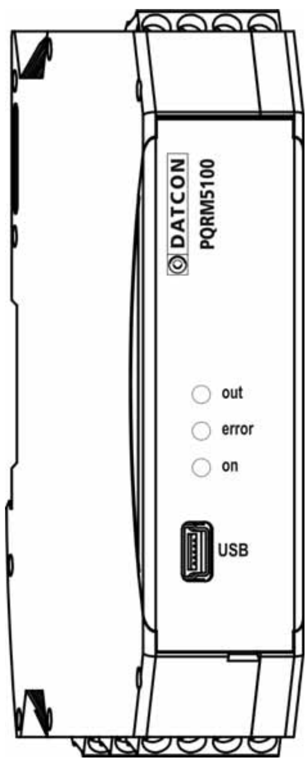
DATCON
INDUSTRIAL MEASUREMENT

PQRM5100 11 Ux Ix xx xx (PS)

Single Phase power transmitter

Instruction manual



Contents

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
PQRM5100 11 Ux Ix xx 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
1 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 instruments must be carried out only by DATCON personnel.

2.2. Appropriate use

The PQRM5100 11 Ux Ix xx xx is a Single Phase power transmitter. 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

The PQRM5100 11 Ux Ix xx xx is a high-tech instrument 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 PQRM5100 11 Ux Ix xx xx is in conformity with the provisions of the following standards:
MSZ EN 61010-1 (safety)
MSZ EN 61326-1 (EMC)

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

3. Product description

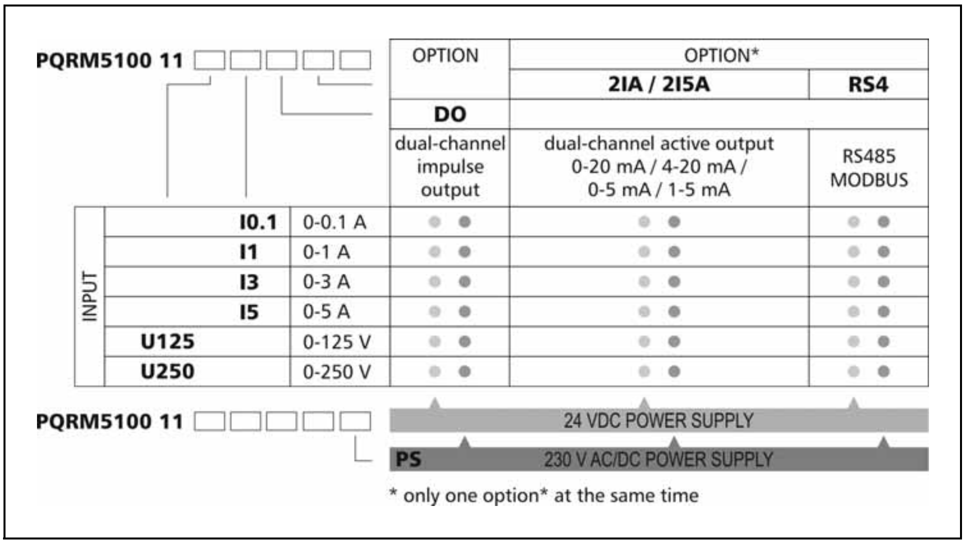
3.1. Delivery configuration

Delivered items

The scope of delivery encompasses:

- PQRM5100 11 Ux Ix xx xx
- documentation:
  this operating instructions
  certification
  warranty

3.2. Type designation



3.3. Operating principle

Area of application

The PQRM5100 11 Ux Ix xx xx (PS) Single Phase power transmitter measures the characteristic for single-phase network system.
The current input of the instrument is isolated from the network with wideband current transformers. The voltage input of the instrument is galvanic connection in the network. The PQRM5100 11 Ux Ix xx xx (PS) Single Phase power transmitter has many measurement configurations. The measurement configuration and the output parameters are configurable from PC via USB port with the help of a free of charge configuration software.
Options:

- Two 4-20 mA / 0-20 mA or 0-5 mA / 1-5 mA galvanic isolated, configurable, scalable analog output
- RS485 galvanic isolated communication output with MODBUS RTU slave protocol. 32 instruments can be connected to the PLC or to the computer.

One option can be installed (dual analog output or communication output) at the same time.

Operating principle

The voltage divider output and current-transformer output signals is led through the signal conditioner and protection circuits to the 16 bit A/D converter inputs. The digitalized signals are processed by the instruments microcontroller. The calculated parameters are produced in IEEE754 standard “Single Precision” figure. The calculated energy values ($+E_P$, $-E_P$, $+E_Q$, $-E_Q$) and the settings are stored an EEPROM for an unlimited period of time. The switched-mode power supply of the instrument produces two galvanic isolated output voltages: one for the instrument circuitry and one for the installed options.

Power supply

The instrument has two power supply version:

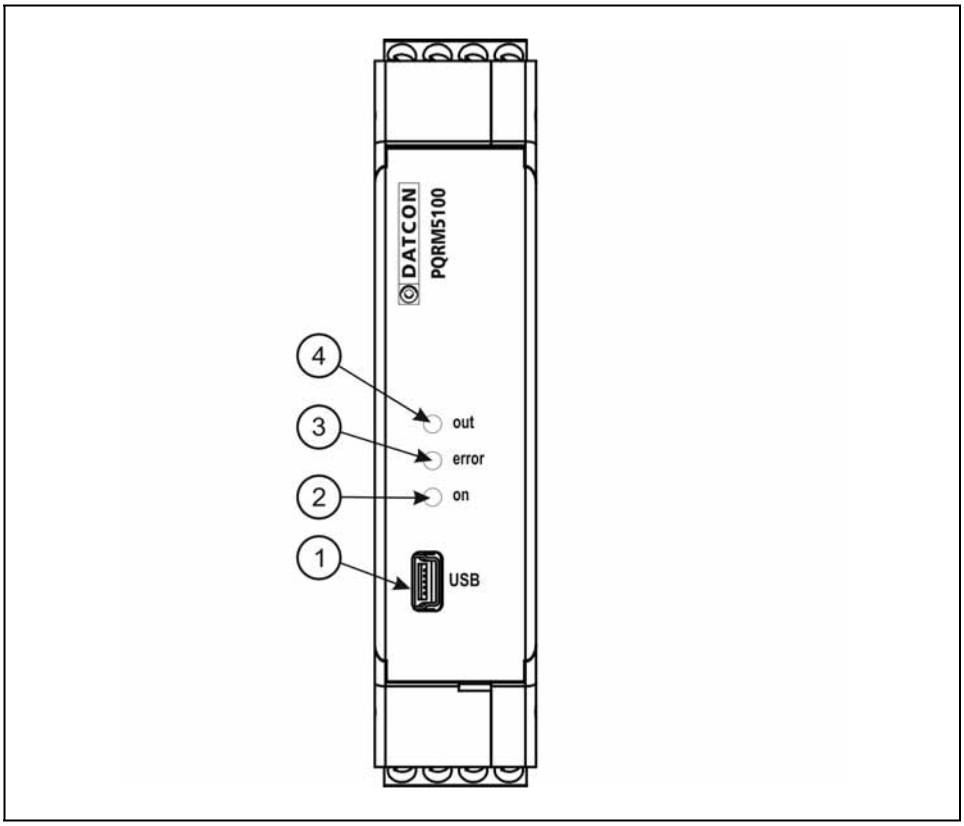
PQRM5100 11 Ux Ix xx xx	24 VDC
PQRM5100 11 Ux Ix xx xx PS	230 V AC/DC

Measuring parameters:

- U_{eff} : Measured voltage [V]
- I_{eff} : Measured current [A]
- P: Measured active power [W]
- Q: Measured reactive power [VAr]
- S: Measured apparent power [VA]
- PF: Calculated power factor
- f: Measured network freuqvency [Hz]
- THDU: Calculated total harmonic distortion of phase voltage (up to 19. harmonic) [%]
- THDI: Calculated total harmonic distortion of phase current (up to 19. harmonic) [%]
- $+E_P$: Measured values of consument active energy [Wh]
- $-E_P$: Measured values of produced active energy [Wh]
- $+E_q$: Measured values of inductiv reactive energy [VArh]
- $-E_q$: Measured values of capacitiv reactive energy [VArh]

3.4. Indicators

The following figure shows the frontpanel:



1. USB configuration port
2. „on” green indicator for indicating that device is ready.
3. „error” red indicator for indicating that a kind of error occurred.
4. „out” yellow indicator for indicating the state of the option. The indicator blinking (2IA option), or light if a successful data exchange has granted through the communication output (RS4 option)

3.5. Storage and transport

This instrument should be stored and transport in places whose climatic conditions are in accordance with chapter **9.1.** as described under the title: Environmental conditions. The packaging of PQRM5100 11 Ux Ix xx xx 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

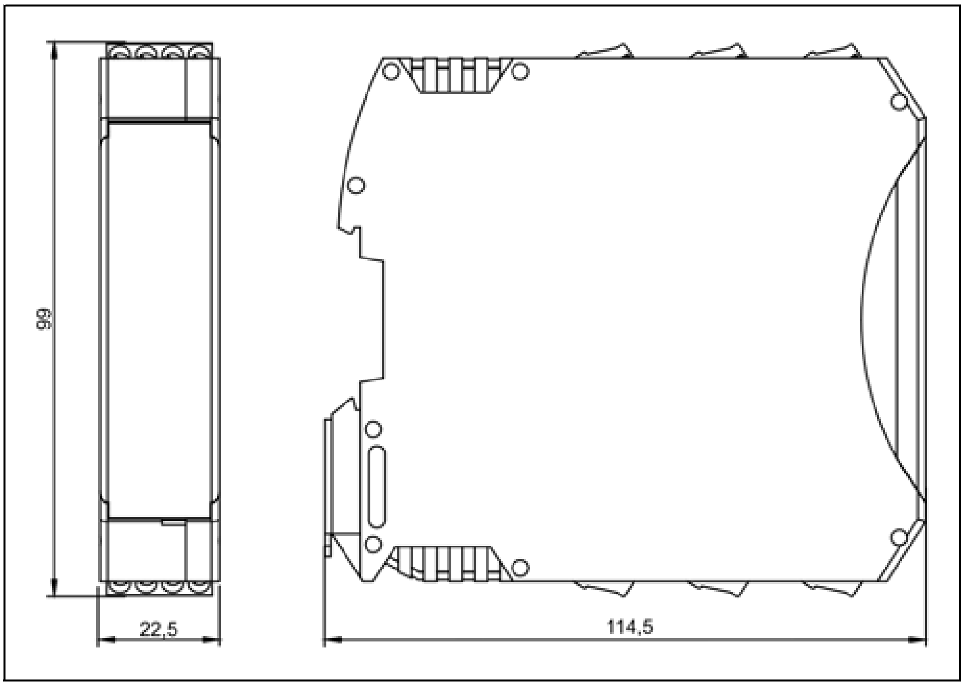
The instrument should be installed in a cabinet with sufficient IP protection, where the operating conditions are in accordance with chapter **9.1.** , as described under the title: Operating conditions.

Mounting position

The instruments are designed in 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.

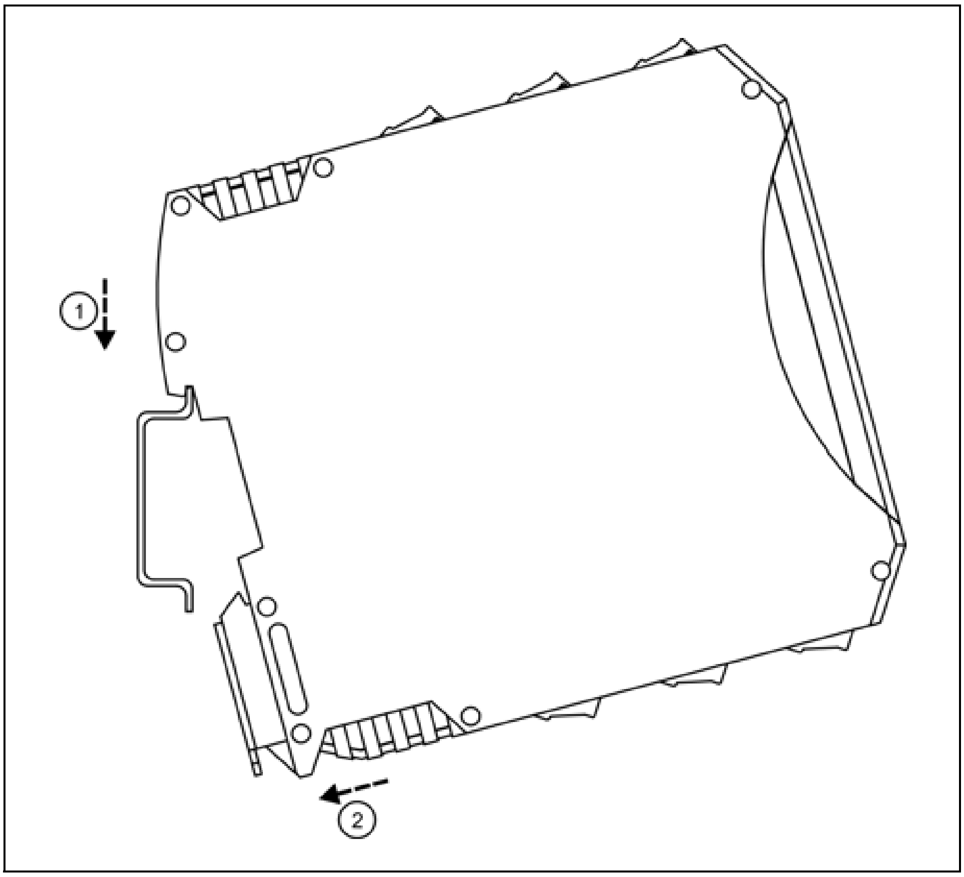
4.2. Main dimensions of the instrument



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:

- The connection must be carried out by trained and authorized personnel only
- Connect only in the complete absence of supply voltage
- Take note the data concerning on the overcurrent protection in installation
- 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 cross-section of the connecting wires specified in the following table

connector	wire cross-section
Main inputs	0,75–1,5 mm^2
Voltage and current measurement inputs	2,5–4,5 mm^2
Analogue outputs	0,25–0,5 mm^2
Communication outputs	0,35–0,5 mm^2
Pulse outputs	0,35–0,5 mm^2

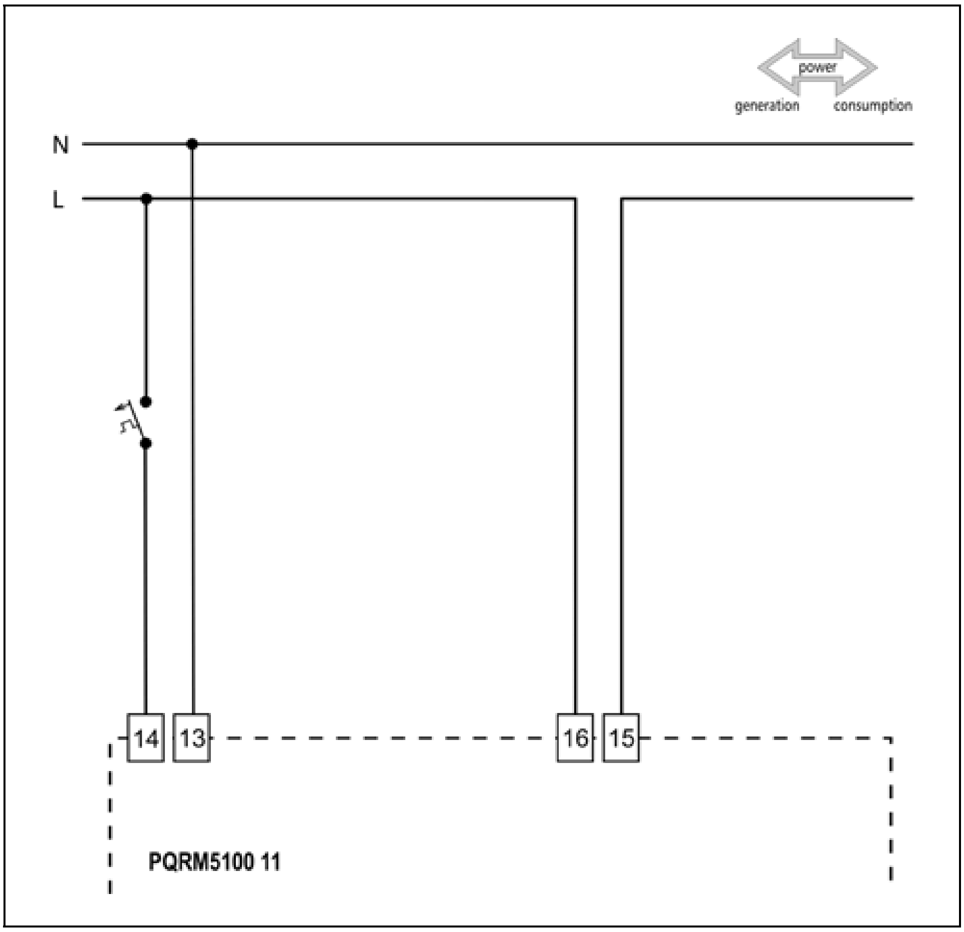
You may use either solid conductor or flexible conductor. In case of using flexible conductor use crimped wire end. Strip approx. 8 mm insulation.

It’s an important rule that the power cables and signal cables should lead on a separate way.

5.2. Connecting the measuring inputs to power network (1ph, 2w, 1m)

The following figure shows the wiring plan, connecting the instrument to low voltage power network.

Wiring plan, connecting the voltage and current inputs to power network



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.

Checking the connections

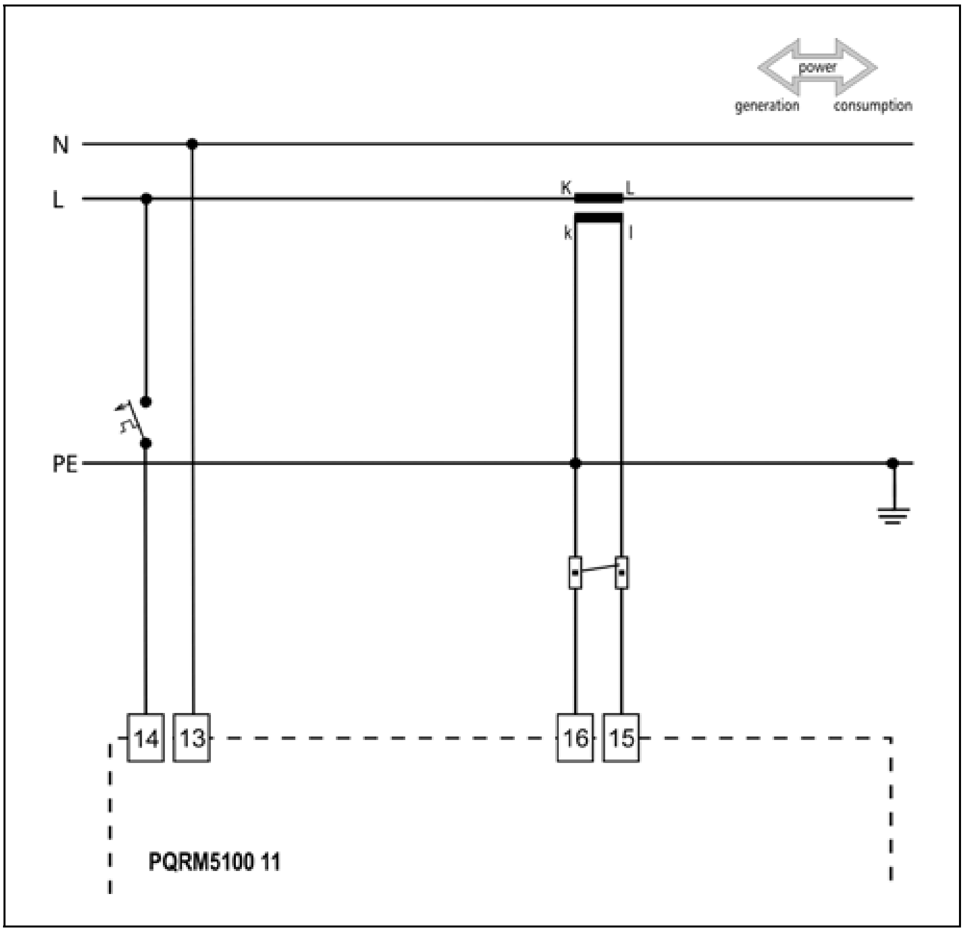
Check if the cables are connected properly (have you connected all the cables, have you connected to the right place, do not the cable-ends touch each other).

5.3. Connecting the measuring inputs to power network trough CT (1ph, 2w, 1m)

The following figure shows the wiring plan, connecting the instrument to low voltage power network.

Wiring plan, connecting the voltage and current inputs to power network

The terminal “k” of CT you have to connecting to earth!



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.

Checking the connections

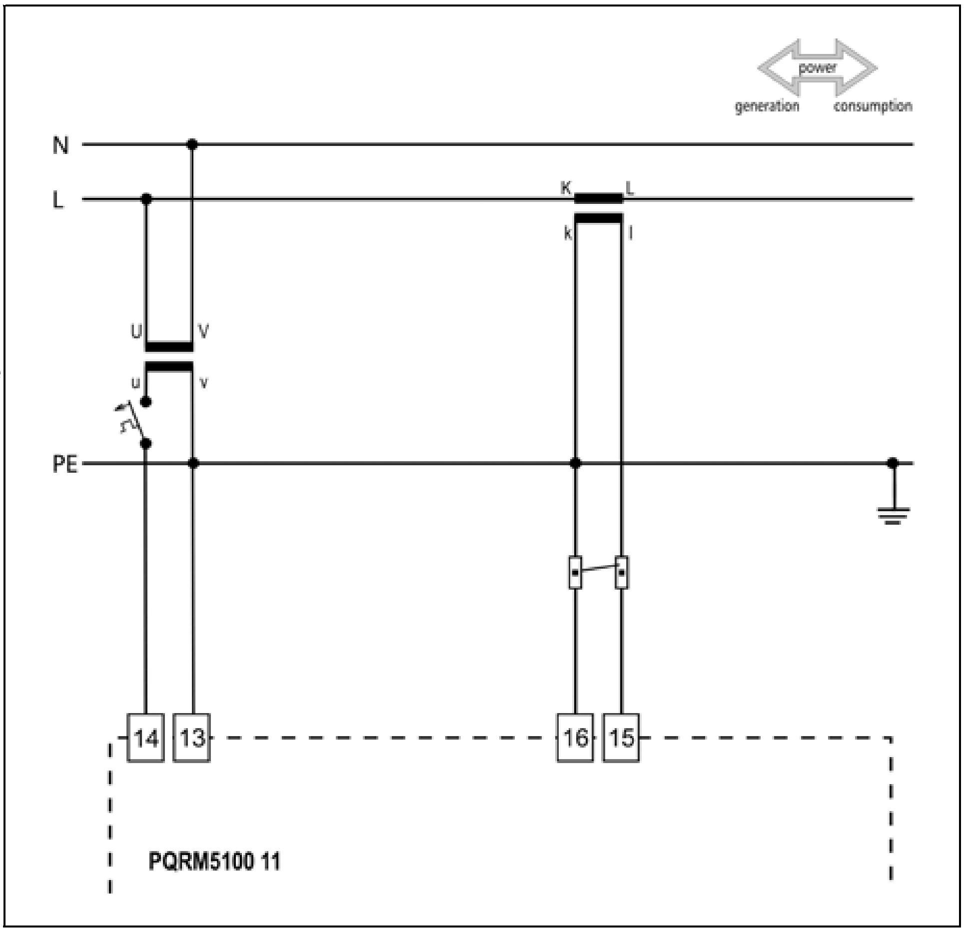
Check if the cables are connected properly (have you connected all the cables, have you connected to the right place, do not the cable-ends touch each other).

5.4. Connecting the measuring inputs to medium power network. (1ph, 2w, 1m)

The following figure shows the wiring plan, connecting the instrument to medium voltage power network.

Wiring plan, connecting the voltage and current inputs to power network.

The terminal "k" of CT and terminal "v" of VT you have to connecting to earth!



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.

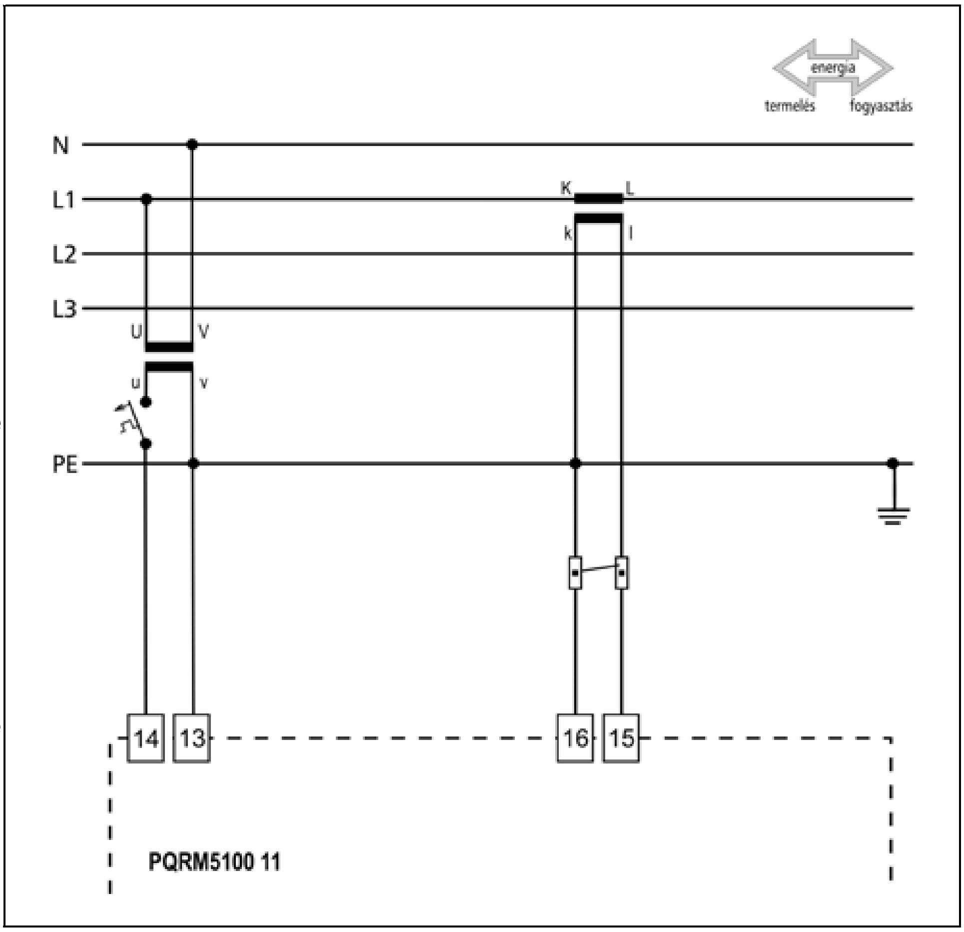
Checking the connections

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).

5.5. Connecting the measuring inputs to symmetrical three-phase power network with neutral conductor. (3 phase, 4 wire, 1 measuring)

The following figure shows the wiring plan to symmetrical three-phase network. Measuring only one phase. The three phase outputs are calculated values. The measuring arrangement use for the measurement of rotating machinery!

Wiring plan, connecting the voltage and current inputs to power network.



The application of:
The vectorsum of all phase voltages is always zero!

The terminal “k” of CT and terminal “v” of VT you have to connecting to earth!

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.

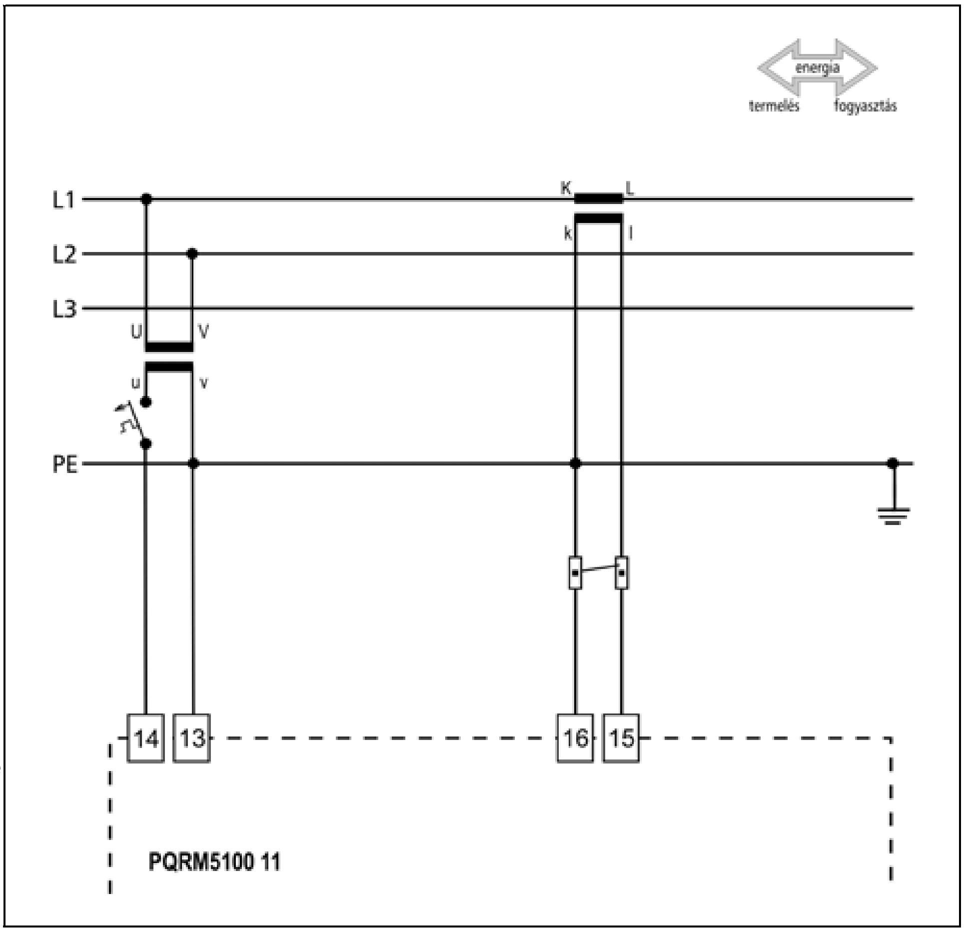
Checking the connections

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).

5.6. Connecting the measuring inputs to symmetrical three-phase power network without neutral conductor. (3 phase, 3 wire, 1 measuring)

The following figure shows the wiring plan to symmetrical three-phase network without neutral conductor. Measuring only one phase. The three phase outputs are calculated values. The measuring arrangement use for the measurement of rotating machinery!

Wiring plan, connecting the voltage and current inputs to power network.



The application of:
The vector sum of all phase voltages is always zero!

The terminal “k” of CT and terminal “v” of VT you have to connecting to earth!

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.

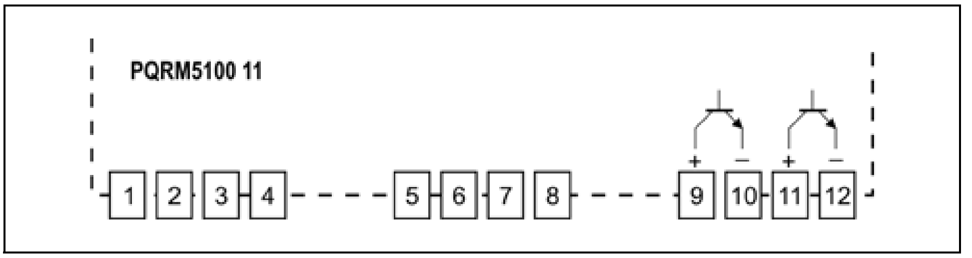
Checking the connections

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).

5.7. Connecting the digital outputs

The digital outputs of the device are passive switch transistor. The external power supply is required for operation. The figure shows the outputs terminal of the switching transistor

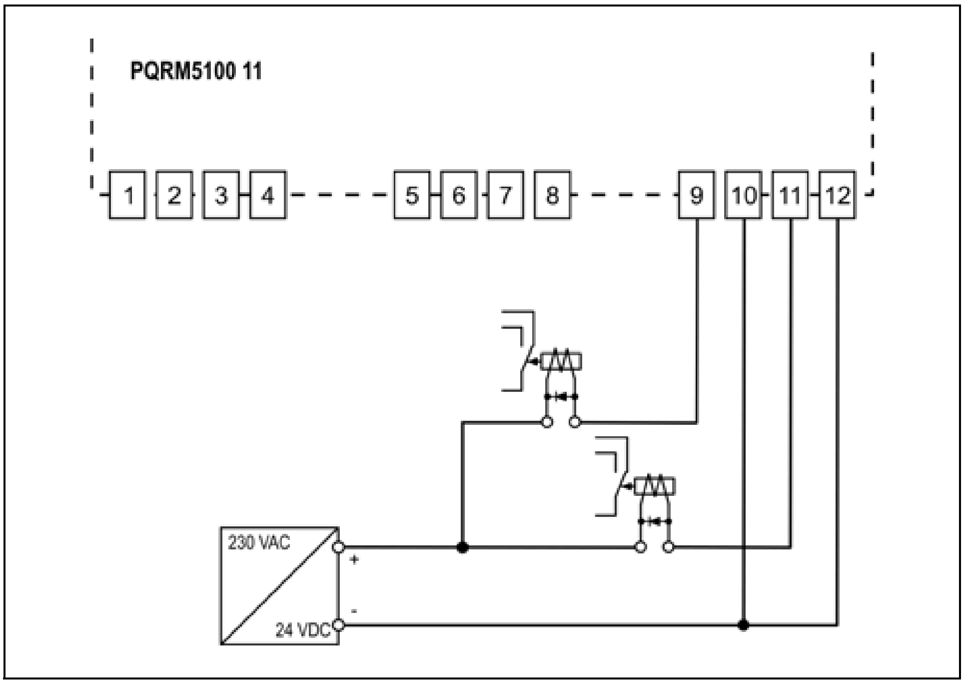
Output terminal of the digital outputs



The technical parameters of the digital outputs refer to the **9.1.** chapter.

Example: Connect the digital output for processing unit.

Wiring plan, connecting to processing unit.



Be careful the polarity of the cables!

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.

9 -10 : digital output 1
11 - 12 : digital output 2

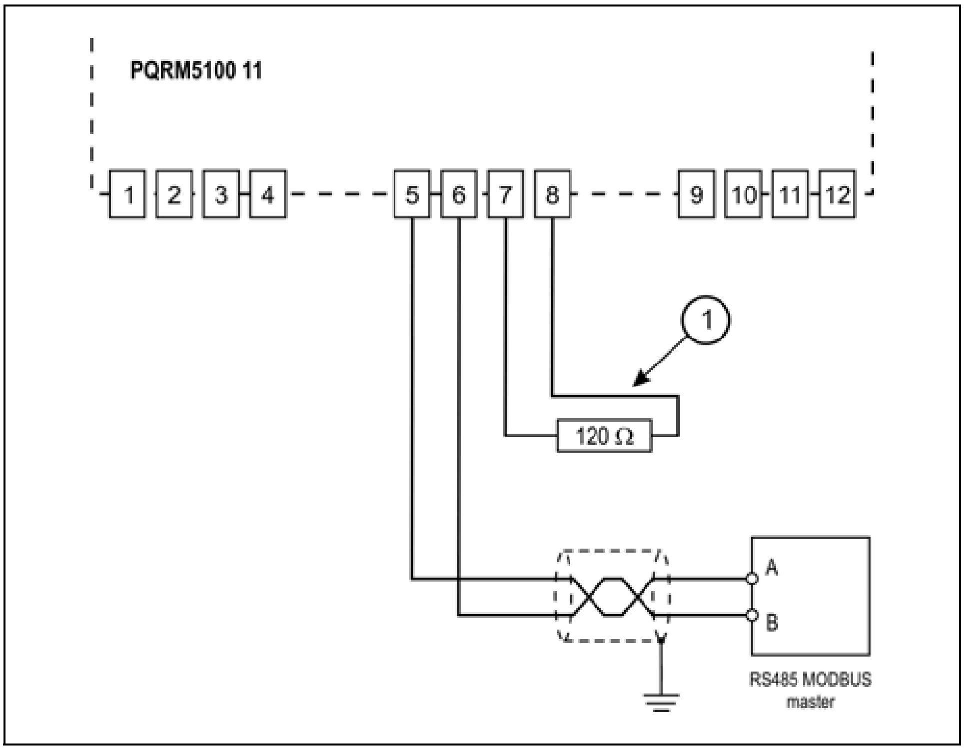
Checking the connections

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).

5.8. Connecting to MODBUS RS485 network

The following figure shows the wiring plan, connecting the devices with MODBUS RS485 option to processing unit:

Wiring plan, connecting to processing unit.



Be careful the polarity of the cables!

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.

Checking the connections

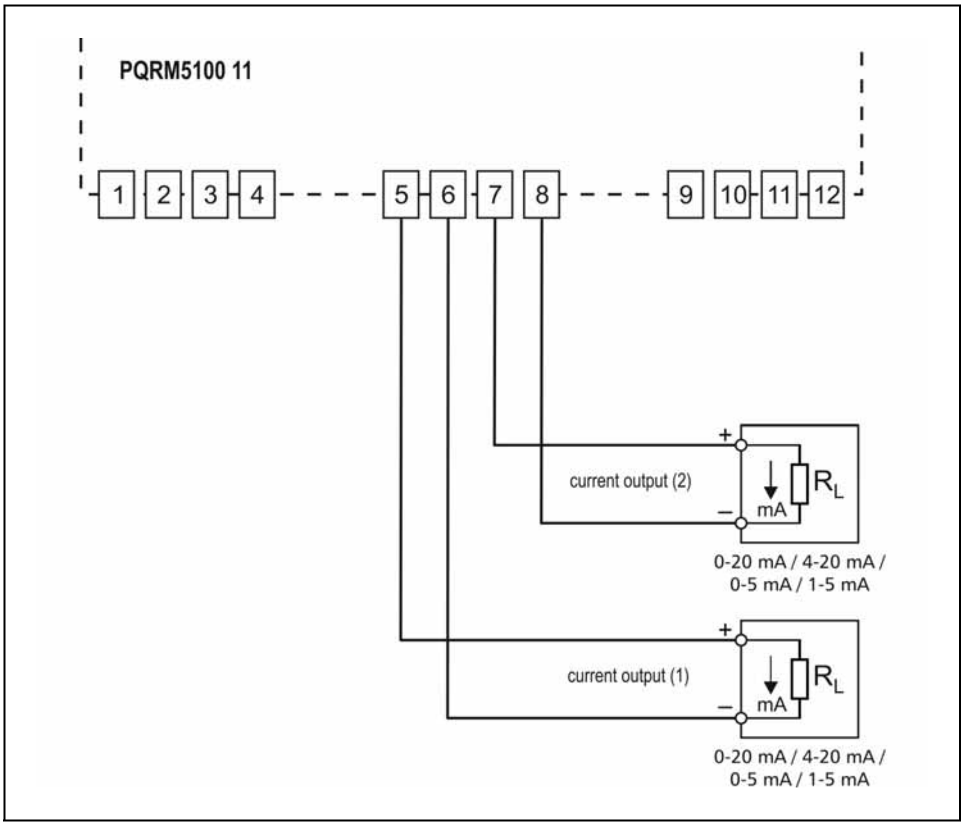
Check if the cables are connected properly (have you connected all the cables, have you connected to the right place, do not the cable-ends touch each other).

5.9. Connecting the analog output to signal processing unit

The following figure shows the wiring plan, connecting the devices with Analog output option to processing unit

Wiring plan, connecting the analog output to the signal processing unit

Be careful the polarity of the cables!



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.

Checking the connections

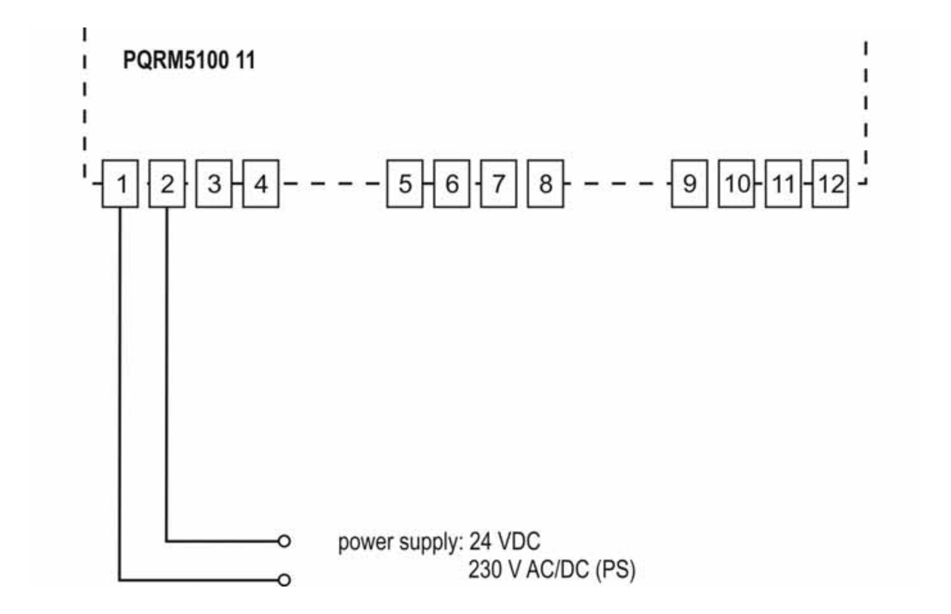
Check if the cables are connected properly (have you connected all the cables, have you connected to the right place, do not the cable-ends touch each other).

5.10. Connecting the power supply

The following figure shows the wiring plan, connecting the PQRM5100 11 Ux Ix xx xx to the power supply

Wiring plan, connecting the power supply

In case of DC supply the polarity is indifferent



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.

Checking the connections

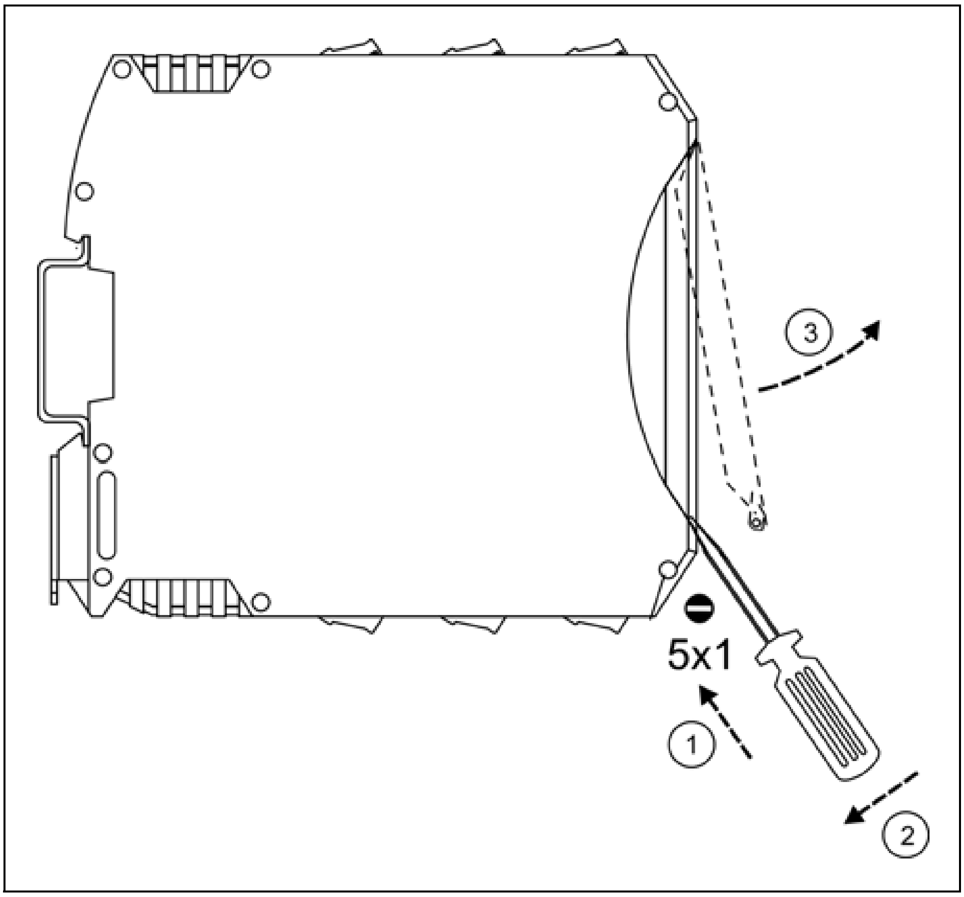
Check if the cables are connected properly (have you connected all the cables, have you connected to the right place, do not the cable-ends touch each other).

Put the instrument under supply voltage

After you have completed all the connections, put the instrument under supply voltage. If the connections are correct the green indicator gives light and you can detect an output signal according to the measured value by the instrument.

5.11. Connecting to PC via USB

The following figure shows the protection covers opened.



1. Insert the screwdriver between the protection covers and the device housing.
2. Push the screwdriver in the specified direction.
3. Open the protection covers
4. Connect the USB cable to device

Checking the connections

Check if the cables are connected properly.

6. Setting-up

6.1. First steps

Necessary tools

For setting-up you need:

- mini USB A (5 pin)-USB A cable
- PQRM_CAL.exe configuration software (version: 3.2.4.)
- PC with free USB port

Software

Easy to use the PQRM_CAL configuration software (free of charge). Simple copy it into an optional folder, click on the “Start” button and you can configure the instrument.

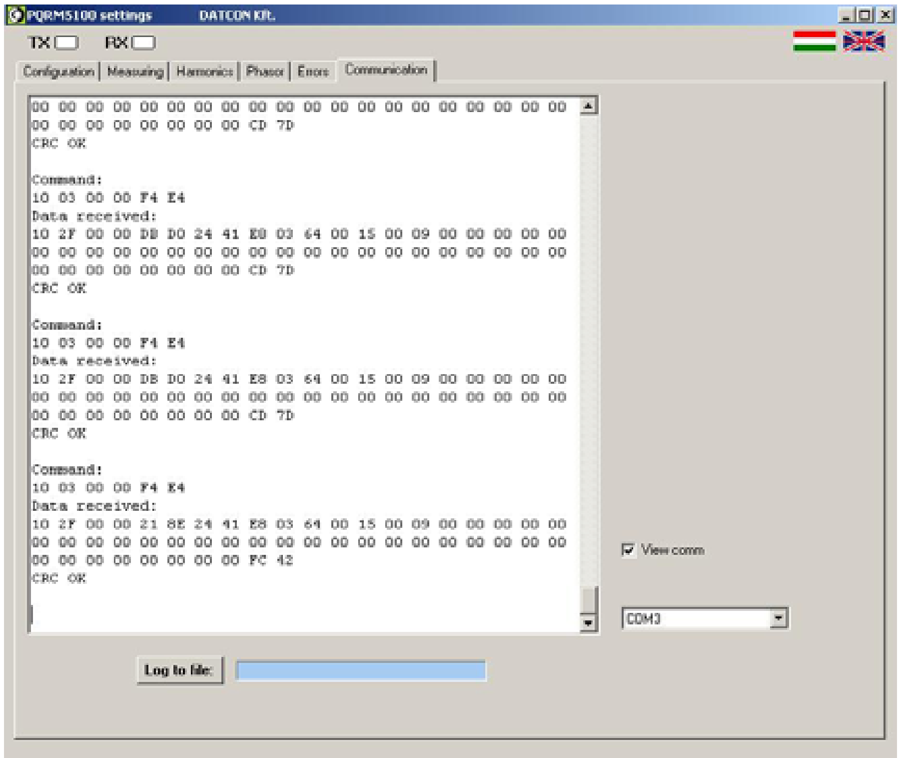
The program allows for setting the device and monitors the measured network. You can with this program identify and acknowledge the errors. The measured values are recorded in a file. The program can communicate with one device at a time!

Setting-up

1. Start the configuration program.
2. Connect the instrument with the USB cable to the PC USB port and put it under supply voltage.
If you have already installed the USB serial card driver, your computer's operating system automatically creates a serial (COMx) port. In case of newly connected device appears in the device operating system setup window. The supplied CD-ROM you will find the driver for your device (MCP2200.inf). If your computer has an Internet connection, you can download the appropriate driver from the web.
4. Select the serial port for the device. Click the „Communication" tab (right side of configuration program) and click “Select com port”. In case of successful contacts flashing the RX window green. If is the connection fails, the RX window lights red, and the terminal window is "Timeout" displayed.

Function

The following figure shows the data exchange between the device and the configuration software. You can set the serial line to the PC and start and stop the collection of measurement data.

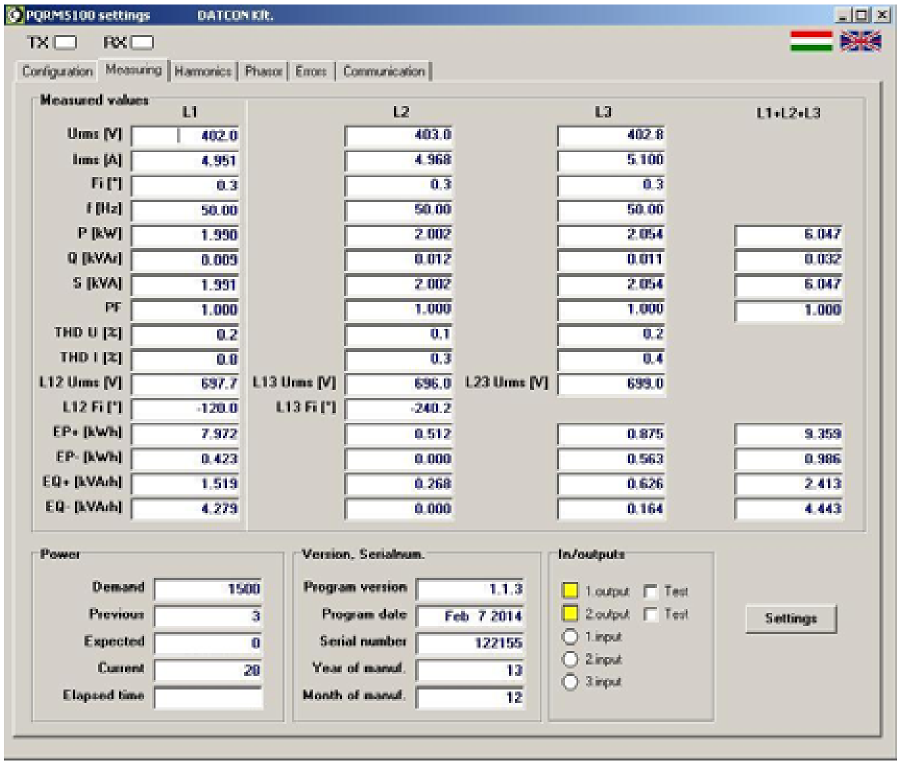


The log file will be written continuously, previously saved data is retained. The recorded data per line equipped with a time stamp.

6.3. Configuration software, Measuring tab.

Function

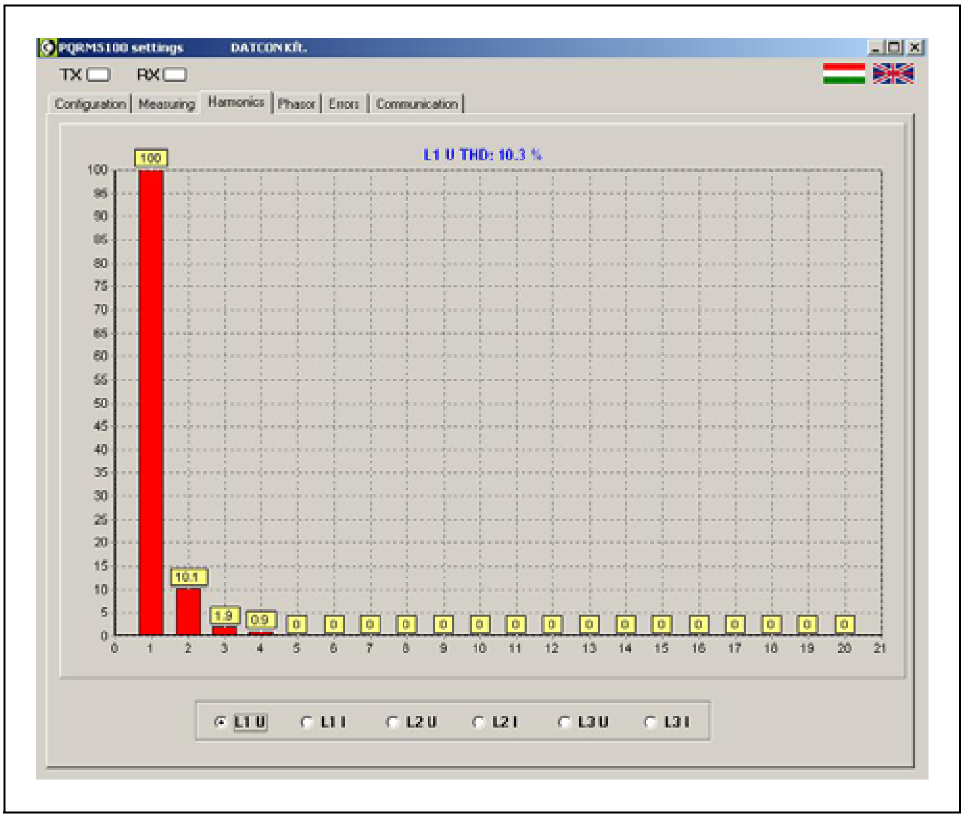
Displays the data of measured electrical network.
The "Settings" button (In the bottom right corner of window) you can enter the "Configuration" menu.



6.4. Configuration software, Harmonics tab.

Function

You can see the phase currents and phase voltages harmonics of network.

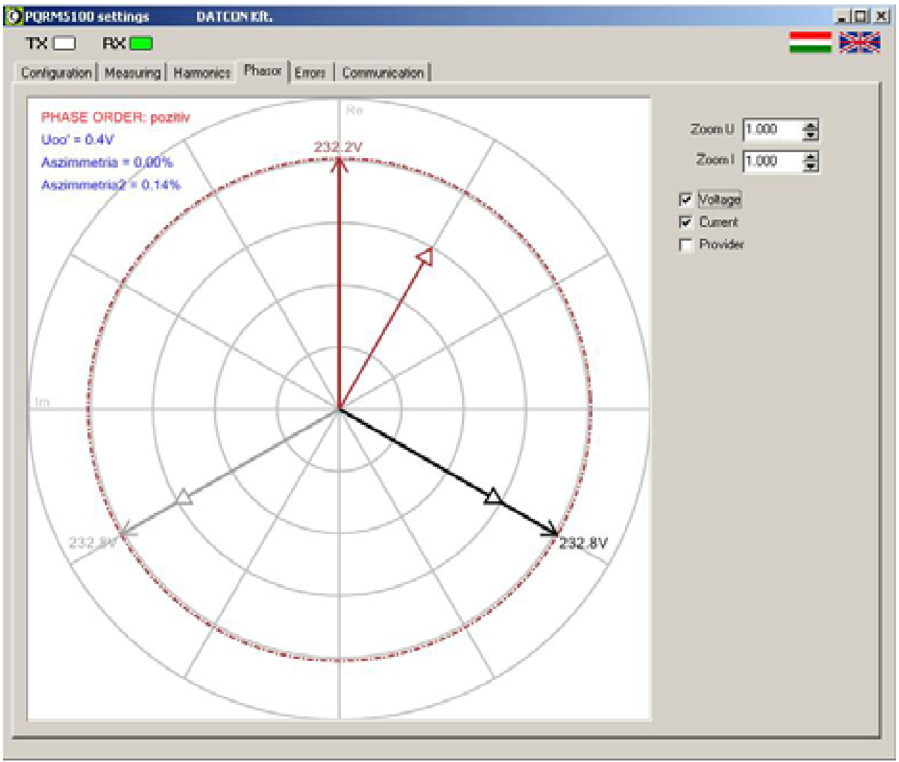


You need to enable harmonic analysis option. If you enable this function, the measurement update time greatly increases.

6.5. Configuration software, Phasor tab

Function

You can see the phase currents and phase voltages vectors of network.

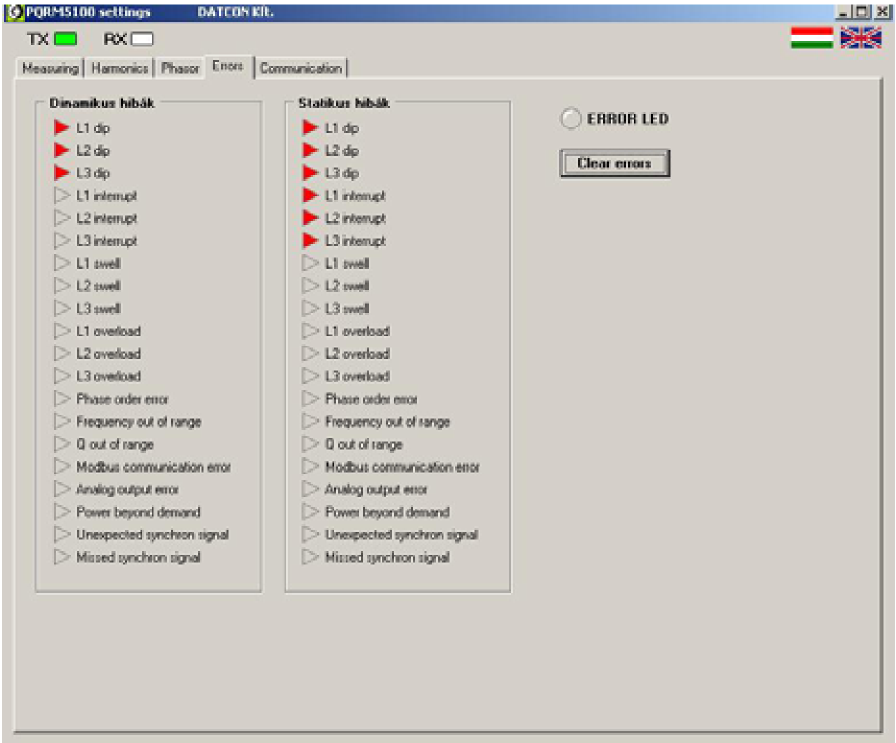


The scale of Vector illustration is aligned of voltage vectors. You can the voltages and currents vectors simultaneous representation. The scale distortion of voltages and currents vectors is possible. The distortion does not affect the measured values.

6.6. Configuration software, Errors tab

Function

You can check the dynamic and static errors.



Dynamic errors:
Incidents such that the system can detect, and which is constantly changing depending on the state of the electrical network.

Static errors:
Incidents such that the system can detect, and whose occurrence is stored depending on the machine configuration. The setting is a **6.23.** section can be performed. The recorded events you can delete with “Clear errors” button.

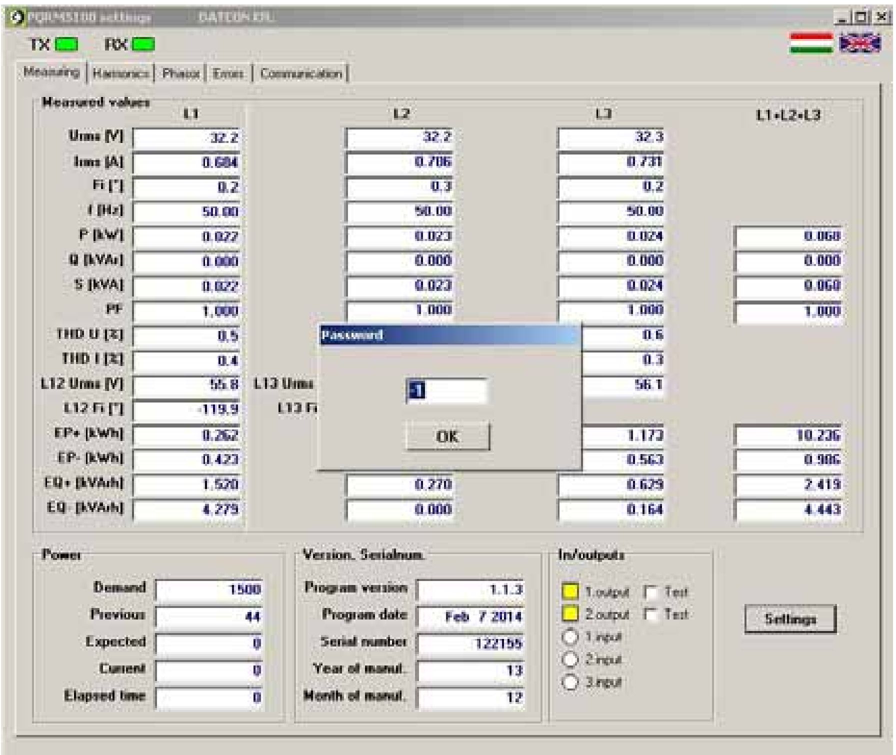
6.7. Configuration software, Configure tab

Function

You can the devices to configure. Password-protected area.

Sequence of operations

1. Click the „Measuring” tab.
2. Click the “Settings” button. (In the bottom right corner of window)
3. Enter the password. [Default: 0]



4. If the entered password was correct, you can see the “Configuration” window. If you want to leave this window, click on the "Exit" button.

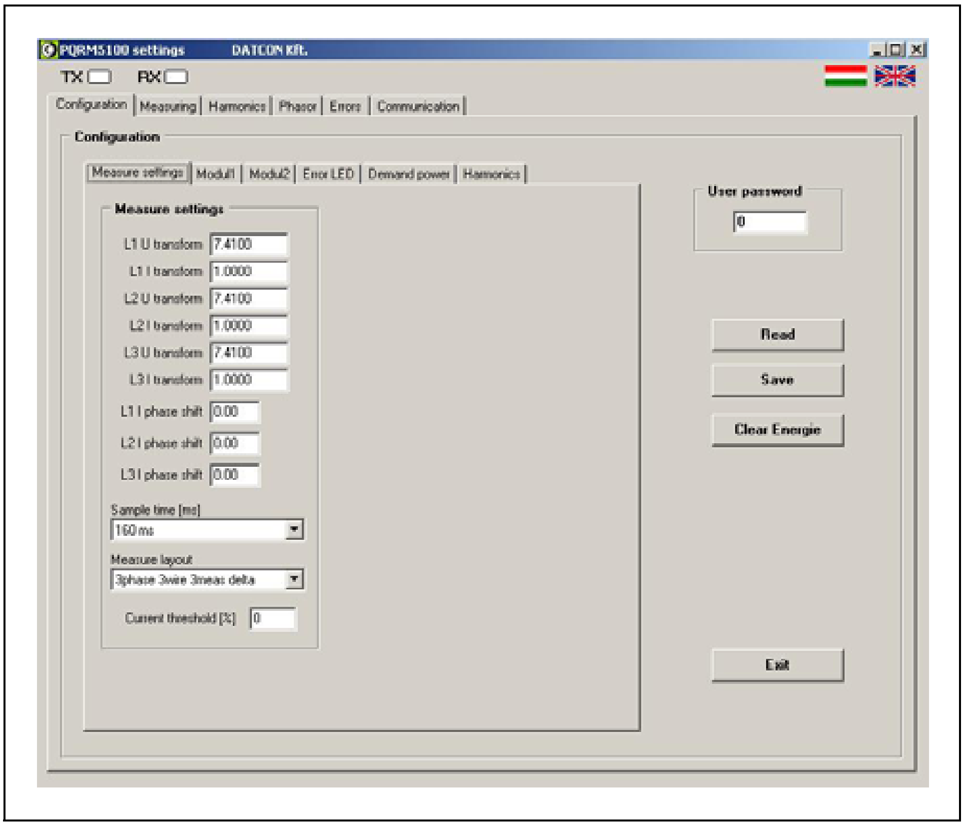
6.8. Voltage Transformers (VT) ratio settings

Function

The voltage inputs of the instrument may connect directly to the power network (Vin < 250 Veff [nominal]), or through voltage transformers (Vin > 250 Veff [nominal]).
When you connect the inputs directly you should set VT=1.
When you connect the inputs through voltage transformers you should set the VT ratio of the applied transformers, so the instrument able to calculate with the primary voltage.
(e.g. 1000/100 V/V, VT=10)
[VT Factory default: 1.]

Sequence of operations

1. Click on the ”Configuration” tab
2. Inside of ”Configuration” tab click on the “Measure settings” tab.
3. Type the VT ratio value to “U transform” field.
4. Click on the “Save” button.



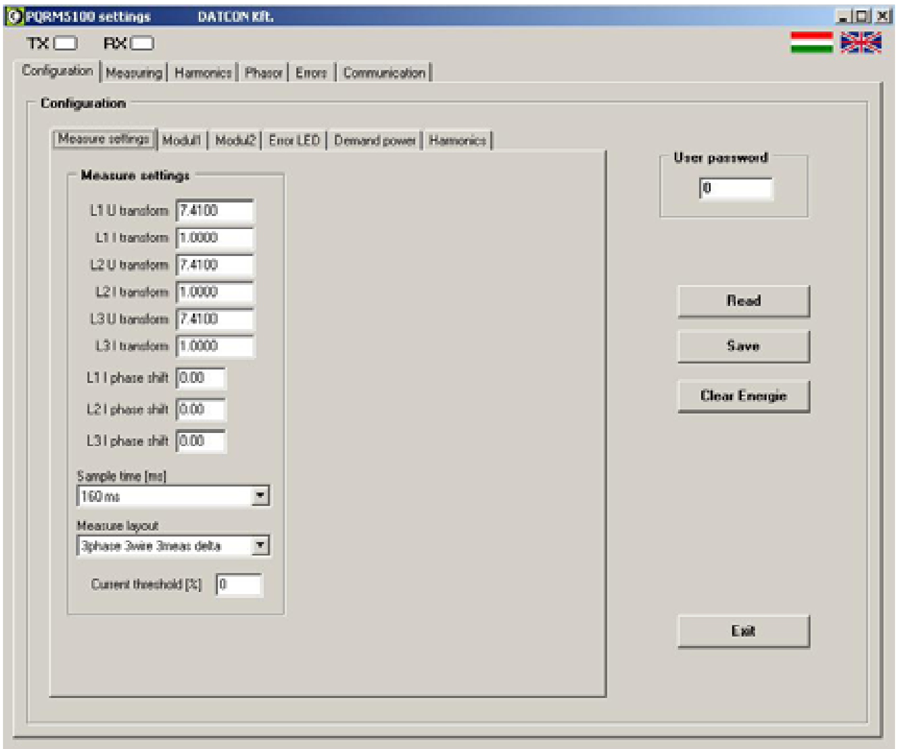
6.9. Current Transformers (CT) ratio settings

Function

The current input of the instrument may connect directly to the power network (Iin < 5 Aeff [nominal]), or through a current transformer (Iin > 5 Aeff [nominal]).
When you connect the input directly you should set CT=1.
When you connect the input through a current transformer you should set the CT ratio of the applied transformer, so the instrument able to compute with the primary current. (e.g. 100/5 A/A, CT=20)
[CT Factory default: 1.]

Sequence of operations

1. Click on the "Configuration" tab
2. Inside of "Configuration" tab click on the "Measure settings" tab.
3. Type the CT ratio value to "I transform" field.
4. Click on the "Save" button.



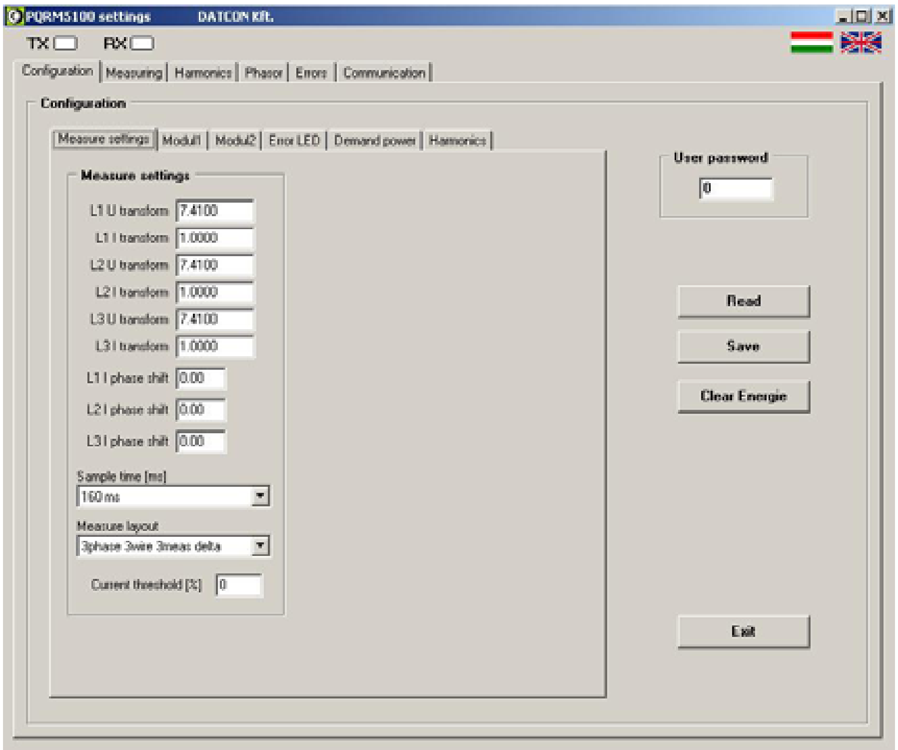
6.10. Phase lag of CT settings

Function

If you know the phase shift (50Hz) of the current transformer, you can specify the value here. The device to compensate the measurement results.
[Default: 0.]

Sequence of operations

1. Click on the ”Configuration” tab
2. Inside of ”Configuration” tab click on the “Measure settings” tab.
3. Type the value to “phase shift” field.
4. Click on the “Save” button.



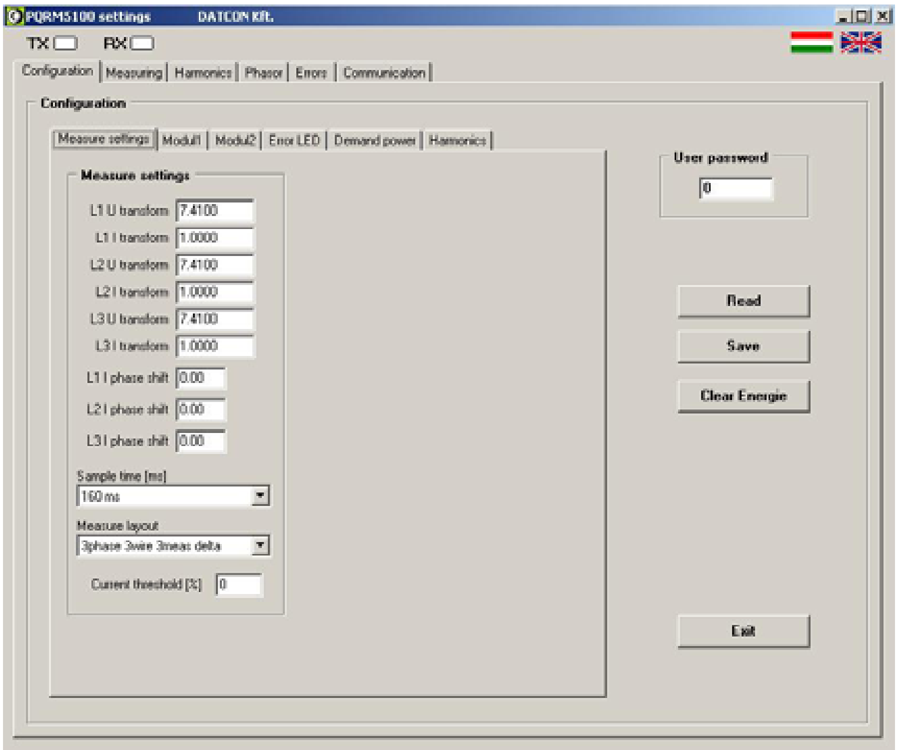
6.11. Sampling time setting

Function

The device sampling the necessary data for the calculation. After sampling time (minimum 80 ms) the MCU of device makes the calculations and updates the outputs. You can increase the sampling time. It is possible to reduce the fluctuation of measured values.
The sampling time modification change refresh time of the instrument.
[Default: 80 ms]

Sequence of operations

1. Click on the ”Configuration” tab
2. Inside of ”Configuration” tab click on the “Measure settings” tab.
3. Select the “Sampling time”
4. Click on the “Save” button.



6.12. Measure layout setting

Function

The PQRM5100 11 Ux Ix xx xx device can operate several types of measurement setup. Here you can set the measuring arrangement.
Possible measuring modes:

3 phase, 4 wire, 3 meter:
Three phase measurement with neutral conductor

3 phase, 3 wire, 3 meter:
Three phase measurement without neutral conductor

3 phase, 3 wire, 2 measure:
Three phase measurement without neutral conductor. Using 2 meter configuration. (Aron mode)

3 phase, 4 wire, 1 meter:
Three phase measurement with neutral conductor. Using 1 meter configuration. It is assumed symmetric load system, so you can use the measurement of rotating electrical machines.

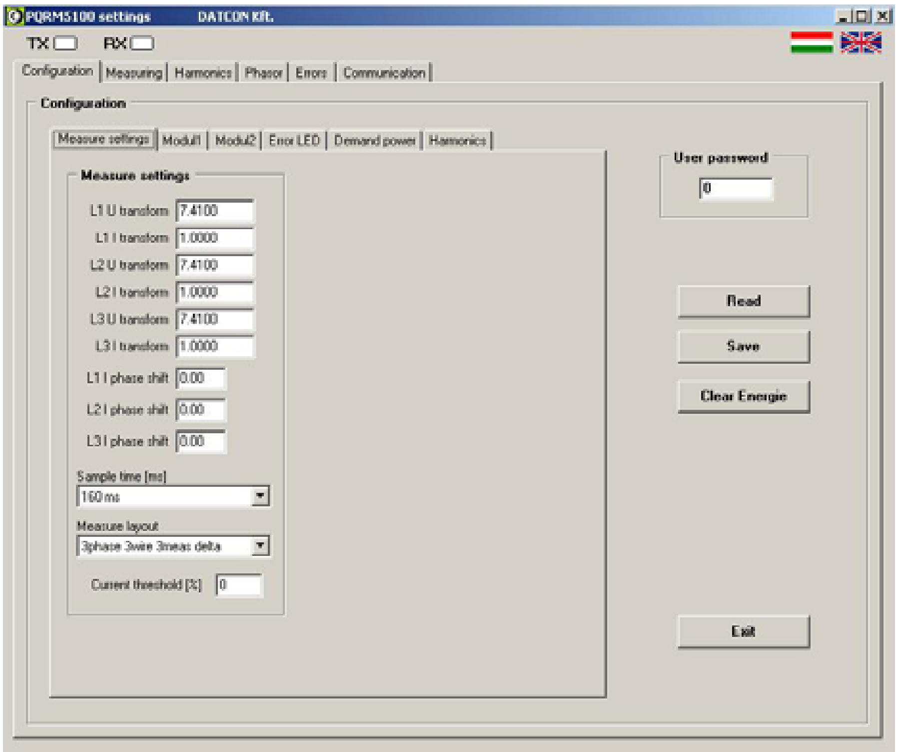
3 phase, 3 wire, 1 meter:
Three phase measurement without neutral conductor. Using 1 meter configuration. It is assumed symmetric load system, so you can use the measurement of rotating electrical machines.

3 phase, 3 wire, 3 meter, 3fmv:
Three phase measurement without neutral conductor, and three phase voltage transformers with delta secondary winding. The secondary winding of the transformer is connecting to earth. The Voltage transformers ratio is multiplied $\sqrt{3}$!

You can find the electrical wiring diagrams for each measurement arrangement on **5. Connecting** chapter.

Sequence of operations

1. Click on the ”Configuration” tab
2. Inside of ”Configuration” tab click on the “Measure settings” tab.
3. Select the “Measure layout”
4. Click on the “Save” button.



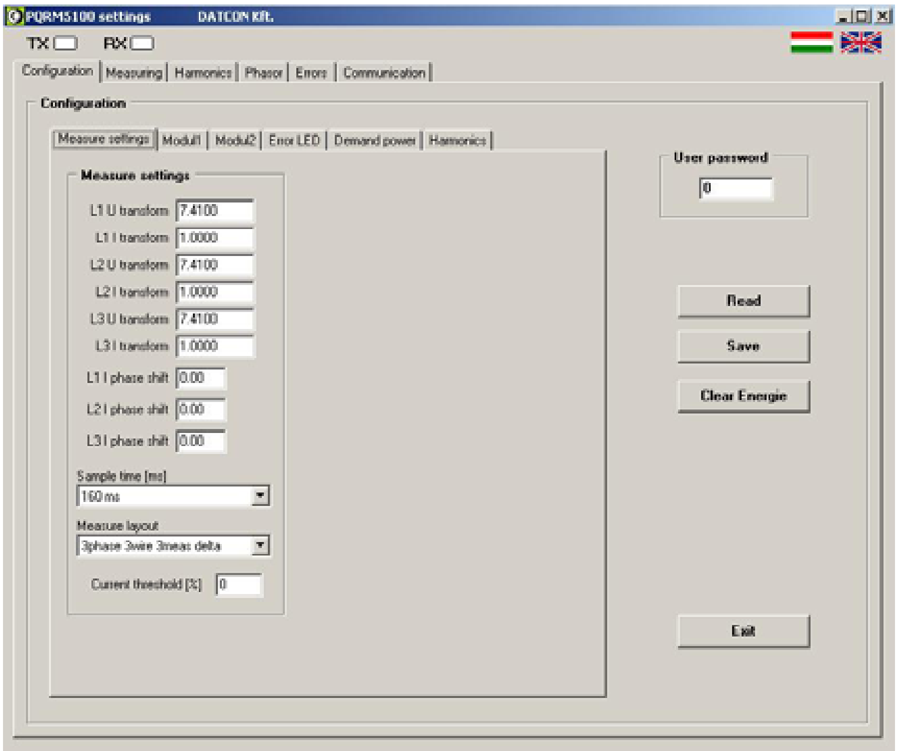
6.13. Current threshold setting

Function

When the current threshold function is used on the current input, the instrument eliminates the input signal under 0.2% of the input range.
This function may be useful when the power network is noisy either in voltage off state or in unloaded state and this effect may cause an error in energy measurement.
[Default: 0.0%]

Sequence of operations

1. Click on the ”Configuration” tab
2. Inside of ”Configuration” tab click on the “Current threshold” tab.
3. The input box, enter the threshold percentage. The percentage refers to the granting of the nominal current value.
4. Click on the “Save” button.



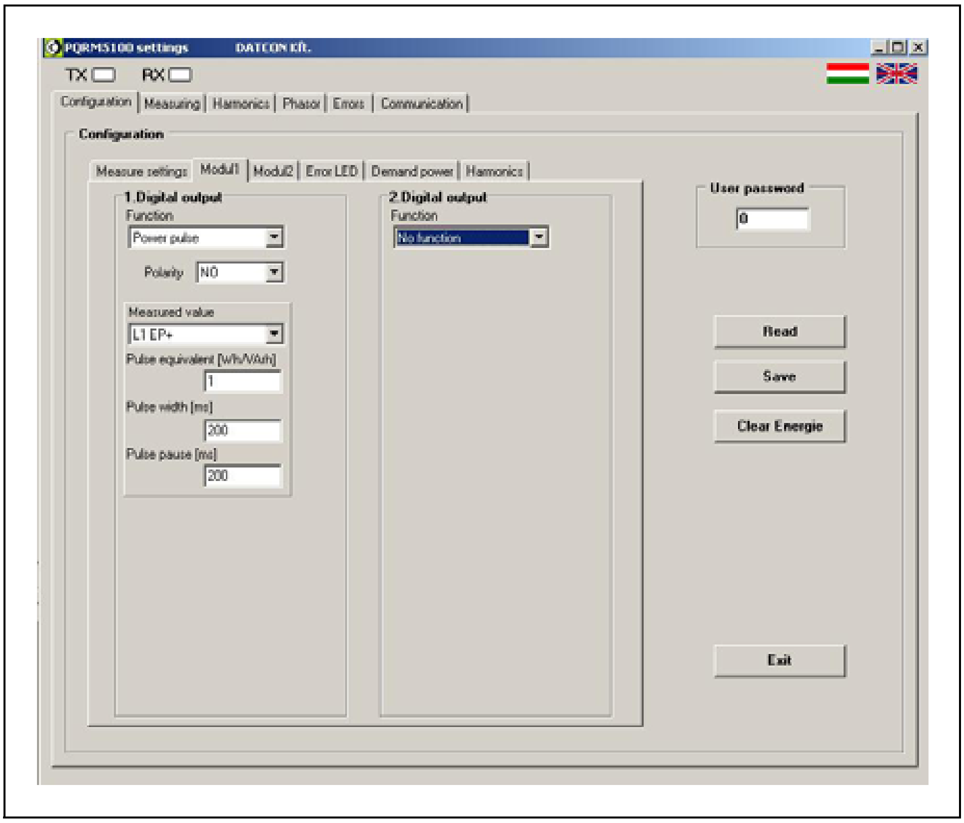
6.14. Digital output, Energy pulse output settings

Function

The instrument has two open collector transistor pulse outputs for transmitting export-import energy values for data acquisition purposes. The frequency of the pulse outputs is proportional to the measured energy.
Here you can set all of the parameters of the pulse outputs.

Sequence of operations

1. Click on the ”Configuration” tab
2. Inside of ”Configuration” tab click on the “Module 1” tab.
3. Select the “Energy pulse” functions from the “Function” pull-down menu.
4. Select the output polarity from the “Polarity” pull-down menu. When you select the “NO (Normally open)” state then the output transistor is in off state when there is no pulse on the output. When you select the “NC (Normally closed)” state then the output transistor is in on state when there is no pulse on the output.



5. Select from the “Measured value” pull-down menu the measured quantity what you are going to transmit.

6. Type-in the energy / pulse ratio into the “ Pulse equivalent” field.
7. Type-in into the “Pulse width [ms]” field the pulse width in milliseconds.
8. Type-in into the “Tmin between pulses [ms]” field the minimum time between the pulses in milliseconds.
9. Click on the “Save” button.

Warning! At settings always take note the maximum power on the power network. Improper settings may cause an error state and you will see: “x output, frequency error” message on the error page.
For setting proper values take note the following expression:

Pulse width [ms] + T min. between pulses [ms] <
(Pmax * Pulse rate [pulse/Wh]) ÷ 3.6

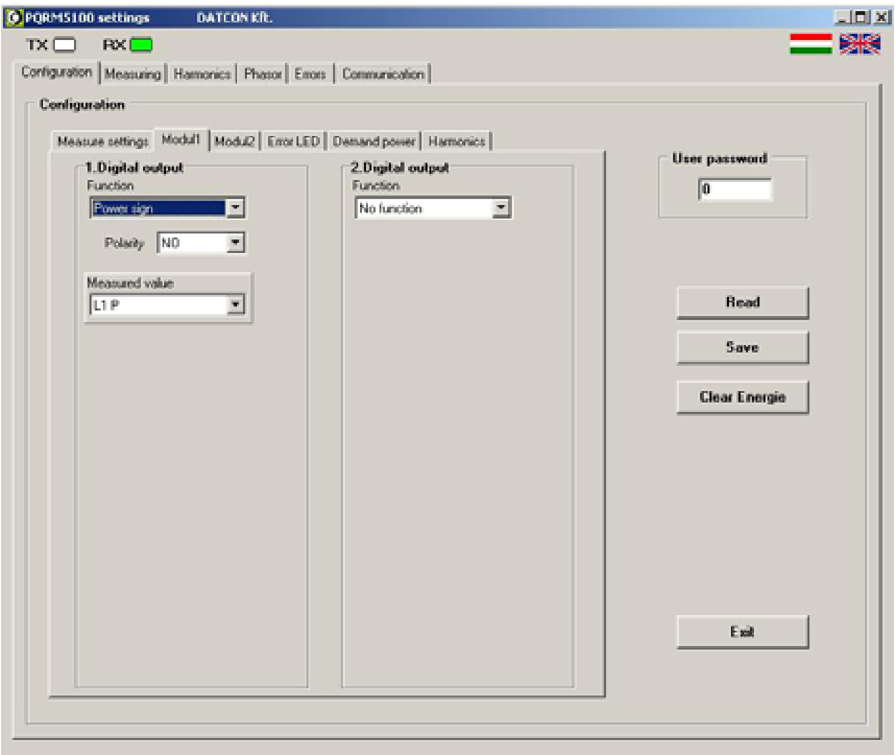
6.15. Digital output, Energy sign output settings

Function

The instrument can transmit the energy sign on the Pulse outputs.
+ sign: energy export
- sign: energy import
Here you can select the output for transmitting sign, the energy (E_P, E_Q) and the polarity of the output.

Sequence of operations

1. Click on the ”Configuration” tab
2. Inside of ”Configuration” tab click on the “Module 1” tab.
3. Select the “Energy sign” function from the “Function” pull-down menu.
4. Select the output polarity from the “Polarity” pull-down menu. When you select the “NO (Normally open)” state then the output transistor is in off state when there is no pulse on the output. When you select the “NC (Normally closed” state then the output transistor is in on state when there is no pulse on the output.



5. Select from the “Measured value” pull-down menu the measured quantity what you are going to sign.
6. Click on the “Save” button.

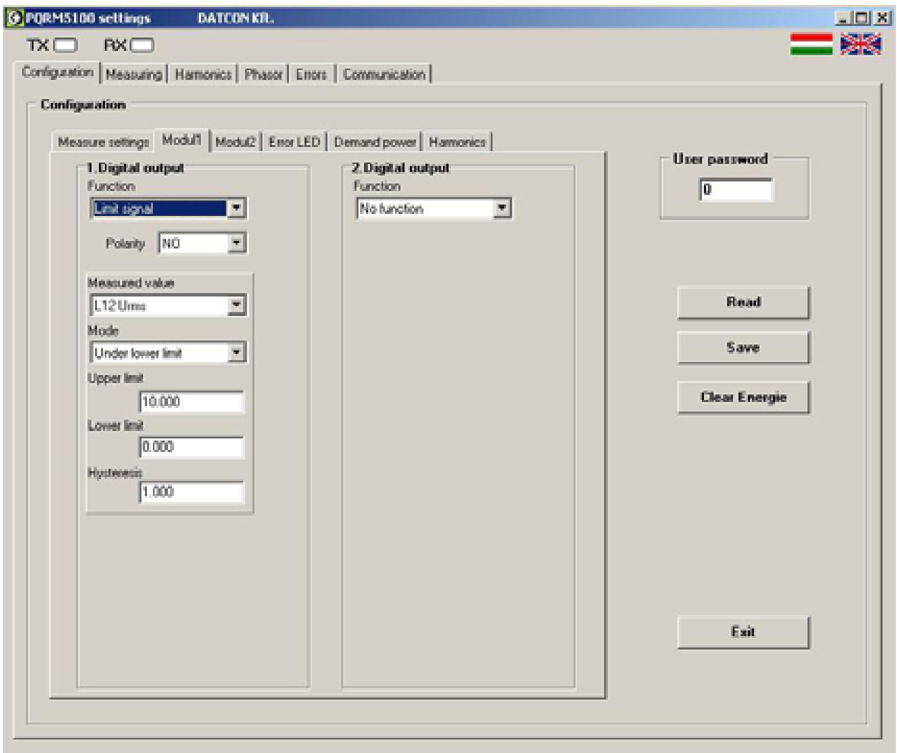
6.16. Digital output, Limit output settings

Function

Here you can set low limit-, high limit values and hysteresis and assign them to any measured quantity. The instrument compares continuously this quantity to the measured value and activates digital output(s) according the output settings.

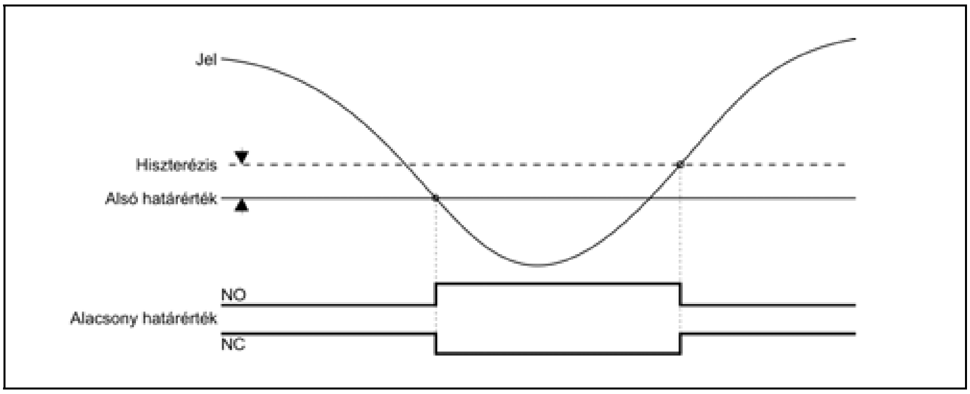
Sequence of operations

1. Click on the ”Configuration” tab
2. Inside of ”Configuration” tab click on the “Module 1” tab.
3. Select the “Limit signal” function on “Function” pull-down menu.
4. Select the output polarity from the “Polarity” pull-down menu. When you select the “NO (Normally open)” state then the output transistor is in off state when there is no pulse on the output. When you select the “NC (Normally closed” state then the output transistor is in on state when there is no pulse on the output.

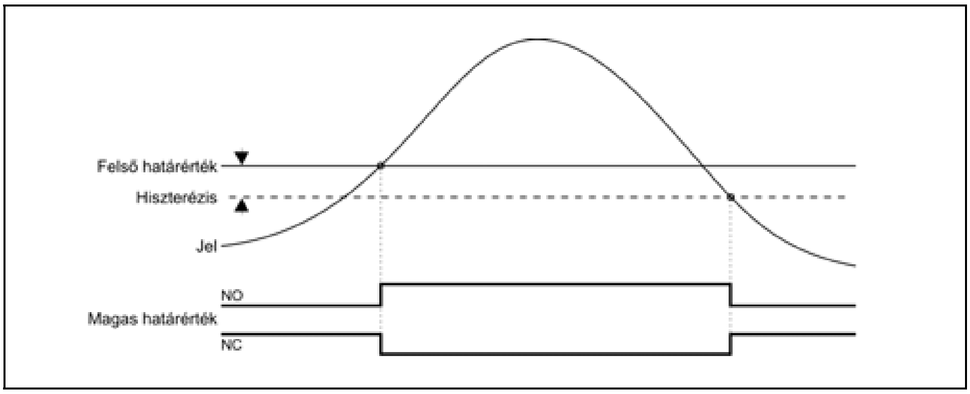


5. Select the desired quantity from the “Measured value” pull-down menu which on you is going to apply the limit function.

6. Select the limit mode from the “Mode” pull-down menu:
“Under low limit”
The output changes into active state when measured value becomes lower as the monitored value.
The output changes into inactive state when measured value becomes higher as the monitored value and hysteresis.

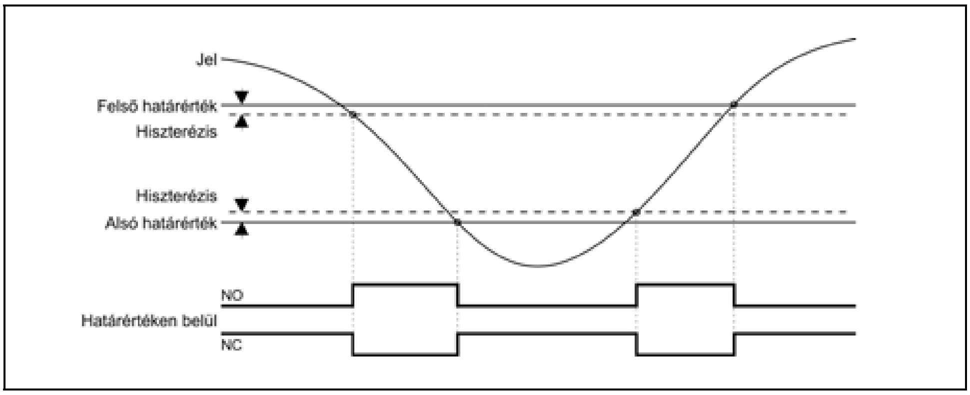


“Above higher limit”
The output changes into active state when measured value becomes higher as the monitored value.
The output changes into inactive state when measured value becomes lower as the monitored value and hysteresis.



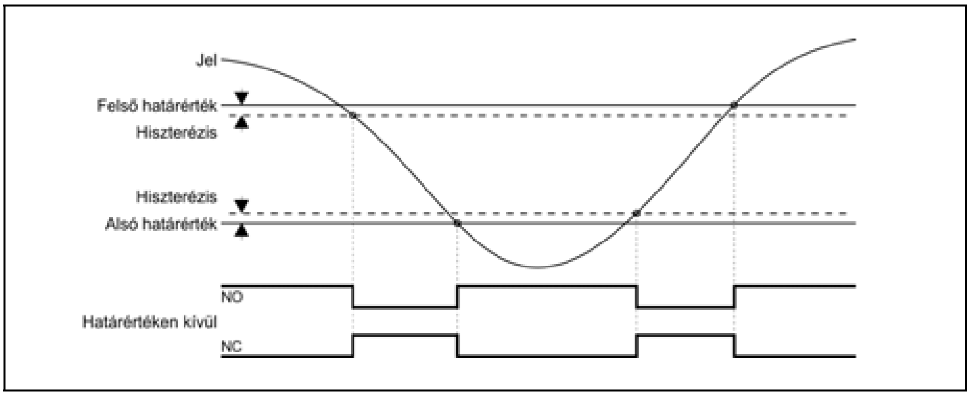
"Between limits"

The output changes into active state when measured value is between of range upper and lower limit as the monitored value. The output changes into inactive state when measured value is out of range as the monitored value. The hysteresis is like the high and low limit functions can use it.



"Out of limits"

The output changes into active state when measured value is out upper and lower limit as the monitored value. The output changes into inactive state when measured value is between of range upper and lower limit as the monitored value. The hysteresis is like the high and low limit functions can use it.



7. Type-in the high limit value into the "Upper limit" field.
8. Type-in the low limit value into the "Lower limit" field.
9. Type-in the hysteresis value into the "Hysteresis" field. The whole hysteresis value is the double of the typed-in value.
10. Click on the "Save" button.

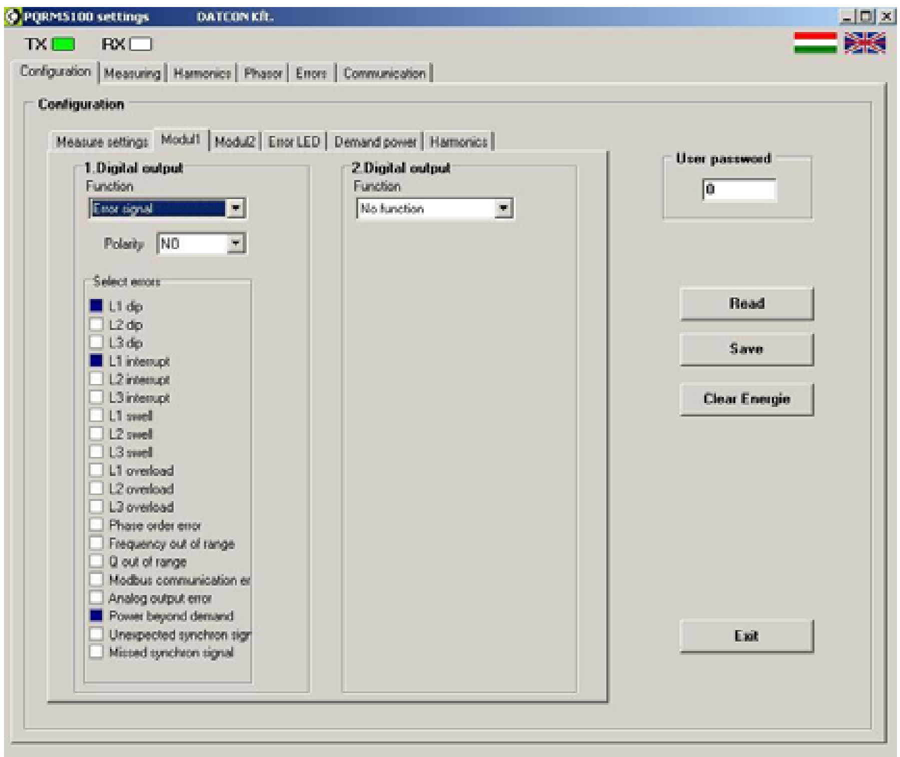
6.17. Digital output, Alarm output settings

Function

The instrument can generate alarm signaling in a case of one or more error state(s). It can be select which error state(s) generate the alarm signaling. The alarm state activates the digital outputs.
After terminating all of the error states the alarm signaling remains as far as it is acknowledged by the user through the configuration program by clicking-on the “Clear errors” button on the “Errors” page.

Sequence of operations

1. Click on the ”Configuration” tab
2. Inside of ”Configuration” tab click on the “Module 1” tab.
3. Select the “Error signal” function on “Function” pull-down menu.
4. Select the output polarity from the “Polarity” pull-down menu.



5. Select the errors on “Select error” menu which on you are going to apply the error function.
6. Click on the “Save” button.

6.18. Digital output, Demand control function setting

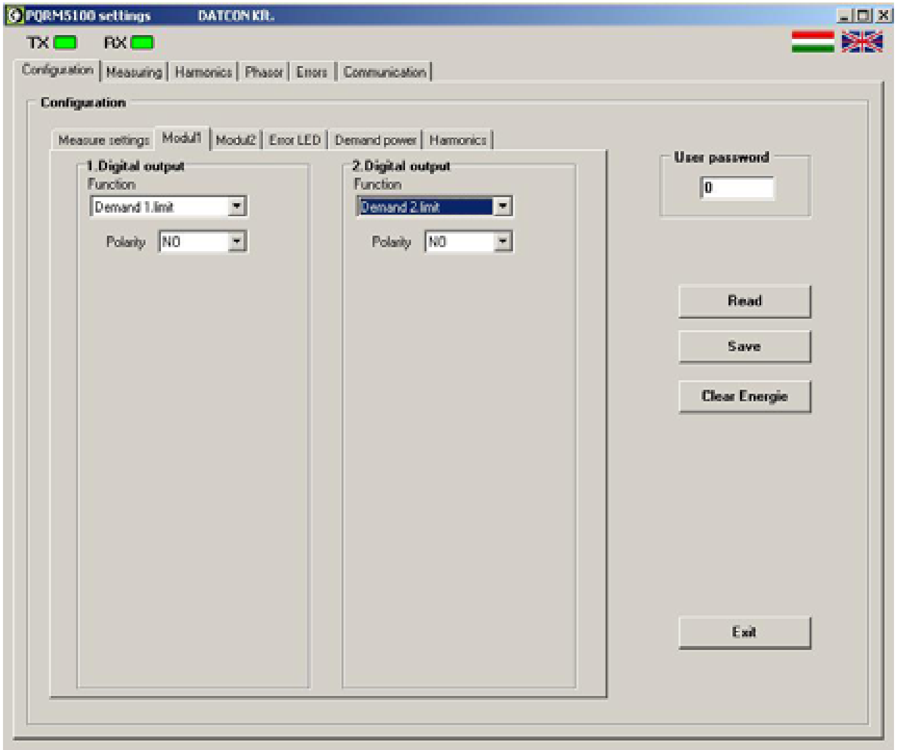
Function

The device calculates the expected average performance (15 min) from actual power. If this value is greater than the setting limit, the device set to active state the digital1 output. If the value is lower than the limit at the next sampling, the device turn back the digital1 output. If the value is greater than the setting limit, the device holds the digital1 output to active state, and the digital2 output sets to active state. At the next sampling the value of expected average power is lower the settings limit, the device set the digital2 output to inactive state.

These outputs states are repeated within a 15 minute period.

Sequence of operations

1. Click on the "Configuration" tab
2. Inside of "Configuration" tab click on the "Module 1" tab.
3. Select the "Demand 1limit" function on "Function" pull-down menu.
4. Select the output polarity from the "Polarity" pull-down menu.



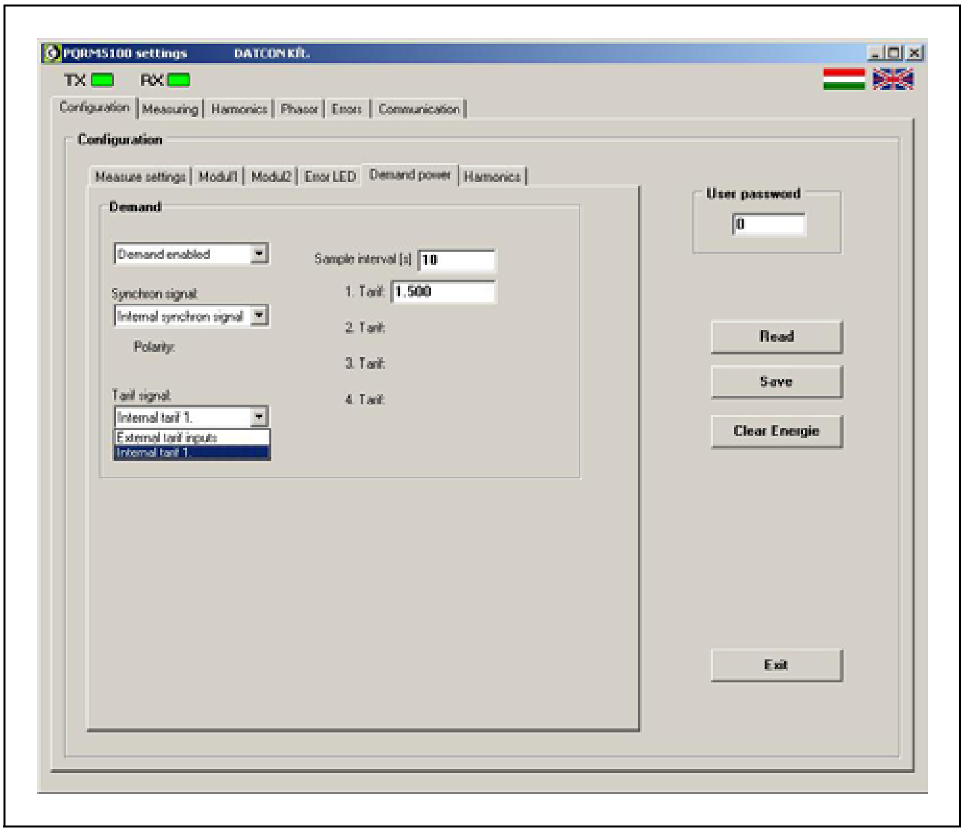
5. Select the “Demand 2 limit” function on “Function” pull-down menu.
6. Select the output polarity from the “Polarity” pull-down menu.
7. Click on the “Save” button.

6.19 Digital output, Tariff settings

Sequence of operations

Before you setting the limit value please read out the **6.18. Digital output, Demand control function** chapter.

1. Click on the ”Configuration” tab
2. Inside of ”Configuration” tab click on the “Demand power” tab.
3. Select the “Demand enable” function on “Demand” pull-down menu.
4. Select the synchrony clock source to “Internal clock source” (The Digital input option not available for PQRM5100 11 Ux Ix xx xx)
5. Type the tariff limit to “1. Tariff” field.



6. Click on the “Save” button.

6.20. Analog output settings

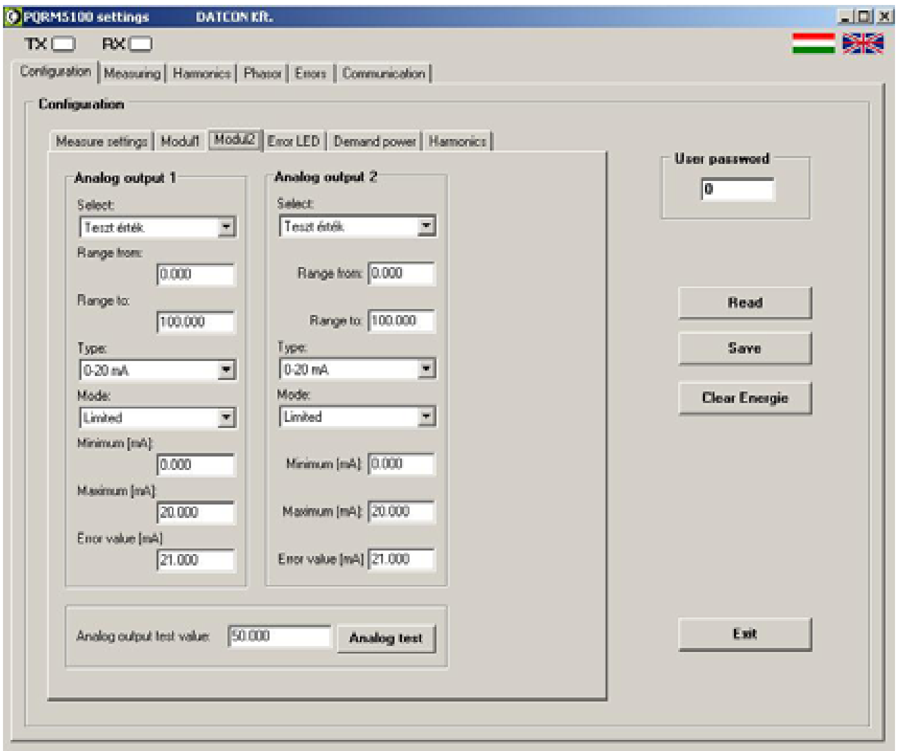
Function

There can be two optional dual independent analog outputs of the instrument. Any of the measured quantities can be transmit in a 0 / 4-20 mA current form.
Here you can set all of the parameters of the outputs.

Measured quantities are:
U_{12}, U_{23}, U_{31}, U_{L1}, U_{L2}, U_{L3}, I_{L1}, I_{L2}, I_{L3},
P_{L1}, P_{L1}, P_{L3}, Q_{L1}, Q_{L2}, Q_{L3}, S_{L1}, S_{L2}, S_{L3},
PF_{L1}, PF_{L2}, PF_{L3}, φ_{L1}, φ_{L2}, φ_{L3},
ΣP, ΣQ, ΣS, ΣPF, $\Sigma\varphi$, f_1, f_2, f_3; ρ_{12}, ρ_{13}

Sequence of operations

1. Click on the ”Configuration” tab
2. Inside of ”Configuration” tab click on the “Modul2” tab. Contents this window depends on device construct.
3. Select the desired measured quantity what you are going to transmit from the “Select” pull-down menu.
4. Type-in into the “Range form” field the lower value of the output scale.
5. Type-in into the “Range to” field the higher value of the output scale.
6. Select the output current range (0-20 / 4-20 mA) from the “Type” pull-down menu.



7. Select the output function mode from the “Mode” pull-down menu.

• Limited mode

The output signal will always remain within the chosen value (0-20 mA, 4-20 mA)

• Unlimited mode

The output signal always follows the input signal, between of range “minimum" and "maximum". The limit of output signal depends by the analog output circuit (approx. 0-22mA).

• Error signal mode

The output signal always follows the input signal, between of range “minimum" and "maximum". If the value of input signal falls outside of range “minimum" and "maximum, the output signal displayed the “Error value”.

8. Type-in into the “Minimum”, into the “Maximum” and into the “Error signal” field the necessary value of the output scale.

Pay attention to the value of the " Error value " always fall for the specified "Minimum" and beyond "Maximum" range, or can not distinguish between the normal states of the error state.

9. Click on the “Save” button.

6.21. Analog output testing

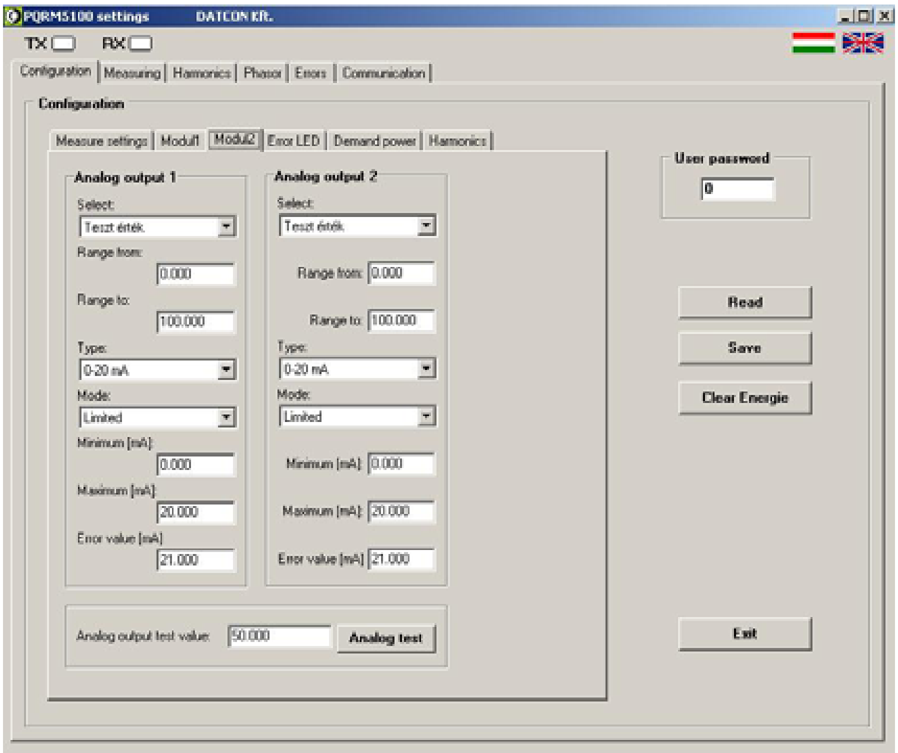
Function

You can here testing the analogue outputs.

Sequence of operations

1. Click on the ”Configuration” tab
2. Inside of ”Configuration” tab click on the “Modul2” tab. Contents this window depends on device construct.
3. Select the “Test value” from the “Select” pull-down menu.
4. Type-in into the “Range form” field the lower value of the output scale.
5. Type-in into the “Range to” field the higher value of the output scale.
6. Select the output current range (0-20 / 4-20 mA) from the “Type” pull-down menu.

7, Type the testing value of the “Analogue output test value” field, and click on the „Analog test” button. The test value displayed on the analogue output.



Attention! If "Test value" position leaves the 'Select' window, the analog output will not change the current output.

Example:

Setting analog output

Type	4-20mA
Mode	Error mode
Min.	3.800 mA
Max.	20.100 mA
Error	20.500 mA
Select	Test value
Range form	0.000
Range to	1000.000

Signal of analog output

Test value	0.000	analogue out = 4 mA
Test value	500.000	analogue out = 12 mA
Test value	1000.000	analogue out = 20 mA
Test value	-6.250	analogue out = 3.9 mA
Test value	1006.250	analogue out = 20.1 mA
Test value	-15.000	analogue out = 20.5 mA
Test value	1010.000	analogue out = 20.5 mA

6.22. Communication settings

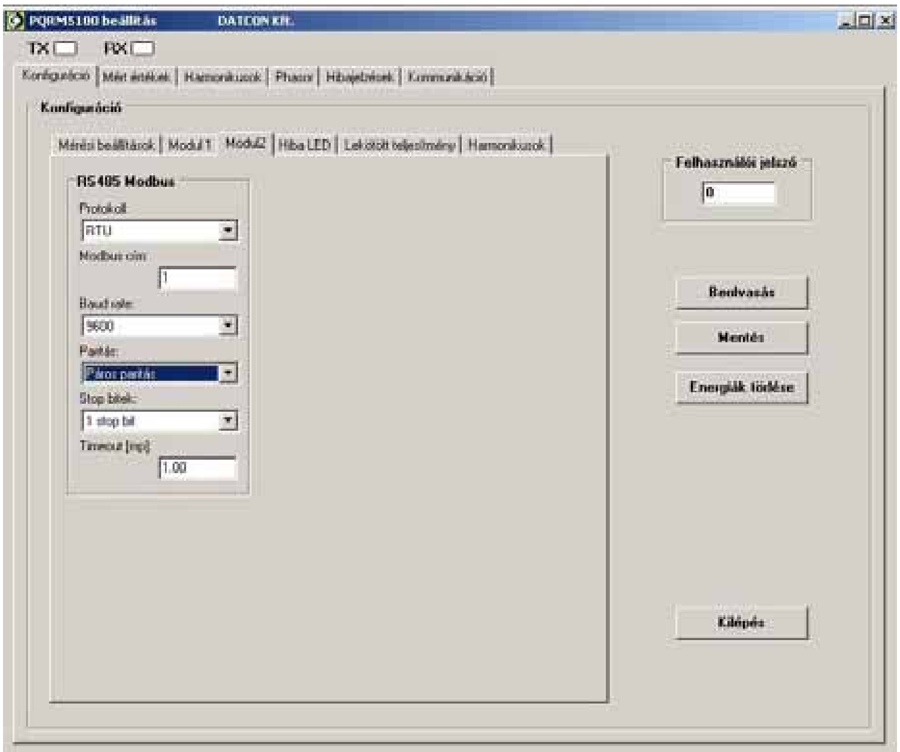
Function

It can be read out through the communication output all of the measured quantities. The optional communication option have two operating mode:

- MODBUS RTU Slave RS485
- MODBUS ASCII Slave RS485

Sequence of operations

1. Click on the ”Configuration” tab
2. Inside of ”Configuration” tab click on the “Modul2” tab. Contents this window depends on device construct.
3. Select the “Protocol” from the “Protocol” pull-down menu.
4. Type-in into the “Modbus Address” field the address of instrument.
5. Select the “Baud rate” from the “Baud rate” pull-down menu.
6. Select the “Parity” from the “Parity” pull-down menu.
7. Select the “Stop bit” from the “Stop bit” pull-down menu.
8. Type-in into the “Timeout” field the response timeout of instrument.
9. Click on the “Save” button.



MODBUS registers format

The range of measured vale is 1000-5027 address, and they are readable with 3 Modbus command.

- 1000-1067, 1132-1143, 2000-2015, 3000-3015, 4000-4015, 5000-5009 of the measured quantities are in 32 bit “Single Precision” floating point format according to IEEE754 standard. This means that all of the measured quantities are stored in 2 MODBUS register.
On the lower address is the upper 16 bit and on the higher address is the lower 16 bit.
- 1068-1131, 2016-2031, 3016-3031, 4016-4031, 5010-5023 of the measured quantities are in 64 bit unsigned word format. The bits are stored in 4 MODBUS register.
- 1144-1145, 2032-2033, 3032-3033, 4032-4033, 5026-5027 of the measured quantities are in 32 bit binary word format. They are the Errors bit. Each error has a bit, and the bit location is specified the errors. The errors bit are stored in 2 MODBUS register.

MODBUS address

All measured value

MB add.	Content	MB add.	Content
1000	$U_{eff\ 12}$ high 16 bit	1001	$U_{eff\ 12}$ low 16 bit
1002	$U_{eff\ 23}$ high 16 bit	1003	$U_{eff\ 23}$ low 16 bit
1004	$U_{eff\ 31}$ high 16 bit	1005	$U_{eff\ 31}$ low 16 bit
1006	$U_{eff\ 1}$ high 16 bit	1007	$U_{eff\ 1}$ low 16 bit
1008	$U_{eff\ 2}$ high 16 bit	1009	$U_{eff\ 2}$ low 16 bit
1010	$U_{eff\ 3}$ high 16 bit	1011	$U_{eff\ 3}$ low 16 bit
1012	$I_{eff\ 1}$ high 16 bit	1013	$I_{eff\ 1}$ low 16 bit
1014	$I_{eff\ 2}$ high 16 bit	1015	$I_{eff\ 2}$ low 16 bit
1016	$I_{eff\ 3}$ high 16 bit	1017	$I_{eff\ 3}$ low 16 bit
1018	P_1 high 16 bit	1019	P_1 low 16 bit
1020	P_2 high 16 bit	1021	P_2 low 16 bit
1022	P_3 high 16 bit	1023	P_3 low 16 bit
1024	Q_1 high 16 bit	1025	Q_1 low 16 bit
1026	Q_2 high 16 bit	1027	Q_2 low 16 bit
1028	Q_3 high 16 bit	1029	Q_3 low 16 bit
1030	S_1 high 16 bit	1031	S_1 low 16 bit
1032	S_2 high 16 bit	1033	S_2 low 16 bit
1034	S_3 high 16 bit	1035	S_3 low 16 bit
1036	PF_1 high 16 bit	1037	PF_1 low 16 bit
1038	PF_2 high 16 bit	1039	PF_2 low 16 bit
1040	PF_3 high 16 bit	1041	PF_3 low 16 bit
1042	Fi_1 high 16 bit	1043	Fi_1 low 16 bit
1044	Fi_2 high 16 bit	1045	Fi_2 low 16 bit
1046	Fi_3 high 16 bit	1047	Fi_3 low 16 bit
1048	∑P high 16 bit	1049	∑P low 16 bit
1050	∑Q high 16 bit	1051	∑Q low 16 bit
1052	∑S high 16 bit	1053	∑S low 16 bit
1054	∑PF high 16 bit	1055	∑PF low 16 bit
1056	∑Fi high 16 bit	1057	∑Fi low 16 bit
1058	f_1 high 16 bit	1059	f_1 low 16 bit
1060	f_2 high 16 bit	1061	f_2 low 16 bit
1062	f_3 high 16 bit	1063	f_3 low 16 bit
1064	ρ_{12} high 16 bit	1065	ρ_{12} low 16 bit
1066	ρ_{13} high 16 bit	1067	ρ_{13} low 16 bit
1068	+EP1 63–48 bit	1069	+EP1 47–32 bit
1070	+EP1 31–16 bit	1071	+EP1 15–0 bit

MB add.	Content	MB add.	Content
1072	$+EP_2$ 63–48 bit	1073	$+EP_2$ 47–32 bit
1074	$+EP_2$ 31–16 bit	1075	$+EP_2$ 15–0 bit
1076	$+EP_3$ 63–48 bit	1077	$+EP_3$ 47–32 bit
1078	$+EP_3$ 31–16 bit	1079	$+EP_3$ 15–0 bit
1080	$-EP_1$ 63–48 bit	1081	$-EP_1$ 47–32 bit
1082	$-EP_1$ 31–16 bit	1083	$-EP_1$ 15–0 bit
1084	$-EP_2$ 63–48 bit	1085	$-EP_2$ 47–32 bit
1086	$-EP_2$ 31–16 bit	1087	$-EP_2$ 15–0 bit
1088	$-EP_3$ 63–48 bit	1089	$-EP_3$ 47–32 bit
1090	$-EP_3$ 31–16 bit	1091	$-EP_3$ 15–0 bit
1092	$+EQ_1$ 63–48 bit	1093	$+EQ_1$ 47–32 bit
1094	$+EQ_1$ 31–16 bit	1095	$+EQ_1$ 15–0 bit
1096	$+EQ_2$ 63–48 bit	1097	$+EQ_2$ 47–32 bit
1098	$+EQ_2$ 31–16 bit	1099	$+EQ_2$ 15–0 bit
1100	$+EQ_3$ 63–48 bit	1101	$+EQ_3$ 47–32 bit
1102	$+EQ_3$ 31–16 bit	1103	$+EQ_3$ 15–0 bit
1104	$-EQ_1$ 63–48 bit	1105	$-EQ_1$ 47–32 bit
1106	$-EQ_1$ 31–16 bit	1107	$-EQ_1$ 15–0 bit
1108	$-EQ_2$ 63–48 bit	1109	$-EQ_2$ 47–32 bit
1110	$-EQ_2$ 31–16 bit	1111	$-EQ_2$ 15–0 bit
1112	$-EQ_3$ 63–48 bit	1113	$-EQ_3$ 47–32 bit
1114	$-EQ_3$ 31–16 bit	1115	$-EQ_3$ 15–0 bit
1116	∑+EP 63–48 bit	1117	∑+EP47–32 bit
1118	∑+EP 31–16 bit	1119	∑+EP 15–0 bit
1120	∑-EP 63–48 bit	1121	∑-EP 47–32 bit
1122	∑-EP 31–16 bit	1123	∑-EP 15–0 bit
1124	∑+EQ 63–48 bit	1125	∑+EQ 47–32 bit
1126	∑+EQ 31–16 bit	1127	∑+EQ 15–0 bit
1128	∑-EQ 63–48 bit	1129	∑-EQ 47–32 bit
1130	∑-EQ 31–16 bit	1131	∑-EQ 15–0 bit
1132	$\sum P_{15\_last}$ high 16 bit	1133	$\sum P_{15\_last}$ low 16 bit
1134	$\sum P_{15\_pill}$ high 16 bit	1135	$\sum P_{15\_pill}$ low 16 bit
1136	$\sum P_{15\_prog}$ high 16 bit	1137	$\sum P_{15\_prog}$ low 16 bit
1138	$\sum P_{15\_limit}$ high 16 bit	1139	$\sum P_{15\_limit}$ low 16 bit
1140	¼ time minut high 16 bit	1141	¼ time minut low 16 bit
1142	¼ time secundum high 16 bit	1143	¼ time secundum low 16 bit
1144	Errors high 16 bit	1145	Errors low 16 bit
1200	Demand registers unit: 0: Wh/VARh, 1: kWh/kVARh, 2: MWh/MVARh, 3: GWh/GVARh (Default: 0, Wh/VARh)		

L1 phase value

MB add.	Content	MB add.	Content
2000	$U_{eff\ 1}$ high 16 bit	2001	$U_{eff\ 1}$ low 16 bit
2002	$I_{eff\ 1}$ high 16 bit	2003	$I_{eff\ 1}$ low 16 bit
2004	P_1 high 16 bit	2005	P_1 low 16 bit
2006	Q_1 high 16 bit	2007	Q_1 low 16 bit
2008	S_1 high 16 bit	2009	S_1 low 16 bit
2010	PF_1 high 16 bit	2011	PF_1 low 16 bit
2012	Fi_1 high 16 bit	2013	Fi_1 low 16 bit
2014	f_1 high 16 bit	2015	f_1 low 16 bit
2016	$+EP_1$ 63–48 bit	2017	$+EP_1$ 47–32 bit
2018	$+EP_1$ 31–16 bit	2019	$+EP_1$ 15–0 bit
2020	$-EP_1$ 63–48 bit	2021	$-EP_1$ 47–32 bit
2022	$-EP_1$ 31–16 bit	2023	$-EP_1$ 15–0 bit
2024	$+EQ_1$ 63–48 bit	2025	$+EQ_1$ 47–32 bit
2026	$+EQ_1$ 31–16 bit	2027	$+EQ_1$ 15–0 bit
2028	$-EQ_1$ 63–48 bit	2029	$-EQ_1$ 47–32 bit
2030	$-EQ_1$ 31–16 bit	2031	$-EQ_1$ 15–0 bit
2032	Hibák high 16 bit	2033	Hibák low 16 bit
2034	THD U1 high 16 bit	2035	THD U1 low 16 bit
2036	THD I1 high 16 bit	2037	THD I1 low 16 bit
2038	U1 fundamental freuq.	2039	U1 1. harmonic
2040	U1 2. harmonic	2041	U1 3. harmonic
2042	U1 4. harmonic	2043	U1 5. harmonic
2044	U1 6. harmonic	2045	U1 7. harmonic
2046	U1 8. harmonic	2047	U1 9. harmonic
2048	U1 10. harmonic	2049	U1 11. harmonic
2050	U1 12. harmonic	2051	U1 13. harmonic
2052	U1 14. harmonic	2053	U1 15. harmonic
2054	U1 16. harmonic	2055	U1 17. harmonic
2056	U1 18. harmonic	2057	U1 19. harmonic
2058	I1 fundamental freuq.	2059	I1 1. harmonic
2060	I1 2. harmonic	2061	I1 3. harmonic
2062	I1 4. harmonic	2063	I1 5. harmonic
2064	I1 6. harmonic	2065	I1 7. harmonic
2066	I1 8. harmonic	2067	I1 9. harmonic
2068	I1 10. harmonic	2069	I1 11. harmonic
2070	I1 12. harmonic	2071	I1 13. harmonic
2072	I1 14. harmonic	2073	I1 15. harmonic
2074	I1 16. harmonic	2075	I1 17. harmonic
2076	I1 18. harmonic	2077	I1 19. harmonic

L2 phase value

MB add.	Content	MB add.	Content
3000	$U_{eff\ 2}$ high 16 bit	3001	$U_{eff\ 2}$ low 16 bit
3002	$I_{eff\ 2}$ high 16 bit	3003	$I_{eff\ 2}$ low 16 bit
3004	P_2 high 16 bit	3005	P_2 low 16 bit
3006	Q_2 high 16 bit	3007	Q_2 low 16 bit
3008	S_2 high 16 bit	3009	S_2 low 16 bit
3010	PF_2 high 16 bit	3011	PF_2 low 16 bit
3012	Fi_2 high 16 bit	3013	Fi_2 low 16 bit
3014	f_2 high 16 bit	3015	f_2 low 16 bit
3016	$+EP_2$ 63–48 bit	3017	$+EP_2$ 47–32 bit
3018	$+EP_2$ 31–16 bit	3019	$+EP_2$ 15–0 bit
3020	$-EP_2$ 63–48 bit	3021	$-EP_2$ 47–32 bit
3022	$-EP_2$ 31–16 bit	3023	$-EP_2$ 15–0 bit
3024	$+EQ_2$ 63–48 bit	3025	$+EQ_2$ 47–32 bit
3026	$+EQ_2$ 31–16 bit	3027	$+EQ_2$ 15–0 bit
3028	$-EQ_2$ 63–48 bit	3029	$-EQ_2$ 47–32 bit
3030	$-EQ_2$ 31–16 bit	3031	$-EQ_2$ 15–0 bit
3032	Hibák high 16 bit	3033	Hibák low 16 bit
3034	THD U2 high 16 bit	3035	THD U2 low 16 bit
3036	THD I2 high 16 bit	3037	THD I2 low 16 bit
3038	U2 fundamental freuq.	3039	U2 1. harmonic
3040	U2 2. harmonic	3041	U2 3. harmonic
3042	U2 4. harmonic	3043	U2 5. harmonic
3044	U2 6. harmonic	3045	U2 7. harmonic
3046	U2 8. harmonic	3047	U2 9. harmonic
3048	U2 10. harmonic	3049	U2 11. harmonic
3050	U2 12. harmonic	3051	U2 13. harmonic
3052	U2 14. harmonic	3053	U2 15. harmonic
3054	U2 16. harmonic	3055	U2 17. harmonic
3056	U2 18. harmonic	3057	U2 19. harmonic
3058	I2 fundamental freuq.	3059	I2 1. harmonic
3060	I2 2. harmonic	3061	I2 3. harmonic
3062	I2 4. harmonic	3063	I2 5. harmonic
3064	I2 6. harmonic	3065	I2 7. harmonic
3066	I2 8. harmonic	3067	I2 9. harmonic
3068	I2 10. harmonic	3069	I2 11. harmonic
3070	I2 12. harmonic	3071	I2 13. harmonic
3072	I2 14. harmonic	3073	I2 15. harmonic
3074	I2 16. harmonic	3075	I2 17. harmonic
3076	I2 18. harmonic	3077	I2 19. harmonic

L3 phase value

MB add.	Content	MB add.	Content
4000	$U_{eff\ 3}$ high 16 bit	4001	$U_{eff\ 3}$ low 16 bit
4002	$I_{eff\ 3}$ high 16 bit	4003	$I_{eff\ 3}$ low 16 bit
4004	P_3 high 16 bit	4005	P_3 low 16 bit
4006	Q_3 high 16 bit	4007	Q_3 low 16 bit
4008	S_3 high 16 bit	4009	S_3 low 16 bit
4010	PF_3 high 16 bit	4011	PF_3 low 16 bit
4012	Fi_3 high 16 bit	4013	Fi_3 low 16 bit
4014	f_3 high 16 bit	4015	f_3 low 16 bit
4016	$+EP_3$ 63–48 bit	4017	$+EP_3$ 47–32 bit
4018	$+EP_3$ 31–16 bit	4019	$+EP_3$ 15–0 bit
4020	$-EP_3$ 63–48 bit	4021	$-EP_3$ 47–32 bit
4022	$-EP_3$ 31–16 bit	4023	$-EP_3$ 15–0 bit
4024	$+EQ_3$ 63–48 bit	4025	$+EQ_3$ 47–32 bit
4026	$+EQ_3$ 31–16 bit	4027	$+EQ_3$ 15–0 bit
4028	$-EQ_3$ 63–48 bit	4029	$-EQ_3$ 47–32 bit
4030	$-EQ_3$ 31–16 bit	4031	$-EQ_3$ 15–0 bit
4032	Hibák high 16 bit	4033	Hibák low 16 bit
4034	THD U3 high 16 bit	4035	THD U3 low 16 bit
4036	THD I3 high 16 bit	4037	THD I3 low 16 bit
4038	U3 fundamental freuq.	4039	U3 1. harmonic
4040	U3 2. harmonic	4041	U3 3. harmonic
4042	U3 4. harmonic	4043	U3 5. harmonic
4044	U3 6. harmonic	4045	U3 7. harmonic
4046	U3 8. harmonic	4047	U3 9. harmonic
4048	U3 10. harmonic	4049	U3 11. harmonic
4050	U3 12. harmonic	4051	U3 13. harmonic
4052	U3 14. harmonic	4053	U3 15. harmonic
4054	U3 16. harmonic	4055	U3 17. harmonic
4056	U3 18. harmonic	4057	U3 19. harmonic
4058	I2 fundamental freuq.	4059	I2 1. harmonic
4060	I2 2. harmonic	4061	I2 3. harmonic
4062	I2 4. harmonic	4063	I2 5. harmonic
4064	I2 6. harmonic	4065	I2 7. harmonic
4066	I2 8. harmonic	4067	I2 9. harmonic
4068	I2 10. harmonic	4069	I2 11. harmonic
4070	I2 12. harmonic	4071	I2 13. harmonic
4072	I2 14. harmonic	4073	I2 15. harmonic
4074	I2 16. harmonic	4075	I2 17. harmonic
4076	I2 18. harmonic	4077	I2 19. harmonic

Three phase value

MB add.	Content	MB add.	Content
5000	∑P high 16 bit	5001	∑P low 16 bit
5002	∑Q high 16 bit	5003	∑Q low 16 bit
5004	∑S high 16 bit	5005	∑S low 16 bit
5006	∑PF high 16 bit	5007	∑PF low 16 bit
5008	∑Fi high 16 bit	5009	∑Fi low 16 bit
5010	∑+EP 63–48 bit	5011	∑+EP47–32 bit
5012	∑+EP 31–16 bit	5013	∑+EP 15–0 bit
5014	∑-EP 63–48 bit	5015	∑-EP 47–32 bit
5016	∑-EP 31–16 bit	5017	∑-EP 15–0 bit
5018	∑+EQ 63–48 bit	5019	∑+EQ 47–32 bit
5020	∑+EQ 31–16 bit	5021	∑+EQ 15–0 bit
5022	∑-EQ 63–48 bit	5023	∑-EQ 47–32 bit
5024	∑-EQ 31–16 bit	5025	∑-EQ 15–0 bit
5026	Hibák high 16 bit	5027	Hibák low 16 bit

Powers, Energies (readable as 32 bit value)

MB add.	Content	MB add.	Content
6000	P_1 high 16 bit	6001	P_1 low 16 bit
6002	Q_1 high 16 bit	6003	Q_1 low 16 bit
6004	P_2 high 16 bit	6005	P_2 low 16 bit
6006	Q_2 high 16 bit	6007	Q_2 low 16 bit
6008	P_3 high 16 bit	6009	P_3 low 16 bit
6010	Q_3 high 16 bit	6011	Q_3 low 16 bit
6012	∑P high 16 bit	6013	∑P low 16 bit
6014	∑Q high 16 bit	6015	∑Q low 16 bit
6016	$+EP_1$ 63–48 bit	6017	$+EP_1$ 47–32 bit
6018	$+EP_1$ 31–16 bit	6019	$+EP_1$ 15–0 bit
6020	$-EP_1$ 63–48 bit	6021	$-EP_1$ 47–32 bit
6022	$-EP_1$ 31–16 bit	6023	$-EP_1$ 15–0 bit
6024	$+EQ_1$ 63–48 bit	6025	$+EQ_1$ 47–32 bit
6026	$+EQ_1$ 31–16 bit	6027	$+EQ_1$ 15–0 bit
6028	$-EQ_1$ 63–48 bit	6029	$-EQ_1$ 47–32 bit
6030	$-EQ_1$ 31–16 bit	6031	$-EQ_1$ 15–0 bit
6032	$+EP_2$ 63–48 bit	6033	$+EP_2$ 47–32 bit
6034	$+EP_2$ 31–16 bit	6035	$+EP_2$ 15–0 bit
6036	$-EP_2$ 63–48 bit	6037	$-EP_2$ 47–32 bit
6038	$-EP_2$ 31–16 bit	6039	$-EP_2$ 15–0 bit
6040	$+EQ_2$ 63–48 bit	6041	$+EQ_2$ 47–32 bit
6042	$+EQ_2$ 31–16 bit	6043	$+EQ_2$ 15–0 bit
6044	$-EQ_2$ 63–48 bit	6045	$-EQ_2$ 47–32 bit
6046	$-EQ_2$ 31–16 bit	6047	$-EQ_2$ 15–0 bit
6048	$+EP_3$ 63–48 bit	6049	$+EP_3$ 47–32 bit
6050	$+EP_3$ 31–16 bit	6051	$+EP_3$ 15–0 bit
6052	$-EP_3$ 63–48 bit	6053	$-EP_3$ 47–32 bit
6054	$-EP_3$ 31–16 bit	6055	$-EP_3$ 15–0 bit
6056	$+EQ_3$ 63–48 bit	6057	$+EQ_3$ 47–32 bit
6058	$+EQ_3$ 31–16 bit	6059	$+EQ_3$ 15–0 bit
6060	$-EQ_3$ 63–48 bit	6061	$-EQ_3$ 47–32 bit
6062	$-EQ_3$ 31–16 bit	6063	$-EQ_3$ 15–0 bit
6064	∑+EP 63–48 bit	6065	∑+EP47–32 bit
6066	∑+EP 31–16 bit	6067	∑+EP 15–0 bit
6068	∑-EP 63–48 bit	6069	∑-EP 47–32 bit
6070	∑-EP 31–16 bit	6071	∑-EP 15–0 bit
6072	∑+EQ 63–48 bit	6073	∑+EQ 47–32 bit
6074	∑+EQ 31–16 bit	6075	∑+EQ 15–0 bit
6076	∑-EQ 63–48 bit	6077	∑-EQ 47–32 bit
6078	∑-EQ 31–16 bit	6079	∑-EQ 15–0 bit

Energies (kWh, kVARh)

MB add.	Content	MB add.	Content
7000	$+EP_1$ 63–48 bit	7001	$+EP_1$ 47–32 bit
7002	$+EP_1$ 31–16 bit	7003	$+EP_1$ 15–0 bit
7004	$+EP_2$ 63–48 bit	7005	$+EP_2$ 47–32 bit
7006	$+EP_2$ 31–16 bit	7007	$+EP_2$ 15–0 bit
7008	$+EP_3$ 63–48 bit	7009	$+EP_3$ 47–32 bit
7010	$+EP_3$ 31–16 bit	7011	$+EP_3$ 15–0 bit
7012	$-EP_1$ 63–48 bit	7013	$-EP_1$ 47–32 bit
7014	$-EP_1$ 31–16 bit	7015	$-EP_1$ 15–0 bit
7016	$-EP_2$ 63–48 bit	7017	$-EP_2$ 47–32 bit
7018	$-EP_2$ 31–16 bit	7019	$-EP_2$ 15–0 bit
7020	$-EP_3$ 63–48 bit	7021	$-EP_3$ 47–32 bit
7022	$-EP_3$ 31–16 bit	7023	$-EP_3$ 15–0 bit
7024	$+EQ_1$ 63–48 bit	7025	$+EQ_1$ 47–32 bit
7026	$+EQ_1$ 31–16 bit	7027	$+EQ_1$ 15–0 bit
7028	$+EQ_2$ 63–48 bit	7029	$+EQ_2$ 47–32 bit
7030	$+EQ_2$ 31–16 bit	7031	$+EQ_2$ 15–0 bit
7032	$+EQ_3$ 63–48 bit	7033	$+EQ_3$ 47–32 bit
7034	$+EQ_3$ 31–16 bit	7035	$+EQ_3$ 15–0 bit
7036	$-EQ_1$ 63–48 bit	7037	$-EQ_1$ 47–32 bit
7038	$-EQ_1$ 31–16 bit	7039	$-EQ_1$ 15–0 bit
7040	$-EQ_2$ 63–48 bit	7041	$-EQ_2$ 47–32 bit
7042	$-EQ_2$ 31–16 bit	7043	$-EQ_2$ 15–0 bit
7044	$-EQ_3$ 63–48 bit	7045	$-EQ_3$ 47–32 bit
7046	$-EQ_3$ 31–16 bit	7047	$-EQ_3$ 15–0 bit
7048	∑+EP 63–48 bit	7049	∑+EP47–32 bit
7050	∑+EP 31–16 bit	7051	∑+EP 15–0 bit
7052	∑-EP 63–48 bit	7053	∑-EP 47–32 bit
7054	∑-EP 31–16 bit	7055	∑-EP 15–0 bit
7056	∑+EQ 63–48 bit	7057	∑+EQ 47–32 bit
7058	∑+EQ 31–16 bit	7059	∑+EQ 15–0 bit
7060	∑-EQ 63–48 bit	7061	∑-EQ 47–32 bit
7062	∑-EQ 31–16 bit	7063	∑-EQ 15–0 bit

Energies (MWh, MVARh)

MB add.	Content	MB add.	Content
7100	$+EP_1$ 63–48 bit	7101	$+EP_1$ 47–32 bit
7102	$+EP_1$ 31–16 bit	7103	$+EP_1$ 15–0 bit
7104	$+EP_2$ 63–48 bit	7105	$+EP_2$ 47–32 bit
7106	$+EP_2$ 31–16 bit	7107	$+EP_2$ 15–0 bit
7108	$+EP_3$ 63–48 bit	7109	$+EP_3$ 47–32 bit
7110	$+EP_3$ 31–16 bit	7111	$+EP_3$ 15–0 bit
7112	$-EP_1$ 63–48 bit	7113	$-EP_1$ 47–32 bit
7114	$-EP_1$ 31–16 bit	7115	$-EP_1$ 15–0 bit
7116	$-EP_2$ 63–48 bit	7117	$-EP_2$ 47–32 bit
7118	$-EP_2$ 31–16 bit	7119	$-EP_2$ 15–0 bit
7120	$-EP_3$ 63–48 bit	7121	$-EP_3$ 47–32 bit
7122	$-EP_3$ 31–16 bit	7123	$-EP_3$ 15–0 bit
7124	$+EQ_1$ 63–48 bit	7125	$+EQ_1$ 47–32 bit
7126	$+EQ_1$ 31–16 bit	7127	$+EQ_1$ 15–0 bit
7128	$+EQ_2$ 63–48 bit	7129	$+EQ_2$ 47–32 bit
7130	$+EQ_2$ 31–16 bit	7131	$+EQ_2$ 15–0 bit
7132	$+EQ_3$ 63–48 bit	7133	$+EQ_3$ 47–32 bit
7134	$+EQ_3$ 31–16 bit	7135	$+EQ_3$ 15–0 bit
7136	$-EQ_1$ 63–48 bit	7137	$-EQ_1$ 47–32 bit
7138	$-EQ_1$ 31–16 bit	7139	$-EQ_1$ 15–0 bit
7140	$-EQ_2$ 63–48 bit	7141	$-EQ_2$ 47–32 bit
7142	$-EQ_2$ 31–16 bit	7143	$-EQ_2$ 15–0 bit
7144	$-EQ_3$ 63–48 bit	7145	$-EQ_3$ 47–32 bit
7146	$-EQ_3$ 31–16 bit	7147	$-EQ_3$ 15–0 bit
7148	∑+EP 63–48 bit	7149	∑+EP47–32 bit
7150	∑+EP 31–16 bit	7151	∑+EP 15–0 bit
7152	∑-EP 63–48 bit	7153	∑-EP 47–32 bit
7154	∑-EP 31–16 bit	7155	∑-EP 15–0 bit
7156	∑+EQ 63–48 bit	7157	∑+EQ 47–32 bit
7158	∑+EQ 31–16 bit	7159	∑+EQ 15–0 bit
7160	∑-EQ 63–48 bit	7161	∑-EQ 47–32 bit
7162	∑-EQ 31–16 bit	7163	∑-EQ 15–0 bit

Energies (GWh, GVARh)

MB add.	Content	MB add.	Content
7200	$+EP_1$ 63–48 bit	7201	$+EP_1$ 47–32 bit
7202	$+EP_1$ 31–16 bit	7203	$+EP_1$ 15–0 bit
7204	$+EP_2$ 63–48 bit	7205	$+EP_2$ 47–32 bit
7206	$+EP_2$ 31–16 bit	7207	$+EP_2$ 15–0 bit
7208	$+EP_3$ 63–48 bit	7209	$+EP_3$ 47–32 bit
7210	$+EP_3$ 31–16 bit	7211	$+EP_3$ 15–0 bit
7212	$-EP_1$ 63–48 bit	7213	$-EP_1$ 47–32 bit
7214	$-EP_1$ 31–16 bit	7215	$-EP_1$ 15–0 bit
7216	$-EP_2$ 63–48 bit	7217	$-EP_2$ 47–32 bit
7218	$-EP_2$ 31–16 bit	7219	$-EP_2$ 15–0 bit
7220	$-EP_3$ 63–48 bit	7221	$-EP_3$ 47–32 bit
7222	$-EP_3$ 31–16 bit	7223	$-EP_3$ 15–0 bit
7224	$+EQ_1$ 63–48 bit	7225	$+EQ_1$ 47–32 bit
7226	$+EQ_1$ 31–16 bit	7227	$+EQ_1$ 15–0 bit
7228	$+EQ_2$ 63–48 bit	7229	$+EQ_2$ 47–32 bit
7230	$+EQ_2$ 31–16 bit	7231	$+EQ_2$ 15–0 bit
7232	$+EQ_3$ 63–48 bit	7233	$+EQ_3$ 47–32 bit
7234	$+EQ_3$ 31–16 bit	7235	$+EQ_3$ 15–0 bit
7236	$-EQ_1$ 63–48 bit	7237	$-EQ_1$ 47–32 bit
7238	$-EQ_1$ 31–16 bit	7239	$-EQ_1$ 15–0 bit
7240	$-EQ_2$ 63–48 bit	7241	$-EQ_2$ 47–32 bit
7242	$-EQ_2$ 31–16 bit	7243	$-EQ_2$ 15–0 bit
7244	$-EQ_3$ 63–48 bit	7245	$-EQ_3$ 47–32 bit
7246	$-EQ_3$ 31–16 bit	7247	$-EQ_3$ 15–0 bit
7248	∑+EP 63–48 bit	7249	∑+EP47–32 bit
7250	∑+EP 31–16 bit	7251	∑+EP 15–0 bit
7252	∑-EP 63–48 bit	7253	∑-EP 47–32 bit
7254	∑-EP 31–16 bit	7255	∑-EP 15–0 bit
7256	∑+EQ 63–48 bit	7257	∑+EQ 47–32 bit
7258	∑+EQ 31–16 bit	7259	∑+EQ 15–0 bit
7260	∑-EQ 63–48 bit	7261	∑-EQ 47–32 bit
7262	∑-EQ 31–16 bit	7263	∑-EQ 15–0 bit

Energies (kWh, kVARh) (32 bit!)

MB add.	Content	MB add.	Content
7300	$+EP_1$ 31–16 bit	7301	$+EP_1$ 15–0 bit
7302	$+EP_2$ 31–16 bit	7303	$+EP_2$ 15–0 bit
7304	$+EP_3$ 31–16 bit	7305	$+EP_3$ 15–0 bit
7306	$-EP_1$ 31–16 bit	7307	$-EP_1$ 15–0 bit
7308	$-EP_2$ 31–16 bit	7309	$-EP_2$ 15–0 bit
7310	$-EP_3$ 31–16 bit	7311	$-EP_3$ 15–0 bit
7312	$+EQ_1$ 31–16 bit	7313	$+EQ_1$ 15–0 bit
7314	$+EQ_2$ 31–16 bit	7315	$+EQ_2$ 15–0 bit
7316	$+EQ_3$ 31–16 bit	7317	$+EQ_3$ 15–0 bit
7318	$-EQ_1$ 31–16 bit	7319	$-EQ_1$ 15–0 bit
7320	$-EQ_2$ 31–16 bit	7321	$-EQ_2$ 15–0 bit
7322	$-EQ_3$ 31–16 bit	7323	$-EQ_3$ 15–0 bit
7324	∑+EP 31–16 bit	7325	∑+EP 15–0 bit
7326	∑-EP 31–16 bit	7327	∑-EP 15–0 bit
7328	∑+EQ 31–16 bit	7329	∑+EQ 15–0 bit
7330	∑-EQ 31–16 bit	7331	∑-EQ 15–0 bit

Energies (MWh, MVARh) (32 bit!)

MB add.	Content	MB add.	Content
7400	$+EP_1$ 31–16 bit	7401	$+EP_1$ 15–0 bit
7402	$+EP_2$ 31–16 bit	7403	$+EP_2$ 15–0 bit
7404	$+EP_3$ 31–16 bit	7405	$+EP_3$ 15–0 bit
7406	$-EP_1$ 31–16 bit	7407	$-EP_1$ 15–0 bit
7408	$-EP_2$ 31–16 bit	7409	$-EP_2$ 15–0 bit
7410	$-EP_3$ 31–16 bit	7411	$-EP_3$ 15–0 bit
7412	$+EQ_1$ 31–16 bit	7413	$+EQ_1$ 15–0 bit
7414	$+EQ_2$ 31–16 bit	7415	$+EQ_2$ 15–0 bit
7416	$+EQ_3$ 31–16 bit	7417	$+EQ_3$ 15–0 bit
7418	$-EQ_1$ 31–16 bit	7419	$-EQ_1$ 15–0 bit
7420	$-EQ_2$ 31–16 bit	7421	$-EQ_2$ 15–0 bit
7422	$-EQ_3$ 31–16 bit	7423	$-EQ_3$ 15–0 bit
7424	∑+EP 31–16 bit	7425	∑+EP 15–0 bit
7426	∑-EP 31–16 bit	7427	∑-EP 15–0 bit
7428	∑+EQ 31–16 bit	7429	∑+EQ 15–0 bit
7430	∑-EQ 31–16 bit	7431	∑-EQ 15–0 bit

Energies (GWh, GVARh) (32 bit!)

MB cím	Tartalom	MB cím	Tartalom
7500	$+EP_1$ 31–16 bit	7501	$+EP_1$ 15–0 bit
7502	$+EP_2$ 31–16 bit	7503	$+EP_2$ 15–0 bit
7504	$+EP_3$ 31–16 bit	7505	$+EP_3$ 15–0 bit
7506	$-EP_1$ 31–16 bit	7507	$-EP_1$ 15–0 bit
7508	$-EP_2$ 31–16 bit	7509	$-EP_2$ 15–0 bit
7510	$-EP_3$ 31–16 bit	7511	$-EP_3$ 15–0 bit
7512	$+EQ_1$ 31–16 bit	7513	$+EQ_1$ 15–0 bit
7514	$+EQ_2$ 31–16 bit	7515	$+EQ_2$ 15–0 bit
7516	$+EQ_3$ 31–16 bit	7517	$+EQ_3$ 15–0 bit
7518	$-EQ_1$ 31–16 bit	7519	$-EQ_1$ 15–0 bit
7520	$-EQ_2$ 31–16 bit	7521	$-EQ_2$ 15–0 bit
7522	$-EQ_3$ 31–16 bit	7523	$-EQ_3$ 15–0 bit
7524	∑+EP 31–16 bit	7525	∑+EP 15–0 bit
7526	∑-EP 31–16 bit	7527	∑-EP 15–0 bit
7528	∑+EQ 31–16 bit	7529	∑+EQ 15–0 bit
7530	∑-EQ 31–16 bit	7531	∑-EQ 15–0 bit

6.23. Errors

Function

Sequence of operations

The device measures the following error conditions.

Error number:	Explanation:
1	L1 voltage dip
2	L2 voltage dip
3	L3 voltage dip
4	L1 voltage interrupt
5	L2 voltage interrupt
6	L3 voltage interrupt
7	L1 voltage swell
8	L2 voltage swell
9	L3 voltage swell
10	L1 overload
11	L2 overload
12	L3 overload
13	Phase sequence error
14	Frequency out of range
15	Q out of range
16	Modbus communication error
17	Analogue output error
18	Demand overrun
19	Unexpeted syncron signal
20	Missed syncron signal

<u>Voltage dip:</u>
The voltage value is less than 90% of nominal value.
(Not used the EN50160 standard)
<u>Voltage interrupt:</u>
The voltage value is less than 10% of nominal value.
(Not used the EN50160 standard)
<u>Voltage swell:</u>
The voltage value is more than 110% of nominal value.
110% t. (Not used the EN50160 standard)

Overload:

The measured current value is more than 120% of nominal current value.

Phase sequence error:

The L1 L2 L3 phases follow each other unlike the positive sequence (-120°, -240°)

The user can be order the detected errors for digital output (**6.17. Digital output, Alarm output settings**) or for Error LED (**6.24. Setting errors LED**).

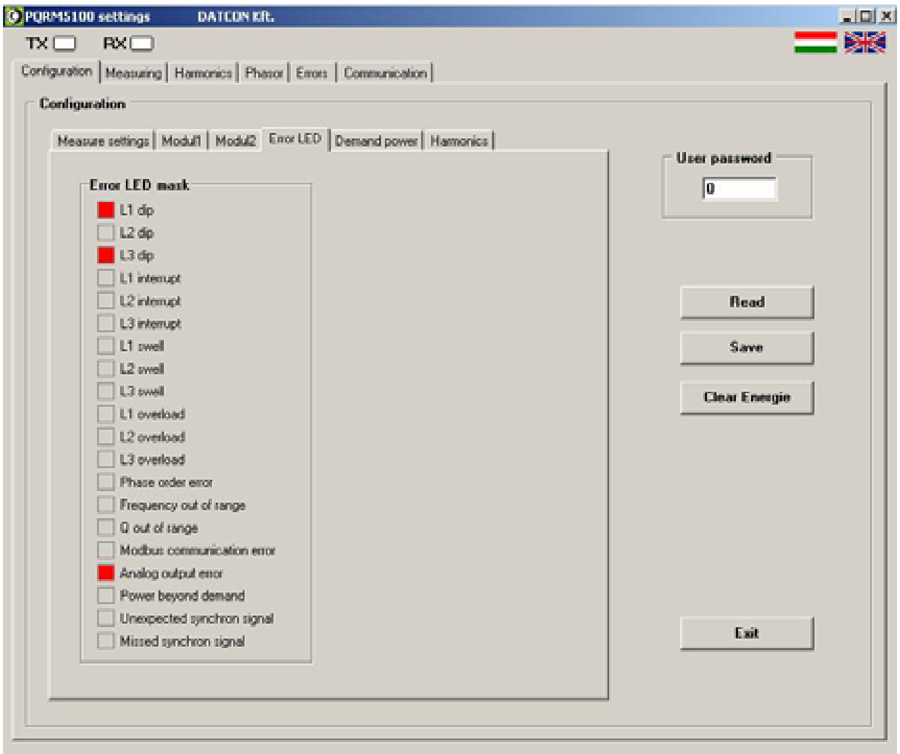
The errors events are stored in volatile memory. If the machine is turned off, the values will be deleted.

6.24. Setting errors LED

Function Programming the error LED

Sequence of operations

1. Click on the ”Configuration” tab
2. Inside of ”Configuration” tab click on the “Error LED” tab.
3. Click on the displayed error.
4. Click on the “Save” button.



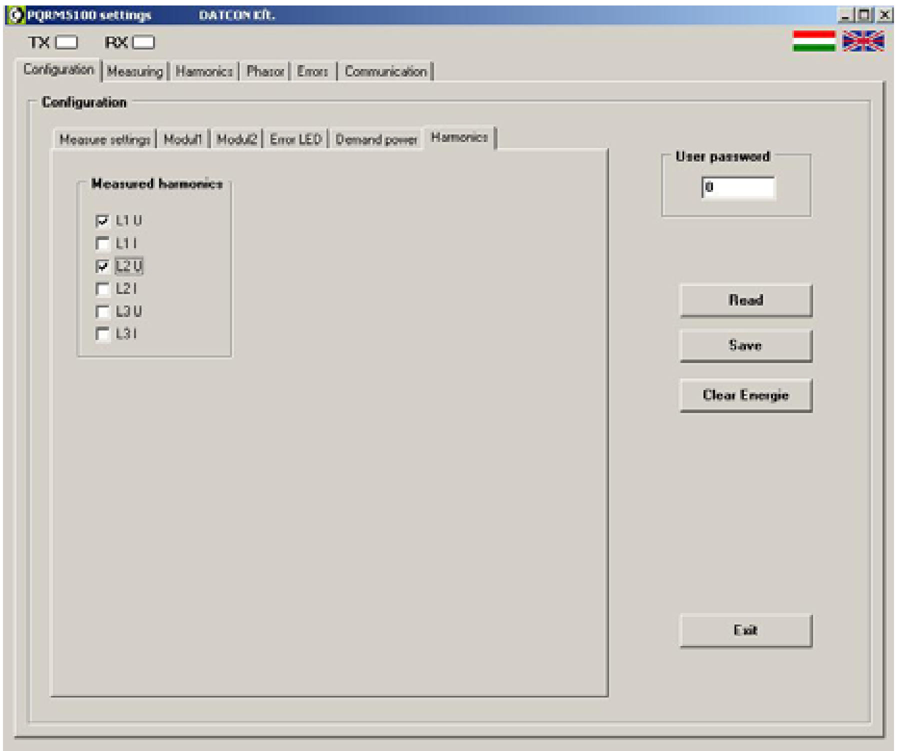
6.25. Harmonics setting

Function

The device can calculate voltage and current content for 18 harmonic. Here can be enabled the harmonics analysis.

Sequence of operations

1. Click on the ”Configuration” tab
2. Inside of ”Configuration” tab click on the “Harmonics” tab.
3. Click on the calculating harmonics.
4. Click on the “Save” button.



The harmonic analysis greatly increases the length of the measurement time.

7. Fault rectification

7.1. Fault finding

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

• The green indicator is dark → check the power supply.
If the supply voltage is OK: the instrument is defective.

• There is no output signal → check the device connected to the input.
When the result of fault finding is that the PQRM5100 11 Ux Ix xx xx (PS) is defective call the manufacturer service department.

7.2. Repairing

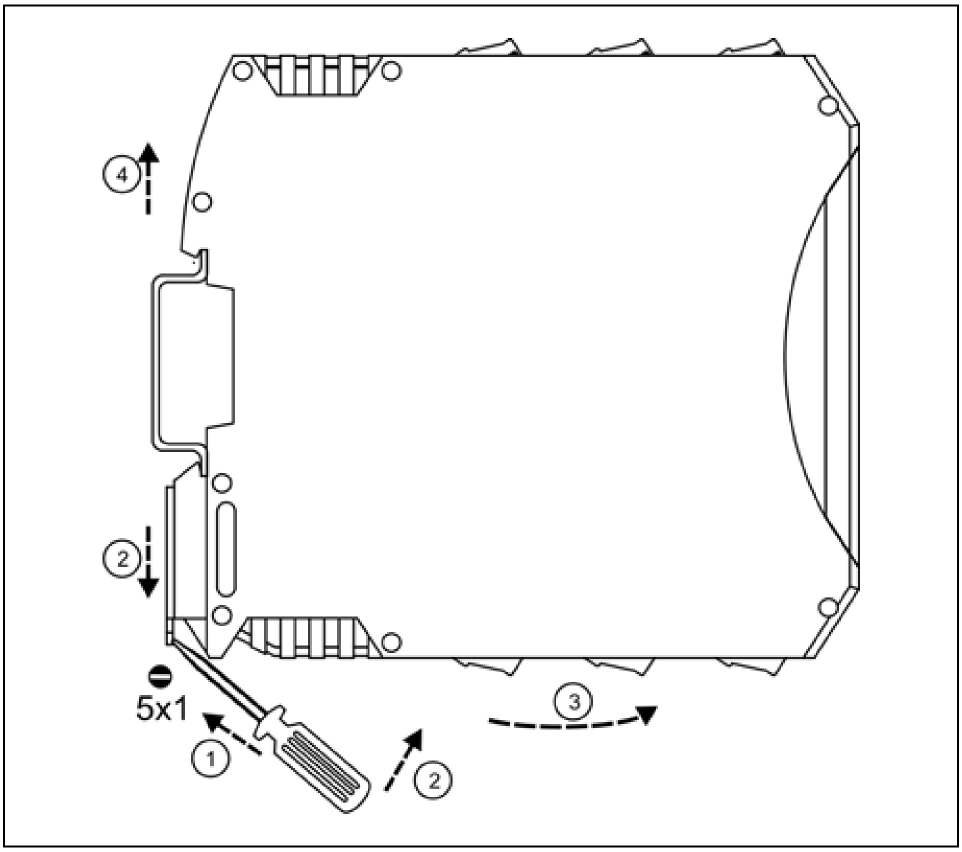
There is no user repairable part inside the instrument.
In accordance with Point **2.1.: For safety and warranty reasons, any internal work on the instrument must be carried out by DATCON personnel.**

8. Dismounting

8.1. 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.

8.2. 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.

9. Appendix

9.1. Technical specification

Safety data:

The connection terminals of the inputs, the outputs and the supply voltages are galvanic isolated from each other. The isolation of the measuring inputs and the power supply input are in accordance with the standard MSZ EN 61010-1, taking into consideration the following:

Pollution level:	2
Measurement category:	CAT III
Overcurrent protection in installation:	4 A

Input parameters:

Measured power network quantities: U_{L1}, I_{L1}, P_{L1}, $Q_{L1,}$ S_{L1}, PF_{L1}, f_1,

Input voltage ranges: 0–125 V AC / 0–250 V AC (none isolated) (specified at ordering)

Input current ranges:

Type	I_{IN} [A]	I_{IN} max. [A]	I_{IN} max. (1s) [A]
I1	0–1	2 x I_{BE}	20
I5	0–5	2 x I_{BE}	100

Input current ranges:	(specified at ordering)
Current measure input	Galvanic isolated , R < 20 mOhm
Voltage measure input	Resistordivider. R = 1.6 MOhm
Consumption of the input:	0.5 VA (max.)
Frequency range:	50 Hz (35Hz – 100Hz)
Response time:	Min. 100ms
Error (23 °C ± 2 °C):	0.2%
Temperature coefficient:	25 ppm / °C (max.)

Output parameters:

The device has one analogue option or one communication option at same time.

MODBUS communication interface (optional):

Interface type:	RS232 / RS485, galvanic isolated
Baud rate:	300 / 600 / 1200 / 2400 / 4800 / 9600 / 14400 / 19200 / 32800 Baud
Parity:	even / odd / none
Protocol:	MODBUS RTU slave
Address:	1-255
Possible commands:	3 (register read)
Termination:	can be switched on/off through the menu

Analogue outputs (optional)

Output type:	2 galvanic isolated active current outputs (configurable, scalable)
Ranges:	0-20 mA / 4-20 mA or 0-5 mA / 1-5 mA
Burden:	500 ohm (max.)
Refreshing time:	same as the measuring time (100 ms)
Setting time: (10-90%)	Max. 60 ms
Overcurrent:	20.8 mA
Error:	<4 uA (23 °C ±2 °C), <40 uA (-20 - 60 °C)
Burden resistance effect:	practically zero

Pulse outputs (optional):

Output type:	2 galvanic isolated transistor
Rating:	30 V, 50 mA

Power supply:

Supply voltage:	24 VDC ±10% PQRM5100 11 Ux Ix xx xx or 230 V AC/DC ±10% PQRM5100 11 Ux Ix xx xx PS
Power consumption:	1.5 VA / 1 W

Galvanic isolation:

Operating isolation voltage:	250 Veff (between measuring inputs and power supply input)
Test /Type voltage:	4200 VDC (1 min.) (between measuring inputs and power supply input) 500 VDC (between output-power supply terminals)
Capacity:	20 pF (between input, output, power supply terminals)
Protection class:	II. reinforced insulation
Leakage current:	0,005 mA (between input, output, power supply terminals)

Ambient conditions:

Operating temperature range:	0-60 °C
Storage temperature range:	0-70 °C
Relative humidity:	90 % (max., non condensing)
Place of installation:	cabinet

Electromagnetic compatibility (EMC)
In accordance with the standard EN 61326-1

Emission: In accordance with the standard EN 61326-1

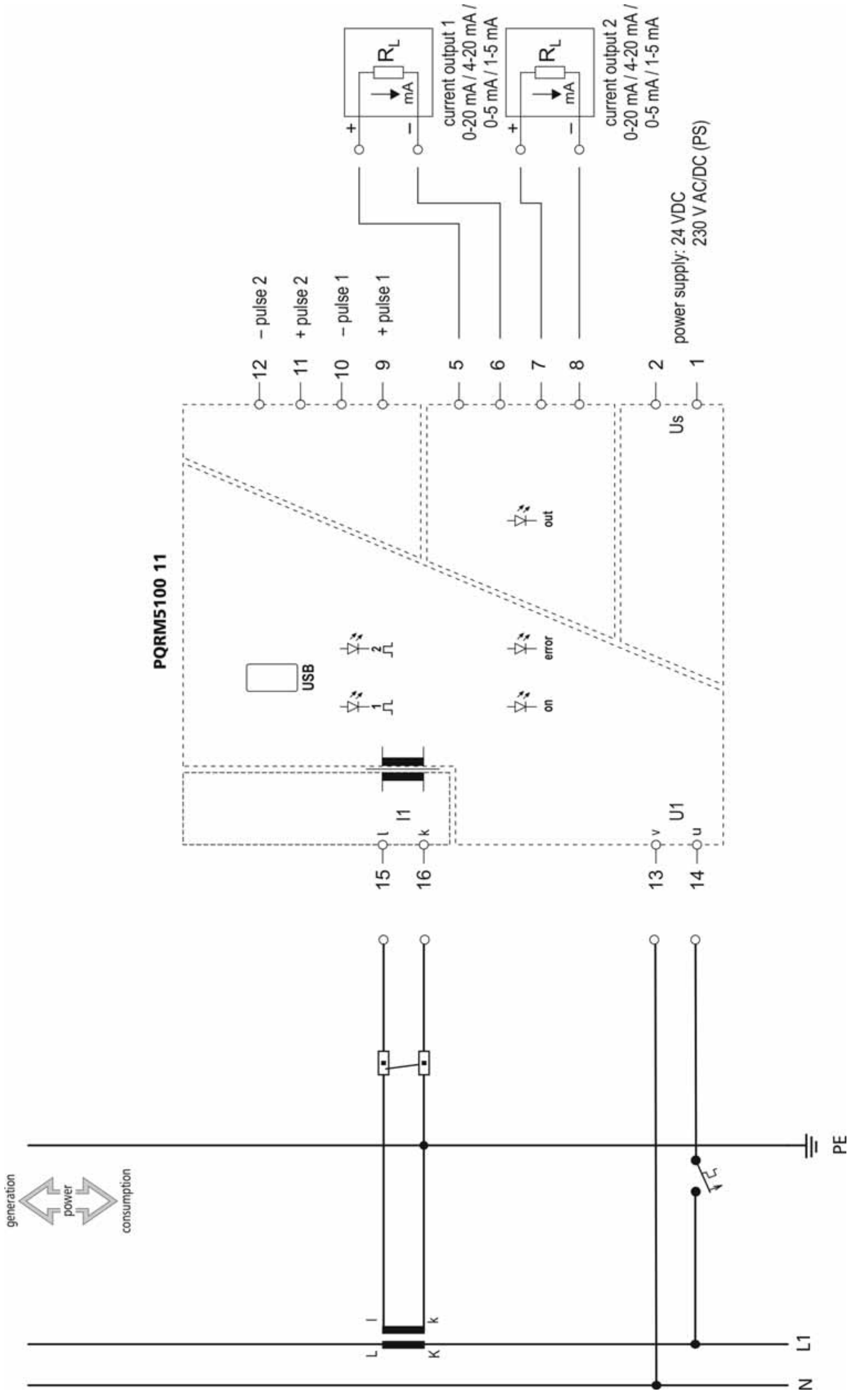
Conducted:	EN 55011 Limits for Class A equipments	
Radiated:	EN 55011 Limits for Class A equipments	
ESD:	4 kV/8 kV contact / air	-A- criteria
BURST:		
- Power measure input	4 kV (5/50 ns, 5KHz)	-A- criteria
- Main supply input (PS)	2 kV (5/50 ns, 5KHz)	-A- criteria
- Analogue outputs	1 kV (5/50 ns, 5KHz)	-A- criteria
- Digital outputs	1 kV (5/50 ns, 5KHz)	-A- criteria
SURGE:		
- Power measure input	4 kV (CATIII, 250V)	-B- criteria
- Main supply input (PS)	2 kV (line to ground)	-B- criteria
- Analogue outputs	1 kV (line to ground)	-B- criteria
- Digital outputs	1 kV (line to ground)	-B- criteria
Conducted RF immunity:	3 Veff	-A- criteria
Conducted RF emission:	1 group, Class B	
Radiated RF immunity:	E =10 V/m	A- criteria
Radiated RF emission:	1 group, Class B	

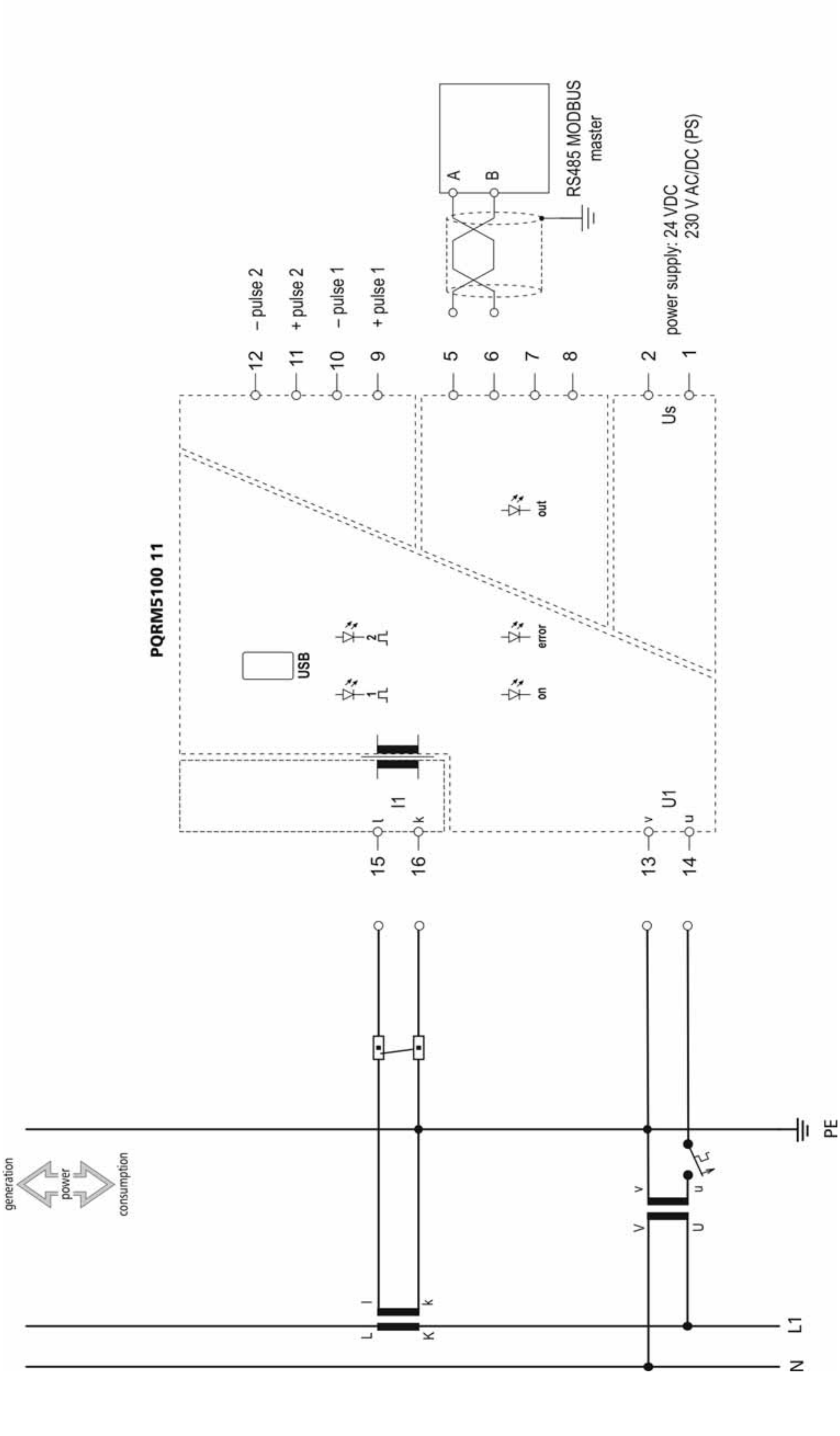
General data:

Housing:	TS-35 rail mounting housing material: polyamide PA6.6
Connection:	screw-terminal
Connecting cable:	2.5 mm^2 (min.) 4.5 mm^2 (max.)
Dimensions:	22.5 x 104 x 114 mm (width x height x depth)
Weight:	0.2 kg maximum
Protection:	IP 20

The Manufacturer maintains the right to change technical data.

9.2. Application examples




PQRM5100 11
USB
1
2
on
error
out
I1
U1
Us
15
16
13
14
l
k
v
u
12 – pulse 2
11 + pulse 2
10 – pulse 1
9 + pulse 1
5
6
7
8
2
1
A
B
RS485 MODBUS
master
power supply: 24 VDC
230 V AC/DC (PS)
generation
power
consumption
L
K
l
k
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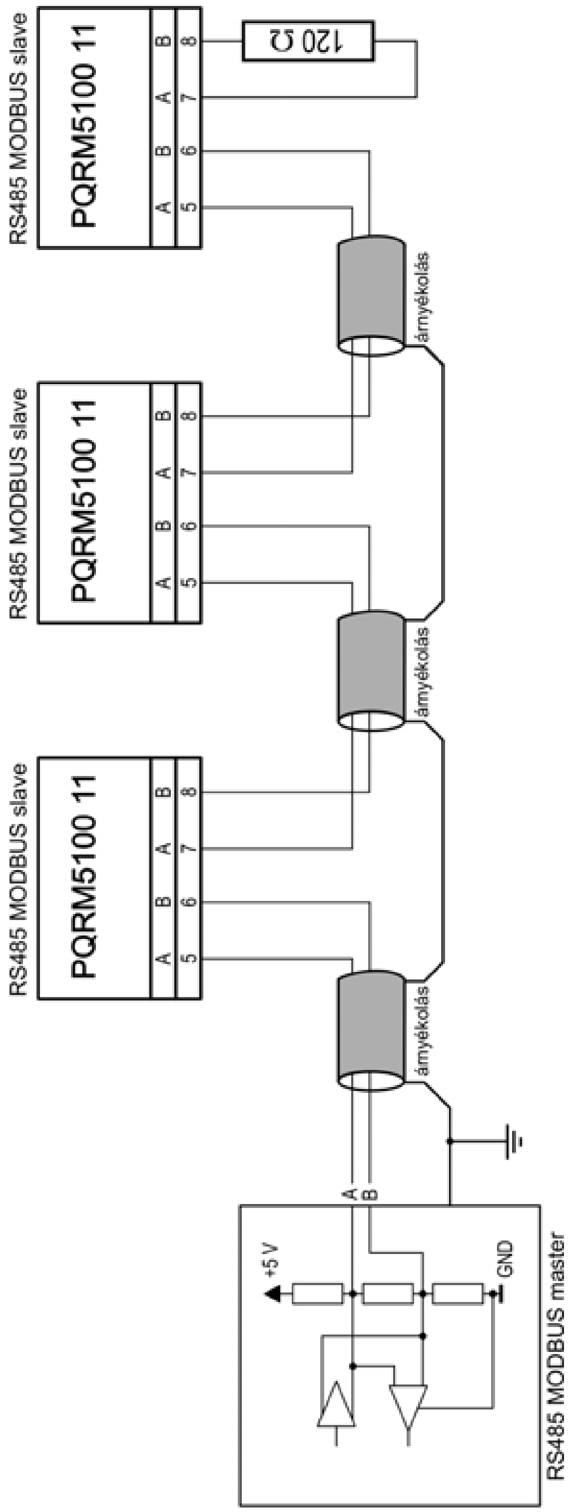
PE
L1
N

RS485 bus topology:



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INDUSTRIAL MEASUREMENT