



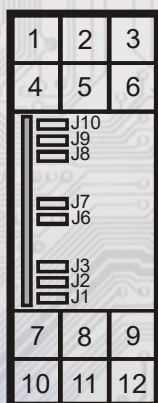
- frequency output: 1Hz ÷ 20kHz
- input selection: (Pt100, Pt1000, Ni 1000, 0 ÷ 100Ω, 0 ÷ 1000Ω, 0 ÷ 5V, 0 ÷ 10V, 4 ÷ 20mA, 0 ÷ 20mA)
- configuration using PC (the MBSset program)
- Modbus RTU communication over RS485 line

The transmitters type RF1 are intended for signal conversion from resistive temperature sensors Pt100, Pt500, Pt1000, Ni1000, Ni10000 and active signals 4 to 20mA or 0 to 10V to the output frequency signal in range 1 Hz to 20kHz.

Basic technical parameters

Supply voltage (Ucc)	12 to 30 VDC	Output resistance	≈ 220 Ω
Current consumption	max. 40 mA (Rz ≥ 10 kΩ)	Load resistance (Rz)	≥ 10 kΩ
Dimensions	85 x 22,5 x 65 mm	Output galvanic separation	no
Input resistance	input signal voltage : 130 kΩ input signal current : 120 Ω	Communication	RS485, protocol ModBus RTU 8bits, 1 stop bit, without parity
Max. measurement current	Ni1000, Pt1000, 0 ÷ 1000Ω: 100μA Pt100, 0 ÷ 100Ω: 1 mA	Configuration program	REGMET MBSset; freeware; www.regmet.cz
Output frequency	1Hz ÷ 20kHz	Communication speed	1200 ÷ 19200 Bd
Output voltage level	Hi ≈ Ucc, Lo ≈ 0V	Galvanic separation of RS485 line	no
Max. output current	100 mA	Range of recommended working temp.	-30 ÷ 50°C
Relative humidity	< 80 %	Range of recommended storage temp.	-30 ÷ 70 °C
Protection type of terminals	IP20	Terminal board	wires max. 2,5 mm ²
Type of input signal	Ni1000/5000ppm (-50 ÷ 200°C), Ni1000/6180ppm (-50 ÷ 200°C), Pt1000/3850ppm (-50 ÷ 400°C) Pt100/3850ppm (-50 ÷ 400°C), 0 ÷ 1000Ω (max.1700Ω) linear, 0 ÷ 100Ω (max.170Ω) linear, 0 ÷ 10V linear, 0 ÷ 5V linear, 4 ÷ 20mA linear, 0 ÷ 20mA linear		

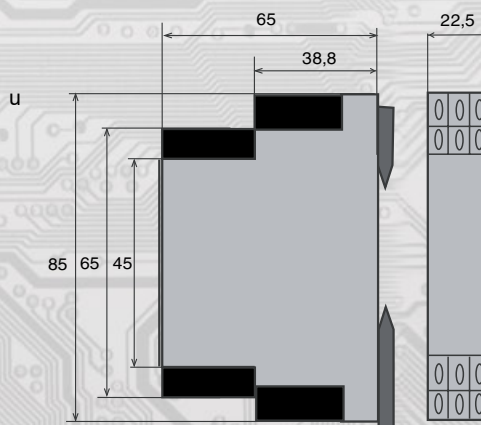
Arrangement of jumpers and connectors



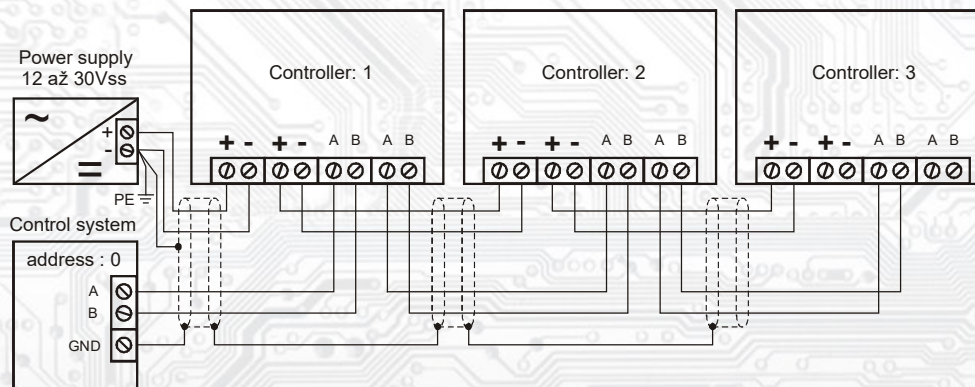
- J1+J3.....input selection
- J6.....record allowed of configuration values
- J7.....definition of network diagnostic mode
- J8.....definition of idle state RS 485 (wire A)
- J9.....definition of idle state RS 485 (wire B)
- J10.....terminating RS 485 120R

- 1.....positive terminal of power supply
- 2.....ground terminal of power supply
- 3.....output of frequency signal
- 4.....
- 7 - 12.....input signal (fig. 3)

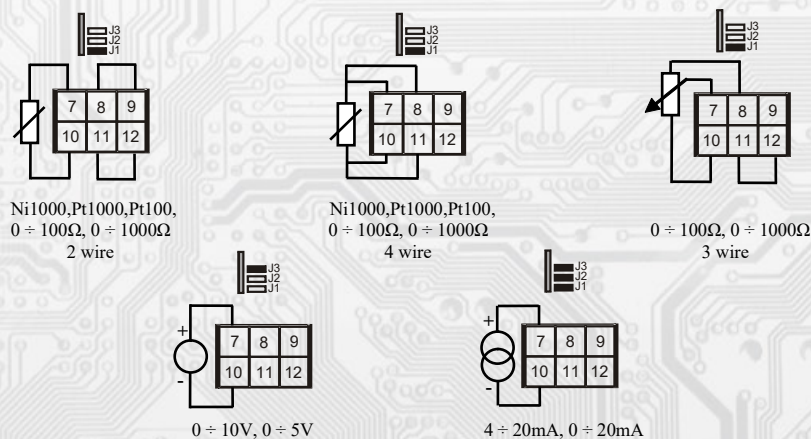
Dimensions



Example of wiring the controllers in the system



Wiring of input signals (fig. 3)



Input HW configuration

using jumpers J1 to J3 that are accessible after removing the front panel:

vstupní signál \ jumper	J1	J2	J3
Ni1000, Pt1000, 0 ÷ 1000Ω, Pt100, 0 ÷ 100Ω	ON	OFF	OFF
0 ÷ 10V, 0 ÷ 5V	OFF	OFF	ON
4 ÷ 20mA, 0 ÷ 20mA	ON	ON	ON

Input SW configuration:

Is done with command 16 (0x10 Preset Multiple Registers) when J6 and J7 are short (accessible after removing the front panel). In this case the transmitter has the address 255 and communication speed 19200Bd. Changes are made by removing jumpers J6 and J7

Function description:

Input signal measurement and conversion to frequency signal:

The input signal is evaluated by the electronics, which converts this value to the frequency output signal as per the parameters set in EXTENDED REGISTERS - viz Map X RAM (EXTENDED REGISTERS).

The current temperature value is sent over the RS485 line in the form of a 16-bit number with a signed integer multiplied by a constant 10.

Properties of the communication protocol

Protocol Modbus RTU with adjustable Baud rate 1200 - 57600 Bd, 8 bits, no parity, 1 stop bit, line RS485, half-duplex operation

Description of data registers

Reading of these registers is done using command 03. (0x03 Read Holding Registers).

Registr 0x0001 **: current input value

Range is 2 bytes, for temperature sensors form of number with sign (signed integer) multiplied by the constant 10 ((0x0001 = 0,1°C, 0xFFFF = -0,1°C).

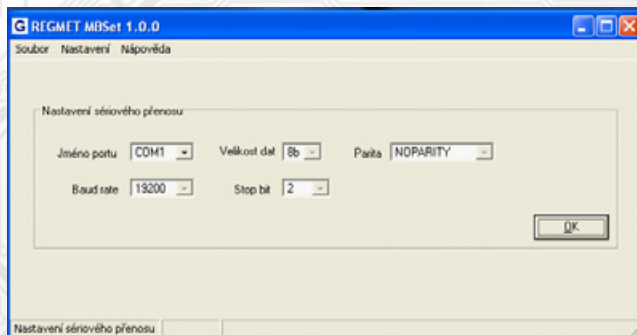
In case of fault of the analogue input (short circuit or interruption of the temperature probe), the sensor transmits the value 0x7FFF = 32767dek. In the case of linear inputs signals depends on the AU_I1 and AU_I2 settings.

SW configuration of transmitter using the REGMET MBSset program:

The configuration application REGMET MBSset is freely available at producer's web pages. The transmitter can be configured only when the jumper J6 is inserted before the connection of supply voltage (reset) and J7 jumper (setting the fixed sensor address to 255 and setting the baudrate to 19 200 Bd - these network variables are reserved for configuration only and, therefore, if the required sensor address of 255 is set, the sensor modifies to 254 automatically) are inserted. In case only the J7 jumper is inserted, it is possible to use a fixed address and baudrate without the risk of overwriting the configuration parameters.

After the launching of REGMET MBSset program, the basic window is opened and the connected sensor is automatically connected with the hosting PC. After running the REGMET MBSset application, the basic window opens, which allows general setup of the application. First, in Nastavení

(Settings)→Sériový přenos (Serial transfer), select the port to which the RS485 communication interface is connected



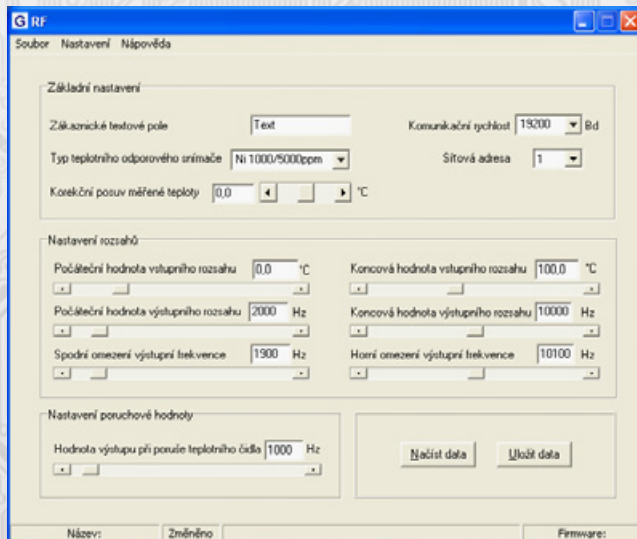
Other options in the settings:

Nastavení (Setting)→Automaticky rozpoznat komponentu při startu programu (Detect component automatically upon application startup) – if a functional converter with jumpers J6 and J7 (or at least J7) inserted is connected to the line prior to running the application, the converter's configuration window opens automatically.

Nastavení (Setting)→Načíst uloženou konfiguraci při spuštění (Load saved configuration upon startup – parameters selected in Nastavení (Settings)→Sériový přenos (Serial transfer) are set every time the application is started.

Nastavení (Setting)→Zobrazovat plovoucí nápovědu (Show floating help) – when pointing on a configuration value, a help is displayed for that option.

Nastavení (Setting)→Výběr komponenty (Component selection) – by selecting an RF component from the drop-down list, the converter's configuration window is opens.



Description of the configuration values (in the brackets, the name of byte of appropriate register is provided to allow setting of the converter using a software other than REGMET MBSset – see the X RAM map).

Users text field (**ZD_TEXT**) - It is determined for the client's identification of the device.

Baud rate (**SK_SPD**) - Selection of baudrate in the range of 1200 ÷ 19200 Bd in case a converter is connected in the serial line.

Network address (**SK-ADR**) - selection of network address (range 1 - 254) in case a converter is connected in the serial line

Correction of temperature (**ZD_OFF**) - Option of temperature correction (offset) e.g. to compensate the losses in the temperature probe line.

Initial value of input range(AU_I1): For temperature sensors, assignment of temperature to the initial value if output range. For linear inputs (R, U, I), this is used as the parametrization value.

Ended value of input range(AU_I2): For temperature sensors, assignment of temperature to the ended value if output range. For linear inputs (R, U, I), this is used as the parametrization value. It acquires the values -3276,7 to 3276,6°C.

Example: if a 0÷10V voltage signal is measured, where 0V corresponds to 20kPa and 10V corresponds to 30MPa, then the AU_I1 variable must contain value 20 and the AU_I2 variable the value 30000 (both values 20 and 30000 meets the format for variables in the range of -32767 to 32766). These values are used to convert the voltage signal and the resulting data transmitted through the serial line are directly in line with the physical quantity in kPa.

Initial value of output range(AU_O1)- assignment of output frequency to initial value of input range. It acquires the values 001 = 1Hz to 20kHz

Ended value of input range(AU_O2) - assignment of output frequency to ended value of input range. It acquires the values 001 = 1Hz to 20kHz

Spodní omezení výstupní frekvence (Lower limit of output frequency) (AU_FL) - lower end value of output frequency in case the input range is underflow.

Horní omezení výstupní frekvence (Upper limit of output frequency) (AU_FH) - upper end value of output frequency in case the input range is overflow.

Hodnota výstupu při poruše teplotního čidla (Output value in case of temperature probe fault) (AU_SP) - output frequency value in case of short circuit or interruption of the temperature probe's input. It acquires the values 001 = 1Hz to 20kHz

Načíst data (Load data) - loads currently set configuration from the converter's memory.

Uložit data (Save data) - saves the configuration set in the application to the converter's memory.

Soubor→Uložit konfiguraci (File→Save configuration) - saves the configuration set in the configuration window into an *.ini file.

Soubor→Načíst konfiguraci (Load configuration) - sets the values in the configuration window as per the selected file.

Mapa X RAM (EXTENDED REGISTERS):

EXTENDED REGISTERS can only be modified if the J6 jumper (enabling writing the configuration values) and J7 jumper (setting the fixed sensor address to 255 and setting the baudrate to 19 200 Bd - these network variables are reserved for configuration only and, therefore, if the required sensor address of 255 is set, the sensor modifies to 254 automatically) are inserted. In case only the J7 jumper is inserted, it is possible to use a fixed address and baudrate without the risk of overwriting the configuration parameters. The configuration is carried out by command 16 (multiple register preset 0x10). The changes are written and configuration is finished by extracting the J6 and J7 jumpers. No reset is necessary for proper function.

X Reg = 8 bytů, ie 4 registry MODBUS

Rozsah adres X Reg **		
X Reg	[hex]	[dek]
X Reg 0	0x2001 ÷ 0x2004	8193 ÷ 8196
X Reg 1	0x2005 ÷ 0x2008	8197 ÷ 8200
X Reg 2	0x2009 ÷ 0x200C	8201 ÷ 8204
X Reg 3	0x200D ÷ 0x2010	8205 ÷ 8208

X Reg	Obsah X Reg							
	Byte 0	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7
X Reg 0	-	-	ZD_TEXT/0	ZD_TEXT/1	ZD_TEXT/2	ZD_TEXT/3	ZD_TEXT/4	ZD_TEXT/5
X Reg 1	ZD_TEXT/6	ZD_TEXT/7	ZD_TEXT/8	ZD_TEXT/9	-	ZD_INT	ZD_OFF/Hi	ZD_OFF/Lo
X Reg 2	SK_ADR	SK_SPD	AU_I1/Hi	AU_I1/Lo	AU_I2/Hi	AU_I2/Lo	AU_O1/Hi	AU_O1/Lo
X Reg 3	AU_O2/Hi	AU_O2/Lo	AU_SP/Hi	AU_SP/Lo	AU_FL/Hi	AU_FL/Lo	AU_FH/Hi	AU_FH/Lo

ZD_TEXT The custom text field, range is 10 bytes. It is determined for the client's identification of the device.

ZD_INT Type of temperature sensor, The range is 1 byte. Takes the value 0 to 255. The number format is 16-bit unsigned integer.

value	ZD_INT [hex]	0x00	0x01	0x02	0x03	0x10	0x11	0x30	0x31	0x40	0x41
value	ZD_INT [dek]	0	1	2	3	16	17	48	49	64	65
sensor type		Ni 1000 5000ppm	Ni 1000 6180ppm	Pt 1000 3850ppm	Pt 100 3850ppm	0÷1000Ω	0÷100Ω	0÷10V	0÷5V	4÷20mA	0÷20mA

Note: Ranges for linear resistors (resistor transmitter) 0 ÷ 1000Ω or 0 ÷ 100Ω allow measurement of values in the range 0 to 1700Ω or 0 to 170Ω. The designation of the ranges is in line with the typical values of the resistance transmitters and appropriate range calibration points.

ZD_OFF Correction of temperature. Range is 2 bytes, form of number with sign (signed integer) multiplied by the constant 10. 0x0001 = 0,1°C, 0xFFFF = -0,1°C.

SK_ADR Network address. range is 1 byte. It acquires the values 0 ÷ 255 dek, whereas the address 0 is reserved for the broadcast and the sensor does not respond to it, the address 255 is reserved for the controller configuration. Thus the range of available addresses is 1 ÷ 254. The number format is unsigned integer.

SK_SPD Baud rate. range is 1 byte, It acquires the values 0 ÷ 4. The number format is unsigned integer.

hodnota SK_SPD [hex]	0x00	0x01	0x02	0x03	0x04
hodnota SK_SPD [dek]	0	1	2	3	4
rychlost [Bd]	1200	2400	4800	9600	19200

AU-I1: Initial value of the input temperature range. It acquires the values -3276,7 to 3276,6°C. Range is 2 bytes, form of number with sign (signed integer) multiplied by the constant 10. 0x0001 = 0,1°C, 0xFFFF = -0,1 ;C.

AU-I2: Ended value of the Input temperature range. It acquires the values -3276,7 to 3276,6. Range is 2 bytes, form of number with sign (signed integer) multiplied by the constant 10. 0x0001 = 0,1°C, 0xFFFF = -0,1°C.

AU-O1: Initial value of the output temperature range. Range is 2 bytes, form of number - unsigned integer. It acquires the values 0x0001 = 1Hz to 0x4E20 = 20kHz

AU-O2: Ended value of the Output temperature range... Range is 2 bytes, form of number - unsigned integer.. It acquires the values 0x0001 = 1Hz to 0x4E20 = 20kHz

AU-SP: Applies only to resistance temperature sensors, determining the output signal value in case of fault of the temperature probe. Output value in case of fault of the temperature probe. It acquires the values 0x0001 = 1Hz to 0x4E20 = 20kHz. Range is 2 bytes, form of number -unsigned integer.

AU-FL: Bottom stop value of the output frequency when the input range is undercurrent. It acquires the values 0x0001 = 1Hz to 0x4E20 = 20kHz. Range is 2 bytes, form of number - unsigned integer.

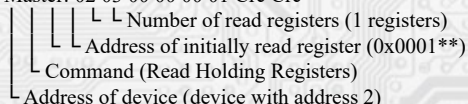
AU-FH: The upper limit value of the output frequency for overflow of the input range. It acquires the values 0x0001 = 1Hz to 0x4E20 = 20kHz. Range is 2 bytes, form of number - unsigned integer.

** During the transfer the register addresses are indexed from zero, i.e. register 0x2001 is physically sent through the busbar as 0x2000... (zero based addressing)

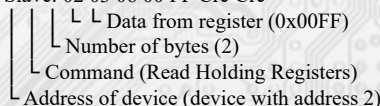
Examples of communication:

Command 03 (0x03): Read Holding Registers:

Master: 02 03 00 00 00 01 Crc Crc



Slave: 02 03 06 00 FF Crc Crc

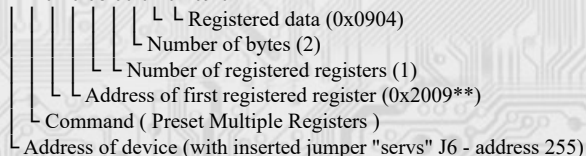


The address of the register read is 0x0001**, which is the address where the current value of the input signal is stored. In case of temperature probe, directly in °C multiplied by the constant of 10 (0x00FF = 25.5°C). In case of linear input signals, the situation depends on AU_I1 and AU_I2

Command 16 (0x10) Write Multiple Registers:

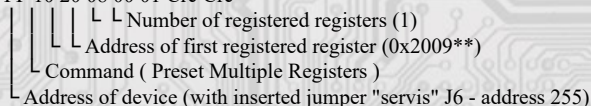
Master:

FF 10 20 08 00 01 02 09 04 Crc Crc



Slave:

FF 10 20 08 00 01 Crc Crc



With writing of the value 0x0904 in register 0x2009** the address 9 is set and the Baud rate 19 200 Bd is set.

** During the transfer the register addresses are indexed from zero, i.e. register 0x0001 is physically sent through the busbar as 0x0000... (zero based addressing)

Installation and connection:

The transmitter has to be fastened with the help of a holder on the mounting bar DIN EN50022.

The signal terminals A and B on the transmitter are connected to the serial line as per the rules for connection of devices in RS485 serial lines (Fig. 2). The use of A, B, ZAK. jumpers is subject to general rules for communication through RS485 lines (note: at end points of the RS485 line, it is necessary to connect a terminating resistor through the ZAK. jumper). The transmitters are supplied from a single 12 to 30 VAC power supply, while the supply voltage is connected to the terminals marked by Ucc and GND (Fig. 2). It is recommended to interconnect the devices using a multi-core shielded cable, which hosts data as well as power supply wires. The cable shield must be interconnected between individual segments of the line and only connected to the lowest potential (PE terminal) in the switchboard.