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

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

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

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

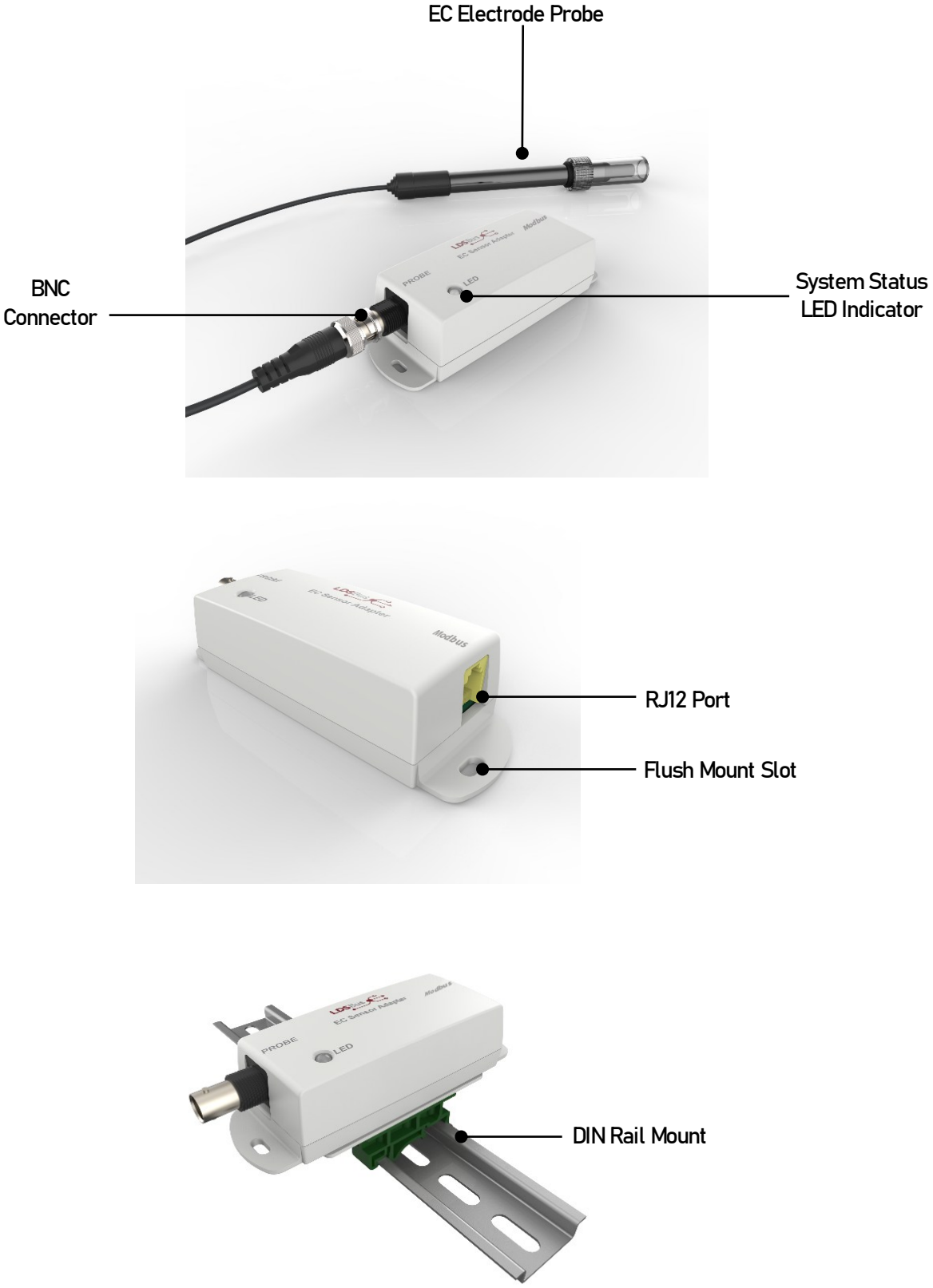

Figure 1 - Modbus EC Sensor Adapter Hardware Features

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

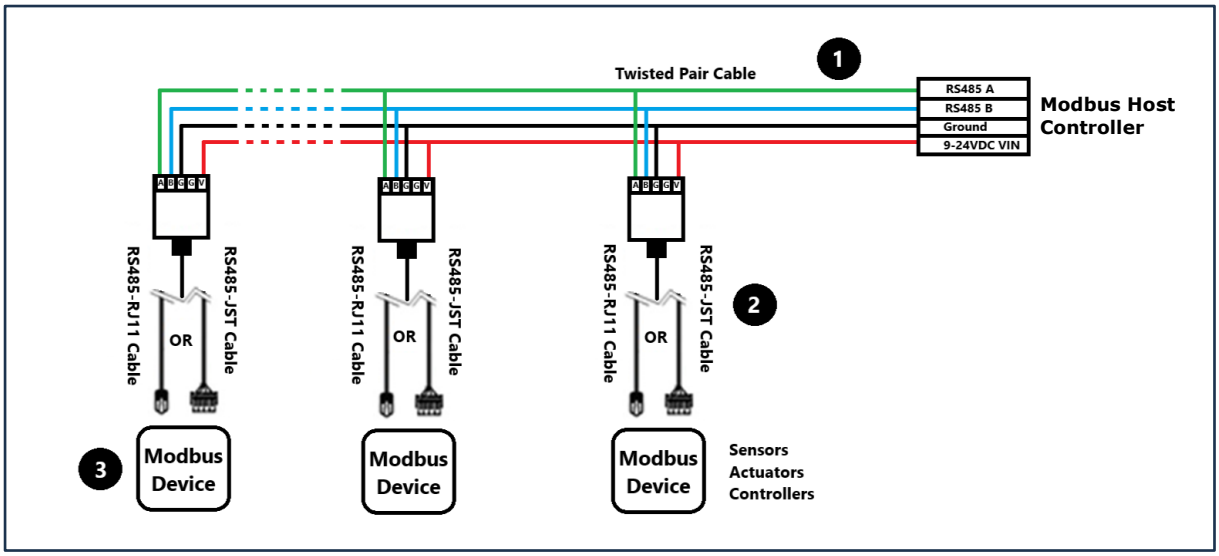

Figure 2 - Connection Diagram for Standard Modbus Power Supply

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.

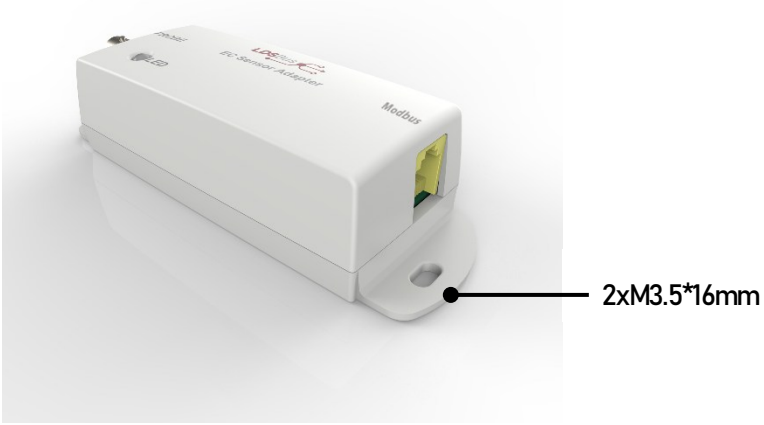

Figure 4 - Modbus EC Sensor Adapter Flush Mount

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).

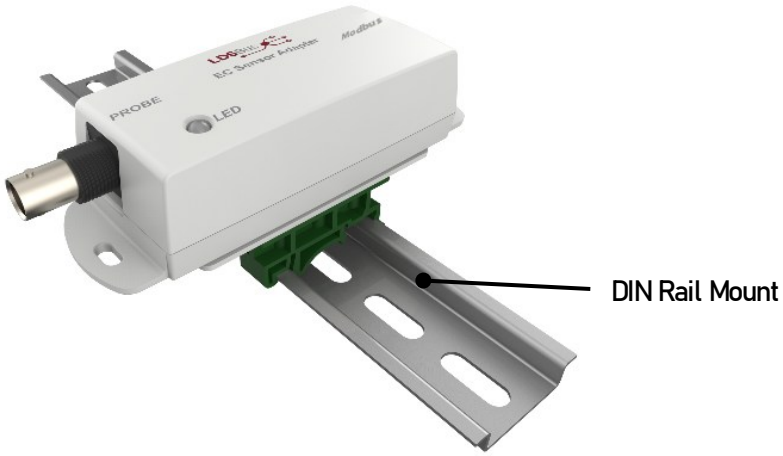

Figure 5 - Modbus EC Sensor Adapter DIN Rail Mount

8 Modbus Registers

Parameter	Starting Address	Quantity of Registers	Supported Function Code	Parameter Range and Description	Default
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
Measuring Temperature	0005H	1	0x03/0x10	Measuring Temperature	25°C
Sensor Calibration Version	0006H	1	0x03/0x10	Calibration version 0x0090	0x0090
Sensor Calibrated Date	0007H	2	0x03/0x10	Calibration date YYYYMMDD 0x20221203	N/A
Sensor Calibrated Constant	0009H	1	0x03/0x10	Constant value = 0x0020	0x0020
Sensor Calibrated ADC (1st Point)	000AH	2	0x03/0x10	Calibrated 1st buffer solution ADC value	N/A
Sensor Calibrated EC (1st Point)	000CH	2	0x03/0x10	Calibrated 1st buffer solution EC value	N/A
Sensor Calibrated ADC (2nd Point)	000EH	2	0x03/0x10	Calibrated 2nd buffer solution ADC value	N/A
Sensor Calibrated EC (2nd Point)	0010H	2	0x03/0x10	Calibrated 2nd buffer solution EC value	N/A
Sensor Calibrated Slope	0012H	2	0x03/0x10	Calibrated slope	N/A
Sensor Calibrated Origin	0014H	2	0x03/0x10	Calibrated origin	N/A
Sensor Calibrated Probe	0016H	2	0x03/0x10	Calibrated probe	N/A
Sensor Calibrated Temperature	0018H	2	0x03/0x10	Calibrated temperature	N/A
Calibration XOR Checksum	001AH	1	0x03/0x10	XOR Checksum 06H to 19H	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	0x8009
Reserved	0030H	N/A	N/A	Reserved	N/A
EC	0031H	1	0x03	0.001mS/cm to 150mS/cm	N/A
Sensor ADC data	0032H	1	0x03	0 to 1023	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

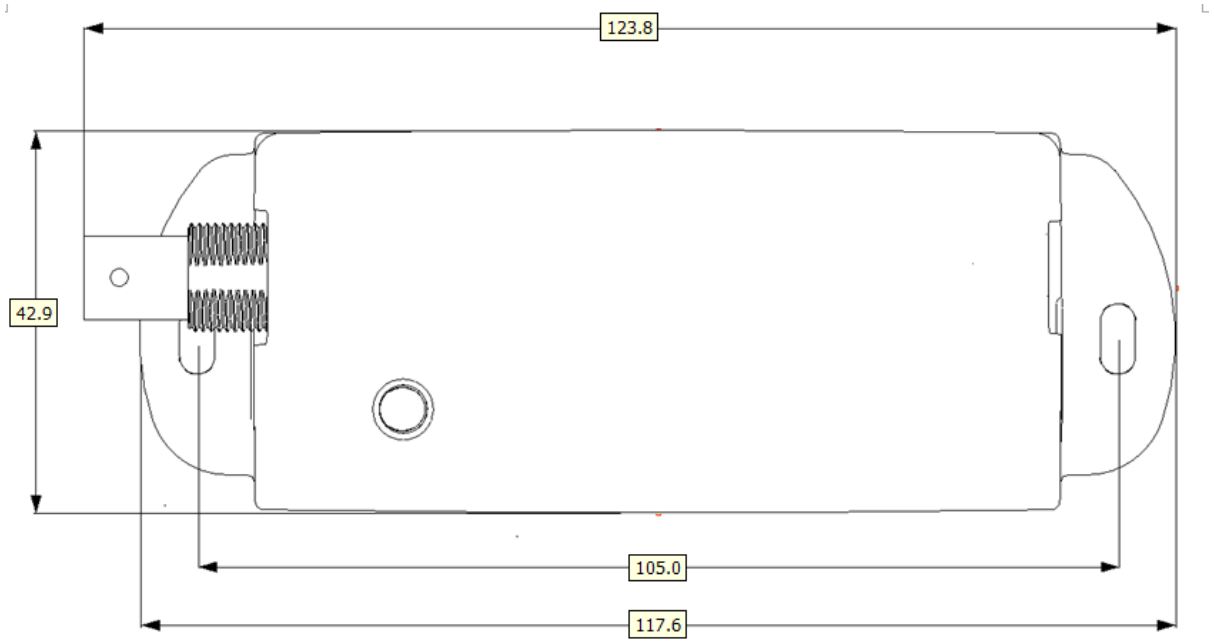

Figure 6 - Modbus EC Sensor Adapter Dimension – Top View

Figure 7 - Modbus EC Sensor Adapter Dimension – Side View

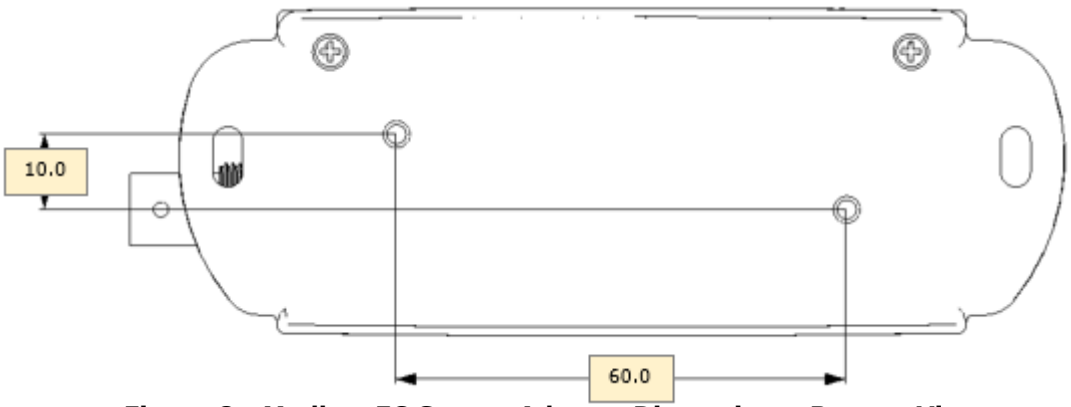

Figure 8 - Modbus EC Sensor Adapter Dimension – Bottom View

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/ 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.

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

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Appendix C – Revision History

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Revision	Changes	Date
Version 1.0	Initial Release	18-06-2025