AX-AVMB2
Analogue to Modbus 2 Channels 1IN 1OUT

AXIO

Product Overview

The AX-AVMB2 is a module that allows the integration of an analogue signal into a Modbus network. It can receive a 0-10VDC input from a sensor or device and convert it to a Modbus RTU register value. It can also generate a 0-10VDC output from a Modbus register value and send it to an actuator or device. The output is electrically separated from the rest of the circuit to prevent interference. The AX-AVMB2 is suitable for automation systems that have limited analogue options in the controller. The module can be configured using the dipswitch on the board or data registers through the Modbus network.

Products Features

- 1x 0-10VDC input
- 1x 0-10VDC output
- DIN rail mounted
- LED status indications
- Isolated RS485 output

Product Specifications

Supply Voltage:	24Vac @ 50Hz ±10% or 24Vdc ±10% at 50mA max
Input Voltage	0-10VDC
Input Impedance:	>10KOhms
Input Resolution:	12 bit
Input Accuracy:	±0.25%
Output Voltage:	0-10VDC
Output Impedance:	10KOhms Min.
Output Accuracy:	±0.25%
Communication	

Protocol:	Modbus RTU protocol over RS485
Electrical interface:	RS485 2W-cabling
Address range:	1-63 (settable using dipswitch), 1-247 (settable using configuration register)
Baud rates supported:	9600bps,19200bps,38400bps,57600bps,115200bps
Parity:	None Odd, Even (default), (odd, none selectable via configuration register)
Number of stop bits:	1(default),2 (2 is selectable via configuration register)
Isolation:	1500VDC (60sec, <1mA leakage current) between Power and Output
120Ohms termination :	Available on board. Enabled using jumper
Recommended cable:	24AWG twisted pair shielded cable (1 pair for data and 1 conductor for common)
Maximum devices on a network:	32

LED Indications:	Unit status, Communication status
Terminals :	Two part pluggable connectors. Suitable for 28~12AWG wires.
Ambient working conditions :	-20°C to 70°C, 0-90% RH
Enclosure:	ABS
Dimensions:	104 x 130 x 55 mm
Weight:	100gms
Country of origin :	United Kingdom

Product Order codes

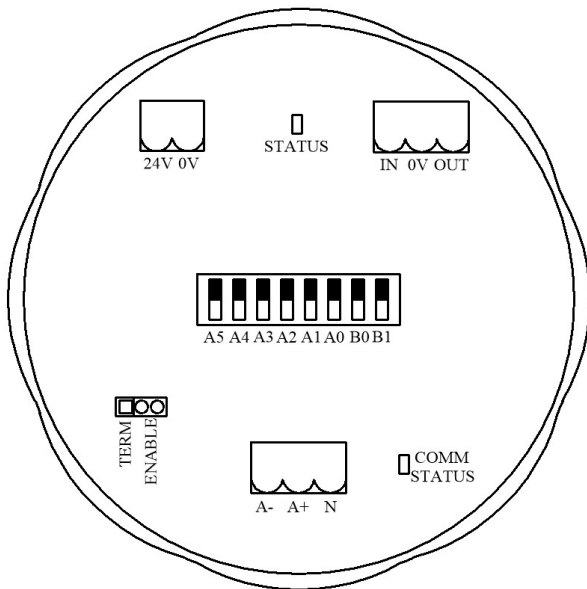| Order Code	Description
AX-AVMB2	Analog voltage to Modbus RTU,1x 0-10VDC In, 1x 0-10VDC Out

Installation

The unit should be installed by suitably qualified technician in conjunction with any guidelines for the equipment it is to be connected to and any local regulations. Field wiring should be installed to satisfy the requirements set out by the manufacturer of the equipment that the sensor is being connected to. Anti-static precautions must be observed when handling. The PCB contains circuitry that can be damaged by static discharge.

Avoid mounting the device near other devices which generate heat. Proper ventilation must be provided to ensure that the ambient working conditions never exceed the maximum ratings.

Do not route the conductors near power lines, power circuits with a high di/dt, switch-mode converters, power-regulation control devices.

Connections

Operation

Input Channel:

The input terminals receive an analog 0-10V DC voltage and convert it to a digital value with a 12 bit analog to digital converter. The digital value is stored in the INPUT_VOLTAGE register in millivolts. The lowest and highest voltages are stored in INPUT_MINIMUM and INPUT_MAXIMUM registers respectively. To reset these registers, write(1) to INPUT_LOG_MIN_MAX register.

Output Channel:

The output has two modes that can be set by OUTPUT_MODE register

1.Normal mode:

The output voltage is determined by OUTPUT_VOLTAGE register. Write the desired output in millivolts to this register.

2.Signal converter mode:

The output voltage depends on the input voltage.

Output voltage = SIGNAL_CONVERTER_OFFSET + (SIGNAL_CONVERTER_GAIN x input voltage)

If SIGNAL_CONVERTER_INVERT is enabled, the output voltage is 10 Volts minus the result of the above function.

Fail safe:

Fail safe can be enabled in Normal mode. If the communication lines are not active for a duration specified in OUTPUT_FAILSAFE_DELAY REGISTER, the output will lock to the voltage set in OUTPUT_VOLTAGE_FAIL_SAFE register.
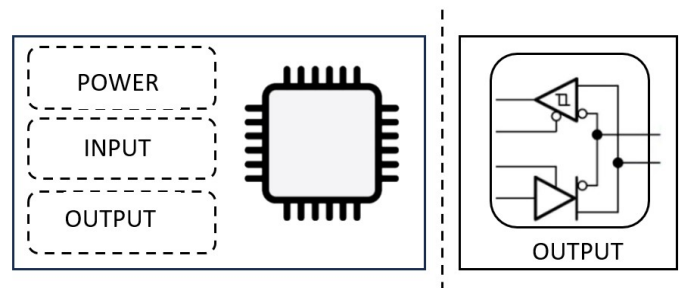
LED indications

Status LED: One dim flash each second if unit is functioning normally. Blinks fast in case of error.

Communication status LED: Flashes once per second if unit sees network activity, 1 second burst when unit accessed/ transmits.
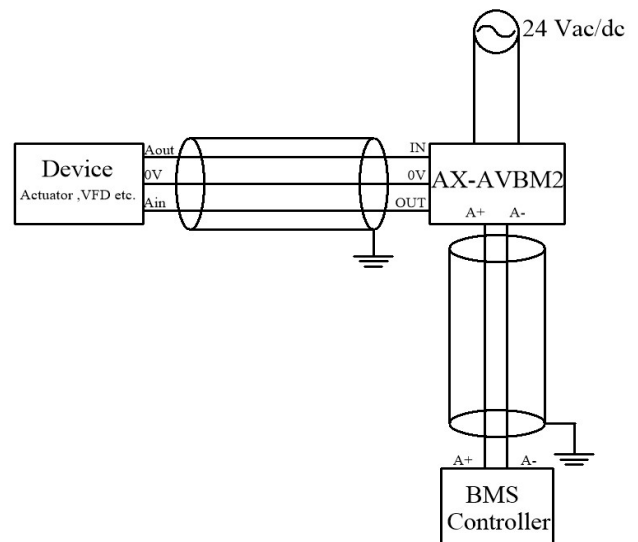
NVM update

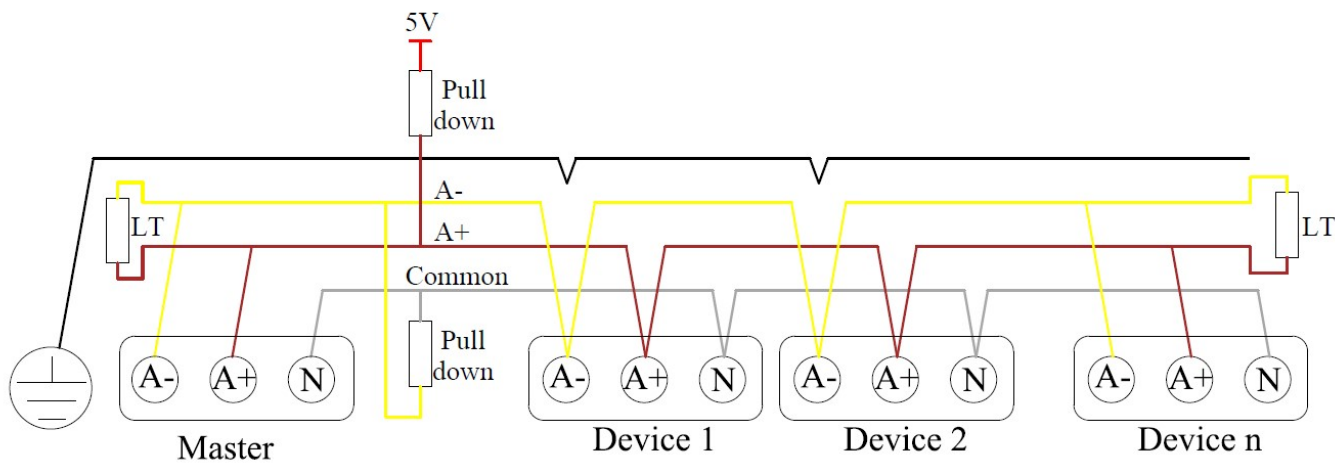Write (1) to Non_volatile_memory_update to retain configuration values even after power loss.

Isolation scheme

Typical wiring

RS-485 output wiring

Use twisted pair shielded cables with a characteristic impedance of approximately 120 ohms. A balanced pair must be used for data lines (A+,A-) and a third conductor for the net common (N). The shield should be connected to the earth at one end only, preferably at the master control panel.

The RS485 standard suggests a daisy chain topology. A long trunk with short derivation cables is also acceptable.

A maximum of 32 devices may be connected to the network without using a repeater. This is subject to changes depending on the Unit Load used by other devices on the network and line polarization.

Either end of the network should be terminated with 120 Ohms to avoid signal reflections. Do not use line termination on a derivation cable. For convenience, unit has the Line Termination (LT) built-in, which may be enabled using the jumper.

Line polarisation might be needed in applications involving noisy environments. A pull-up is connected to a 5V source on A+ circuit. A pull-down resistor to the common is connected on A– circuit. The value of the resistors is chosen between 450 ohms and 650 ohms. Line polarisation will reduce the maximum number of devices that may be connected to a network.

Modbus RTU is a serial protocol. As the number of devices in a network increases, there will be potential delays in updating data from each device. The system designer determines the number of devices connected in a network depending on the required data refresh interval.

Network Configuration

The communication parameters can be set using the Dipswitches or can be programmed over the network.

If any switches are ON, switches A5 to A0 sets the device address and B1 and B0 sets the baud rate. The Parity will be Even, and the Number of Stop bits will be 1 in this mode. If changes are made after powering up, new values will not be updated until either the unit is re-powered or a software reset is executed.

If the dipswitches A5 to A0 are set to OFF, the communication parameters will be loaded from the internal configuration registers. When these registers are modified, the updated values will not be stored until a Non Volatile Memory Update command has been executed and will not be used until either a Force Reset command or a re-power of the unit.

It is of great importance to ensure at the time of the procedure of devices addressing, that there is not two devices with the same address. In such a case, an abnormal behaviour of the whole serial bus can occur, the Master being unable impossibility to communicate with any slave on the bus.

Dipswitch configuration

A5	A4	A3	A2	A1	A0	
OFF	OFF	OFF	OFF	OFF	OFF	Comms. set by Modbus registers
						Address
OFF	OFF	OFF	OFF	OFF	ON	1
OFF	OFF	OFF	OFF	ON	OFF	2
↓	↓	↓	↓	↓	↓	↓
ON	ON	ON	ON	ON	ON	63

B1	B0	Baud Rate	Parity	No of Stop Bits
OFF	OFF	9600		
OFF	ON	19200	Even	One
ON	OFF	38400		
ON	ON	57600		

Modbus Registers

ADDRESS	DESCRIPTION	DATA TYPE	DATA	ACCESS	NVM
30001	INPUT_VOLTAGE (mV)	UINT16	0-10000(DEFAULT:0)	R	
30002	INPUT_MINIMUM (mV)	UINT16	0-10000(DEFAULT:0)	R	
30003	INPUT_MAXIMUM (mV)	UINT16	0-10000(DEFAULT:0)	R	
30004	UNIT_STATUS	UINT16	0: NORMAL 1: ERROR	R	
30005	RESERVED	UINT16	0-65535(DEFAULT:0)	R	
40001	INPUT_SAMPLING_TIME (mS)	UINT16	200-2000(DEFAULT:200)	R/W	*
40002	INPUT_LOG_MIN_MAX	UINT16	1: CLEAR	R/W	
40003	OUTPUT_MODE	UINT16	0: NORMAL(DEFAULT) 1: SIGNAL CONVERTER		*
40004	OUTPUT_VOLTAGE (mV)	UINT16	0-10000(DEFAULT:0)	R/W	
40005	OUTPUT_FAILSAFE_DELAY (minutes)	UINT16	0:DISABLED(DEFAULT) 1-10080	R/W	*
40006	OUTPUT_VOLTAGE_FAIL_SAFE (mV)	UINT16	0-10000(DEFAULT:0)	R/W	*
40007	SIGNAL_CONVERTER_OFFSET (mV)	UINT16	0-5000(DEFAULT:0)	R/W	*
40008	SIGNAL_CONVERTER_GAIN(%)	UINT16	10-500(DEFAULT:100)	R/W	*
40009	SIGNAL_CONVERTER_INVERT	UINT16	0:OUTPUT IS NORMAL 1:OUTPUT IS INVERTED	R/W	*
40010	SIGNAL_CONVERTER_LIMIT (mV)	UINT16	0-10000(DEFAULT:10000)	R/W	*
40011	DEVICE_ID	UINT16	0-65535 (DEFAULT:1)	R/W	*
40012	MODBUS ADDRESS (NETWORK)	UINT16	1-247(DEFAULT:1)	R/W	*
40013	BAUD RATE (NETWORK)	UINT16	0: 9600 1:19200(DEFAULT) 2:38400 3:57600 4:115200	R/W	*
40014	PARITY (NETWORK)	UINT16	0:NONE 1:ODD 2:EVEN(DEFAULT)	R/W	*
40015	NO OF STOP BITS (NETWORK)	UINT16	0:1 STOP BIT (DEFAULT) 1:2 STOP BITS	R/W	*
40016	FORCE_RESET	UINT16	1:RESET	R/W	
40017	NON_VOLATILE_MEMORY_UPDATE	UINT16	1:UPDATE	R/W	
40018	FORCE_FACTORY_DEFAULTS	UINT16	1:FORCE DEFAULTS	R/W	
40019	RESERVED_CAL_KEY	UINT16	DO NOT MODIFY	R/W	
40020	RESERVED_CAL_IN	UINT16	DO NOT MODIFY	R/W	
40021	RESERVED_CAL_OUT	UINT16	DO NOT MODIFY	R/W	

Common exceptions

- Exception code :01 - ILLEGAL FUNCTION

    Reason: Function code in the query is not supported by this device.

- Exception code : 02 ILLEGAL DATA ADDRESS

    Reason: Starting address or starting address+ number of registers is outside the acceptable range.
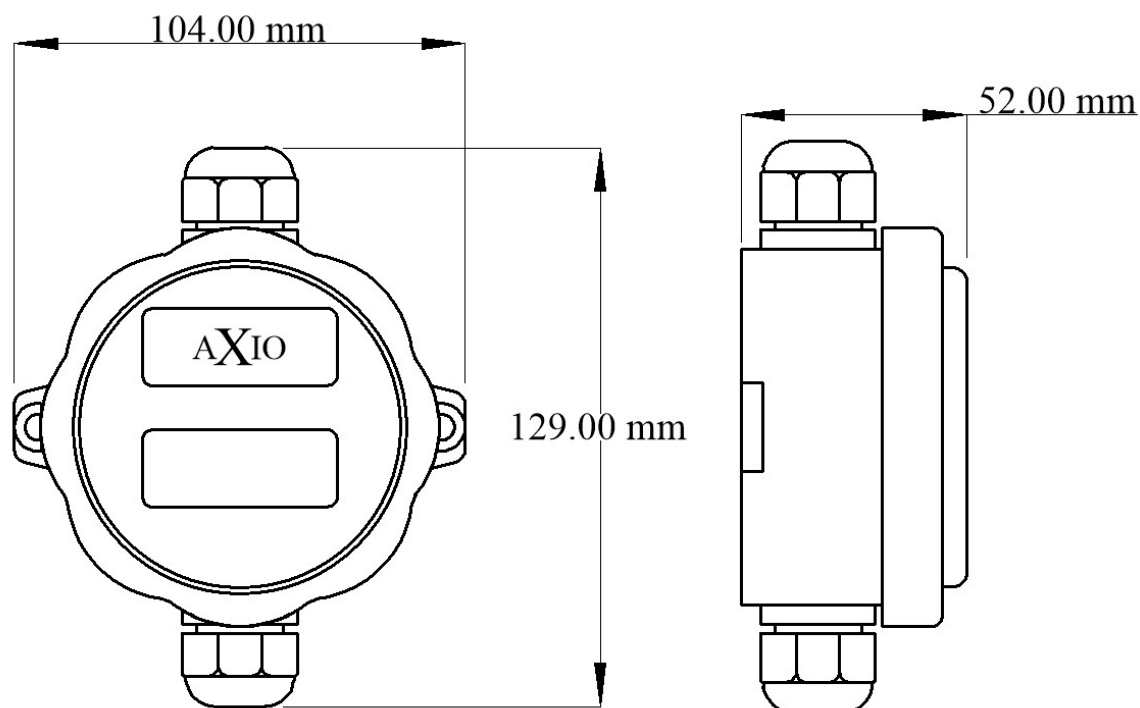
- Exception code : 03 ILLEGAL DATA VALUE

    Reason: The value in the request data field is not an authorized value for the slave.

Supported function codes

03	READ HOLDING REGISTERS (4XXXX BANK)
04	READ INPUT REGISTERS (3XXXX BANK)
06	WRITE SINGLE REGISTER(4XXXX BANK)
16	WRITE MULTIPLE REGISTERS(4XXXX BANK)

Dimensions

104.00 mm

129.00 mm

52.00 mm

Datasheet Contents

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