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USER GUIDE

DPT-Ctrl-MOD

Produal

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DPT-Ctrl-MOD Modbus differential pressure or airflow controller

User Guide

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measure-be sure.

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1 Safety precautions

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

Read this user guide carefully before commissioning, using or servicing this device. To avoid any kind of damage to people or property, follow the instructions carefully. Produal is not liable for any hazards or damages to people or property which are caused by ignoring the using or installation instructions.

To avoid electrical shock or damage to equipment, disconnect power before installing or servicing the product. Use only a proper wiring rated for the full operating voltage and maximum current in the system even in the event of a fault.

The product condition must be checked before installation. Do not drop the product or use excessive force during installation. Do not use the product if any damages are visible.

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 kind of 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.

1.1 Intended use

DPT-Ctrl-MOD differential pressure or airflow controllers are intended to be used to measure and control differential pressure and air flow in ventilation ducts.

These transmitters are intended to be connected to building automation systems in the HVAC/R industry.

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2 Commissioning

2.1 Mounting the product

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

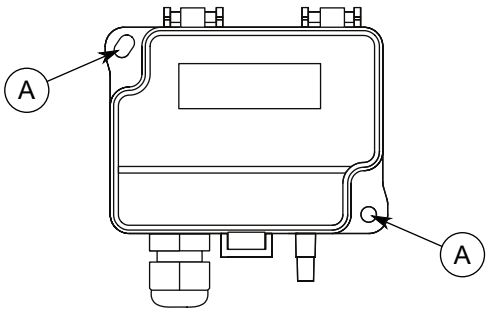
1. Check that the product is not damaged during transportation.
2. Select the mounting location.

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.

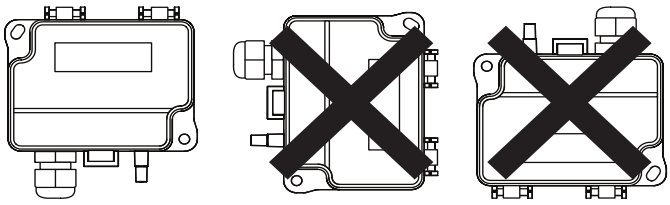
Operating conditions	
Temperature	-20...50 °C
Humidity	0...95 %rH (non condensing)

3. Mount the product on flat surface using the mounting points.



A. Mounting point

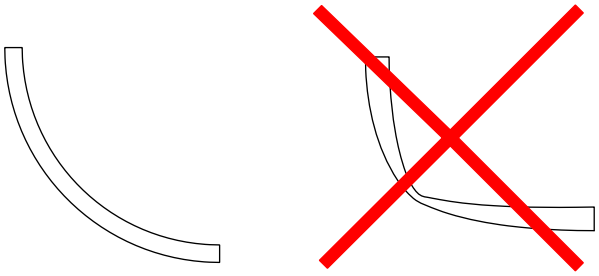
Mounting orientation:



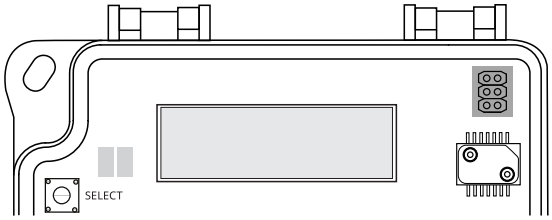
Select the mounting screws according to the mounting surface. The maximum screw diameter is 4.3 mm.

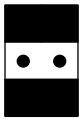
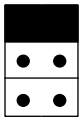
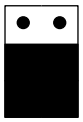
Important: Don't use excessive force when tightening the mounting screws.

4. Install the measuring hoses carefully so that the hoses don't bend too tightly.
Too tight curves may prevent the air flow to the sensor.



2.2 Input settings

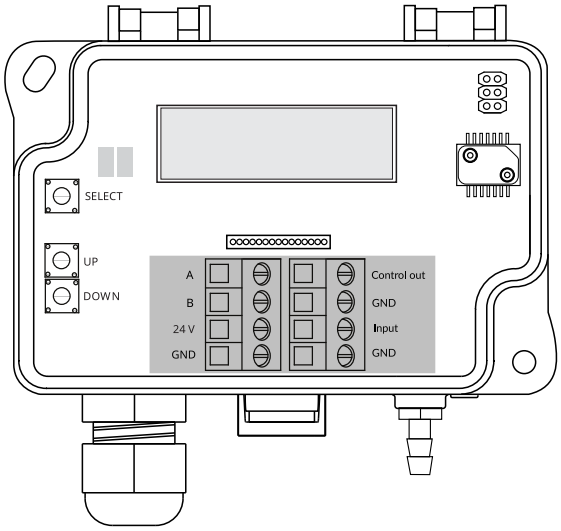


	*NTC 10K or digital input
	Pt1000, NI1000 or NI1000-LG input
	0...10 Vdc input
	* factory default

Note: The input setting must also be set via device menu.

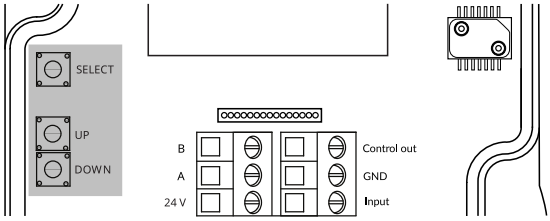
See more information about menu settings from the chapter Input menu on page 9.

2.3 Wiring



A	Modbus RTU (RS-485)
B	
24V	24 Vac/dc supply
GND	0 V
Control out	Control output, 0...10 Vdc
GND	0 V
Input	Input, 0...10 Vdc, NTC 10K, Pt1000, Ni1000, Ni1000-LG or DI
GND	0 V

2.4 Configuring settings via device menu



1. Press the *SELECT* button for two seconds to activate device menu.
2. Use *UP* and *DOWN* buttons to navigate to *Control unit* menu.
3. Press the *SELECT* button to activate a *Control unit* menu.
4. Use *UP* and *DOWN* buttons to select control mode.
   - Select *Pressure* to control pressure.
   - Select *Flow* to control air flow.
5. Press the *SELECT* button to accept the *Control unit* setting.
6. Use *UP* and *DOWN* buttons to navigate in the device menu.
   See the available settings in menus from the following chapters.
7. Press the *SELECT* button to activate a sub menu.
8. Press *UP* and *DOWN* buttons to select a value.
9. Press the *SELECT* button to accept the setting.
10. Navigate to *Exit menu* view and press *SELECT* button to save settings and exit the menu.

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

2.4.1 Available settings for pressure control

2.4.1.1 Press unit menu

The display and output pressure unit is selected in *Press unit* menu

The following units are available:

- *Pa*
- *kPa*
- *NONE*
- *psi*
- *mbar*
- *"WC*
- *mmWC*

2.4.1.2 Response time menu

The measurement response time is selected via *Response time* menu. The response time range is 1.0...20.0 s and the default value is 4 s.

2.4.1.3 Ref Pres SP1 menu

The controller setpoint is selected in *Ref Pres SP1* menu. The value can be adjusted by 1 Pa steps.

2.4.1.4 Ref Pres SP2 menu

Note: This value is only available if *BIN IN* is selected in *Input* menu.

The second controller setpoint is selected in *Ref Pres SP2* menu. The value can be adjusted by 1 Pa steps.

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2.4.1.5 P-value menu

The controller proportional gain is selected in *P-value* menu. The value can be adjusted by one unit steps.

2.4.1.6 I-value menu

The controller integral gain is selected in *I-value* menu. The value can be adjusted by 0.01 unit steps.

2.4.1.7 D-value menu

The controller derivative gain is selected in *D-value* menu. The value can be adjusted by 0.01 unit steps.

2.4.2 Available settings for flow control

2.4.2.1 Manufacturer menu

Menu selection	Calculation equation	Description
Fläkt Woods	$q = \frac{1}{k}\sqrt{\Delta P}$	Select the fan manufacturer when connecting the device to a fan with pressure measurement points.
Rosenberg	$q = k\sqrt{\frac{2\Delta P}{\rho}}$	
Nicotra-Gebh	$q = k\sqrt{\frac{2\Delta P}{\rho}}$	
Comefri	$q = k\sqrt{\frac{2\Delta P}{\rho}}$	
Ziehl	$q = k\sqrt{\Delta P}$	
Ebm-Papst	$q = k\sqrt{\Delta P}$	
Gebhardt	$q = k\sqrt{\frac{2\Delta P}{\rho}}$	
Nicotra	$q = k\sqrt{\Delta P}$	
Common probe	$q = k\sqrt{\Delta P}$	Select this when connecting the device to a common measurement probe.

2.4.2.2 Formula unit menu

Formula unit menu is available if *Common probe* is selected in *Manufacturer* menu. The measurement unit used in the probe formula is selected in this menu.

The following units are available:

- *m3/h*
- *m3/s*
- *NONE*
- *f/min*
- *m/s*
- *l/s*
- *cfm*

2.4.2.3 K-Value menu

Each fan and measuring probe has a specific K-value. The K-value is selected via *K-Value* menu. See the manufacturer specification for the correct value.

See the following table for the equations used in flow calculations and 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-Gebh	$q = k\sqrt{\frac{2\Delta P}{\rho}}$	m^3/h	50...4700
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
Nicotra	$q = k\sqrt{\Delta P}$	m^3/h	50...5300
Common probe	$q = k\sqrt{\Delta P}$	Selectable, m^3/h as a default	0.001...9999.000

q	aif flow
k	K-value
ΔP	differential pressure
ρ	air density

2.4.2.4 Flow unit menu

The display and output flow unit is selected in *Flow unit* menu

The following units are available:

- *m3/h*
- *m3/s*
- *NONE*
- *l/s*
- *cfm*

2.4.2.5 Response time menu

The measurement response time is selected via *Response time* menu. The response time range is 1.0...20.0 s and the default value is 4 s.

2.4.2.6 Ref flow SP1 menu

The controller setpoint is selected in *Ref flow SP1* menu. The adjustment range depends on the selected flow unit.

2.4.2.7 Ref flow SP2 menu

Note: This value is only available if *BIN IN* is selected in *Input* menu.

The second controller setpoint is selected in *Ref flow SP2* menu. The adjustment range depends on the selected flow unit.

2.4.2.8 P-value menu

The controller proportional gain is selected in *P-value* menu. The value can be adjusted by one unit steps.

2.4.2.9 I-value menu

The controller integral gain is selected in *I-value* menu. The value can be adjusted by 0.01 unit steps.

2.4.2.10 D-value menu

The controller derivative gain is selected in *D-value* menu. The value can be adjusted by 0.01 unit steps.

2.4.3 Input menu

The input type is selected in *Input* menu. The input accuracy is ±0.5 % of the value.

Available types are:

- 0...10 V
- NTC 10K
- Pt1000
- Ni1000
- Ni1000-LG
- *BIN IN* (digital input)

Note: The jumper settings must be set according to the selected input setting.

See more information about input jumper settings from the chapter Input settings on page 5.

2.4.4 Temp comp menu

The device includes an external temperature compensation function that can be enabled from *Temp comp* menu. When the function is activated and an outdoor temperature sensor is connected, the effective set point of the device will be adjusted to compensate the cold temperature. This may result in energy savings.

If temperature compensation is enabled, the device will linearly decrease the control setpoint (pressure or flow) from 0 % to *TC DROP* value starting at *TC START TE* temperature and stopping to *TC STOP TE* temperature.

The starting and stopping temperature difference must be at least 5 °C. The starting temperature must be higher than the stopping temperature.

Menu item	Available value	Description
Temp comp	*Off / On*	*Off* Temperature compensation off. *On* Temperature compensation on.
TC START TE	*-45...50 °C*	Temperature compensation starting temperature.
TC STOP TE	*-50...45 °C*	Temperature compensation stopping temperature.
TC DROP %	*0...100 %*	Maximum dropping rate.

2.4.5 Fixed output menu

The control output can be fixed to a constant value through *Fixed output* menu. Primary purpose of this functionality is to enable the adjustment of air valves and terminals without affecting the duct pressure or air flow. The function can be also used in troubleshooting the installation.

The function can also be controlled via Modbus.

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Menu item	Available value	Description
Fixed output	*Off / On*	*Off* Fixed output off. *On* Fixed output on.
Fixed	*0...100 %*	Fixed output value.

2.4.6 Available settings for Modbus

2.4.6.1 Address menu

Modbus address is selected via *Address* menu. Address range is 1...247.

2.4.6.2 Baud rate menu

Modbus speed is selected via *Baud rate* menu. The bus speed can be 9600, 19200, 38400 or 57600 bits/s.

2.4.6.3 Parity bit menu

Modbus parity is selected via *Parity bit* menu. The bus parity can be *none*, *odd* or *even*.

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3 Maintenance

3.1 Zeroing

The possible zero point drifting can be eliminated by using the zeroing button on the circuit board.

Note: Supply voltage must have been connected for one hour prior the zeroing.

Note: Zeroing can also be done via Modbus register. Make sure that there is no pressure in the duct when zeroing via Modbus register.

1. Disconnect both pressure measurement hoses.
2. Push *SELECT* button for two seconds.
3. Push *SELECT* button to select *Zero sensor*.
   Zeroing starts. The zeroing is complete when the indicator light turns off.
4. Connect the pressure measurement hoses.

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4 Modbus

4.1 Modbus properties

Protocol	RS-485 Modbus RTU
Bus speed	9600*/19200/38400/57600 bit/s
Data bits	8
Parity	none*/odd/even
Stop bits	1
Modbus ID	1*
Unit load	1/4 UL
	* factory setting

4.2 Modbus function codes

The device supports the following Modbus function codes.

Decimal	Hexa-decimal	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

4.3 Modbus registers

4.3.1 Coils

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

4.3.2 Discrete inputs

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

4.3.3 Input registers

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

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Register	Parameter description	Data type	Values	Range
1	Pressure measurement value	S16	*-250...2500 / -700...7000*	• -250...2500 Pa (-2500 models) • -700...7000 Pa (-7000 models)
2	Input value (0...10 V)	U16	*0...100*	0...100 %
3	Input value (Pt1000)	S16	*-500...500*	-50.0....50.0 °C
4	Input value (Ni1000)	S16	*-500...500*	-50.0....50.0 °C
5	Input value (Ni1000-LG)	S16	*-500...500*	-50.0....50.0 °C
6	Input value (NTC 10K)	S16	*-500...500*	-50.0....50.0 °C
7	Flow value (m^3/s)	U16	*0...10000*	0...100.00 m^3/s
8	Flow value (m^3/h)	U16	*0...30000*	0...30000 m^3/h
9	Flow value (cfm)	U16	*0...30000*	0...30000 cfm
10	Flow value (l/s)	U16	*0...3000*	0...3000 l/s
11	Velocity value (m/s)	U16	*0...1000*	0...100.0 m/s
12	Velocity value (f/min)	U16	*0...5000*	0...5000 f/min

4.3.4 Holding registers

Register	Parameter description	Data type	Values	Range	Default
0	Fan manufacturer	U16	*0 - 1 - 2 ... - 8*	0. Fläkt Woods 1. Rosenberg 2. Nicotra-Gebhardt 3. Comefri 4. Ziehl 5. ebm-papst 6. Gebhardt 7. Nicotra 8. 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	*0*
3	K-value, decimal part	U16	*0...999*	0...999	*0*
4	Response time	U16	*0 - 1 - 2 … - 20*	0 = 0.4 s, 1...20 s	*4*
5	Control mode	U16	*0 - 1*	0. Pressure control 1. Flow control	*0*
6	Pressure control setpoint	S16	*-250...2500 / -700...7000*	• -250...2500 Pa (-2500 models) • -700...7000 Pa (-7000 models)	*0*
7	Flow control setpoint, integer part	U16	*0...30000*	0...30000	*0*
8	Flow control setpoint, decimal part	U16	*0...999*	0...999	*0*
9	Proportional band	U16	*0...10000*	0...10000	*0*
10	Integration value, integer part	U16	*0...1000*	0...1000	*0*

Register	Parameter description	Data type	Values	Range	Default
11	Integration value, decimal part	U16	*0...99*	0...99	*0*
12	Derivation value, integer part	U16	*0...1000*	0...1000	*0*
13	Derivation value, decimal part	U16	*0...99*	0...99	*0*
14	Override value	U16	*0...100*	0...100 %	*0*
15	Override status	U16	*0 - 1*	0. Override off 1. Override on	*0*
16	Temperature compensation, status	U16	*0 - 1*	0. Compensation off 1. Compensation on	*0*
17	Temperature compensation, starting temperature	S16	*-45...50*	-45...50 °C	*0*
18	Temperature compensation, stopping temperature	S16	*-50...45*	-50...45 °C	*0*
19	Temperature compensation, drop rate, integer part	U16	*0...99*	0...99 %	*0*
20	Temperature compensation, drop rate, decimal part	U16	*0...999*	0.0...0.999 %	*0*
21	Pressure control setpoint 1	S16	*-250...2500 / -700...7000*	• -250...2500 Pa (-2500 models) • -700...7000 Pa (-7000 models)	*2500 / 7000*
22	Pressure control setpoint 2	S16	*-250...2500 / -700...7000*	• -250...2500 Pa (-2500 models) • -700...7000 Pa (-7000 models)	*0*
23	Flow control setpoint 1, integer part	U16	*0...30000*	0...30000	*0*
24	Flow control setpoint 1, decimal part	U16	*0...999*	0...999	*0*
25	Flow control setpoint 2, integer part	U16	*0...30000*	0...30000	*0*
26	Flow control setpoint 2, decimal part	U16	*0...999*	0...999	*0*
27	Flow measurement 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*

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5 Disposal

The 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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