english

PCA 1000D

Part.-No. 38999

Sensor-control module for differential pressure and volume

Operating Instructions

Software version: D1673A from Version 1.03

L-BAL-E120-GB 1419 Index 002

systemair

Content

1 General notes 4
1.1 Structure of the operating instructions 4
1.2 Target group 4
1.3 Exclusion of liability 4
1.4 Copyright 4

2 Safety instructions 5

3 Product overview 6
3.1 Operational area 6
3.2 Function 6
3.3 Storage 7
3.4 Disposal / recycling 7

4 Mounting 7
4.1 General notes 7
4.2 Temperature influences during commissioning 8

5 Electrical installation 8
5.1 Safety precautions 8
5.2 EMC-compatible installation of control lines 9
5.3 Connection Voltage supply 9
5.4 Output voltage 0 - 10 V 9
5.5 Input for switch over Setpoint 1/ 2 9

6 Device construction 10

7 Programming 11
7.1 Select operation mode 11
7.2 Start-up 12
7.3 Menu structure 12
7.4 Parameter table 14

7.5 Measuring ranges and tolerance of pressure sensor . 16
7.6 Check sensor function 17

8 Enclosure 17
8.1 Technical data 17
8.2 Connection diagram 19
8.3 Dimensions [mm] 19
8.4 Manufacturer reference 20

1 General notes

1.1 Structure of the operating instructions

Before installation and start-up, read this manual carefully to ensure correct use!
We emphasize that these operating instructions apply to specific units only, and are in no way valid for the complete system!

Use these operating instructions to work safely with and on the device. They contain safety instructions that must be complied with as well as information that is required for failure-free operation of the device.
Keep these operating insturctions together with the device. It must be ensured that all persons that are to work on the device can refer to the operating instructions at any time.

1.2 Target group

The operating instructions address persons entrusted with planning, installation, commissioning and maintenance and servicing and who have the corresponding qualifications and skills for their job.

1.3 Exclusion of liability

To allow for future developments, construction methods and technical data given are subject to alteration. We do not accept any liability for possible errors or omissions in the information contained in data, illustrations or drawings provided.
We accept no liability for damage caused by misuse, incorrect use, improper use or as a consequence of unauthorized repairs or modifications.

1.4 Copyright

These operating instructions contain copyright protected information. The operating instructions may be neither completely nor partially photocopied, reproduced, translated or put on data medium without previous explicit consent. Infringements are liable for

2 Safety instructions

- Mounting, electrical connection, and start-up operation may only be carried out by an electrical specialist in accordance with electrotechnical regulations (e.g. DIN EN 50110 or DIN EN 60204)!
- Persons entrusted with the planning, installation, commissioning and maintenance and servicing in connection with the device must have the corresponding qualifications and skills for these jobs. In addition, they must be knowledgeable about the safety regulations, EU directives, rules for the prevention of accidents and the corresponding national as well as regional and in-house regulations.
- The equipment is to be used solely for the purposes specified and confirmed in the order. Other uses which do not coincide with, or which exceed those specified will be deemed unauthorised unless contractually agreed. Damages resulting from such unauthorised uses will not be the liability of the manufacturer. The user will assume sole liability.
- It is strictly forbidden for work to be carried out on any components while they are connected to live voltage.
- The safe isolation from the supply must be checked using a two-pole voltage detector.
- The owner is obliged to ensure that the device is operated in perfect working order only.
- Inspect electrical equipment periodically: retighten loose connections – immediately replace damaged lines and cables.
- Never clean electrical equipment with water or similar liquids.
- A separate fault and performance monitoring-system with an alarm signal function is necessary in order to prevent personal injuries and material damages during malfunctions and in case the device fails. Substitute operation must be taken into consideration!

3 Product overview

3.1 Operational area

Pressure and volume control for ventilation systems.

Depending on the programmed Mode the device can be used as sensor or as a control module for pressure or volume.

- For operation as pressure sensor the device supplies an output signal (0 - 10 V) proportional to the measuring range.
- For operation as air volume sensor the device supplies an output signal (0 - 10 V) proportional to the air volume measuring range (☞ INFO / Range qV). Function in combination with centrifugal fans and measuring device in the inlet ring. The controller calculates the air volume of the fan from the “K-Factor” differential between the suction side and the inlet duct.
- For operation as control module for pressure or volume the purpose of the device is to reach and maintain the target value set. To accomplish this, the measured actual value (sensor value) is compared with the adjusted target value, and the controlled value is deduced from this. Controlled output (0 - 10 V) e.g. for activating a speed controller for fans or an EC-fan directly.

3.2 Function

Sensor with a membrane system suitable for measuring differential or negative pressure of non-aggressive gas.

The differential pressure to be measured takes effect on a spring supported silicone membrane.

Changes in position of the membrane are detected by a differential transformer and converted into an output signal of 0 - 10 V by an electronics unit.

Function when the pressure at the “Plus”- connection exceeds the pressure at the “Minus”- connection.

3.3 Storage

- The device must be stored in its original packaging in a dry and weather-proof room.
- Avoid exposure to extreme heat and cold.
- Avoid over-long storage periods (we recommend a maximum of one year).

3.4 Disposal / recycling

Disposal must be carried out professionally and environmentally friendly in accordance with the legal stipulations.

4 Mounting

4.1 General notes

Attention!
The following points must be complied with during the mechanical installation to avoid causing a defect in the device due to assembly errors or environmental influences:

- Before installation remove the device from the packing and check for any possible shipping damage!
- Assemble the device on a clean and stable base. Do not distort during assembly! Use the appropriate mounting devices for proper installation of the unit!
- Do not mount equipment on vibrating base!
- When mounted onto lightweight walls, there must be no impermissibly high vibrations or shock loads. Any banging shut of doors that are integrated into these lightweight walls, can result in extremely high shock loads. Therefore, we advise you to decouple the devices from the wall.
- Do not allow drilling chips, screws and other foreign bodies to reach the device interior!
- The device should be installed in a location where it will not be disturbed, but at the same time can be easily accessed!

- Any cable ducts openings not used must be sealed!
- Care must be taken to avoid direct radiation from the sun!
- The pressure measuring depends on position, therefore the mounting must be made vertical and as possible on a vibration-free place (cable inlet and pressure connections down).
- The pressure line´s connection should be with plastic-hose (in building), inside diameter 4 / 5 mm.

4.2 Temperature influences during commissioning

Avoid condensation in the controller and functional faults attributable to condensation by storing the controller at room temperature!

5 Electrical installation

5.1 Safety precautions

Danger due to electric current

- Work on electric components may only be carried out by trained electricians or by persons instructed in electricity under the supervision of an electrician in accordance with electrical engineering regulations.
- The programming of the equipment takes place with switched on supply voltage by opened cover and voltage for change-over Setpoint 1/2. Use only PELV current sources which guarantee reliable electrical isolation of the operating voltage as per IEC/DIN EN 60204-1.
- Inspect electrical equipment periodically: retighten loose connections – immediately replace damaged lines and cables.
- Never clean electrical equipment with water or similar liquids.

Information

The respective connections are represented in the enclosure of this manual (☞ Connection diagram)!

5.2 EMC-compatible installation of control lines

Pay attention to maintain sufficient distance from powerlines and motor wires to prevent interferences. The control cable may not be longer than 30 m. Screened control cables must be used when the cable length is longer than 20 m!

5.3 Connection Voltage supply

Connection Voltage supply at terminals: “+Ub” and “GND”. Here, it must be strictly observed that the mains voltage lies within the allowable tolerance specifications (☞Technical data and name-plate affixed to the side).

5.4 Output voltage 0 - 10 V

Connection to Terminals “A” - “GND” (I_{max}☞Technical data).

It is not permissible to connect outputs of several devices to each other!

5.5 Input for switch over Setpoint 1/ 2

Via voltage at terminals “1” and “2” (10... 24 V DC) a switchover between Setpoint 1 and Setpoint 2 is possible (note polarity☞ connection diagram).

- Voltage OFF => Setting “Setpoint 1” active
- Voltage ON => Setting “Setpoint 2” active

Setpoint 1active

100 Pa *(0.401 in.wg)* Δp

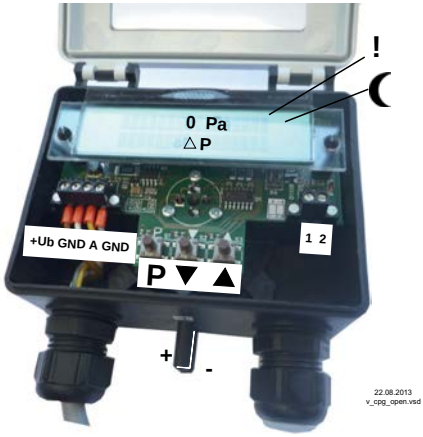
The active Setpoint is indicated in the menu INFO, an active “Setpoint 2” is signalized by the moon symbol.

Setpoint 2 active

80 Pa *(0.321 in.wg)* Δp ☾

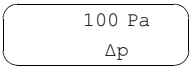
6 Device construction

Screw off the hinged cover to proceed with electrical connection and programming. Subsequently close carefully!



!	Exceeding measuring range
☾	Moon symbol = Adjustment for Setpoint 2 active
+Ub / GND	Voltage supply
A / GND	Output signal 0 - 10 V
1 / 2	Voltage input for switch over Set-point 1 / 2
+	“Plus”- connection in area with higher pressure
-	“Minus”- connection in area with lower pressure

Multipurpose LC display and internal keyboard



Text line 1: 16 figures for display of actual and desired values
Text line 2: 16 figures for display of menu text

P ▼ ▲

P	Program key and open menu
▼	Menu selection, reduce value
▲	Menu selection, increase value
▼ + ▲	ESC-key combination, Escape = leave menu

7 Programming

7.1 Select operation mode

Information

Simple installation is possible through the selection of the preprogrammed mode of operation.
This determines the basic function of the device, factory set **4.01**.

Mode	Function
4.00	Pressure sensor output 0...10 V proportional to measuring range
4.01	Pressure controller (PID): output 0...10 V depending on adjusted Setpoint and measured actual value.
5.00	Air volume sensor: Output 0...10 V propotional to measuring range (depending on setting for K-Factor)
5.01	Air volume controller (PID): Output 0...10 V depending on adjusted Setpoint and measured actual value

7.2 Start-up

Attention, electrostatic sensitive devices!
Be sure to ground the board at a suitable point in order to prevent damage to the electronic components being caused by electrostatic discharges. Such damage could occur, e.g., if a metal water pipe or heating line are briefly touched.
It is prohibited to touch any other areas of the printed circuit board than the 3 programming keys.

Procedure

1. You must mount and connect the device in accordance with the operating instructions.
2. Double check that all connections are correct.
3. The supply voltage must match the information on the rating plate.
4. Set the mode, unit and measuring range and adjust the sensor in the **BASE SETUP**.
5. Set the parameters for control operation for the modes **4.01** and **5.01** under **SETTING**.

Information
When saving the Operating Mode, the factory settings are stored. Therefore all the settings you have made, are lost.

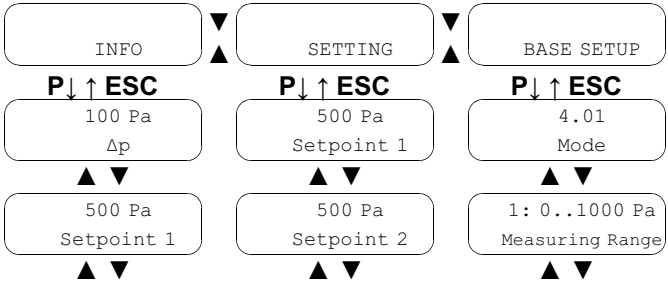
7.3 Menu structure

100 Pa Δp	**Display after turning on the voltage supply.** Switch over between actual value display and "INFO" with the key shortcut for Escape (ESC = ▼ + ▲).	INFO

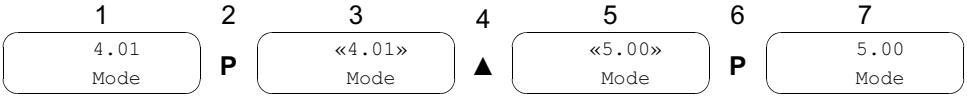
Selection of the menu group (e.g. BASE SETUP) to the right through the ▼-key, to the left through the ▲-key. You can go to the menu items in the **menu** groups (e.g. mode) by using the P key. Use the arrow keys to move up and down within the menu group.

To make adjustments, press the **P** key after selecting the menu item. If the previously set value starts to flash, it can be adjusted with the ▼ + ▲ keys and then saved with the **P** key. To exit the menu without making any changes, use the “ESC” short-key, i. e., the originally set values remain.

Example for Mode 2.01 (Factory setting)



Reprogramming Mode 4.01 to 5.00 in “BASE SETUP”



7.4 Parameter table

Parameter	Display / factory setting				Funktion
Mode	**4.00**	**4.01**	**5.00**	**5.01**	Mode
INFO					**Information**
Δp	0 Pa *(0.000 in.wg)*	0 Pa *(0.000 in.wg)*	-	-	Display actual value for differential pressure
qV	-	-	0 m^3/h *(0 cfm)*	0 m^3/h *(0 cfm)*	Display actual value for airflow
Setpoint 1	-	500 Pa *(2.000 in.wg)*	-	1185 m^3/h *(697 cfm)*	Display active Setpoint
Range qV	-	-	2371 m^3/h *(1394 cfm)*	2371 m^3/h *(1394 cfm)*	Air volume measuring range depending on sensor measuring range and K-Factor
Uout	0.0 V	9.9 V	0.0 V	9.9 V	Magnitude of the output voltage 0...10 V
UNIcon	2.01	2.01	2.01	2.01	Software version
Δp	-	-	0 Pa *(0.000 in.wg)*	0 Pa *(0.000 in.wg)*	Display actual value for volume measurement
SETTING 4.01 + 5.01					**Setting**
Setpoint 1	-	500 Pa *(2.000 in.wg)*	-	1185 m^3/h *(697 cfm)*	Setpoint 1[1]
Setpoint 2	-	500 Pa *(2.000 in.wg)*	-	1185 m^3/h *(697 cfm)*	Setpoint 2[1] (active if voltage at terminals 1, 2)
Pband	-	500 Pa *(2.000 in.wg)*	-	1185 m^3/h *(697 cfm)*	Pband[1, 2]
Min. Uout	-	0.0 V	-	0.0 V	Min. output voltage: 0.0...10.0 V (priority over “Max. Uout”)
Max. Uout	-	10.0 V	-	10.0 V	Max. output voltage: 10.0...0.0 V

Parameter	Display / factory setting				Funktion
BASE SETUP					**Base setup**
Mode	**4.00**	**4.01**	**5.00**	**5.01**	**Mode**
metric Units	metric units: Pa, m^3/h, K-Factor *inch units: in.wg, cfm, K-Factor US*				SI units or Imperial units (US)
Measuring Range	**1: 0...1000 Pa *(0...4.0 in.wg)*** 2: 0...500 Pa *(0...2.0 in.wg)* 3: 0...300 Pa *(0...1.2 in.wg)* 4: 0...200 Pa *(0...0.8 in.wg)*				Adjustable measuring range
K-Factor *K-Factor US*	-	-	75 *(697)*	75 *(697)*	Nozzle coefficient (K-Factor) ☞ following table
Autozero	OFF => ON				Automatic “0” offset[3]
Offset	0 Pa *(0.000 in.wg)*				Sensor offset (automatically when “Autozero”) Setting range: +/ - 1000 Pa *(+/- 4.000 in.wg)*

*1 Setting range **4.01**: 0..100 % sensor measurung range, **5.01**: 0...Max. Range qV (depending on K-Factor and sensor measuring range)*

2 small value = quick regulation, great value = slow regulation (high stability)

3 Do the adjustment with the pressure hoses disconnected, the necessary difference up to “0” is displayed under “Offset”.

- Parameter for selected mode not available

(xxx) Values for Imperial units (US)

7.5 Measuring ranges and tolerance of pressure sensor

At the factory the devices are set to the respective highest measuring range (= MB1). As small as possible measuring range must be chosen for maximum accuracy at maximum resolution of the output signal (☞ BASE SETUP of respective Mode).

Measuring ranges and tolerance (4.00 output 0 - 10 V)					
PCA 1000D	**NA** [%]	**EA** [%]	**LA** [%]	**A** [%]	**H** [%]
MB [Pa]					
MB1: 0...1000	+/-0.5	+/-0.5	+/-0.25	0.1	0.2
MB2: 0...500	+/-0.7	+/-0.7	+/-0.5	0.2	0.2
MB3: 0...300	+/-0.9	+/-0.9	+/-0.9	0.3	0.2
MB4: 0...200	+/-1.0	+/-1.0	+/-1.25	0.3	0.2
Temperature drift (related to the highest measuring range) Zero point: +/-0.2 % / 10 K, final value: +/- 0.2 % / 10 K					
MB = Measuring range, **NA** = Zero point deviation, **EA** = Final value deviation, **LA** = Linearity deviation, **A** = Resolution, **H** = Hysteresis					

Nozzle coefficient (K-Factor) 5.00 + 5.01

Maximum K-Factor depending on the measuring range of the pressure sensor				
Range [Pa] *[in.wg]*	200 *0.8*	300 *1.2*	500 *2.0*	1000 *4.0*
Max. K-Factor *US*	4596 *32767*	3752 *32767*	2906 *32767*	2055 *32500*

Air volume measuring range [m^3/h], [cfm] depends on selected measuring range of pressure senosr [Pa], [in.wg] and selected “K-Factor (US)”. In menu “INFO” display for “Range qV”. Maximum measuring range in each case possible “K-Faktor (US)”☞ Technical data.

7.6 Check sensor function

1. Program Mode **4.00** for pressure sensor.
2. Voltage supply (+Ub and GND) connected, output 0 - 10 V (A - GND) disconnected.
3. Remove pressure hoses and measure output signal, nominal = 0 V.
4. Create pressure at the "+" connection against the "-" connection (e.g. by **carefully** blowing in), measure the output signal (0...10 V ≙ measuring range).
5. If the sensor works, reconnect the pressure hoses and check these if necessary.

8 Enclosure

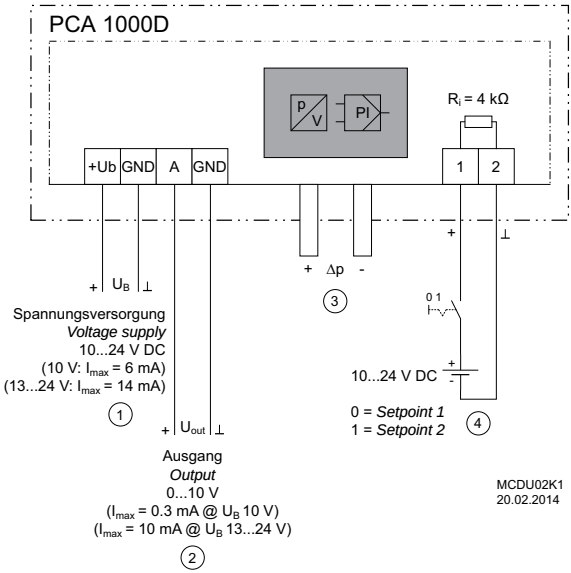
8.1 Technical data

Type	PCA 1000D
Part-No.	38999 (320043-42)
Pressure measuring range 1	0...1000 Pa *(0...4.0 in.wg)*
Pressure measuring range 2	0...500 Pa *(0...2.0 in.wg)*
Pressure measuring range 3	0...300 Pa *(0...1.2 in.wg)*
Pressure measuring range 4	0...200 Pa *(0...0.8 in.wg)*
Air flow-Measuring range	max. 65000 m^3/h (*38257 cfm*) depending on set measuring range and K-Factor
Voltage supply	10 V...24 V DC Protected against reverse polarity

	@ U_b 10 V DC	@ U_b 13...24 V DC
Max. load output 0 - 10 V (short-circuit-proof)	0.3 mA	10 mA
Max. current consumption ca.	6 mA	14 mA

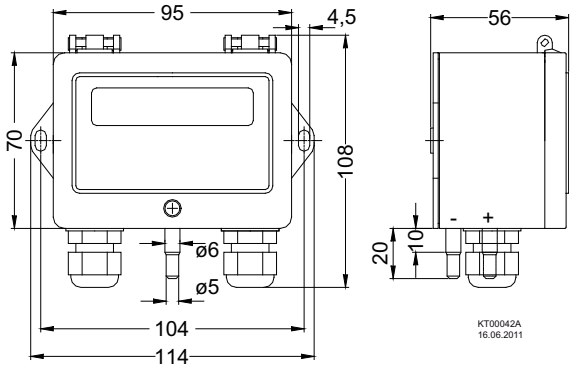
Pressure connections “+, -”	Hose connectors d = 5 / 6 mm *(0.20 / 0.24 inch)*
Housing	Cover ABS, bottom Polyamid PA 6.6 Fire protection classification UL 94 HB
Use position	vertical (measuring depends on position)
Protection class	IP54 according EN 60529
Weight	approx. 250 g *(0.55 lb)*
Permissible ambient temperature	-10...50 °C *(14...122 °F)*
Permissible rel. humidity	85 % no condensation
Overload protection	0.2 bar *(80 in.wg)*
Static pressure max.	0.2 bar *(80 in.wg)*
Interference emission	according EN 61000-6-3 (domestic household applications)
Interference immunity	according EN 61000-6-2 (industrial applications)

8.2 Connection diagram



1 *Voltage supply 10...24 V DC*
2 *Output 0...10 V*
3 *Pressure connections*
4 *Voltage input for switch over Setpoint 1 / Setpoint 2*

8.3 Dimensions [mm]



8.4 Manufacturer reference CE

Our products are manufactured in accordance with the relevant international regulations. If you have any questions concerning the use of our products or plan special uses, please contact:

Systemair
Industrievägen 3
73930 Skinnskatteberg
Telefon:+46 (0) 222 440 00
Telefax:+46 (0) 222 440 99