CO2 Accuracy	±40 ppm +3% @ NTP
CO2 Display Resolution	1ppm
CO2 Sensing Method	Non Dispersive Infra-red (NDIR)
CO2 Typical Sensor Life	10+ Year
Temp Range	0 - 50°C
Temp Accuracy	±0.3°C @ 25°C
Temp Display Resolution	0.1°C
RH Range	0 - 100%
RH Accuracy	±2% @ 20 - 80%
RH Display Resolution	0.1%
Operating Conditions	Temp 0 - 50°C
	Humidity 0 - 95% (NC)
Sampling Method	Diffusion
Warm-up Time	30 Seconds
Colour	Pure White (RAL9010)
Approval	CE

Note: Please refer to datasheet for full specification as certain values do not apply to TR or Duct range.

IMPORTANT – Please read carefully

1. When the sensor is used as part of a Gas Safety system, please ensure the correct program is used (TR Jumper = GG, BAC DIP 4 = ON).
2. The sensors must be continuously powered to allow the CO2 auto-calibration to take place (every 8 days).
3. The use of solvents, cleaners or fine dusts near to the unit can damage the sensing elements.
4. If there is any question over the application, please contact Flamefast to discuss.

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 failure of the analogue outputs.

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 (if present) will cycle through Green, Amber, Red then white with a 30 second count down. During this 30 seconds the volt free contact will be in the default position for the selected programme and all voltage outputs will give 6.00V.

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 and the CO2 level on the centre line of the display with be replaced by the temperature.

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.

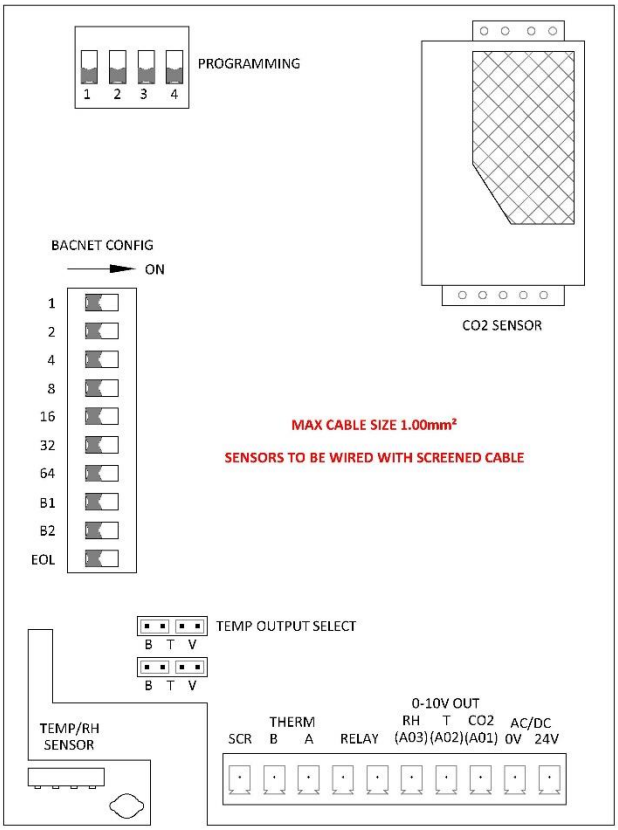
If the sensor is installed as part of a Gas Safety system, the sensor should be 'bump' tested by applying a CO2 test gas, although the same result can be achieved by breathing on the sensor.

TROUBLESHOOTING

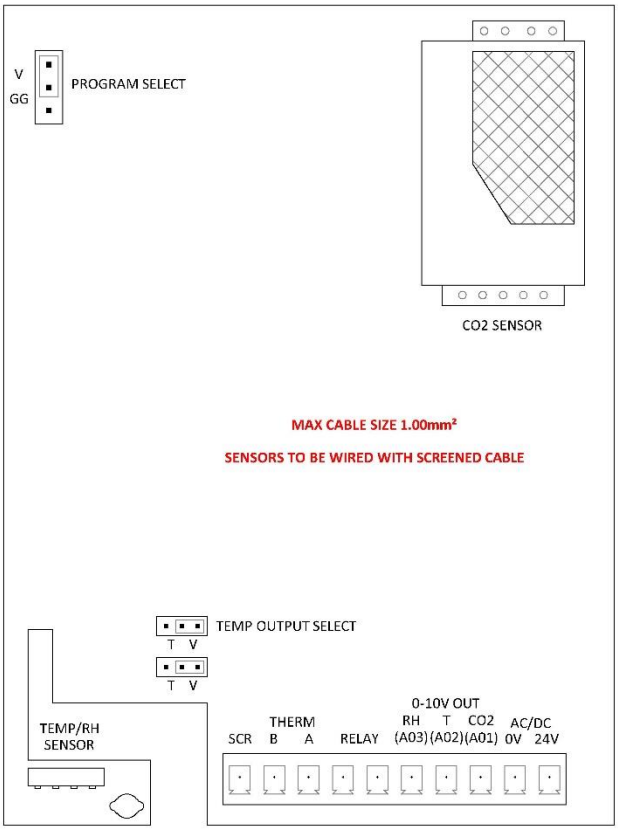
If you are having any issues, please contact Flamefast to discuss.

CONNECTION DETAILS

BAC RANGE



TR RANGE



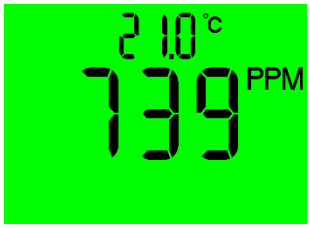
BACNET CONFIGURATION (BAC Range Only)

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 (BAC Range)

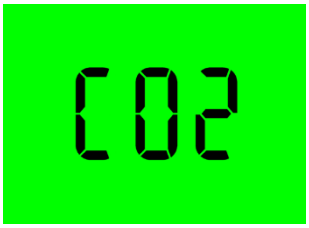
Program Switch	1	2	3	4
OFF	Backlight On	PPM Readout (see Diagram 1)	CO2 0-10V 0-2,000ppm	Ventilation Program
ON	Backlight Off	Display 'CO2' (see Diagram 2)	CO2 0-10V 0-5,000ppm	Gas Safety Program

DIAGRAM 1



When DIP Switch 2 is OFF an active CO2 concentration will be displayed

DIAGRAM 2



When DIP Switch 2 is ON the LCD will simply 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.	

When connected to a Gas Safety System, the Gas Safety program MUST be used.

PROGRAMMING JUMPER (TR Range)

	Ventilation (V)	Gas Safety (GG)
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.	

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 TR 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
- V = 0-10V

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 '**V**' and '**B**'.

If however a duct version of the BAC or TR is used and a Temperature and/or Relative Humidity output is required, position '**V**' must **not** have a jumper fitted. This will bypass the on board thermistor and monitor the duct probe.

BACNET SPECIFICATION
APPLIES TO 'BAC' RANGE ONLY

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
Object Name	"FFBAC_XXX", XXX = MAC address	R
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 1 = AI-1 CO2 2 = AI-2 Temperature 3 = AI-3 Relative Humidity
1001	Analogue Output 2 (Default 2)	
1002	Analogue Output 3 (Default 3)	
1003	Relay Activation (Default 1)	0 = Network Writable 1 = AI-1 CO2 2 = AI-2 Temperature 3 = AI-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	

Analog Input Objects

Property Name /ID	Comments/Default Value	R/W
Object Identifier	OBJECT_ANALOG_INPUT:X	R
Object Name	AI-1 CO2 AI-2 Temperature AI-3 Relative Humidity	R
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 AI-2 DEGREES-CELSIUS AI-3 PERCENT-RELATIVE-HUMIDITY	R
Min Pres Value	AI-1 0 (0 to 10000) AI-2 0.0 (0.0 to 50.0) AI-3 0.0 (0.0 to 100.0)	R/W
Max Pres Value	AI-1 5000 (0 to 10000) AI-2 50.0 (0.0 to 50.0) AI-3 100.0 (0.0 to 100.0)	R/W
Resolution	AI-1 1 AI-2 0.1 AI-3 0.1	R

Analog Output Objects

Property Name /ID	Default	R/W
Object Identifier	OBJECT_ANALOG_OUTPUT:X	R
Object Name	AO-1 Voltage output 1 AO-2 Voltage output 2 AO-3 Voltage output 3	R
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) AO-2 0.0 (0.0 to 10.0) AO-3 0.0 (0.0 to 10.0)	R/W
Max Pres Value	AO-1 10.0 (0.0 to 10.0) AO-2 10.0 (0.0 to 10.0) AO-3 10.0 (0.0 to 10.0)	R/W
Resolution	0.001	R

Analog Value Objects

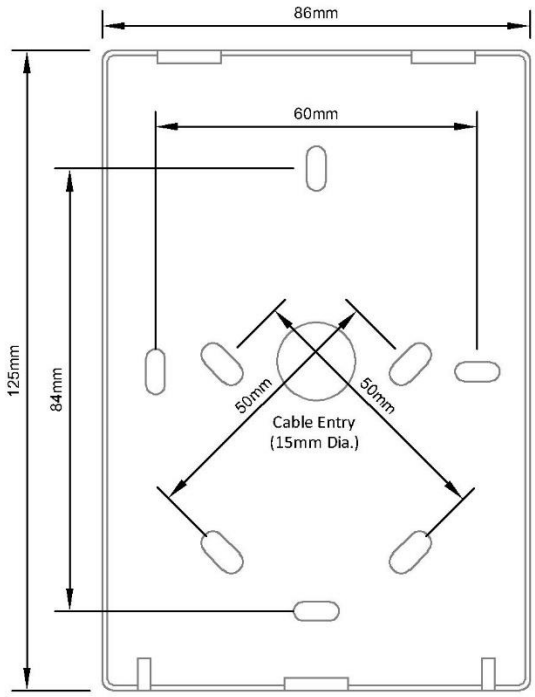
Property Name /ID	Default	R/W
Object Identifier	OBJECT_ANALOG_VALUE:X	R
Object Name	AV-1 CO2 offset AV-2 Temp offset AV-3 RH offset AV-4 Amber set point AV-5 Red set point	R
Object Type	2	R
Present Value	AV-1 0 (-1000 to 1000) AV-2 0 (-20.0 to 20.0) AV-3 0 (-50.0 to 50.0) AV-4 1000.0 (0.0 to 10000.0)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

Binary Output Objects

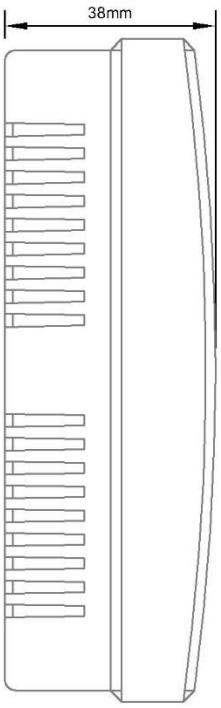
Property Name /ID	Default	R/W
Object Identifier	OBJECT_BINARY_OUTPUT:X	R
Object Name	BO-1 Relay	R
Object Type	4	R
Present Value	0 = OFF 1 = ON	R/W
Polarity	0 = Normal 1 = Reverse	R/W
Status Flag	0000	R
Event State	NORMAL	R
Out-Of-Service	FALSE	R/W

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

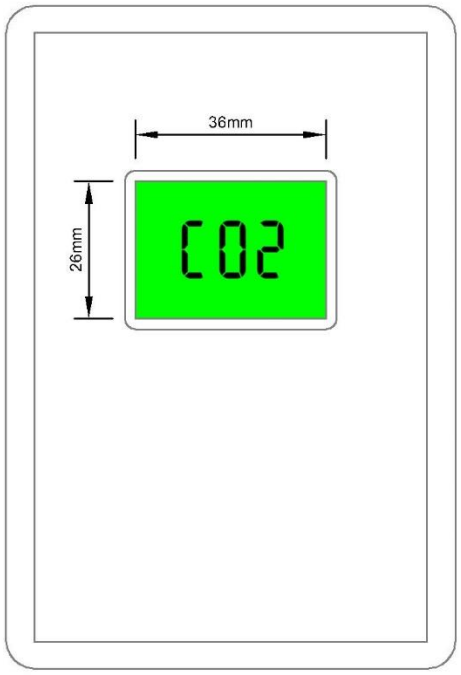
DIMENSIONS
WALL & DUCT



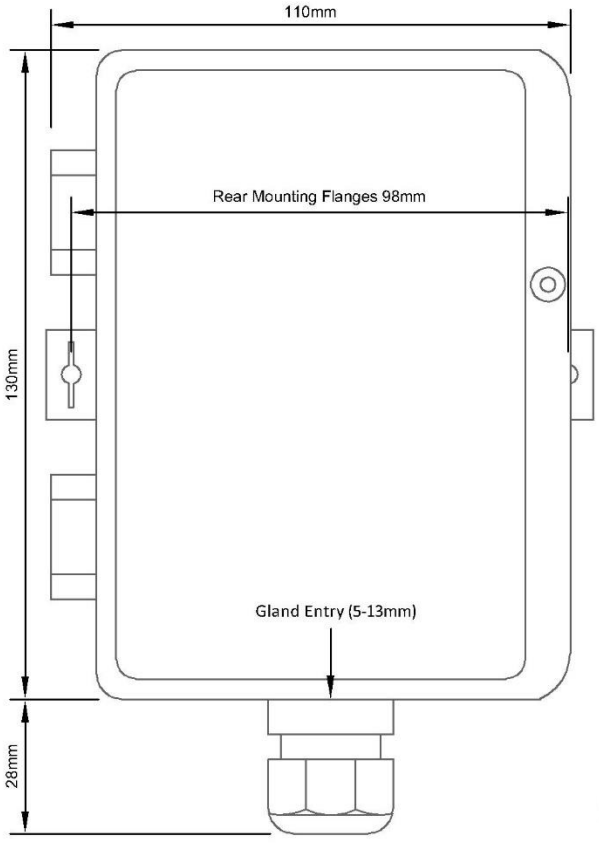
REAR ELEVATION



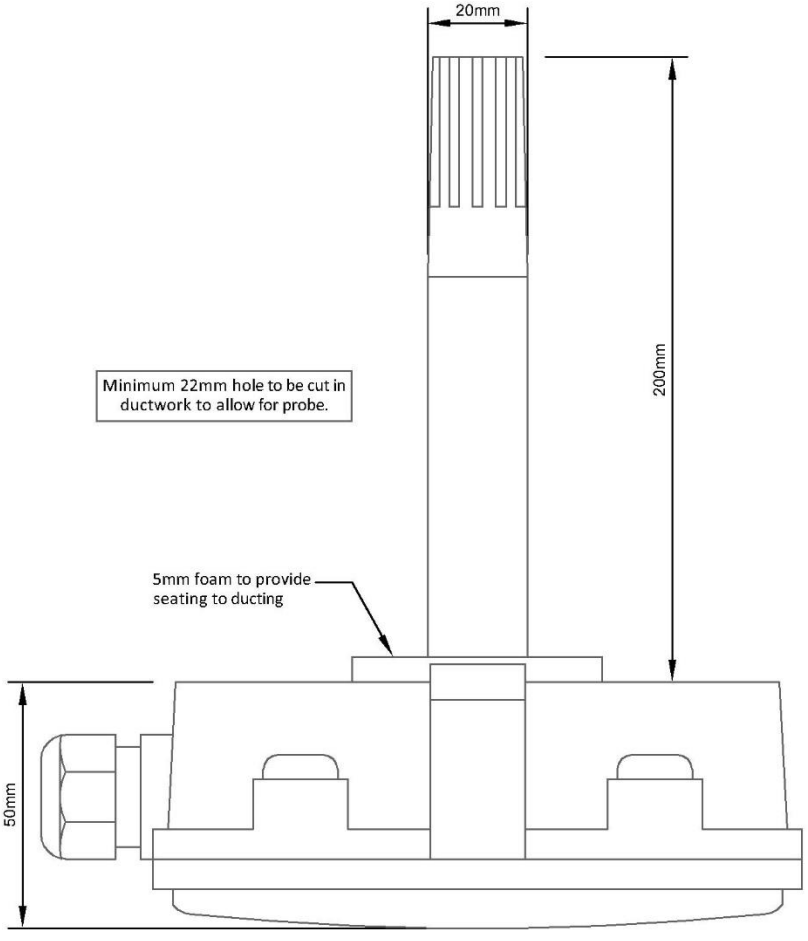
SIDE ELEVATION



FRONT ELEVATION



FRONT ELEVATION



SIDE ELEVATION