



Rotovac 20



Instruction manual



[GB] It is imperative to read this instruction manual prior to initial operation! Comply with safety instructions!
Keep for further use!
This documentation is not subject to revision service!



➔ DANGER indicates a hazardous situation which, if not avoided, will result in death or serious injury.



⚠ WARNING indicates a hazardous situation which, if not avoided, could result in death or serious injury.



• CAUTION indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.



NOTICE is used to address practices not related to personal injury.



Caution! Hot surface!



Disconnect equipment from AC power.



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1 Safety information

1.1 General information

WARNING

- ☞ **Read and comply with this manual before installing or operating the equipment.**

CAUTION

- Use the mounted handle when moving the pump.

NOTICE

Remove all packing material, remove the product from its packing-box, remove the protective covers from the inlet and outlet ports and keep, inspect the equipment.

1.2 Intended use

WARNING

- ☞ The pump and all system parts must not be used on humans or animals.
- ☞ Prevent any part of the human body from coming into contact with vacuum.
- ☞ Ensure that the individual components are only connected, combined and operated according to their design and as indicated in the instructions for use.
- ☞ Comply with notes on correct vacuum and electrical connections, see section "Use and operation".

- ☞ The pumps are designed for **ambient temperatures** during operation between +10°C and +40°C. Check the maximum temperatures if installing the pump in a cabinet or a housing and make sure ventilation is adequate. Install an external automatic ventilation system if necessary. If pumping hot process gases make sure that the maximum permitted gas inlet temperature, which depends on several parameters like inlet pressure or ambient temperature (see "Technical data"), is not exceeded.

- ☞ Particles and dust must not be aspirated.

NOTICE

Use the equipment **for the intended use only**, i.e. for generation of vacuum in vessels designed for that purpose.

1.3 Setting up and installing the equipment

DANGER

- Equipment must be connected only to a **suitable electrical supply** and a suitable earth point. Failure to connect the motor to ground may result in deadly electrical shock.

WARNING

- ☞ Due to the high compression ratio of the pumps, pressure at the outlet port might be generated being higher than the maximum permissible pressure compatible with the mechanical stability of the system.
- ☞ Do not permit any **uncontrolled pressurizing** (e. g. make sure that the exhaust pipeline cannot become blocked). If there is an exhaust isolation valve, make sure that you cannot operate the equipment with the valve closed. **Risk of bursting!**
- ☞ Check the overpressure safety relief device at the exhaust waste vapor condenser in appropriate intervals.
- ☞ Always provide a free and pressureless exhaust pipeline.

CAUTION

- Provide a firm level platform for the equipment and check that the system to be evacuated is mechanically stable and that all fittings are secure. Ensure a stable position of the pump without any mechanical contact except of the pump feet. Comply with all applicable safety regulations.

- Comply with **maximum permissible pressures** at inlet and outlet and pressure differences between inlet and outlet, see section "Technical data". Do not operate the pump with overpressure at the inlet.
- Avoid overpressure of more than 0.2 bar in case inert gas is connected to the pump, the gas ballast or to a venting valve.
- **Attention:** Flexible elements tend to shrink when evacuated.
- Connect pipes gas tight at inlet and outlet of the pump.
- Check that mains voltage and current conform with the equipment (see rating plate).
- Check that the voltage selection switch is set correctly. Unplug the equipment before setting the voltage selection switch! Note: If the equipment is switched on with wrong voltage selection, the equipment may be damaged!
- Ensure that the **coolant outlet pipeline** of the condenser (accessory) is always free and that it cannot get blocked. Install an optional coolant valve always in the supply line of the exhaust waste vapor condenser only.

NOTICE

Keep a distance of minimum 20 cm between fan and ambient parts (e.g. housing, walls, ...). Check fan regularly for dust/dirt, clean if necessary to avoid a cutback of ventilation.

The diameter of the inlet and outlet pipeline should be at least as large as the diameter of the pump connection pipelines.

If the equipment is brought from cold environment into a room for operation, allow the equipment to warm up for one day (pay attention to water condensation on cold surfaces).

Secure coolant hoses at the hose nozzles (e.g. with hose clip) to prevent their accidental slipping.

Comply with all **applicable and relevant safety requirements** (regulations and guidelines), **implement the required actions and adopt suitable safety measures**.

1.4 Ambient conditions

WARNING

☞ Pay attention to the **permissible maximum ambient and gas inlet temperatures** (see "Technical data").

CAUTION

- Adopt suitable measures in case of differences, e. g. using the equipment outdoors, installation in altitudes of more than 1000 m above mean sea level, conductive pollution or bedewing.

NOTICE

To the best of our knowledge the equipment is in compliance with the requirements of the applicable EC-directives and harmonized standards (see "Declaration of conformity") with regard to design, type and model. Directive IEC 1010 gives in detail conditions under which the equipment can be operated safely (see also IP degree of protection).

1.5 Operating conditions



- ➔ The pumps are **not suitable** to pump
 - **unstable substances** and substances which react explosively under **impact** (mechanical stress) and/or when being exposed to **elevated temperatures** without air,
 - **self inflammable** substances,
 - substances which are **inflammable without air** and
 - **explosive substances**.

- ➔ The pumps have **no approval** for operation below ground.



- ☞ The pumps are **not suitable** for pumping dust.

- The pumps are **not suitable** for pumping substances which may form **deposits** inside the pump. Deposits and condensate in the pump may lead to increased temperatures even to the point of exceeding the maximum permitted temperatures!
- If there is a danger of formation of **deposits** in the pump chamber (check inlet and outlet of the pump), inspect the pump chambers regularly and clean if necessary.

- **Take into consideration interactions and chemical reactions of the pumped media.** Ensure that the materials of the wetted parts are compatible with the pumped substances, see section "Technical data".
If pumping **different substances**, it is recommended to purge the pump with air or inert gas prior to changing the pumped media in order to pump out residues and to avoid reactions of the pumped substances with each other and with the pump materials.

1.6 Safety during operation



- ➔ Adopt suitable measures to prevent the release of dangerous, toxic, explosive, corrosive, noxious or polluting fluids, vapors and gases. In case install an appropriate collecting and disposal system and take protective action for pump and environment.

- ➔ The user must take suitable precautions to prevent any formation of explosive mixtures in the expansion chamber or at the outlet. In case of e.g. a diaphragm crack, mechanically generated sparks, hot surfaces or static electricity may ignite these mixtures. Use inert gas for gas ballast or venting if necessary.

- ➔ Potentially explosive mixtures at the outlet of the pump have to be drained appropriately, sucked off or diluted with inert gas to non-explosive mixtures.

WARNING

- ☞ Prevent any part of the human body from coming into contact with vacuum.
- ☞ Never aspirate dust into the pump.
- ☞ Make sure that the exhaust pipeline cannot become blocked.
- ☞ Check the overpressure safety relief device at the exhaust waste vapor condenser at appropriate intervals.
- ☞ Comply with applicable regulations when disposing of chemicals. Take into consideration that chemicals may be contaminated. Take adequate precautions to protect people from the effects of dangerous substances (chemicals, thermal decomposition products of fluoroelastomers). Use appropriate protective clothing and safety goggles.
- ☞ Use only **original manufacturer's spare parts and accessories**. Otherwise the safety and performance of the equipment, as well as the electromagnetic compatibility of the equipment might be reduced.
The CE mark or the cTÜVus mark may be voided if not using original manufacturer's spare parts.
- ☞ Failure of the pump (e.g., due to power interruption), failure of connected components or of parts of the supply, or a change of parameters must not be allowed to lead to a dangerous situation under any circumstances. In case of a diaphragm failure or in case of a leak in the manifold, pumped substances might be released into the environment or into the pump housing or motor.
Especially comply with notes on use and operation and maintenance.
- ☞ The residual **leak rate of the equipment** might render possible an exchange of gas, albeit extremely slight, between the environment and the vacuum system.
Adopt suitable measures to prevent contamination of the pumped substances or the environment.

CAUTION



- Pumping at high inlet pressure may lead to overpressure at the gas ballast valve. Pumped gases or condensate might be expelled if the valve is open. If an inert gas supply is connected to the gas ballast, ensure that its inlet pipeline is not contaminated.
- Pay attention to the safety symbol "hot surfaces" on the equipment. Hot parts may cause burns if touched. Adopt suitable measures to prevent any danger arising from hot surfaces or electric sparks. Ensure that hot surfaces of the pump do not cause burns. Provide a suitable contact guard if necessary.
- Ensure that the **coolant outlet pipe** at the waste vapor condenser is always free and that it cannot get blocked.

NOTICE

Do not start the pump if the pressure difference between inlet and outlet exceeds 1.1 bar at maximum.
Prevent the backpressure of gases and the backflow of condensates at the outlet.

Never suck liquids or dust into the pump.
Check the liquid level in the catchpots regularly and drain condensate in time to prevent overflowing.

Provide appropriate protective measures (i.e. precautions which allow for the requirements of the respective application) even for the case of failure and **malfunction**.
Failure of the pump (e.g. due to power failure) or of connected components, of parts of the supply or change of parameters must not lead to a critical dangerous situation under any circumstances.

In case of overload, the motor is shut down by a **self-hold thermal cutout** in the winding.

Note: Only manual reset is possible. Switch off the pump and disconnect from the power source. Identify and eliminate the cause of failure. Wait approx. five minutes before restarting the pump.

1.7 Maintenance and repair

Wear parts have to be replaced regularly. In case of normal wear, the lifetime of the diaphragms and valves is > 10000 operating hours. Bearings have a typical durability of 40000 h. Motor capacitors have a typical durability in the range of 10000 to 40000 h depending strongly on operation conditions including ambient temperature, humidity or load.

! DANGER



- Ensure that the pump cannot be operated accidentally. Never operate the pump if covers or other parts of the pump are disassembled. Never operate a defective or damaged pump.
- **Isolate equipment from mains and wait two minutes** before starting maintenance to allow the capacitors to discharge.
- **Attention:** The pump might be contaminated with process chemicals which have been pumped during operation. Ensure that the pump is decontaminated before maintenance and take adequate precautions to protect people from the effects of dangerous substances if contamination has occurred.

! WARNING

- ☞ Take adequate precautions to protect people from the effects of dangerous substances if contamination has occurred. Use appropriate protective clothing, safety goggles and protective gloves.
- ☞ **Wear parts have to be replaced regularly.**
- ☞ **Never operate a defective or damaged pump.**
- ☞ Check every motor capacitor regularly by measuring its capacity and estimating its time in operation. Replace old capacitors early enough to prevent a failure in operation. If an old motor capacitor fails, the capacitor may get hot. It may even melt or emit a flame, which could be **dangerous for persons and equipment in the vicinity**. The capacitors have to be checked and replaced by an electrician.
- ☞ Vent the pump before starting maintenance. Isolate the pump and other components from the vacuum system. Allow sufficient cooling of the pump. Separate the pump from the coolant circuit and drain condensate, if applicable.

NOTICE

Clean the surface of the device only with a damp cloth. Use water or a mild detergent as cleaning agent.

Ensure that **maintenance** is done only by suitably trained and supervised technicians. Ensure that the maintenance technician is familiar with the safety procedures which relate to the products processed by the pumping system.

In order to comply with law (occupational, health and safety regulations, safety at work law and regulations for environmental protection) vacuum pumps, components and measuring instruments returned to the manufacturer can be repaired only when certain procedures (see section "**Questions / Repair**") are followed.

2 Standard items and options

	Item	qty	P/N 100-115 V~ 50/60 Hz, 120 V~ 60 Hz / 200-230 V~ 50/60 Hz
	ROTAVAC 20	1	591-07210-00-1
Standard items ROTAVAC 20			
	ROTAVAC 20		
	Power cord (CEE)	1	14-300-009-81
	Instruction manual	1	01-005-005-36
	Warranty card / Confirmation of condition of unit	1	01-006-002-58

3 Technical data

Type		Rotavac 20
Maximum pumping speed* 50/60 Hz according ISO 21360	m ³ /h	3.4 / 3.8
Ultimate vacuum (absolute) without gas ballast	mbar	1.5
Ultimate vacuum (absolute) with gas ballast	mbar	3
Maximum permissible inlet pressure (absolute)	bar	1.1
Maximum permissible outlet pressure (absolute)	bar	1.1
Maximum permissible difference pressure between inlet and outlet	bar	1.1
Maximum permissible pressure (absolute) at gas ballast valve	bar	1.2
Permissible ambient temperature storage	°C	-10 to +60
operation	°C	+10 to +40
Permissible relative atmospheric moisture during operation (no condensation)	%	30 to 85
Pollution degree		2
Nominal power electrical	kW	0.25
No-load speed 50/60 Hz	min ⁻¹	1500 / 1800
Maximum permissible range of supply voltage (±10%) Attention: See rating plate		100-115 V~ 50/60 Hz, 120 V~ 60 Hz / 200-230 V~ 50/60 Hz
Maximum rated current at 100-115 V~ 50/60 Hz / 120 V~ 60 Hz	A	5.7
200-230 V~ 50/60 Hz	A	3.0
Device fuse		6.3 A slow blow fuse
Motor protection		thermal cutout, manual reset
Degree of protection IEC 529		IP 40
Inlet		hose nozzle DN 8 mm
Outlet		hose nozzle DN 8-10 mm
Coolant connection		hose nozzle DN 6-8 mm
Maximum permissible pressure of coolant at waste vapor condenser	bar	6 (absolute)
Permissible range of coolant temperature (vapor condenser)	°C	-15 to +20
Volume round bottom flask	ml	500
A-weighted emission sound pressure level* (uncertainty K _{PA} : 3 dB(A))	dB(A)	45
Dimensions L x W x H approx.	mm	326 x 243 x 402
Weight approx.	kg	17.3

* Pumping speed of the pump

** Measurement according to EN ISO 2151:2004 and EN ISO 3744:1995 at 230V/50Hz and ultimate vacuum with exhaust tube at outlet.

We reserve the right for technical modification without prior notice!

3.1 Gas inlet temperatures

Operating condition	Inlet pressure	Permitted range of gas temperatures at inlet
Continuous operation	> 100 mbar (high gas load)	+10°C to +40°C
Continuous operation	< 100 mbar (low gas load)	0°C to +60°C
Short-time (< 5 minutes)	< 100 mbar (low gas load)	-10°C to +80°C

We reserve the right for technical modification without prior notice!

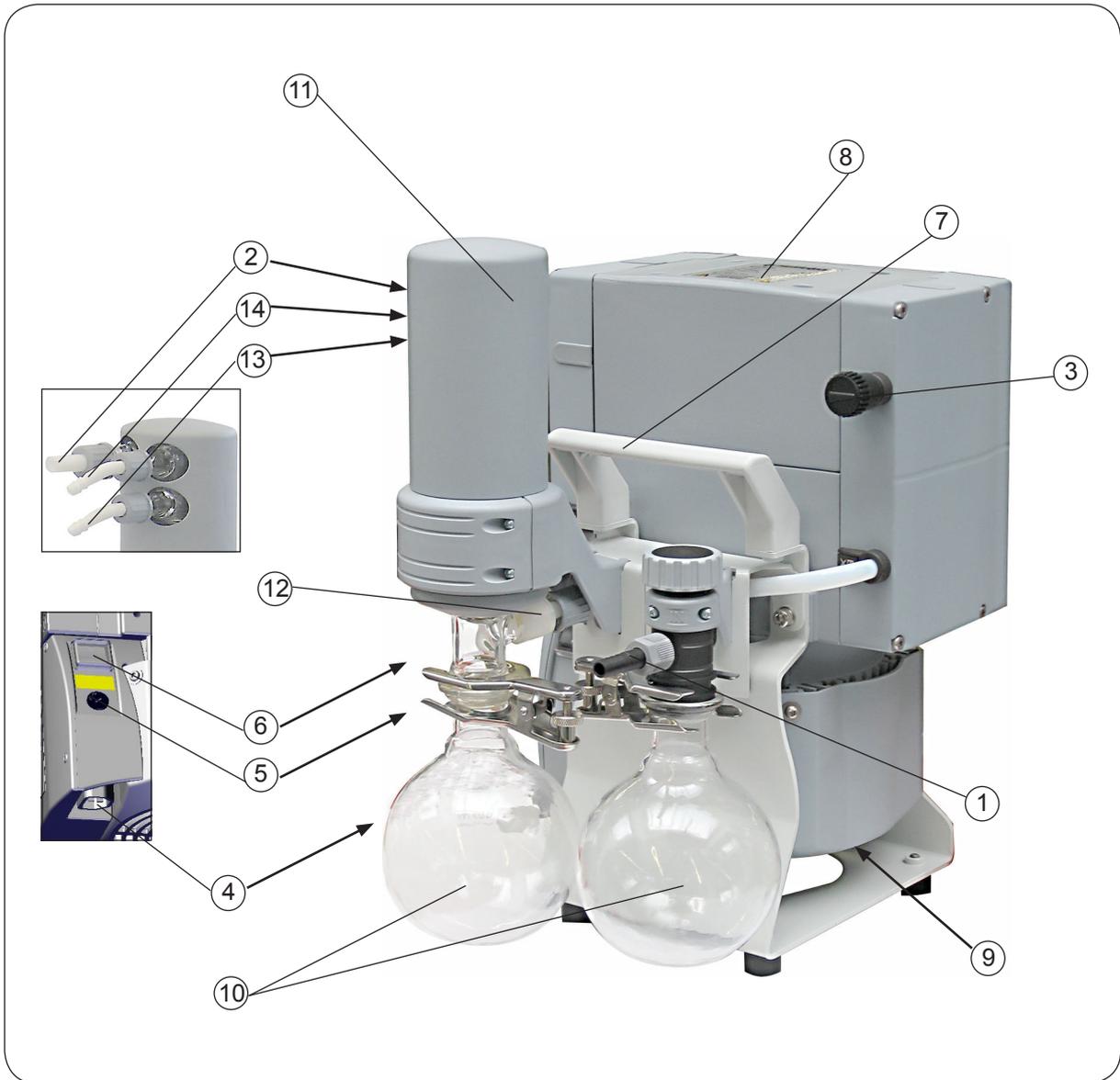
3.2 Wetted parts

Components	Wetted materials
Head cover	ETFE carbon fiber reinforced
Diaphragm clamping disc	ETFE carbon fiber reinforced
Diaphragm	PTFE
Valves	FFKM
O-rings	FPM
Valve head	ECTFE carbon fiber reinforced
Gas ballast tube	PTFE carbon reinforced
Inlet (hose nozzle)	PP
Outlet (hose nozzle)	PET
Tubing	PTFE
Overpressure safety relief device	PTFE / silicone rubber
Exhaust waste vapor condenser / catchpot	Borosilicate glass

We reserve the right for technical modification without prior notice!

3.3 Pump parts

Position	Component	Position	Component
1	Inlet	12	Overpressure safety relief device
2	Outlet	13	Coolant inlet
3	Gas ballast valve	14	Coolant outlet
4	Mains connection		
5	Voltage selection switch		
6	On / Off switch		
7	Handle		
8	Rating plate		
9	Fan		
10	Catchpot		
11	Exhaust waste vapor condenser		



4 Use and operation

4.1 Installing in a vacuum system

DANGER

- If there is risk of release of dangerous or polluting fluids, install an appropriate system to catch and dispose of those fluids.

WARNING

- ☞ Connect an exhaust line gas tight at the pump outlet if necessary. Always dispose of exhaust gases appropriately (e.g. into a fume hood).
- ☞ Never block the gas outlet. The exhaust line must always be free of obstructions (no back pressure) to ensure an unimpeded discharge of gas.
- ☞ Particles and dust must not be aspirated, the user has to provide appropriate filters if necessary. The user must ensure their suitability concerning gas flow, chemical resistance and safeness against clogging prior to use.
- ☞ Make sure ventilation is adequate if the pumping unit is installed in a housing or if ambient temperature is elevated. Provide external venting if necessary.

CAUTION

- Reduce the transmission of vibration and prevent loading due to rigid pipelines. Insert elastic hoses or flexible elements as couplings between the pump and rigid pipes. **Attention:** Flexible elements tend to shrink when evacuated.
- Connection lines at the pump inlet have to be gas tight.
- Especially if the gas ballast valve is open, a power failure may cause unintentional ventilation of the pump and the vacuum system. In case this constitutes a potential source of danger, take appropriate safety measures.
- Before switching on check that mains voltage and current conform with the equipment (see rating plate).
- Check that the voltage selection switch is set correctly. Unplug the equipment before setting the voltage selection switch! Note: If the equipment is switched on with wrong voltage selection, the equipment may be damaged!



NOTICE

Keep a distance of minimum 20cm between fan and ambient parts. Avoid throttling losses by using connecting pipes with large diameter and keeping them as short as possible. Install outlet pipelines always falling to avoid backflow of condensate towards the pump. Use of a suitable valve to isolate the pump from the vacuum system is recommended to allow the pump to warm up before pumping condensable vapors or to clean the pump before it is switched off.

When assembling, ensure **vacuum-tightness**. After assembly, check the whole system for leaks.

Secure hose connections at the pump appropriately against accidental detaching. If exhaust noise is annoying, connect an exhaust hose.

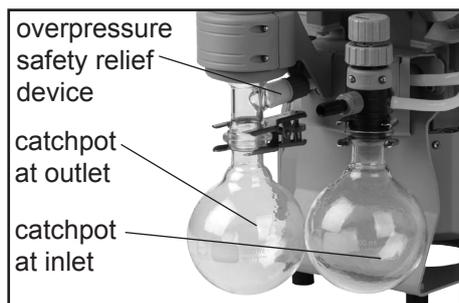
4.2 Exhaust waste vapor condenser and separator

WARNING

- ☞ Check glass parts for damage and bracing.
Use only faultless glass parts.

Assembling the hose nozzle with union nut:

- Take the hose nozzle with attached compression ferrule and union nut out of the catchpot and put onto inlet connection
- Tighten the union nut by hand until you can feel the stop. Then tighten an additional 1/4 rotation with an open-ended wrench (size 17mm) for final installation.



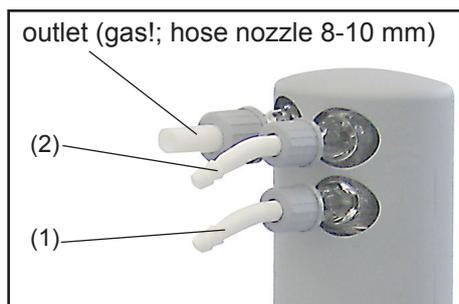
Catchpots:

The catchpot at the inlet protects against droplets and particles from entering the pump.

- ☞ Enhances lifetimes of diaphragms and valves.
- ☞ Improves vacuum performance in applications with condensable vapors.

Both catchpots are coated with a protective layer to protect against shattering in case of breakage or implosion.

- Assemble the catchpots at the inlet and at the outlet using joint clips.



Exhaust waste vapor condenser:

- Assemble hose nozzles for coolant inlet (1) and coolant outlet (2) pipelines at the exhaust waste vapor condenser. The **exhaust waste vapor condenser** enables an efficient condensation of the pumped vapors at the outlet.

- ☞ No backflow of condensates.
- ☞ Controlled recovery of condensates.
- ☞ Next to 100% solvent recovery.
- ☞ The isolation cover protects against glass splinters in case of breaking, acts as thermal isolation to avoid condensation of humidity and is intended to absorb shocks.

NOTICE

Attach the pipelines of the coolant circuit to the respective hose nozzles (hose nozzles 6-8 mm, see image) at the waste vapor condenser.

Check hose connections prior to starting operation of the cooling system. Secure coolant hoses at the hose nozzles (e.g. with hose clip) to prevent their accidental slipping.

DANGER

- If necessary connect the exhaust to a suitable treatment plant to prevent the discharge of dangerous gases and vapors to the surrounding atmosphere.

WARNING

- ☞ The gas outlet (hose nozzle 8-10 mm) must not be blocked. The exhaust pipeline has always to be free and pressureless to enable an unhindered discharge of gases.

CAUTION

- **Attention:** Install hoses of the cooling system in a way to avoid flow / dropping of condensed water onto the pumping unit (especially cables and electronic parts) (see degree of protection IP).
- Ensure that the **coolant outlet pipeline** is always free and that it cannot get blocked.
- Maximum permissible coolant pressure at the exhaust waste vapor condenser: 6 bar (absolute)
- Comply with the maximum permissible coolant pressures of additional components in the coolant circuit (e.g. cooling water valve).
- Avoid overpressure in the coolant circuit (e.g. caused by blocked or squeezed coolant hoses).
- Only install an optional coolant valve in the supply line of the exhaust waste vapor condenser.

4.3 During operation**DANGER**

- **Potentially dangerous gases or vapors** at the outlet of the pump have to be drained and disposed appropriately.

WARNING

- ⓘ Due to the high compression ratio of the pumps, pressure at the outlet port might be generated being higher than the maximum permissible pressure compatible with the mechanical stability of the system. Ensure that the pump outlet cannot become blocked or restricted.
- ⓘ **Maximum ambient temperature:** 40 °C
Make sure ventilation is adequate if pump is installed in a housing or if ambient temperature is elevated.

CAUTION

- If pump is installed in altitudes of more than 1000 m above mean sea level check compatibility with applicable safety requirements, e. g. IEC 60034 (motor may overheat due to insufficient cooling).
- Check compatibility with **maximally permitted pressures** at inlet and outlet.

NOTICE

Do not start the pump if the **pressure at outlet port** exceeds **maximum 1.1 bar (absolute)**. Attempts to start the pump at higher pressures may cause blockade and damage of the motor.

If pumping condensable vapors (water vapor, solvents, etc.), let the pump run with **gas ballast** to help purge any condensation in the pump.

Prevent internal condensation, transfer of liquids or dust. The diaphragm and valves will be damaged, if liquids are pumped in significant amounts. Check the pump regularly for external soiling and deposits, clean if necessary to avoid an increase of the pump's operating temperature.

NOTICE

In case of overload, the motor is shut down by a **self-hold thermal circuit breaker** in the winding.

Note: Only a manual reset is possible. Switch off the pump and disconnect the electrical power cord. Identify and eliminate the cause of failure. Wait approximately five minutes before restarting the pump.

Avoid overheating (e.g., due to hot process gases). A warm up period (approximately 15 min.) is required to ensure that the rated ultimate vacuum and pumping speed are attained.

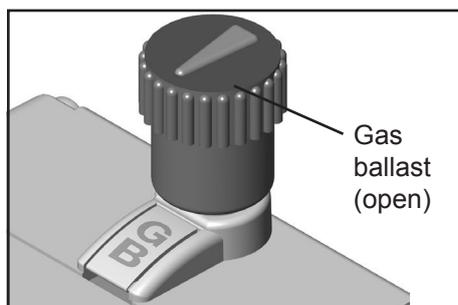
4.4 Attention: Important notes regarding the use of gas ballast

! DANGER

- ➔ When using air rather than inert gas, risk of significant damage to equipment and/or facilities, risk of personal injury or even loss of life exists due to the formation of hazardous and/or explosive mixtures if air and pumped media react inside or at the outlet of the pump.

! WARNING

- ☞ Make sure that air/gas inlet through the gas ballast valve never leads to hazardous, explosive or otherwise dangerous mixtures. If in doubt, use inert gas or close gas ballast valve.



To reduce condensation in the pump, do not pump vapor before the pump has reached its operating temperature. Open the gas ballast valve when pumping condensable vapors.

For **condensable vapors** (water vapor, solvents, etc.):

- The gas ballast valve is open if the arrow on the gas ballast cap is pointing towards the labelling "GB".
- With gas ballast valve open, the ultimate vacuum will be reduced.
- Use inert gas for gas ballast to avoid the formation of explosive mixtures.
- Close the gas ballast valve by turning the cap 180°.

In case of low boiling solvents (when the formation of condensate is unlikely), the use of gas ballast might be unnecessary. Operating the pump without gas ballast increases the solvent recovery rate at the exhaust waste vapor condenser.

4.5 Attention: Notes concerning the operation of the exhaust waste vapor condenser

! DANGER

- ➔ Connect the exhaust to a suitable treatment plant to prevent the discharge of dangerous gases and vapors to the surrounding atmosphere.

! WARNING

- ☞ The gas outlet (hose nozzle 8-10 mm) must not be blocked. The exhaust pipeline has always to be free and pressureless to enable an unhindered discharge of gases.
- ☞ Check the overpressure safety relief device at the exhaust waste vapor condenser regularly, replace if necessary. Check especially for conglutination and cracks.

! CAUTION

- Ensure that the **coolant outlet pipeline** is always free and that it cannot get blocked.
- Maximum permissible coolant pressure at the exhaust waste vapor condenser: 6 bar (absolute).
- Comply with the maximum permissible coolant pressures of additional components in the coolant circuit (e.g. coolant valve).
- Install optional coolant valves always in the supply line of the waste vapor condenser only.
- Avoid overpressure in the coolant circuit (e.g. caused by blocked or squeezed coolant hoses).

NOTICE

In case of **condensation**: Check liquid level in the catchpot during operation. Avoid overflowing of the catchpot.

Do not allow the catchpot to get overfilled. Maximum liquid level approx. 80% to avoid problems when removing the catchpot.

Check liquid level in the catchpot regularly and drain catchpot in time.

Permissible range of coolant temperature at the exhaust waste vapor condenser: -15°C to +20°C.

Check hose connections prior to starting operation of the cooling system.

Check coolant hoses regularly during operation.

Removing the catchpot:

Catchpot at the outlet:

Remove joint clip, remove catchpot and drain condensate.

Catchpot at the inlet:

Admit air or inert gas (via the pump inlet) to restore atmospheric pressure in the catchpot before attempting removal. Remove joint clip. Remove catchpot and drain condensate.

Reattach drained catchpots.

WARNING

 **Important:** Comply with regulations when disposing of solvents/condensates. Recycle if possible; purify if contaminated.

4.6 Shutdown

NOTICE

Short-term:

Has the pump been exposed to condensate?

- Allow the pump to continue to run at atmospheric pressure for a few minutes

Has the pump been exposed to media which may damage the pump materials or forms **deposits**?

- Check and clean pump heads if necessary.

Long-term:

- Take measures as described in section short-term shutdown.
- Separate pump from the application.
- Drain catchpot.
- Close inlet and outlet port (e. g. with transport caps).
- Close gas ballast.
- Store the pump in dry conditions.

5 Troubleshooting

Fault	Possible cause	Remedy
<input type="checkbox"/> Pump does not start or stops immediately.	<ul style="list-style-type: none"> ➔ Supply voltage too low or power supply failure? ➔ Control signal for motor speed is missing? ➔ Pressure in outlet pipeline too high? ➔ Motor overloaded? 	<ul style="list-style-type: none"> ✓ Check supply voltage. Check fuse. ✓ Check control signal. ✓ Remove blockade in line, open valve. ✓ Allow motor to cool down, identify and eliminate cause of failure. Manual reset is necessary. Switch off pump or unplug mains.
<input type="checkbox"/> Pump does not achieve its ultimate vacuum or usual pumping speed.	<ul style="list-style-type: none"> ➔ Leak in the pipeline or vacuum system? ➔ Long, narrow line? ➔ Pump has been exposed to condensate? ➔ Deposits have been formed inside the pump? ➔ Diaphragms or valves damaged? ➔ Outgassing substances or vapor generated in the process? ➔ Pump temperature too high (motor speed reduced)? 	<ul style="list-style-type: none"> ✓ Check pump directly - connect vacuum gauge directly at pump inlet - then check connection, pipeline and vacuum system if necessary. ✓ Use lines with larger diameter, length as short as possible. ✓ Allow pump to run for some minutes with atmospheric pressure at the inlet. ✓ Clean and inspect the pump heads. ✓ Replace diaphragms and/or valves. ✓ Check process parameters. ✓ Ensure sufficient cooling of the pump or reduce inlet pressure.
<input type="checkbox"/> Pump too noisy.	<ul style="list-style-type: none"> ➔ Loud exhaust noise? ➔ Diaphragm crack or diaphragm clamping disc loose? ➔ Other than above mentioned causes? 	<ul style="list-style-type: none"> ✓ Connect hose or silencer to pump outlet. ✓ Perform maintenance. ✓ Contact local distributor.
<input type="checkbox"/> Pump seized.		<ul style="list-style-type: none"> ✓ Contact local distributor.

6 Replacing diaphragms and valves

! DANGER



- ➔ **Never operate the pump if covers or other parts of the pump are disassembled.** Ensure that the pump cannot be operated accidentally.
- ➔ **Before starting maintenance** isolate the pump from the electrical supply and wait **two minutes** after isolating the equipment from mains to allow the capacitors to discharge.
- ➔ **Attention:** The pump might be contaminated with the process chemicals that have been pumped during operation. Ensure that the pump is decontaminated before maintenance. Avoid the release of pollutants.

! WARNING

- ⚠ **Never operate a defective or damaged pump.**
- ⚠ Wear appropriate safety-clothing when you come into contact with contaminated components.
- ⚠ Check every motor capacitor regularly by measuring its capacity and estimating its service life. Replace old capacitors early enough to prevent a failure. The capacitors must be checked and replaced by a trained electrician.
- ⚠ Vent the pump and isolate it from the vacuum system before you start maintenance. Allow sufficient cooling of the pump before starting maintenance.

NOTICE

Ensure that maintenance is done only by suitable trained and supervised technicians.

All bearings are encapsulated and are filled with long-life lubricant. Under normal operating conditions, the pump is maintenance free. The valves and diaphragms as well as the motor capacitors are wear parts. If the rated ultimate vacuum is no longer achieved or in case of increased noise level, the pump interior, the diaphragms and the valves must be cleaned and must be checked for cracks or other damage.

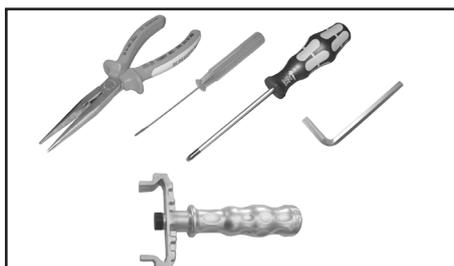
Depending on individual cases it may be efficient to check and clean the pump heads on a regular basis. In case of normal wear the lifetime of the diaphragms and valves is > 10000 operating hours.

- Prevent internal condensation, transfer of liquids or dust. The diaphragm and valves will be damaged, if liquids are pumped in significant amount.
- If the pump is exposed to corrosive gases or vapor or in case of deposits, maintenance should be carried out frequently.
- Regular maintenance will improve the lifetime of the pump and also protect both man and environment.

	order no.
Set of seals Rotavac 20.....	11-300-009-32
Valve Rot.-Valve Contr./Rotavac 20	23-30-01-01-89
Diaphragm Rot.-Valve Contr./Rotavac 20.....	23-30-01-06-22
Diaphragm key Rot.-Valve Contr./Rotavac 20	02-07-02-01-14

⚠ **Please read section "Replacing diaphragms and valves" completely before starting maintenance.**

The pictures may show other versions of pumps. This does not change the method of replacing diaphragms and valves.



Tools required (metric):

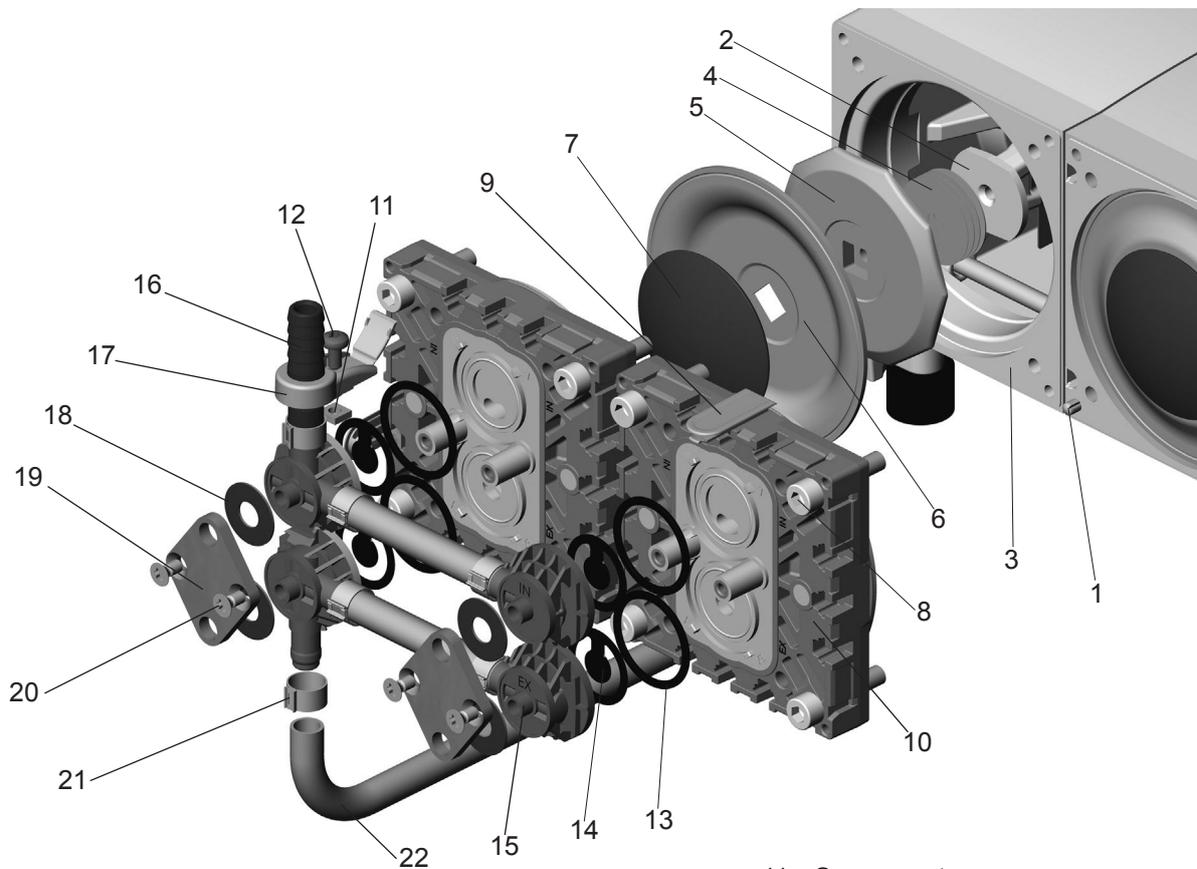
- Torx driver T20
- Allen key size 5
- 2.5 mm wide slotted screwdriver
- Flat pliers
- Diaphragm key width 66 mm

6.1 Cleaning and inspecting the pump heads

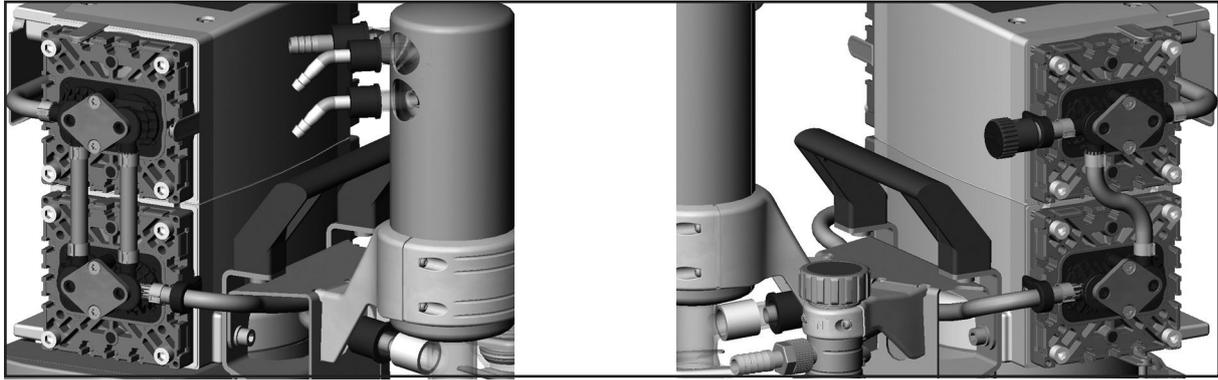
The replacement of the diaphragm and the replacement of the valves can be carried out separately.

- ☞ To replace the valves, remove the head covers of one side of the pump along with the assembled valve heads and fittings.
- ☞ To maintain the diaphragms, the valve heads and the fittings need not be disassembled. The head covers can be removed along with the assembled valve heads and fittings.

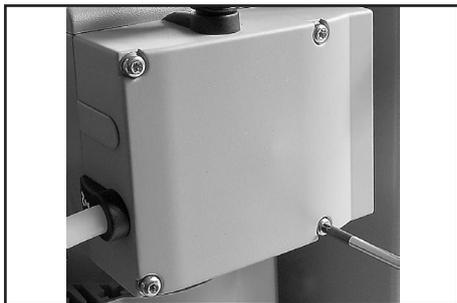
View of the disassembled pump head parts



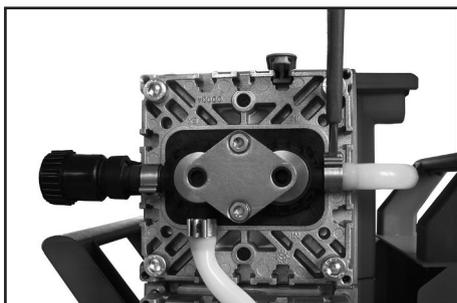
- | | |
|---|---|
| 1: Head alignment pin / mark | 11: Square nut |
| 2: Connecting rod | 12: Fillister head screw |
| 3: Housing | 13: O-ring |
| 4: Washer | 14: Valve |
| 5: Diaphragm support disc | 15: Valve head |
| 6: Diaphragm | 16: Hose nozzle |
| 7: Diaphragm clamping disc with square head screw | 17: Connection fastener with hinged cover |
| 8: Allen screw | 18: Disc spring |
| 9: Cap | 19: Clamping bracket |
| 10: Head cover | 20: Countersunk screw |
| | 21: Hose clip |
| | 22: Connection tube |



- ➔ Remove catchpots at inlet and outlet.

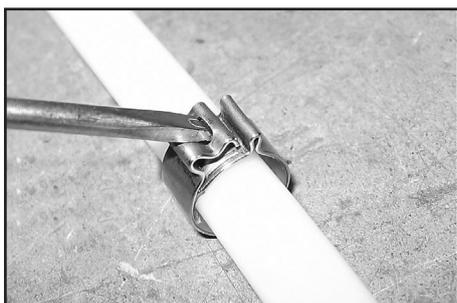


- ➔ Remove the 4 screws affixing the head cover cowling with a Torx driver T20. Pay attention to the washers under the screws and remove.
- ➔ Pull off head cover cowling carefully. Do not tilt.



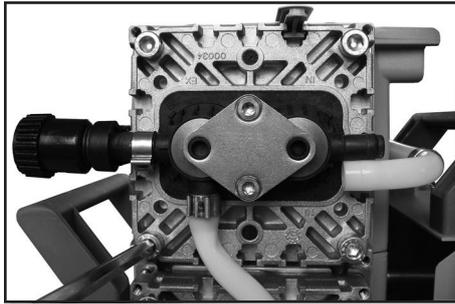
Detach the coupling of the connection tube to the other side of the pump as well as the hose connection to the inlet/outlet of the vacuum system at the valve head.

- ➔ Open the hose clip with a slotted screwdriver.
- ➔ Pull the tubing off the hose connector.

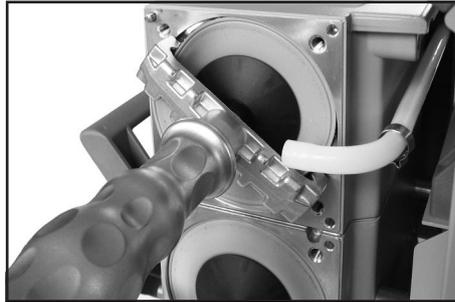


- Opening the hose clip:
- ➔ Apply slotted screwdriver as shown and turn.

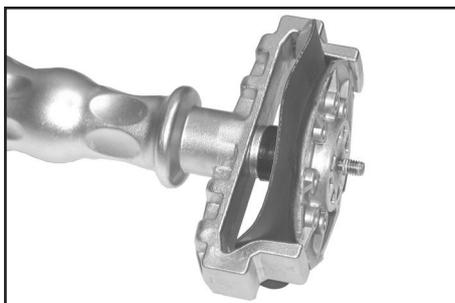
6.2 Replacing the diaphragm



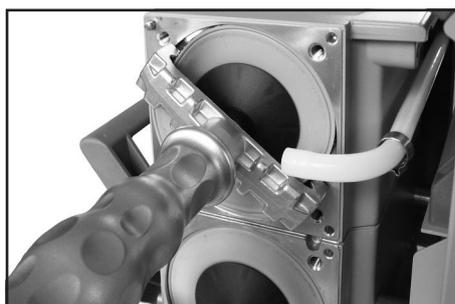
- ➔ Disassemble head covers to check the diaphragm.
- ➔ Unscrew eight Allen screws with an Allen key size 5. Remove both head covers together with valve heads and connections.
- ⚠ It is not necessary to disassemble the valve heads, the connection fasteners, or the hose connection between the adjacent head covers.



- ⚠ Check diaphragm for damage and replace if necessary.
- ➔ Lift diaphragm carefully sidewise.
- ⚠ Never use a pointed or sharp-edged tool to lift the diaphragm.
- ➔ Use the diaphragm key to grip the diaphragm support disc below the diaphragm.
- ➔ Unscrew diaphragm support disc with diaphragm and diaphragm clamping disc.
- ➔ Check for washers between the diaphragm support disc and the connecting rod. Do not mix the washers from the different pump heads, since these are set at the factory to ensure proper pump performance. Make sure that the original number is reassembled at the individual pump head.
- ⚠ Too few washers: The pump will not attain vacuum specification. Too many washers: Diaphragm clamping disc will hit head cover, causing noisy operation and possibly causing the pump to seize up.
- ⚠ If the old diaphragm is difficult to separate from the diaphragm support disc, immerse assembly in naphtha or petroleum ether. Do not inhale vapors!



- ➔ Position new diaphragm between diaphragm clamping disc with square head screw and diaphragm support disc.
- ⚠ Note: Position diaphragm with pale side towards diaphragm clamping disc (facing pump chamber).
- ⚠ Make sure that the square head screw of the diaphragm clamping disc is correctly seated in the guide hole of the diaphragm support disc.
- ➔ Lift the diaphragm at the side. Place the diaphragm carefully together with diaphragm clamping disc and diaphragm support disc in the diaphragm key.
- ⚠ Avoid damage of the diaphragm: Do not excessively bend or crease the diaphragm.



- ⚠ Assemble the original number of washers between diaphragm support disc and connecting rod.
- ➔ Screw diaphragm clamping disc, diaphragm, diaphragm support disc, and washers to connecting rod.
- ➔ Optimum torque for the diaphragm support disc: 6 Nm, it is recommended to use a torque wrench. Attach Allen key to diaphragm key (hexagonal bolt 6 mm wide).
Note: Never use the diaphragm key with any additional tools like tongs or Allen keys without appropriate torque limitation.

6.3 Replacing the valves



- ➔ Open the hinged cover of the connection fastener with a slotted screwdriver.



Loosen connection fastener slightly.

- ➔ Turn the fillister head screw with a Torx driver T20 at most one turn.
- ⚠ Do not detach the fillister head screw from the square nut.

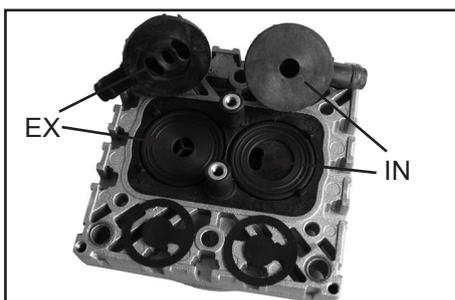


Loosen the clamping brackets on the valve heads.

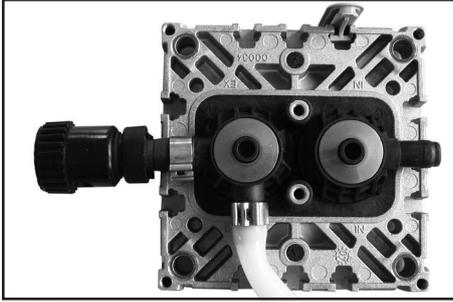
- ➔ Unscrew at each clamping bracket the two countersunk screws with a Torx driver T20. Remove the clamping brackets.



- ➔ Remove valve heads along with the disc springs, connection tube if applicable, hose nozzles and connection fasteners or move the valve heads carefully aside. Note position and orientation of the valve heads.
- ⚠ Note position and alignment of valves.
- ➔ Check valves and O-rings for damage and soiling.
- ➔ Replace valves or O-rings if necessary.
- ➔ Use petroleum ether or other industrial solvent to remove deposits. Do not inhale vapors.



- ➔ Insert O-rings and valves. See figure for the correct position of the valves:
- ⚠ Inlet side (IN):
Marked "IN" next to the valve seat. The valve tongue points at the kidney-shaped orifice in the valve seat.
- ⚠ Outlet side (EX):
Marked with "EX" next to the valve seat. The valve is oriented the same direction as the valve at the inlet side.



- ➔ Position valve heads, with hose nozzle, if applicable, connection tube or connection fastener, and disc springs on the valve seats. Position disc springs with large opening downwards. Pay attention to the correct orientation of the valve heads.

- ☞ Center the valve head with respect to the valve seat. The valve head must lie flat on the valve seat.

Valve head with gas ballast or hose nozzle connection:

- ➔ Insert square nut in the groove of the head cover or position square nut in the groove and then screw on connection fastener.

- ☞ Loosely fasten fillister head screw.



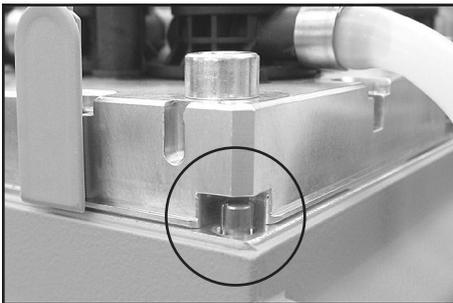
- ➔ Position clamping bracket with countersunk bores facing upwards.

- ➔ Align the countersunk bores with the threaded pegs.

- ➔ Loosely fasten the countersunk screws and correct the alignment of the valve heads if necessary.

- ➔ Tighten countersunk screws with Torx screwdriver T20.

- ☞ Torque: 3 Nm.



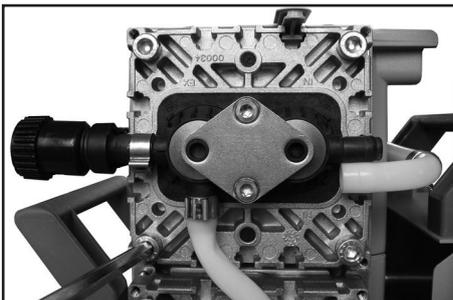
- ➔ Bring the diaphragms into a position, in which they are in contact with the housing and centered with respect to the bore.

- ➔ Put on head cover with valve heads and connections attached.

- ☞ Pay attention to the correct orientation of the head covers:

Housing with head alignment pin: The head alignment pin at the pump housing has to fit into the recess at the head cover.

Housing with mark: Align the recess at the head cover with the mark at the pump housing.



- ➔ Loosely screw in the Allen head screws at the head covers diagonally at first slightly with an Allen key size 5, then tighten.

- ☞ Recommended torque: 12 Nm.

- ➔ Slide the caps into the head cover.



Affix the connection tube to the other side of the pump, as well as the hose connection to the inlet or outlet of the vacuum system at the valve head.

- ➔ Slip connecting tube onto hose connection of valve head.

- ➔ Slide on the tube and the hose clip until touching the nose at the valve head.

- ➔ Close hose clip with flat pliers.



- ➔ Put head cover cowling on.
- ➔ Slide the head cover cowling in the grooves of the caps and under the connection fasteners.
- ➔ Install the washers. Use a Torx driver T20 to attach the 4 screws holding the head cover cowling.



- ➔ Tighten the fillister head screws of the connection fasteners with a Torx driver T20.
- ➔ Close the hinged covers.

Replace diaphragms and valves of the opposite side of the pump in the same way!



- ➔ Assemble catchpots with joint clips.

If the pump does not achieve the ultimate vacuum:

- Whenever the diaphragms and valves have been replaced, a break-in period of several hours is required before the pump achieves its ultimate vacuum.
- In case of an unusual noise, switch off pump immediately and check clamping disc positions.

If the specified ultimate vacuum is not achieved, and if this does not change after the break-in period: Check hose connectors at pump head for leaks. If necessary recheck valve seats and diaphragms.

6.4 Replacing the device fuse

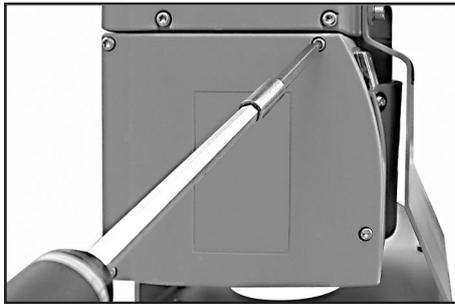
WARNING



The replacing of the fuse has to be carried out by a **trained electrician**.

Switch off the pump.

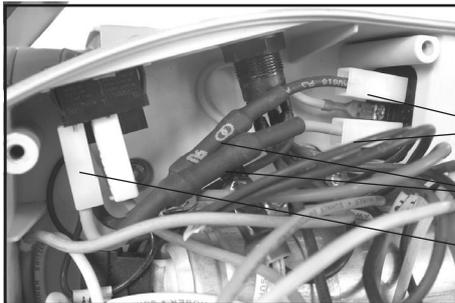
Disconnect the electrical power cord before opening the terminal box. After disconnecting from power, wait two minutes to allow the capacitors to discharge. After replacing the fuse, the pump must be checked for electric safety (see below)! Identify and eliminate the cause of failure before switching on the pump again.



The pigtail fuses are integrated into wires ((1), black and blue) inside the terminal box.

To replace the fuses it is necessary to replace both wires completely (fixed with flat pin bushes (2)).

- Open the terminal box. Unscrew the four screws with a Torx driver T20. Remove the terminal box cover. Remove both wires with integrated fuses (fixed with flat pin bushes (2), see figure). Mount the new wires (flat pin bushes) and close the terminal box. Fasten the cover with the four screws.



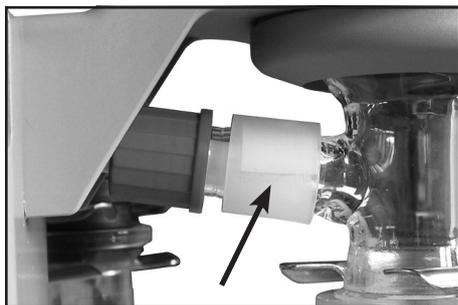
Set of fuses Rot.-Valve Contr./Rotavac 20

.....11-300-009-30

WARNING

Important: Check operability and safety of the pump after repair and after replacing the device fuse.

Check the electrical safety (protective conductor resistance, insulating resistance, high voltage test) according to IEC 61010 and national regulations.

6.5 Replacing the overpressure safety relief device at the condenser**Overpressure safety relief device**

..... 23-30-01-04-98

Round bottom flask 500 ml, coated

.....514-83000-02



- ➔ Remove joint clip at the catchpot.
- ➔ Unscrew the four Torx screws at the counter holder of the condenser and remove condenser. Thereby remove the adapter from the inlet of the condenser.
- ➔ Pull off old overpressure safety relief device and install new one. Check for correct position of the PTFE-foil under the overpressure safety relief device.
- ➔ Reassembly in reverse order.
- ➔ Position adapter in the inlet of the condenser and screw condenser with counter holder to the pump (Torx screws). Fix with union nut.
- ➔ Reassemble catchpot.

8 Service

Your unit is not working?

1. Please contact Heidolph Instruments or your authorized Heidolph Instruments dealer via telephone or email.

In Germany	Tel.:	0800-5889708 (freecall)
In USA		866-650-9604
In UK		01799-513320
Worldwide		+49-91229920-74
	Fax:	+49 (0) 91 22 99 20 65
	E-Mail:	sales@heidolph.de

2. After consulting with a Heidolph service employee:

- Package the unit for shipping per the recommended methods of the service department and mail to the following including the declaration of non-objection:

Heidolph Instruments GmbH & Co. KG
Lab Equipment Sales
Walpersdorfer Str. 12
D-91126 Schwabach / Germany

9 Disposal

- ➔ Properly dispose of the unit according to the valid national and legal regulations pertaining to disposal of used laboratory equipment.

10 Confirmation of condition of unit

In case of repair

1. Details about the unit

Model _____
 Serial number _____
 Reason for repair _____

2. Has the unit been cleaned or decontaminated / sterilized?

yes no

3. Is the unit in a condition which does not represent any health threats for the staff of our service department?

yes no

If not, which substances has the
appliance come into contact with?

4. Shipper

Name _____
 First name _____
 Company _____
 Department _____
 Street _____
 ZIP code _____
 City _____
 Country _____
 Phone _____
 E-Mail _____

5. Legally binding declaration

The customer is aware of being legally liable to
Heidolph Instruments for any damages arising from
incomplete and incorrect information.

Date _____
 Signature _____
 Company stamp _____

Please note: The shipper is responsible for the return of the goods in wellpacked condition, suitable for the mode of transport.



EU-Konformitätserklärung EU Declaration of conformity

CE **Vakuumpumpe**
Vacuum pump

Wir, die Heidolph Instruments GmbH & Co. KG,
We, Heidolph Instruments GmbH & Co. KG,

Heidolph Instruments GmbH & Co. KG
Walpersdorfer Straße 12
91126 Schwabach / Deutschland

erklären, dass nachstehend bezeichnete Geräte in Konzeption und Bauart sowie in der von uns in Verkehr gebrachten Ausführung den grundlegenden Anforderungen der zutreffenden, aufgeführten EU-Richtlinien entspricht. Bei einer mit uns nicht abgestimmten Änderung an dem Gerät verliert diese Erklärung ihre Gültigkeit.

hereby declare, that the product designated below is in compliance with the basic requirements of all applicable EU-directives stated below with regard to design, type of model sold and manufactured by us. This certificate will be invalid if the product is modified without the prior written consent and agreement of the manufacturer.

Rotavac Valve Control	591-00130
Rotavac Valve Tec	591-00160
Rotavac Vario Pumping Unit	591-00142
Rotavac Vario Control	591-00141
Rotavac Vario Tec	591-00171
Rotavac 20	591-07210

Maschinenrichtlinie / Machinery Directive 2006/42/EG
EMV-Richtlinie / Electromagnetic Compatibility Directive 2014/30/EU
Angewandte (harmonisierte) Normen / (Harmonized) Standards applied:
EN 61010-1:2011-07, EN 1012-2, EN 61326-1:2013,

Bevollmächtigter für die Zusammenstellung der technischen Unterlagen / Person
Authorized to compile the technical file: Marcell Sarré - Heidolph Instruments GmbH & Co. KG,
Walpersdorfer Straße 12, 91126 Schwabach / Germany

Schwabach, 21.04. 2016

Wolfgang Jaenicke
Geschäftsführer
Managing Director

Marcell Sarré
Qualitätsmanager
Quality Manager

01-001-025-11-4

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01-005-005-36-1-EN

01/06/2018

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