

AC550/AC750

User manual



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AC550/AC750

ADVANCED MODULAR GATEWAY / DATA CONCENTRATOR

USER MANUAL

i. About this document

This document contains detailed information on the AC550 and AC750, their key features, functionalities, and installation manuals with maintenance.

The document is intended for a technical audience, who are responsible for the product and its integration into the system.

ii. Reference documents

- Iskraemeco's general terms and conditions
- Technical descriptions of modules
- Technical description of antenna coupler

iii. Versioning

Date	Version	Update
21.03.2017	V0.10	The draft version of the document.
01.03.2018	V1.00	The initial version of the document.
13.07.2018	V1.10	<ul style="list-style-type: none">• Added new functionalities (software (FW) version 2.0.5447):<ul style="list-style-type: none">- Security on management interface (HTTPs)- GW protocol (according to DLMS UA 1000-2 Ed. 8.0:2014, chapter 10.7)- Support for 3G/2G module (AC150-A3)• Miscellaneous improvements on the Web User Interface

iv. Definitions, Acronyms and Abbreviations

AC	Alternating Current
AMI	Advanced Metering Infrastructure
APN	Access Point Name
CENELEC	European Committee for Electrotechnical Standardization
COSEM	Companion Specification for Energy Metering
CSS	Cascading Style Sheets
CMUX	Converter-MULTipleXer
CSV	Comma Separated Values file, which allows data to be saved in a table-structured format
CPU	Central Processing Unit
DC	Data Concentrator (AC750)
DHCP	Dynamic Host Configuration Protocol
DIN	Deutsches Institut für Normung
DLMS	Device Language Message Specification
DNS	Domain Name System/Server/Service
EAP	Extensible Authentication Protocol
EN	European Norm
ESD	ElectroStatic Discharge
FCC	Federal Communications Commission
FEM	Field Exchangeable Module
FLASH	Electronic (solid-state) non-volatile computer storage medium that can be electrically erased and reprogrammed
FQDN	Fully Qualified Domain Name
G3-PLC	Communication technology with low layer protocol for enabling large-scale infrastructure on the electrical grid
GND	Ground
GPRS	General Packet Radio Service
GRE	Generic Routing Encapsulation
GSM	Global System for Mobile
GW	Gateway (AC550)
HES	Head-End System
HTML	HyperText Markup Language
HTTP	Hypertext Transfer Protocol
HTTPS	HyperText Transfer Protocol Secure
HW	HardWare
ICCID	Integrated Circuit Card Identifier
ID	IDentification
IEC	International Electrotechnical Commission
IMEI	International Mobile Equipment Identity
IP	Internet Protocol
LAN	Local Area Network
Last gasp	the other name of functionality Push on power down
LED	Light Emitting Diode
Linux	free and open-source software operating system
LiSOCl	Lithium Thionyl Chloride
LOC	LOCal
MAC address	Media Access Control address
NAN	Neighbourhood Area Network
NC	Not Connected
Node	In Web user interface means attached device
NTP	Network Time Protocol
P2P	Peer-to-peer
PAN	Personal Area Network
PPE	Personal Protective Equipment
pw	password

OVC	OverVoltage Category
PLC	Power Line Communication
PSK	Pre-Shared Key
RAM	Random-Access Memory
RBAC	Role Based Access Control
RFC	Request For Comments
RSSI	Received Signal Strength Indicator
RTC	Real Time Clock
RX	receive
SIM	Subscriber Identity Module
SOAP	Simple Object Access Protocol
SW	SoftWare
TX	transmit
USB	Universal Serial Bus
UV	UltraViolet
WAN	Wide Area Network
Web service	A method of communication between two electronic devices over the World Wide Web.
Web-UI	Web User Interface
WEEE	Waste Electrical and Electronic Equipment Directive
XML	Extensible Mark-up Language

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1. SAFETY INFORMATION

Safety information used in this document is described with the following symbols and pictograms:



DANGER: for a possibly dangerous situation, which could result in severe physical injury or fatality – attention to high-risk hazards



WARNING: attention to medium risk hazards

CAUTION: for a possibly dangerous situation, which could result in minor physical injury or material damage - attention to low-risk hazards



Operating instruction: for general details and other useful information

All safety information in this document describes the type and source of danger, its possible consequences, and measures to avoid danger.

1.1. Responsibilities

The owner of the device is responsible for assuring that all authorized persons who work with it, read, and understand the parts of this document that explain safe handling with the device.

The personnel must be sufficiently qualified for the work that will be performed. The installation personnel must possess the required electro technical knowledge and skills, and must be authorized by the utility to perform the installation procedure.

The personnel must strictly follow safety regulations and operating instructions, written in the individual chapters in this document.

The owner of the device responds specially for the protection of the persons, for prevention of material damage and for training of personnel.

1.2. Safety instructions

1.2.1. Handling and mounting

At the beginning of installation at the metering/data-gathering point, the device should be carefully taken out of the box in which it is packed. This should prevent the device from falling as well as any other external or internal damage to it and personal injuries. Should such an incident occurs despite all precautions, the device should not be installed at metering/communication point as such damage may result in different hazards. In such a case, the device needs to be sent back to the manufacturer for examination and testing.



CAUTION

The edges of the seals, sealing wires and edges under (removed) device cover are sharp!

**CAUTION**

The temperature of the terminal block of the connected and operating device may rise; therefore, the temperature of the device cover may rise as well.

**DANGER**

In a case of any damage inside the device (fire, explosion...), do not open it.

**CAUTION**

The device may be used only for the purpose of data gathering and communication, for which it was produced. Any misuse of the device will lead to potential hazards.

**WARNING**

Safety measures should be observed at all times. Do not break the seals or open the device at any time!



It must be consulted in all cases where symbol  is marked in order to find out the nature of the potential hazards and any actions, which have to be taken to avoid them.

The device installation procedure is described in this document. For safety reasons, the following instructions should be followed.



See the complete document for detailed technical features of the device and its intended use.



Only a properly connected device can perform correctly!

1.2.2. Installation procedure



DANGER

The device is connected to electrical network. Any unauthorized manipulation of the device is life hazardous and prohibited according to the applicable legislation. Any attempt to damage the seals as well as any unauthorized opening of the device cover is strictly forbidden.

Installation companies shall implement a training policy that ensures that all installers are adequately trained, understand risk and safety issues, and possess the relevant skills before they commence operational duties.

The installer will need to recognise and understand different installations, meter types and various equipment associated with those installations applicable to the successful installation of the device.



CAUTION

On the supply side of the installation site, the installer must provide environment according to requirements for OVC III or lower, so proper overvoltage protection must be installed (max. overvoltage < 4 kV). The protection must be done according to local regulation.

The installer must provide overcurrent protection on the supply side of installation. The cut-off current of protection must not be higher than the maximal current (I_{max}) of the device. The current capability of overcurrent protection must be according to UC rating of the device equipment. The overcurrent protection must be done according to local regulation as well.

The installer is responsible for coordinating the rating and the characteristics of the supply side overcurrent protection devices.



The installer must consult and comply with local regulations and read the installation instructions written in this document before installation.

This document provides the instructions for installing the device.

The document provides a short overview of the device, details of its installation and set-up, installation considerations, and health and safety considerations.

The installer will be considered as a public face by both the device owner and its customers. The installer shall adopt the highest standards of behaviour and be respectful to clients and members of the public.

Before the beginning of the installation procedure, it should be checked if the installation point is correctly prepared for device installation. The installation point must always be left clean and in order.

The work location shall be defined and clearly marked. Adequate working space as well as means of access and lighting shall be provided at all parts of an electrical installation on, with, or near which any work activity is to be carried out.

Where it is necessary, safe access to the work location shall be clearly marked.

The installation point must not be exposed to running water or fire.

Device installation must not be performed by unauthorised and untrained personnel. Such persons are not allowed to cut the seals and open the device cover because of electric shock possibility.



DANGER

Opening the terminal, module or device cover is life hazardous due to possibility of electric shock.

Installation personnel must possess the required electro technical knowledge and skills, and must be authorised by the device owner to perform the installation procedure.

The installer is obligated to perform the installation procedure in accordance with the national legislation and internal norms of the device owner.

National legislation can set out the minimum age and the competence criteria for installers. In a case, where no national requirements are defined, the following criteria shall be used by assessing the competence of installers: electro technical knowledge, experiences with electrical work, understanding of the installation procedures, practical experience of that work, understanding the hazards which can arise during the work and the precautions to be observed, and the ability to distinguish whether is safe to continue working.

According to the basic principles, either the nominated person in control of the electrical installation or the nominated person in control of the work activity shall ensure that specific and detailed instructions are given to the personnel carrying out the work before starting and when completion of the work.

Before starting work, the nominated person in control of the work activity shall give notification to the nominated person in control of the electrical installation, of the nature, place, and consequences to the electrical installation of the intended work.

**CAUTION**

It is expected that the installer fully understands the risks and safety issues involved in electrical installations. The installer shall be aware at all times of the potential hazard of electrical shock.

Tools, equipment, and devices shall comply with the requirements of relevant national or international standards where these exist. Tools, equipment, and devices shall be used in accordance with the instructions and/or guidance provided by the manufacturer or supplier.

Any tools, equipment, and devices provided for the purpose of safe operation with, or work on, with, or near electrical installations shall be suitable for that use, be maintained, and properly used.

Personnel shall be equipped with clothing suitable for the workplace and its conditions. This could include the use of close-fitting clothing or additional PPE (personal protective equipment).

**CAUTION**

The installer must be properly equipped with personal protection equipment (PPE) and use the appropriate tools at all times during the installation.

Working procedures are divided into three different types: dead working, live working, and working in the vicinity of live parts. All these procedures are based on the use of safety measures against electric shock and/or the effects of short-circuits and arcing.



The installer must be informed whether the national legislation permits the work on the installation under voltage – live work, and must follow the rules of legislation.



Depending on the kind of work, the personnel working in such conditions shall be instructed or skilled. Live working requires the use of specific procedures. Instructions shall be given on how to maintain tools, equipment, and devices in good working order and how to verify them before working.

This subclause deals with the essential requirements (“the five safety or golden rules”) for ensuring that the electrical installation at the work location is disconnected from mains secure for the duration of the work.

This shall require clear identification of the work location. After the respective electrical installations have been identified, the following five essential requirements shall be undertaken in the specified order unless there are essential reasons for doing otherwise: disconnect completely (1.), secure against re-connection (2.), verify that the installation is dead (3.), carry out earthing and short-circuiting (4.), and provide protection against adjacent live parts (5.).

**CAUTION**

Do not attempt to install the device before you have isolated the installation site from the network!

**DANGER**

The main fuses must be removed before making any modifications to the installation, and kept safe until completing the work to prevent the unnoticed reinsertion.

**DANGER**

Connecting the device to the electrical network under voltage is life hazardous. The device connection procedure may only be performed by trained and adequately authorized personnel.

**CAUTION**

Only one wire (solid wire or wire/wires equipped with ferrule) may be connected in one terminal. Otherwise, the terminal could be damaged or the contact could not be made properly.

**CAUTION**

Use only wires according to requirements in the manual.

**DANGER**

The isolation of the connecting cables must extend over the completely visible part of the cables. There must be no further bare part of the cable visible above the terminal edge. Touching live parts is life hazardous. The stripped part of the connecting wire should be shortened if necessary.

**CAUTION**

At the end of installation at the installation point, no cables should stay unconnected or hanging freely from the installation point. Device cover must be closed and sealed.

The device has to be mounted on a smooth vertical surface and fixed on 3 points with screws using the prescribed torque (the device has two attachment holes and, optionally, a top hanger).

The device is intended for mounting at an indoor installation point, in a device cabinet, secured against the undesired access of unauthorized persons. Do not expose device surface to very high temperatures even though the surface is made of non-flammable plastics to prevent fire.

Electrical connection: mounting cables must be properly dimensioned and of proper shape. They must be mounted using the prescribed torque. The device should be connected according to the device connection diagram that is attached to the inner side of the device cover.

**CAUTION**

If it is possible to install the device without isolation from the electricity network, i.e. on live network, then appropriate instructions and safety warnings shall be provided.

**DANGER**

The preliminary fuses and/or voltage arresters must be re-inserted before commissioning and functional check of the device.

Seals on the device have to be checked at the end of the installation procedure so that the consumer (final customer) cannot come into unintentional contact with live parts of the device.

**DANGER**

If the device cover is not mounted tight, there exists a danger of contact with the connection terminals. Contact with live parts of the device is life hazardous.

**CAUTION**

For safety reasons, place the device cover immediately after the installation procedure and fix it with sealable locking cap!

**DANGER**

Switch on the power. Beware of the risk of electric shock at all times!



The functional check requires voltage to be applied.

If no main voltage is present, commissioning and functional check must be performed at a later date.

1.2.3. Maintenance

The device-design, the built-in components, and the manufacturing procedures ensure high long-term stability of product.



In the case service of the device is needed, the requirements from the device installation procedure must be observed and followed.

Cleaning of the device is allowed only with a soft dry cloth. Cleaning is allowed only in front plate of the device. Cleaning is forbidden in the region of terminal block, where cables are connected to the device, and in the region of the module. Cleaning can be performed only by the personnel responsible for device maintenance.



CAUTION

Never clean soiled device under running water, or with high-pressure devices. Penetrating water can cause short circuits. A damp cleaning cloth is sufficient to remove normal dirt such as dust. If the device is more heavily soiled, it should be dismantled and sent to the responsible service or repair centre.

Visible signs of fraud attempt (mechanical damages, presence of a liquid, etc.) must be regularly checked.

The quality of seals and the state of the terminals and connecting cables must be regularly checked.

If there exists a suspicion of incorrect operation of the device, the local utility must be informed immediately.



DANGER

Breaking the seals and removing the device cover will lead to potential hazards because there are live electrical parts inside.



After the end of the device's lifetime, the device should be treated according to the Waste Electric and Electronic (WEEE) Directive!

2. AC550/AC750 OVERVIEW

The AC550/AC750 is a family of communication devices based on a single platform. They provide connectivity between Head-End-System and smart electricity meters and designed with two exchangeable communication modules to cope with the rapid development of communication technologies.

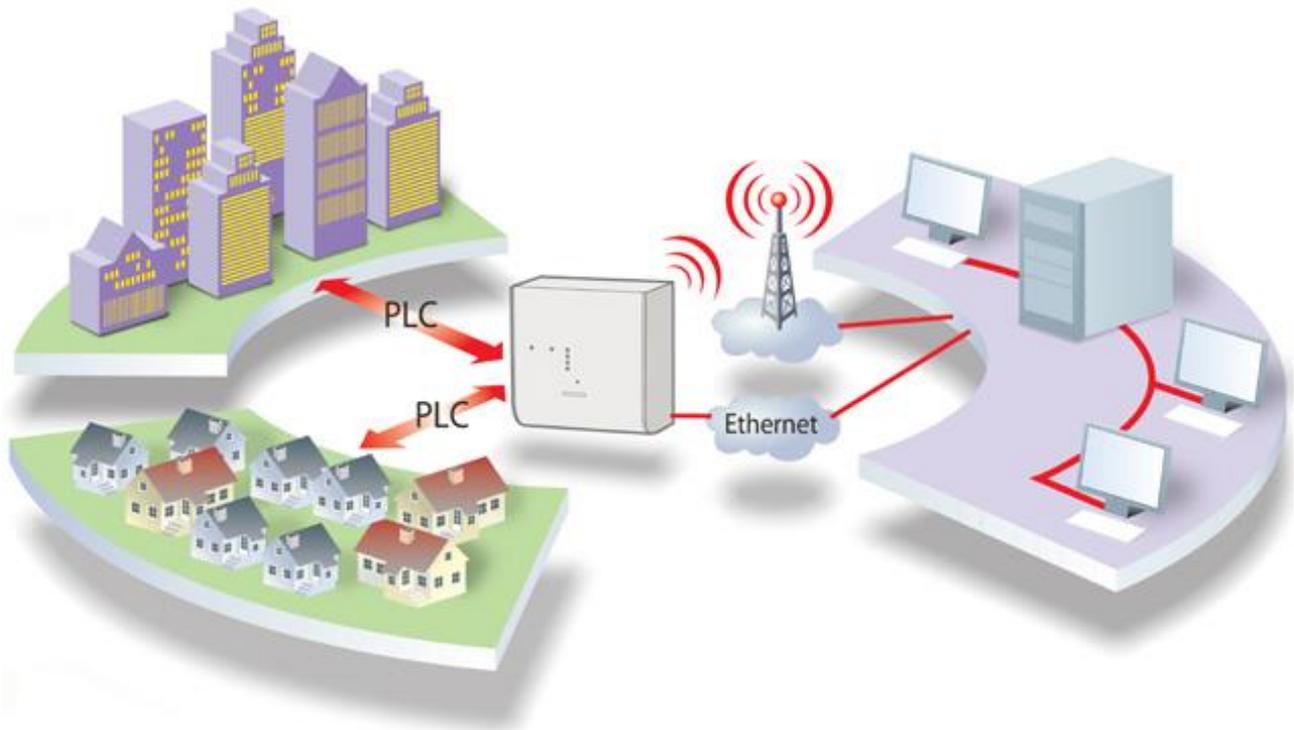


Figure 1: AC550/AC750 in the AMI system

3. AC550/AC750 INTRODUCTION

3.1. Standards and references

EN 62368-1: 2014 + AC:2015	Audio/video, information and communication technology equipment - Part 1: Safety requirements
EN 41003:2008	Particular safety requirements for equipment to be connected to telecommunication networks and/or a cable distribution system
EN 50065-1	Signalling on low-voltage electrical installations in the frequency range 3 kHz to 148.5 kHz. General requirements, frequency bands and electromagnetic disturbances
EN 50065-2-3	Signalling on low-voltage electrical installations in the frequency range 3 kHz to 148.5 kHz. Immunity requirements for mains communications equipment and systems operating in the range of frequencies 3 kHz to 95 kHz and intended for use by electricity suppliers and distributors
EN 55022	Information technology equipment - Radio disturbance characteristics - Limits and methods of measurement
EN 55032	Electromagnetic compatibility of multimedia equipment - Emission Requirements
EN 55024	Information technology equipment - Immunity characteristics - Limits and methods of measurement
EN 55011	Industrial, scientific and medical equipment. Radio-frequency disturbance characteristics. Limits and methods of measurement
EN 301 489-1 V1.9.2	Electromagnetic compatibility and Radio spectrum Matters (ERM); ElectroMagnetic Compatibility (EMC) standard for radio equipment and services; Part 1: Common technical requirements
EN 61000-3-2:2014	Electromagnetic compatibility (EMC) - Part 3-2: Limits - Limits for harmonic current emissions (equipment input current ≤ 16 A per phase)
EN 61000-3-3:2013	Electromagnetic compatibility (EMC) - Part 3-3: Limits - Limitation of voltage changes, voltage fluctuations and flicker in public low-voltage supply systems, for equipment with rated current ≤ 16 A per phase and not subject to conditional connection
IEC 61000-4-1	Electromagnetic compatibility (EMC) - Part 4-1: Testing and measurement techniques - Overview of IEC 61000-4 series
IEC 61000-4-2	Electromagnetic compatibility (EMC) - Part 4-2: Testing and measurement techniques - Electrostatic discharge immunity test
IEC 61000-4-3	Electromagnetic compatibility (EMC) - Part 4-3: Testing and measurement techniques - Radiated, radio-frequency, electromagnetic field immunity test
IEC 61000-4-4	Electromagnetic compatibility (EMC) - Part 4-4: Testing and measurement techniques - Electrical fast transient/burst immunity test
IEC 61000-4-5	Electromagnetic compatibility (EMC) - Part 4-5: Testing and measurement techniques - Surge immunity test
IEC 61000-4-6	Electromagnetic compatibility (EMC) - Testing and measurement techniques - Immunity to conducted disturbances, induced by radio-frequency fields
EN 61000-4-8	Electromagnetic Compatibility (EMC) - Part 4-8: Testing and Measurement Techniques - Power Frequency Magnetic Field Immunity Test
IEC 61000-4-11	Testing and Measurement Techniques - Voltage Dips, Short Interruptions and Voltage Variations Immunity Tests
IEC 61000-4-12	Electromagnetic compatibility (EMC) - Part 4-12: Testing and measurement techniques - Ring wave Immunity test
IEC 61180:2016	High-voltage test techniques for low-voltage equipment - Definitions, test and procedure requirements, test equipment
IEC 60364 -1:2005	Low-voltage electrical installations - Part 1: Fundamental principles, assessment of general characteristics, definitions
EN 50470-1	Electricity metering equipment (a.c.) - Part 1: General requirements, tests and test conditions Metering equipment (class indexes A, B and C)
IEC 62052-11:2003 + A1:2016	Electricity metering equipment (AC) - General requirements, tests and test conditions - Part 11: Metering equipment
IEC 62052-31: 2015	Electricity metering equipment (AC) - General requirements, tests and test conditions - Part 31: Product safety requirements and tests
IEC 62054-21	Electricity metering (AC) - Tariff and load control - Part 21: Particular requirements for time switches
EN 60068-2-1	Environmental testing. Tests. Test A. Cold
EN 60068-2-2	Environmental testing. Tests. Test B. Dry heat
EN 60068-2-6	Environmental testing. Tests. Test Fc. Vibration (sinusoidal)

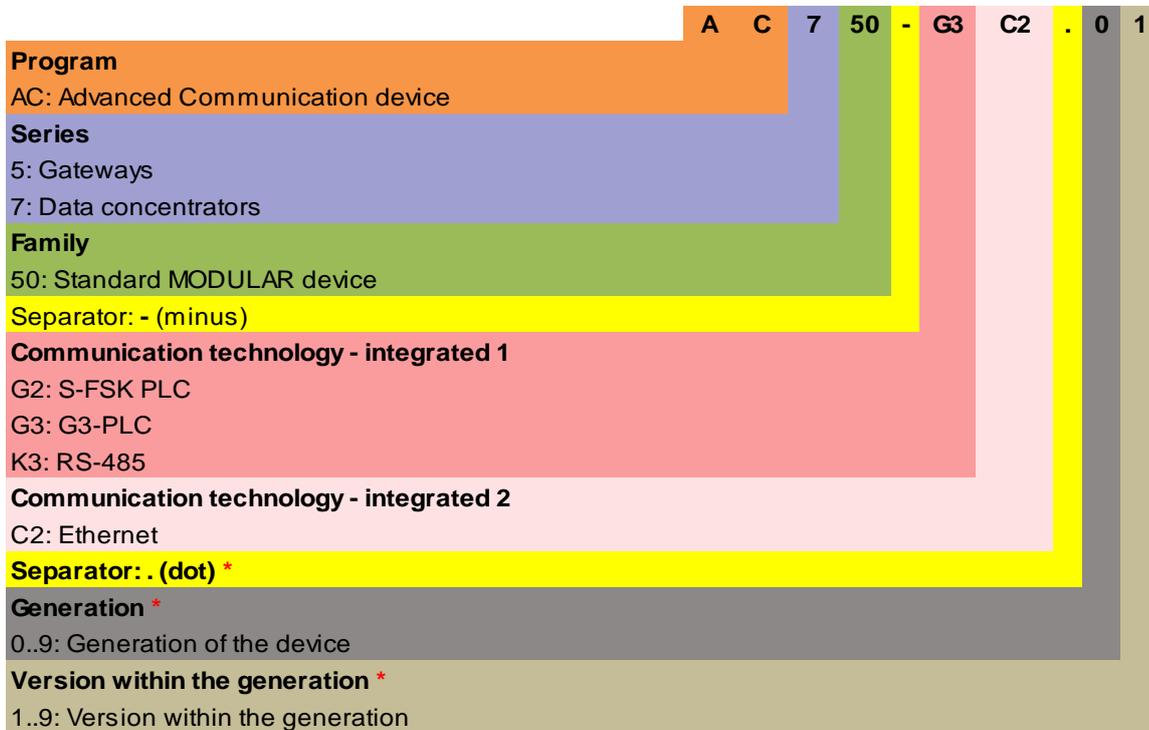
EN 60068-2-14	Environmental testing. Tests. Test N. Change of temperature
EN 60068-2-27	Environmental testing - Part 2-27: Tests - Test Ea and guidance: Shock
EN 60068-2-30	Environmental testing. Tests. Test Db and guidance: Damp heat, cyclic (12 h + 12 h cycle)
EN 60068-2-75	Environmental testing - Part 2-75: Tests - Test Eh: Hammer tests
EN 60085	Electrical insulation. Thermal evaluation and designation
IEC 60529	Degrees of protection provided by enclosures (IP Code)
IEC 62262: 2002	Degrees of protection provided by enclosures for electrical equipment against external mechanical impacts (IK code)
IEC 60998-2-1:2002	Connecting devices for low-voltage circuits for household and similar purposes - Part 2-1: Particular requirements for connecting devices as separate entities with screw-type clamping units
IEC 60695-2-11	Glow wire flammability test for end products
UL 94 Ed. 6: 2013/2016	Standard for safety: Tests for Flammability of Plastic Materials for Parts in Devices and Appliances
EN 60715: 2002	Dimensions of low-voltage switchgear and controlgear - Standardized mounting on rails for mechanical support of electrical devices in switchgear and controlgear installations
EN 61140	Protection against electric shock - Common aspects for installation and equipment
DLMS UA 1000-2 Ed. 8.0:2014	DLMS/COSEM Architecture and Protocols, the "Green Book" Ed. 8
DLMS UA 1000-1 Ed. 12.0:2014	COSEM Identification System and Interface Classes, the "Blue Book" Ed. 12
IEC 62056-1-0 Ed.1:2016	Electricity metering – Data exchange – The DLMS/COSEM suite – Part 1-0: Smart metering standardisation framework
IEC 62056-46 Ed. 1.1:2007	Electricity metering – Data exchange for meter reading, tariff and load control – Part 46: Data link layer using HDLC protocol
IEC 62056-5-3: 2016	Electricity metering – Data exchange – The DLMS/COSEM suite – Part 5-3: DLMS/COSEM application layer
IEC 62056-6-1: 2015	Electricity metering – Data exchange - The DLMS/COSEM suite - Part 6-1: Object Identification System (OBIS)
IEC 62056-6-2: 2016	Electricity metering – Data exchange – The DLMS/COSEM suite – Part 6-2: COSEM interface classes
IEC 62056-9-7: 2013	Electricity metering – Data exchange – The DLMS/COSEM suite - Part 9-7: Communication profile for TCP-UDP/IP networks
ITU-T G.9901	Narrowband orthogonal frequency division multiplexing power line communication transceivers - Power spectral density specification (04/2014)
ITU-T G.9903	Narrowband orthogonal frequency division multiplexing power line communication transceivers for G3-PLC networks (02/2014)
ITU-T G.9903	Narrowband orthogonal frequency division multiplexing power line communication transceivers for G3-PLC network - Amendment 1 (08/2015)
IEC 62056-4-7:2015	Electricity metering data exchange - The DLMS/COSEM suite - Part 4-7: DLMS/COSEM transport layer for IP networks
CLC/TS 52056-8-5: 2015	Electricity metering data exchange. The DLMS/COSEM suite. Narrow-band OFDM G3-PLC communication profile for neighbourhood networks
IEEE 802.15.4	IEEE Standard for Low-Rate Wireless Networks
RFC 3561	Ad Hoc On Demand Distance Vector (AODV) Parameters
RFC 6130	Mobile Ad Hoc Network (MANET) Neighbourhood Discovery Protocol (NHDP)
RFC 5444	Generalized Mobile Ad Hoc Network (MANET) Packet/Message Format
RFC 4944	Transmission of IPv6 Packets over IEEE 802.15.4 Networks
RFC 2460	Internet Protocol, Version 6 (IPv6) Specification
RFC 768	User Datagram Protocol
RFC 2463	Internet Control Message Protocol (ICMPv6) for the Internet Protocol Version 6 (IPv6) Specification
RFC 4861	Neighbour Discovery for IP version 6 (IPv6)

3.2. Type designation

Product type designation can be found on the device's nameplate on the front side of the device (see chapter 4.2.2. *Nameplate*). In Table 1, explanation of the AC550/AC750 type designation can be found.

Example:

AC750-G3C2.01 – Smart modular data concentrator with integrated G3-PLC and Ethernet communication interfaces (HW version 01)



* Type designation of the 1st-generation product is written without generation (and version within generation).

Table 1: Description of the AC550/AC750 type designation

3.3. Appearance

The main part of the device is covered with device cover with transparent window.

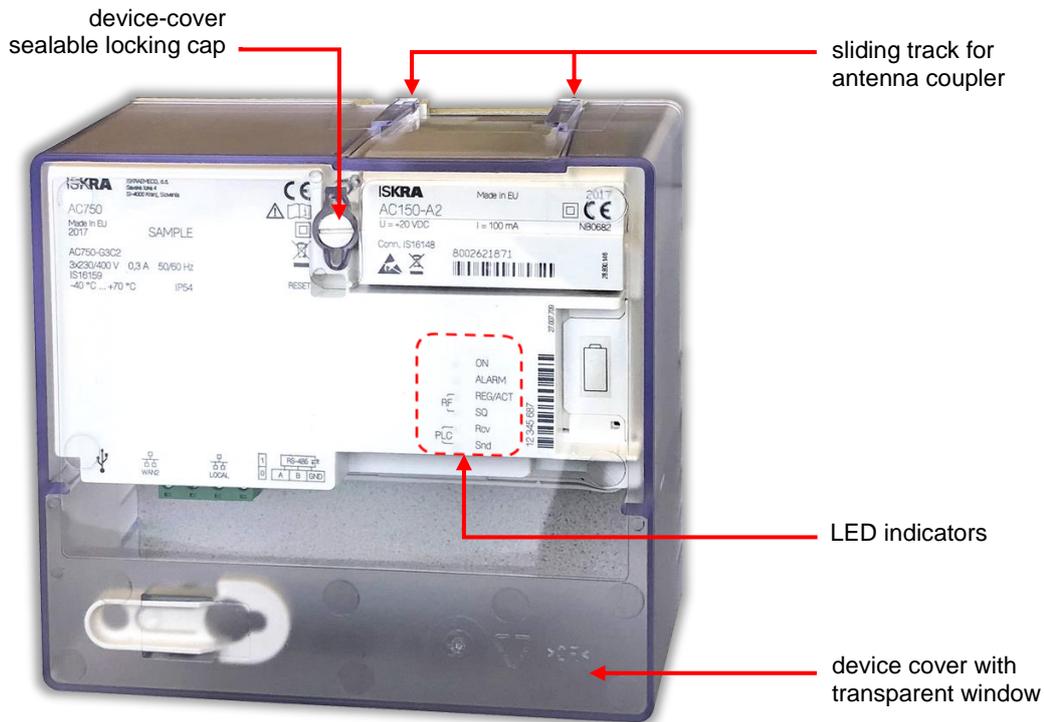


Figure 2: AC550/AC750 – front view

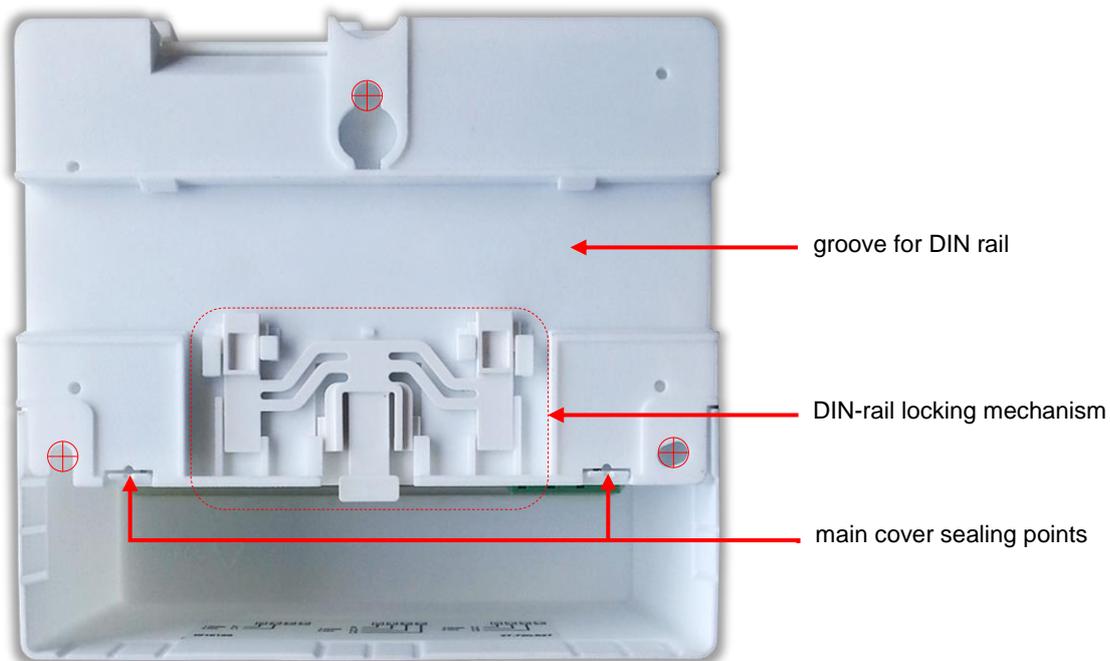


Figure 3: AC550/AC750 – back view

3.4. Main device properties

- Communication channels (WAN):
 - Ethernet interface (10/100 base T)
 - P2P communication module AC150 (optional)
- Communication channels (NAN):
 - PLC (G3-PLC standard)
 - Plug & Play installation
 - Communication on 3 phases
 - RS-485
 - Mode: half duplex
 - Max speed: 115200 bps
 - Maximum number of slaves: 31
- Communication channel (LAN)
 - Ethernet interface (10/100 base T)
- Monitoring: Events logs and Alarms
- Web user interface
- Device configuration and management can be done locally or remotely, in compliance with the pre-defined security levels
- Anti-tampering:
 - Cover-removal detection
 - Seals
- Mounting:
 - Three-fixing points
 - DIN rail
- Compact plastic housing:
 - Made of high quality fire-extinguishing UV stabilized material that can be recycled
 - IP54 protection against dust and water penetration
 - IK07 protection against mechanical impacts

3.5. Connection diagram

A connection diagram shows the correct connection of a device into the electrical network.

The device has the appropriate connection diagram attached to the inner side of the device cover.

To each connection diagram, corresponding identification number (IS number) is assigned and it is printed on the nameplate (see chapter 4.2.2. *Nameplate*). Connection diagram of the device is shown in Figure 4.

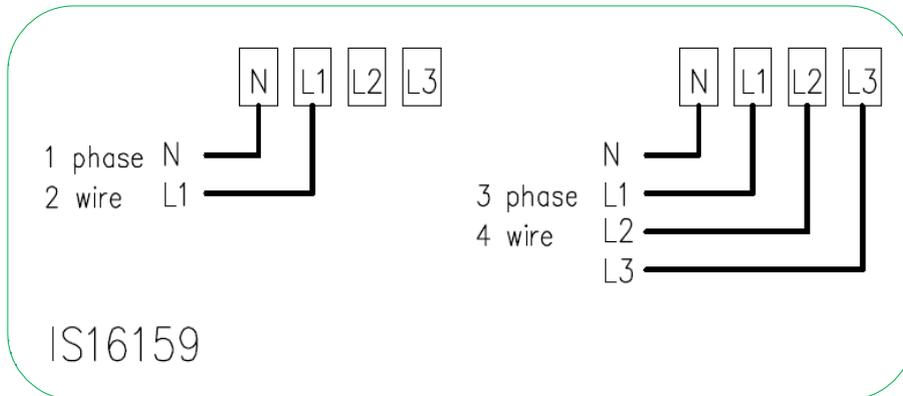


Figure 4: Connection diagram of AC550/AC750

Choose appropriate connection diagram according to mains-connection type:

- **1-phase connection**
- **3-phase 4-wire connection (with neutral)**

4. CONSTRUCTION

4.1. Technical figures and dimensions

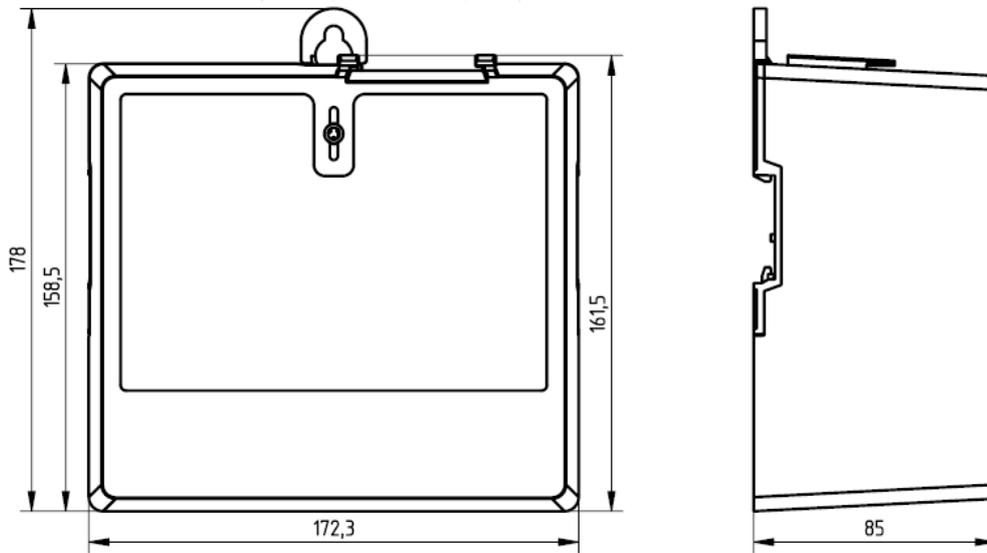


Figure 5: Overall dimensions of AC550/AC750 with device cover (in mm)

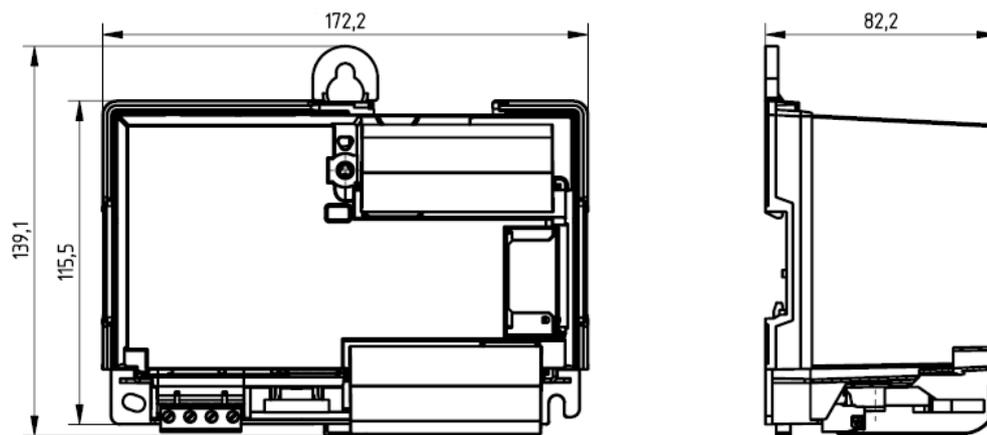


Figure 6: Overall dimensions of AC550/AC750 without device cover (in mm)

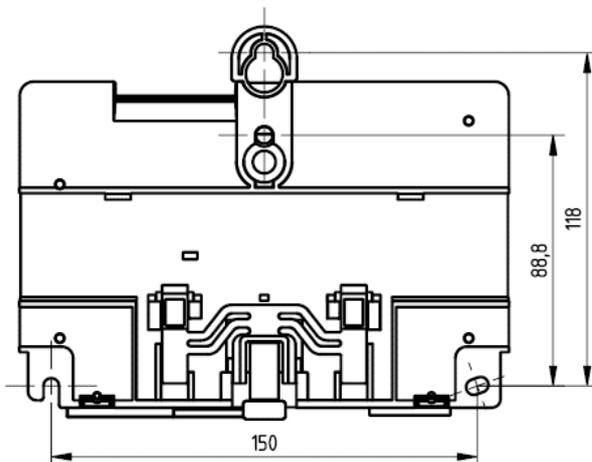


Figure 7: Fixing dimensions of AC550/AC750 (in mm)

4.2. Main parts of the device

The main parts of the device are:

- Device cover (see chapters 3.3 *Appearance*)
- Nameplate
- Terminals and communication ports
- Module areas
- Battery compartment
- LED indicators
- Reset button
- Device-cover opening detector

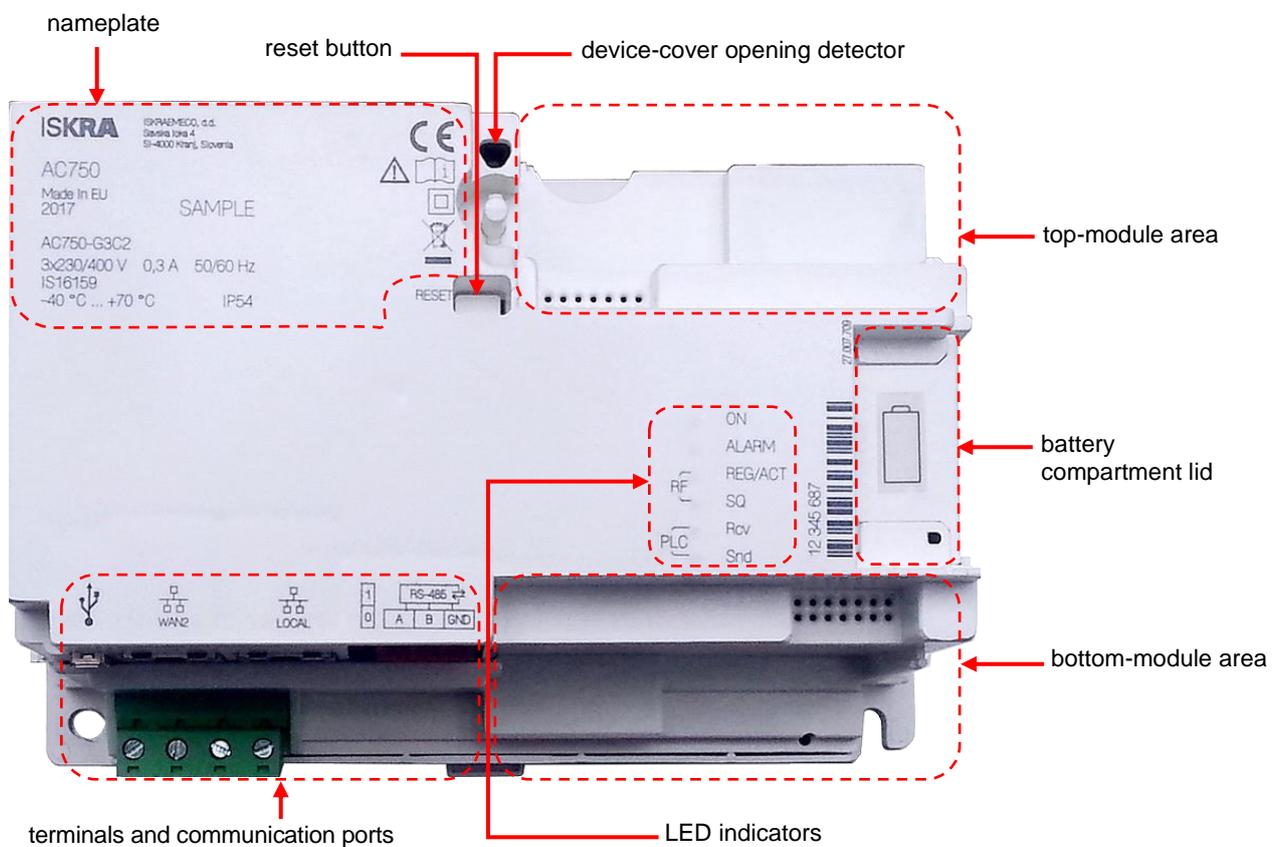


Figure 8: Main parts of the device (except device cover)

4.2.1. Device cover

The entire device (except back of the device) is covered by device cover (Figure 2 and Figure 9).

On the front side, it has a transparent window, which allows the front part of the device (under the cover) to be visible. On the top of the cover, sliding tracks for antenna coupler are available (to connect antenna coupler for connecting an external antenna).

The cover is fixed on the device with a plastic sealable locking cap, which is located on the front side of the meter.

The entire device cover (including the locking cap and the cover window) is made of high quality UV-stabilized polycarbonate that can be recycled and is semi-transparent, while window is fully transparent.



Figure 9: Device cover

On the inner side of the cover, the device's connection diagram (in a form of a label), and attached hanger can be found (Figure 10).

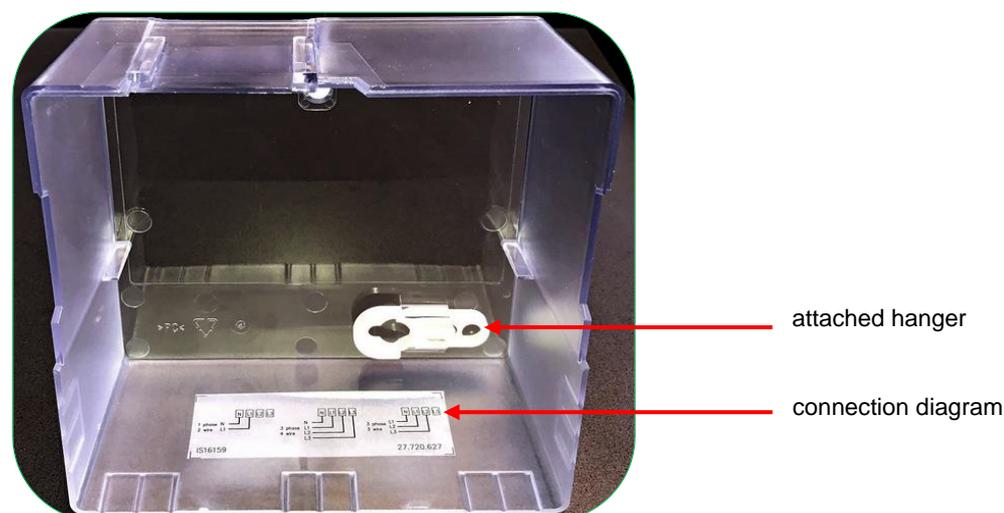


Figure 10: Inner side of device cover with device's connection diagram and attached hanger

4.2.2. Nameplate

Basic data and type designation of the device can be found on the nameplate (Figure 11).

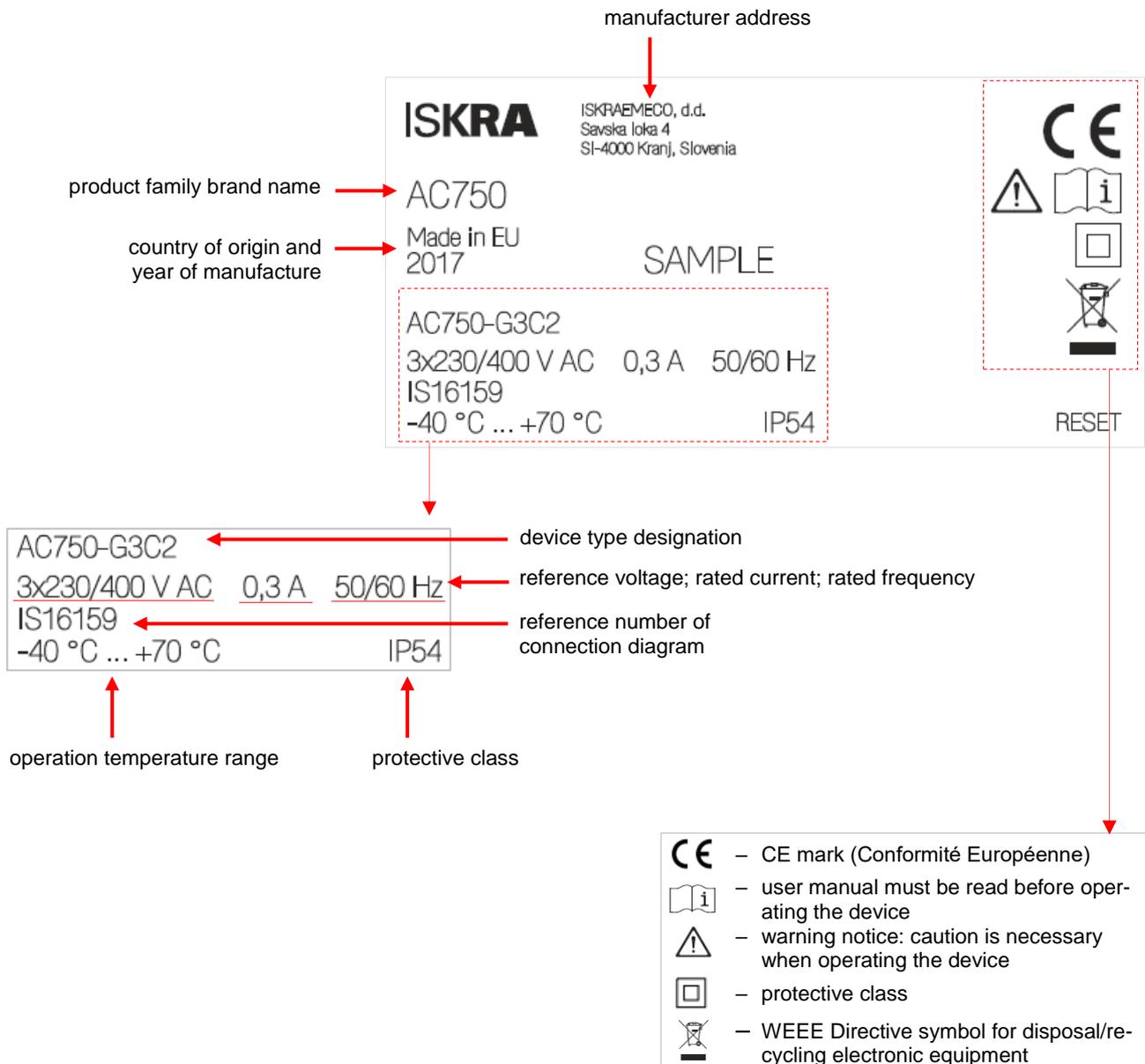


Figure 11: Nameplate (example of AC750)

4.2.3. Connectors and communication ports

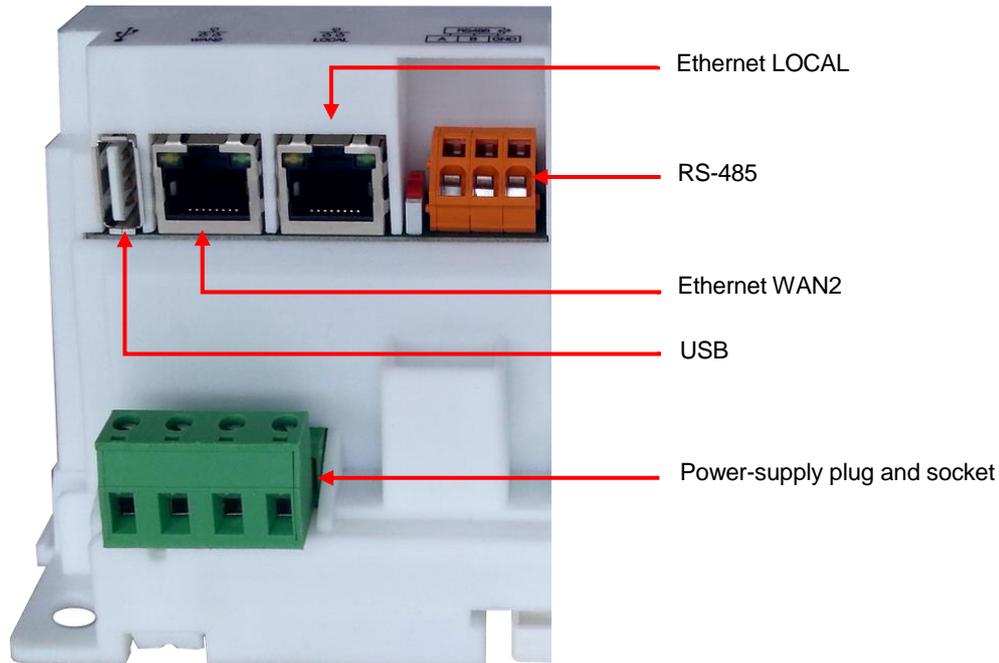


Figure 12: Terminals and communication ports

4.2.3.1. Power supply

Power supply part of the device is designed as combination of a plug and a socket. Built-in plug is male type of a plug. The socket is a female-type plug with terminals, where cables can be inserted. Once, the socket has correctly inserted and cables are screwed, it becomes female plug connector, which can be connected/inserted in the male plug built in the device. For more information, see Table 2.

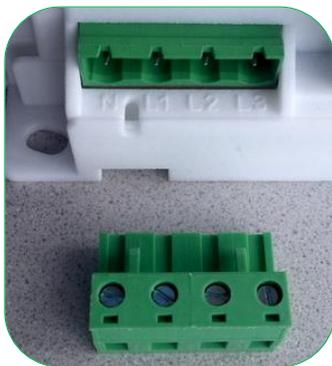


Figure 13: Power supply – female and male plug

Terminal mark	Function (according to connection type) *		Diam. [mm]	Note	Wire [mm ²] **	Screw head type and size	Torque [N m]
	1-phase	3-phase 4-wire with neutral					
N	Neutral	Neutral	2.8	voltage	0.2–2.5	Slot (2.5)	0.6
L1	L1-in	L1-in	2.8	voltage	0.2–2.5	Slot (2.5)	0.6
L2	–	L2-in	2.8	voltage	0.2–2.5	Slot (2.5)	0.6
L3	–	L3-in	2.8	voltage	0.2–2.5	Slot (2.5)	0.6

* See connection diagram (Figure 4)

** Minimum cross section of a wire shall be according to standards.

Table 2: Terminal data of power supply terminals

4.2.3.2. RS-485

RS-485 communication port is equipped with switch for RS-485 line termination with resistor of 120 Ω. The port consists of three-pole screw-less spring-cage terminal.



Figure 14: RS-485 communication port and switch for RS-485 line termination with a resistor of 120 Ω

Terminal mark	Function	Diam. [mm]	Note	Wire [mm ²] *	Screwdriver type and size
A	RS-485	2.4	A	0.2-2.5	Regular (0.5×3.5)
B	RS-485	2.4	B	0.2-2.5	Regular (0.5×3.5)
GND	RS-485	2.4	GND	0.2-2.5	Regular (0.5×3.5)

* Minimum cross section of a wire should be according to standards.

Table 3: Terminal data of RS-485 interface

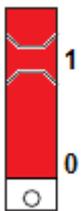


Figure 15: Terminating-resistor switch – positions 1 (up) and 0 (down)

Meaning of the switch positions is described in Table 4.

Switch position	Description	Using on
0	RS-485 line is not terminated	All devices, except the first and the last in RS-485 communication line
1	RS-485 line is terminated with resistor 120 Ω	The first and the last device in RS-485 communication line

Table 4: RS-485 switch position



NOTE

RS-485 communication line should be terminated on the first and the last device.

4.2.3.3. Ethernet

Two ports for Ethernet communication are available, where RJ45 8-pins plug connectors can be plugged. Each RJ45 port is equipped with yellow and green LED diode (Figure 17).

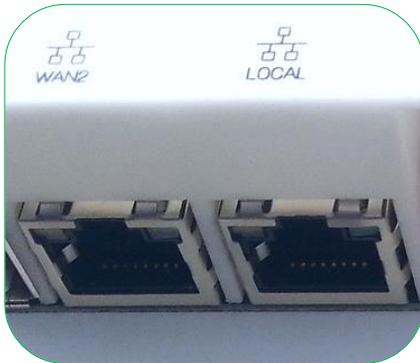


Figure 16: Ethernet communication ports – RJ45 (left: WAN2, right: LOCAL)

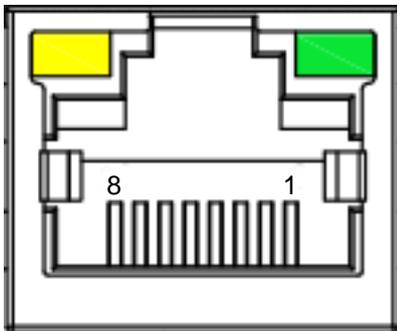


Figure 17: 8-pins RJ45 port with yellow and green LED diodes

4.2.3.4. USB port

Communication port is not available yet.



Figure 18: USB port, connector type A



NOTE

Communication via USB port is not available yet.

4.2.4. Module areas for device modules

A device module is an exchangeable, plug-in hardware unit, which can be fitted in a module area of the device, under the device cover.

The module can be inserted/removed even when the device is in full operational state (hot swap).

The communication modules operate on a so-called P* interface. P* interface is intended to be a universal interface for various modules supporting different technologies. Modules that comply with P* are easily exchangeable.

P* interface is designed as plug and play interface for connecting a module to a host device (e.g. data concentrator). It enables connecting a module in a host device only with plugging the module in the device and the host device recognizes it.

The AC550/AC750 device is a host device and it offers two plug female sockets of FEM 1 type for connecting modules; therefore, at the same time, two modules can be connected in the device, one on top, and another one on bottom of the device. See Figure 19 and Table 5.

A module is designed with a male plug of FEM 1 type with 14 pins, which can be plugged in one of the FEM 1 plug female sockets located in a host device.

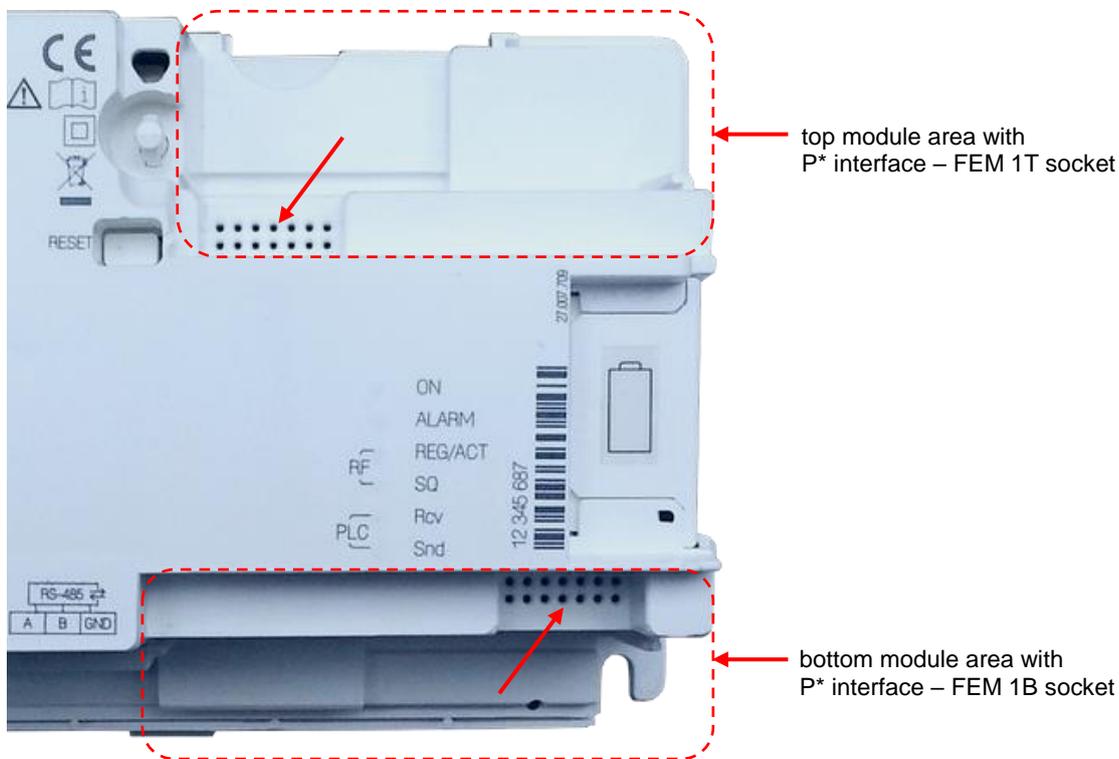


Figure 19: Module areas with FEM1 sockets for connecting modules

Module area	Socket name	Module type, which can be connected
Top	FEM 1T	<ul style="list-style-type: none"> • Communication module (only wireless WAN)
Bottom	FEM 1B *	<ul style="list-style-type: none"> • Communication module (except wireless WAN) • I/O module

* FEM 1B is not supported yet.

Table 5: Characteristics of module areas

Information of AC150 modules is available in separate documentation (Technical descriptions).

4.2.5. Battery compartment lid

Battery compartment lid is located on the right side of the device (see Figure 8). It consists of battery compartment and sliding battery-compartment lid. The lid has sealing point, which enables sealing it and makes protection against battery removal.

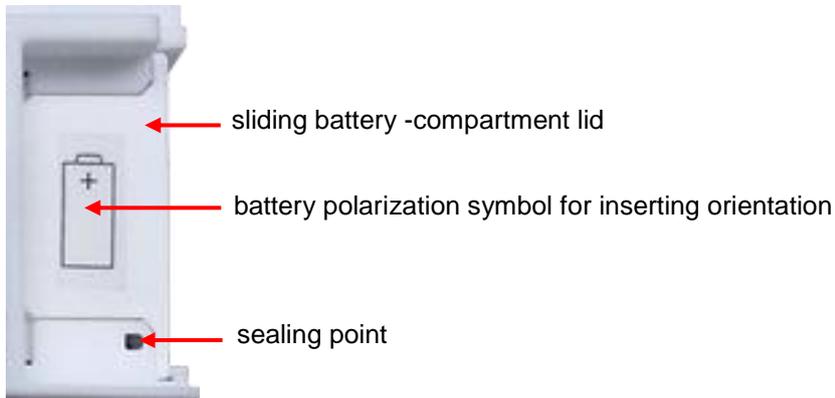


Figure 20: Battery compartment covered with its lid



NOTE

Type of battery: 1/2AA non-rechargeable LiSOCl Battery (3.6 V).

4.2.6. LED indicators

The device is equipped with six LED indicators on the front plate and additional two standard LED indicators on each RJ45 socket. Those LED indicators are used to identify the device status.



Figure 21: LED indicators

LED	State	Colour	Description
ON	<ul style="list-style-type: none"> • Constant ON • Blinking 	<ul style="list-style-type: none"> • Green • Green 	<ul style="list-style-type: none"> • Normal operation • Backup power supply is charging
ALARM	<ul style="list-style-type: none"> • Constant ON • Constant ON 	<ul style="list-style-type: none"> • Red • Yellow 	<ul style="list-style-type: none"> • Critical alarm (see chapter 5.3.2. Alarms) or application is not running • Not all 3 phases are connected
RF: REG/ACT	<ul style="list-style-type: none"> • Constant ON • Blinking 	<ul style="list-style-type: none"> • Green • Green 	<ul style="list-style-type: none"> • WAN1: registered to network • WAN1: communication in progress
RF: SQ	<ul style="list-style-type: none"> • Constant ON • Blinking fast (1.5 sec on, 0.5 sec off) • Blinking slow (0.5 sec on, 1.5 sec off) • OFF 	<ul style="list-style-type: none"> • Green • Green • Green • Green 	<ul style="list-style-type: none"> • WAN1: Signal level (Very high) • WAN1: Signal level (Medium) • WAN1: Signal level (Low) • WAN1: Signal level (Very low)
PLC: RCV	Blinking	• Green	• PLC Receiving
PLC: SND	Blinking	• Green	• PLC Sending

Table 6: Meaning of LED indicators



NOTE

Ethernet ports have indication on the connectors for Link and communication statuses.



NOTE

While the device is rebooting, all LEDs lit and blink.

4.2.7. Reset button

The Reset button is located in the hole on the front of the device, on the right side of mark “RESET”. It is intended to reset the application (SW) or reboot the device (HW). The reset button is designed to avoid pressing it accidentally and can be pressed with long thin object, e.g. 0.5×3×100 mm screwdriver.



Figure 22: RESET button

In a case of connection, performance or any other type of malfunction, the reset button can be used.

The device offers two types of resets:

- **Short press:** press and hold for 1 second until ON LED blinks once – application restart
- **Long press:** press and hold for 3 second – device reboot



NOTE

After device starts rebooting, all LEDs are blinking.



NOTE

The RESET actions will not affect the device settings.

4.2.8. Device cover opening detector

Device-cover opening detector is located above the Reset button (see Figure 8).

4.3. Sealing

The device can be sealed by four seals (Figure 23).

By the manufacturer, the device housing is sealed by two seals (bottom arrows in Figure 23).

Another two sealing points can be sealed by a customer:

- device cover – through the sealable locking cap of the device cover
- battery – through the battery compartment lid.



Figure 23: Positions of sealing points

5. DESCRIPTION OF MAIN DEVICE FUNCTIONALITIES AND FEATURES

5.1. Web user interface

The configuration and maintenance tool of the device is Web user interface (Web-UI) designed by Iskraemeco. It can be accessed locally or remotely. The Web-UI is scaled automatically to the screen (e.g. computers, tablets, mobiles, etc.) From the Web-UI, a single device can be accessed and it is possible to:

- Configure parameters
- View the system information
- Monitor alarms and events
- Diagnose the communication
- Administer and manage users
- etc.



NOTE

The Web-UI is compatible with the following web browsers:

- Microsoft Internet Explorer 10 or higher
- Google Chrome 38 or higher
- Mozilla Firefox 28 or higher

JavaScript, HTML and CSS must be enabled.



NOTE

Running Web-UI

Step-by-step procedure is described in chapter 7.1.1. *Local connection*

5.1.1. Web user interface structure

The Web user interface (Web-UI) is shown in Figure 24.

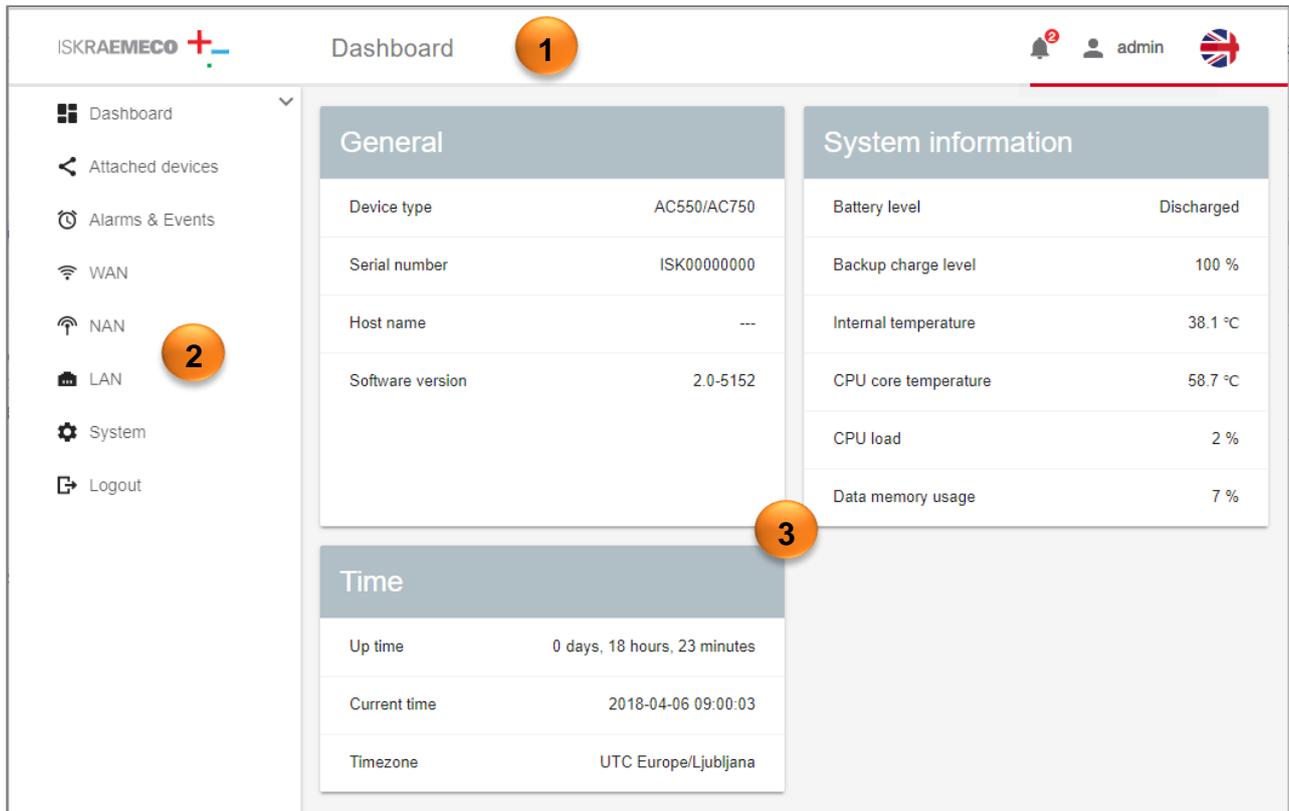


Figure 24: Web user interface – dashboard page

Every page on the Web-UI has the following components (Figure 24):

- *Header* [1]
- *Menu* [2]
- *Main content area* [3]

Header

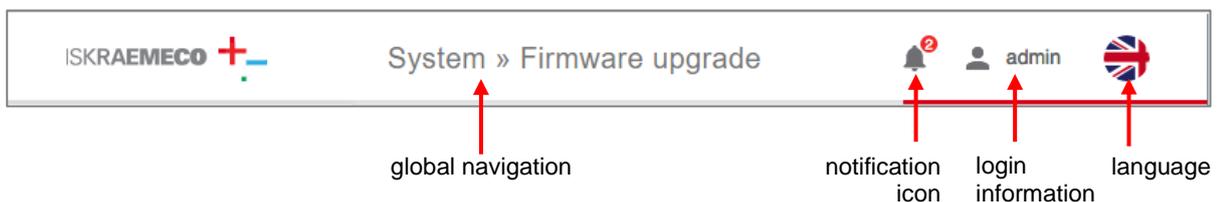


Figure 25: Web user interface – header

The **header** of the Web-UI provides (Figure 25):

- **Global navigation** – displays the current page name and its path
- **Notification icon** – displays alarms
- **Login information** – displays the user name, which is currently logged in
- **Language** – displays the current language

Menu

On left side of Web-UI is **menu** (see Figure 24), which enables access to other statuses and configuration web pages.

- **Dashboard** – the dashboard screen displays general information when you log into the device
- **Attached devices** – displays the devices connected to your network
- **Alarms & Events** – displays alarms & events and configuration of alarms
- **WAN** – displays the parameters for the interface to connect to WAN
- **NAN** - displays the parameters for the interface to meters or other devices
- **LAN** - displays the parameters for LOCAL interface to connect to computer
- **System** – displays other system parameters
- **Logout** – logging out from the Web-UI

Main content area

The **main content area** (see Figure 24) in the middle of the page displays the main information given in the page.

5.1.2. Dashboard

On the device's home page is a **dashboard**, which displays the status of the device for monitoring and diagnostics purposes:

- **General**
- **System information**
- **Time**

General		System information	
Device type	AC550/AC750	Battery level	Discharged
Serial number	ISK00000000	Backup charge level	100 %
Host name	---	Internal temperature	38.1 °C
Software version	2.0-5152	CPU core temperature	58.7 °C
		CPU load	2 %
		Data memory usage	7 %

Time	
Up time	0 days, 18 hours, 23 minutes
Current time	2018-04-06 09:00:03
Timezone	UTC Europe/Ljubljana

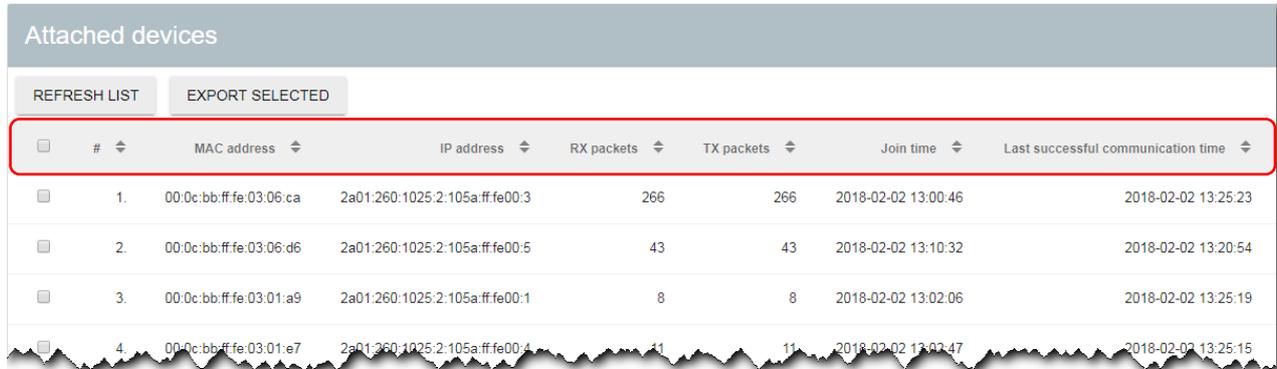
Figure 26: Dashboard page of the Web user interface

The parameters displayed on Dashboard page are: (Figure 26).

- **General**
 - **Device type** – the type of device
 - **Serial number** – manufacturer serial number of the device
 - **Host name** – the device host name (See chapter 5.7.1.1. *Host name*)
 - **Status** – Current status of the device (currently not supported)
 - **Software version** – FW version currently running on the device
- **System information**
 - **Battery level** – (in V) – voltage information of the battery for the RTC backup (optional); possible values:
 - FULL
 - LOW
 - Discharged
 - No battery
 - **Backup charge level** - (in %) charge level of SuperCap for backup power supply
 - **Internal temperature** – (in °C) the internal temperature of the device
 - **CPU core temperature** – (in °C) the temperature of the CPU
 - **CPU load** – (in %) the load of the CPU
 - **Data memory usage** – (in %) the FLASH data partition memory usage
- **Time**
 - **Up time** – The time elapsed since last boot
 - **Current time** – the time of the device (format: YYYY-MM-DD HH:MM:SS)
 - **Timezone** – Linux time zone (area/location)

5.2. Attached devices

The **Attached devices** page of Web-UI displays all devices connected to the network (e.g. smart meters). New device, which keeps a G3-PLC interface, is discovered by the AC550/AC750 automatically in accordance to the G3-PLC specifications and is presented in a table within *Attached devices*. The columns in the table can be sorted by pressing the column header (in Figure 27, header row is marked red).



<input type="checkbox"/>	#	MAC address	IP address	RX packets	TX packets	Join time	Last successful communication time
<input type="checkbox"/>	1.	00:0c:bb:ff:fe:03:06:ca	2a01:260:1025:2:105a:ffe00:3	266	266	2018-02-02 13:00:46	2018-02-02 13:25:23
<input type="checkbox"/>	2.	00:0c:bb:ff:fe:03:06:d6	2a01:260:1025:2:105a:ffe00:5	43	43	2018-02-02 13:10:32	2018-02-02 13:20:54
<input type="checkbox"/>	3.	00:0c:bb:ff:fe:03:01:a9	2a01:260:1025:2:105a:ffe00:1	8	8	2018-02-02 13:02:06	2018-02-02 13:25:19
<input type="checkbox"/>	4.	00:0c:bb:ff:fe:03:01:e7	2a01:260:1025:2:105a:ffe00:4	11	11	2018-02-02 13:02:47	2018-02-02 13:25:15

Figure 27: List of attached devices

The information presented in the table includes:

- **MAC Address** – MAC address of the attached device (e.g. smart meter)
- **IP address** – the IP address, which is allocated to the device
- **RX packets** – number of received packets from device
- **TX packets** – number of transmitted (sent) packets to device
- **Join time** – the time stamp when the device was attached (format: YYYY-MM-DD HH:MM:SS)
- **Last successful communication time** – the time stamp of last successful communication time (format: YYYY-MM-DD HH:MM:SS)



NOTE

In order to display the current status of the attached device list, the page needs to be refreshed. It can be done by:

- pressing **REFRESH LIST** button above the header row
- using the standard web browser refresh command (refresh button, F5...)

If needed, a list of attached devices can be exported in CSV file.

1. Select (click in check boxes) all attached devices you want to be exported.
2. Click on **EXPORT SELECTED** button.

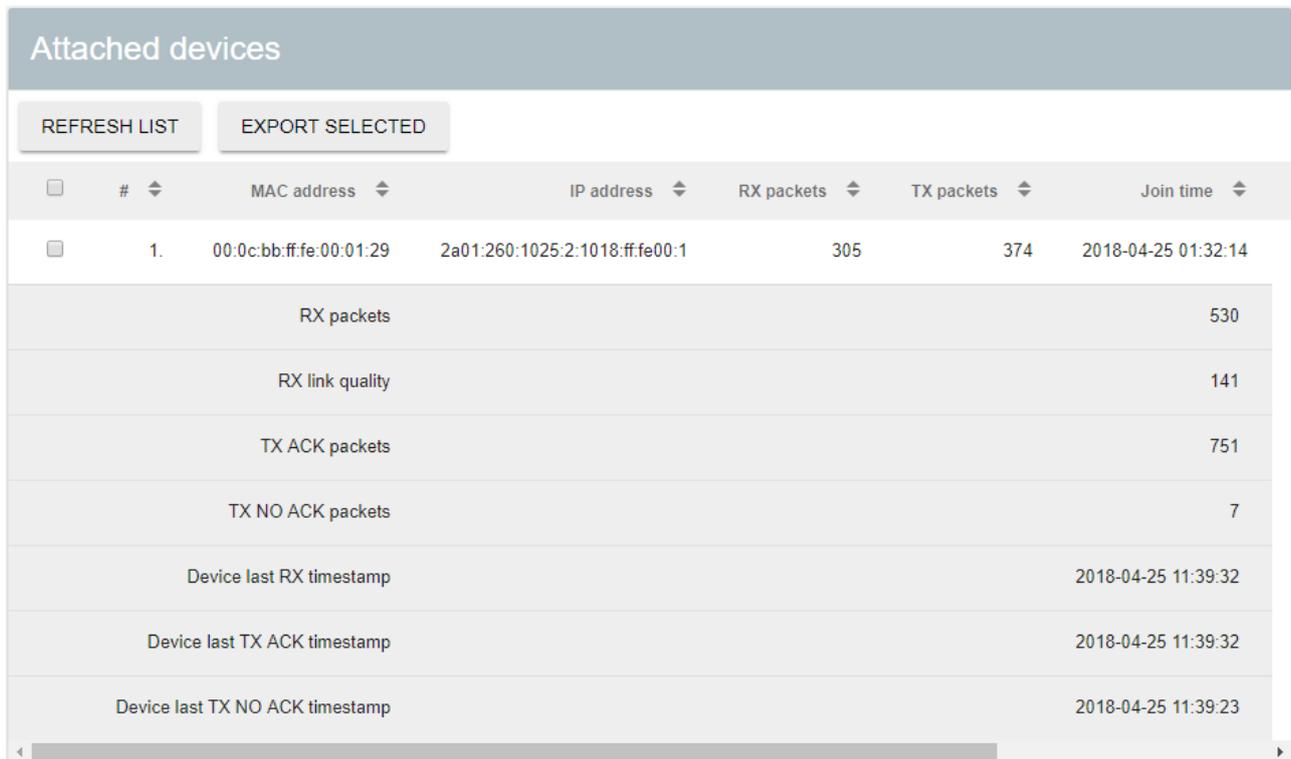
CSV file is generated and downloaded in browser's default location for downloads.



NOTE

Complete loss of voltage may lead to loss of PLC address of the PAN device (e.g. smart meter) and consequently the PLC connectivity is lost. The connectivity is automatically restored after the PAN device is restarted or after the time, which is define with "no-communication time out" parameter in the PAN device (default value of this parameter is 30 hours).

When one of attached devices from the list is selected, list with detailed information of the attached device is shown (see Figure 28).



<input type="checkbox"/>	#	MAC address	IP address	RX packets	TX packets	Join time
<input type="checkbox"/>	1.	00:0c:bb:ff:fe:00:01:29	2a01:260:1025:2:1018:fffe00:1	305	374	2018-04-25 01:32:14
RX packets				530		
RX link quality				141		
TX ACK packets				751		
TX NO ACK packets				7		
Device last RX timestamp				2018-04-25 11:39:32		
Device last TX ACK timestamp				2018-04-25 11:39:32		
Device last TX NO ACK timestamp				2018-04-25 11:39:23		

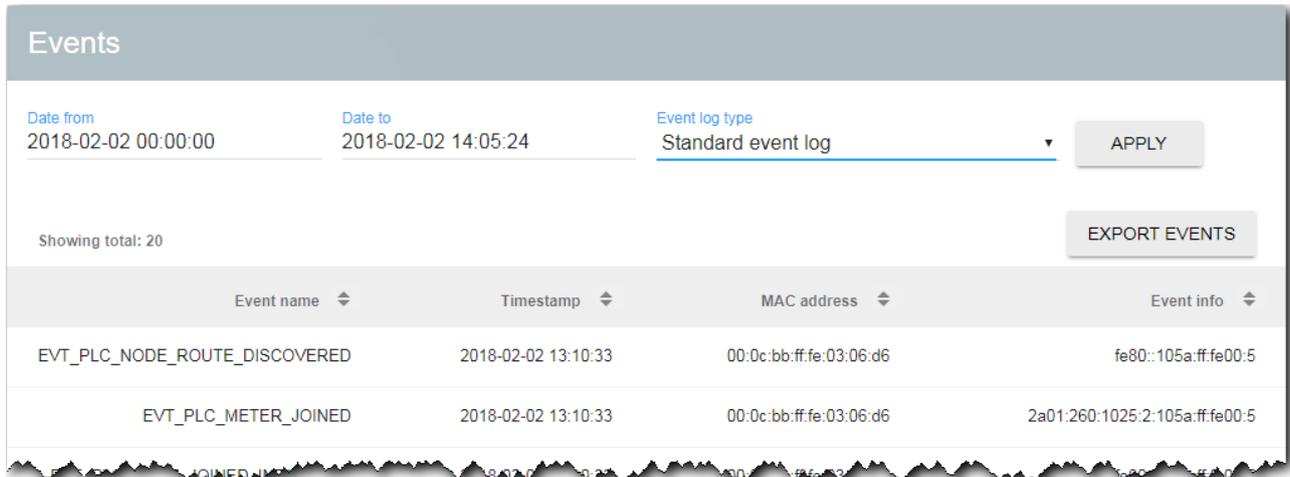
Figure 28: Detailed information of selected attached device

The detailed information presented in the table includes:

- **RX packets** – number of received packets from device
- **RX link quality** – link quality of the last received frame
- **TX ACK packets** – number of transmitted and acknowledged packet by PAN coordinator modem
- **TX NO ACK packets** – number of not acknowledged or refused transmitted packet from PAN coordinator modem
- **Device last RX timestamp** – timestamp of the last received packet
- **Device last TX ACK timestamp** – timestamp of last transmitted and acknowledged packet by PAN coordinator
- **Device last TX NO ACK timestamp** – timestamp of last not acknowledged or refused transmitted packet by PAN coordinator modem

5.3. Alarm and Events

Events and alarms are used for device and system diagnostics.



The screenshot shows the 'Events' page with the following data:

Event name	Timestamp	MAC address	Event info
EVT_PLC_NODE_ROUTE_DISCOVERED	2018-02-02 13:10:33	00:0c:bb:ff:fe:03:06:d6	fe80::105a:ff:fe00:5
EVT_PLC_METER_JOINED	2018-02-02 13:10:33	00:0c:bb:ff:fe:03:06:d6	2a01:260:1025:2:105a:ff:fe00:5

Figure 29: Alarms & Events page

5.3.1. Events

Events are stored in dedicated event log and can be:

- Viewed from the Web-UI locally or remotely
- Exported to a file from the Web-UI
- Read by HES with dedicated web service

Critical events in the AC550/AC750 or in attached devices (e.g. smart meters) can trigger alarms (see chapter 5.3.2. *Alarms*) towards the HES. The device features event logs listed in Table 7.

Event log type	Capacity
Standard event log	1000
PLC communication log	1000
WAN communication log	1000
Power failure event log	1000
Security event log	1000
Service event log	1000

Table 7: Event-log types

To view events, follow next instructions.

1. Go to *Alarms & Events* page in the menu.
2. Select *Event log Type* from the drop down menu.
3. Define the time period from *Date from* and *Date to* fields.
4. Press **APPLY** button



NOTES

- By default, events are sorted from old to new.
- Sorting of columns can be done by pressing the column header.
- Each event has additional information (e.g. event counter). To view the additional information, press on the Event ID.

	Event name	Event description	Standard event log	PLC communication log	WAN communication log	Power failure event log	Security event log	Service event log
1	EVT_PLC_NODE_JOINED_INDICATION	Node joined to PAN	+	+				
2	EVT_PLC_NODE_ROUTE_DISCOVERED	Node route discovered	+	+				
3	EVT_PLC_NODE_LEAVE_INDICATION	Node left PAN network	+	+				
4	EVT_PLC_NODE_LEAVE_CONFORMATION	Node kicked off from PAN network	+	+				
5	EVT_PLC_NETWORK_CFM	Start G3-PLC PAN network confirm message	+	+				
6	EVT_PLC_NODE_JOIN_DECLINED	Node join to PAN declined	+	+				
7	EVT_PLC_METER_JOINED	G3 PLC meter joined to PAN	+	+				
8	EVT_PLC_METER_REMOVED	Meter removed from PAN network	+	+				
9	EVT_SYS_POWER_FAIL	Power fail	+			+		
10	EVT_SYS_POWER_RETURN	Power return	+			+		
11	EVT_SYS_POWER_BACKUP_LOW	Backup power supply low	+			+		
12	EVT_SYS_POWER_BACKUP_EMPTY	Backup power supply empty	+			+		
13	EVT_SYS_REBOOT	Device reboot request from application/web	+					+
14	EVT_SYS_RESTART	GW/DC restarted with restart cause	+					+
15	EVT_SYS_TIME_SET	Time set	+				+	
16	EVT_SYS_TIME_SYNCHRONISED	Time synchronized with NTP server	+				+	
17	EVT_SYS_NTP_ERROR	Error synchronizing time with NTP server	+				+	
18	EVT_SYS_MAIN_COVER_OPENED	GW/DC main cover opened	+					+
19	EVT_SYS_MAIN_COVER_CLOSED	GW/DC main cover closed	+					+
20	EVT_SYS_TERMINAL_COVER_OPENED	GW/DC terminal cover opened	+					+
21	EVT_SYS_TERMINAL_COVER_CLOSED	GW/DC terminal cover closed	+					+
22	EVT_SYS_FW_INTERNAL_ERROR	Firmware/application internal error	+					+
23	EVT_SYS_CPU_OVERLOADED	CPU overloaded	+					+
24	EVT_SYS_VOL_MEM_LOW_LEVEL	Volatile memory (RAM) low level	+					+
25	EVT_SYS_NOVOL_MEM_LOW_LEVEL	Non-volatile memory (FLASH, root partition) low level	+					+
26	EVT_SYS_DATA_MEM_LOW_LEVEL	Non-volatile memory (FLASH, data partition) low level	+					+
27	EVT_SYS_RESET_KEY_PRESSED	Reset key pressed	+					+
28	EVT_SYS_PHASE_L1_OUTAGE	Phase L1 outage	+			+		
29	EVT_SYS_PHASE_L2_OUTAGE	Phase L2 outage	+			+		
30	EVT_SYS_PHASE_L3_OUTAGE	Phase L3 outage	+			+		
31	EVT_SYS_PHASE_L1_RETURN	Phase L1 returned	+			+		
32	EVT_SYS_PHASE_L2_RETURN	Phase L2 returned	+			+		
33	EVT_SYS_PHASE_L3_RETURN	Phase L3 returned	+			+		
34	EVT_SYS_FULL_POWER_OUTAGE	Full power outage (all three phases outage)	+			+		

	Event name	Event description	Standard event log	PLC communication log	WAN communication log	Power failure event log	Security event log	Service event log
35	EVT_SYS_BATTERY_DISCHARGED	Battery discharged	+			+		
36	EVT_SYS_BATTERY_LOW_LEVEL	Battery low level	+			+		
37	EVT_WAN_WAN1_CONNECT	WAN1 connect	+		+			
38	EVT_WAN_WAN1_DISCONNECT	WAN1 disconnect event	+		+			
39	EVT_WAN_WAN1_CONNECT_FAIL	WAN1 connect fail	+		+			
40	EVT_WAN_WAN1_PING_FAIL	WAN1 heartbeat ping fail	+		+			
41	EVT_WAN_WAN2_CONNECT	WAN2 connect	+		+			
42	EVT_WAN_WAN2_DISCONNECT	WAN2 disconnect event	+		+			
43	EVT_WAN_WAN1_SIGNAL_LOW	WAN1 GSM signal level is low	+		+			
44	EVT_WAN_WAN1_SIGNAL_RESTORED	WAN1 GSM signal level restored	+		+			
45	EVT_WAN_WAN2_CARRIER_UP	WAN2 carrier present, cable connect	+		+			
46	EVT_WAN_WAN2_CARRIER_DOWN	WAN2 carrier lost, cable disconnect	+		+			
47	EVT_WAN_LAN_CARRIER_UP	LOC carrier present, cable connect	+		+			
48	EVT_WAN_LAN_CARRIER_DOWN	LOC carrier lost, cable disconnect	+		+			
49	EVT_WAN_WAN1_MODEM_NOT_DETECTED	WAN1 modem not detected	+		+			
50	EVT_WAN_WAN1_MODEM_SIM_ERROR	WAN1 modem SIM card error	+		+			
51	EVT_WAN_WAN1_MODEM_DETECTED	WAN1 modem detected	+		+			
52	EVT_WAN_WAN1_CMUX_ERROR	WAN1 modem CMUX error	+		+			
53	EVT_WAN_WAN1_MODEM_FW_UPGRADE_OK	WAN1 modem FW upgrade completed OK	+				+	
54	EVT_WAN_WAN1_MODEM_FW_UPGRADE_ERROR	WAN1 modem FW upgrade error	+				+	
55	EVT_CNTR_UPGRADE_STARTED	Upgrade started	+				+	
56	EVT_CNTR_UPGRADE_SUCCEEDED	Upgrade succeeded	+				+	
57	EVT_CNTR_UPGRADE_FAILED	Upgrade failed	+				+	
58	EVT_CNTR_PARAMETERS_SET	Parameters set	+				+	
59	EVT_CNTR_UPGRADE_STATUS	Upgrade progress status	+				+	
60	EVT_CNTR_UPGRADE_ROLLBACK	Upgrade rollback initiated	+				+	
61	EVT_CNTR_UPGRADE_IMAGE_SIGNATURE	Invalid image signature	+				+	

Table 8: List of events

5.3.2. Alarms

Two types of alarm exist:

- **Notifications** – configurable, any event can be configured as a notification
- **Critical alarms** – fixed, 3 critical alarms are supported:
 - Device cover opened
 - Main cover opened
 - Battery discharged (RTC-backup battery is empty)

Notifications are sent only once and are expected to be confirmed by HES. If not confirmed, they remain stored in AC550/AC750 and can be read later. They can be read remotely by using GetPendingAlarms web service method.

Critical alarms must be explicitly cleared from the Web-UI (locally or remotely) or from HES using ClearAlarmFlags method.

Configuration of notifications can be done locally or remotely via the Web-UI (see chapter 5.1. *Web user interface*).



NOTE

Alarms have a priority over all other running processes.

Settings		
This settings page contains event & alarms that will be send to HES.		
Event name	Event description	Enabled
EVT_PLC_NODE_JOINED_INDICATION	Node meter joined to PAN	<input type="checkbox"/>
EVT_PLC_NODE_ROUTE_DISCOVERED	Node route discovered	<input type="checkbox"/>
EVT_PLC_NODE_LEAVE_INDICATION	Node left PAN network	<input type="checkbox"/>
EVT_PLC_NODE_LEAVE_CONFORMATION	Node kicked off from PAN network	<input type="checkbox"/>
EVT_PLC_NETWORK_CFM	G3PLC PAN network start	<input type="checkbox"/>
EVT_PLC_NODE_JOIN_DECLINED	Node join to PAN declined couse	<input type="checkbox"/>
EVT_PLC_METER_JOINED	G3 PLC meter joined to PAN	<input type="checkbox"/>
EVT_PLC_METER_REMOVED	Meter removed from PAN network	<input type="checkbox"/>
EVT_SYS_POWER_FAIL	Power fail	<input checked="" type="checkbox"/>
EVT_SYS_POWER_RETURN	Power return	<input checked="" type="checkbox"/>
EVT_SYS_POWER_BACKUP_LOW	Power supercap backup low	<input type="checkbox"/>

Figure 30: Alarms settings page

For alarms configuration, follow next procedure.

1. Go to *Alarms & Events/Settings* page.
2. Select alarms by sliding the bar to the right side under Enabled column.

**NOTE**

After enabling, the slide bar becomes blue.

3. Press **APPLY** button at the bottom of the page.

IP address of the alarm-notification destination can be configured via file (.xml format). Parameter name is **alm-alarm-destination-url**. For more information, see 5.7.2. *Advanced settings*.

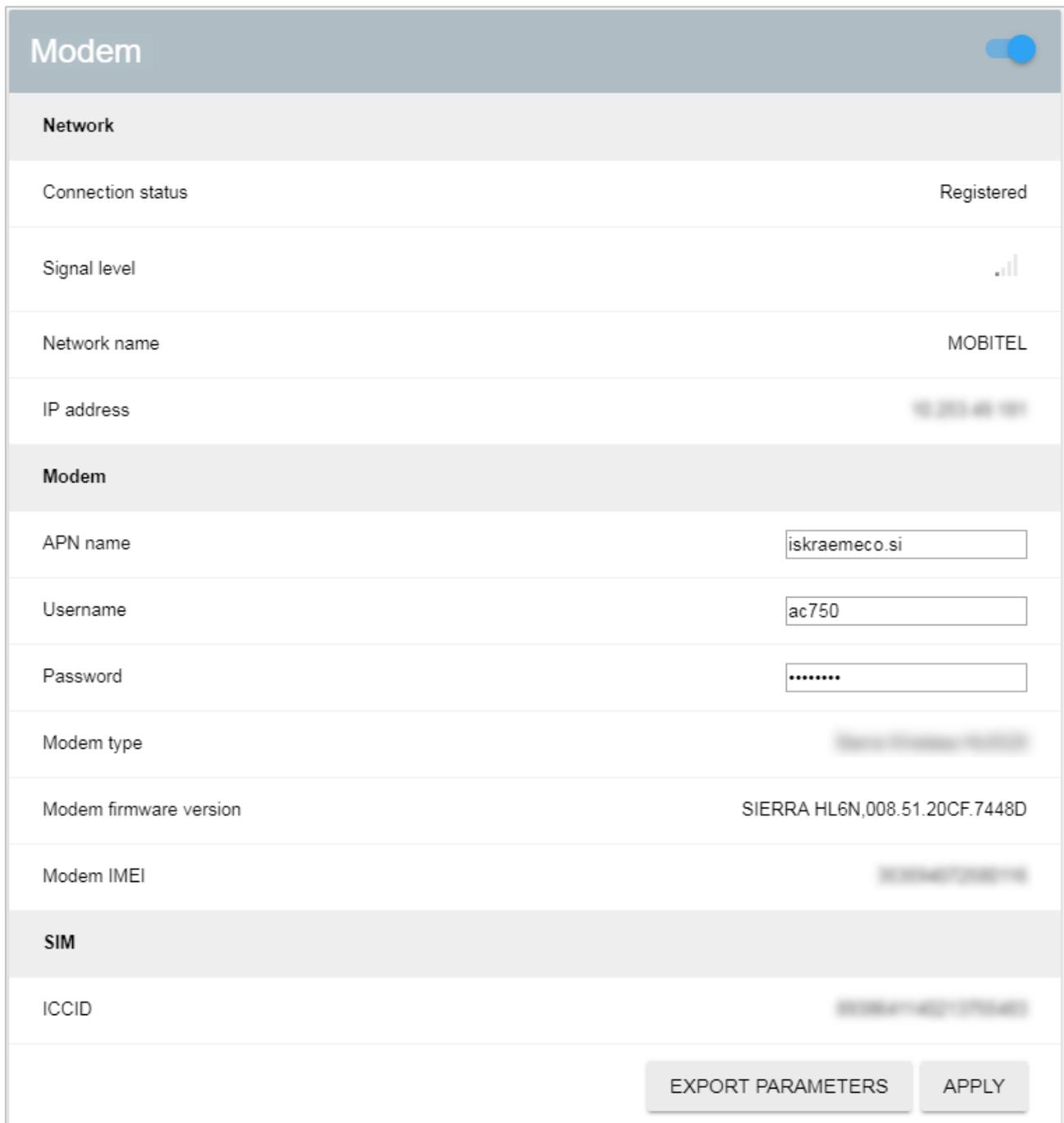
5.4. WAN interface

The WAN interface is used for communication with HES. It is possible to communicate over:

- Wireless modem (WAN1) using FEM1T (top module)
- Ethernet (WAN2)

5.4.1. Modem

Configuration and monitoring of the main parameters of the Wireless modem (e.g. GPRS) is done by *WAN/Modem* page.



Modem	
Network	
Connection status	Registered
Signal level	
Network name	MOBITEL
IP address	192.168.1.101
Modem	
APN name	<input type="text" value="iskraemeco.si"/>
Username	<input type="text" value="ac750"/>
Password	<input type="password" value="....."/>
Modem type	Sierra Wireless HSP
Modem firmware version	SIERRA HL6N,008.51.20CF.7448D
Modem IMEI	35204708019148
SIM	
ICCID	890141402170480

Figure 31: Modem (Wireless modem) parameters

The *Modem* page presents network information and parameters (some of them are read-only, and some of them can be changed (write) from the Web-UI):

- **Modem** (write) – Modem enabled/disabled
- **Network**
 - **Connection status** – network connection status
 - *Registered* (to mobile network)
 - *Not registered* (to mobile network)
 - **Signal level** (read-only) – received signal strength (see chapter 5.4.1.1. *Signal level*)
 - **Network name** (read only) – mobile network operator name
 - **IP address** (read only) – IP address of the device (WAN interface)
- **Modem**
 - **APN name** (write) – APN name for the network (string up to 50 characters)
 - **Username** (write) – username for the APN (optional, string type, up to 30 characters)
 - **Password** (write) – password for the APN (optional, string type, up to 30 characters)
 - **Modem type** (read only) – modem type
 - **Modem firmware version** (read only) – modem firmware version
 - **Modem IMEI** (read only) – modem IMEI number
- **SIM**
 - **ICCID** (read only) – integrated circuit card identifier

To configure write-featured parameter, enter a valid value or select an option from a dropdown menu and press **APPLY** button.

**NOTE**

Even mobile provider supports IPv6 addresses and communication runs in IPv6 network, in **IP address** (WAN/Modem/Network/IP address), IPv4 address of the device is always shown.

**NOTE**

Some parameters are defined as Advanced parameters and can be configured via file (.xml format). For more information, see 5.7.2. *Advanced settings*.

**NOTE**

Disabling a communication interface means that the device will not be accessible from the disabled interface. This action results in the loss of connection on the disabled interface. Use care when disabling interfaces.

5.4.1.1. Signal level

Signal level is presented in different levels:

-  Excellent
-  Good
-  Fair
-  Poor
-  No signal

For more information about signal strength, see appropriate technical description of communication module, which is used in the device.

**NOTE**

If signal strength of wireless communication (e.g. GSM/GPRS) is not sufficient, connect an external antenna via antenna coupler.

5.4.2. Ethernet

Configuration and monitoring of the main parameters of the Ethernet is done on *WAN/Ethernet* page.



Ethernet [Toggle]	
IPv4 parameters	
DHCP	[Toggle]
IP address	<input type="text"/>
Subnet mask	<input type="text"/>
IP config gateway	<input type="text"/>
DNS server 1	<input type="text"/>
DNS server 2	<input type="text"/>
IPv6 parameters	
IP address	<input type="text"/>
<input type="button" value="EXPORT PARAMETERS"/> <input type="button" value="APPLY"/>	

Figure 32: Ethernet parameters

- **Ethernet** (write) – Ethernet enabled/disabled
- **IPv4 parameters**
 - **DHCP** (write) – DHCP state (enabled/disabled)
 - **IP address** (write) – IPv4 address of the device (Ethernet interface)
 - **Subnet mask** (write) – Subnet mask of the connected network
 - **IP config gateway** (write) – Default gateway IP address
 - **DNS server 1** (write) – IP address for DNS1 server (preferred server)
 - **DNS server 2** (write) – IP address for DNS2 (alternative server)
- **IPv6 parameters**
 - **IP address** (write) – IPv6 address of the device (Ethernet interface)

To configure write-featured parameter, enter a valid value or select an option from a dropdown menu and press **APPLY** button.



NOTE

Some parameters are defined as Advanced parameters and can be configured via file (.xml format). For more information, see 5.7.2. *Advanced settings*.



NOTE

Disabling a communication interface means that the device will not be accessible from the disabled interface. This action results in the loss of connection on the disabled interface. Use care when disabling interfaces.

5.5. NAN interface

5.5.1. PLC

The PLC interface is in accordance to G3-PLC standard (ITU-T G.9903 (02-2014)) and is operating in the CENELEC A band.

The device Web-UI presents the following pages, which are related to PLC:

- **Attached devices**
- **PLC parameters**
- **Alarms & Events**
- **Advanced settings**

5.5.1.1. Attached devices

See chapter 5.2. *Attached devices*.

5.5.1.2. PLC parameters

Configuration of the PLC parameters can be done via the *PLC* page under *NAN* menu.

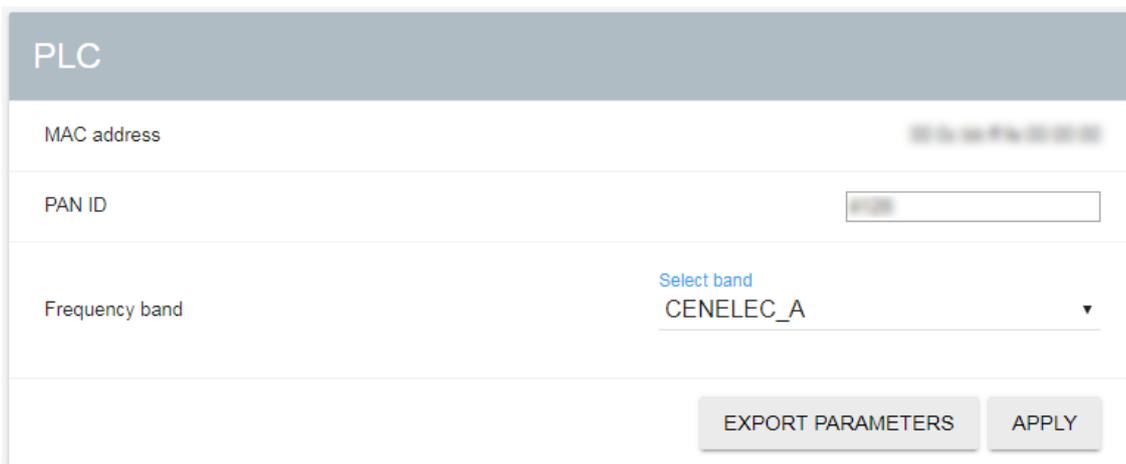


Figure 33: PLC Parameters

- **MAC address** (read-only) – G3-PLC PAN coordinator MAC address
- **PAN ID** (write) – G3-PLC PAN ID
- **Frequency band** (write) – G3-PLC band (CELENEC-A or FCC, default: CELENEC-A).



NOTE

PAN ID must be unique per PLC network (PAN). Changing the PAN ID will reset the PLC network and the PAN device (e.g. smart meter) addresses will be lost. Consequently, the PLC connectivity is lost.



NOTE

FCC frequency band is not supported yet.

To configure write-featured parameter, manually enter a valid value or select an option from a dropdown menu and press **APPLY** button.

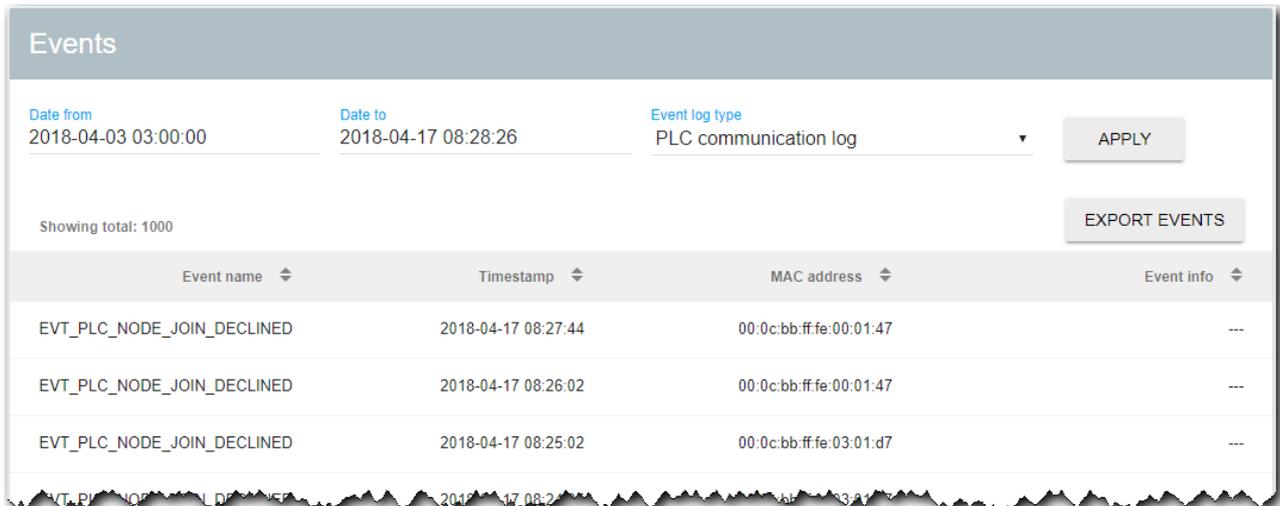


NOTE

Some parameters are defined as Advanced parameters and can be configured via file (.xml format). For more information, see 5.7.2. *Advanced settings*.

5.5.1.3. PLC Alarms & Events

PLC related events are presented in a dedicated PLC communication log in the *Alarms & Events* page. For more information about Alarms & Events page, see chapter 5.3. *Alarm and Events*.



Event name	Timestamp	MAC address	Event info
EVT_PLC_NODE_JOIN_DECLINED	2018-04-17 08:27:44	00:0c:bb:ff:fe:00:01:47	---
EVT_PLC_NODE_JOIN_DECLINED	2018-04-17 08:26:02	00:0c:bb:ff:fe:00:01:47	---
EVT_PLC_NODE_JOIN_DECLINED	2018-04-17 08:25:02	00:0c:bb:ff:fe:03:01:d7	---

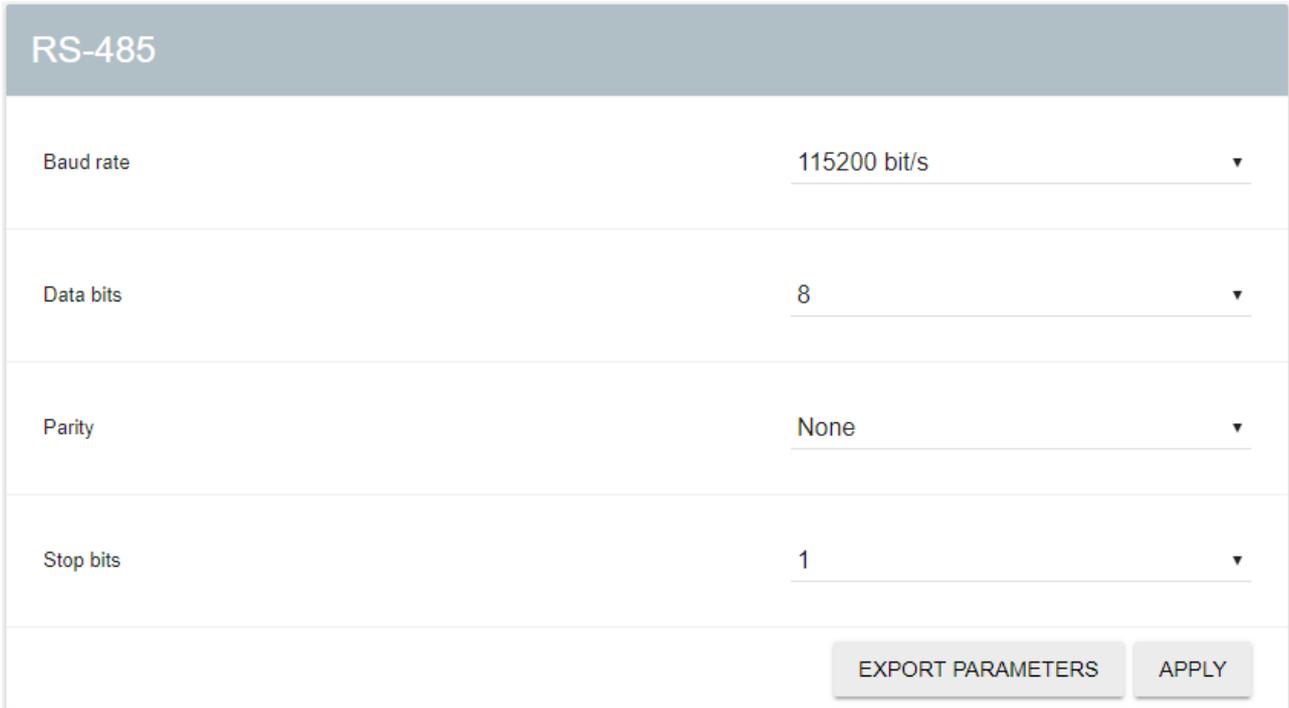
Figure 34: PLC communication log

5.5.1.4. Advanced PLC parameters

Configuration of advanced PLC parameters can be done on *System/Advanced settings* page. For more information, see 5.7.2. *Advanced settings*.

5.5.2. Serial RS-485

Configuration of the main parameters for the RS-485 interface can be done on *NAN/RS485* page.



RS-485	
Baud rate	115200 bit/s ▼
Data bits	8 ▼
Parity	None ▼
Stop bits	1 ▼
<input type="button" value="EXPORT PARAMETERS"/> <input type="button" value="APPLY"/>	

Figure 35: RS-485 parameters

- **Baud rate** (write) – RS-485 serial port baud rate in bps units (Default: 9600)
- **Data bits** (write) – RS-485 serial port data bits (Default: 8)
- **Parity** (write) – RS-485 serial port parity – (Default: None parity)
- **Stop bits** (write) – RS-485 serial port stop bits (Default: 1)

To configure write-featured parameter, manually enter a valid value or select an option from a dropdown menu and press **APPLY** button.



NOTE

For communication via RS-485, HES should use TCP port 3011.



NOTE

Some parameters are defined as Advanced parameters and can be configured via file (.xml format). For more information, see 5.7.2. *Advanced settings*

5.6. LAN interface

5.6.1. Local Ethernet

Configuration and monitoring of the main parameters of the Local Ethernet is done on *LAN/Local Ethernet* page.



Local Ethernet 	
IP address	<input type="text" value="10.0.0.1"/>
Subnet mask	<input type="text" value="255.255.255.0"/>
Default gateway	<input type="text" value="0.0.0.0"/>
<input type="button" value="EXPORT PARAMETERS"/>	

Figure 36: Local Ethernet parameters

- **Local Ethernet** (write) – Local Ethernet disabled/enabled (connection state). Use to disable/enable access to the device through Local Ethernet interface
- **IP address** (read-only) – IPv4 address
- **Subnet mask** (read-only) – IPv4 Subnet mask of the connected network
- **Default gateway** (read-only) – Default gateway IP address



NOTE

Disabling a communication interface means that the device will not be accessible from the disabled interface. This action results in the loss of connection on the disabled interface. Use care when disabling interfaces.

5.7. System

From the **System** menu, the following web pages can be accessed:

- **System settings** – displays system settings (data and time, NTP server, etc.)
- **Advanced settings** – used to configure advanced parameters via files
- **User management** – used to manage users and their user roles
- **Firmware upgrade** – used to upgrade the firmware of the device
- **System reboot** – used to reboot the system of the device
- **System information** – used to display system information

5.7.1. System settings

The System settings page on the Web-UI displays the following:

- Host name of the device
- Device time settings

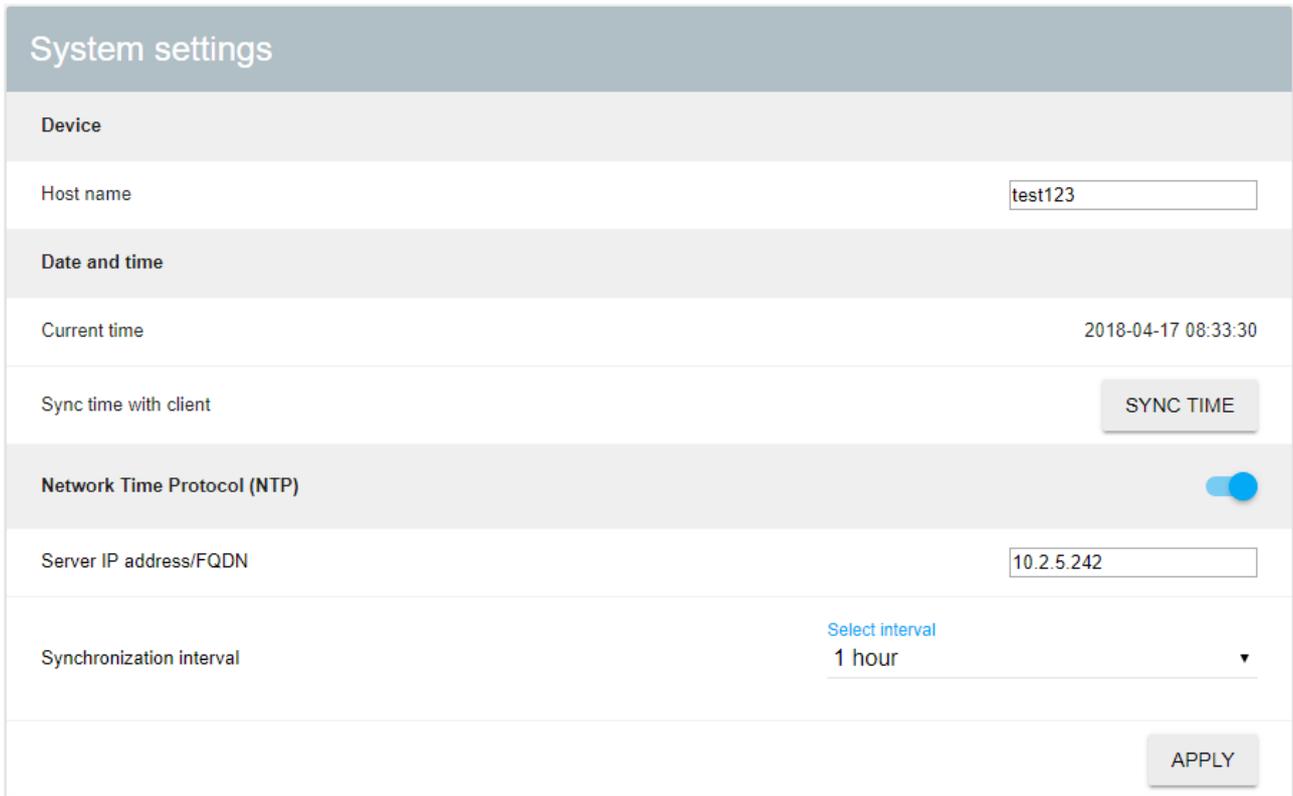


Figure 37: System settings page

5.7.1.1. Host name

The host name of a device is its identification. The host name is displayed also on the *Dashboard* page (see chapter 5.1.2. *Dashboard*).

To define the host name, follow next steps.

1. Log into the Web-UI
2. Go to *System/System settings* page
3. Enter Host name in the *Host name* field
4. Press **APPLY** button at the bottom of the page



NOTE

Maximum number of characters in the host name is 64.

5.7.1.2. Device Time

The device's time and date are displayed on the *Dashboard* (*Time/Current time*) and the *System settings* page (*Date and time/Current time*) of the Web-UI (see chapter 5.1.2. *Dashboard* and Figure 37).



NOTE

The time must be synchronized periodically in order to maintain high accuracy of the clock.

Time zone is defined as in Linux OS format and can be configured via file (.xml format). Parameter name is **sys-time-zone**. For more information, see 5.7.2. *Advanced settings*.

5.7.1.2.1. Time synchronization

Time synchronization can be done by (see Figure 37):

- Synchronization with client (computer system time), where Web-UI is used (On-demand))
- Using an NTP (Network Time Protocol) server

Time synchronization with client (On-demand) (see Figure 37)

1. Log into the Web-UI
1. Go to *System/Settings* page
2. Press **SYNC TIME** button



NOTE

This action will synchronize the device time with the host system time (host system, where Web-UI is executed).

Time synchronize using an NTP server (see Figure 37)

3. Log into the Web-UI
4. Go to *System/System settings* page
5. In the *Server IP address/FQDN* Field (under *Network Time Protocol (NTP)* settings, enter the NTP server IP address, or fully qualified domain name (e.g. *myhost.example.com*)
6. In *Synchronization interval*, select a synchronisation interval from the drop-down list
7. Press **APPLY** button at the bottom of the page



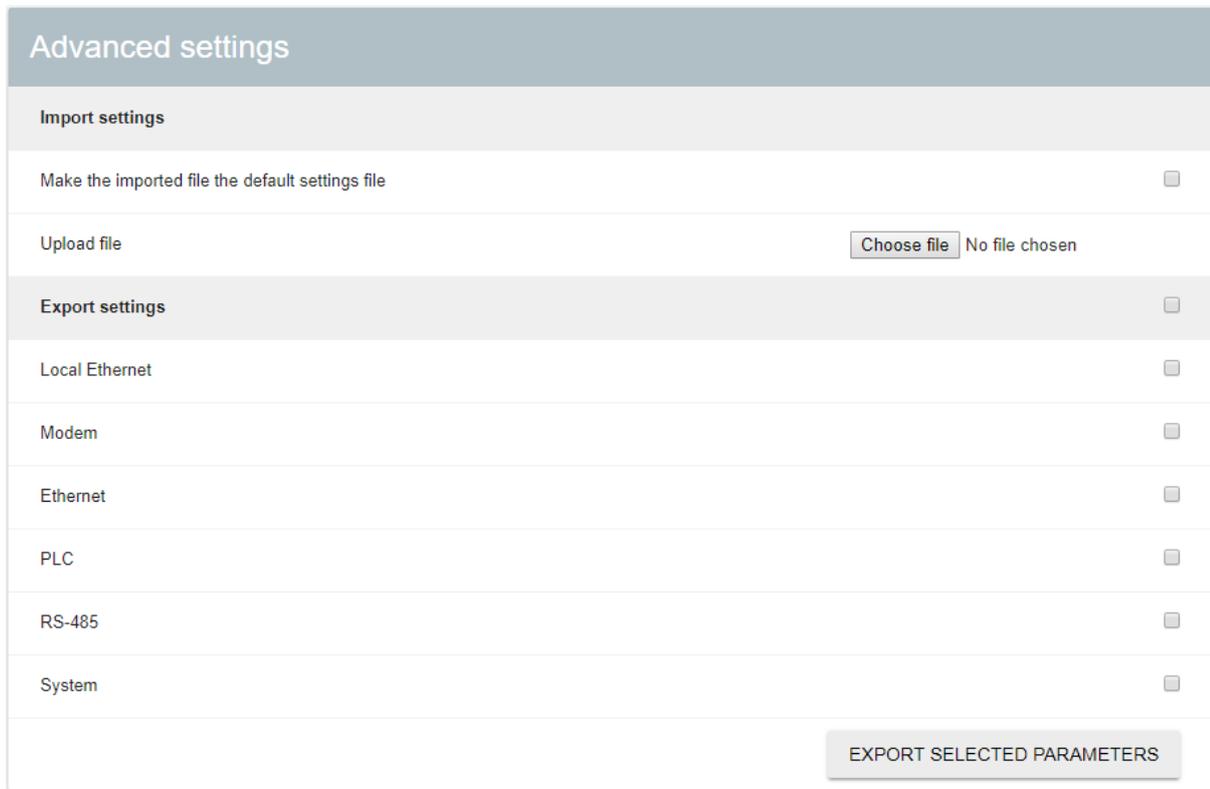
NOTES

- In a case the time synchronization using NTP server is enabled, the clock will also be synchronized with the NTP server at application start-up.
- In a case, the time synchronization with the NTP server failed, retry attempt is after one quarter of set NTP synchronization interval until action is completed successfully.

5.7.2. Advanced settings

Advanced settings (or parameters) can be done by import of parameter files to the device or export them from it. Access to advanced settings is possible by *System/Advanced settings*.

Parameters file format is **.xml**.



Advanced settings	
Import settings	
Make the imported file the default settings file	<input type="checkbox"/>
Upload file	<input type="button" value="Choose file"/> No file chosen
Export settings	
Local Ethernet	<input type="checkbox"/>
Modem	<input type="checkbox"/>
Ethernet	<input type="checkbox"/>
PLC	<input type="checkbox"/>
RS-485	<input type="checkbox"/>
System	<input type="checkbox"/>
<input type="button" value="EXPORT SELECTED PARAMETERS"/>	

Figure 38: Advanced settings page

5.7.2.1. Import settings

For import a parameter file, follow next instructions.

1. Log into the Web-UI
2. Go to *System/Advanced settings* page, *Import settings* section
3. In *Upload file* row click on **Browse...** button and select the parameter file.
In *Upload file* row, name of selected file appears.
4. For importing file to the device click on **IMPORT FILE** button.
Importing file begins and notification is shown.
Event EVT_CNTR_PARAMETERS_SET is logged in the Standard Event Log.



NOTE

The imported file name structure must be: `Parameters_ParametersType_Date`

- `ParametersType` values are: Ethernet/WAN1/WAN2/PLC/DCMNG/RS485
- `Date` format is: YYYY-MM-DD

For example: `Parameters_plc_2017-6-30`



NOTE

The imported file should be validated manually before importing it to the device.



NOTE

If the check box **Make the imported file the default settings file** is checked, imported settings become default settings.

5.7.2.2. Export settings

From the device, following parameter files can be exported:

- **Local Ethernet** – Local Ethernet parameters
- **Modem** – Wireless modem parameters
- **Ethernet** – WAN Ethernet parameters
- **PLC** – PLC parameters
- **DCMNG** – device management parameters
- **RS485** – RS-485 parameters
- **System** – CNTR (Central Daemon) parameters

To export a parameter file:

1. Log into the Web-UI
2. Go to *System/Advanced settings* page, *Export settings* section
3. Select the check-box of the files, which you wish to export



NOTE

To export all parameters, select all by checking the check box in *Export settings* row.

4. Press **EXPORT SELECTED PARAMETERS** button at the bottom of the page. Export file(s) begins. The file(s) will be stored in your download folder (download location of your web browser).



NOTE

The exported file name structure is: *AC750_Parameters_ParametersType_Date-Time*

- *ParametersType* values are: Ethernet/WAN1/WAN2/PLC/DCMNG/RS485
- *Date* format is: YYYY-MM-DD
- *Time* format is: HH-MM-SS

For example: *AC750_Parameters_plc_2017-6-30-14-09-29*

5.7.3. User Management

The device supports Role Based Access Control (RBAC) in order to protect the device from an unauthorized access.

By default, there are three built-in users, which are protected with unique username and password (see Table 9 and Figure 39).

Username	Role	Description
admin	admin	administrator
user	user	end user
main	main	maintenance

Table 9: Built-in users

By roles, three types of users are supported:

- admin
- user
- main



Figure 39: User management page

To add new user, follow next steps.

1. Log into the Web-UI
2. Go to *System/User management* page
3. Press **ADD NEW USER** button
4. Enter *Username, password* and select appropriate user role (type of user) in the New user form.
5. Press **SAVE** button to save the new user



NOTE

User name must be unique.

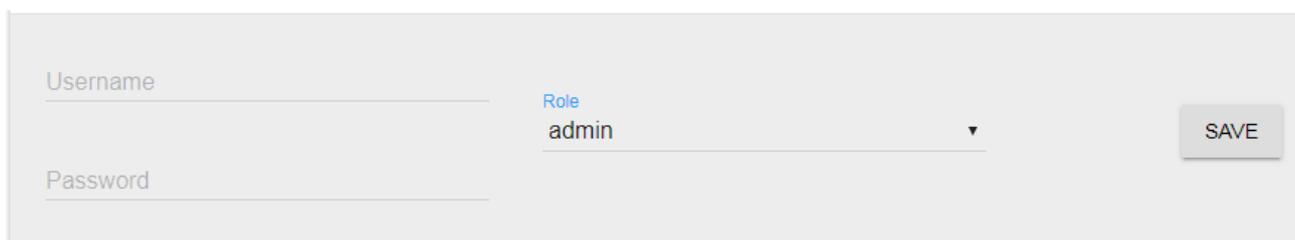


Figure 40: New user form

To remove a user, follow next steps.

1. Log into the Web-UI
2. Go to *System/User management* page
3. Press command **Remove** (of a user, which you want to be removed).
Notification is shown and Event EVT_CNTR_PARAMETERS_SET is logged in the Standard Event Log.

**NOTE**

- Default users cannot be removed.
- Logged user cannot delete itself.

5.7.4. Firmware upgrade

Firmware upgrade can be done locally or remotely from the Web-UI.

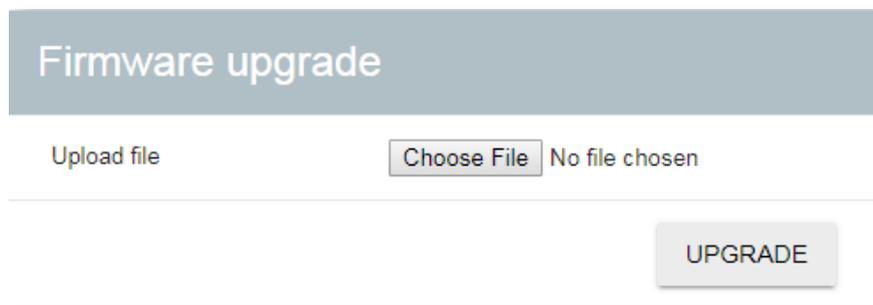


Figure 41: Firmware upgrade page

To upgrade the device firmware by the Web-UI, follow instructions below.

1. Log into the Web-UI
2. Go to *System/Firmware upgrade* page
3. Press **Choose File** button and select the upgrade file; progress bar appears.
4. Press **UPGRADE** button. The upgrade process begins.

**NOTE**

After the firmware has been upgraded, the device reboots and loses PLC address of the PAN device (e.g. smart meter). Consequently, the PLC connectivity is lost. The connectivity is automatically restored after the PAN device is restarted or after the time, which is define with "no-communication time out" parameter (default value of this parameter is 30 hours) in the PAN device.

**NOTE**

If the upgrade file is invalid, the upgrade process with stop and event will be logged in event log. For more events related to firmware upgrade process, please see chapter 5.3. *Alarm and Events*.

5.7.5. System reboot

System reboot can be made by pressing on the **SYSTEM REBOOT** button (Web-UI/System/Settings). Before pressing the button, type of reboot can be selected (Figure 42).

- Reboot with saved settings
- Reboot with default settings



Figure 42: System reboot



NOTE

On reboot with default settings, the current settings will be overwritten by the default settings.

5.7.6. System information

System information (*System/Information*) are presented in *System information* page.

System information	
Linux kernel version	4.1.15-1.0.0-rakunx6ul+gf9b6945
Firmware version	2.0.5243 Apr 13 2018
Software version	2.0-5243
Webservice	2.0.5243 Apr 13 2018 ws: 1.6.3
Apache version	2.4.16
Production date	Oct 26 2017
Web UI version	2.0-5243
centrald	2.0.5243 Apr 13 2018
comd	2.0.5243 Apr 13 2018
dcmngd	2.0.5243 Apr 13 2018
plcd	2.0.5243 Apr 13 2018
wanmngd	2.0.5243 Apr 13 2018
G3-PLC firmware	4.0.32 Nov 16 2017 22:25:07

Figure 43: System information

- **Linux kernel version** – Linux kernel version
- **Firmware version** – system firmware version
- **Software version** – software version
- **Webservice** – web service version
- **Apache version** – apache version
- **Production date** – date of production
- **Web UI version** – Web user interface version
- **centrald** – central daemon version
- **comd** – communication daemon version
- **dcmngd** – DC management daemon version
- **plcd** – PLC daemon version
- **wanmngd** – WAN daemon version
- **G3-PLC firmware** – G3-PLC firmware version

5.8. HES interface

The interface between the device and the HES depends on the type of request:

- Device management request
- Meter data readings request

5.8.1. Web services for device management

The device is integrated into HES over a standard Web services interface. The interface is designed for device management. The web services interface facilitates choice of communication media (e.g. GPRS/UMTS, Ethernet) and also simplify integration of the concentrator in a third party vendors HES.

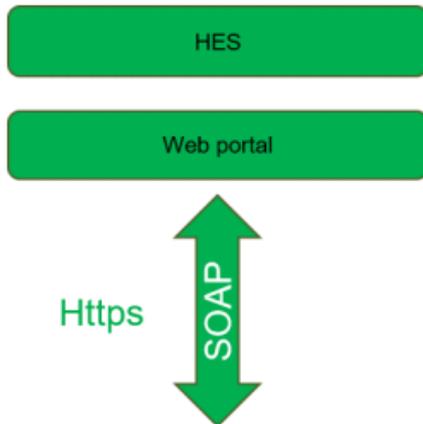


Figure 44: Device management interface architecture

There are two types of web services:

- PULL
- PUSH

PULL web services are used for device management i.e. to collect data or to set a parameter in the device. The trigger for those web services is from the HES.

PUSH web services are used to transfer alarms to the HES. The device itself triggers the web service call to the HES upon occurrence of an alarm (see chapter 5.3.2. *Alarms*). In this case, the information that will be sent to the HES will include:

- Alarm ID
- Alarm name
- Time stamp



NOTE

Additional data fields are optional. For more information, please contact your representative.

5.8.2. Meter data readings

The interface for meter data readings is bidirectional transparent interface. Three modes are supported:

- Directly **via IPv6 network**
- **Via GRE** (Generic Routing Encapsulation) tunnelling in a case a non-IPv6 network.
- **Via Gateway protocol** (according to DLMS UA 1000-2 Ed. 8.0:2014, chapter 10.7) in a case a non-IPv6 network.

The selection between the modes is done via IP network and the GRE tunnel parameters.

5.9. White list

White list is an advanced feature, which can be used to control which PAN device (e.g. smart meter) allowed to join a specific PAN coordinator (e.g. gateway or data concentrator).

The white list contains the PAN devices, which are allowed to join the network. PAN devices, which are not in the list, will not be able to join the PAN coordinator.

White-list parameters are described in Table 10.

Parameter	Description	R/W	Data type	Default
White-list	G3 PLC List of accepted MAC addresses on G3 PLC network	R/W	String, format: xx:xx:xx:ff:fe:xx:xx:xx	blank
Use-white-list	use G3 PLC white list	R/W	<ul style="list-style-type: none"> true - use white list false - do not use white list 	false

Table 10: White-list parameters

Parameters can be seen in exported file in xml format and they can be changed in the file. After the xml file is changed (and saved), it should be imported.

To define a white list, follow next instructions.

1. Go to *System/Advanced settings*
2. Under the *Export settings* field, check **PLC** (in the PLC check box).
3. Export the parameter by pressing the **EXPORT SELECTED PARAMETERS** button at the bottom of the page.
4. After parameter file is downloaded, open the file and edit the white list parameters.



NOTE

Since the parameters file is in .xml format, it is recommended to handle the file with proper application for edit .xml files.

5. Add a PAN device (e.g. smart meter) to white list by entering the MAC address of the PAN device. To add multiple PAN devices, copy the line and enter the MAC address.
6. Set use-white-list parameter to value 'true'.

```
<white-list>00:0c:bb:ff:fe:00:00:0a</white-list>
<white-list>00:0c:bb:ff:fe:00:00:0b</white-list>
<white-list>00:0c:bb:ff:fe:00:00:0c</white-list>
<white-list>00:0c:bb:ff:fe:00:00:0d</white-list>
<use-white-list>true</use-white-list>
```

Figure 45: White-list parameters in xml file (example)

7. Import the file to the device by using the **Choose File** button under *Import settings* field.



NOTE

Changing white list parameters triggers PLC module reset which results in losing all PLC address of the PAN devices (e.g. smart meter). Consequently, the PLC connectivity is lost. The connectivity is automatically restored after the PAN device is restarted or after the time, which is define with "no-communication time out" parameter (default value of this parameter is 30 hours) in the PAN device.

5.10. Push on power down (Last gasp)

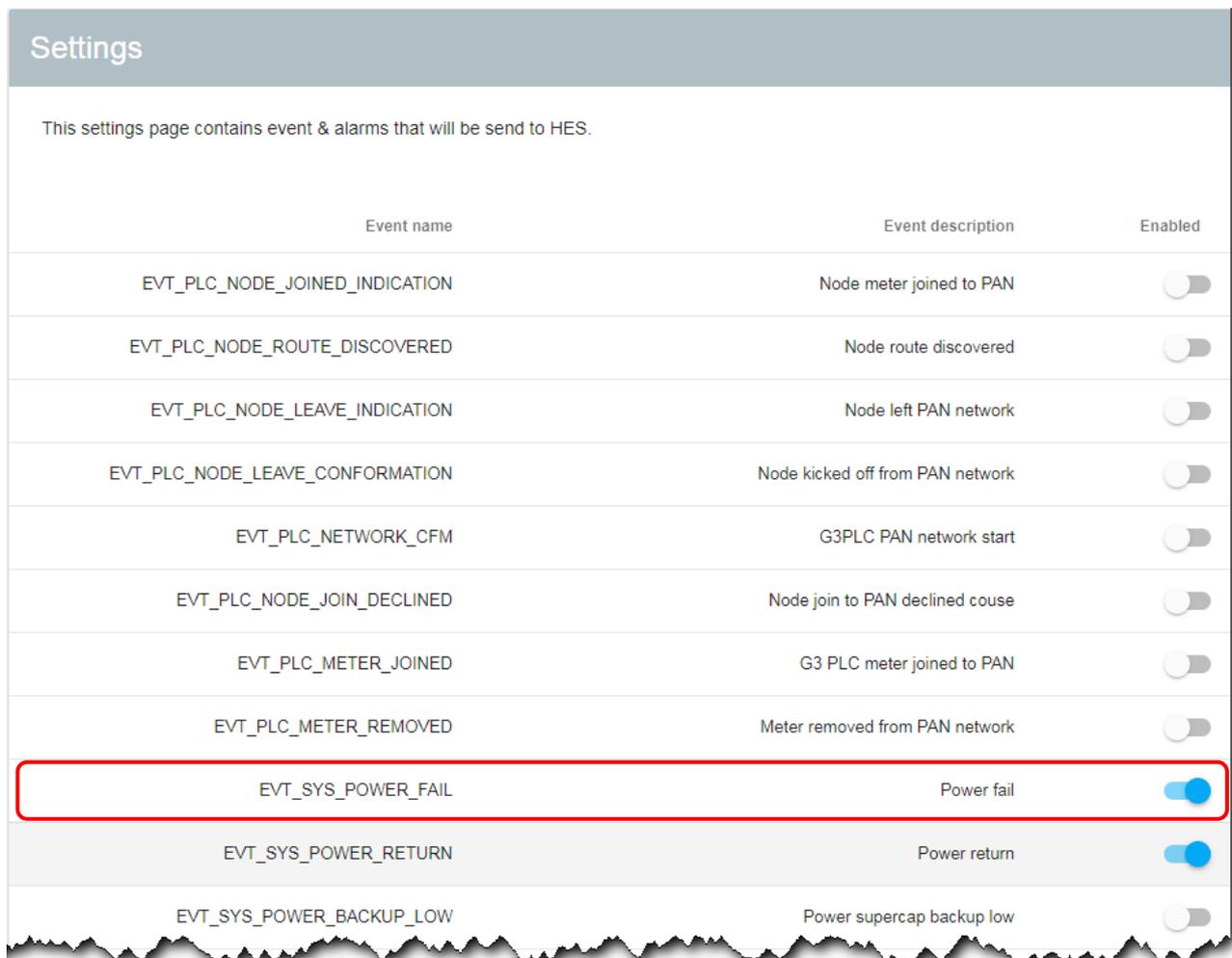
Push on power down (Last gasp) presents a functionality, which detects full power failure and sends a notification message from the device to the HES.

Push on power down message will be sent only in the case of full power failure and it has a priority above all other processes (if any are pending). The device detects full power down within 3 seconds.

The Push-on-power-down notification message type is as similar to other alarms. Type of message:

- Web service (HTTP protocol)
- Message content: Identification of Full power failure (Alarm ID, Alarm name) and time stamp

Push on power down functionality can be enabled or disabled by “**EVT_SYS_POWER_FAIL**” slider (Figure 46), which can be found in *Web-UI / Alarms & Events / Settings*. For more information, see chapter 5.3.2. *Alarms*.



Event name	Event description	Enabled
EVT_PLC_NODE_JOINED_INDICATION	Node meter joined to PAN	<input type="checkbox"/>
EVT_PLC_NODE_ROUTE_DISCOVERED	Node route discovered	<input type="checkbox"/>
EVT_PLC_NODE_LEAVE_INDICATION	Node left PAN network	<input type="checkbox"/>
EVT_PLC_NODE_LEAVE_CONFORMATION	Node kicked off from PAN network	<input type="checkbox"/>
EVT_PLC_NETWORK_CFM	G3PLC PAN network start	<input type="checkbox"/>
EVT_PLC_NODE_JOIN_DECLINED	Node join to PAN declined cause	<input type="checkbox"/>
EVT_PLC_METER_JOINED	G3 PLC meter joined to PAN	<input type="checkbox"/>
EVT_PLC_METER_REMOVED	Meter removed from PAN network	<input type="checkbox"/>
EVT_SYS_POWER_FAIL	Power fail	<input checked="" type="checkbox"/>
EVT_SYS_POWER_RETURN	Power return	<input checked="" type="checkbox"/>
EVT_SYS_POWER_BACKUP_LOW	Power supercap backup low	<input type="checkbox"/>

Figure 46: Power failure alarm in Settings of Alarms & Events

5.11. Security

Two levels of security are supported:

- Physical security
- Logical security

5.11.1. Physical security

The Physical security consists of mechanisms for preventing and detecting unauthorized local access attempts:

- Sealing protection
- Tamper detectors

5.11.1.1. Sealing protection

There are several areas protected with seal protection in order to protect the device from unauthorised local access (see chapter 4.3. *Sealing*).

5.11.1.2. Tamper detectors

There are two tamper detectors to detect removal of the device cover:

- Device-cover opening detector
- Device-housing opening detector

In a case, device cover or device housing is removed:

- Alarm is triggered toward HES (see chapter 5.3. *Alarms and Events*)
- Event is recorded in the security event log (see chapter 5.3. *Alarms and Events*)
- Alarm LED indicator lit (RED colour)



NOTE

Device-cover opening alarm is defined as critical alarms, therefore Alarm LED indicator lit (RED colour) until alarm is cleared

5.11.2. Logical security

Logical security consists of multiple mechanisms to protect all layers:

- HTTPs: TLS is used to protect communication through the web services and with the Web User Interface. The server side authentication is done using self-signed certificates. Client side authentication and authorization is done using username/password
- Role Based Access Control (RBAC) – the device supports by default three roles:
 - Administrator (username: *admin* / password: *admin*)
 - Maintenance (username: *main* / password: *main*)
 - User (username: *user* / password: *user*)
- APN authentication: username/password pair can be configured in the device for WAN1 (e.g. GPRS)
- Firewall: Incoming network traffic is allowed only from pre-configured ports
- DLMS/COSEM Security: metering data is protected according to secure mechanisms in the DLMS/COSEM standard
- G3-PLC security (MAC layer): A dedicated PSK (Pre-Shared Key) to protect the PLC network from unauthorised access (EAP-PSK authentication protocol)

5.12. Backup features

Backup features are used to prevent malfunctions and to maintain the device operational after power outage. There are two types of backup features supported:

- RTC backup – keeps the time up to date during power outage
- Backup power supply – ensures proper shut down of the system and supports Push on power down (Last gasp) functionality

5.12.1. RTC backup

There are two types of backup power storage for the RTC:

- Super capacitor
- Exchangeable Battery (optional)

The super capacitor is built-in the device and provides the RTC power for up to 7 days (when fully charged). It is charging when the device is connected to power and is fully charged after 24 hours.

The field exchangeable battery is optional. Battery level status is displayed on the dashboard page of the Web-UI and can be indicated with LED indicator (Alarm LED) as well.



NOTE

If battery is inserted, RTC backup is primarily based on the battery. If battery is empty or removed, the RTC backup will be supported by the build-in super capacitor.



NOTE

The battery can be exchanged during operation.

5.12.2. Backup power supply

The device is equipped with backup power supply in a case of power failure.

The Backup power supply supports:

- Storing active processes and data
- Proper system Shut-down
- Push on power down (Last gasp) functionality

6. INSTALLATION PROCEDURE

The device should be installed according to the enclosed connection diagram (see chapter 3.5. *Connection diagram*). The connection diagram can be found on the inner side of the device cover (see Figure 10).



RECOMMENDATION

As universal tool for all installation and mounting actions on the device, a screwdriver of dimensions 0.5×3×100 mm can be used.

6.1. Installation site preparation

The device can operate in OVC III or IV. Regarding to OVC of installation site, prepare appropriate environment (see appropriate subchapter).

6.1.1. Installation site in CAT III environment

Mains power input must be protected by fuses in each phase (see Table 11).



CAUTION

The overcurrent protection must act as all pole disconnecter, and be done according to local regulation as well.

Fuse type	C
Nominal current	10 A
Short circuit capability	min 6 kA
OVC	CAT III

Table 11: Fuse requirements for CAT III environment

It is recommended to use surge protection devices type B in each phase.

6.1.2. Installation site in CAT IV environment

Mains power input must be protected by fuses in each phase (Table 12)



CAUTION

The overcurrent protection must act as all pole disconnecter, and be done according to local regulation as well.

Fuse type	C
Nominal current	10 A
Short circuit capability	min 6 kA
OVC	CAT IV

Table 12: Fuse requirements for CAT IV environment

Installation site must be equipped with surge protection devices of type B in each phase.

6.2. Preparation of cables

6.2.1. Power (main) cables

Power supply plug (male) should be made by cables according to the connection diagram and Table 2.

1. Use cables with a cross section from 0.2 mm² up to 2.5 mm²
2. Remove approx. 8 mm of insulation on the cables
3. Insert the cables in the male plug according to appropriate connection diagram (see chapter 3.5. *Connection* diagram)
4. Tighten the cables with 0.6 Nm torque.

Once, the plug is made – properly inserted and screwed wires with recommended torque – it can be simply used with inserting/removing the plug into / out of the socket (female). See Figure 47.

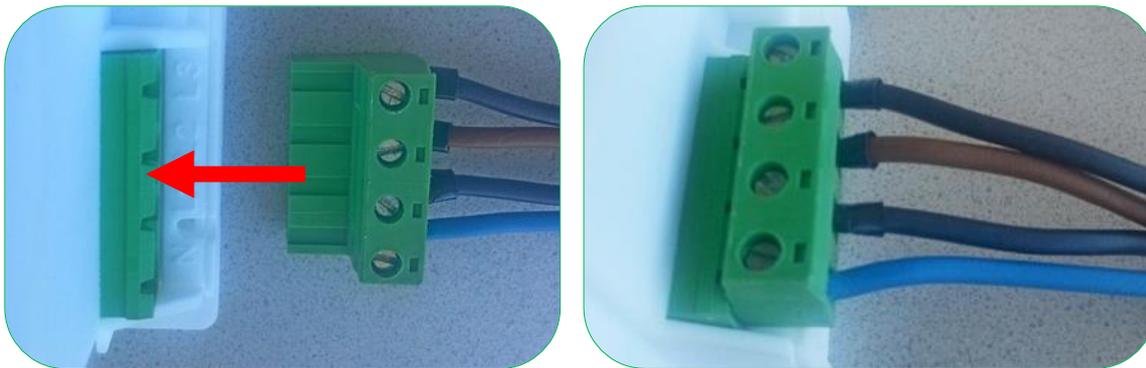


Figure 47: Power supply – inserting male plug in female socket

6.2.2. Cables for RS-485

For these terminals, cables with a cross section of maximum 2.5 mm² can be used (see Table 3). Remove approx. 8 mm of insulation on the cables. Shielded twisted paired cable should be used. Maximum length between the first and the last device is 1000 m.

6.2.3. RJ45 port

For connection to WAN2 or LOCAL port, a standard shielded CAT5 or CAT6 Ethernet cable with an RJ45 male connector should be used. (See Table 13.) Maximum length of the cable is 10 m.

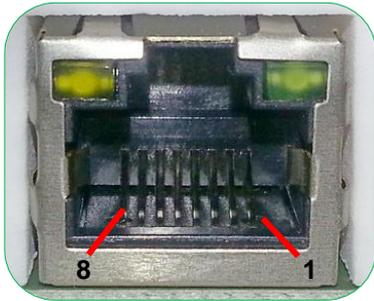


Figure 48: Ethernet port – RJ45 female socket

Pin #	Signal name	Description
1	TX+	Transmit Data +
2	TX-	Transmit Data -
3	RX+	Receive Data +
4	NC	Not connected
5	NC	Not connected
6	RX-	Receive Data -
7	NC	Not connected
8	NC	Not connected

Table 13: Pin designation of RJ45 port



Figure 49: RJ45 connector



NOTE

For local connection of the device to computer via Ethernet port, crossover Ethernet cable should be used.

6.3. Mounting and installation procedure

**NOTE**

This product can be damaged by electrostatic discharge (ESD). When handling, care must be taken so that the devices are not damaged.

1. Unlock device-cover sealable locking cap (Figure 50) and remove the device cover.

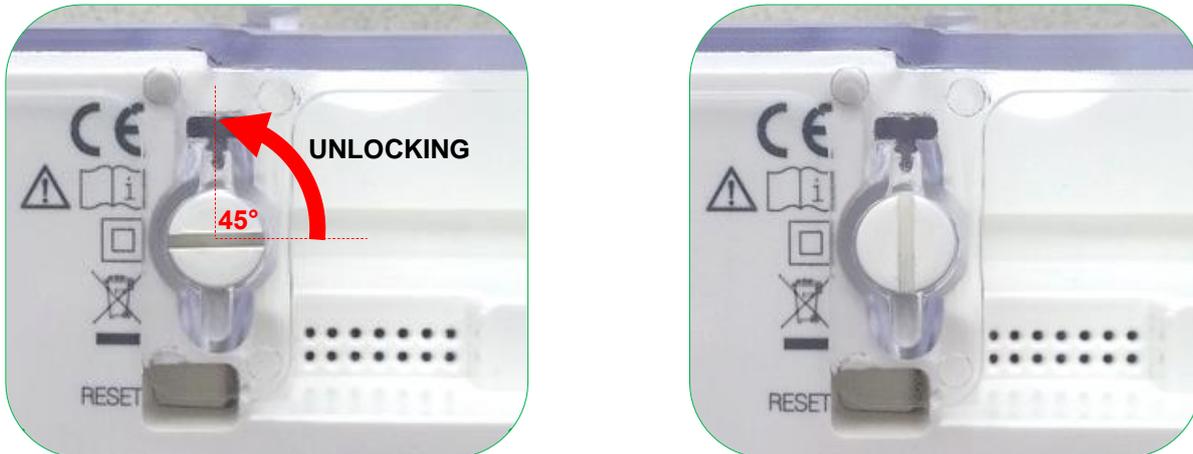


Figure 50: Unlocking device-cover locking cap (left: locked; right: unlocked)

2. Mount the device to the wall or other vertical surface.
For fixing dimensions, see chapter 4.1. *Technical figures and dimensions*.
If needed, a hanger can be mounted on the device (see chapter 6.3.1. *Mounting a hanger*).
For mounting on DIN rail, see chapter 6.3.2. *Mounting the device on DIN rail*.
3. Connect the power supply plug (with appropriate inserted and screwed wires – see chapter 6.2.1. *Power (main) cables*). Check the quality of the cable connection before plug is plugged.
4. Make connection via any other communication interface, which needed and check its functioning by LED indicators.
5. Close the device cover and seal the device.

6.3.1. Mounting a hanger

A hanger is attached in inner side of the device cover. If necessary, it can be mounted as it is shown in Figure 51.

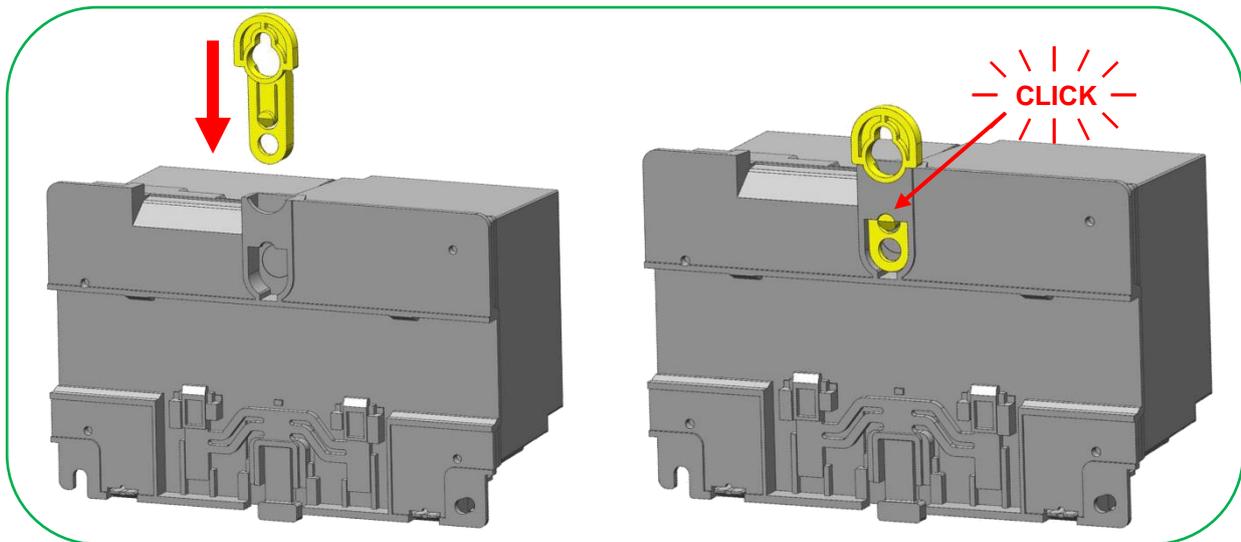


Figure 51: Mounting the device's hanger

For removing the hanger, use a tool as a screwdriver and follow instructions as they are presented in Figure 52.

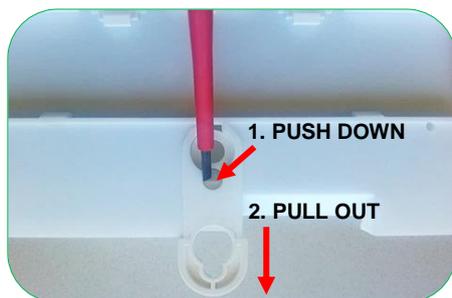


Figure 52: Removing the hanger

6.3.2. Mounting the device on DIN rail

A mechanism for mounting on DIN rail is on backside of the device.

1. Remove the device cover.



Figure 53: DIN rail and the device

2. Unlock the mechanism as it is shown in Figure 54.



Figure 54: Unlock the mechanism

3. In the top-to-bottom direction, hang the device on the DIN rail (Figure 55). The rail must be inserted under the upper plastic pins (Figure 56).

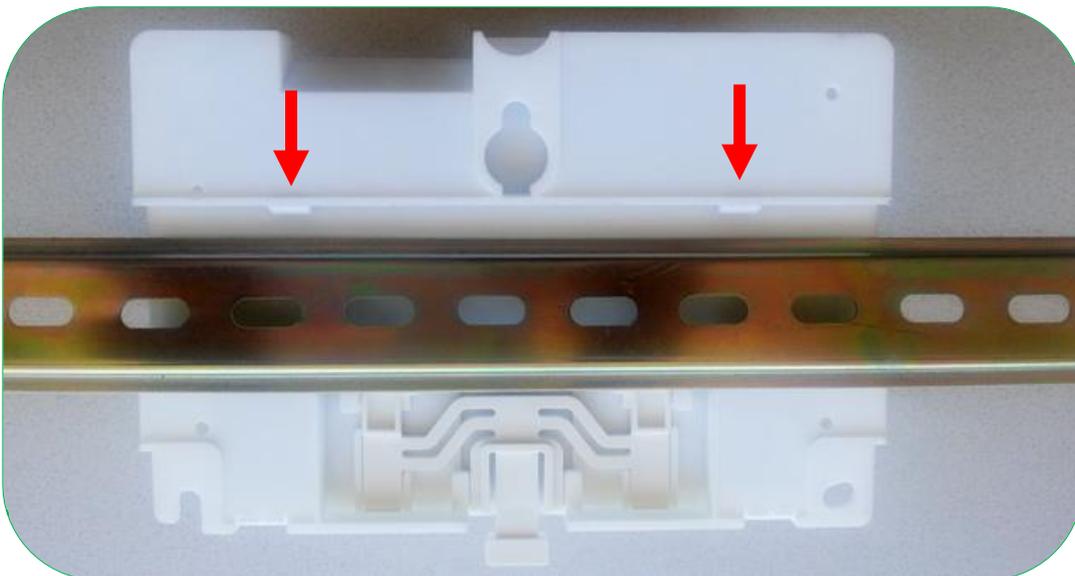


Figure 55: Hanging the device on the DIN rail (back view)

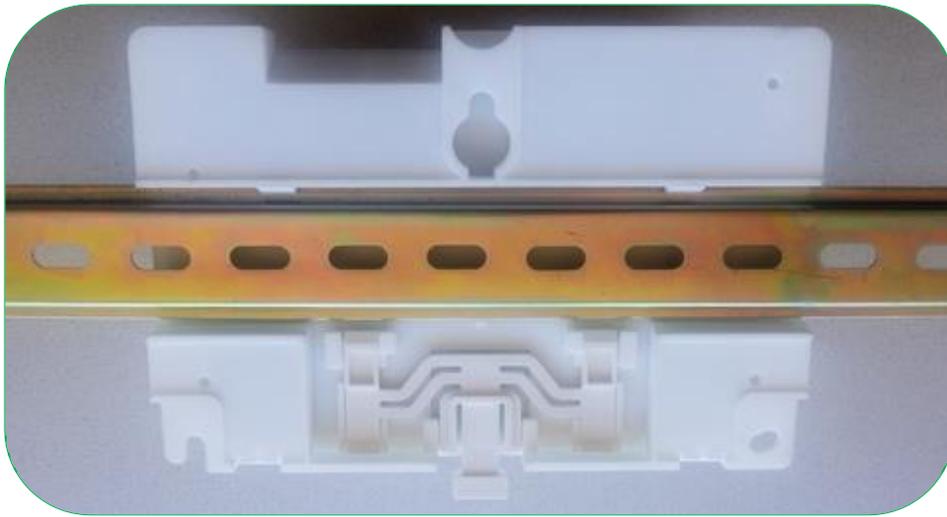


Figure 56: Hanged device on the DIN rail (back view)

4. Lock the mechanism (Figure 57).

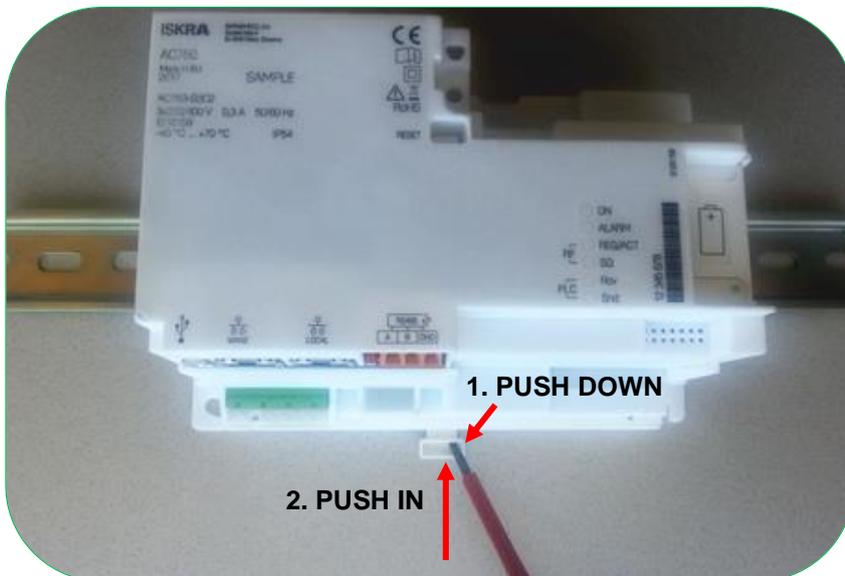


Figure 57: Locking the mechanism

5. Mount device cover and if needed, seal the device.

6.3.3. Connecting the RS-485 terminals

RS-485 terminals are terminals of screw-less type.

For inserting a wire in any RS-485 terminal, use following procedure:

1. Insert a screwdriver in upper hole of the terminal (Figure 58).
2. Lift screwdriver's handle up (Figure 58).
When screwdriver's handle is lifted up, bottom terminal opens.



Figure 58: Opening RS-485 terminal

3. Insert already prepared cable in the opened terminal (Figure 59).



Figure 59: Inserting the cable in opened RS-485 terminal

4. Lower the screwdriver's handle down.
The bottom terminal became closed.

For removing a cable from any RS-485 terminal, use the same procedure, as for inserting it, but instead of inserting, the wire should be removed.

6.3.4. Disassembling of a module

The device possesses a module area, which allows exchange of communication modules.

**WARNING**

Only authorised personnel should open the device cover.

**WARNING**

Only modules in original housing can be inserted.

To remove a communication module, follow the next procedure:

1. Remove the device cover.
2. Remove a module (or both) as it is shown in Figure 60 or/and in Figure 61.

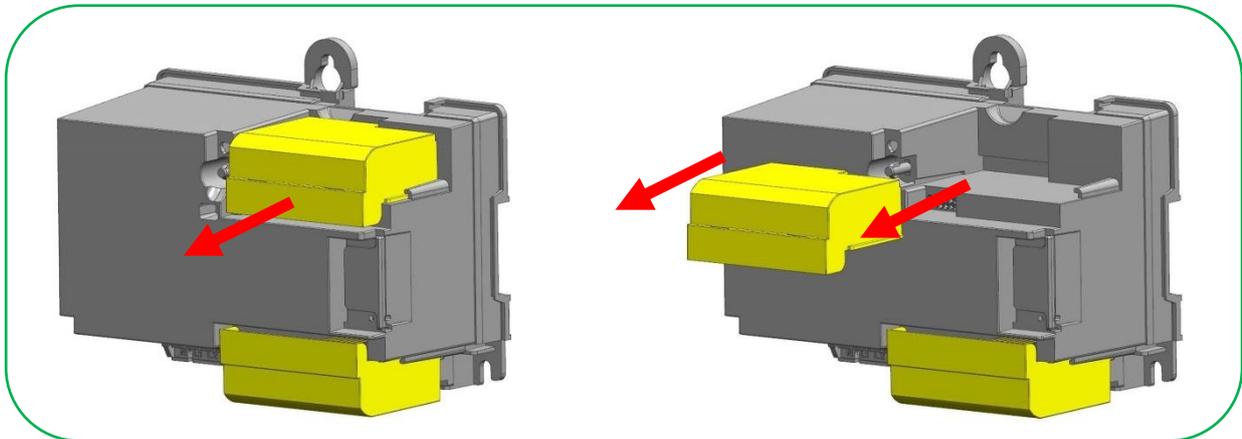


Figure 60: Removing top module

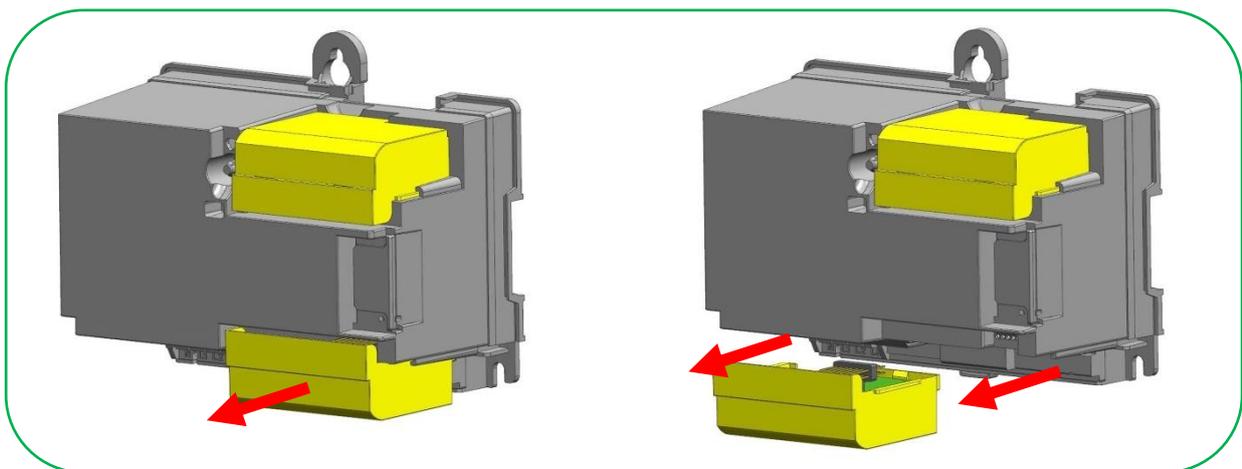


Figure 61: Removing bottom module

6.4. Exchanging battery

**WARNING!**

Electro Static electricity can harm some parts of the device.
To prevent electro static damage, discharge static electricity from your body before handling with the device. You can do so by touching an unpainted grounded metal surface.

**NOTE**

Battery must be placed correctly.

**NOTE**

This product can be damaged by electrostatic discharge (ESD). When handling, care must be taken so that devices are not damaged.

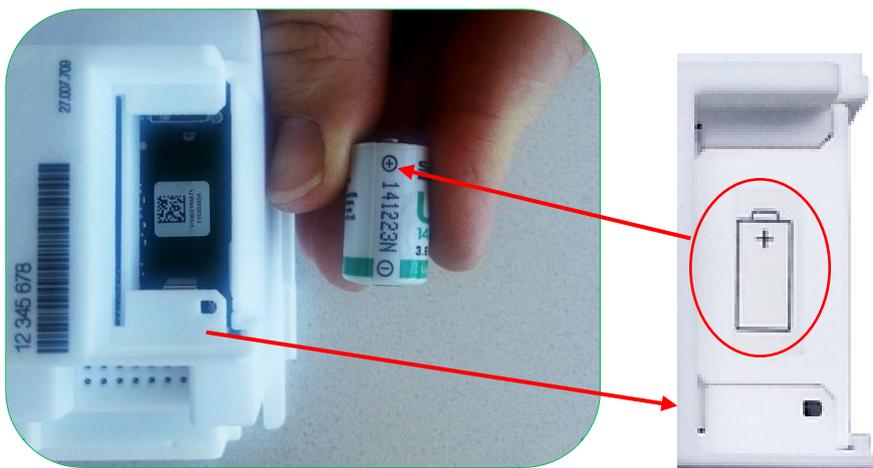


Figure 62: Correctly oriented battery

7. NETWORK CONFIGURATION

7.1. Connecting to the device

**NOTE**

When trying to connect to the device via the Web User Interface over HTTPS, a security warning will be displayed in the web-browser. This warning is a notification that the SSL certificate is self-signed. In order to continue to the Web User Interface, it is required to let the browser to accept the self-signed certificate.

7.1.1. Local connection

Local connection to the device with an Ethernet cable can be done by following instructions.

1. Power-on the device (ON LED lit)
2. Connect a crossover Ethernet cable to an Ethernet port on your computer.
3. Connect the other end of the Ethernet cable to the **LOCAL** Ethernet port on the device.
4. Setup the computer to obtain IP address automatically (DHCP).

**NOTE**

Configuration of the IP address is not part of this document and can be found in the operating system documentation.

5. Launch a web browser from a computer.
6. In the *address* field of a web browser, enter IP address **10.0.0.1**.
7. Enter the device's username and password in *Login dialog box*.

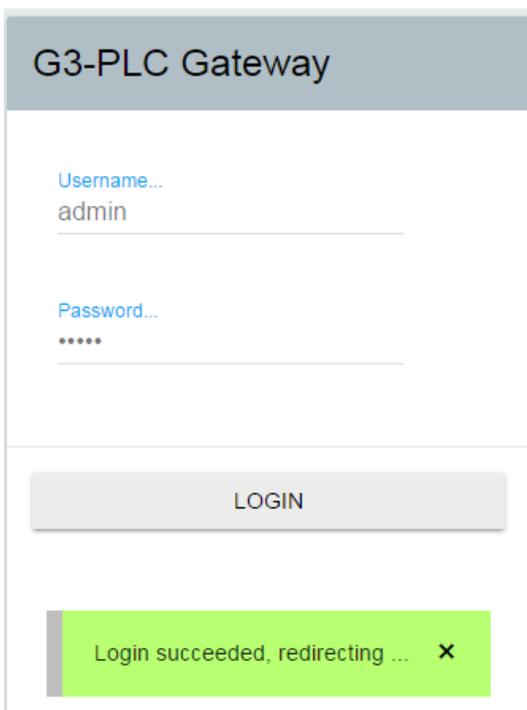


Figure 63: Login dialog box

7.1.2. Remote connection

For remote connection to the device Web-UI via the mobile or Ethernet network, the device's IP address is needed.

**NOTE**

For more information about getting an IP address, please contact your mobile network operator or IT department.

To connect remotely, follow next steps.

1. Make sure that device is reachable via your IP address.
2. Launch a web browser from a computer.
3. In the *address* field of a web browser, enter the device IP address.
4. Enter the device's username and password in *Login dialog box*.

8. DEINSTALLATION PROCEDURE

1. Disconnect the device from the network.
2. Remove the device cover.
3. Unscrew/disconnect all connected cables.
4. Unscrew the fixing screws and remove the device.
5. After de-installation, protect all disconnected cables against electric shock.

9. TECHNICAL CHARACTERISTICS

Model type	AC750-G3C2
Reference voltage	1x230 V, 3x 230/400 V
Extended operating voltage range	-20% +15%
Reference frequency	50/60 Hz
Extended operating frequency range	-10% +10%
Power consumption (Maximum)	10 W / 30 VA
Power consumption (Typical)	6.5 W / 20 VA
Electrostatic discharges (IEC 61000-4-2)	contact 8 kV, air 8 kV
Electromagnetic RF fields (IEC 61000-4-3)	10 V/m
Radio interference suppression	Class B
Fast transient burst (IEC 61000-4-4)	2 kV
Overvoltage category (IEC 60664-1)	OVC III, OVC IV *
Surge 1.2/50µs (IEC 61000-4-5)	4 kV
Immunity to conducted disturbances (IEC 61000-4-6)	10 V
Impulse voltage 1.2/50µs (EN 50470-1)	12 kV
Protection against electric shock (IEC 60050-131)	Class 2
Internal clock accuracy; for whole temperature range (IEC 62054-21)	+/-10 ppm , +/-1 sec/day
Internal clock accuracy at 23°C (IEC 62054-21)	+/-6 ppm , +/-0.5 sec/day
Backup time with SuperCap	< 7 days
Operating temperature	-40 °C to +70 °C
Storage temperature	-40 °C to +80 °C
Humidity (IEC 62052-11)	Relative up to 98% non-condensing
Ingress protection (IEC 60529)	IP54
Operation altitude	< 2000 m
Pollution degree rating	2
Case Material	Antistatic polycarbonate plastic
Flammability class	UL94 V-0
Degrees of protection against external mechanical impacts (IEC 62262)	IK07
Class of Mechanical conditions	M1
Height/Width/Depth (in mm)	161.5/172.3/85
Weight	ca. 1.1 kg

* OVC IV is covered in a case installation point is equipped with maximum 4 kV overvoltage protection.

Owing to periodic improvements of our products, the supplied products can differ in some details from information stated in this document.

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