

User 's Manual

EN

Series of smart gateways

SG-E1 / SG-W1 / SG-W1A

Series of smart gateways

SG-E1 / SG-W1 / SG-W1A

User and Installation manual



Security Advices and Warnings

Please read this chapter carefully and examine the equipment carefully for potential damages which might arise during transport and to become familiar with it before continue to install, energize and work with a SG.

This chapter deals with important information and warnings that should be considered for safe installation and handling with a device in order to assure its correct use and continuous operation.

Everyone using the product should become familiar with the contents of chapter »Security Advices and Warnings«.

If equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.

PLEASE NOTE

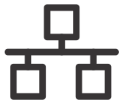
This booklet contains instructions for installation and use of SG. Installation and use of a device also includes handling with dangerous currents and voltages therefore should be installed, operated, serviced and maintained by qualified personnel only. ISKRA d.o.o. company assumes no responsibility in connection with installation and use of the product. If there is any doubt regarding installation and use of the system in which the device is used for measuring or supervision, please contact a person who is responsible for installation of such system.

Before installing

Check the following before installing the device:

- Nominal voltage.
- Terminals integrity.
- Protection fuse for voltage inputs (recommended maximal external fuse size is 10 A).
- External switch or circuit breaker must be included in the installation for disconnection of the devices' aux. power supply. It must be suitably located and properly marked for reliable disconnection of the device when needed.
- Proper connection and voltage level of I/O module.

Used symbols on devices' housing and labels

SYMBOL	EXPLANATION
	DANGER Indicates proximity of hazardous high voltage, which might result in serious injury or death if not handled with care.
	WARNING Indicates situations where careful reading of this manual is required and following requested steps to avoid potential injury is advised.
	Compliance of the product with directive 2002/96/EC, as first priority, the prevention of waste electrical and electronic equipment (WEEE), and in addition, the reuse, recycling and other forms of recovery of such wastes so as to reduce the disposal of waste. It also seeks to improve the environmental performance of all operators involved in the life cycle of electrical and electronic equipment.
	Wi-Fi symbol.
	Network symbol.
	Compliance of the product with European CE directives.
	Compliance of the product with UK Conformity Assessed (UKCA) directives.

Disposal

It is strongly recommended that electrical and electronic equipment (WEEE) is not deposit as municipal waste. The manufacturer or provider shall take waste electrical and electronic equipment free of charge. The complete procedure after lifetime should comply with the Directive 2002/96/EC about restriction on the use of certain hazardous substances in electrical and electronic equipment.

Table of contents

<u>1</u>	<u>BASIC DESCRIPTION AND OPERATION</u>	<u>1-1</u>
1.1	DESCRIPTION OF THE DEVICE	1-2
1.2	APPEARANCE	1-2
1.3	SG APPLICATION	1-3
1.4	MAIN FEATURES	1-5
<u>2</u>	<u>CONNECTION</u>	<u>2-6</u>
2.1	MOUNTING	2-7
2.2	ELECTRICAL CONNECTION	2-8
<u>3</u>	<u>FIRST STEPS</u>	<u>3-10</u>
3.1	INTRODUCTION	3-11
3.2	CONNECTING SG TO WI-FI NETWORK	3-11
3.3	SG IP ADDRESS	3-15
3.4	CONFIGURING SG WITH MIQEN CONFIGURATION SW	3-18
<u>4</u>	<u>SG FUNCTIONS</u>	<u>4-21</u>
4.1	SG PUSH/PUBLISH SYSTEM	4-21
4.2	REST API	4-21
4.3	SG WEB INTERFACE	4-29
4.4	RESET BUTTON	4-39
4.5	FACTORY RESET	4-39
4.6	SG AP (ACCESS POINT) MODE	4-39
4.7	STATIC (FIXED) IP CONFIGURATION	4-39
4.8	MQTT COMMANDS	4-40
<u>5</u>	<u>TECHNICAL DATA</u>	<u>5-44</u>
5.1	MECHANICAL CHARACTERISTICS OF INPUT	5-45
5.2	POWER SUPPLY INPUT	5-45
5.3	LED	5-45
5.4	WI-FI	5-45
5.5	IR SERIAL COMMUNICATION	5-45
5.6	ETHERNET (ONLY FOR SG-E1)	5-46
5.7	RS485 SERIAL COMMUNICATION	5-46
5.8	DIGITAL INPUT	5-46
5.9	TEMPERATURE SENSOR (PT1000) INPUT	5-46
5.10	SAFETY AND AMBIENT CONDITIONS	5-46
5.11	EC DIRECTIVES CONFORMITY	5-47
5.12	DIMENSIONS	5-47
<u>6</u>	<u>ABBREVIATION/GLOSSARY</u>	<u>6-48</u>

1 BASIC DESCRIPTION AND OPERATION

This chapter presents all relevant information about the SG required to understand its purpose, applicability and basic features related to its operation.

In this chapter, you will find:

1.1	DESCRIPTION OF THE DEVICE	1-2
1.2	APPEARANCE	1-2
1.3	SG APPLICATION	1-3
1.4	MAIN FEATURES	1-5

1.1 Description of the device

The SG series of smart gateways are intended to connect various equipment into communication network. The gateway has built-in two optical (IR) communication ports and the RS485 serial communication with the MODBUS protocol. RS485 communication enables data transmission and consequently the connection of communication gateway into the RS485 network and communication with various equipment, consisting of RS485 communication (e.g. energy meters, latching switches, power monitoring devices, etc.), via MODBUS.

The SG series also consist of pulse input and temperature sensor (Pt1000) input.

The SG-W1 version is equipped with Wi-Fi communication. This type also has an alternative version with an external antenna (SG-W1A).

The SG-E1 version is equipped with Ethernet communication. Activation of Wi-Fi communication (via parameter) is also possible with this device, but in that case, the Ethernet will not be active on RJ45.

1.2 Appearance

- 1 **RJ-45 terminal** can be utilized either for RS485 communication or for Ethernet communication (only for SG-E1)
- 2 **RS485 communication**
- 3 **IR communication port** (one on each side)
- 4 **DIN-rail fitting**
- 5 **External antenna** (only for SG-W1A)
- 6 **Multifunctional green, red, orange LED**
- 7 **Power supply**
- 8 **Power input and temperature sensor (Pt1000) input**

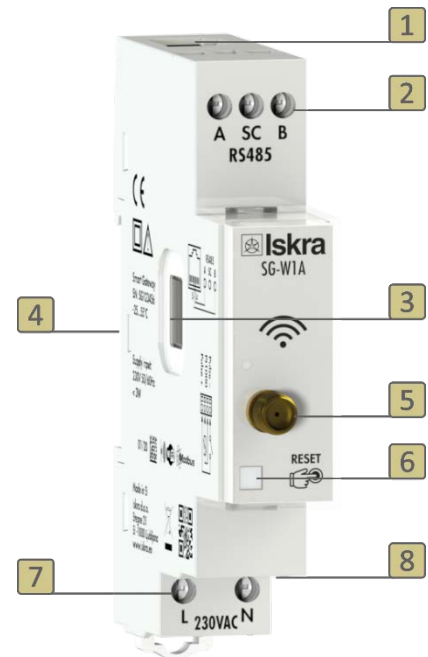


Figure 1: Appearance of smart gateway SG.

A built-in LED diode indicates different operation states of the SG. A tactile switch is built-in for reset and factory reset of a gateway. Short press resets the gateway, pressing button for more than 10 seconds (orange LED diode starts blinking fast) will do a factory reset (meaning setting SG to factory settings). Connecting terminals are built to be fastened according to EN 60715 standard. The SG interface with corresponding equipment enables setting and reading the instruments.

1.3 SG application

The SG can be used in a variety of applications including:

- Single-phase single point metering and control.
- Three-phase single point metering and control.
- Connecting different devices via IR communication and RS485 communication.
- Connecting different devices via Wi-Fi (e.g. Pt1000 temperature sensor).
- Monitoring single or multiple devices.

SINGLE-PHASE SINGLE POINT METERING AND CONTROL



Figure 2: Connection diagram for SG. It is connected to an energy meter (on the left side of the SG) and to latching switch (on the right side of the SG) by IR communication. It is possible to read and control data with the computer or mobile phone.

THREE-PHASE MULTI POINT METERING AND CONTROL

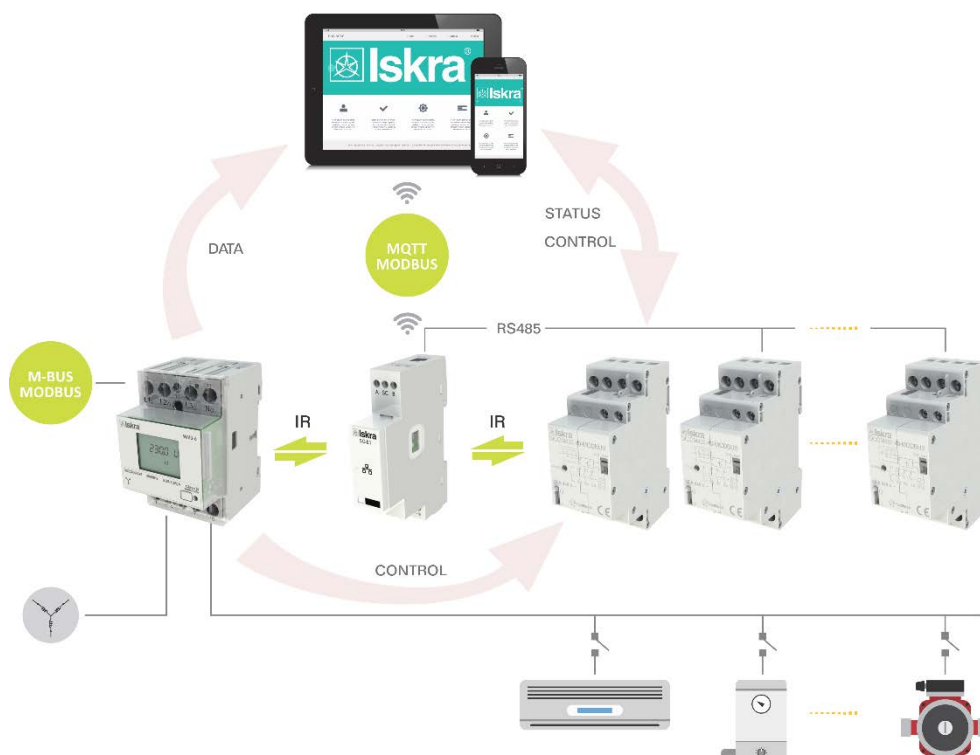


Figure 3: Connection diagram for SG for connection to three-phase energy meter. It is connected to an energy meter (on the left side of the SG); to one latching switch (on the right side of the SG) by IR communication and to two latching switches by RS485 communication. It is possible to read and control data with the computer or mobile phone

1.4 Main features

- AC mains power supply.
- Nominal supply voltage (U_n) from 85 V to 265 V AC or 85 V to 300 V DC.
- Nominal frequencies 50 Hz and 60 Hz.
- Multifunctional front LED.
- RS485 serial communication.
- IR serial communication (2 ports).
- Wi-Fi communication (can operate with or without an external antenna).
- Ethernet communication (valid only for SG-E1)
- 1-DIN rail width mounting communication gateway according to EN 60715.
- Pulse and temperature input.
- SG-W1A can only operate with an external antenna.
- SMA male connector (only for SG-W1A).

2 CONNECTION

This chapter deals with the instructions for SG connection. Both the use and connection of the device includes handling with dangerous currents and voltages. Connection shall, therefore, be performed ONLY a by a qualified person using an appropriate equipment. ISKRA, d.o.o. does not take any responsibility regarding the use and connection. If any doubt occurs regarding connection and use in the system which device is intended for, please contact a person who is responsible for such installations.

In this chapter you will find:

2.1	MOUNTING	2-7
2.2	ELECTRICAL CONNECTION	2-8

2.1 Mounting

The SG is intended only for DIN-rail mounting. It should be mounted on a DIN-rail between an energy meter and latching switch.

WARNING

Case is sealed. Do not open the device. No warranty if case is opened.

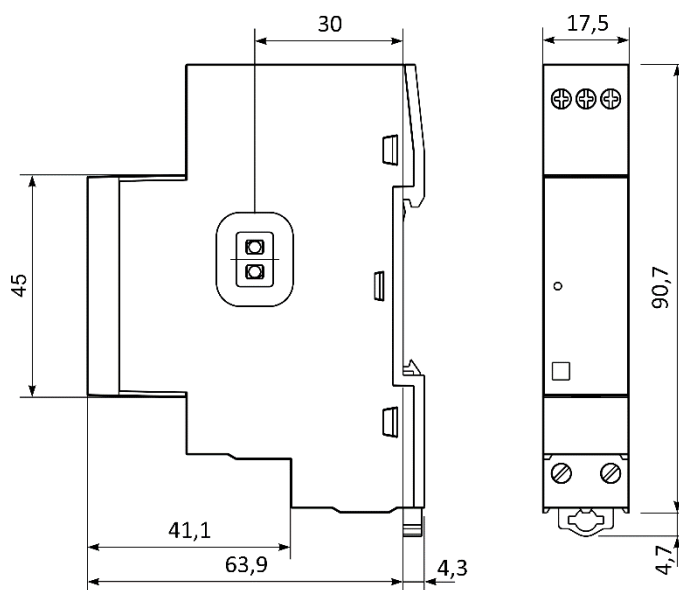


Figure 4: Dimensional drawings of SG-W1 and E1.

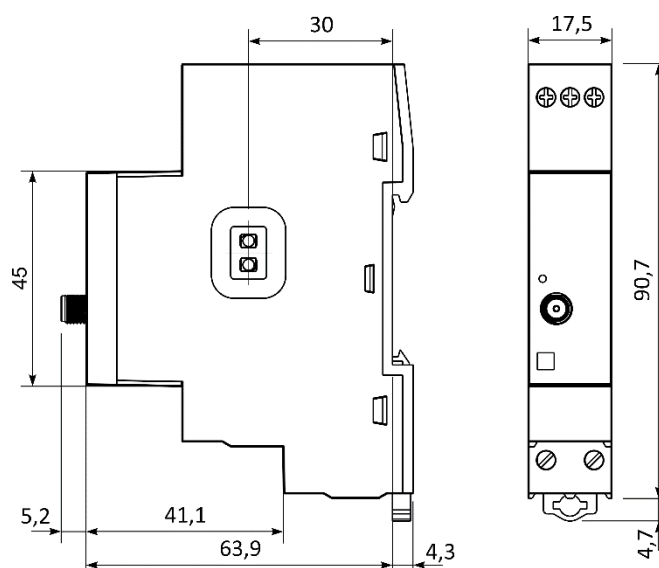


Figure 5: Dimensional drawings of SG-W1 with an external antenna.

2.2 Electrical connection

WARNING

Installation must be carried out and inspected by a specialist or under his supervision. Wrong or incomplete connection of voltage or other terminals can cause non-operation or damage to the device.

The SG should be connected to power supply voltage. Two IR communication ports are assembled into the gateway, one on each side. The left one communicates with energy meter, the right one is meant to connect to latching switch. The latching switch can be turned on/off by energy meter with set limit values or by user via Wi-Fi network using dedicated software (e.g. MiQen software).

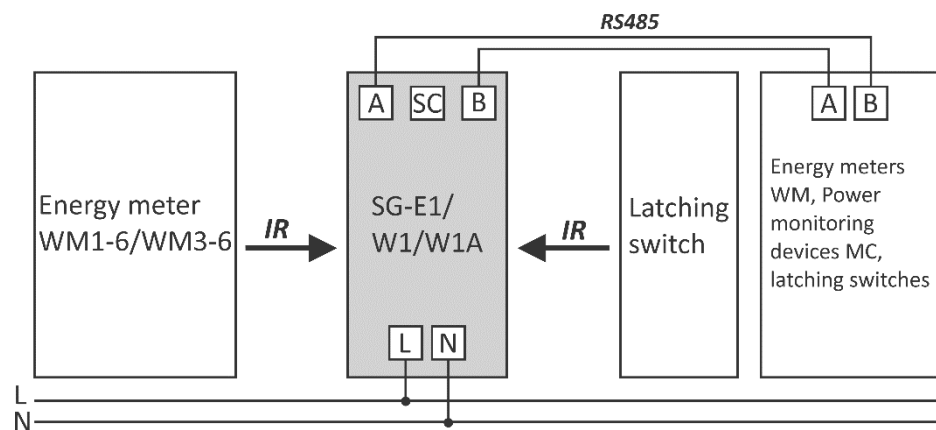


Figure 6: IR and RS485 connection of SG

Additionally, devices (e.g. energy meters, latching switches, power monitoring devices, etc.) can be connected to the gateway via RS485 communication.

All devices connected to SG are visible at their Modbus addresses.

SG can manage 4 devices on WEB interface (1 energy meter and 1 latching switch via IR MODBUS communication and 2 devices via RS485 communication). However, there can be more than 2 devices on RS485 network, but controlling of them is possible only through Modbus TCP with their Modbus addresses.

PLEASE NOTE

For proper operation of the IR communication, avoid a powerful external source of light.

Communication connection

The complete SG system is assembled with three main units and two optionally units, which are used for communication with outside world:

- **The power supply unit.**

SG is supplied from AC power mains with nominal voltage 230 V. An isolated SMPS power supply is used to supply main MCU as well as Wi-Fi module, communication units and MCU peripherals.

- **The processing unit (SOC) with two IR communication channels, RS485 communication channel, LED indicator and Switch for reset/factory reset.**

Various equipment can be connected to SG communication gateway via IR communication or via RS485 communication. All communication channels using MODBUS protocol.

- **Wi-Fi module.**

Wi-Fi module is equipped on each gateway and enables connection of SG to user's Wi-Fi network using TCP MODBUS protocol.

- **Ethernet module.**

Gateway SG-E1 version also contains 10/100 Base-T/TX Ethernet Transceiver for ethernet communication.

- **Extension modules of SG (pulse input and temperature sensor (Pt1000) input)**

SG does not have any adjustable elements (e.g. potentiometers), which assures a better long-term stability.

Terminals

Pulse input	Pulse -	Pulse +
Power supply	N	L
RS485 communication	A	SC B
Temperature sensor	Pt1000	Pt1000

Table 1: Survey of communication connection

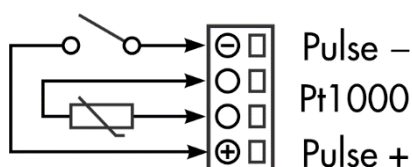


Figure 7: Pulse and temperature sensor connection of SG

PLEASE NOTE

Check labels on the side of the meter to check what modules are built in.

3 FIRST STEPS

Programming a SG is very transparent and user friendly. Numerous settings are organized in groups according to their functionality.

In this chapter you will find basic programming steps:

3.1	INTRODUCTION	3-11
3.2	CONNECTING SG TO WI-FI NETWORK	3-11
3.3	SG IP ADDRESS	3-15
3.4	CONFIGURING SG WITH MIQEN CONFIGURATION SW	3-18

3.1 Introduction

Connecting the SG is very transparent and user friendly. The flowchart below illustrates the first few steps to more clearly understanding software settings.

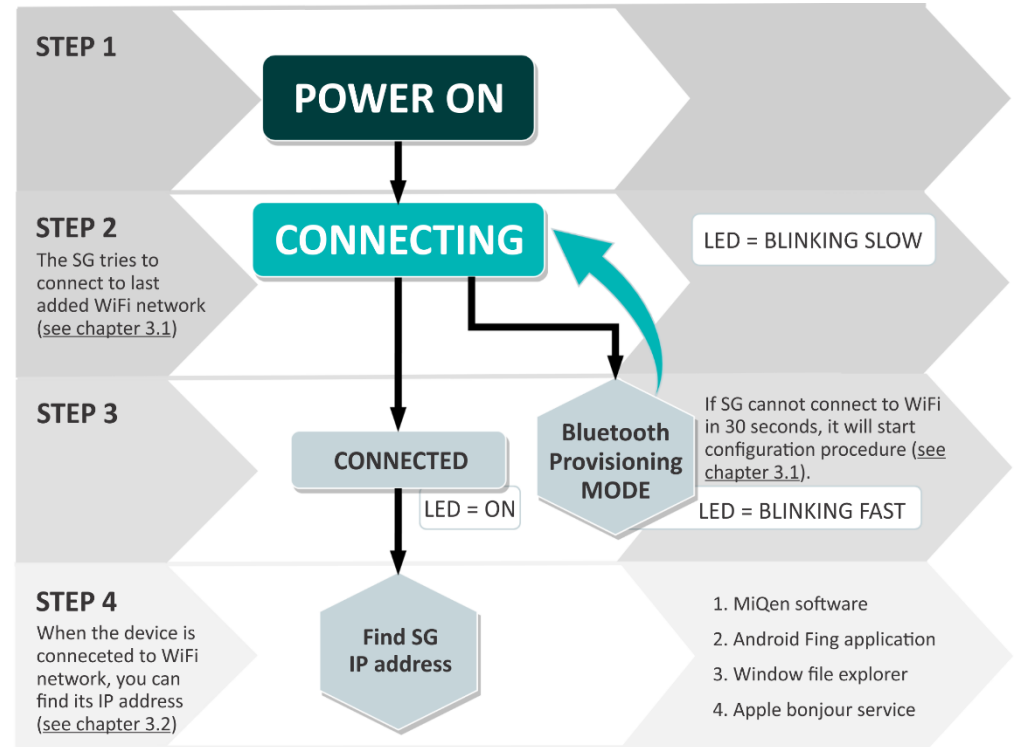


Figure 8: Process flowchart

3.2 Connecting SG to Wi-Fi Network

After we mounted SG on a DIN-rail and supplied it with AC power (power-up the device), we must connect SG to Wi-Fi network. At first, SG tries to connect to last successfully added Wi-Fi network (green LED blinking fast). If SG cannot connect to Wi-Fi in 30 seconds, it will start WiFi provisioning procedure (orange LED blinking fast). This mode is active for 3 minutes and after that, it cycles to connection mode again (green LED blinking fast).

3.2.1 SETUP SG IN CONFIGURATION MODE

Connecting SG to Wi-Fi network is called provisioning. User needs smartphone with Bluetooth and provisioning application. Provisioning application is available for various platforms:

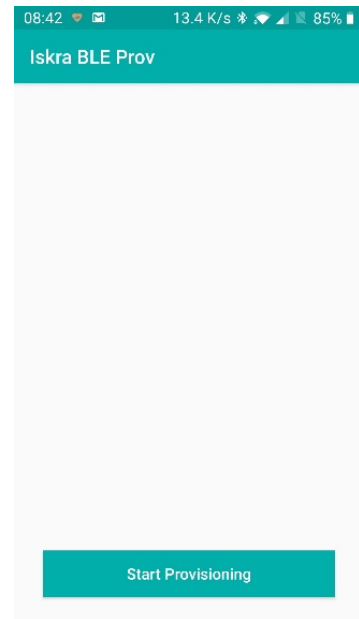
Android (Iskra version): <https://fwupdate.iskrasistemi.si/apk/app-ble-sec1-debug.apk> (Note: Install apps from external sources must be enabled on smartphone)

Android (generic): <https://play.google.com/store/apps/details?id=com.espressif.provble>

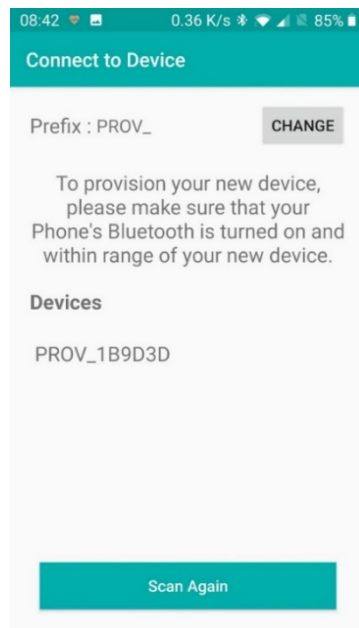
iOS (generic): <https://apps.apple.com/us/app/esp-ble-provisioning/id1473590141>

3.2.2 Provisioning procedure

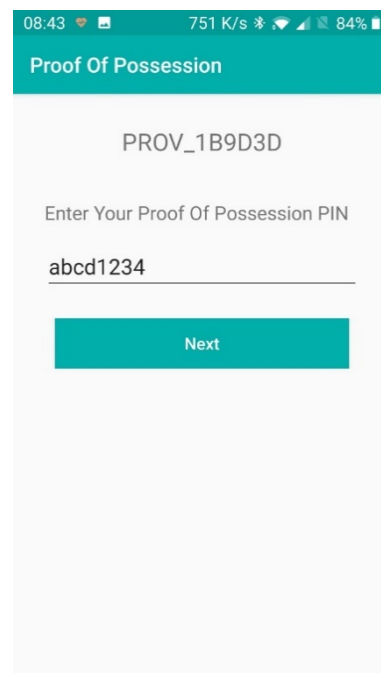
Start Iskra BLE_PROV application on your smartphone. If Orange LED is blinking fast, click on Start Provisioning.



If device is found, click on it, otherwise click on Scan Again.



Enter Proof of possession PIN and click Next.



08:43 751 K/s 84%

Proof Of Possession

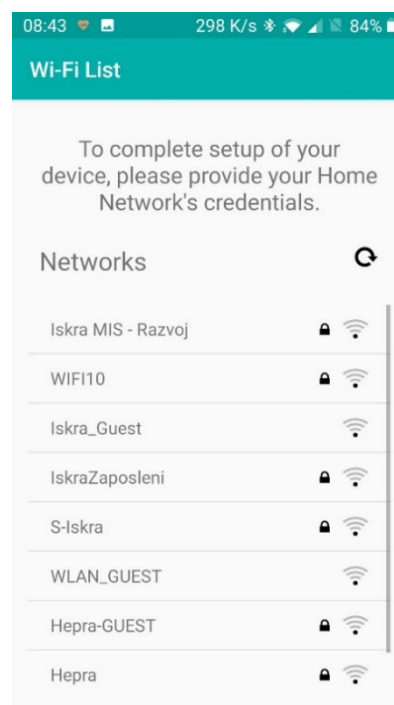
PROV_1B9D3D

Enter Your Proof Of Possession PIN

abcd1234

Next

Wait for available Network list and select one of them. If your network is hidden, then click on Join to another network.



08:43 298 K/s 84%

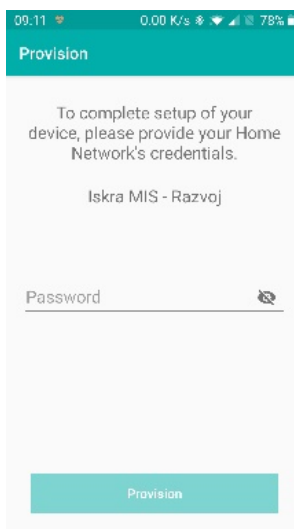
Wi-Fi List

To complete setup of your device, please provide your Home Network's credentials.

Networks

Iskra MIS - Razvoj	🔒	📶
WIFI10	🔒	📶
Iskra_Guest		📶
IskraZaposleni	🔒	📶
S-Iskra	🔒	📶
WLAN_GUEST		📶
Hepra-GUEST	🔒	📶
Hepra	🔒	📶

Enter password for WiFi network. If you are connecting to hidden network, enter network name too. Click on Provision.



09:11 0.00 K/s 78%

Provision

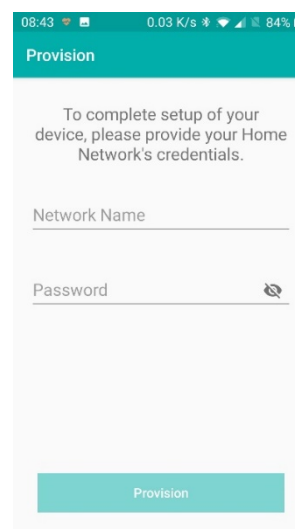
To complete setup of your device, please provide your Home Network's credentials.

Iskra MIS - Razvoj

Network Name

Password

Provision



08:43 0.03 K/s 84%

Provision

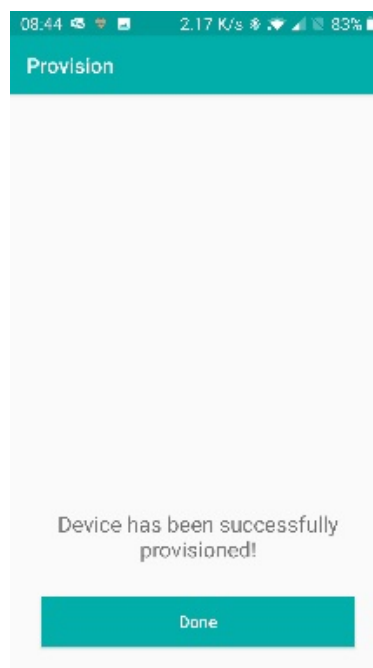
To complete setup of your device, please provide your Home Network's credentials.

Network Name

Password

Provision

Wait till SG connects to provisioned network.



08:44 2.17 K/s 83%

Provision

Device has been successfully provisioned!

Done

- PRINT PREVIEW  : preview of a PDF file
- GRAPHICAL ANALYSIS  : measurements can be shown in a graphical form
- COMMUNICATION PORT SETTING  : under communication form
- INTERACTIVE INSTRUMENT  : additional communication feature of a device allows interactive handling with a dislocated device as if it would be operational in front of a user)
- MEMORY INFO  : shows available memory since last official data transfer
- HELP  : for more detailed information how to handle a device

The latest version of MiQen software can be downloaded from ISKRA d.o.o. website <https://www.iskra.eu/>.

PLEASE NOTE

MiQen has a very intuitive help system. All functions and settings are described in Info window on the bottom of MiQen window. In MiQen Help file, detailed instructions about software usage, connection, and communication with a different type of devices, driver installation, etc. are described.

MiQen has a functionality to search for network devices. Your PC must be connected to the same network as SG! All settings can be programmed using MiQen software.

Start MiQen application and click on Browse Ethernet devices.

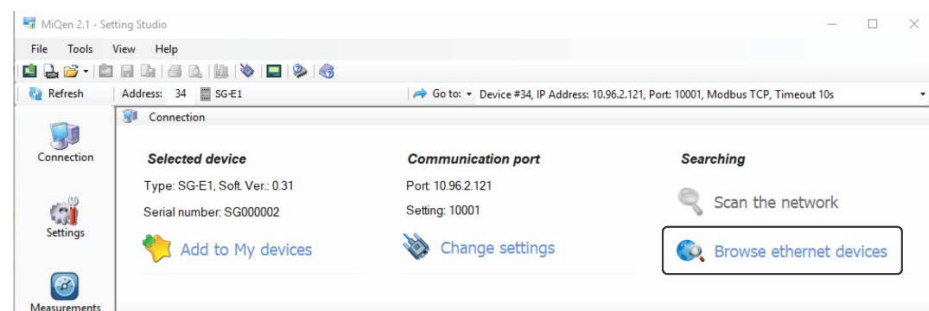


Figure 10: Browse ethernet devices selection

MiQen scans Wi-Fi network and displays results. You get a list of all detected devices on your network. You can double click on your device and MiQen will establish a connection with it.

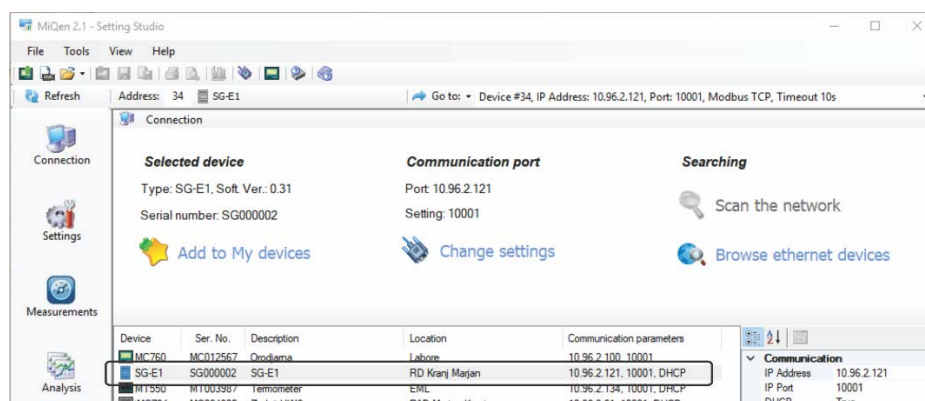


Figure 11: List of all detected devices. Double click on SG device

PLEASE NOTE

If you cannot see your device, click on Browse Ethernet devices again.

3.3.3 Find IP using Fing application on Android

If you are using Android smartphone, you can use Fing application from Google Play Store. Your smartphone must be connected to same Wi-Fi network as SG.

Start Fing application and find the SG.

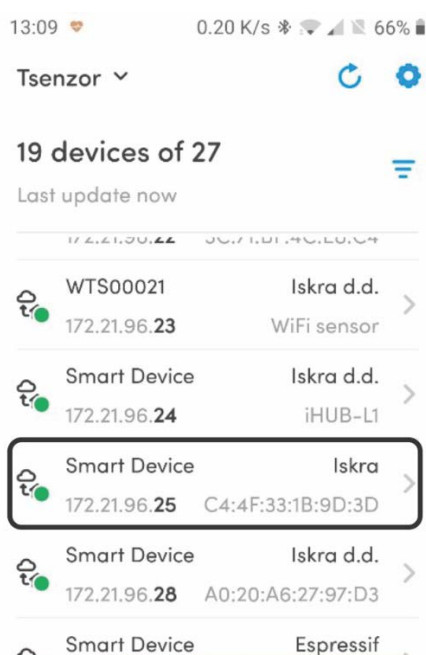


Figure 12: SG name in Fling application

3.4 Configuring SG with MiQen configuration SW

Start the MiQen application and then click on Change settings under Communication port. There are two ways to connect MiQen to SG, via Wi-Fi or via the RS485 connection.

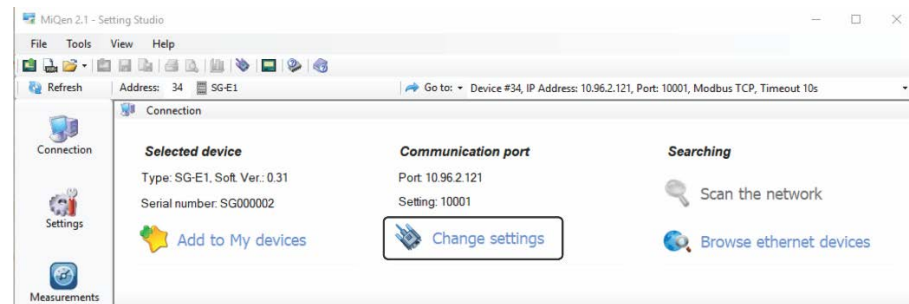


Figure 13: Change settings selection

3.4.1 Connecting MiQen to SG via Wi-Fi

For connecting in this mode, we need IP address of SG (see chapter 3.2). Enter SG IP address, IP port (default is 10001) and click OK. Set SG address to 34 and click Refresh.

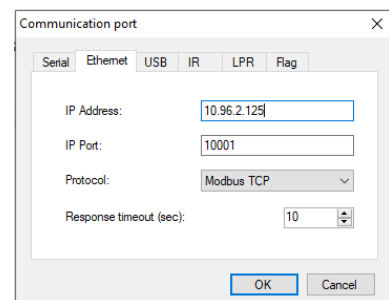


Figure 14: Communication port for connecting MiQen to SG via Wi-Fi

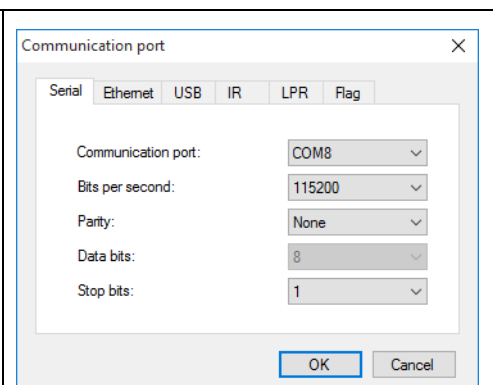
3.4.2 Connecting MiQen to SG via RS485

This connection works only if SG's RS485 port is configured as a slave (Default setting). If you enable RS485 devices in settings, RS485 on SG becomes master and you cannot use RS485 port for settings.

If you want to connect via RS485, you need to wire your RS485 adapter to SG's RS485 port. Set communication port to COM on which you have RS485 adapter. Speed is 115200 bits/s, parity is none and Stop bits is 1.

Click OK.
Set SG address to 34 and click Refresh.

Figure 15: Communication port for connection MiQen to SG via RS485



3.4.3 Connecting to SG

From now on, the procedure is the same, no matter if you connect via Wi-Fi or RS485. Set Address to 34 and click *Refresh*.

WARNING!

It is very important to set address to 34!

If settings are correct, you can see SG under Selected device. Click on *Settings* icon and click *Read settings*.

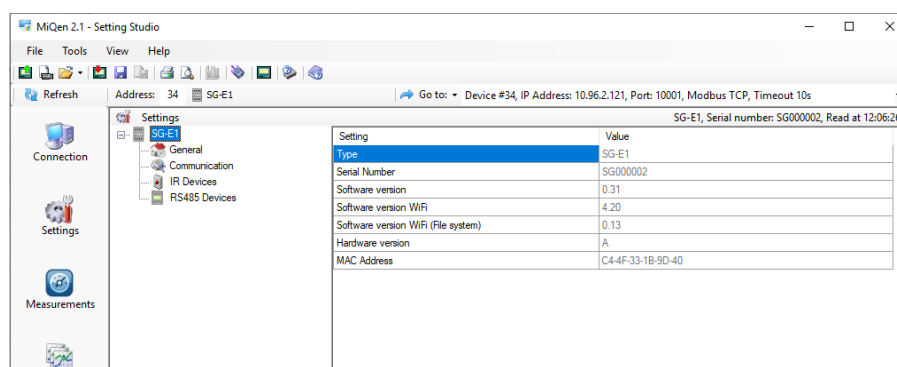


Figure 16: Set Address to 34



Figure 17: Read settings selection

MiQen will download settings and you can check and set settings.



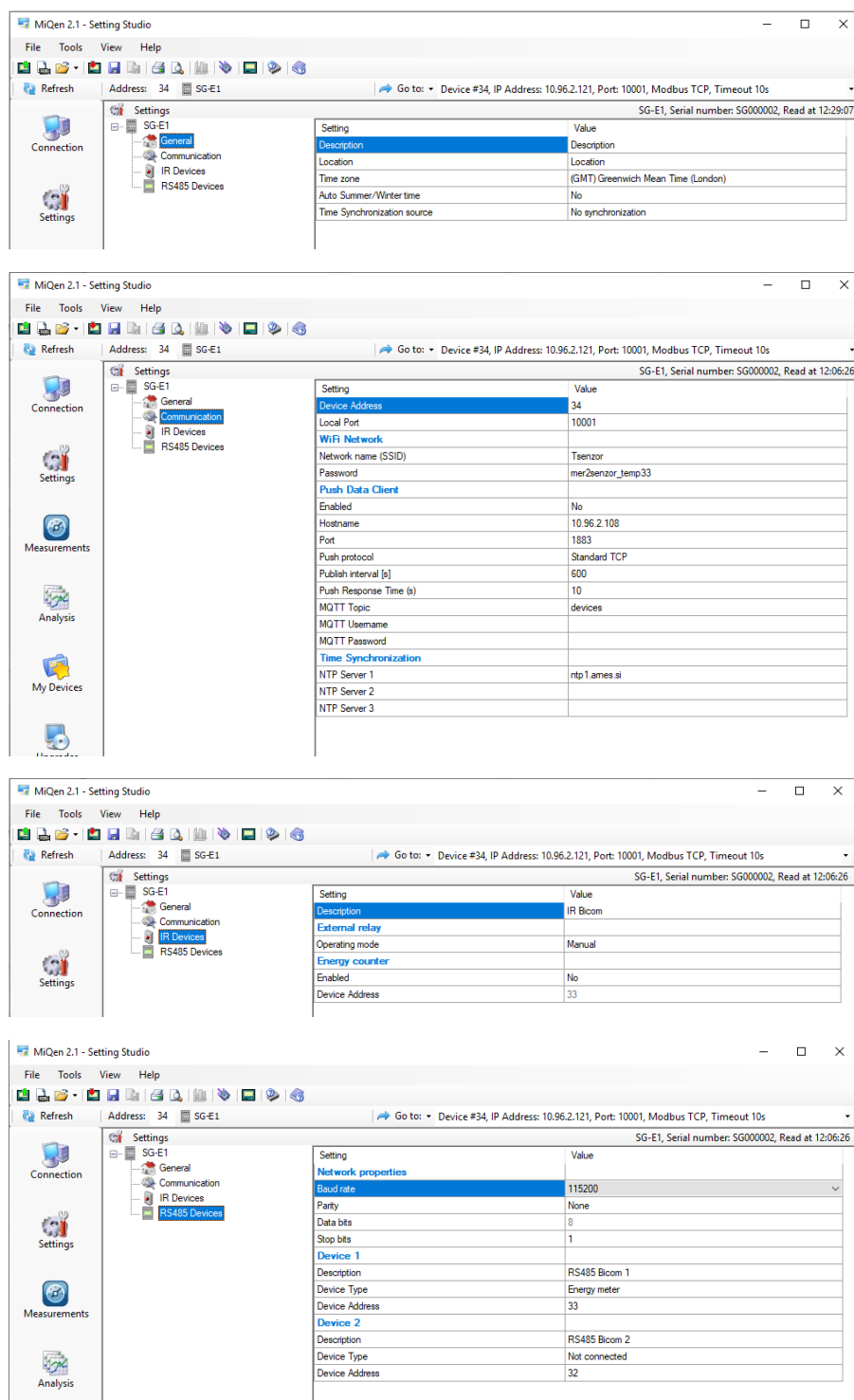


Figure 18: MiQen settings

WARNING

If MiQen is connected to SG via RS485, it will lose connection if you change Device Type from not connected to any other type.

4 SG FUNCTIONS

4.1	SG PUSH/PUBLISH SYSTEM	4-21
4.2	REST API	4-21
4.4	RESET BUTTON	4-39
4.5	FACTORY RESET	4-39
4.6	SG AP (ACCESS POINT) MODE	4-39
4.7	STATIC (FIXED) IP CONFIGURATION	4-39
4.8	MQTT COMMANDS	4-40

4.1 SG Push/Publish system

The SG can be used to publish up to 17 device's measurements to cloud systems. Supported protocols are:

- MQTT (JSON data format)
- Iskra's proprietary push to MiSmart system (XML data format)

As mentioned, SG has possibility to push 17 device's measurement, left IR device and 16 RS486 devices.

Every device has settings for pushing data to 2 different push/publish systems.

For example:

Every device can publish measurements to 2 different MQTT brokers with different time interval. MQTT payload is the same as with REST API (described in REST API chapter)

4.2 REST API

SG can also act as TCP REST API server (JSON data format) for polling measurement data.

Up to 17 connected devices can be used for REST API:

Device	REST API Link for Measurements
Device 1	/get_command?command=get_measurements&number=0
Device 2	/get_command?command=get_measurements&number=1
Device 3	/get_command?command=get_measurements&number=2
...	...
Device 17	/get_command?command=get_measurements&number=16

Device	REST API Link for Energy Counters
Device 1	/get_command?command=get_counters&number=0
Device 2	/get_command?command= get_counters &number=1
Device 3	/get_command?command= get_counters &number=2
...	...
Device 17	/get_command?command= get_counters &number=16

4.2.1 Get settings command

With get_settings command, complete settings are returned in JSON format.

Command: http://sg000013/get_command?command=get_settings

JSON Response:

```
{
  "header": {
    "cmd": "get_settings",
    "timestamp": "28.10.2020 11:40:44"
  },
  "settings": {
    "locked": 0,
    "description": "SG ",    "location": "Home",
    "wifi_ssid": "",
    "wifi_password": "",
    "ntp_server1": "ntp1.arnes.si",
    "ntp_server2": "ntp2.arnes.si",
    "ntp_server3": "ntp3.arnes.si",
    "push1_protocol": 1,
    "push1_resp_time": 10,
    "mqtt1_server": "",
    "mqtt1_port": 1883,
    "mqtt1_cert_file": "",
    "mqtt1_key_file": "",
    "mqtt1_roottopic": "devices/SG000013",
    "mqtt1_sub_topic": "cmd",
    "mqtt1_pub_topic": "publish",
    "mqtt1_username": "",
    "mqtt1_password": "",
    "mqtt1_tls": 0,
    "push2_protocol": 0,
    "push2_resp_time": 10,
    "mqtt2_server": "",
    "mqtt2_port": 1883,
    "mqtt2_cert_file": "",
    "mqtt2_key_file": "",
    "mqtt2_roottopic": "devices",
    "mqtt2_sub_topic": "cmd",
    "mqtt2_pub_topic": "publish",
    "mqtt2_username": "",
    "mqtt2_password": "",
    "mqtt2_tls": 0,
    "connection_mode": 2,
    "wifi_max_retry": 10,
    "sg_modbus_addr": 34,
    "tcp_port": 10001,
    "http_port": 80,
    "timezone": 60,    "time_sync_src": 1,
    "left_ir_enabled": 0,
    "ir_counter_addr": 33,
    "leftir_pushlink": 0,
    "leftir_pushintv": 600,
    "ir_ext_rel_mode": 0,
    "ir_relay_desc": "IR Bicom",
    "rs485_baud_rate": 7,
    "rs485_stop_bits": 0,
    "rs485_parity": 0,
    "rs485_data_bits": 0,
  }
}
```

```
"rs485_type_1": 4,  
"rs485_type_2": 0,  
"rs485_type_3": 0,  
"rs485_type_4": 0,  
"rs485_type_5": 0,  
"rs485_type_6": 0,  
"rs485_type_7": 0,  
"rs485_type_8": 0,  
"rs485_type_9": 0,  
"rs485_type_10": 0,  
"rs485_type_11": 0,  
"rs485_type_12": 0,  
"rs485_type_13": 0,  
"rs485_type_14": 0,  
"rs485_type_15": 0,  
"rs485_type_16": 0,  
"rs485_addr_1": 35,  
"rs485_addr_2": 2,  
"rs485_addr_3": 3,  
"rs485_addr_4": 4,  
"rs485_addr_5": 5,  
"rs485_addr_6": 6,  
"rs485_addr_7": 7,  
"rs485_addr_8": 8,  
"rs485_addr_9": 9,  
"rs485_addr_10": 10,  
"rs485_addr_11": 11,  
"rs485_addr_12": 12,  
"rs485_addr_13": 13,  
"rs485_addr_14": 14,  
"rs485_addr_15": 15,  
"rs485_addr_16": 16,  
"rs485_desc_1": "MC666",  
"rs485_desc_2": "RS485 Device 2",  
"rs485_desc_3": "RS485 Device 3",  
"rs485_desc_4": "RS485 Device 4",  
"rs485_desc_5": "RS485 Device 5",  
"rs485_desc_6": "RS485 Device 6",  
"rs485_desc_7": "RS485 Device 7",  
"rs485_desc_8": "RS485 Device 8",  
"rs485_desc_9": "RS485 Device 9",  
"rs485_desc_10": "RS485 Device 10",  
"rs485_desc_11": "RS485 Device 11",  
"rs485_desc_12": "RS485 Device 12",  
"rs485_desc_13": "RS485 Device 13",  
"rs485_desc_14": "RS485 Device 14",  
"rs485_desc_15": "RS485 Device 15",  
"rs485_desc_16": "RS485 Device 16",  
"rs485_pushInk1": 0,  
"rs485_pushInk2": 0,  
"rs485_pushInk3": 0,  
"rs485_pushInk4": 0,
```

```
"rs485_pushlnk5": 0,  
"rs485_pushlnk6": 0,  
"rs485_pushlnk7": 0,  
"rs485_pushlnk8": 0,  
"rs485_pushlnk9": 0,  
"rs485_pushlnk10": 0,  
"rs485_pushlnk11": 0,  
"rs485_pushlnk12": 0,  
"rs485_pushlnk13": 0,  
"rs485_pushlnk14": 0,  
"rs485_pushlnk15": 0,  
"rs485_pushlnk16": 0,  
"rs485_pushint1": 600,  
"rs485_pushint2": 600,  
"rs485_pushint3": 600,  
"rs485_pushint4": 600,  
"rs485_pushint5": 600,  
"rs485_pushint6": 600,  
"rs485_pushint7": 600,  
"rs485_pushint8": 600,  
"rs485_pushint9": 600,  
"rs485_pushint10": 600,  
"rs485_pushint11": 600,  
"rs485_pushint12": 600,  
"rs485_pushint13": 600,  
"rs485_pushint14": 600,  
"rs485_pushint15": 600,  
"rs485_pushint16": 600,  
"log_disable1": 65535,  
"log_disable2": 65535,  
"mqtt1_loglevel": 3,  
"mqtt2_loglevel": 0,  
"pcnt_threshold": 10,  
"serial_number": "SG000013",  
"model_type": "SG-W1",  
"debug_console": 0  
}  
}
```

4.2.2 Measurements JSON data format

API command: http://SG_IP_address/get_command?command=get_measurements

Example:

http://10.96.2.121/get_command?command=get_measurements&number=0

JSON Response:

```
{
  "header": {
    "cmd"           : "get_measurements",
    "number"        : 0,
    "modbus_addr"   : 33,
    "local_time"    : "25.02.2020 13:18:42",
    "description"   : " WM3M4C ",
    "location"      : "Here",
    "model"         : "WM3M4C",
    "serial_number" : "18230001"
  },
  "measurements": {
    "frequency": "50.01 ",
    "U1": "220.5 V",
    "U2": "220.6 V",
    "U3": "220.5 V",
    "I1": "0.074 A",
    "I2": "0.045 A",
    "I3": "0.019 A",
    "P0": "6.5 W",
    "P1": "2.6 W",
    "P2": "2.2 W",
    "P3": "1.7 W",
    "Q0": "-27.7 var",
    "Q1": "-15.6 var",
    "Q2": "-9.0 var",
    "Q3": "-2.9 var",
    "S0": "30.5 VA",
    "S1": "16.4 VA",
    "S2": "9.8 VA",
    "S3": "4.2 VA",
    "PF0": "0.2124 Cap",
    "PF1": "0.1607 Cap",
    "PF2": "0.2190 Cap",
    "PF3": "0.3984 Cap",
    "PA0": "-76.91",
    "PA1": "-80.57",
    "PA2": "-76.82",
    "PA3": "-60.85",
    "Tint": "36.70",
    "THDI1": "23.36",
    "THDI2": "31.12",
    "THDI3": "74.02",
    "THDUp1": "2.50",
    "THDUp2": "2.51",
    "THDUp3": "2.51",
    "tariff": 1
  }
}
```

4.2.3 Energy counters data format

API command: http://SG_IP_address/get_command?command=get_counters

Example:

http://10.96.2.121/get_command?command=get_counters&number=0

JSON Response:

```
{
  "header": {
    "cmd": "get_energy_counters",
    "number": 0,
    "total": 2,
    "local_time": "28.10.2020 09:00:36",
    "modbus_addr": 33,
    "description": "IE38",
    "location": "Here",
    "model": "-",
    "serial_number": "X0000121",
    "resetable_counters": 16,
    "non_resetable_counters": 4
  },
  "counters": {
    "counter1nr": "0.2 kWh",
    "counter2nr": "0.0 kWh",
    "counter3nr": "0.0 kvarh",
    "counter4nr": "0.0 kvarh",
    "counter1": "0.2 kWh",
    "counter2": "0.0 kWh",
    "counter3": "0.0 kvarh",
    "counter4": "0.0 kvarh",
    "counter5": "0.2 kWh",
    "counter6": "0.0 kWh",
    "counter7": "0.0 kvarh",
    "counter8": "0.0 kvarh",
    "counter9": "0.00 kWh",
    "counter10": "0.00 kWh",
    "counter11": "0.00 kvarh",
    "counter12": "0.00 kvarh",
    "counter13": "0.00 k",
    "counter14": "0.00 k",
    "counter15": "0.00 k",
    "counter16": "0.00 k"
  },
  "settings": {
    "phase1nr": "Total",
    "phase2nr": "Total",
    "phase3nr": "Total",
    "phase4nr": "Total",
    "phase1": "Total",
    "phase2": "Total",
    "phase3": "Total",
    "phase4": "Total",
    "phase5": "Total",
    "phase6": "Total",
    "phase7": "Total",
    "phase8": "Total",
    "phase9": "Total",
  }
}
```



```
"phase10": "Total",  
"phase11": "Total",  
"phase12": "Total",  
"phase13": "Total",  
"phase14": "Total",  
"phase15": "Total",  
"phase16": "Total",  
"tariff1nr": "1 2 3 4 ",  
"tariff2nr": "1 2 3 4 ",  
"tariff3nr": "1 2 3 4 ",  
"tariff4nr": "1 2 3 4 ",  
"tariff1": "1 2 3 4 ",  
"tariff2": "1 2 3 4 ",  
"tariff3": "1 2 3 4 ",  
"tariff4": "1 2 3 4 ",  
"tariff5": "1 2 3 4 ",  
"tariff6": "1 2 3 4 ",  
"tariff7": "1 2 3 4 ",  
"tariff8": "1 2 3 4 ",  
"tariff9": "",  
"tariff10": "",  
"tariff11": "",  
"tariff12": "",  
"tariff13": "",  
"tariff14": "",  
"tariff15": "",  
"tariff16": ""  
}  
}
```

4.2.4 IoT use case

You can use SG to connect energy meter with RS485 communication to home automation SW like “Home assistant”.

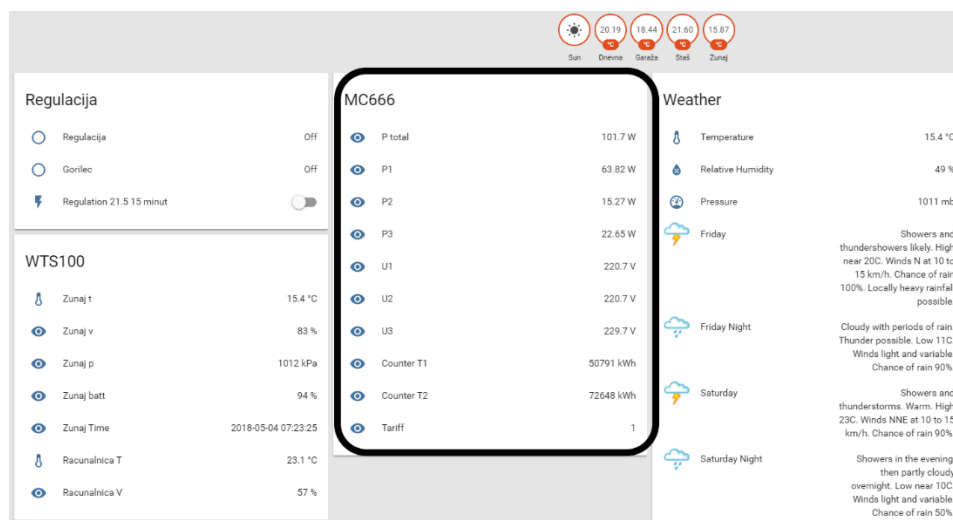


Figure 19: Home assistant screen

MC666 is energy meter, Home assistant is configured to read active powers and voltages.

Example of REST configuration for U1 measurement:

```
- platform: rest
  resource: http://sg000013/get_command?command=get_measurements
  name: 'U1'
  unit_of_measurement: 'V'
  value_template: '{{ value_json.measurements.U1.split(" ")[0] }}'
```

4.3 SG WEB interface

The SG WEB interface is intended to display statuses, measuring data, change settings and provide an interface for SW upgrade.

Pages for measuring data displays results of maximum 3 connected devices.

4.3.1 Status page

Status provides basic device status and settings.

Iskra

SG Status

SG Status	General	
SG Settings	Model Type	SG-E1
	Serial number	SG000039
	Connection mode	Ethernet
	Description	Description
	Location	Location
	Flash Size	8 MB
	EEPROM	2 kB
	SG Status	
	IP address	10.96.2.143
Measurements	MAC address	98:F4:AB:0E:60:17
	App Status	Normal
	Upgrade Status	OK
	MQTT 1 Status	Connected
	MQTT 2 Status	Disabled
	Settings CRC	0x9BCD (0x9BCD)
	Free Memory	109636 (86524)
	Error flags	0x00000000
	Version Info	
Energy Counters	SW Version	78
	HW Version	B
	Filesystem Version	32
	Other	
	Temperature	N/A °C
	Digital input count	0
	Uptime	0d 00:46:15
	Local Time	06.09.2021 09:52:09
	Load Profile	
Energy Recorder		
External Devices		
Bicom control		
SG Upgrade		

Figure 20: ISKRA SG status screen

4.3.2 SG Settings

SG Settings segment consists of General, Communication, IR Devices, and RS485 Devices section. General section is intended for general settings and time settings. Communication section sets SG communication and MQTT settings. IR Devices section is intended for IR relay and IR counter settings. RS485 Devices sets settings of RS485 communication.



SG Settings

SG Status	General
SG Settings	General Communication IR Devices RS485 Devices General Settings Description: Description Location: Location Connection Mode: ☐ WiFi ☒ Ethernet WiFi SSID: Tsenzor WiFi Password: ***** ☒ Obtain an IP address automatically (DHCP) ☐ Use following IP address IP: 10.98.2.143 Gateway: 10.98.0.1 Netmask: 255.255.252.0 DNS1: 8.8.8.8 DNS2: 8.8.4.4 Use WiFi AP as a fallback connection: ☒ Disabled ☐ Enabled TCP Modbus: ☐ Disabled ☒ Enabled UDP Discovery: ☐ Disabled ☒ Enabled Pulse counter: ☒ Disabled ☐ Enabled Temperature input: ☒ Disabled ☐ Enabled Local Modbus Address: 34 Local TCP Modbus Port: 10001 Local Http Port: 80 Energy Recorder 1 Counter: 0 Time Settings NTP Synchronization: ☐ Disabled ☒ Enabled Timezone: (+1:00) European Central Time (Brussels) ▼ NTP Servers: ntp1.arnes.si ntp2.arnes.si ntp3.arnes.si Debug settings ☒ Internal port ☐ RS485 port Debug 1 value: 0 Debug 2 value: 0 Debug task: ☒ Disabled ☐ Enabled Save settings

Figure 21: SG settings: General section



SG SETTINGS

SG Status SG Settings Measurements Energy Counters Load Profile Energy Recorder External Devices Bicom control SG Upgrade	General Communication IR Devices RS485 Devices Push / Publish Link 1: Push protocol: ☐ Disabled ☒ MQTT ☐ Standard TCP MQTT/PUSH Server: 10.96.2.94 MQTT/PUSH Port: 1883 Push response time: 10 MQTT Protocol: ☒ MQTT over TCP ☐ MQTT over SSL ☐ MQTT over SSL Mutual Auth MQTT Username: MQTT Password: MQTT Root Topic: SG000039 MQTT Subscribe topic: cmd MQTT Publish topic: publish MQTT Server certificate filename: MQTT Client certificate filename: MQTT Client Private key filename: MQTT Logging: Warnings Push / Publish Link 2: Push protocol: ☒ Disabled ☐ MQTT ☐ Standard TCP MQTT/PUSH Server: MQTT/PUSH Port: 1883 Push response time: 10 MQTT Protocol: ☒ MQTT over TCP ☐ MQTT over SSL ☐ MQTT over SSL Mutual Auth MQTT Username: MQTT Password: MQTT Root Topic: SG000039 MQTT Subscribe topic: cmd MQTT Publish topic: publish MQTT Server certificate filename: MQTT Client certificate filename: MQTT Client Private key filename: MQTT Logging: No Logging Save settings
---	---

Figure 22: SG settings: Communication

 **Iskra**

SG Settings

SG Status

SG Settings

Measurements

Energy Counters

Load Profile

Energy Recorder

External Devices

Bicom control

SG Upgrade

General

Communication

IR Devices

RS485 Devices

IR Energy Counter:

☐ Disabled

☒ Enabled

IR Energy Counter Modbus Address:

IR Energy Counter Push/Publish:

IR Energy Counter Push/Publish Interval:

IR Relay

IR Relay Operating Mode:

☒ Not Connected

☐ Controlled by SG

☐ Controlled by IR Counter

IR Relay Push/Publish:

IR Relay Push/Publish Interval:

IR Relay Description:

Save settings

Figure 23: SG settings: IR devices


Iskra

SG SETTINGS

	General	Communication	IR Devices	RS485 Devices
SG Settings				
SG Status				
Measurements				
Energy Counters				
Power Graph				
External Devices				
Bicom control				
SG Upgrade				

RS485 Communication parameters:

RS485 Baud Rate:

RS485 Parity:

☒ None

☐ Odd

☐ Even

RS485 Stop Bits:

☒ 1

☐ 2

RS 485 Device 1

RS 485 Device 1 Type:

RS 485 Device 1 Modbus Address:

RS 485 Device 1 Push/Publish:

RS 485 Device 1 Push/Publish Interval:

RS 485 Device 1 Description:

RS 485 Device 2

RS 485 Device 2 Type:

RS 485 Device 2 Modbus Address:

RS 485 Device 2 Push/Publish:

RS 485 Device 2 Push/Publish Interval:

RS 485 Device 2 Description:

RS 485 Device 5

RS 485 Device 5 Modbus Address:

RS 485 Device 5 Push/Publish:

RS 485 Device 5 Push/Publish Interval:

RS 485 Device 5 Description:

RS 485 Device 6

RS 485 Device 6 Type:

RS 485 Device 6 Modbus Address:

RS 485 Device 6 Push/Publish:

RS 485 Device 6 Push/Publish Interval:

RS 485 Device 6 Description:

RS 485 Device 7

RS 485 Device 7 Type:

RS 485 Device 7 Modbus Address:

RS 485 Device 7 Push/Publish:

RS 485 Device 7 Push/Publish Interval:

RS 485 Device 7 Description:

RS 485 Device 8

RS 485 Device 8 Type:

RS 485 Device 8 Modbus Address:

RS 485 Device 8 Push/Publish:

RS 485 Device 8 Push/Publish Interval:

RS 485 Device 8 Description:

Figure 24: SG settings: RS485 devices

4.3.3 Energy counters

Energy Counters page displays energy counter values for connected devices.

 COUNTERS																																																																															
SG Status	Device 1 ▾																																																																														
SG Settings																																																																															
Measurements																																																																															
Energy Counters																																																																															
Power Graph																																																																															
External Devices																																																																															
Bicom control																																																																															
SG Upgrade																																																																															
	Device Model IE38MDC Device Serial Number X0000121 Device Modbus Address 33 Device Description IE38 Marjan Device Location Pr men																																																																														
	<table> <tr> <th>Counters (Reset)</th><th>Counter Value</th></tr> <tr> <td>Counter 1 - Total</td><td></td></tr> <tr> <td>Tariff:1 2 3 4</td><td>0.0 kWh</td></tr> <tr> <td>Direction:</td><td></td></tr> <tr> <td>Counter 2 - Total</td><td></td></tr> <tr> <td>Tariff:1 2 3 4</td><td>0.0 kWh</td></tr> <tr> <td>Direction:</td><td></td></tr> <tr> <td>Counter 3 - Total</td><td></td></tr> <tr> <td>Tariff:1 2 3 4</td><td>0.0 kvarh</td></tr> <tr> <td>Direction:</td><td></td></tr> <tr> <td>Counter 4 - Total</td><td></td></tr> <tr> <td>Tariff:1 2 3 4</td><td>0.0 kvarh</td></tr> <tr> <td>Direction:</td><td></td></tr> <tr> <td>Counter 5 - Total</td><td></td></tr> <tr> <td>Tariff:1 2 3 4</td><td>0.0 kWh</td></tr> <tr> <td>Direction:</td><td></td></tr> <tr> <td>Counter 6 - Total</td><td></td></tr> <tr> <td>Tariff:1 2 3 4</td><td>0.0 kWh</td></tr> <tr> <td>Direction:</td><td></td></tr> <tr> <td>Counter 7 - Total</td><td></td></tr> <tr> <td>Tariff:1 2 3 4</td><td>0.0 kvarh</td></tr> <tr> <td>Direction:</td><td></td></tr> <tr> <td>Counter 8 - Total</td><td></td></tr> <tr> <td>Tariff:1 2 3 4</td><td>0.0 kvarh</td></tr> <tr> <td>Direction:</td><td></td></tr> <tr> <th>Counters (Non Reset)</th><th>Counter value</th></tr> <tr> <td>Counter 1 - Total</td><td></td></tr> <tr> <td>Tariff:1 2 3 4</td><td>12345678.9 kWh</td></tr> <tr> <td>Direction:</td><td></td></tr> <tr> <td>Counter 2 - Total</td><td></td></tr> <tr> <td>Tariff:1 2 3 4</td><td>23456789.0 kWh</td></tr> <tr> <td>Direction:</td><td></td></tr> <tr> <td>Counter 3 - Total</td><td></td></tr> <tr> <td>Tariff:1 2 3 4</td><td>0.0 kvarh</td></tr> <tr> <td>Direction:</td><td></td></tr> <tr> <td>Counter 4 - Total</td><td></td></tr> <tr> <td>Tariff:1 2 3 4</td><td>0.0 kvarh</td></tr> <tr> <td>Direction:</td><td></td></tr> <tr> <td colspan="2">Local Time: 28.10.2020 09:49:53</td></tr> </table>	Counters (Reset)	Counter Value	Counter 1 - Total		Tariff:1 2 3 4	0.0 kWh	Direction:		Counter 2 - Total		Tariff:1 2 3 4	0.0 kWh	Direction:		Counter 3 - Total		Tariff:1 2 3 4	0.0 kvarh	Direction:		Counter 4 - Total		Tariff:1 2 3 4	0.0 kvarh	Direction:		Counter 5 - Total		Tariff:1 2 3 4	0.0 kWh	Direction:		Counter 6 - Total		Tariff:1 2 3 4	0.0 kWh	Direction:		Counter 7 - Total		Tariff:1 2 3 4	0.0 kvarh	Direction:		Counter 8 - Total		Tariff:1 2 3 4	0.0 kvarh	Direction:		Counters (Non Reset)	Counter value	Counter 1 - Total		Tariff:1 2 3 4	12345678.9 kWh	Direction:		Counter 2 - Total		Tariff:1 2 3 4	23456789.0 kWh	Direction:		Counter 3 - Total		Tariff:1 2 3 4	0.0 kvarh	Direction:		Counter 4 - Total		Tariff:1 2 3 4	0.0 kvarh	Direction:		Local Time: 28.10.2020 09:49:53	
Counters (Reset)	Counter Value																																																																														
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Tariff:1 2 3 4	0.0 kWh																																																																														
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Tariff:1 2 3 4	0.0 kvarh																																																																														
Direction:																																																																															
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Tariff:1 2 3 4	0.0 kvarh																																																																														
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Tariff:1 2 3 4	0.0 kWh																																																																														
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Counter 6 - Total																																																																															
Tariff:1 2 3 4	0.0 kWh																																																																														
Direction:																																																																															
Counter 7 - Total																																																																															
Tariff:1 2 3 4	0.0 kvarh																																																																														
Direction:																																																																															
Counter 8 - Total																																																																															
Tariff:1 2 3 4	0.0 kvarh																																																																														
Direction:																																																																															
Counters (Non Reset)	Counter value																																																																														
Counter 1 - Total																																																																															
Tariff:1 2 3 4	12345678.9 kWh																																																																														
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Tariff:1 2 3 4	0.0 kvarh																																																																														
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Counter 4 - Total																																																																															
Tariff:1 2 3 4	0.0 kvarh																																																																														
Direction:																																																																															
Local Time: 28.10.2020 09:49:53																																																																															

Figure 25: COUNTERS screen

4.3.4 Measurements

Measurements page displays basic measuring data from connected devices.

 MEASUREMENTS																																																																																													
SG Status	Device 1 ▾																																																																																												
SG Settings																																																																																													
Measurements																																																																																													
Energy Counters																																																																																													
Power Graph																																																																																													
External Devices																																																																																													
Bicom control																																																																																													
SG Upgrade																																																																																													
	<table> <tr> <td>Device Model</td><td>IE38MDC</td></tr> <tr> <td>Device Serial Number</td><td>X0000121</td></tr> <tr> <td>Device Modbus Address</td><td>33</td></tr> <tr> <td>Device Description</td><td>IE38 Marjan</td></tr> <tr> <td>Device Location</td><td>Pr men</td></tr> <tr> <td>Phase 1</td><td>Value</td></tr> <tr> <td>U1</td><td>0.0 mV</td></tr> <tr> <td>I1</td><td>0.0 A</td></tr> <tr> <td>Real Power</td><td>0.0 W</td></tr> <tr> <td>Reactive Power</td><td>0.0 var</td></tr> <tr> <td>Apparent Power</td><td>0.0 VA</td></tr> <tr> <td>Power Factor</td><td>1.0 Ind</td></tr> <tr> <td>Power Angle</td><td>0.00°</td></tr> <tr> <td>THD-Up</td><td>0.00%</td></tr> <tr> <td>THD-I</td><td>0.00%</td></tr> <tr> <td>Phase 2</td><td>Value</td></tr> <tr> <td>U2</td><td>0.0 mV</td></tr> <tr> <td>I2</td><td>0.0 A</td></tr> <tr> <td>Real Power</td><td>0.0 W</td></tr> <tr> <td>Reactive Power</td><td>0.0 var</td></tr> <tr> <td>Apparent Power</td><td>0.0 VA</td></tr> <tr> <td>Power Factor</td><td>1.0 Ind</td></tr> <tr> <td>Power Angle</td><td>0.00°</td></tr> <tr> <td>THD-Up</td><td>0.00%</td></tr> <tr> <td>THD-I</td><td>0.00%</td></tr> <tr> <td>Phase 3</td><td>Value</td></tr> <tr> <td>U3</td><td>248.5 V</td></tr> <tr> <td>I3</td><td>0.0 A</td></tr> <tr> <td>Real Power</td><td>0.0 W</td></tr> <tr> <td>Reactive Power</td><td>0.0 var</td></tr> <tr> <td>Apparent Power</td><td>0.0 VA</td></tr> <tr> <td>Power Factor</td><td>1.0 Ind</td></tr> <tr> <td>Power Angle</td><td>0.00°</td></tr> <tr> <td>THD-Up</td><td>3.29%</td></tr> <tr> <td>THD-I</td><td>0.00%</td></tr> <tr> <td>Total</td><td>Value</td></tr> <tr> <td>Total Real Power</td><td>0.0 W</td></tr> <tr> <td>Total Reactive Power</td><td>0.0 var</td></tr> <tr> <td>Total Apparent Power</td><td>0.0 VA</td></tr> <tr> <td>Total Power Factor</td><td>1.0 Ind</td></tr> <tr> <td>Total Power Angle</td><td>0.00°</td></tr> <tr> <td>Others</td><td>Value</td></tr> <tr> <td>Frequency</td><td>50.03 Hz</td></tr> <tr> <td>Internal Temperature</td><td>32.70°C</td></tr> <tr> <td>Active Tariff</td><td>1</td></tr> <tr> <td>Local Time</td><td>28.10.2020 09:47:44</td></tr> </table>	Device Model	IE38MDC	Device Serial Number	X0000121	Device Modbus Address	33	Device Description	IE38 Marjan	Device Location	Pr men	Phase 1	Value	U1	0.0 mV	I1	0.0 A	Real Power	0.0 W	Reactive Power	0.0 var	Apparent Power	0.0 VA	Power Factor	1.0 Ind	Power Angle	0.00°	THD-Up	0.00%	THD-I	0.00%	Phase 2	Value	U2	0.0 mV	I2	0.0 A	Real Power	0.0 W	Reactive Power	0.0 var	Apparent Power	0.0 VA	Power Factor	1.0 Ind	Power Angle	0.00°	THD-Up	0.00%	THD-I	0.00%	Phase 3	Value	U3	248.5 V	I3	0.0 A	Real Power	0.0 W	Reactive Power	0.0 var	Apparent Power	0.0 VA	Power Factor	1.0 Ind	Power Angle	0.00°	THD-Up	3.29%	THD-I	0.00%	Total	Value	Total Real Power	0.0 W	Total Reactive Power	0.0 var	Total Apparent Power	0.0 VA	Total Power Factor	1.0 Ind	Total Power Angle	0.00°	Others	Value	Frequency	50.03 Hz	Internal Temperature	32.70°C	Active Tariff	1	Local Time	28.10.2020 09:47:44
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Active Tariff	1																																																																																												
Local Time	28.10.2020 09:47:44																																																																																												

Figure 26: MEASUREMENTS screen

4.3.5 Load Profile

Load Profile page displays measurements of energy per time (last 24 hours) in 15 minutes intervals.

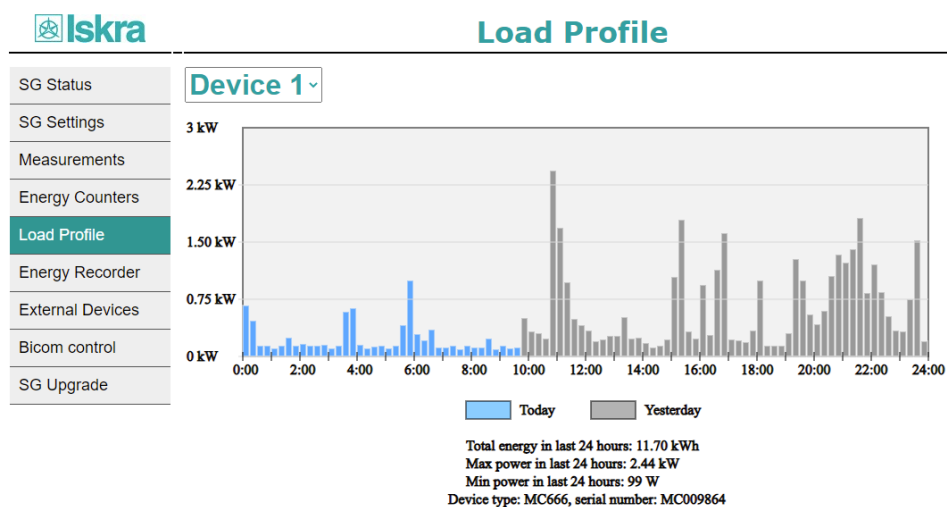


Figure 27: Load Profile graph screen

4.3.6 External Devices

External devices page displays all devices connected to SG

Iskra External Devices	
SG Status	External Device Model Serial no. Modbus addr
SG Settings	Left IR Device WM3M4C W4124940 33
Measurements	Right IR Device Disabled
Energy Counters	RS 485 Device 1 Disabled 35
Load Profile	RS 485 Device 2 Disabled 36
Energy Recorder	RS 485 Device 3 BI432 BI010001 31
External Devices	RS 485 Device 4 BI432 BI001487 32
Bicom control	RS 485 Device 5 Disabled 5
SG Upgrade	RS 485 Device 6 Disabled 6
	RS 485 Device 7 Disabled 7
	RS 485 Device 8 Disabled 8
	RS 485 Device 9 Disabled 9
	RS 485 Device 10 Disabled 10
	RS 485 Device 11 Disabled 11
	RS 485 Device 12 Disabled 12
	RS 485 Device 13 Disabled 13
	RS 485 Device 14 Disabled 14
	RS 485 Device 15 Disabled 15
	RS 485 Device 16 Disabled 16

Figure 28: External devices screen

4.3.7 Bicom control

There are up to three bicom controls on web page. Every Bicom has ON, OFF and Toggle button.

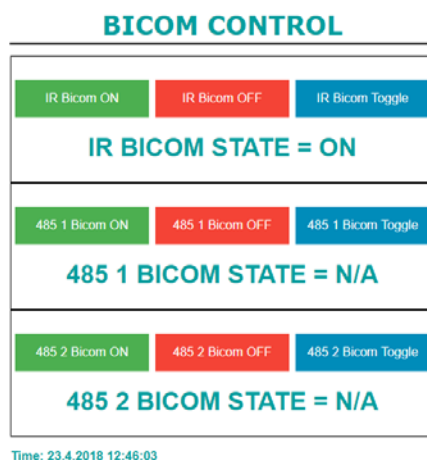


Figure 29: BICOM CONTROL screen

4.3.8 Upgrade

SG supports firmware upgrade via HTTPS WEB server.

User must enter URL of upgrade file and select certificate for WEB server verification. Certificate must be present on SG's internal filesystem.

If there is no certificate present on device, click on **Certificate Manager** button and add certificate file.

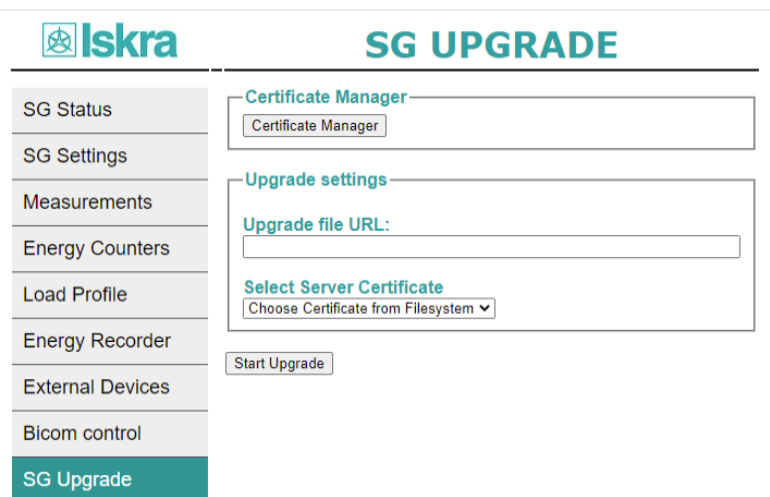


Figure 30: Upgrade WEB page

WARNING

When Start Upgrade button is clicked SG is redirected to status page. If not, wait a few seconds and click again.

It is possible that default setting will be applied after upgrade. Also provisioning must be done again.

4.3.9 Certificate manager

Server certificate must be present on SG to perform upgrade. Certificate file can be uploaded with certificate manager.

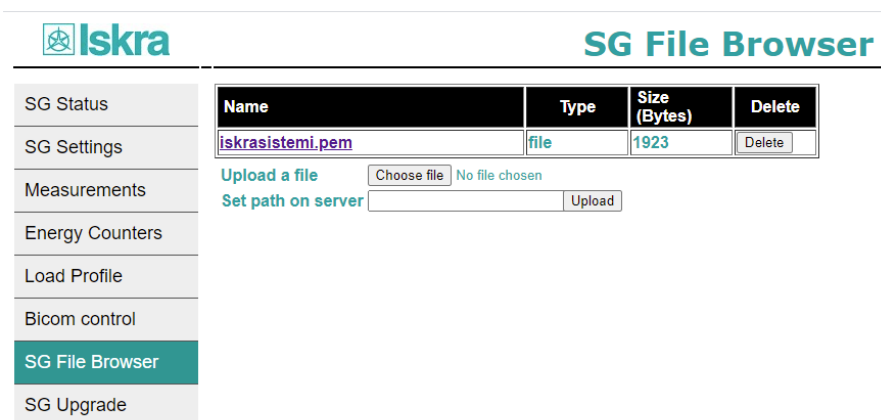


Figure 31: Certificate manager WEB page

4.4 Reset button

SG is using capacitive touch sensor as reset button. Reset must be pressed at least 2 seconds to reset SG.

4.5 Factory reset

Factory reset is a way to restore the device to its original (factory) settings. Wi-Fi provisioning data is also deleted, so provisioning must be done again.

Factory reset procedure:

1. Press and hold reset button (orange LED is blinking slowly).
2. After 10 seconds green LED blinks and reset must be released.
3. Within 10 seconds press and hold reset button again (red LED is blinking slowly).
4. After 10 seconds red LED blinks to indicate success.

4.6 SG AP (access point) mode

If **Use WiFi AP as a fallback connection** setting is selected, then SG acts as a Wi-Fi access point when SG can't connect to Wi-Fi or Ethernet network.

Name of AP is serial number of SG (ISxxxxxx). Password is set to 12345678.

IP address of SG is 192.168.4.1.

4.7 Static (fixed) IP configuration

SG can be set to use static IP instead of DHCP.

WEB settings:

- ☐ Obtain an IP address automatically (DHCP)
☒ Use following IP address

IP:
 Gateway:
 Netmask:
 DNS1:
 DNS2:

MiQen settings:

Network connection	Ethernet
Static (fixed) IP Address	Yes
IP Address	10.96.2.143
Subnet Mask	255.255.252.0
Gateway Address	10.96.0.1
Primary DNS server	8.8.8.8
Secondary DNS server	8.8.4.4

4.8 MQTT commands

SG can receive MQTT commands published to \$root_topic/\$subscribe_topic. Topics are settable in communication settings. MQTT commands must be in JSON format. List of MQTT commands:

4.8.1 Upgrade command

```
{
  "data": {
    "cmd": "upgrade_app",
    "uri": "https://fwupdate.iskrasistemi.si/SG-78.bin",
    "cert": "iskrasistemi.pem"
  }
}
```

4.8.2 Reboot command

```
{
  "data": {
    "cmd": "reboot"
  }
}
```

4.8.3 Get settings command

```
{
  "data": {
    "cmd": "get_settings"
  }
}
```

4.8.4 Set settings command

With set settings command every single setting can be changed. Settings names and format can be read with get_settings command.

```
{
  "data": {
    "cmd": "set_settings",
    "mqtt_tls": 1,
    "mqtt_port": 8883,
    "connection_mode": 2
  }
}
```

4.8.5 Get measurements command

Measurements from connected devices can be read with measurements command. Argument addr is modbus address of device. Address 0 is used for IR device.

```
{
  "data": {
    "cmd": "measurements",
    "addr": 0
  }
}
```

4.8.6 Get counters command

Energy consumption counters of connected devices command.

```
{
  "data": {
    "cmd": "counters",
    "addr": 35
  }
}
```

4.8.7 Bicom command

Bicom command is used to manipulate bistable switches. Address 0 is used for IR device. Val arguments are: on, off and status.

```
{
  "data": {
    "cmd": "bicom",
    "addr": 32,
    "val": "on"
  }
}
```

4.8.8 Detect 485 devices command

Command is used to detect devices connected to RS485 interface. Baud rate and stop bits needs to be specified as arguments to command.

```
{
  "data": {
    "cmd": "detect_485_devices",
    "baud_rate": 19200,
    "stop_bits": 2
  }
}
```

4.8.9 Modbus commands

Following modbus commands are supported on SG:

- Read modbus registers
- Write single modbus register
- Write multiple modbus registers

Every command supports addressing by modbus address or by serial number.

4.8.9.1 Read Modbus command

```
{
  "data": {
    "cmd": "modbus_read",
    "modbus_address": 33,
    "reg": 40156,
    "no_regs": 1
  }
}
```

```
"data": {
  "cmd": "modbus_read",
  "serial_number": "MC024305",
  "reg": 40156,
  "no_regs": 1
}
```

Response is:

```
{
  "cmd": "modbus_read",
  "modbus address": 33,
  "register": 40156,
  "number of registers": 1,
  "values": ["0x0002"]
}
```

4.8.9.2 Write Modbus single register

```
{
  "data": {
    "cmd": "modbus_write_single",
    "modbus_address": 33,
    "reg": 40156,
    "value": 0
  }
}
{
  "data": {
    "cmd": "modbus_write_single",
    "serial_number": "MC024305",
    "reg": 40156,
    "value": 4
  }
}
```

4.8.9.3 Write Modbus multiple registers

Values are in byte format and number of bytes should be odd.

```
{
  "data": {
    "cmd": "modbus_write_multi",
    "modbus_address": 33,
    "reg": 40101,
    "values": [65, 66]
  }
}

{

{
  "data": {
    "cmd": "modbus_write_multi",
    "serial_number": "MC024305",
    "reg": 40101,
    "values": [65, 66]
  }
}
```


4.8.9.4 Write certificate command

SG can receive certificate over MQTT and save it to local filesystem.

```
{
  "data": {
    "cmd": "write_cert",
    "name": "certificate_name.pem",
    "cert": "-----BEGIN CERTIFICATE-----
MIIFYDCCBEigAwIBAgIQAF3ITfU6UK47naqPGQKtZANBgqhkiG9w0BAQsFADA/
MSQwIgYDVQQKEExtEawdpdGFsIFNpZ25hdHVyZSBucnVzdCBDbY4xZzAVBgNVBAMT
DKRTVCBSb290IENBIFgzMB4XDTIxMDEyMDE5MTQwM10XDTI0MDkzMDE4MTQwM1ow
TzELMAkGA1UEBhMCVVMxKTAnBgNVBAoTIEludGVybmV0IFNlY3VyaXR5IFJlc2Vh
cmNoIEdyb3VwMRUwEwYDVQQDEwxJU1JHIFJvb3QgWDEwggIiMA0GCSqGSIb3DQEB
AQUAAAIcDwAwggIKAoICAQCt6CRz9BQ385ueK1coHIe+3Lff0JCMbjzmV6B493XC
ov71am72AE8o295ohmxEk7axY/0UEmu/H9LqMZshftEzPLpI9d153704/xLxIZpL
wYqGcWlKZmSj348cL+tKSIG8+TA5oCu4kuPt5l+LA0f00eXfJlII1PoOK5PCm+D
LtFJV4yAdLbaL9A4jXsDcCEbdfIwPPqPrt3aY6vrFk/CjhFLfs8L6P+1dy70sntK
4EwSJQxwjQMpoOFTJ0wT2e4ZvxCzSow/iaNhUd6shweU9GNx7C7ib1uYgeGJXDR5
bHbv05BieebbpJovJsXQE0E03tkQjhb7t/eo98fLAgeYjzYIlefIn5YNNnWe+w5y
sR2bvAP5SQXYgd0FtCrWQemsAXaVCg/Y39W9Eh81LYgXbNKYwagJZHduRze6zqxZ
Xmidf3LwicUGQSk+WT7dJvUkyRGnWqNMQB9GoZm1pZpRboY7nn1ypxIFeFntPLf4
FQsDj43QLwWyPntKHETzBRL8xurgUBN8Q5N0s8p0544fAQjQMNRbcTa0B7rBMDbc
SLeC05imfWCKoqMpgsy6vYMEG6KDA0Gh1gXxG8K28Kh8hjtGqEgqiNx2mna/H2qL
PRmP6zjzZN7IKw0KKP/32+IVQtQi0Cdd4Xn+G0dwik105tmL0sbdJ1Fu/7xk9TND
TwIDAQABo4IBRjCCAUIwDwYDVR0TAQH/BAUwAwEB/zA0BgNVHQ8BAf8EBAMCAQYw
SwYIKwYBBQUHAQEPPzA9MDsGCCsGAQUFBzAChi9odHRwOi8vYXBwcy5pZGVudHJ1
c3QuY29tL3Jvb3RzL2RzdHJvb3RjYXgzLnA3YzAfBgNVHSMEGDAWgBTEp7Gkeyxx
+tvhS5B1/8QVYIWJEDBUBgNVHSAETTLMAgGBmeBDAECATA/BgsrBgEEAYLfEwEB
ATAwMC4GCCsGAQUFBwIBFiJodHRwOi8vY3BzLnJvb3QteDEubGV0c2VudVY3J5cHQu
b3JnMDwGA1UdHwQ1MDMwMAAvoC2GK2h0dHA6Ly9jcmwuaWRlbnRydXN0LmNvbS9E
U1RST09UQ0FYM0NSTC5jcmwwHQYDVRO0BBYEFHm0WeZ7tuXkAX0ACIjIGlj26Ztu
MA0GCSqGSIb3DQEBChwUAA4IBAQAkwBsIm7/DLLQrt2M51oGrS+o44+/yQoDFVDC
5WxCu2+b9LRPwkSICHXM6webFGJueN7sJ7o5XPWioW5WlHAQU7G75K/QosMrAdSW
9MUgNTP52GE24HGNTLi1qoJFlcDyqSMo59ahy2cI2qBDLKobkx/J3vWraV0T9VuG
WCLKTVXkcGdtwlfFRjLBz4pYg1htmf5X6DY08A4jqv2I19DjXA6USbw1FzXSLr90
he8Y4IWS6wY7bCkjcWdCRQJMEhg76fs03txE+FiYruq9RUWhiF1myv4Q6W+CyBFC
Dfvp700GAN6dEOM4+qR9sdjoSYKEBpsr6GtPAQw4dy753ec5
-----END CERTIFICATE-----
"
  }
}
```

5 TECHNICAL DATA

In following chapter all technical data regarding operation of a three-phase electrical energy meter is presented.

5.1	MECHANICAL CHARACTERISTICS OF INPUT	5-45
5.2	POWER SUPPLY INPUT	5-45
5.3	LED	5-45
5.4	Wi-Fi	5-45
5.5	IR SERIAL COMMUNICATION	5-45
5.6	ETHERNET (ONLY FOR SG-E1)	5-46
5.7	RS485 SERIAL COMMUNICATION	5-46
5.8	DIGITAL INPUT	5-46
5.9	TEMPERATURE SENSOR (Pt1000) INPUT	5-46
5.10	SAFETY AND AMBIENT CONDITIONS	5-46
5.11	EC DIRECTIVES CONFORMITY	5-47
5.12	DIMENSIONS	5-47

5.1 Mechanical characteristics of input

Rail mounting according DIN EN 60715.

Terminals		Max. conductor cross-sections
Main inputs	Contacts capacity:	0.5 mm ² ... 3 mm ²
	Connection screws:	M3
	Max torque:	0.5 Nm
	Length of removed isolation:	6 mm
RS485 module	Contacts capacity:	0.5 mm ² ... 3 mm ²
	Connection screws:	M3
	Max torque:	0.5 Nm
	Length of removed isolation:	6 mm

5.2 Power Supply input

Nominal voltage U_n :	From 85 V to 265 V AC or 85 V to 300 V DC
Power consumption:	< 3 W
Nominal frequency f_n :	50 Hz and 60 Hz
Length of removed isolation:	6 mm

5.3 LED

Colour:	
Green:	Slow blinking = operational state, Fast blinking = connecting state
Red:	Fast blinking = upgrading
Orange:	Fast blinking = provisioning mode, Slow blinking = factory reset procedure in progress (10 seconds)

5.4 Wi-Fi

Protocol:	802.11 b/g/n
Data rate:	150 Mbps
Adjustable transmitting power:	20.5 dBm

5.5 IR Serial communication

Type:	IR
Speed:	19200 bit/s
Frame:	8, N, 1
Protocol:	MODBUS RTU

5.6 Ethernet (only for SG-E1)

- Compliant with IEEE 802.3/802.3u (Fast Ethernet)
- Compliant with ISO 802-3/IEEE 802.3 (10 BASE-T)

5.7 RS485 Serial communication

Type:	RS485
Speed:	1200 bit/s to 115200 bit/s (default 115200 bit/s)
Frame:	8, N, 1
Protocol:	MODBUS RTU

5.8 Digital input

Rated voltage:	230 V (-20%...+15%)
Input resistance:	450 k Ω

5.9 Temperature sensor (Pt1000) input

Measuring method:	two wire connection
Input range with programmable ratings:	
RTD sensors limit values:	200 Ω - 10 k Ω
Measuring voltage:	≤ 1 V
Minimum temperature range:	100 K
Minimum differential resistance:	400 Ω (1000 Ω -> 1400 Ω)
Lead resistance:	< 10 Ω per lead
Consumption:	< 0.5 VA

5.10 Safety and ambient conditions

According to standards for IEC 60950.

Temperature and climatic condition according to EN 62052-11.

Dust/water protection:	IP50
Operating temperature:	-25 °C ... +55 °C
Storage temperature:	-40 °C ... + 70 °C
Enclosure:	self-extinguish, complying UL94-V

5.11 EC DIRECTIVES CONFORMITY

EU Directive on Measuring Instruments **2014/32/EU**

EU Directive on EMC **2014/30/EU**

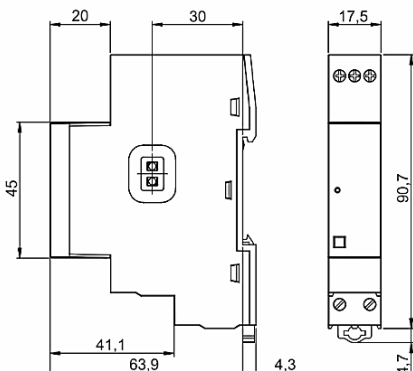
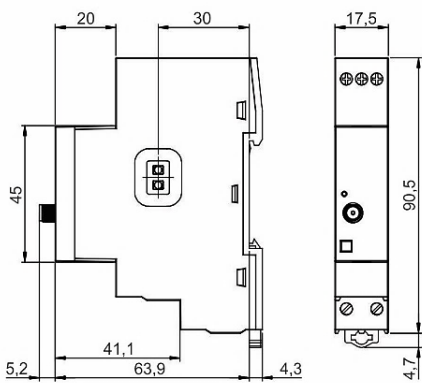
EU Directive on Low Voltage **2014/35/EU**

EU Directive WEEE **2002/96/EC**

EU RED Directive **2014/53/EU**

5.12 Dimensions

5.12.1 Dimensional drawing

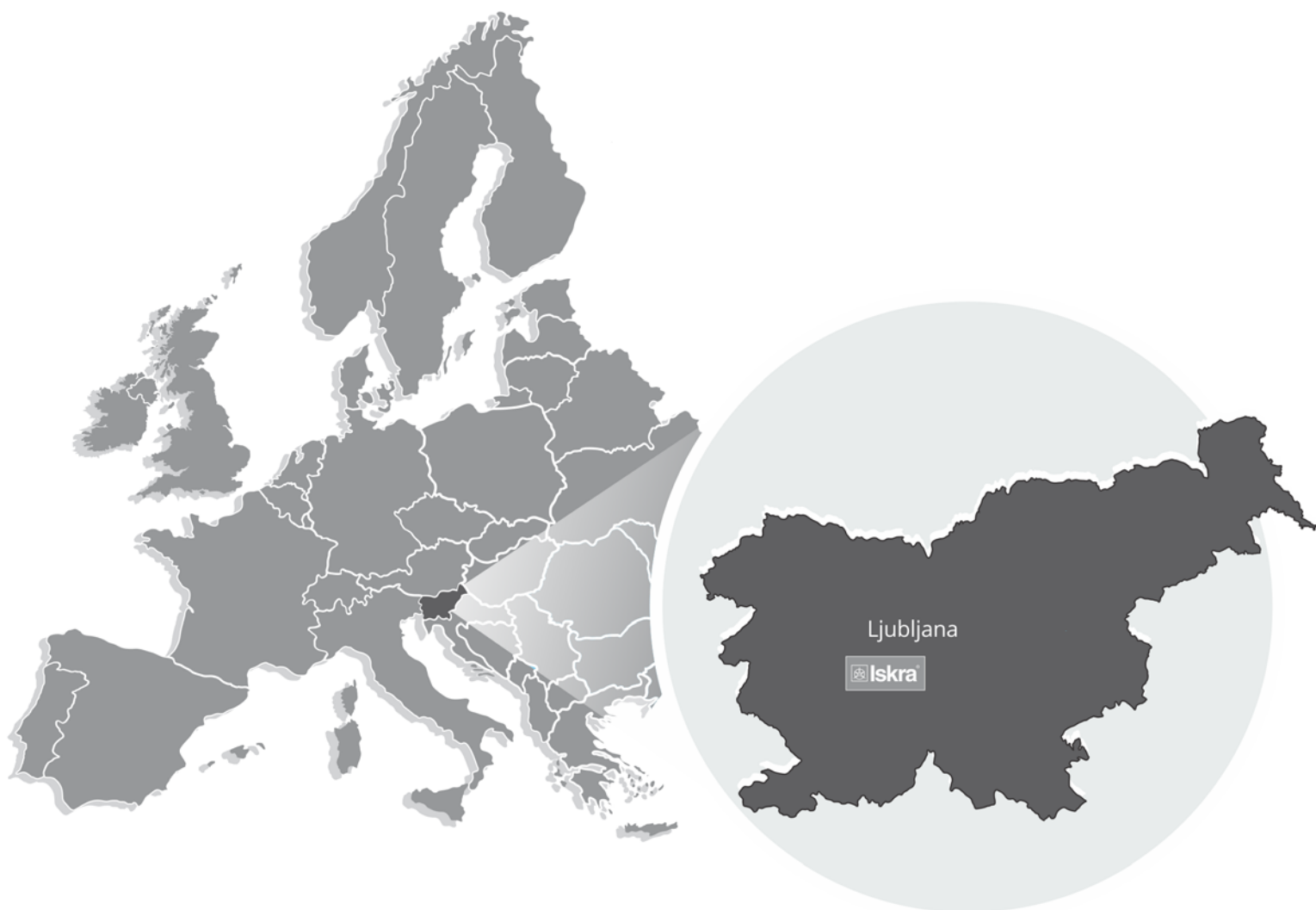
Construction	Appearance (SG-E1/W1)	Appearance (SG-W1A)
Dimensions	All dimensions are in mm 	

6 ABBREVIATION/GLOSSARY

Abbreviations are explained within the text where they appear the first time. Most common abbreviations and expressions are explained in the following table:

Term	Explanation
<i>Ethernet</i>	<i>IEEE 802.3 data layer protocol</i>
<i>MODBUS / DNP3</i>	<i>Industrial protocol for data transmission</i>
<i>MiQen</i>	<i>Setting Software for ISKRA instruments</i>
<i>PI</i>	<i>Pulse input module</i>
<i>AC</i>	<i>Alternating quantity</i>
<i>IR</i>	<i>Infrared (optical) communication</i>
<i>Pt1000</i>	<i>Temperature sensor</i>
<i>PQ</i>	<i>Power Quality</i>

List of common abbreviations and expressions



Iskra, d.o.o.
BU Ljubljana
 Stegne 21
 SI-1000, Ljubljana
 Phone: +386 1 513 10 00

Iskra, d.o.o.
BU Capacitors
 Vajdova ulica 71
 SI-8333, Semič
 Phone: +386 7 38 49 200

Iskra, d.o.o.
BU MIS
 Ljubljanska c. 24a
 SI-4000, Kranj
 Phone: +386 4 237 21 12

Iskra, d.o.o.
BU Batteries & Potentiometers
 Šentvid pri Stični 108
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