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!

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!

LONGO LPC-3 complies to the following standards:

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.

MANUFACTURER:
SMARTEH d.o.o.
Poljubinj 114
5220 Tolmin
Slovenia
Index

Longo programmable controller LPC-3.GOT.001

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1 ABBREVIATIONS

PLC  Programmable logic controller
GUI  Graphical user interface
TCP  Transmission control protocol
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
CAN  Controller area network
COM  Communication
SD   Secure digital
LED  Light emitting diode
RAM  Random access memory
NV   Non volatile
PS   Power supply
2 DESCRIPTION

Smarteh LPC-3.GOT.001 graphical operation terminal is designed and developed as ideal solution for the automation of machines and production lines supplement to LPC-3 modules. It is PLC based product with software tools allowing users to design GUI. Different communication protocols offers various connectivity opportunities.

LPC-3.GOT.001 is equipped with Ethernet connection and can be used as a Modbus TCP/IP Master and/or Slave device. USB port is used for local programming and debugging. Over TCP/IP, programming and debugging is possible via LAN (inside building) or even via WAN network (remotely over internet).

LPC-3.GOT.001 also includes two galvanic isolated CAN bus for CANopen protocol and non-isolated RS-485 bus for Modbus RTU master protocol, used e.g. for local or remote connection to other LPC PLCs. Integrated "Setting Storage FLASH", "RTC" and "NV RAM", does not need the battery for it is functioning. There is also a built-in buzzer which can be controlled through PLC program.

Smarteh IDE (Integrated Development Environment) software tool is used with all the PLCs from the LPC family and it supports all five standard PLC programmable languages (FBD, LD, SFC, ST, IL). It also supports "off line", "on line" debugging and local/remote program transferring. Distributed processing is supported which makes it possible to handle fast operations. GUI design tool supports large set of dynamic controls from buttons to indicators and enables connectivity between PLC programs and user interface.

LPC-3.GOT.001 is an innovative and an attractive solution for a competitive price.

LPC-3.GOT.001 is powered from external DC power supply.
3 FEATURES

Table 1: Features

<table>
<thead>
<tr>
<th>Feature</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aluminium frame with 7” LCD display and resistive touch screen - landscape or portrait orientation</td>
</tr>
<tr>
<td>Graphical interface is freely designed by the user with GUI editor in SmartehIDE</td>
</tr>
<tr>
<td>Ethernet connectivity with Modbus TCP/IP Slave (server) and/or Master (client) functionality,</td>
</tr>
<tr>
<td>web server and SSL</td>
</tr>
<tr>
<td>Modbus RTU Master</td>
</tr>
<tr>
<td>USB port for Debugging and application transfer</td>
</tr>
<tr>
<td>Remote access and application transfer</td>
</tr>
<tr>
<td>2 galvanic isolated (2500 V DC) CAN port - one for master, one for slave</td>
</tr>
<tr>
<td>RTC and 512 kB NV RAM with super capacitor for needed energy storage</td>
</tr>
<tr>
<td>Micro SD Card slot</td>
</tr>
<tr>
<td>Built-in buzzer controlled from PLC program</td>
</tr>
<tr>
<td>Display brightness level controlled from PLC program</td>
</tr>
<tr>
<td>Disconnectable spring type connectors</td>
</tr>
<tr>
<td>3 status LEDs</td>
</tr>
<tr>
<td>Quality design</td>
</tr>
</tbody>
</table>
4 INSTALLATION

4.1 Block diagram

Figure 2: LPC-3.GOT block diagram

Coloured areas represents different voltage domains - galvanic isolated areas. Please refer to General technical specifications in TECHNICAL SPECIFICATION for details.
4.2 Input & output connection interfaces

Table 2: Power supply

| PS1.1 (+) | PLC power supply | 8 .. 30 V DC, 2 A |
| PS1.2 (-) | GND |

Table 3: Switches

| S1 | Operation mode (RUN/STOP) | RUN: PLC normal operational mode |
| STOP: application not running |

| S2 | COM1 RS-485 termination (Trm1) | ON: corresponding channel is internally terminated with 120 Ω |
| OFF: no internal termination present |

| S3 | CAN1 bus termination (Trm2) | ON: corresponding channel is internally terminated with 120 Ω |
| OFF: no internal termination present |

| S4 | CAN2 bus termination (Trm3) | ON: corresponding channel is internally terminated with 120 Ω |
| OFF: no internal termination present |

Table 4: CAN1 & CAN2

| CAN1.1 | CAN1 Low (Lo) (Master) | 0 .. 5 V |
| CAN1.2 | CAN1 High (Hi) (Master) |
| CAN1.3 | CAN1 reference point (GND1) | 0 V to CAN1 |
| CAN2.1 | CAN2 Low (Lo) (Slave) | 0 .. 5 V |
| CAN2.2 | CAN2 High (Hi) (Slave) |
| CAN2.3 | CAN2 reference point (GND1) | 0 V to CAN1 |

Table 5: COM1 RS-485

| COM1.1 | RS-485 (A) | 0 .. 5 V |
| COM1.2 | RS-485 (B) |
| GND |

---

2 Wires connected to the module must have cross sectional area at least 0.75 mm². Minimum temperature rating of wire insulation must be 85 °C.

3 Wires connected to the module must have cross sectional area at least 0.14 mm². Use twisted-pair cables of type CAT5+ or better, shielding is recommended. Minimum temperature rating of wire insulation must be 85 °C. Galvanic isolation of 2500 V DC between CAN1, CAN2 and rest of the PLC circuit is provided.

4 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 mm². Use twisted-pair cables of type CAT5+ or better, shielding is recommended.
<table>
<thead>
<tr>
<th>Table 6: LEDs</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>LED1: green</td>
<td>Application running (RUN)</td>
</tr>
<tr>
<td>LED2: blue</td>
<td>Additional LED</td>
</tr>
<tr>
<td>LED3: green</td>
<td>Power (PWR)</td>
</tr>
</tbody>
</table>
4.3 Mounting instructions

**Figure 3: Housing dimensions**

Dimensions in millimeters.
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.001 is not connected to the main power supply. Wires connected to the PLC must have cross sectional area at least 0.75 mm². Minimum temperature rating of wire insulation must be 85 °C.

Mounting instructions:

1. Switch off power supply.
2. Mount LPC-3.GOT.001 to the provided place, using φ3 mm screws.
3. Connect input, output and communication wires.
4. Switch on power supply.
# 5 TECHNICAL SPECIFICATIONS

<table>
<thead>
<tr>
<th>Table 7: Technical specifications</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Power supply PS1</strong></td>
</tr>
<tr>
<td><strong>Inrush current</strong></td>
</tr>
<tr>
<td><strong>Power consumption PS1</strong></td>
</tr>
<tr>
<td><strong>Connection type for PS1</strong></td>
</tr>
<tr>
<td><strong>Connection type for CAN1, CAN2, COM1</strong></td>
</tr>
<tr>
<td><strong>CAN1 or CAN2 isolation voltage to PS1</strong></td>
</tr>
<tr>
<td><strong>COM1 RS-485 port</strong></td>
</tr>
<tr>
<td><strong>Ethernet</strong></td>
</tr>
<tr>
<td><strong>USB</strong></td>
</tr>
<tr>
<td><strong>RTC</strong></td>
</tr>
<tr>
<td><strong>Operating system</strong></td>
</tr>
<tr>
<td><strong>CPU</strong></td>
</tr>
<tr>
<td><strong>RAM</strong></td>
</tr>
<tr>
<td><strong>Flash</strong></td>
</tr>
<tr>
<td><strong>NV RAM</strong></td>
</tr>
<tr>
<td><strong>Display</strong></td>
</tr>
<tr>
<td><strong>Dimensions (L x W x H)</strong></td>
</tr>
<tr>
<td><strong>Weight</strong></td>
</tr>
<tr>
<td><strong>Ambient temperature</strong></td>
</tr>
<tr>
<td><strong>Ambient humidity</strong></td>
</tr>
<tr>
<td><strong>Maximum altitude</strong></td>
</tr>
<tr>
<td><strong>Mounting position</strong></td>
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<tr>
<td><strong>Transport and storage temperature</strong></td>
</tr>
<tr>
<td><strong>Pollution degree</strong></td>
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<tr>
<td><strong>Over-voltage category</strong></td>
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<tr>
<td><strong>Electrical equipment</strong></td>
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<tr>
<td><strong>Protection class front side</strong></td>
</tr>
<tr>
<td><strong>Protection class back side</strong></td>
</tr>
</tbody>
</table>
6 CONNECTION & CONFIGURATION GUIDE

6.1 Main connection scheme & configuration

**Figure 4: Main connection scheme**

5 Coloured areas represents galvanic isolated areas. Please refer to General technical specifications for details.
**Figure 5: Grounding possibilities**

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

---

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

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

7.1 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.

Modbus TCP/IP master unit
When configured for Modbus TCP/IP Master / Client mode, the LPC-3.GOT.001 functions as a master device, controlling the communications with other slave devices such as sensors, inverters, other PLCs, etc. LPC-3.GOT.001 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 1023 addresses.

Modbus TCP/IP slave unit
Modbus TCP slave has 1024 addresses in each memory section:
   Coils:           00000 to 01023
   Discrete inputs: 10000 to 11023
   Input register:  30000 to 31023
   Holding registers: 40000 to 41023

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 LPC-3.GOT.001 functions as a master device, controlling the communications with other slave devices such as sensors, inverters, other PLCs, etc. LPC-3.GOT.001 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.001 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

CANopen unit
CANopen unit consists of Master and Slave communication ports. They are independent, thus can be connected to two different CAN network at the same time.

The ports can operate at baud rates 50 kbps, 125 kbps or 250 kbps.

It follows the internationally standardized (EN 50325-4) CAN-based higher-layer protocol for embedded control systems. Advised rules and concepts by this standard must be followed to fulfil the conditions and so achieving normal operation and results.

The structure of the network as cable type and lengths, baud rates, number of the nodes and termination must be taken into account within the recommendations and requirements, when designing the network.

The bus network can consist of at least one Master and at list one Slave node by the standard, but it is advised that with increased number of nodes, the Master node fastest interval is extended. Below are two examples:

Example 1: network with 1 master and 9 slaves, every slave have defined 32 (4x8) byte of data and baud rate 125 Kbps. Fastest Cycle time for this configuration is 50 ms.

Example 2: network with 1 master and 4 slaves, every slave have defined 4 byte of data and baud rate 250 Kbps. Fastest Cycle time for this configuration is 5 ms.

5 ms is the fastest recommended cycle time.

It is recommended to power-up all the nodes on the same network at the same time, if some or all nodes had been reprogrammed (to reinitialize the communication properly).
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.
7.2 GUI design and programming

Figure 7: LPC Manager interface example

![LPC Manager interface example](image)

Figure 8: LPC GUI Manager interface example

![LPC GUI Manager interface example](image)

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

6 Configuration of the PLC is done using Smarteh IDE software tool. Please refer to LPC Manager user manual for details.

7 Configuration of the PLC is done using Smarteh IDE software tool. Please refer to LPC GUI Manager user manual for details.
8 MODULE LABELING

Figure 9: Labels

Label 1 (sample):

```
LPC-3.GOT
P/N: 226GOT14001001
D/C: 05/15
```

Label 2 (sample):

```
S/N: GOT-S9-150000190
```

Label 3 (sample):

```
MAC: 20-41-5A-1A-00-00
```

**Label 1 descriptions:**

1. **LPC-3.GOT** is the full product name.
2. **P/N: 226GOT14001001** is the part number.
   - 226 - general code for product family,
   - GOT - short product name,
   - 14001 - sequence code,
     - 14 - year of code opening,
     - 001 - derivation code,
     - 001 - version code (reserved for future HW and/or SW firmware upgrades).
3. **D/C: 05/15** is the date code.
   - 05 - week and,
   - 15 - year of production.

**Label 2 descriptions:**

1. **S/N: GOT-S9-150000190** is the serial number.
   - GOT - short product name,
   - S9 - user code (test procedure, e.g. Smarteh person xxx),
   - 1500000190 - year and current stack code,
     - 15 - year,
     - 00000190 - current stack number; previous module would have the stack number 00000189 and the next one 00000191.

**Label 3 description:**

- MAC: 20-41-5A-1A-00-00 is the MAC address.
9 SPARE PARTS

For ordering spare parts following Part Numbers should be used:

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Description</th>
<th>P/N</th>
</tr>
</thead>
<tbody>
<tr>
<td>LPC-3.GOT.001</td>
<td>Graphical operation terminal</td>
<td>226GOT14001001</td>
</tr>
</tbody>
</table>
## 10 CHANGES

The following table describes all the changes to the document.

<table>
<thead>
<tr>
<th>Date</th>
<th>V.</th>
<th>Description</th>
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</thead>
<tbody>
<tr>
<td>15.01.18</td>
<td>6</td>
<td>Technical data update.</td>
</tr>
<tr>
<td>15.11.18</td>
<td>7</td>
<td>Technical data update.</td>
</tr>
<tr>
<td>30.09.17</td>
<td>5</td>
<td>Added technical data.</td>
</tr>
<tr>
<td>15.04.17</td>
<td>4</td>
<td>RTU update.</td>
</tr>
<tr>
<td>20.03.17</td>
<td>3</td>
<td>Technical data update.</td>
</tr>
<tr>
<td>15.11.16</td>
<td>2</td>
<td>Pictures update, and text corrections.</td>
</tr>
<tr>
<td>15.09.16</td>
<td>1</td>
<td>The initial version, issued as LPC-3.GOT User Manual.</td>
</tr>
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</table>