Modbus CO2 Sensor Datasheet

1 Introduction

Modbus CO2 Sensor is a true CO2 sensor that features four sensors in a compact, low-profile design. It includes sensors to measure CO2, temperature, humidity, and ambient light. The device can be flush mounted on the ceiling or swivel mounted on the wall. The sensor is available in two versions, namely Basic and Pro.

1.1 Features

- Temperature, humidity, and ambient light sensors are integrated in the CO2 Sensor
- Measures CO2 up to 40000ppm
- CO2 measurement accuracy:
  - Basic version: +/-50ppm (400-2000ppm)
  - Pro version: +/-40ppm (400-5000ppm)
- Measures temperature up to 60°C with an accuracy of ±1.5°C
- Measures humidity from 0 to 100% with an accuracy of ±9%RH
- Measures ambient light up to 100K Lux with an accuracy of ±15% Lux
- Implements the Modbus RTU protocol
- Low power consumption 300mW
- Operating temperature range: 0°C to +60°C
- Swivel mount and Flush mount options

Visit https://brtsys.com/resources for more information.

2 Part Numbers / Ordering Information

Part Number	Description
MS-1101-01A	Modbus CO2 Sensor, Temperature & Humidity Sensor & ALS Sensor
MS-1102-01A	Modbus CO2 Sensor Pro, Temperature & Humidity Sensor & ALS Sensor
MA-0101-01A	Modbus RS485-JST Cable (30cm)
LA-1701-01A	LDSBus Sensor Swivel Mount Set

Table 1 - Part Numbers / Ordering Information

Table of Contents

3 Specifications

Features	Sensors	CO2 Sensor/ CO2 Sensor Pro
		Ambient Light Sensor
		Temperature Sensor
		Humidity Sensor
	Interface	RS485 Modbus RTU
	LED Indicator (RGB)	System Status Indicator (Please refer to LED section)
	Mounting	Flush Mount - Fixed Angle Installation
		Swivel Mount – Adjustable Angle Installation (requires LDSBus Sensor Swivel Mount Set)
Power	Modbus Voltage	9-24V DC Bus Power
	Device Input Voltage	5V DC
	Typical Power	112mW
	Max. Power	295mW
CO2 Sensor	Overall Sensing Range	0-40000 ppm
	Specified Range	400-2000 ppm 400-5000 ppm (Pro)
	Accuracy	± (50ppm+5% of Reading) ± (40ppm+5% of Reading) (Pro)
	Update Interval	5 seconds (minimum)
Ambient Light Sensor	Range	0.001 to 100K Lux
	Accuracy	±15%
Temperature Sensor	Range	-10°C to 60°C (14°F to 140°F)
	Accuracy	±1.5°C (±34.7°F)
	Resolution	0.1°C
Humidity Sensor	Range	0 to 100% RH
	Accuracy	±9% RH
Physical Characteristics	Color	White
	Housing	Polycarbonate
	Dimensions	Φ 62mm x H25mm (Flush) Φ 62mm x H60mm (Swivel)
Environmental Limits	Operating Temperature	0 to 60°C
	Storage Temperature	-20 to 85°C
	Ambient Relative Humidity	5 to 95% (non-condensing)
Package Contents	Device	1X Modbus CO2 Sensor with Flush Mount
	Wire Assembly	1X Modbus RS485-JST Cable(30cm)
	Self-Tapping Screws	2X M3*16mm (Thread)
Optional	Mounting Accessories	1x Swivel mount bracket

Table 2 - Modbus CO2 Sensor Specifications

4 FCC Compliance Statement

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions:

(1) These devices may not cause harmful interference, and

(2) These devices must accept any interference received, including interference that may cause undesired operation.

NOTE: The equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If the equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Re-orient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

To maintain compliance with FCC's RF exposure guidelines, at least 20cm of separation distance between the device and the user's body must be always maintained.

FCC Radiation Exposure Statement

This device complies with FCC radiation exposure limits set forth for an uncontrolled environment and it also complies with Part 15 of the FCC RF Rules. This equipment must be installed and operated in accordance with the instructions provided, and the antenna(s) used for this transmitter must be installed to provide a separation distance of at least 20 cm from all persons and must not be co-located or operating in conjunction with any other antenna or transmitter. End-users and installers must be provided with antenna installation instructions and consider removing the no-collocation statement.

Caution

Any changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

5 Hardware Features

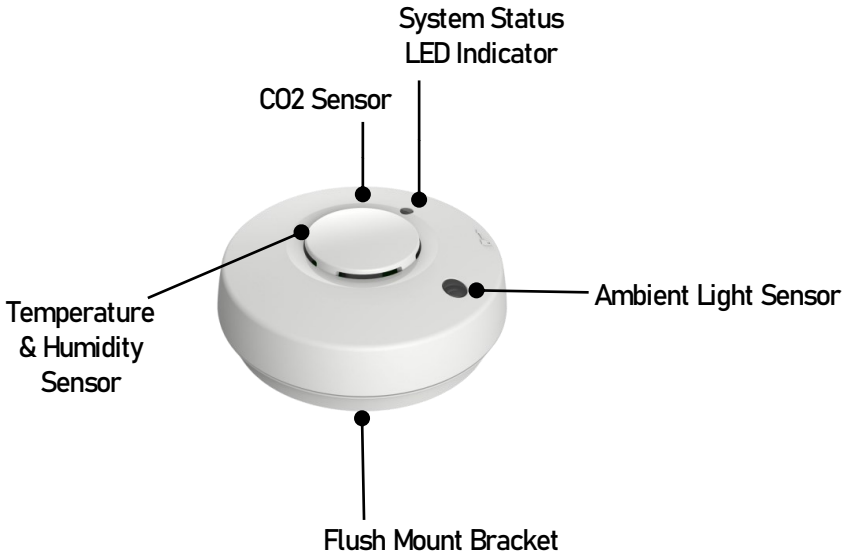


Figure 1 - Modbus CO2 Sensor Hardware Features

Label	Description
Temperature & Humidity Sensor	Measure Temperature and Humidity
CO2 Sensor	Measure Carbon Dioxide
Ambient Light Sensor	Measure the light brightness (lux)
System Status LED Indicator	Modbus status LED. Refer to section 10 for more details

Table 3 - Hardware Labels & Description

6 Sensor Configuration and Installation

Please visit https://brtsys.com/resources/software/utility-tools to access the Modbus Configuration Utility guide on how to configure the device name, device address and termination settings before using it for your specific application.

6.1 Connection Diagram for Standard Modbus Power Supply

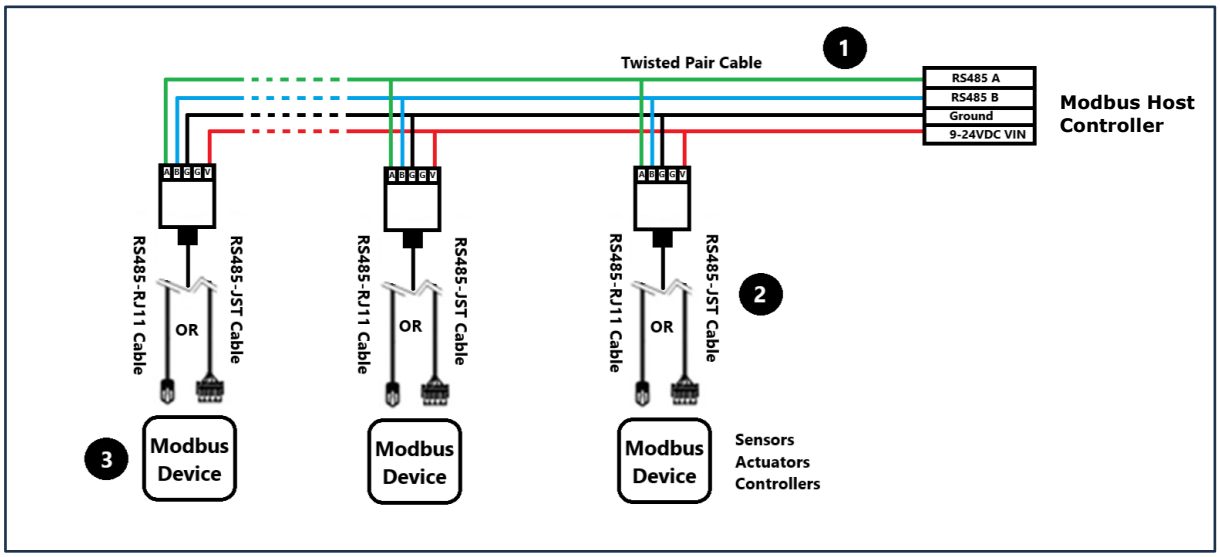


Figure 2 - Connection Diagram for Standard Modbus Power Supply

Setup Instructions:

1. Use a Cat5e/Cat6e RJ45 Twisted Pair Cable to connect the Modbus controller (Host) to the network for RS485 communication and power.

2. Connect each Modbus device to the network using either an RS485-JST cable or an RS485-RJ11 cable, as provided with the device.

3. BRTSys Modbus devices have built-in bus termination resistors. These resistors can be enabled or disabled by using the BRTSys Modbus Configuration Utility. When installing the device as the last device on the bus, these terminations may be used to terminate the bus.

6.2 RS485-JST Cable(30cm)

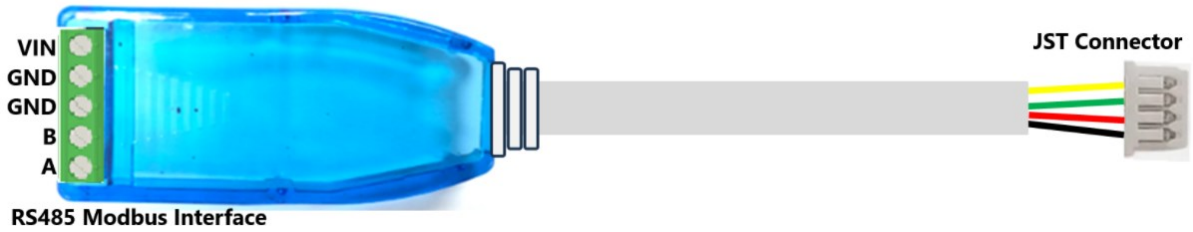


Figure 3 - RS485-JST Cable(30cm)

PIN Legend	Function
VIN	Modbus Input Voltage 9-24VDC
GND	Ground
GND	Ground
B	RS485-B
A	RS485-A

Table 4 - RS485-JST Cable(30cm) Pin Configuration

7 Mounting Instructions

The flush mount is the default sensor setup included in the package. Use the mounting instructions in section 7.1**Error! Reference source not found.** for the flush mount method.

The swivel mount is an optional setup that requires purchasing the swivel mount bracket. Follow the mounting instructions in section 7.2 for the swivel mount method.

Make sure the device has been configured using the Modbus Configuration Utility before mounting.

7.1 Flush Mount

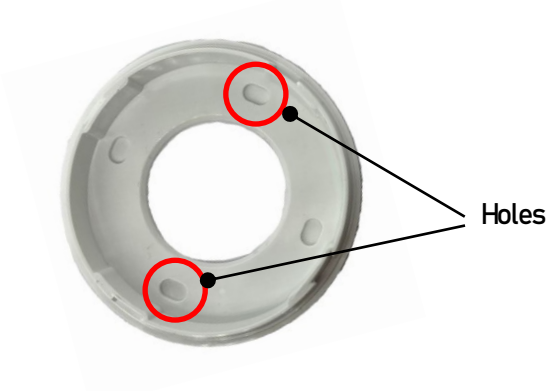
The flush mounting procedure assumes a flat hollow surface behind which the RS485-JST cable is concealed and made accessible through an opening. Figure 4 shows the front face of the Modbus CO2 Sensor device. Note the lock/unlock direction on the cover.

Figure 4 - Modbus CO2 Sensor

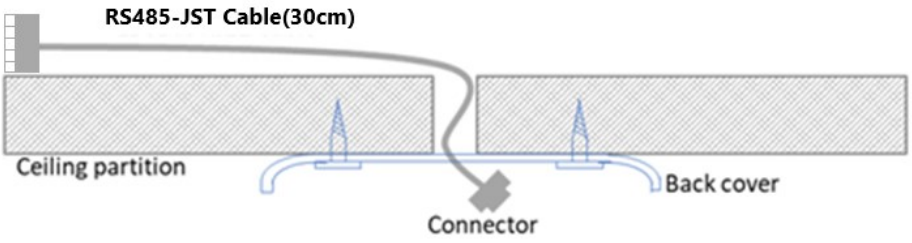
Follow these steps to fix the flush mount –

1. Unlock the back cover. Twist the top cover in the anticlockwise direction to unlock.

2. Make two holes in the back cover using the indentations as guides.

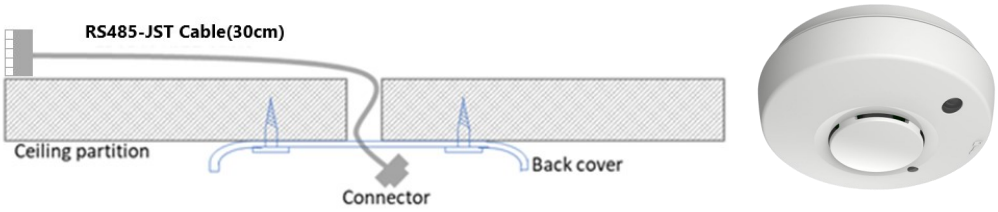


3. Prepare the ceiling and route the RS485-JST cable through the ceiling opening. Run the RS485-JST cable through the centre (hole) of the back cover and fasten the back cover to the ceiling with self-tapping screws as shown in the picture below –



4. Attach the cable to the JST connector of the sensor.

5. Twist the front face in a clockwise direction to attach it to the back cover and lock it.



7.2 Swivel Mount

The swivel mount is shown in Figure 5.

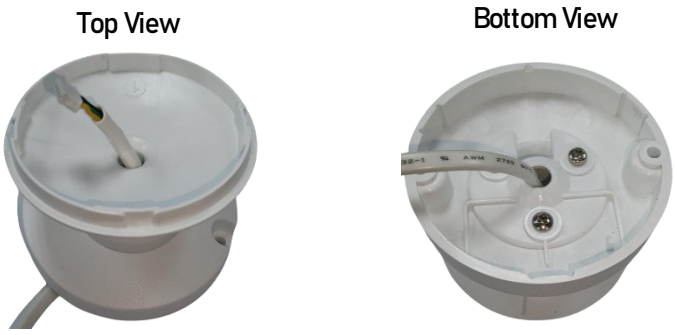


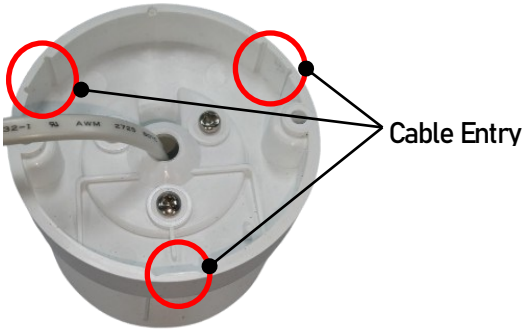
Figure 5 - Modbus CO2 Sensor – Swivel Mount – Top & Bottom View

Angle of Rotation:

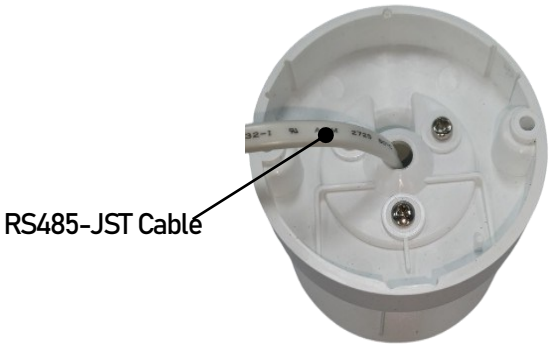
Figure 6 - Modbus CO2 Sensor – Swivel Mount – Angle of Rotation

Follow these steps to fix the swivel mount –

1. Choose the position for the wall mount and drill holes for mounting the swivel mount on the wall.
2. Route and affix the RJ11-JST cable on the wall through a buried or wall mounted conduit to butt against the base of the swivel mount.
3. Break off one of the three cable entry locations on the base plate for cable routing.



4. Push through the RS485-JST cable in the bottom hole (Swivel Mount bottom section) as shown in the below picture.



5. Fasten the swivel mount to the wall using the mounting screws. Ensure that the cable is sitting in the cable entry slot.
6. Unlock the back cover. Twist the top cover in the anticlockwise direction to unlock.

7. Connect the JST cable from the top section of the swivel mount to the JST connector located on the back of the device.

8. Attach the device to the top section of the swivel mount.

9. Turn the device clockwise to secure it to the swivel mount.

8 Modbus Registers

Parameter	Starting Address	Quantity of Registers	Supported Function Code	Parameter Range and Description	Default
Address	0000H	1	0x03/0x10	1 to 126	126
RS485 Termination	0001H	1	0x03/0x10	0 - Termination OFF 1 - Termination ON	Termination OFF
Baud Rate	0002H	1	0x03/0x10	0 - 1200 bps 1 - 2400 bps 2 - 4800 bps 3 - 9600 bps 4 -19200 bps 5 - 38400 bps 6 -115200 bps	9600 bps
Parity	0003H	1	0x03/0x10	0 – None 1 – Odd 2 - Even	Even
Status LED Enable	0004H	1	0x03/0x10	0 - LED OFF 1 - LED ON	LED ON
Sensor Calibrated Date	0005H	2	0x03/0x10	Calibration date YYYYMMDD 0x20221203	N/A
Sensor Calibrated Const	0007H	1	0x03/0x10	Constant value = 0x0004	0x0004
Sensor Calibrated CO2 Calibrated CO2	0008H	1	0x03/0x10	Offset value 400 to 65535ppm	N/A
CAL XOR Checksum Value	0009H	1	0x03/0x10	XOR Checksum from register 05H to 08H	N/A
Device UUID	0026H	8	0x03	MSxxxxxxxxxxxxyy where x is ASCII character and yy is 16-bit running number	N/A
Device Firmware Version	002EH	1	0x03	0xXXMN XX – Not concerned M – Major N - Minor	N/A
Device Part Number	002FH	1	0x03	Device ID	0x8011
Reserved	0030H				
CO2	0031H	1	0x03	400 - 2000 ppm	N/A
Temperature	0032H	1	0x03	-1000 to 6000 (-10.00°C to 60°C)	N/A
Humidity	0033H	1	0x03	0 to 9999 (0% to 99.99%)	N/A
Luminance	0034H	2	0x03	0 to 100000 lux	N/A
Reset	0150H	1	0x06	Write 1 to reset	N/A
Reserved	0151H	N/A	N/A	Reserved	N/A
Identify	0152H	1	0x06	Write 1 to start blinking the device @1Hz for 10 seconds	N/A

Table 5 - Modbus Registers

9 Mechanical Dimensions

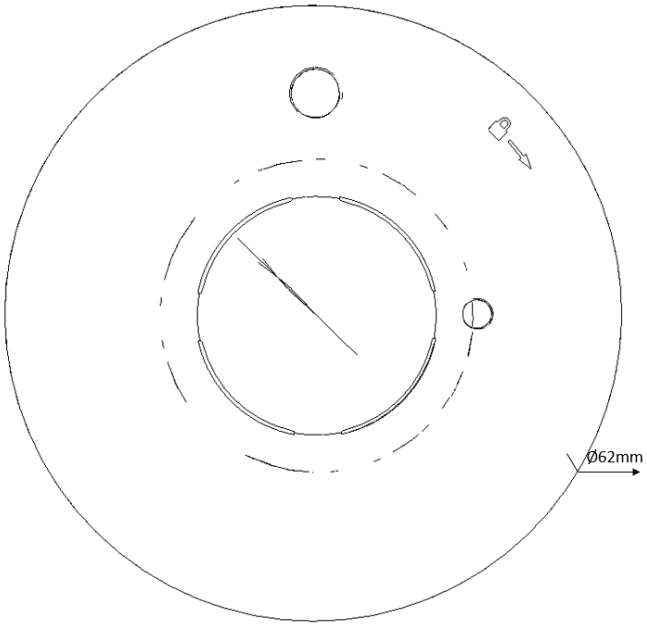


Figure 7 - Modbus CO2 Sensor Dimension – Top View

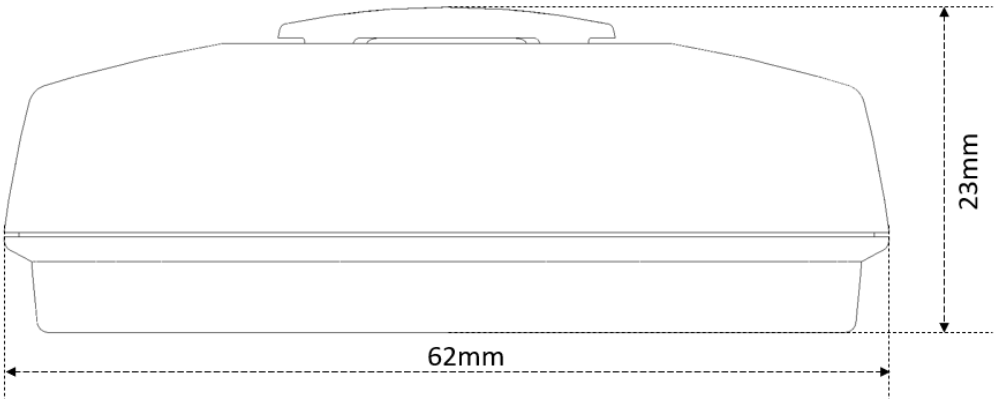


Figure 8 - Modbus CO2 Sensor Dimension – Side View Flush Mount

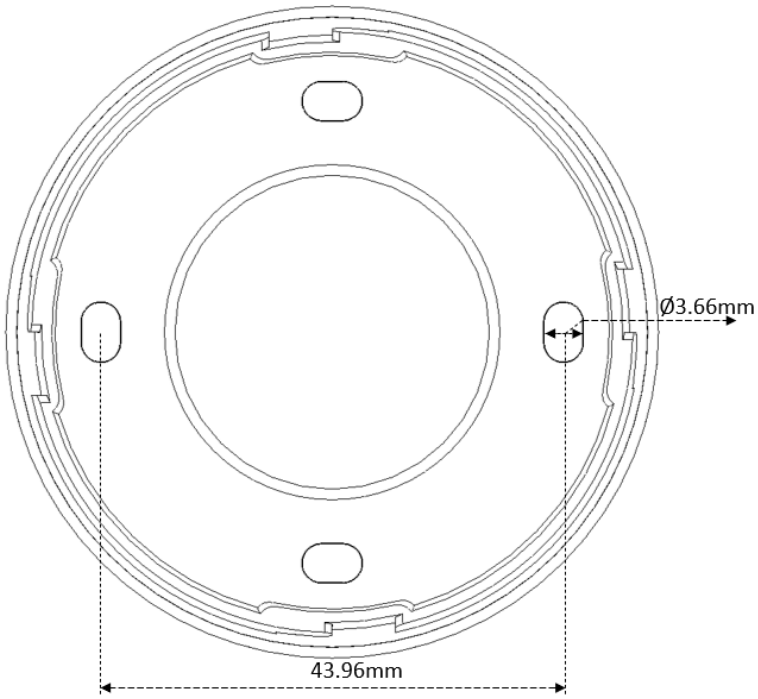


Figure 9 - Modbus CO2 Sensor Mounting Holes – Flush Mount

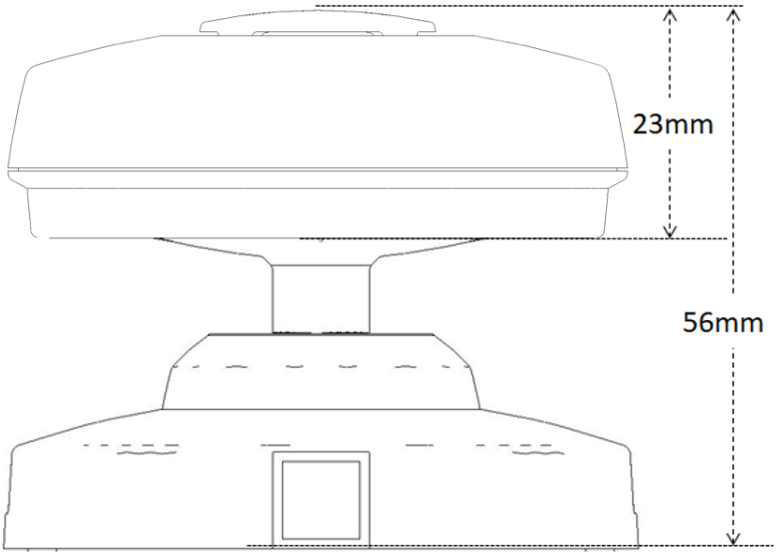


Figure 10 - Modbus CO2 Sensor Dimension – Side View- Swivel Mount

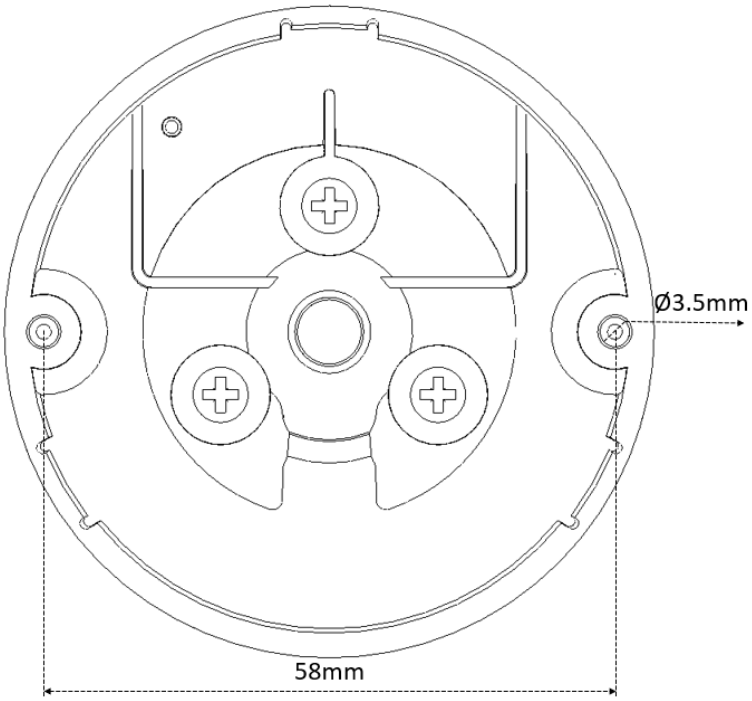


Figure 11 - Modbus CO2 Sensor Mounting Holes – Swivel Mount

Note: All dimensions are in millimeters.

10 System Status LED Indicators

Device Status	LED Color		Flashing Frequency	Description
Termination ON	BLUE		Steady – Non-flashing	
Termination OFF	GREEN		Steady – Non-flashing	
Device Configuration Error	RED		Steady – Non-flashing	Device configuration error
Communication	RED/GREEN/ BLUE/YELLOW	-	Blink twice (Short blink)	Device in communication
Firmware update	YELLOW		Steady – Non-flashing	Device firmware update.

Table 6 - System Status LED Indicators

Note:

1. For reliable communication, ensure that the power supply and the RS485 termination settings are correct.
2. Ensure that the Modbus address and baud rate are configured correctly before deployment.

11 Contact Information

Refer to https://brtsys.com/contact-us/ for contact information.

Appendix A – References

Document References

Modbus Configuration Utility User Guide

Acronyms and Abbreviations

Terms	Description
C02	Carbon dioxide
DC	Direct Current
LED	Light Emitting Diode
UUID	Universally Unique Identifier
RTU	Remote Terminal Unit
PPM	Parts Per Million

Appendix B – List of Figures and Tables

List of Figures

List of Tables

Appendix C – Revision History

Document Title: Modbus CO2 Sensor Datasheet

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Product Page: https://brtsys.com/product-category/sensors/

Document Feedback: Send Feedback

Revision	Changes	Date
Version 1.0	Initial Release	03-01-2025
Version 1.1	Updated Release	22-05-2025