USER MANUAL

Longo programmable controller
LPC-3.GOT.112
Graphical Operation Terminal

Version 4

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Written by SMARTEH d.o.o.

User Manual

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STANDARDS AND PROVISIONS: Standards, recommendations, regulations and provisions of the country in which the devices will operate, must be considered while planning and setting up electrical devices. Work on 100 .. 230 V AC network is allowed for authorized personnel only.

DANGER WARNINGS: Devices or modules must be protected from moisture, dirt and damage during transport, storing and operation.

WARRANTY CONDITIONS: For all modules LONGO LPC-3 – if no modifications are performed upon and are correctly connected by authorized personnel – in consideration of maximum allowed connecting power, warranty of 24 months is valid from the date of sale to the end buyer, but not more than 36 months after delivery from Smarteh. In case of claims within warranty time, which are based on material malfunctions the producer offers free replacement. The method of return of malfunctioned module, together with description, can be arranged with our authorized representative. Warranty does not include damage due to transport or because of unconsidered corresponding regulations of the country, where the module is installed.

This device must be connected properly by the provided connection scheme in this manual. Misconnections may result in device damage, fire or personal injury.
Hazardous voltage in the device can cause electric shock and may result in personal injury or death.
NEVER SERVICE THIS PRODUCT YOURSELF!
This device must not be installed in the systems critical for life (e.g. medical devices, aircrafts, etc.).

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

Waste electrical and electronic equipment (WEEE) must be collected separately!

LPC-3.GOT complies to the following standards:

- EMC: EN 55032:2015, EN 55035:2017, EN 61000-3-2:2014, 61000-3-3:2013

Smarteh d.o.o. operates a policy of continuous development. Therefore we reserve the right to make changes and improvements to any of the products described in this manual without any prior notice.

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Longo programmable controller LPC-3.GOT.112

1 ABBREVIATIONS

SOM	System on module
ARM	Advanced RISC machines
OS	Operating system
TCP	Transmission control protocol
SSL	Secure sockets layer
IEC	International electrotechnical commission
COM	Communication
USB	Universal serial bus
USB OTG	Universal serial bus On the go
PLC	Programmable logic controller
LED	Light emitting diode
RAM	Random access memory
NV	Non volatile
PS	Power supply
GUI	Graphical user interface
RTU	Remote terminal unit
RTC	Real time clock
IDE	Integrated development environment
FBD	Function block diagram
LD	Ladder diagram
SFC	Sequential function chart
ST	Structured text
IL	Instruction list

2 DESCRIPTION

Smarteh LPC-3.GOT.112 PLC based graphical operation terminal offers improved performance and a wide range of new features within a single compact SOM based package. The graphical operation terminal based on ARM architecture processor running Linux based OS adds more computing power, more control and additional interface connection offering capability for future core SOM module upgrades without hardware changes.

LPC-3.GOT.112 has an integrated USB programming and debugging port, connection for Smarteh intelligent peripheral modules, two Ethernet port and WiFi connectivity that can be used as a programming and debugging port, as a Modbus TCP/IP Master and/or Slave device and as BACnet IP (B-ASC). LPC-3.GOT.112 is also equipped with RS-485 port for Modbus RTU Master or Slave communication with other Modbus RTU equipment.

Hardware configuration is done using Smarteh IDE programming software, used to select the required graphical operation terminal.

This software provides you with a simple entry in the IEC programming languages such as:

- Instruction List (IL)
- Function Block Diagram (FBD)
- Ladder Diagram (LD)
- Structured Text (ST)
- Sequential Function Chart (SFC).

This provides a large number of operators such as:

- Logic operators such as AND, OR, ...
- Arithmetic operators such as ADD, MUL, ...
- Comparison operators such as <, =, >
- Other ...

Programming software is used to create, debug, test and document a project. Functions for analog processing, closed-loop control and function blocks such as timers and counters simplify programming.

Smarteh IDE programming software also provides you with a simple entry in the GUI design tool supports large set of dynamic controls from buttons to indicators and enables connectivity between PLC program and graphical user interface.

3 FEATURES

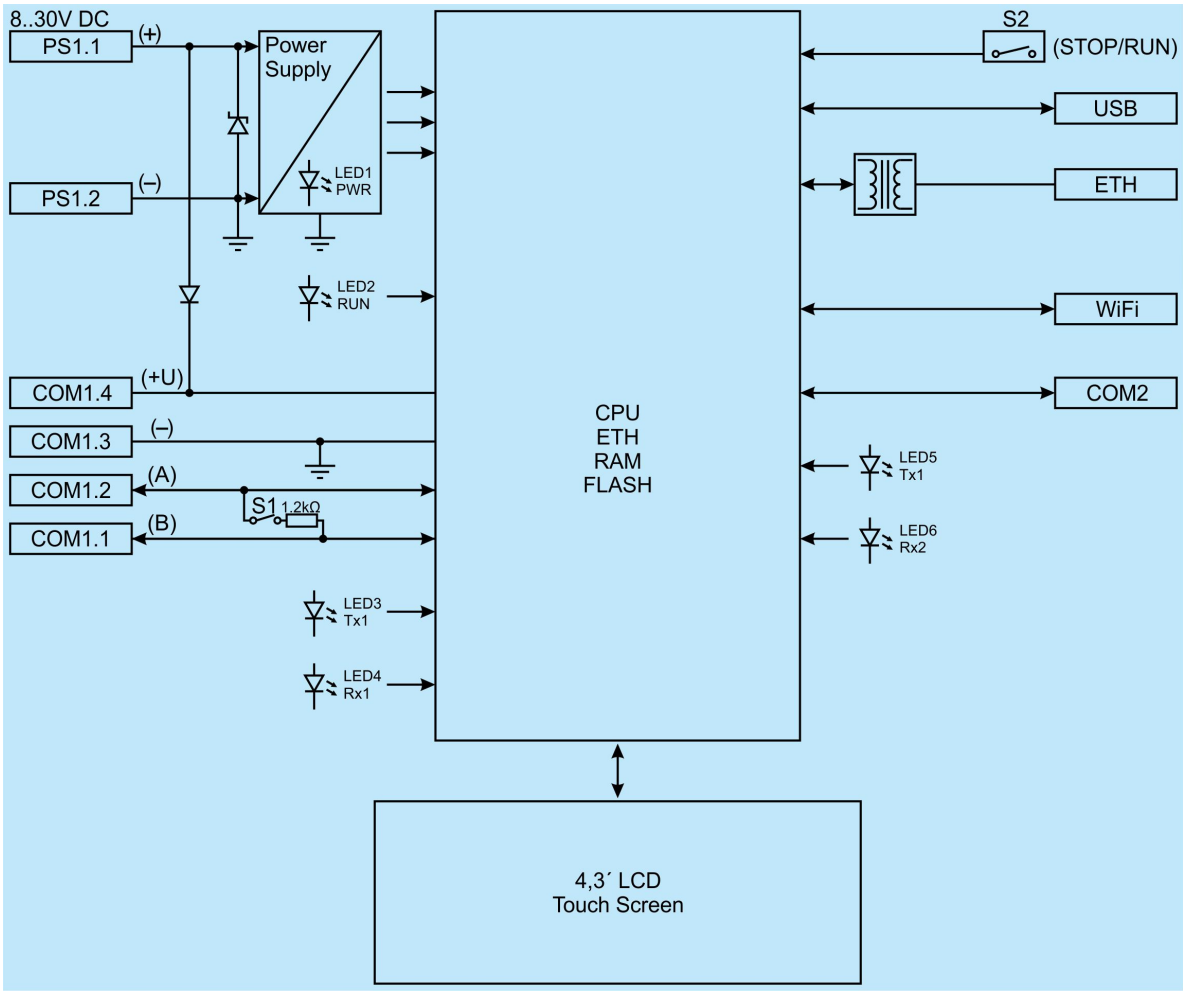
Figure 1: LPC-3.GOT.112

Table 1: Features
Frameless glass screen with 4.3” LCD display and capacitive touch screen, landscape or portrait orientation
Real Time Linux OS ARM based main module
Graphical interface is freely designed by the user with GUI editor in Smarteh IDE software
Ethernet & WiFi connectivity for debugging and application transfer, Modbus TCP/IP Slave (server) and/or Master (client) functionality, BACnet IP (B-ASC), web server and SSL certificate
Wi-Fi connector for external antenna
USB port for debugging and application transfer, USB OTG
Modbus RTU Master or Slave
Smarteh bus for connection with LPC-2 Smarteh intelligent peripheral modules
Remote access and application transfer
RTC and 512 kB NV RAM with super capacitor for needed energy storage
Built-in buzzer controlled from PLC program
Display brightness level controlled from PLC program
White or black glass screen
Metal back housing
Status LEDs
Quality design

4 INSTALLATION

4.1 Block diagram

Figure 2: LPC-3.GOT.112 block diagram



4.2 Input & output connection interfaces

Figure 3: Connection scheme

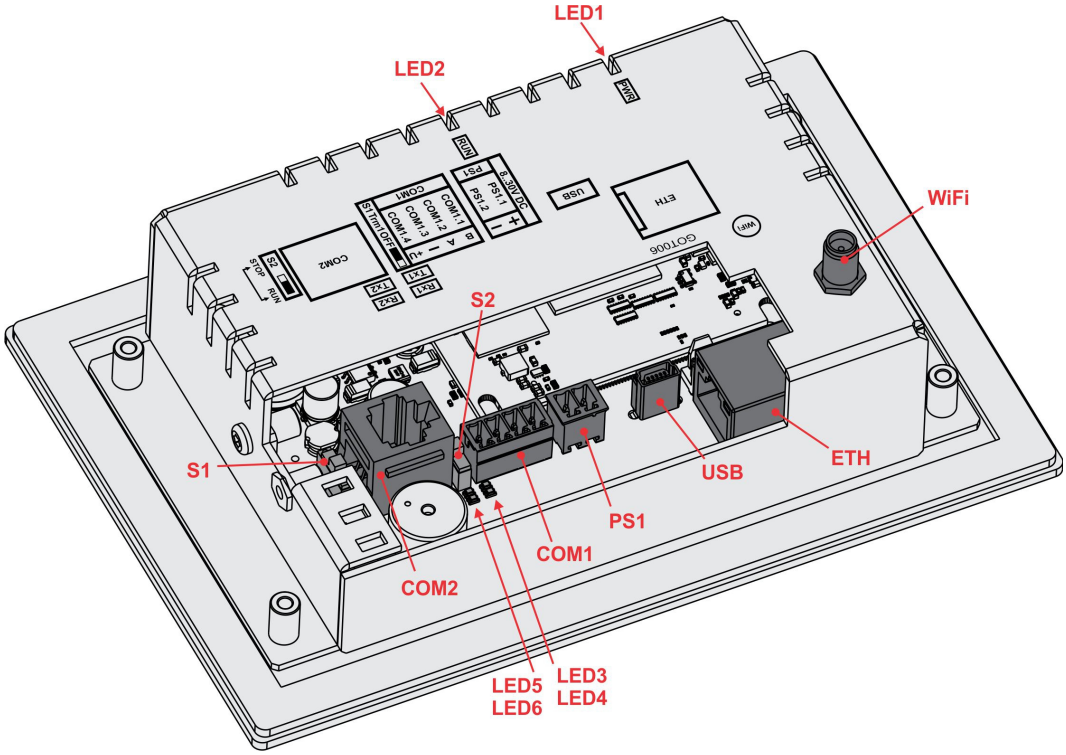


Table 2: PS1 Power supply[1]

PS1.1 (+)	+	Power supply input, 8 .. 30 V DC, 2 A
PS1.2 (-)	—	GND

Table 3: COM1 RS-485[2]

COM1.1	RS-485 (B) Modbus RTU	0 .. 3.3 V
COM1.2	RS-485 (A) Modbus RTU	
COM1.3	—	GND
COM1.4	+U	Power supply output

1 **Wires** connected to the module must have cross sectional area at least 0.75 mm^2. Minimum temperature rating of wire insulation must be 85 °C.

2 **Different protocols** like Modbus RTU Master can be selected inside Smarteh IDE. **Wires** connected to the module must have cross sectional area at least 0.14 mm^2. Use twisted-pair cables of type CAT5+ or better, shielding is recommended.

Table 4: COM2 Smarteh bus		
COM2.1	N.C.	
COM2.2	–	GND
COM2.3	+U	Power supply output (from PS1.1)
COM2.4	RS-485 (A), Smarteh bus	0 .. 3.3 V
COM2.5	RS-485 (B), Smarteh bus	
COM2.6	N.C.	

Table 5: WiFi		
WiFi	WiFi antenna connector	SMA

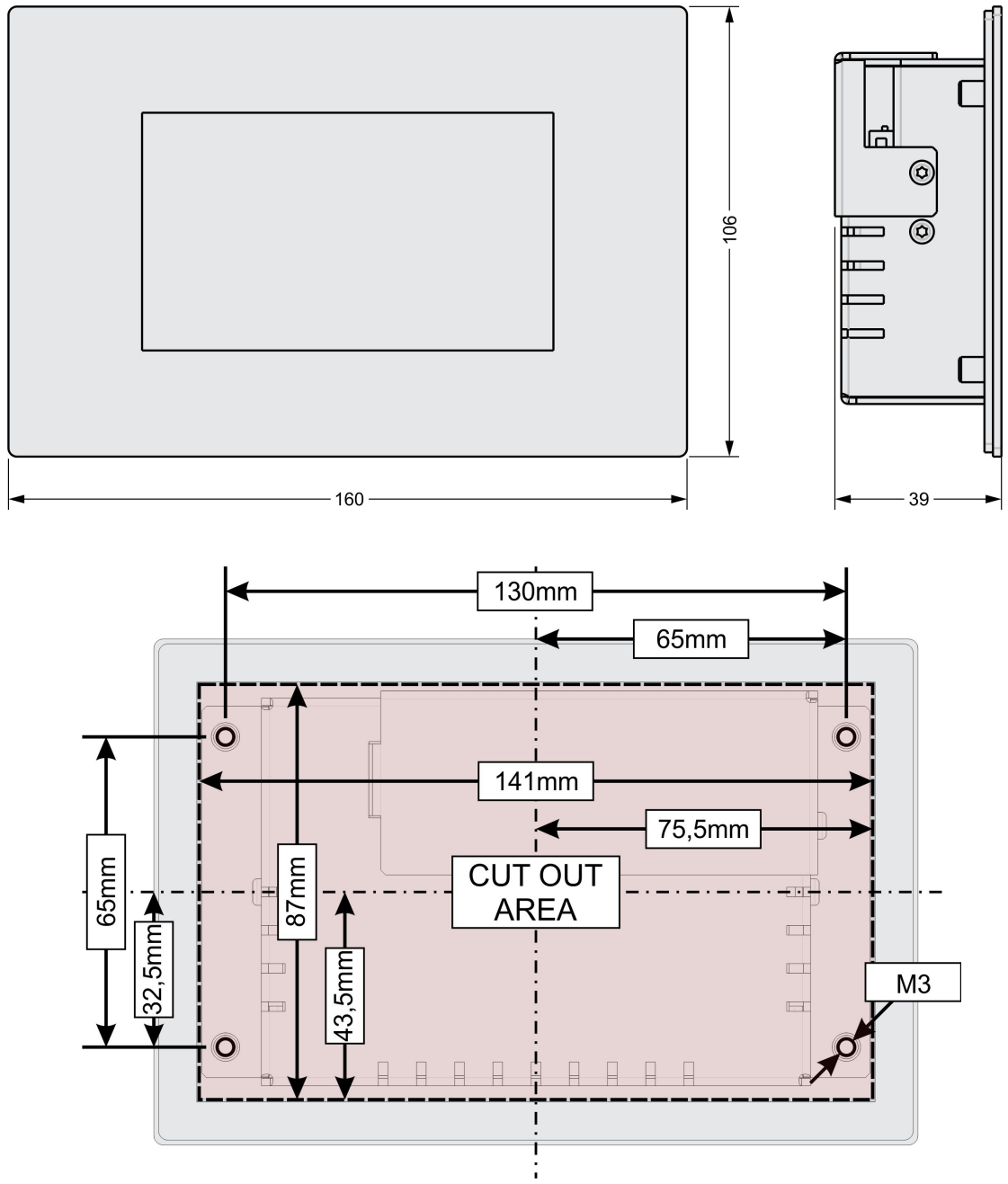
Table 6: USB and Ethernet		
USB	USB	mini B type, device mode or host mode, USB On-The-Go
ETH	Ethernet	RJ-45 shielded

Table 7: Switches		
S1	Operation mode (RUN/STOP)	RUN: PLC normal operational mode STOP: application not running
S2	COM2 RS-485 termination (Trm1)	ON: corresponding channel is internally terminated with 1k2 Ω OFF: no internal termination present

Table 8: LEDs		
LED1	PWR, Power (green)	ON: PLC is powered on OFF: PLC has no power supply
LED2	RUN, Application running (green)	ON: application is running OFF: application is stopped or PLC in boot mode
LED3	Tx1, COM1 Tx status (green)	OFF: Not transmitting packets ON: Transmitting packets
LED4	Rx1, COM1 Rx status (red)	OFF: No receiving packets ON: Receiving packets
LED5	Tx2, COM2 Tx status (green)	OFF: Not transmitting packets ON: Transmitting packets
LED6	Rx2, COM2 Rx status (red)	OFF: No receiving packets ON: Receiving packets

4.3 Mounting instructions

Figure 4: Housing dimensions



Dimensions in millimetres.

EXTERNAL SWITCH OR CIRCUIT-BREAKER AND EXTERNAL OVERCURRENT PROTECTION: The unit is allowed to be connected to installation with over current protection that has nominal value of 6 A or less.

All connections, PLC attachments and assembling must be done while LPC-3.GOT.112 is not connected to the main power supply. Module should be positioned in the wall inside of the room. Avoid direct sunlight, positioning near heating/cooling source object or under high luminance lights for best performance of the on-board sensors. Junction box and tubes in the wall must be sealed to prevent airflow. Displayed temperature is adequate to temperature approx. 10 cm below module and 1 cm off the wall. Recommended installation height is 1.5 m above floor level. Portrait orientation of the module may produce slight errors in temperature measurements.

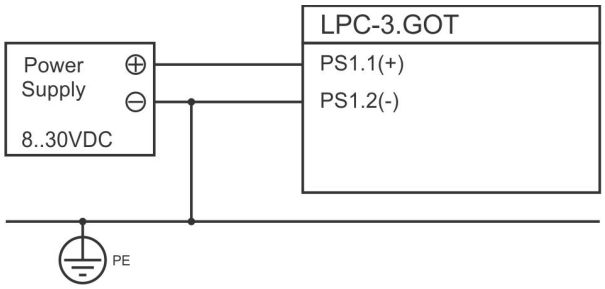
Wires connected to the PLC must have cross sectional area at least 0.75 mm^2. Minimum temperature rating of wire insulation must be 85 °C.

Mounting instructions on the enclosure door

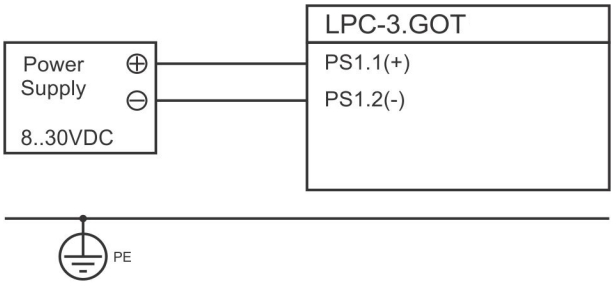
1. Switch off power supply.
2. Make cut out and mounting holes – see Figure 4.
3. Mount LPC-3.GOT.112 into cut out and fasten it with screws.
4. Connect power supply and communication wires.
5. Switch on power supply.

4.4 Grounding possibilities

Figure 5: Grounding possibilities



LPC-3.GOT.xxx negative power supply pole connected to the Protective Earth (PE) ⏚ functional earthing.



LPC-3.GOT.xxx negative power supply poles not connected to the Protective Earth (PE) ⏚ functional earthing.

5 TECHNICAL SPECIFICATIONS

Table 9: Technical specifications	
Rated power supply PS1	24 V DC, 2A
Operational power supply PS1	8 .. 30 V DC
Power consumption PS1	max. 5 W
Connection type for PS1	disconnectable spring type connectors for stranded wire 0.75 to 1.5 mm^2
Connection type for COM1	disconnectable spring type connectors for stranded wire 0.14 to 1.5 mm^2
Connection type for COM2	RJ-12 6/4
COM1 RS-485 port	non isolated, 2 wire
COM2 Smarteh bus	non isolated
Ethernet	RJ-45, 10/100/1000T IEEE 802.3
WiFi	IEEE 802.11 b/g/n, SMA female connector
USB	mini B type, device mode or host mode (USB On-The-Go), high-speed/full-speed
RTC	capacitor backed up with retention of cca. 14 days
Operating system	Linux
CPU	i.MX6 Single (ARM® Cortex™-A9) @ 1GHz
RAM	1 GB DDR3
Flash	4 GB eMMC 8bits (MLC type)
NV RAM	512 kB, capacitor backed up with retention cca. 14 days
Display	4.3", 480 × 272 resolution
LCD viewing angle (R/L/T/B)	70° /70° /50° /70°
Dimensions (L x W x H)	106 x 160 x 39 mm
Display dimensions (L x W)	54 x 95 mm
Weight	650 g
Ambient temperature	0 to 50°C
Ambient humidity	max. 95 %, no condensation
Maximum altitude	2000 m
Mounting position	vertical
Transport and storage temperature	-20 to 60 °C
Pollution degree	2
Over-voltage category	II
Electrical equipment	class II (double insulation)
Protection class front side	IP 65
Protection class back side	IP 30

6 PROGRAMMING GUIDE

This chapter is intended to offer the programmer additional informations about some of the functionalities and units integrated in this graphical operation terminal.

6.1 Basic functionalities

RTC unit

For RTC back-up and for Retain variables there is Super Capacitor instead of battery integrated inside PLC. This way, replacement of the discharged battery is avoided. The Retention time is minimum 14 days from the power down. RTC time provides date and time information.

Ethernet

Ethernet port can be used as a programming and debugging port, as a Modbus TCP/IP Master and/or Slave device and as BACnet IP (B-ASC).

WiFi

WiFi port can be used as a programming and debugging port, as a Modbus TCP/IP Master and/or Slave device and as BACnet IP (B-ASC).

Modbus TCP/IP master unit

When configured for Modbus TCP/IP Master / Client mode, the LPC-3.GOT.112 functions as a master device, controlling the communications with other slave devices such as sensors, inverters, other PLCs, etc. LPC-3.GOT.112 sends Modbus TCP/IP commands to and receives Modbus TCP/IP responses from the slave units.

Following commands are supported:

01 – Read Coil Status
02 – Read Input Status
03 – Read Holding Registers
04 – Read Input Registers
05 – Write Single Coil
06 – Write Single Register
15 – Write Multiple Coils
16 – Write Multiple Registers

Note: each of this command can read/write up to 10000 addresses.

Modbus TCP/IP slave unit

Modbus TCP slave has 10000 addresses in each memory section:

Coils:	00000 to 09999
Discrete inputs:	10000 to 19999
Input register:	30000 to 39999
Holding registers:	40000 to 49999

Supports up to 5 connections to the slave units (defined with MaxRemoteTCPClient parameter).
Highest scan rate is 100 ms.

Modbus RTU master unit

When configured for Modbus RTU Master mode, the the LPC-3.GOT.112 functions as a master device, controlling the communications with other slave devices such as sensors, inverters, other PLCs, etc. LPC-3.GOT.112 sends Modbus RTU commands to and receives Modbus RTU responses from the slave devices.

Following commands are supported:

01 – Read Coil Status
02 – Read Input Status
03 – Read Holding Registers
04 – Read Input Registers
05 – Write Single Coil
06 – Write Single Register
15 – Write Multiple Coils
16 – Write Multiple Registers

Note: each of this commands can read/write up to 246 bytes of data. For analog (Input and Holding registers) this means 123 values, while for digital (Statuses and Coils) this means 1968 values. When higher quantity of data is required, LPC-3.GOT.112 can execute up to 32 same or different supported commands simultaneous.

Physical layer: RS-485
Supported baud rates: 9600, 19200, 38400, 57600 and 115200bps
Parity: None, Odd, Even.
Stop bit: 1

Modbus RTU slave unit

Modbus TCP slave has 1023 addresses in each memory section:

Coils:	00000 to 01023
Discrete inputs:	10000 to 11023
Input register:	30000 to 31023
Holding registers:	40000 to 41023

Highest scan rate is 100 ms.

Smarteh RS485 bus for connectivity with LPC-2 system

Port COM2 is used for communication with LPC-2 slave modules. All communication settings are configured in SmartehIDE software program.

BACnet IP unit

When configured for BACnet IP (B-ACS), following commands are supported:

Data Sharing

ReadProperty-B (DS-RP-B)
WriteProperty-B (DS-WP-B)

Device and Network Management

Dynamic Device Binding-B (DM-DDB-B)
Dynamic Object Binding-B (DM-DOB-B)
Device Communication Control-B (DM-DCC-B)
Time Synchronization-B (DM-TS-B)
UTCTimeSynchronization-B (DM-UTC-B)

For more information, please contact producer.

RUN/STOP Switch

Run: Status RUN status LED “on” indicate that the user graphical application is up and user program is running.

Stop: When the switch is turn to STOP state, the RUN status LED is “off” and application is stopped.

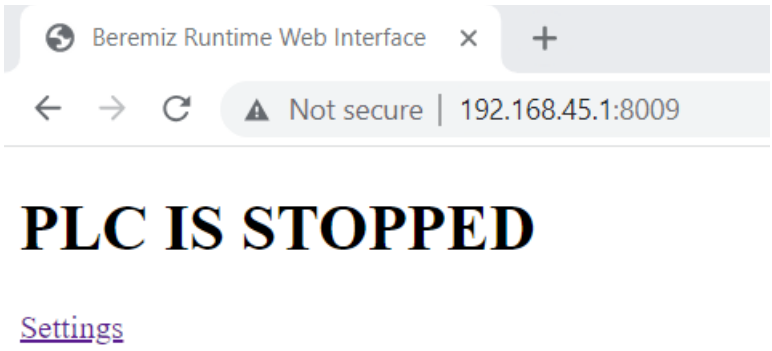
PLC task cycle time

Main PLC task interval (under Project tab -> Resource → Tasks → Interval) time is not recommended to be set lower than 50 ms.

6.2 WiFi configuration

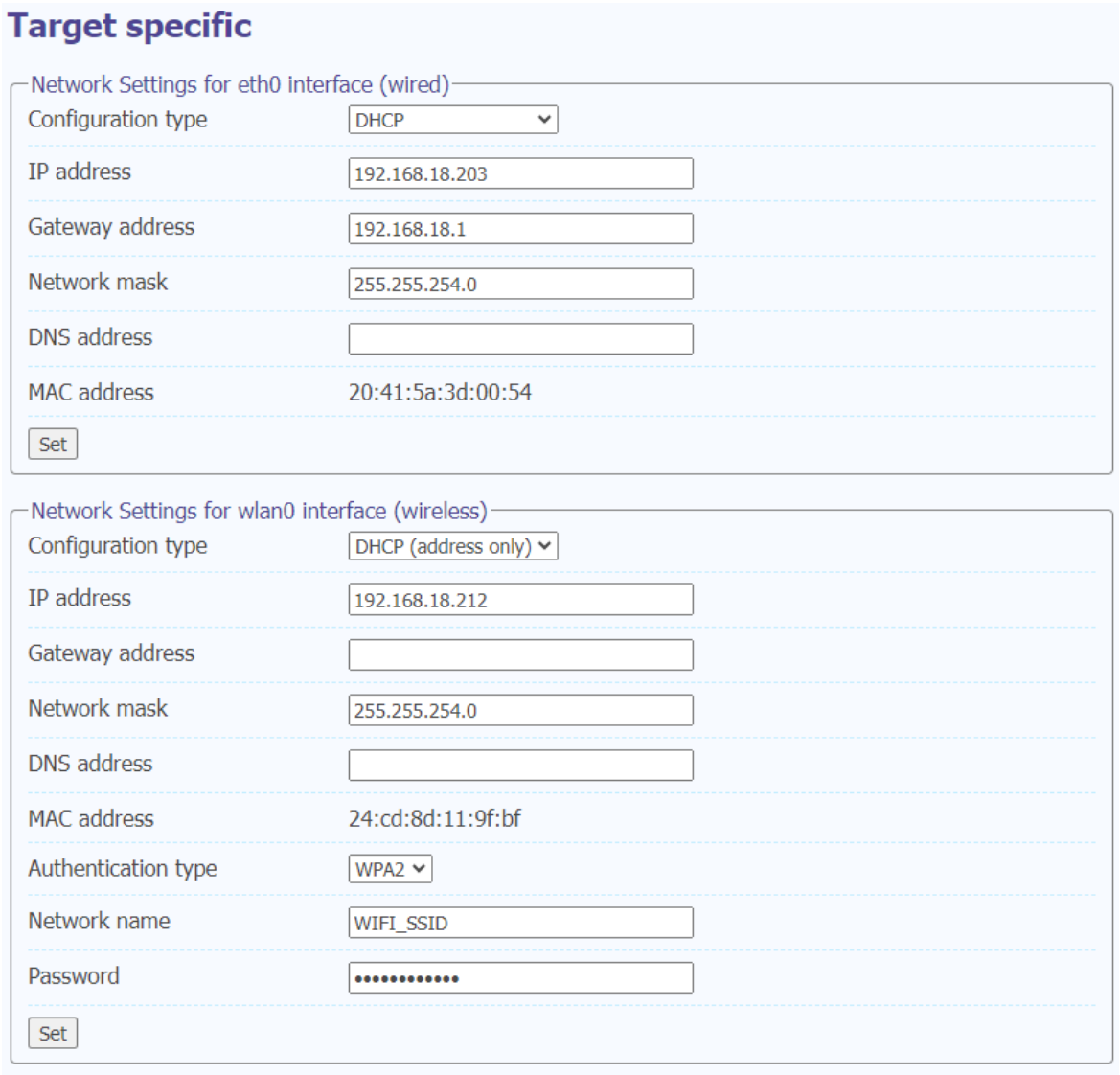
1. Connect module to the PC via USB connector and switch ON power supply.
2. In the address bar, type the module's default IP address: 192.168.45.1 followed by the port number: 8009 (e.g., http://192.168.45.1:8009). Refer to Figure 6: Web interface.
3. Click on “Settings” button on the web interface.

Figure 6: Web interface



4. The Settings page opens. In the “Network Settings for wlan0 interface (wireless)” section set the parameters of the wireless network to which you want to connect: “Configuration type”, “Authentication type”, “Network name” and “Password”. Refer to Figure 7: Web interface settings.
5. Click the "Set" button at the bottom of the section to apply the changes.

Figure 7: Web interface settings



6.3 Ethernet configuration

1. Connect module to the PC via USB connector and switch ON power supply.
2. Open a web browser on your PC.
3. In the address bar, type the module's default IP address: 192.168.45.1 followed by the port number: 8009 (e.g., http://192.168.45.1:8009). Press Enter. Refer to Figure 7: Web interface settings.
4. Click on “Settings” button on the web interface.
5. The Settings page will display two sections for configuring network connections (Ethernet and Wi-Fi). The “Network Settings for eth0 interface (wired)” section allows you to set parameters for the module's RJ45 Ethernet port. Enter the desired network parameters for

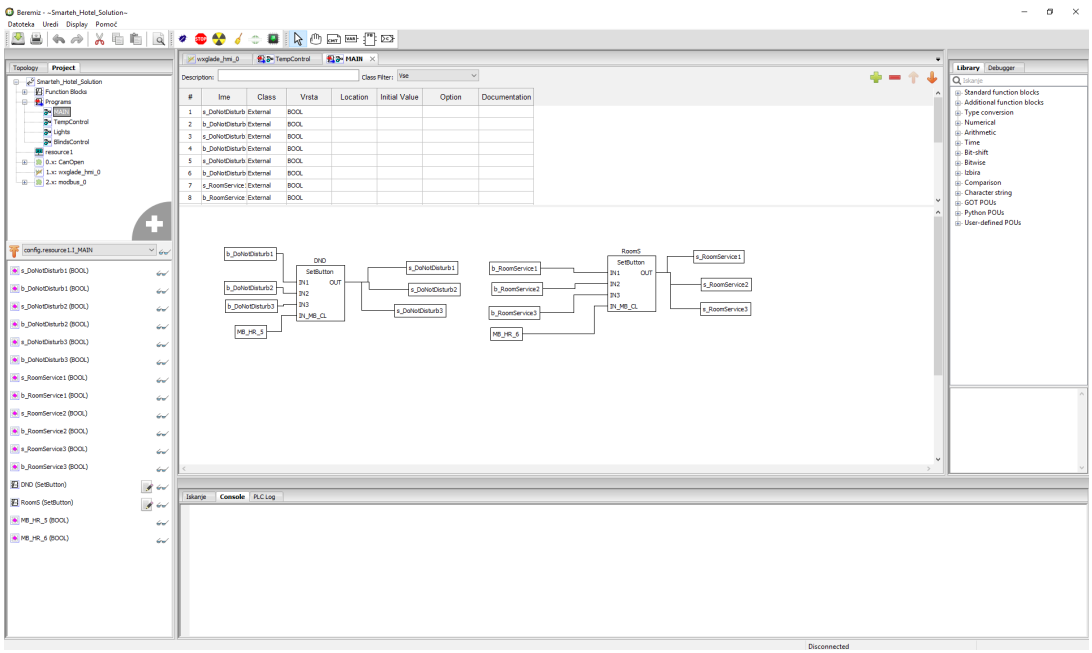
your specific network configuration. Ethernet port and WiFi must use the same Gateway. So if we select the first port on DHCP, we must set the second one to DHCP (address only). Refer to Figure 7: Web interface settings

6. Once you have configured the settings, connect a UTP cable to the desired port.
7. Click the "Set" button at the bottom of the section to apply the changes.

6.4 GUI design and programming

Graphical interface is freely designed by the user with GUI editor in SmartehIDE (Inkscape 0.92).

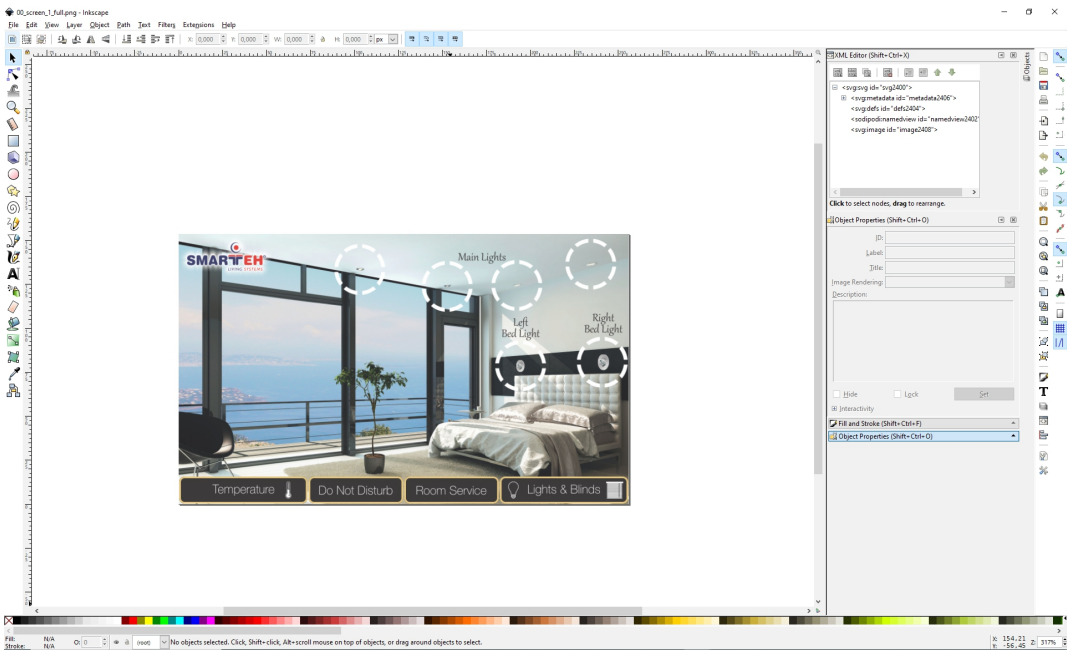
Figure 8: SmartehIDE software tool[3]



NOTE: It is recommended that only one Ethernet or Wifi connection to the Smarteh PLC GUI by using an internet browser, is established and used at a time. Exceptionally up to three Ethernet or Wifi connections could be established at the same time.

3 **Configuration** of the PLC is done using SmartehIDE software tool. **Please refer to SmartehIDE and LPC Manager user manual** for details.

Figure 9: Inkscape open source tool[4]



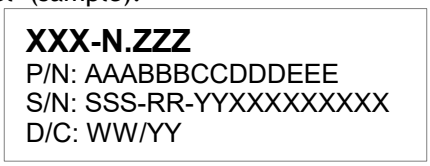
NOTE: Recommended minimum size of the touch object is 10 x 10 mm.

4 **Configuration** of the GUI is done using Inkscape 0.92 open source tool.

7 MODULE LABELING

Figure 10: Label

Label (sample):



Label description:

1. **XXX-N.ZZZ** - full product name.
   - **XXX-N** - Product family
   - **ZZZ** - product
2. **P/N: AAABBBCCDDDEEE -** part number.
   - **AAA** - general code for product family,
   - **BBB** - short product name,
   - **CCDDD** - sequence code,
     - **CC** - year of code opening,
     - **DDD** - derivation code,
   - **EEE** – version code (reserved for future HW and/or SW firmware upgrades).
3. **S/N: SSS-RR-YYXXXXXXXXX -** serial number.
   - **SSS** – short product name,
   - **RR** – user code (test procedure, e.g. Smarteh person xxx),
   - **YY** – year,
   - **XXXXXXXXX**– current stack number.
4. **D/C: WW/YY -** date code.
   - **WW** – week and
   - **YY** – year of production.

Optional

1. ***MAC***
2. ***Symbols***
3. ***WAMP***
4. ***QR code***
5. ***Other***

8 SPARE PARTS

For ordering spare parts following Part Numbers should be used:

LPC-3.GOT.112 Graphical operation terminal	
LPC-3.GOT.112, black glass screen	P/N: 226GOT23112B01

9 CHANGES

The following table describes all the changes to the document.

Date	V.	Description
02.10.24	4	Figure 3 updated.
05.06.24	3	Chapter 6 updated.
19.12.23	2	Revision of the document.
21.09.23	1	The initial version, issued as *LPC-3.GOT.112 User Manual*.

10 NOTES