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OPERATING INSTRUCTIONS

EN

Translation of the original instructions

PTR 225, PTR 225 S, PTR 237

Penning Gauge

BG 5043 BEN / A (2016-10)

PFEIFFER VACUUM

Product Identification

In all communications with Pfeiffer Vacuum, please specify the information given on the product nameplate.

Pfeiffer Vacuum, D-35614 Asslar
Typ: PTR225 (2015/07)
No: PTT13148300
F-No: 1

Specimen nameplate

Validity

This document applies to products with part number

PT T13 148 300	(PTR 225,	DN 25 ISO-KF)
PT T13 148 320	(PTR 225 S,	DN 25 ISO-KF, with switching function)
PT T13 358 300	(PTR 237,	DN 40 CF-F)

The part number (No) can be taken from the product nameplate.

We reserve the right to make technical changes without prior notice.

All dimensions in mm.

The references to diagrams, e.g. (4/5), consist of the fig. no. and the item no. in that order.

Intended Use

The Penning Gauges PTR 225, PTR 225 S and PTR 237 have been designed for vacuum measurement of in the pressure range of $1 \cdot 10^{-9}$ to $1 \cdot 10^{-2}$ mbar.

Description

The Penning gauge PTR 225, PTR 225 S or PTR 237 is a compact active pressure converter housing a Penning measurement system as well as the corresponding operating electronics. They have been developed specifically for integration into vacuum systems and offer a measurement range from 1·10-9 to 1·10-2 mbar.

The gauge is connected directly to the vacuum system through its DN 25 KF or DN 40 CF flange.

The electrical connection is provided through a screened 8-pin FCC 68 connector.

Unpacking and Checking

Unpack the PTR 225, PTR 225 S or PTR 237 immediately after delivery, even if it is to be installed at a later date.

Examine the packaging for any external damage. Completely remove all packaging materials.

Retain the shipping container and the packaging materials in the event of complaints about damage.

Check that the PTR 225, PTR 225 S or PTR 237 is complete and carefully examine the gauges visually.

If any damage is discovered, report it immediately to the forwarding agent and insurer. If the damaged part has to be replaced, please get in touch with the orders department.

Design and Function

Based on a supply voltage of 24 V the PTR 225, PTR 225 S or PTR 237 generates the internal supply voltages required for operation of the integrated Penning measurement system. The PTR 225, PTR 225 S or PTR 237 supplies a logarithmic representation of the vacuum pressure by way of a voltage signal which ranges from 0.66 V to 10 V. Moreover, the high tension generated in the PTR 225, PTR 225 S or PTR 237 can be switched on and off by applying an external control voltage or by connecting an external switch.

When the gas discharge in the Penning measurement system is ignited, the operating voltage is raised to 2.8 kV. After successful ignition, this voltage then drops to 1.6 kV thereby increasing the useful service life of the Penning measurement system.

A status output indicates the two possible conditions of the Penning measurement system:

1. not ignited (including high tension OFF) and
2. ignited (and pressure > 3·10-9 mbar).

A much improved ignition characteristic in the high vacuum range has been obtained through the special design for the electrodes in the measurement system.

The PTR 225 S Penning gauge is equipped with an adjustable switching threshold. The switching element is a relay. The status of the threshold is indicated by a LED.

Scope of Delivery

- Penning gauge
- Replacement cathode plate of titanium
- Replacement ceramics disc
- 3.5 mm jack plug (PTR 225 S only)

Contents

Product Identification 2
Validity 2
Intended Use 2
Description 2
Unpacking and Checking 2
Design and Function 2
Scope of Delivery 3

Contents 4

1 Safety 5
1.1 Symbols Used 5
1.2 Personnel Qualifications 5
1.3 General Safety Instructions 5
1.4 Liability and Warranty 5

2 Technical Data 6

3 Installation 8
3.1 Vacuum Connection 8
3.2 Electrical Connection 8
3.2.1 Power Supply 10
3.2.2 Switching on the High Tension 10
3.2.3 Measurement Signal Output 10
3.2.4 Status Output 11
3.2.5 Identification 11
3.2.6 Switching Threshold (PTR 225 S) 11
3.2.7 Monitor Output 12

4 Operation 13
4.1 Operation 13
4.2 Measurement System Status Indication 14
4.3 Degassing 14

5 Maintenance 15
5.1 The Electronics Assembly 15
5.2 Cleaning the Sensor 15
5.2.1 Detaching the Electronics Assembly 15
5.2.2 Disassembly of the Sensor 16
5.2.3 Cleaning the Individual Parts 16
5.2.4 Assembly of the Sensor 16
5.2.5 Assembly of the Electronics Assembly 17

6 Troubleshooting 18

7 Wearing Parts and Original Spare Parts 18

8 Accessories 19

9 Returning the Product 19

10 Disposal 20

Appendix 21
A: Relationship between output voltage and pressure (U = 0,4 V; "not ignited") 21
B: Example for Connecting 22
C: Conversion Table 22

EU Declaration of Conformity 23

For cross-references within this document, the symbol (→ 🗎 XY) is used.

1 Safety

1.1 Symbols Used

Symbols for residual risks

DANGER

Information on preventing any kind of physical injury.

WARNING

Information on preventing extensive equipment and environmental damage.

Caution

Information on correct handling or use. Disregard can lead to malfunctions or minor equipment damage.

Notice

1.2 Personnel Qualifications

Skilled personnel

All work described in this document may only be carried out by persons who have suitable technical training and the necessary experience or who have been instructed by the end-user of the product.

1.3 General Safety Instructions

- Adhere to the applicable regulations and take the necessary precautions for the process media used.

  Consider possible reactions with the product materials (→ 🗎 6).
- Adhere to the applicable regulations and take the necessary precautions for all work you are going to do and consider the safety instructions in this document.
- Before beginning to work, find out whether any vacuum components are contaminated. Adhere to the relevant regulations and take the necessary precautions when handling contaminated parts.

Communicate the safety instructions to all other users.

1.4 Liability and Warranty

Pfeiffer Vacuum assumes no liability and the warranty is rendered null and void if the end-user or third parties

- disregard the information in this document
- use the product in a non-conforming manner
- make any kind of interventions (modifications, alterations etc.) on the product
- use the product with accessories not listed in the corresponding product documentation.

2 Technical Data

General Data	Measurement range	$1 \cdot 10^{-9}$ to $1 \cdot 10^{-2}$ mbar
	Measurement uncertainty in the range from	$1 \cdot 10^{-8}$ to $1 \cdot 10^{-4}$ mbar
	Deviation from the characteristic	±30 % of the displayed value
	Average temperature coefficient of the output span	<0,5 % / K of the displayed value
	Reproducibility	<4 % of the displayed value
	Measurement principle	Cold cathode ionization according to Penning
	Supply voltage	14,5 to 36 V DC; typ. 24 V DC, 2 Vss
	Power consumption	<2 W
	Protection	IP 40
	Flammability	UL 94 - V 2
	Status displays	
	Operation (POWER)	orange LED
	Ready to measure (ignited) READY	green LED
	Switching threshold (active) (PTR 225 S only)	green LED
Measurement System	Measurement system	detachable
	Vacuum connection	DN 25 KF or DN 40 CF
	Degassing temperature	see Section 4.3
	Internal volume	21 cm^3 approx.
	Materials in contact with the medium	stainless steel; CrNi; AL_2O_3 ceramics; NiFe; Ni; titanium
	Overpressure tolerance	≤10 bar abs.
	(The limits for the flange connections must be observed)	
	Operating voltage	1,6 kV (current limited to <0,5 mA)
	Ignition voltage	2,8 kV (current limited to < 0,5 mA)
Signal Output	Signal output	0 to 10,6 V
	Permissible load resistance	Ra ≥ 10 kΩ
	Measurement signal	0,66 to 10,0 V
		logarithmic 1,333 V / per decade
	Status signal (not ignited)	0,4 V
Switching threshold (PTR 225 S only)	Switching threshold	Relay changeover contact
	Adjustment range	$1 \cdot 10^{-9}$ to $1 \cdot 10^{-3}$ mbar
	Hysteresis	±30 % of the adjusted range
	Rating	DC 60 V, 0,5 A
	Error status	Resting contact when "not ignited"; "HV OFF" or "supply off"

Control Inputs	Input resistance	R_E : 10 kΩ approx.
	High voltage cut-in with negative logic at pin 7:	
	High voltage ON	at U <2,5 V
	High voltage OFF	at U >4 V
	or	
	High voltage cut-in with positive logic at pin 8:	
	High voltage ON	at U >12 V
	High voltage OFF	at U <7 V
Status Output (Voltage output which is programmable control compatible)	Ready to measure	High level (13,5 to 35 V, max. 50 mA)
	Error (not ignited, HV off)	0 V
	For this refer also to section 3.2.4.	
Mechanical Data	Dimensions [mm]	

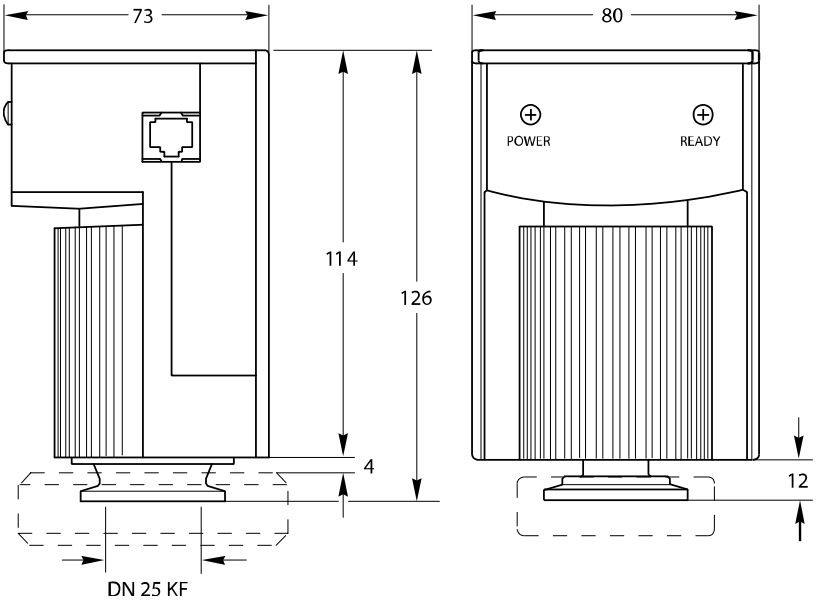


Fig. 1 Dimensional drawing for PTR 225 and PTR 225 S

	Weight	500 g approx.
Ambient Conditions	Storage temperature range	–20 °C to +70 °C
	Climatic rating KWF	to DIN 40040
	Operating temperature range	10 °C to 50 °C
	Max. rel. humidity of the ambient air (on 30 days per year, non-condensing)	70 %[1] or 95 %[2]

[1] usable measurement range 10^{-2} to 10^{-9} mbar

[2] usable measurement range 10^{-2} to 10^{-7} mbar

3 Installation

3.1 Vacuum Connection

Please check by referring to the technical data whether or not your gauge is suitable for your application.

The Penning gauge PTR 225, PTR 225 S or PTR 237 should preferably be mounted flange down. Inclined installation is possible but the horizontal orientation must not be exceeded.

Flange up installation is not permissible because under such circumstances condensate may collect in the PTR 225, PTR 225 S or PTR 237. This will either adversely affect the measurements, or the sensor itself may possibly be damaged.

The Penning gauge is equipped with a DN 25 KF or a DN 40 CF connection flange which is used to connect the gauge to the mating connection flange on a vacuum system with the aid of a centering ring and a clamping ring.

In the PTR 225, PTR 225 S or PTR 237 the cathode plate (7/5) also acts as a baffle.

3.2 Electrical Connection

The supply voltage and the high voltage switching signal as well as the measurement voltage signal are carried through the 8-way FCC 68 socket.

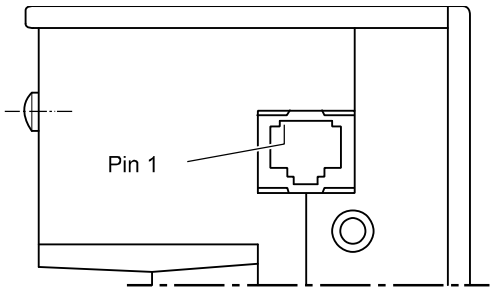


Fig. 2 Connection socket

The pinout is given in Fig. 2.

Pin	Signal	Designation on the rear
Pin 1	Supply voltage 14,5 V to 36 V DC	+24 V DC
Pin 2	0 V supply; used as the ground reference for the supply and control signal voltages	COMMON
Pin 3	Pressure dependent logarithmic signal output	SIGN 0 - 10 V
Pin 4	"PM gauge" identification (100 kΩ)	IDENT
Pin 5	Signal ground (use only for the pressure signal)	SIGN COM
Pin 6	Status (ready to measure)	STATUS
Pin 7	High tension "ON / OFF" (control input); Low active	HV ON (L)
Pin 8	High tension "ON / OFF" (control input); High active	HV ON (H)

Signal ground (Pin 5) and power supply ground (Pin 2) are internally linked. For this also refer to the block diagram of Fig. 3.

An example of how to connect the PTR 225, PTR 225 S or PTR 237 is given in Annex B.

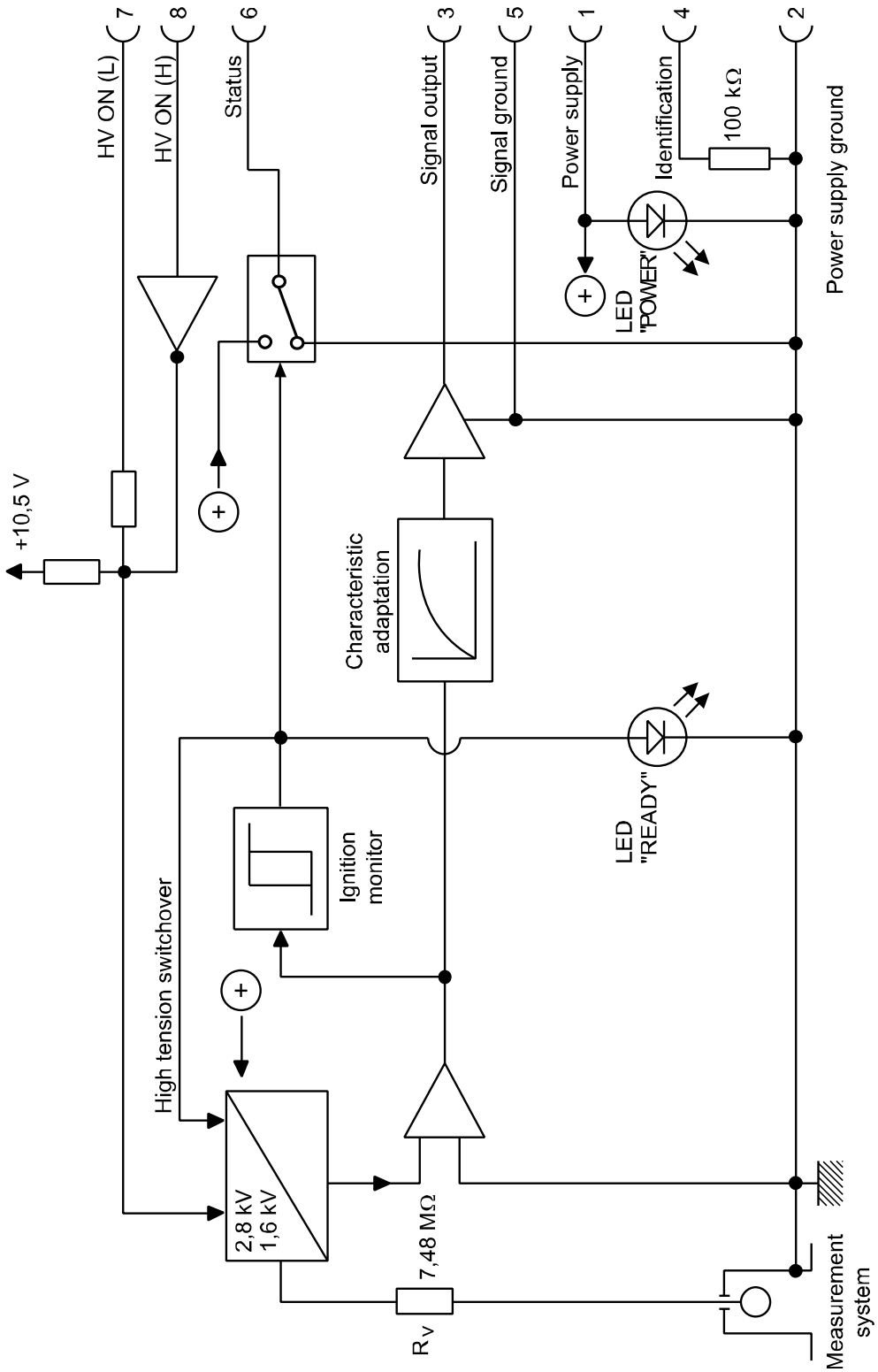


Fig. 3 Block diagram PTR 225, PTR 225 S, PTR 237

3.2.1 Power Supply

DANGER



The Penning gauge PTR 225, PTR 225 S or PTR 237 may only be connected to supply units or measuring instruments which meet the requirements of mains isolated extra-low voltages (PELV) and VDE 0100.

The Penning gauges PTR 225, PTR 225 S or PTR 237 is capable of operating off supply voltages ranging from 14.5 V to 36 V. A supply voltage of 24 V DC is recommended.

The power supply must be connected to Pin 1 (+) and Pin 2 (power supply ground).

3.2.2 Switching on the High Tension

The high voltage may be switched on either through Pin 7 using negative logic or Pin 8 using positive logic.

In each case Pin 2 must be used as the reference potential.

Pin 7 switches the high voltage on when

- contact is established with Pin 2 or
- a voltage of less than 2.5 V is present with reference to Pin 2.

Pin 7 switches the high voltage off when

- there is no contact with Pin 2 (open input) or
- a voltage greater than 4 V is present with reference to Pin 2.

Pin 8 switches the high voltage on when

- contact is established with Pin 1 (supply voltage) or
- a voltage greater than 12 V is present with reference to Pin 2.

Pin 8 switches the high voltage off when

- there is no contact with Pin 1 (open input) or
- a voltage of less than 7 V is present with reference to Pin 2.

Operation of the PTR 225, PTR 225 S or PTR 237 in the pressure range above 10^{-2} mbar will cause the accumulation of contaminations and will thus reduce service life. For this reason, the high tension should only be switched on or off when the pressure has dropped to the 10-2 to 10-3 mbar range.

The high tension may also be switched on or off directly by the output signal provided by a Pirani gauge TTR 91 S / TTR 96 S. Thus the Penning gauge can be switched on or off automatically at a pressure of approximately $5 \cdot 10^{-3}$ mbar.

3.2.3 Measurement Signal Output

The PTR 225, PTR 225 S or PTR 237 supplies a defined output signal ranging from 0.66 V to 10 V at Pin 3 with reference to Pin 5 which is signal ground. For this also refer to Table 1 in Annex A.

Table 1 has been included to clarify the relationship between the output voltage and the pressure.

The measurement signal provided by the Penning gauge depends on the type of gas. The values stated in Table 1 apply to nitrogen and air. For other gases, corresponding correction factors must be used which are available from Pfeiffer Vacuum upon request.

3.2.4 Status Output

When the gauge is ready to measure, this is indicated via the status output.

Status	Status signal at Pin 6 (with respect to Pin 2)
High voltage OFF	0 V
High voltage ON (not yet ignited)	0 V
High voltage ON at $p < 3 \cdot 10^{-9}$ mbar	0 V
High voltage ON at $p > 3 \cdot 10^{-9}$ mbar	High (13.5 - 32 V, depending at $p > 3 \cdot 10^{-9}$ mbar on the supply voltage (50 mA max.)

When the pressure drops below $3 \cdot 10^{-9}$ mbar, the status signal remains HIGH.

3.2.5 Identification

For the purpose of identifying the connected type of gauge and the pressure range, the Penning gauge is equipped with an identification resistor (R = 100 kΩ) between Pin 4 and Pin 2. This resistor may be sensed by connected operating or control units so that these can automatically adapt.

3.2.6 Switching Threshold (PTR 225 S)

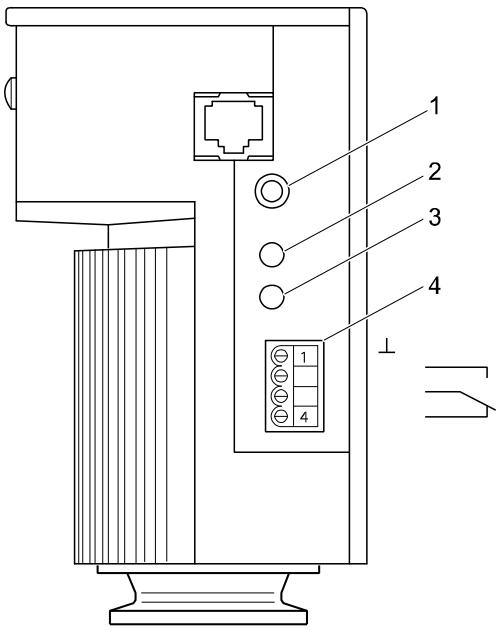
The built-in switching threshold may be adjusted through potentiometer (4/2) in the range between $1 \cdot 10^{-3}$ -$1 \cdot 10^{-9}$ mbar.

To adjust the threshold remove the cap (4/2) and use a screwdriver to adjust the threshold to the desired level.

In order to check the adjustment, a voltmeter may be connected to the monitor output (4/1) (see Section 3.2.7 and Table 1 in the Annex).

The threshold switch is a floating relay (changeover contact) which may be accessed via pluggable screw terminals (4/4). When the pressure drops below the adjusted threshold, a green LED (4/3) comes on.

In the case of a fault (i.e. discharge not present) or if the supply voltage has been switched off the relay contacts return to their rest position.



Key to Fig. 4

1 Monitor output
2 Potentiometer for adjustment of the switching threshold
3 LED (green)
4 Connector
Pin 1 Ground
Pin 2 Normally open relay contact
Pin 3 Center relay contact
Pin 4 Normally closed contact

Fig. 4 Penning gauge PTR 225 S

3.2.7 Monitor Output

The monitor output (4/1) is accessible through a 3.5 mm jack socket so that the measurement signal and the trigger setting may be measured. The stereo jack plug which is included with the instrument may be used to connect a voltmeter, for example. For this also refer to Fig. 5.

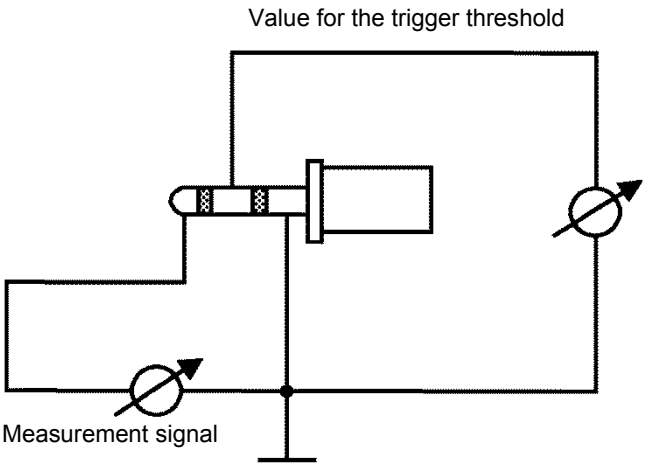


Fig. 5 Jack plug for the monitor output

4 Operation

DANGER

A high tension which is dangerous when touched is applied to the sensor in the Penning gauge. You must always switch off the supply voltage for the gauge before starting any work on the gauge (even when removing the gauge from the connection flange) so as to avoid injury when inadvertently coming in to contact with the high tension.



Key to Fig. 6:
1 LED "POWER" (orange)
2 LED "READY" (green)

Fig. 6 Penning transmitter - front view

4.1 Operation

Apply the 24 V supply voltage to the gauge. The orange "POWER" LED (6/1) comes on.

Switch the high tension on via the high tension switching input. See Section 3.2.2.

After successful ignition and at a pressure > $3 \cdot 10^{-9}$ mbar the additional green or READY LED (6/2) will come on.

Now the gauge is ready to make measurements.

No LED on

- Supply voltage is missing.

→ Measurement signal 0 V

Only the orange LED (6/1) is on

- The supply voltage is present.
- The high tension has not been switched on.

→ Measurement signal 0 V

The green LED (6/2) is on, the orange LED (6/1) is on

- The supply voltage is present.
- The high tension has been switched on.
- The gas discharge has been started.
- The pressure is over $3 \cdot 10^{-9}$ mbar

→ Measurement signal 0,66 V

4.2 Measurement System Status Indication

In the case of the Penning method of measurement one only may draw conclusions as to proper functioning while the gauge is in the measurement mode, i.e. when the gas discharge is running.

Trouble-free operation ("READY" LED (6/2) is on, status output HIGH) is marked by the presence of a pressure dependent signal starting at a pressure of about $3 \cdot 10^{-9}$ mbar up to the range limit of $1 \cdot 10^{-2}$ mbar. When the pressure drops $< 3 \cdot 10^{-9}$ mbar this status is also maintained.

When the “READY” LED (6/2) is not on, status output 0 V:

Cause 1: When the high voltage was switched on the pressure was below $p < 3 \cdot 10^{-9}$ mbar.

Cause 2: No ignition of the gas discharge, even if the power supply voltage is present, the high tension has been switched on and a pressure between about $3 \cdot 10^{-9}$ mbar and $1 \cdot 10^{-2}$ mbar.

4.3 Degassing

WARNING

Before baking out the sensing cell you must detach the electronics assembly from the sensing cell. The electronics assembly may be damaged when exceeding a temperature of 70 °C.

Before baking out, you must make sure that an aluminum edged seal (PTR 225 / PTR 225 S) or a copper seal (PTR 237) is used as the flange seal.

The Penning gauge PTR 225, PTR 225 S or PTR 237 are equipped with all-metal sensing cells so that any outgassing caused by polymer seals is entirely avoided.

After having detached the electronics (refer to Section 5.2.1) from the sensing cell, the outgassing rate of the sensing cell may be reduced considerably by baking out, so that the accuracy of the measurements in the range below $1 \cdot 10^{-6}$ mbar is improved.

When using the gauge chiefly in the UHV range ($< 10^{-8}$ mbar) it is recommended to remove the cathode plate. This helps to reduce the surface area of the surfaces which may release gas.

How to proceed in order to detach the electronics assembly is described in Section 5.2 (cleaning of the sensor).

Permissible bake out temperatures:

Sensing cell of the PTR 225 / 225 S:	150 °C (with aluminum edged seal)
Sensing cell of the PTR 237:	350 °C

5 Maintenance

DANGER



DANGER: contaminated parts

Contaminated parts can be detrimental to health and environment.

Before you begin to work, find out whether any parts are contaminated. Adhere to the relevant regulations and take the necessary precautions when handling contaminated parts.

Caution



Caution: vacuum component

Dirt and damages impair the function of the vacuum component.

When handling vacuum components, take appropriate measures to ensure cleanliness and prevent damages.

Caution



Caution: dirt sensitive area

Touching the product or parts thereof with bare hands increases the desorption rate.

Always wear clean, lint-free gloves and use clean tools when working in this area.

5.1 The Electronics Assembly

The electronics assembly of the Penning gauge PTR 225, PTR 225 S or PTR 237 does not require any maintenance.

5.2 Cleaning the Sensor

DANGER



A high tension which is dangerous when touched is applied to the sensor in the Penning gauge. You must always switch off the supply voltage for the gauge before starting any work on the gauge (even when removing the gauge from the connection flange) so as to avoid injury when inadvertently coming in to contact with the high tension.

5.2.1 Detaching the Electronics Assembly

In order to detach the electronics assembly and the magnet assembly (7/1) you must loosen the two cross head screws which can be accessed through two holes in the rear of the gauge by turning these by about 1.5 turns.

Then the electronics assembly and the magnet assembly (7/1) may be pulled off from the sensor housing.



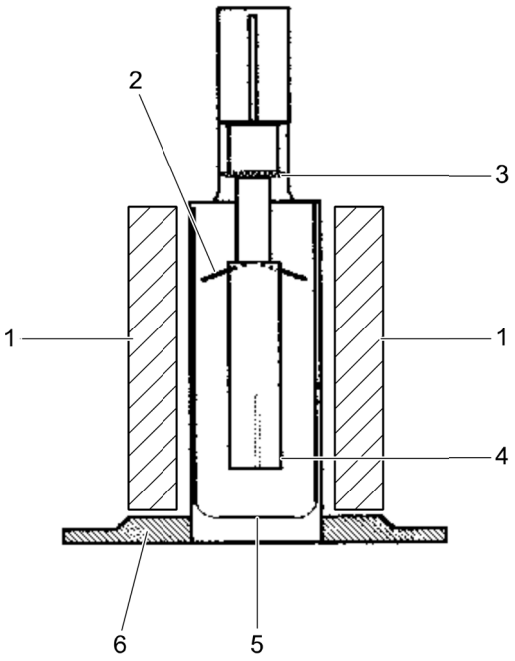
The magnet assembly (7/1) may drop down during the pulling off process.

5.2.2 Disassembly of the Sensor

The sensor consists of the vacuum housing, the anode ring (7/4) with ignition aid (7/2) and the cathode plate (7/5). See Fig. 7.

How to disassemble:

1) Use a pair of tweezers to pull the cathode plate (7/5) out of the sensor.
2) Use a pair of pliers to pull the anode ring out from the housing; for this move the pliers to and fro a little.
3) Detach the ceramics disc (7/3) from the current feed- through.



Key to fig. 7:

1 Magnet assembly
2 Ignition aid
3 ceramics disc
4 Anode ring
5 Cathode plate
6 Sensor housing with flange

Fig. 7 Sensor

5.2.3 Cleaning the Individual Parts

Do not damage the sealing surfaces of the vacuum flange.

In the case of severe contamination, the inside of the housing may be cleaned with steel wool or similar and then subjected to further cleaning with alcohol. Finally blow clean with oil-free pressurized air or nitrogen. Any possibly present flakes will be removed by blowing these out of the housing.

If possible, the cathode plate (7/5) should be replaced by a new cathode plate. The same should be done for the anode ring (7/4) with the ignition aid (7/2) and the ceramics protection disc (7/3) which protects the current feed-through against contamination.

5.2.4 Assembly of the Sensor

The sensor is reassembled in the reverse order as for disassembly which is described in Section 5.2.2.

When inserting the anode ring (7/4) you must make sure that a clearance of 1 mm remains between the wings of the ignition aid (7/2) and the wall of the housing. Moreover, make sure that the anode ring is lying snug on the ceramics disc.

When inserting the cathode plate (7/5) into the housing the wings of the ignition aid (7/2) must not be bent. Therefore insert slowly and carefully.

5.2.5 Assembly of the Electronics Assembly

How to proceed:

1) Place the magnet assembly on the sensor.
2) Push the electronics assembly over the magnet assembly and the sensor, and turn slightly as required until the correct orientation between electronics assembly and sensor has been found. When the electronics assembly has been placed as required, the black magnet housing is fully surrounded by the housing of the PTR 225, PTR 225 S or 237.
3) Retighten the cross head screws at the rear of the gauge.

6 Troubleshooting

Problem	Possible cause	Correction
No LED is on.	Supply voltage is missing.	
The "POWER" LED (6/1) is on, the "READY" LED (6/2) is not on.	High tension has not been activated. Pressure has dropped below < $3 \cdot 10^{-9}$ mbar. The gas discharge has not ignited. Sensing cell not properly connected to the electronics assembly (e.g. after maintenance). Missing anode ring (e.g. after maintenance).	
The measurement signal is always greater than 10 V even if the pressure is much lower than 10^{-2} mbar.	Short circuit in the sensing cell.	Clean the sensing cell. For this refer to section 5.2.
During pumpdown the measurement signal remains at some level although the pressure is dropping.	Contamination within the sensing cell.	Replace the sensing cell.

7 Wearing Parts and Original Spare Parts

When ordering spare parts, always indicate:

- all information on the product nameplate
- description and ordering number according to the spare parts list

	Ordering number
Maintenance set, consisting of: Cathode plate of titanium (5 pcs.) Ceramics disc (5 pcs) Gauge	PT 120 030 -T
Repair set kit, consisting of: Anode ring with ignition aid	PT 120 031 -T
Replacement sensor (DN 25 KF), complete with magnet assembly (PR 25)	PT 120 032 -T
Replacement sensor (DN 40 CF-F), complete with magnet assembly	PT 120 033 -T

8 Accessories

	Ordering number
10 m long connection cable, with two FCC 68 plugs, screened	PT 448 450 -T

For overpressure operation and degassing:

	Ordering number
Clamping ring for metal seals DN 25 ISO-KF	110BSD025
Aluminum edged seal, aluminum, annealed, DN 25 ISO-KF	110ZSK025

9 Returning the Product



WARNING

WARNING: forwarding contaminated products

Products returned to Pfeiffer Vacuum for service or repair should, if possible, be free of harmful substances (e.g. radioactive, toxic, caustic or microbiological). Otherwise, the type of contamination must be declared.

Adhere to the forwarding regulations of all involved countries and forwarding companies and enclose a completed contamination declaration (form under www.pfeiffer-vacuum.com).

Products that are not clearly declared as "free of harmful substances" are decontaminated at the expense of the customer.

Products not accompanied by a duly completed declaration of contamination are returned to the sender at his own expense.

10 Disposal

DANGER

DANGER: contaminated parts

Contaminated parts can be detrimental to health and environment.

Before beginning to work, find out whether any parts are contaminated. Adhere to the relevant regulations and take the necessary precautions when handling contaminated parts.

WARNING

WARNING: substances detrimental to the environment

Products or parts thereof (mechanical and electric components, operating fluids etc.) can be detrimental to the environment.

Dispose of such substances in accordance with the relevant local regulations.

Separating the components

After disassembling the product, separate its components according to the following criteria:

Contaminated components

Contaminated components (radioactive, toxic, caustic or biological hazard etc.) must be decontaminated in accordance with the relevant national regulations, separated according to their materials, and disposed of.

Other components

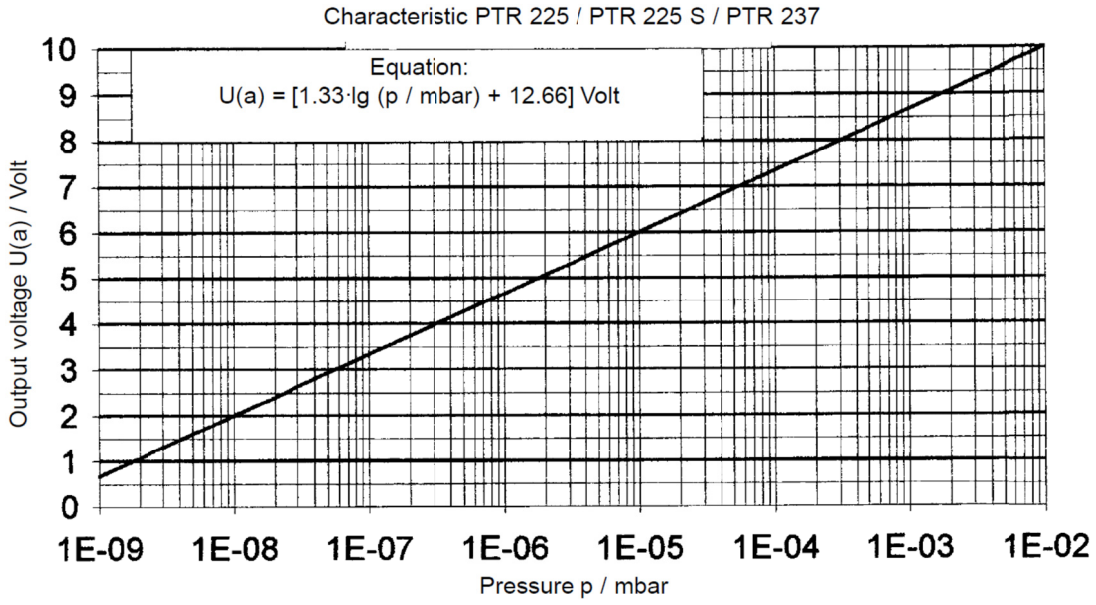
Such components must be separated according to their materials and recycled.

Appendix

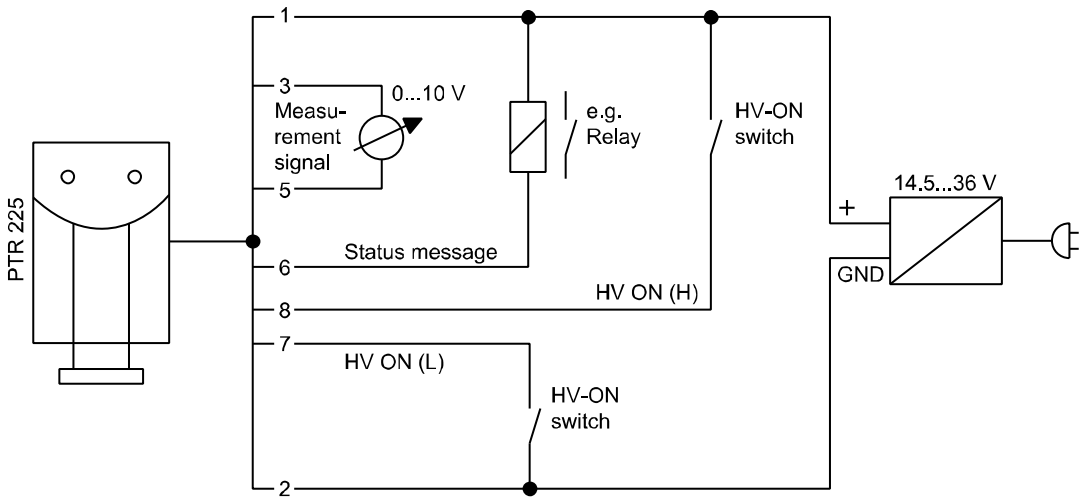
A: Relationship between output voltage and pressure

(U = 0,4 V; "not ignited")

U (Out) [V]	Pressure [mbar]	U Out) [V]	Pressure [mbar]	U (Out) [V]	Pressure [mbar]	U (Out) [V]	Pressure [mbar]
0,667	1,00E-09	3,4	1,12E-07	6	1,00E-05	8,6	8,91E-04
0,8	1,26E-09	3,5	1,33E-07	6,1	1,19E-05	8,7	1,06E-03
1	1,78E-09	3,6	1,59E-07	6,2	1,41E-05	8,8	1,26E-03
1,1	2,11E-09	3,7	1,88E-07	6,3	1,68E-05	8,9	1,50E-03
1,2	2,51E-09	3,8	2,24E-07	6,4	2,00E-05	9	1,78E-03
1,3	2,99E-09	3,9	2,66E-07	6,5	2,37E-05	9,1	2,11E-03
1,4	3,55E-09	4	3,16E-07	6,6	2,82E-05	9,2	2,51E-03
1,5	4,22E-09	4,1	3,76E-07	6,7	3,35E-05	9,3	2,99E-03
1,6	5,01E-09	4,2	4,47E-07	6,8	3,98E-05	9,4	3,55E-03
1,7	5,96E-09	4,3	5,31E-07	6,9	4,73E-05	9,5	4,22E-03
1,8	7,08E-09	4,4	6,31E-07	7	5,62E-05	9,6	5,01E-03
1,9	8,41E-09	4,5	7,50E-07	7,1	6,68E-05	9,7	5,96E-03
2	1,00E-08	4,6	8,91E-07	7,2	7,94E-05	9,8	7,08E-03
2,1	1,19E-08	4,7	1,06E-06	7,3	9,44E-05	9,9	8,41E-03
2,2	1,41E-08	4,8	1,26E-06	7,4	1,12E-04	10	1,00E-02
2,3	1,68E-08	4,9	1,50E-06	7,5	1,33E-04		
2,4	2,00E-08	5	1,78E-06	7,6	1,59E-04		
2,5	2,37E-08	5,1	2,11E-06	7,7	1,88E-04		
2,6	2,82E-08	5,2	2,51E-06	7,8	2,24E-04		
2,7	3,35E-08	5,3	2,99E-06	7,9	2,66E-04		
2,8	3,98E-08	5,4	3,55E-06	8	3,16E-04		
2,9	4,73E-08	5,5	4,22E-06	8,1	3,76E-04		
3	5,62E-08	5,6	5,01E-06	8,2	4,47E-04		
3,1	6,68E-08	5,7	5,96E-06	8,3	5,31E-04		
3,2	7,94E-08	5,8	7,08E-06	8,4	6,31E-04		
3,3	9,44E-08	5,9	8,41E-06	8,5	7,50E-04		



B: Example for Connecting



Example for connecting the PTR 225: Switching the high tension via an external switch or contact

C: Conversion Table

Pressure units
(vacuum technology)

	mbar	Bar	Pa	hPa	kPa	Torr mm HG
mbar	1	1×10^{-3}	100	1	0.1	0.75
Bar	1×10^{3}	1	1×10^{5}	1×10^{3}	100	750
Pa	0.01	1×10^{-8}	1	0.01	1×10^{-3}	7.5×10^{-3}
hPa	1	1×10^{-3}	100	1	0.1	0.75
kPa	10	0.01	1×10^{3}	10	1	7.5
Torr mm HG	1.332	1.332×10^{-3}	133.32	1.3332	0.1332	1

1 Pa = 1 N/m^2

EU Declaration of Conformity

CE

We, Pfeiffer Vacuum, hereby declare that the equipment mentioned below complies with the provisions of the Directive relating to electromagnetic compatibility 2014/30/EU and the Directive on the restriction of the use of certain hazardous substances in electrical and electronic equipment 2011/65/EU.

Products

Penning gauge

PTR 225, PTR 225 S, PTR 237

Part numbers

PT T13 148 300
PT T13 148 320
PT T13 358 300

Standards

Harmonized and international/national standards and specifications:

- EN 61000-6-2:2005
  (EMC: generic immunity standard for industrial environments)
- EN 61000-6-4:2007 + A1:2011
  (EMC: generic emission standard for industrial environments)
- EN 61010-1:2010
  (Safety requirements for electrical equipment for measurement, control and laboratory use)
- EN 61326-1:2013
  (EMC requirements for electrical equipment for measurement, control and laboratory use)

Manufacturer / Signatures

Pfeiffer Vacuum GmbH, Berliner Str. 43, D-35614 Asslar

21 April 2016

Dr. Ulrich von Hülsen
General Manager

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