GRUBATEC
MESS- UND REGELTECHNIK

GRILLO

Operating and installation instructions

DPC200 - Differential Pressure Regulator

Low-pressure sensor with PI control function

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1. General safety instructions

1.1 Signal words for warnings

The safety instructions in this user manual are for hazard prevention. They are located in the operating instructions before any action/work/activity is described that could potentially cause a hazard.

CAUTION	Identification of a low-risk hazard that may result in property damage or minor bodily injury.

A NOTICE	Signal word for important product information that should be highlighted in particular.

Danger word 	**Type of hazard** Source of danger Hazard prevention

1.2 Pictograms and symbols used

The following symbols are used in this guide:

 General hazard symbol (Danger, warning, caution)	 General note

1.3 General Information

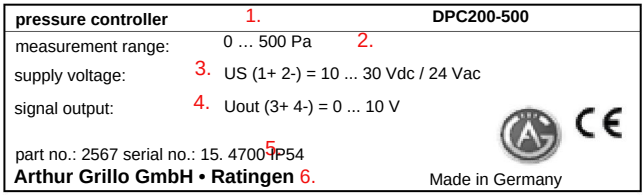
A NOTICE 	This instruction manual contains information on the proper installation and operation of the differential pressure regulator and is intended solely for the operator and authorized personnel. Following this manual will help to avoid hazards and downtime.

2. Product description

The DPC200 differential pressure regulators are used to measure small differential pressures of non-aggressive gases, especially air.

2.1 Type plate

1. Type designation
2. Measuring range
3. Supply voltage
4. Output signal
5. Serial number
6. Manufacturer



2.2 Intended Use

The application area includes, for example, air conditioning technology for the control of fans, room pressure monitoring or filter control.

The user has access to an analog output of 0-10 V DC. Depending on the device settings, this signal has different meanings:

1. Pressure sensor: Output signal is proportional to the measured pressure.
2. Volume flow sensor: Output signal is squared.
3. In pressure or volume flow control, the output signal represents the manipulated variable.
   the PI regulation.

2.3 Functional description

A soft silicone membrane is used as a sensor, which moves against a measuring spring under the influence of the differential pressure until the spring force compensates for the pressure acting on the membrane.

The deflection of the diaphragm is detected without contact using a differential transformer and converted into a standardized output signal by electronics.
The DPC200 combines various functions:

1. **Measuring device:** In this mode, the measured differential pressure is displayed on the screen.
   represented and provided as a proportional 0...10 V DC output signal.
2. **Control mode:** Two setpoints can be set in the device and connected to the potential-free
   The contact input must be selected. The PI algorithm calculates the measured value.
   The differential pressure is measured against the setpoint, controlling the manipulated variable to maintain a constant pressure according to the setpoint. The manipulated variable is defined as 0...10 V. DC signal available.

In addition to the measured variable differential pressure, the measured variable volume flow can also be used for measurement and control.

3. Assembly

The DPC200 differential pressure regulator is designed for wall mounting.
Please consider the following factors when selecting the installation
location: • The mounting surface must be sufficiently firm and free from
vibrations. • The surrounding area must meet the climatic conditions specified in the technical data.
fulfill.

CAUTION

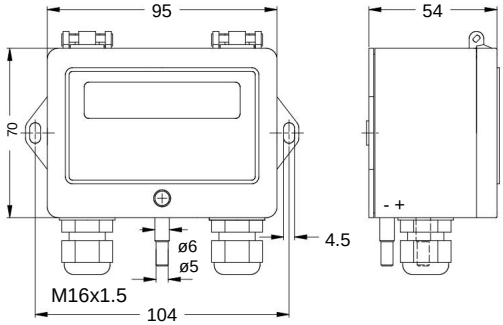
Property damage:

Read the operating instructions carefully before assembly and commissioning.
The device may only be connected and commissioned by experienced personnel.

A NOTICE

• The device's position is
dependent. • The DPC200 must be mounted vertically. •
The DPC200 can be mounted on a wall.

3.1 Dimensions All
dimensions in mm.

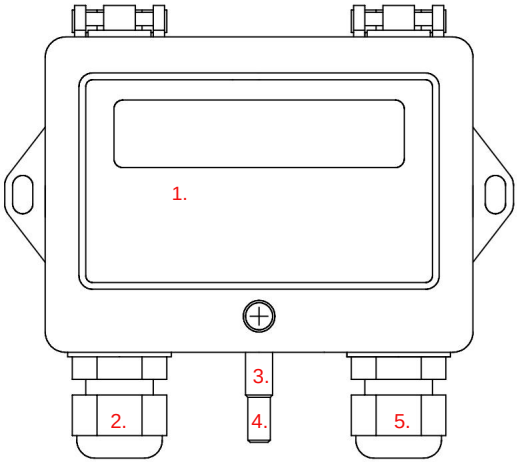


3.2 Wall mounting 1.
Hold the DPC200 against the wall and mark the mounting holes.
2. Drill mounting holes for adequately sized screws or dowels.
3. Press in the dowel.
4. Guide the fastening screws through the screw channels of the housing screws so that
the screws protrude from the rear of the housing.
5. Fit the housing with the screws precisely into the mounting holes with the dowels.
place.
6. Tighten the screws.

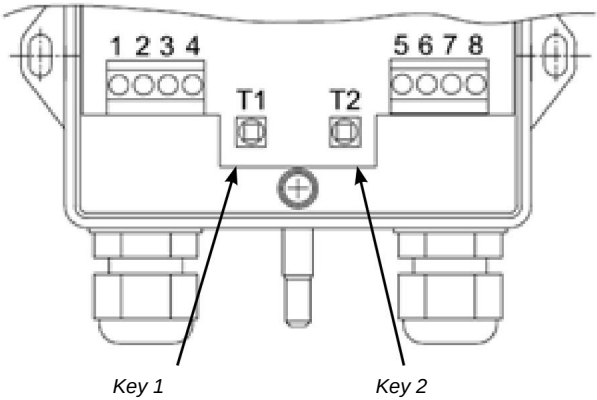
4.
commissioning

4.1 Overview DPC200

1. Front cover
2. Cable entry
3. Pressure connection 1
4. Pressure connection 2
5. Cable entry



4.2 Schematic interior view



Buttons 1 and 2 are for operating the menu.

4.3 Pressure connections

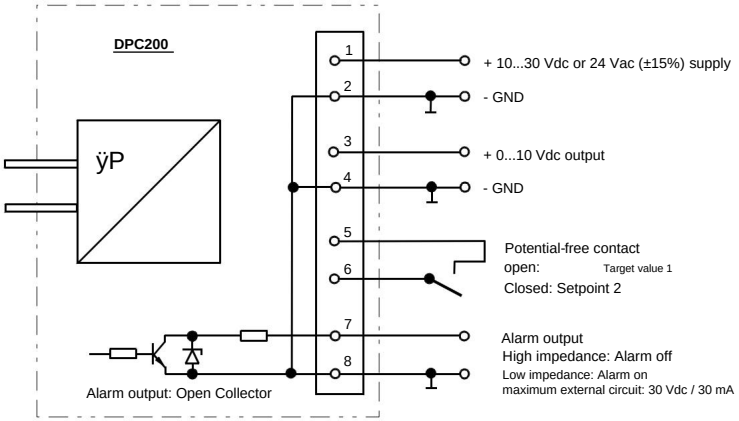
Connect all pressure ports properly with plastic hoses (inner diameter 5 and 6 mm).

7
8

Alarm output
high ohm: alarm off
low ohm: alarm on
maximum customer circuit 30 Vdc / 30 mA

Alarm output: Open Collector

4.4 Electrical connection



1. Screw on the screws for the front cover.
2. Open the front cover.
3. M16 x 1.5 screw connections are provided for cable entry.

4.5 Zero point setting

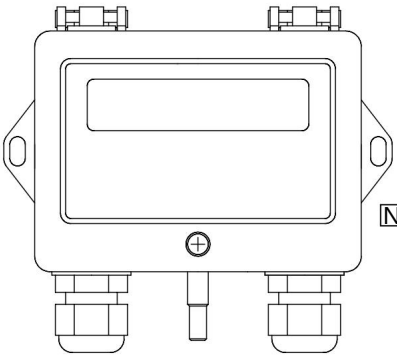
ÿP

1 + Supply: 10...30 Vdc;
24 Vac +/-15%

2 - GND

The device's zero point can be readjusted externally using a small rod magnet, independent of the menu.

3 + Output 0...10 V



Adjustment:
The device is in **measurement mode** or **control mode** and not in the menu:

- Disconnect pressure hoses from the nozzles
- Briefly touch the bar magnet (N/S) to the adjustment side

N$ Hold zero point.

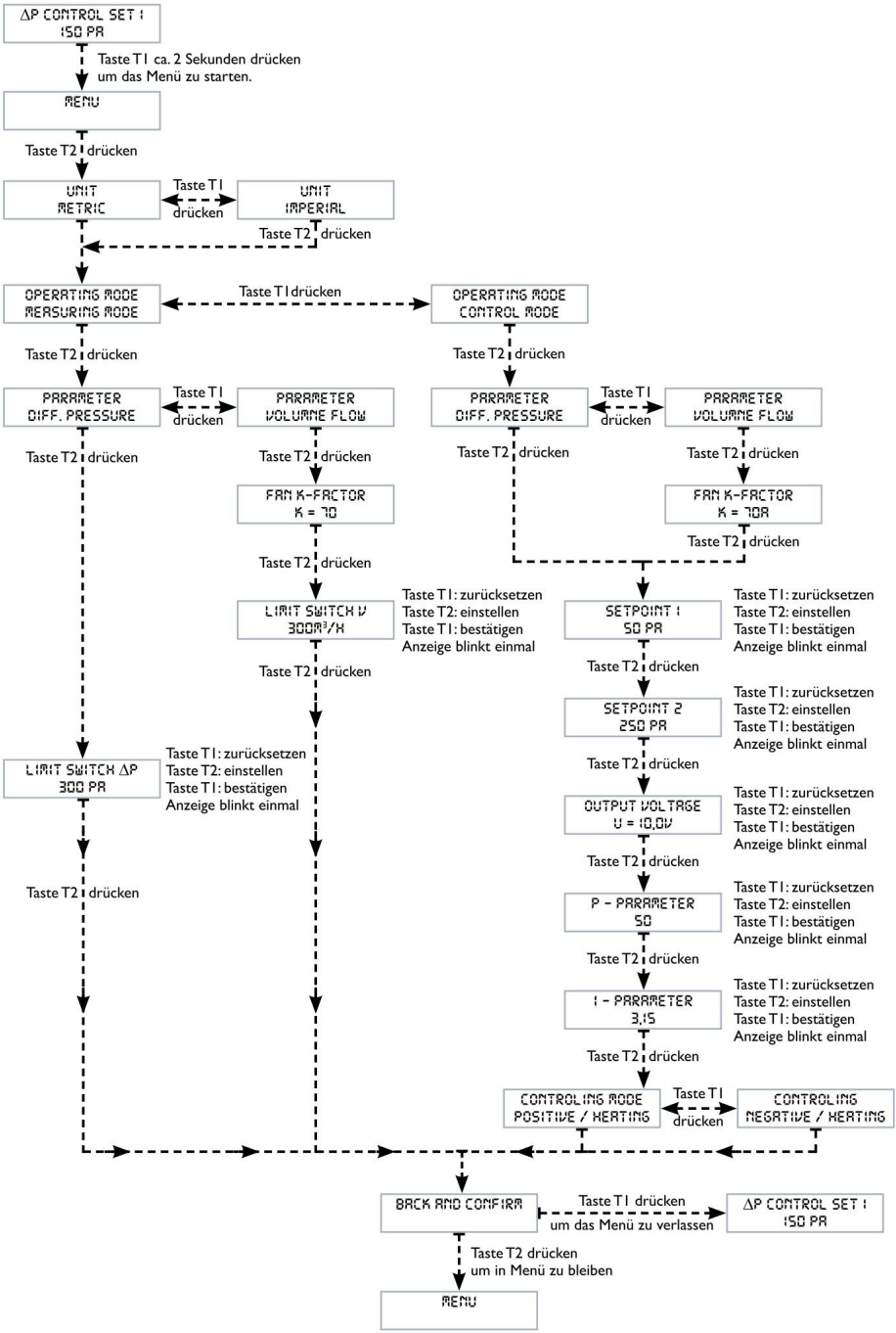
The new zero point is saved.

5. Operation

5.1 Start menu

To operate the menu, unscrew the front cover to access the T1 and T2 buttons.

5.2 Menu structure



5.3 Measurement mode

Display	action
Measurement 200 Pa	**To start the menu:** Press and hold button T1 for approximately 2 seconds.
menu	Press the T2 key to proceed to the next menu item.
unit metric	Press T1 to switch between: metric <=> imperial Press key T2 to go to the next menu item
operating mode control mode	Press button T1 to switch between: measuring mode <=> control mode. Press button T2 to go to the next menu item.
parameter differential pressure	Press button T1 to switch between: differential pressure <=> volume flow. Press button T2 to go to the next menu item.

	If parameter selection = differential pressure
limit switch 150 Pa	Key T1: Reset value Key T2: Set value Button T1: Confirm value, display flashes once Press the T2 key to proceed to the next menu item.
back and confirm	Press the T1 key to exit the menu. Press the T2 key to stay in the menu.

	If parameter selection = volume flow **Then comes the additional input for the k-factor.**
fan k-factor k = 70	Key T1: Reset value Key T2: Set value Button T1: Confirm value, display flashes once Press the T2 key to proceed to the next menu item.
limit switch 300 m³/h	Key T1: Reset value Key T2: Set value Button T1: Confirm value, display flashes once Press the T2 key to proceed to the next menu item.
back and confirm	Press the T1 key to exit the menu. Press the T2 key to stay in the menu.

5.4 Control mode

Display	action
Measurement 200 Pa	**To start the menu:** Press and hold button T1 for approximately 2 seconds.
menu	Press the T2 key to proceed to the next menu item.
unit metric	Press T1 to switch between: Press T2 to switch between metric and imperial modes. Press T1 to switch between measuring
operating mode control mode	mode and control mode. Press T2 to switch between diff. pressure and volume flow. Press T2 to switch between different menu items.
parameter differential pressure	

	If parameter selection = diff. pressure or after entering the k-factor:
setpoint 1 50 Pa	Key T2: Set value Button T1: Confirm value, display flashes once Press the T2 key to proceed to the next menu item.
setpoint 2 250 Pa	Key T1: Reset value Key T2: Set value Button T1: Confirm value, display flashes once Press the T2 key to proceed to the next menu item.
output voltage U = 10.0 V DC	Key T1: Reset value Key T2: Set value Button T1: Confirm value, display flashes once Press the T2 key to proceed to the next menu item.
P - parameter 50	Key T1: Reset value Key T2: Set value Button T1: Confirm value, display flashes once Press the T2 key to proceed to the next menu item.
I - parameter 3.15	Key T1: Reset value Key T2: Set value Button T1: Confirm value, display flashes once Press the T2 key to proceed to the next menu item.
controlling mode positive / heating	Press T1 key to switch between: positive / heating <=> negative / cooling Press the T2 key to proceed to the next menu item.
back and confirm	Press the T1 key to exit the menu. Press the T2 key to stay in the menu.

	If parameter selection = volume flow Then comes the additional input for the k-factor.
fan k-factor k = 70	Key T1: Reset value Key T2: Set value Button T1: Confirm value, display flashes once Press the T2 key to proceed to the next menu item.

5.5 Adjustable Parameters

parameter	Selection or setting range	Basic setting
Unit	metric or imperial	metric
Operating mode:	Measurement or control mode	Measurement mode
Measured variable	Differential pressure ÿP [Pa] or [InH2 O] Volume flow rate V [m3 /h] or [cfm]	Differential pressure ÿP [Pa]
K-factor:	Volume flow rate calculation according to: $V = k \cdot \sqrt{ÿÿp}$ where: V = volume flow rate in [m3 /h] or [cfm] k = flow factor, adjustment range: 1...10,000 ÿp = differential pressure in [Pa] or [InH2O] Volume flow display range up to 999,999 m³ /h **Maximum volume flow rate (Vmax)** Measuring range: 50 Pa, k=10,000 → Vmax = 70,710 m³ /h; range: 500 Pa, k=10,000 Vmax = Vmax = 223,607 m³ /h; Measuring Measuring range: 1000 Pa, k=10,000 316,228 m³ /h; range: 2000 Pa, k=10,000 Vmax = Vmax = 447,214 m³ /h; Measuring Measuring range: 4000 Pa, k=10,000 632,456 m³ /h; Measuring range: 6000 Pa, k=10,000 Vmax = 774,597 m3 /h;	K = 70
Limit:	Differential pressure from 0% to 100% of the measuring range; volume flow rate from 0.5% to 100% of the measuring range; k-factor is taken into account. Example -> see chapter 5.6	OFF
Target values	Differential pressure from 0% to 100% of the measuring range; volume flow from 0.5% to 100% of the measuring range; k-factor is taken into account.	Placeholder 1: 8888 2: 8888
Output voltage:	0…10 V DC	Uout = 10 V DC
P-component:	0 ... 1000	P = 50
I-component:	0…100	I = 3.15
Rule characteristics:	Positive (heating): Control deviation = setpoint – actual value The output increases if: target value > actual value. Negative (cooling): Control deviation = Actual value - Setpoint The output increases if: actual value > target value.	positive / heating

5.6 Calculation of the limit value

A NOTICE

The device requires a minimum pressure to display a value.
Minimum pressure = **0.5% of the measuring range**
Pressure < 0.5% of the measuring range = Display shows **0 m3 /h**
Minimum flow: ***V_min=ÿ(0.005 x measuring range) xk***
Maximum flow rate: ***V_max=ÿ(measuring range) xk***

Example: Calculating the limit value *The limit*

value must lie between the minimum and maximum flow rates.

The reference device in this example is a DPC200 with a measuring range of 0...1000 Pa.

The formula for calculating the limit: *V = ÿÿP × k*

Given: *Measuring range =* ***0...1000 Pa;*** *k-factor (k) =* ***116;*** *Limit value (V) =* ***1200 m3 / h***

Therefore: *ÿP= (V/ k)2 = (1200/116)2 = 107 Pa > 5 Pa = 0.5% of the measuring range*

Minimum flow rate: *V_min = ÿ(0.005 x 1000) x 116 = 259 m3 / h*

Maximum flow: *V_max = ÿ(1000) x 116 = 3668 m3 / h*

Result: The limit value of **1200 m3 /h** lies between V_min and V_max and can therefore be set via **DPC200 (0...1000 Pa) .**

5.7 Function - Alarm Output

The DPC200 features an open collector alarm output, which has a different function depending on the operating mode. In **alarm mode,** the contact between terminals 7 and 8 becomes low-resistance and can handle a maximum load of 30 V DC / 30 mA. When no alarm is triggered, this contact has high resistance.

The alarm status is indicated on the display **by an exclamation mark (!).**
(2nd line / 16th character).

Rule mode:

To detect the limits of the control system, the alarm output in control mode refers to the set maximum output voltage (MaxUout). MaxUout can be set in the menu item "output voltage". The default value is set to 10 V DC.

Alarm ON: Analog output remains constant for 12 seconds greater than: 0.95 • MaxUout
Alarm OFF: Analog output remains constant at less than 0.9 • MaxUout for 12 seconds

Measurement mode:

For limit monitoring, a limit value can be entered under the menu item "limit switch". The previously set parameters (unit, measured quantity, k-factor, and measuring range) are taken into account. In the default state, the limit values are not active. The display in the second line shows "OFF". ***1 • Limit value***

Alarm ON: Measured value consistently greater than 0.95 for 12 seconds. Alarm OFF: Measured value consistently less than 0.95 for 12 seconds.

6. Maintenance

The DPC200 contains no wear parts or consumables. Maintenance is not required. Upon request, Arthur Grillo GmbH offers annual calibration with a factory certificate. For more information, please contact:

7. Warranty

Warranty and liability claims for personal injury and property damage are excluded if they are due to one or more of the following causes:

- Improper use of the device.
- Improper assembly, commissioning, operation and maintenance of the device.
- Unauthorized structural modifications to the device beyond its intended purpose.
- Improperly performed repairs.
- Disasters caused by foreign bodies and force majeure.

8. Error messages / malfunctions

Description	measure
The display shows nothing.	Check electrical connection
The measured value remains at zero.	Functional test with slight pressure application in differential pressure measurement mode
Measurement error	Perform zero point adjustment according to chapter 4.5.
Errors persist	Contact manufacturer
Display shows: !	The device is in alarm mode; see chapter 5.7.

9. Disposal

When disposing of electronic components and devices, please observe the legal regulations in the user's country regarding their disposal.

10. Technical Data

Technical data

Measuring medium:	Air or non-aggressive gases
Sensor:	Silicone diaphragm with measuring spring and differential transformer
Smallest measuring span:	0...50 Pa
Maximum measuring range: Overload protection:	0...6000 Pa 0.2 bar
Static pressure:	max. 0.2 bar
Pressure connections:	Hose barbs 5 mm ø and 6 mm ø UL 94 HB;
Housing:	Ultramid with hinged ABS cover Cable entry M16x1.5, screw terminals,
Electrical connections:	electronics protected against reverse polarity
Supply voltage:	10...30 Vdc; 24 Vac (±15%) approx.
Power consumption:	10 mA @ 10 Vdc, approx. 12 mA @ 24 Vdc 0...10 V
Exit:	(Imax = 0.4mA @ 10Vdc, Imax = 2mA @ 20Vdc)
Alarm output:	Open collector, max. 30 V / 30 mA
Advertisement:	Two-line alphanumeric LCD display, 2x16 characters
Operating mode:	Measurement mode or control mode
Rule characteristics:	Pi algorithm
Target value setting:	2 setpoints adjustable via buttons,
	Selection of setpoints via potential-free contact
Protection class:	IP 54 according to EN
Ambient temperature:	60529 -10...+50
Storage temperature:	°C -25...+60 °C
Weight:	approx. 250
Usage position:	g vertically, position dependency when rotated by 90° approx. 25 Pa
EMC:	Tested according to EN 61000-6-2, EN 61000-6-3, CE marking

Error limits:	Zero point deviation:	± 0.75%
	Sum of linearity and hysteresis:	± 0.5% ... ± 1% ±
	Temperature drift at zero point:	0.3% / 10K ±
	Temperature drift measuring range:	0.2% / 10K

10.1 CE marking

As an electrical device, the DPC200 falls within the scope of Directive 2004/108/EC (EMC Directive). The following standards were applied within the framework of the EMC Directive:

DIN EN 61000-6-2:2006-03 Correction 1:2011-06	Electromagnetic compatibility (EMC) - Part 6-2: Technical standards - Immunity to interference for industrial areas
DIN EN 61000-6-3:2011-09	Electromagnetic compatibility (EMC) - Part 6-3: Technical basic standards - Interference emission for residential areas, Business and commercial sectors as well as small businesses

You can request the declaration of conformity here:

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