



SMARTEH[®]
LIVING SYSTEMS

USER MANUAL

- ▶ Longo programmable controller
LPC-2.DL2
DALI-2 module

Version 3

Written by SMARTEH d.o.o.
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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 .. 240 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-2 - 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!

LONGO LPC-2 complies to the following standards:

- EMC: EN 61000-6-3:2007 + A1:2011, EN 61000-6-1:2007, EN 61000-3-2:2006 + A1:2009 + A2: 2009, EN 61000-3-3:2013
- LVD: IEC 61010-1:2010 (3rd Ed.), IEC 61010-2-201:2013 (1st Ed.)

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-2.DL2

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1 ABBREVIATIONS

DC	Direct current
DALI	Digitally Addressable Lighting Interface
DSI	Digital Serial Interface



2 DESCRIPTION

LPC-2.DL2 is a master and power supply DALI-2, DALI or DSI module. It can control up to 64 slave DALI-2 devices.

Its main field of application is controlling electronic dimmable ballasts in lighting system.

LPC-2.DL2 is controlled and powered from the main module (e.g., LPC-2.MC8, LPC-2.MC9) via Right internal bus. DALI bus is powered from the main module via Right internal bus or external power supply which is connected to PS IN connector.



3 FEATURES

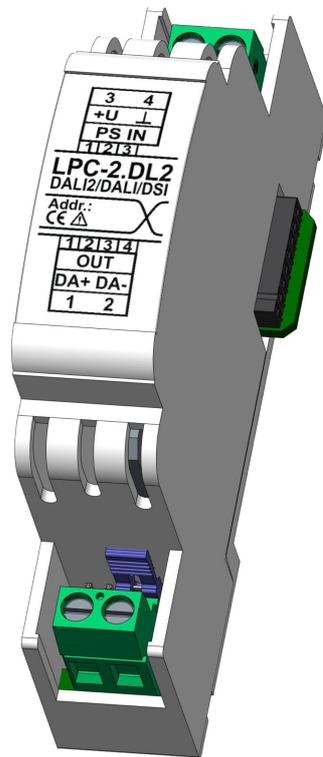


Figure 1: LPC-2.DL2 module

Table 1: Technical data

Standard DALI-2, DALI or DSI master and power supply

Master, multi-master or slave mode

Supplied from main module or external power supply

Connection up to 64 slave devices

Small dimensions and standard DIN EN50022-35 rail mounting



4 OPERATION

Module parameters can be read or written via Smarteh IDE software.

4.1 Parameters

Transmit

Options [OptionBits]: Device configuration settings. (Bit marked with 'n' is not used and is set to '0')

Type: USINT

Raw to engineering data:

- nxxxxxx0 (bin) → Bus power ON
- nxxxxxx1 (bin) → Bus power OFF
- nxxxxx0x (bin) → Collision detection ON
- nxxxxx1x (bin) → Collision detection OFF
- nxxxx0xx (bin) → No reset (normal operation)
- nxxxx1xx (bin) → Reset module
- nx000xxx (bin) → No multi-master
- nx001xxx (bin) → Multi-master priority 1
- nx010xxx (bin) → Multi-master priority 2
- nx011xxx (bin) → Multi-master priority 3
- nx100xxx (bin) → Multi-master priority 4
- nx101xxx (bin) → Multi-master priority 5
- n0xxxxxx (bin) → DALI2/DALI standard
- n1xxxxxx (bin) → DSI standard

Packet 1 Tx Counter [P1_TxCnt]: Transmitted data counter for packet 1. After change of value of this counter, values of Packet 1 Command Data 1, Packet 1 Command Data 2 and Packet 1 Command Data 3 will be transmitted to DALI network. Number of transmitted data is defined in Packet 1 Command length parameter. User should first set right values to parameters of all three command data of Packet 1 and Packet 1 Command length, then change value of Packet 1 Tx Counter.

Type: USINT

Raw to engineering data: 0 .. 255 → 0 .. 255

Packet 1 Command length [P1_CmdLength]: Packet 1 transmitted data properties. (Bits marked with 'n' are not used and are set to '0')

Type: USINT

Raw to engineering data:

- nnnnxx00 (bin) → Data length in bytes - 0 byte
- nnnnxx01 (bin) → Data length in bytes - 1 byte
- nnnnxx10 (bin) → Data length in bytes - 2 bytes
- nnnnxx11 (bin) → Data length in bytes - 3 bytes
- nnnnx0xx (bin) → One message



nnnx1xx (bin) → Double message¹
 nnnn0xxx (bin) → No answer expected
 nnnn1xxx (bin) → Answer expected

Packet 1 Command Data 1 [P1_Cmd1]: Data byte 1 for command 1.
 Type: USINT

Raw to engineering data: 0 .. 255 → 0 .. 255

Packet 1 Command Data 2 [P1_Cmd2]: Data byte 2 for command 1.
 Type: USINT

Raw to engineering data: 0 .. 255 → 0 .. 255

Packet 1 Command Data 3 [P1_Cmd3]: Data byte 3 for command 1.
 Type: USINT

Raw to engineering data: 0 .. 255 → 0 .. 255

Packet 2 Tx Counter [P2_TxCnt]: Transmitted data counter for packet 2, data will be transmitted only if counter changes.
 Type: USINT

Raw to engineering data: 0 .. 255 → 0 .. 255

Packet 2 Command length [P2_CmdLength]: Packet 2 transmitted data properties. (Bits marked with 'n' are not used and are set to '0')
 Type: USINT

Raw to engineering data: nnnxx00 (bin) → Data length in bytes - 0 byte
 nnnxx01 (bin) → Data length in bytes - 1 byte
 nnnxx10 (bin) → Data length in bytes - 2 bytes
 nnnxx11 (bin) → Data length in bytes - 3 bytes
 nnnx0xx (bin) → One message
 nnnx1xx (bin) → Double message²
 nnnn0xxx (bin) → No answer expected
 nnnn1xxx (bin) → Answer expected

Packet 2 Command Data 1 [P2_Cmd1]: Data byte 1 for command 2.
 Type: USINT

Raw to engineering data: 0 .. 255 → 0 .. 255

Packet 2 Command Data 2 [P2_Cmd2]: Data byte 2 for command 2.
 Type: USINT

Raw to engineering data: 0 .. 255 → 0 .. 255

1 This is a special message that consist of two messages which both need to be sent inside 100ms. In this case both messages should be in 2 successive/adjacent packet fields, both marked as double message. This message will be sent by controller in 2 successive data packets in less than 100ms.
 2 This is a special message that consist of two messages which both need to be sent inside 100ms. In this case both messages should be in 2 successive/adjacent packet fields, both marked as double message. This message will be sent by controller in 2 successive data packets in less than 100ms.



Packet 2 Command Data 3 [P2_Cmd3]: Data byte 3 for command 2.
Type: USINT

Raw to engineering data: 0 .. 255 → 0 .. 255

Packet 3 Tx Counter [P3_TxCnt]: Transmitted data counter for packet 3, data will be transmitted only if counter changes.
Type: USINT

Raw to engineering data: 0 .. 255 → 0 .. 255

Packet 3 Command length [P3_CmdLength]: Packet 3 transmitted data properties. (Bits marked with 'n' are not used and are set to '0')
Type: USINT

Raw to engineering data:

- nnnnx00 (bin) → Data length in bytes - 0 byte
- nnnnx01 (bin) → Data length in bytes - 1 byte
- nnnnx10 (bin) → Data length in bytes - 2 bytes
- nnnnx11 (bin) → Data length in bytes - 3 bytes
- nnnnx0xx (bin) → One message
- nnnnx1xx (bin) → Double message³
- nnnn0xxx (bin) → No answer expected
- nnnn1xxx (bin) → Answer expected

Packet 3 Command Data 1 [P3_Cmd1]: Data byte 1 for command 3.
Type: USINT

Raw to engineering data: 0 .. 255 → 0 .. 255

Packet 3 Command Data 2 [P3_Cmd2]: Data byte 2 for command 3.
Type: USINT

Raw to engineering data: 0 .. 255 → 0 .. 255

Packet 2 Command Data 3 [P3_Cmd3]: Data byte 3 for command 3.
Type: USINT

Raw to engineering data: 0 .. 255 → 0 .. 255

Event/bus data mode [EventBusDataMode]: Command for Event/Bus data. (Bits marked with 'n' are not used and are set to '0')
Type: USINT

Raw to engineering data:

- nnnnnn00 (bin) → Do nothing
- nnnnnn01 (bin) → Read new data if available⁴
- nnnnnn10 (bin) → Clear Event/Bus data

³ This is a special message that consist of two messages which both need to be sent inside 100ms. In this case both messages should be in 2 successive/adjacent packet fields, both marked as double message. This message will be sent by controller in 2 successive data packets in less than 100ms.

⁴ If this bit is set then data will be updated after each change off counter of internal bus transfers [InternalBusTransferCnt] until all data from Event/Buss buffer has been read.



Receive

Counter of internal bus transfers [InternalBusTransferCnt]: Counter that changes after each data transfer between main module and DL2 module. Data transfer is done, when data in PLC DL2 Tx buffer are transferred to DL2 module or data from DL2 module are read to DL2 Rx buffer in PLC. It updates every cca. 100 ms when module is connected and program is running.
Type: USINT

Raw to engineering data: 0 .. 255 → 0 .. 255

Bus status [BusStatus]: Status of DALI bus. (Bits marked with 'n' are not used and are set to '0')
Type: USINT

Raw to engineering data: nnnnxxn0 (bin) → Bus OK
 nnnnxxn1 (bin) → Bus shortcut
 nnnn0nx (bin) → No collision on DALI bus
 nnnn1nx (bin) → Collision on DALI bus detected
 nnnn0xn (bin) → Event bus buffer not full
 nnnn1xn (bin) → Event bus buffer full

Packet 1 counter feedback of Tx command [P1_TxCntFB]: Counter of last transmitted command 1 (Used to synchronize return status/data with command).
Type: USINT

Raw to engineering data: 0 .. 255 → 0 .. 255

Packet 1 Tx status [P1_TxStatus]: Status of transmitted command 1. (Bits marked with 'n' are not used and are set to '0')
Type: USINT

Raw to engineering data: nnnnxx1 (bin) → Expected answer received
 nnnnxx1x (bin) → Error during reception
 nnnn1xx (bin) → Error during transmission

Packet 1 Rx data [P1_RxData]: Command 1 return data.
Type: USINT

Raw to engineering data: 0 .. 255 → 0 .. 255

Packet 2 counter feedback of Tx command [P2_TxCntFB]: Counter of last transmitted command 2 (Used to synchronize return status/data with command).
Type: USINT

Raw to engineering data: 0 .. 255 → 0 .. 255

Packet 2 Tx status [P2_TxStatus]: Status of transmitted command 2. (Bits marked with 'n' are not used and are set to '0')
Type: USINT

Raw to engineering data: nnnnxx1 (bin) → Expected answer received
 nnnnxx1x (bin) → Error during reception
 nnnn1xx (bin) → Error during transmission



Packet 2 Rx data [P2_RxData]: Command 2 return data
Type: USINT

Raw to engineering data: 0 .. 255 → 0 .. 255

Packet 3 counter feedback of Tx command [P3_TxCntFB]: Counter of last transmitted command 3 (Used to synchronize return status/data with command).
Type: USINT

Raw to engineering data: 0 .. 255 → 0 .. 255

Packet 3 Tx status [P3_TxStatus]: Status of transmitted command 3. (Bits marked with 'n' are not used and are set to '0')
Type: USINT

Raw to engineering data: nnnnxx1 (bin) → Expected answer received
nnnnxx1x (bin) → Error during reception
nnnn1xx (bin) → Error during transmission

Packet 3 Rx data [P3_RxData]: Command 3 return data.
Type: USINT

Raw to engineering data: 0 .. 255 → 0 .. 255

Event/bus counter [EventBusCounter]: When counter changes we have new Event/Bus data in buffer.
Type: USINT

Raw to engineering data: 0 .. 255 → 0 .. 255

Number of Event/Bus data [EventBusDataLength]: Number of Event/Bus data in current buffer (0..3). (Bits marked with 'n' are not used and are set to '0')
Type: USINT

Raw to engineering data: nnnnnn00 (bin) → Data length in bytes - 0 byte
nnnnnn01 (bin) → Data length in bytes - 1 byte
nnnnnn10 (bin) → Data length in bytes - 2 bytes
nnnnnn11 (bin) → Data length in bytes - 3 bytes

Event/bus data 1 [EventBusData1]: Event data 1 - used for monitor other data than standard commands and responses (multimaster communication and event messages).
Type: USINT

Raw to engineering data: 0 .. 255 → 0 .. 255

Event/bus data 2 [EventBusData2]: Event data 2 - used for monitor other data than standard commands and responses (multi-master communication and event messages).
Type: USINT

Raw to engineering data: 0 .. 255 → 0 .. 255

Event/bus data 3 [EventBusData3]: Event data 3 - used for monitor other data than standard commands and responses (multi-master communication and event messages).



Type: USINT

Raw to engineering data: 0 .. 255 → 0 .. 255

Number of Event/Bus data in internal module buffer [EventBusDataTotal]: Number of all Event/Bus messages in internal DALI module buffer, that were not read yet to event Bus data registers [EventBusData1], [EventBusData2] and [EventBusData3].

Type: USINT

Raw to engineering data: 0 .. 255 → 0 .. 255

4.2 Power supply settings

LPC-2.DL2 module is powered from the main module via Right internal bus. LPC-2.DL2 module can be used as power supply for DALI bus which can be supplied from the main module via Right internal bus or from external power supply. That is selected with jumper S1. If main module is selected as power supply then output current must be limited at 115 mA due to main module output power limit. If external power supply is selected as source for DALI bus then you can choose which current limit to use; 115 mA or 220 mA. If DALI bus is not powered from the LPC-2.DL2 module, then jumper S2 is in position 3-4. Power consumption from main module varies depending on the placement of the jumpers (see table 5). For jumpers S1 and S2 positions see Table 6 and Table 7.



5 INSTALLATION

5.1 Connection scheme

Figure 2: Connection scheme

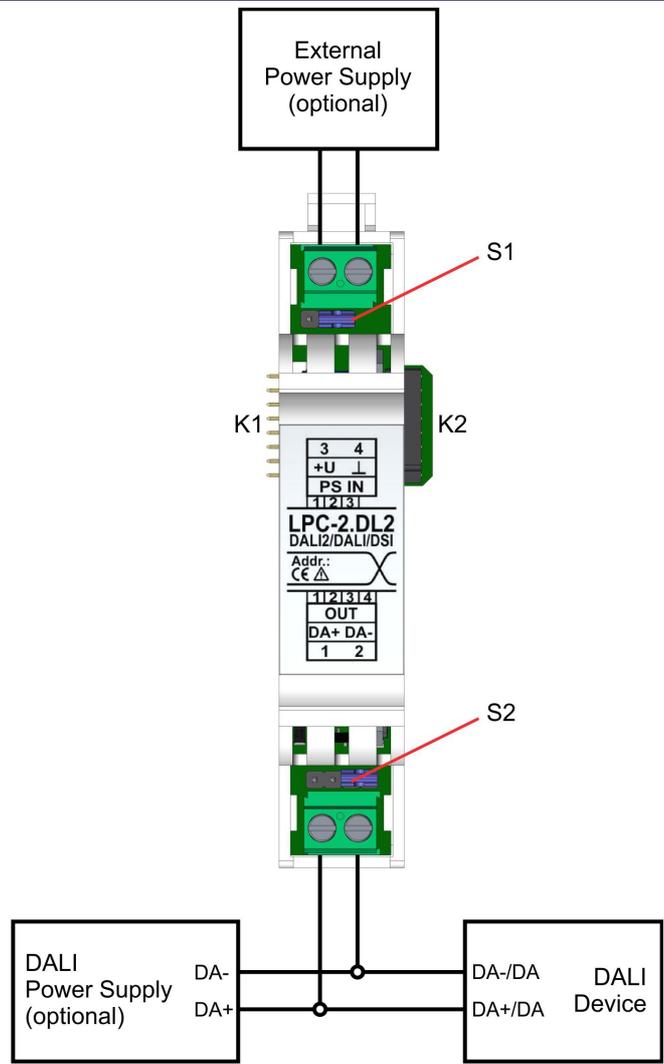


Table 2: IN (optional)

PS IN.3	+U	External Power Supply 21.6 .. 26.4 V DC
PS IN.4	⊥	External Power Supply GND



Table 3: OUT⁵

OUT.1	DA+	DALI bus 0 .. 20.5 V DC
OUT.2	DA-	DALI bus GND

Table 4: K1

Internal BUS	Data & DC power supply	Connection to I/O module
--------------	------------------------	--------------------------

Table 5: K2

Internal BUS	Data & DC power supply	Connection to I/O module
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Table 6: S1 - Power supply for DALI bus

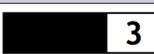
S1		Position 1-2, External power supply
S1		Position 2-3, Main module via internal bus

Table 7: S2 - Current limit

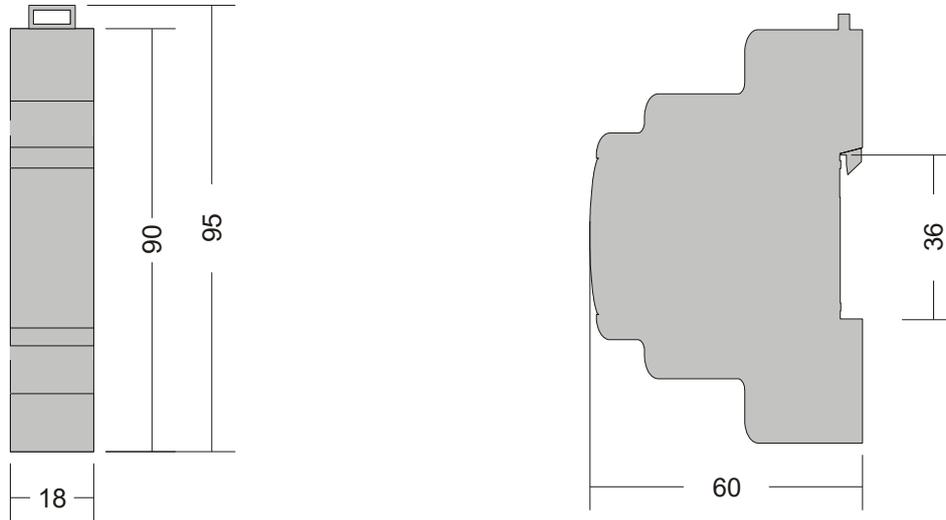
S2		Position 1-2, 115 mA
S2		Position 2-3, 220 mA
S2		Position 3-4, Power supply disconnected

5 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.



5.2 Mounting instructions

Figure 3: Housing dimensions



- Dimensions in millimeters.



All connections, module attachments and assembling must be done while module is not connected to the main power supply.

Mounting instructions:

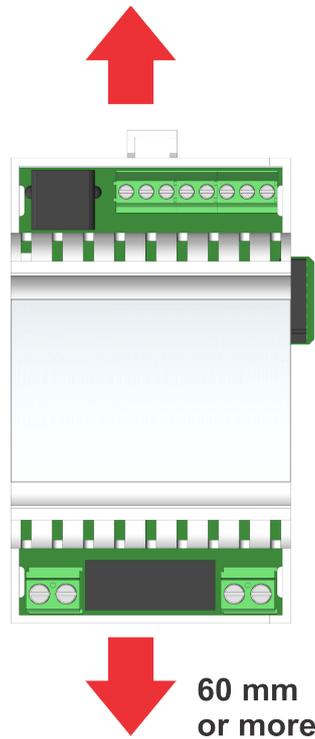
1. Switch OFF main power supply.
2. Mount LPC-2.DL2 module to the provided place inside an electrical panel (DIN EN50022-35 rail mounting).
3. Mount other LPC-2 modules (if required). Mount each module to the DIN rail first, then attach modules together through K1 and K2 connectors.
4. Connect input and output wires according to the connection scheme in Figure 2.
5. Switch ON main power supply.

Dismount in reverse order. For mounting/dismounting modules to/from DIN rail a free space of at least one module must be left on the DIN rail.

NOTE: LPC-2 main module should be powered separately from other electrical appliance connected to LPC-2 system. Signal wires must be installed separately from power and high voltage wires in accordance with general industry electrical installation standard.



Figure 4: Minimum clearances



The clearances above must be considered before module mounting.



5.3 Module labeling

Figure 5: Label

Label (sample):

```

XXX-N.ZZZ
P/N: AAABBBCCDDDEEE
S/N: SSS-RR-YYXXXXXXXXXX
D/C: WW/YY
    
```

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-YYXXXXXXXXXX** - serial number.
 - **SSS** - short product name,
 - **RR** - user code (test procedure, e.g. Smarteh person xxx),
 - **YY** - year,
 - **XXXXXXXXXX** - 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. **Other**



6 TECHNICAL SPECIFICATIONS

Table 8: Technical specifications

Power supply for DALI bus, selected by jumper S1	from main module via internal bus external 21.6 V .. 26.4 V DC
Max. external power supply consumption	7 W
Main module power consumption depending on jumpers settings (see chapter 4.2, table 7 and table 8)	S1 position 2-3, S2 position 1-2, max. 6 W
	S1 position 2-3, S2 position 2-3, max. 11 W
	S1 position 2-3, S2 position 3-4, max. 2 W
	S1 position 1-2, max. 2 W
Maximum supply current	S2 position 1-2, 125 mA
	S2 position 2-3, 230 mA
Guaranteed supply current	S2 position 1-2, 115 mA
	S2 position 2-3, 220 mA
DALI bus allowed voltage	22.5 V
DALI bus current consumption	< 2 mA
Number of standard DSI, DALI or DALI-2 outputs	1
Connection type	screw type connector for stranded wire 0.75 to 2.5 mm ²
Dimensions (L x W x H)	90 x 18 x 60 mm
Weight	60 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
Overvoltage category	II
Electrical equipment	Class II (double insulation)
Protection class	IP 30



7 CHANGES

The following table describes all the changes to the document.

Date	V.	Description
24.12.19	3	Technical update.
09.12.19	2	Technical update.
18.11.19	1	The initial version, issued as <i>LPC-2.DL2 module UserManual</i> .





8 NOTES

