



OPERATING INSTRUCTIONS

EN

Translation of the original instructions

CPT 200

Digital Piezo Gauge



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1 About this manual

1.1 Validity

This operating manual is for customers of Pfeiffer Vacuum. It describes the functioning of the designated product and provides the most important information for safe use of the unit. The description follows applicable EU guidelines. All information provided in this operating manual refers to the current state of the product's development. The documentation remains valid as long as the customer does not make any changes to the product.

Up-to-date operating instructions can also be downloaded from www.pfeiffer-vacuum.com.

1.2 Conventions

Safety instructions

The safety instructions in Pfeiffer Vacuum operating instructions are the result of risk evaluations and hazard analyses and are oriented on international certification standards as specified by UL, CSA, ANSI Z-535, SEMI S1, ISO 3864 and DIN 4844. In this document, the following hazard levels and information are considered:

DANGER
Imminent danger Indicates an imminent hazardous situation that will result in death or serious injury.
WARNING
Possibly imminent danger Indicates an imminent hazardous situation that can result in death or serious injury.
CAUTION
Possibly imminent danger Indicates an imminent hazardous situation that can result in minor or moderate injury.
NOTICE
Command or note Command to perform an action or information about properties, the disregarding of which may result in damage to the product.

Pictographs



Warning of a displayed source of danger in connection with operation of the unit or equipment



Command to perform an action or task associated with a source of danger, the disregarding of which may result in serious accidents

Instructions in the text

→ Work instruction: here you have to do something.

Abbreviations

CPT: Digital Piezo gauge

2 Safety

2.1 Safety precautions



Duty to inform

Each person involved in the installation or operation of the unit must read and observe the safety-related parts of these operating instructions.

→ The operator is obligated to make operating personnel aware of dangers originating from the unit or the entire system.

The gauge CPT 200 has been tested and accepted in compliance with EN 61010/VDE 0411 "Safety Equipment for Electrical Components".

- Observe the safety and accident prevention regulations.
- Check regularly that all safety precautions are being complied with.
- The unit has been accredited with protection class IP 54. Take necessary measures when installing into ambient conditions, which afford other protection classes.
- Consider possible reactions between the materials and the process media.
- Consider possible reactions of the process media due to the heat generated by the product.
- Do not modify or alter the unit yourself.
- Note the shipping instructions, when returning the unit.
- Inform yourself about a possible contamination before starting work.
- Adhere to the relevant regulations and take the necessary precautions, when handling contaminated parts.
- Communicate the safety instructions to other users.

2.2 Proper use

- Only use the CPT 200 digital gauge for measuring total pressures in the 1 ... 2000 hPa range.

2.3 Improper use

Improper use will cause all claims for liability and warranties to be forfeited. Improper use is defined as usage for purposes deviating from those mentioned above, especially:

- connection to pumps or units which are not suitable for this purpose according to their operating instructions
- connection to units which have exposed voltage-carrying parts
- operation of the devices in areas with ionizing radiation



3 Product description

The CPT 200 digital transmitter consists of a piezo-resistive sensor component. Sensor head and associated electronics are installed in a compact housing.

3.1 Product identification

To correctly identify the product when communicating with Pfeiffer Vacuum, always have the information from the rating plate available.

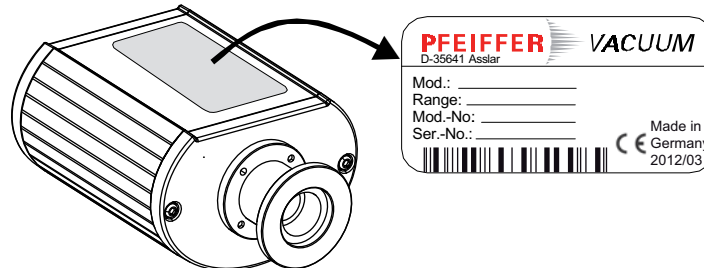


Fig. 1: Product identification on the rating plate

Scope of delivery

The following positions are included in the delivery consignment:

- CPT 200
- Protective cover
- Operating instructions

3.2 Function

The gauge can be operated in conjunction with the DigiLine Controller and the measuring software DokuStar (please see "Accessories") on a PC or with customized, digital signal evaluation.

The gauge responds to measurement value queries, type queries and setting commands.

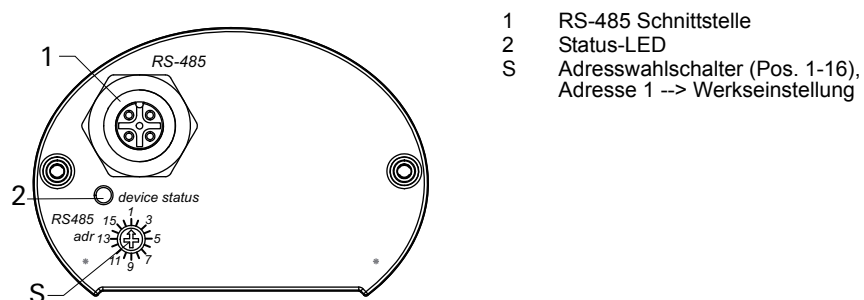


Fig. 2: DigiLine CPT 200 in Standardausführung

3.3 Range of application

The unit CPT 200 must be installed and operated in the following ambient conditions:

Installation location	weather protected (indoor)
Protection class	IP 54
Installation altitude	max. 2000 m
Ambient temperature	+5°C to +60°C
Relative humidity	5 ... 85 %, non-condensing
Atmospheric pressure	860 hPa - 1060 hPa



4 Transport and storage

Units without external protection must not come into contact with electrostatically chargeable materials and must not be moved within electrical or magnetic fields.

- In rooms with moist or aggressive atmospheres, the unit must be airproof shrink-wrapped in a plastic bag together with a bag of desiccant.
- Keep the original protective covers.

5 Installation

5.1 Vacuum connection



NOTICE

Vacuum component

Dirt and damage impair the function of the vacuum component.

- When handling vacuum components, ensure that they are kept clean and are protected against damage.
- Ensure that the connection flange is clean, dry and free of grease.

CAUTION

Excess pressure in the vacuum system 1500 to 4000 hPa

Damage to health through emission of process media, because elastomer washers cannot withstand the pressure.

- Use sealing rings with an outer centering ring.

Mounting orientation

The installation position can be freely selected. The preferred position is a horizontal to vertical position so that condensate and particles do not penetrate the measurement chamber.

Connecting the gauge



CAUTION

Excess pressure in the vacuum system > 1000 hPa

Danger of injuries by inadvertent opening of elements under stress due to parts flying around.

- Only use stressed elements, which can be opened and closed with appropriate tools (e.g. strap retainer-tension ring).
- Remove the protective cover, which is required during maintenance work.
- Make the flange connection.



5.2 Electrical connection



NOTICE

Damage to the product

Only connect cables when de-energized.

→ Never establish a connection using a live cable.

Die Kommunikation erfolgt über die serielle Schnittstelle RS-485 (Adresse 1 ... 16 einstellbar).

Setting the address selection switch

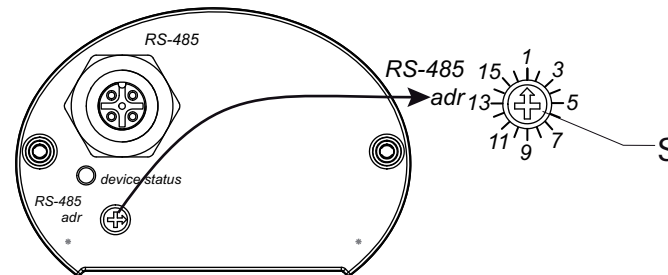
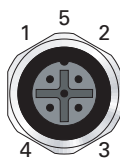


Fig. 3: Setting the address selection switch

- Remove the rubber plug (not shown in the illustration) from the address selector switch, and set the required address according to the relevant connection situation.
- Reinsert the rubber plug.

RS-485



M12 socket with screw coupling for the connection of a Pfeiffer Vacuum control unit or a PC. The use of a Y-connector enables the series connection in a bus system.

Pin	Assignment
1	RS-485: D+
2	+24 V
3	GND
4	RS-485: D-
5	not connected

Connecting the gauge to the DPG 202 controller

Up to 2 gauges can be connected to the DPG 202 controller.

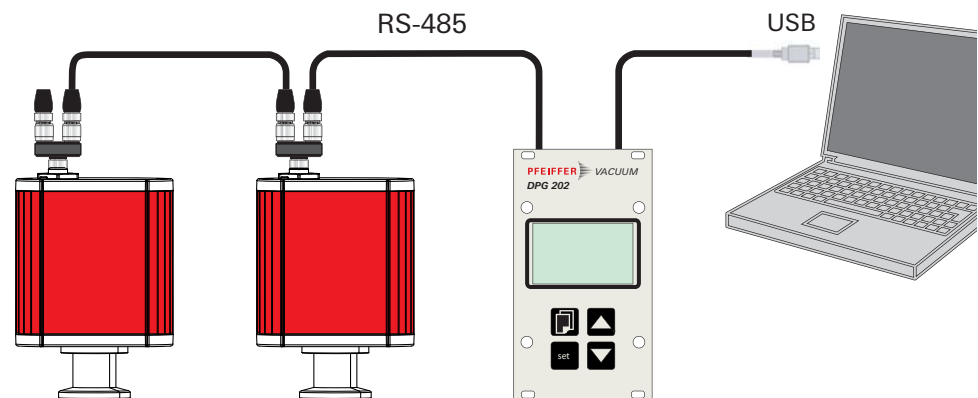


Fig. 4: Connections diagram gauge/DPG 202

- Set the relevant address at the address selector switch S.
- Connect the gauge to the control unit using the connection cable.
- Switch on the control unit.

Connecting the gauge to the USB/RS-485 converter

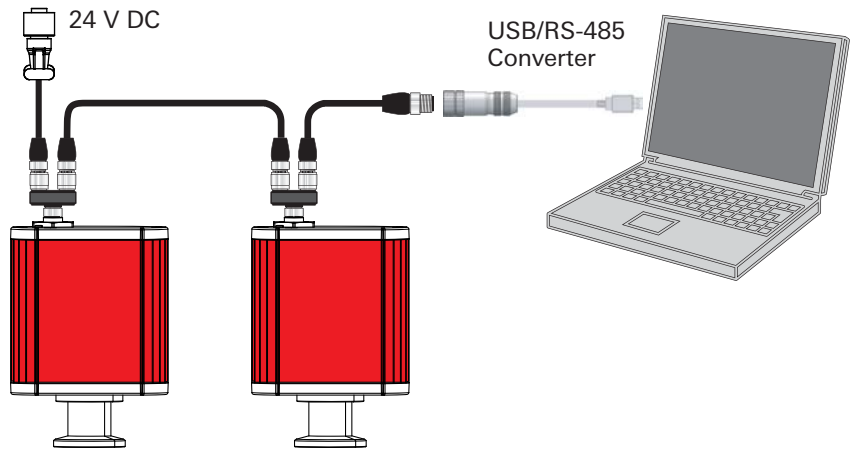


Fig. 5: Connections diagram gauge - USB/RS-485 converter

- Set the relevant address at the address selector switch S.
- Connect the gauge to the USB/RS-485 converter using the connection cable.
- Connect the gauge to the power supply.

5.3 Removal of components for their maintenance



WARNING

Contamination of gauge parts possible due to the media measured!

Poisoning hazard through contact with harmful substances.

- In the case of contamination, carry out appropriate safety precautions in order to prevent danger to health through dangerous substances.
- Decontaminate affected parts before carrying out maintenance work.
- Switch off the power supply on the control unit/power supply or disconnect the equipment from the mains supply.
- Loosen any connection cables.
- Detach the gauge from the vacuum apparatus.
- Close the flange opening by using the original protective cover.



6 Operation

6.1 Before switching on

After switching on the power supply, the connected gauge is ready for operation. It is advisable to wait for a stabilization period of 5-10 minutes before measurement. Operate the gauge during the measurement continuously independent of the applied pressure. The pressure measured is independent of the type of gas.

Operation display via LED

Status within 1s	Meaning
Off	no or insufficient power supply
Green on	valid measurement at two-component gauges, sensor component for low pressure range is activ)
Green flashing, (1 Hz)	Sensor component for high pressure range is activ. Only valid for two-component gauges
Yellow on	Unit function is O.K., but due to internal operations (e. g. during adjustment or after automatic heating filament switching) no valid measuring values will be displayed temporarily
Yellow on	Measuring range: overrange / underrange
Red on	Software or unit malfunction
Green/yellow/red off (1 s)	one-off: LED test after reset
Red/green flashing, (1 Hz)	Software update in process

6.2 Configuring the data exchange

Die Kommunikation erfolgt, je nach Stellung des Adresswahlschalters (Adresse 1 ... 16 einstellbar) am Transmitter, über die serielle Schnittstelle RS-485.

- 9600 baud
- 8 data bits
- 1 stop bit
- no parity

Parameter overview

#	Name	Data type	Handling					
				CPT 200	PPT 200	RPT 200	HPT 200	MPT 200
022	Filament selection	7 - u_short_int	readable, writable				X	
040	Degas	6 - boolean_new	readable, writable				X	
041	Sensor on/off	6 - boolean_new	readable, writable				X	X
049	Switch mode	7 - u_short_int	readable, writable			X	X	X
303	Actual error code	4 - string	read-only	X	X	X	X	X
312	Software version	4 - string	read-only	X	X	X	X	X
349	Component name	4 - string	read-only	X	X	X	X	X
730	Pressure switch-point 1	10 - u_expo_new	readable, writable	only analog/relay version				
732	Pressure switch-point 2	10 - u_expo_new	readable, writable	only analog/relay version				
740	Pressure in [hPa]	10 - u_expo_new	readable, conditionally writable	X	X	X	X	X
741	Pressure set point	7 - u_short_int	only writable	X	X	X	X	X
742	Correction value (Pirani)	2 - u_real	readable, writable		X	X	X	X
743	Correction value (Bayard-Alpert)	2 - u_real	readable, writable				X	
743	Correction value (Cold cathode)	2 - u_real	readable, writable					X



Parameters are displayed in square brackets as a three-digit number in bold font. The designation may also be stated if necessary.

Example: **[P:312] Software version**

Reading the actual pressure value [P:740]

Pressure value as the value to be queried and also as equalization (see below) are transmitted by means of a string in the format "aaaabb", whereby "aaaa" is the mantissa and "bb" the exponent with offset 20 of an exponential number. "aaaa" is therefore in the range "1000" (for 1.000) to "9999" (for 9.999). The individual characters of the string are the numbers "0" (ASCII 48) to "9" (ASCII 57).

Example: "104223" represents $1.042 \times 10^{+3}$ hPa, "750015" represents 7.500×10^{-5} hPa (Depending on the gauge and its accuracy the number of significant digits in the mantissa can vary).

Reading error codes [P:303]

Parameter 303 transfers the actual error code of the unit. The following error codes can occur:

Value	CPT 200	PPT 200	RPT 200	HPT 200	MPT 200	Meaning
000000	X	X	X	X	X	No error
Wrm001				X		Filament 1 defective in auto-mode
Err001	X	X	X	X	X	Defective gauge
Err002	X	X	X	X	X	Defective memory
Err003				X		Filament 1 defective
Err004				X		Filament 2 defective
Err005				X		Both filaments defective

Reading the component names [P:349]

Parameter 349 contains a token of the component name:

- _____
"CPT 200"
- _____
"RPT 200"
- _____
"PPT 200"
- _____
"HPT 200"
- _____
"MPT 200"

Reading the software version [P:312]

The software version can be read from the connected device using parameter 312:

- Example: 010102



6.3 Pfeiffer Vacuum Protocol for "RS-485"

Telegram frame

The telegram frame of the Pfeiffer Vacuum protocol contains only ASCII code characters [32; 127], the exception being the end character of the message C_R . Basically, a master \square (e.g. a PC) sends a telegram, which is answered by a slave \bigcirc (e.g. electronic drive unit or gauge).

a2	a1	a0	*	0	n2	n1	n0	l1	l0	dn	...	d0	c2	c1	c0	C_R
a2 - a0		Unit address for slave \bigcirc – Individual address of the unit ["001";"015"]														
*		Action														
n2 - n0		Pfeiffer Vacuum parameter numbers														
l1 - l0		Data length dn ... d0														
dn - d0		Data in data type concerned														
c2 - c0		Checksum (sum of ASCII values of cells a2 to d0) modulo 256														
C_R		Carriage return (ASCII 13)														

Telegrams

Data request $\square \Rightarrow \bigcirc ?$

a2	a1	a0	0	0	n2	n1	n0	0	2	=	?	c2	c1	c0	C_R
----	----	----	---	---	----	----	----	---	---	---	---	----	----	----	-------

Control command $\square \Rightarrow \bigcirc !$

a2	a1	a0	1	0	n2	n1	n0	l1	l0	dn	...	d0	c2	c1	c0	C_R
----	----	----	---	---	----	----	----	----	----	----	-----	----	----	----	----	-------

Data response / control command understood $\bigcirc \Rightarrow \square \checkmark$

a2	a1	a0	1	0	n2	n1	n0	l1	l0	dn	...	d0	c2	c1	c0	C_R
----	----	----	---	---	----	----	----	----	----	----	-----	----	----	----	----	-------

Error message $\bigcirc \Rightarrow \square *$

a2	a1	a0	1	0	n2	n1	n0	0	6	N	O	_	D	E	F	c2	c1	c0	C_R
										_	R	A	N	G	E				
										_	L	O	G	I	C				

NO_DEF	The parameter n2 - n0 does not exist
_RANGE	Data dn - d0 are outside the permitted range
_LOGIC	Logic access violation

Telegram examples

Read actual pressure value (data query)

(Parameter [P:740], Slave device address: "001")

$\square \Rightarrow \bigcirc ?$	0	0	1	0	0	7	4	0	0	2	=	?	1	0	6	C_R	
ASCII	48	48	49	48	48	55	52	48	48	50	61	63	49	48	54	13	
$\bigcirc \Rightarrow \square \checkmark$	0	0	1	1	0	7	4	0	0	3	0	0	1	1	3	0	C_R
ASCII	48	48	49	49	48	55	52	48	48	51	48	48	49	49	51	48	13

Activate/send parameter for atmospheric pressure (high pressure) (control command)

Atmospheric pressure adjustment (Parameter [P:741/740], Slave device address: "001")

$\square \Rightarrow \bigcirc ?$	0	0	1	1	0	7	4	1	0	3	0	0	1	1	3	0	C_R
ASCII	48	48	49	49	48	55	52	49	48	51	48	48	49	49	51	48	13
$\bigcirc \Rightarrow \square \checkmark$	0	0	1	1	0	7	4	1	0	3	0	0	1	1	3	0	C_R
ASCII	48	48	49	49	48	55	52	49	48	51	48	48	49	49	51	48	13

Activate/send parameter for low pressure (control command)

Low pressure adjustment (Parameter [P:741/740], Slave device address: "001")

☐⇒○?	0	0	1	1	0	7	4	1	0	3	0	0	0	1	2	9	C _R
ASCII	48	48	49	49	48	55	52	49	48	51	48	48	48	49	50	57	13
○⇒☐✓	0	0	1	1	0	7	4	1	0	3	0	0	0	1	2	9	C _R
ASCII	48	48	49	49	48	55	52	49	48	51	48	48	48	49	50	57	13

Applied data types

Data type	Description	Size I1 - I0	Example
0 - boolean_old	Boolean value (false / true)	06	000000 / 111111
1 - u_integer	Positive integer number	06	000000 to 999999
2 - u_real	Positive fixed point number	06	001571 equal to 15.71
4 - string	String	06	TC_400
6 - boolean_new	Boolean value (false / true)	01	0 / 1
7 - u_short_int	Positive integer number	03	000 to 999
10 - u_expo_new	Positive exponential number	06	100023
11 - string	String	16	BrezelBier&Wurst

6.4 Adjusting the gauge

Before adjustment, the gauge should be operated at the relevant pressure for approx. 5–10 minutes (warm-up time).

For correct zero point adjustment, the pressure in the vacuum chamber must be $p \leq 1 \cdot 10^{-1}$ hPa.

With controller DPG 202:

→ Adjust the gauge as described in the instruction for the control unit.

RS-485

- Evacuate the vacuum chamber to the pressure $p \leq 1 \cdot 10^{-1}$ hPa.
- Set the pressure adjusting point [P:741] to "000" for low pressure and transmit.
- Transmit the actual pressure value ([P:740] with «000000») for low pressure (represents $p < 1.0 \cdot 10^{-1}$); ==> "ur" (under range).
 - Is the low pressure exactly known, e. g. 4 mbar; send [P:740] with value «400020».
- Vent vacuum chamber to atmospheric pressure with air or N₂; afterwards wait about 10 minutes.
- Set the pressure adjusting point [P:741] to "001" for high pressure and transmit.
- Set the actual pressure value [P:740] exactly to the present pressure,
 - at e. g. 980 hPa; send [P:740] with value «980022»



7 Malfunctions

7.1 Rectifying malfunctions

Problem	Possible causes	Remedy
Gauge does not respond	<ul style="list-style-type: none"> • No supply voltage • Incorrect address set • Gauge defective 	<ul style="list-style-type: none"> ⇒ Connect cable or power supply. ⇒ Set the address selector switch to the serial interface to be used. ⇒ Replace gauge.
Measurement value shows ur / or, although the pressure is within the gauges measuring range (1 ... 2000 hPa)	<ul style="list-style-type: none"> • Adjustment necessary • Gauge defective 	<ul style="list-style-type: none"> ⇒ Readjust gauge. ⇒ Replace sensor/gauge.

8 Service

Do make use of the Pfeiffer Vacuum service facilities. In the event that repairs are necessary a number of options are available to ensure any system down time is kept to minimum:

- Repair in the nearby Service center
- Send unit and have it replaced with a new unit

Sending of units (Service Request)

For a quick and smooth handling of the service process, Pfeiffer Vacuum recommends the following steps:

- Download the forms "Service Request" and "Declaration on Contamination".¹⁾
- Fill out the "Service Request" form and send it by fax or e-mail to your local Pfeiffer Vacuum service contact.
- Include the confirmation on the "Service Request" from Pfeiffer Vacuum with your shipment.
- Fill out the "Declaration of Contamination" and include it in the shipment. This document is mandatory to protect our service engineers.
 - Fill out and send one declaration for each device.
- If possible, send unit in the original packaging.

In the absence or incompleteness of the "Declaration on Contamination" and/or the use of unsuitable transport packaging, Pfeiffer Vacuum reserves the right to make a decontamination and/or to send the product back at the shipper's expense.

Service orders

All service orders are carried out exclusively according to our repair conditions for vacuum units and components. Detailed information, addresses and forms at:

<http://www.pfeiffer-vacuum.com/service/repair-services/container>.

¹⁾ Forms under www.pfeiffer-vacuum.com



9 Accessories

Designation	CPT 200
Termination resistor for RS-485	PT 348 105 -T
M12 m plug 4-pole with screw terminals RS-485	PT 348 106 -T
Power separator for RS-485	PT 348 132 -T
Adapter RS-485, M12, 4-pole - D-sub socket, 9-pole, 0.2 m	PT 348 133 -T
Supply cable DigiLine, M12, 4-pole to TPS, 3 m	PT 348 163 -T
Connection cable, RS-485, M12/D-sub 9-pole, 3 m	PT 348 223 -T
Interface cable, M12 m straight/M12 m straight, 3 m	PM 061 283 -T
Y-Connector M12 to RS-485	P 4723 010
DPG 202, Controller and power supply unit for up to 2 gauges	PT G12 020
DokuStar Plus software, 16 channels	PT 882 501
PV TurboControl - Software for Pfeiffer Vacuum products with PV protocol	PM 061 741
Centering ring with poral filter, pore size 20 µm, FPM/stainless steel	PF 117 216 -T
Centering ring with metal mesh-fine filter, pore size 4 µm, FPM/stainless steel	PT 120 132 -T
TPS 111, mains pack 19" rack module 3HU	PM 061 344 -T
TPS 110, mains pack for wall/standard rail fitting	PM 061 340 -T
Connector M12 to RS-485	PM 061 270 -X
USB converter to RS-485 interface	PM 061 207 -T

10 Technical data and dimensions

10.1 General

Conversion table: pressure units

	mbar	bar	Pa	hPa	kPa	Torr mm Hg
mbar	1	$1 \cdot 10^{-3}$	100	1	0.1	0.75
bar	1000	1	$1 \cdot 10^5$	1000	100	750
Pa	0.01	$1 \cdot 10^{-5}$	1	0.01	$1 \cdot 10^{-3}$	$7.5 \cdot 10^{-3}$
hPa	1	$1 \cdot 10^{-3}$	100	1	0.1	0.75
kPa	10	0.01	1000	10	1	7.5
Torr mm Hg	1.33	$1.33 \cdot 10^{-3}$	133.32	1.33	0.133	1

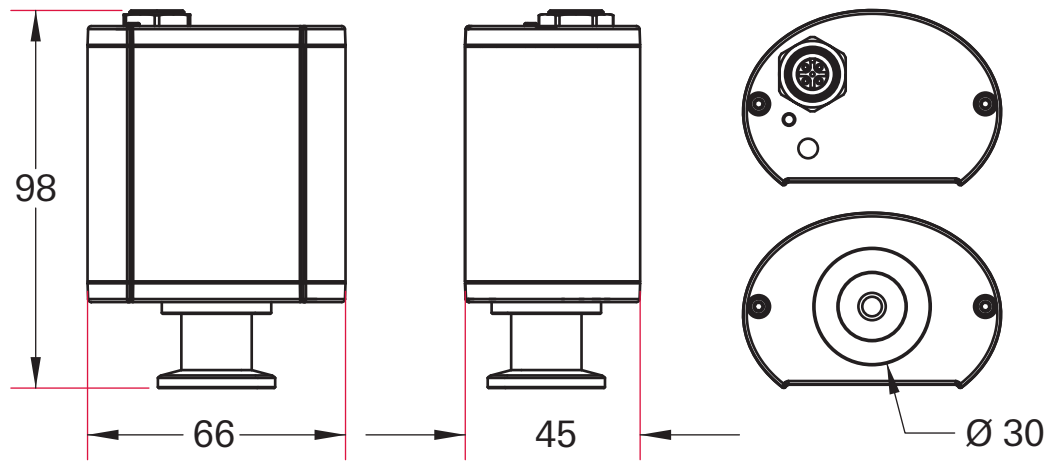
1 Pa = 1 N/m²

10.2 Technical data

Parameter	CPT 200	CPT 200
Nominal diameter	DN 16 ISO-KF	G ¼"
Protection category	IP54	IP54
Bakeout temperature max. at the flange	70 °C	70 °C
Seal	FPM	FPM
Pressure max.	4000 hPa	4000 hPa
Accuracy	1-1200 hPa: ± 0.1 % F.S.; >1200 hPa: ± 1 % F.S.	1-1200 hPa: ± 0,1 % F.S.; >1200 hPa: ± 1 % F.S.
Weight	190 g	190 g
Materials in contact with media	Ceramic, Stainless Steel, FPM	Ceramic, Stainless Steel, FPM
Measurement range max.	2000 hPa	2000 hPa
Measurement range min.	1 hPa	1 hPa
Sensor cable length max.	100 m	100 m
Method of measurement	Piezo	Piezo
Measuring cycle	10 ms	10 ms
Interfaces	RS-485	RS-485
Temperature: Operating	+5-+60 °C	+5-+60 °C
Temperature: Storage	-40-+65 °C	-40-+65 °C
Supply: Voltage	24 V DC	24 V DC
Supply: power consumption	1.5 W	1.5 W



10.3 Dimensions





Declaration of conformity

We hereby declare that the product cited below satisfies all relevant provisions according to the following **EC directives**:

- **Electromagnetic Compatibility 2014/30/EU**
- **Restriction of the use of certain Hazardous Substances 2011/65/EU**

DigiLine
CPT 200

Harmonised standards and national standards and specifications which have been applied:

EN 61326-1: 2013 Group 1 / Class B
EN 50581: 2012

Signature:

Pfeiffer Vacuum GmbH
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35614 Asslar
Germany

(Dr. Ulrich von Hülsen)
Managing Director

2016-04-08



VACUUM SOLUTIONS FROM A SINGLE SOURCE

Pfeiffer Vacuum stands for innovative and custom vacuum solutions worldwide, technological perfection, competent advice and reliable service.

COMPLETE RANGE OF PRODUCTS

From a single component to complex systems:

We are the only supplier of vacuum technology that provides a complete product portfolio.

COMPETENCE IN THEORY AND PRACTICE

Benefit from our know-how and our portfolio of training opportunities!

We support you with your plant layout and provide first-class on-site service worldwide.

Are you looking for a
perfect vacuum solution?
Please contact us:

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