LABOR – ASTER

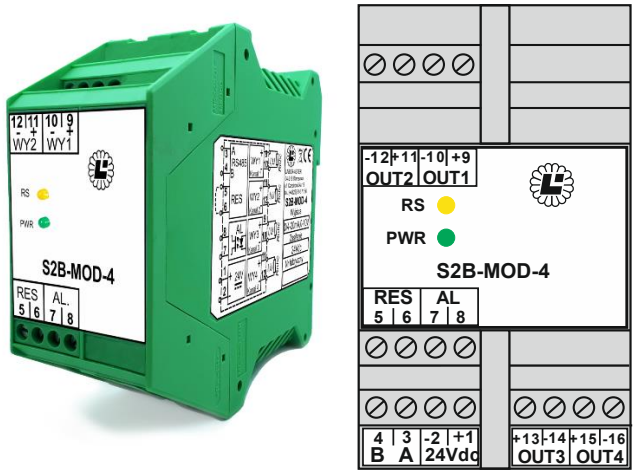
INDUSTRIAL AUTOMATION

Certyfikat nr QS/14/07

AC 083
QMS

SIGNAL TRANSLATOR TYPE S2B-MOD-4

- **Translation of digital value RS485 MODBUS RTU to standard analog signal.**
- **4 separated output channels.**
- **Remote reading and retransmission of the signal from LABOR-ASTER devices equipped with MODBUS RTU protocol.**
- **Remote reading, retransmission and scaling of any register from any device with MODBUS RTU protocol.**
- **Support for reading extended registers representing IEEE754 floating point format and 32-bit integer.**
- **Remote setting of the value with possibility of converting type current/voltage.**
- **RS485 link with galvanic optoisolation.**
- **Input, output and power supply circuits mutually separated.**
- **Possibility of up to 254 devices into the network.**
- **Alarm in the event of transmission failure.**
- **Program *"Labor Programmer"* for easy programming it.**



APPLICATION

The **S2B-MOD-4** translator is used in measurement systems basing on **MODBUS RTU** communication network**.**

The translator is used as a "SLAVE" (receives requests sent by "MASTER" device) and as a "MASTER" (transmits reading requests to other "SLAVE" device). User can remotely read any register from a devices equipped with MODBUS RTU protocol, scale it and set output signal. In "SLAVE" mode device fully perform MODBUS RTU protocol including diagnostic counters. From the perspective of the protocol service the device is seen as a set of 16-bit registers and four 1-bit registers. Changing the device settings (function, transmission parameters, output type, alarm function) is only possible in programming mode (when the RES terminals are shorted).

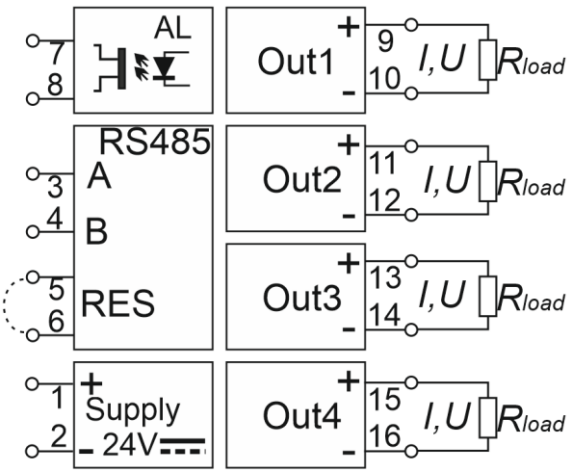


Fig.1 Block scheme and terminal description of **S2B-MOD-4**

BASIC TECHNICAL PARAMETERS

Supply voltage	-	24Vdc (21...28V) dc
Output signal	-	0…20mA , Rload < 680Ω
(4 separated channels)		0...10V , Rload > 2kΩ
Class	-	0,1%
Nonlinearity	-	(12 bit) ±0.025%
Temperature drift	-	±0,01%/°C
Communication	-	RS485
Transmission protocol	-	MODBUS RTU
Transmission speed	-	300 … 57600 bd
Device's address	-	1…254
Data bits	-	8,9
Parity	-	N(none),E(even),O(odd)
STOP bit	-	1,2
Factory settings	-	9600 bd, module address 127,8,N,1
Amount of device on oneRS485 line	-	max 254
Line length	-	max 1200m
Galvanic separation	-	2kV between all circuits
Housing	-	45,5 x 99 x 114,5mm
protection level	-	IP20
mounting	-	on TS35 rail
Ambient temperature	-	0....55°C
Relative humidity	-	do 90%

Safety requirements	-	**PN-EN 61010-1:2002**
EMC requirements	-	**PN-EN 61000-6-1**
	-	**PN-EN 61000-6-3**

HOW TO ORDER:

S2B-MOD-4 (four output channels)

Production and distribution: **LABOR – ASTER**
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The manufacturer reserves the right to make changes to the product.

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Opis działania programu

The program has 2 basic operating modes chosen by input signal on RES terminals. After shorting RES terminals the device enters programming mode. During programming mode transmission parameters are constant and as follows: 9600 8 N 1 and device address is 127 (0x7F). In the programming mode user can program all parameters including transmission parameters. After opening RES terminals all parameters are set as programmed. In the programming mode (RES terminals shorted) all registers are allowed to be written. In the normal mode (RES terminals opened) only some registers are allowed to be written. In the case of shorting RES terminals PWR LED starts flashing. For programming the device can be used any program supporting the MODBUS RTU protocol but it is recommended to use the program "Labor Programmer" available free for download at www.labor-automatyka.pl. This program supports extended formats when programming (floating point and 32-bit integer format).

The device has few modes.

1. Common end device with MODBUS RTU protocol. Registers settings depend on control program and involves writing values from -100 to 11000 to the registers.
2. Signal transmitter from device type As702. In this mode the device is MASTER. It autonomously reads As702 device and writes its own registers. It is possible to define which channel is transmitted from the device.
3. Transmitter from one, two, three or four devices type S2-MOD. In this mode the device is MASTER and reads data from other devices.
4. Transmitter from any device a variable in multiple formats, also in 2-register formats e.g. floating-point according to the IEEE754 standard and also 32-bit signed integers. Number of defined channels from 1 to 4.

Special parameter registers changes their meaning depending on transmission mode.

Alarm turns on after programmed delay time in case of loss of the communication with control program or remote device. Alarm parameters and its behavior is programmable. Alarm output in MASTER mode is turned on if at least one device is not read and turned off if transmission is correct for all programmed channels. In SLAVE mode alarm output is designated to control only transmission controlling output 1. For other analog outputs alarm is operating only as setting default values while writing to the appropriate register fails. Alarm output operates only when RES terminals are opened but function operates always in terms of setting default values.

Scaling function

In universal reading mode the user must determine device address, register number and data for scaling. The device requires to define a minimum (for 0.00%) and a maximum (for 100.00%). These parameters are saved in single-precision floating-point format. They are used to converter input to a value used by the device which is range 0-10000. Wrong setting of the values causes to result to be limited to allowable values which are -100 (-1.00%) to 1100 (110.00%). This limitations can be changed for all channels to e.g. 0-10000. Offset can also be programmed to get 4-20mA standard.

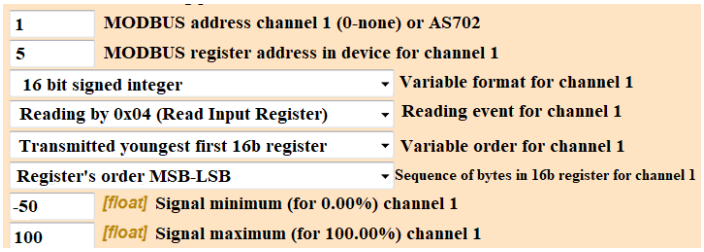
Example

Task

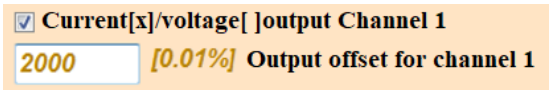
Read data from a temperature transmitter in range -50 to 100ºC. The transmitter has Modbus address 1. Data is in register address 5. Set analog output 4…20mA based in channel 1.

Solution

1. In field “Channel 1 Modbus address” write value 1.
2. In field „Channel 1 Modbus register address” write value 5.
3. Value format of a classic Modbus register is shown on the right.



4. Check box to set current output and write value 2000 (20%) as the output 1 offset.



Modbus RTU Register map

The device has many other registers e.g. calibration and test data including multiregister type. Modification of the calibration data by a user will cause malfunction of the device and loss of the warranty claims in this respect. Each device is individually calibrated in the production process and the results are archived.

16-bit registers

Number	Address	~RES	RES[1]	Description of the behavior
1.	0	RW	RW	Signal value for channel 1. Value from range -100-10000. Maximal value is 11000.
2.	1	RW	RW	Signal value for channel 2. Value from range -100-10000. Maximal value is 11000.
3.	2	RW	RW	Signal value for channel 3. Value from range -100-10000. Maximal value is 11000.
4.	3	RW	RW	Signal value for channel 4. Value from range -100-10000. Maximal value is 11000.
23.	22	RW	RW	Address on the bus. While in RES mode it is 127 (0x7F)
24.	23	RW	RW	Stop bits number. Values 1 or 2. While in RES mode it is 1.
25.	24	RW	RW	Byte size. Values 8 or 9. While in RES mode it is 8.
26.	25	RW	RW	Parity. Allowed: ‘N’ (none) ‘E’ (parity) ‘O’ (odd). While in RES mode it is ‘N’.
27.	26	RW	RW	Transmission speed (any from range 300…57600)[2]. While in RES mode it is 9600.

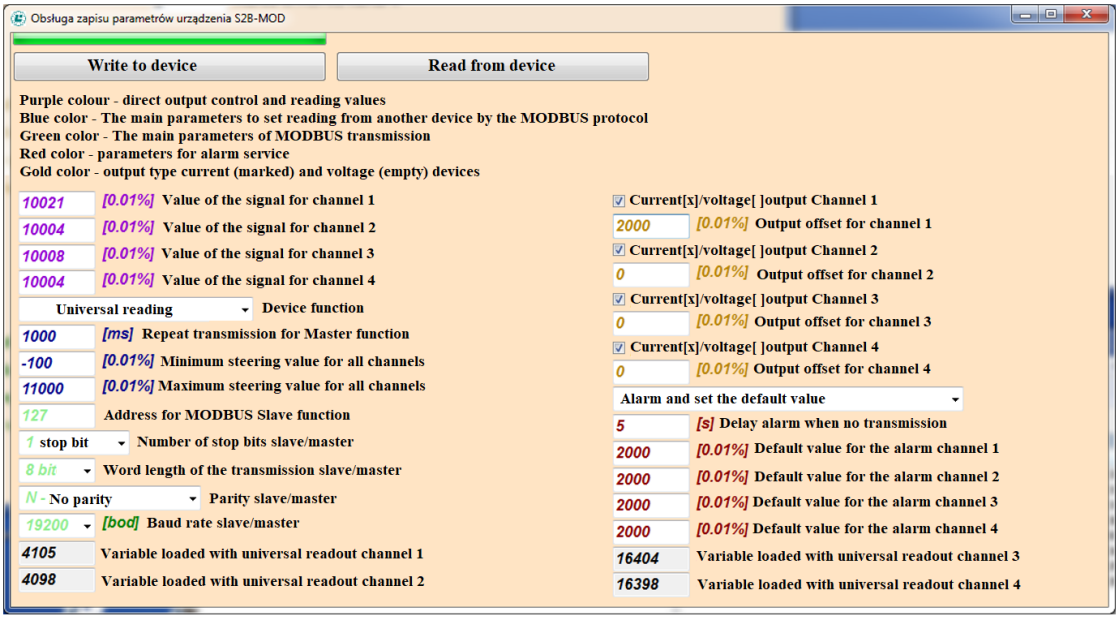
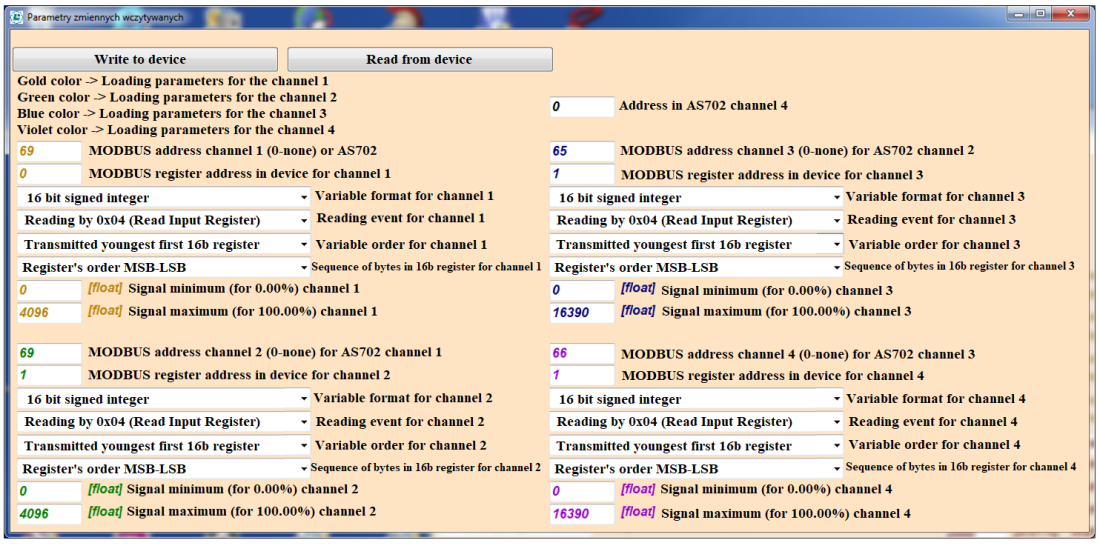
[1] Power LED blinks when RES mode is activated. It is a special mode to program the device.
[2] The devices allows setting any transmission speed. Each setting of any transmission speed is always burdened with a discretization error. The permissible discretization error for one baud in serial transmission is 2.5%. The device design guarantees the correct setting of the transmission speed for typical value, i.e. 300 600 1200 2400 4800 9600 14400 19200 38400 57600 bd. The remaining values can be realized with a different error.

Programming

For programming, use the "Labor Programmer" program. The program should be installed and working in administration mode. To program S2B-MOD, connect the USB-RS485 converter to it, and the USB plug to the computer with the program installed. The transmission parameters are 9600,8,N,1 and the "Device address" is 127. The serial port number is the same as for the USB-RS485 converter. After connecting the power supply, short the RES jumper in the S2B-MOD device. After starting the program, windows with parameters should appear.

It often happens that you need to experimentally adjust the device settings to read the variable. To facilitate verification, floating-point registers are provided called "**Variable read with universal reading channel...**". The contents of this register are not deleted when switching to programming mode. Therefore, you can set the format, open the RES jumper (the device starts reading). Then close the jumper and check whether the contents of this cell make metrological sense. The parameters in the main window are saved immediately (after clicking YES in the window with the message "Do you want to initialize this variable?" - it appears immediately with the drop-down list and binary options, and when entering a value after clicking ENTER on the keyboard or double-clicking the field with this value with the mouse), while in the auxiliary window you should use the "Save to device" and "Read from device" buttons.

Main window for **S2B-MOD-4**. (cyclical parameter reading)



Auxiliary window for **S2B-MOD-4**. (parameters of loaded variables)