

Vaccuperm VGA-146

Vacuum regulator

GB Service instructions





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Warning

These operating instructions are also available on www.Grundfosalldos.com.

Prior to installation, read these installation and operating instructions. Installation and operation must comply with local regulations and accepted codes of good practice.

1. Of general interest

1.1 Structure of the documentation

The Grundfos Alldos vacuum regulator VGA-146VGA-146 is a state-of-the-art solution, which complies with recognised safety regulations. Conformity with applicable standards, directives and laws has been verified. Nevertheless, certain risks which cannot be prevented by the manufacturer are associated with the use of the system.

Purpose of this manual:

- Inform users of optimum use.
- Warn users of possible residual risks when using correctly and identify measures that should be taken to avoid damage.
- Caution users against obvious misuse or inappropriate use and inform them of the necessary care that must be taken when operating the system.

1.2 About this manual

This manual contains the following standardised safety instructions about possible residual risks:



Warning

If these safety instructions are not observed, it may result in personal injury!

Caution

If these safety instructions are not observed, it may result in malfunction or damage to the equipment!

Note

Notes or instructions that make the job easier and ensure safe operation.

Information about possible residual risks is provided:

- On warning signs displayed in the installation location.
- At the start of each section in this manual.
- Directly before any operating procedures that could involve residual risks.

1.3 User/target groups

Users are persons who are responsible for operating and monitoring the device VGA-146 at the installation location.

The system may only be operated by trained and qualified personnel. Personnel must have appropriate technical knowledge and be familiar with the basic principles of measuring and control technology.

1.3.1 Responsibilities of the users

The users' responsibilities:

- Read this manual before operating the VGA-146.
- Be trained by qualified personnel from Grundfos Alldos in the operation of the system.
- Observe the recognised regulations governing safety in the workplace and accident prevention.
- Wear appropriate protective clothing in accordance with national regulations for the prevention of accidents when operating the system and handling chemicals (German GUV-V D05).

1.4 Responsibilities of the operator

The owner of the building or operator of the VGA-146 is responsible for the following:

- Consider this manual to be part of the product and ensure that it is kept clearly accessible in the immediate vicinity of the system for the entire service life of the system.
- Meet the installation requirements specified by the manufacturer (required water connections and fittings, environmental conditions, electrical connection, protective pipe for dosing line if necessary, audible or optical warning device for alarm messages if necessary).
- Ensure that water lines and fixings are regularly checked, serviced and maintained.
- Obtain official approval for storing chemicals, if necessary.
- Train users in the operation of the system.
- Ensure that the regulations for the prevention of accidents are observed in the installation location (German GUV-V D05 regulation for the prevention of accidents, "Chlorination of Water" dated January 1997).
- Provide all users and service personnel with protective clothing in accordance with GUV-V D05 (face mask, gloves, protective apron).

1.5 Maintenance and service personnel

The system may only be maintained and serviced by authorised service personnel from Grundfos Alldos.

1.6 Correct usage

The Grundfos Alldos VGA-146 may be used for dosing chlorine (Cl₂) as being described in this manual.

1.7 Inappropriate usage

Applications other than those listed in section 1.6 *Correct usage* are considered not to be in accordance with the intended use and are not permitted. The manufacturer, Grundfos Alldos, accepts no liability for any damage resulting from incorrect use.

The system comprises state-of-the-art components and has undergone safety-related testing.

Warning



Unauthorised structural modifications to the system may result in serious damage to equipment and personal injury.

It is forbidden to open, modify, change the structure of, bridge, remove, bypass or disable components, especially safety equipment.

2. Technical Data

2.1 Type key VGA-146

Example: Vacuum regulator Type key VGA-146-D/1/6-S-0RF

Code	Example	VGA-146	-D	/1	/6	-S	-0	R	F
	Vaccuperm Gas Advanced = VGA								
	Installation								
D	Directly on the drum								
W	Wall-mounting								
C	Header line								
	Connection								
1	G 1								
2	G 3/4								
3	US yoke								
4	Copper pipe 6/8 (G 1/2)								
	Connection output								
5	PE 8/11								
6	PE 10/14								
7	PVC pipe DN15								
	Inlet valve								
S	Short								
L	Long, 230-240V/50-60Hz								
M	Long, 110-115V/50-60Hz								
	Pressure indication								
0	Without pressure gauge								
1	Pressure gauge without contacts								
2	Pressure gauge with MIN 'NO'								
3	Pressure gauge with MIN 'NC'								
	Connection pressure gauge								
T	Top								
R	Right-hand-side								
L	Left-hand-side								
F	Front								
	Pressure inlet								
F	Front								
L	Left								
R	Right								

2.2 General Data

Permissible medium	Cl ₂
Flow range	0.2 - 10 kg/h, 10 - 530 lbs/day
Minimal admission pressure	2 bar
Maximum admission pressure	11 bar
Max. ambient temperature	40°C

2.2.1 Pressure connection

Pressure line connection (inlet)	G3/4, G1, Cu pipe 6/8, USA yoke
Vacuum line connection (outlet)	PE 10/14, PVC pipe DN 15
Overpressure valve connection	PE hose 8/11
Overpressure line to be used	PE hose 8/11

2.2.2 Liquid trap (with heating)

Voltage	VGA-146-X/X/X/L-0XX:	230 V, 50/60 Hz
	VGA-146-X/X/X/M-0XX:	115 V, 50/60 Hz
Mains cable	length 1.5 m euro plug (for 230 V) or USA plug (for 115 V)	
Power consumption	12 W	
Degree of protection	IP 54	
Temperature	max. 60°C, self-regulating	

2.2.3 Pressure gauge (limit contact for minimal admission pressure)

Measuring range	0 - 16 bar
Switch point	adjusted to the permissible minimal admission pressure (2 bar)
Switching performance	contact opens in case of decreasing the adjusted switching point
Maximum switching capacity	10 W for DC, 10 VA for AC
Maximum switching voltage	100 V, DC or AC
Maximum switching current	0.5 A for DC or AC, in case of pure ohmic load
Switching hysteresis	max. 2.5%
Temperature range	-30°C up to +75°C
Connection	2 wires, arbitrary polarity, length of the cables about 3m each

2.2.4 Accessories (not including)

Holding plate for wall fixing at change of container
Installation material in 3 lengths
Test medium for leak search

2.2.5 Between vacuum regulator and dosing regulator

Length of the vacuum line in (m)	Dosing quantity (g/h)			
	1000	2000	4000	10000
0	DN 8	DN 8	DN 10	DN15
10	DN 8	DN 8	DN 10	DN15
20	DN 8	DN 10	DN 15	DN20
30	DN 8	DN 10	DN 15	DN20
40	DN 8	DN 15	DN 15	DN20
50	DN 10	DN 15	DN 15	DN20
75	DN 10	DN 15	DN 15	DN25
100	DN 10	DN 15	DN 20	DN25

Grundfos Alldos company standard calculated with pressure drop $p=12.5$ mbar

The indications in this table result from pressure loss observations. They do not take into consideration the possible influence of length and diameter of lines on the operational reliability of the system.

2.3 Dimensioned drawings

Note According to the design, the measures may vary slightly.

2.3.1 Design with liquid trap

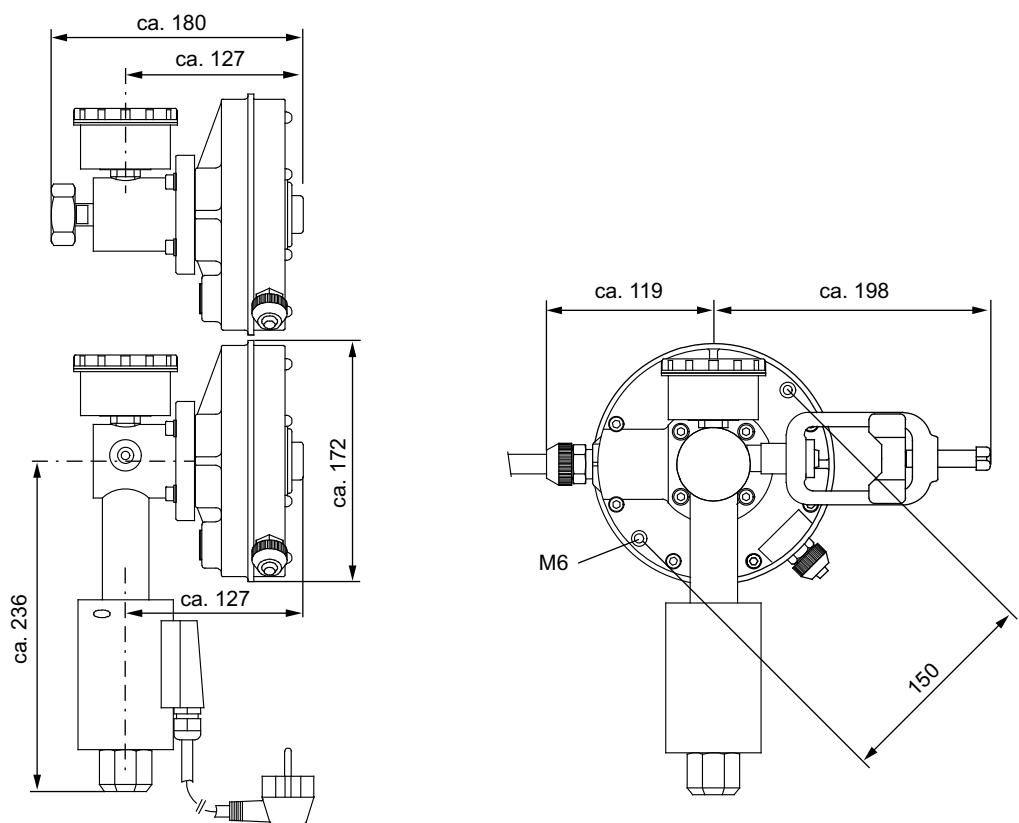


Fig. 1 Dimensional drawing vacuum regulator

2.3.2 Design with mounting plate

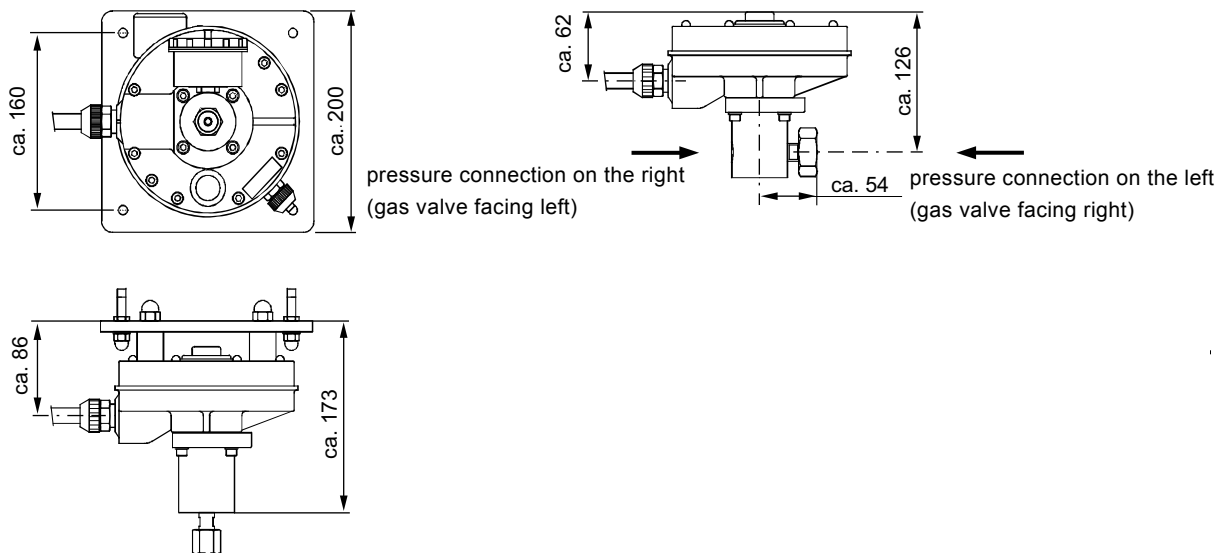


Fig. 2 Dimensional drawing vacuum regulator on mounting plate

TM04_0845_0908

3. Installation

3.1 Transport and storage

- Handle with care, do not throw!
- Dry and cool storage place.

3.2 Unpacking

- Observe when unpacking:
 - No humidity should get into gas-leading parts!
 - No foreign matter should get into gas-leading parts!
- Mount as soon as possible after unpacking.

3.3 Mounting

Requirements for mounting

- Installations at the pressure side from the containers resp. the evaporator are present and checked for tightness
- Piping has been rinsed with nitrogen
 - no more soiling present
- In case of design without liquid gas trap and for mounting to header lines: Filter and liquid gas trap resp. pressure reducing valve has been installed directly before the vacuum regulator
- Directly before the vacuum regulator the highest temperature in the course of the pressure gas lines is present.
 - If necessary, wrap a heater band around the pressure line connection of the vacuum regulator.



Warning

Ensure that all container valves are closed before mounting.
Only use the intended line types!

In case of design without mounting plate:

Caution

The device will only be carried by the connection with the pressure line.
Ensure that all piping is free of distortion.
Do not mount the device in a distorted manner.

4. Commissioning

4.1 Preparations for commissioning

4.1.1 Vacuum connections



Warning

Before connecting, ensure that the valves of all gas containers are closed.

Only use the intended line types!

Only tighten the union nuts of the vacuum connections by hand. Do not use any tools!

Caution

Danger of damages!

Maximum length of the vacuum line, see chapter 2.2.5 Between vacuum regulator and dosing regulator

- At the vacuum regulator, connect the vacuum line and connect it to the dosing regulators.



Warning

Lead the overpressure line downwards, as chlorine is heavier than air.

Connect the overpressure line to a suitable adsorption device. If using a gas warning device:

Mount the sensor in a distance of about 10 cm from the outlet hole of the adsorption device.

The overpressure line must end in the room, never lead to the open air!

- Connect the overpressure line to the overpressure connection.
- Connect the vacuum line to the injector.

4.1.2 Pressure line connection

Note

Ensure that the pressure lines are as short as possible.

- Slightly apply grease to the gasket, if necessary
- Connect the pressure line to the pressure line connection

4.1.3 Electrical connections

Before connecting the mains cable:

Check if the mains voltage indicated on the type plate corresponds to the local mains voltage. Wrong voltage can lead to damages of the product!

Caution

To ensure electromagnetic compatibility (EMC):

Signal lines must be shielded. The shield must be connected to PE or ground on the side of the counterpart, par exemple a controller.

Signal lines and mains lines must be guided in different cable channels.

Connecting the liquid trap (option)

- Connect mains cable of the liquid trap with the mains

Connecting the contact manometer (option)

- Connect two cables with an external evaluation device

Note

The polarity is arbitrary.

4.2 Checks before commissioning

Check tightness of the total plant before start-up.

- Observe manual of the gas dosing regulators!



Warning

Check the tightness not until the total plant is ready for start-up.

Danger of gas leakage!



Warning

Before checking the tightness:

Start running the optional built-in liquid trap or the separate liquid trap!

Danger of gas leakage!

4.2.1 Checking the tightness of pressure gas lines

Pressure gas lines are all lines from the gas containers to the vacuum regulator.

- If the plant is equipped with a nitrogen rinsing device: Check tightness roughly with nitrogen (all dosing media)
- Detailed checking: with ammonia

4.2.2 Checking the tightness with nitrogen

- Close all container valves
- Open container connection valves and all shut-off valves up to the gas dosing system
- Open the connection valve of the nitrogen cylinder
- Slowly open the valve of the nitrogen cylinder, until the lines have a pressure of about 10 bar (read at the manometer of the vacuum regulator).



Warning

Maximum nitrogen pressure 16 bar!

Danger of damages and gas leakage when being exceeded!

- Apply leakage spray or soap water to all components under pressure
 - Formation of bubbles and/or pressure drop at manometer
 - > **Leakage in pressure lines!**
- Depressurize the plant!
- Eliminate leakage!
- Check tightness again!
 - No formation of bubbles, pressure at manometer does not drop significantly within one hour
 - > **Pressure lines are tight.**

4.2.3 Checking the tightness with ammonia

- Open all container valves and container connection valves and quickly close them again
- Slowly pass the open ammonia bottle along pressure-gas leading parts
 - Formation of white mist: **Leakage in pressure lines!**
- Depressurize the plant!
- Eliminate leakage!
- Check tightness again!

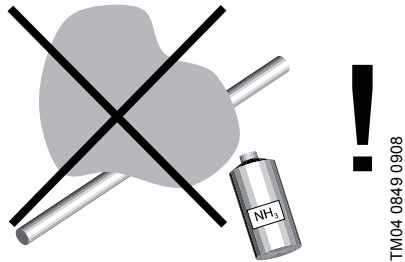


Fig. 3 Formation of white mist: Leakage in pressure lines!

– No formation of white mist: Pressure lines are tight.

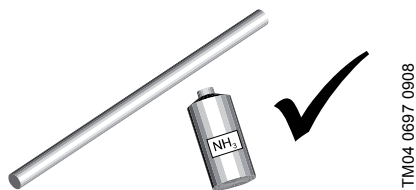


Fig. 4 Pressure lines are tight



Warning

Liquid ammonia must not come in contact with parts of the plant!

Danger of leakages by corrosion!

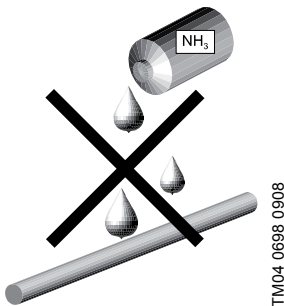


Fig. 5 Liquid ammonia makes leakages by corrosion

5. Maintenance

Rates for cleaning and maintenance

- at least every 12 months
- in case of malfunction



Warning

Switch off the whole plant before doing cleaning and maintenance work!

Danger of gas break-out!



Warning

Before re-starting, check the tightness!

Danger of gas break-out!

5.1 Possible faults

Fault	To be recognized by	Cause	Correction
Gas leakage	Gas odour Formation of mist at the connections when checking the tightness	Connections not tight	Check connections and retighten them
	Gas escapes at the overpressure line while the plant is not running	Inlet valve not tight	Clean the inlet valve, replace damaged parts, use better gas
	Loss of pressure at the manometer while the plant is not running and the gas supply is closed	Inlet valve or connections not tight	Clean the inlet valve or the connections, replace damaged parts, use better gas.
Overpressure valve not tight	Vacuum present in the overpressure line while the plant is running (to be felt by putting on a finger)	Spring corroded or soiled	Replace or clean the spring. Do not remove the suspension wire of the spring!
		O-ring (19) defective	Replace o-ring (19)
		Diaphragm defective	Replace diaphragm
Disturbed regulation	Vibrations and booming of the device	Diaphragm distorted or mounted incorrectly	Mount the diaphragm correctly, slightly apply teflon grease to the guide tappet
Desired dosing flow is not reached	Vacuum present in the overpressure line while the plant is running (to be felt by putting on a finger)	Diaphragm damaged	Replace the diaphragm
		Admission pressure too low (< 2 bar)	Clean the filter
	Pressure gauge of the vacuum regulator	Gas container empty	Replace gas containers by full ones
		Shut-off valves in the pressure lines closed or not perfectly open	Open the shut-off valves
Re-liquefaction of the gas	Formation of ice on filter or pressure line connection during start-up, damages of PVC enclosure parts (only visible when the device is open)	Temperature at the pressure line connection lower than the temperature of the other pressure gas lines	Wrap a heater band around the filter and/or the pressure line connection and warm them up. Close gas supply before the filter, adjust the gas dosing system to minimal dosing flow and start the plant
		Heating of the liquid trap not connected or defective	Connect the heating or repair it
		Vacuum regulator without liquid trap used with gas drum	Use a vacuum regulator with a liquid trap
External evaluation device shows mistakenly too low admission pressure (only for the optional contact manometer)	Formation of ice on filter or pressure line connection during start-up, damages of PVC enclosure parts (only visible when the device is open)	Line between contact manometer and evaluation device interrupted	Check line and repair it

5.2 Disassembling and cleaning the vacuum regulator

Note

Numbers in brackets, see fig. 6, assembly drawing, in chapter 5.3 Spare part sets Vacuum Regulator VGA-146

5.2.1 Switching off the plant

- Set system to low dosing flow
- While the plant is still running: Close the container valves
- Let the plant run until the measuring tube shows no more gas flow
- Switch off the system, observe operation manual of the dosing regulator.

Only executions with liquid trap

- Disconnect the liquid trap from the mains and let it cool

Only executions with kontakt manometer

- Disconnect the line to the evaluation device

5.2.2 Demounting the vacuum regulator

- Remove overpressure line
 - Loosen the union nut
 - Take off the hose
- Remove vacuum line:
 - Loosen the union nut
 - Take off the hose
- Take off the vacuum regulator from the pressure line

5.2.3 Unscrew the inlet valve support

Required tools and accessories

- Allan key 5 mm

Procedure

- Unscrew hexagon screws (1.9)
- Take out the inlet valve
- Take out the O-ring (18)

5.2.4 Disassembling the inlet valve

Required tools and accessories

- fork wrench 24 mm
- screwdriver
- pin $\varnothing$ 5 mm

Procedure

- Unscrew the inlet valve with the fork wrench from the inlet valve support
- Unscrew the valve cone (15) with the screwdriver
 - hold up the spring seat (16) with the finger in the course of this

Caution

Do not damage the sealing surface of the valve cone!

Do not treat plastic parts with tools (danger of deformation and damages!)

- Press out the valve seat (1.1) with the pin carefully out of 1.2
- Take out filter (1.4) and valve cartridge (1.5)

Only executions with liquid trap

- Open the cap (1.13)
- Take off the filter (1.16)

5.2.5 Cleaning the parts of the inlet valve and the optional liquid trap

Required tools and accessories

- Hot water (ca. 40°C)
- Soft brush

Procedure

- Clean all parts with hot water, use brush if necessary:
 - Inner side of the inlet valve support
 - Valve seat (1.1)
 - Valve cone (15)
 - Screw Part (1.2)
 - Spring (17)
 - Spring seat (16)
 - Inner side of the liquid trap and the filter (1.16), if present
- Replace damaged parts, if necessary Suggestion:
 - Replace valve seat (1.1), spring (17), O-rings (1.6, 1.17, 1.22) and filters (1.4, 1.16)
- Check the sealing surface of the valve cone (15)
 - replace it in case of being damaged



Warning

Replace the valve cone even in case of most little damages!

Danger of gas break-out!

- Dry all parts well

Caution

Danger of corrosion when mounting moist parts!

5.2.6 Re-assembling the inlet valve

Caution

All sealing surfaces must be clean and free from deposits.

Lay down the inlet valve in order not to bend the tappet of the valve cone (15)!

- Slightly apply teflon grease to the valve seat and press it (together with the O-ring) into the screw part
- Insert the valve cone into seat and screw part
- Insert spring from the lower side
- Screw on the spring seat from the lower side until the limit stop
 - hold up the valve cone with the screwdriver in the course of this
- Put new O-ring (1.7) into the inlet valve support
- Put in new filter (1.4) and valve cartridge (1.5) into the inlet valve support
- Screw in the inlet valve

Only executions with liquid trap

- Put in new O-ring (1.17) (serves for fixing the filter)
- Put in new filter (1.16)
- Put in new O-rings (1.22)
- Screw on the cap (1.13)

5.2.7 Disassembling the vacuum regulator

Required tools and accessories

- Allan key 5 mm

Procedure

- Unscrew hexagon screws (35)
- Take off upper section
- Take out diaphragm (29) with diaphragm disk (27) and diaphragm ring (26)
- Disassemble valve cone (20) and spring (21) by unscrewing the nut (25)
- Unscrew diaphragm ring and take out the diaphragm

5.2.8 Cleaning the parts of the vacuum regulator

Required tools and accessories

- Hot water (ca. 40°C)
- Soft brush

Procedure

- Clean all parts with hot water, use brush if necessary:
 - Inner sides of upper and lower section
 - Diaphragm disk (27)
 - Diaphragm ring (26)
 - Nut (25)
 - Spring (21)

Caution *Do not remove the suspension wire of the spring!*

- valve cone (20)
- Replace damaged parts, if necessary
- Dry all parts well

Caution *Danger of corrosion when mounting moist parts!*

5.2.9 Re-assembling the vacuum regulator

- Put new O-ring in the diaphragm disk
- Put new diaphragm (29) onto the diaphragm disk (27)

Caution *Observe fitting position and centering of the diaphragm!*

- Screw on diaphragm ring (26)
- Slightly apply teflon grease onto the guide bush in the lower part
- Put new O-ring (19) into the valve cone (20)
 - Do not damage the valve cone!
- Put in the valve cone (20)
- Put in the spring (21)
- Screw in the nut (25)
- Put new O-ring (30) into the lower section
- Place the assembled diaphragm disk in the lower section and align it



Warning

The diaphragm disk must easily move in the guide bush.

Danger of gas break-out in case of sluggish or sticking movement!

- Press down the diaphragm disk (27) by hand. The valve cone (20) of the overpressure valve must open. In non-operated condition it must tighten well.
- Put upper section onto lower section
 - Observe position of the overpressure valve!
- Put in hexagonal screws (35)
- Put on disks cap nuts (37)
- Tighten the hexagonal screws (35) crosswise
 - Torque: 200 Ncm
- Mount the inlet valve support:
 - Put in new O-ring (18)
 - Put on inlet valve support
 - Put in disks and hexagonal screws
 - Tighten the hexagonal screws without distorting the inlet valve support
 - Tighten the hexagonal screws

5.2.10 Remounting the vacuum regulator

- Remount the vacuum regulator according to chap. 4
 - Sealing surfaces must be clean
- Use a new flat gasket



Warning

Check the tightness before restarting (observe operation manual)!

Danger of gas break-out!

5.3 Spare part sets Vacuum Regulator VGA-146

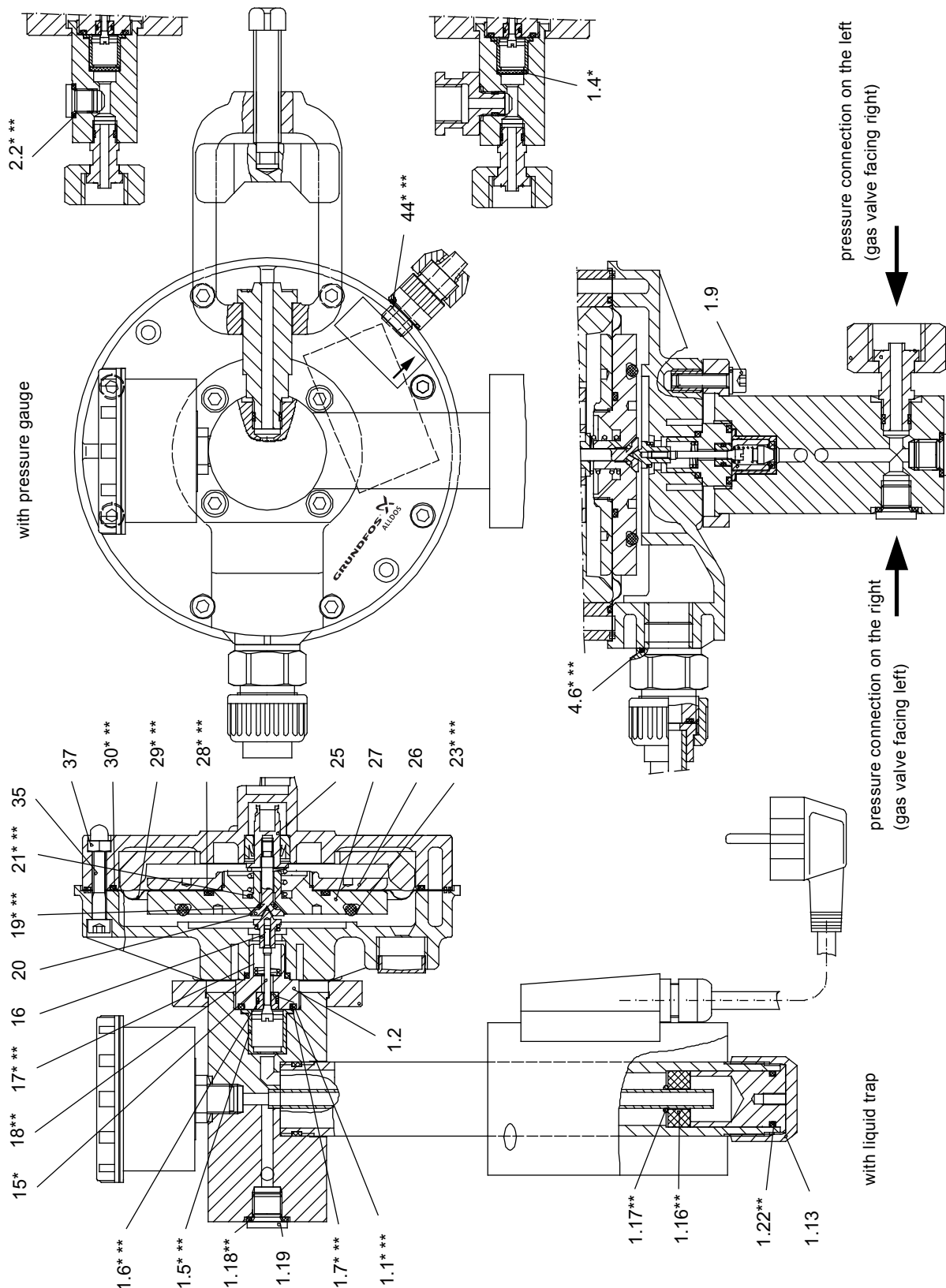


Fig. 6 Assembly drawing with spare parts

Items with one or two asterisks are parts of the spare part sets. We suggest to store some spare part sets to ensure fast replacing of wearing parts (only by authorized personnel), if necessary.

Item	Description	Oder no.
All No. with *	Spare part set VGA-146	91836513 (553-1074)
All No. with **	Spare part set VGA-146 with liquid trap	91835842 (553-1075)

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