Iskra®

User's Manual

EN

Communication gateway iHUB-L1

October 2018 • Version 1.00

Communication gateway

iHUB-L1

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 an iHUB-L1.

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 iHUB-L1. 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 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 switching the device ON

Check the following before switching on 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.
	Compliance of the product with European CE 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

BASIC DESCRIPTION AND OPERATION

This chapter presents all relevant information about the iHUB-L1 required to understand its purpose, applicability and basic features related to its operation.

In this chapter, you will find:

Description of the device

The iHUB-L1 communication gateway is intended to connect various equipment into communication network via Wi-Fi communication. The gateway has build-in two optical (IR) communication ports and the RS485 serial communication with the MODBUS protocol. RS485 communication enables data transmission and thus connection of communication gateway into the RS485 network and communication with various equipment, which is equipped with RS485 communication (e.g. energy meters, bi-stable switches, power monitoring devices, etc.), via TCP MODBUS.

The iHUB-L1-IO is also equipped with pulse input and temperature sensor (Pt1000) input.

Appearance

1. **Power input and temperature sensor (Pt1000) input (iHUB-L1-IO)**
2. **RS485 communication**
3. **IR communication port** (one on each side)
4. **DIN-rail fitting**
5. **Reset and factory reset switch**
6. **Multifunctional green LED**
7. **Power supply**

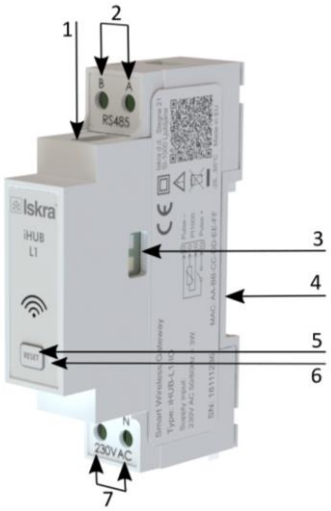


Figure 1: *Appearance of communication gateway iHUB-L1.*

A built-in green LED diode indicates different operation states of the iHUB-L1. A tactile switch is built-in for reset and factory reset of a gateway. Short press resets the gateway, pressing button for more than 5 seconds (LED diode starts blinking fast) will do a factory reset (meaning setting iHUB-L1 to factory settings and turn into access point mode). Connecting terminals are built to be fastened according to EN 60715 standard. The iHUB-L1 interface with corresponding equipment enables setting and reading the instruments.

iHUB-L1 application

The iHUB-L1 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.

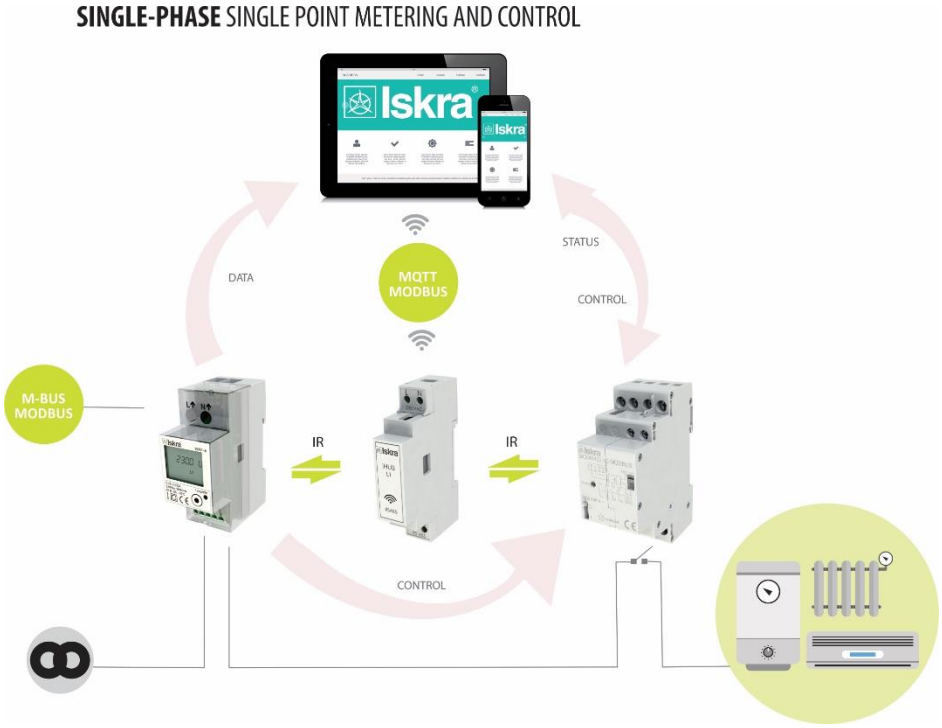


Figure 2: *Connection diagram for iHUB-L1. It is connected to an energy meter (on the left side of the iHUB-L1) and to latching switch (on the right side of the iHUB-L1) by IR communication. It is possible to read and control data with the computer or mobile phone.*

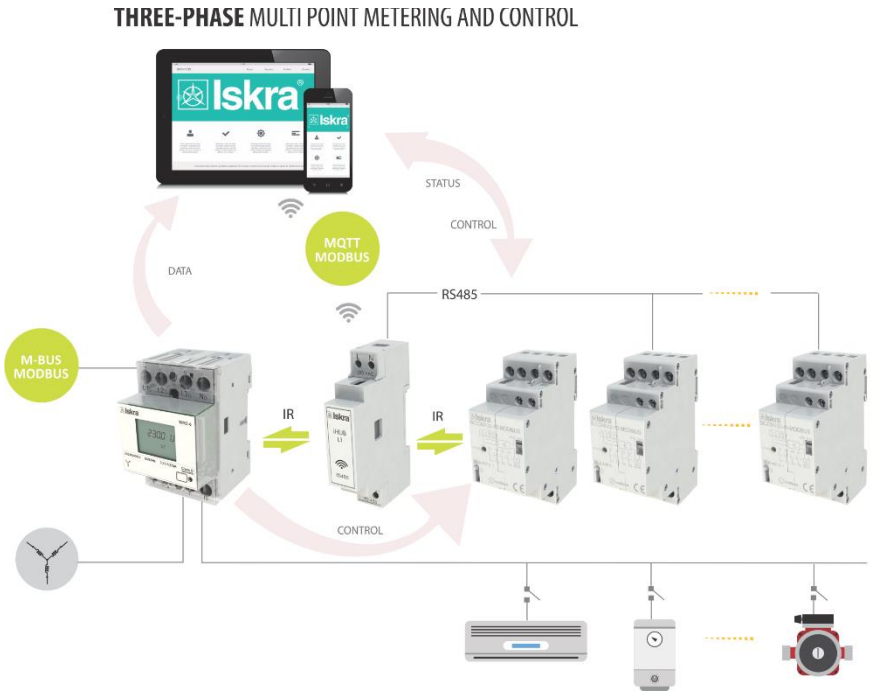


Figure 3: *Connection diagram for iHUB-L1 for connection to three-phase energy meter. It is connected to an energy meter (on the left side of the iHUB-L1); to one latching switch (on the right side of the iHUB-L1) by IR communication and to two latching switches by RS485 communication. It is possible to read and control data with the computer or mobile phone.*

Main features

- AC mains power supply.
- Nominal supply voltage (U_n) from 85 V to 265 V.
- Voltage operating range: - 20% to + 15%.
- Nominal frequencies 50 Hz and 60 Hz.
- Multifunctional front green LED.
- RS485 serial communication.
- IR serial communication (2 ports).
- Wi-Fi communication.
- 1-DIN rail width mounting communication gateway according to EN 60715.

CONNECTION

This chapter deals with the instructions for iHUB-L1 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.d. 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:

Mounting

The iHUB-L1 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.

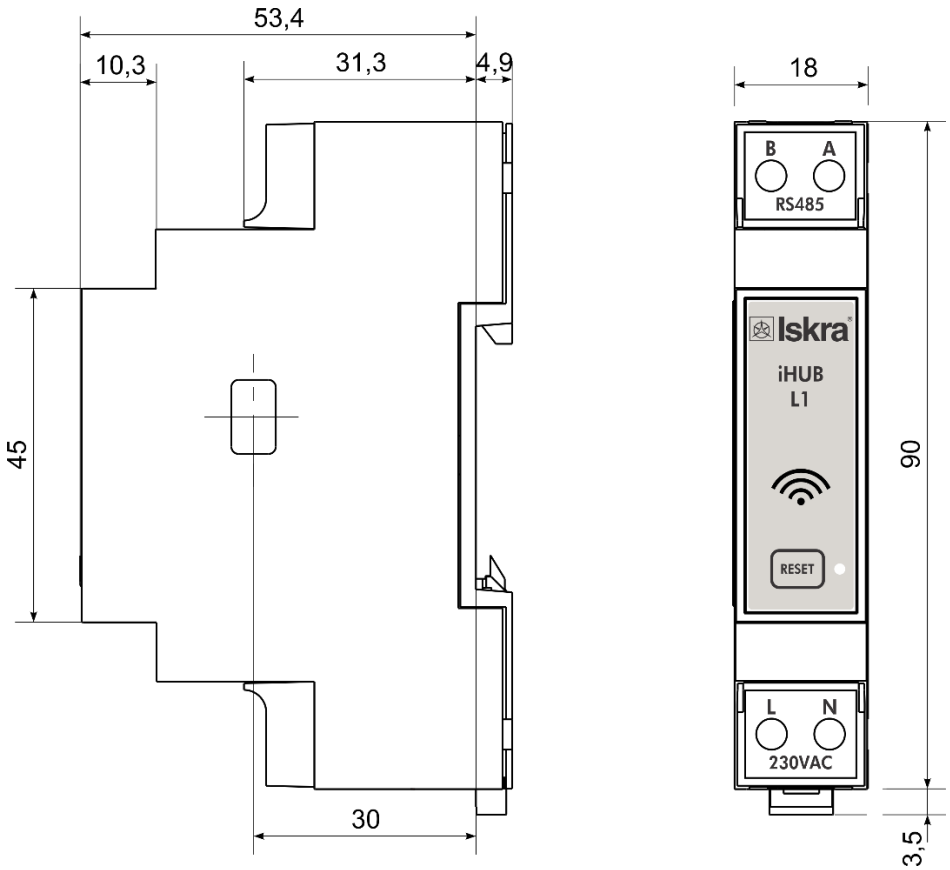


Figure 4: *Dimensional drawing of iHUB-L1*

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 iHUB-L1 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).

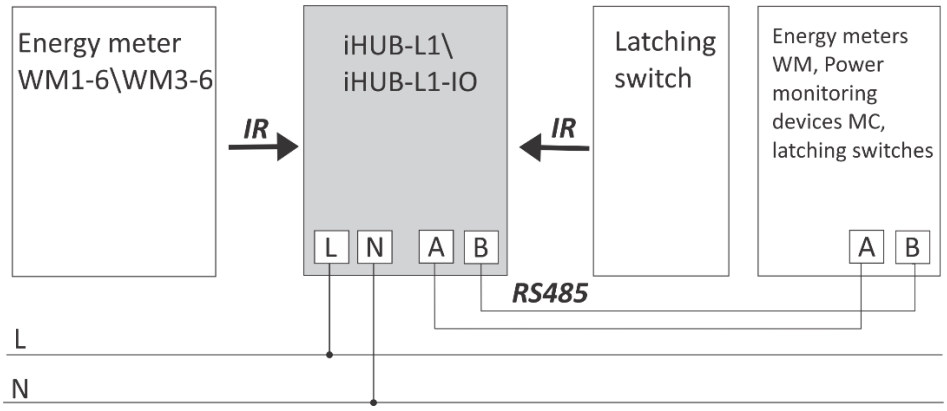


Figure 5: *IR and RS485 connection of iHUB-L1*

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

Up to 2 devices can be connected to the RS485 network allowing the iHUB-L1 to manage 4 devices altogether (1 energy meter and 1 latching switch via IR MODBUS communication, additionally managing 2 devices via RS485 communication).

PLEASE NOTE

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

Communication connection

The complete iHUB-L1 system is assembled with three main units and two optionally units, which are used for communication with outside world:

- **The power supply unit.**

iHUB-L1 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 (MCU) with IR communication, RS485 communication, LED indicator and Switch for reset/factory reset.**

IR communication unit and RS485 unit are connected to MCU via UART interface. Various equipment can be connected to iHUB-L1 communication gateway via IR communication or via RS485 communication. Both IR communication modules using MODBUS protocol.

- **Wi-Fi module.**

Wi-Fi module is equipped on each gateway and enables connection of iHUB-L1 to user's Wi-Fi network using TCP MODBUS protocol. Furthermore, Wi-Fi module communicates with main processing unit via UART interface.

- **Extension modules of iHUB-L1-IO (pulse input and temperature sensor (Pt1000) input)**

iHUB-L1-IO does not have any adjustable elements (e.g. potentiometers), which assures a better long-term stability.

Table 1: *Survey of communication connection*

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

*Only for the iHUB-L1-IO

PLEASE NOTE

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

FIRST STEPS

Programming a iHUB-L1is very transparent and user friendly. Numerous settings are organized in groups according to their functionality.

In this chapter you will find basic programming steps:

Introduction

Connecting iHUB-L1 is very transparent and user friendly. The flowchart below illustrates the first few steps to more clearly understanding software settings.

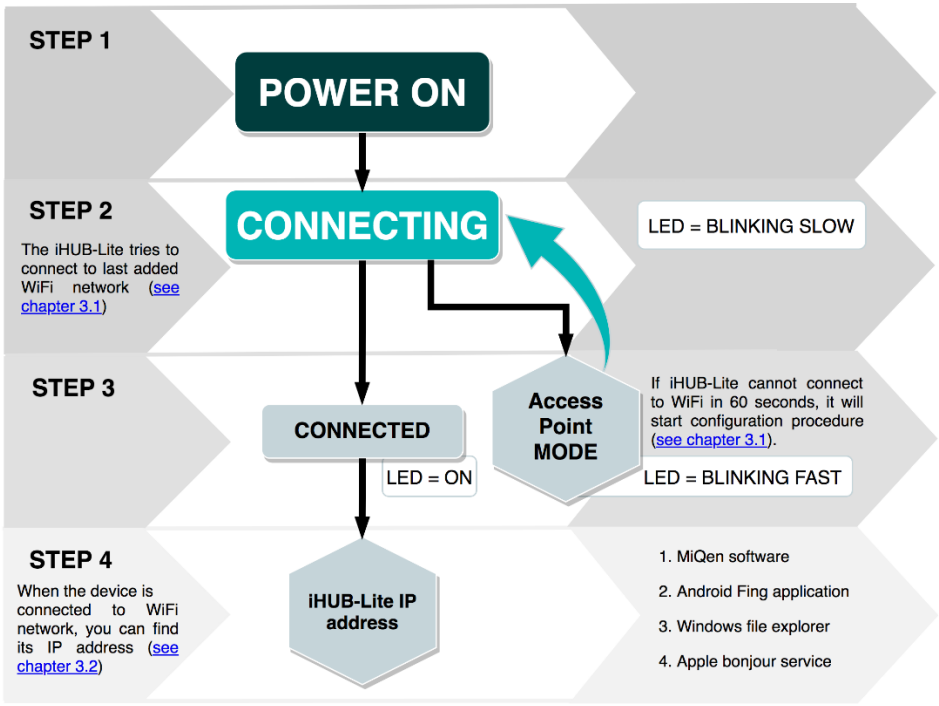


Figure 6: *Process flowchart*

Connecting iHUB-L1 to Wi-Fi Network

After we mounted iHUB-L1 on a DIN-rail and supplied it with AC power (power-up the device), we must connect iHUB-L1 to Wi-Fi network. At first, iHUB-L1 tries to connect to last successfully added Wi-Fi network. If iHUB-L1 cannot connect to Wi-Fi in 60 seconds, it will start configuration procedure. This mode is active for 3 minutes and after that, it cycles to connection mode again.

SETUP iHUB-L1 IN CONFIGURATION MODE

Search Wi-Fi networks with your smartphone. Find Wi-Fi network starting with IHL.

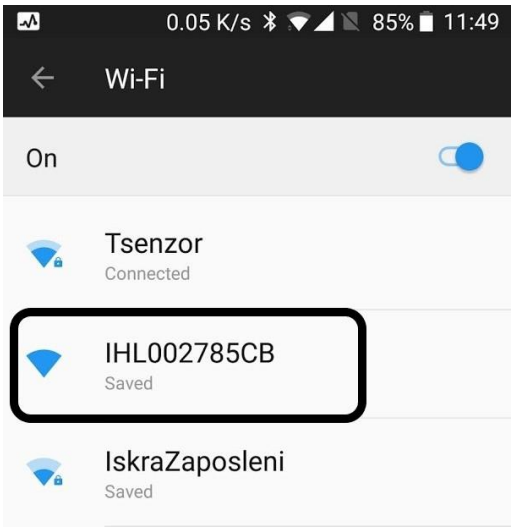


Figure 7: *Selection of the IHL Wi-Fi network*

Some smartphones get pop-up Sign to Wi-Fi network.

Figure 8: *Pop-up sign*

After connecting to IHL network, configuration page will appear.

If you do not get this page, you can start a web browser on your phone and go to IP address: 192.168.4.1.

Click on *Configure Wi-Fi* to get available Wi-Fi networks.

Figure 9:*Wi-Fi configuration*

Select Wi-Fi network then enter the password and click on *save*.

If you have hidden Wi-Fi network, you can manually enter SSID and password. Click on *save* and wait.

PLEASE NOTE

iHUB-L1 will now enter connection mode and connect to the selected Wi-Fi network. You can switch your phone back to your previous Wi-Fi network.

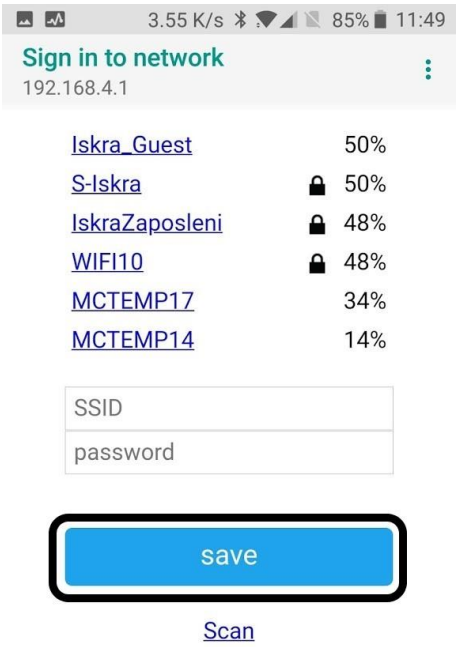


Figure 10: *Sign in to network*

iHUB-L1 IP address

If the previous step is completed, iHUB-L1 will connect to Wi-Fi network. In order to connect to iHUB-L1, you must find its IP address. There are several ways to find it:

1. MiQen configuration SW (Browse Ethernet devices)
2. Adroid Fling application
3. Windows file explorer
4. Apple bonjour service

Find IP address with MiQen

MiQen software is a tool for complete programming and monitoring of ISKRA measuring instruments. Remote operation is possible by means of serial (RS485/RS232), USB or TCP/IP communication. A user-friendly interface consists of six segments (Connection, Settings, Measurements, Analysis, My devices, and Upgrades). These segments are easily accessed by means of six icons on the left side.

The latest version of MiQen software can be downloaded from ISKRA d.d. 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 iHUB-L1! All settings can be programmed using MiQen software.

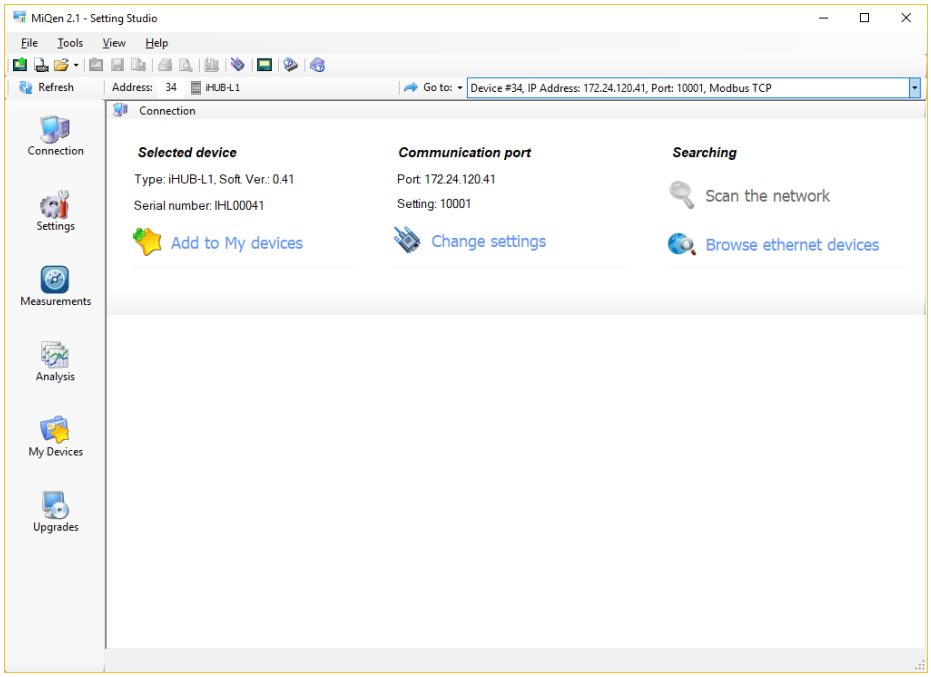


Figure 11: *MiQen programming and monitoring software*

Start MiQen application and click on Browse ethernet devices.

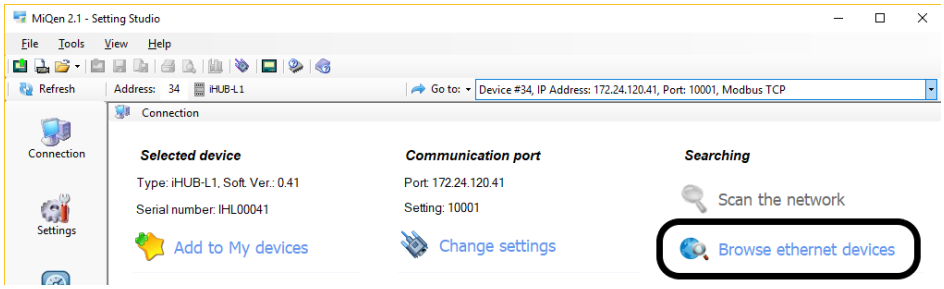


Figure 12: *Browse ethernet devices selection*

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.

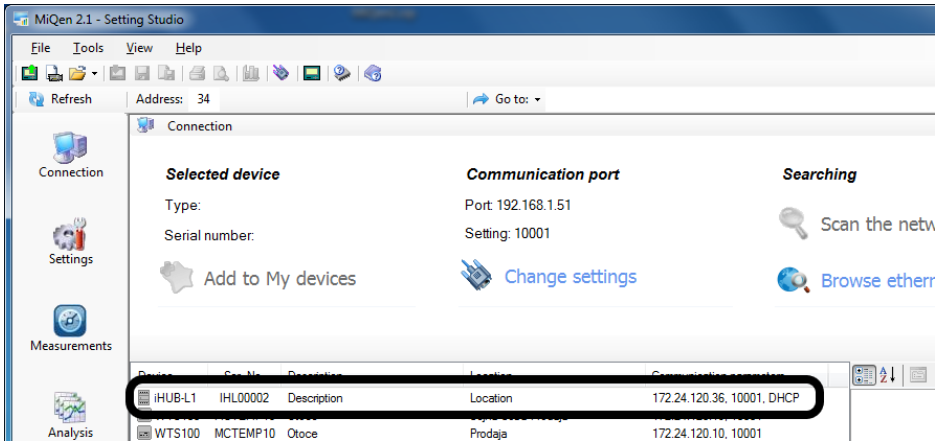


Figure 13: *List of all detected devices. Double click on iHUB-L1 device*

PLEASE NOTE

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

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 iHUB-L1.

Start Fing application and find the iHUB-L1.

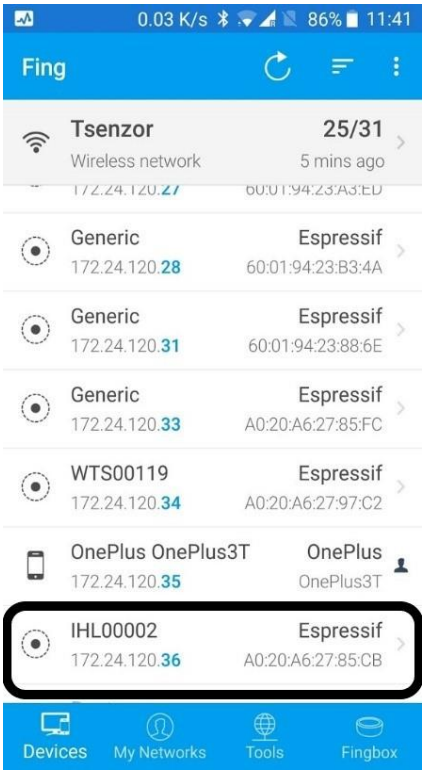


Figure 14: *iHUB-L1 name in Fing application*

Find IP using Apple Bonjour

If you have installed Apple Bonjour, than you can find IP address by using iHUB's serial number. In WEB browser's address bar type: http://IHL00002.local where IHL000002 is serial number.

Find IP using Windows file manager

You can find iHUB's IP address also with file explorer in windows. PC must be connected to the same network as iHUB-L1. Open explorer and click on *Network*. If you get prompt that network discovery is disabled, enable it.

Windows will give a list of all network devices. iHUB-L1 device name is starting with IHL. Double click on *IHLxxxxxx* and iHUB's WEB page will open. There you can see its IP address.

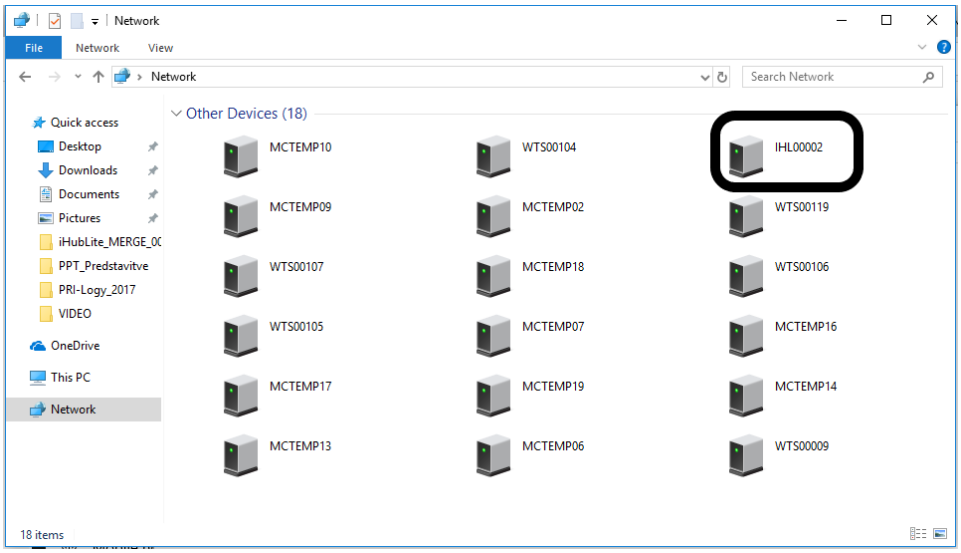


Figure 15: *iHUB-L1 name in Windows file manager*

Configuring iHUB-L1 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 iHUB-L1, via Wi-Fi or via the RS485 connection.

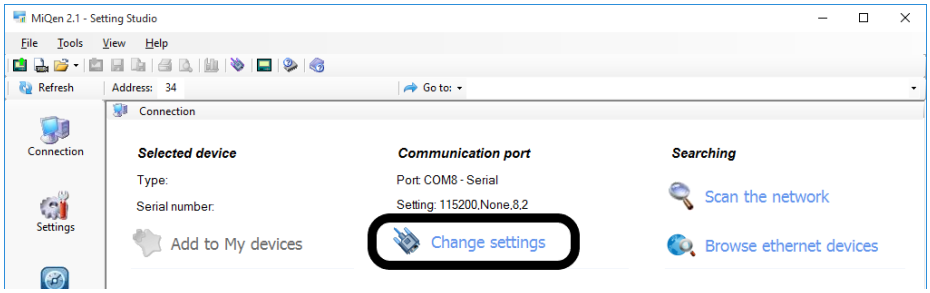


Figure 16: *Change settings selection*

CONNECTING MIQEN TO iHUB-L1 VIA Wi-Fi

For connecting in this mode, we need IP address of iHUB-L1 (see chapter 3.2). Enter iHUB-L1 IP address, IP port (default is 10001) and click OK.

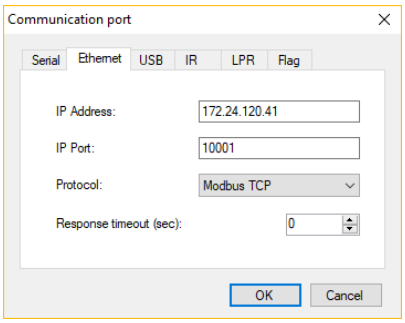


Figure 17: *Communication port for connecting MiQen to iHUB-L1 via Wi-Fi*

Connecting MiQen to iHUB-L1 via RS485

This connection works only is iHUB's RS485 port is configured as a slave (Default setting). If you enable RS485 devices in settings, RS485 on iHUB-L1 becomes master and you ca not use RS485 port for settings.

If you want to connect via RS485, you need to wire your RS485 adapter to iHUB'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*.

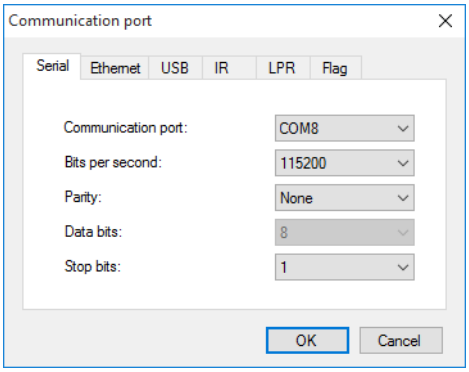


Figure 18: *Communication port for connection MiQen to iHUB-L1 via RS485*

Connecting to iHUB-L1

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 iHUB-L1 under Selected device. Click on *Settings* icon and click *Read settings*.

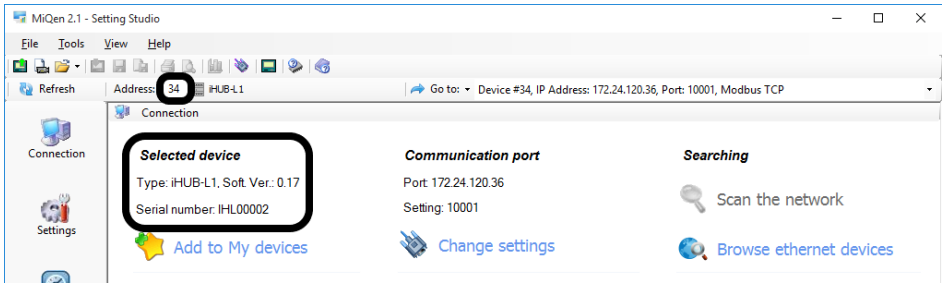
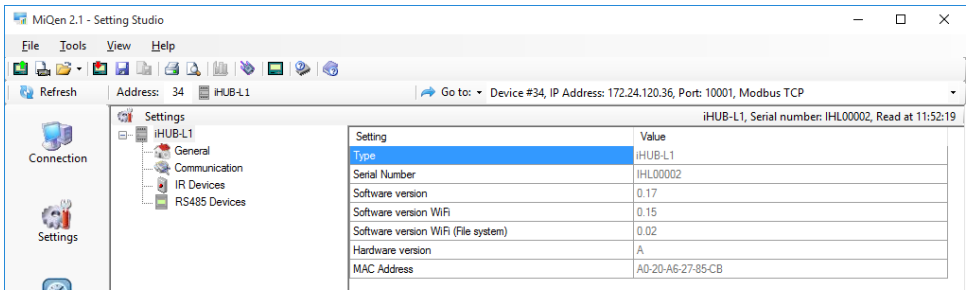
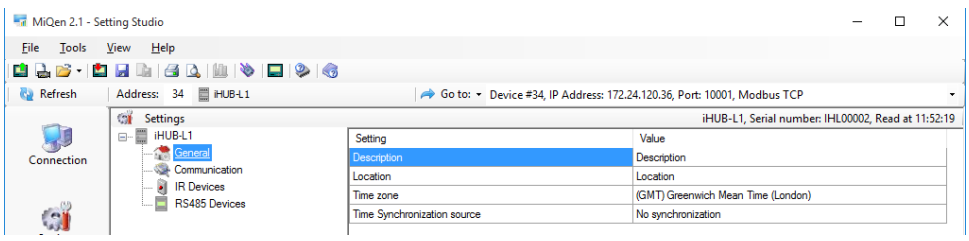


Figure 19: *Set Address to 34*

Figure 20: *Read settings selection*

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





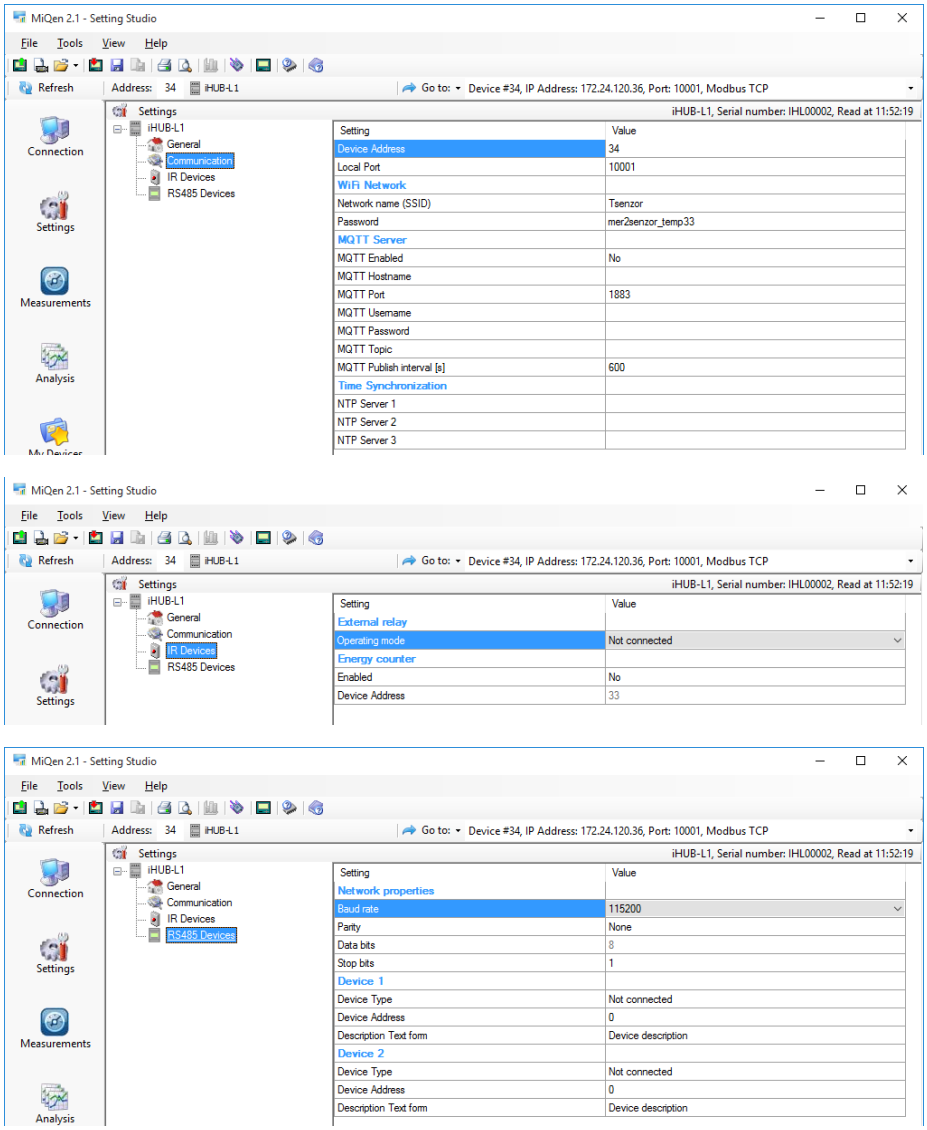


Figure 21: *MiQen settings*

WARNING

If MiQen is connected to iHUB-L1 via RS485, it will lose connection if you change Device Type from not connected to any other type.

iHUB-L1 IoT

The iHUB-L1 can be used to publish one device's measurements to MQTT broker or serve data via TCP REST API. The data format in both cases is JSON.

Selecting device for publishing data

If more than one device is connected to iHUB-L1, there is a priority list for publishing IoT data.

1st priority: left IR device

2nd priority: RS485 Device 1

3rd priority: RS485 Device 2

Measurements data format


```
{
"model":"MC666 Analyzer  ",
"measurements":
{
"frequency":"50.032 Hz",
"U1":"221.92 V",
"U2":"228.95 V",
"U3":"228.56 V",
"I1":"0.548 A",
"I2":"0.718 A",
"I3":"0.144 A",
"P0":"213.5 W",
"P1":"63.9 W",
"P2":"127.92 W",
"P3":"21.67 W",
"Q0":"-25.42 var",
"Q1":"-103.7 var",
"Q2":"103.19 var",
"Q3":"-24.92 var",
"S0":"319.19 VA",
"S1":"121.78 VA",
"S2":"164.36 VA",
"S3":"33.0 VA",
"PF0":"0.6689 Cap",
"PF1":"0.5247 Cap",
"PF2":"0.7783 Ind",
"PF3":"0.6568 Cap",
"PA0":"-6.79",
"PA1":"-47.18",
"PA2":"37.93",
"PA3":"41.62",
"tariff":"1"
},
"timestamp":"1539260709",
"local_time":"11.10.2018 12:25:09"}
```

Energy counters data format

{
"model":"MC666 Analyzer ",
"measurements":
{
"counter1":"51550.4 kWh",
"counter2":"73835.1 kWh",
"counter3":"125385 kWh",
"counter4":"590.39 kWh"},
"settings":
{
"phase1":"Total",
"phase2":"Total",
"phase3":"Total",
"phase4":"Phase3",
"tariff1":"1",
"tariff2":"2",
"tariff3":"1,2",
"tariff4":"1,2"
},
"timestamp":"1539260946",
"local_time":"11.10.2018 12:29:06"
}

IoT use cases

You can use iHUB-L1 to connect energy meter with RS485 communication to home automation SW like “Home assistant”.

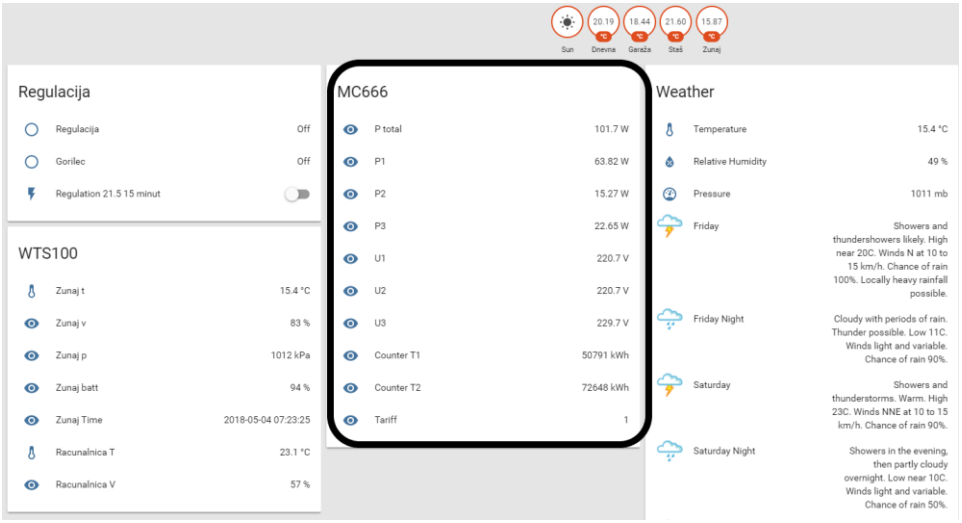


Figure 22: *Home assistant screen*

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

iHUB-L1 WEB interface

The iHUB-L1 WEB interface is intended to display statuses, settings, measuring data and provide an interface for SW upgrade.

Pages for measuring data displays results of the highest priority connected device (if you have more than one device connected).

Status page

Status provides basic device status and settings.

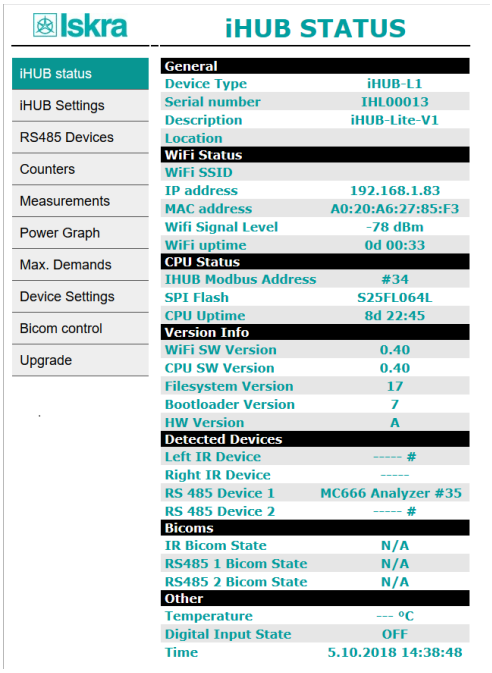
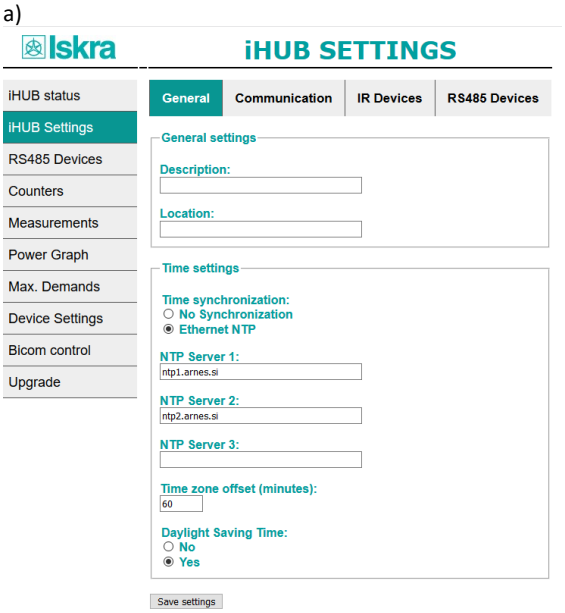


Figure 23: *ISKRA iHUB status screen*

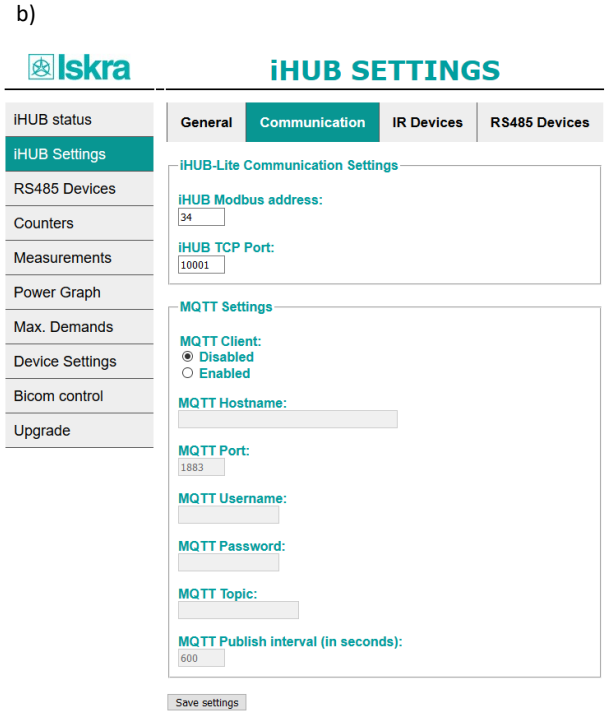
iHUB Settings

iHUB 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 iHUB-L1 communication and MQTT settings. IR Devices section is intended for IR relay and IR counter settings. RS485 Devices sets settings of RS485 communication.

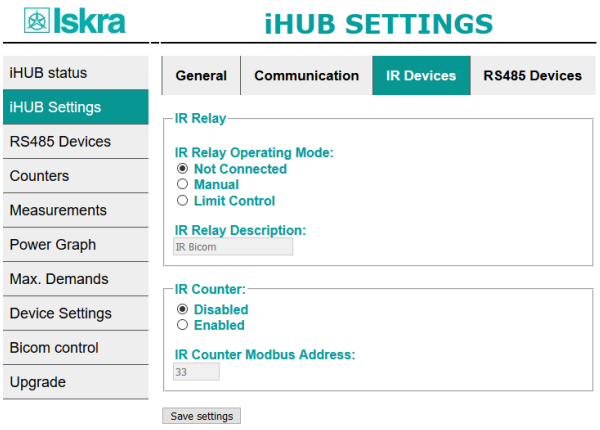
a)



b)



c)



d)

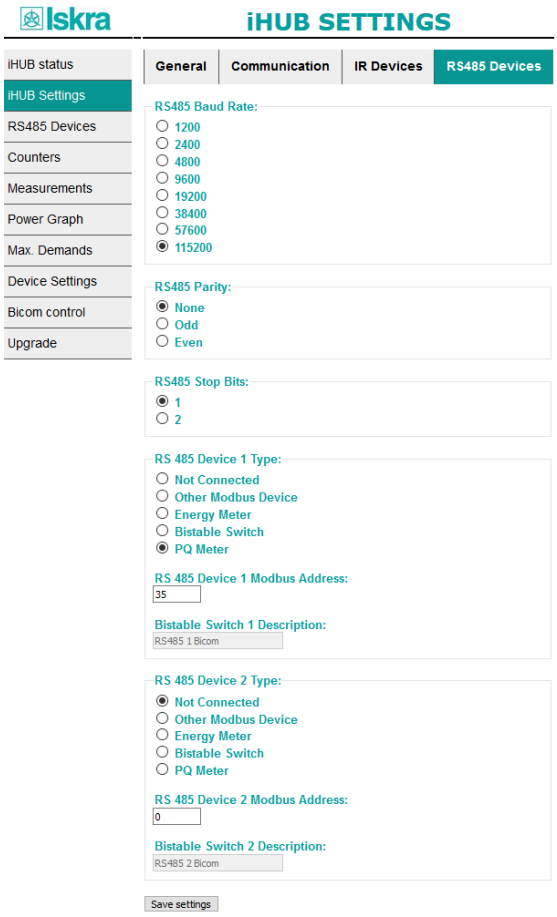


Figure 24: *iHUB Settings screen,* ***a)*** *General section,* ***b)*** *Communication,* ***c)*** *IR Devices,* ***d)*** *RS485 Devices*

RS485 Devices

RS485 Devices segment displays connected devices to the RS485 bus. For the first time, you need to click on Scan RS485 Bus button. Finding connected devices will take around one minute.

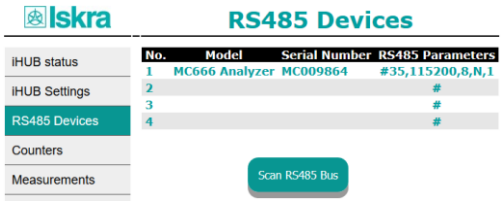


Figure 25: *RS485 Devices screen*

Counters

Counters page displays energy counter values.

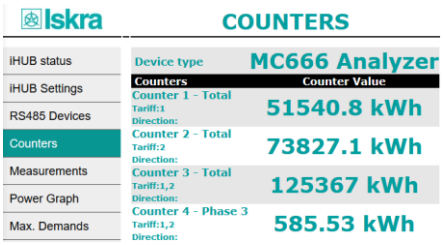


Figure26: *COUNTERS screen*

Measurements

Measurements page displays basic measuring data from one connected device.

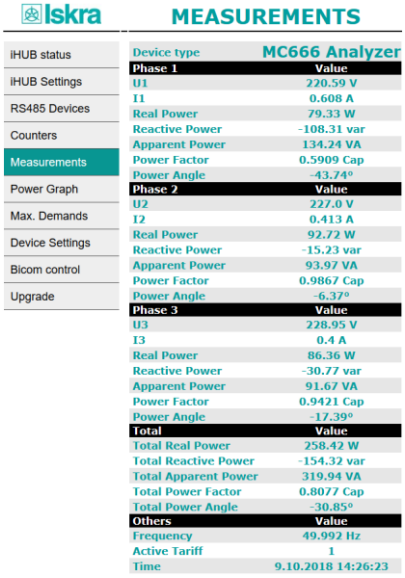


Figure 27: *MEASUREMENTS screen*

Power graph

Power graph page displays measurements of energy per time (last 24 hours).

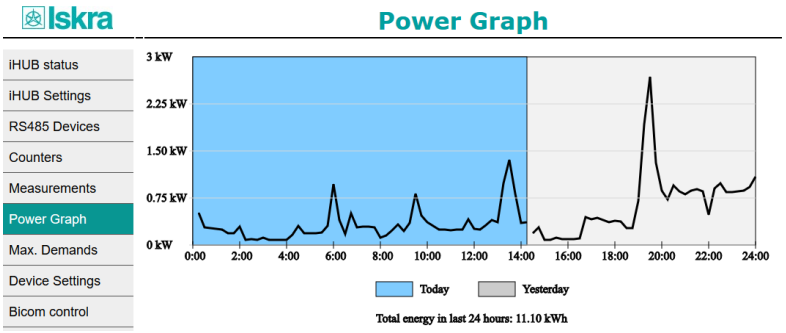


Figure 28: *Power graph screen*

Maximum demand

Maximum demands are displayed only for a device, which supports this measurement (PQ meters). If energy meter is connected, results will be undefined.

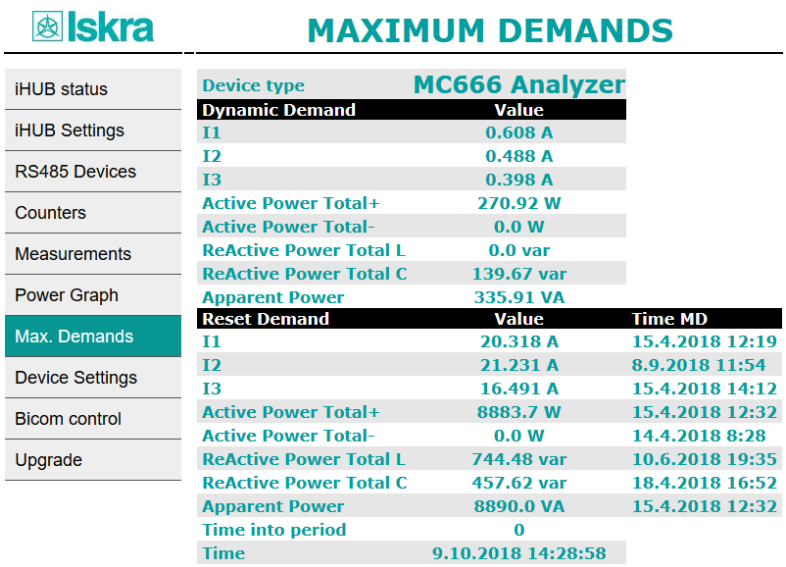


Figure 29: *MAXIMUM DEMANDS screen*

Device Settings

Settings page also contains value from connected device.

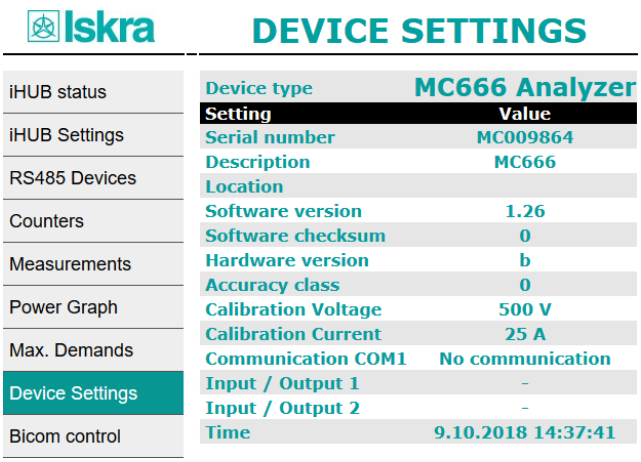


Figure 30: *SETTINGS screen*

Bicom control

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

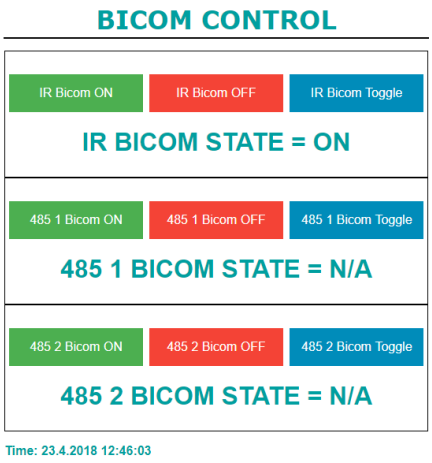


Figure 31: *BICOM CONTROL screen*

Upgrade

There are two upgrades available on WEB page.

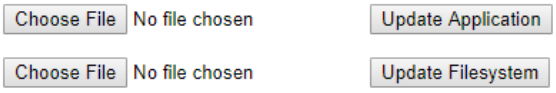


Figure 32: *Available upgrades*

Top 2 buttons are intended for Wi-Fi application upgrade, while bottom buttons are used for file system upgrade. In both cases, you need to click on Choose File to select upgrade file and then click the right button to start to upgrade.

TECHNICAL DATA

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

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*

Power Supply input

Nominal voltage U_n:	*From 85 V to 230 V (+15 % - 20%)*
Power consumption:	*< 3 W*
Nominal frequency f_n:	*50 Hz and 60 Hz*
Length of removed isolation:	*6 mm*

LED

Colour:	*green*
LED on:	*connected*
LED blinking slow:	*1 /s*
LED blinking fast:	*10 /s*

Wi-Fi

Protocol:	*802.11 b/g/n*
Frequency range:	*2.4 GHz – 2.5 GHz (2400 M – 2483.5 M)*
Security:	*WPA/WPA2*
Encryption:	*WEP/TKIP/AES*

RS485 Serial communication

Type:	*RS485*
Speed:	*1200 bit/s to 115200 bit/s (default 115200 bit/s)*
Frame:	*8, N, 2*
Protocol:	*MODBUS RTU*
Address:	*34 (default)*

Pulse input (optional)

Subject to safe and correct installation, the equipment will interface to any meter (gas, water or electricity) having a suitable pulse output such as:

- a volt-free contact,
- Reed relay,
- open collector (drain) – when connecting the correct polarity should be observed.

Output voltage U_o:	*3.3 V (when no pulse output connected to pulse input connection of iHUB-L1)*

Temperature sensor (Pt1000) input

Measuring method:	two wire connection
Input range with programmable ratings:	
RTD sensors limit values:	*200 Ω - 10 kΩ*
Measuring voltage:	*≤ 3.3 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*

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*

EC DIRECTIVES CONFORMITY

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

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

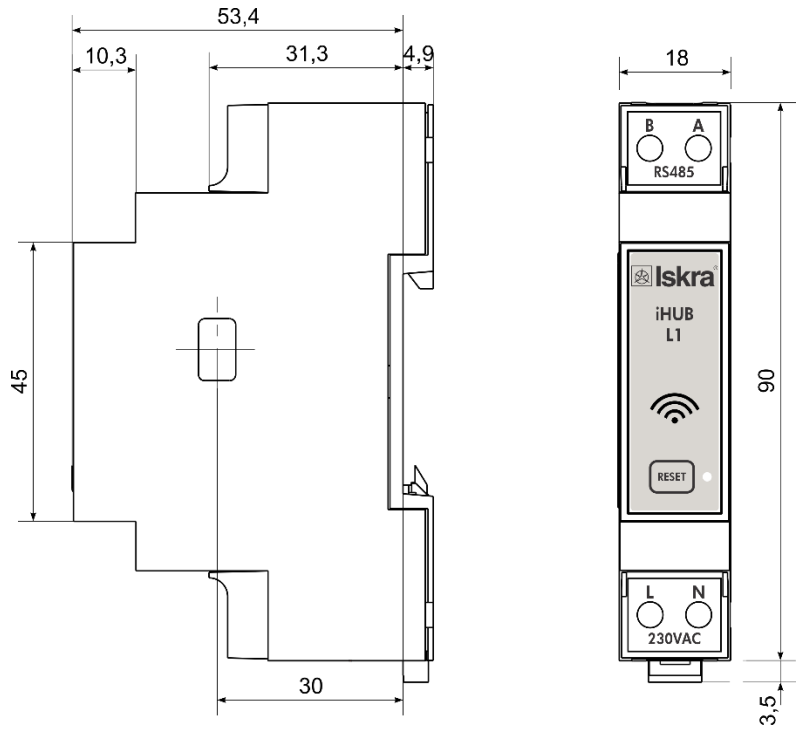
EU Directive on Low Voltage **2014/35/EU**

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

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

Dimensions

Dimensional drawing

Construction	***Appearance***
Dimensions	All dimensions are in mm 

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

List of common abbreviations and expressions

PE Ljubljana
Stegne 21
SI-1000 , Ljubljana
Phone: + 386 1 513 10 00

PE Kondenzatorji
Vajdova ulica 71
SI-8333 , Semič
Phone: +386 7 38 49 200

PE Stikala
Ljubljanska c. 24a
SI-4000 , Kranj
Phone: +386 4 237 21 12

PE Instrumenti
Otoče 5a
SI-4244 , Podnart
Phone: +386 4 535 9114

PE Baterije in potenciometri
Šentvid pri Stični 108
SI-1296 , Šentvid pri Stični
Phone: +386 1 780 08 00

PE Galvanotehnika
Glinek 5
SI-1291 , Škofljica
Phone: +386 1 366 80 50

Iskra IP, d.o.o.
Metliška cesta 8
SI-8333 , Semič
Phone: +386 7 384 94 54

Iskra Lotrič, d.o.o.
Otoče 5a
SI-4244 , Podnart
Phone: +386 4 535 91 68

Iskra ODM, d.o.o.
Otoče 5a
4244 , Podnart
Phone: +386 4 237 21 96

Iskra STIK, d.o.o.
Ljubljanska cesta 24a
SI-4000 , Kranj
Phone: +386 4 237 22 33

Iskra Tela L, d.o.o.
Omladinska 66
78250 , Laktaši
Phone: +387 51 535 890

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Ul, Dame Gruev br. 16/5 kat
1000 , Skopje
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11000 , Beograd
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1705 , China HK City
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