USER MANUAL

Longo programmable controller
LPC-2.R02
Room module

Version 3

Written by SMARTEH d.o.o.
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User Manual

Document Version: 3
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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.R02

1 ABBREVIATIONS

ADC   Analog to digital converter

DAC   Digital to analog converter

NTC   Negative temperature coefficient

LED   Light emitting diode

2 DESCRIPTION

LPC-2.R02 is a mixed analog and digital module. Type and number of module inputs and outputs are conveniently chosen, making LPC-2.R02 very suitable for hotel rooms or offices automation with chilled beam solution even though it's also suitable for fan coil, cabin unit or general purpose solutions.

Module features 4 triac outputs where Q8 can be used for higher power loads, e.g. re-heater, 4 analog outputs, 2 analog inputs, 3 voltage free (dry) contacts digital inputs and 24 V DC/AC power supply output. For example, triac outputs may be used to drive up to 3 speed fan, hot and cool valves, welcome light, energize room power relay, etc. Digital inputs may be used for balcony and window contacts, SOS switch, light switches, occupancy switch, condense sensor, etc. Analog inputs may be used for actuator feedback, NTC, etc. Analog outputs may be used for actuator reference signal 0 .. 10 V, hot and cool valves, etc. See connection scheme example for better representation.

LEDs indicate state of contact or active signal present on corresponding module input and/or output.

LPC-2.R02 is controlled and powered from the main module (e.g., LPC-2.MC8, LPC-2.MC9) via Right internal bus.

3 FEATURES
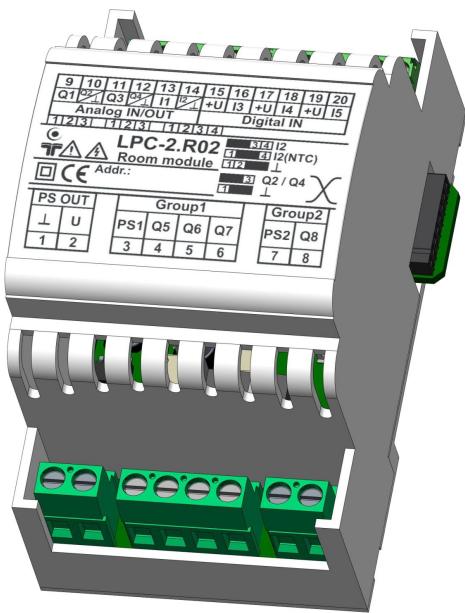
Figure 1: LPC-2.R02 module

Table 1: Features

4 analog outputs, where Q2 and Q4 may also be used for GND connection (jumper selectable)

2 analog inputs, where I2 input may also be used for NTC or GND connection (jumper selectable)

Analog input voltage range: 0 .. 10 V @ ±1 % measurement error of full scale

Analog output voltage output range: 0 .. 10 V @ ±1 % accuracy of full scale value

Tacho input

3 voltage free digital inputs, galvanic isolated

Flexible digital input for wide use of operation

3 snubberless zero crossing triacs output also suitable for use with inductive loads up to 0.9 A

1 snubberless zero crossing triac output also suitable for use with inductive loads up to 3.5 A, with load test function

24 V AC/DC power supply output with overload protection

Standard DIN EN50022-35 rail mounting

4 OPERATION

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

4.1 Parameters

If parameter is set to logical "1", is considered to be active, enabled or set. If parameter has logical value "0" is considered to be inactive, disabled or cleared.

Parameter can be a output, input, status or setting. Output and input parameters corresponds to the physical output and input pins of the module. Status parameters are used for additional information from the module, where setting parameters are used to select different settings on the module.

Output:

PSOUT – Power supply mode OFF, AC, DC *[PSOUTMode]*: Mode of power supply output.
Type: WORD
Raw to engineering data: 0 → Off
                             1 → AC
                             2 → DC

Q1 – Analog output 0 .. 10 V *[AOUT1]*: Analog output voltage on pin Q1.
Type: WORD
Raw to engineering data: 0 .. 10000 → 0 .. 10.000 V

Q2 – Analog output 0 .. 10 V / GND – jumper selectable *[AOUT2]*: Analog output voltage on pin Q2.
Type: WORD
Raw to engineering data: 0 .. 10000 → 0 .. 10.000 V

Q3 – Analog output 0 .. 10 V *[AOUT3]*: Analog output voltage on pin Q3.
Type: WORD
Raw to engineering data: 0 .. 10000 → 0 .. 10.000 V

Q4 – Analog output 0 .. 10 V / GND – jumper selectable *[AOUT4]*: Analog output voltage on pin Q4.
Type: WORD
Raw to engineering data: 0 .. 10000 → 0 .. 10.000 V

Q5 – Triac digital output *[DOUT5]*: Digital output state on pin Q5.
Type: BOOL
Raw to engineering data: "0" → Output off
                             "1" → Output on

Q6 – Triac digital output *[DOUT6]*: Digital output state on pin Q6.
Type: BOOL
Raw to engineering data: "0" → Output off
                             "1" → Output on

Q7 – Triac digital output *[DOUT7]*: Digital output state on pin Q7.
Type: BOOL
Raw to engineering data: "0" → Output off
                             "1" → Output on

Q8 – Triac digital output *[DOUT8]***:** Digital output state on pin Q8.
Type: BOOL
Raw to engineering data: "0" → Output off
                                              "1" → Output on

Input:

I1 – Analog input 0 .. 10 V / Tacho *[AIN1]***:** This parameter depends on the *AIN1Sel* parameter.
Type: WORD

If *AIN1Sel*
is "0":
          Analog input voltage on pin I1.
          Raw to engineering data: 0 .. 10000 → 0 .. 10.000 V

is "1":
          Tacho input on pin I1.
          Raw to engineering data: 0 .. 10000 → 0 .. 100.00 Hz

I2 – Analog input 0 .. 10 V / NTC / GND – jumper selectable *[AIN2]***:** This parameter depends on the *AIN2Sel* parameter.
Type: WORD

If *AIN2Sel*
is "0":
          Analog input voltage on pin I1.
          Raw to engineering data: 0 .. 10000 → 0 .. 10.000 V

is "1":
          NTC input on pin I1.
          Raw to engineering data: 0 .. 10000 → 0 .. 100.00 ˚C

I3 – Digital input *[DIN3]***:** Digital input state on pin I3.
Type: BOOL
Raw to engineering data: "0" → Contact opened
                                              "1" → Contact closed

I4 – Digital input *[DIN4]***:** Digital input state on pin I4.
Type: BOOL
Raw to engineering data: "0" → Contact opened
                                              "1" → Contact closed

I5 – Digital input *[DIN5]***:** Digital input state on pin I5.
Type: BOOL
Raw to engineering data: "0" → Contact opened
                                              "1" → Contact closed

Status:

Q8 - load connection status *[DOUT8LoadOK]***:** Status of the load on pin Q8.
Type: BOOL
Raw to engineering data: "0" → Unconnected
                                              "1" → Connected

PS OUT overload status *[PSOUTOverload]***:** Overload status of the PS OUT.

Type: BOOL
Raw to engineering data: "0" → OK
                                   "1" → Overload

Setting:

I1 type selector *[AIN1Sel]*: Selector for I1 input.
Type: BOOL
Raw to engineering data: "0" → Voltage input
                                   "1" → Tacho input

I2 type selector *[AIN2Sel]*: Selector for I2 input.
Type: BOOL
Raw to engineering data: "0" → Voltage input
                                   "1" → NTC input

5 INSTALLATION

5.1 Connection scheme

Figure 2: Connection scheme example
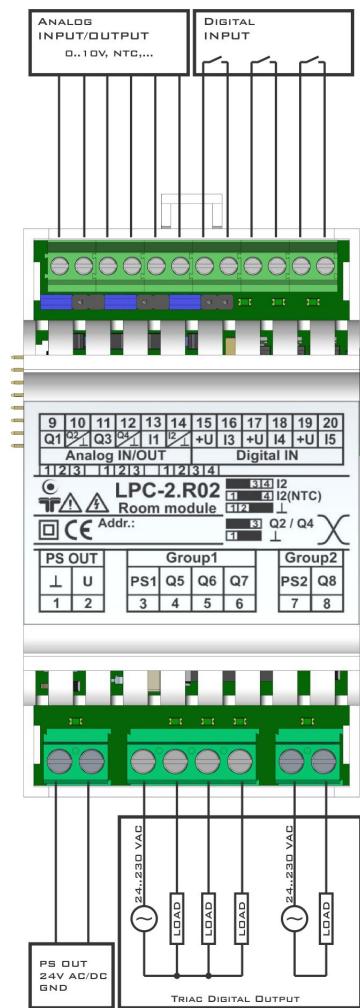
NOTE: Special care must be taken in case of high inductance loads, e.g. Relays or contactors. High inductance load may cause output fail to close. In that case, use of appropriate snubber is advised.

Figure 3: Tacho input connection scheme example
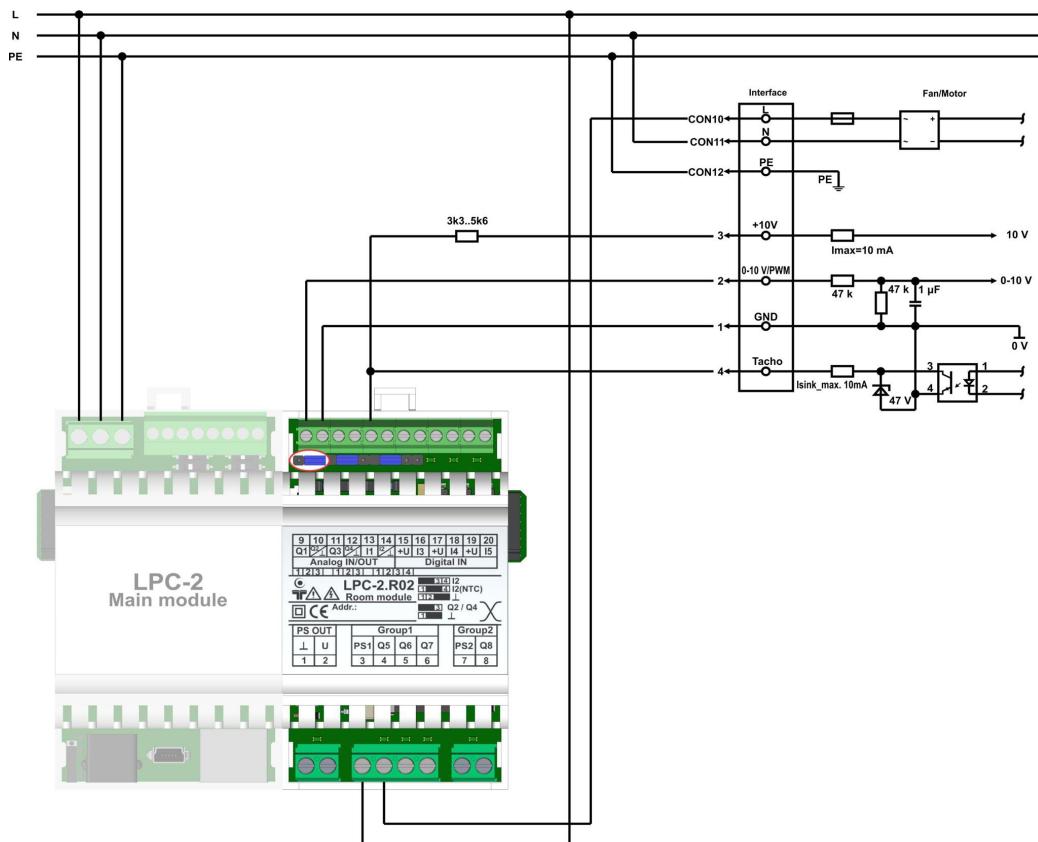
Figure 4: Connection scheme
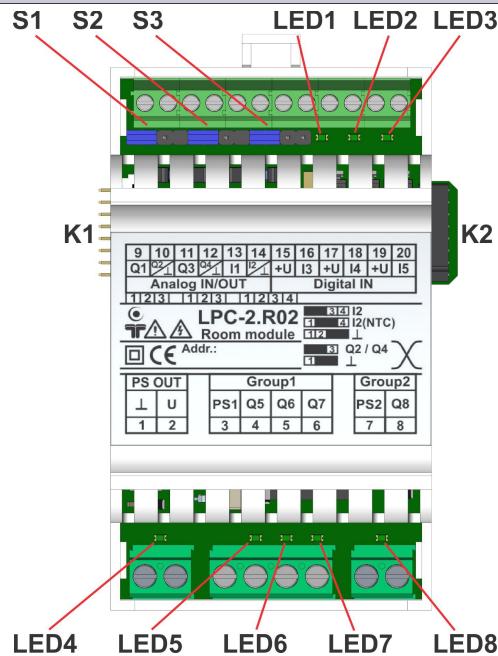
Table 2: PS OUT[1]

PS OUT.1	⊥	GND
PS OUT.2	U	Power supply output, 24 V AC/DC

Table 3: Group1[1]

Group1.3	PS1	Group1 common AC supply, 24 .. 230 V AC
Group1.4	Q5	Triac digital output, 24 .. 230 V AC, make contacts (NO)
Group1.5	Q6	Triac digital output, 24 .. 230 V AC, make contacts (NO)
Group1.6	Q7	Triac digital output, 24 .. 230 V AC, make contacts (NO)

Table 4: Group2[1]

Group2.7	PS2	Group2 common AC supply, 24 .. 230 V AC
Group2.8	Q8	Triac digital output, 24 .. 230 V AC, make contacts (NO)

Table 5: K1

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

Table 6: K2

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

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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.

Table 7: Analog IN/OUT[2]

Analog IN/OUT.9	Q1	Analog output 0 .. 10 V
Analog IN/OUT.10	Q2/⊥	Jumper **S1**: ■■■ 3 Analog output 0 .. 10 V Jumper **S1**: 1 ■■■ GND
Analog IN/OUT.11	Q3	Analog output 0 .. 10 V
Analog IN/OUT.12	Q4/⊥	Jumper **S2**: ■■■ 3 Analog output 0 .. 10 V Jumper **S2**: 1 ■■■ GND
Analog IN/OUT.13	I1	Analog input 0 .. 10 V
Analog IN/OUT.14	I2/⊥	Jumper **S3**: ■■ 3 4 Analog input 0 .. 10 V Jumper **S3**: 1 ■■ 4 NTC input Jumper **S3**: 1 2 ■■ GND
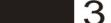
Table 8: Digital IN[2]

|		
Digital IN.15	+U	Power supply output, 24 V DC / 50 mA
Digital IN.16	I3	Digital input, 0 .. 24 V DC
Digital IN.17	+U	Power supply output, 24 V DC / 50 mA
Digital IN.18	I4	Digital input, 0 .. 24 V DC
Digital IN.19	+U	Power supply output, 24 V DC / 50 mA
Digital IN.20	I5	Digital input, 0 .. 24 V DC

Table 9: LEDs

LED1: green	Digital input state	ON: I3 connected to +U (contact closed) OFF: I3 not connected to +U (contact opened)
LED2: green	Digital input state	ON: I4 connected to +U (contact closed) OFF: I4 not connected to +U (contact opened)
LED3: green	Digital input state	ON: I5 connected to +U (contact closed) OFF: I5 not connected to +U (contact opened)
LED4: green	Power supply output state	ON: PS OUT power supply on (AC or DC) OFF: PS OUT power supply off
LED5: green	Triac digital output state	ON: Q5 triac on (conductive) OFF: Q5 triac off (non conductive)
LED6: green	Triac digital output state	ON: Q6 triac on (conductive) OFF: Q6 triac off (non conductive
LED7: green	Triac digital output state	ON: Q7 triac on (conductive) OFF: Q7 triac off (non conductive)
LED8: green	Triac digital output state	ON: Q8 triac on (conductive) OFF: Q8 triac off (non conductive)

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2   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.

5.2 Mounting instructions

Figure 5: Housing dimensions
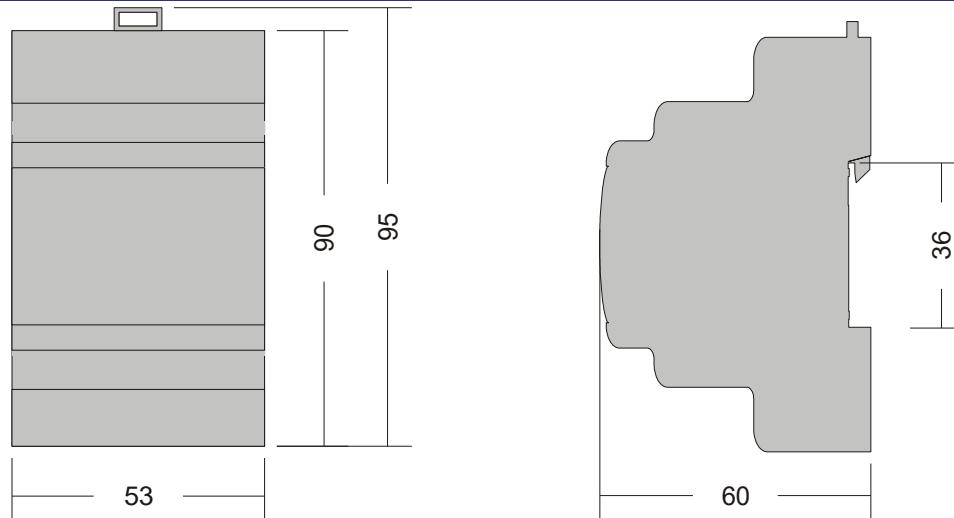
Dimensions in milimeters.

⚠️ 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.R02 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 digital inputs and outputs 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.

5.3 Module labeling

Figure 6: Labels

Label 1 (sample):

> **LPC-2.R02**
> P/N:225R0216001001
> D/C: 53/15
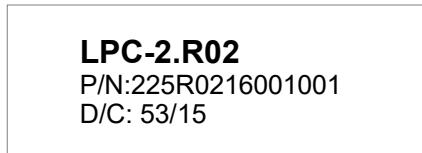
Label 2 (sample):

> S/N: R02-S9-1600000190

Label 1 descriptions:

1. **LPC-2.R02** is the full product name.
2. **P/N: 225R0216001001** is the part number.

   - **225** – general code for product family,

   - **R02** – short product name,

   - **16001** – sequence code,

     - 16 – year of code opening,

     - 001 – derivation code,

   - **001** – version code (reserved for future HW and/or SW firmware upgrades).

3. **D/C: 53/15** is the date code.

   - **53** – week and

   - **15** – year of production.

Label 2 descriptions:

1. **S/N: R02-S9-1600000190** is the serial number.

   - **R02** – short product name,

   - **S9** – user code (test procedure, e.g. Smarteh person xxx),

   - **1600000190** – year and current stack code,

     - 16 – year (last two cyphers),

     - 00000190 – current stack number; previous module would have the stack number 00000189 and the next one 00000191.

6 TECHNICAL SPECIFICATIONS

Table 10: Technical specifications

Power supply	from internal BUS
Power consumption	with PS OUT enabled, max. 9 W
	with PS OUT disabled, max. 2.5 W
Connection type	screw type connector for stranded wire 0.75 to 2.5 mm^2
Dimensions (L x W x H)	90 x 53 x 60 mm
Weight	100 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
Protection class	IP 30

Table 11: Analog IN/OUT technical specifications

Max. analog input current consumption	1 mA
Max. analog output current consumption	20 mA
Analog input resistance	11 kΩ
Load resistance per analog output	R > 500 Ω
Analog input measuring error of the full scale value	±1 %[3]
Analog output accuracy of the full scale value	±1 %
Max. transition time of analog output	1 s
ADC resolution	12 bit
DAC resolution	16 bit
NTC thermistor	NTC-4 - see spare parts
Tacho input max. frequency	100 Hz

Table 12: Digital IN technical specifications

Number of digital inputs	3 free (dry) contact inputs
Inputs threshold	ON: < 5 kΩ
	OFF: > 40 kΩ

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3 Measuring error of the full scale value is ±5 %, if analog input I2 is left unconnected and its corresponding jumper is set to I2.

Table 13: Group1 and Group2 digital output technical specifications

Number of triac digital outputs	4 triac make contacts (NO)
Rated load voltage	24 .. 230 V AC
Output current per triac of Group1	0.05 .. 0.9 A continuous load
Output current per triac of Group2	ambient temperature < 50 °C, 0.05 .. 3 A continuous load
	ambient temperature < 40 °C, 0.05 .. 3.5 A continuous load
Max. sum triac output load	1000 W

Table 14: PS OUT technical specifications

PS OUT max. load	ambient temperature < 50 °C, max. 5.5 W
	ambient temperature < 40 °C, max. 6.5 W
PS OUT max. load with integrated rectifier and capacitor	3 W

7 SPARE PARTS

For ordering spare parts following Part Numbers should be used:

LPC-2.R02 Room module
LPC-2.R02   P/N: 225R0216001001

Temperature sensor NTC-4 10k 7m
NTC-4 10k   P/N: 204NTC07004001

Temperature sensor NTC-4 10k 4m
NTC-4 10k   P/N: 204NTC12004002

8 CHANGES

The following table describes all the changes to the document.

Date	V.	Description
14.06.2019	3	Additional note added.
15.03.2018	2	Technical data update.
30.09.2016	1	The initial version, issued as *LPC-2.R02 User Manual*.

9 NOTES