

*MONITORING, DATA LOGGING AND
CONTROL SYSTEM
MS5, MS5D*

APPENDIXES
TO INSTRUCTION MANUAL



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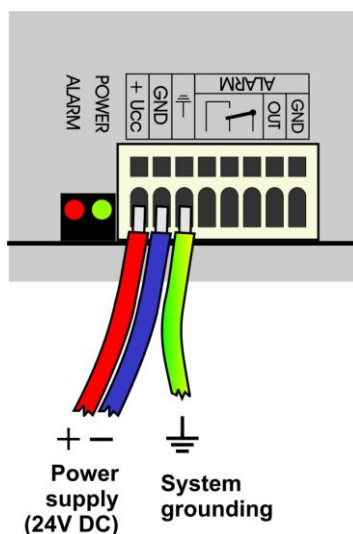
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APPENDIX 1: Power input of data logger

1. Wiring of power connector



2. Parameters of power input

Power voltage of data logger is 24V DC. Consumption of data logger differs depending on kind of connected peripherals. Approximate values are in the below table. If output relay module will be connected to data logger, this voltage must be complied. Data logger itself is able to work at power voltage range (9..30)V DC. Always it is necessary to consider if A0 inputs will be installed before selection of power voltage. If it is to be, see, what lowest power voltage transmitters connected to this input need. Select data logger power voltage at least 3V higher than this. It is necessary to warn negative pole of power connector is galvanically connected to internal GND of data logger. Thus also with inputs (if galvanically not isolated) and with voltage of ALARM output.

<i>Approximate maximum current consumption</i>			
	Power 24V	Power 9 V	Power 12V
data logger MS5 without input modules	approximately 50 mA	<i>approximately 100 mA</i>	<i>approximately 80 mA</i>
data logger MS5D without input modules	approximately 70 mA	<i>approximately 180 mA</i>	<i>approximately 110 mA</i>
Input modules galvanically not isolated, CTU, CTK, FU, FK except A0	< 1 mA	< 3 mA	< 3 mA
Input module galvanically isolated and ac, RP, RS	approximately 10 mA	<i>approximately 35 mA</i>	<i>approximately 25 mA</i>
Input module A0*	20 mA max.	<i>20 mA max.</i>	<i>20 mA max.</i>
Output relay module, all relay closed	approximately 200 mA	---	---
Ethernet interface	approximately 25 mA	<i>approximately 40 mA</i>	<i>approximately 35 mA</i>
SMS communication modules	approximately 6 mA	<i>approximately 20 mA</i>	<i>approximately 15 mA</i>

*A0 short circuited at the input has approximately 28mA current consumption

3. System back-up in case of mains power failure

In case data logger function is necessary to back up during power mains failure, first specify the current consumption of the entire system. Then choose suitable back-up source in accordance with the required time of uninterrupted operation. If there is a need to inform operating staff or distant user on battery operation, then it is necessary to install binary input module S1 to any of input channels and connect it with the backup source output signalizing battery operation.

When installing power sources it is necessary to follow valid safety regulations and recommendations specified in instruction manuals of source manufactures. Leads to battery must be of suitable cross-section size. In back-up design it is necessary to consider allowed temperature source a battery.

Recommended back-up systems:

a) Back-up source AWZ224, manufacturer Pulsar sp.j., Poland

To this source it is necessary to buy two lead accumulators 12V/7Ah in hermetical maintenance-free type of construction, e.g. type ELNIKA 12V/7.2Ah. Source is designed for mounting to vertical inflammable wall with sufficient air flow. Its protection rate is IP20. It is not designed for mounting to closed switchboard. More details are described in manufacturer instruction manual.

This back-up source is able to supply data logger with transmitters of current consumption 200mA for approximately 35 hours. Discharged accumulators are recharged to full capacity in approximately 14 hours.

Make basic wiring in accordance with instruction manual of the manufacturer. Connect data logger this way: connect terminal **-OUT** of source to terminal **GND** of the power data logger connector, connect terminal **+OUT** of source to terminal **+Ucc**. In case information for data logger on battery operation is required, install input module S1 to data logger and connect second terminal **+OUT** of source to terminal **IN** of this input and connect source terminal **BS** to terminal **COM** of input S1. In user PC program state „OFF“ corresponds to „Mains operation“ and state „ON“ corresponds to „Battery operation“. User can be informed on switch-over to battery operation by suitable adjustment of conditions and alarms.

b) Back-up source MINI-DC-UPS/24DC/2 with battery MINI-BAT/24DC/1.3AH, manufacturer Phoenix Contact

This source is designed for mounting to 35mm DIN rail in data logger case MP033 and MP034. It contains two modules - UPS and battery. More details are described in manufacturer instruction manual.

This back-up source is able to supply data logger system with 200 mA consumption at least 3 hours, data logger system with 500 mA consumption at least 2 hours, data logger system with 1A consumption at least one hour. Discharged accumulators are recharged to full capacity in approximately 3 hours.

Make basic wiring in accordance with instruction manual of the manufacturer. Connect battery (without fuse) with proper polarity to terminal **+/- Battery**, connect output of source **-Out** to terminal **GND** of data logger power connector and source output **+Out** to data logger terminal **+Ucc**.

In case information for data logger on battery operation is required, install input module S1 to data logger and connect terminal **-OUT** of source to terminal **COM** of this input and connect source terminal **Bat.mode** to terminal **IN** of input S1. In user PC program state „OFF“ corresponds to „Mains operation“ and state „ON“ corresponds to „Battery operation“. User can be informed on switch-over to battery operation by suitable adjustment of conditions and alarms.

Example of backed up system:

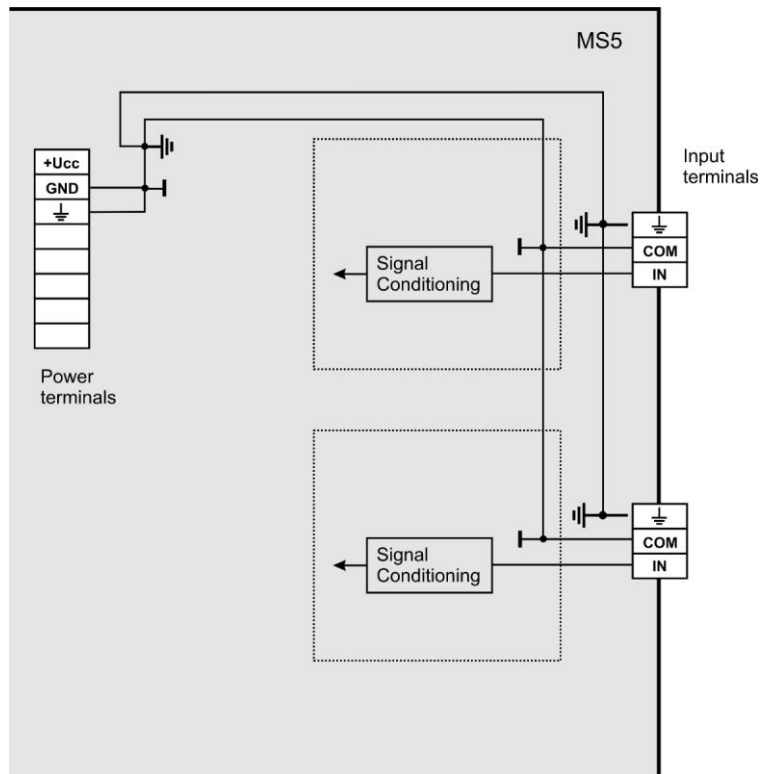
There is a requirement to back up data logger MS5D with 10 input modules K1 and 6 modules A0. Three T3110 transmitters are connected to inputs A0. Data logger is connected to LAN network via Ethernet interface and equipped with SMS module and external GSM modem Wavecom, powered from the same source as data logger.

Total consumption of the system: 70mA (MS5D) + 10x1mA (10xK1) + 6x20mA (6xA0) + 40mA (Ethernet interface) + 6mA (SMS module) + approximately 100mA (GSM modem) = 346 mA.

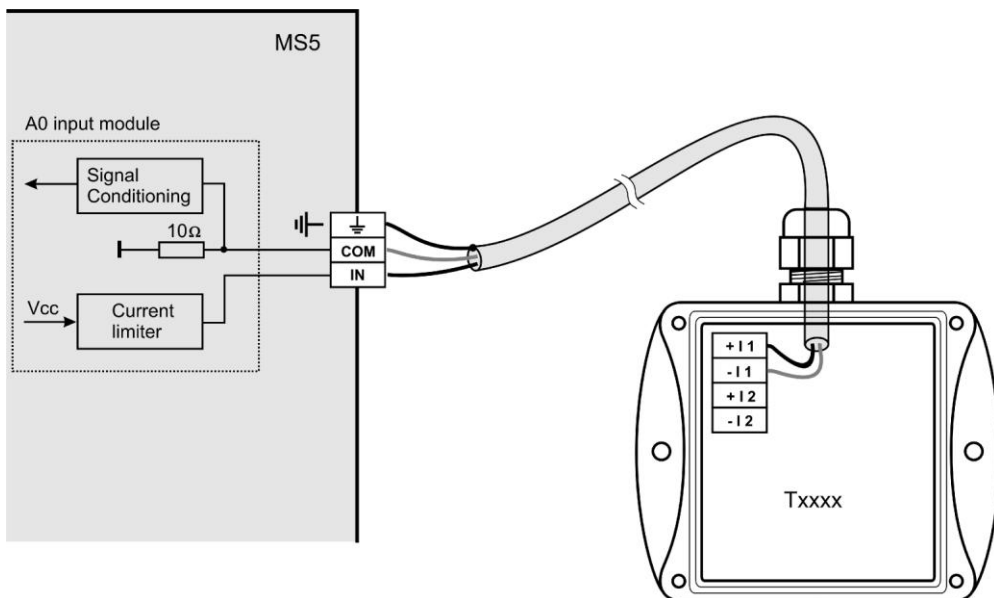
By means of back-up source AWZ224 we are able to reach up to approximately 20 hours of backed up operation, by means of system MINI-DC-UPS almost 3 hours of backed up operation. It is supposed in described calculation, no short-circuit of current loops at input A0 appears. In opposite case current approximately 28mA/input A0 must be calculated.

APPENDIX 2: Input circuits of data logger

1. Connection of earthing terminals in data logger with galvanically not isolated inputs

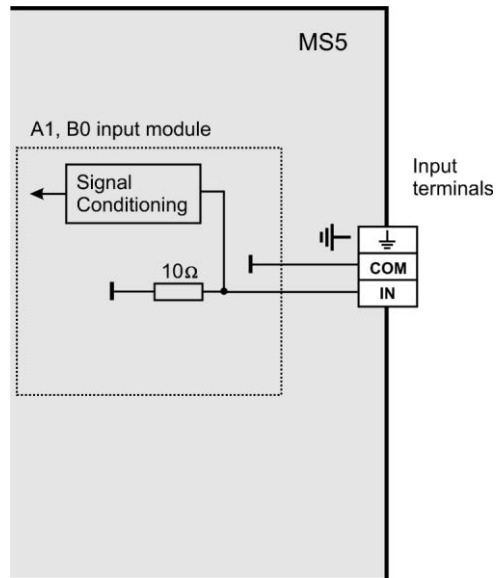


2. Input for two-wire connected passive transmitters - input type A0:



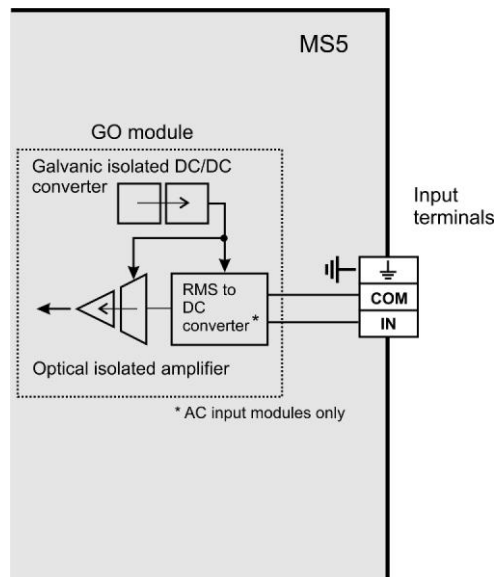
Note: All temperature and humidity transmitters Comet are connectable this way.

3. Input for measurement of current 0(4) to 20 mA



Inputs for measurement of higher currents (1A and 5A) differs by the value of shunt resistor. Voltage inputs have resistor divider instead of shunt resistor. Inputs for measurement of resistance have reference voltage via suitable resistor connected to the IN terminal.

4. Concept of galvanically isolated analog inputs



APPENDIX 3: Input module RP

What can be connected to the RP input module:

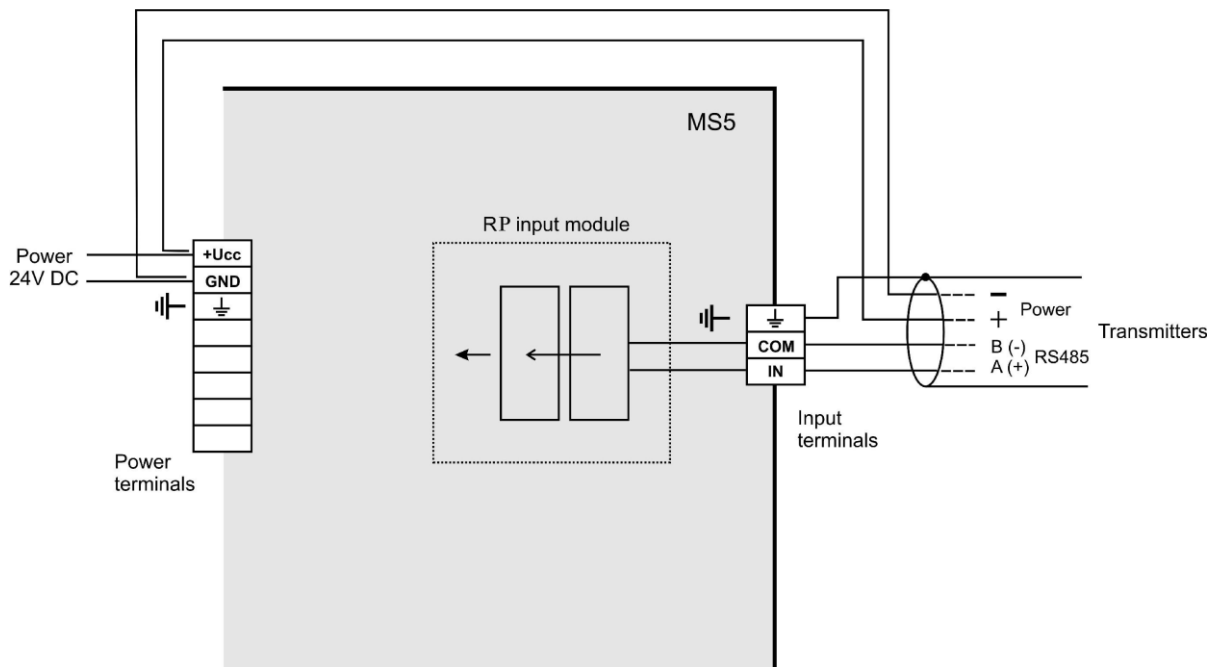
- device, which is equipped with communication link RS485 (link is galvanically isolated at RP module side)
- device must support communication protocols ModBus RTU or ADVANTECH
- 1 to 16 input device can be connected to one module
- Comet transmitters Tx4xx or other manufacturer devices are connectable this way to data logger
- it is not recommended to connect one RP module to devices working with different communication speeds or different communication protocols

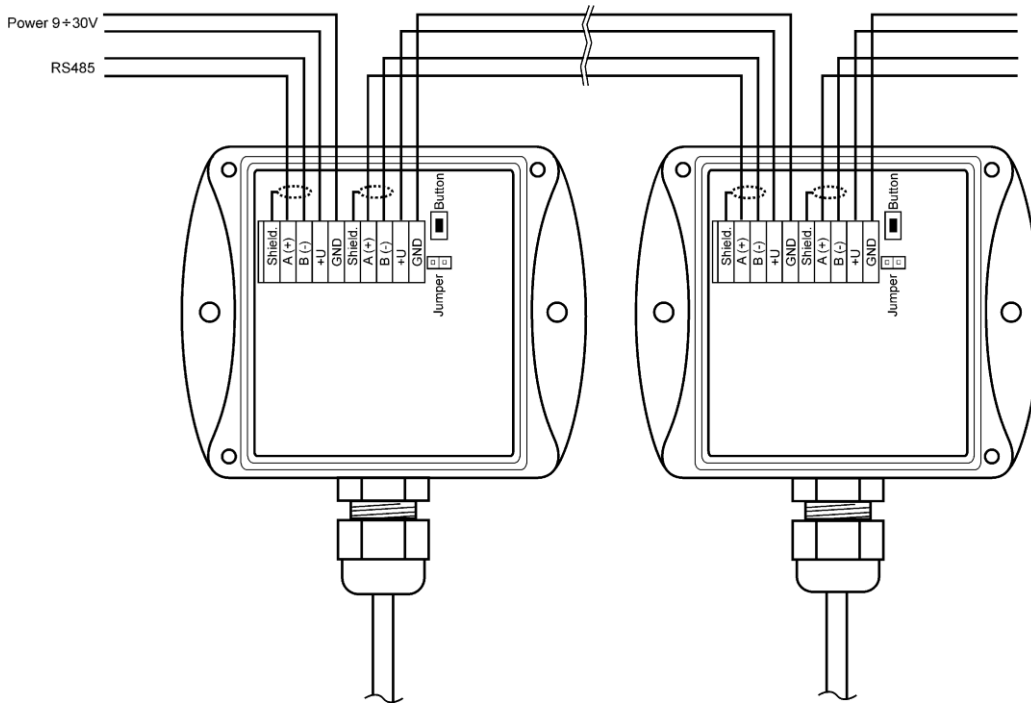
How to set data logger together with input devices:

- Connect each from input devices one after another to the computer and set these parameters:
 - address of input device
 - suitable communication speed, for all device must be the **same**
 - communication protocol and other settings specific for this protocolSome types of input device can require connection of internal jumper Init. Follow the rules in manual for these devices.
- Connect input device to the RS485 network. Connect link to input terminals of data logger module RP and switch on.

•

Example of connection to transmitter Comet:





Run user SW for data logger and set the data logger: *Configuration – Setting of data logger*. Here at bookmark **Ch..Marking and conversions** set for each channel these items:

- Device address (for RS485): enter address of input device operated from that data logger channel.
- Communication speed – set speed, input device is set to before
- Maximum waiting time: time data logger will be waiting for response from input device is adjustable from 30 to 210 ms. If response does not come within this time, error is reported.
- Communication protocol – ModBus can be used (recommended) or Advantech. New transmitters are usually set to ModBus protocol.

for ModBus protocol:

- source data – specification of transmitter space data are supposed to be gotten. For Comet transmitter it is possible to use reading of storing registers or input port without distinction.
- address of read register – enter address of register with required measured value for specification of connected device. Address can be entered from 0 to 65535. **ATTENTION** – this address corresponds to physical address of register. There are different ways of specification of this address. That is why disagreement can appear, if transmitter is adjusted by program from the manufacturer with address, which is physically present in communication. Read carefully description of connected device. Sometimes specified address equals to physical address of register (e.g. in case of RP module). Sometimes shift of 1 is defined (entered address 1 corresponds to physical address 0), sometimes shift of 40 000 or 40 001 is defined (entered address 40 001 corresponds to physical address 0). E.g. in the last case if in documentation is specified data is at the address of 40 005, it is necessary to enter address of register 4.

Comet transmitters use these physical addresses of registers:

Value	physical register address
Temperature	48
Relative humidity	49
Calculated humidity value	50
Barometric pressure	51

- format of data - must correspond to specification of the device, if addresses from above table for Comet transmitter are used, use Signed format of data. Then set in Conversions: measured value 0 corresponds to displayed value 0, measured value 10 corresponds to displayed value 1.

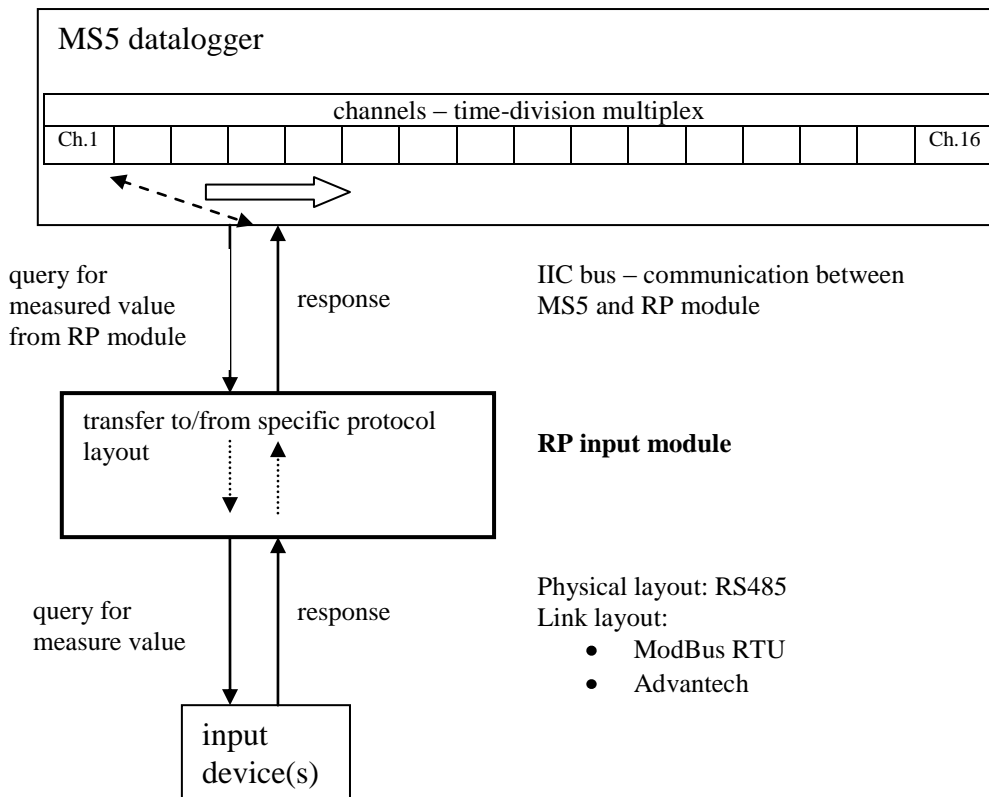
Note: Comet transmitters also enable to read with better resolution in format float uC, address of registers are then 8,10,12 and 14 for corresponding value. Support of float uC format with these transmitters is not specified and guaranteed in documentation for Advantech protocol:

- Multi-input device: If this input device measures more values, then tick this field. More information – see below protocol description.
- Number of input channel: valid for multi-input device. It is a number from 0 to 7
- Check sum – must correspond to setting of the transmitter

After this setting RP module works with those inputs identically as with usual analog channels

Detailed specification of communication protocol

Principle of communication:

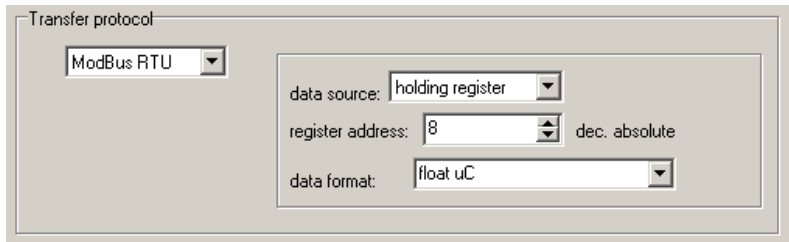


A) Communication possibilities (common setting)

Communication	
Connected device address:	4
Maximum wait time:	210 ms
Baudrate (common for all devices):	9600 Bd
Parity (common for all devices)	two stop bits, no parity

Connected device address, Baudrate and Parity options are noted in table above. Maximum wait time (= Time out) ... is adjustable up to 210 ms approximately. After expiration of this duration communication error is reported and module continues with reading of the following channel.

B) ModBus RTU transfer protocol



RTU ModBus message frame:

Connected device address	Function code	Data	CRC
1 byte	1 byte	n byte	2 byte

Supported data request formats:

Connected device address	Function code	Starting address	No. of registers	CRC
1 byte	0x03 or 0x04	2 byte (0...65535)	2 byte	2 byte

Data source:

RP module supports two function codes:

0x03 ... Read holding registers

0x04 ... Read input registers

other functions are not supported

Register address (= starting address):

absolute address of the first 16-bit reading register (address on the link layout), range: 0...65535

Data format – RP input module is suitable for reading of continuous quantities. Every read value is converted to 4 byte float (single) format for MS5. Data format item specifies No. of requested registers and their conversion method to MS5 float format.

Possible options:

- signed (-32768..32767) ... 2 byte, “integer” format, No. of registers = 1
- unsigned (0...65535) ... 2 byte, “word” format, No. of registers = 1
- signed (-32768..32767) ... 2 byte, “integer” format, No. of registers = 1
- float IEEE754 ...4 byte, float format (register 0,register 1), No. of registers = 2
- float IEEE754 ...4 byte, float format, (register 1,register 0), No. of registers = 2
- float for uControllers ...4 byte, float format (register 0,register 1), No. of registers = 2
- float for uControllers ..4 byte, float format, (register 1,register 0), No. of registers = 2

Data response format:

Connected device address	Function code	Byte count	Data	CRC
--------------------------	---------------	------------	------	-----

1 byte	1 byte	1 byte	ByteCount byte	2 byte
--------	--------	--------	----------------	--------

Function code in response is the same as in the request. If the exception occurs function code is 0x83 or 0x84 and data field contains error code.

Example:

Data request:

0x01, 0x03, 0x00, 0x30, 0x00, 0x01, 0x84, 0x05

Data answer:

0x01, 0x03, 0x02, 0x01, 0x01, 0x78, 0x14

data field: 0x0101 (257)

Data format of float expressions:

- float IEEE754 No. 1 is expressed as 0x3F800000
- float IEEE754 inverse No. 1 is expressed as 0x0000803F
- float for uControllers No. 1 is expressed as 0x80000000
- float for uControllers inverse No. 1 is expressed as 0x00000080

C) Advantech ASCII transfer protocol

Data request format:

start of reading	Connected device address	channel number*	CRC*	end
#	2 ascii byte	1 ascii byte	2 ascii byte	0x0D

Data answer format:

start reading	measured value	CRC*	end
---------------	----------------	------	-----

>	<i>n</i> ascii byte	2 ascii byte	0x0D
---	---------------------	--------------	------

*...optionally

Multichannel device: for the input devices that measures several values. In this case the query contains „Channel number“ field (0...7).

Check sum enabled: when is used the query contains two ascii byte **CRC** and answer have to contain the right **CRC**. Check sum is the sum of all transmitted byte before the check sum, transmission is converted to ASCII code.

Module RP supports response format corresponding with "Engineering units" protocol ADVANTECH:

>**sxxxx.xxxx**(CRC)(cr)

where

s ... sign („+“ or „-“ or nothing)

x ... digits, maximum number of digits left from decimal point is 11, right from decimal point is 6

(cr) ... 0x0D

Examples:

a) one channel transmitter without CRC

the query message: #032(cr)

(hexadecimal expression: 0x23,0x30,0x33,0x32,0x0D)

the response: >+23.50 (cr)

(hexadecimal expression: 0x3C, 0x2B,0x32,0x33,0x2E,0x35,0x30,0x0D)

b) multi-channel device with CRC:

the query message: #032B8 (cr)

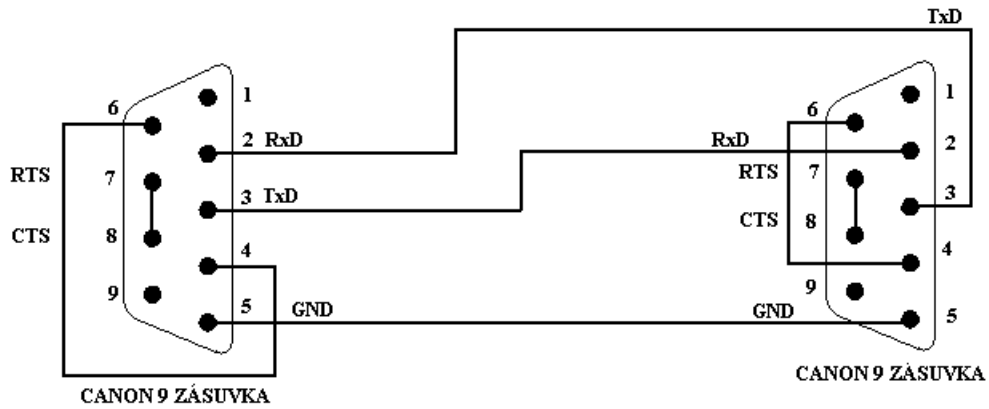
(hexadecimal expression: 0x23,0x30,0x33,0x32,0x42,0x38,0x0D)

the response: >358B(cr)

(hexadecimal expression: 0x23,0x33,0x35,0x38,0x42,0x0D)

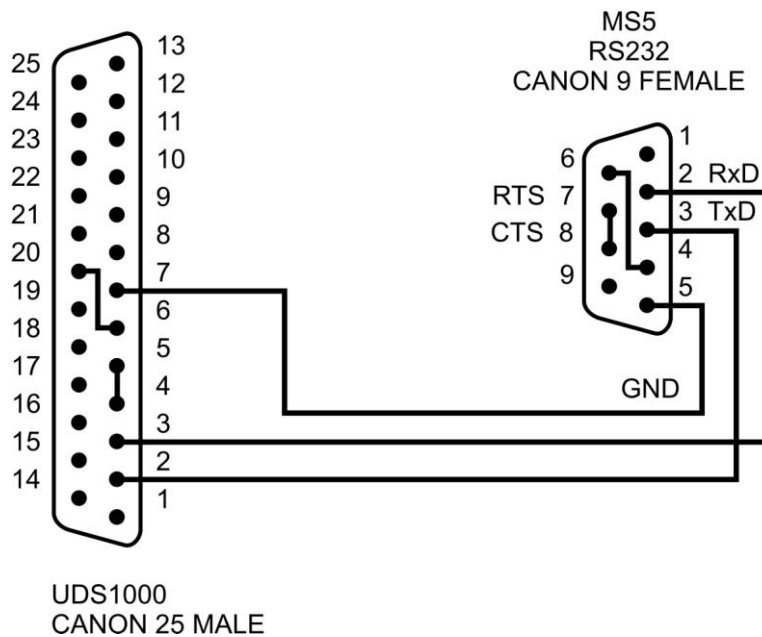
APPENDIX 4: Communication cables

1.. Wiring diagram of communication cable RS232

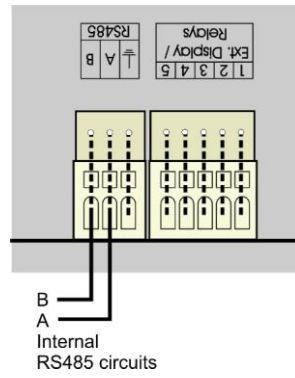


This communication cable serves for direct connection of data logger to the computer.

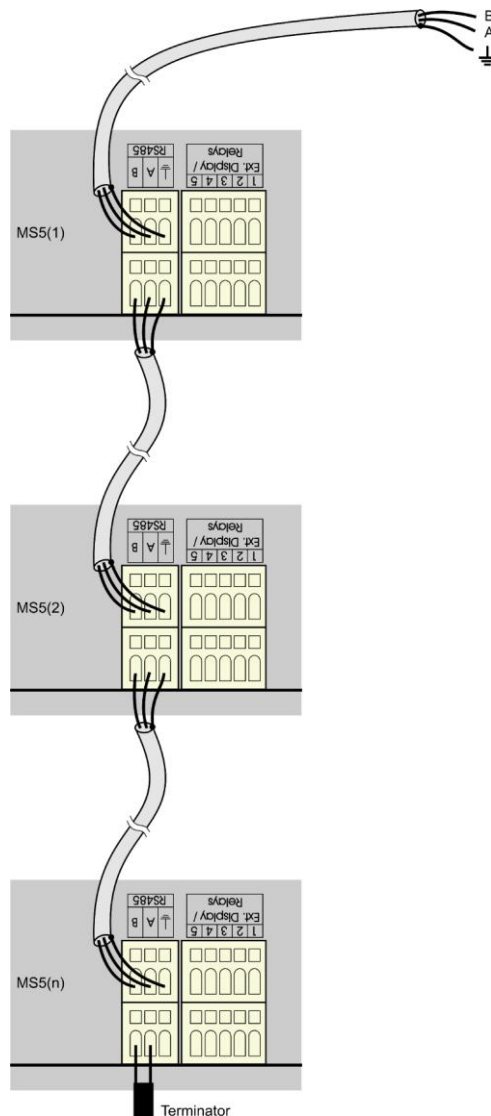
3. Wiring diagram of communication cable between data logger and RS232/Ethernet converter UDS10/100/1000



4. Wiring of RS485 terminals at data logger
- 5.



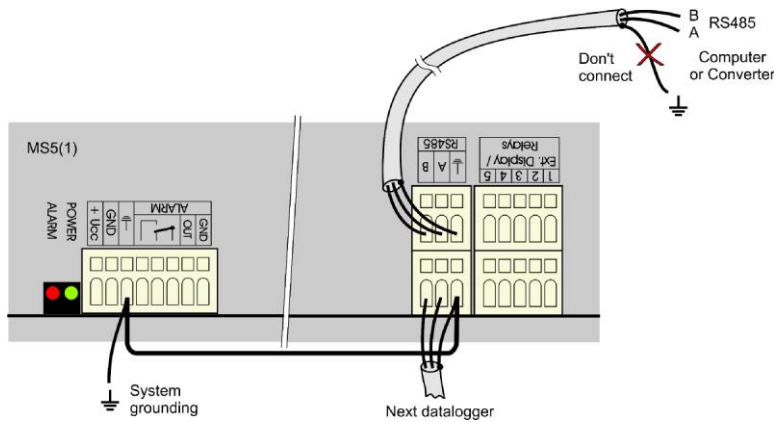
D4.4 The way of data loggers connection by means of RS485 interfaces



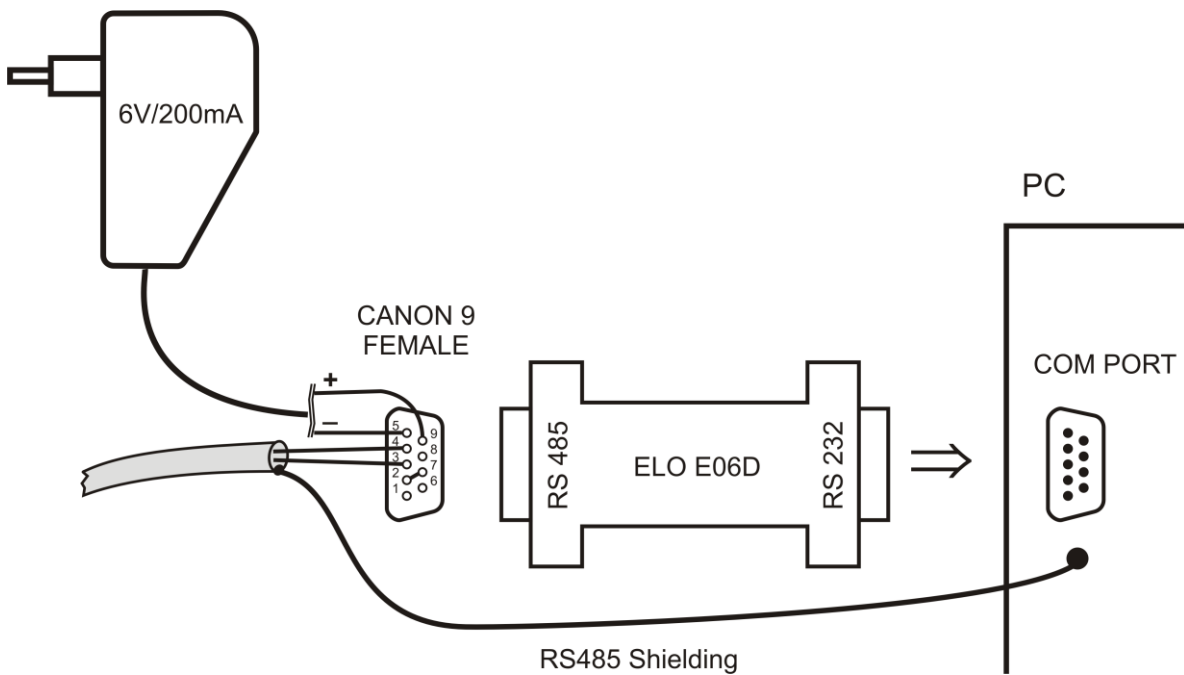
Recommended parameters of connection leads:

Twisted two-wire, shielded, nominal impedance 100 Ω, loop resistance max. 240 Ω, max. 98 Ω/km, maximum capacity 65 pF/m, crosstalk between pairs -40 dB/150 kHz. For longer distances use cabling in one line, i.e. no „tree“ or „star“ (for shorter distances different topology can be tolerated). At the beginning and end termination resistor should be (120 Ω). In many cases termination resistor can be omitted due low communication speed. Marking of link leads from other manufacturers: „+“ corresponds with marking „A“, „-“ corresponds with marking „B“. Connect cable shielding to each other, do not connect to transmitter, if those are not equipped with shielding terminal galvanically isolated from communication and measuring circuits, including case metal parts.

In case shielding of RS485 link is not possible to ground at computer side, ground at data logger nearest to the computer:

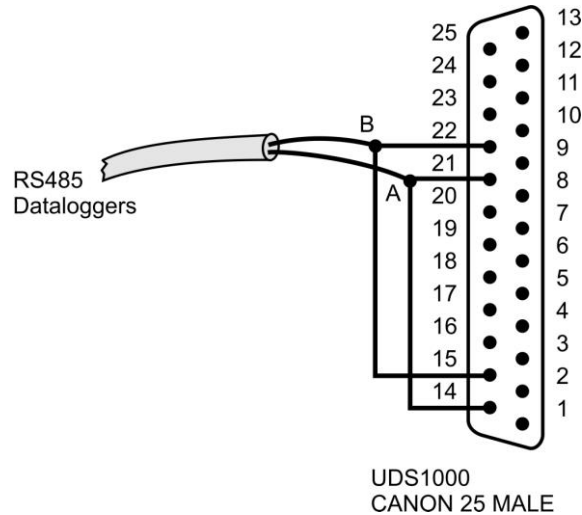


Wiring diagram of connection to RS232/RS485 converter:

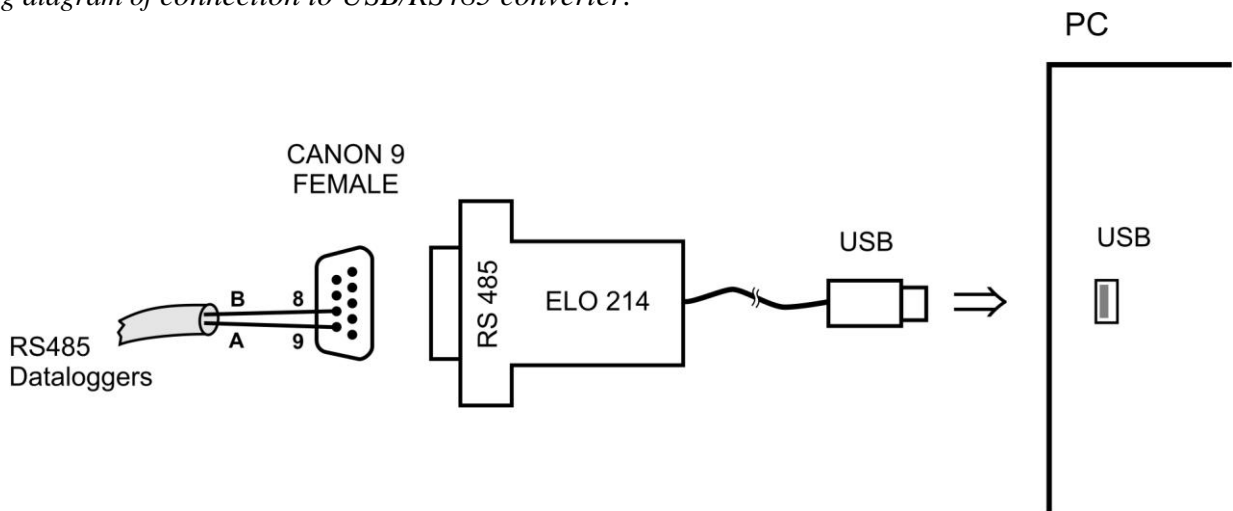


For connection of RS485 link to the computer it is recommended to use external RS485/RS232 converter with automatic switching of transfer direction, type E06D powered from adapter 6V DC. This converter is possible to plug to serial communication computer port COM. Connect link from data logger to the RS485 side with correct polarity (pins 3 and 4) and **connect pins 2 and 7 to each other** . It corresponds with setting of time constant of automatic converter switching for speed 115200 Bd. At this setting mostly there are no problems in communication at lower speed). During communication it is necessary to connect DC output of ac/dc adapter 230V/6V DC to the converter and adapter plugged in mains.

Wiring diagram of cable between data logger and RS485/Ethernet converter UDS10/100/1000



Wiring diagram of connection to USB/RS485 converter:

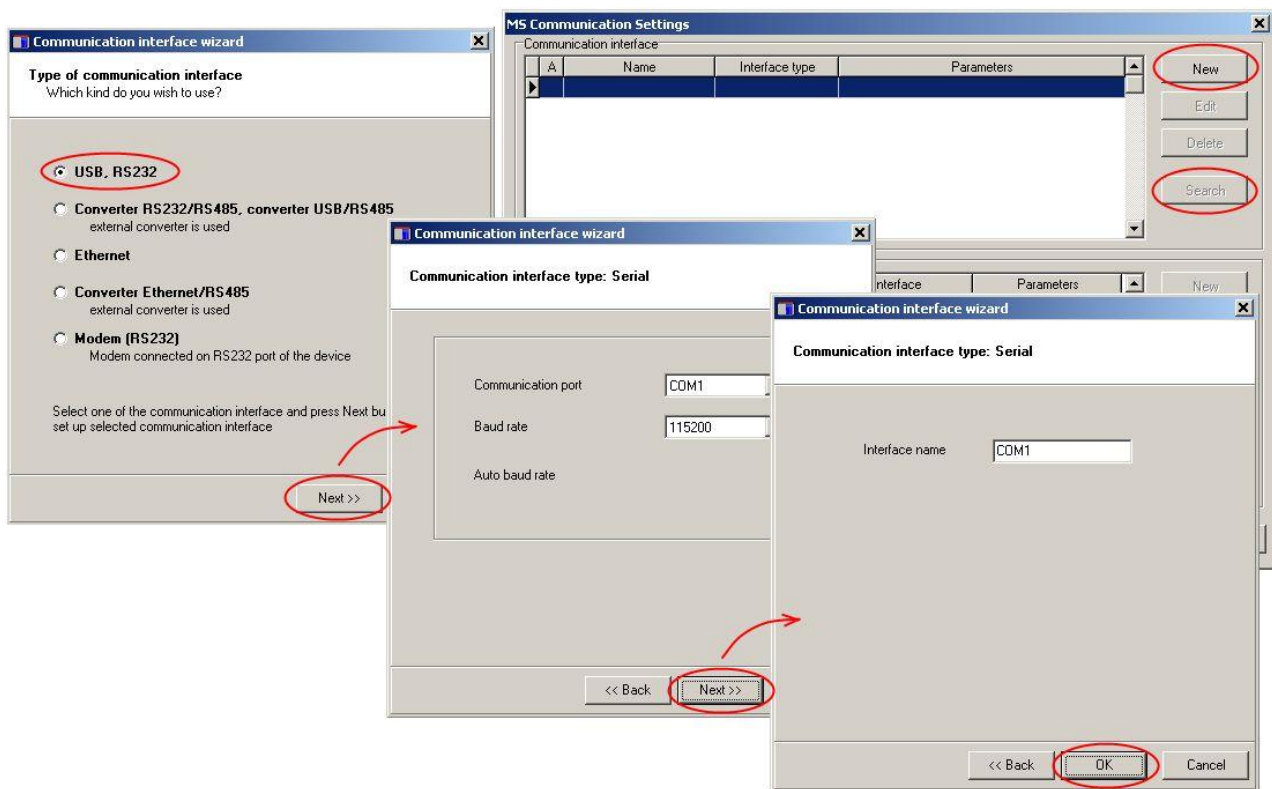


Note: if cable shielding is not connected to ground of some data logger (see figure above), then connect shielding to pin 5 of SubD connector.

APPENDIX 5: Communication of data logger with computer

1. Connection of data logger to computer by means of RS232 interface

- Connect data logger to the computer and switch on its power.
- Select menu item *Configuration – Communication settings* in the software and continue by option *New* in the section *Communication interface*. Choose *USB/RS232* option in wizard window and press *Next* button.
- Select number of COM port, baudrate, set option *Autobaudrate* and click *Next* button.
- In the final window of the wizard confirm or change name of the interface (combination of letters and digits only)
- Confirm window and press button *Search*. Program goes through all used communication speeds and displays found data loggers in bottom window part (Dataloggers). Window of *Communication settings* finally confirm (button *OK*).



Note: 230400 Bd baudrate is unsupported for standard PC COM port

2. Connection of data logger to computer by means of USB interface

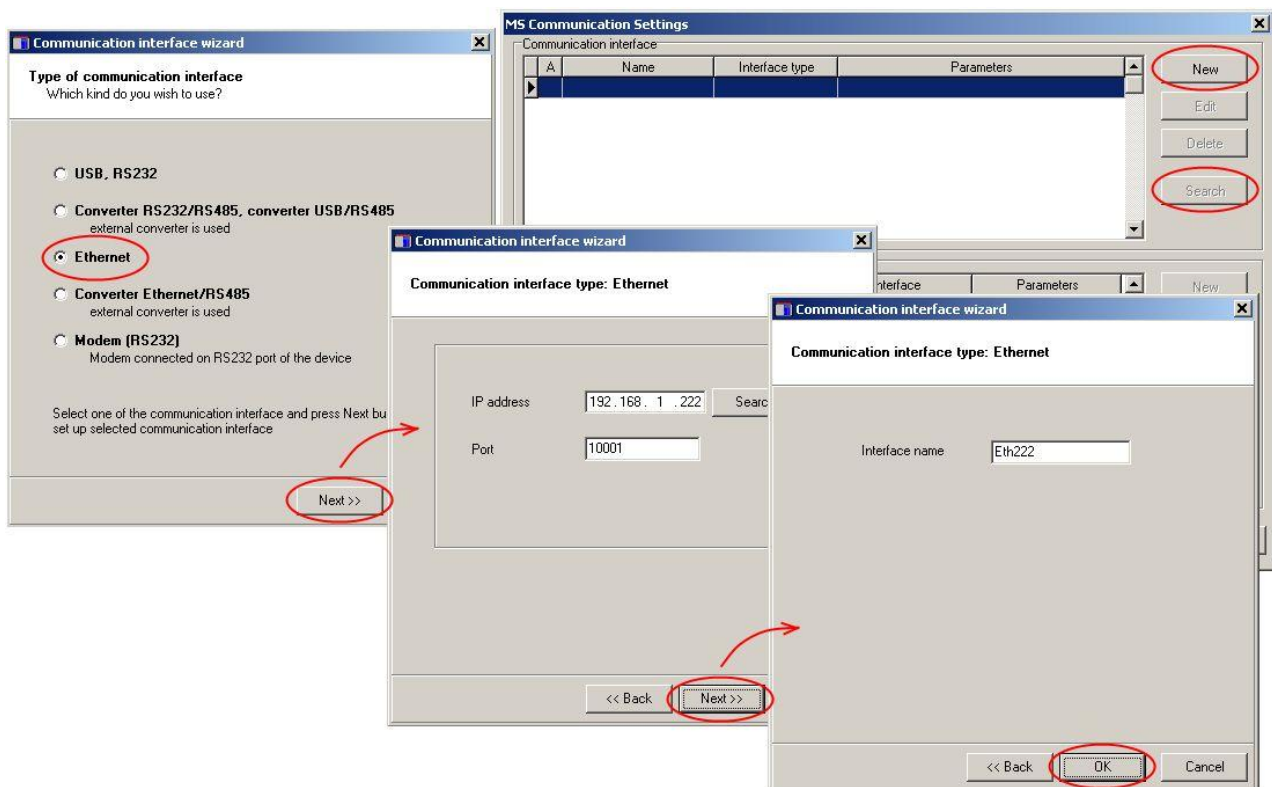
- Procedure is the same as in previous case. USB interface is interpreted in the computer as *Virtual COM port*. Drivers would be installed automatically during installation of the SW. Drivers are available also on installation CD or at www.cometsystem.cz.

If you disconnect the converter from the computer, it can happen, data logger will not be found in the next

communication. The cause is, operation system assigned to converter different number of communication port. You can change it in the above window of communication device or in operation system – Device Administrator, COM and LPT ports – Parameters – Specify.

3. Connection of data logger to computer by means of Ethernet interface

- Connect data logger to the computer and switch on its power. There have to be set Ethernet communication interface in data logger. If communication interface is set to RS232, data logger may communicate but extended ethernet functions (services) will be unavailable (warning e-mails, traps, SOAP, Syslog, web).
- Select menu item *Configuration – Communication settings* in the software and continue by option *New* in the section *Communication interface*. Choose *Ethernet* option in wizard window and press *Next* button.
- Enter IP address of data logger (if you do not know you can search the network by button *Search*), number of port (10001) and click *Next* button.
- In the final window of the wizard confirm or change name of the interface (combination of letters and digits only)
- Confirm window and press button *Search*. Program performs test communication and displays found data loggers at window lower part (Dataloggers). Window of Communication settings finally confirm (button *OK*).

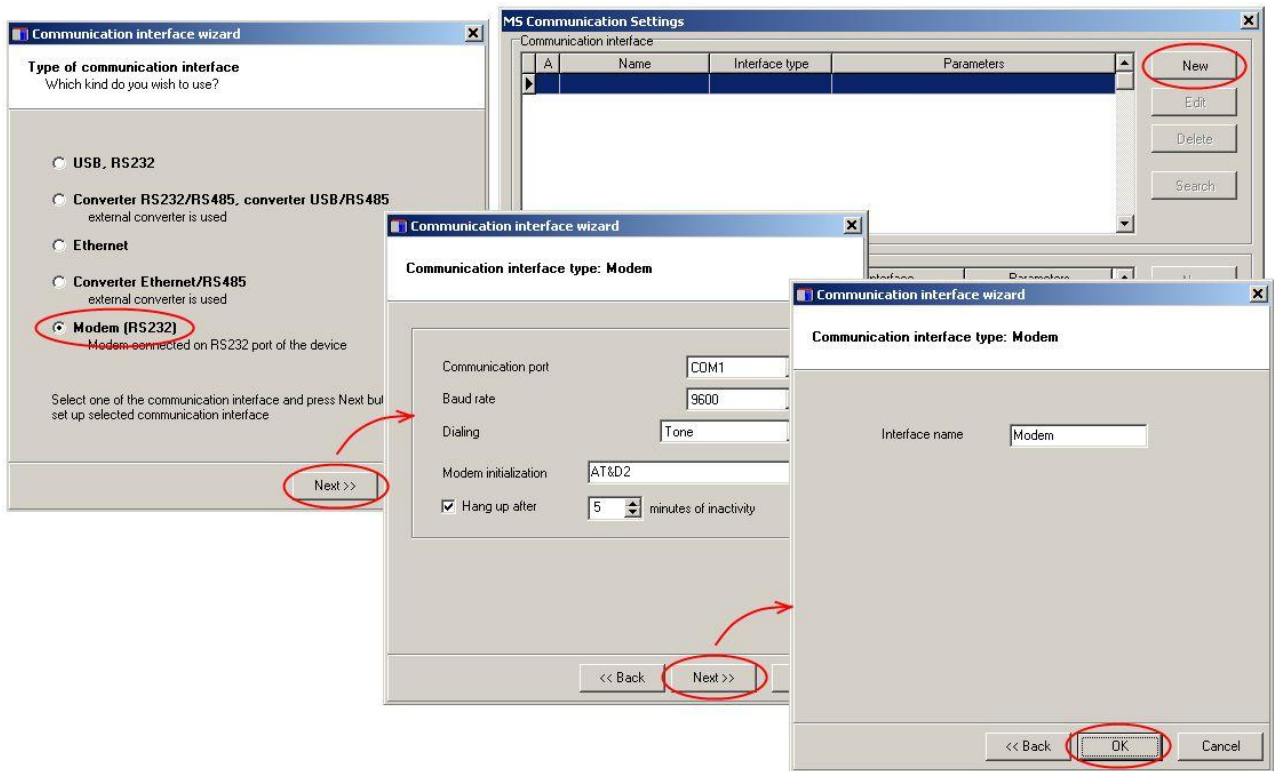


4. Connection of data logger to computer by means of interface RS485

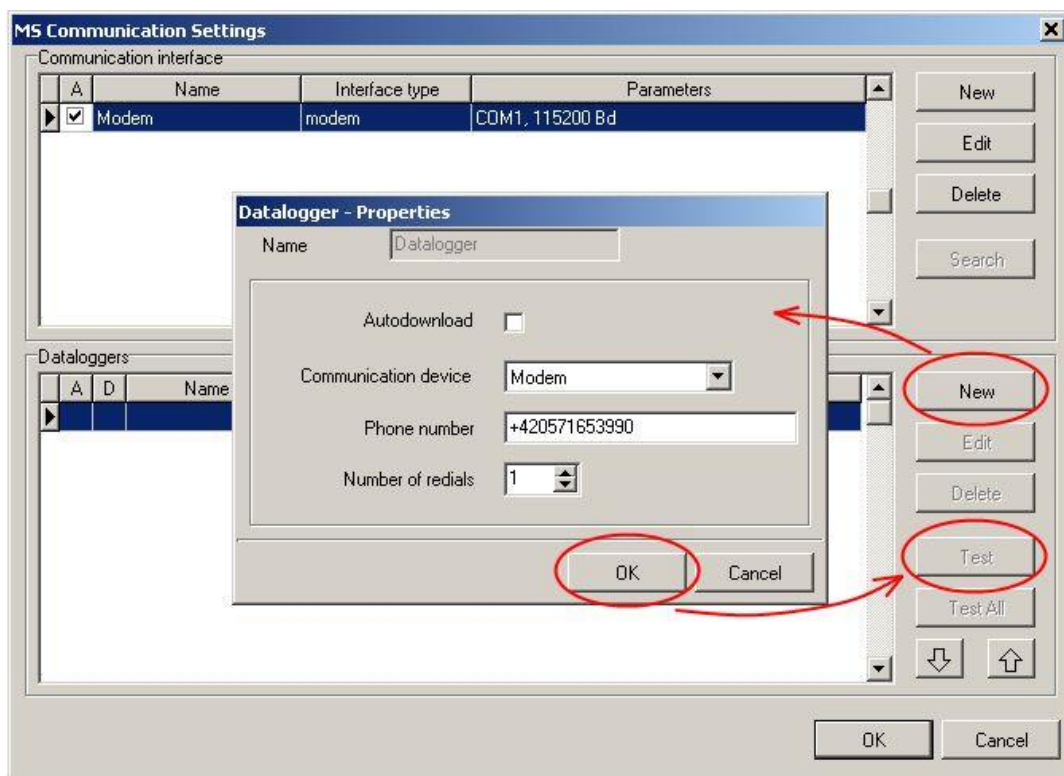
- Connect data loggers to the computer and switch on their power.
- Select menu item *Configuration – Communication settings* in the software and continue by option *New* in the section *Communication interface*. Choose *Converter RS232/RS485*, *converter USB/RS485* or *Converter Ethernet/RS485* option in wizard window and press *Next* button.
- Set particular options of the interface according to selected interface type. For converter RS232/RS485 or converter USB/RS485 select communication port and baudrate. For converter Ethernet/RS485 enter IP address and port number. Then click *Next* button.
- In the final window of the wizard confirm or change name of the interface (combination of letters and digits only).
- Confirm window and press button *Search*. Program goes through all addresses and displays found data loggers in the bottom window part (Dataloggers). Window of Communication settings finally confirm (button OK).

5. Connection of data logger to computer by means via modem

- At the data logger side and PC side suitable modem must be used (recommended type: Wavecom M1306B, Supreme, Xtend). Connect interfaces RS232 of data logger and PC with modems by cables, delivered with modems.
- Used SIM card must enable to transfer data (verify at your operator) and must not be protected by PIN code.
- Used SIM card must be financially credited sufficiently. Data logger is not able to detect low credit! Use suitable tariff.
- Connect modem at data logger side to RS232 computer port.
- Click by right mouse button to icon of user program for data logger, select *Options-Shortcut-Target*, where append text of */master*, e.g.:
`"C:\Program Files\COMET\MS234p\Ms_234p.exe" /master`
- ATTENTION – between quotation mark and slash must be a space. Then confirm the window.
- Click this icon to run the program.
- Select item *Configuration – Modem initialization*.
- If this operation is finished successfully, modem is properly set to data logger. If operation is not finished successfully, you can try to set modem manually (see below).
- Disconnect configured modem from computer and connect it to data logger.
- By means of the keyboard set on data logger display communication interface RS232-modem, communication speed 9600Bd.
- Connect second GSM modem to the computer.
- Select menu item *Configuration – Communication settings* in the software and continue by option *New* in the section *Communication interface*. Choose *Modem (RS232)* option in wizard window and press *Next* button.
- Select number of COM port, where modem is connected and communication parameters. Some modem types work only on speed 9600 Bd. Select *Tone dialing* and input *Modem initialization string* to *AT&D2*. Then click *Next* button.
- In the final window of the wizard confirm or change name of the interface (combination of letters and digits only)



- In the part *Dataloggers* select option *New*. Select communication interface, enter telephone number of modem at the data logger side and save settings (button *OK*).
- Perform communication test (button *Test*).



SIM cards of both modems must enable data transfers and must not be blocked by PIN code. More information concerning solution of problems is specified in Appendix 6.

APPENDIX 6: Configuration of data logger with external modem

When there is a need to connect datalogger via telephone network (land line or GSM) the configuring of GSM modem on datalogger side is necessary. Connect modem to computer by a cable, which is the accessory of the modem, plug in the ac/dc adapter and switch ON the modem. Bellow is mentioned "manual" setting by Hyperterminal.

Instructions for "manual" communication setting by means of modems:

Configuration of data logger's communication interface

Connect data logger via RS232 link to the computer (included cable), switch on and run user PC program. Choose selection *RS232- modem* from *Configuration menu*.

Configuration of external modem at data logger side

Run *HyperTerminal* program on your computer (it is located in *Accessory - Communication*). After its running a request of creation of new connection appears. Cancel this request. In menu *File - Parameters* choose in item *Connect by means of* selection *Directly to port COM1* (respectively COM2, if modem is connected to communication port COM2). Choose selection *Configuration* at the same window and set parameters *Number of bits per second* to 115200, *Number of data bits* to 8, *Parity*: no, *Stop-bits*: 1, *Flow control*: hardware. Confirm both windows to return to terminal. Here enter command **AT (cr)** (i.e. enter in upper case letters AT and press the Enter key). Modem must response: **OK**.

Setting of modem for land line

Now it is necessary to configure modem itself in the way modem after reception must "hung-up" (disconnect the call) and cancel the control of the DTR-DSR loop. This can be done as follows:

- a) **AT&Y0** cr (selection of user template 0)
- b) **ATS0=1** cr (modem „hang-up after the call“)
- c) **ATS23=060** cr (communication speed 19200 Bd)
- d) **AT&D1** cr (cancel of testing DTR-DSR loop)
- e) **AT&W0** cr (saving of active configuration to profile 0)

Now modem is configured and can be switched OFF. Modem responds **OK** to each commands.

Notice: *Be careful not to send to modem AT command in other communication speed. It could cause modem reconfiguration.*

Note: *The above description was verified with modems Microcom DeskPorte 56k Voice, ASKEY V 1456 VQE R-1 and ORIGO FM-56DT.*

Setting of GSM modem - SIM card used in GSM modem must be set not to require PIN after switching ON the modem power. Modem should be set to automatically pick up the call and to enter data mode immediately.

Example for GSM modem WAVECOM Supreme, Xtend:

- a) **AT&F** cr (factory default)

- b) **AT+IPR=9600** cr (serial interface of modem sets to 9600 Bd)
- c) now is necessary to change Hyperterminal baudrate to 9600Bd
- d) **AT+CICB=0** cr (automatic jump to data mode)
- e) **ATS0=1** cr (automatic call pick-up after first ring)
- f) **AT&D0** cr (DTR is ignored)
- g) **AT&S0** cr (DSR always ON)
- h) **ATE0** cr (ECHO off)
- i) **AT&W** cr (configuration writing to EEPROM memory).

What to do if connection does not work

If communication via modems does not work and data logger itself communicates with the computer, check first if wiring and each setting are correct. Pay attention to connection cables, which must be original to modems. Cable included in data logger is designed only for direct connection between computer and data logger. If everything is correct it is useful to test communication between two computers. Modem, which was at data logger side connect to the first computer and run *Hyperterminal*. Connect modem, which was at the computer to the second computer (it is supposed, it is already installed) and also run *Hyperterminal*. Here in contrary with the first computer create new connection with telephone number of link, first modem is connected to. Now there is no other way out than take modem user manual and try to create both-direction data connection at suitable communication speed.

APPENDIX 7: Influence of cable resistance to measurement accuracy with RTD sensors

In case inputs J (Ni1000), K (Pt100) or K1 (Pt1000) are installed and RTD probe is connected, then non zero cable resistance causes additional measurement error, which is added to real temperature. This error depends on cable cross-section, its length and sensor type. If it is known correction is enabled by recalculation of input channels.

Added error for copper wire (two wires) at temperature 23°C:

Cable cross-section [mm ²]	0,22	0,34	0,50	1,00	1,50	2,00	2,50
Cable length [m]	Added error for Ni1000/6180ppm [°C]						
1	0,02	0,01	0,01	0,00	0,00	0,00	0,00
2	0,04	0,03	0,02	0,01	0,00	0,00	0,00
5	0,12	0,07	0,05	0,02	0,01	0,01	0,01
10	0,24	0,15	0,10	0,05	0,03	0,02	0,02
15	0,36	0,23	0,16	0,08	0,05	0,04	0,03
Cable length [m]	Added error for Pt100/3850ppm [°C]						
1	0,36	0,24	0,16	0,08	0,05	0,04	0,03
2	0,73	0,47	0,32	0,16	0,11	0,08	0,06
5	1,82	1,18	0,80	0,40	0,27	0,20	0,16
10	3,64	2,36	1,60	0,80	0,53	0,40	0,32
15	5,47	3,54	2,40	1,20	0,80	0,60	0,48
Cable length [m]	Added error for Pt1000/3850ppm [°C]						
1	0,04	0,02	0,02	0,01	0,01	0,00	0,00
2	0,07	0,05	0,03	0,02	0,01	0,01	0,01
5	0,18	0,12	0,08	0,04	0,03	0,02	0,02
10	0,36	0,24	0,16	0,08	0,05	0,04	0,03
15	0,55	0,35	0,24	0,12	0,08	0,06	0,05

Added error for copper wire (two wires) at temperature 100°C:

Cable cross-section [mm ²]	0,22	0,34	0,50	1,00	1,50	2,00	2,50
Cable length [m]	Added error for Ni1000/6180ppm [°C]						
1	0,02	0,01	0,01	0,00	0,00	0,00	0,00
2	0,04	0,02	0,02	0,01	0,00	0,00	0,00
5	0,10	0,06	0,04	0,02	0,01	0,01	0,01
10	0,20	0,13	0,09	0,04	0,03	0,02	0,02
15	0,30	0,20	0,13	0,06	0,04	0,03	0,02
Cable length [m]	Added error for Pt100/3850ppm [°C]						
1	0,37	0,24	0,16	0,08	0,05	0,04	0,03
2	0,75	0,48	0,33	0,16	0,11	0,08	0,07
5	1,86	1,21	0,82	0,41	0,27	0,21	0,16
10	3,73	2,41	1,64	0,82	0,55	0,41	0,33
15	5,60	3,62	2,46	1,23	0,82	0,62	0,49
Cable length [m]	Added error for Pt1000/3850ppm [°C]						
1	0,04	0,02	0,02	0,01	0,01	0,00	0,00
2	0,07	0,05	0,03	0,02	0,01	0,01	0,01
5	0,19	0,12	0,08	0,04	0,03	0,02	0,02
10	0,37	0,24	0,16	0,08	0,05	0,04	0,03
15	0,56	0,36	0,25	0,12	0,08	0,06	0,05

APPENDIX 8: Selected error messages of data logger

This error messages you can see on data logger's LCD, among measured values or during some actions in software. If software reports error message, take care on sign of this error number. Positive errors are evaluated by datalogger and their description is in the table below. Negative errors are evaluated by software. In this case additional text in message specify what problem appeared.

Error number	MEANING
1	A/D converter is at lower limitation (input quantity – is below lower limit of module range) or for RP input module & Advantech protocol: >-0000 response
2	A/D converter is at upper limitation (input quantity – is over upper limit of module range) or for RP input module & Advantech protocol: >+9999 response
3	RS , RP input module did not receive response from connected device in adjusted time
4	RP input module: invalid CRC
5	RP input module & Advantech protocol: invalid character in response
6	RP input module & Advantech protocol: invalid character in response
7	RP input module & ModBus protocol: unknown function code
8	RP input module & ModBus protocol: ModBus exception occurs
9	RP input module & Advantech protocol: too long response
10	counter module does not contain valid data
130	input module was not found
137	counter value is not possible to display (it contains more than 10 digits) – only display error
149	RP input module: unknown transfer protocol
160-177	corruption of configuration areas of data logger
178	installed different type of module
179	upgrade of input module was not performed
187-188	unauthorized access (non valid password)
189	error of measurement of thermocouple cold junction

APPENDIX 2: Support of reception and sending of SMS messages

Data logger enables to respond to SMS query and sending SMS alarm messages. GSM modem connected to data logger must support PDU SMS format and its SIM card must have stored SCA number (Service Center Address). SIM card must not be blocked by PIN code and must have sufficient financial credit. Data logger does not enable monitoring of financial credit of the SIM card.

Format of received SMS messages:

PDU format, support of 7 bit, 8 bit a 16 bit coding without compression, telephone number in international/national format, ISDN/telephone numbering plan, maximum 15 characters of telephone number, maximum length of text message 64 characters, message can contain UDH of 36 character maximum length, TP-PID= 00h (Short Message Type 0). If those parameters are matched, message is accepted and decoded by data logger, i.e. UDH block is removed, text is converted to capital letters and compared with predefined strings: **Info, Alarm, Ch1 to Ch16, Set1 to Set16, Clr1 to Clr16**. In case valid string was received (no matter if capital/lower-case letters), data logger sends proper response and received message is cleared from modem. If received SMS message is not valid it is cleared from modem without sending any response.

Format of sent SMS messages:

PDU format, 7 bit coding without compression, telephone number in international format maximum length 15 characters, Validity period: 3 days, with all messages except response to request **Info** one SMS is sent of maximum 160 characters. In response to request **Info** sequence of one to four SMS messages is sent (depending on configuration of data logger), maximum length is 152 characters for a message. Messages contain UDH with code for linking to one long SMS on mobile telephones, which support linking of SMS together. For proper function **it is necessary** to have telephone number SCA (Service Center Address) stored on SIM card of the modem.

With messages sent due to creation of alarm or critical state, after SMS is sent all alarm states in data logger are stored. If no change in alarms appears, another message is not sent. If alarm stops to be active and appears again, message is sent. If alarm at another channel appears, message is sent again (If it is allowed by the user). If critical error state for sending SMS appeared (defined delay expired) and before sending of this SMS appeared new critical states, the states are included into the SMS. It is always recommended to set suitable hysteresis and alarm delay.

Detailed description of SMS content:

1. Information on data logger

is sent if SMS with text **Info** was received. Then SMS contains:

- type of data logger (e.g. MS5)
- name of data logger (see setting of data logger)
- state of memory occupation
- for each channel:
 - channel name
 - measured value
 - physical unit
 - state of alarms

Total number of sent SMS messages is 1 to 4 depending on configuration of data logger. Messages contain information intended for linking together at the recipient to one long SMS.

2. State of alarms

is sent if SMS with text **Alarm** was received
or

if at some channel appeared new alarm and is required its report by SMS. Message contains:

- type of data logger (e.g. MS5)
- name of data logger (see setting of data logger)
- list of channels, where Alarm 1 appeared
- list of channels, where Alarm 2 appeared

3. Information on particular channel

is sent if SMS with text **Chn** (where n is channel number 1 to 16). Message contains:

- type of data logger (e.g. MS5)
- name of data logger (see setting of data logger)
- state of memory occupation
- information on specified channel:
 - channel name
 - measured value
 - physical unit
 - state of alarms

4. Message on setting of remote condition number 4 at selected channel

is sent, if SMS was received with the text **Setn** (where n is channel number 1 to 16) respectively **Clr n**.

Message contains:

- type of data logger (e.g. MS5D)
- name of data logger (see setting of data logger)
- state of setting condition or error message (unacceptable statement, if condition is set other way than to Remote or Access denied, if PIN code is incorrect while using protected communication)

5. Message on creation of critical state

is sent if critical error state in data logger appeared and SMS report is required.

Message contains:

- text WARNING!
- type of data logger (e.g. MS5D)
- name of data logger (see setting of data logger)

actual list of critical states in data logger (selftest error, configuration, measurement, overrun of adjusted limit, fulfilling of memory)

Some other settings concerning communication between data logger and modem (If linking of SMSs is used, how some error states are solved, etc.) are specified in Advanced options tab and are described in Appendix 15.

APPENDIX 10: Setting of communication with data logger via Ethernet

Setting depends on type of communication device. Below are described general steps and examples illustrate data logger equipped with own Ethernet interface or with converter *UDS-1000* from *Lantronix*.

Procedure:

1. Probably knowing of MAC address of converter or data logger is necessary (if it is equipped with Ethernet interface). MAC address is mostly specified on the manufacturer label.

Example of MAC address: 00-20-4A-80-F2-FB

2. Ask administrator of your network to assign free IP address

Example of IP address: 194.168.1.211

3. Connect data logger to Ethernet network (directly or via converter) and switch on its power
4. Run user SW for data logger and in window Configuration - Setting communication display parameters of the Ethernet communication device (button New or Change) and use selection Search (next to IP address). If device is not found (detect e.g. by means of disconnecting from Ethernet network and see, if there is any change in the search), then follow the below instruction.
5. If connection is not successful, try to disconnect the computer from the network, use crossed Ethernet cable to connect data logger to the computer directly and repeat the settings.

If IP address is set correctly, communication device is found, but data logger does not work, check setting of Communication interface. Best way is to check on display of data logger: must be set to Ethernet.

Solving problems with communication:

- A) data logger is connected to the network by external converter (UDS100, UDS1000, UDS1100...):

Problem can be in setting of communication interface and communication speed of Ethernet output itself. In this case proceed this way:

Run internet browser and enter directly data logger IP address (it is necessary to have installed Java script), wait for reading of www pages of this device.

Enter at bookmark Port Properties or Channel 1:

- *Serial protocol:
RS232, if data logger contains Ethernet interface or you communicate with data logger connected to converter UDS-10 connected to RS232 interface of data logger
RS485-2 wire, if converter is connected to RS485 interface of one or several data loggers*
- *Speed – communication speed, must be the same, as set on data logger itself (can be found from data logger menu of MS5D LCD)*
- *Character Size: 8, Parity: None, Stopbit: 1, Flow Control: None, UDP Datagram Mode: Disable, Remote IP Address: same as used before, Local Port: 10001, Disconnect Mode: Ignore DTR, Other items: Disabled*

Save the configuration to the device finally and try to find data logger again.

B) Data logger is equipped with internal Ethernet interface

- **In the window of device finding only IP and MAC address are displayed**

Other details are marked as N/A. This problem appears in case, IP address of data logger is set to different network, than network data logger is actually connected to.

Select in program menu *Configuration - Setting communication – Change – Find - Change IP* and change IP address to new one. The rest of settings leave without changes and press the button *Change*.

- **IP address is not displayed even in the window for device finding**

Select in program menu *Configuration - Setting communication – Change – Find - Help! My device wasn't found!*. Input MAC address of the device (e.g. 00-20-4A-84-F0-80), assign new IP address and press the button *Change*.

- **Device is not found even after manual entering of MAC address**

This problem appears especially in cases, IP device belongs to different network and at the same time incorrect gate address and mask is specified.

Select in program menu *Configuration - Setting communication – Change – Find - Change IP*. Input MAC address of the device (e.g. 00-20-4A-84-F0-80), assign IP address, check the option *Set IP address to ARP table only* and press the button *Change*.

Run command line of system Windows (Start/run) and enter `telnet new IP_address 9999`. You get to the text mode of setting data logger interface (e.g.: `telnet 192.168.1.211 9999`).

Press enter key and 0 - Global Settings, set IP address of the device, cancel IP address of gate, set number of mask bits to 0. Confirm the rest by enter key to get to menu. Here save setting by selection 9 Save and Exit. Then connection is closed. Now it is possible to connect to data logger by the program.

- **Communication with program works, but it is not possible to change setting of data logger Ethernet interface**

If data logger is set to communicate with the program (it is possible to read the Display mode, download data etc.), but configuration of Ethernet interface cannot be changed (e.g. IP address of traps, IP address of data logger...), probably you have adjusted high level of security. Proceed in accordance with the Service manual.

APPENDIX 11: Creation of www pages for MS5

Data logger enables user to store own web pages to display actual measured values and alarm states. Files `web2cob.exe`, `mimetype.ini`, `ron.gif`, `al2.gif`, `alarm.gif`, `led.gif` will be necessary for successful creation of own www pages. Download files from manufacturer pages. Also tftp client is necessary (default in Windows XP).

Pages are created in html code, web server of data logger detects the GET command. Data logger has available six banks WEB1-6 after 64kB for www pages.

Address of www pages is http://IP_address_data_logger/page.html. If your main page is named `index.html`, only enter data logger IP address in internet browser to address of pages.

Procedure of www pages creation:

Create HTML pages in any editor. Enter proper mark to the point where values from data logger are meant to be located:

`<%srn%>` serial number of data logger
`<%name%>` name of data logger
`<%rfr%>` refresh of pages
`<%type%>` data logger model
`<%fw%>` version of firmware of data logger Ethernet interface (it is different from FW version of data logger itself)

`<%iacs%>` state of internal audio indication
`<%oacs%>` state of ALARM OUT output
`<%iap%>` icon of state of internal audio indication
`<%oap%>` icon of state of output ALARM OUT
`<%tico%>` icon of selftest state
`<%slft%>` values measured by selftest
`<%ram%>` state of memory occupation and logging mode

Valid for all 16 channels; enter 1 for required channel:

`<%c1n%>` name of channel 1
`<%c1v%>` measured value
`<%c1u%>` physical unit of the value
`<%c1a%>` state of alarm 1
`<%c1b%>` state of alarm 2
`<%c1p%>` name of actual process
`<%c1r%>` information, if record runs

Example:

Example of the code :

```
<!DOCTYPE HTML PUBLIC "-//W3C//DTD HTML 4.01 Transitional//EN">
<html>
  <head>
    <meta http-equiv="refresh" content="<%rfr%>">
    <meta http-equiv="content-type" content="text/html; charset=windows-1250">
    <title>values</title>
    <style type="text/css">
  <!--
    body{ font-family: verdana, arial, helvetica, sans-serif; font-size: 76%;
        color: #000; background-color: #fff; }
```

```

h1 { font-size: 2.0em; font-weight: normal;margin-top: 0em; margin-bottom:
    0em; }
.a1 {background-color: red;}
.a2 {background-color: yellow;}
.a0 {background-color: #d3d3d3;}
//-->
</style>
</head>
<body>
<script>
p1 = new Image();
p1.src = "ok.gif";
p2 = new Image();
p2.src = "all.gif";
p3 = new Image();
p3.src = "al2.gif";
p4 = new Image();
p4.src = "ron.gif";
</script>

<h1>Monitoring:</h1>
<table border="1" cellpadding="2" cellspacing="0">
<tr bgcolor="#bbbbbb">
<td><b>Nr.</b></td>
<td width="180px" align="center"><b>Channel name</b></td>
<td><b>R</b></td>
<td width="180px" align="center"><b>Value</b></td>
<td width="80px" align="center"><b>Unit</b></td>
<td width="20px" align="center"><b>I.</b></td>
<td width="20px" align="center"><b>II.</b></td>
<td width="180px" align="center"><b>Process</b></td>
</tr>
<tr>
<td>1</td>
<td align="left">&nbsp;<b><!--%c1n%--></b></td>
<td><b><!--%c1r%--></b></td>
<td align="right"><b><!--%c1v%--></b>&nbsp;</td>
<td>&nbsp;<b><!--%c1u%--></b></td>
<td align="center"><b><!--%c1a%--></b></td>
<td align="center"><b><!--%c1b%--></b></td>
<td>&nbsp;<b><!--%c1p%--></b></td>
</tr>
<tr>
<td>2</td>
<td align="left">&nbsp;<b><!--%c2n%--></b></td>
<td><b><!--%c2r%--></b></td>
<td align="right"><b><!--%c2v%--></b>&nbsp;</td>
<td>&nbsp;<b><!--%c2u%--></b></td>
<td align="center"><b><!--%c2a%--></b></td>
<td align="center"><b><!--%c2b%--></b></td>
<td>&nbsp;<b><!--%c2p%--></b></td>
</tr>
<tr>
<td>3</td>
<td align="left">&nbsp;<b><!--%c3n%--></b></td>
<td><b><!--%c3r%--></b></td>
<td align="right"><b><!--%c3v%--></b>&nbsp;</td>
<td>&nbsp;<b><!--%c3u%--></b></td>
<td align="center"><b><!--%c3a%--></b></td>
<td align="center"><b><!--%c3b%--></b></td>
<td>&nbsp;<b><!--%c3p%--></b></td>
</tr>

```

```

...
...
<tr>
  <td>15</td>
  <td align="left">&nbsp;<%%c15n%></td>
  <td><%%c15r%></td>
  <td align="right"><%%c15v%>&nbsp;</td>
  <td>&nbsp;<%%c15u%></td>
  <td><center><%%c15a%></center></td>
  <td><center><%%c15b%></center></td>
  <td>&nbsp;<%%c15p%></td>
</tr>
<tr>
  <td>16</td>
  <td align="left">&nbsp;<%%c16n%></td>
  <td><%%c16r%></td>
  <td align="right"><%%c16v%>&nbsp;</td>
  <td>&nbsp;<%%c16u%></td>
  <td><center><%%c16a%></center></td>
  <td><center><%%c16b%></center></td>
  <td>&nbsp;<%%c16p%></td>
</tr>
</table>
</body>
</html>

```

Pages are displayed in browser this way:

Monitoring:

Nr.	Channel name	R	Value	Unit	I.	II.	Process
1	Chann.1: DC I	<input checked="" type="checkbox"/>	0.02	mA			
2							
3							
4	Chann.4: DC I	<input checked="" type="checkbox"/>	0.02	mA			
5							
6							
7							
8	Chann.8:Counter	<input checked="" type="checkbox"/>	0				
9							
10	Chann.10:Counter	<input checked="" type="checkbox"/>	76				
11							
12							
13							
14							
15							
16							

Compilation and upload of pages

Store pages for upload to data logger to one directory. The above required pictures store to the same directory with you r pages. Run program **web2cob.exe** to create **.cob** file. Upload this file by means of tftp protocol to data logger.

Parameters of program web2cob.exe:

Web2CoB [/o <output file>] [/d <directory>]

Output file: Name of output file. Preset name is **cobox.cob**.

Directory: Source directory with www pages.

Parameters of tftp transfer: select binary transfer, method PUT. Select target address from WEB1 to WEB6.

Note: File **mimetype.ini** must be located in the same directory as **Web2Cob.exe**

Example:

Data logger has IP address **192.168.1.205**. In directory **c:\MS\www** are located www pages. In directory **c:\MS** are files **Web2Cob.exe** and **mimetype.ini**. Go to the directory **c:\MS** and enter command:

```
web2cob.exe /d www /o TESTWEB.cob
```

In directory **c:\MS** file **TESTWEB.cob** is created.

Upload www pages to data logger by command **tftp -i 192.168.1.205 PUT TESTWEB.COB WEB1**, memory area WEB1

Limitation:

Maximum size of one WEB (cob) page is 64kB. In case size of www page exceeds 64kB, divide it to max. 6 blocks, compile one after another and store to areas WEB1-WEB6

Each tag of type **<% %>** must be located on separate line in source file.

Capacity of www server of data logger is limited. The bigger the pages are, the lower number of possible simultaneous accesses will be.

APPENDIX 12: SOAP protocol of Ethernet interface for MS5

SOAP serves for sending measured data to a HTTP server. With the aid of this protocol data are sent as a XML document (SOAP message). The advantage of this protocol is that sent data aren't binary and for this reason SOAP messages are allowed through firewalls.

Example:

```
<?xml version="1.0" encoding="utf-8"?>
<soap:Envelope xmlns:soap=http://schemas.xmlsoap.org/soap/envelope/
  xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
  xmlns:xsd="http://www.w3.org/2001/XMLSchema">
  <soap:Body>
    <InsertSample xmlns="http://cometsystem.cz/schemas/soapMS5.xsd">
      <passKey>07050029</passKey>
      <name>Device name</name>
      <SampleDate>Local: 0.098</SampleDate>
      <CH1>
        <V>0.02</V>
        <I>1</I>
        <II>0</II>
      </CH1>
      <CH2>
        <V>0.02</V>
        <I>1</I>
        <II>0</II>
      </CH2>
      <CH3>
        <V>Input closed</V>
        <I>0</I>
        <II>1</II>
      </CH3>
      ...
      ...
      <CH16>
        <V></V>
        <I>0</I>
        <II>0</II>
      </CH16>
      <SELFTEST>Pass (25 V -4.9 V 3.1 V)</SELFTEST>
      <INT_ACOUSTICS>Inactive</INT_ACOUSTICS>
      <ALARM_OUT>Inactive</ALARM_OUT>
      <MEM_USG>18%, cyclic record</MEM_USG>
    </InsertSample>
  </soap:Body>
</soap:Envelope>
```

element <soap:Envelope>: Specifies that the XML document is a SOAP message. It is defined by the SOAP protocol.

element <soap:Body>: Everything what is nested in this element are SOAP message data. It is defined by the SOAP protocol.

element <InsertSample>: It is needed to have running HTTP server for accepting SOAP messages. For example it can be Microsoft Internet Information Service or Apache HTTP server. There have to be installed a web service for processing data from the message on this server. For example ASP.NET or PHP can be used for creating the web service. This service must include a method of the same name as this element (thus **InsertSample**). Descendants of the element

InsertSample (nested elements **PassKey**, **SampleDate**,...) must correspond to parameters of the method.

The attribute **xmlns** defines a namespace for elements of the SOAP message. For namespace name was chosen the URI referring to the XSD schema which describes this SOAP message. This schema only defines the structure of the XML document which represents the SOAP message. It is in no manner related to the sending and accepting functionality.

Element <passKey>: Contains the device serial number (an eight digit whole number)

Element <SampleDate>: Contains the value of time (format: **dd.mm.yyyy hh:mm:ss**) or a number of seconds elapsed from enabling the device (format: **Local: <NumberOfSeconds>/1000**).

Elements <CH1> to <CH16>: actual values

Element <V>: measured value on channel

Element <I>: alarm I state

Element <II>: alarm II state

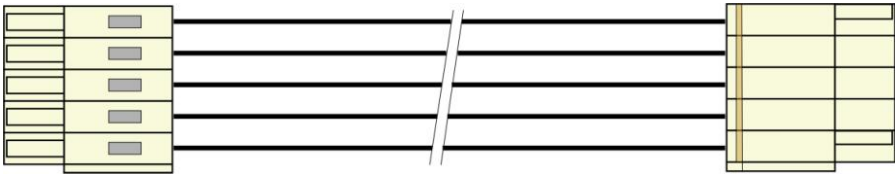
Element <SELFTEST>: selftest status

Element <INT_ACOUSTIC>: state of acoustic signalization (**Active** or **Inactive**)

Element <ALARM_OUT>: state of alarm out signalization (**Active** or **Inactive**)

Element <MEM_USG>: percent of memory occupation and record type (**non-cyclic record** or **cyclic record**)

APPENDIX 13: Connection of data logger with output relay module and external terminal



ATTENTION – cable is crossed, if wired different way than on the figure, connected circuits can be damaged !

APPENDIX 14: Setting of client administration and passwords

This appendix describes protection of data logger MS+, MS5 against unauthorized access. This issue is applied to the following levels:

- Communication encryption
- Users and passwords list
- Login dialog settings
- Program security
- Data logger security
- Synchronization of users and passwords list (centralized administration of users and passwords)

1. Communication encryption

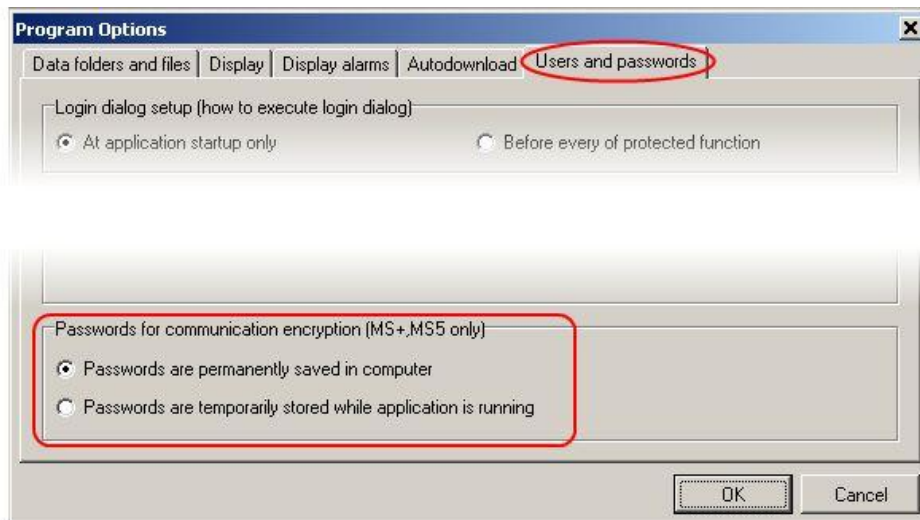
It's protection of data which are transferred between computer and data logger by entered password. The reason of communication encryption is protection against interception of the transferred data in the network (intranet/internet). This data could be decoded because documents about data logger communication protocol is commonly available.

Communication encryption option and password settings is available in the data logger configuration (tab "Common", option "Communication data encryption by password").



The way to input password for communication encryption is possible set in program options (tab "Users and passwords", section "Password for communication encryption").

- Passwords are permanently saved in computer
During first communication initialization with data logger is user asked for the password. Password is saved to the computer. Then password is used in communication with data logger automatically even after re-run of the program.
- Passwords are temporarily stored while application is running
During first communication initialization with data logger is user asked for the password. Password is remembered by program. Then password is used in communication with data logger automatically until program is closed (password will be lost). If the program is started up afterwards, user is asked for the password again.



2. Users and passwords list

Security is commonly implemented by the system of users and passwords list where users have been given access rights. The list of authorized users is applied in the level of data logger security (list in the data logger) and in the level of program security (list in the program), it means, in the system can be two or more independent lists of users and passwords (system is computer/computers with connection of one or more data loggers).

The list of users and passwords can contain up to 16 users with following properties:

User name – unique user name for the access to the account (login).

Name and surname – name and surname of the user.

Description – description of the user account.

Password – user password creation (available through new account creating only).

Password confirmation – user password confirmation (available through new account creating only).

Change password – password change of the selected user (available through account editing only).

Group membership – membership in the group of users

- **User with limited rights** – it is possible define access to the HW and SW protected functions except access to the security administration for the member of this group.
- **Administrator** – member of this group has unlimited access to the HW and SW protected functions including security administration.

SW protected functions – distinguished functions for work with the program.

HW protected functions – distinguished functions for work with data logger.

Export – save list of users and passwords to the file.

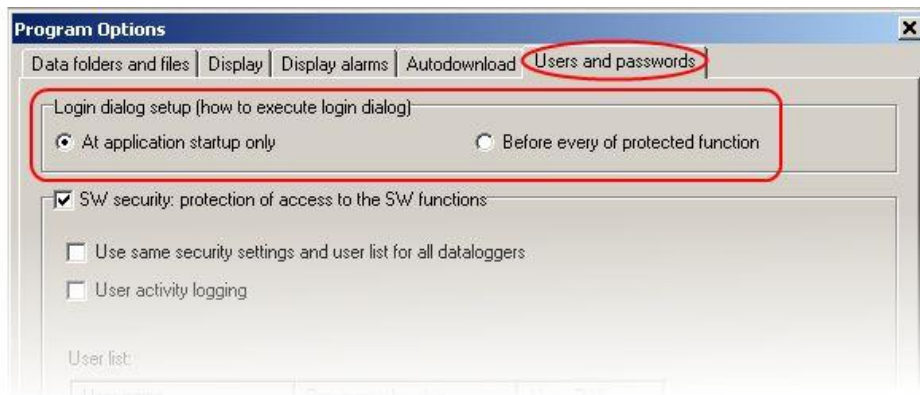
Import – load list of users and passwords from the file.

List of users and passwords stored in the file can be used for transfer of users between program installations on more computers, for theirs back-up or for import to the data logger. This file should be stored on **safe place!**

3. Login dialog settings

Option “**Login dialog settings**” is designed for settings of behaviour of login dialogs (is related to program security and data logger security also!).

- **At application startup only**
Login dialog is used only once, at the time of first run. Entered access data is used at the next time automatically until access data become invalid. Then it's required to enter access data again. Data become invalid for example in this cases: program shut down, user log out, access data are invalid.
- **Before every protected functions**
Login data have to enter every time when access rights verification is required. It's access verification to some protected functions almost.



4. Program security

Program security (SW security) is protection against unauthorized access to the program and restriction of program functions according to settings of users rights. It limits access to the program and program's "Protected functions" according to users rights defined in the list of users and passwords in the program.

By activating of the option "SW security" is set administrator account and it's required new password for it. It's required login to the user account after settings is applied and/or program startup otherwise you can't work with the program.

Current user can be logged out by option "User logout..." from the menu File.



SW protected functions:

- **Program options settings**
Protection of program options setting (Folders, Display, Autodownload).
- **Communication settings**
Protection of communication settings editing (list of communication interfaces and data loggers).
- **Clear display statistics**

- Protection of statistics reset of the current data logger in the Display mode on the corresponding tab.
- **Clear display alarms**
Protection of alarm records erasing of the current data logger in the Display mode on the corresponding tab.
- **Delete event viewer messages**
Protection of messages deleting in the event viewer.

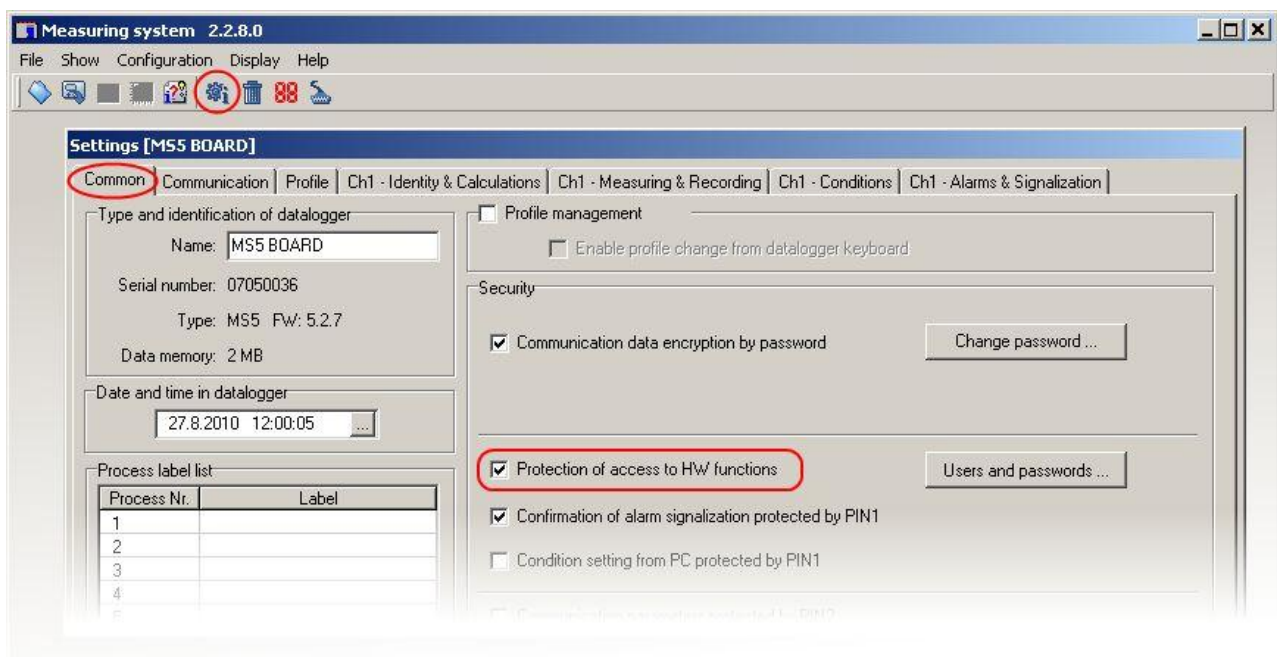
Other functions of the security:

- **User same security settings and user list for all dataloggers**
See Synchronization of users and passwords list (centralized administration of users and passwords).
- **User activity logging**
By activating this option is possible log specific users activity. Logged events are stored and available to show through event viewer.

5. Data logger security

Data logger security (HW security) is protection against unauthorized access to the data logger and restriction of data logger configuration possibilities according to settings of users rights. It limits access to the data logger, data logger's "Protected functions" and configuration possibilities according to users rights defined in the list of users and passwords in the data logger.

By activating of the option "Protection of access to HW functions" is set administrator account and it's required new password for it. User accounts of data logger is possible edit by button "Users and passwords". If data logger security is active, it's performed verification of users rights during each of access attempt to the data logger (it depends on settings of option "Login dialog settings", eventually on data logger account synchronization with computer).



Data logger security is possible set just in case communication encryption is active.

HW protected functions:

- **Data logger settings writing**
User can save performed changes to the data logger.
- **Erase memory, reset counter inputs**
- **Alarm confirmation by PIN1**
User is authorized to cancel (confirm) alarm signalization base on assigned PIN.

Another settings of data logger security:

- **Confirmation of alarm signalization protected by PIN1**
PIN1 settings is available in user account (see HW protected functions).
- **Condition settings from PC protected by PIN1**
Switching between states of remote conditions in Display mode is protected by PIN1. PIN1 settings is available in user account (see HW protected functions).

Alarm signalization is possible cancel (confirm) by following ways:

- By option “Deactivate alarm signalization” from the program menu (menu Configuration)
- By button “Enter” on the data logger keyboard
- In the menu of data logger keyboard (data loggers with display only)

6. Synchronization of users and passwords (centralized administration of users and passwords)

Synchronization means using the same security settings and users list for all dataloggers. It can be set by appropriate option in the program options on the tab “Users and passwords”. If it’s active, there’s only one and centralized users list in the system. This list is managed in the program options and it’s distributed to the data loggers. If data logger is synchronized, users account editing is unavailable in the data logger.

List distribution is performed:

- **Globally**
After changes of program options is confirmed, request for synchronization is rised. If the request is confirmed, synchronization is performed for all available data loggers (see list of data loggers in the communication settings).
- **Distributively**
 - **Through program menu** (option “Update users and passwords in datalogger”)
Synchronization of selected data logger is performed.
 - **Before access to data logger configuration**
After dialog of synchronization request is confirmed, synchronization of selected data logger is performed.

Synchronization checking is made through each of access attempt to the data logger configuration. If data logger is not synchronized for some reason, user is requested to perform synchronization of date logger. Synchronization process can be made by user with administrator access rights for data logger only (in data logger without security is every approaching user administrator).

If security in data logger is not active due to synchronization, it’s switched on including communication encryption. If communication encryption was switched on due to synchronization, user is asked for new password of communication logger encryption to create it. If user don’t create this password, synchronization of the selected data logger is canceled.

If you switch off synchronization, it remains valid last known configuration in every data logger (configuration, let us say security is without changes in data logger) and security in data logger is administrated distributively for selected data logger. It’s possible switched off security for selected data logger and it means switched off synchronization for this data logger (administrator only).

Examples of security settings

1. Restriction of the program startup and functionality, data logger has no security

User wants to secure the system on the computer side only.

Characteristics

- Security (users and passwords) is set in computer only. If data logger is connected to other computer that has no security, access to the data logger is without protection (unlimited).
- It's possible to set restriction of work with program for the user (see SW protected functions).
- Easy settings
- Low level of the security

Settings

Switch on security in program options, option "SW security", and create new administrator password. Add/remove user to/from the list of users and passwords.

Edit user's properties in the list of users and passwords – button "Properties". In user account on the tab "Details" can be set restriction for work with program (SW protected functions).

Save the settings. After you set the settings, log in to the program.



2. Data logger with active security and with access from more computers

User wants to secure selected data logger and it don't make any difference computer security (program security). For example, data logger connected by ethernet and it can be available from more computers.

Characteristics

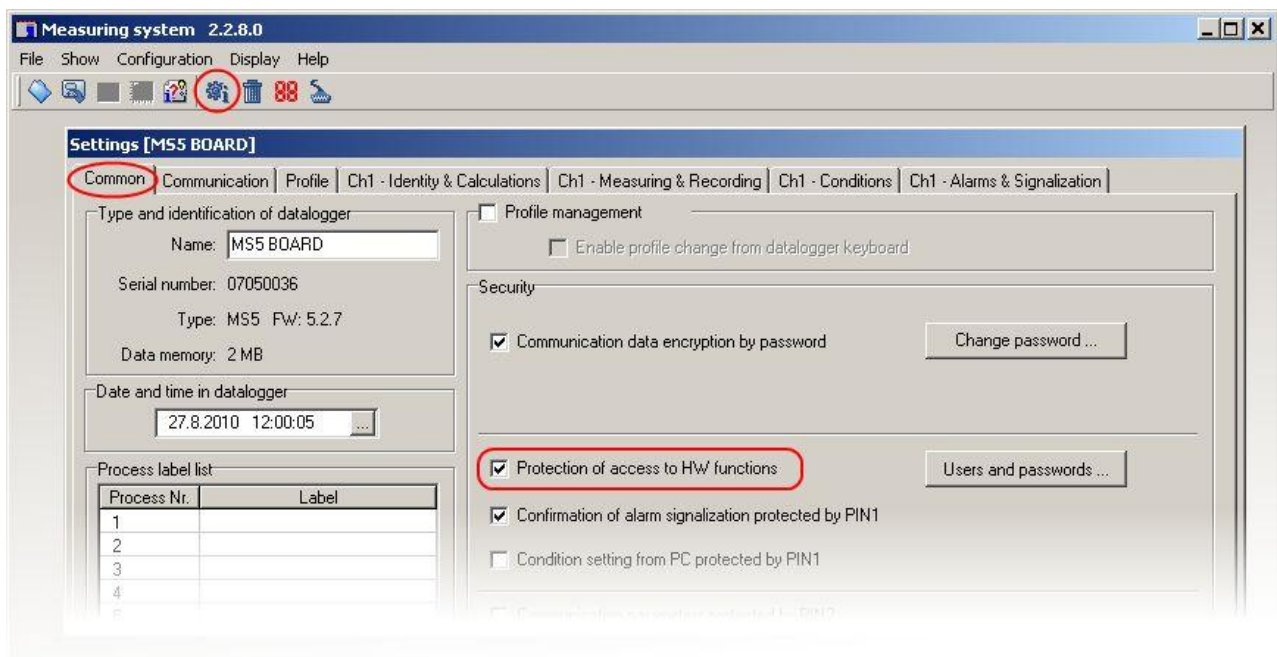
- Security (users and passwords) is set in data logger only.
- Communication between computer and data logger is encrypted by password.
- You need to know login data (name and password) for the access to data logger. This data can be stored in the computer. When you are connected to data logger from any other computer, you need to enter login data again.
- It can be set restriction of work with data logger for the user (see HW protected functions).

- Higher level of security

Settings

Switch on data logger security, option “Security On/Off”, and create new administrator password. It can be edit user’s properties in the section “users list”. In user’s properties (user account) on the tab “Details” can be set restriction for work with data logger (HW protected functions).

Save the settings (configuration).



3. Identification of user who canceled (confirmed) alarm signalization

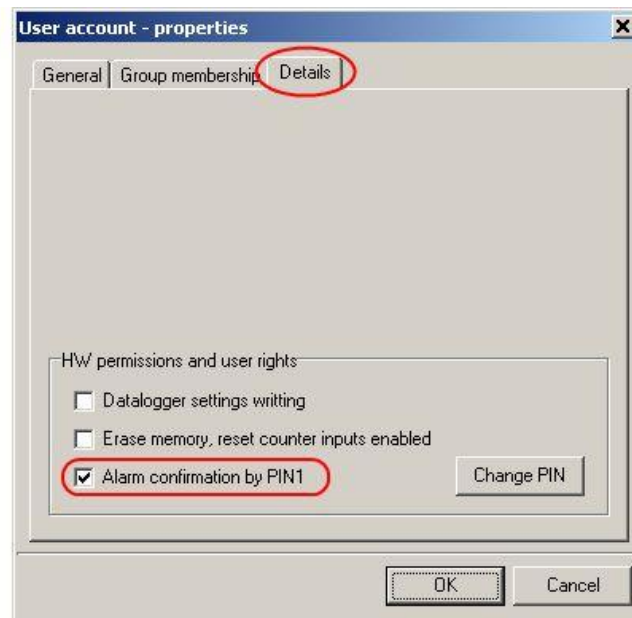
It’s possible to record events of alarm signalization revocation in the measured values and identify the user who performed this action (this record is available with co-operation with identification of user only). Identification of user who canceled (confirmed) alarm signalization is available only, if data logger security is active.

Characteristics

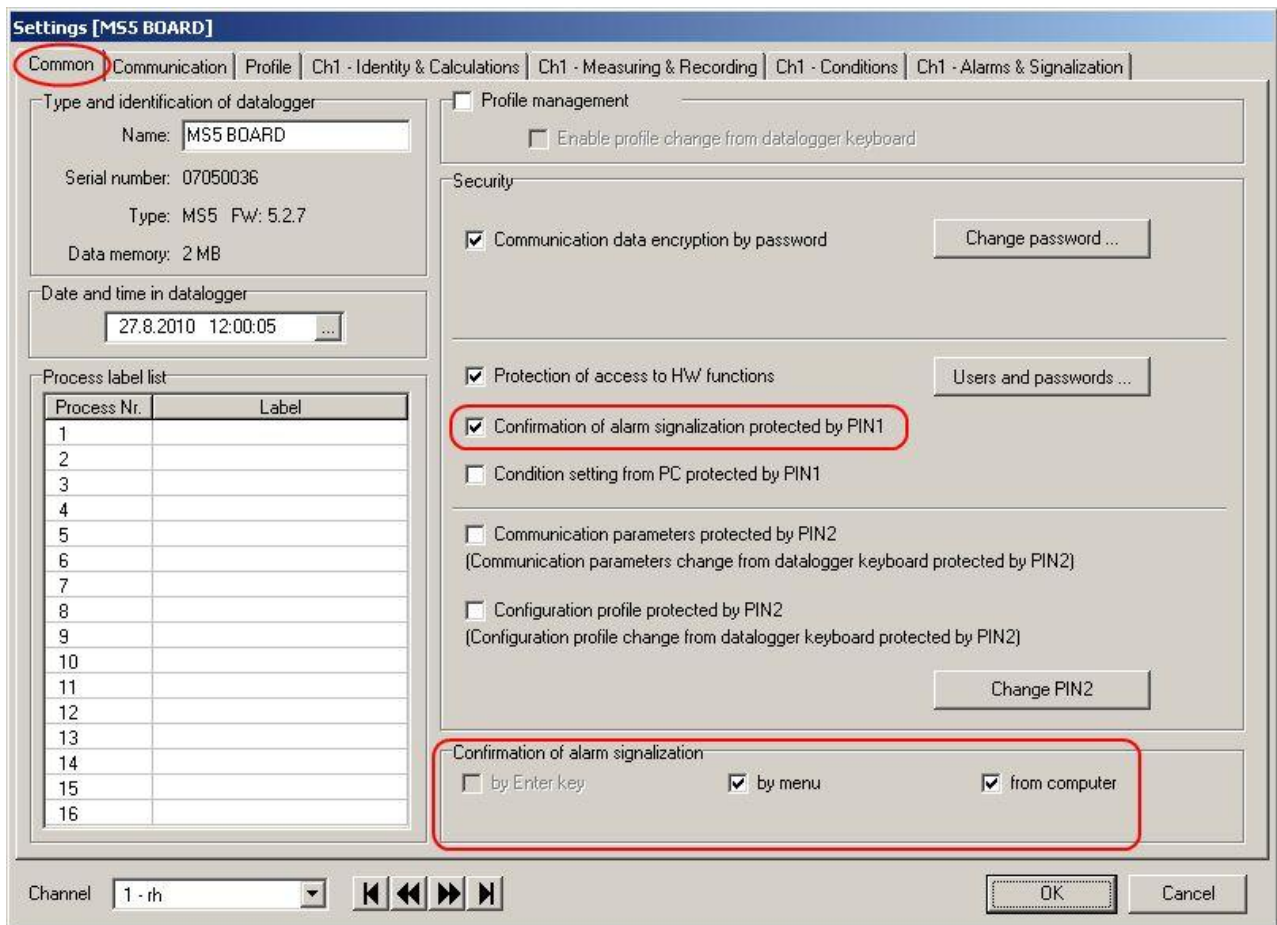
- There is active security (users and passwords) in the data logger.
- Communication between computer and data logger is encrypted by password.
- You need to know login data (name and password) for the access to data logger. This data can be stored in the computer. When you are connected to data logger from any other computer, you need to enter login data again.
- It can be set restriction of work with data logger for the user (see HW protected functions).
- Higher level of security
- Alarm signalization revocation is performed by enter PIN1 on the data logger keyboard or in the computer.

Settings

First follow steps from previous example (ex. 2). Go to the tab “Details” in user account. Select option “Alarm confirmation by PIN1” and create new PIN1 for selected user. You can repeat this step for any number of users in the list.

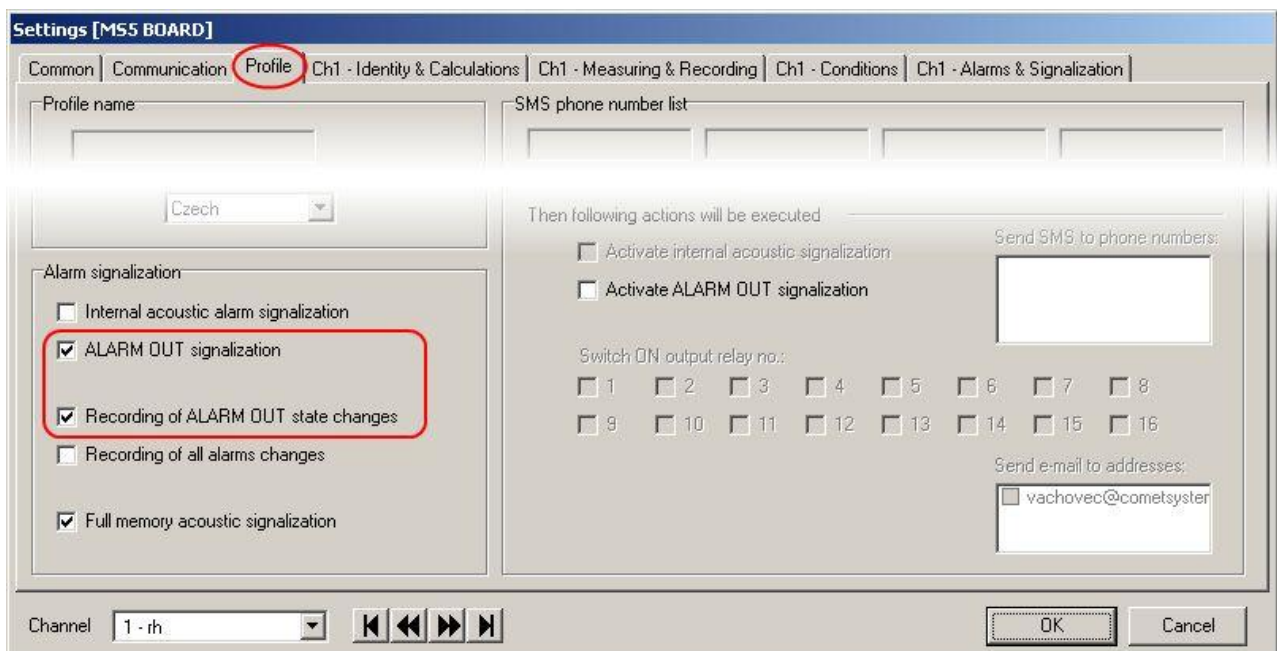


Enable option “Confirmation of alarm signalization protected by PIN1” in the window of data logger configuration – tab “Common”. In the section “Confirmation of alarm signalization” select option from where can be alarm signalization canceled (confirmed).



Go to the tab “Profile” and enable option “Recording of ALARM OUT state changes” in the section “Alarm signalization”.

Save data logger settings (configuration).



4. Security of more data loggers with centralized administration from one computer

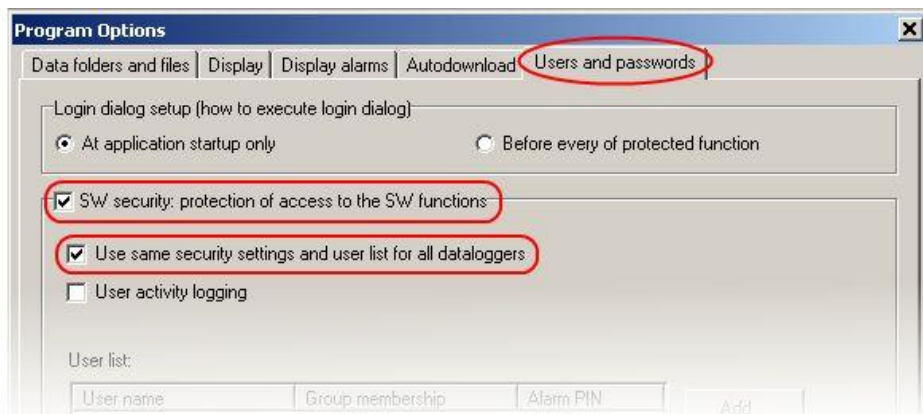
User works with many data loggers from one place (computer) and this data loggers share security (users and passwords).

Characteristics

- There is active security (users and passwords) in all of data loggers.
- Communication between computer and data loggers is encrypted by password.
- You need to know login data (name and password) for the access to the system. This data can be stored in the computer. When you are connected to data loggers from any other computer, you need to enter login data again.
- Program checks changes of the security (users and passwords) settings and update it in the data loggers.
- It can be set restriction of work with data logger (HW protected functions) and restriction of work with program (SW protected functions) for the user.
- High level of security

Settings

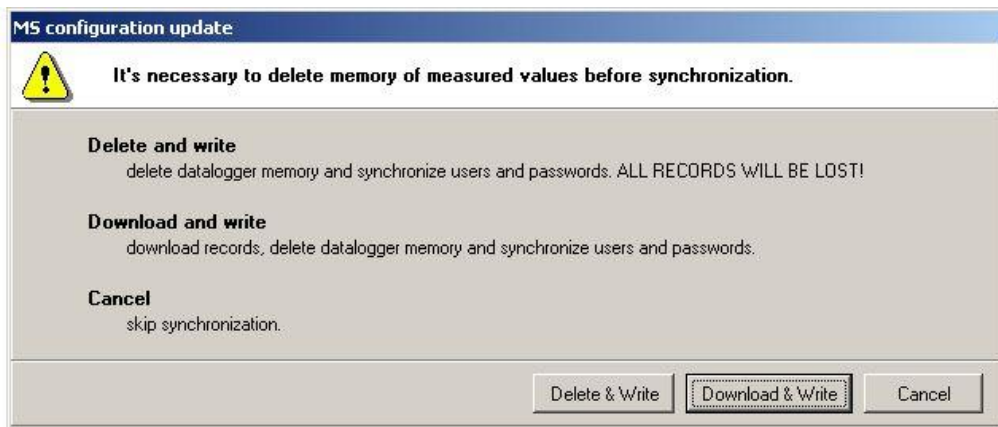
First follow steps from example 1. In addition enable option “Use same security settings and user list for all data loggers”.



After settings confirmation log in to the program as administrator. Then confirm synchronization request (button YES in the dialog).

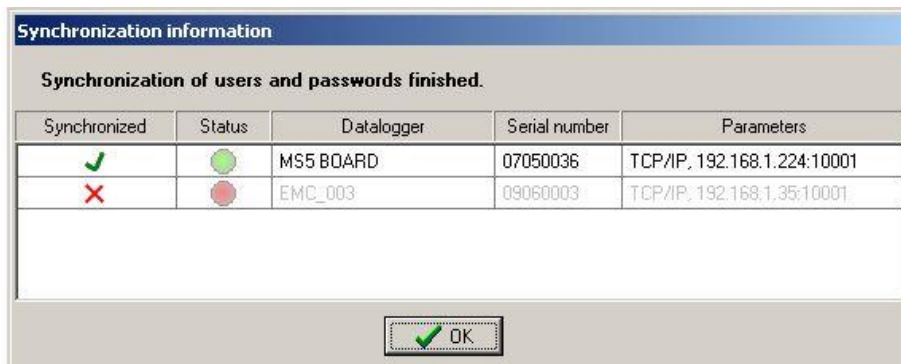


Software set up security and communication encryption for each of available data loggers through synchronization process. If communication encryption is switched on, program require to enter new password of communication encryption. Changes of security (users and passwords) in data logger require memory deleting, that is why user is inform about it and may download current records from data logger before memory is deleted.



If you select “Cancel” option, current data logger is skipped (synchronization is not applied on it) and synchronization process continue with next available data logger from the list.

User is inform about synchronization finalization by summary table with synchronization result.



APPENDIX 15 Advanced settings of data logger

Follow this appendix If you need:

- to activate external terminal
- to activate output relays module
- to activate Ethernet interface in data logger
- to invert behavior of ALARM OUT output
- to set data logger for SMS messaging

Procedure:

- Click right mouse button on icon of user program for data logger, select Options-Shortcut-Target, where append text of */master*, e.g.:
`"C:\Program Files\COMET\MS234p\Ms_234p.exe" /master`
ATTENTION – between quotation mark and slash must be a space. Then confirm the window.
- Click this icon to run the program.
- after reading configuration of data logger another folder appears *Advanced options*
- do required settings and then click button OK – ATTENTION, all recorded data in data logger will be erased!
- Remove text */master* from text in the desktop shortcut

Notes:

- Activation of external terminal and relay outputs is necessary to make data logger communicate with these devices. *If* these items are active, then you can set and use them in usual data logger configuration.
- Activation of Ethernet interface is necessary to switch on this interface on data logger display or in user SW.
- Inversion behavior of output ALARM OUT is suitable, when you need status without data logger power to consider as alarm. With inverse behavior of this output relay is closed in the state without alarm and there is a voltage present at the output.
- Advanced setting of SMS messages:
 - You can change communication speed between data logger and modem (it has nothing to do with communication speed for communication with computer, even if one RS232 interface is used for both). It is recommended to set 9600 Bd.
 - You can switch on flow control of RTS/CTS – usually it is not needed.
 - You can disable to link SMS messages into one long message. This function is not supported by operators in some countries, that is why it is necessary to disable to link SMS in particular situation. It concerns response to SMS **Info**, which can sustain from up to four SMS messages.
 - Other selections concern rather diagnostics in solving problems with messages. Keep default ticked *Erase damaged messages from modem* and not ticked *End SMS transaction in progress with error*.
- It is not enabled to set clock frequency of processor in *master* mode.