PRODUAL

PART OF BEMSIQ GROUP

DPT-Dual-MOD-AHU Modbus differential pressure transmitter

USER GUIDE

Made in Finland

5 years warranty

MANAGEMENT SYSTEM CERTIFICATION DNV ISO 9001 • ISO 14001 Finland

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1 Introduction

The DPT-Dual-MOD-AHU Modbus differential pressure transmitter is especially designed for air handling units. It has two pressure sensors with different measurement ranges, and is ideal for measuring pressure from two measurement points. It also measures air volume flow rate and air velocity. In a typical air handling unit application, one sensor monitors the airflow across the centrifugal fan while the other sensor monitors the filter cleanliness.

This differential pressure transmitter has two multifunctional inputs for reading 0...10 V, digital and resistive signals from external devices. For example, you can connect two passive temperature sensors (Pt1000, Ni1000, Ni1000-LG or NTC 10) to this transmitter to measure temperature at two measurement points.

This differential pressure transmitter does not have analogue outputs. The BMS system reads the measurement data directly from the Modbus registers of the transmitter using Modbus RTU communication over the RS-485 interface.

The transmitter supports six pressure measurement units and four airflow measurement units for the display. The backlit display shows the measured airflow and differential pressure at the same time. If external passive temperature sensors are connected to the multifunctional inputs, the display alternates between showing the differential pressure/airflow readings and the temperature readings. For voltage input signal, the display shows the measured voltage.

Commissioning the device is simple using the device menu. The measurement range settings are fixed and cannot be modified.

1.1 About this user guide

This user guide contains important information about the installation, wiring, configuration and use of the product. Read this guide carefully before you install the product, connect the wires, or operate the product. Make sure that you fully understand all instructions before you start work. If you are not sure what the instructions mean, contact the seller or the manufacturer.

Follow all instructions in this user guide carefully. Always obey the applicable local rules and regulations.

The original instructions were written in English. If there are differences between the English instructions and the translations, refer to the English instructions.

If you find a mistake in the English instructions or in the translations, please send the details to the manufacturer.

1.2 Intended use

The DPT-Dual-MOD-AHU differential pressure transmitters are intended to be used for measuring differential pressure, air volume flow rate and air velocity in air handling units in commercial environments.

This transmitter has input connectors that allow passive temperature sensors and other external devices to be connected to the transmitter.

This device is compatible with dry air. It is intended to be connected to a building automation system in the HVAC/R industry.

2 Safety precautions

The product is developed, manufactured and tested according to high quality standards. However, instructions for safe use must be followed when installing, using or disposing the product or parts of product.

Read this user guide carefully before you commission, use or service this device. To avoid any kind of damage to people or property, follow the instructions carefully. Produal is not liable for any hazards, injury to people, or damage to property caused by incorrect installation or misuse of the device.

To avoid electrical shock or damage to equipment, disconnect power before you install or service the product. Use only proper wiring that is rated for the full operating voltage and maximum current in the system. The wiring must also withstand fault conditions.

To avoid fire and/or explosion, do not use the product in potentially flammable or explosive atmosphere.

Make sure that the product is not damaged before installation. Do not drop the product or use excessive force during installation. Do not use the product if you can see any damages.

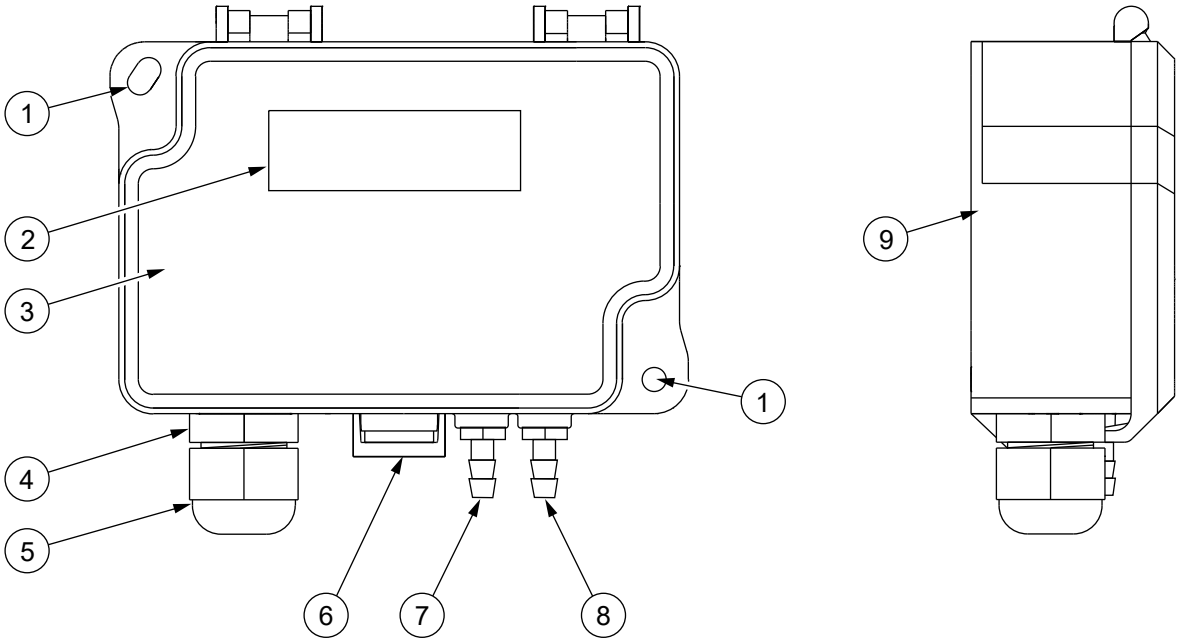
After installation, the product will be part of a system whose specifications and performance characteristics are not designed or controlled by Produal. Refer to national and local authorities to ensure that the installation is functional and safe.

The product should only be used in professionally designed applications. Unauthorised modifications are not allowed. The product must not be used in relation with any equipment that in case of a failure may threaten, directly or indirectly, human health or life or result in danger to human beings, animals or property.

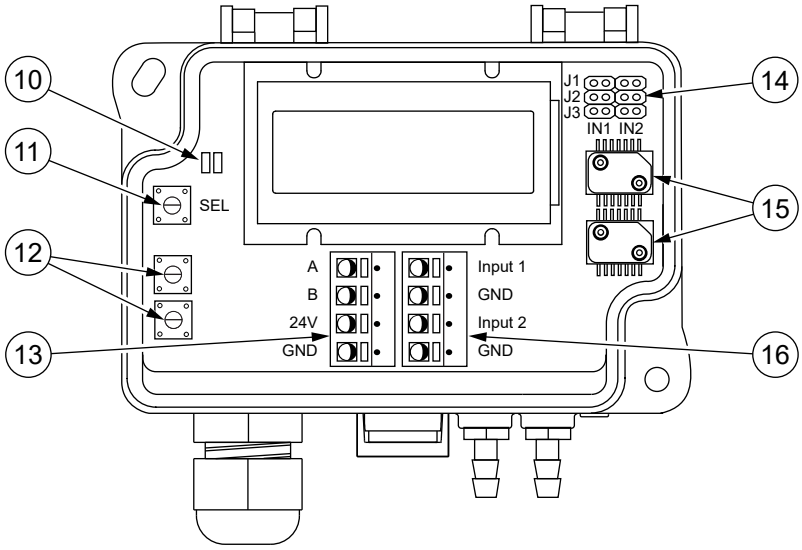
In this document, there are different warnings and notes. The warning and note types are defined in the following table.

Sign	Description
WARNING:	The warning symbol indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.
CAUTION:	The caution symbol indicates a potentially hazardous situation which, if not avoided, could result in minor or moderate injury.
Important:	The important symbol indicates a potentially hazardous situation which, if not avoided, could result in damage to the device or property.
Note:	The note symbol indicates a useful tip or a recommended way to complete a task. These notes also provide information that is useful but not critical to the user.

3 Main components



1	Mounting point	2	Display
3	Cover	4	Cable gland
5	Strain relief	6	Cover latch
7	Pressure connection A for differential pressure or airflow measurement (+ high pressure / – low pressure)	8	Pressure connection B (differential pressure measurement) (+ high pressure / – low pressure)
9	Housing		



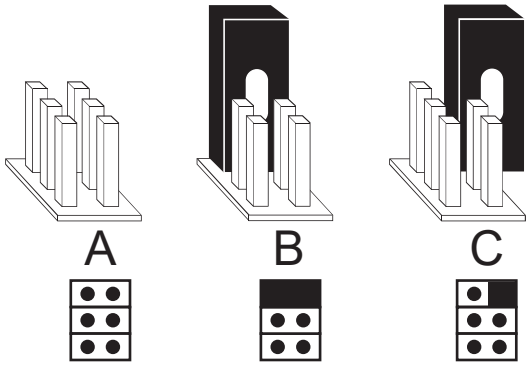
10	Zeroing indicator light	11	*SELECT* menu button / zeroing button
12	Menu navigation buttons	13	Terminal block
14	Input jumpers	15	Pressure sensors
16	Input terminal block		

4 Commissioning

4.1 Setting the jumpers

Important: Set the jumpers in the correct position before you connect the supply voltage to the device.

Install the jumpers as shown in the figure below to close the circuit or to store the jumper while the circuit remains open.



A. No jumper: circuit open
B. Jumper installed: circuit closed
C. Jumper stored: circuit open

4.1.1 Input settings

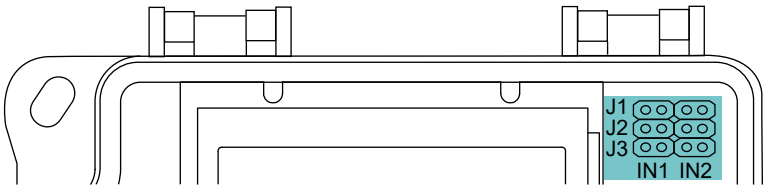
This transmitter has two inputs for external temperature sensors and other devices. You can configure the input type for each input separately. The transmitter supports the following input types:

- 0...10 V
- digital
- Pt1000
- Ni1000
- Ni1000-LG
- NTC 10

If you connect external devices to the inputs, set the jumpers to the transmitter as follows:

1. Install jumpers to *J1*, *J2* and *J3* jumper blocks for inputs *IN1* and *IN2* according to the required input types.

   See the table below for the correct jumper settings.



   Install a jumper to jumper blocks that are fully black ■ in the table.

   As the factory setting, no jumpers are installed to jumper blocks.

Jumper	0...10 V	Pt1000	Ni1000 / Ni1000-LG	NTC10	Digital (BIN IN)
J1	○ ○	■	■	■	■
J2	■	○ ○	○ ○	○ ○	○ ○
J3	■	○ ○	○ ○	■	■

2. Configure the settings for the external devices using the device menu. See section The Sensor 1 and Sensor 2 menus on page 15 for instructions.

4.2 Mounting

WARNING: Handle the product with care. Dropping the product may cause internal damage and unwanted functions in the connected system.

CAUTION: Place the product outside the reach of children and animals.

Important: The product may only be installed in a location where the ambient conditions meet the operating condition requirements.

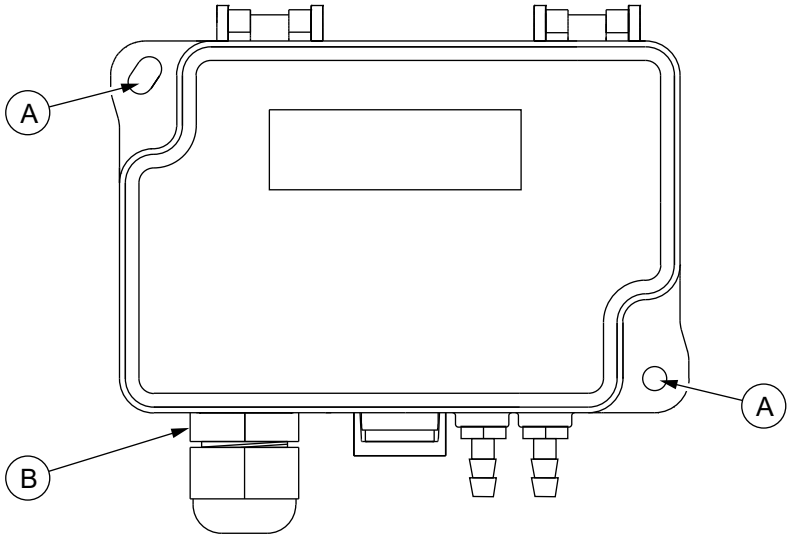
Note: When the temperature drops below 0 °C, the display fades slightly and the response time increases.

Operating conditions	
Ambient temperature	-20...50 °C
Ambient humidity	0...95 %rH (non-condensing)

1. Check that the product is not damaged during transportation.
2. Select the mounting position on the wall panel of an air handling unit, on a wall, or on other flat and vertically upright surface.
3. Use the device as a template and mark the screw holes on the mounting surface.
4. Select the mounting screws according to the mounting surface.

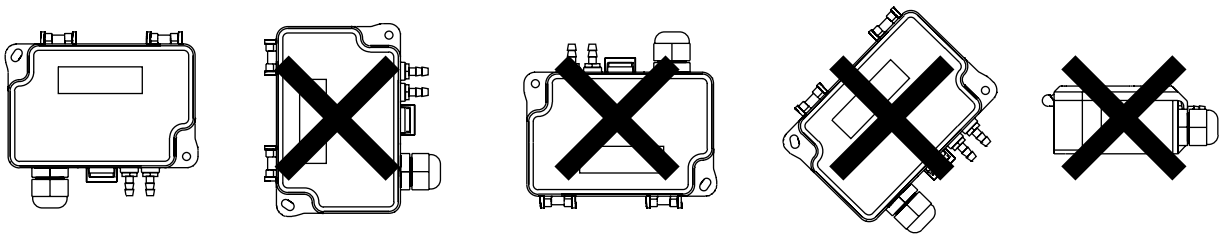
   The maximum screw diameter is 4.3 mm.

5. Make sure that the cable gland points down.



A. Mounting point
B. Cable gland

6. Mount the device with the screws using the mounting points.
   See the figure below for the correct mounting orientation.



7. Make sure that the device is horizontally and vertically level.
8. Tighten the screws.

4.3 Connecting the measurement hoses

Note: The hose length does not have an effect on the measurement accuracy. However, long hoses cause delay to the measurement.

Air handling unit

In a typical air handling unit application, connect measurement hoses as follows:

- Connect two measurement hoses to pressure connection A to measure airflow.
- Connect two measurement hoses to pressure connection B to measure differential pressure across the filter.

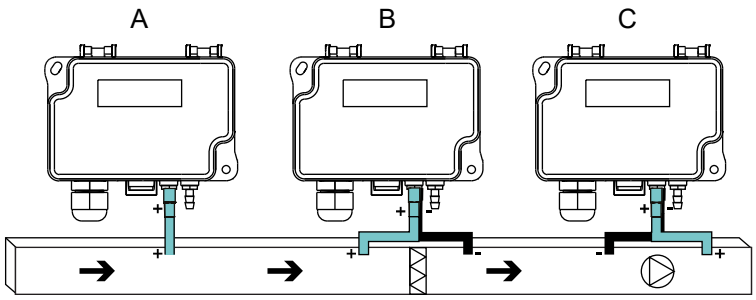
You can use pressure connection A for pressure or air flow measurement. Pressure connection B can only be used for pressure measurement.

Measuring airflow

To measure airflow, connect the measurement hoses to FloXact™ airflow probe, or to the measurement ports specified by the fan manufacturer. See the FloXact™ user guide or the fan manufacturer's technical specifications for more information.

Measuring pressure

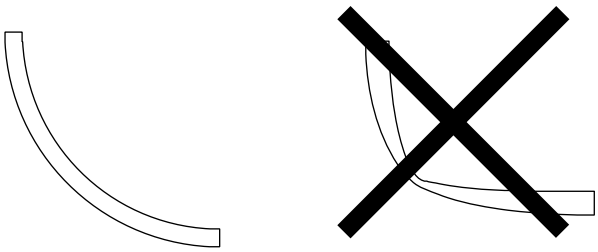
To measure pressure, connect the measurement hoses to the pressure connections of the transmitter and to the ventilation duct according to your application. See the instructions below.



A. Static pressure
B. Filter/damper monitoring
C. Fan/blower monitoring

- If the pressure is static, connect the pressure measurement hose to the "+" connection only.
- Filter or damper monitoring:
  1. Connect a pressure measurement hose to the duct on the high pressure side before the filter/damper and another pressure measurement hose on the low pressure side after the filter/damper.
  2. Connect the high pressure measurement hose to the "+" connection.
  3. Connect the low pressure measurement hose to the "–" connection.
- Fan or blower monitoring:
  1. Connect a pressure measurement hose to the duct on the low pressure side before the fan/blower and another pressure measurement hose on the high pressure side after the fan/blower.
  2. Connect the high pressure measurement hose to the "+" connection.
  3. Connect the low pressure measurement hose to the "–" connection.
- Install the measuring hoses carefully and make sure that the hoses do not bend too tightly.

  Too tight curves can prevent the airflow to the sensor.



4.4 Wiring

WARNING: Device wiring and commissioning can only be carried out by qualified professionals. Always make the device wirings in de-energised electricity network.

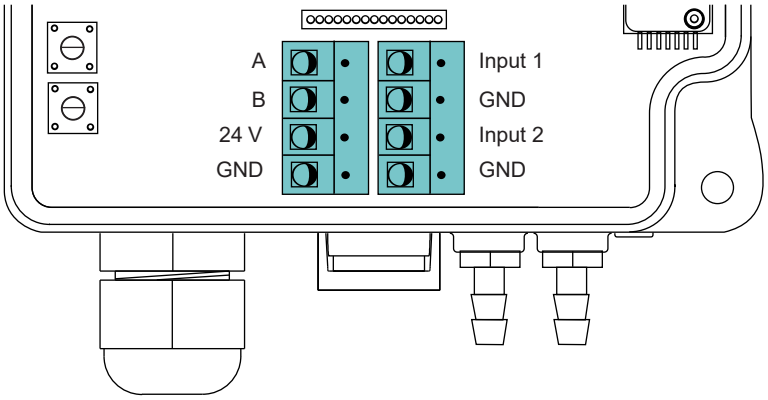
WARNING: This product is appliance class III product according to IEC 60664-1. The product may only be connected to SELV (separated extra low voltage) electricity network.

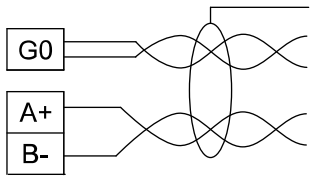
CAUTION: Use single stranded wires or use wire end sleeves if multi stranded wires are used.

Important: For CE and UKCA compliance, a properly grounded shielding cable is required.

Note: When using 0...10 V inputs, this device and the connected devices must have the same power supply voltage potential. For example, you can connect all devices to the same power supply.

1. Open the cover.
2. Unscrew the strain relief on the cable gland.
3. Route the cable through the strain relief and the cable gland.
4. Connect the wires to the terminal blocks according to the table below.



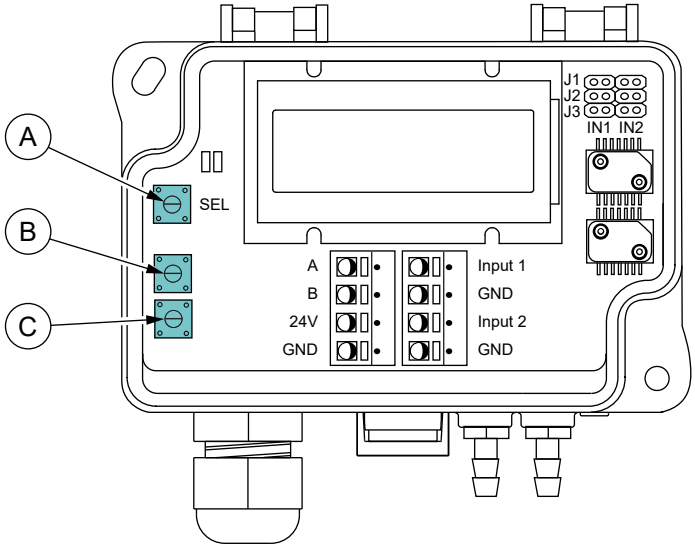
A+ *B-*		Modbus RTU, RS-485
24 V		24 Vac/dc power supply
GND		0 V
Input 1		Input 1: digital / 0...10 V / PT1000 / Ni1000 / Ni1000-LG / NTC 10
GND		Ground
Input 2		Input 2: digital / 0...10 V / PT1000 / Ni1000 / Ni1000-LG / NTC 10
GND		Ground

The nominal tightening torque for wiring terminal screws is 0.4 Nm.

Important: Do not use excessive force when you tighten the wiring terminal screws.

5. Tighten the strain relief.
6. Close the cover.

4.5 Configuring settings using the device menu



A. *SELECT* button
B. *UP* button
C. *DOWN* button

1. Open the cover.

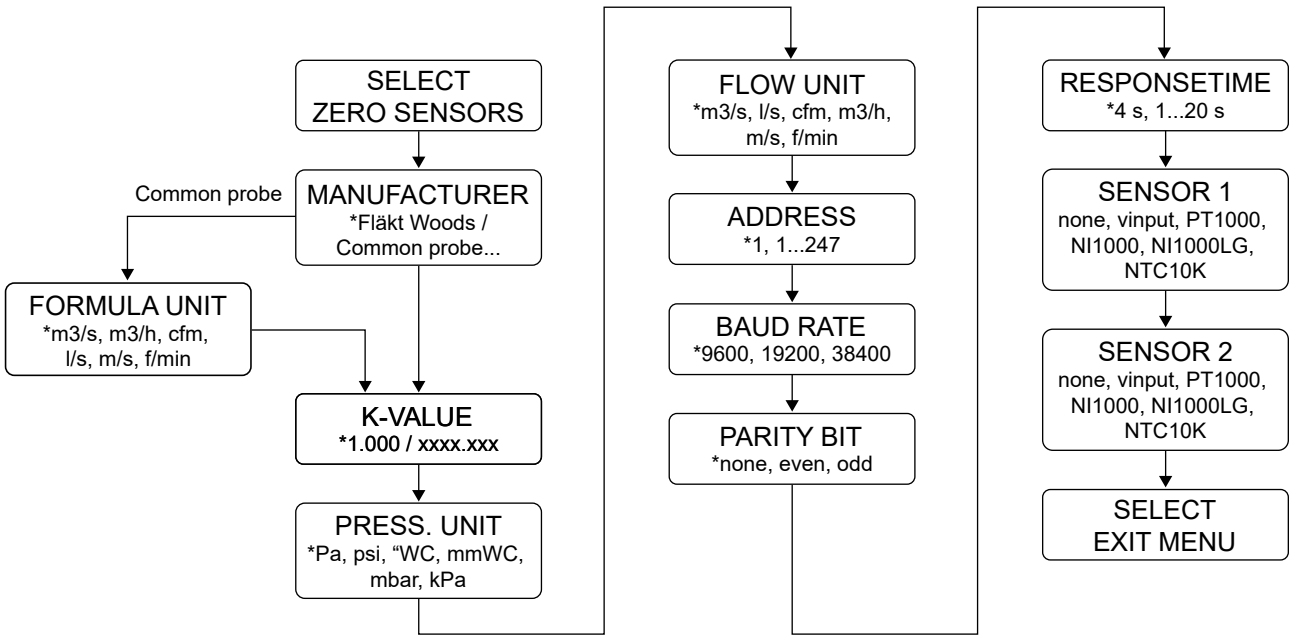
   CAUTION: When the power supply is connected, be extra careful when handling the product without the cover.

2. Press the *SELECT* button for two seconds to activate the device menu.
3. Use the *UP* and *DOWN* buttons to navigate the menu.
4. Press the *SELECT* button to change the value of a menu item.
5. Press the *UP* or *DOWN* button to select a value.
6. Press the *SELECT* button to accept the new value and to return to menu navigation.
7. Navigate to the *EXIT MENU* view and press the *SELECT* button to save the settings and exit the menu.

   Note: If you do not press any buttons for 50 seconds, the device returns to normal operation. In this case, the settings are not saved.

4.5.1 Device menu structure

See the figure below for the full menu structure. The default values are marked with an asterisk (*).



Note: In the *Sensor 1* menu, you can select the input type for *Input 1* connector. In the *Sensor 2* menu, you can select the input type for *Input 2* connector.

4.5.2 The Manufacturer menu

Select the manufacturer in the *MANUFACTURER* menu if you connect DPT-Dual-MOD-AHU to a fan with pressure measurement points. Select *Common probe* if you use DPT-Dual-MOD-AHU with FloXact™ or other common measurement probe.

If you select *Common probe*, select the measurement unit used in the formula from the *FORMULA UNIT* menu.

Menu selection	Calculation equation	Description
Fläkt Woods	$q = \frac{1}{k}\sqrt{\Delta P}$	Select the fan manufacturer if you connect the device to a fan with pressure measurement points.
Rosenberg	$q = k\sqrt{\frac{2\Delta P}{\rho}}$	
Nicotra	$q = k\sqrt{\Delta P}$	
Comefri	$q = k\sqrt{\frac{2\Delta P}{\rho}}$	
Ziehl	$q = k\sqrt{\Delta P}$	
Ebm-Papst	$q = k\sqrt{\Delta P}$	
Gebhardt	$q = k\sqrt{\frac{2\Delta P}{\rho}}$	
Common probe	$q = k\sqrt{\Delta P}$	Select *Common probe* if you connect the device to a common measurement probe (e.g. FloXact™).

4.5.3 The Formula unit menu

The *FORMULA UNIT* menu is available if you selected *Common probe* in the *MANUFACTURER* menu. The measurement unit you select in this menu is used in the calculation formula.

Select one of the following units:

- *m3/s*
- *m3/h*
- *cfm*
- *l/s*
- *m/s*
- *f/min*

The correct formula unit depends on the probe you use. For example, if you use the *FloXact™* airflow probe, the correct formula unit is *l/s*.

4.5.4 The K-value menu

Each fan and measuring probe has a specific K-value. You can select the K-value in the *K-VALUE* menu. See the manufacturer specification for the correct value. The available value range is 0.001...9999.999.

See the following table for the equations used in the flow calculations and the typical K-values according to the fan manufacturer.

Selection in the Manufacturer menu	Equation	Equation unit	Typical K-value range
Fläkt Woods	$q = \frac{1}{k}\sqrt{\Delta P}$	m^3/s	0.3...99
Rosenberg	$q = k\sqrt{\frac{2\Delta P}{\rho}}$	m^3/h	37...800
Nicotra	$q = k\sqrt{\Delta P}$	m^3/h	50...5300
Comefri	$q = k\sqrt{\frac{2\Delta P}{\rho}}$	m^3/h	10...2000
Ziehl	$q = k\sqrt{\Delta P}$	m^3/h	10...1500
Ebm-Papst	$q = k\sqrt{\Delta P}$	m^3/h	10...1500
Gebhardt	$q = k\sqrt{\frac{2\Delta P}{\rho}}$	m^3/h	50...4700
Common probe	$q = k\sqrt{\Delta P}$	Selectable, m^3/h as a default	0.001...9999.000

q	airflow
k	K-value
ΔP	differential pressure
ρ	air density

4.5.5 The Press. unit menu

You can select the pressure unit for the display in this menu.

Note: Pascal (Pa) is the base unit for measurement. You can select some other unit to show on the display. The values for these other units are converted from pascals.

Name	Values	Default	Description
Press. unit	*Pa, psi, "WC, mmWC, mbar, kPa*	*Pa*	Measurement unit shown on the display.

4.5.6 The Flow unit menu

You can select the airflow unit for the display in this menu.

Name	Values	Default	Description
Flow unit	*m3/s, l/s, cfm, m3/h, m/s, f/min*	*m3/s*	Measurement unit shown on the display. Air volume flow: *m3/s, l/s, cfm, m3/h* Air velocity: *m/s, ft/min*. Available, if you selected *Common probe* in the *Manufacturer* menu and *m/s* or *f/min* in the *Formula unit* menu.

4.5.7 The Address menu

You can select the Modbus address in the *Address* menu.

Name	Values	Default	Description
Address	1...247	1	Modbus address for the device.

4.5.8 The Baud rate menu

You can select the Modbus speed in the *Baud rate* menu.

Name	Values	Default	Description
Baud rate	*9600 / 19200 / 38400*	*9600*	Modbus speed (bits/s).

4.5.9 The Parity bit menu

You can select the Modbus parity in the *Parity bit* menu.

Name	Values	Default	Description
Parity bit	*none / odd / even*	*none*	Bus parity.

4.5.10 The Response time menu

You can select the measurement response time in the *Response time* menu. Response time is the time it takes for the output signal to reach 63 % of the final value after a change in differential pressure. This time period is also known as T_{63}.

Name	Values	Default	Description
Response time	1...20 s	*4 s*	Measurement response time in seconds.

4.5.11 The Sensor 1 and Sensor 2 menus

This transmitter has two inputs for external temperature sensors and other devices. You can select the input type for the external device connected to *Input 1* connector in the *Sensor 1* menu. You can select the input type for the external device connected to *Input 2* connector in the *Sensor 2* menu.

Name	Values	Default	Description
Sensor 1	*none, vinput, PT1000, NI1000, NI1000LG, NTC10K*	*none*	Input type for device connected to *Input 1* connector. Select *none* if you do not connect any devices to *Input 1* connector. Select *vinput* to connect voltage input to *Input 1* connector.
Sensor 2	*none, vinput, PT1000, NI1000, NI1000LG, NTC10K*	*none*	Input type for device connected to *Input 2* connector. Select *none* if you do not connect any devices to *Input 2* connector. Select *vinput* to connect voltage input to *Input 2* connector.

Also set the jumpers for the inputs to match the input types you selected in this menu. See section Input settings on page 6 for instructions.

4.5.12 The Exit menu view

Navigate to the *EXIT MENU* view and press the *SELECT* button to save the settings and exit the menu.

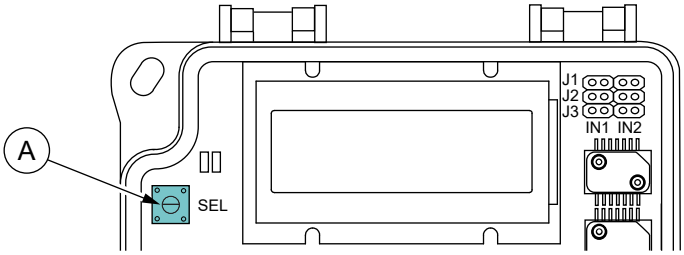
5 Maintenance

5.1 Manual zeroing

Note: The zero point will drift over time. Zero point drifting can cause problems depending on the application. In high-accuracy applications, reset the zero point every 6 months.

You can reset the zero point manually by using the *SELECT* button on the circuit board. You can also reset the zero point via Modbus communication.

1. Disconnect all pressure measurement hoses from the device.
2. Push the *SELECT* button for 2 seconds to open the menu.
   The first menu item is *Zero sensors*.



A. *SELECT* button

3. While *Zero sensors* is shown on the display, push the *SELECT* button to start zeroing.
   Text *Zeroing...* appears on the display.
4. Wait until the *Zeroing...* text disappears from the display.
5. Connect the pressure measurement hoses to the device (+ high pressure, – low pressure).
   See section Connecting the measurement hoses on page 8 for instructions.

6 Modbus

This device has an RS-485 connection for Modbus RTU communication.

Note: Modbus communication settings must be configured in the device menu before you can access the Modbus registers via bus.

6.1 Modbus properties

Protocol	RS-485 Modbus RTU
Bus speed	*9600/19200/38400 bit/s
Data bits	8
Parity	*none/odd/even
Stop bits	1
Modbus ID	*1
Unit load	1/8 UL
	* factory setting

6.2 Modbus function codes

This device supports the following Modbus function codes.

Decimal	Hexadec-imal	Function
1	0x01	Read Coils
2	0x02	Read Discrete Inputs
3	0x03	Read Holding Registers
4	0x04	Read Input Registers
5	0x05	Write Single Coil
6	0x06	Write Single Register

6.3 Modbus registers

Note: If you try to write a parameter value that is beyond the parameter value range, the value will be replaced by the nearest acceptable value.

6.3.1 Coils

Register	Parameter description	Data type	Values	Range	Default
0	Measurement zeroing	Bit	*0 - 1*	0. Off 1. On	*0*

6.3.2 Discrete inputs

Register	Parameter description	Data type	Values	Range
0	Digital input 1 status	Bit	*0 - 1*	0. Off 1. On
1	Digital input 2 status		*0 - 1*	0. Off 1. On

6.3.3 Input registers

Register	Parameter description	Data type	Values	Range
0	Program version	U16	*0...9900*	0.00...99.00
1	Pressure measurement value from pressure connection A	S16	*-700...7000*	-700...7000 Pa
2	Pressure measurement value from pressure connection B	S16	*-250...2500*	-250...2500 Pa
3	Input 1 measurement value (0...10 V)	U16	*0...1000*	0...10.00 V
4	Input 1 measurement value (Pt1000)	S16	*-500...500*	-50.0....50.0 °C
5	Input 1 measurement value (Ni1000)	S16	*-500...500*	-50.0....50.0 °C
6	Input 1 measurement value (Ni1000-LG)	S16	*-500...500*	-50.0....50.0 °C
7	Input 1 measurement value (NTC 10)	S16	*-500...500*	-50.0....50.0 °C
8	Input 2 measurement value (0...10 V)	U16	*0...1000*	0...10.00 V
9	Input 2 measurement value (Pt1000)	S16	*-500...500*	-50.0....50.0 °C
10	Input 2 measurement value (Ni1000)	S16	*-500...500*	-50.0....50.0 °C
11	Input 2 measurement value (Ni1000-LG)	S16	*-500...500*	-50.0....50.0 °C
12	Input 2 measurement value (NTC 10)	S16	*-500...500*	-50.0....50.0 °C
13	Flow rate measurement value (m^3/s)		*0...10000*	0...100 m^3/s
14	Flow rate measurement value (m^3/h)		*0...30000*	0...30000 m^3/h
15	Flow rate measurement value (cfm)		*0...30000*	0...30000 cfm
16	Flow rate measurement value (l/s)		*0...3000*	0...3000 l/s
17	Air velocity measurement value (m/s)		*0...1000*	0...100.0 m/s
18	Air velocity measurement value (ft/min)		*0...5000*	0...5000 ft/min

6.3.4 Holding registers

Register	Parameter description	Data type	Values	Range	Default
0	Fan manufacturer	U16	*0 - 1 - 2 ... - 7*	0. Fläkt Woods 1. Rosenberg 2. Nicotra 3. Comefri 4. Ziehl 5. Ebm-Papst 6. Gebhardt 7. Common probe	*0*
1	Formula unit	U16	*0 - 1 - 2 ... - 5*	0. m^3/s 1. m^3/h 2. cfm 3. l/s 4. m/s 5. f/min	*0*
2	K-value, integer part	U16	*0...9999*	0...9999	*1*
3	K-value, decimal part	U16	*0...999*	0...999	*0*
4	Response time	U16	*0 - 1 - 2 ... - 20*	1...20 s	*4*

7 Disposal

This device is considered as electrical and electronic equipment for disposal in terms of the applicable European Directive. At the end of life, the product must enter the recycling system at an appropriate collection point.

- The device must be disposed through channels provided for this purpose.
- The disposal must be completed according to the local and currently applicable laws and regulations.

Generally all metals can be recycled as material. Plastics and cardboard packaging material can be used in energy recovery. Printed circuit boards need selective treatment according to IEC 62635 guidelines. To aid recycling, plastic parts are marked with an appropriate identification code. Contact your local Produal distributor for further information on environmental aspects and recycling instructions for professional recyclers.