

Product overview

The AX-GS-CM-M is an optimal solution for detecting hazardous emissions in parking garages, loading docks, warehouses, and other similar environments. It employs an electrochemical sensor to monitor carbon monoxide (CO) concentration levels ranging from 0 to 300 parts per million (ppm). The device transmits data over the RS-485 network using the Modbus RTU protocol. By continuously monitoring CO levels, the ventilation system can be adjusted accordingly to maintain air quality within safe limits.



Products Features

- Monitors CO levels over a range of 0 to 300ppm
- Electrochemical sensing element
- Isolated RS-485 Output
- Rising Clamp Terminals
- Easy maintenance and 3 year exchange sensor option
- Sensor is UL recognised component UL2034, UL2075, E240671
- 3 Year Warranty

Product Specifications

Sensor Type:	CO : Electrochemical 3-electrode Temperature (option) : 10K3A1 NTC Thermistor
Power Supply:	24Vac \pm 10%, 100mA maximum or 24Vdc \pm 10%, 60mA maximum
Output:	Isolated RS-485 Modbus RTU Supported baud rates: 9600,19200,38400,57600,115200bps. More info in installation manual.
Output Accuracy:	CO : \pm 5ppm or \pm 5% of reading (whichever is greater) between 0-50°C Temperature (option) : \pm 0.3 °C Typical
Output Stability:	<5% signal drift per year
Display (option)	4 digit 9mm high character backlit LCD
Typical Coverage Area:	700m ² or 15m radius
Settling Time:	3 minutes after power up
Response Time(t ₉₀):	<35 Seconds
Life Expectancy:	>7 years dependant on environment
Ambient Range:	0-50°C, 15-90% RH non-condensing
Housing:	Flame retardant ABS, IP65, White (optional Black - see order codes)
Dimensions & Weight:	92mm diameter x 52mm,
Terminals:	Rising clamp for 0.5-1.5mm ²
Country of origin	UK

Product Order codes

Order Code	Description
AX-GS-CM-M	0-300 ppm
AX-GS-CM-ML	0-300 ppm with Display
AX-GS-CM-M-OT	0-300 ppm CO, 0-50DegC Outside temperature
AX-GS-CM-ML-OT	0-300 ppm CO, 0-50DegC Outside temperature , LCD Display (CO reading in ppm)

Add -B to all part numbers for optional black enclosure.
Add -WR for white enclosure with rear entry. Add -BR for black enclosure with rear entry

AX-GS-CM-M

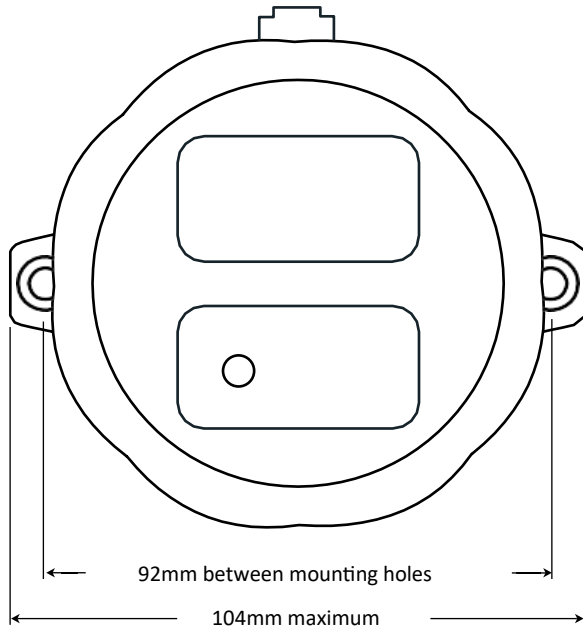
Carbon Monoxide transmitter - MODBUS RTU



Installation

The AX-GS-CM-M should be installed by a suitably qualified technician in accordance with any guidelines for the device and the equipment which is to be connected to. Field wiring should be installed to satisfy the requirements set out by the manufacturer of the equipment that the unit is being connected to using screened cable where necessary.

Fixing



Location

The enclosure should be mounted at a height of 1 to 1.5 metres from the floor of the area to be monitored in an area of good airflow. For best operation do not mount the sensor near doors, opening windows, supply air diffusers or other known air disturbances. Avoid areas where the transmitter would be exposed to vibrations or rapid temperature changes.

Status LED

This flashes 4 times every 6 seconds. A brighter flash in the sequence indicates a fault, ordered as:

- 1 - EEPROM
- 2 - CO Sensor
- 3 - Ext. Temperature sensor
- 4 - CO Gain Error

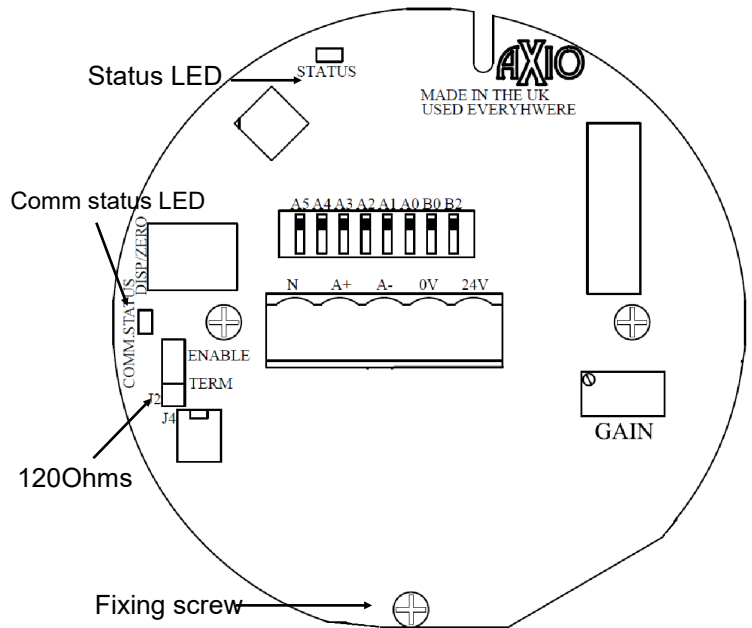
Communication status LED

OFF - No valid communication

Short flash - Valid packets received. NOT for this unit.

Long flash - Valid packets received. Replied to the request.

Connections



- 1. NET COMMON
- 2. DATA+
- 3. DATA -
- 4. 0V
- 5. 24V AC/DC

Termination Impedance

If the slave device is at the end of the network, enable 120 Ohms termination resistor by placing TERM in ENABLE Position. This ensures the proper termination of signals travelling in both directions on the bus. Do NOT use more than two termination impedances in a network.

Sensor module replacement

To replace the sensor module remove the fixing screw and slide module to the right. After replacing the module, check the status LED indications give 4 equal flashes (no bright flash).

Usage

Suitable for monitoring and ventilation applications. Do NOT use in safety critical or hazardous applications.

Datasheet Contents

Every effort has been taken in the production of this data sheet to ensure accuracy. Annicom do not accept responsibility for any damage, expense, injury, loss or consequential loss resulting from any errors or omissions. Annicom has a policy of continuous improvement and reserves the right to change this specification without notice.

Installation and Operation

The purpose of this document is to provide information on installing and setting up AX-GS-CM-M range of carbon monoxide transmitters. The details of the variants of the transmitters are provided in the relevant datasheet. Please download the latest datasheets from our website www.annicom.com. This manual is applicable for the following models.

CO transmitters : AX-GS-CM-M(L)(-B)(-WR)(-BR), AX-GS-CM-M(L)-T(-B)(-WR)(-BR)

General

Read this manual carefully before installing and commissioning the transmitter. It is imperative that the installation be carried out by qualified personnel familiar with relevant standards and safety procedures. Failing to do so may result in personal injury and product damage.

Prior to installation ensure that all power sources are disconnected and locked out and remain locked out during Installation and set-up. Follow electrostatic discharge (ESD) precautions while installation to prevent equipment damage.



Do NOT use the product in explosive or hazardous environments, with combustible or flammable gases, or in safety critical systems where the failure of the product could result in loss of life, significant property damage, or damage to the environment.

Gas detection principle

AX-GS-CM-M range of transmitters use 3-electrode electrochemical sensors to detect carbon monoxide gas. They exhibit good linearity, are highly selective, and respond quickly to the target gas. Inside an electrochemical cell, three electrodes (sensing, reference, and counter electrodes) are immersed in an electrolyte. The material selected for the electrode determines the target gas. In this case, it is carbon monoxide. When CO gas comes into contact with the electrodes through diffusion, it undergoes a series of reactions that result in an electrical current flowing between the electrodes. The magnitude of the current is proportional to the concentration of CO gas present.

The ambient temperature has a small yet significant effect on the electrochemical cells. A built-in temperature sensor mitigates this effect. Data from the electrochemical cell and temperature sensor are digitally processed using a microcontroller. The processed data is then transmitted over RS-485 lines using the Modbus RTU protocol.

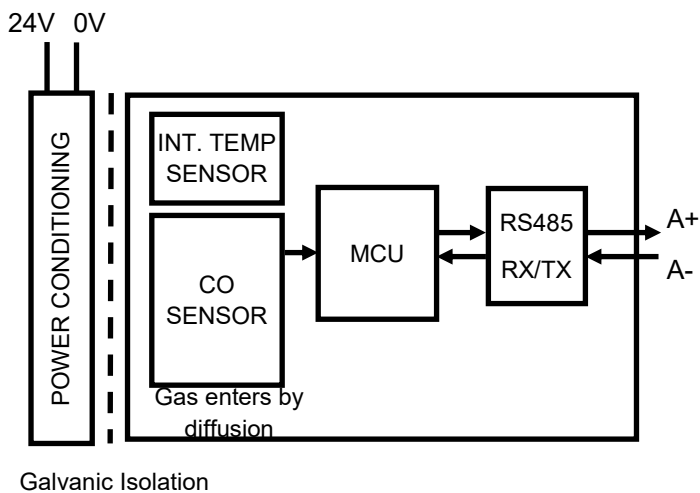


Figure 1

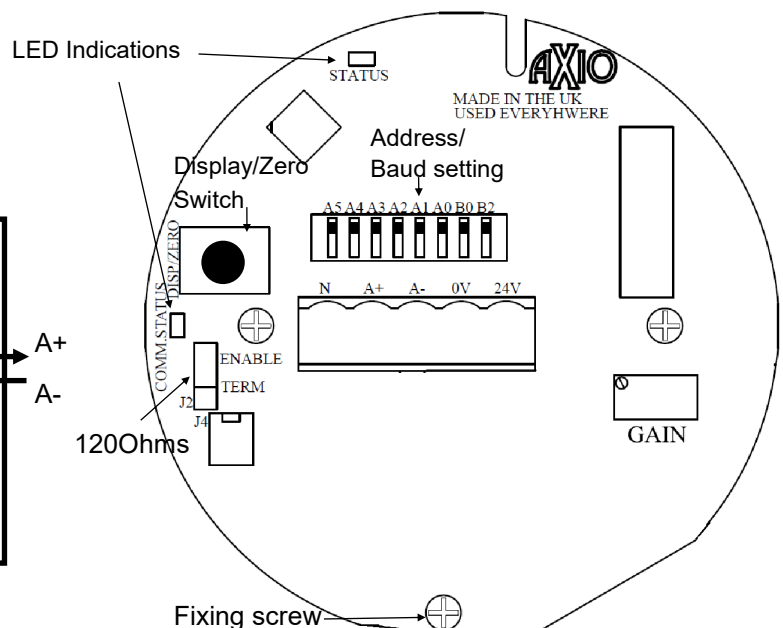


Figure 2 - Connections

Siting gas detectors

- Choose a location with good air circulation and representative of the monitored area.
- Mount the transmitter on a flat surface 1 to 1.5 metres from the floor of the area to be monitored.
- For best operation do not mount the sensor near doors, opening windows, supply air diffusers or other known air disturbances .
- Avoid areas where the transmitter would be exposed to vibrations or rapid temperature changes.
- The enclosure has integrated tabs for mounting. Use #10 screws (not provided) to secure the enclosure on to the wall.
- Rotate the lid in anti-clockwise direction to remove the lid and access the wiring terminals.
- Complete the wiring as per the below instructions. Reinstall the lid.
- Secure the lid to enclosure with the provided screw.

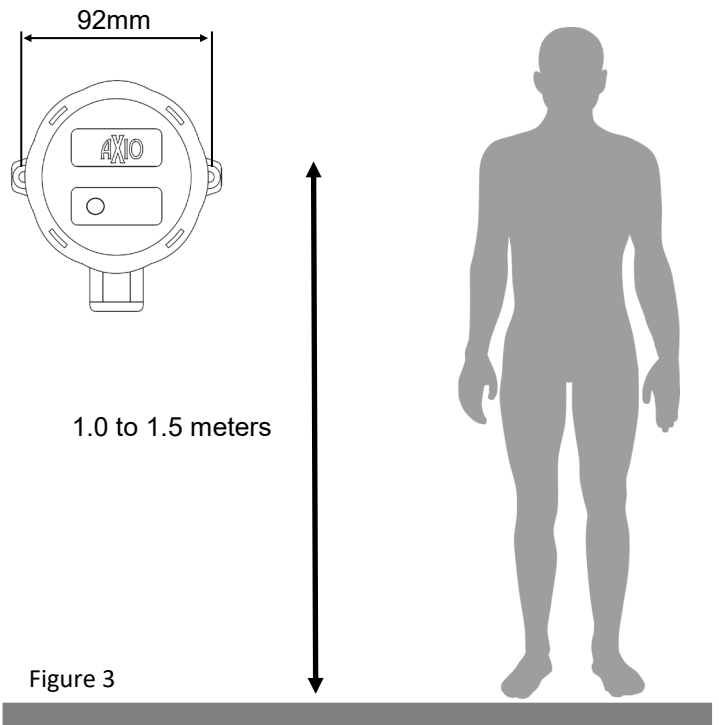


Figure 3

Dimensions and mounting

To install the enclosure,

- Place it on the surface where you want to mount it and mark the locations of the holes (92mm apart).
- Drill the holes and secure the enclosure with #10 screws (not supplied).
- Choose the cable entry option that suits your needs: bottom (Figure 4.a), top (Figure 4.b) or rear (Figure 4.c, for -R versions only).

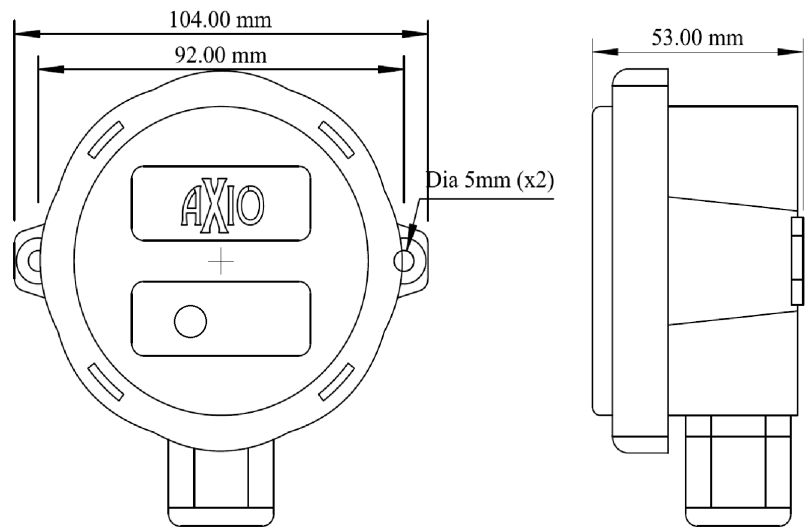
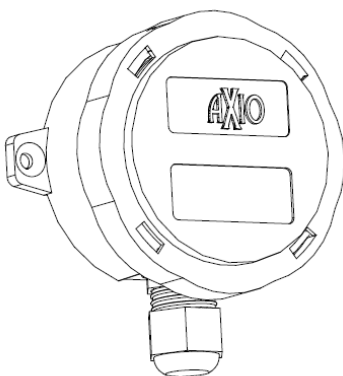
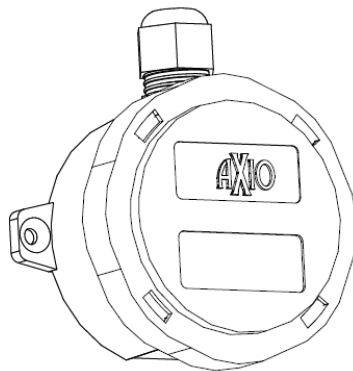


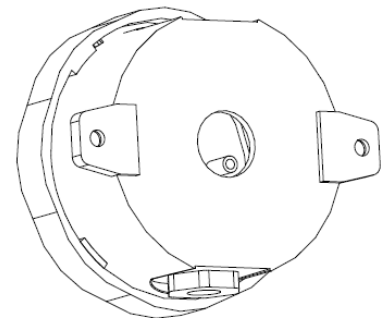
Figure 4



(a)



(b)



(c)

RS-485 output wiring

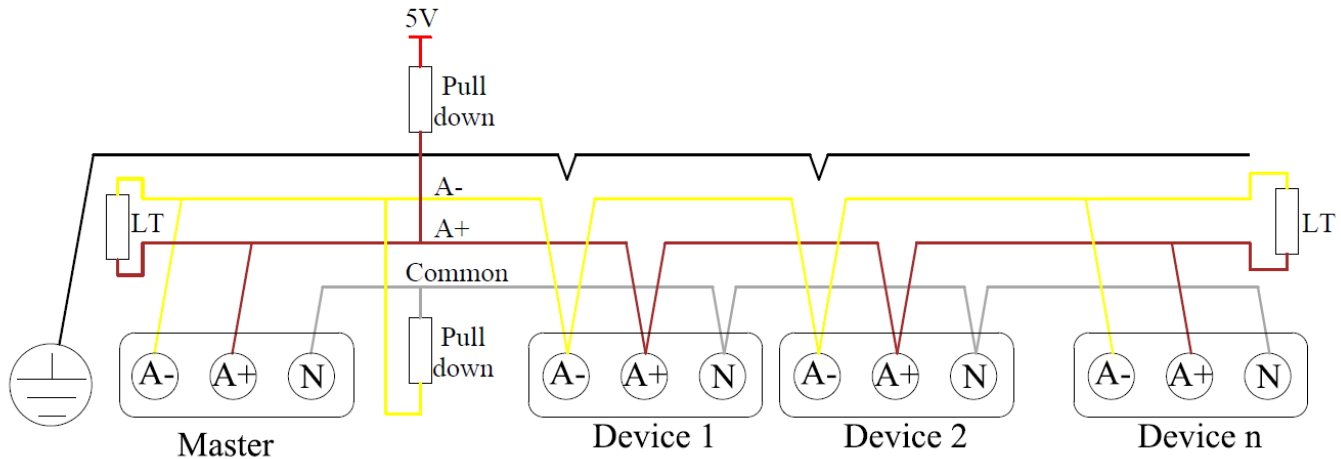


Figure 5

Use twisted pair shielded cables with a characteristic impedance of approximately 120 ohms. A balanced pair must be used for data lines (A+,A-) and a third conductor for the net common (N). The shield should be connected to the earth at one end only, preferably at the master control panel.

The RS485 standard suggests a daisy chain topology. A long trunk with short derivation cables is also acceptable.

A maximum of 32 devices may be connected to the network without using a repeater. This is subject to changes depending on the Unit Load used by other devices on the network and line polarization.

Either end of the network should be terminated with 120 Ohms to avoid signal reflections. Do not use line termination on a derivation cable. For convenience, unit has the Line Termination (LT) built-in, which may be enabled using the jumper.

Line polarisation might be needed in applications involving noisy environments. A pull-up is connected to a 5V source on A+ circuit. A pull-down resistor to the common is connected on A- circuit. The value of the resistors is chosen between 450 ohms and 650 ohms. Line polarisation will reduce the maximum number of devices that may be connected to a network.

Modbus RTU is a serial protocol. As the number of devices in a network increases, there will be potential delays in updating data from each device. The system designer determines the number of devices connected in a network depending on the required data refresh interval.

Network Configuration

The communication parameters can be set using the Dipswitches or can be programmed over the network.

If any switches are ON, switches A5 to A0 sets the device address and B1 and B0 sets the baud rate. The Parity will be Even, and the Number of Stop bits will be 1 in this mode.

If the dipswitches A5 to A0 are set to OFF, the communication parameters will be loaded from the internal configuration registers. When these registers are modified, the updated values will not be stored until a Non Volatile Memory Update command has been executed and will not be used until either a Force Reset command or a re-power of the unit.

A unique address for each device is essential for the proper operation of the serial bus. If two devices have the same address, the Master will not be able to communicate with any slave on the bus, causing a malfunction. The address assignment must be checked carefully before the procedure.

Dipswitch configuration

A5	A4	A3	A2	A1	A0	
OFF	OFF	OFF	OFF	OFF	OFF	Comms. set by Modbus registers
						Address
OFF	OFF	OFF	OFF	OFF	ON	1
OFF	OFF	OFF	OFF	ON	OFF	2
↓	↓	↓	↓	↓	↓	↓
ON	ON	ON	ON	ON	ON	63
B1	B0	Baud Rate	Parity		No of Stop Bits	
OFF	OFF	9600	Even		One	
OFF	ON	19200				
ON	OFF	38400				
ON	ON	57600				

Supported Function Codes

03	READ HOLDING REGISTERS (4XXXX BANK)
04	READ INPUT REGISTERS (3XXXX BANK)
06	WRITE SINGLE REGISTER(4XXXX BANK)
16	WRITE MULTIPLE REGISTERS(4XXXX BANK)

Modbus Registers

ADDRESS	DESCRIPTION	DATA TYPE	DATA	ACCESS	NVM
3XXXX REGISTER BANK					
30001	CO_CONCENTRATION (0.0-300.0) (ppm)	UINT16	0 - 3000	R	
30002 ¹	EXT_TEMP (-20.0 to +70.0) (°C)	INT16	-200 - +700	R	
30003	FAULT (0: NO_FAULT, 1: FAULT)	UINT16	BITS 15-5: RESERVED BIT4: EXT_TEMPERATURE ² BIT3: CO_GAIN BIT2: CO_SENSOR BIT1: INT_TEMP_SENSOR BIT0: EEPROM	R	
30004:7	RESERVED	UINT16		R	
4XXXX REGISTER BANK					
40001	MODBUS ADDRESS (NETWORK)	UINT16	1-247(DEFAULT:1)	R/W	*
40002	BAUD RATE (NETWORK)	UINT16	0: 9600 1:19200(DEFAULT) 2:38400 3:57600 4:115200	R/W	*
40003	PARITY (NETWORK)	UINT16	0:NONE 1:ODD 2:EVEN(DEFAULT)	R/W	*
40004	NO OF STOP BITS (NETWORK)	UINT16	0:1 STOP BIT (DEFAULT) 1:2 STOP BITS	R/W	*
40005	DISPLAY (SETTING MULTIPLE BITS WILL ENABLE SCROLLING)	UINT16	DEFAULT: 63 (CYCLE THROUGH) BIT15:6: RESERVED BIT5: STOP_BITS BIT4: PARITY BIT3: BAUD BIT2: ADDRESS BIT1: TEMP (°C) ³ BIT0: CO (PPM)	R/W	*
40006	FORCE_RESET	UINT16	1:RESET	R/W	
40007	NON_VOLATILE_MEMORY_UPDATE	UINT16	1:UPDATE	R/W	
40008	FORCE_FACTORY_DEFAULTS	UINT16	1:FORCE DEFAULTS	R/W	
40009	CALIBRATE_ZERO	UINT16	WRITE 0x5A TO ZERO	R/W	
40010	EXT_TEMP_OFFSET(-5.0°C to 5.0°C)	INT16	-50 - 50	R/W	*

¹ Register content will be zero in non -T versions

² Fault will be active in non -T versions

³ Displays 'FAIL' in non -T versions

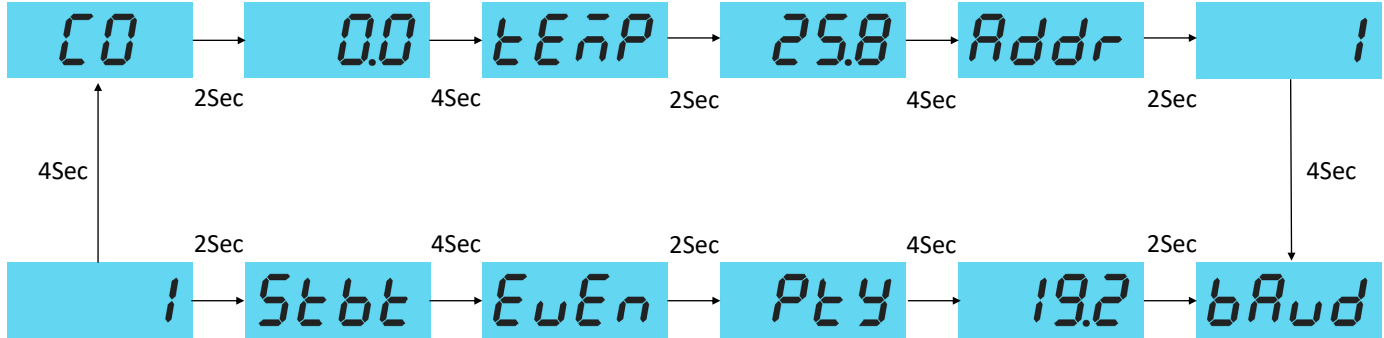
Common Exceptions

- Exception code :01 ILLEGAL FUNCTION Function code in the query is not supported by this device.
- Exception code :02 ILLEGAL DATA ADDRESS Starting address or starting address+ number of registers is outside range.
- Exception code :03 ILLEGAL DATA VALUE The value in the request data field is not an authorized value for the slave.

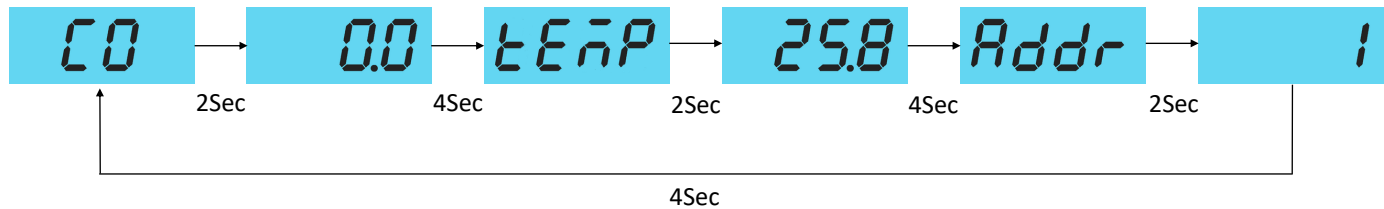
Display (if fitted)

The -L version of the device features a segmented display with a blue backlight for local readout. The switch on the PCB and register 40005 control the displayed parameter. By default, the display is programmed to cycle through the available parameters.

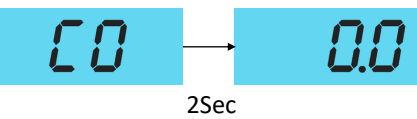
40005 Register value : 63



40005 Register value : 7



40005 Register value : 1



Calibration

The device comes with pre-calibrated sensors. The sensors have an expected lifetime of 7 years. It is recommended to verify the calibration once a year.

Use a calibrated gas source (not supplied) to verify the calibration. The transmitter must be turned on for at least 15 minutes before applying the calibrated gas. Place the calibration cap (not supplied) over the sensor and allow a steady flow of gas (0.4 to 1 litre/min) using a regulator for a minimum of 2 minutes.

ZEROING - Place the device in clean air or apply nitrogen gas. Press and hold the ZERO switch for 10 seconds. The display (if fitted) will show 'ZERO', save the value to EEPROM, and reset after 5 seconds.

SPAN ADJUSTMENT - Apply calibrated CO gas of known concentration and observe the output. If the output is less than expected, reduce the gain by adjusting the GAIN trimpot counterclockwise.

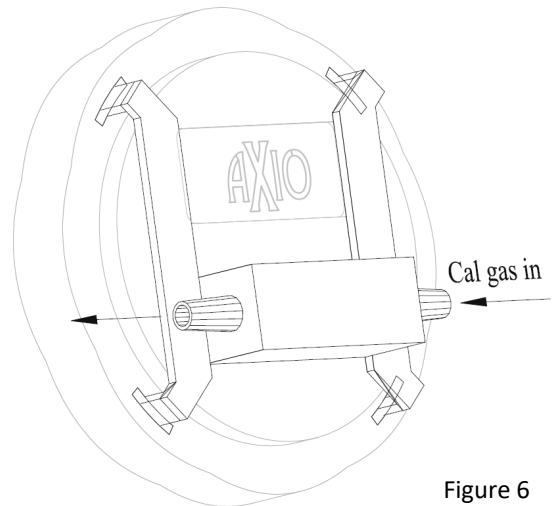


Figure 6

Testing

Before powering on, remove the lid and ensure all connections are secure. Ensure 120 Ohms termination is enabled only at the end of the line.

Observe the status LED after powering on. The 1st, 2nd and 4th flash in the status led sequence should be dim. If the BMS controller to which the device is connected is sending requests, the device will send messages back and the communication LED will have a bright flash to indicate that it has responded to the request. If the communication is okay but the request is not addressed to the device, the communication status LED will do a dim flash. If the communication is not valid, i.e., incorrect baud rate, parity,

etc., or the line is idle, the communication status LED will stay off.

Let the transmitter warm up and stabilize for at least 15 minutes.

To perform a bump test, you will need a gas source with a known concentration (not supplied). Place the calibration cap (not supplied) over the sensor and allow a steady flow of gas (0.4 to 1 litres/min) using a regulator. The gas will diffuse into the sensor and change the output. The transmitter output will depend on the concentration of the target gas. Observe the output on the display (if fitted) or the controller.

PCB Exchange

There is an option to exchange the PCB at the end of its lifetime rather than replacing the entire transmitter. This will save costs and is environmental friendly. Contact our sales for the pricing.

Product Specifications

Power Supply:	24Vac \pm 10%, 100mA maximum or 24Vdc \pm 10%, 60mA maximum
Sensor Type :	Electrochemical 3-electrode
Output:	
	Protocol: Modbus RTU protocol over RS485 2Wire
	Address range: 1-63 (settable using dipswitch), 1-247 (settable using configuration register)
	Baud rates supported: 9600bps,19200bps,38400bps,57600bps,115200bps
	Parity: None Odd, Even (default), (odd, none selectable via configuration register)
	Number of stop bits: 1(default),2 (2 is selectable via configuration register)
	Isolation: 1500VDC (60sec, <1mA leakage current) between Power and Output
	120Ohms termination : Available on board. Enabled using jumper
	Recommended cable: 24AWG twisted pair shielded cable (1 pair for data and 1 conductor for common)
	Maximum devices on a network: 32
Detection Range:	0-300ppm
Detection Accuracy:	\pm 5ppm or \pm 5% of reading (whichever is greater)
Response time(t_{90}):	< 35 seconds
Long term sensitivity drift:	<5% signal drift per year
Typical Coverage Area:	700m ² or 15m radius
Settling Time:	3 minutes after power up
Life Expectancy:	>5 Years
Display (Option):	4 digit 9mm with back light
Ambient Temperature & Humidity:	0-50°C, 15-90% RH non-condensing
Housing:	Flame retardant ABS, IP65 White (optional Black-see order codes)
Dimensions & Weight:	92mm diameter x 52mm, 180gms
Terminals:	Rising clamp for 0.5-1.5mm ² , 2 Part Pluggable
Warranty:	3 years
Country of origin:	UK

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