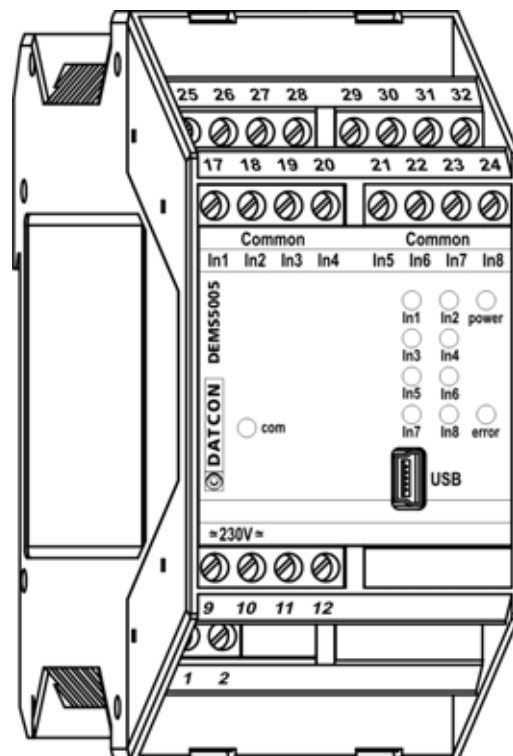


DEMS5005 xx, DEMS5005 xx PS

Pulse Collector

Operating Instructions



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1. About this document

1.1. Function

This operating instructions manual has all the information you need for quick set-up and safe operation of DEMS5005 xx.

Please read this manual before you start setup.

1.2. Target group

This operating instructions manual is directed to trained personnel. The contents of this manual should be made available to these personnel and put into practice by them.

1.3. Symbolism used



Information, tip, note

This symbol indicates helpful additional information.



Caution, warning, danger

This symbol informs you of a dangerous situation that could occur. Ignoring this cautionary note can impair the person and/or the instrument.

List



The dot set in front indicates a list with no implied sequence.

Action



This arrow indicates a single action.

Sequence



Numbers set in front indicate successive steps in a procedure.

2. For your safety

2.1. Authorized personnel



All operations described in this operating instructions manual must be carried out only by trained and authorized specialist personnel. For safety and warranty reasons, any internal work on the instrument must be carried out only by DATCON personnel.

2.2. Appropriate use

The DEMS5005 xx is a Pulse Collector. Detailed information on the application range is available in chapter **3. Product description.**

2.3. Warning about misuse



Inappropriate or incorrect use of the instrument can give rise to application-specific hazards, or damage to system components through incorrect mounting or adjustment.

2.4. General safety instructions



Using the DEMS5005 xx requiring the strict observance of standard regulations and guidelines.

The user must take note of the safety instructions in this operating instructions manual, the country-specific installation standards as well as all prevailing safety regulations and accident prevention rules.

2.5. CE conformity

The DEMS5005 xx is in conformity with the provisions of the following standards:

EN 61326-1 (EMC),
EN 61010-1 (Safety),

2.6. Environmental instructions

Protection of the environment is one of our most important duties.

Please take note of the instructions written in the following chapters:

- Chapter **3.6. Storage and transport**
- Chapter **9.2. Disposal**

3. Product description

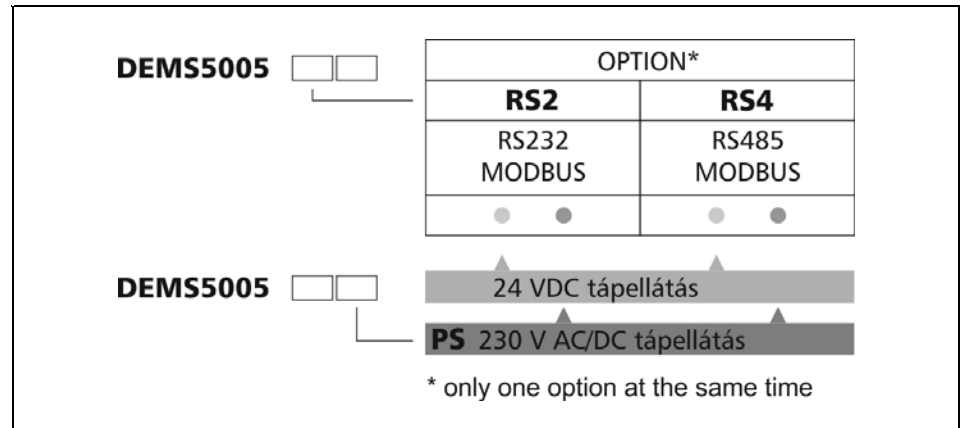
3.1. Delivery configuration

Delivered items

The scope of delivery encompasses:

- DEMS5005 xx xx
- mini USB A (5 pins) - USB A cable
- DEMS5005 configuration software (CD)
- documentation:
 - this operating instructions
 - certification

3.2. Type designation



Area of application**3.3. Principle of operation**

The DEMS5005 xx xx Pulse Collector provide counting the pulses of NAMUR / contact type outputs (eg. power meters).

The instrument has eight inputs with common GND so the inputs are not isolated from each other.

The input signals type are selectable from NAMUR compatible signal or simple contact (eg. contact of reed relay).

Each input can be selected to counting of rising edge (for NO contact) or falling edge (for NC contact).

Each input can operate in two measuring range:

- debounced input mode: 0-10 Hz
- without debouncing: 0-50 Hz

The collected pulses are readable and modifiable via MODBUS interface or the configuration software.

You can set all parameters and view all counted data with the configuration PC software via USB cable. You can save to file and load from file these settings.

The Pulse Collector feature complete 3-way isolation: the inputs to MODBUS and both to the power supply circuits are isolated.

The instrument is able to perform the following functions:

- Measure the time interval between the last two pulses.
- Alarm when these intervals higher than the limits.
- Indicate the errors (eg. NAMUR open or shorted state).
- Indicated the incoming pulses by eight yellow LEDs on the instrument front.

Changing the settings - in addition to the configuration software - it is possible using the MODBUS communications. The MODBUS provides RTU protocol only.

Principle of operation

The measuring current (8.2 mA) flows from Inx terminal through the external NAMUR switch or simple contact to Common terminal. This external contact shorts Inx and Common or opens the current circuit. The voltage between input and Common sensed by the input electronics. This electronics protects the instrument from overvoltage and fits to input of an 8 bit high speed A/D converter. This digitized data is processed by a microcontroller. The microcontroller evaluates the signal level, detects the NAMUR errors, implements the debouncing method, measures the time between two pulses and stored new data to unvolatile memory. The counted event is displayed by yellow indicator LEDs.

You can view and modify the collected pulses and the settings via configuration software or MODBUS RTU communication.

Power supply

There are two power supply range instrument:

DEMS5005 xx: 24 VDC; 3 W

DEMS5005 xx **PS**: 230 V AC/DC; 3.5 VA / 3 W

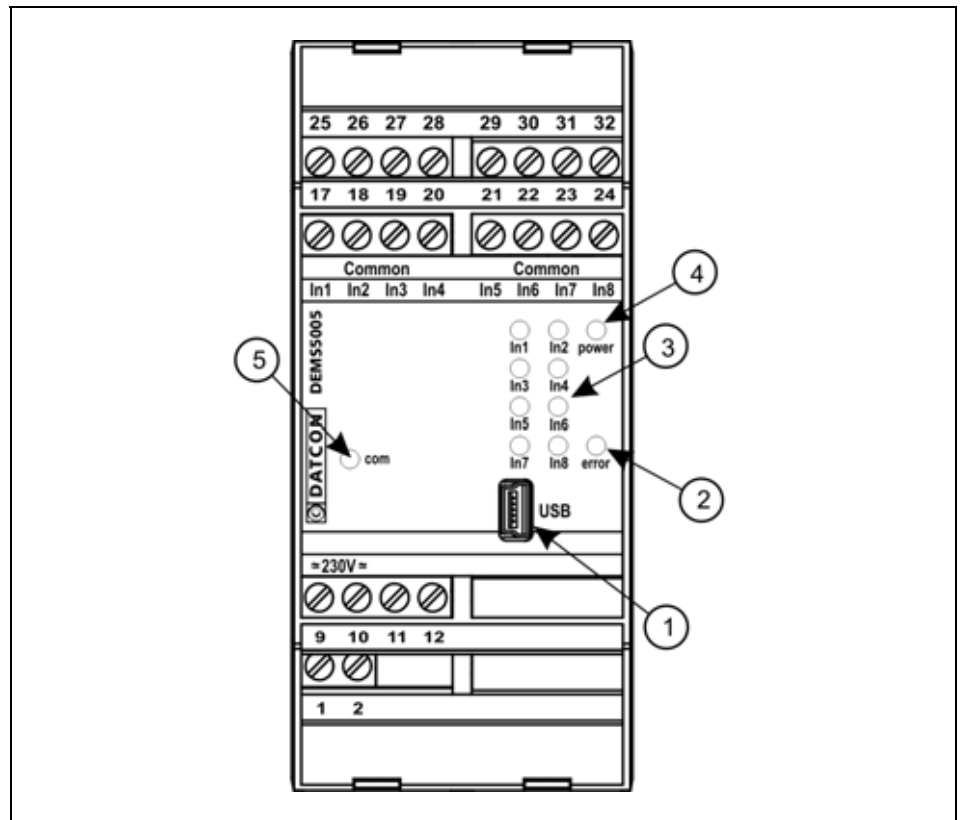
3.4. Adjustment

After connecting the instrument is ready to work with the factory default parameters are written in Chapter 6.1.. For working with the default parameters there is no need any adjustment. The detailed description of the setup can be found in Chapter 7..

3.5. Indicators, USB connector

The following figure shows the indicators and the USB connector on the instrument front:

Indicators



1. USB-B mini, 5 pole connector for connecting to the PC at configuration.
2. „error” red indicator has two function:
 - continuous light indicates that the instrument is in configuration mode (USB connector is active)
 - blinking light indicates different error states
3. „In1”-„In8” yellow indicators:

Indicates by 0.1 sec blinking that there was a count event at assignet input connector.
4. „power” green indicator has three function:
 - continuous light indicates that the instrument works properly
 - blinking light indicates the setup state after power on event. (While this indicator is blinking the instrument can not counting the pulses.)
 - when the instrument is in configuration mode (USB connector is active) blinking light indicates the good communication with PC.
5. „com” yellow indicator:

blinking light indicates the good communication with MODBUS RTU master device.

3.6. Storage and transport

This instrument should be stored and transport in places whose climatic conditions are in accordance with chapter 10.1. Technical specifications, as described under the title: Environmental conditions.



The packaging of instrument consist of environment-friendly, recyclable cardboard is used to protect the instrument against the impacts of normal stresses occurring during transportation. The corrugated cardboard box is made from environment-friendly, recyclable paper. The inner protective material is nylon, which should be disposed of via specialized recycling companies.

4. Mounting

4.1. General instructions



The instrument should be installed in a cabinet with sufficient IP protection, where the operating conditions are in accordance with chapter 10.1. Technical specification, as described under the title: Operating conditions.

Mounting position

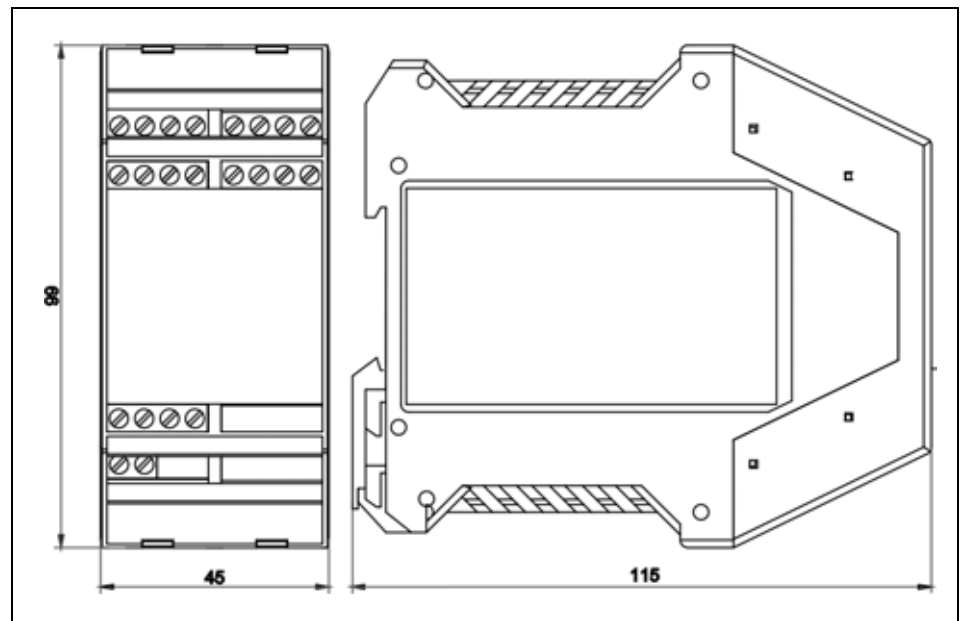
The instruments are designed in a housing for mounting on TS-35 rail.

The instruments should be mounted in vertical position (horizontal rail position).



Horizontal mounting may cause overheating and damage of the instrument.

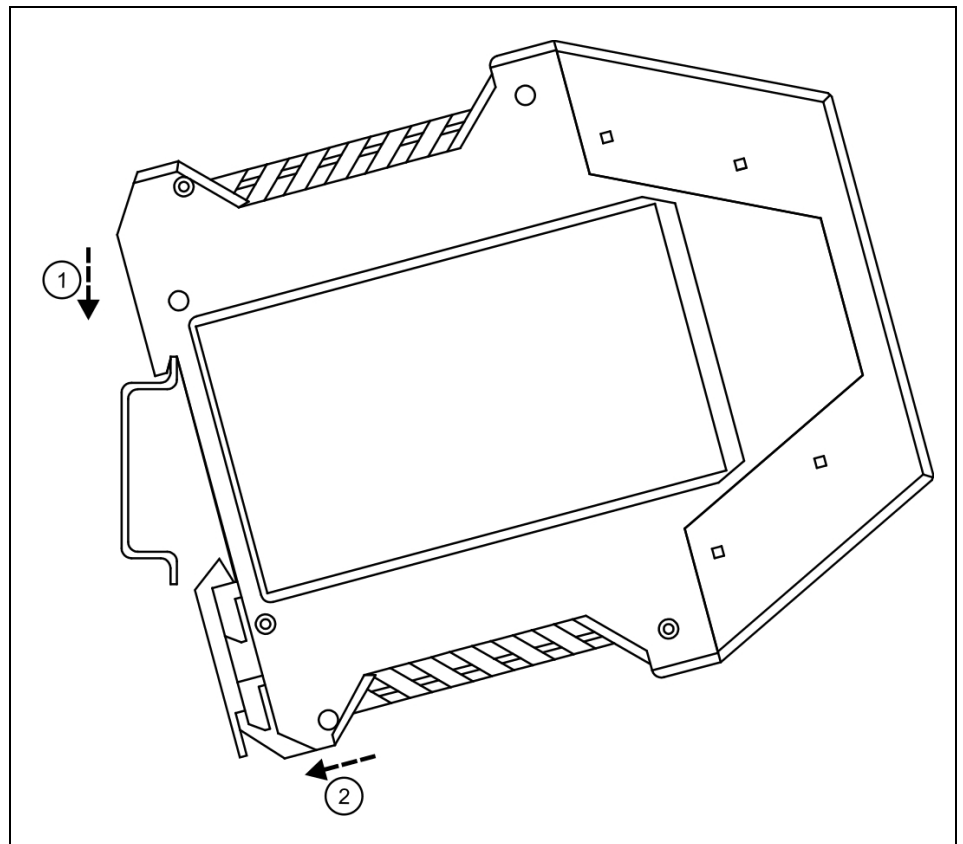
4.2. Main dimensions of the instrument



4.3. Mounting

The following figure shows the mounting procedures (fixing on the rail):

Mounting on the rail



The mounting doesn't need any tool.

1. Tilt the instrument according to the figure; put the instrument's mounting hole onto the upper edge of the rail (figure step 1.).
2. Push the instrument's bottom onto the bottom edge of the rail (figure step 2.), you will hear the fixing assembly closing.
3. Check the hold of the fixing by moving the instrument firmly.

5. Connecting

5.1. Preparing the connection

Always observe the following safety instructions:

- o The connection must be carried out by trained and authorized personnel only!
- o Connect only in the complete absence of supply voltage
- o Use only a screwdriver with appropriate head



Select and prepare connection cable

Take note the suitability of the connecting cable (wire cross-section, insulation, etc.).

The wire cross-section should be 0.25-1.5 mm².

You may use either solid conductor or flexible conductor.

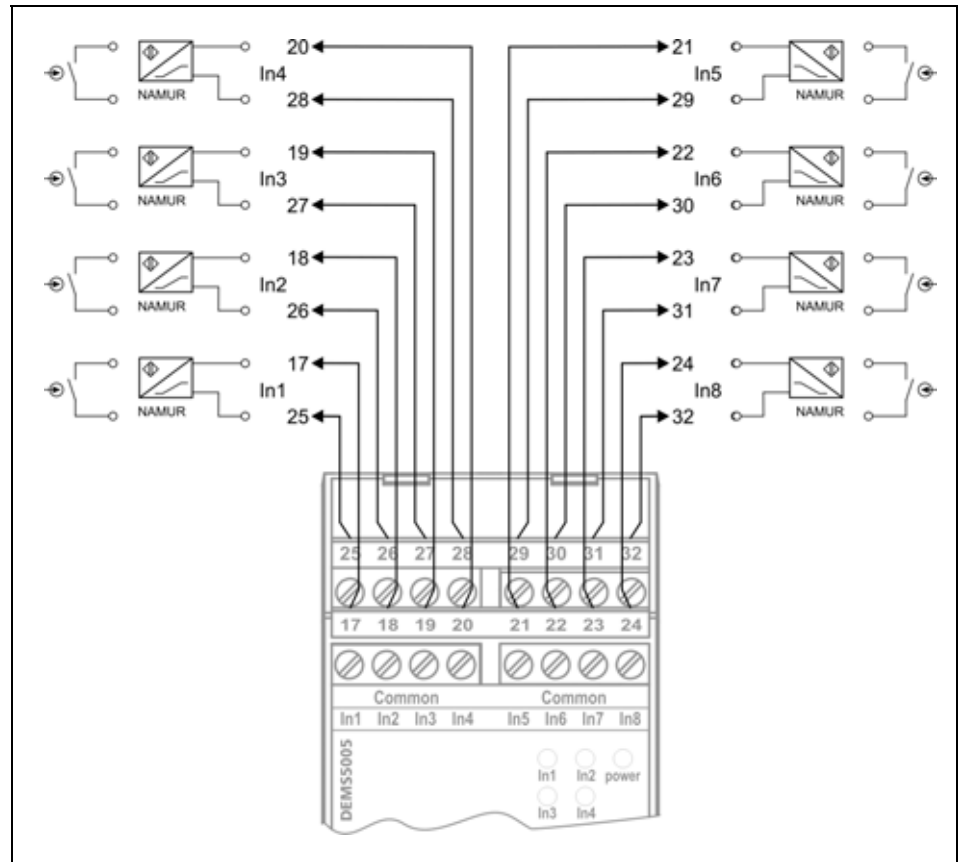
In case of using flexible conductor use crimped wire end.

For the input connection we recommended to use screened cable. It's an important rule that the power cables and signal cables should lead on a separate way.

5.2. Connecting pulse sources to instrument

The following figure shows the wiring plan:

Wiring plan
(see also "Application example")



1. Loosen terminal screws.
2. Insert the wire ends into the open terminals according to the wiring plan.
3. Screw the terminal in.
4. Check the hold of the wires in terminals by pulling on them firmly.

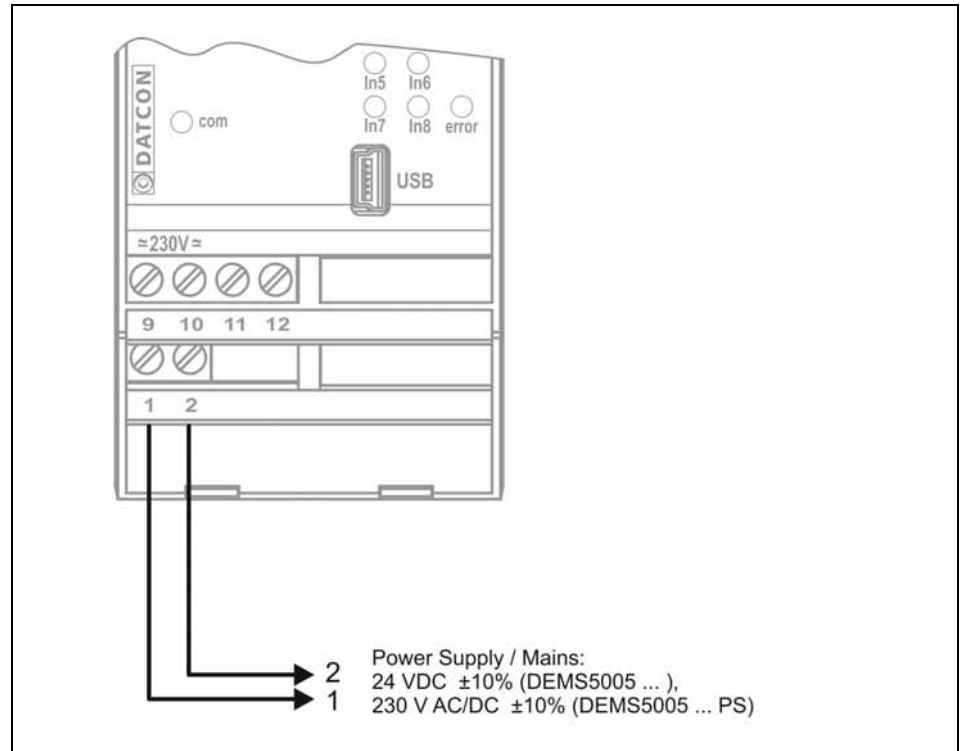
Check if the cables are connected properly (have you connected all the cables, have you connected to the right place, do not the cable-ends touch each other).

The instrument has eight inputs with common GND so the inputs are not isolated from each other.

5.3. Connecting power supply to instrument

The following figure shows the wiring plan:

Wiring plan
(see also "Application example")



1. Loosen terminal screws.
2. Insert the wire ends into the open terminals according to the wiring plan.
3. Screw the terminal in.
4. Check the hold of the wires in terminals by pulling on them firmly.

Check if the cables are connected properly (have you connected all the cables, have you connected to the right place, do not the cable-ends touch each other).

5.4. Put the instrument under supply voltage

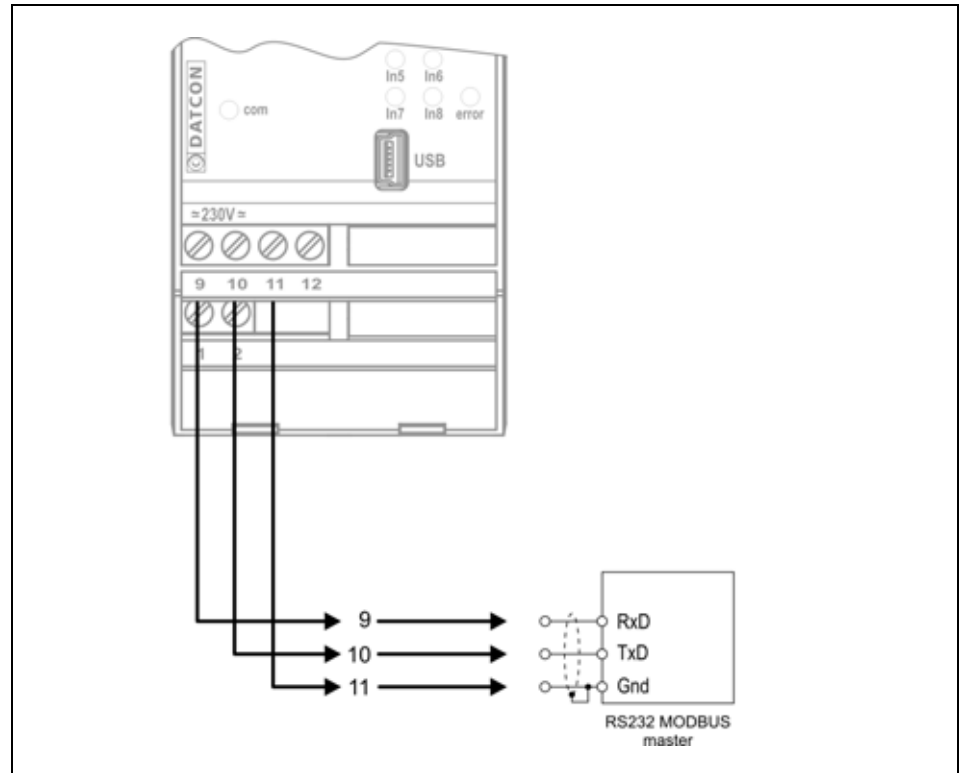
Test the connecting

After you have completed the connections, put the instrument under supply voltage. If the connection is correct the green 'power' indicator gives blinking light and a few seconds later gives continuous light.

5.5. Connecting MODBUS RS232 to instrument

The following figure shows the wiring plan:

Wiring plan
(see also "Application example")



1. Loosen terminal screws.
2. Insert the wire ends into the open terminals according to the wiring plan.
3. Screw the terminal in.
4. Check the hold of the wires in terminals by pulling on them firmly.

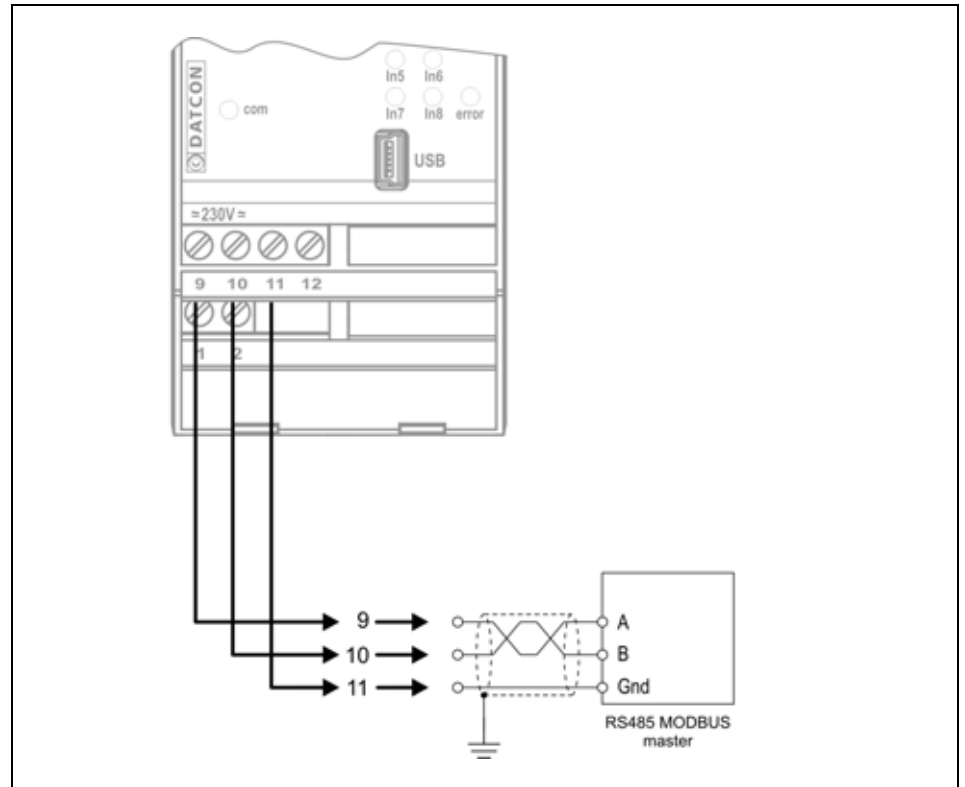
Check if the cables are connected properly (have you connected all the cables, have you connected to the right place, do not the cable-ends touch each other).

See also for detailed information:
www.modbus.org.

5.6. Connecting MODBUS RS485 to instrument

The following figure shows the wiring plan:

Wiring plan
(see also "Application example")



1. Loosen terminal screws.
2. Insert the wire ends into the open terminals according to the wiring plan.
3. Screw the terminal in.
4. Check the hold of the wires in terminals by pulling on them firmly.

Check if the cables are connected properly (have you connected all the cables, have you connected to the right place, do not the cable-ends touch each other).

See also for detailed information:
www.modbus.org.

6. The first start-up, indicators

6.1. The first start-up

After connecting the instrument is ready to work with the factory default parameters.

When you are going to use other parameters you should set-up the instrument according to Chapter 7.

The factory default settings:

- Type of inputs: contact.
- Debouncing of inputs: on.
- Counted event: close (rising edge).
- Maximum time allowed between two pulses: 4E9 ms
- MODBUS address: 0.
- MODBUS data settings: 9600 bit/sec, even parity.
- MODBUS RS485 settings: pull up and pull down resistor: off, termination resistor: off
- MODBUS timing: comm.. timeout: 1 minute, answer delay: 0 ms.

6.2. Indicators

- **the 'power' indicator (green):**

- Blinking: the instrument is not ready for working yet. (Please wait for up to 2 minute.)
- Continuous light: the instrument is working properly.
- This indicator blinks too, when the configuration software communicates with the instrument.

- **the 'error' indicator (red):**

- When the configuration software communicates with the instrument then this indicator gives continuous light.
- When the error state occurs and there is an error, this indicator is blinking. The number of blinkings gives information about the type of error:
 - 1 blink: the settings are corrupted. Use the configuration software to setting the instrument again.
 - 2 blinks: the collected pulses are lost.
 - 3 blinks: internal power error (repairing: in factory service only).
 - 4 or 5 blinks: MODBUS interface error (repairing: in factory service only).

- **the 'In1'-'In8' indicators (yellow):**

Indicates by 0.1 sec blinking that there was a count event at assigned input connector.

- **the 'com' indicator (yellow):**

blinking light indicates the good communication with MODBUS RTU master device.

7. Setting-up

7.1. First steps

Necessary tools

For setting-up you need:

- mini USB A (5 pin)-USB A cable (accessory)
- USB driver installer.exe software for installing the virtual serial port for USB communication (accessory)
- DEMS5005English.exe configuration software (accessory)
- PC with Windows operation system and one free USB connector

Software

Step 1:

install the USB driver for making the virtual serial port:

- Disconnect the USB cable from instrument.
- Run the /DEMS5005/USB Driver/USB driver installer.exe.
- Connect the instrument with the USB cable to the PC USB port.

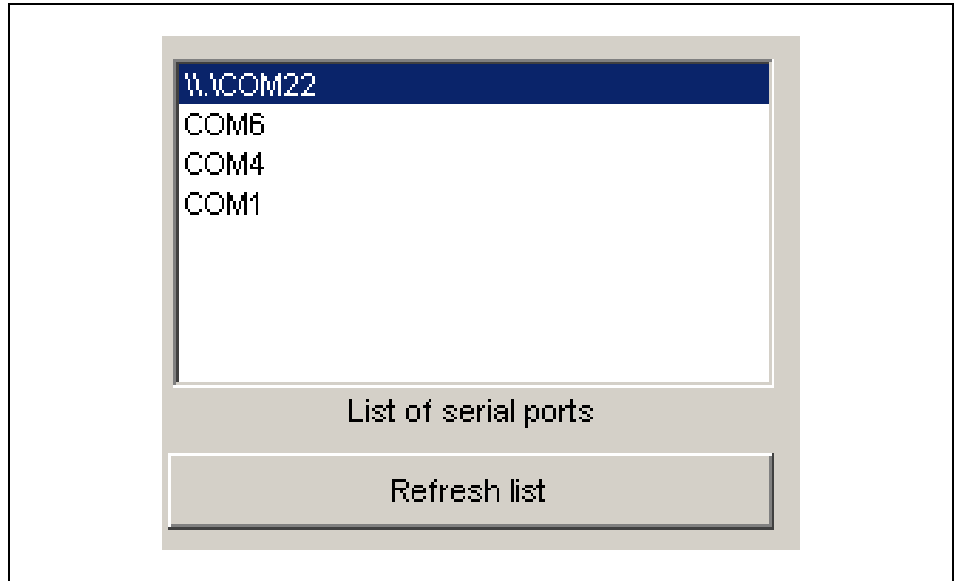
Step 2:

Easy to use DEMS5005English.exe configuration software (free of charge). Simple copy it into an optional folder, run this application and you can configure the instrument.

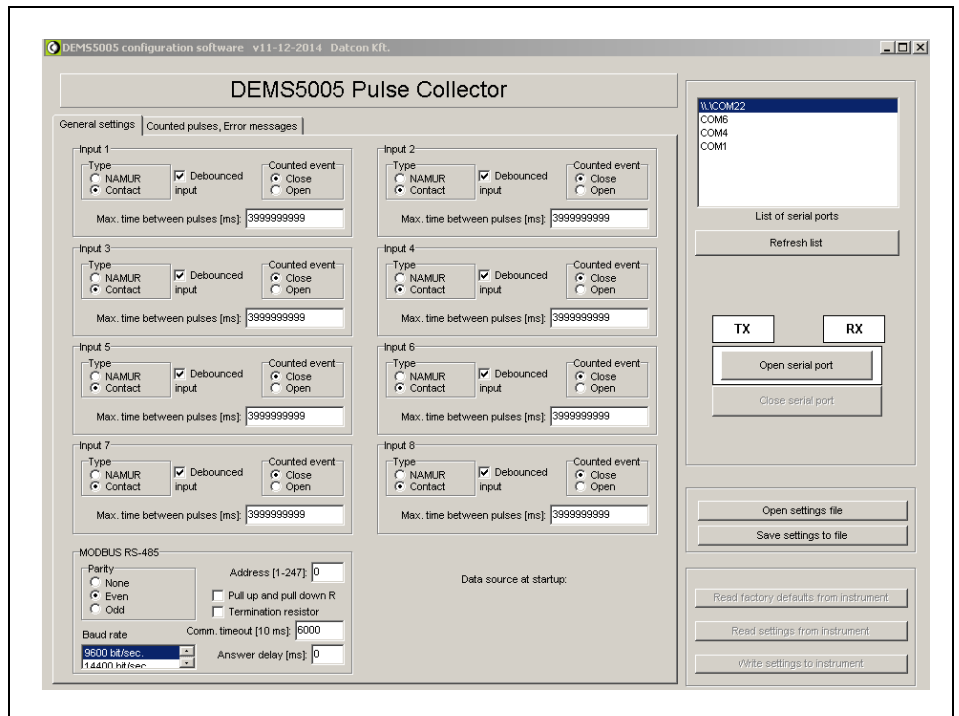
Setting-up

1. Connect the instrument with the USB cable to the PC USB port and put it under supply voltage.
2. DEMS5005English.exe configuration program.
3. Select the appropriate serial port.
4. Click on the "Open serial port" button.
5. Use the configuration software as is written on the following pages.
6. At the end of the settings click on the "Write settings to instrument" button, the new settings are written into the instrument.
7. Click on the "Close serial port" button for finishing the configuration procedure and disconnect the USB cable.
- 8 Close DEMS5005English.exe configuration program.

The virtual serial port setting panel (for USB communication):



The all perspective of configuration program:

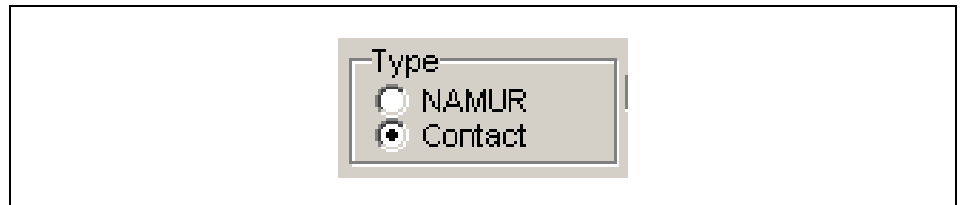


7.2. Input type setting

Function

The instrument can receive pulses from two different type of contacts. The selectable type can be NAMUR compatible contact or simply contact.
[Factory default: Contact]

Sequence of operations 1. Select the appropriate input mode by clicking the button.



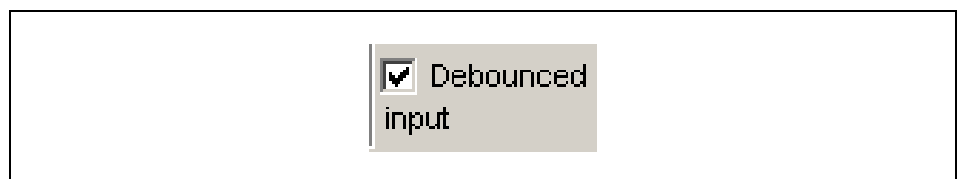
2. At the end of the settings click on the "Write settings to instrument" button, the new settings are written into the instrument.

7.3. Debouncing setting

Function

The debouncer input filter takes an input signal from a bouncing contact and generates a clean output for pulse counting. You can enable or disable this function by check or uncheck the check box.
[Factory default: Debounced input]

Sequence of operations 1. Check the check box for debounced mode or uncheck it for disable debounced mode and enabled faster pulse counting.



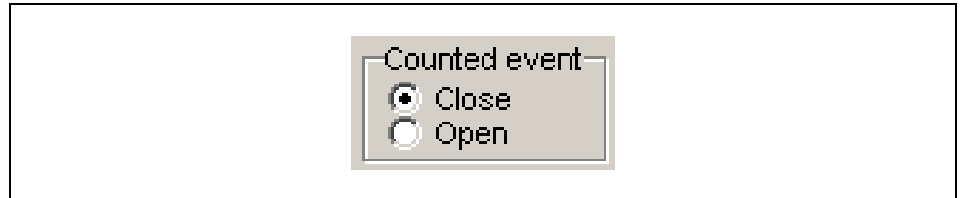
2. At the end of the settings click on the "Write settings to instrument" button, the new settings are written into the instrument.

7.4. Counted event setting

Function

- Close: the instrument counts the raising edges of pulses.
 - Open: the instrument counts the falling edges of pulses.
- [Factory default: Close]

Sequence of operations 1. Select the appropriate input mode by clicking the button.



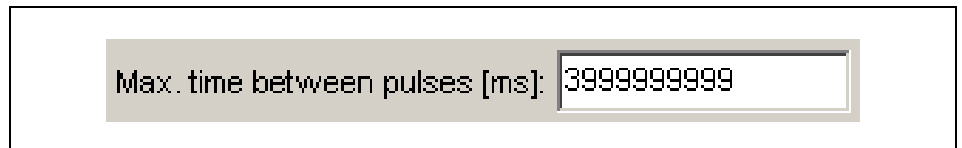
2. At the end of the settings click on the “Write settings to instrument” button, the new settings are written into the instrument.

7.5. Max time between pulses setting

Function

This time interval defines the maximum enabled time between last two pulses. If the measured time between pulses is longer than this value, the error flag is set.

Sequence of operations 1. Type the appropriate value into field.
[Factory default: 3 999 999 999 ms]



2. At the end of the settings click on the “Write settings to instrument” button, the new settings are written into the instrument.

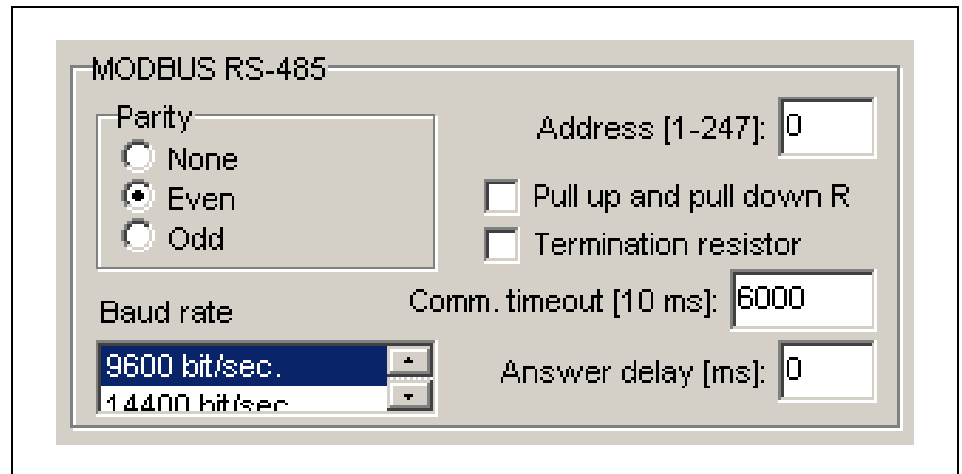
7.6. MODBUS parameters setting

Function

These parameters define the MODBUS communication.

Sequence of operations

1. Modify the values as MODBUS master require.



2. At the end of the settings click on the "Write settings to instrument" button, the new settings are written into the instrument.

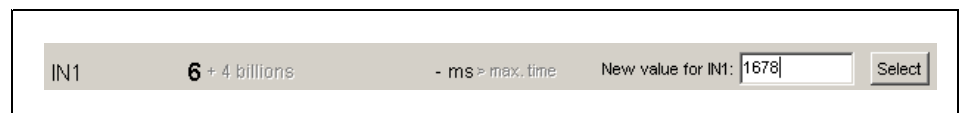
7.7. Modify the collected pulses values

Function

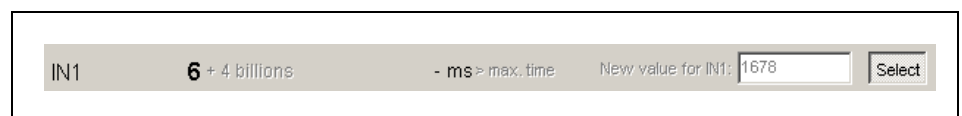
The value of collected pulses in counter is variable. You can modify this value.

Sequence of operations

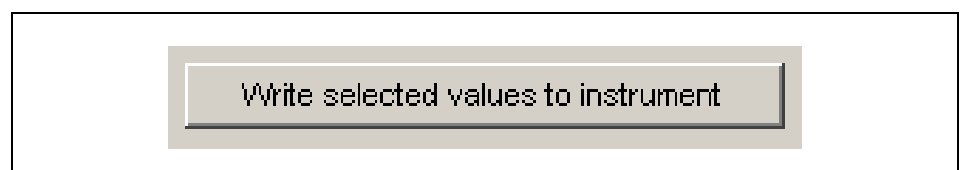
1. Type the appropriate values into fields.



2. Mark the value for change by pressing down the 'Select' button.



3. Modify the counted pulses value by pressing down the 'Write selected values to instrument' button.



7.8. Resetting default setting

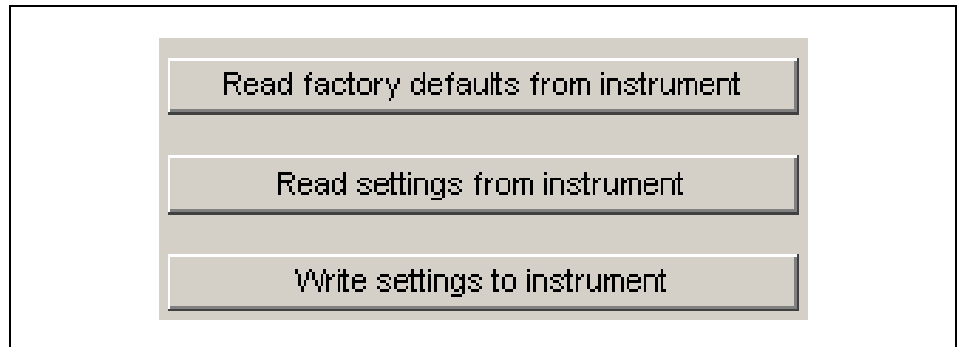
Function

In this case all the settings are deleted, and the default settings are restored.

Using this function makes sense in that case, when the settings of the instrument have changed so much, that it is easier to start the setting-up process from the default factory setting.

1. Click on the "Read factory defaults from instrument" button. The default settings are appeared on fields.
2. If necessary change the settings.

Sequence of operations



3. At the end of the settings click on the "Write settings to instrument" button, the new settings are written into the instrument.

8. Fault rectification

8.1. Fault finding

The fault finding must be carried out by trained and authorized personnel only!

- o The green indicator is dark → check the power supply. If the supply voltage is OK: the instrument is defective.
- o The instrument does not sense the input pulses → check the device connected to the input.

When the result of fault finding is that the instrument is defective call the manufacturer service department.

8.2. Repairing

There is no user repairable part inside the instrument. In accordance with Point 2.1.: **For safety and warranty reasons, any internal work on the instrument must be carried out only by DATCON personnel.**

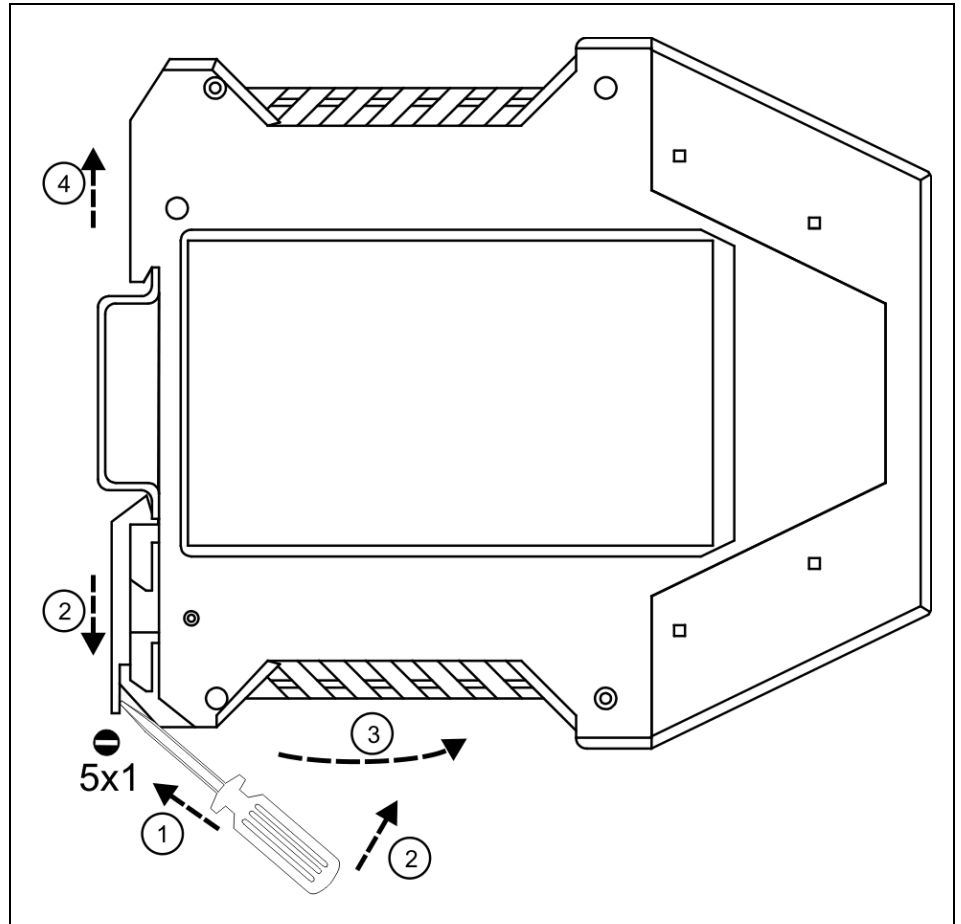


9. Dismounting

9.1. Dismounting procedure

The following figure shows the dismounting procedures:

Dismounting from the rail



The dismounting procedure needs a screwdriver for slotted screws.

1. Before dismounting disconnect all wires.
 2. Put the screwdriver end into the fixing assembly's hole (figure step 1.).
 3. Lift the screwdriver handle until it possible to open the fixing assembly (figure step 2.).
 4. Keeping the screwdriver in this position lift the instrument bottom from the bottom edge of the rail (figure step 3.).
- Lift the whole instrument (you may put out the screwdriver) (figure step 4), the instrument will be free.

9.2. Disposal

According with the concerning EU directive, the manufacturer undertakes the disposal of the instrument that are manufactured by it and intended to be destroyed. Please deliver it in contamination-free condition to the site of the Manufacturer or to a specialized recycling company.

10. Appendix

10.1. Technical specification

Power supply

Power supply:	DEMS5005 xx: 24 VDC $\pm 10\%$ DEMS5005 xx PS : 230 V AC/DC $\pm 10\%$
Power consumption:	3.5 VA / 3 W

Galvanic isolation

Test voltage:	2500 VDC (between input-output, input-power supply terminals) 500 VDC (between output-power supply terminals)
---------------	--

Input parameters

Input signal:	<ul style="list-style-type: none"> • contact • NAMUR (DIN19234)
Counting input pulses:	<ul style="list-style-type: none"> • rising edge (when the contact closes) • falling edge (when the contact opens)
Voltage between Inx and Common:	8.2 V (NAMUR standard)
Current at shorted input terminals:	8.2 mA (NAMUR standard)
NAMUR current levels:	
Low signal:	0.5-1.2 mA
High signal:	2.1-6.5 mA
Open:	< 0.5 mA
Shorted:	> 6.5 mA
Frequency of input signal:	
Debounced input mode:	0-10 Hz
Without debouncing:	0-50 Hz
Minimum pulse width of input signal:	
Debounced input mode:	50 ms
Without debouncing:	10 ms

Indicators

Normal operation / power on:	1 green indicator LED
Error / setting mode:	1 red indicator LED
Incoming pulses:	8 yellow indicator LEDs
MODBUS communication:	1 yellow indicator LEDs

Pulse counter

Maximum countable pulses:	4E9 (4 billions)
When the counter is overflowed:	the counter is cleared, the overflow bit is set to 1, then the counter can count more 4 billions pulses.
Modifying the counter:	the counter is modifiable with the configuration software or MODBUS connection. When the counter is written then the overflow bit is cleared.
Measurable time between the incoming pulses:	1-3'999'999'999 ms
Resolution of the time between the incoming pulses:	1 ms

Communication interface

Type:	RS232 or RS485, isolated up to 500 V
RS485 termination resistor:	120 ohm (switch on by configuration software)
Baud rate:	300 / 600 / 1200 / 2400 / 4800 / 9600 Baud
Parity:	even / odd / none
Protocol:	MODBUS RTU slave
Address:	1-247 (default: 0)
Implemented MODBUS function:	3 (read holding registers)

Ambient conditions

Operating temperature range:	0-60 °C
Storage temperature range:	-25 - +70 °C
Climatic class::	EN 60654-1, class B2
Relative humidity:	90% (max., non condensing)
Place of installation:	cabinet
Mounting position:	vertical (horizontal rail position)

Electromagnetic compatibility (EMC)

Accordance with the standard EN 61326-1:2004

Immunity:	-A- criterion
Noise emission:	-A- class

Electric shock protection

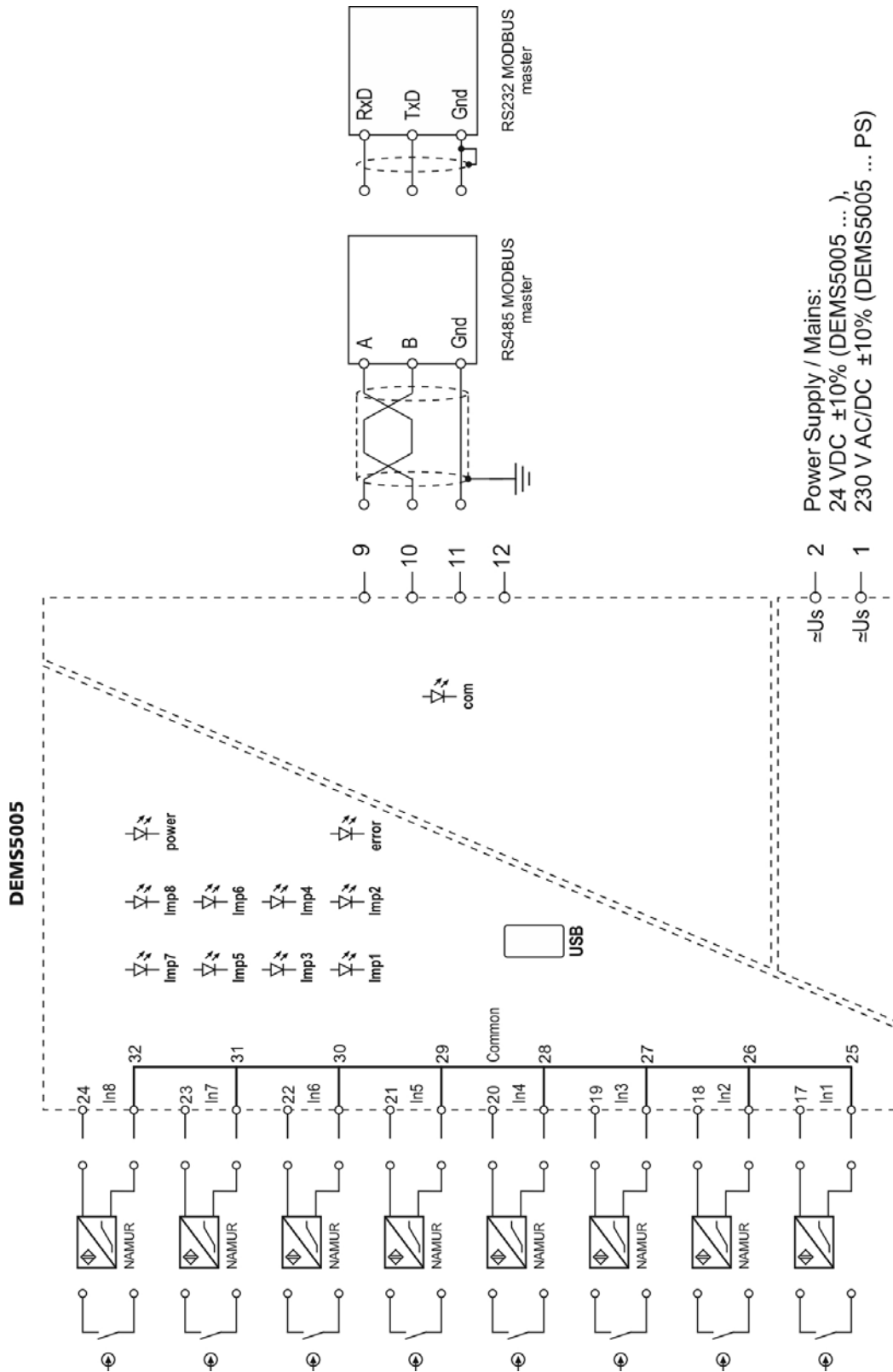
IEC 364-4-41 SELV system

General data

Housing:	TS-35 rail mounting housing material: polyamide PA6.6
Connection:	screw-terminal
Connecting cable:	1.5 mm ² (max.)
Dimensions:	45 x 99 x 115 mm (width x height x depth)
Mass:	0.3 kg
Ingress Protection (EN 60529):	IP 20

The Manufacturer maintains the right to change technical data.

10.2. Application example



10.3. MODBUS registers

Symbolism used:

R = read only

W = write only

RW = read and write register

The register addresses is in decimal number system.

UI32 = 32 bits, unsigned integer

UI16 = 16 bits, unsigned integer

Read only registers

R1000 UI32: collected pulses for In1

R1002 UI32: collected pulses for In2

R1004 UI32: collected pulses for In3

R1006 UI32: collected pulses for In4

R1008 UI32: collected pulses for In5

R1010 UI32: collected pulses for In6

R1012 UI32: collected pulses for In7

R1014 UI32: collected pulses for In8

R1016 UI32: time between the incoming pulses [ms] for In1

R1018 UI32: time between the incoming pulses [ms] for In2

R1020 UI32: time between the incoming pulses [ms] for In3

R1022 UI32: time between the incoming pulses [ms] for In4

R1024 UI32: time between the incoming pulses [ms] for In5

R1026 UI32: time between the incoming pulses [ms] for In6

R1028 UI32: time between the incoming pulses [ms] for In7

R1030 UI32: time between the incoming pulses [ms] for In8

Each bit is individually and represents one of the inputs.

(bit0 = In1, bit1 = In2, etc)

R1032 UI16: General error flags. When the error event is ended the corresponding error flag is cleared automatically.

R1033 UI16: General error flags. After the error event is ended the corresponding error flag remains in 1. You can clear by writing RW1040 register.

R1034 UI16: If the counter of pulses value $\geq 4\ 000\ 000\ 000$ then the corresponding flag bit is 1.

R1035 UI16: NAMUR input error flags: 1 = the NAMUR input is opened or shorted.

R1036 UI16: NAMUR input opened error flags: 1 = the NAMUR input is opened.

R1037 UI16: NAMUR input shorted error flags: 1 = the NAMUR input is shorted.

R1038 UI16: Timeout error flags: 1 = there was not incoming pulse so the time out event is occurred.

R1039 UI16: Source of the stored data: 1 = RAM1, 2 = RAM2, 3 = RAM3, 11 = EE1, 12 = EE2, 13 = EE3, 21 = error, 32 = error

Symbolism used:

B2: 2. bit of the register

B1: 1. bit of the register

B0: 0. bit of the register

Read/write registers

RW1040 UI16: the register R1033 is cleared by manually if write this register.

RW1041 UI16: Type of In1

B2 = 0: NAMUR, B2 = 1: contact

B1 = 0: debouncing off, B1 = 1: debouncing on

B0 = 0: counting the raising edge (close contact), b0 = 1 counting the falling edge (open contact)

RW1042 UI16: Type of In2 (same like In1)

RW1043 UI16: Type of In3 (same like In1)

RW1044 UI16: Type of In4 (same like In1)

RW1045 UI16: Type of In5 (same like In1)

RW1046 UI16: Type of In6 (same like In1)

RW1047 UI16: Type of In7 (same like In1)

RW1048 UI16: Type of In8 (same like In1)

RW1049 UI16: the all of pulse counter is cleared by manually if write this register.

RW1050 UI32: In1: max enabled time between pulses [ms]

RW1052 UI32: In2: max enabled time between pulses [ms]

RW1054 UI32: In3: max enabled time between pulses [ms]

RW1056 UI32: In4: max enabled time between pulses [ms]

RW1058 UI32: In5: max enabled time between pulses [ms]

RW1060 UI32: In6: max enabled time between pulses [ms]

RW1062 UI32: In7: max enabled time between pulses [ms]

RW1064 UI32: In8: max enabled time between pulses [ms]

RW1066 UI32: In1: modify the counter of collected pulses.

RW1068 UI32: In2: modify the counter of collected pulses.

RW1070 UI32: In3: modify the counter of collected pulses.

RW1072 UI32: In4: modify the counter of collected pulses.

RW1074 UI32: In5: modify the counter of collected pulses.

RW1076 UI32: In6: modify the counter of collected pulses.

RW1078 UI32: In7: modify the counter of collected pulses.

RW1080 UI32: In8: modify the counter of collected pulses.

