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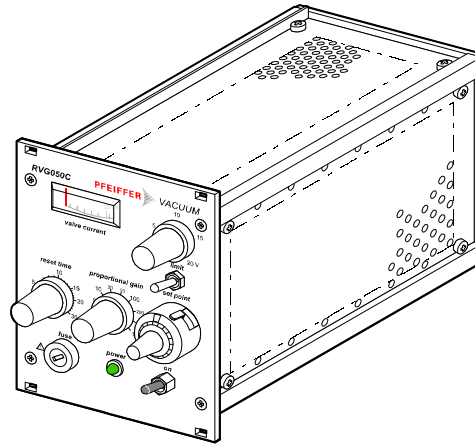
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Operating Instructions
Incl. Declaration of Conformity

PFEIFFER VACUUM

Control Unit

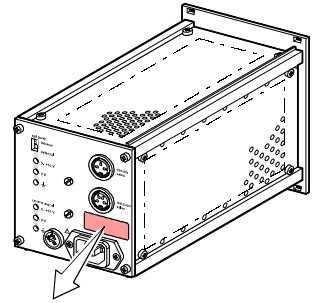
RVG 050 C



CE

Product Identification

In all communications with Pfeiffer Vacuum, please specify the information on the product nameplate. For convenient reference copy that information into the space provided below:



Pfeiffer Vacuum, D-35614 Asslar
Typ: – – – – – – – – – – – – –
No: – – – – – – – – – – – – –
F-No: – – – – – – – – – – – – –
– – – – – V – – – – Hz – – – VA

Validity

This document applies to products with part number PFI00795.

The part number can be taken from the product nameplate.

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

Dimensions in mm.

Intended Use

The Control Unit RVG 050 C is used in conjunction with UDV 146 gas dosing valve for configuring controlled systems. Depending on the type of signal generator used, total pressures, partial pressures or gas currents can be controlled.

Functional Principle

The gas flow of the gas dosing valve is controlled by varying the length of the bolt. This change in length is achieved by changing the temperature with a heater coil. The Control Unit compares the nominal value with the actual value and controls the heating power via a PI controller in such a way that deviation of the actual value from the nominal value is kept as close to zero as possible.

Total pressure gauges with analog outputs can be used as signal generators (actual value). The setpoint, for instance the pressure desired in a vacuum system, can be set on the control unit with a precision potentiometer (scale 0 … 1000) or supplied by an external source.

An additional remotely controlled isolation valve cuts off the gas flow in the event of a power failure or when the unit is switched off.

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For cross-references within this document, the symbol (→ 🗎 XY) is used, for cross-references to other documents, the symbol (→ 🕮 [Z]).

1 Safety

1.1 Symbols Used

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.

<....> Labeling

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 all work you are going to do and consider the safety instructions in this document.

Communicate the safety instructions to all other users.

1.4 Liability and Warranty

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

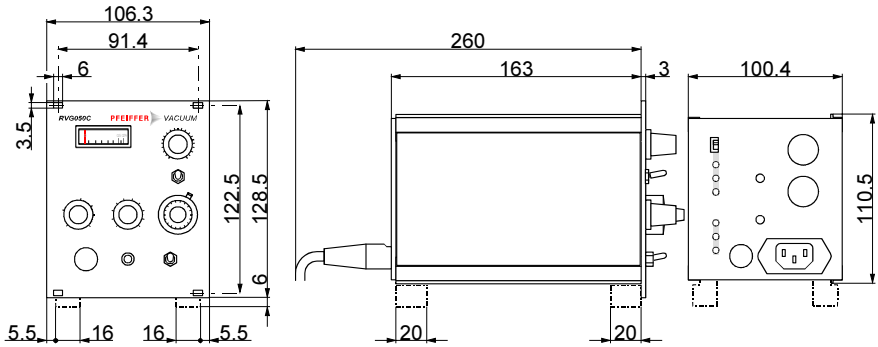
- disregard the information in this document
- use the product in a non-conforming manner
- make any kind of interventions (modifications, alterations etc.) on the product
- use the product with accessories not listed in the corresponding product documentation.

2 Technical Data

Mains specifications	Nominal voltage	115 / 230 V~ ±10 % (dual voltage, selectable)
	Frequency	50 … 60 Hz
	Power consumption	20 VA
	Overvoltage category	II
	Protection class	1
	Fuse	
	For 230 V	125 mATT
	For 115 V	250 mATT
	Connection	European appliance connector IEC 60320 C14
Ambiance	Temperature	
	Operation	+ 5 … +50 °C
	Storage	–20 … +60 °C
	Relative humidity	≤80% up to +31 °C, decreasing to 50% at +40 °C
	Use	indoors only max. altitude 2000 m NN
	Pollution degree	II
	Protection type	IP20

Control circuit	Regulating characteristics	proportional - integral (PI)
	Proportional gain V_p (referenced to 100 mV input)	2 … 1000
	Reset time T_n	2 … 30 s
	Actual value-input signal	0 … +10 V= (<input> jacks)
	Impedance	≈100 kΩ
	Internal nominal value	
	Nominal value, adjustable	0 … +10 V=
	Scale divisions	0 … 1000
	External nominal value	
	Voltage	1 … 10 V= / ≈100 kΩ
	Output <dosing valve>	
	Voltage	0 … +20 V=
	Current	≤0.5 A
		≈0.7 A short circuit current
		<10 s duration of short circuit
	Output <isolation valve>	
	voltage	24 V=
	current	≤0.2 A

Dimensions



Use

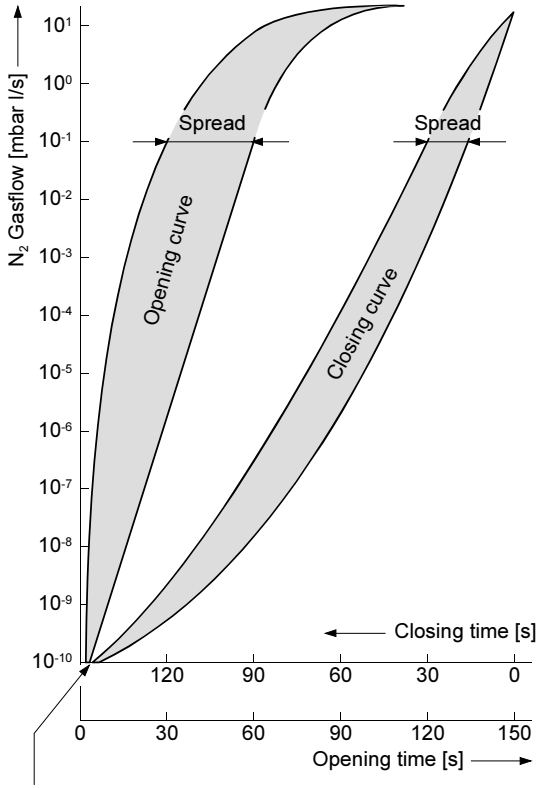
For incorporation into a rack or control panel or for use as a desk-top unit.

Weight

≈2.3 kg

Gas throughput characteristic

Example of the gas throughput characteristic of a UDV 146 used in conjunction with the RVG 050 C at maximum power.



Manually adjusted valve opening and closing

The spread is a function of the mechanical tolerances of the valve.

3 Installation

3.1 Personnel



Skilled personnel



The unit may only be installed by persons who have suitable technical training and the necessary experience.

3.2 Installation, Setup

The product is suited for incorporation into a 19" rack or a control panel or for use as desk-top unit.



DANGER



Caution: damaged product

Putting a damaged product into operation can be extremely hazardous.

In case of visible damages, make sure the product is not put into operation.

3.2.1 Rack Installation

The product is designed for installation into a 19" rack chassis adapter using acc. to DIN 41 494. For this purpose, four collar screws and plastic sleeves are supplied with it.



DANGER



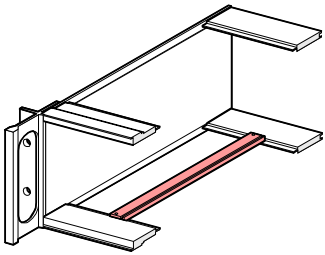
Caution: protection class of the rack

If the product is installed in a rack, it is likely to lower the protection class of the rack (protection against foreign bodies and water) e.g. the EN 60204-1 regulations for racks.

Take appropriate measures for the rack to meet the specifications of the protection class.

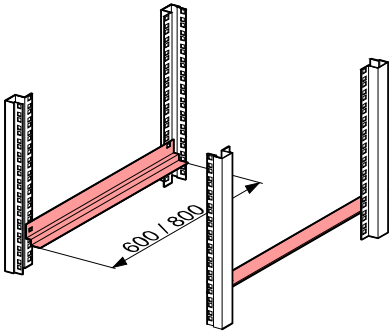
Guide rail

In order to reduce the mechanical strain on the front of RVG 050 C, preferably equip the rack chassis adapter with a guide rail.



Slide rails

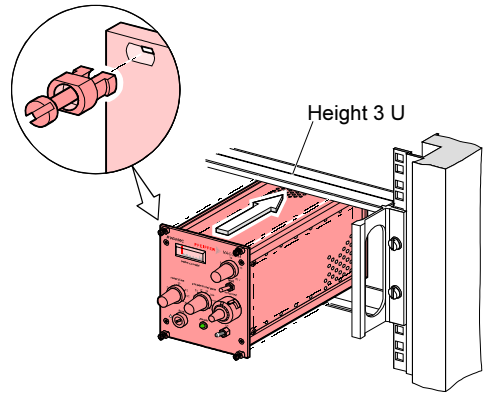
For safe and easy installation of heavy rack chassis adapters, preferably equip the rack frame with slide rails.



Height 3 U rack chassis adapter

❶ Secure the rack adapter in the rack frame.

❷ Slide RVG 050 C into the rack chassis adapter.

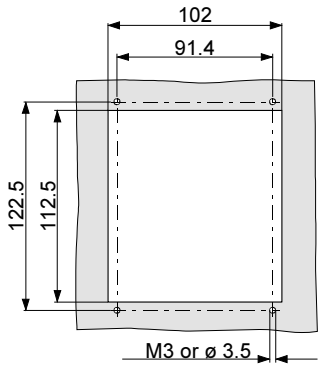


❸ Fasten RVG 050 C to the rack chassis adapter using the screws and plastic sleeves supplied with it.

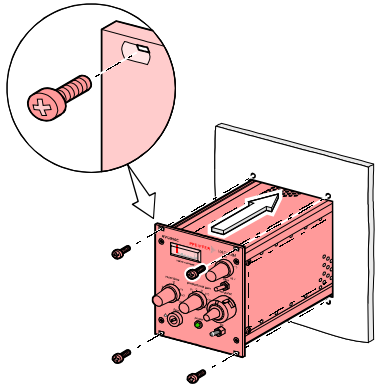
The temperature inside the rack must not exceed the admissible maximum ambient temperature (→ 8).

3.2.2 Installation in a Control Panel

For mounting into a control panel, the following cut-out is required:



❶ Slide RVG 050 C into the cut-out of the control panel.



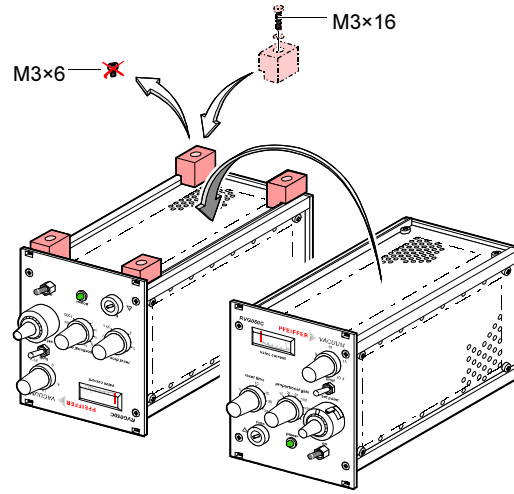
❷ Fasten it with four M3 or equivalent screws.

Make sure the admissible maximum ambient temperature (→ 🗎 8) is not exceeded.

3.2.3 Use as Desk-top Unit

RVG 050 C is also suited for use as desk-top unit. For this purpose four rubber feet, four pen head screws and four suitable washers are supplied with it.

❶ Remove one of the four pen head screws (M3×6), position the rubber feet and fasten it with a screw M3×16.



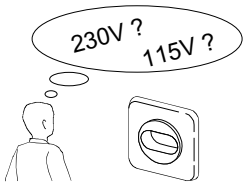
❷ Mount the other three rubber feet as described in ❶.

Select a location where the admissible maximum ambient temperature (→ 🗎 8) is not exceeded (e.g. due to sun irradiation).

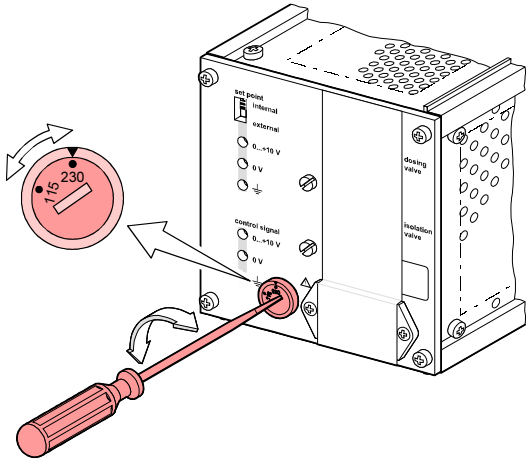
3.3 Mains Power Connector

Setting the nominal voltage

RVG 050 C can be operated with 230 V or with 115 V line voltage.



Set the nominal voltage to the local line voltage with the voltage selector on the back of the unit.

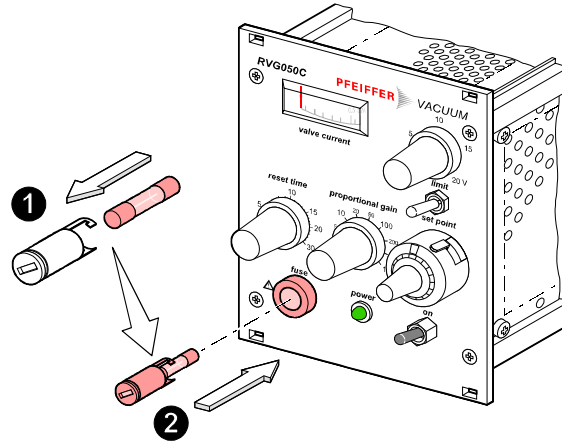


Mounting fuse

A fuse holder and correct fuses for the admissible line voltages are included in the delivery.

Mount the correct fuse for the local line voltage.

Line voltage	Fuse
230 V	125 mATT, 250 V, ø5×20 mm
115 V	250 mATT, 250 V, ø5×20 mm



Connecting mains power

DANGER

Caution: protective ground

Incorrectly grounded products can be extremely hazardous in the event of a fault.

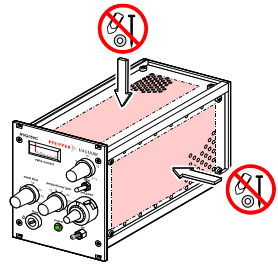
Use only a 3-conductor power cable with protective ground. The power connector may only be plugged into a socket with a protective ground. The protection must not be nullified by an extension cable without protective ground.

DANGER

Caution: line voltage

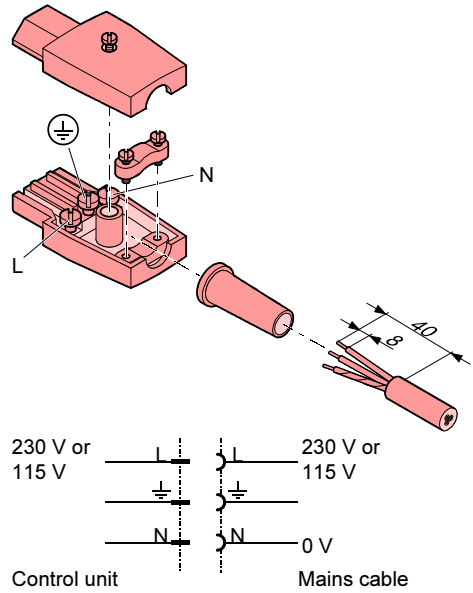
Inserting items into the product can be extremely hazardous.

Do not insert any items through the openings in the housing.

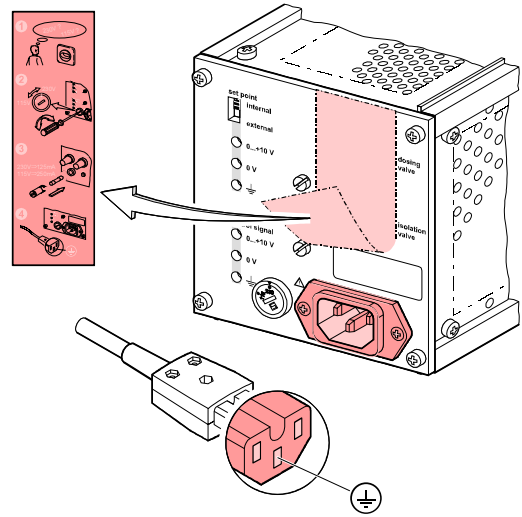


A 3-conductor power cable with protective ground has to be supplied by the user. A appliance conductor is included in the delivery.

Pin assignment



Connecting Control Unit



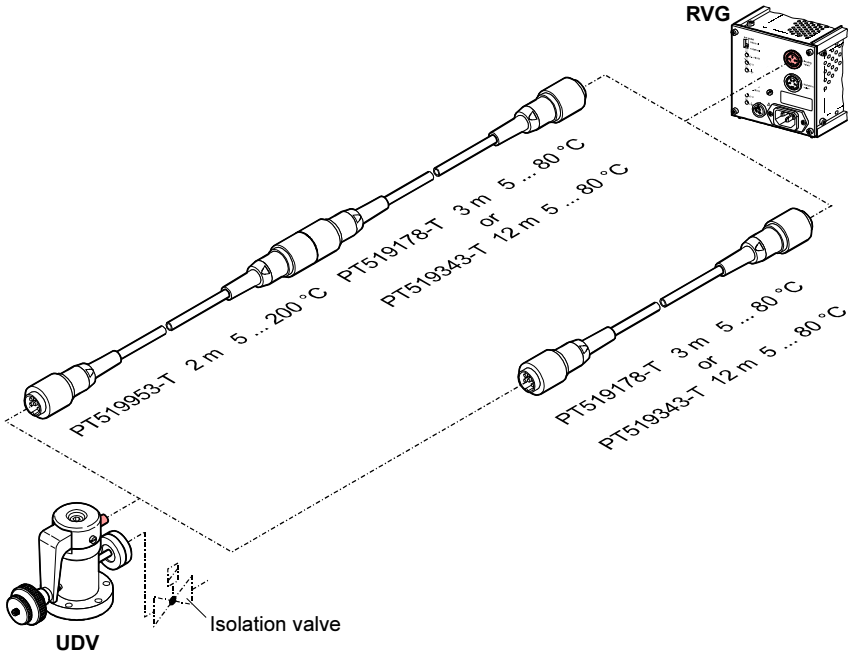
If the unit is installed in a rack, the main voltage should be supplied and turned on via a central distributor.

3.4 Connector Valve RVG 050 C ⇒ UDV 146

At operating temperatures at UDV 146 of 5 … 80 °C, use the standard cable PT519178-T or PT519343-T (→ 39).

At temperatures >80 … 200 °C, use the heat resistant extension cable PT519953-T between UDV 146 and standard cable.

Turn off RVG 050 C before connecting or disconnecting UDV 146.



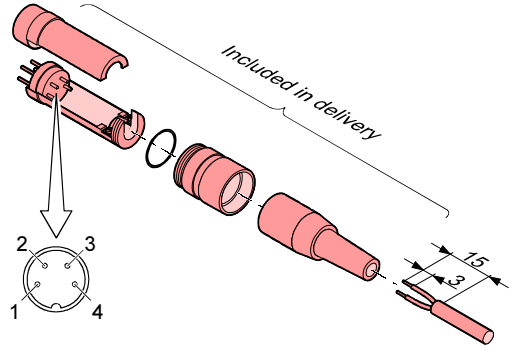
3.5 Connector Valve RVG 050 C ⇒ Isolation Valve

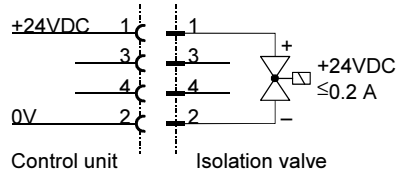
We recommend to use a remotely controlled isolation valve, which cuts off the gas flow in the event of a power failure or when the unit is switched off.

For this purpose, a 4 pole connector acc. to IEC 130-9 is included in the delivery.

Pin assignment

Pin assignment of the connector:



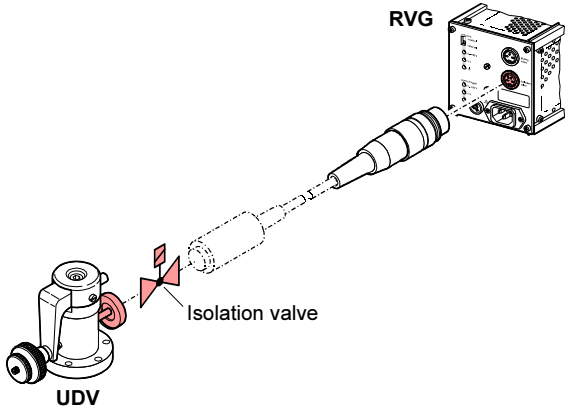


Connecting isolation valve

The isolation valve, the plug at the valve and the cable have to be supplied by the user.

The isolation valve has to close in the non-energized state.

Turn off RVG 050 C before connecting or disconnecting isolation valve.

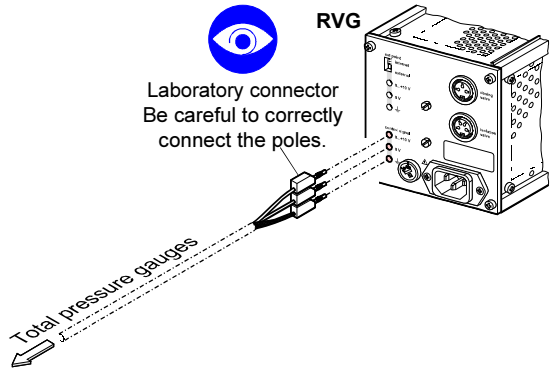


3.6 Connector Control Signal Actual Value Transmitter ⇒ RVG 050 C

Connect one end of the screening to the ground jack of RVG 050 C as short as possible. Connect the other end as described in the manual of the total pressure gauge. If both sides of the screening are connected to ground, precautions against ground currents must be taken. This is achieved by operating both vacuum gauge and RVG 050 C from a central mains distributor, the ground point of which must not have a potential difference with respect to the switch cabinet and the vacuum system.

☞ Use a screened, twisted bipolar cable (electromagnetic compatibility).

☞ Turn off RVG 050 C before connecting or disconnecting control signal actual value transmitter.



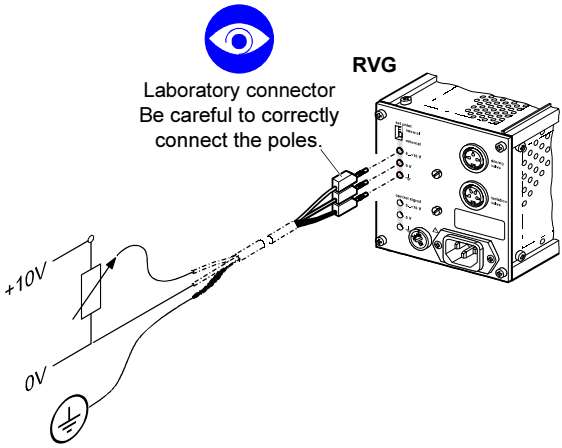
3.7 Connector External Setting of Nominal Value ⇒ RVG 050 C



For external setting of the nominal value, set the switch on the back panel to <external> (→ 🗎 29).

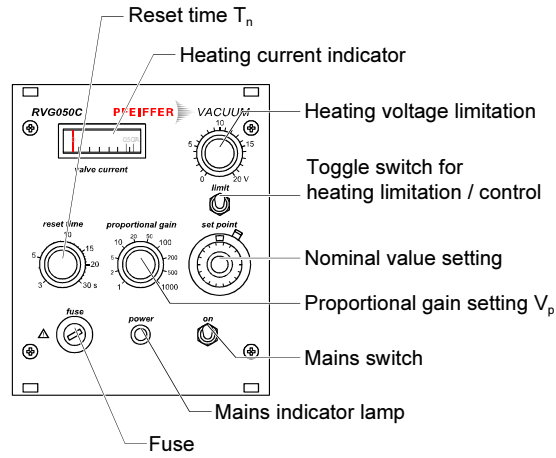
Use a screened, twisted bipolar cable (electromagnetic compatibility).

Turn off RVG 050 C before connecting or disconnecting external setting of the nominal value.



4 Operation

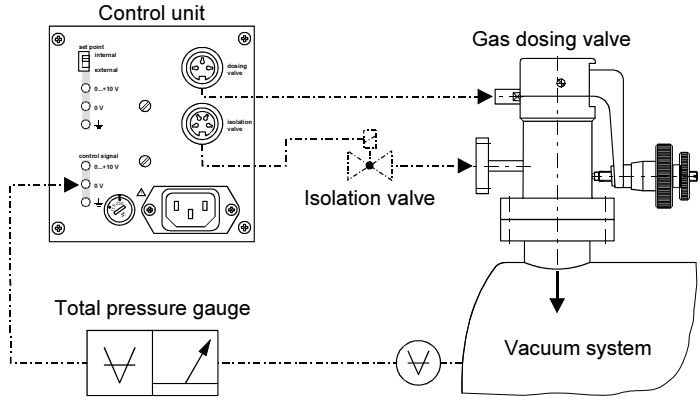
4.1 Front Panel



4.2 Configuration of a Controlled System

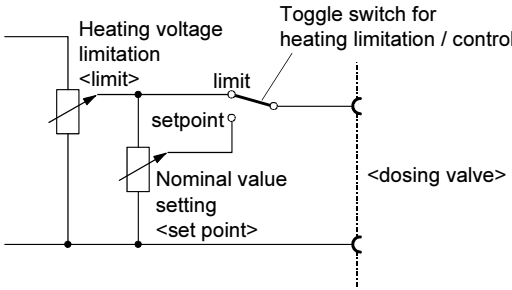
A total pressure gauge measures the actual pressure in a vacuum system and gives a pressure-dependent, electrical signal (actual value) to the Control Unit. The Control Unit, in turn, regulates the gas dosing valve to ensure that the desired pressure is maintained in the vacuum system.

Controlled system



The value set at the potentiometer of the heating limitation <limit> limits the output voltage of the controller.

If the toggle switch for heating limitation / control is set to <limit>, the control is not operative. In the position <set point> the control is operative. The Control Unit compares the nominal value with the actual value and controls the heating power via a PI controller in such a way that deviation of the actual value from the nominal value is kept as close to zero as possible. The maximum heating voltage during control is limited to the value set at the potentiometer <limit>.



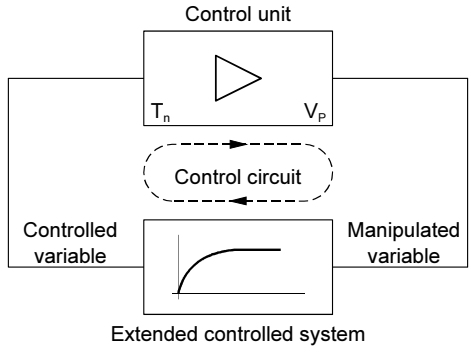
The current flowing in the valve's heating coil can be read at any time on the <valve current> heating current indicator.

Total pressure gauges with analog outputs can be used as signal generators (actual value). The setpoint, for instance the pressure desired in a vacuum system, can be set on the Control Unit with the <set point> 10-turn precision potentiometer (scale 0 … 1000) or supplied by an external source.

An additional remotely controlled isolation valve cuts off the gas flow in the event of a power failure or when the unit is switched off.

Extended controlled system

Gas dosing valve – isolation valve – vacuum system – total pressure gauge are, for control trop considerations, considered as "extended controlled system". The following block circuit diagram results for the control circuit:



Guidelines for setting T_n (reset time) and setting V_p (proportional gain) → 35.

4.3 Turning RVG 050 C On and Off

WARNING

Caution: line voltage

Incorrect voltages can destroy the product.

The nominal voltage of the product (→ product nameplate) must correspond to the local line voltage ratings. If they do not correspond, set the correct nominal voltage (→ 16).

Caution

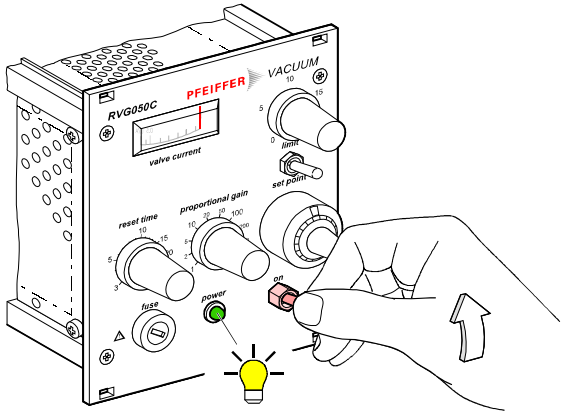
Caution: wrongly set parameters

When the product is switched on, the set parameters are activated at once. This can e.g. lead to damages at the valve plate (sapphire) of the gas dosing valve or may lead to an unstable control loop.

Check the parameters before the unit is switched on.

Turning RVG 050 C on

The power switch is on the front plate of the unit. Turn RVG 050 C on with the power switch (or centrally, via a switched power distributor, if the unit is incorporated in a rack).



Turning RVG 050 C off

Turn RVG 050 C off with the power switch (or centrally, via a switched power distributor, if the unit is incorporated in a rack).

4.4 Setting the Nominal Value

Internal setting of nominal value



Set the switch on the back panel to <internal>.

The internal setting of the nominal value is set by a 10-turn precision potentiometer (scale 0 … 1000 corresponds to 0 … +10 V=). For Pfeiffer Vacuum total vacuum gauges, the indicated analog output voltage practically corresponds with the final value of the respective range; for analog gauges, this is equivalent to the final value of the respective scale.

External setting of nominal value



Set the switch on the back panel to <external>.

A voltage which changes with time (command variable) within the range of 0 … +10 V= can also be used as an external nominal voltage (sequence regulation). By this means, the pressure within a vacuum system can follow a specified time function.

4.5 Setting the Control Range

If the vacuum gauge has an analog output range of 0 … +10 V, its pressure range corresponds with the nominal value setting of RVG 050 C. If, for example, the <set point> potentiometer is set to 450, the pressure will be controlled according to a directly proportional analog output voltage of 4.5 V on the total pressure gauge.

However, if the total pressure gauge has an analog output range of 0 … +1 V, for example, only the 0 … 100 scale division range (corresponding to 0 ... 1 V) may be used to enter the set point. Settings higher than 100 scale divisions may not be used.

Total vacuum gauges with both, <LIN> (linear) and <LOG> (logarithmic) operating modes can be operated in either mode for pressure control purposes. In <LOG> mode, it is possible to control the pressure over several decades without a measurement range switchover.

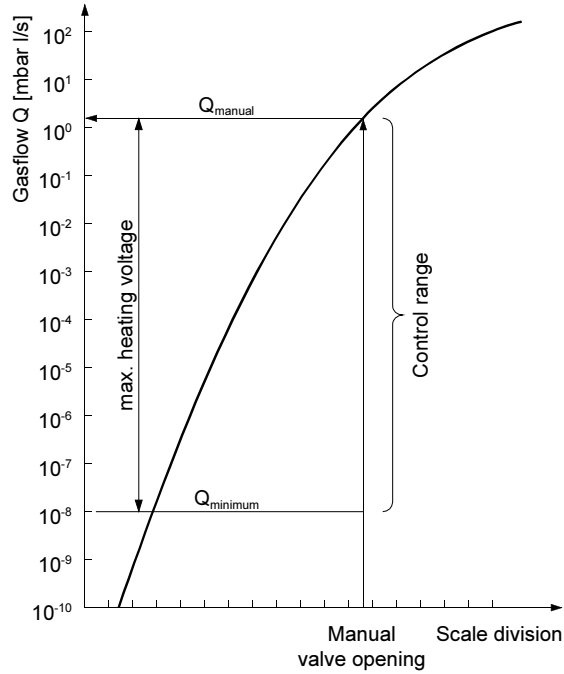
If pressure control with high resolution, i.e. with a very precise set point setting, is required, such total vacuum gauges should be operated in <LIN> mode. In this mode, the set point entry range stretches across an entire pressure decade, which has been selected with the range switch on the total vacuum gauge.

Deviations occurring with automatic range switchover are due to the hysteresis.

4.6 Setting the Heating Voltage Limitation

The valve opening on UDV 146 is adjusted manually to produce gas flow Q_{manual}. If there is no isolation valve, this manually set value limits the control range and thus also the gas flow in the event of a power failure. Once the required set point has been entered on RVG 050 C any required gas flow between Q_{manual} and $Q_{minimum}$ can be established and maintained. The valve conductance is determined by the mechanical adjustment and the effective heating power. Increasing the heating current always causes the valve to close, lowering the heating current causes it to open (→ 🕮 [1]).

This is a typical characteristic curve for a gas flow shown as a function of the valve opening. Here the inlet pressure was 1 bar.



Heating voltage at low gas flows

Caution

Caution: Heating voltage at a closed valve or at low gas flows

If the maximum heating voltage is applied at closed valve or low gas flow (<10^{-8} mbar l/s), the valve plate (sapphire) could be damaged.

Use maximum heating voltage only at gas flows >10^{-8} mbar l/s.

This could happen if, for example, RVG 050 C constantly received a signal indicating that the actual pressure value was higher than the nominal value, e.g. due to a leak or increased degassing. Therefore, the heating voltage must always be limited by the <limit> potentiometer when the valve has been manually set between closed and half-open, i.e. especially when the flow rates are very low.

Thus the heating voltage must be adjusted according to the required gas flow, making it directly related to the pumping speed of the vacuum pumps being used in the system.

4.7 Setting the Pressure

Internal setting of nominal value

❶ Turn RVG 050 C off (→ 🗎 29).

❷ Set the switch on the back panel to <internal>.

❸ Check that the <input> socket on RVG 050 C is correctly connected to the analog output of the actual value output unit (→ 🗎 23).

❹ Set total pressure gauge with modes <LIN> and <LOG> to the mode <LIN>.

❺ Open UDV 146 valve from the adjustment screw until the pressure is higher by approx. a factor of 10 than the required control pressure. Set the pressure range switch to a value one order of magnitude above the required controlled pressure.

❻ Set the toggle switch to <limit> and the heating voltage to "0".

❼ Turn RVG 050 C on (→ 🗎 28).

❽ Slowly turn up the <limit> heating voltage until the pressure on the display is at a value at least 30% lower than the required controlled pressure.

❾ Set the <set point> 10-turn precision potentiometer to the required control value.

❿ Set the toggle switch to <set point>.

⓫ Adjusting the control parameters <reset time> and <proportional gain> → 🗎 35. It is not possible to give a fixed time constant for control systems in general. The time constant depends on the particular manual valve adjustment, the primary pressure, the effective pumping speed of the pumping system being used and the ambient temperature. The gain parameters can be adjusted from the front panel controls within a wide range to allow optimal adaptation to this combination of factors in any particular control system.

External setting of nominal value

❶ Turn RVG 050 C off (→ 🗎 29).

❷ Set the switch on the back panel to <external>.

❸ Check that the <external> socket on the RVG 050 C is correctly connected to the unit supplying the external nominal value (e.g. computer or PLC) (→ 🗎 24).

❹ Check that the <input> socket on the RVG 050 C is correctly connected to the analog output of the actual value output unit(→ 🗎 23).

❺ Set total pressure gauge with modes <LIN> and <LOG> to the mode <LIN>.

❻ Open the UDV 146 valve from the adjustment screw until the pressure is higher by approx. a factor of 10 than the required control pressure. Set the pressure range switch to a value one order of magnitude above the required controlled pressure.

❼ Set the toggle switch to <limit> and the heating voltage to "0".

❽ Turn RVG 050 C on (→ 🗎 28).

❾ Slowly turn up the <limit> heating voltage until the pressure on the display is at a value at least 30% lower than the required controlled pressure.

❿ Set the desired value by the unit supplying the external value.

⓬ Set the toggle switch to <set point>.

⓭ Adjusting the control parameters <reset time> and <proportional gain> → 🗎 35. It is not possible to give a fixed time constant for control systems in general. The time constant depends on the particular manual valve adjustment, the primary pressure, the effective pumping speed of the pumping system being used and the ambient temperature. The gain parameters can be adjusted from the front panel controls within a wide range to allow optimal adaptation to this combination of factors in any particular control system.

4.8 Guidelines for Setting Controller Parameters

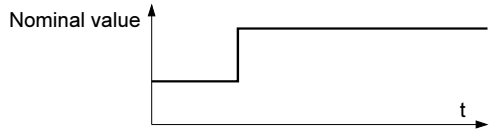
The control parameters T_n (reset time) and V_p (proportional gain) have to be set in a way that the control loop is stable (no oscillations!). The optimal control parameters depend on the extended control system.

The following is generally applicable for setting the T_n (reset time) and V_p (proportional gain) controller parameters.

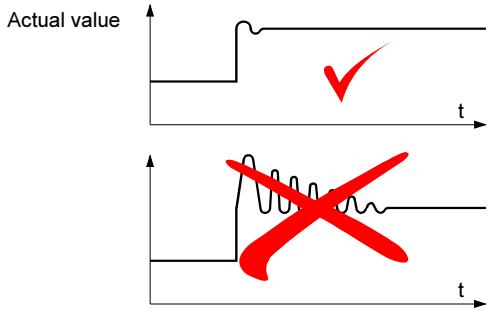
- The lower proportional gain V_p is, the more stable the transient period and the larger the first overshoots. The control speed is slower. Increasing proportional gain V_p increases the control speed, but when V_p is too high, the control circuit can become unstable.
- Lowering reset time T_n also increases the control speed, but conversely, when T_n is too low, the control circuit can become unstable.
- A high reset time means that it takes longer to filter out interference, and the control speed is slower.
- For difficult to control systems (high control time constants) we recommend starting with a low set point and then slowly increasing it to the required values.

To check the control parameter settings, check the reaction of the control circuit as follows:

- Make a sudden change in the set point and record the reaction of the actual value on a strip chart or observe it on an oscilloscope.



- In a correctly adjusted control circuit, the actual value will be corrected quickly to equal the set point without any large overshoots or long transient periods.



4.9 Turning RVG 050 C off and Closing UDV 146

Without isolation valve

STOP DANGER

Caution: hot surface

Touching the hot surface (>55 °C) can cause burns.

Switch product off and let it cool down.

Turn RVG 050 C off (→ 29).

Close UDV 146 manually after a cool-down time of ≈2 minutes.

The UDV 146 opens to the mechanical stop if the power fails.

With isolation valve

The remote controlled isolation valve is closed in the non-energized state. This has the effect of stopping gas admission to the process chamber when RVG 050 C is turned off, or in the event of a power failure.

4.10 General Information on the Total Pressure Gauges to be Used

As actual value input unit for pressure controlling with RVG 050 C, use total pressure gauges with a 0 … +10 V= analog output (e.g. Pfeiffer Vacuum total pressure gauge TPG 300).

Correlation between pressure and analog output
→ 🕮 total pressure gauges.

5 Maintenance

The product requires no maintenance.

Cleaning RVG 050 C

A slightly damp cloth normally suffices for cleaning the outside of the unit. Do not use any aggressive or scouring cleaning agents.



Make sure that no liquid can penetrate the product. Allow the product to dry thoroughly before putting it into operation again.

6 Troubleshooting

Power supply

Type of error	Possible cause and remedy
Power supply signal lamp is not lit (instrument is not operating)	Product not connected to mains. ⇨ Connect product to mains (→ 16).
	Fuse not mounted. ⇨ Mount correct fuse (→ 17).
	Fuse has blown. ⇨ Replace fuse.
The mains fuse blows repeatedly	Wrong nominal voltage set. ⇨ Establish correct mains connection (→ 16).
	Incorrect fuse mounted. ⇨ Mount correct fuse(→ 17).

Control circuit

When the control circuit does not function properly, first check that the gas dosing valve (→ 20) and total pressure gauge are correctly connected (→ 23). Watch that the input voltage polarity at the <input> socket is correct.

Type of error	Possible cause and remedy
The pressure is not controlled; there is no current flowing through the valve coil (<valve current> display on zero)	The <set point> switch on the back panel is set incorrectly. ⇨ Correct switch setting (→ 29).
	Heating voltage limitation <limit> is on "0". ⇨ Set heating voltage limitation correctly (→ 31).
	Cable to gas dosing valve defective. ⇨ Repair or replace cable (→ 39).
	Heating coil of the UDV 146 is defective. ⇨ Check heating coil (→ [2]).

Type of error	Possible cause and remedy
The pressure is not controlled although there is current flowing	Manual setting of the valve opening to small. ⇨ Open valve further (→ 🕮 [1]).
	The toggle switch on the front panel is on <limit>. ⇨ Set the toggle switch to <set point>.
	There is a short circuit in the heating coil of the UDV 146. ⇨ Check heating coil (→ 🕮 [2]).
	The heating coil of the UDV 146 has ground contact. ⇨ Check heating coil(→ 🕮 [2]).

Technical support

If you need help in troubleshooting, please contact your local Pfeiffer Vacuum service center.

7 Accessories

	Ordering number
Gas dosing valve UDV 146	PFI52034
Standard cable 3 m, ≤80 °C	PT519178-T
12 m, ≤80 °C	PT519343-T
Extension cable heat resistant, 2 m, ≤200 °C	PT519953-T
Laboratory connector ø2 mm Set consisting of 10 pieces red and black each	BN 846 254 -T

8 Storage



Caution

Caution: electronic component

Inappropriate storage (static electricity, humidity etc.) can damage electronic components.

Store product in antistatic bag or container. Observe the corresponding specifications in the "Technical Data" (→ 🗎 8).

9 Disposal



WARNING

Caution: 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:

Non-electronic components

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

Electronic components

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

Appendix

A: Conversion Tables

Weight

	kg	lb	slug	oz	cwt	sh cwt
kg	1	2.205	68.522×10^{-3}	35.274	19.684×10^{-3}	22.046×10^{-3}
lb	0.454	1	31.081×10^{-3}	16	8.929×10^{-3}	10×10^{-3}
slug	14.594	32.174	1	514.785	0.287	0.322
oz	28.349×10^{-3}	62.5×10^{-3}	1.943×10^{-3}	1	0.588×10^{-3}	0.625×10^{-3}
cwt	50.802	112	3.481	1.792×10^{3}	1	1.12
sh cwt	45.359	100	3.108	$1.6\cdot10^{3}$	0.893	1

Pressure

	N/m², Pa	bar	mbar	Torr	at	lbf/in², psi
N/m², Pa	1	10×10^{-6}	10×10^{-3}	7.5×10^{-3}	9.869×10^{-6}	0.145×10^{-3}
bar	100×10^{3}	1	10^{3}	750.062	0.987	14.504
mbar	100	10^{-3}	1	750.062×10^{-3}	0.987×10^{-3}	14.504×10^{-3}
Torr	133.322	1.333×10^{-3}	1.333	1	1.316×10^{-3}	19.337×10^{-3}
at	101.325×10^{3}	1.013	1.013×10^{3}	760	1	14.696
lbf/in², psi	6.895×10^{3}	68.948×10^{-3}	68.948	51.715	68.046×10^{-3}	1

Pressure units used in the vacuum technology

	mbar	Pascal	Torr	mmWs	psi	inch of merc.
mbar	1	100	750.062×10^{-3}	10.2	14.504×10^{-3}	2.95×10^{-2}
Pascal	10×10^{-3}	1	7.5×10^{-3}	0.102	0.145×10^{-3}	2.95×10^{-4}
Torr	1.333	133.332	1	13.595	19.337×10^{-3}	3.937×10^{-2}
mmWs	9.81×10^{-2}	9.81	7.356×10^{-2}	1	1.422×10^{-3}	2.896×10^{-3}
psi	68.948	6.895×10^{3}	51.715	703	1	2.036
inch of merc.	33.86	3.386×10^{3}	25.4	345	0.491	1

Linear measures

	mm	m	inch	ft
mm	1	10^{-3}	39.37×10^{-3}	3.281×10^{-3}
m	10^{3}	1	39.37	3.281
inch	25.4	25.4×10^{-3}	1	8.333×10^{-2}
ft	304.8	0.305	12	1

Temperature

	Kelvin	Celsius	Rankine	Fahrenheit
Kelvin	1	°C+273.15	°R×5/9	(°F+459.67)×5/9
Celsius	K-273.15	1	(°R-491.69)×5/9	5/9×°F-17.778
Rankine	K×9/5	(°C×9/5)+491.69	1	°F+459.67
Fahrenheit	9/5×K-459.67	9/5×(°C+17.778)	°R-459.67	1

B: Literature

[1] www.pfeiffer-vacuum.de
Instruction Sheet
All-metal regulating valve UDV 146
BP 805 282 BE
Pfeiffer Vacuum GmbH, D–35614 Asslar
Deutschland

[2] www.pfeiffer-vacuum.de
Operating Instructions
All-metal regulating valve UDV 146
BP 805 281 BE
Pfeiffer Vacuum GmbH, D–35614 Asslar
Deutschland

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Declaration of Conformity

as defined by the Directive relating to machinery 98/37/EC, Appendix IIb

We, Pfeiffer Vacuum, hereby declare that putting the incomplete equipment mentioned below into operation is not permitted until evidence is given that the system into which that incomplete equipment shall be installed is in accordance with the provisions of the EC Directive relating to machinery.

We also declare that the equipment mentioned below complies with the provisions of the Directive relating to electrical equipment designed for use within certain voltage limits 73/23/EEC and the Directive relating to electromagnetic compatibility 89/336/EEC.

Product

Control Unit

RVG 050 C

Part number

PFI00795

Standards

Harmonized and international/national standards and specifications:

- EN 61010-1 (Safety requirements for electrical equipment for measurement, control and laboratory use
- EN 50081-1 (Electromagnetic compatibility generic emission standard)
- EN 50082-2 (Electromagnetic compatibility generic immunity standard)

Signature

Pfeiffer Vacuum GmbH, Asslar

6 March 2001



Wolfgang Dondorf
Managing director

Notes

Notes

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