Modbus Thermocouple Sensor Adapter Datasheet

1 Introduction

The Modbus Thermocouple Sensor Adapter is designed to operate with any K-type thermocouple probe and provides temperature measurements ranging between -200°C to 1372°C with an accuracy of ±0.5°C. The adapter automatically manages all the necessary signal conditioning and analog to digital conversions to produce linearized temperature readings and can sustain high report rates. The Modbus Thermocouple Sensor Adapter may be used in applications such as food production, metal extruders, furnaces, cryogenic baths, and freezers to name a few.

1.1 Features

- Thermocouple Sensor Adapter connects with any K-type Thermocouple probe
- Measures Temperature in the range of -200°C to 1372°C with an accuracy of ±0.5°C
- Automatic cold junction compensation and linearization for high accuracy readings
- Implements Modbus RTU protocol.
- Low power consumption 5V, 85mW
- High report rate of 1 report every 5 seconds
- 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-0301-01A	Modbus Thermocouple Sensor Adapter
MA-0102-01A	Modbus RS485-RJ11 Cable (30cm)
LA-1201-01A	LDSBus DIN Rail Mount Set

Table 1 - Part Numbers / Ordering Information

Table of Contents

3 Specifications

Features	Interface	K-type connector (connect to K-type probe), 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	85mW
	Max. Power	320mW
Thermocouple Sensor input module	Range	-200°C to +1372°C
	Accuracy	±0.5C
	Resolution	0.0625°C/ 0.25°C (Configurable)
	Response Time	<3 seconds
	Thermocouple Type	Type-K
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 Thermocouple Sensor Adapter
	Wire Assembly	1X Modbus RS485-RJ11 Cable(30cm)
Optional	Mounting Accessories	1x DIN Rail Bracket Set

Table 2 - Modbus Thermocouple 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

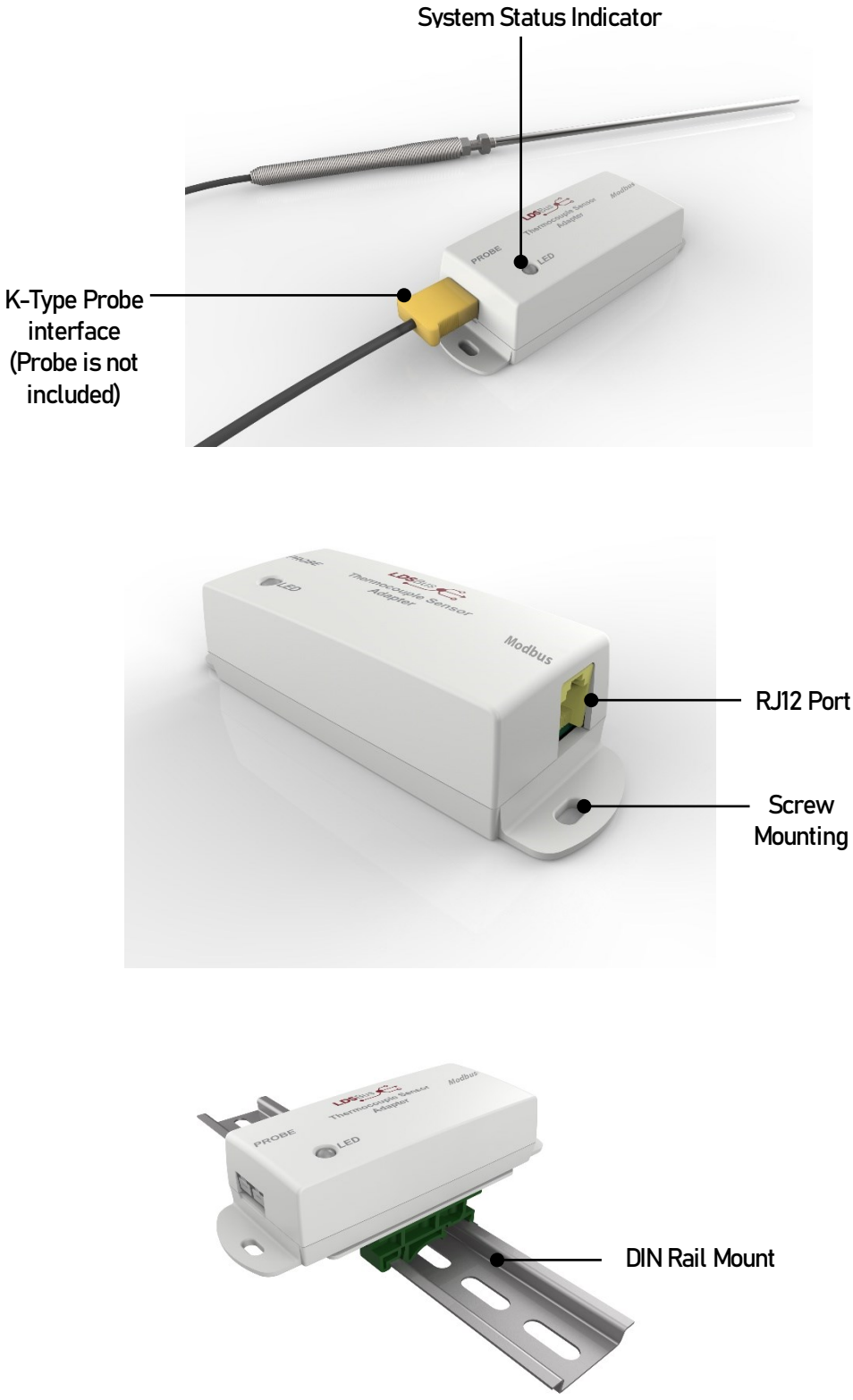

Figure 1 - Modbus Thermocouple Sensor Adapter - Hardware Features

Function	Labels	Description
K-Type Probe Interface	Probe	Probe Interface
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 Thermocouple 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

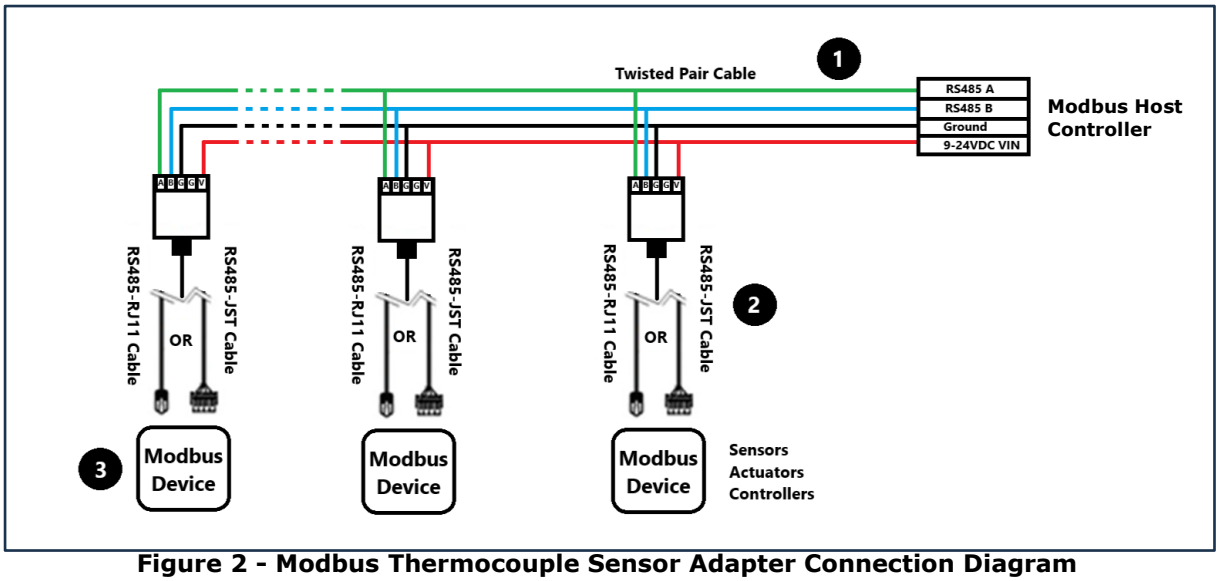

Figure 2 - Modbus Thermocouple Sensor Adapter Connection Diagram

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.

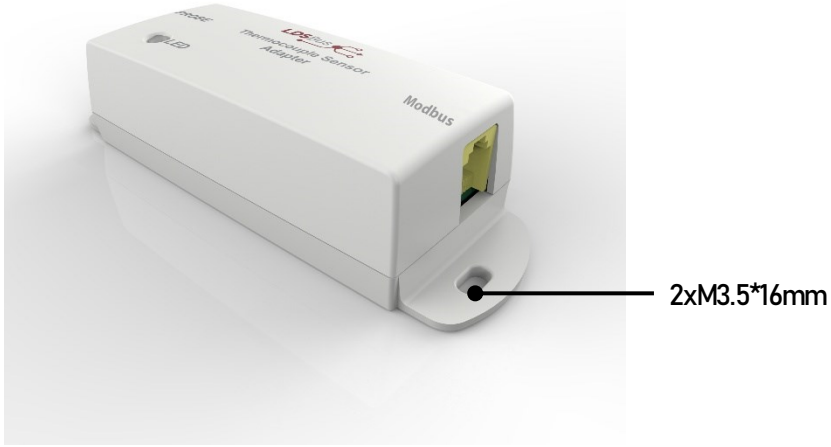

Figure 4 - Modbus Thermocouple Sensor Adapter Flush Mount

7.2 DIN Rail Mount

The device can be mounted on a DIN Rail using the Modbus DIN Rail Mount set. This set is optional and includes the bracket and mounting screws.

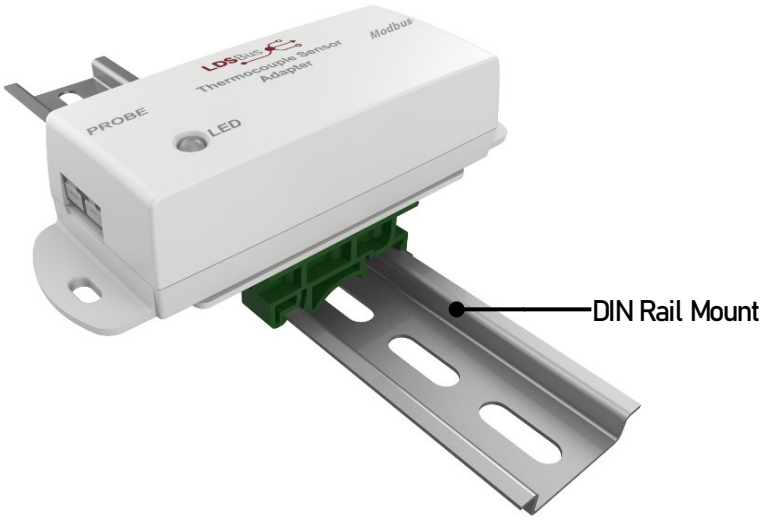

Figure 5 - Modbus Thermocouple Sensor Adapter DIN Rail Mount

8 Modbus Registers

Parameter	Starting Address	Quantity of Registers	Supported Function Code	Parameter Range and Description	Default
Address(1)	0000H	1	0x03/0x10	1 to 126	126
RS485 Termination(1)	0001H	1	0x03/0x10	0 - Termination OFF 1 - Termination ON	Termination OFF
Baud Rate(1)	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(1)	0003H	1	0x03/0x10	0 – None 1 – Odd 2 - Even	Even
Status LED Enable(1)	0004H	1	0x03/0x10	0 - LED OFF 1 - LED ON	LED ON
Device UUID	0026H	8	0x03	MSxxxxxxxxxxxxyy where x is ASCII char 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	0x8001
Reserved	0030H	N/A	N/A	Reserved	N/A
Temperature	0031H	2	0x03	-20000 to 137200 (-200 to 1372°C)	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

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

9 Mechanical Dimensions

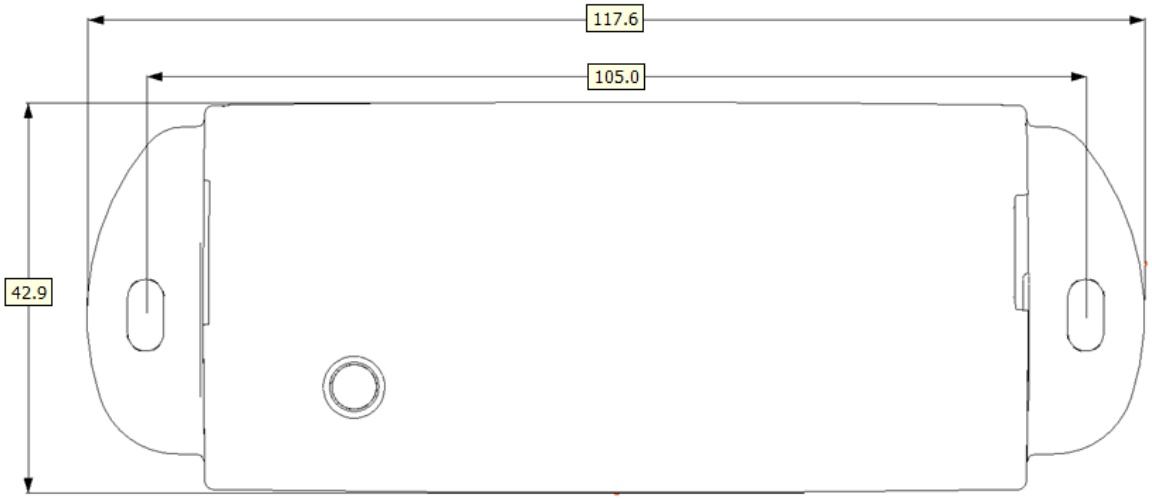

Figure 6 - Modbus Thermocouple Sensor Adapter Dimension – Top View

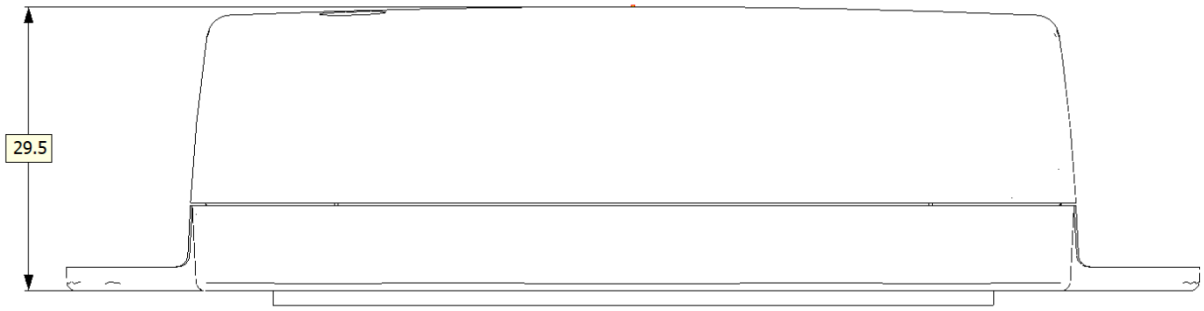

Figure 7 - Modbus Thermocouple Sensor Adapter Dimension – Side View

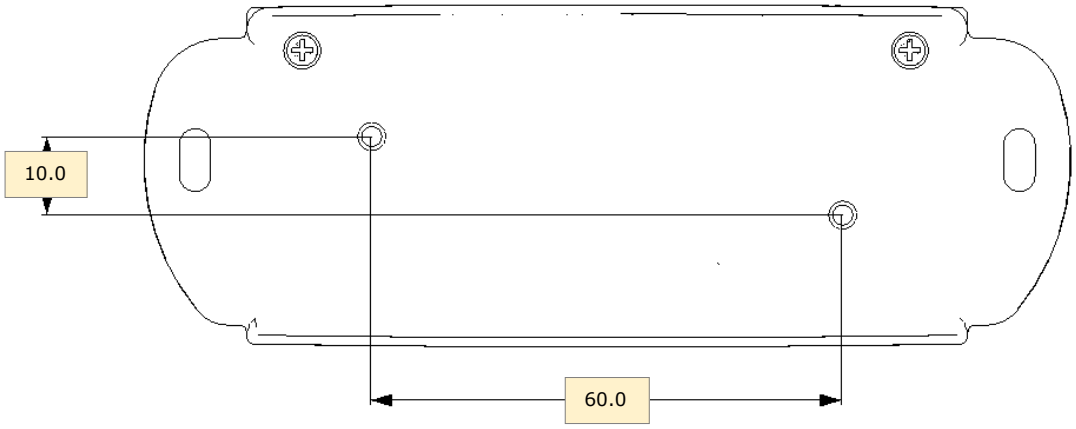

Figure 8 – Modbus Thermocouple Sensor Adapter Dimension – Bottom View

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 Type-K Plug Interface Probe Standard

Table 7 provides a list of Type K Plugs to terminate Type K thermocouple probes for connection to Modbus Thermocouple Sensor Adapter.

'+' Contact	'-' Contact	IEC Miniature		ANSI Miniature		JIS Miniature	
		Color	Green	Color	Yellow	Color	Blue
Nickel Chromium	Nickel Alloy						

Table 7 - Type-K Plugs Interface

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
DC	Direct Current
IoT	Internet of Things
LED	Light Emitting Diode

Appendix B – List of Figures and Tables

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Appendix C – Revision History

Document Title: Modbus Thermocouple Sensor Adapter Datasheet

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Clearance No.: BRTSYS#109

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

Document Feedback: Send Feedback

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