

## Product Datasheet - Technical Specifications



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# Modbus EC Sensor Adapter Datasheet



## 1 Introduction

The Modbus **E**lectrical **C**onductivity (EC) Sensor Adapter is designed to work with EC probes to form a complete EC sensor. The adapter consists of built-in BNC connector used to attach EC probes.

The adapter and probe are calibrated using a two-point calibration procedure and the resulting sensor supports EC measurements ranging from 0.001mS/cm to 150mS/cm with a 0.001 mS/cm resolution.

The sensor is suitable for use in measuring salts, nutrients, and impurities in water in hydroponics, aquaponics and aquaculture and freshwater systems. Monitoring, alerting, and controlling the system can be done in real-time.

## 1.1 Features

- Supports Probe Cell Constant  $K=0.1$ ,  $K=1.0$  and  $K=10$  probes with BNC connectors
- Measures EC range of 0.001mS/cm to 150mS/cm with linearized output and 0.001mS/cm resolution
- 2 Point step-by-step guided calibration
- Implements Modbus RTU protocol
- High report rate of 1 report every 5 seconds
- Low power consumption 5V-91mW
- Operating temperature range: 0°C to +70°C
- Flush mount and DIN Rail Mount options



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## 2 Part Numbers / Ordering Information

| Part Number | Description                    |
|-------------|--------------------------------|
| MS-0501-01A | Modbus EC Sensor Adapter       |
| MA-0102-01A | Modbus RS485-RJ11 Cable (30cm) |
| LA-1201-01A | LDSBus DIN Rail Mount Set      |

**Table 1 - Part Numbers / Ordering Information**

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### 3 Specifications

|                                 |                           |                                                                        |
|---------------------------------|---------------------------|------------------------------------------------------------------------|
| <b>Features</b>                 | Interface                 | BNC – EC probe connector<br>RS485 Modbus RTU                           |
|                                 | LED Indicator (RGB)       | System Status Indicator (Please refer to <a href="#">LED section</a> ) |
|                                 | Mounting                  | Flush Mount<br>DIN Rail Mount                                          |
| <b>Power</b>                    | Modbus Voltage            | 9-24V DC Bus Power                                                     |
|                                 | Device Input Voltage      | 5V DC Bus Power                                                        |
|                                 | Typical Power             | 5V 91mW                                                                |
|                                 | Max. Power                | 266mW                                                                  |
| <b>EC Sensor input module</b>   | Detection Range           | 0.001 – 150mS/cm                                                       |
|                                 | Resolution                | 0.001mS/cm                                                             |
|                                 | Response Time             | <1Minute                                                               |
|                                 | Calibration               | 2 Point Calibration                                                    |
| <b>Physical Characteristics</b> | Color                     | White                                                                  |
|                                 | Housing                   | Polycarbonate                                                          |
|                                 | Dimensions                | L117.6mm x W42.9mm x H29.7mm                                           |
| <b>Environmental Limits</b>     | Operating Temperature     | 0 to 70°C                                                              |
|                                 | Storage Temperature       | -20 to 85°C                                                            |
|                                 | Ambient Relative Humidity | 5 to 95% (non-condensing)                                              |
| <b>Package Contents</b>         | Device                    | 1x Modbus EC Sensor Adapter                                            |
|                                 | Wire Assembly             | 1X Modbus RS485-RJ11 Cable(30cm)                                       |
| <b>Optional</b>                 | Mounting Accessories      | 1x LDSBus DIN Rail Mount set                                           |

**Table 2 - Modbus EC Sensor Adapter 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

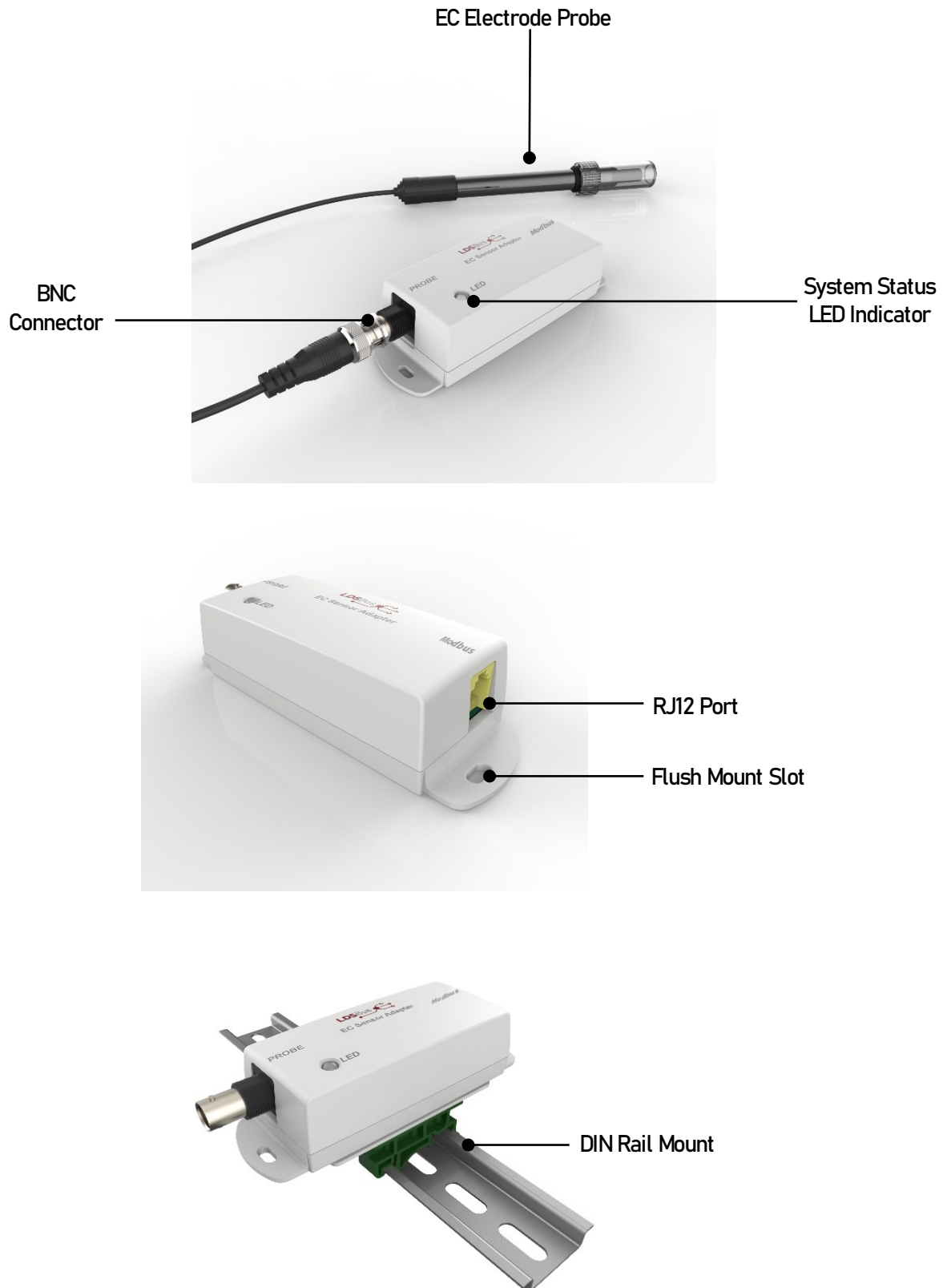
This device complies with FCC radiation exposure limits set forth for an uncontrolled environment and it also complies with Part 15 of the FCC RF Rules. This equipment must be installed and operated in accordance with the instructions provided, and the antenna(s) used for this transmitter must be installed 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 EC Sensor Adapter Hardware Features**

| Function                    | Labels | Description                                                                                                 |
|-----------------------------|--------|-------------------------------------------------------------------------------------------------------------|
| BNC Connector               | Probe  | Probe Interface                                                                                             |
| EC Electrode Probe          | -      | Sensing probe                                                                                               |
| System Status LED Indicator | LED    | Modbus status LED                                                                                           |
| RJ12 Port                   | Modbus | Modbus data and power interface port. The physical port is RJ12. The connection interface can be RJ11/RJ12. |

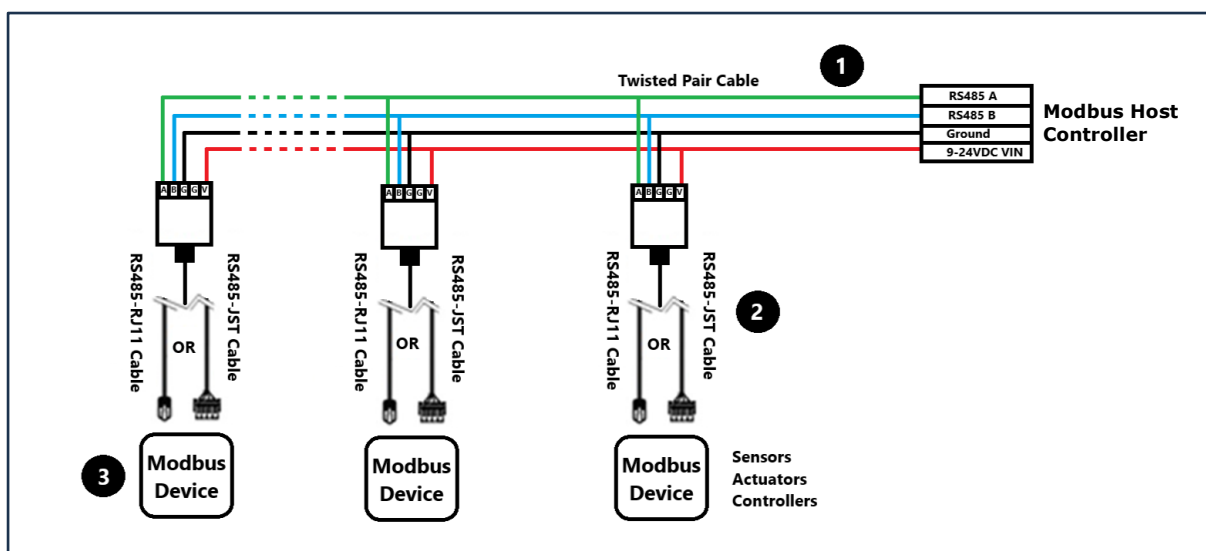
**Table 3 - Modbus EC Sensor Adapter Hardware Features**



## 6 Sensor Adapter 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

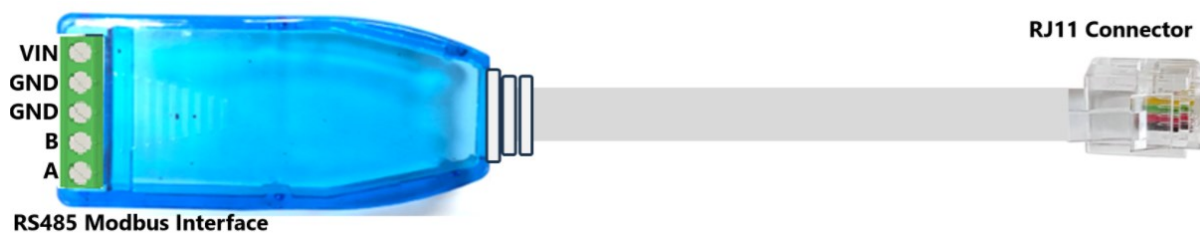


**Figure 2 - Connection Diagram for Standard Modbus Power Supply**

#### **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-RJ11 Cable(30cm)



**Figure 3 - RS485-RJ11 Cable(30cm)**

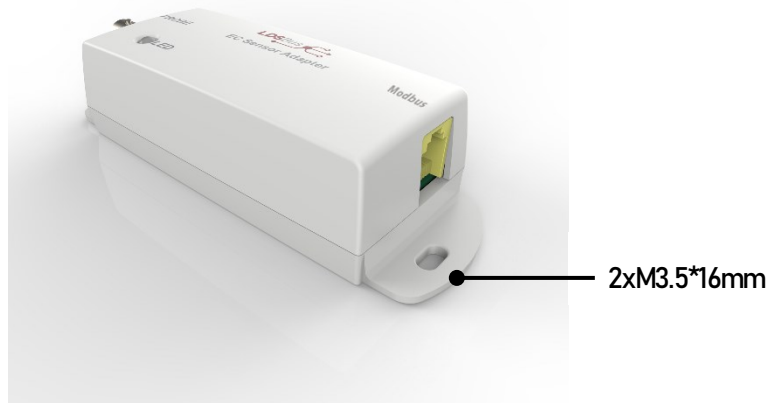
| PIN Legend | Function                     |
|------------|------------------------------|
| VIN        | Modbus Input Voltage 9-24VDC |
| GND        | Ground                       |
| GND        | Ground                       |
| B          | RS485-B                      |
| A          | RS485-A  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

**Table 4 - RS485-RJ11 Cable(30cm) Pin Configuration**

## 7 Mounting Instructions

### 7.1 Flush Mount

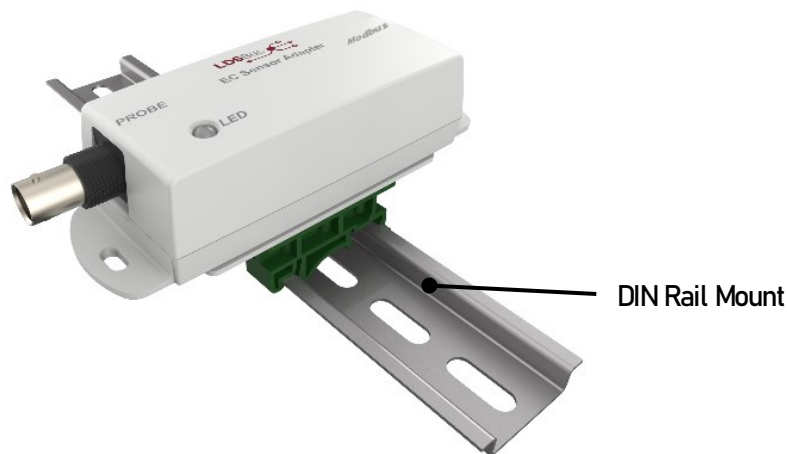
The device can be flush mounted directly on a wall or any flat surface using 2 M3.5\*16mm (thread) screws.



**Figure 4 - Modbus EC Sensor Adapter Flush Mount**

### 7.2 DIN Rail Mount

The device can be fixed using a DIN Rail bracket that has two mounting holes. The package includes mounting screws and a backplate. (The DIN Rail Bracket is not included in the package).



**Figure 5 - Modbus EC Sensor Adapter DIN Rail Mount**

## 8 Modbus Registers

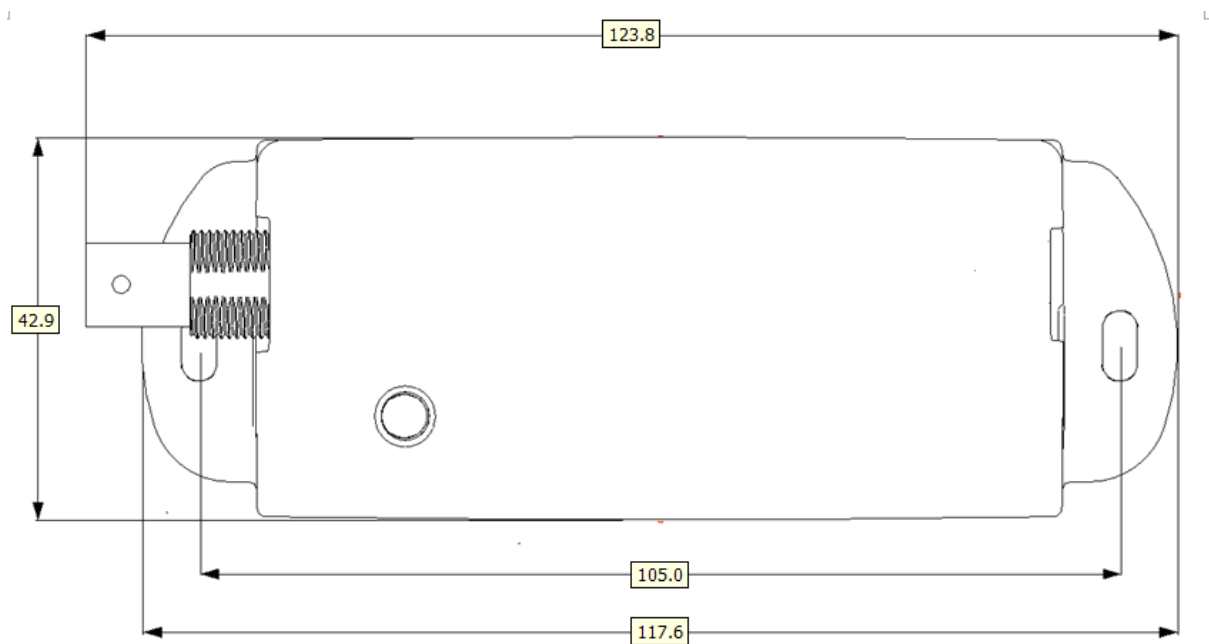
| Parameter                                           | Starting Address | Quantity of Registers | Supported Function Code | Parameter Range and Description                                                                                  | Default         |
|-----------------------------------------------------|------------------|-----------------------|-------------------------|------------------------------------------------------------------------------------------------------------------|-----------------|
| <b>Address<sup>(1)</sup></b>                        | 0000H            | 1                     | 0x03/0x10               | 1 to 126                                                                                                         | 126             |
| <b>RS485 Termination<sup>(1)</sup></b>              | 0001H            | 1                     | 0x03/0x10               | 0 - Termination OFF<br>1 - Termination ON                                                                        | Termination OFF |
| <b>Baud Rate<sup>(1)</sup></b>                      | 0002H            | 1                     | 0x03/0x10               | 0 - 1200 bps<br>1 - 2400 bps<br>2 - 4800 bps<br>3 - 9600 bps<br>4 - 19200 bps<br>5 - 38400 bps<br>6 - 115200 bps | 9600 bps        |
| <b>Parity<sup>(1)</sup></b>                         | 0003H            | 1                     | 0x03/0x10               | 0 - None<br>1 - Odd<br>2 - Even                                                                                  | Even            |
| <b>Status LED Enable<sup>(1)</sup></b>              | 0004H            | 1                     | 0x03/0x10               | 0 - LED OFF<br>1 - LED ON                                                                                        | LED ON          |
| <b>Measuring Temperature</b>                        | 0005H            | 1                     | 0x03/0x10               | Measuring Temperature                                                                                            | 25°C            |
| <b>Sensor Calibration Version</b>                   | 0006H            | 1                     | 0x03/0x10               | Calibration version<br>0x0090                                                                                    | 0x0090          |
| <b>Sensor Calibrated Date</b>                       | 0007H            | 2                     | 0x03/0x10               | Calibration date<br>YYYYMMDD<br>0x20221203                                                                       | N/A             |
| <b>Sensor Calibrated Constant</b>                   | 0009H            | 1                     | 0x03/0x10               | Constant value =<br>0x0020                                                                                       | 0x0020          |
| <b>Sensor Calibrated ADC (1<sup>st</sup> Point)</b> | 000AH            | 2                     | 0x03/0x10               | Calibrated 1 <sup>st</sup> buffer<br>solution ADC value                                                          | N/A             |
| <b>Sensor Calibrated EC (1<sup>st</sup> Point)</b>  | 000CH            | 2                     | 0x03/0x10               | Calibrated 1 <sup>st</sup> buffer<br>solution EC value                                                           | N/A             |
| <b>Sensor Calibrated ADC (2<sup>nd</sup> Point)</b> | 000EH            | 2                     | 0x03/0x10               | Calibrated 2 <sup>nd</sup> buffer<br>solution ADC value                                                          | N/A             |
| <b>Sensor Calibrated EC (2<sup>nd</sup> Point)</b>  | 0010H            | 2                     | 0x03/0x10               | Calibrated 2 <sup>nd</sup> buffer<br>solution EC value                                                           | N/A             |
| <b>Sensor Calibrated Slope</b>                      | 0012H            | 2                     | 0x03/0x10               | Calibrated slope                                                                                                 | N/A             |
| <b>Sensor Calibrated Origin</b>                     | 0014H            | 2                     | 0x03/0x10               | Calibrated origin                                                                                                | N/A             |
| <b>Sensor Calibrated Probe</b>                      | 0016H            | 2                     | 0x03/0x10               | Calibrated probe                                                                                                 | N/A             |
| <b>Sensor Calibrated Temperature</b>                | 0018H            | 2                     | 0x03/0x10               | Calibrated temperature                                                                                           | N/A             |
| <b>Calibration XOR Checksum</b>                     | 001AH            | 1                     | 0x03/0x10               | XOR Checksum 06H to<br>19H                                                                                       | N/A             |
| <b>Device UUID</b>                                  | 0026H            | 8                     | 0x03                    | MSxxxxxxxxxyy<br>where x is ASCII<br>character and yy is 16-<br>bit running<br>number                            | N/A             |
| <b>Device Firmware Version</b>                      | 002EH            | 1                     | 0x03                    | 0xXXMN<br>XX - Not concerned<br>M - Major<br>N - Minor                                                           | N/A             |
| <b>Device Part Number</b>                           | 002FH            | 1                     | 0x03                    | Device ID                                                                                                        | 0x8009          |
| <b>Reserved</b>                                     | 0030H            | N/A                   | N/A                     | Reserved                                                                                                         | N/A             |
| <b>EC</b>                                           | 0031H            | 1                     | 0x03                    | 0.001mS/cm to<br>150mS/cm                                                                                        | N/A             |
| <b>Sensor ADC data</b>                              | 0032H            | 1                     | 0x03                    | 0 to 1023                                                                                                        | N/A             |
| <b>Reset</b>                                        | 0150H            | 1                     | 0x06                    | Write 1 to reset                                                                                                 | N/A             |
| <b>Reserved</b>                                     | 0151H            | N/A                   | N/A                     | Reserved                                                                                                         | N/A             |

|                 |       |   |      |                                                                |     |
|-----------------|-------|---|------|----------------------------------------------------------------|-----|
| <b>Identify</b> | 0152H | 1 | 0x06 | Write 1 to start<br>blinking the device<br>@1Hz for 10 seconds | N/A |
|-----------------|-------|---|------|----------------------------------------------------------------|-----|

**Table 5 - Modbus Registers**

<sup>(1)</sup>This indicates that any updates to these communication/status register(s) will only take effect after the device has been rebooted.

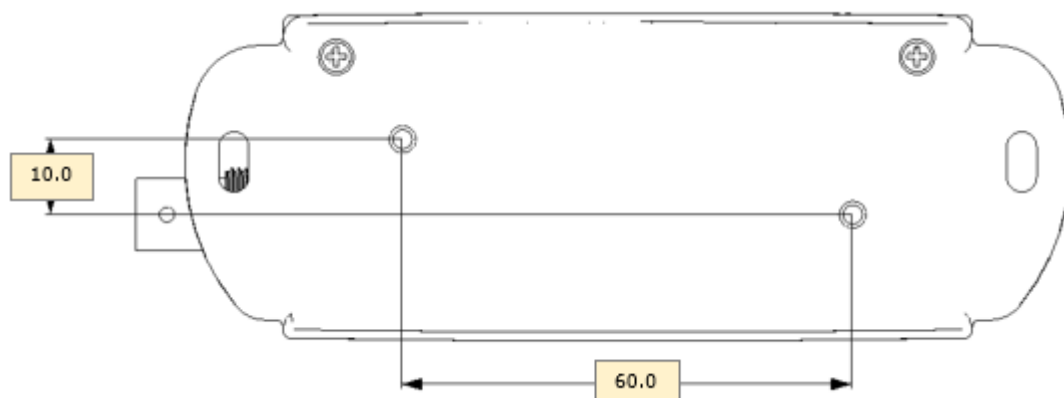
## 9 Mechanical Dimensions



**Figure 6 - Modbus EC Sensor Adapter Dimension – Top View**



**Figure 7 - Modbus EC Sensor Adapter Dimension – Side View**



**Figure 8 - Modbus EC Sensor Adapter Dimension – Bottom View**

**Note:** All dimensions are in millimetres.

## 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/<br>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 Probe Selection

The following specifications are recommended for selecting a Probe -

|                 |   |                        |
|-----------------|---|------------------------|
| Detection Range | : | 0.001mS/cm to 1.5mS/cm |
| Cell Constant   | : | K=0.1                  |
| Detection Range | : | 0.05mS/cm to 15mS/cm   |
| Cell Constant   | : | K=1.0                  |
| Detection Range | : | 0.5mS/cm to 150mS/cm   |
| Cell Constant   | : | K=10                   |
| Connector       | : | BNC                    |

For information related to probes recommendation and selection criteria, please refer to [LDSBus Probe Specifications](#).



## 12 Contact Information

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

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## Appendix A – References

### Document References

[Modbus Configuration Utility User Guide](#)

[LDSBus Probe Specifications](#)

### Acronyms and Abbreviations

| Terms | Description                  |
|-------|------------------------------|
| EC    | Electrical Conductivity      |
| LED   | Light Emitting Diode         |
| mS/cm | milli Siemens per centimeter |

## **Appendix B – List of Figures and Tables**

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## Appendix C – Revision History

Document Title: Modbus EC Sensor Adapter Datasheet

Document Reference No.: BRTSYS\_000184

Clearance No.: BRTSYS#105

Product Page: <https://brtsys.com/product-category/adapters/>

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| Revision    | Changes                                                                                                                                                                                  | Date       |
|-------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|
| Version 1.0 | Initial Release                                                                                                                                                                          | 18-06-2025 |
| Version 1.1 | Added a note (under Modbus Registers table) to highlight that that any updates to some of the communication/status register(s) will only take effect after the device has been rebooted. | 09-07-2025 |