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User Guide

SIMON S

Document revision	Release date	Valid for			
		Hardware	Bootloader	Firmware	ENVIS software
1.1	21.6.2019	2.1	4.0	3.0	1.8

The complete and most actual version of this manual is available online at http://www.KMB.cz/

Contents

1 General Description

The SIMON S is specially designed for temporary monitoring of energy and power quality in three-phase distribution systems. It is designed for measurements in substations, switch cabinet, low voltage distribution networks or directly by customers. It uses standard USB port for configuration. Optionally it can be equipped with other communication peripherals such as WiFi.

1.1 Characteristic Features

Connection and Measurement

- four voltage inputs
- 1 current connector with up to 4 current inputs for connecting a SI current probe
- power supply:
  - from an external AC power
  - internal battery (for a limited time to cover loss of power supply)
  - via USB interface (when setting up the device and downloading)
- 128 samples per period, voltage inputs and current inputs up to 4 currents are read continuously without any gaps
- 50 voltage and current harmonics
- evaluation of all usual three-phase and single-phase quantities such as powers (active, reactive, apparent, distortion, fundamental), power factors, harmonics and THD of voltages and currents etc.

Registration of Measured Data

- built-in real-time clock with battery backup.
- ”flash” memory with a capacity of 512 megabytes to record the measured data
- aggregation interval from 200 milliseconds to 24 hours

Transfer and Evaluation of Recorded Data

- USB communication interface for data transmission, device configuration and firmware upgrade
- wireless communication: WiFi (optional)
- visualization and setup program ENVIS

Registration of Measured Data

- built-in real-time clock with battery backup
- flash memory to record the measured data with a capacity of 512 MB
- aggregation interval from 200 milliseconds to 24 hours
- records voltage outages

Transfer and Evaluation of Recorded Data

- software ENVIS v1.8 or higher available for download free of charge for configuration and data analysis
- USB interface for data transmission, device configuration and firmware upgrade
- can be equipped with WiFi (option W)

1.2 Types and accessories

The SIMON S is available in several configurations according to the customer requirements[1]. See the ordering scheme on figure 1.

SIMON S 1 W

Instrument Type
SIMON S = Portable Network Monitor

Current Inputs
0 = Without input for current probe
1 = 1 input for SI current probe (up to 4 currents)

Wireless Communication Interface
N = Without communication interface
W = WiFi interface with internal antenna

Figure 1: Schematics of the SIMON S ordering options and variants.

SU basic	Voltage measurement set – 8× croco-clip XKK-1001 (20m span), 8× voltage cable XSMF-419 with fuses, 3× jumper cable SPQ-Ux, 2× spare fuse GT632210
SU plus	Voltage measurement set – 8× croco-clip XDK-1033 (30m span, dolphin-clip), 8× voltage cable XSMF-419 with fuses, 3× jumper cable SPQ-Ux, 2× spare fuse GT632210
SU pro	Voltage measurement set – 8× croco-clip XDK-1033 (30m span, dolphin-clip), 8× voltage cable XSMF-419 with fuses, 4× magnetic adapter for screw head XMA-7, 3× jumper cable SPQ-Ux, 2× spare fuse GT632210

Figure 2: Available voltage measuring sets for SIMON S .

[1]Complete and most up to date list of optional and other accessories are available on request from the device vendor.

SI 3000 4 JRF1

Current Probe Type
SI = Probe for SIMON class instruments

Current Ranges
10000 = Inom 10000A/3000A/1000A/300A
3000 = Inom 3000A/1000A/300A/100A
1000 = Inom 1000A/300A/100A/30A
300 = Inom 300A/100A/30A/10A

Number of Current Sensors
3 = Three sensors
4 = Four sensors

Current Sensor Type
JRF55= Rogowski coil (Ø7mm), latch lock, length 20cm (Ø5,5cm), only I300
JRF1 = Rogowski coil (Ø12mm), latch lock, length 40cm (Ø12,7cm)
JRF2 = Rogowski coil (Ø12mm), latch lock, length 60cm (Ø19,1cm)
JRF3 = Rogowski coil (Ø12mm), latch lock, length 100cm (Ø32,0cm)

Figure 3: Available SI series rogowski coil current probes forSIMON S .

SI 250 4 JCLA

Current Probe Type
SI = Probe for SIMON class instruments

Current Ranges
250 = Inom 250A/50A/10A/2A

Number of Current Sensors
3 = Three sensors
4 = Four sensors

Current Sensor Type
JCLA = Clamp-on CT, max. conductor Ø13mm

Figure 4: Available SI series clamp current probes forSIMON S .

2 Functional Description

2.1 Instrument Construction

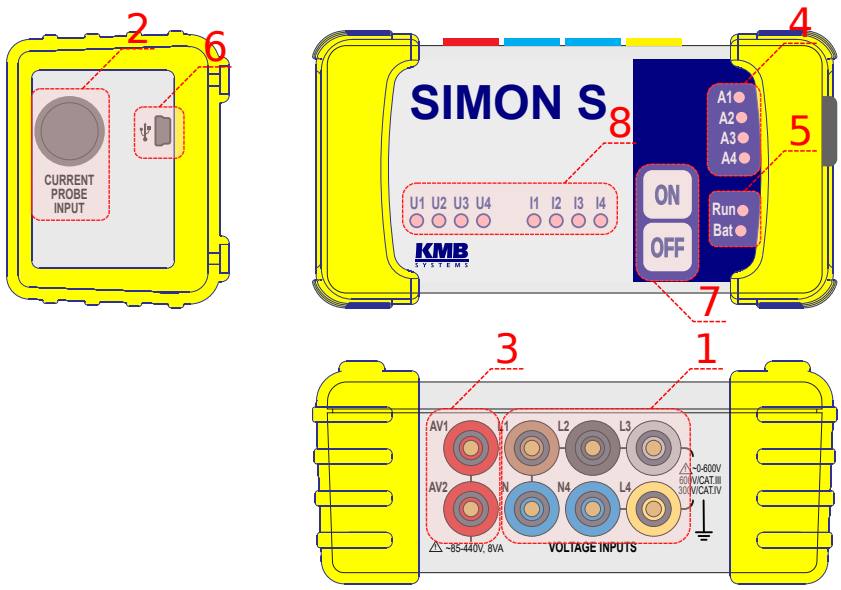


Figure 5: Description of SIMON S

1. Inputs for voltage measurement
2. Inputs for connection of SI and SPQ-I current probes
3. Inputs of power supply voltage
4. 4 configurable alarm LEDs
5. Status LEDs
6. Connector for USB cable
7. Control buttons
8. Voltage and current status LEDs

2.2 Design of Current Sensors

Figure 6: Current probe SPQ-series with three JRF sensors.

Correct polarity must be observed while connecting current sensors. The arrow on the current sensor must show the direction of the nominal power flow, that is from the power source to point of consumption.

After locking up the sensor lock, adjust the sensor position on measured conductor in order that the lock is as far of the conductor as possible – in such position the measurement accuracy is the best.

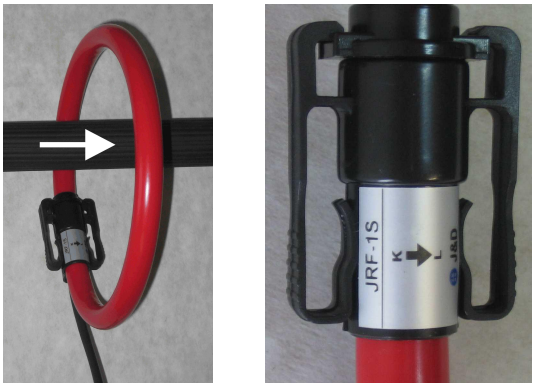


Figure 7: Current probe assembly illustration and detail of current direction indicator.

2.3 Control

SIMON S device has two buttons which are used to turn the device on / off and to start / stop each recording.

2.3.1 Machine Status

The instrument can be in one of three states illustrated below.

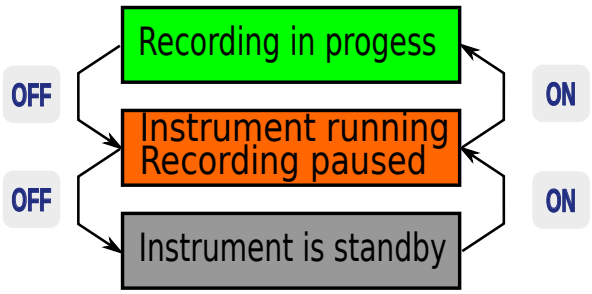


Figure 8: Instrument statuses and function of buttons

2.3.2 LED Codes

LED "Run":

- (off) instrument is turned off
- (orange) instrument is in standby, no recording
- (green) initialization of the instrument
- (blinking green) recording started, the instrument setup matches the actual connection
- (blinking red) record is running, instrument setup does not match the actual connection (the data may be invalid)

LED "Bat" - power supply status, instrument on-line (LED "Run" is ON):

- (green) battery charge is full, power supply is connected
- (blinking green) battery charge is full, power supply is not connected
- (orange) battery charge is normal, power supply is connected, battery is charging
- (blinking orange) battery charge is low, instrument won't turn on again until charged, power supply is not connected
- (red) battery level is low, power supply is connected, battery charging
- (blinking red) battery level is very low, power supply is not connected, connect power supply
- (blinking red - double flash) battery level is critical, instrument will turn of soon

LED "Bat" - power supply status, instrument off (LED "Run" is OFF):

- (green) charging completed
- (orange) battery is being charged

LED A1-A4:

- LED A1 ÷ A4 is fully configurable alarm and it can be programmed in the 'Output Settings' section of the ENVIS.Daq program

LED U1-U4:

- (green) voltage wthing 90-110% Unom
- (orange) voltage within 85-90% Unom
- (red) voltage out of range listed above
- (blinking red) voltage bellow 1% Unom, if U1-U3 then wrong phase order

LED I1-I4:

- (green) current within x-80% Inom
- (orange) current withing 80-100% Unom
- (red) current above 100% Inom
- (blinking red) respective line of current is not matching to voltage. Check connection.

LED on SPQ-I current probe indicates the current range configured.

3 Operating the Meter

3.1 Safety requirements when using SIMON S

Warning !: When working with the instrument it is necessary to perform all necessary measures for the protection of persons and property against injury and electric shock.

- The device must be operated by a person with all required qualifications for such work and this person must know in detail the operation principles of the equipment listed in this description!
- When the device is being connected to the parts which are under dangerous voltage it is necessary to comply with all the necessary measures to protect users and equipment against injury with electrical shock.
- Person, performing the installation or maintenance of the instrument must be equipped with and must use personal protective clothing and tools.
- If the analyzer is used in a manner not specified by the manufacturer, the protection provided by the analyzer may be impaired.
- If the analyzer or its accessories appear to be impaired or not functioning properly, do not use it and send it in for repair.

3.2 Preparation Prior to Measurement

Before the measurement is started it is necessary to configure the instrument appropriately. This setting is always done by PC with a supplied program ENVIS.Daq[2].

[2]Before first use the ENVIS must be installed in the PC. Detailed description can be found in The ENVIS User Guide.

3.2.1 Configuring SIMON S on a PC

Connect SIMON S to the computer via USB cable[3]. The connection through the USB interface should also supply enough power to the analyzer. No additional auxiliary voltage is required. Than the unit is ready to be adjusted. This setting can erase all previously archived data in internal memory of the instrument. So before writing new configuration to the device make sure to backup the last measured archive.

1. Run the ENVIS.Daq.
2. Open the main window (Figure 9).
3. Choose the type of communication interface and its other related parameters. Because the device driver creates a virtual PC COM port select the appropriate COM Port.
4. Press the 'Connect' button.

Figure 9: Start screen of ENVIS.Daq

5. Now you are connected to the instrument, from this screen you can navigate to configuration, live data or download archives.

[3]When the instrument is connected for the first time it is necessary to provide a proper USB driver. This driver can be found in the ENVIS installation directory and on the KMB DVD.

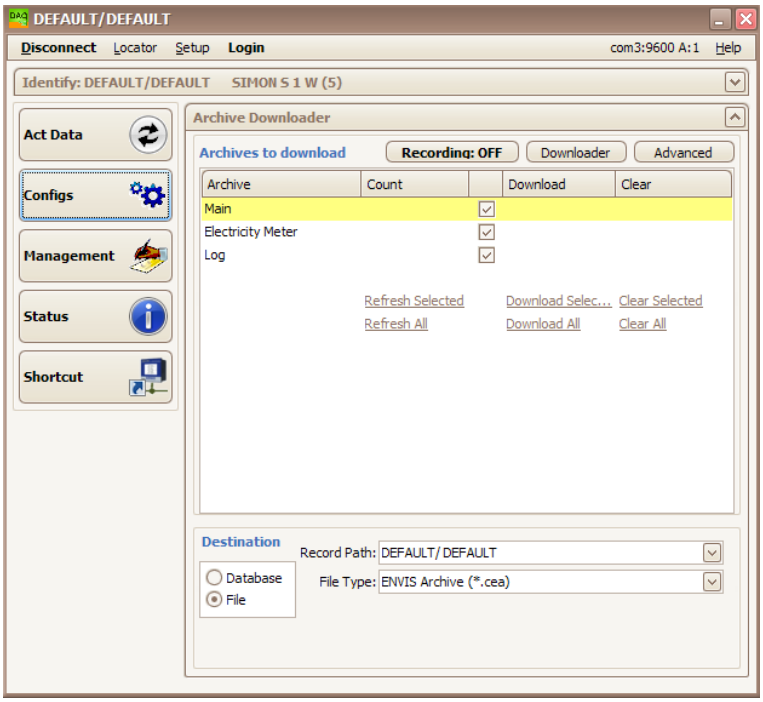


Figure 10: Start screen of ENVIS.Daq

6. Navigate to configuration to perform setup prior to the measurement. (Most typical setup is presented here)

7. We start with configuration of installation, where Nominal voltages, currents, powers, frequency, connection modes, and current probe is set up

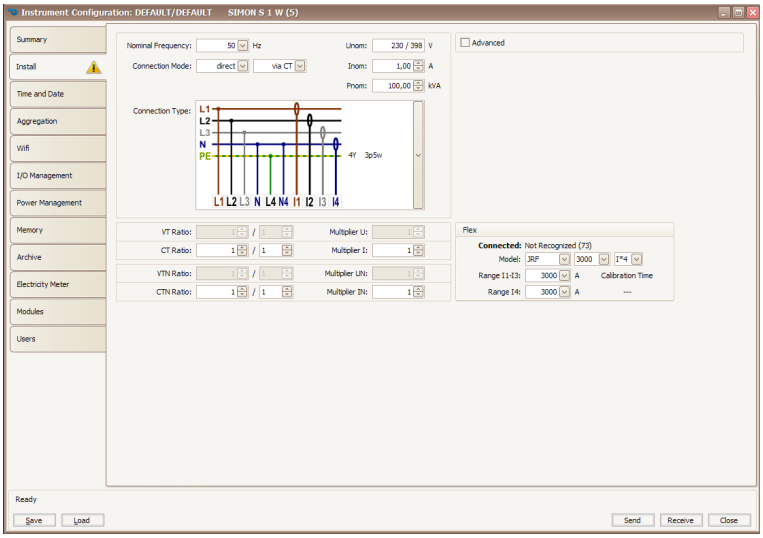


Figure 11: Installation setup

(a) Unom - nominal voltage of the measured network should be set. Either set line-line voltage or phase-neutral voltage and other will calculate automatically. Used for PQ evaluation, alarms and reporting

(b) Inom - nominal measured current. Used for some alarms and reporting.

(c) Pnom - nominal measured power. Used for some alarms and reporting.

(d) Nominal frequency - Frequency of the measured system should be set.

(e) Connection Mode - Either direct when measuring the system voltage directly or via VT when voltage is measured via Voltage Transformers, in MV/HV systems

(f) Connection type - selection depends on measured system.Such as 3-phase without neutral (3p3w, 3D), or 3-phase with neutral (3p4w, 3Y) etc..

(g) VT ratio - configured when measuring via VT

(h) CT ratio - configured when measuring on secondary side of the regular CT. Under normal conditions when measuring directly using SI or SPQ-I current probes 1/1 should be kept

(i) Flex - Configuration of the current range and current probe. When SI Probe is used it's detected automatically and you just have to select proper current range which should be used and number of currents you'd you'd like to measure. With 4 sensor current probe you can also measure only 3 currents.

8. Prior to each measurement it's strongly recommended to check instruments time and adjust it if it is not correct.

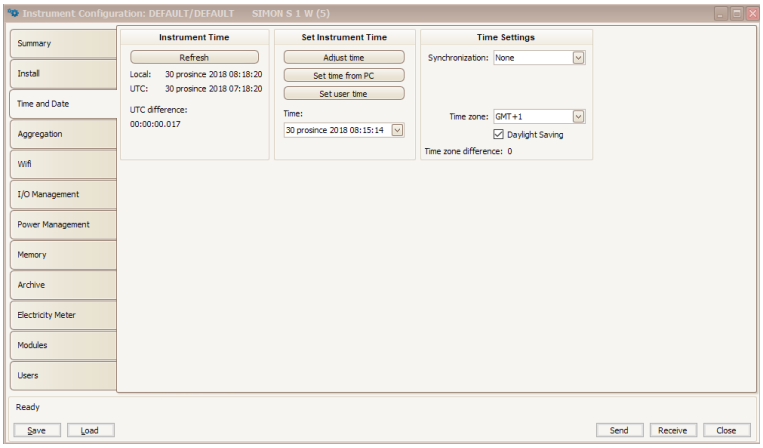


Figure 12: Time setup

9. Configuration of recording is made in Archive tab. You should name the measurement here, configure recording interval and select quantities to be recorded.As Min/Max values are recorded for each interval together with it's average so usually it is not necessary to configure extremely short recording intervals.

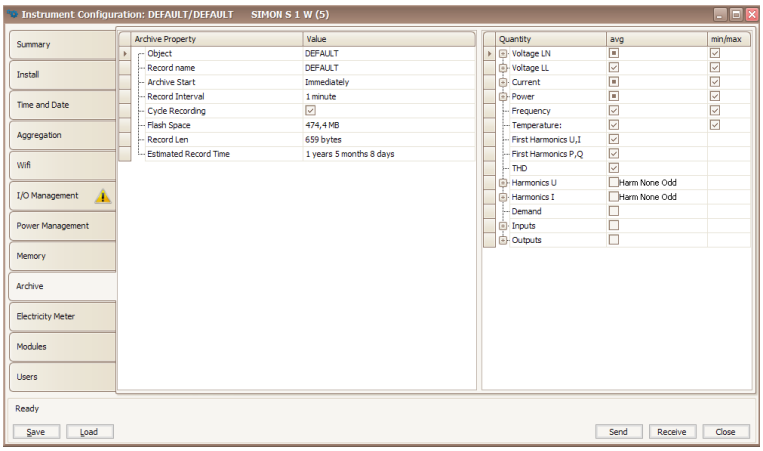


Figure 13: Archive configuration

10. Now measurement setup is made and we can send the setting to the instrument by clicking ”Send”.

3.3 Installation of the instrument

The SIMON S instrument needs to be placed in dry and moisture free location inside or outside of the cabinet. Current sensors can be placed on un-insulated or insulated bars or cables. Current sensor lock should be placed on opposite side to measured conductor for most accurate measurement. Make sure not to damage any lead wires while closing the cabinet.

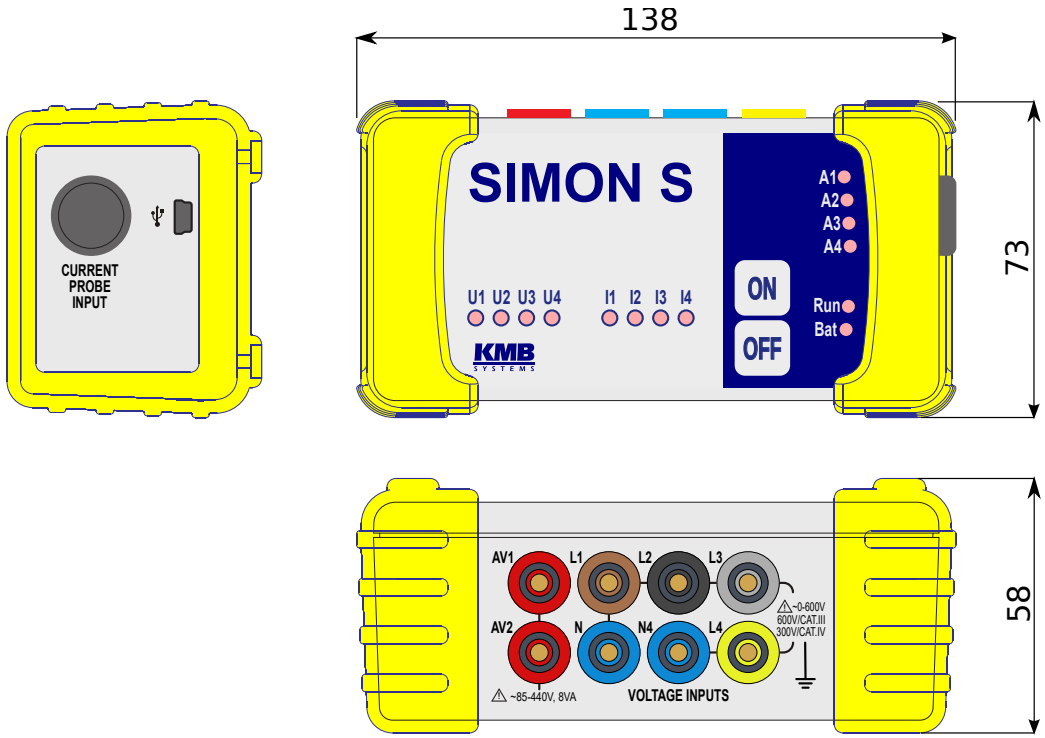


Figure 14: Dimensions of the SIMON S analyzer.

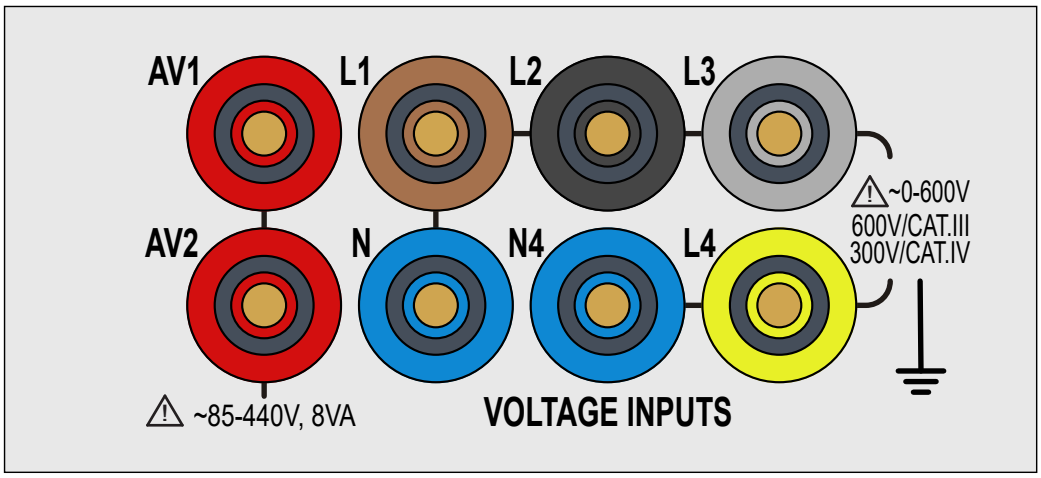


Figure 15: Terminals of the SIMON S analyzer.

3.3.1 Supply voltage

Instrument features separate voltage input on terminals **AV1** and **AV2**. Proper supply voltage of correct levels (see. technical specification) needs to be provided prior to the measurement. Supply directly from measured voltage can be easily obtained using supplied two SPQ-Ux jumper cables connected between **AV1 - L1** and **A2 - N** or **AV1 - L1**, **AV2 - L2** to supply from line-to-line voltage.

Warning !: Voltage between terminals **AV1** and **AV2** have to be bellow maximal allowed supply voltage under any conditions. Serious damage to the instrument can be caused when this limit is crossed.

3.3.2 Measured voltage

The measured phase voltages are connected to terminals **L1, L2, L3**. The common terminal to connect the neutral wire is identified as N (it remains unused with delta and Aron connections).Terminal **L4** measures against separate **N4** terminal and you can for example measure voltage of PE against ground. In case fourth voltage have same neutral wire to other three you can use SPQ-Ux jumper cable connected between **N, N4**.

All supplied voltage cables are equipped with built in fuse.

3.3.3 Measured currents

Current is measured using SPQ-I or SI series of current probes. Probe is connected to the instruments **current probe input** located on its right side. Connection is made using push-pull type connector and connection is made by pushing it to the input while holding it's body and disconnecting is made by pulling while holding it's body. No twisting or screwing during the connector mating or un-mating should be made.

While installing the current sensors you need to follow same order like for voltage cables. Arrow on the each current sensor should point from source to load in compliance with current flow direction. For best accuracy position rogowski coil lock furthest from the measured conductor.

3.3.4 Communication peripherals

USB communication port for USB slave is located on the front panel. This communication port is intended for easy local configuration and fast download of archived data to the local PC. Use the supplied USB cable only

(USB-A/mini). SIMON S is a USB 2.0 slave device. For correct operation it needs a driver installed in your operating system (see the ENVIS user guide for more info).

WiFi optionally SIMON S can be equipped with WiFi suitable for wireless configuration and overview of live data measurement.

To be able to connect over WiFi to the instrument, you need to configure the WiFi module first (Default IP: is 10.0.0.1 and SSID is name of the instrument). In configuration under WiFi you can change the IP address of the WiFi connection and also SSID (first you have to click connect to open the WiFi module setting). When connecting to the WiFi network, make sure PC have IP address from same sub-net as the instrument. Such as 10.0.0.2 when instruments IP is 10.0.0.1. No password is used in standard setup.

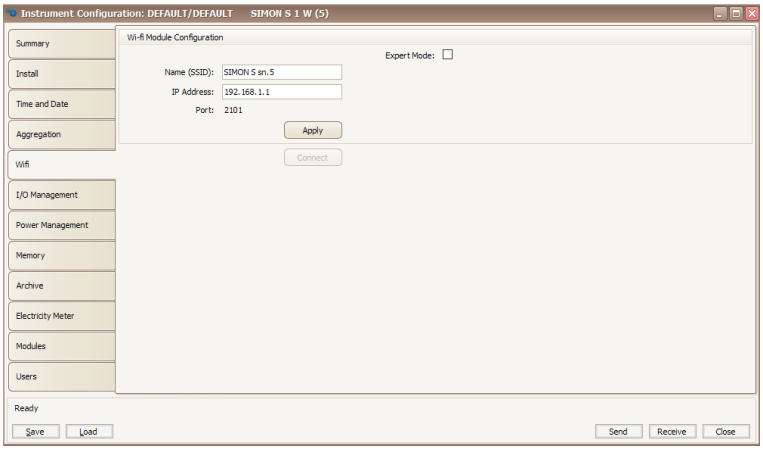


Figure 16: WiFi configuration

Expert mode is for advanced users who'd like to protect WiFi with the password, change WiFi mode, or connect instrument to existing WiFi network. Expert configuration is accessed via Web browser. First you change to Expert mode, then you connect to new wifi network with name xbee-..... and then you will type IP address of the instrument into web browser where you can proceed with configuration of WiFi module.

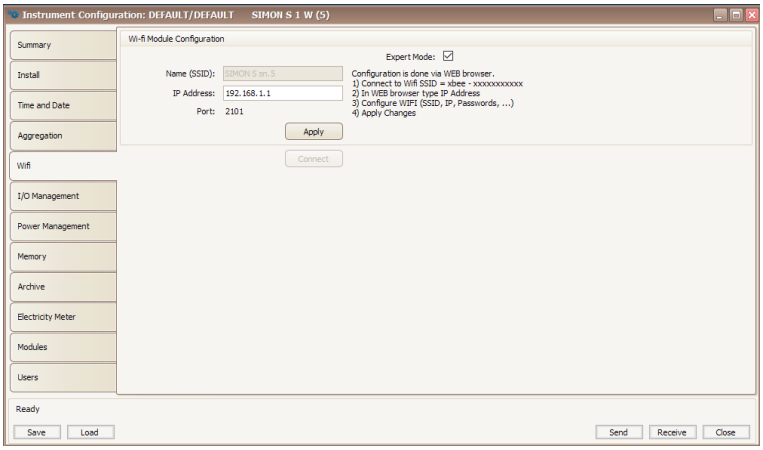
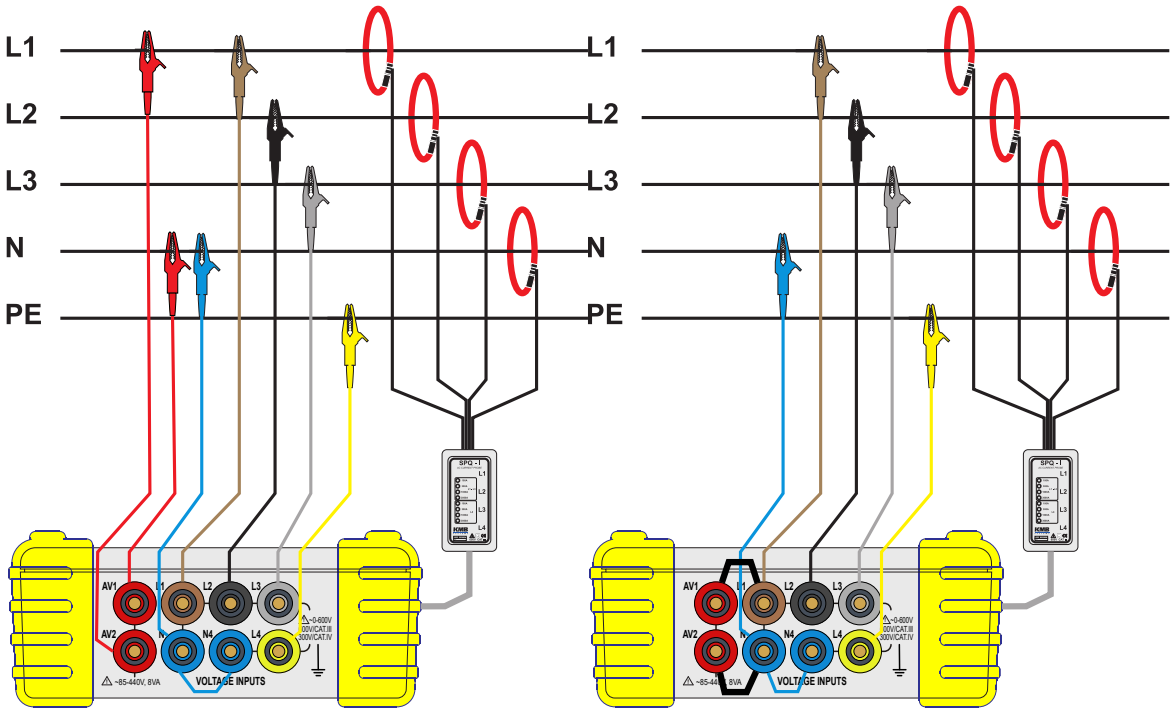


Figure 17: WiFi configuration - expert mode

3.3.5 Typical connection schemes



(a) Separate aux. voltage

(b) Aux. voltage from measured voltage using SPQ-Ux jumper

Figure 18: Connection in 5 wire network

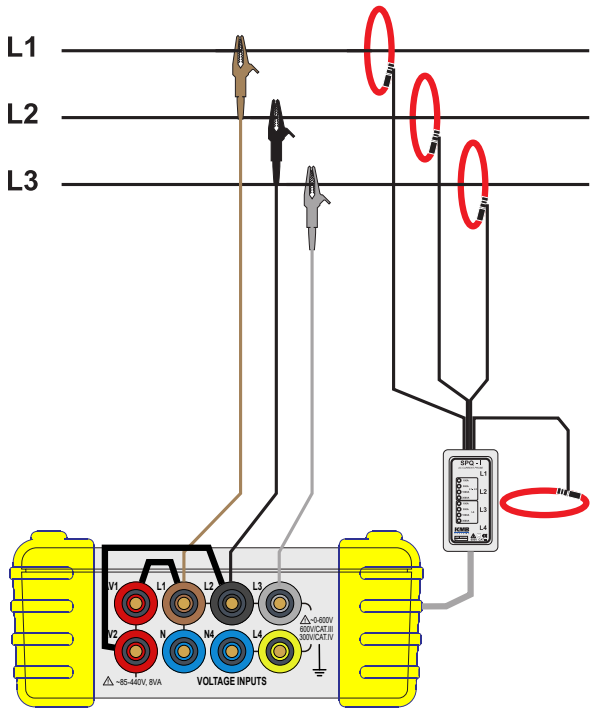


Figure 19: Connection in 3 wire network - supply voltage from line to line voltage via SPQ-Ux jumper

4 Maintenance, Service, Warranty

Maintenance: the SIMON S power analyzer does not require any maintenance during its operation. For reliable operation it is only necessary to meet the operating conditions specified and not expose the instrument to violent handling and contact with water or chemicals which could cause mechanical damage.

The lithium cell built in the instrument can backup a real time circuit for more than 5 years without power supply, at average temperature $20^{\circ}C$ and load current in the instrument less than $10\,\mu A$. If the cell is empty, it is necessary to ship the instrument to the manufacturer for battery replacement.

Service: in the case of failure or a breakdown of the product, you should contact the supplier at their address:

KMB Systems, s. r. o.
Tř. dr. M. Horákové 559
460 05 Liberec 7
Czech Republic
Tel. 485 130 314, Fax 482 739 957
E-mail: kmb@kmb.cz, Web: `www.kmb.cz`

The product must be in proper packaging to prevent damage during transit. A description of the problem or its symptoms must be delivered together with the product.

If a warranty repair is claimed, the warranty certificate must be sent in. In case of an out-of-warranty repair you have to enclose an order for the repair.

Warranty certificate: warranty period of 24 months from the date of purchase is provided for the instrument, however, no longer than 30 months from the day of dispatch from the manufacturer. Problems in the warranty period, provably because of faulty workmanship, design or inconvenient material, will be repaired free of charge by the manufacturer or an authorized servicing organization.

The warranty ceases even within the warranty period if the user makes unauthorized modifications or changes to the instrument, connects it to out-of-range quantities, if the instrument is damaged due to ineligible or improper handling by the user, or when it is operated in contradiction with the technical specifications presented.