Modbus 4CH Solid State Relay Datasheet

1 Introduction

Modbus 4CH **S**olid **S**tate **R**elay (SSR) incorporates 4 relay controllers with an AC load current handling capacity of 1.80A. The relays can switch AC loads between 50Hz and 60Hz. Additional zero-cross features are included in the Modbus 4CH solid state relay.

Modbus 4CH Solid State Relay controllers are ideal for forward and reverse motor control applications, switching loads on and off, and handling inrush current efficiently.

Enhance your illumination control with our cutting-edge product tailored for precise LED strip management. Engineered with meticulous technical precision, our solid-state relay incorporates zero-cross detection technology, providing a distinct advantage in efficiency and performance. This innovative feature ensures optimal synchronization with the AC power waveform, mitigating electrical stress during switching and minimizing potential flickering issues.

1.1 Features

- 4 Channels Solid State Relay
- Status LEDs indicate relay activation states.
- Supports AC loads up to 1.8A per relay channel.
- Supports AC (20VAC to 240VAC)
- Supports zero-cross turn-on circuitry.
- Fast-blow fuse protection
- Implements the Modbus RTU protocol.
- Low power consumption of 271mW (typical)
- Operating temperature from 0°C to 70°C
- Flush mount and DIN Rail mounting options.

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

2 Part Numbers / Ordering Information

Part Number	Description
MC-0102-01A	Modbus 4CH Solid State Relay
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	RS485 Modbus RTU
	System Status Indicator	1x RGB LED
	Relay Status Indicator	2x RG LEDs
	Power Indicator	1x Green LED
	Mounting	Flush Mount
		DIN-Rail Mount
Power	Modbus Voltage	9-24V DC Bus Power
	Device Input Voltage	5V DC
	Operating Power	Typ:271mW Max:421mW
Relay	Number of SSR Channel	4
	Relay Type	AC Solid State Switch, dual power SCR thyristor outputs, Zero-Cross Detection
	Contact arrangement	Solid State Switch
	Rated voltage	20VAC~ 240VAC
	Max. switching voltage	240VAC
	Rated power	1.80A @240VAC / 440W @240VAC
	Load continuous current	1.80A
	Maximum Surge Current	30A, t<16ms
Physical Characteristics	Colour	White
	Housing	Polycarbonate
	Dimension	L138.2mm x W76.0mm x H31.9mm
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 4CH Solid State Relay
	Wire Assembly	1x Modbus RS485-RJ11 Cable(30cm)
Optional	Mounting Accessories	1x LDSBus DIN Rail Mount Set

Table 2 - Modbus 4CH Solid State Relay 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

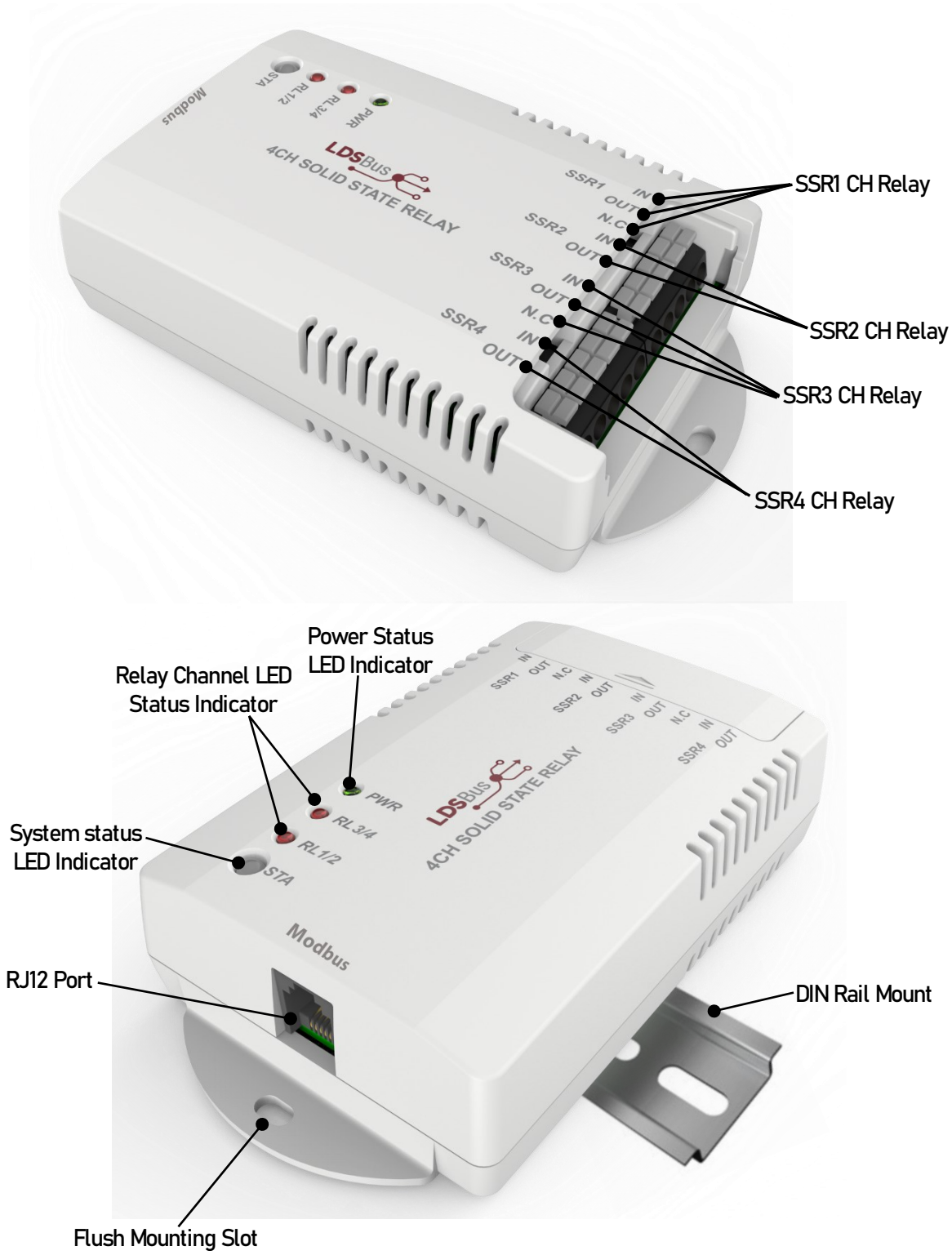


Figure 1 - Modbus 4CH Solid State Relay Hardware Features

Function	Labels	Description
SSR1 CH Relay	IN	Solid State Relay Channel 1 Input
	OUT	Solid State Relay Channel 1 Output
	NC	No Connection
SSR2 CH Relay	IN	Solid State Relay Channel 2 Input
	OUT	Solid State Relay Channel 2 Output
SSR3 CH Relay	IN	Solid State Relay Channel 3 Input
	OUT	Solid State Relay Channel 3 Output
	NC	No Connection
SSR4 CH Relay	IN	Solid State Relay Channel 4 Input
	OUT	Solid State Relay Channel 4 Output
Power Status LED Indicator	PWR	Power status LED
Relay Channel LED Status Indicator	RL 1/2	Solid State Relay 1 & 2 status LED
	RL 3/4	Solid State Relay 3 & 4 status LED. Refer to section 12 for more details
System Status LED Indicator	STA	Modbus status LED. Refer to section 11 for more details
RJ12 Port	Modbus	Modbus data and power interface port

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

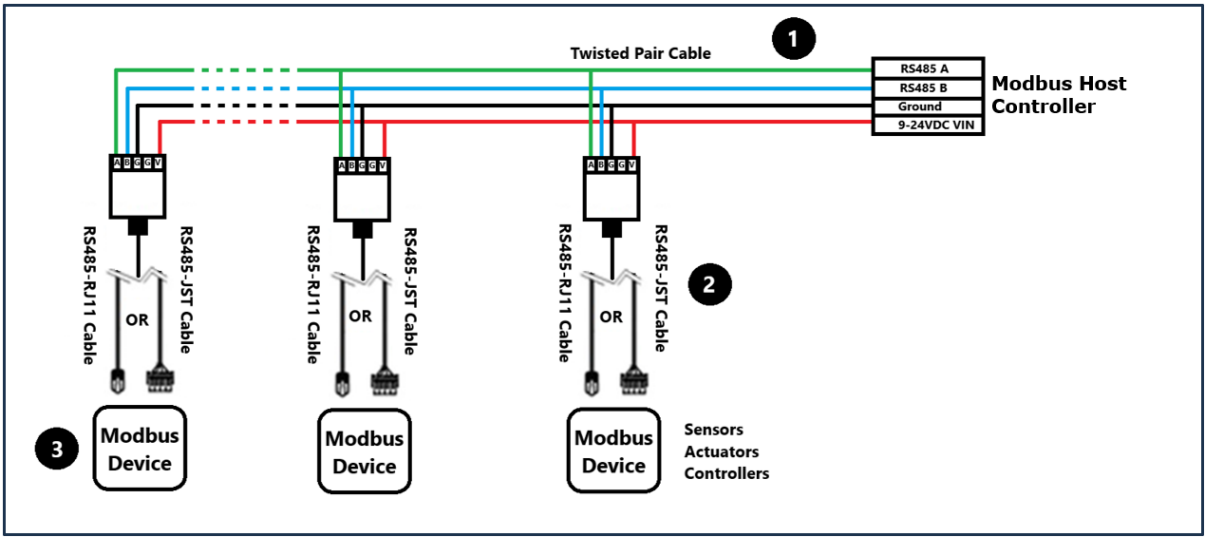


Figure 2 - Connection Diagram for Standard Modbus Power Supply

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-RJ11 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-RJ11 Cable(30cm) Pin Configuration

7 Mounting Instructions

7.1 Flush Mount

The Modbus 4CH Solid State Relay can be flush mounted directly on a wall or any flat surface using 2 M3.5*16mm (thread) screws.

Figure 4 - Modbus 4CH Solid State Relay Flush Mount

7.2 DIN Rail Mount

The Modbus 4CH Solid State Relay 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.

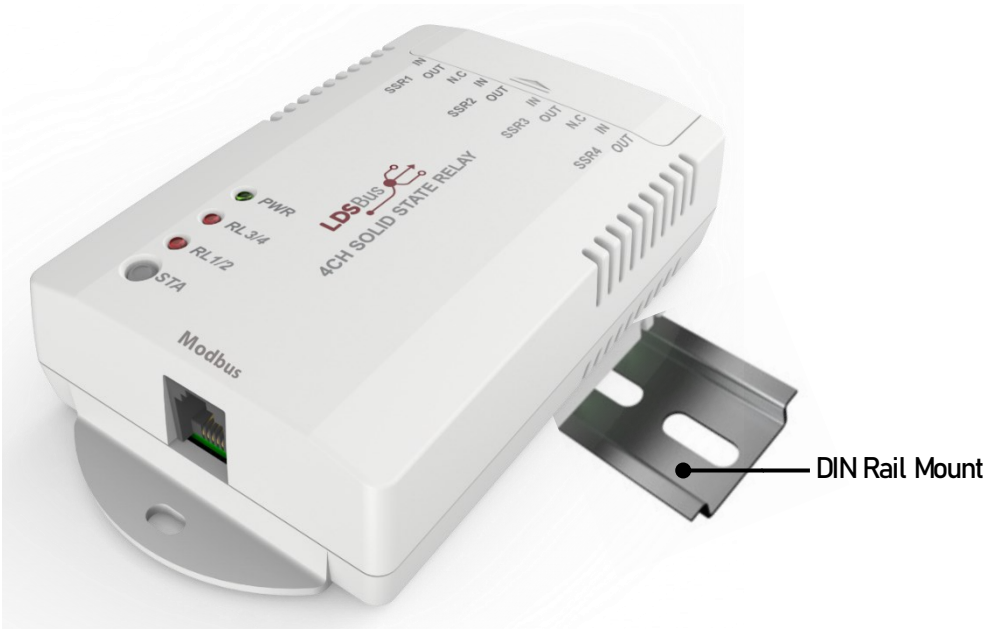


Figure 5 - Modbus 4CH Solid State Relay DIN Rail Mount

8 Terminal Wiring Instruction SSR Channel

8.1 Connection and Wire

Connections are made with Push-in CAGE CLAMP technology. If using solid conductor wire / clamp with insulation ferrule, the stripped conductor is easily inserted into the clamp until it hits the backstop without the need for a screwdriver. If you use soft conductor wire, use a flat head screwdriver to press down the push button and push in the wire, as shown, until it hits the backstop. To remove the conductor wire from its connector, use a flat head screwdriver to press down the push button and pull out the wire as shown in Figure 6.

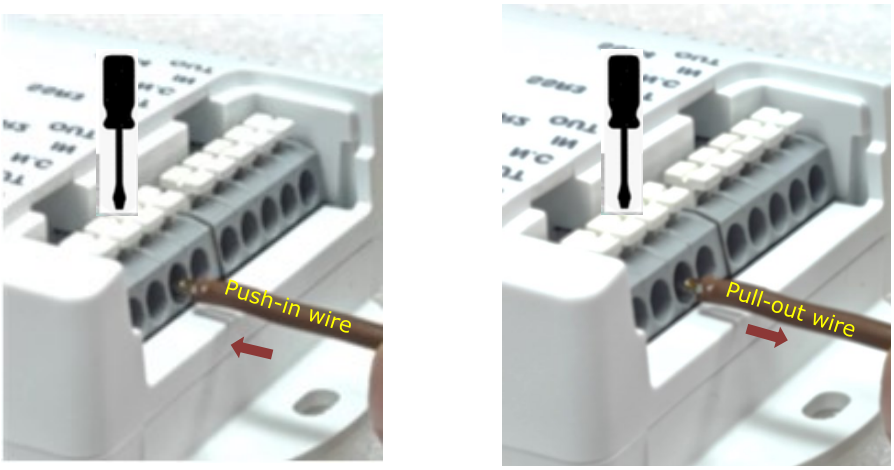


Figure 6 - Terminal Wiring on SSR Channel (Push-in wire & Pull-out wire)

Table 5 provides a list of American Wire Gauges (AWGs) that can be used in Terminal Blocks.

Conductor Type	Wire dimeter/AWG
Solid conductor	0.25~2.5mm^2/20~12 AWG
Stranded conductor	0.25~2.5mm^2/20~12 AWG
Stranded conductor; with insulated ferrule	0.25~1.5mm^2

Table 5 - AWG to use in Terminal Block

As shown in Figure 7, the wire strip may be 8mm to 12mm long. For safety, ensure that the striped conductor is always fully inserted, and no part of the conducting surface is exposed.

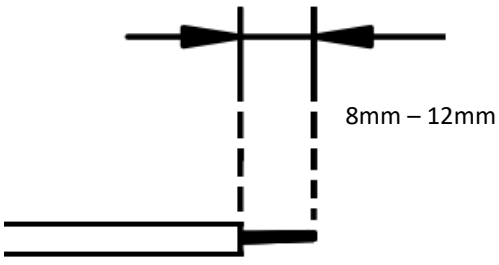
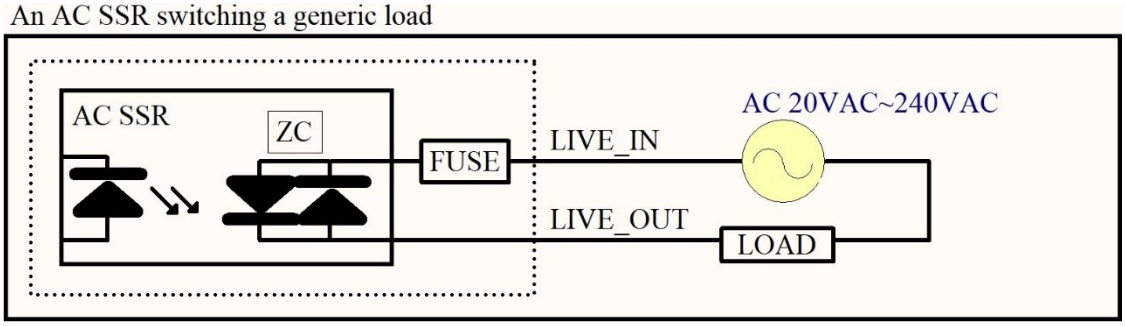


Figure 7 - Wire Strip Length

8.2 Setup

WARNING:

Please ensure that the power to the AC load device is turned off before initiating the setup process to prevent any potential hazards. Prioritize safety by disconnecting power sources before proceeding with installation or configuration.



Consider the Modbus 4CH Solid State Relay, Channel 1, as an illustration. The Modbus 4CH Solid State Relay is designed to facilitate the control of AC loads, capable of managing a maximum load of 240VAC/1.80A per channel. Provided below are recommended wiring configurations and wire specifications for optimal usage.

The following is the connection diagram:

Use AWG 20~12; A Brown wire indicates that it comes from an AC Source line → Connect to SSR 'IN'	Use AWG 20~12; A Brown wire indicates that it comes to an AC load line → Connect to SSR 'OUT'

9 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
RESERVED	0005H	1	N/A	N/A	N/A
REG_SSR1_ CONTROL	0006H	1	0x03/0x10	SSR 1 control 0 - Deactivate 1 - Activate	0x00FF
REG_SSR1_ MODE	0007H	1	0x03/0x10	SSR 1 mode 0 - Level Mode 1 – Pulse Mode	0x0000 (Level Mode)
RESERVED	0008H	1	N/A	N/A	N/A
REG_SSR1_ DEACTIVATION_ MODE	0009H	1	0x03/0x10	Deactivation mode for SSR 1 0 - Deactivation None 1 - Immediate 2 – Immediate After T1*	0x0000 (Deactivation None)
REG_SSR1_T1	000AH	1	0x03/0x10	SSR 1 timing T1*	0x0000 (0 Second)
REG_SSR1_T2	000BH	1	0x03/0x10	SSR 1 timing T2*	0x0000 (0 Second)
REG_SSR1_NO_O F_CYCLES	000CH	1	0x03/0x10	Number of cycles for SSR 1 (write 1 always)	1
REG_SSR2_ CONTROL	000DH	1	0x03/0x10	SSR 2 control 0 - Deactivate 1 - Activate	0x00FF
REG_SSR2_ MODE	000EH	1	0x03/0x10	SSR 2 mode 0 - Level Mode 1 – Pulse Mode	0x0000 (Level Mode)
RESERVED	000FH	1	N/A	Reserved	N/A
REG_SSR2_ DEACTIVATION_ MODE	0010H	1	0x03/0x10	Deactivation mode for SSR 2 0 - Deactivation None 1 - Immediate 2 - Immediate After T1*	0x0000 (Deactivation None)
REG_SSR2_T1	0011H	1	0x03/0x10	SSR 2 timing T1*	0x0000 (0 Second)
REG_SSR2_T2	0012H	1	0x03/0x10	SSR 2 timing T2*	0x0000 (0 Second)
REG_SSR2_NO_O F_CYCLES	0013H	1	0x03/0x10	Number of cycles for SSR 2 (write 1 always)	1
REG_SSR3_ CONTROL	0014H	1	0x03/0x10	SSR 3 control 0 - Deactivate 1 - Activate	0x00FF
REG_SSR3_ MODE	0015H	1	0x03/0x10	SSR 3 mode 0 - Level Mode	0x0000 (Level Mode)

				1 – Pulse Mode	
RESERVED	0016H	1	N/A	N/A	N/A
REG_SSR3_ DEACTIVATION_ MODE	0017H	1	0x03/0x10	Deactivation mode for SSR 3 0 - Deactivation None 1 - Immediate 2 – Immediate After T1*	0x0000 (Deactivation None)
REG_SSR3_T1	0018H	1	0x03/0x10	SSR 3 timing T1*	0x0000 (0 Second)
REG_SSR3_T2	0019H	1	0x03/0x10	SSR 3 timing T2*	0x0000 (0 Second)
REG_SSR3_NO_O F_CYCLES	001AH	1	0x03/0x10	Number of cycles for SSR 3 (write 1 always)	1
REG_SSR4_ CONTROL	001BH	1	0x03/0x10	SSR 4 control 0 - Deactivate 1 - Activate	0x00FF
REG_SSR4_ MODE	001CH	1	0x03/0x10	SSR 4 mode 0 - Level Mode 1 - Pulse Mode	0x0000 (Level Mode)
RESERVED	001DH	1	N/A	N/A	N/A
REG_SSR4_ DEACTIVATION_ MODE	001EH	1	0x03/0x10	Deactivation mode for SSR 4 0 - Deactivation None 1 - Immediate 2 – Immediate After T1*	0x0000 (Deactivation None)
REG_SSR4_T1	001FH	1	0x03/0x10	SSR 4 timing T1*	0x0000 (0 Second)
REG_SSR4_T2	0020H	1	0x03/0x10	SSR 4 timing T2*	0x0000 (0 Second)
REG_SSR4_NO_O F_CYCLES	0021H	1	0x03/0x10	Number of cycles for SSR 4 (write 1 always)	1
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	0x4002
Reserved	0030H	N/A	N/A	Reserved	N/A
SSR CH1_CH2_CH3_C H4_STATUS	0031H	1	0x03	SSR channel 1 2,3 and 4 statuses	N/A
SSR BOARD_ TEMPERATURE	0032H	1	0x03	Board temperature -- 5500 to 12500 (-55 to 125 in degrees)	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 6 - Modbus Registers

*T1 – Enabled duration of the control signal in pulse mode
*T2 – Disabled duration of the control signal in pulse mode

10 Mechanical Dimensions

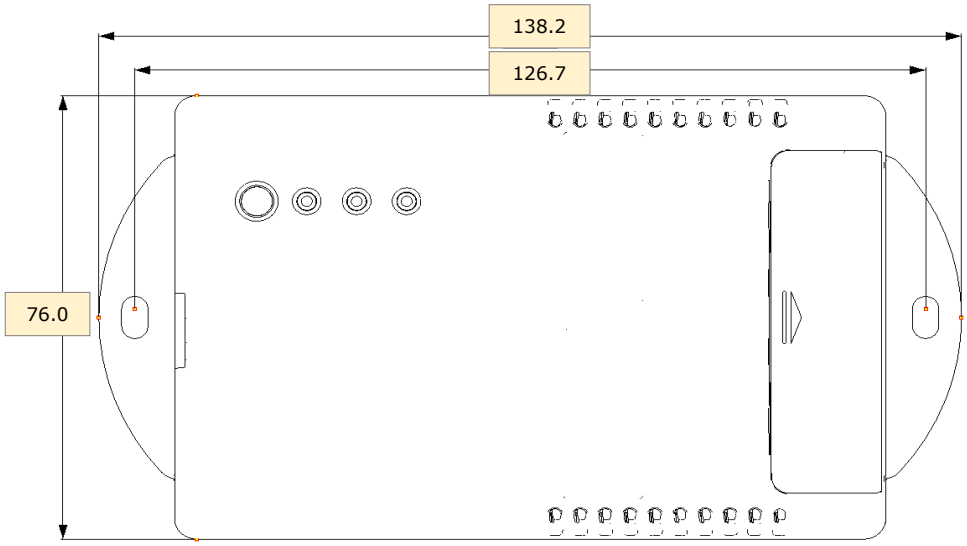


Figure 8 - Modbus 4CH Solid State Relay Dimension – Top View

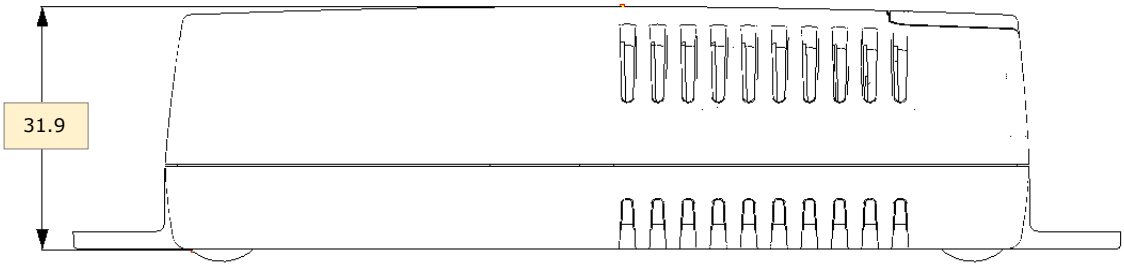


Figure 9 - Modbus 4CH Solid State Relay Dimension – Side View

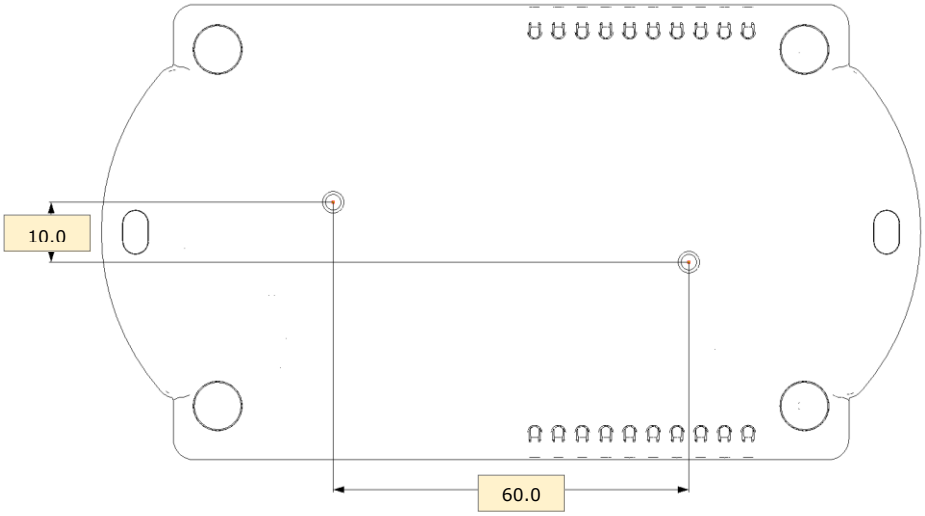


Figure 10 - Modbus 4CH Solid State Relay Dimension – Bottom View

Note: All dimensions are in millimeters.

11 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	YELLOW		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 7 - 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.

12 Relay Channel Status LED Indicators

There are 2 channel status LEDs, and these LEDs are dual-color LEDs. RL1/2 indicates the status of relay channels 1 and 2 and RL3/4 indicates the status of channels 3 and 4.

Device Status	LED Color		SSR1	SSR2	Description
RL1/2	OFF		OFF	OFF	SSR1 and SSR2 both are Inactive
	Red		ON	OFF	SSR1 Active and SSR2 Inactive
	Green		OFF	ON	SSR2 Active and SSR1 Inactive
	Yellow		ON	ON	SSR1 and SSR2 both are Active
			SSR3	**SSR4**	
RL3/4	OFF		OFF	OFF	SSR3 and SSR4 both are Inactive
	Red		ON	OFF	SSR3 Active and SSR4 Inactive
	Green		OFF	ON	SSR4 Active and SSR3 Inactive
	Yellow		ON	ON	SSR3 and SSR4 both are Active
PWRGreen	Green		-	-	SSR All Channel Power Enabled

Table 8 - Relay Channel Status LED Indicators

13 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
AC	Alternating Current
AWG	American Wire Gauges
DC	Direct Current
IoT	Internet of Things
LED	Light Emitting Diode
SSR	Solid State Relay
4CH	4 Channels
RL1/RL2/RL3/RL4	Solid State Relay Channel 1/2/3/4
PWR	Power
N.C	No Connection

Appendix B – List of Figures and Tables

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Appendix C – Revision History

Document Title: Modbus 4CH Solid State Relay Datasheet

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