USER MANUAL

Longo programmable controller
LPC-2.VV4
dp input output module

Version 4

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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, we offer warranty for 24 months from date of sale to end buyer. 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: IEC/EN 61000-6-2, IEC/EN 61000-6-4,
- LVD: IEC 61010-1:2010 (3rd Edition), IEC 61010-2-201:2013 (1st Ed.)

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Longo programmable controller LPC-2.VV4

1 ABBREVIATIONS

Sorted by order of appearance in document:

dp	Delta P, pressure difference
VAV	Variable air volume
I/O	Input output
NTC	Negative temperature coefficient
LED	Light emitting diode
ERR	Error
PWR	Power
NO	Normally open
NC	Normally closed

2 DESCRIPTION

LPC-2.VV4 is a differential pressure module with various inputs and outputs integrated. Module is an optional choice to be used in ventilation control systems as VAV and similar.

The LPC-2.VV4 module is powered directly from the LPC-2 main unit. There are two LEDs. Green (PWR) indicates power supply presence, and red (ERR) indicates LPC-2.VV4 module error.

3 FEATURES

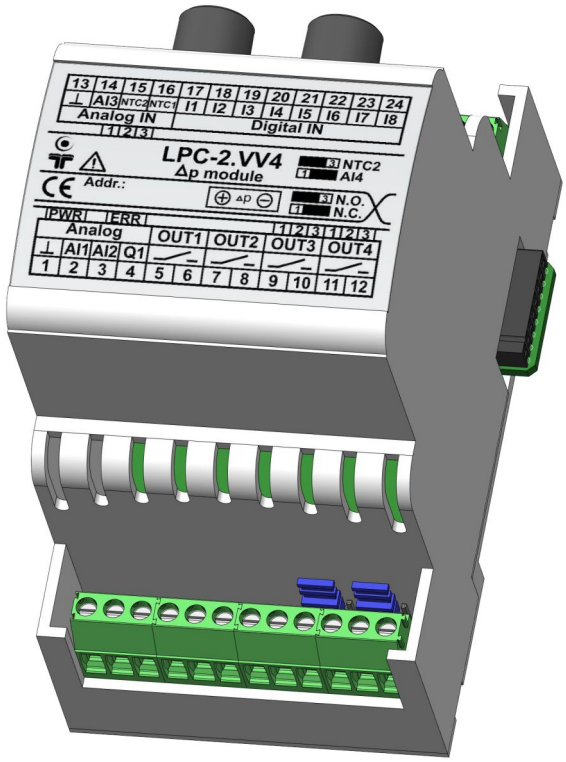


Figure 1: LPC-2.VV4 module

Table 1: Features
Powered from LPC-2 main unit
DeltaP measurement: 0 .. 500 Pa
3 x Voltage analog inputs: 0 .. 10 V
1 x NTC 10k input
1 x NTC 10k / voltage analog input: 0 .. 10 V, jumper selectable
8 x Digital inputs
1 x Voltage analog output: 0 .. 10 V
2 x Relay outputs, NO
2 x Relay outputs, NO / NC, jumper selectable
Standard DIN EN50022-35 rail mounting

4 OPERATION

LPC-2.VV4 module can be controlled from the main PLC module (e.g. LPC-2.MM1). Module parameters can be read or written via Smarteh IDE software.
LPC-2.VV4 module can also be controlled by the Modbus RTU Slave main module (e.g. LPC-2.MU1).

4.1 SmartehIDE parameters

Input / Feedback

Pressure sensor calibration feedback [VV4_x_di_sensor_calibration_fdb]: Feedback of pressure sensor calibration procedure after the pressure sensor calibration command was sent.

Type: BOOL

Raw to engineering data: "0" → Not calibrated
"1" → Calibration successful

I1 - Digital input [VV4_x_di_I1]: Digital input state on pin I1.

Type: BOOL

Raw to engineering data: "0" → False
"1" → True

I2 - Digital input [VV4_x_di_I2]: Digital input state on pin I2.

Type: BOOL

Raw to engineering data: "0" → False
"1" → True

I3 - Digital input [VV4_x_di_I3]: Digital input state on pin I3.

Type: BOOL

Raw to engineering data: "0" → False
"1" → True

I4 - Digital input [VV4_x_di_I4]: Digital input state on pin I4.

Type: BOOL

Raw to engineering data: "0" → False
"1" → True

I5 - Digital input [VV4_x_di_I5]: Digital input state on pin I5.

Type: BOOL

Raw to engineering data: "0" → False
"1" → True

I6 - Digital input [VV4_x_di_I6]: Digital input state on pin I6.

Type: BOOL

Raw to engineering data: "0" → False
"1" → True

I7 - Digital input [VV4_x_di_I7]: Digital input state on pin I7.

Type: BOOL

Raw to engineering data: "0" → False
"1" → True

I8 - Digital input [VV4_x_di_I8]: Digital input state on pin I8.

Type: BOOL

Raw to engineering data: "0" → False
"1" → True

AI1 - Analog input 0 .. 10 V [VV4_x_ai_AI1]: Analog input voltage on pin AI1.

Type: UINT

Raw to engineering data: 0 .. 10000 → 0 .. 10.000 V

AI2 - Analog input 0 .. 10 V [VV4_x_ai_AI2]: Analog input voltage on pin AI2.

Type: UINT

Raw to engineering data: 0 .. 10000 → 0 .. 10.000 V

AI3 - Analog input 0 .. 10 V [VV4_x_ai_AI3]: Analog input voltage on pin AI3.

Type: UINT

Raw to engineering data: 0 .. 10000 → 0 .. 10.000 V

AI4 - Analog input 0 .. 10 V - jumper selectable [VV4_x_ai_AI4]: Analog input voltage on pin AI4, when the voltage analog input (AI4) type is selected by jumper.

Type: UINT

Raw to engineering data: 0 .. 10000 → 0 .. 10.000 V

NTC2 - Analog input NTC 2 - jumper selectable [VV4_x_ai_NTC2]: Raw analog voltage input value of pin AI4, when the NTC input type is selected by jumper. For calculating the resistance value of connected NTC thermistor use the Formula 1: Formula for calculating the resistance of a connected NTC thermistor on pin AI4.

Type: UINT

Raw to engineering data: 0 .. 1023 → 0 .. 1.023 V

NTC - Analog input NTC 1 [VV4_x_ai_NTC]: Raw analog voltage input value of pin NTC. For calculating the resistance value of connected NTC thermistor use the Formula 2: Formula for calculating the resistance of a connected NTC thermistor on pin NTC.

Type: UINT

Raw to engineering data: 0 .. 1023 → 0 .. 1.023 V

3.3V internal voltage reference [VV4_x_ai_internal_reference]: Internal reference voltage value. This value is used for calculating NTC thermistor resistance.

Type: UINT

Raw to engineering data: 0 .. 10000 → 0 .. 10.000 V

Actual pressure raw value [VV4_x_ai_actual_pressure_raw]: Raw value of pressure sensor.

Type: UINT

Raw to engineering data: 0 .. 65535 → 0 .. 65535

Pressure offset [VV4_x_ai_pressure_offset]: Raw value of pressure sensor offset.

Type: UINT

Raw to engineering data: 0 .. 65535 → 0 .. 65535

Actual pressure [Pa] [VV4_x_ai_actual_pressure]:

Type: UINT

Raw to engineering data: 0 .. 500 → 0 .. 500 Pa

Output / Commands

Pressure sensor calibration command [VV4_x_do_sensor_calibration_cmd]: Command to trigger pressure sensor calibration.

Type: BOOL

Raw to engineering data: "0" → Pressure sensor in measurement mode
"1" → Start pressure sensor calibration

OUT1 - Relay digital output [VV4_x_do_OUT1]: Digital output state on pin OUT1.

Type: BOOL

Raw to engineering data: "0" → Output off
"1" → Output on

OUT2 - Relay digital output [VV4_x_do_OUT2]: Digital output state on pin OUT2.

Type: BOOL

Raw to engineering data: "0" → Output off
"1" → Output on

OUT3 - Relay digital output [VV4_x_do_OUT3]: Digital output state on pin OUT3.

Type: BOOL

Raw to engineering data: "0" → Output off
"1" → Output on

OUT4 - Relay digital output [VV4_x_do_OUT4]: Digital output state on pin OUT4.

Type: BOOL

Raw to engineering data: "0" → Output off
"1" → Output on

Q1 - Analog output 0 .. 10 V [VV4_x_ao_Q1]: Analog output voltage on pin Q1.

Type: UINT

Raw to engineering data: 0 .. 10000 → 0 .. 10.000 V

$$R_{NTC} = \frac{VV4\_x\_ai\_NTC2 \times 120000}{VV4\_x\_ai\_internal\_reference - VV4\_x\_ai\_NTC2} - 10000\ [\Omega]$$

Formula 1: Formula for calculating the resistance of a connected NTC thermistor on pin AI4

$$R_{NTC} = \frac{VV4\_x\_ai\_NTC \times 120000}{VV4\_x\_ai\_internal\_reference - VV4\_x\_ai\_NTC} - 10000\ [\Omega]$$

Formula 2: Formula for calculating the resistance of a connected NTC thermistor on pin NTC

5 INSTALLATION

5.1 Connection scheme

Figure 2: Connection scheme example

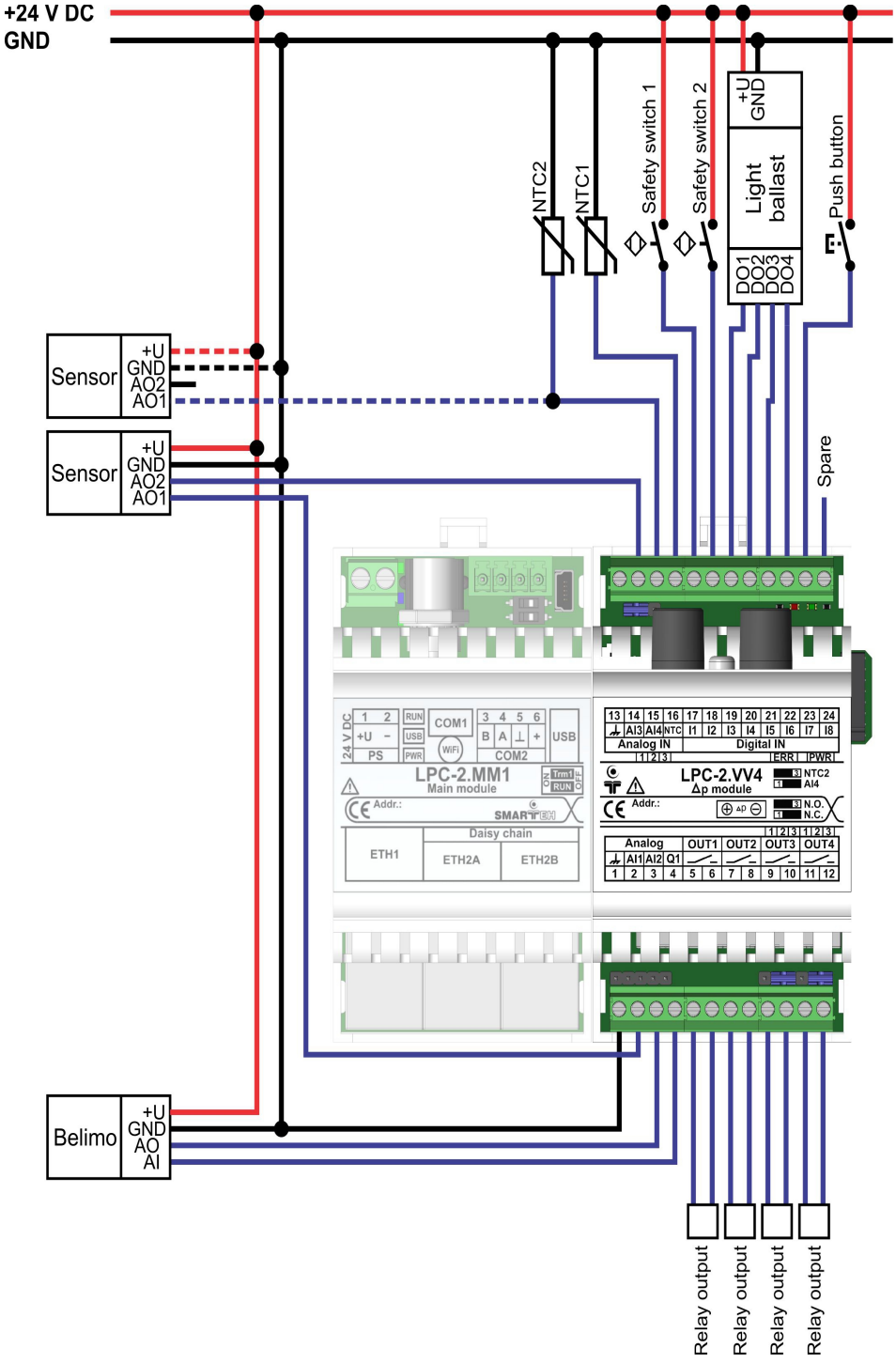


Figure 3: Connection scheme

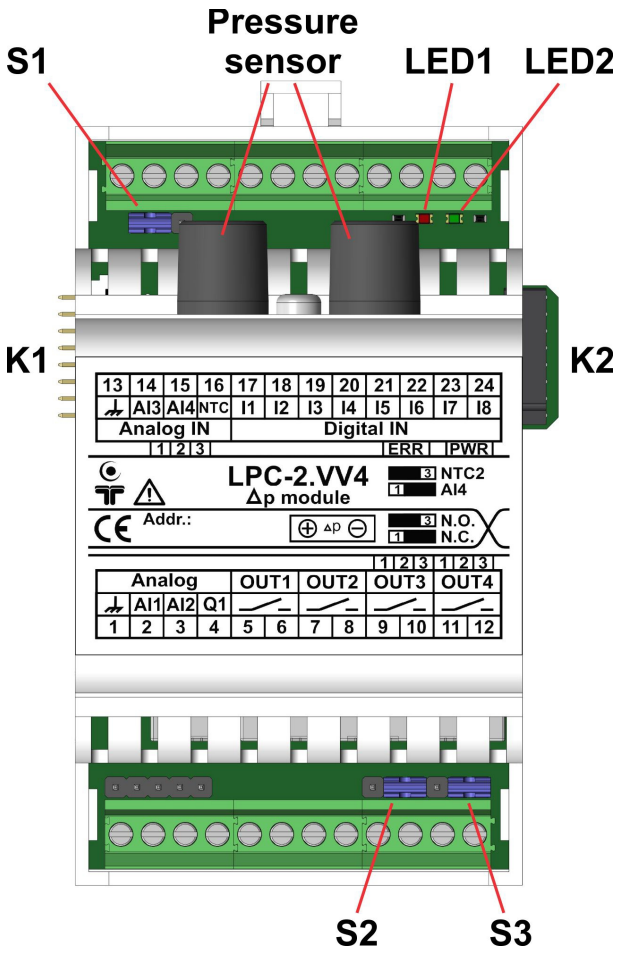


Table 2: Analog

Analog.1	⏚	EGND
Analog.2	AI1	Analog input 0 .. 10 V
Analog.3	AI2	Analog input 0 .. 10 V
Analog.4	Q1	Analog output 0 .. 10V

Table 3: Pressure sensor

DeltaP.+	Positive pressure	Delta pressure up to 500 Pa
DeltaP.-	Negative pressure	Delta pressure up to 500 Pa

Table 4: OUT

OUT1.5 OUT1.6	Voltage free contacts	Normally open relay output
OUT2.7 OUT2.8	Voltage free contacts	Normally open relay output
OUT3.9 OUT3.10	Voltage free contacts	Jumper S2: ■■ 3 Normally Open relay output Jumper S2: 1 ■■ Normally Closed relay output
OUT4.11 OUT4.12	Voltage free contacts	Jumper S3: ■■ 3 Normally Open relay output Jumper S3: 1 ■■ Normally Closed relay output

Table 5: Analog IN

Analog IN.13	⏚	EGND
Analog IN.14	AI3	Analog input, 0 .. 10 V
Analog IN.15	AI4	Jumper S1: NTC 10k Jumper S1: Analog input 0 .. 10 V
Analog IN.16	NTC	Analog input, NTC 10k

Table 6: Digital IN

Digital IN.17	I1	Digital input, 0 .. 24 V DC
Digital IN.18	I2	Digital input, 0 .. 24 V DC
Digital IN.19	I3	Digital input, 0 .. 24 V DC
Digital IN.20	I4	Digital input, 0 .. 24 V DC
Digital IN.21	I5	Digital input, 0 .. 24 V DC
Digital IN.22	I6	Digital input, 0 .. 24 V DC
Digital IN.23	I7	Digital input, 0 .. 24 V DC
Digital IN.24	I8	Digital input, 0 .. 24 V DC

Table 7: K1 & K2

K1	Internal BUS	Data & DC power supply

Table 7: K1 & K2		
K2	Internal BUS	Data & DC power supply

Table 8: LEDs		
LED1: red	ERR, Communication status	ON: communication fault OFF: communication OK
LED2: green	PWR, Power supply status	ON: power supply OK OFF: power supply missing or power off

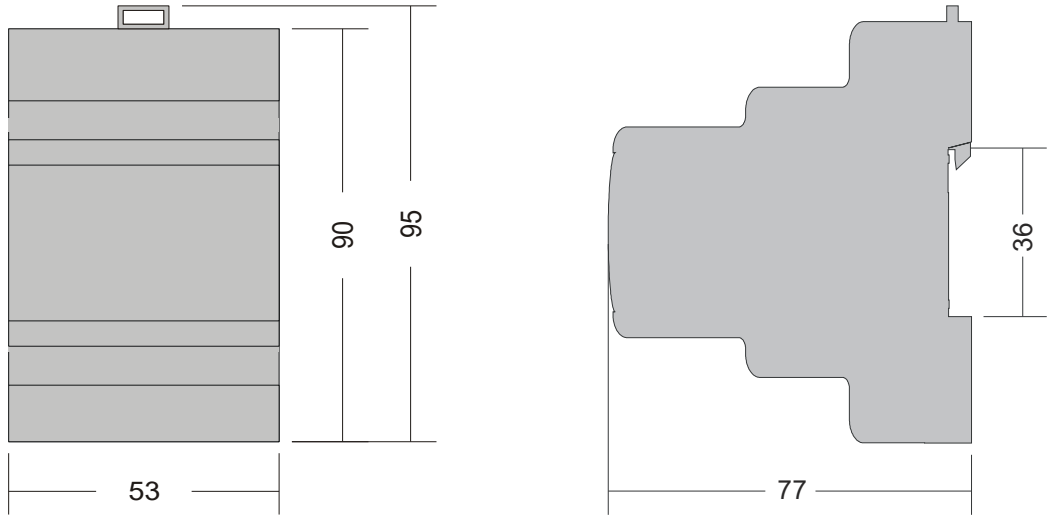
* NOTE: Special care must be taken in case of usage inductive character loads, e.g. contactors, solenoids, or loads that draw high inrush currents, e.g. capacitive character load, incandescent lamps. Inductive character loads cause over-voltage spikes at output relay contacts when they are switched off. The use of appropriate suppression circuits is advised.

Loads that draw high inrush currents may cause the relay output to be temporarily overloaded with the current above its allowed limits, which may damage the output, even though that steady-state current is within the allowed limits. For that type of load, the use of an appropriate inrush current limiter is advised.

Inductive or capacitive loads influence the relay contacts by shortening their working life period or can even permanently melt contacts together. Consider using another type of digital output e.g. triac.

5.2 Mounting instructions

Figure 4: 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 16 A or less.

RECOMMENDATION ON SWITCH OR CIRCUIT-BREAKER PROTECTION: There should be two poles main switch in the installation in order to switch off the unit. The switch should meet the requirements of standard IEC60947 and have a nominal value at least 6 A. The switch or circuit-breaker should be within easy reach of the operator. It should be marked as the disconnecting device for the equipment.

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

The modules must be installed in enclosure with no openings. Enclosure must provide electrical and fire protection The shall withstand dynamic test with 500 g steel sphere from distance is 1.3 m and also static test 30 N. When installed in enclosure, only authorized person can have a key to open it.

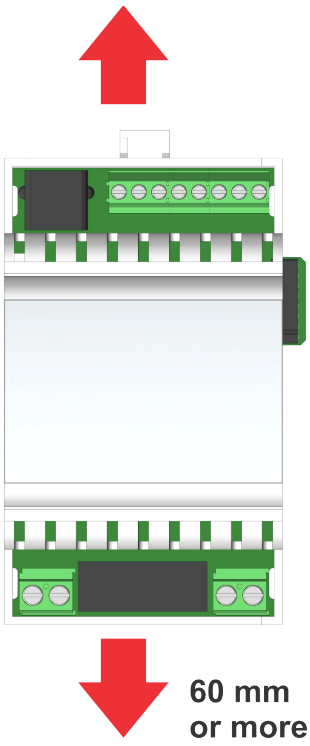
Mounting instructions:

1. Switch OFF main power supply.
2. Mount LPC-2.VV4 module to the provided place inside an electrical panel (DIN EN50022-35 rail mounting).
3. Mount other modules. Mount each module to the DIN rail first, then attach modules together through K1 and K2 connectors.
4. Connect wires to the connectors according to the connection scheme. Recommended/Highest tightening torque is 0.5 / 0.6 Nm (4.42/5.31 lbf in)
5. Connect power supply wires to the connector according to the connection scheme. Recommended/Highest tightening torque is 0.5 / 0.6 Nm (4.42/5.31 lbf in)
6. Switch ON main power supply.
7. Power (PWR) green LED should switch on. Red LED (ERR) should switch off.

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. A disconnect device shall be incorporated in the field wiring.

NOTE: Signal wires must be installed separately from power and high voltage wires in accordance with general industry electrical installation standard.

Figure 5: Minimum clearances

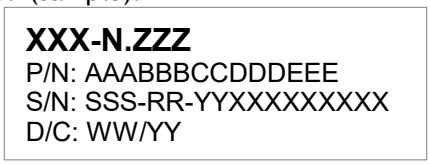


The clearances must be considered before module mounting.

5.3 Module labeling

Figure 6: 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. ***Other***

6 TECHNICAL SPECIFICATIONS

Table 9: Technical specifications	
Power supply	from LPC-2 main module
Power consumption	0.5 W
DeltaP measurement range	500 Pa
DeltaP accuracy of full scale span	± 0.4 %
Dimensions (W x H x D)	90 x 53 x 77 mm
Weight	120 g
Maximum altitude	2000 m
Mounting position	all directions
Ambient temperature	0 to 50 °C
Ambient humidity	max. 95 %, no condensation
Transport and storage temperature	-20 to 60 °C
Protection class	IP 20
CE marking	yes

Table 10: Analog IN/OUT Technical specifications	
Analog voltage input range	0 .. 10 V
NTC input type	NTC 10 kΩ
Analog input AI1, AI2, AI3, AI4, NTC 10k measuring accuracy on full scale range	± 1%
Analog input resistance	11 kΩ
Load resistance per analog output	R > 500 Ω
Analog voltage output Q1 range	0 .. 10 V
Analog voltage output measuring accuracy on full scale range	± 2%
Max. analog output current	20 mA

Table 11: Digital IN/OUT Technical specifications	
Digital input voltage range	0 .. 28 V DC
Digital input threshold	ON: > 7 V DC
	OFF: < 3 V DC
Digital input resistance	8 kΩ
Digital output max. current per channel	DC: 48V, 1A 30V, 3A

7 SPARE PARTS

For ordering spare parts following Part Numbers should be used:

LPC-2.VV4 module	
LPC-2.VV4	P/N: 225VV422001001

Main modules	
LPC-2.MM1	P/N: 225MM123001001
LPC-2.MM2	P/N: 225MM223001001

8 CHANGES

The following table describes all the changes to the document.

Date	V.	Description
28.06.24	4	Chapter 4 *Operation* added.
12.04.24	3	Updated Table 9.
19.02.24	2	Chapter 2 and figure 2 updated.
27.09.23	1	The initial version, issues as *LPC-2.VV4 User Manual*.

9 NOTES