

Carbon Monoxide transmitter - BACnet MS/TP

Product overview

The AX-GS-CM-BN can detect hazardous carbon monoxide emissions in parking garages, warehouses, and other similar environments. It uses 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 BACnet MS/TP 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 BACnet MS/TP Supported baud rates: 9600,19200,38400,57600,115200bps. More info in installation manual.
Output Accuracy:	CO : $\pm 5\text{ppm}$ or $\pm 5\%$ of reading (whichever is greater) between 0-50°C Temperature (option) : $\pm 0.3^\circ\text{C}$ 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:	>3 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-BN	0-300 ppm BACnet MS/TP CO transmitter
AX-GS-CM-BNL	0-300 ppm BACnet MS/TP CO transmitter with Display
AX-GS-CM-BN-OT	0-300 ppm CO, 0-50DegC Outside temperature BACnet MS/TP transmitter
AX-GS-CM-BNL-OT	0-300 ppm CO, 0-50DegC Outside temperature BACnet MS/TP transmitter, LCD Display
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	

Fixing



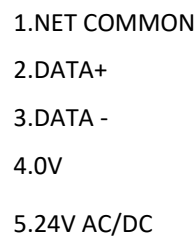
Status LED

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

Communication status LED

OFF - No valid communication
Short flash - Token Received
Long flash - Replied to the data sharing request.

Connections



Termination Impedance

If the slave device is at the end of the network, enable 120Ohms 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.

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-BN 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-BN(L)(-B)(-WR)(-BR), AX-GS-CM-BN(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-BN 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 BACnet MS/TP protocol.

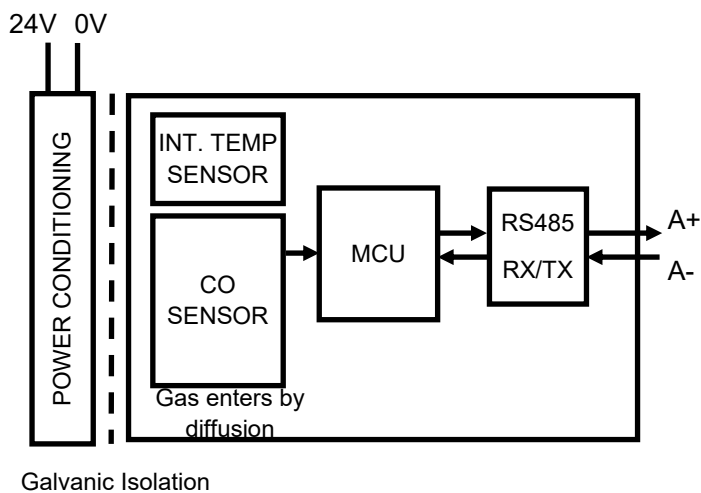


Figure 1

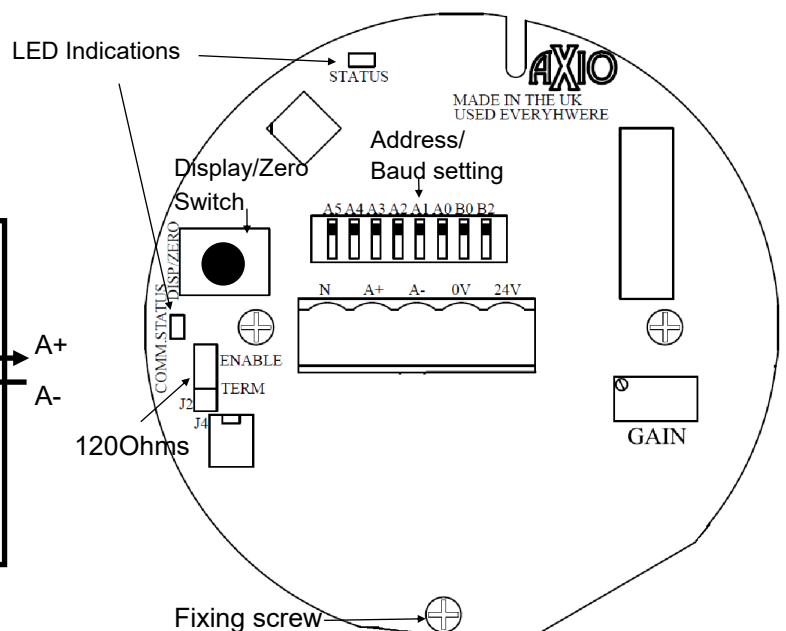
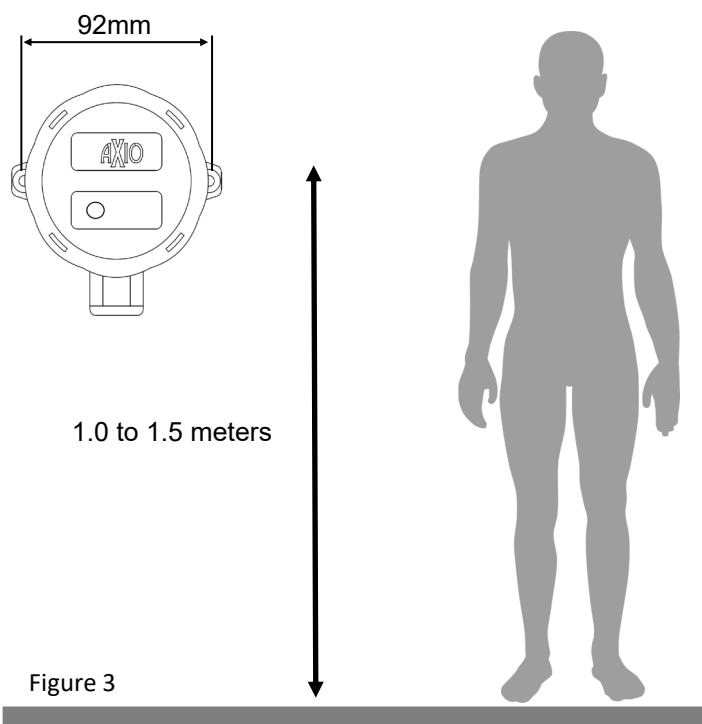


Figure 2 - Connections

Carbon Monoxide transmitter - BACnet MS/TP

Siting gas detectors

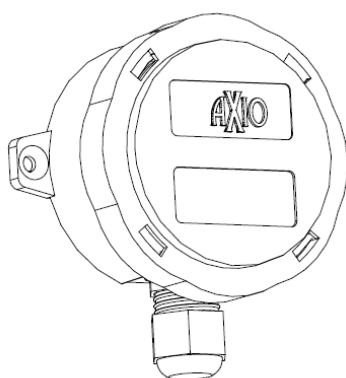
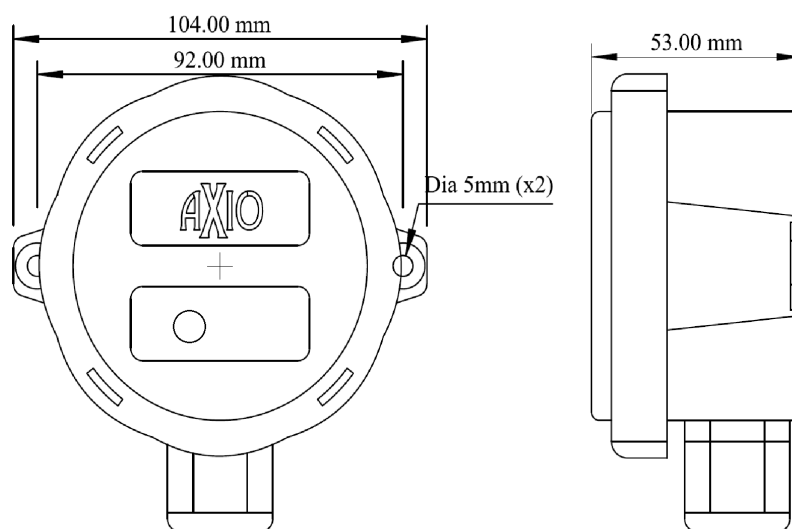
- Choose a location with good air circulation and representative of the monitored area.
- Mount the transmitter on a flat surface 1 to 1.5 metres from the floor of the area to be monitored.
- For best operation do not mount the sensor near doors, opening windows, supply air diffusers or other known air 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.



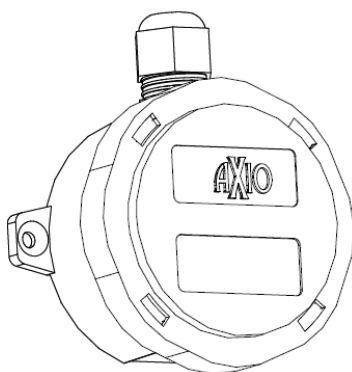
Dimensions and mounting

To install the enclosure,

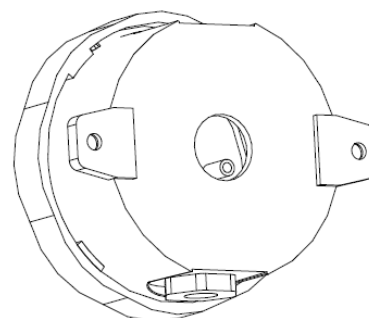
- Place it on the surface where you want to mount it and mark the locations of the holes (92mm apart).
- Drill the holes and secure the enclosure with #10 screws (not supplied).
- Choose the cable entry option that suits your needs: bottom (Figure 4.a), top (Figure 4.b) or rear (Figure 4.c, for -R versions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



(a)



(b)



(c)

RS-485 output wiring

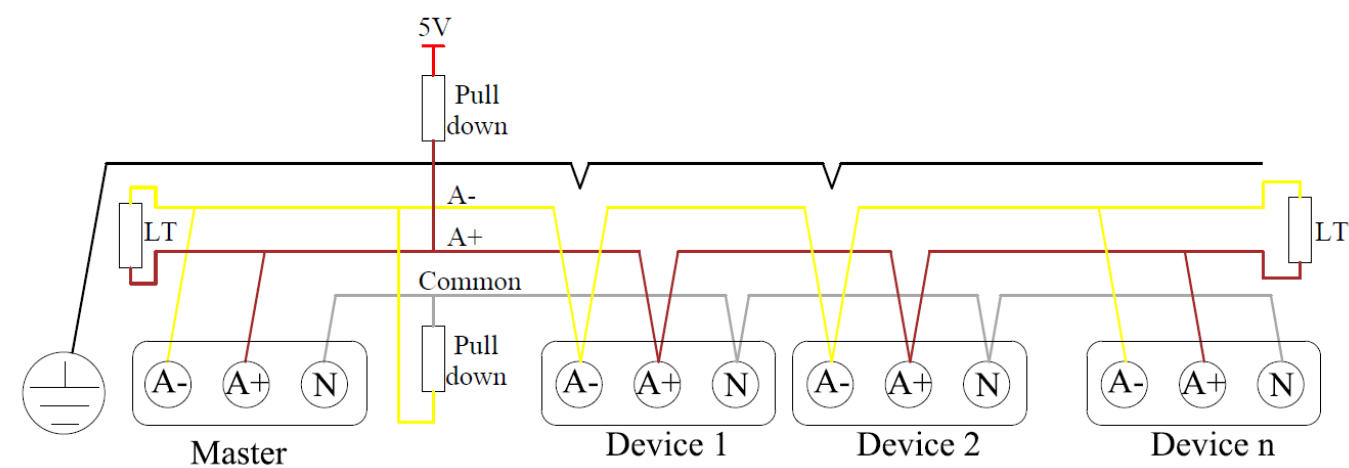


Figure 5

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.

BACnet 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 None, 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 BACnet objects .

A unique address for each device is essential for the proper operation of the serial bus. If two devices have the same address, duplicate tokens generated will cause 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 BACnet objects
						Address
OFF	OFF	OFF	OFF	OFF	ON	1
OFF	OFF	OFF	OFF	ON	OFF	2
↓	↓	↓	↓	↓	↓	↓
ON	ON	ON	ON	ON	ON	63

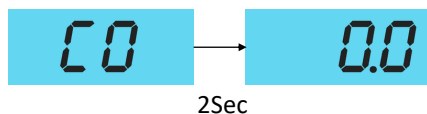
B0	B1	Baud Rate	Parity	No of Stop Bits
OFF	OFF	9600	None	One
OFF	ON	19200		
ON	OFF	38400		
ON	ON	57600		

Carbon Monoxide transmitter - BACnet MS/TP

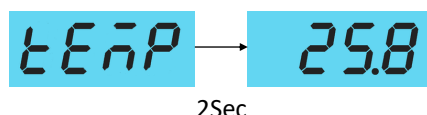
Display (if fitted)

The -L version of the device features a segmented display with a blue backlight for local readout. The switch on the PCB and object (Multistate value,0) control the displayed parameter.

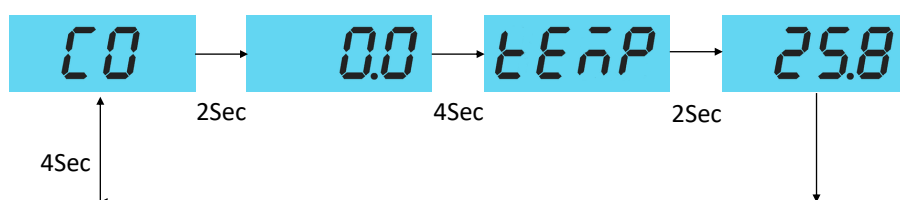
Multi-state Value 0 Present Value : 1



Multi-state Value 0 Present Value : 2



Multi-state Value 0 Present Value : 3



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.

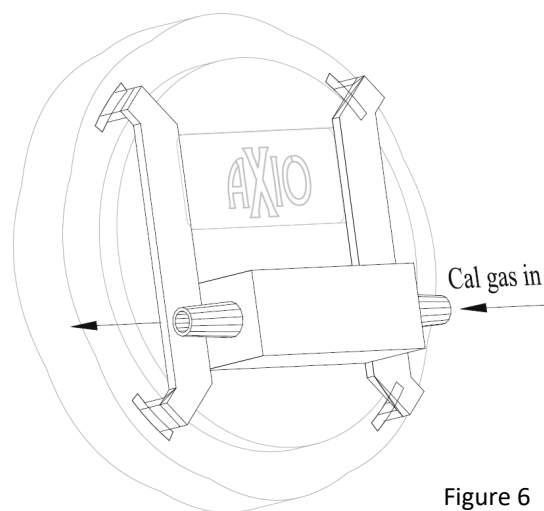


Figure 6

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.

BACnet Protocol Implementation Conformance Statement (PICS)**Date:** 28 March 2025**Vendor Name:** Annicom Ltd.**Product Name:** Carbon Monoxide transmitter**Product Model Number:** AX-GS-CM-BN**Application Software Version:** AX-GS-CMBN01.00 **Firmware Revision:** AX-CMBN01.00 **BACnet Protocol Revision:** 19

Product Description : The AX-GS-CM-BN can detect hazardous carbon monoxide emissions in parking garages, warehouses, and other similar environments. It uses 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 BACnet MS/TP protocol.

BACnet Standardized Device Profiles Supported (Annex L): BACnet Application Specific Controller (B-ASC)**BACnet Interoperability Building Blocks Supported (Annex K):** DS-RP-B, DS-WP-B**Segmentation Capability:** Segmentation not supported.**Standard Object Types Supported:**

Object type	Dynamically creatable	Dynamically deletable	Optional properties supported
Analog Value	No	No	Description
Multistate Value	No	No	Description
Device	No	No	Description, Max_Master, Max_Info_Frames

Analog Value Objects**CO_Value**

Property	Property datatype	Default Value	Writable	Conditionally writable	Range
Object_Identifier	BACnetObjectIdentifier	Analog Value, 0	No	No	
Object_Name	CharacterString	CO_Value	No	No	
Object_Type	BACnetObjectType	Analog Value(2)			
Present_Value	REAL	0	No	Yes. When Out_Of_Service is True	0-300
Description	CharacterString	CO Value in ppm	No	No	
Status_Flags	BACnetStatusFlags	F,F,F,F	No	No	
Event_State	BACnetEventState	Normal	No	No	
Out_Of_Service	BOOLEAN	False	Yes		
Units	BACnetEngineeringUnits	Parts Per Million	No	No	
Property_List	BACnetARRAY[N] of BACnetPropertyIdentifier		No	No	

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Temperature

Property	Property datatype	Default Value	Writable	Conditionally writable	Range
Object_Identifier	BACnetObjectIdentifier	Analog Value, 1	No	No	
Object_Name	CharacterString	Temperature	No	No	
Object_Type	BACnetObjectType	Analog Value(2)	No	No	
Present_Value	REAL	0	No	Yes. When Out_Of_Service is True	-20 to 50
Description	CharacterString	Temperature in Degree Celsius	No	No	
Status_Flags	BACnetStatusFlags	F,F,F,F	No	No	
Event_State	BACnetEventState	Normal	No	No	
Out_Of_Service	BOOLEAN	False	Yes		
Units	BACnetEngineeringUnits	Degrees Celsius	No	No	
Property_List	BACnetARRAY[N] of BACnetPropertyIdentifier		No	No	

Temperature_Offset

Property	Property datatype	Default Value	Writable	Conditionally writable	Range
Object_Identifier	BACnetObjectIdentifier	Analog Value, 2	No	No	
Object_Name	CharacterString	Temperature_Offset	No	No	
Object_Type	BACnetObjectType	Analog Value(2)	No	No	
Present_Value	REAL	0	Yes		-15 to 15
Description	CharacterString	Temperature_Offset in Degree Celsius	No	No	
Status_Flags	BACnetStatusFlags	F,F,F,F	No	No	
Event_State	BACnetEventState	Normal	No	No	
Out_Of_Service	BOOLEAN	False	No	No	
Units	BACnetEngineeringUnits	Degrees Celsius	No	No	
Property_List	BACnetARRAY[N] of BACnetPropertyIdentifier		No	No	

Sensitivity

Property	Property datatype	Default Value	Writable	Conditionally writable	Range
Object_Identifier	BACnetObjectIdentifier	Analog Value, 3	No	No	
Object_Name	CharacterString	Sensitivity	No	No	
Object_Type	BACnetObjectType	Analog Value(2)	No	No	
Present_Value	REAL	0	No	No	
Description	CharacterString	CO Sensor Sensitivity	No	No	
Status_Flags	BACnetStatusFlags	F,F,F,F	No	No	
Event_State	BACnetEventState	Normal	No	No	
Out_Of_Service	BOOLEAN	False	No	No	
Units	BACnetEngineeringUnits	Degrees Celsius	No	No	
Property_List	BACnetARRAY[N] of BACnetPropertyIdentifier		No	No	

Carbon Monoxide transmitter - BACnet MS/TP

Fault

Property	Property datatype	Default Value	Writable	Conditionally writable	Range
Object_Identifier	BACnetObjectIdentifier	Analog Value, 4	No	No	
Object_Name	CharacterString	Fault	No	No	
Object_Type	BACnetObjectType	Analog Value(2)	No	No	
Present_Value	REAL	0	No	No	
Description	CharacterString	Fault Status	No	No	
Status_Flags	BACnetStatusFlags	F,F,F,F	No	No	
Event_State	BACnetEventState	Normal	No	No	
Out_Of_Service	BOOLEAN	False	No	No	
Units	BACnetEngineeringUnits	No Units	No	No	
Property_List	BACnetARRAY[N] of BACnetPropertyIdentifier		No	No	

MS/TP Address

Property	Property datatype	Default Value	Writable	Conditionally writable	Range
Object_Identifier	BACnetObjectIdentifier	Analog Value, 5	No	No	
Object_Name	CharacterString	MS/TP Address	No	No	
Object_Type	BACnetObjectType	Analog Value(2)	No	No	
Present_Value	REAL	31	Yes		1-127
Description	CharacterString	MS/TP Address when all dipswitches are OFF	No	No	
Status_Flags	BACnetStatusFlags	F,F,F,F	No	No	
Event_State	BACnetEventState	Normal	No	No	
Out_Of_Service	BOOLEAN	False	No	No	
Units	BACnetEngineeringUnits	No Units	No	No	
Property_List	BACnetARRAY[N] of BACnetPropertyIdentifier		No	No	

Multi State Value Objects

Display Mode

Property	Property datatype	Default Value	Writable	Conditionally writable	Range
Object_Identifier	BACnetObjectIdentifier	Multi State Value, 0	No	No	
Object_Name	CharacterString	Display Mode	No	No	
Object_Type	BACnetObjectType	Multi-State Value(2)	No	No	
Present_Value	Unsigned	1	Yes		1-3
Description	CharacterString	Set parameter to display on LCD	No	No	
Number_Of_States	Unsigned	3	No	No	
State_Text	BACnetARRAY[N] of CharacterString	1:CO Value ppm 2:Temperature in DegC	No	No	
Status_Flags	BACnetStatusFlags	F,F,F,F	No	No	
Event_State	BACnetEventState	Normal	No	No	
Out_Of_Service	BOOLEAN	False	No	No	
Property_List	BACnetARRAY[N] of BACnetPropertyIdentifier		No	No	

Carbon Monoxide transmitter - BACnet MS/TP

MS/TP Baud Rate

Property	Property datatype	Default Value	Writable	Conditionally writable	Range
Object_Identifier	BACnetObjectIdentifier	Multi State Value, 1	No	No	
Object_Name	CharacterString	MS/TP Baud Rate	No	No	
Object_Type	BACnetObjectType	Multi-State Value(2)	No	No	
Present_Value	Unsigned	1	Yes	No	1-5
Description	CharacterString	Sets baud when all dipswitches are OFF	No	No	
Number_Of_States	Unsigned	5	No	No	
State_Text	BACnetARRAY[N] of CharacterString	1:9600 bps 2:19200 bps 3:38400 bps 4:57600bps 5:115200 bps	No	No	
Status_Flags	BACnetStatusFlags	F,F,F,F	No	No	
Event_State	BACnetEventState	Normal	No	No	
Out_Of_Service	BOOLEAN	False	No	No	
Property_List	BACnetARRAY[N] of BACnetPropertyIdentifier		No	No	

Device Object

Property	Property datatype	Default Value	Writable	Conditionally writable	Range
Object_Identifier	BACnetObjectIdentifier	Device, 898001	Yes		
Object_Name	CharacterString	CMBN00898	Yes		
Object_Type	BACnetObjectType	Device(8)	No	No	
System_Status	BACnetDeviceStatus	Operational(0)	No	No	
Vendor_Name	CharacterString	Annicom Ltd.	No	No	
Vendor_Identifier	Unsigned16	898	No	No	
Model_Name	CharacterString	AX-GS-CM-BN	No	No	
Firmware_Revision	CharacterString	AX-CMBN01.00	No	No	
Application_Software_Version	CharacterString	AX-GS-CMBN01.00	No	No	
Description	CharacterString	Carbon Monoxide Transmitter	No	No	
Protocol_Version	Unsigned	1	No	No	
Protocol_Revision	Unsigned	19	No	No	
Protocol_Services_Supported	BACnetServicesSupported	Read Property, Write Property, I Am	No	No	
Protocol_Object_Types_Supported	BACnetObjectTypesSupported	Analog Value, Device, Multi State Value	No	No	
Object_List	BACnetARRAY[N] of BACnetObjectIdentifier		No	No	
Max_APDU_Length_Accepted	Unsigned	128	No	No	
Segmentation_Supported	BACnetSegmentation	None(3)	No	No	
APDU_Timeout	Unsigned	10000	No	No	

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Num-ber_Of_APDU_Retries	Unsigned	3	No	No	
Max_Master	Unsigned	127	Yes		1-127
Max_Info_Frames	Unsigned	1	No	No	
De-vice_Address_Binding	BACnetLIST of BAC-netAddressBinding	NULL	No	No	
Database_Revision	Unsigned	0	No	No	
Property_List	BACnetARRAY[N] of BAC-netPropertyIdentifier		No	No	

Data Link Layer Options: MS/TP master (Clause 9), baud rate(s): 9600,19200,38400,57600,115200 bps

Device Address Binding: Not supported

Networking Options : None

Character Sets Supported: ISO 10646 (UTF-8)