



QP.94.Ui.4000

Differential pressure sensors, QP.94.Ui / QP.95.Ui

- Active differential pressure sensors
- Power supply : AC/DC 24 Volt
- Output signal : 0..10Vdc of 4..20 mA
- Measuring range adjustable: 0..1000Pa > 0..4000Pa
- 10-point offset with turning knob
- 5-point calibration

Δp

air [Pa]

Optional

- LCD display
- MODBUS RTU or BACnet MS/TP communication

Installation & commissioning

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1. General

All work (such as assembly, electrical connection, commissioning, operation and maintenance) must be carried out by qualified personnel.

The current local rules and regulations (e.g. building regulations, electrical/VDE guidelines etc.) should be observed.

Installers and operators are required to inform themselves sufficiently before use.

Read the product description before operating.

Make sure that the product is suitable for your application.

No liability is accepted for misprints or changes after publication.

Intended use also includes compliance with the operating and installation instructions. We assume no liability for damage caused by improper use.

Unauthorized or improper alterations to this device will invalidate the type approval and the warranty and guarantee claims.

2. Function

Measurement of differential pressure or the volume flow of air or non-combustible and non-aggressive gases.

3. Mounting

The differential pressure sensor is fastened to the air duct or the wall with the two mounting latches.

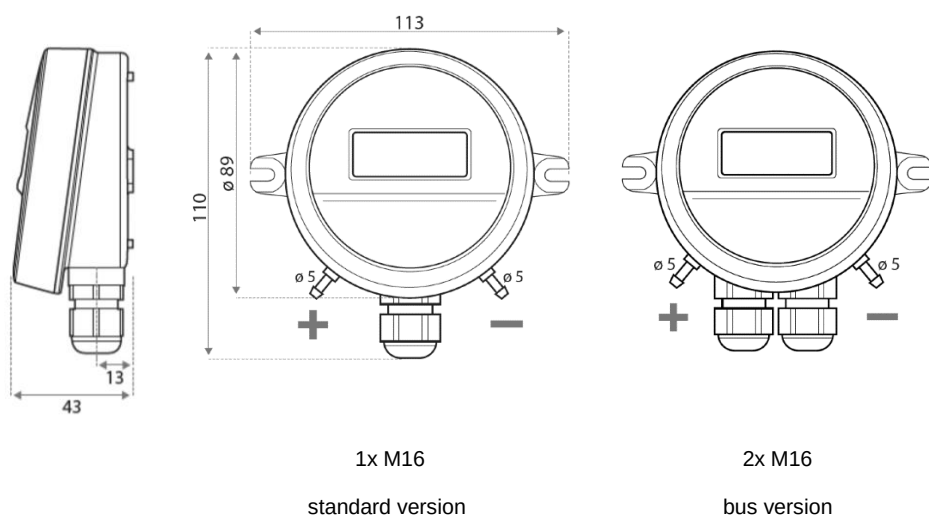
PVC hoses 6x4 mm are used to directly connect the duct connection fittings with the sensor reading inputs of the transmitter.

Note correct polarity.

The mounting location should be free of vibration.

4. Dimensions

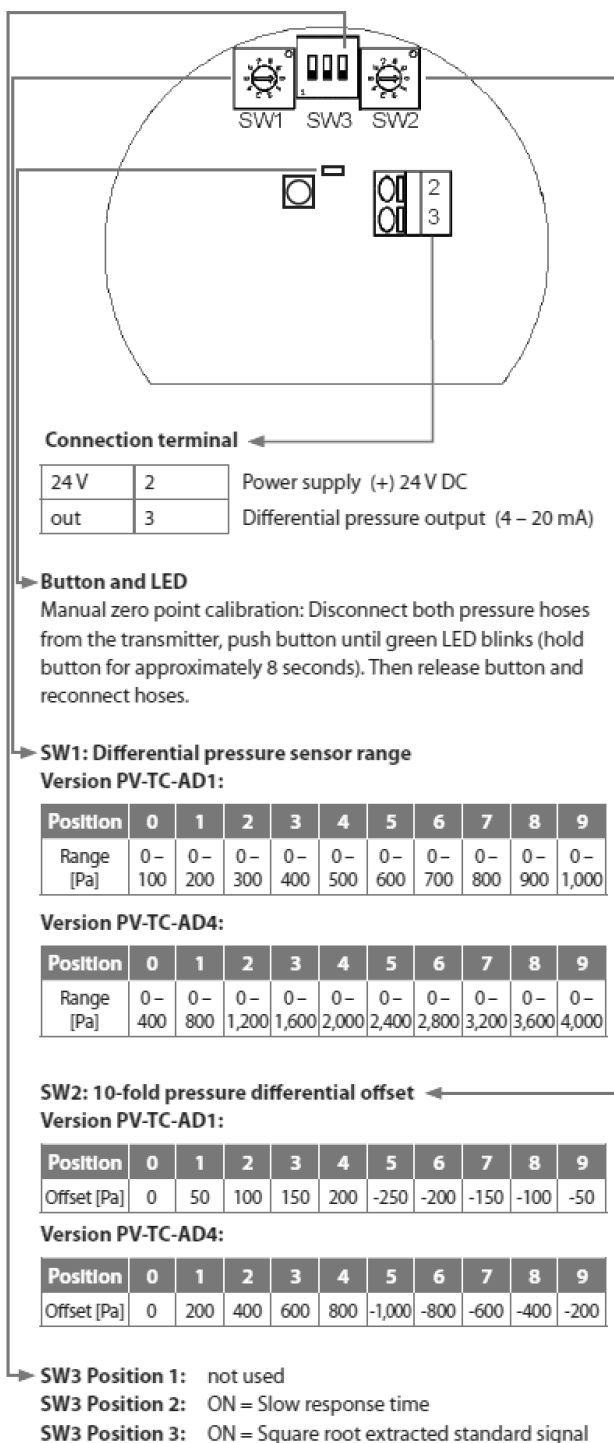
[mm]



5. Electrical connections and settings, 2-wire versions

Current transmitter with 5P calibration (2 wire, 4 – 20 mA)

2 wire version (PV-TC-...):



Valid from sensor firmware 0.11 and display firmware 0.57:

Use the Ⓢ and Ⓜ buttons to move through the menu.
 In the main menu the following information is displayed:

Display	Description
Prs Pa	Differential pressure
Type	Hardware version/sensor type
Ver Sen	Firmware version of the sensor
Ver Dis	Firmware version of the display

By pressing the Ⓢ button the currently displayed value can be changed (in temperature unit). The variable value will flash, it is changed with the Ⓢ and Ⓜ buttons. By pressing the Ⓢ button again, the entered value is stored. By simultaneously pressing the two Ⓢ and Ⓜ buttons for about 4 seconds, the configuration menu is started. The following data can be displayed or changed here:

Display	Description
Contr.%	Display contrast (default: 50%)
Norm %	Simulation of the analog output e.g. 50% = 12mA
Passwd	Password entry „0000“

After correctly entering the password (by pressing the Ⓢ button jumps to the next position, using the buttons Ⓢ and Ⓜ changed to the respective number) the following menu appears:

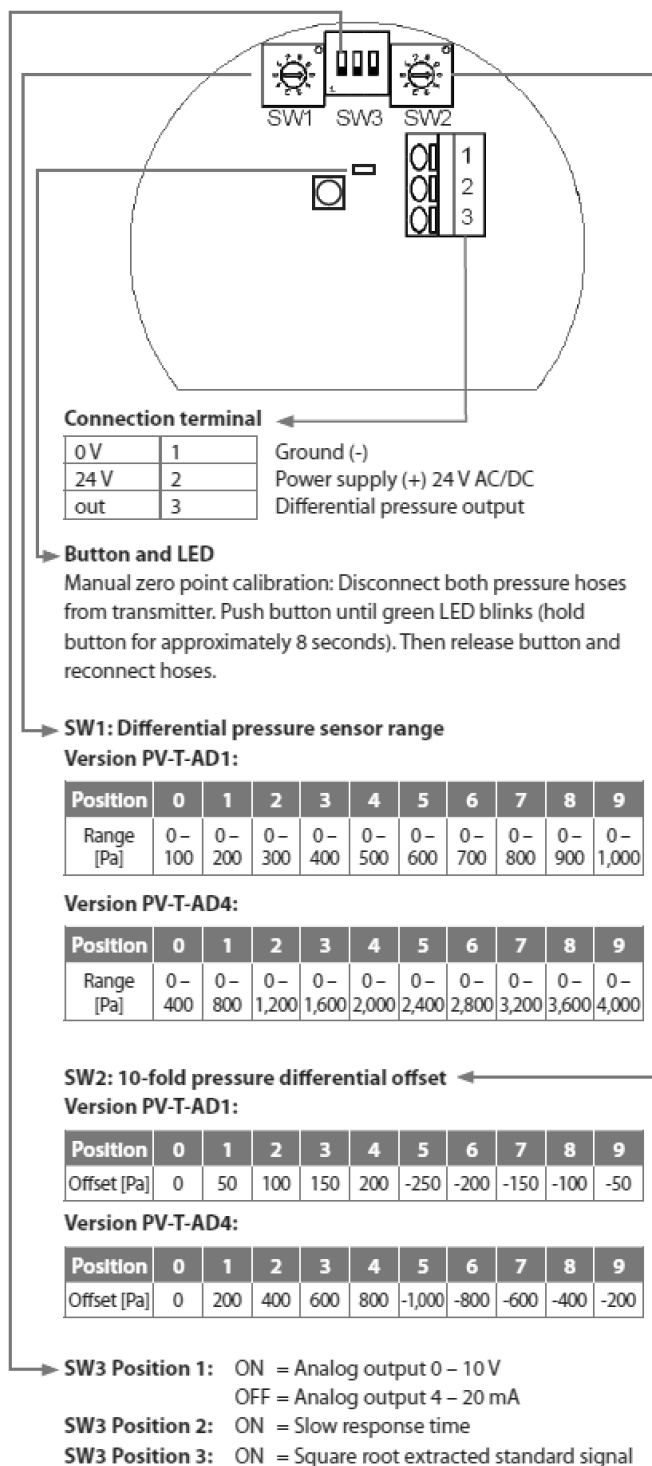
Display	Description
Mode	Parameters and 5P calibration see page 9
...	
Res.All	

Buttons Ⓢ and Ⓜ are used to navigate the menu. By pressing the button Ⓢ for approx. 4 seconds (or if no button is pressed for approx. 1 minute), the device leaves the configuration menu and returns to the home menu.

6. Electrical connections and settings, 3-wire versions

Current/voltage transmitter with 5P calibration
 (3 wire, 0 – 10 V / 4 – 20 mA switchable)

3 wire version (PV-T-...):



Valid from sensor firmware 0.11 and display firmware 0.57:

Use the ⏪ and ⏩ buttons to move through the menu.
 In the main menu the following information is displayed:

Display	Description
Prs Pa	Differential pressure
Type	Hardware version/sensor type
Ver Sen	Firmware version of the sensor
Ver Dis	Firmware version of the display

By pressing the ⏪ button the currently displayed value can be changed (in temperature unit). The variable value will flash, it is changed with the ⏪ and ⏩ buttons. By pressing the ⏪ button again, the entered value is stored. By simultaneously pressing the two ⏪ and ⏩ buttons for about 4 seconds, the configuration menu is started. The following data can be displayed or changed here:

Display	Description
Time s	Illumination time of the display in seconds
Contr. %	Display contrast (default: 50%)
Norm %	Simulation of the analog output e.g. 50% = 5 V or 12 mA
Passwd	Password entry „0000“

After correctly entering the password (by pressing the ⏪ button jumps to the next position, using the buttons ⏪ and ⏩ changed to the respective number) the following menu appears:

Display	Description
Mode	Parameters and 5P calibration see page 9
...	
Res.All	

Buttons ⏪ and ⏩ are used to navigate the menu. By pressing the button ⏪ for approx. 4 seconds (or if no button is pressed for approx. 1 minute), the device leaves the configuration menu and returns to the home menu.

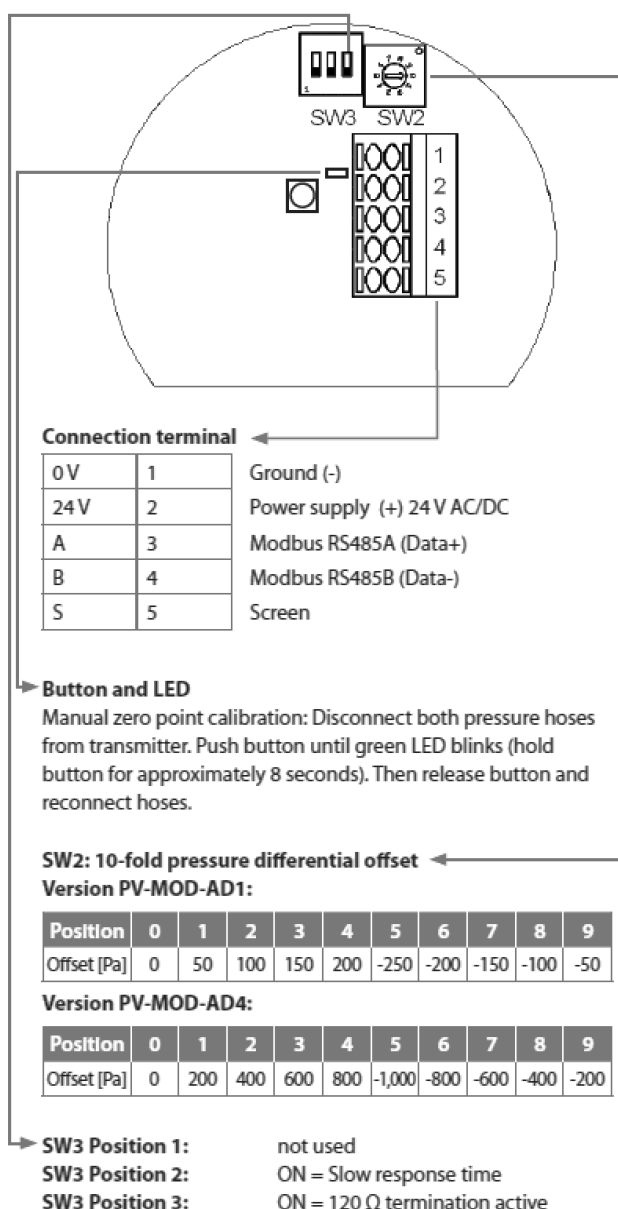
7. MODBUS Version



Electrical Connection/Settings

Modbus transmitter with 5P calibration

Modbus version (PV-MOD-...):



Display Menu Structure

Valid from sensor firmware 0.11 and display firmware 0.57:

Use the ⏪ and ⏩ buttons to move through the menu. In the main menu the following information is displayed:

Display	Description
Prs Pa	Differential pressure
MB Addr	Modbus address
Type	Hardware version/sensor type
Ver Sen	Firmware version of the sensor
Ver Dis	Firmware version of the display

By pressing the ⏪ button the currently displayed value can be changed (in temperature unit). The variable value will flash, it is changed with the ⏪ and ⏩ buttons. By pressing the ⏪ button again, the entered value is stored. By simultaneously pressing the two ⏪ and ⏩ buttons for about 4 seconds, the configuration menu is started. The following data can be displayed or changed here:

Display	Description
Time s	Illumination time of the display in seconds (0 = illumination always on)
Contr.%	Display contrast (default: 50%)
Passwd	Password entry „0000“

After correctly entering the password (by pressing the ⏪ button jumps to the next position, using the buttons ⏪ and ⏩ changed to the respective number) the following menu appears:

Display	Description
MB Mode	Modbus mode (RTU or ASCII)
MB Baud	Baud baud rate (9.6, 19.2, 38.4 or 56.0)
MB Pari	Parity (Even, Odd or None)
MB Addr	Modbus address
Mode	Parameters and 5P calibration see page 9
...	
Res.All	

Buttons ⏪ and ⏩ are used to navigate the menu. By pressing the button ⏪ for approx. 4 seconds (or if no button is pressed for approx. 1 minute), the device leaves the configuration menu and returns to the home menu.



Hinweis:
 We recommend our parameter programming tool PROG-MOD-01 to program Modbus parameters quickly.

Bus settings

Modbus protocol

Mode:	Sensor setting (default RTU)	selectable RTU / ASCII
Baud rate:	Sensor setting (default 9.6 (= 9600))	selectable 9.6 / 19.2 / 38.4 / 56.0
Parity:	Sensor setting (default Even)	selectable Even / Odd / None
Address:	Sensor setting (default 1)	selectable 1 to 127

ATTENTION: Changes take immediate effect without restarting the transmitter.

Data bits:	8 (in RTU mode); 7 (in ASCII mode)
Stop bits:	1 (for parity Even / Odd); 2 (for parity None)
Functionality:	04 Read Input Registers (3x)

Register overview

Register	PWM address	Data type	Unit of Measure	Description
0 (0x00)	30001	Signed 16	Pa	Pressure differential
1 (0x01)	30002	Unsigned	m³/h	Volume flow low
2 (0x02)	30003	Unsigned	65536 m³/h	Volume flow high
16 (0x10)	30017	Signed 16	0 = no sensor fault 1 = sensor fault	fault status
20 (0x14)	30021	Signed 16	1/10 V	Power supply

Request to transmitter (RTU example)

Byte	Byte 0	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7
Description	Address	Function	Start address		Register count		CRC	
Example	01	04	0000		0001		...	
Meaning	Transmitter 1	Read input registers	Register 0 (PWM 30001)		1 Register		Checksum	

Transmitter response (RTU example)

	Byte 0	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6
Description	Address	Function	Number of data bytes	Differential pressure in Pa		CRC	
Example	01	04	02	01E1		...	
Meaning	Transmitter 1	Read input registers	2 Data bytes	481 (= 481 Pa)		Checksum	
Data type				Signed 16			

Volume flow registers (1 and 2)

Register 1 (volume flow Low) is sufficient for values up to 65535.

Starting at 65536, the value is calculated from registers 1 (Low) and 2 (High) based on the following formula:

$$\text{Volume flow} = \text{High} \times 65536 + \text{Low}$$

Example:

Query

	Byte 0	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7
Description	Address	Function	Start address		Register count		CRC	
Example	01	04	0001		0002		...	
Meaning	Transmitter 1	Read input registers	Register 1 (PWM 30002)		2 Register		Checksum	

Reply 1

	Byte 0	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7	Byte 8
Description	Address	Function	Number of data bytes	Volume flow High		Volume flow Low		CRC	
Example	01	04	04	00	00	5B	9A	...	
Meaning	Transmitter 1	Read input registers	4 Data bytes	0		23450		Checksum	
Meaning				23450 m³/h					

Reply 2

	Byte 0	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7	Byte 8
Description	Address	Function	Number of data bytes	Volume flow High		Volume flow Low		CRC	
Example	01	04	04	00	01	56	62	...	
Meaning	Transmitter 1	Read input registers	4 Data bytes	65536		22114		Checksum	
Meaning				87650 m³/h					

The hexadecimal value 15662_{hex} composed of both registers corresponds to the decimal value 87650.

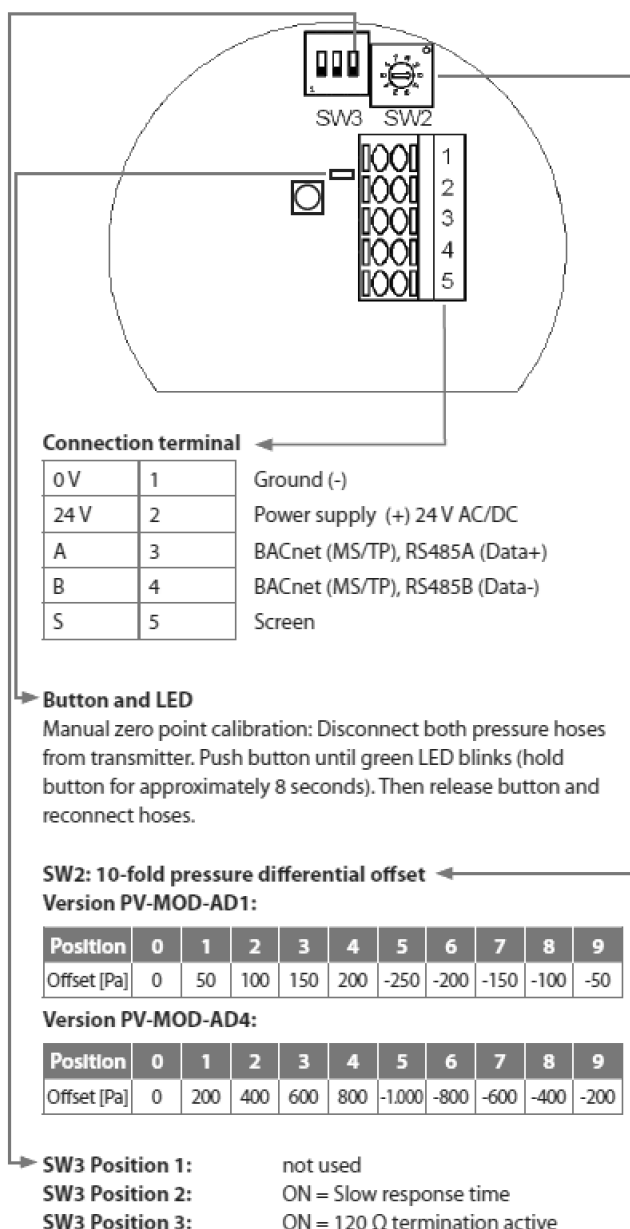
8. BACnet Version



Electrical Connection/Settings

BACnet transmitter with 5P calibration

BACnet version (PV-BAC-...):



Display Menu Structure

Valid from sensor firmware 0.10 and display firmware 0.58:

Use the ⏮ and ⏭ buttons to move through the menu.
 In the main menu the following information is displayed:

Display	Description
Prs Pa	Differential pressure
Bac MAC	BACnet MAC-Adresse
Type	Hardware version/sensor type
Ver Sen	Firmware version of the sensor
Ver Dis	Firmware version of the display

By pressing the ⏮ button the currently displayed value can be changed (in temperature unit). The variable value will flash, it is changed with the ⏮ and ⏭ buttons. By pressing the ⏮ button again, the entered value is stored. By simultaneously pressing the two ⏮ and ⏭ buttons for about 4 seconds, the configuration menu is started. The following data can be displayed or changed here:

Display	Description
Time s	Illumination time of the display in seconds (0 = illumination always on)
Contr.%	Display contrast (default: 50%)
Passwd	Password entry „0000“

After correctly entering the password (by pressing the ⏮ button jumps to the next position, using the buttons ⏮ and ⏭ changed to the respective number) the following menu appears:

Display	Description
Bac Bd	Baud rate (9.6 (Default), 19.2, 38.4, 57.6, 76.8, 115.2 or auto)
Bac MAC	BACnet MAC-Adresse (1 bis 127, Default 99)
Mode	Parameters and 5P calibration
...	see page 9
Res.All	

Buttons ⏮ and ⏭ are used to navigate the menu. By pressing the button ⏮ for approx. 4 seconds (or if no button is pressed for approx. 1 minute), the device leaves the configuration menu and returns to the home menu.

9. Parameters and 5P calibration

Menu Item	Description	Min	Max	Default
Mode	Device mode pressure differential (Prs) or volume flow (Vol) Prs			Prs
D. kg/m ³	Air density (Rho)	0.01	9.99	1.20
K1 m ² /h	K factor (see following page)	1	9,999	500
Corr.K2	Correction factor K2	0.01	2.00	1.00
CPX1 Pa	Pressure differential point 1 sensor reading	0	4,000	500
CPY1 Pa	Pressure differential point 1 output value	0	4,000	500
CPX2 Pa	Pressure differential point 2 sensor reading	0	4,000	1,000
CPY2 Pa	Pressure differential point 2 output value	0	4,000	1,000
CPX3 Pa	Pressure differential point 3 sensor reading	0	4,000	2,000
CPY3 Pa	Pressure differential point 3 output value	0	4,000	2,000
CPX4 Pa	Pressure differential point 4 sensor reading	0	4,000	3,000
CPY4 Pa	Pressure differential point 4 output value	0	4,000	3,000
CPX5 Pa	Pressure differential point 5 sensor reading	0	4,000	3,500
CPY5 Pa	Pressure differential point 5 output value	0	4,000	3,500
Res.All	Reset to factory settings			

Device mode „Mode“

Prs is the pressure differential mode and is the default setting.

If the device is switched to volume flow mode (Vol), it automatically calculates the volume flow from the measured pressure differential and the programmable factors (air density and K factor). The rotating switch (sensor range and offset) have the following effects:

SW1: Sensor range / volume flow (on analog transmitters PV-TC-... and PV-T-...)

Position	0	1	2	3	4	5	6	7	8	9
Range [m ³ /h]	0-1,000	0-2,000	0-3,000	0-5,000	0-7,000	0-10,000	0-20,000	0-30,000	0-50,000	0-99,999

SW2: Offset / volume flow (on all transmitters PV-...)

Position	0	1	2	3	4	5	6	7	8	9
Offset [m ³ /h]	0	200	400	600	800	-1,000	-800	-600	-400	-200

The display shows values from 0 bis 9,999 as „m³/h“. Starting at 10,000, the display automatically shows the values with UoM „10 x m³/h“. The display output „2.345 10 x m³/h“ therefore corresponds to 23,450 m³/h.

The pressure differential calibration points are replaced by the volume flow calibration points.

Menu Item	Description	Min	Max	Default
CVX1 10x m ³ /h	Volume flow point 1 sensor reading	0	9,999	400
CVY1 10x m ³ /h	Volume flow point 1 output value	0	9,999	400
CVX2 10x m ³ /h	Volume flow point 2 sensor reading	0	9,999	800
CVY2 10x m ³ /h	Volume flow point 2 output value	0	9,999	800
CVX3 10x m ³ /h	Volume flow point 3 sensor reading	0	9,999	1,200
CVY3 10x m ³ /h	Volume flow point 3 output value	0	9,999	1,200
CVX4 10x m ³ /h	Volume flow point 4 sensor reading	0	9,999	1,600
CVY4 10x m ³ /h	Volume flow point 4 output value	0	9,999	1,600
CVX5 10x m ³ /h	Volume flow point 5 sensor reading	0	9,999	2,000
CVY5 10x m ³ /h	Volume flow point 5 output value	0	9,999	2,000

The 5P calibration in the pressure differential range is lost when the mode is changed. The volume flow calibration points always have the UoM „10 x m³/h“.

K factor

Flexible hoses are used to transmit the measured pressure differential via connection nipples to the Piezo pressure differential sensor. The pressure differential is then electronically analyzed, converted into volume flow with the programmed K factor and density ρ and output to the LCD display.

The following basic formula is used for the calculation:

$$V_h = K_1 \times K_2 \times \sqrt{\frac{2 \times \Delta p}{\rho}}$$

V_h = Volume flow [m³/h]
 K_1 = K factor [m²s/h]
 K_2 = Multiplier
 Δp = Pressure differential [Pa]
 ρ = Air density [kg/m³]

Note: many blower manufacturers use simplified basic formulas and therefore modified K values. The formula of the particular manufacturer must always be taken into consideration when entering the K factor on the PV-...

Examples of the K factor (K1) to be entered at the PV-... :

Ebm-Pabst blower types: R3G, K3K, etc.:
K1 = 0,7746 x K_{Ebm-Pabst}

Fläkt blower types: CXLF, GXLB, GXHB, GPEB, etc.:
K1 = 2.788,5 / K_{Fläkt}

Gebhardt blower types: RZR, RZA, RZM, RLM, etc.:
K1 = K_{Gebhardt}

Rosenberg blower types: DKH, GKH, etc.:
K1 = K_{Rosenberg}

Ziehl-Abegg blower types: ER...C, GR...C, etc.:
K1 = 0,7746 x K_{Ziehl-Abegg}

Figures are non-binding. Observe the latest manufacturer specification sheets. Modifications made without notice.

The **K2 correction factor** is a multiplier designed for user-programmable parameter setting. The value does not change on K2 = 1.

5P calibration

5 arbitrary reference locations can be programmed between the two limit values in X (sensor reading) and Y (output value). A linear interpolation is performed between these reference locations (see figure).

A reference location in X and Y cannot be positioned beyond the sensor limit values. The X values of the reference locations must follow a monotone sequence of 1-2-3-4-5. Non-monotone X values are ignored.

The following figures illustrate this:

Since the function shown in the figure below between reference locations 3 and 4 is not definitive (dotted line), reference location 4 is ignored.

If fewer than 5 calibration points are used, the X values of not used reference locations must be set to the lower limit value (minimum adjustment setting) or the upper limit value (maximum adjustment setting). The associated Y value remains arbitrary.

