# PLA 404 RGP

Portable power quality analyzer class S

User and service manual


version 1.3

## Content

# 1. Introduction

Power quality analyser PLA404RGP is designed for measurement of voltage network quality in LV and MV according the norm EN 50160.

Technology of the measurement is performed according the norm “IEC 61000-4-30: Electromagnetic compatibility (EMC) – Part 4-30: Testing and measurement techniques – Power quality measurement methods”, measurement class “Class A”.

Power quality analyser PLA404RGP is designed for measurement and monitoring of electrical parameters in 2, 3 and 4 conductor networks and in TN and TT grids.

# 2. Safety instructions

Instrument comply the standard EN 61010-1: Safety requirements for electrical equipment for measurement, control, and laboratory use.

- Installation of the instrument can be done by qualified and authorised person only.
- Instrument should not be installed in the environment with increased humidity and close to explosive gases.
- Use the instrument in accordance instructions written in the user manual.
- Installation and connection changes can be done without supply voltage only.
- Do not apply supply, measuring voltage and current higher that allowed.

# 3. Packaging content

- Power quality analyser PLA404RGP – 1 unit
- Rogowski coils 40cm – 4 units
- Voltage clamps CATIII 1000V – 4 units
- USB cable
- Supply voltage cable
- User manual
- Carrying bag

**BMR** *trading*
Horní lán 17
779 00 Olomouc
Czech Republic

phone: +420 778 066 566
export@bmr-trading.com
www.bmr-trading.com

# 4. Device description

Power quality analyser PLA404RGP is a portable measuring instrument without a display. Configuration of the instrument is performed only via Power Monitoring Software.


*Picture 1. Device overview*

On a side of the instrument there are terminals for measuring inputs described in the chapter 4.4, supply voltage inputs and communication inputs. USB v2.0 and Ethernet. For a variant PLA404RGPW there is an internal WiFi antenna and no Ethernet interface.

PLA404RGP has on front side supply voltage indication LED (green) and dichromatic signalization LED which informs about the status of the device. Signalization LED can inform about following statuses:

| | |
|---|---|
| **LED On (red)** | Device firmware update in process |
| **LED On (yellow) for 4 seconds** | New configuration of the device is being loaded to the instrument |
| **LED flashing (green)** | Device system is booting after the start |
| **LED On (green)** | Device is ready for measurement and measurement profile is active |
| **LED flashing (orange)** | Measurement profile is not active, no data are logged into flash memory |

## 4.1. Measured parameters

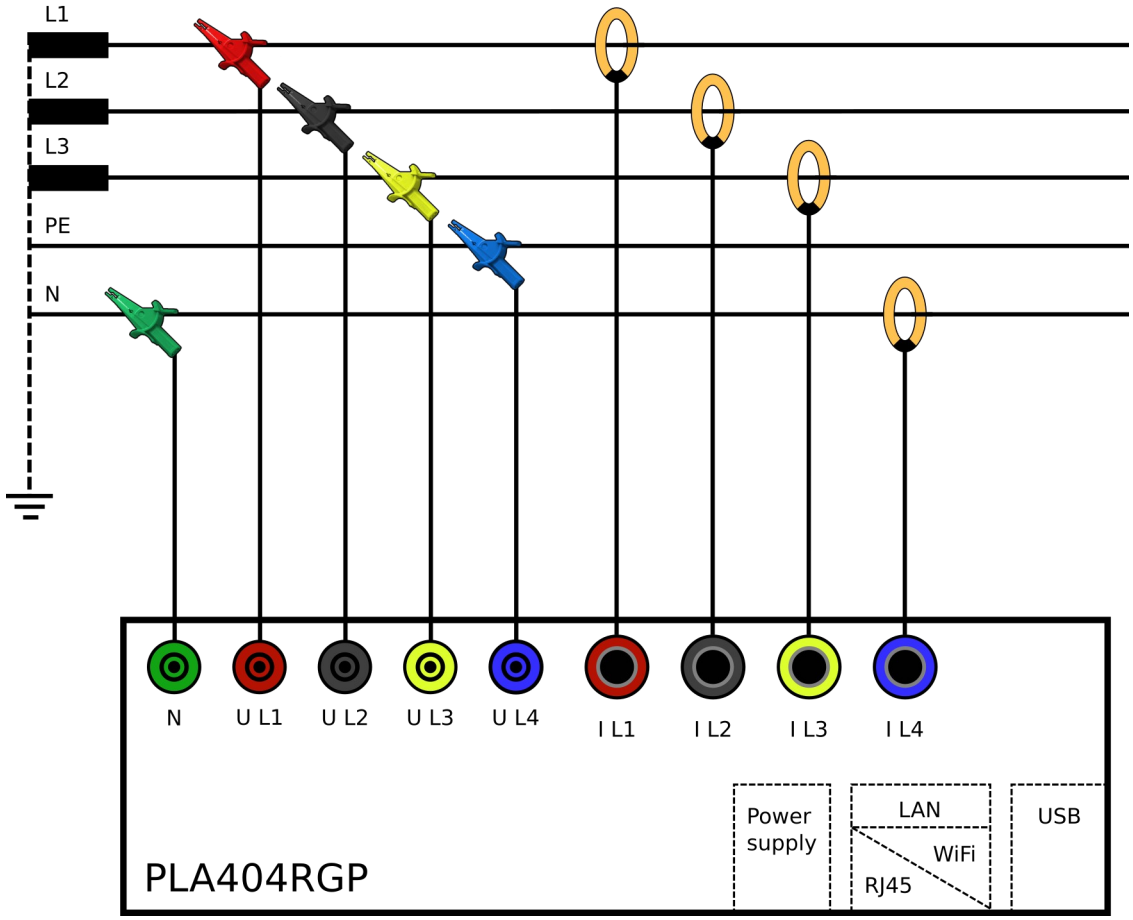
Power quality analyser PLA404RGP measures following parameters.

| Parameter | L1 | L2 | L3 | L4 | L1-2 | L2-3 | L3-1 | ΣL1-3 | ΣL1-4 | Max | Min | AVG | Measuring range | Displayed range | Accuracy |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Phase voltage | ● | ● | ● | ● | | | | | | ● | ● | ● | 2... 600 V | 0 ... 1 MV | ±0.2 % |
| Line voltage | | | | | ● | ● | ● | | | ● | ● | ● | 4 ... 1000 V | 0 ... 1 MV | ±0.2 % |
| Frequency | ● | | | | | | | | | ● | ● | ● | 40 ... 70 Hz | 40 ... 70 Hz | 10 mHz |
| Current | ● | ● | ● | ● | | | | | | ● | ● | ● | 0.001 ... 6 A | 0 ... 1 MA | ±0.3 % (1%) |
| cosφ | ● | ● | ● | ● | | | | | | ● | ● | ● | 0.01 L ... 0.01 C | 0.01L ... 0.01C | ±1 % |
| Power factor | ● | ● | ● | ● | | | | ● | ● | ● | ● | ● | 0.01 L ... 0.01 C | 0.01L ... 0.01C | ±1 % |
| THDU L-N | ● | ● | ● | ● | | | | | | ● | ● | ● | 0 ... 99.9 % | 0 ... 99.9 % | ±5 % |
| THDU L-L | | | | | ● | ● | ● | | | ● | ● | ● | 0 ... 99.9 % | 0 ... 99.9 % | ±5 % |
| THDI | ● | ● | ● | ● | | | | | | ● | ● | ● | 0 ... 99.9 % | 0 ... 99.9 % | ±5 % |
| Harmonics of voltage | ● | ● | ● | ● | | | | | | ● | ● | ● | 0 ... 99.9 % | 0 ... 99.9 % | class 1 |
| Group of interharmonics U | ● | ● | ● | ● | | | | | | | | | 0 ... 99.9 % | 0 ... 99.9 % | class 1 |
| Group of harmonics U | ● | ● | ● | ● | | | | | | | | | 0 ... 99.9 % | 0 ... 99.9 % | class 1 |
| Harmonics P | ● | ● | ● | ● | | | | | | | | | 0 ... 99.9 % | 0 ... 99.9 % | class 1 |
| Harmonics Q | ● | ● | ● | ● | | | | | | | | | 0 ... 99.9 % | 0 ... 99.9 % | class 1 |
| Harmonics I | ● | ● | ● | ● | | | | | | ● | ● | ● | 0 ... 99.9 % | 0 ... 99.9 % | class 1 |
| Group of interharmonics I | ● | ● | ● | ● | | | | | | | | | 0 ... 99.9 % | 0 ... 99.9 % | class 1 |
| Group of harmonics I | ● | ● | ● | ● | | | | | | | | | 0 ... 99.9 % | 0 ... 99.9 % | class 1 |
| Short-term flicker | ● | ● | ● | ● | | | | | | ● | ● | ● | 0 ... 20.0 Pst | 0.4 ... 20.0 Pst | class A |
| Long-term flicker | ● | ● | ● | ● | | | | | | ● | ● | ● | 0 ... 20.0 Plt | 0,4 ... 20.0 Plt | class A |
| Under-voltage | ● | ● | ● | ● | ● | ● | ● | | | ● | ● | ● | 0 ... 100 % | 0 ... 100 % | ±0.2 % |
| Over-voltage | ● | ● | ● | ● | ● | ● | ● | | | ● | ● | ● | 0 ... 100 % | 0 ... 100 % | ±0.2 % |
| Unbalance U | | | | | | | | | | ● | ● | ● | 0 ... 100 % | 0 ... 100 % | ±0.15 % |
| Neutral point displacement | | | | | | | | | | ● | ● | ● | 10 ... 600 V | 0 ... 1 MV | ±0.2 % |
| K-factor | ● | ● | ● | ● | | | | | | | | | | | |
| Unbalance I | | | | | | | | | | ● | ● | ● | | | ±0.5 % |
| Transients | ● | ● | ● | ● | | | | | | | | | | | 25 µs |
| Events | ● | ● | ● | ● | | | | | | | | | | | 10 ms |
| Ripple control signal | ● | ● | ● | ● | ● | ● | ● | | | ● | ● | ● | | | |
| Active power | ● | ● | ● | ● | | | | ● | ● | ● | ● | ● | 0 ... 10.8 kW | 0 ... 999 GW | ±0.4 % |
| Reactive power | ● | ● | ● | ● | | | | ● | ● | ● | ● | ● | 0 ... 10.8 kvar | 0 ... 999 Gvar | ±0.4 % |
| Apparent power | ● | ● | ● | ● | | | | ● | ● | ● | ● | ● | 0 ... 10.8 kVA | 0 ... 999 GVA | ±0.4 % |
| Distortion power | ● | ● | ● | ● | | | | ● | ● | ● | ● | ● | | | ±0.5 % |
| Active energy +/- | ● | ● | ● | | | | | ● | | | | | 0 ... 999 GWh | 0 ... 999 GVh | class 0.5 |
| Reactive ind. energy +/- | ● | ● | ● | | | | | ● | | | | | 0 ... 999 Gvarh | 0 ... 999 Gvarh | class 0.5* |
| Reactive cap. Energies +/- | ● | ● | ● | | | | | ● | | | | | 0 ... 999 Gvarh | 0 ... 999 Gvarh | class 0.5* |

* fundamental

*Table 1. Measured parameters*

## 4.2. Connection

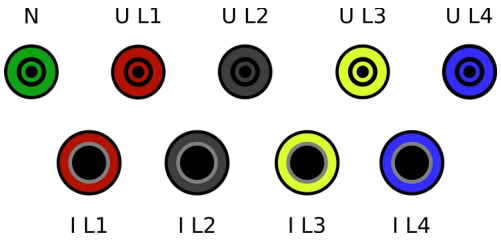



## 4.3. Supply voltage

PLA404RGP has an universal supply voltage input 85 ... 460 V AC/DC.

## 4.4. Measuring inputs

PLA404RGP has 4 voltage measuring inputs + 1 input for neutral wire connection with input impedance 4 MΩ suitable for measurement according the category CATIII 600 V. There are also 4 current inputs constructed for flexible Rogowski coils type 100 mV / 1 kA / 50 Hz.




Together with an instrument the set of 5 voltage cables and 4 flexible current Rogowski coils is delivered.

### 4.4.1. Voltage measuring inputs

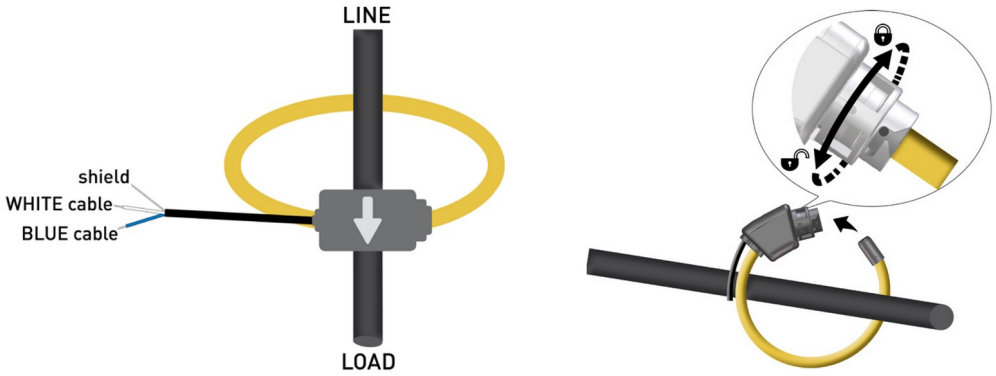
Instrument PLA404RGP has voltage measuring inputs with an input impedance 4 MΩ suitable for measurement according the category CATIII 600 V.

**Notice**

*If the voltage measuring inputs are connected over the voltage measuring transformers the power of measuring transformer power must be at appropriate level. Voltage measuring inputs have 5 mW self consumption. Recommendation from measuring transformer producers is to have loaded voltage measuring transformer on 70% of maximum power for the best accuracy.*

### 4.4.2. Current measuring Rogowski coils

Current measuring inputs of PLA404RGP are constructed for flexible Rogowski coils type 100 mV / 1 kA / 50 Hz.




Inside the PLA404RGP there is digital integrator for adjusting the measuring range of current input. For proper current measurement the measuring range (10A, 30A, 100A, 300A, 1kA, 3kA, 10kA) must to be defined via Power Monitoring Software (PMS).

**Important**

*Measuring range of current might be changed always at opened Rogowski coils.*

**Notice**

*PLA404RGP is not designed for DC current measurement!*

### 4.4.3. Current measuring clamps

As an optional accessory for measuring of small currents from 10 mA up to 100 A there are current clamps MCP100 with internal diameter Ø 20 mm. Current clamp MCP100 provide greater accuracy ±0.3% from measuring range while Rogowski coils ±1% from measuring range.

Measuring current ranges has to be set via PMS software (1A, 10A, 30A, 100A).

## 4.5. Ethernet

The configuration of Ethernet is defined by the network administrator and have to be set on the PLA44RGP correspondingly. See chapter 8.5. Instrument is equipped by Ethernet interface 10/100Mbit/s with RJ45 connector. For connection use the cable CAT5 type.

**Important**

*If the network configuration is not known, the Ethernet cable should not be plugged into the device.*

**Note**

*PLA404RGP does not support the DHCP. Instrument's IP address has to be configured manually at the instrument side.*

## 4.6. WiFi

Instrument PLA404RGPW is equipped by WiFi modules instead of Ethernet interface. Default configuration of WiFi is:

Infrastructure: Access Point

SSID: PLA404RGPW

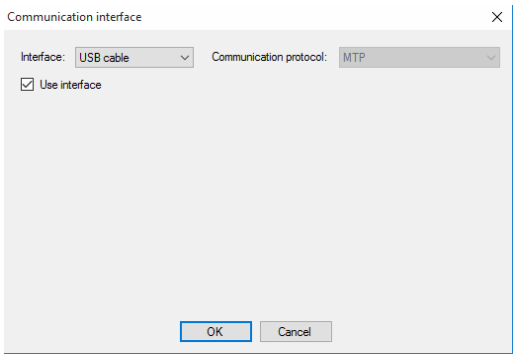
IP address: 192.168.1.201

DHCP time: 10min

Number of HHCP addresses: 5

## 4.7. USB

Device has one USB interface of type B for direct connection of PLA404RGP to computer with PMS program. After connection of PLA404RGP via USB cable to the PC it is necessary select correct communication interface at PMS software.

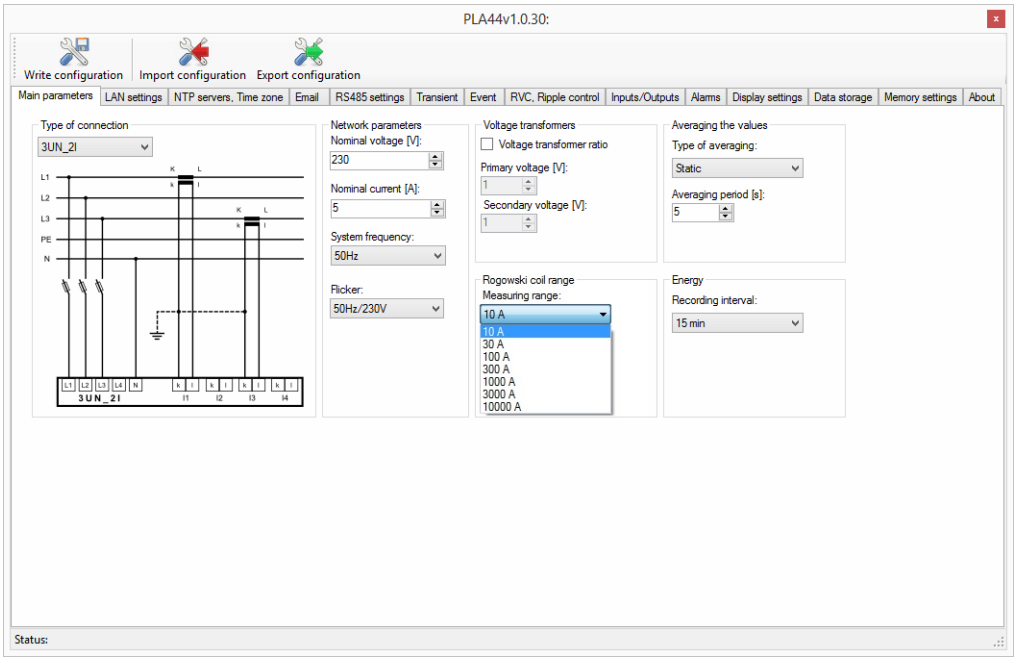



# 5. Device Settings

PLA404RGP can be configured via Power Monitoring Software (PMS).

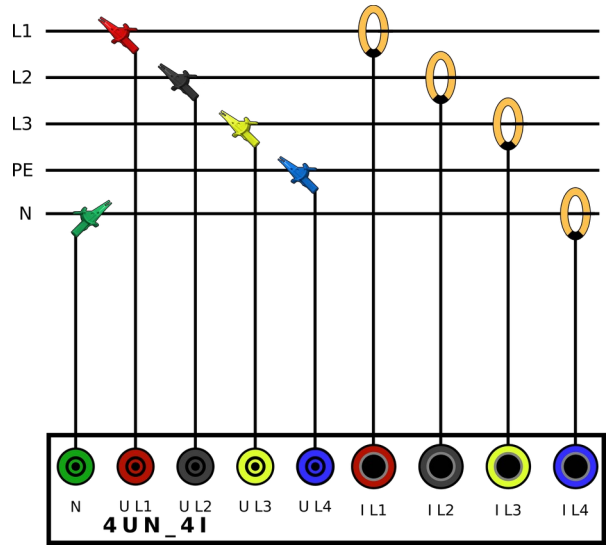
## 5.1. Main parameters

Setting “Main parameters” gathers all settings related to measuring circuits connection type, measuring transformers and type of parameters calculation.

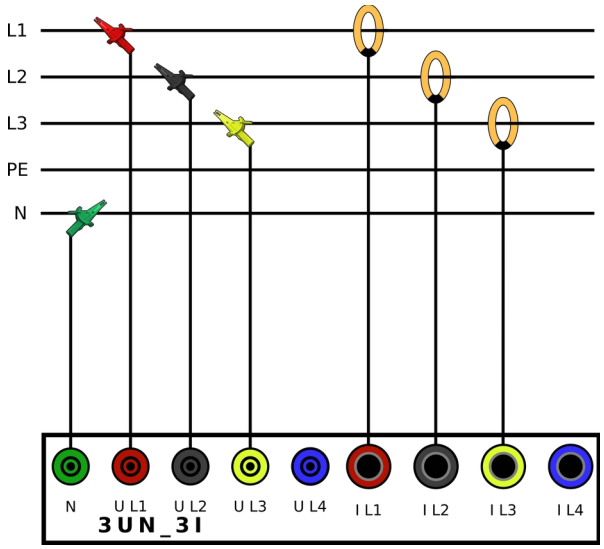



### 5.1.1. Network type

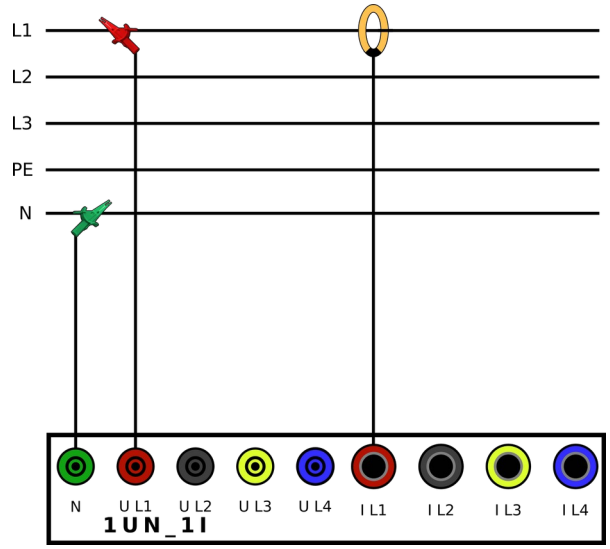
Defines the types network system in which the PLA44RGP is connected. The main connection diagram of PLA44RGP is shown in chapter 4.2. In the following table are shown all possible connection variants that can be defined in the device menu.



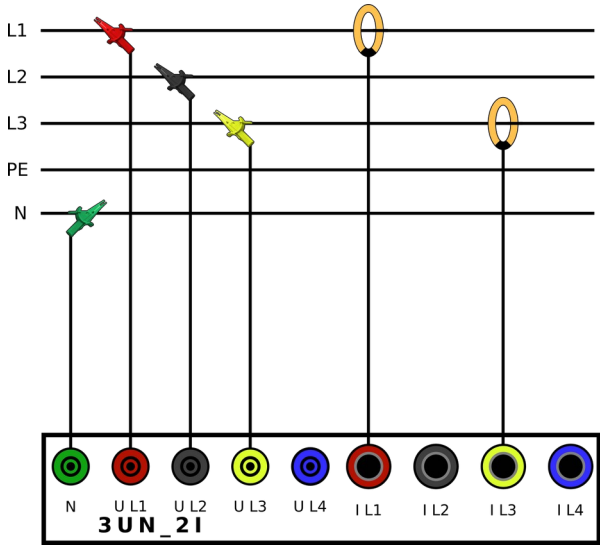

*Connection for asymmetric loads in TN-C-S grids*




*Connection for asymmetric loads in TN-C or TN-C-S grids*




*Connection for single-phase loads*

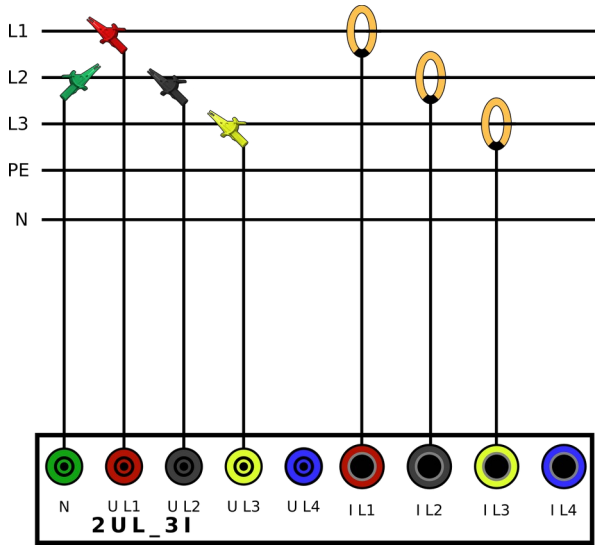



*Connection for symmetric loads with two CT only*

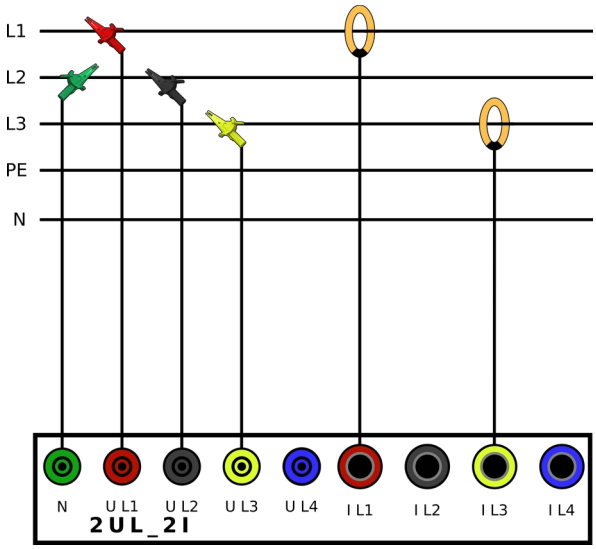
**BMR** *trading*
Horní lán 17
779 00 Olomouc
Czech Republic



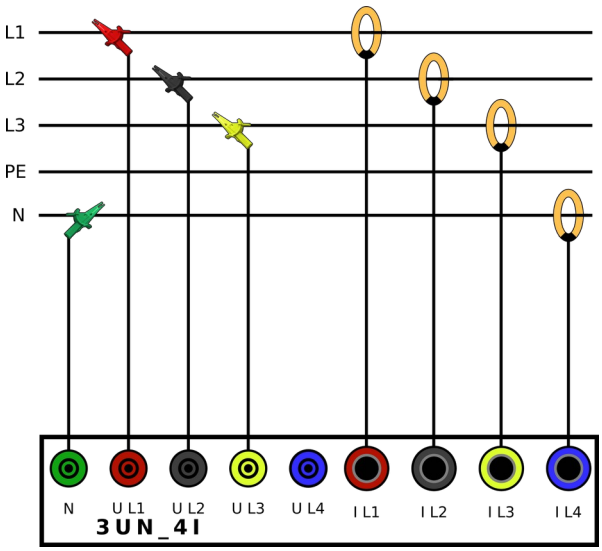
phone: +420 778 066 566
export@bmr-trading.com
www.bmr-trading.com




*Connection for MV grid*




*Connection for MV grid (Aron connection)*




*Connection for asymmetric loads in TN-C-S grids*

## 6. Measurement procedure

Measurement start

1. While instrument is without applied supply voltage make a connection of measuring probes to instruments.
2. Connect voltage and current measuring probes to the measured circuit according to appropriate connection schema. Current probes has to be connected with correct direction. Arrow on the current probes has to have direction to the load.
3. Apply the supply voltage. PLA404RGP is ready to operate after the status green LED stops flashing and start light permanently. Both LEDs (POWER and STATUS) have to light permanently green.
4. Via software Power Monitoring Software set the proper configuration of measured circuits (see the chapter 5.1.1).
5. Set the further parameter such as nominal grid frequency, voltage and current and measuring rates and ranges for current and voltage probes.

Measurement end

1. Disconnect supply voltage from an instruments.
2. Remove the voltage and current measuring probes from the measured circuits.
3. Unplug the voltage and current measuring probes from an instrument.

## 7. Data communication

## 7.1. Ethernet

Instrument is equipped by Ethernet interface 10/100Mbit/s with RJ45 connector. For connection use the cable CAT5 type.

The configuration of Ethernet is defined by the network administrator and have to be set on the PLA404RGP correspondingly.

**Important**

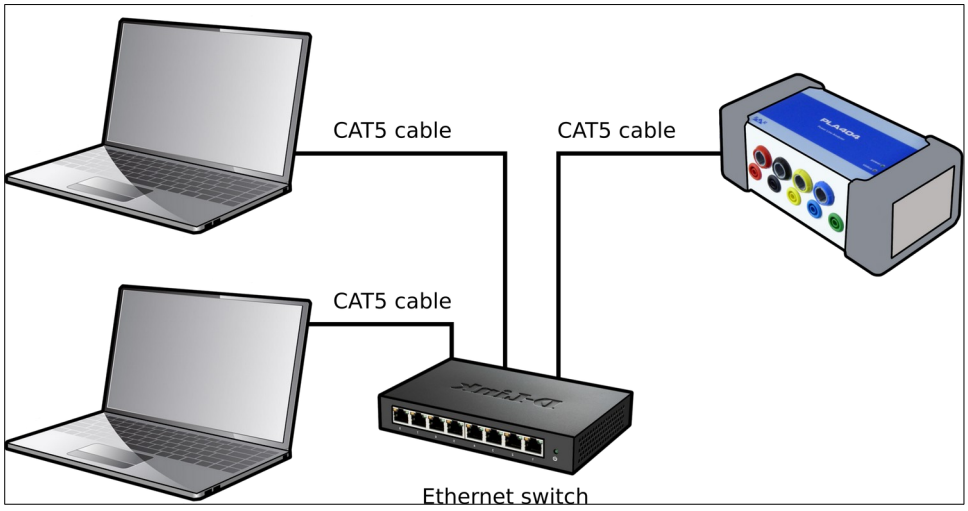
*If the network configuration is not known, the Ethernet cable should not be plugged into the device.*

| | |
|---|---|
| IP address | 199.168.1.201 |
| Masc | 255.255.255.0 |
| FTP server | 21 |
| FTP server (max 5 simultaneous connections) | 50000 - 50005 |
| Web-server | 80 |
| Modbus TCP | 502 |

### 7.1.1. Direct connection to PC

### 7.1.2. Connection to LAN

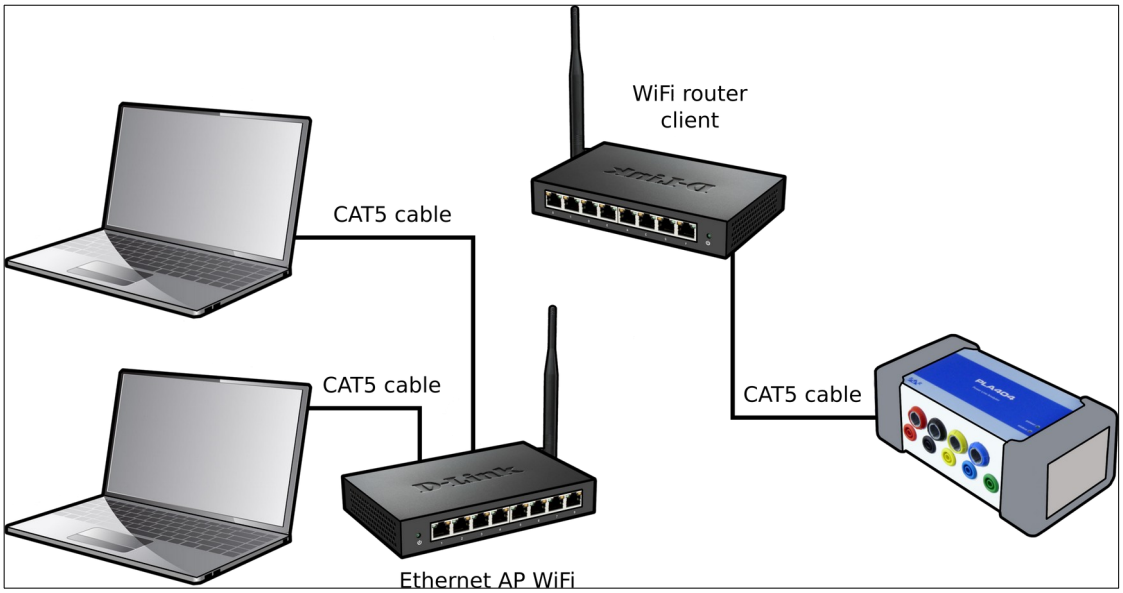
Make a connection to the active network item (Switch, Hub, Router) via UTP cable.




**Notice**

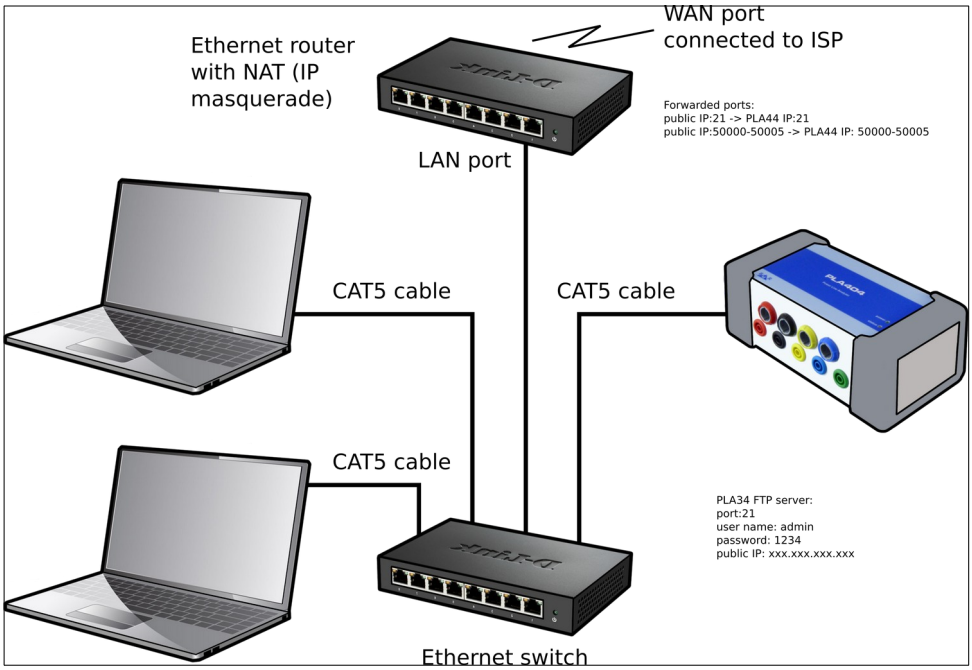
*PLA404RGP does not support the DHCP. Instrument IP address has to be configured manually at the instrument side.*

### 7.1.3. Connection to WiFi




### 7.1.4. Connection to LAN with NAT server

If there is request for remote access (from Internet) to PLA404RGP, which is place in the local network behind the router with active NAT server, the following parameters configuration to be defined on the router.




For access to web server of PLA404RGP there has to be created port forwarding (virtual server):

- `router public IP address:port 80 --> IP address of PLA404RGP:port 80`

For access to FTP server of PLA404RGP (needed for PMS software) there has to be created port forwarding (virtual server):

- `router public IP address:port 21 --> IP of PLA34 :port 21`
- `router public IP address:port 50000...50005 --> IP of PLA404RGP:port 50000...50005`

**Notice**

*Number of port of 80, 21 is possible change on router. Range of ports 50000 ... 50005 is fixed and it is not possible to change it.*

On the PLA404RGP device is necessary set following parameters in:

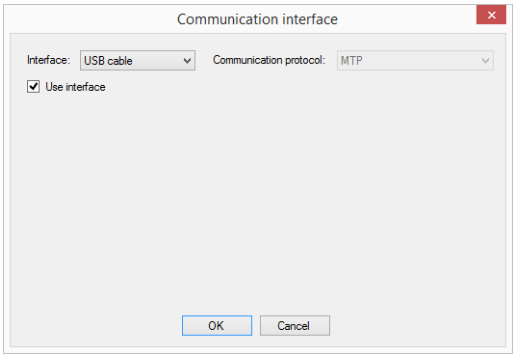
- IP - public
- FTP: 21 (factory value)
- user name: admin (factory value)
- password: 1234 (factory value)

**Notice**

*For communication with FTP server of PLA404RGP within local network is IP-public parameter set on the same as IP of the device. For communication with FTP server of PLA404RGP from the internet is the IP-public parameter set on public IP obtained from Internet provider.*

## 7.2. USB

Device has one USB interface of type B for direct connection of PLA404RGP to the PC. After connection of PLA34 via USB cable to the PC it is necessary select correct communication interface at PMS software.



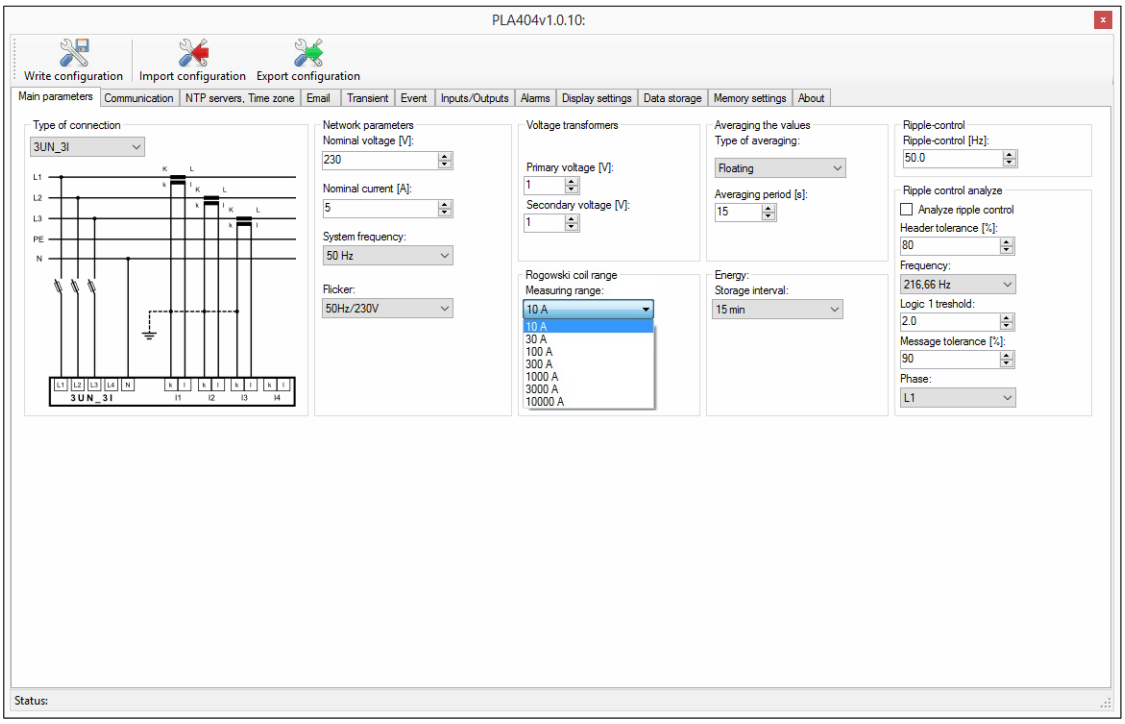
# 8. Device settings

Before usage of the PLA404RGP instrument it is necessary set several parameters essential for correct operation of the instrument in the different type of installations.

PLA404RGP can be set only via Power Monitoring Software at device configuration part.

## 8.1. Main parameters

Setting “Main parameters” gathers all settings related to measuring circuits connection type, measuring transformers and type of parameters calculation.




| Parameter | Description | Factory settings | Settings range |
|---|---|---|---|
| Type of connection | Defines the type of network and measuring circuit connection | 3UN_4I | Chapter 8.1.1 |
| Nominal voltage | Network nominal phase voltage | 230 V | 1V ... 750 kV |
| Nominal current | Network nominal phase current | 5 A | 1A ... 750 kA |
| System frequency | Defines the nominal system frequency | 50 Hz | 45 ... 75 Hz |
| Flicker | Parameter of the nominal voltage and frequency for flicker calculation | 230V - 50Hz | 120/230V, 50/60Hz |
| Voltage transformer ratio | Enable the usage of measuring voltage transformer | No | No / Yes |
| Primary voltage | Primary voltage of measuring voltage transformer in case of its usage | 230V | 1 ... 750 kV |
| Secondary voltage | Secondary voltage of measuring voltage transformer in case of its usage | 230V | 1 ... 750 kV |
| Current transformer ratio | Enable the usage of measuring current transformer | No | No / Yes |
| Primary current | Primary current of measuring current transformer in case of its usage | 1A | 1 ... 750 kA |
| Secondary current | Secondary current of measuring current transformer in case of its usage | 1A | 1 / 5 A |
| Type of averaging | Type of averaging method | Static | Static / Sliding |
| Averaging period | Time for averaging period setting | 5s | 1 ... 3600s |
| Storage interval | Interval of energy counters load profile | 15 min | 15, 30, 45, 60 min |

### 8.1.1. Network type

Details of possible connections of measuring inputs are described in the chapter 5.1.1

### 8.1.2. Nominal voltage

Nominal voltage setting is fundamental setting used for capturing thresholds of voltage events and transients. Appropriate

value of phase nominal voltage has to be set.

### 8.1.3. Nominal current

Nominal current setting is fundamental value setting used for threshold calculation for current events.

### 8.1.4. System frequency

PLA404RGP is designed for measurement in the 50 Hz and 60 Hz networks nominal frequency. Select the right system frequency for correct sampling of measured voltages and currents.

### 8.1.5. Flicker

Analyser calculates flicker according to the norm EN 61000-4-15. It provides values for short-term flicker (10 minutes), long-term flicker (2 hours). For correct calculation of both flickers it is necessary set correct nominal values used in the country standards. Available settings are:

- 230 V – 50 Hz
- 230 V – 60 Hz
- 120 V – 50 Hz
- 120 V – 60 Hz

### 8.1.6. Ripple control

Ripple control offers feature that provides information about effective voltage value for particular harmonic frequency of measured signal. The frequency of ripple control is adjustable from 50 Hz till 3000 Hz with decimal setting option.

### 8.1.7. Voltage transformers

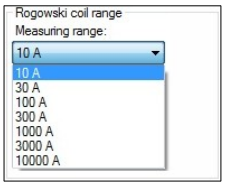
If the voltage measuring transformers are used the settings of primary and secondary voltage has to be configured. Both voltage levels (primary and secondary) are set in volts.

### 8.1.8. Current transformers

Instrument has 4 current inputs for indirect measurement via current transformers with secondary current 5A or 1A. In case of measuring current transformer usage the primary and secondary current value of CT has to be set.

### 8.1.9. Rogowski coil measuring range

PLA404RGP is an instrument with current measuring inputs designed for connection of Rogowski coils. Instead of current transformer ratio the current measuring range is set. The sensitivity of Rogowski coil allows the wide range setting from 10 A till 10 kA.




### 8.1.10. Current measuring clamps

### 8.1.11. Averaging

This setting defines type of averaging and period of average values calculation. Average values are available on the display of an instrument and in Power Monitoring Software.

There are two types of averaging method:

- **Static window** method cumulates measured values over the defined period. After the period ends the average values are calculated and shown. Cumulated values are erased and new period is measured again.
- **Sliding window** method continually cumulates measured values over the defined period and over this period shows calculated average values. While the time is moving the oldest values are erased and new values added.

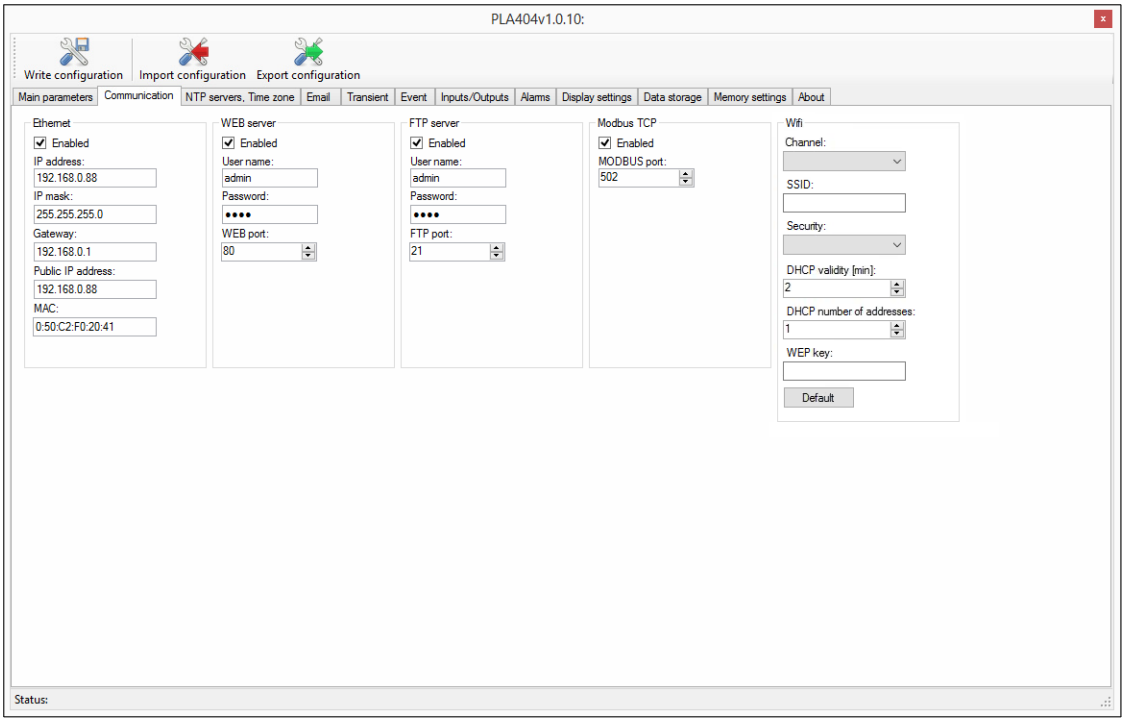
### 8.1.12. Energy

Provides setting of recording interval for historical values of energy counters available in PLA404RGP.

## 8.2. Communication settings

Instrument is equipped by one Ethernet interface 10/100Mbit/s and RS485. In the PMS software, settings of all available

communication interfaces are grouped in cart called “Communication”.




### 8.2.1. Ethernet

Defines the configuration of Ethernet interface of instrument for visibility and accessibility on LAN and Internet.

| Parameter | Description | Factory setting | Setting range |
|---|---|---|---|
| IP address | Instrument IP address in the local network | 192.168.001.201 | |
| IP Mask | Mask of the Ethernet network | 255.255.255.0 | |
| Gateway | IP address of PC or router used as a gateway to parent network | 192.168.001.001 | |
| Public IP address | Public IP address of router | 192.168.001.001 | |
| MAC | Web-server settings advance menu | | |

**Important**

*Public IP address is necessary to set for these cases when instrument is accessed from different network, for example Internet, while it is located in the Ethernet behind the NAT server.*

### 8.2.2. Web-server

Instrument has build in web-server for remote on-line monitoring via Internet or local network. Following table describes settings related to web server configuration of PLA404RGP.

| Parameter | Description | Factory setting | Setting range |
|---|---|---|---|
| WEB server | Activates the internal web server | Yes | Yes / No |
| User name | Web-server user name | admin | |
| Password | Web-server password | 1234 | |
| Web port | Port of web server | 80 | 1 ... 65535 |

**Notice**

*Web server is optimized for portable instruments such as mobile phones and tablets.*

### 8.2.3. FTP server

FTP server is a fundamental communication protocol for reading the measured data, recorded data and configuration of the instrument. Enabled FTP is server is an essential setting needed for correct work of PLA404RGP with Power Monitoring Software.

| Parameter | Description | Factory setting | Setting range |
|---|---|---|---|
| FTP server | Activates the internal FTP server of an instrument | Yes | Yes / No |
| User name | FTP server user name | admin | |
| Password | FTP server password | 1234 | |
| FTP port | Port of FTP server | 21 | 1 ... 65535 |

### 8.2.4. Modbus TCP

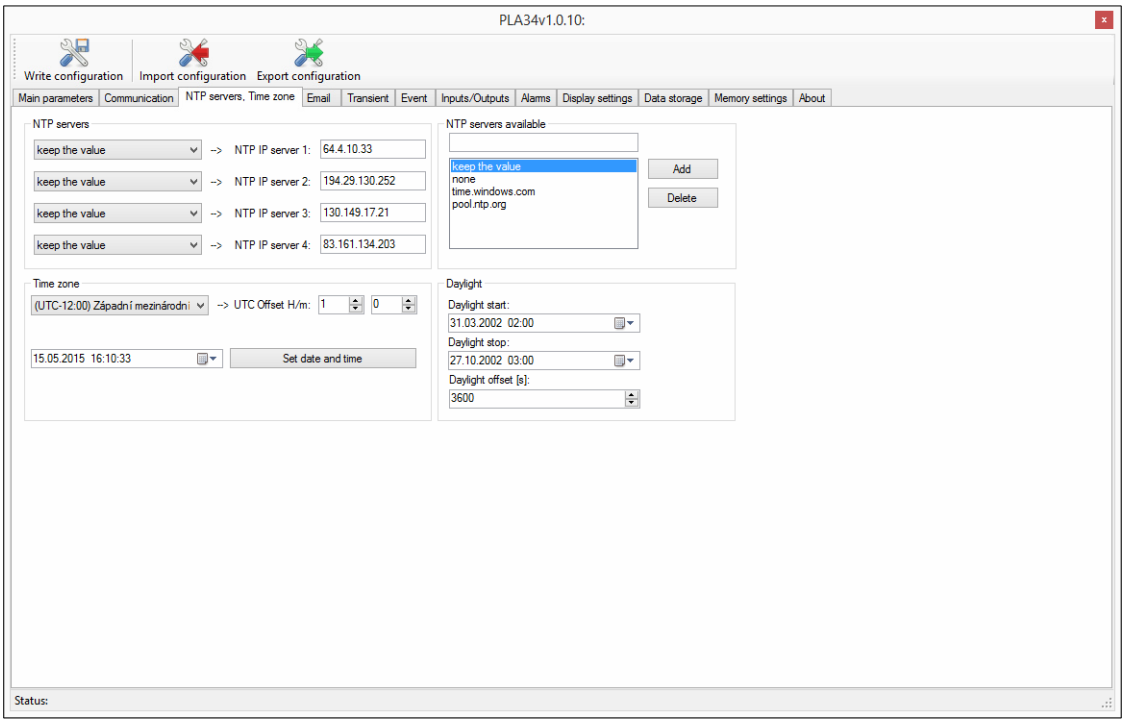
Communication protocol Modbus TCP is used for communication with PLA404RGP over the Ethernet interface.

| Parameter | Description | Factory setting | Setting range |
|---|---|---|---|
| Modbus TCP | Activates the Modbus TCP communication protocol of an instrument | Yes | Yes / No |
| Modbus port | Port of Mobus TCP communication | 502 | 1 ... 65535 |

**Note**

*On the request the table of Modbus registers can be provided. Please, contact us on export@bmr-trading.com.*

## 8.3. NTP server, Time zone

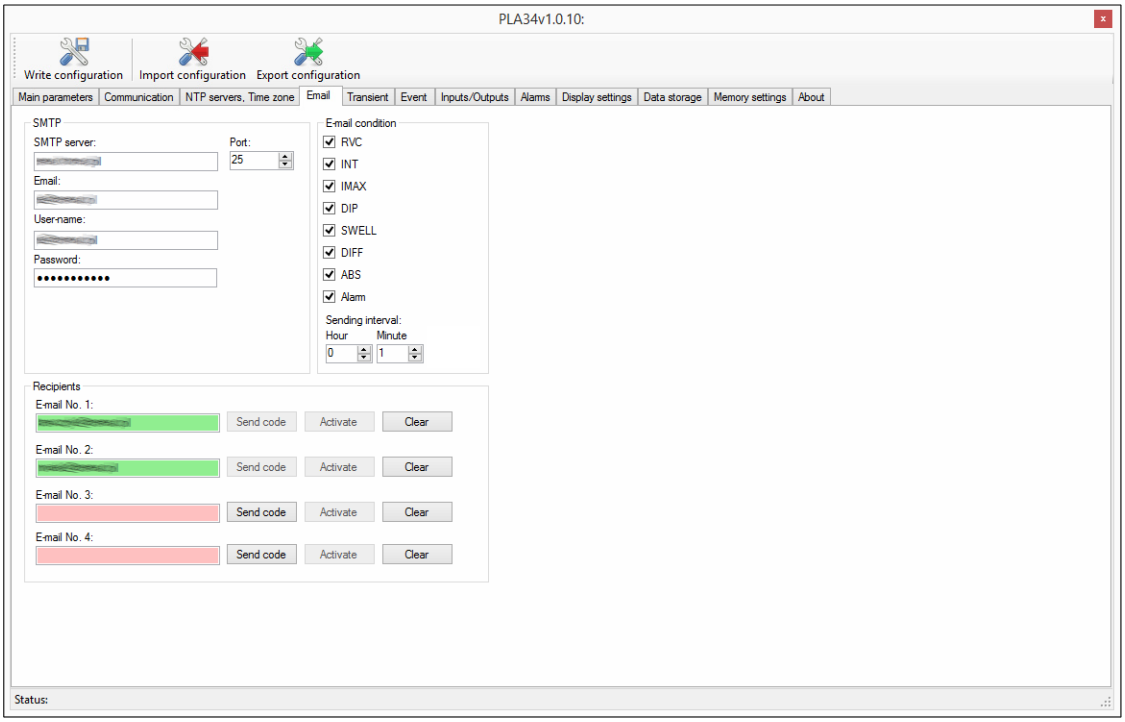



PLA404RGP can synchronize internal clock according to NTP servers while it is connected to Internet. NTP time synchronization has always priority above the manual clock settings. Clock synchronization by NTP is fully automatic and there is no need to set anything.

The selection of closest NTP server is adjustable in software PMS. For the finding the closest NTP server refer to the following link http://support.ntp.org/bin/view/Servers/StratumOneTimeServers.

## 8.4. Email

PLA404RGP can notice several events and alarms by sending an e-mail up to 4 different e-mail addresses. The email notification setting is available only from Power Monitoring Software.




For correct setting obtain the SMTP server address from your provider. If the SMTP server requires authentication enter the user name and password.

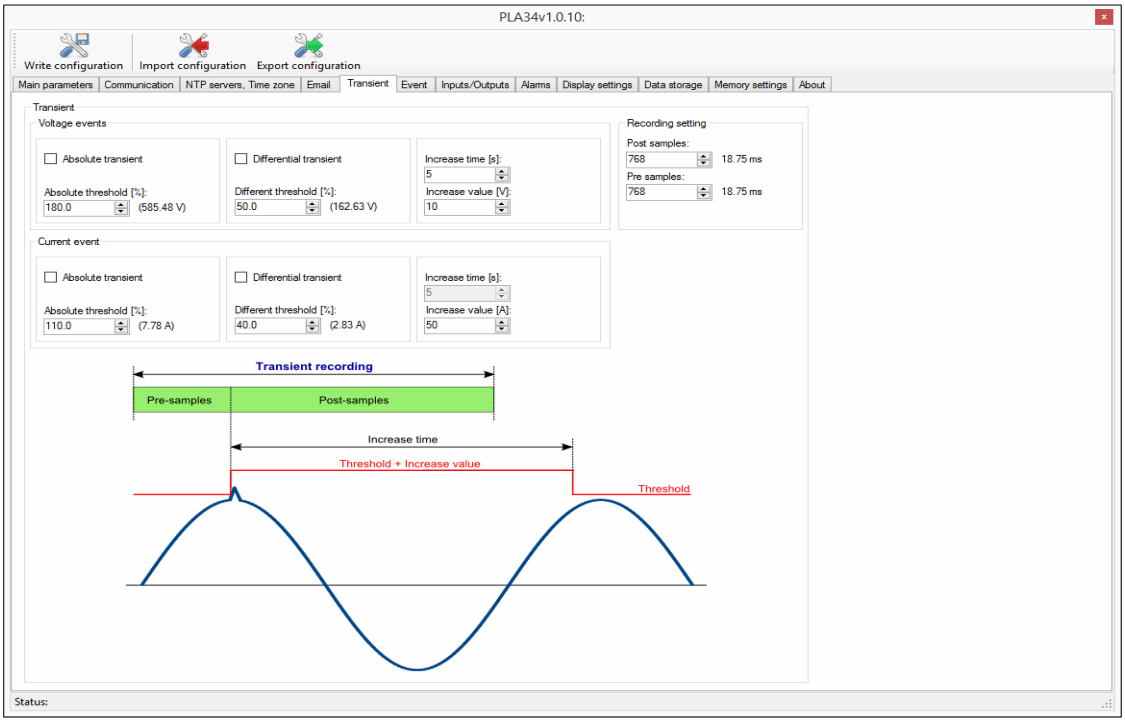
Select the requested e-mail notification and sending interval. Sending interval defines how often the emails are sent in order to prevent

Sending interval defines how often the email is sent. Factory setting is 1 hour which means that all events and alarms that appears during that hour are sent in one email. This interval prevents the instrument to send too many e-mails.

For most recent 5 events and transients the graphs are sent in the e-mail too. Other events and transients are shown as a recording in table.

## 8.5. Transients

Voltage transients are short commutation, impulse or oscillatory events in electrical grid. Their source can be inductive load switching, power factor correction instruments, atmospheric events, protection instruments action or malfunction of switching elements in the grid.

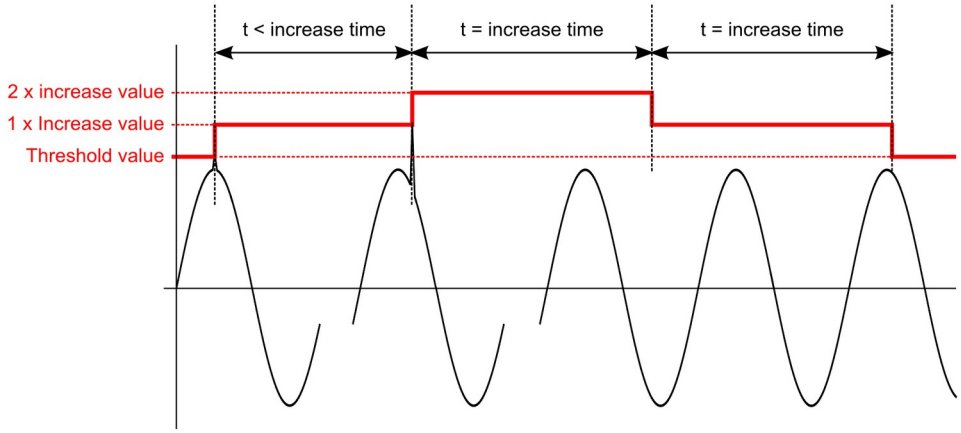



PLA404RGP analyser detects two types of transients. Absolute transients and differential transients.

- **Absolute transients** are detected according to override of defined voltage level. The trigger for detection of the absolute transients is defined by absolute threshold (percentage of Udin).
- **Differential transients** are detected according to the difference between two consecutive voltage measurements. The difference between measurement is defined by differential threshold (percentage of Udin).

Common settings for absolute and differential transients is for the parameters used for tuning the transients detection and transients recording.

If the transient is detected and being recorded the instrument increase the absolute and differential thresholds to prevent of misled transient detection. It prevents instrument against wrong recordings. This is defined by two user adjustable parameters. Increase value and increase time.



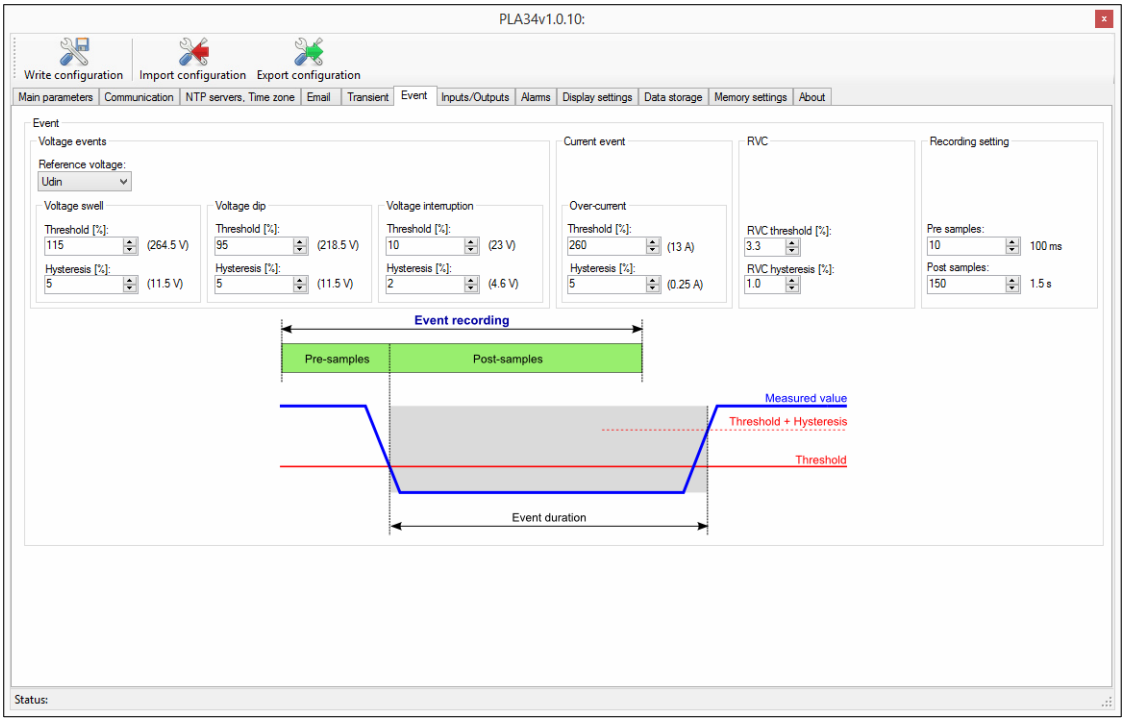

- Increase value is the value that is used for increasing the absolute and differential threshold while transient is detected. Set value increase the threshold level for the defined time.
- Increase time is a time delay for which the increased value of threshold is valid. After the increase time expires the value of threshold is returned back the user set value.

If another transient appears while the increase time is still not expired the threshold is increased once again. After the increased time expires the threshold is recovered to the previous level and after another period of increase time it is threshold recovered to the user defined level of absolute and differential thresholds.

| Parameter | Description | Factory setting | Setting range |
|---|---|---|---|
| Absolute transient | Absolute transient activation | No | YES / NO |
| Absolute threshold | Threshold of absolute transient (percentage of Udin) | 110% | 100 ... 500% |
| Difference transient | Difference transient activation | No | YES / NO |
| Difference threshold | Threshold of differential transient (percentage of Udin) | 20% | 1 ... 100% |
| Increase time | Time delay for increased threshold by increase value | 5 s | 1 ... 20 s |
| Increase value | Voltage increment for transient recording insensitivity after transient starts | 10 V | 1 ... 750000 V |
| Post samples | Number of recorded samples after the transient start | 768 | 0 ... 8000 |
| Pre samples | Number of recorded samples before the transient start | 768 | 0 ... 8000 |

Memory space for capturing of the particular transients is fixed on the maximum of 8000 samples. Definition of number Pre and Post samples is limited by this maximum samples memory space.

## 8.6. Events




Events captured by PLA404RGP are fully adjustable by the parameters described in the table beneath.

| Parameter | Description | Factory setting | Setting range |
|---|---|---|---|
| Reference | Reference voltage level type | Udin | Udin / Sliding |
| Over-voltage ▶ | Threshold | 110% | 100 ... 500% |
| | Hysteresis | 5% | 1 ... 20% |
| Under-voltage ▶ | Threshold | 90% | 1 ... 100% |
| | Hysteresis | 5% | 1 ... 20% |
| Interruption ▶ | Threshold | 5% | 1 ... 100% |
| | Hysteresis | 2% | 1 ... 20% |
| Over-current ▶ | Threshold | 110% | 100 ... 500% |
| | Hysteresis | 5% | 1 ... 20% |
| Pre Samples | Number of recorded half periods Urms1/2 (10ms = 1) before event | 10 | 0 ... 4000 |
| Post Samples | Number of recorded half periods Urms1/2 (10ms = 1) after event | 150 | 0 ... 4000 |

Memory for capturing the samples of RMS curve is fixed on the maximum of 4000 samples. Definition of number Pre and Post samples is limited by this maximum samples memory space.

### 8.6.1. Voltage dip detection

The dip threshold is a percentage of either Udin or the sliding voltage reference. The user shall declare the reference voltage in use.

- On single-phase systems a voltage dip begins when the Urms voltage falls below the dip threshold, and ends when the Urms voltage is equal to or above the dip threshold plus the hysteresis voltage.
- On poly-phase systems a dip begins when the Urms voltage of one or more channels is below the dip threshold and ends when the Urms voltage on all measured channels is equal to or above the dip threshold plus the hysteresis voltage.

The dip threshold and the hysteresis voltage are both set by the user according to the use.

### 8.6.2. Voltage swell detection

The swell threshold is a percentage of either Udin or the sliding reference voltage. The user shall declare the reference voltage in use.

- On single-phase systems a swell begins when the Urms voltage rises above the swell threshold, and ends when the Urms voltage is equal to or below the swell threshold minus the hysteresis voltage.

- On poly-phase systems a swell begins when the Urms voltage of one or more channels is above the swell threshold and ends when the Urms voltage on all measured channels is equal to or below the swell threshold minus the hysteresis voltage.

The swell threshold and the hysteresis voltage are both set by the user according to the use.

### 8.6.3. RVC

A Rapid Voltage Change (RVC) is an event characterized by a quick transition from one steady-state voltage to another. Typically, RVC events are counted for a period of one hour, or for each day. Mains signalling voltage, called “ripple control signal” in certain applications, is a burst of signals, often applied at a non-harmonic frequency, that remotely control industrial equipment, revenue meters, and other devices.

If the change in voltage is sufficient to cross the dip threshold or the swell threshold, then the event shall not be recorded as an RVC event. It is a dip or a swell.

The RVC threshold (or thresholds) and the RVC hysteresis are both set by the user according to the use. The RVC threshold is a percentage of Udin. The RVC hysteresis is a smaller percentage of Udin.

**NOTE**

*Although RVC and Flicker both may cause changes in illumination levels that irritate people, the two are different in concept. RVC is a discrete event, while flicker is a quasi-stationary condition.*

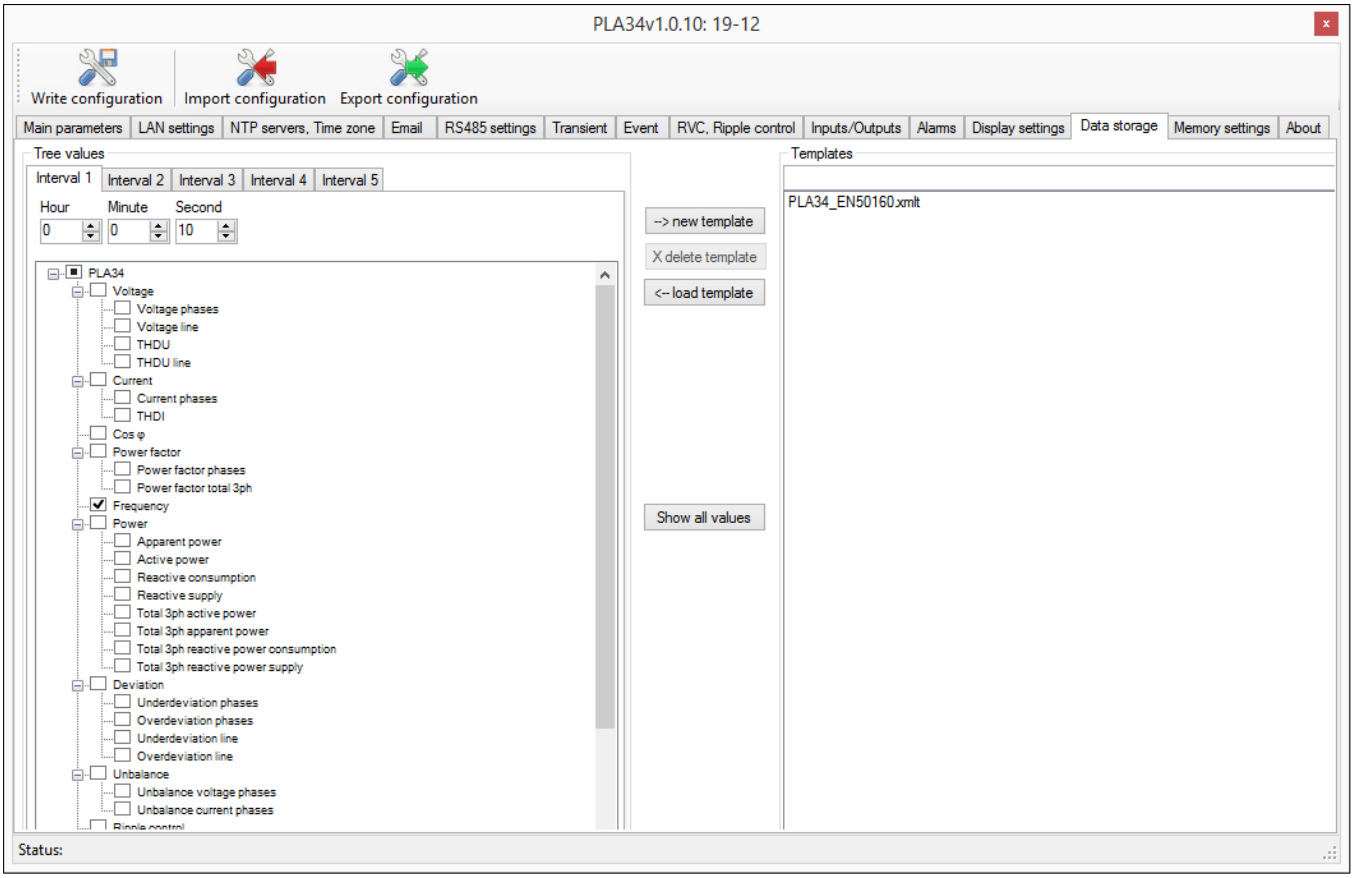
| Parameter | Description | Factory setting | Setting range |
|---|---|---|---|
| RVC threshold | The RVC threshold is a percentage of Udin | 3.3% | 1 ... 100% |
| RVC hysteresis | The RVC hysteresis is a smaller percentage of Udin | 1% | 1 ... 20% |

According to the norm the ideal settings is RVC threshold on 3.5% of Udin and hysteresis on 1% of Udin.

## 8.7. Data storage

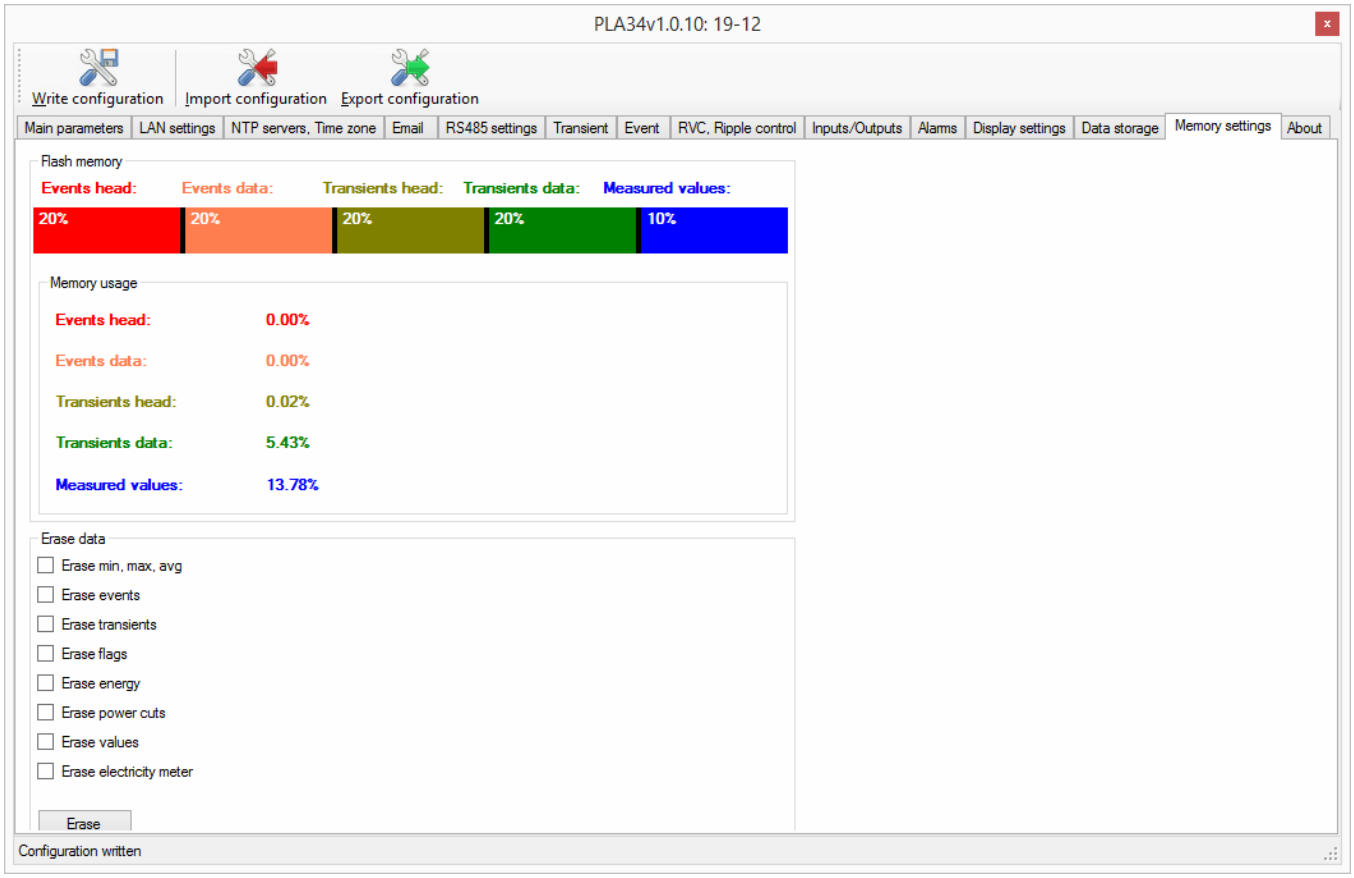
Measured parameters can be recorded in the internal flash memory. For this purposes cart Data storage offers the list of all parameters that can be stored. PLA34 allows to define 5 different time intervals with adjustable time and recorded parameters.

List of recorded parameters of all intervals can be saved as a template for further usage. There is also predefined template according the power quality norm EN50160.




## 8.8. Memory settings

Memory of the PLA404RGP is possible be managed to obtain more space for preferred recordings. Simple move of particular memory are borders modify the size of available space.



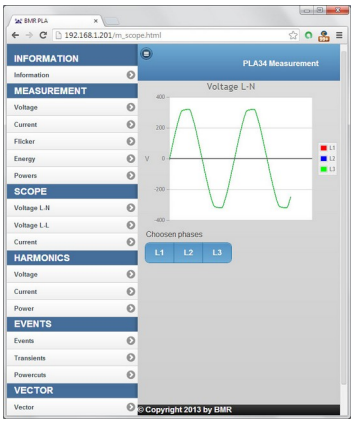

## 8.9. About

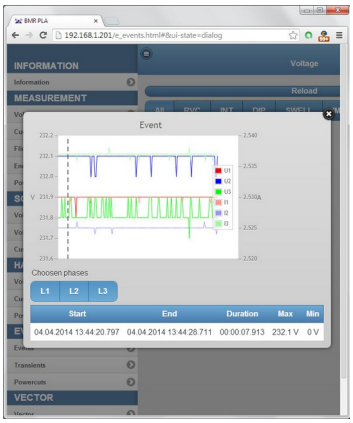
Information about the vendor and device firmware version.

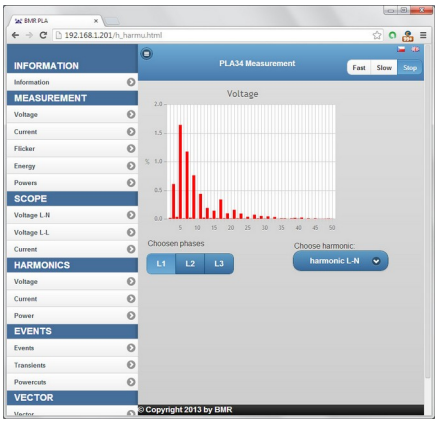
# 9. Web interface

PLA404RGP has build in web server to show measured parameters in the internet browsers. For enabling the web server see the chapter 8.2.2. Web server is designed for web browsers compatible with HTML5 specification.

Web server of an instrument is available after setting the instrument IP address to the web browser. Access to the web page is protected by user name and password.



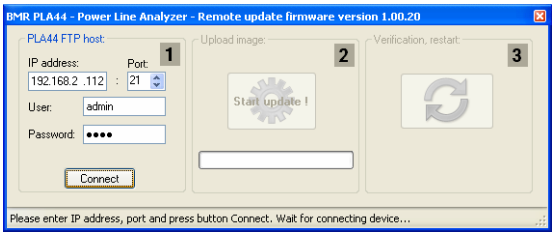

**Note**

*Factory setting of user name is **admin**. Password factory setting is **1234**.*

# 10. Firmware update

Device firmware can be update when the new firmware is released. Visit the www.bmr-trading.com for to verify availability

of new firmware. Firmware file is prepared as an exe file that is directly run on Windows PC.




For the successful firmware update connect the PLA404RGP via Ethernet to PC where the Update software will run. Enter the IP address of the PLA404RGP and user name and password. Pressing button Connect will verify accessibility of an instrument and prepare connection for firmware update start.

**Important**

*While firmware is being updated, device should be connected to stable power supply and Ethernet connection should not be removed or interrupted.*

# 11. Technical features

| Parameter | Value |
|---|---|
| Supply voltage | 85 ... 460 $V_{AC/DC}$ |
| System frequency | 50 Hz / 60 Hz |
| Power consumption | < 4 VA |
| Voltage measuring range L - N | 2 ... 600 $V_{AC}$ |
| Voltage measuring range L - L | 4 ... 1000 $V_{AC}$ |
| Current measuring range | Rogowski coil, Measuring clamps |
| Frequency measuring range | 40 ... 70 Hz |
| Clock accuracy | < 1 s per day |
| Clock backup | 10 years (Lithium battery) |
| Grid type | TN, TT, IT |
| Sampling rate | 40 kHz |
| Transients capturing | > 25 µs |
| Events trigger | 10 ms |
| Supply voltage power cuts memory | 15 events |
| Data memory for measured parameters | 1 GB Flash type |
| Ethernet | RJ45 / 10/100 Mbit |
| USB | Type B |
| Rogowski coils type | 40 cm / ø 8 mm / cable length 3 m |
| Over-voltage class | 600V CATIII |
| Pollution degree | 2 |
| Temperature limit | -30°C ... +70°C |
| Device dimensions | 180 x 87 x 68 mm |
| Carrying bag dimensions | 305 x 270 x 144 mm |
| Weight | device: 600 g |
| Protection degree | IP40 |
| Related standards | EN 61000-4-30 ed-3 cl. S, EN 61000-4-7, EN 61000-4-15, EN 61557-12 |