

SPSA | ACTUATOR POWERED DAMPER PRESSURE CONTROLLER

Mounting and operating instructions



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SAFETY AND PRECAUTIONS



Read all information, the datasheet, mounting instructions and wiring scheme before working with the product. For personal and equipment safety, and for optimum product performance, make sure you entirely understand the contents before installing, using, or maintaining this product.



For safety and licensing (CE) reasons, unauthorised conversion and / or modifications to the product are not permitted.



The product must not be exposed to abnormal conditions, such as: extreme temperatures, direct sunlight or vibrations. Chemical vapours with high concentration in combination with long exposure times can affect the product performance. Make sure the work environment is as dry as possible; check for condensation spots.



All installations shall comply with the local health and safety regulations and local electrical codes. This product can only be installed by an engineer or a technician who has an expert knowledge of the product and safety precautions.



Avoid contacts with energised electrical parts; always treat the product as if it is life. Always disconnect the power source before connecting the power cables, servicing or repairing the product.



Always verify that you apply appropriate power supply to the product and use wires with appropriate size and characteristics. Make sure that all the screws and nuts are well tightened and fuses (if any) are fitted well.



Recycling of equipment and packaging should be taken into consideration and disposed in accordance with local and national legislation / regulations.



In case there are any questions that are not answered, please contact your technical support or consult a professional.

PRODUCT DESCRIPTION

The SPSA differential pressure controller controls directly actuator powered dampers. It features an analogue / digital output with integrated PI control, Modbus RTU communication, and setpoint setting.

ARTICLE CODES

Code	Supply	Connection
SPSAG-2K0	13–26 VAC 18–34 VDC	3-wire
SPSAF-2K0	18–34 VDC	4-wire

INTENDED AREA OF USE

- Direct pressure control on actuator powered dampers
- Clean air and non-aggressive, non-combustible gases
- For indoor use only

TECHNICAL DATA

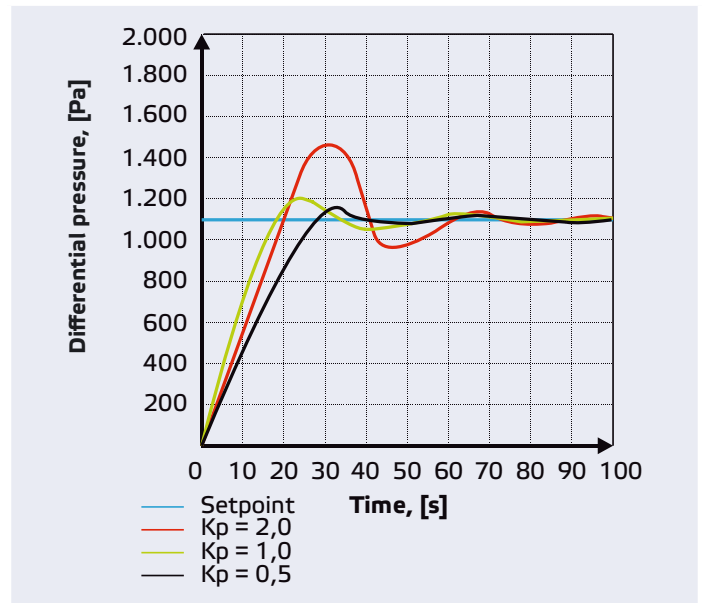
- Analogue output: 0–10 VDC / 0–20 mA
- Digital output: PWM (open collector)
- Power consumption, no load:
 - ▶ 18–34 VDC supply: 20–10 mA
 - ▶ 13–26 VAC supply: 15–10 mA
- Automatic operating ranges, depending on the selected setpoint
 - ▶ SPSAX-2K0: 0–2.000 Pa
- Accuracy of the analogue voltage output: $\pm 3\%$
- Long-term stability: $\pm 1\%$ per year
- Enclosure: reinforced plastic ABS, grey (RAL 7035)
- Aluminium pressure connection nozzles: hose diameter = 6 / 7 mm
- Protection standard: IP65 (according to EN 60529)
- Operating ambient conditions:
 - ▶ temperature: 10–60 °C
 - ▶ rel. humidity: < 95 % rH (non-condensing)
- Storage temperature: -40–60 °C

STANDARDS

- Low Voltage Directive 2014/35/EU
- EMC Directive 2014/30/EU
- WEEE Directive 2012/19/EU
- RoHs Directive 2011/65/EU



OPERATIONAL DIAGRAMS



WIRING AND CONNECTIONS

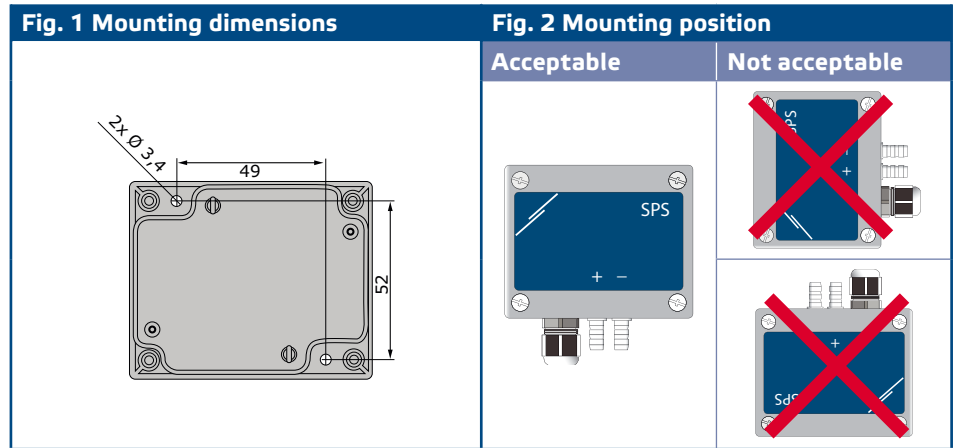
Vin	Positive DC voltage / AC ~
GND	Ground / AC ~
A	Modbus RTU (RS485) signal A
/B	Modbus RTU (RS485) signal /B
Ao1	Analogue (0–10 VDC / 0–20 mA) or PWM (open collector) output
GND	Ground reference for analogue output
Connections	Cable cross section: max. 0,75 mm ² Cable gland clamping range: 3–6 mm

MOUNTING INSTRUCTIONS IN STEPS

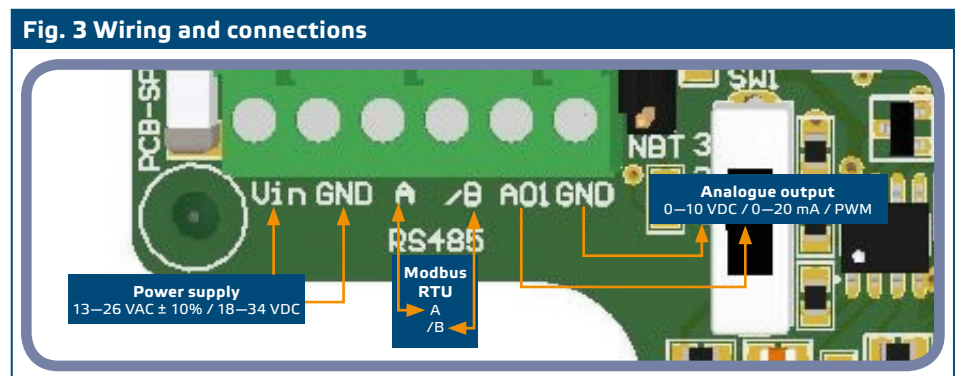
Before you start mounting the SPSA controller, read carefully **“Safety and Precautions”**. Choose a smooth surface for an installation location (a wall, a panel, etc.).

Follow these steps:

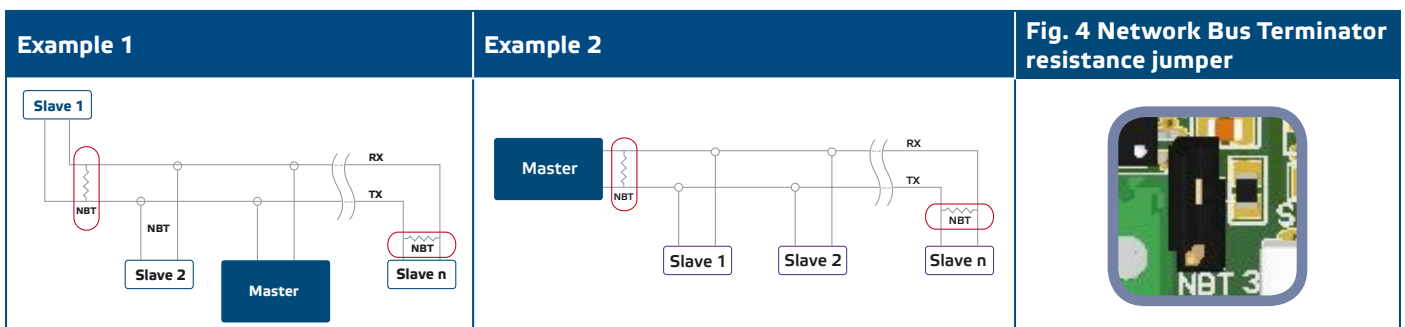
1. Unscrew the four screws on the front cover of the enclosure to remove it.
2. Fix the rear lid of the enclosure onto the surface by means of suitable fasteners adhering to the fixing dimensions and the correct mounting position shown in **Fig. 1 Mounting dimensions** and **Fig. 2 Mounting position**.



3. Do the wiring according to the wiring diagram (see **Fig. 3**) using the legend information from the section **“Wiring and connections”**.



4. If your unit starts or terminates the network, make sure the NBT jumper is placed onto the pins as indicated in **Examples 1 & 2** below. In all other cases, the jumper must not be connected. By default, the NBT jumper is disconnected - see **Fig. 4 Network Bus Terminator resistance jumper**.

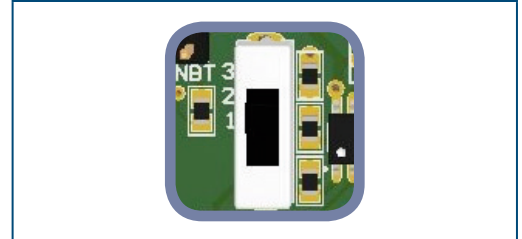


ATTENTION

If an AC power supply is used with any of the units in a Modbus network, the GND terminal should NOT BE CONNECTED to other units on the network or via the CNVT-USB-RS485 converter. This may cause permanent damage to the communication semiconductors and / or the computer!

5. Customise the factory settings to the desired ones:
 - 5.1 To select the analogue output mode, use SW1 switch. (See **Fig. 5 Analogue output selection switch**)
 - ▶ Select switch position 1 for 0–10 VDC mode of the analogue output.
 - ▶ Select switch position 2 for 0–20 mA mode of the analogue output.
 - ▶ Select switch position 3 for PWM (open collector).

Fig. 5 Analogue output selection switch (SW1)



6. Put back the front cover and fix it.
7. Connect the nozzles with the tubing.
8. Switch on the power supply.

ATTENTION

*If a G-type article is using the same AC power supply source (transformer) as F-type article, a **SHORT CIRCUIT** may result when the power supply and analogue signal terminals are connected to the same common ground! In this case always connect different article types to separate AC transformers or use the same article version.*

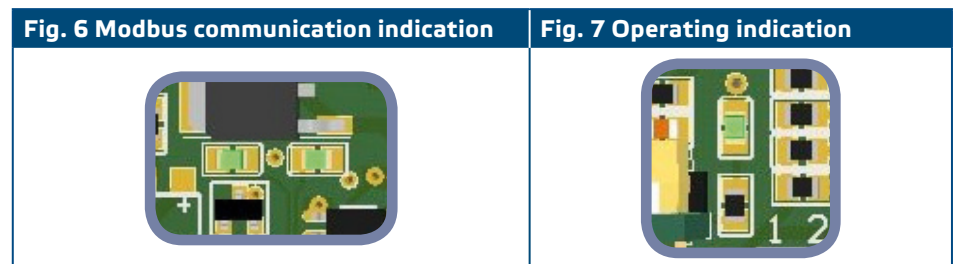
NOTE

*For sensor calibration and Modbus register reset procedures, refer to section **“Operating instructions”**.*

VERIFICATION OF INSTALLATION INSTRUCTIONS

Check if the LEDs shown in **Fig. 6 Modbus communication indication** blink. If they do, your unit has detected a Modbus network. If they do not blink, check the connections again.

Check if the green LED, shown in **Fig. 7 Operating indication** is on. Continuous green light means the unit is supplied. If the light is not on, check the connections again.



ATTENTION

The status of the LEDs can be checked only when the unit is energised. Take the relevant safety measures!

OPERATING INSTRUCTIONS



ATTENTION

1. Calibration procedure:

Make sure that the nozzles are free and not connected.

- 1.1 Disconnect the nozzles.
- 1.2 Press button SW2 (**Fig. 8**) for 4 seconds until the blue LED on the printed circuit board blinks twice. (See **Fig. 9** *Sensor calibration and Modbus register reset indication*.) Then release this button.
- 1.3 In 2 seconds the blue LED blinks twice to show that the calibration procedure has finished.

Fig. 8 Sensor calibration and Modbus register reset tact switch

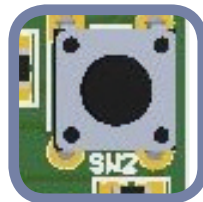
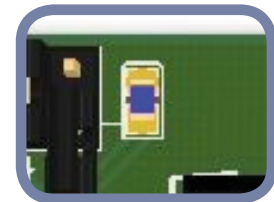


Fig. 9 Sensor calibration and Modbus register reset indication



2. Reset of Modbus Registers procedure:

Press button SW2 for 4 seconds until the blue LED on the printed circuit board (**Fig. 8**) blinks twice and hold the button until it blinks three times. The Modbus registers are restored to their default values (factory preset).



NOTE

*Do not release SW2 button after the LED (**Fig. 8**) blinks twice until it blinks three times once again, otherwise the unit will carry out a calibration procedure instead of Modbus registers reset procedure.*

3. Factory preset values of the parameters:

All the data is arranged in two sectors: input registers and holding registers.

INPUT REGISTERS (see **Table** *Modbus register maps*)

Input registers are read-only. They contain the measured data. These input registers, which are not used with this unit, return '0' when they are addressed.

All the data can be read using the command "Read Inputs Registers". **Table 1** *Modbus register maps* shows the returned data type and the way it should be interpreted. For example the reading 1.000 in register 1 means that the measured differential pressure is 1.000 Pa, reading 100 in register 2 means that the analogue / digital output is 10,0 % of the full scale.

- **Input register 7** gives information about the current working range. To get better measurement resolution, the ranges switch automatically according to the selected setpoint. The maximum setpoint for a given range is 80 % of the range span.
- **Input registers 3, 4, 5, 6, 8, 9** and **10** are not used. They return '0' limit.

HOLDING REGISTERS (see Table *Modbus register maps*)

These registers are read / write registers and they can be managed with “Read Holding Registers” command, “Write Single Register” and “Write Multiple Register” commands. They are separated in parts containing different kind of information.

Part 1:

This part contains information about the unit and Modbus communication settings.

- **Holding register 1** (40001) contains the address at which the unit replies to the master unit in a Modbus network. The default address is ‘1’. It can be changed in two ways:

1. Send command “Write Single Register” with address ‘1’ and write the new address value.
2. Connect only your unit to a master controller or use the 3SModbus PC application and send the command “Write Single Register” to address ‘0’ (Modbus broadcast address), and write a new address value.

- **The next two holding registers (2 and 3)** also contain Modbus settings. Changes in these registers change the communication settings. The default Modbus settings are 19200-E-1 as stated in the *Modbus Protocol Specification*.

- **The next three holding registers (4, 5 and 6)** are read-only. They keep information about the hardware and firmware versions.

- **The next four registers (7, 8, 9 and 10)** are not used. They are read-only.

**NOTE**

Writing on these registers does not return Modbus error exception, however, it does not change anything either!

Part 2:

- **Holding register 11** (40011) contains the setpoint for the differential pressure. The default value is ‘100’ (100 Pa). The user is allowed to write values in the range of 0–2.000. If a value out of this range is written in this register, the controller automatically writes the corresponding default value back in this holding register. If ‘0’ is written in register 11, the controller stops working.

- **Holding registers 12, 13, 14 and 15** are not used. They return ‘0’.

- **Holding register 16** (40016) contains the proportional gain (Kp). The default value is ‘10’ and the user is allowed to write values in the range of 1–100. If a different value is written, the default value ‘10’ is written back in this holding register.

- **Holding register 17** (40017) contains the integration time (Ti). The default value is ‘30’ and the user is allowed to write values in the range of 1–1.000. If a different value is written, the default value ‘30’ is written back in this register.

- **Holding registers 18, 19 and 20** are not used. They return ‘0’.

MODBUS REGISTER MAPS

INPUT REGISTERS					
		Data type	Description	Data	Values
1	Differential pressure	unsigned int.	Measured differential pressure	0—2.000 0—6.000	1.000 = 1.000 Pa
2	Output	unsigned int.	Analogue / digital output value: 0—100 %	0—1.000	100 = 10,0 %
3-6			Reserved, returns 0		
7	Differential pressure range	unsigned int.	Indicates the current range	SPSAX-2K0 0 = 0—100 Pa 1 = 0—250 Pa 2 = 0—500 Pa 3 = 0—750 Pa 4 = 0—1.000 Pa 5 = 0—2.000 Pa	2.000 = 2.000 Pa
8-10			Reserved, returns 0		

HOLDING REGISTERS						
		Data type	Description	Data	Default	Values
1	Address	unsigned int.	Device address	1—247	1	
2	Baud rate	unsigned int.	Modbus communication baud rate	1 = 9.600 2 = 19.200 3 = 38.400	2	
3	Parity mode	unsigned int.	Parity check mode	0 = 8N1 1 = 8E1 2 = 8O1	1	0 = 8N1 1 = 8E1 2 = 8O1
4	Device type	unsigned int.	Device type (<i>Read only</i>)	SPSAX-2K0 = 1064		
5	HW version	unsigned int.	Hardware version of the device (<i>Read only</i>)	XXX		0 x 200 = HW version 2.00
6	FW version	unsigned int.	Firmware version of the device (<i>Read only</i>)	XXX		0 x 100 = FW version 1.00
7-10		unsigned int.	Reserved, returns 0			
11	Differential pressure setpoint	unsigned int.	Setpoint - desired differential pressure	SPSAX-2K0 0—2.000	100 1.000	1.000 = 1.000 Pa
12-16			Reserved, returns 0			
16	Kp	unsigned int.	Proportional gain	0—100	10	100 = 100
17	Ti	unsigned int.	Integration period	0—1.000	30	10 = 1 s
18-20			Reserved, returns 0			

If you want to find out more about Modbus over serial line, please visit: http://www.modbus.org/docs/Modbus_over_serial_line_V1_02.pdf

TRANSPORT AND STOCK KEEPING INFORMATION

Avoid shocks and extreme conditions; stock in original packing.

WARRANTY INFORMATION AND RESTRICTIONS

Two years from the delivery date against defects in manufacturing. Any modifications or alterations to the product after the date of publication relieve the manufacturer of any responsibilities. The manufacturer bears no responsibility for any misprints or mistakes in this data.

MAINTENANCE

In normal conditions this product is maintenance-free. If soiled, clean with a dry or dampish cloth. In case of heavy pollution, clean with a non-aggressive product. In these circumstances the unit should be disconnected from the supply. Pay attention that no fluids enter the unit. Only reconnect it to the supply when it is completely dry.