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USER GUIDE

DPT-Flow-MOD

Produal

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PRODUAL

PART OF BEMSIQ GROUP

DPT-Flow-MOD Modbus airflow transmitter

USER GUIDE

This user guide is for software version 1.5.

Made in Finland

5 years warranty

MANAGEMENT SYSTEM CERTIFICATION DNV ISO 9001 · ISO 14001 Finland

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1 Introduction

The DPT-Flow-MOD Modbus airflow transmitter is a multifunctional transmitter for measuring airflow volume, air velocity, differential pressure, and static pressure. It has two functions for airflow measurement. You can either monitor airflow across a centrifugal fan, or connect an airflow volume probe to the transmitter to monitor airflow volume in a ventilation duct. You can use this transmitter with the FloXact airflow volume probe and other airflow probes, pitot tube, or air dampers.

This airflow 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, four airflow volume units and two air velocity units for the display. The backlit display can show the measured pressure and airflow volume or air velocity at the same time.

The following options are available:

- Automatic zeroing (-AZ models)
- Cold resistance up to -40 °C (-40C models)

The -AZ models adjust the zero point automatically and do not require manual zeroing.

The -40C models are designed for very cold environments up to -40 °C. A heating element warms the transmitter in subzero temperatures.

Commissioning the device is simple. You can configure measurement settings and response time using the device menu or via Modbus communication. You can configure the Modbus settings and display settings 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-Flow-MOD airflow transmitters are intended to be used for measuring airflow volume, air velocity, static pressure, or differential pressure in commercial environments.

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

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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 of the product or parts of the 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.

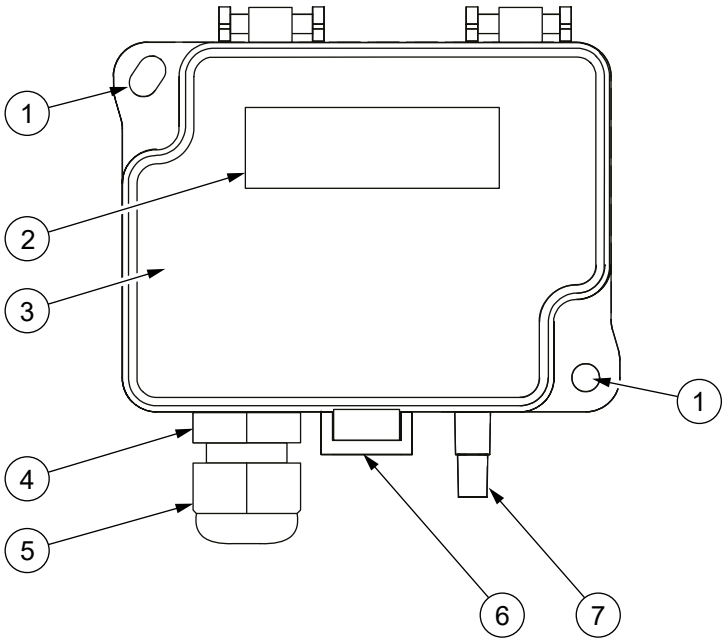
The product should only be used in professionally designed applications. Unauthorised modifications are not allowed. The product must not be used in relation to any equipment that in case of a failure may threaten, directly or indirectly, human health or life or result in danger to human beings, animals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

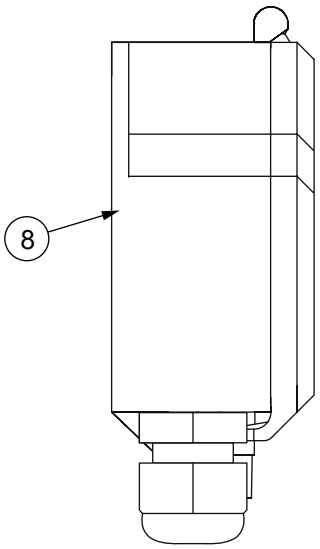
In this document, there are different warnings and notes. The warning and note types are defined in the following table.

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.

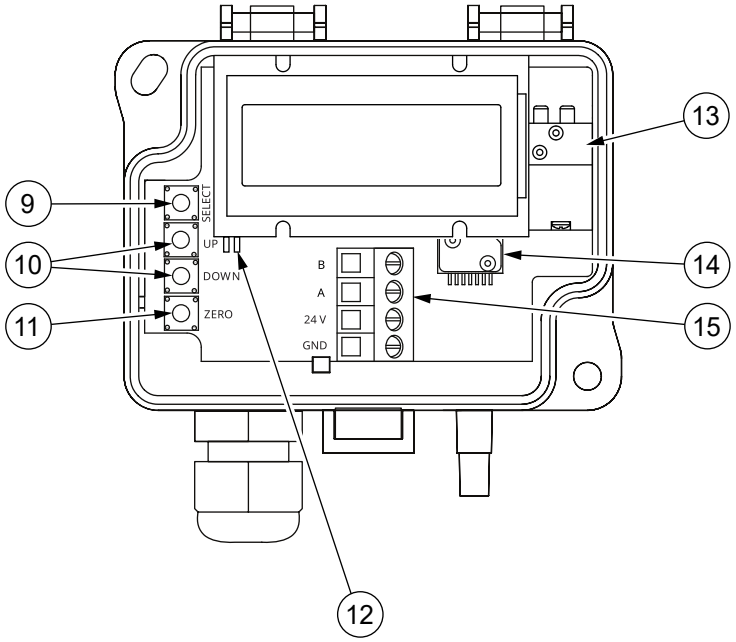
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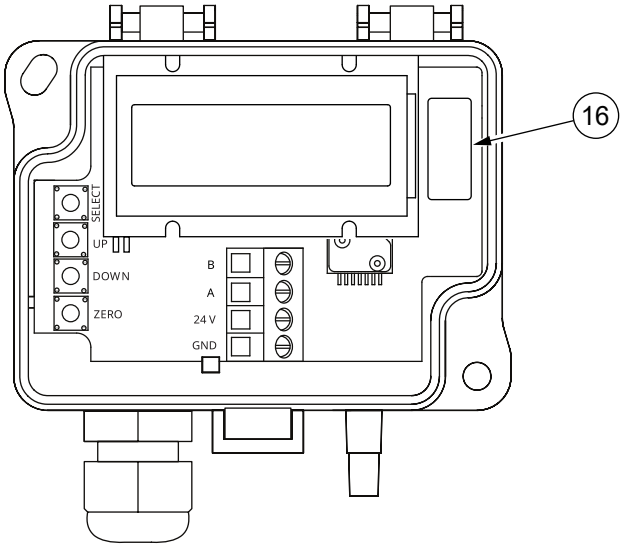
3 Main components





1	Mounting point	2	Display
3	Cover	4	Cable gland
5	Strain relief	6	Cover latch
7	Pressure connection (+ high pressure / - low pressure)	8	Housing





9	Menu button (*SELECT*)	10	Menu navigation buttons
11	Zeroing button	12	Zeroing indicator light
13	Automatic zeroing module (-AZ models)	14	Pressure sensor
15	Terminal block	16	Heating element (-40C models)

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4 Commissioning

4.1 Mounting

WARNING: Handle the product with care. Dropping the product can damage it internally and cause unwanted functions in the connected system.

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

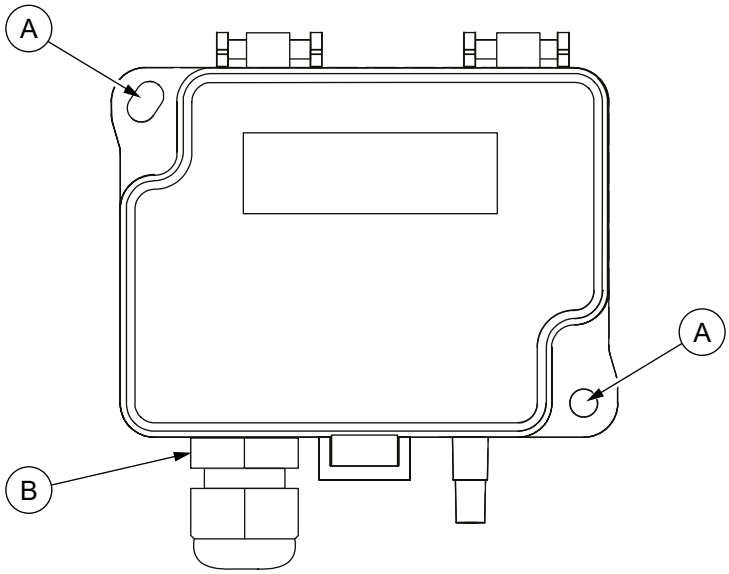
Important: Only install this device in a location where the ambient conditions meet the operating condition requirements.

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

Operating conditions

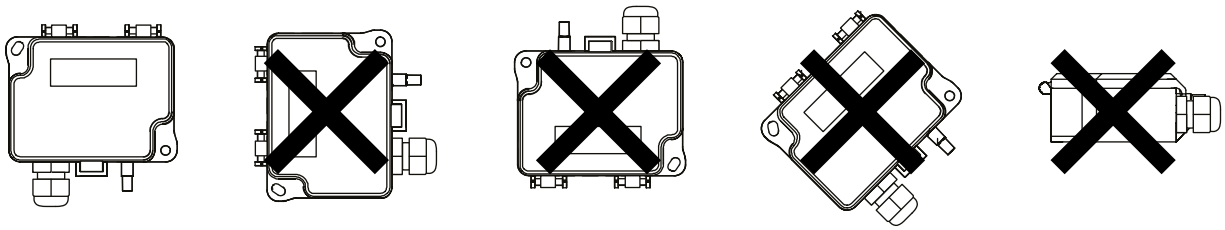
Ambient temperature	-20...50 °C
Ambient temperature (-AZ models)	-5...50 °C
Ambient temperature (-40C models)	-40...50 °C
Ambient humidity	0...95 %rH (non-condensing)

1. Check that the product is not damaged during transportation.
2. Select the mounting position.
   Mount the device on a wall or other flat, 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 4.0 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.

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

4.2 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.

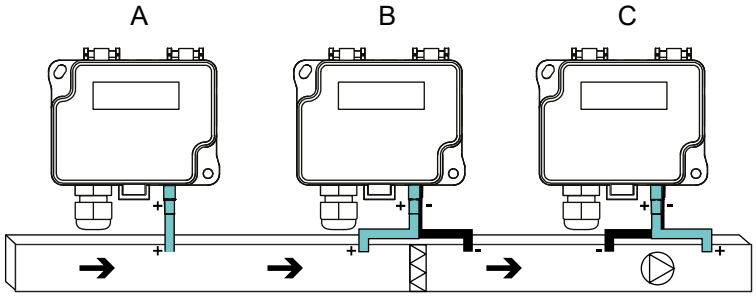
Airflow monitoring

To monitor airflow volume in a ventilation duct, connect the pressure measurement hoses to a FloXact airflow volume probe or other flow measurement probe according to probe manufacturer's installation instructions.

To monitor airflow volume across a centrifugal fan, connect the pressure measurement hoses to the measurement ports specified by the fan manufacturer.

Pressure monitoring

To monitor 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.



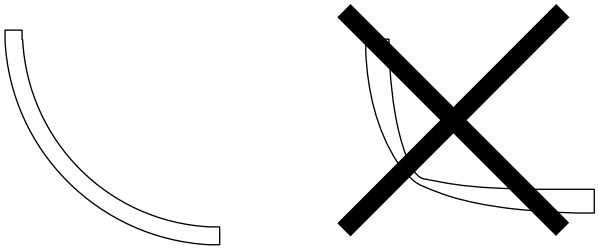
A. Static pressure
B. Filter/damper monitoring
C. Fan/blower monitoring

- 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.



4.3 Wiring

WARNING: Only connect wires and commission the device if you are qualified for electrical work and familiar with building automation products. Risk of electric shock and damage to the device.

WARNING: Always commission the device in a de-energised electricity network. Risk of electric shock.

WARNING: Connect this device to SELV (separated extra low voltage) electricity network only. This device is an appliance class III product according to IEC 60664-1.

CAUTION: Use single-stranded wires if possible. If you use multi-stranded wires, always install wire end sleeves to the wires to prevent short circuits and ensure secure attachment.

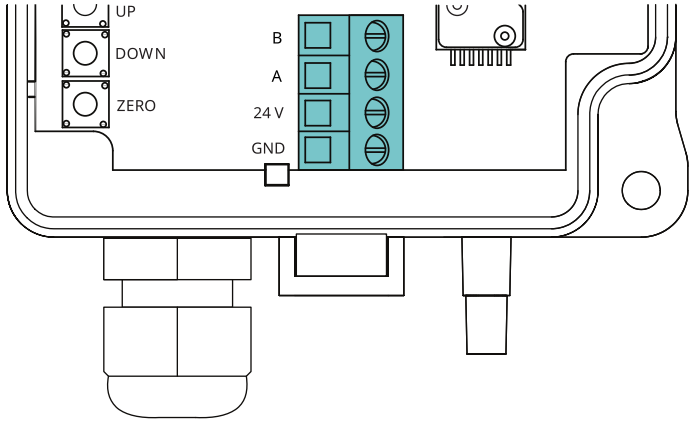
Important: For CE and UKCA compliance, use correctly grounded, shielded cable.

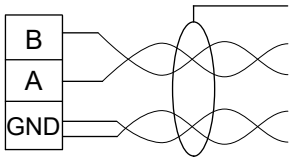
Note: Use a shielded twisted-pair cable for Modbus cabling. Connect the shield to earth at only one point to prevent ground loops and noise. The shield is usually connected to earth at the end of the main cable.

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.

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4. Connect the wires to the terminal block according to the table below.



B- *A+*		Modbus RTU (RS-485)
24V	Power supply, 24 Vac/dc	
GND	Power supply, 0 V	

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.

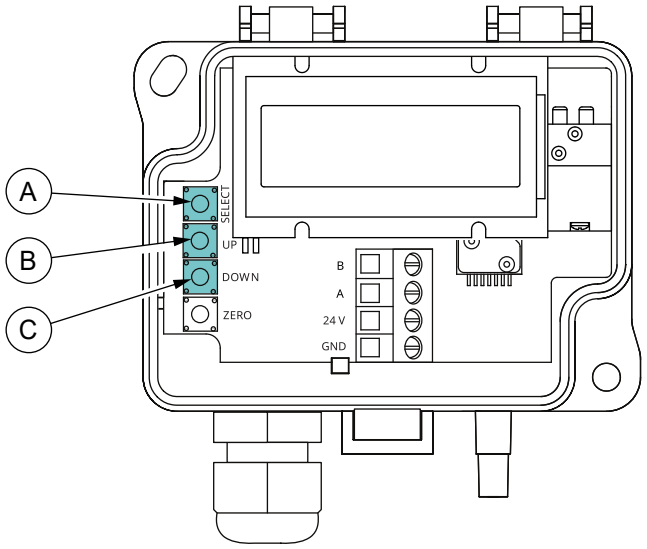
4.4 Operation in subzero temperatures (-40C models)

Note: When the operating temperature is below 0 °C, power consumption increases.

All -40C models have a heating element that warms the transmitter to keep it fully functional in very cold environments.

If you start the -40C model in subzero temperatures, keep the cover closed and let the display warm up for 15 minutes. The display operates correctly after the warm-up period.

4.5 Configuring settings using the device menu



A. Open device menu / select parameter / confirm parameter value (*SELECT* button)
B. Scroll up / change parameter value (*UP* button)
C. Scroll down / change parameter value (*DOWN* button)

1. Open the cover.

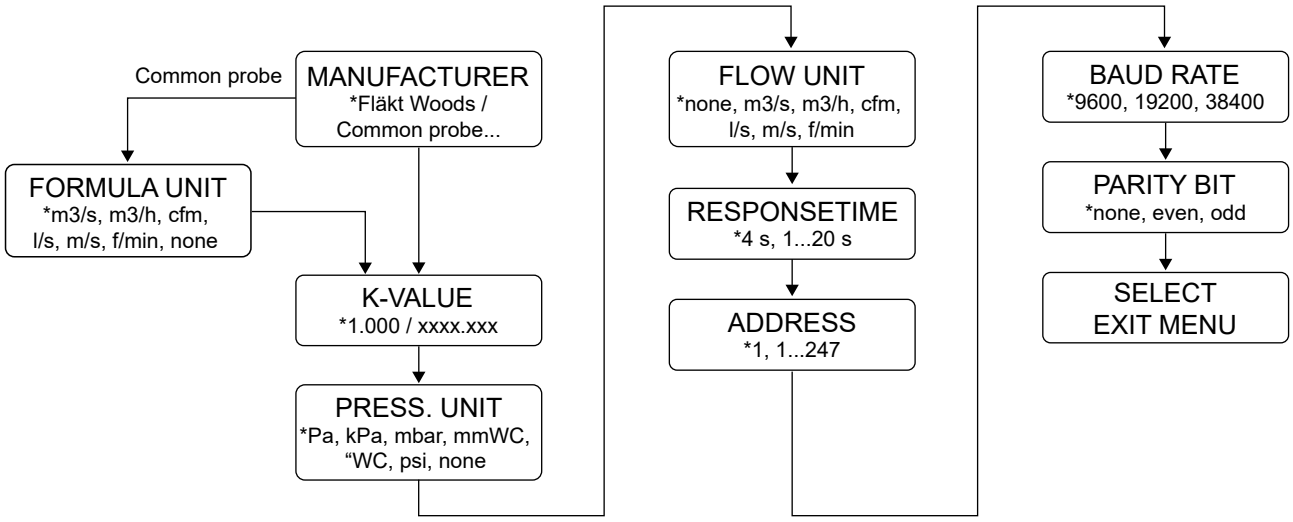
   CAUTION: Be very careful if you touch the device when the power supply is connected and the cover is open.

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 (*).



4.5.2 The Manufacturer menu

Select the manufacturer in the *MANUFACTURER* menu if you connect the DPT-Flow-MOD transmitter to a fan with pressure measurement points. Select *Common probe* if you use the DPT-Flow-MOD transmitter with FloXact airflow volume probe 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 (for example, 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.

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

Name	Values	Default	Description
Formula unit	*m3/s, m3/h, cfm, l/s, m/s, f/min, none*	*m3/s*	Formula unit used in calculation formula. Airflow volume units: *m3/s, m3/h, cfm, l/s*. Air velocity units: *m/s, f/min*. If you select *none*, the transmitter operates only as a pressure transmitter and flow measurement values are not shown on the display.

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.

Manufacturer menu selection	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 the default	0.001...9999.999

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. You can also hide pressure measurement from the display.

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 / kPa / mbar / mmWC / "WC / psi / none*	*Pa*	Measurement unit shown on the display. If you select *none*, pressure is not shown on the display.

4.5.6 The Flow unit menu

You can select the airflow unit for the display in this menu. Airflow measurement value is hidden from the display by default. If you select a flow unit instead of the default setting, airflow measurement value is shown on the display.

Name	Values	Default	Description
Flow unit	*m3/s, m3/h, cfm, l/s, m/s, f/min, none*	*none*	Measurement unit shown on the display. If you select *none*, airflow is not shown on the display. Airflow volume units: *m3/s, m3/h, cfm, l/s* Air velocity units: *m/s, ft/min*.

If you selected *Common probe* in the *MANUFACTURER* menu, the flow unit shown in this menu by default is the same unit you selected in the *FORMULA UNIT* menu.

4.5.7 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.

4.5.8 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.

4.5.9 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).

4.5.10 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.

4.5.11 The Exit menu view

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

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5 Maintenance

5.1 Automatic zeroing

The -AZ models include an automatic zeroing function, which adjusts the transmitter zero point every 10 minutes. Automatic zeroing removes zero point drifting that can occur due to thermal, electronic or mechanical effects. As a result, it is not necessary to calibrate the transmitter zero point manually.

The zeroing process takes approximately 5 seconds. During the zeroing process, the output and display values are locked to the latest measured values to avoid conflict with the building management system. A red indicator light comes on when zeroing starts. When the zeroing process is completed, the device returns to its normal operation mode.

5.2 Manual zeroing

Note: If the device does not have automatic zeroing, the zero point will drift over time. Zero point drifting can cause problems depending on the application. In high-accuracy applications, use devices with automatic zeroing or reset the zero point manually every 6 months.

You can reset the zero point manually by using the zeroing button on the circuit board. Manual zeroing is not necessary for the -AZ models.

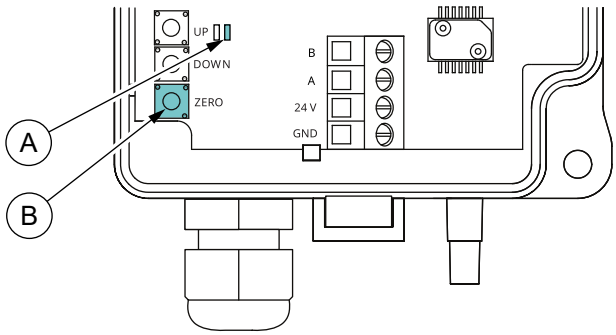
You can also reset the zero point via Modbus communication. If you reset the zero point via Modbus communication, make sure that there is no pressure in the measurement hoses during zeroing.

Note: Supply power must be on for one hour before zeroing.

1. Disconnect both pressure measurement hoses from the device.
2. Open the cover.

   CAUTION: Be very careful if you touch the device when the power supply is connected and the cover is open.
3. Push the zeroing button until the red indicator light comes on.

   Text *Zeroing...* appears on the display.



A. Indicator light
B. Zeroing button

4. Wait until the red indicator light goes off.
5. Connect the pressure measurement hoses to the device (+ high pressure, – low pressure).

   See section Connecting the measurement hoses on page 7 for instructions.

6 Modbus

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	1/4 UL
	* factory setting

Important: This device writes the Modbus register values to non-volatile memory unless otherwise specified in this document. The non-volatile memory durability is 100000 write cycles.

6.2 Modbus function codes

The device supports the following Modbus function codes.

Decimal	Hexadec-imal	Function
1	0x01	Read Coils
3	0x03	Read Holding Registers
4	0x04	Read Input Registers
5	0x05	Write Single Coil
6	0x06	Write Single Register
16	0x10	Write Multiple Registers

6.3 Modbus registers

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 Input registers

Register	Parameter description	Data type	Values	Range
0	Program version	U16	*0...9900*	0.00...99.00

Register	Parameter description	Data type	Values	Range
1	Pressure measurement value (Pa)	S16	*-250...2500 / -700...7000*	• -250...2500 Pa (-2500 models) • -700...7000 Pa (-7000 models)
2	Airflow volume measurement value (m^3/s)	U16	*0...10000*	0...10000 m^3/s
3	Airflow volume measurement value (m^3/h)	U16	*0...30000*	0...30000 m^3/h
4	Airflow volume measurement value (cfm)	U16	*0...30000*	0...30000 cfm
5	Airflow volume measurement value (l/s)	U16	*0...3000*	0...3000 l/s
6	Air velocity measurement value (m/s)	U16	*0...1000*	0...1000 m/s
7	Air velocity measurement value (f/min)	U16	*0...5000*	0...5000 f/min

6.3.3 Holding registers

Register	Parameter description	Data type	Values	Range	Default
0	Fan manufacturer	U16	*0 - 1 - 2 - 3 - 4 - 5 - 6 - 7 - 8*	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 - 3 - 4 - 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*

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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.



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