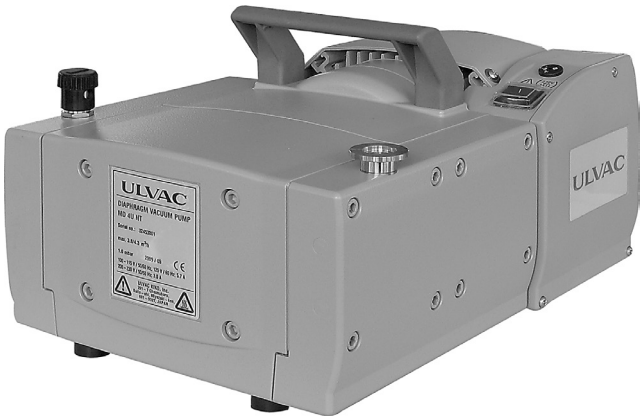
ULVAC

Instructions for use

⚠CAUTION

The voltage changeover switch at the time of the delivery is "240".
(The voltage corresponds to 180-253V.)

Application at "90-126V":
Please exchange a voltage changeover switch with "120".
Change the selection at the voltage changeover switch only if the pump is separated from mains.



MD 4U NT

Diaphragm pump

Contents

DANGER ➨ Danger! Immediate danger. Death or severe injuries as well as damage to equipment and environment can occur.

WARNING ☞ Warning! Possible danger. Severe injuries as well as damage to equipment and environment can occur.

CAUTION • Caution! Possible danger. Slight injuries as well as damage to equipment and environment can occur.

NOTICE Note. Disregarding of notes may cause damage to the product.

Caution! Hot surface!

Isolate equipment from mains before removing the cover.

Safety information!

General information

NOTICE

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

☞ Transport the pump at the provided handle.

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.

If the equipment is damaged, notify the supplier and the carrier in writing within three days; state the item number of the product together with the order number and the supplier's invoice number. Retain all packing material for inspection.

Do not use the equipment if it is damaged.

If the equipment is not used immediately, replace the protective covers. Store the equipment in suitable conditions.

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".

⚠CAUTION

- 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.

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.

The supply cable may be fitted with a moulded European IEC plug or a plug suitable for your local electrical supply. If the plug has been removed or has to be removed, the cable will contain wires colour coded as follows: green or green and yellow: earth; blue or white: neutral; brown or black: live.

⚠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!**

☞ Always provide a free and pressureless exhaust pipeline.

⚠CAUTION

- Comply with **maximum permissible pressures** at inlet and outlet and pressure differences, see section ”Technical data”. Do not operate the pump with overpressure at the inlet.
- Check that mains voltage and current conform with the equipment (see rating plate).
- Change the setting of the voltage changeover switch (pump with dual-voltage motor) only if the pump is separated from mains. Check that the voltage changeover switch is set correctly. **Attention**: If the pump is switched on with wrong voltage selection, the motor might be damaged!
- 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.
- Connect pipes gas tight at inlet and outlet of the pump.
- **Attention:** Flexible elements tend to shrink when evacuated.

NOTICE

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.

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.

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

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

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

Ambient conditions

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

Operating conditions

DANGER

➨ **The pumps have no approval for operation in or for pumping of potentially explosive atmospheres.**

➨ 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**.

CAUTION

- 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 excessing 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.

- The pumps are **not suitable** for pumping dust and have **no approval** for operation below ground.

NOTICE

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.
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”.

Safety during operation

DANGER

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

➨ Prevent any part of the human body from coming into contact with vacuum.

➨ 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.

☞ Pay attention to the symbol ”hot surfaces” on the equipment. Adopt suitable measures to prevent any danger arising from the formation of hot surfaces or electric sparks. Provide a suitable protection against contact if necessary.

WARNING

☞ Pumping at **high inlet pressure** may lead to overpressure at the gas ballast valve. Pumped gases or condensate might be pushed out in case the valve is open. If an inert gas supply is connected, ensure that the inlet pipeline is not contaminated.

⚠CAUTION

- Comply with applicable regulations when disposing of chemicals. Take into consideration that chemicals may be polluted.
  Take adequate precautions to protect people from the effects of dangerous substances (chemicals, thermal decomposition products of fluoroelastomers), wear appropriate safety-clothing and safety glasses.

- Use only **OEM spare parts and accessories.** Otherwise safety and performance of the equipment as well as the electromagnetic compatibility of the equipment might be reduced.
  Possibly the CE mark or the cTÜVus mark become void if not using OEM spare parts.

- Failure of the pump (e.g. due to power failure) or of connected components, parts of the supply or change of parameters must not lead to a critical dangerous situation under any circumstances. In case of diaphragm cracks or leaks in the manifold pumped substances might be released into the environment or into the pump housing or motor. Comply especially with notes on operation and use and maintenance.

- Due to the residual **leak rate of the equipment**, there might be 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.

NOTICE

Do not start the pump if the pressure difference between inlet and outlet port exceeds 1.1 bar at maximum.
Prevent the backpressure of gases and the backflow of condensates.
Never suck liquids or dust into the pump.

Provide appropriate protective measures (i.e. precautions which allow for the requirements of the respective application) even for the case of failure and **malfunction**.

In case of overload the motor is shut down by a **self-hold thermal cutout** in the winding.
Attention: Reset possible only manually. Switch off the pump or isolate the equipment from mains. Identify and eliminate the cause of failure. Wait approx. five minutes before restarting the pump.

Attention: In case of **supply voltage below 100V**, the lock of the cutout might be restricted and the pump might restart on its own after sufficient cooling down. Take suitable precautions, if an automatic restart of the pump may lead to a critical dangerous situation.

The A-weighted emission sound pressure level of the pump does not exceed 70 dB(A). Measurement according to EN ISO 2151:2004 and EN ISO 3744:1995 with standard silencer or exhaust tube at outlet.

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 the operation conditions like ambient temperature, humidity or load.

⚠CAUTION

- Check every capacitor regularly by measuring its capacity and estimating its operation time. Exchange old capacitors early enough to prevent a failure. If an overaged motor capacitor fails it might get hot and even melt and may cause a flame to form which could be **dangerous for persons and equipment in the vicinity**. The capacitors have to be replaced by an electrician.

➨ **Isolate equipment from mains** and **wait two minutes** before starting maintenance to allow the capacitors to discharge.

⚠WARNING

☞ **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.**

☞ **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.

⚠CAUTION

- Before starting maintenance vent the pump, isolate the pump and other components from the vacuum system. Allow sufficient cooling of the pump.

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 **"Notes on return to the factory"**) are followed.

Technical data

Type		MD 4U NT
Maximum pumping speed 50/60 Hz (ISO 21360)	m^3/h	3.8 / 4.3
Ultimate vacuum (absolute) without gas ballast	mbar	1
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 pressure (absolute) at gas ballast valve	bar	1.2
Permissible ambient temperature storage / operation	°C	-10 to +60 / +10 to +40
Permissible relative atmospheric moisture during operation (no condensation)	%	30 to 85
Rated motor power	kW	0.25
No-load speed 50/60 Hz	min^{-1}	1500 / 1800
Maximum permissible range of supply voltage (+/- 10%) dual voltage motor **Attention: Observe specifications on 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 200-230 V~ 50/60 Hz	 A A	 5.7 3.0
Device fuse		slow blow fuse 6.3A
Motor protection		thermal cutout, manual reset
Degree of protection IEC 529		IP 40
Inlet		small flange KF 16
Outlet		silencer
Dimensions L x W x H approx.	mm	325 x 239 x 198
Weight approx.	kg	16.4

We reserve the right for technical modifications without prior notice!

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

Wetted parts

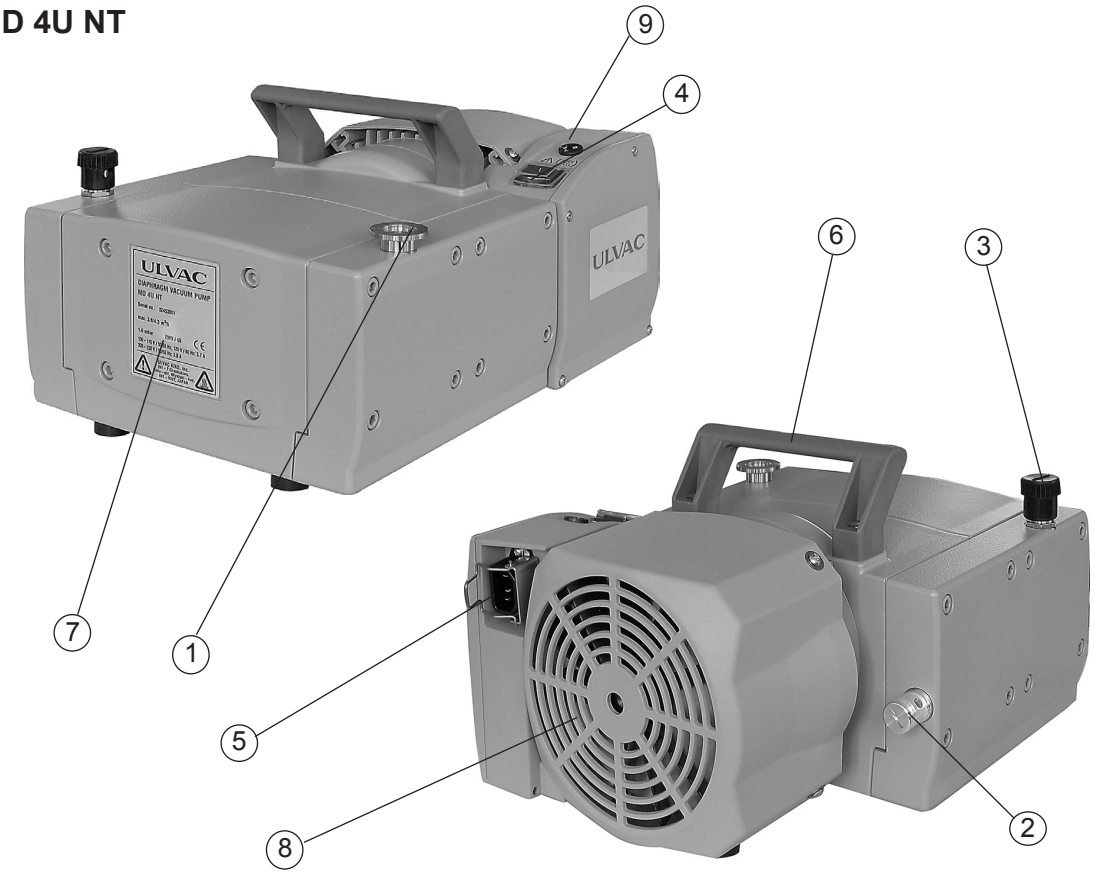
Components	Wetted materials
Housing cover	aluminium alloy (AlMgSi0.5 or AlSi12)
Head cover	aluminium alloy (AlSi12)
Diaphragm clamping disc	aluminium alloy (AlSi12)
Diaphragm	FPM
Valves	FPM
O-rings	FPM
Connection tube	aluminium alloy (AlMgSi0.5)
Small flange	stainless steel
Silencer	aluminium alloy / silicone

Pump parts

Position	Component
1	Inlet
2	Outlet
3	Gas ballast valve
4	ON/OFF switch
5	Mains connection
6	Handle
7	Pump rating plate
8	Fan
9	Voltage changeover switch

We reserve the right for technical modifications without prior notice!

MD 4U NT



Use and operation

Installing in a vacuum system

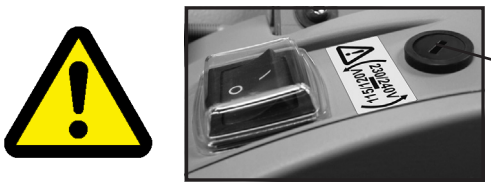
⚠CAUTION

- Connection lines at the pump inlet have to be gas tight. 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.
- Connect an exhaust line gas tight at the pump outlet if necessary. Always dispose of exhaust gases appropriately (e.g. into a fume hood). If there is risk of release of dangerous or polluting fluids, install an appropriate system to catch and dispose of those fluids.

- Reduce the transmission of vibration and prevent mechanical load 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.
- The gas outlet must never be blocked. The exhaust line has always to be free (pressureless) to ensure an unimpeded discharge of gas.
- Especially if the gas ballast valve is open, a power failure may cause accidental ventilation of the pump. In case this constitutes a potential source of danger, take appropriate safety measures.

- **Pump with dual-voltage motor**: Check that the voltage changeover switch at the terminal box is positioned correctly.
  Attention: If the pump is switched on with wrong voltage selection, the motor may be damaged!
  Before starting the pump, check that the voltage changeover switch at the terminal box is correctly positioned.
  Change the selection at the voltage changeover switch only if the pump is separated from mains.

Voltage selection switch:
1. Disconnect the electrical power cord.
2. Use a screw driver to adjust the **voltage selection switch** at the terminal box of the pump to the supply voltage:
”120” corresponds to 90-126 V and ”240” corresponds to 180-253 V.



⚠CAUTION

- Make sure ventilation is adequate especially if the pump is installed in a housing or if the ambient temperature is elevated. Provide external ventilation if necessary. Keep a distance of minimum 20 cm between fan and ambient parts.

NOTICE

Avoid throttling losses by using connecting pipes with large diameter and by keeping them as short as possible.
In case of perturbing exhaust noise connect an exhaust hose or use a silencer. 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 vapours 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.

⚠CAUTION

- The gas outlet must not be blocked. The exhaust pipeline has always to be free and pressureless to enable an unhindered discharge of gases.
- If necessary connect the exhaust to a suitable treatment plant to prevent the discharge of dangerous gases and vapours to the surrounding atmosphere.

During operation

⚠CAUTION

- **Maximum ambient temperature**: 40 °C
- Make sure ventilation is adequate especially if the pump is installed in a housing or if the ambient temperature is elevated.
- **Potentially dangerous gases or vapours** at the outlet of the pump have to be drained and disposed of appropriately.
- Due to the high compression ratio of the pumps, the pressure at the outlet port might get higher than the maximally permitted pressure compatible with the **mechanical stability** of the system. Ensure that the pump outlet is not blocked or restricted.

NOTICE

If pumping condensable vapours (water vapour, solvents, ...), let the pump run with **gas ballast** to reduce condensation in the pump.

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

Operating the pump at high inlet pressure or pumping dusty gases for a long time may cause clogging of the silencer. Check the silencer regularly and replace or install a hose nozzle (order no. 20639758) with sealing ring (order no. 20639729) instead.

Prevent internal condensation, transfer of liquids or dust. The diaphragms 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.

In case of excess temperature, the motor is shut down by a **thermal cutout** in the winding. Attention: Reset possible only manually. Switch off the pump or isolate the equipment from mains. Determine and eliminate the cause of failure. Wait approx. five minutes before restarting the pump.
Attention: In case of **supply voltage below 100V**, the lock of the cutout might be restricted and the pump might restart on its own after sufficient cooling down. Take suitable precautions, if an automatic restart of the pump might lead to a dangerous situation.

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

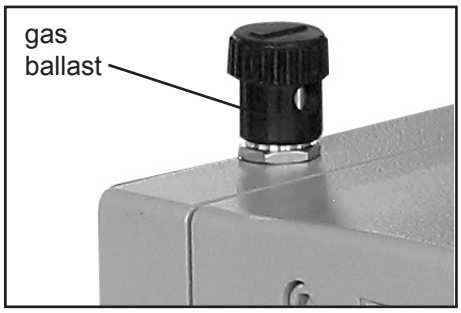
Attention: Important notes regarding the use of gas ballast

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.



For **condensable vapours** (water vapour, solvents, ...):

☞ Do not pump vapour before pump has reached its operating temperature. Open gas ballast valve when pumping condensable vapours.

☞ The gas ballast valve is open, if the gas ballast nozzle is visible in the opening of the gas ballast cap.

☞ 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.

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 form **deposits**?
Check and clean pump heads if necessary.

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

Troubleshooting

Fault	Possible cause	Remedy
❑ Pump does not start or stops immediately.	➡ Mains not plugged in, electrical supply failure?	✓ Plug in mains. Check fuse.
	➡ Device fuse blown?	✓ Identify cause of failure. Replace device fuse.
	➡ Pressure in outlet pipeline or in the system (at outlet side) too high?	✓ Remove blockade in line, open valve, or reduce overpressure in the system.
	➡ Motor overloaded?	✓ Allow motor to cool down, identify and eliminate cause of failure. Manual reset is necessary. Switch off pump or unplug mains.
❑ Pump does not achieve its ultimate vacuum or usual pumping speed.	➡ Centring ring at small flange connection not correctly positioned or leak in the pipeline or vacuum system?	✓ Check pump directly - connect vacuum gauge directly at pump inlet - then check connection, pipeline and vacuum system if necessary.
	➡ Long, narrow line?	✓ Use lines with larger diameter, length as short as possible.
	➡ Pump has been exposed to condensate?	✓ Allow pump to run for some minutes with atmospheric pressure at the inlet.
	➡ Deposits have been formed inside the pump?	✓ Clean and inspect the pump heads.
	➡ Diaphragms or valves damaged?	✓ Replace diaphragms and/or valves.
	➡ Outgassing substances or vapour generated in the process?	✓ Check process parameters.
❑ Pump too noisy.	➡ Loud exhaust noise?	✓ Connect hose or silencer to pump outlet.
	➡ Diaphragm crack or diaphragm clamping disc loose?	✓ Perform maintenance.
	➡ Other than above mentioned causes?	✓ Contact local distributor.
❑ Pump seized.		✓ Contact local distributor.

Replacing diaphragms and valves

NOTICE

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 the diaphragms and valves must be checked for cracks or other damage. Check every capacitor regularly by measuring its capacity and estimating its operation time. Exchange old capacitors early enough to prevent a failure. The capacitors have to be replaced by an electrician. 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 vapour 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.

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

⚠WARNING

☞ 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.**

☞ **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. Avoid the release of pollutants. Allow sufficient cooling of the pump.

⚠CAUTION

- Attention: The pump might be contaminated with the process chemicals that 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. Ensure that the maintenance technician is familiar with the safety procedures which relate to the products processed by the pumping system.
- Wear appropriate safety-clothing when you come into contact with contaminated components. Avoid the release of pollutants.

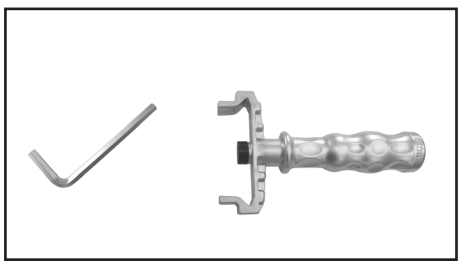
NOTICE

Before starting maintenance vent the pump and isolate it from the vacuum system.

Set of seals (diaphragms, valves, O-rings) **20696861**
Diaphragm key (w/f 66)..... **20636397**

☞ **Please read section ”Replacing diaphragms and valves” completely before starting maintenance.**

Partially the pictures show pumps in other versions. This doesn’t influence replacing diaphragms and valves of the pump.

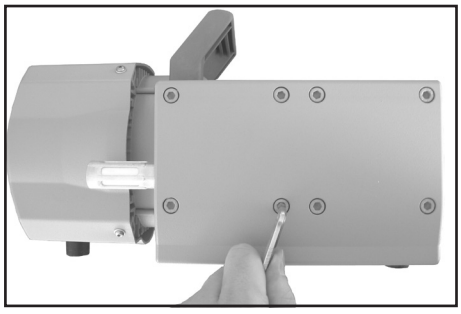


Tools required (metric):

- Hex key size 5
- Diaphragm key w/f 66

Cleaning and inspecting the pump heads

➨ Position the pump on the side. Support pump appropriately if necessary. Open only one side of the pump at a time.



➨ To check the valves use a hex key to remove eight socket-head screws from the pump head and remove the housing cover with head cover, valves and O-rings.

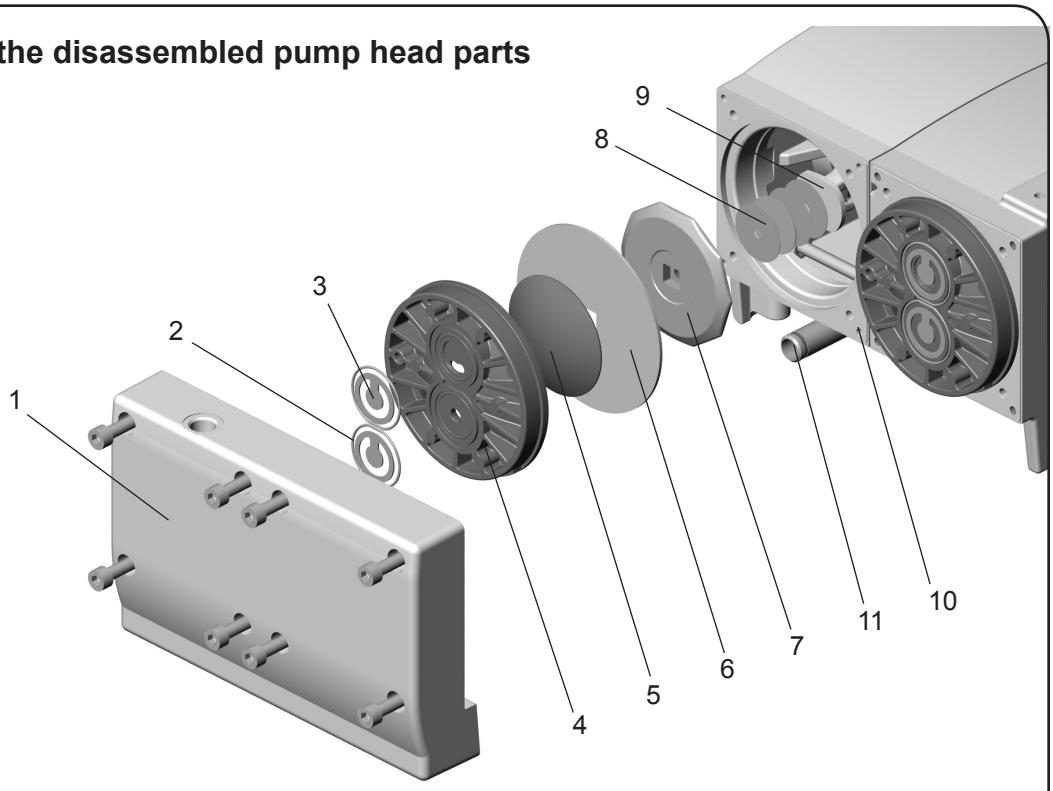
☞ Never remove parts by using a spiky or sharp-edged tool (e.g. screw driver), we recommend to use a rubber mallet or compressed air (to be blown **carefully** into port).

➨ Remove the head cover carefully from the housing cover. Note the position of the valves and remove them.

☞ Replace valves if necessary.

☞ Use petroleum ether or industrial solvent to remove deposits. Do not inhale.

View of the disassembled pump head parts

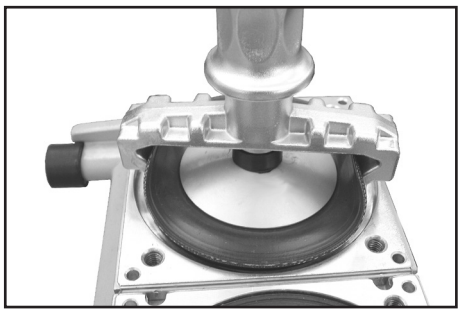


Pump head parts:

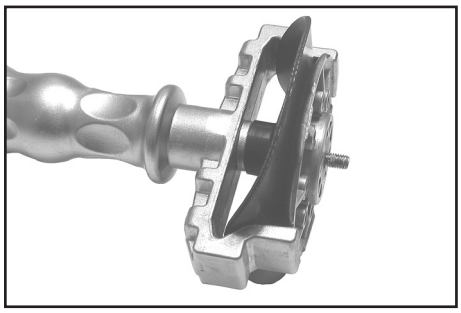
1: Housing cover
2: O-rings (not ME 8 NT)
3: Valves
4: Head cover
5: Diaphragm clamping disc with square head screw
6: Diaphragm
7: Diaphragm support disc
8: Washer
9: Connecting rod
10: Housing
11: Connecting tube with O-ring

☞ Underneath the pump there is a connecting tube between the two housing covers. The connecting tube is merely stuck into the housing covers and sealed with seal rings at the connecting tube's ends. If the housing cover is removed, the connecting tube becomes detached as well.

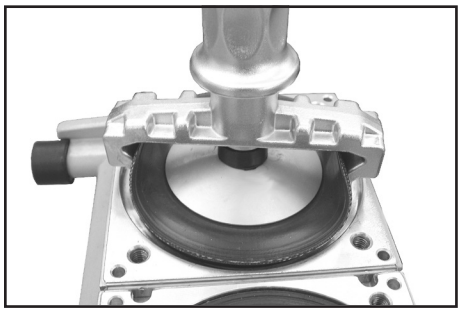
Replacing the diaphragm



☞ Check the diaphragm for damage and replace if necessary.
➨ Lift the diaphragm carefully sidewise.
☞ Never use a spiky or sharp-edged tool to lift the diaphragm.
➨ Use the diaphragm key to grip the diaphragm support disc under the diaphragm. Unscrew the diaphragm support disc with diaphragm and diaphragm clamping disc.
☞ If the old diaphragm is difficult to separate from the support disc, immerse assembly in naphtha or petroleum ether. Do not inhale!
➨ Check for washers between the diaphragm support disc and the connecting rod. **Do not mix the washers from the different pump heads**. Make sure that the original number is reassembled at the individual pump head.
☞ Smaller number of washers: The pump will not attain ultimate vacuum. More washers: Clamping disc will hit head cover; noise or even blockade and damage of the pump.

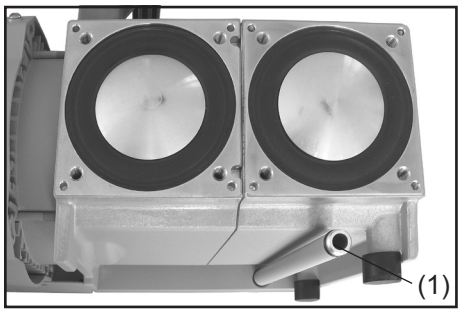


➨ Position the new diaphragm between the diaphragm clamping disc with square head screw and the diaphragm support disc.
☞ **Attention:** Double diaphragm! Put the two diaphragms together with the printed sides outwards.
☞ Make sure that the square head screw of the diaphragm clamping disc is correctly seated in the guide hole of the diaphragm support disc.
➨ Lift the diaphragm at the side and position it carefully together with the diaphragm clamping disc and the diaphragm support disc in the diaphragm key.
☞ Avoid damage of the diaphragm: Do not bend the diaphragm too much.

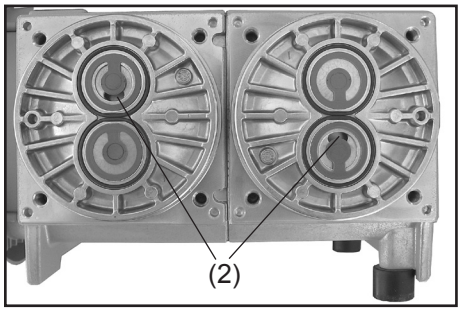


☞ Pay attention to washers. Do not remove, assemble the original number of washers between the support disc and the connecting rod.
➨ Screw diaphragm clamping disc, diaphragm, diaphragm support disc and washers (if applicable) to connecting rod.
➨ Optimum torque for the diaphragm support disc: **6 Nm**, use torque key. Attach torque key to diaphragm key (hexagonal bolt 6 mm wide).

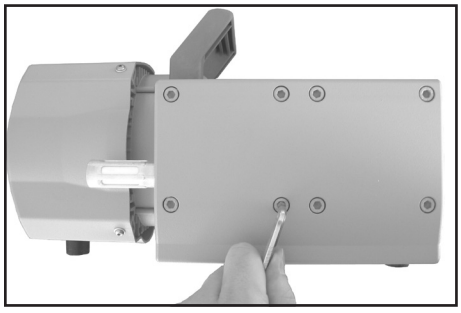
Assembling pump heads



➨ Bring the diaphragms into a position in which they are in contact with the housing and centred with respect to the bore.
➨ When mounting the housing cover, install the connecting tube (1) under the pump between the two housing covers. Pay attention to the correct positions of the seal rings (replace if damaged) in the grooves at the ends of the tube. Stick the connecting tube in the bore of the housing cover. After the assembly the connecting tube may have some play.



Reassemble in reverse order.
➨ Install head cover, valves, O-rings and housing cover.
☞ Make sure that the diaphragm stays centric so that it will become clamped uniformly between housing and head cover.
➨ Put the head cover onto the housing.
☞ Orientation of the head cover: Align the nib at the head cover with the notch of the housing cover.
➨ Put the valves in place. In case install O-rings.
☞ Make sure that the **valves are correctly seated**: Valves at the outlet with round centred opening under valve, valves at the inlet with kidney-shaped opening of the head cover (2) beside valve.



➨ Put housing cover in place.
☞ If it is not possible to position the housing cover, check the head cover for correct orientation. The nib at the head cover has to lock into the notch of the housing cover.
➨ Install the connecting tube (1) under the pump between the two housing covers.
➨ Screw in the socket head screws fixing the housing cover crosswise first slightly, then tighten.
☞ Torque **12 Nm**.

➨ Position the diaphragm pump carefully on the other side, support pump appropriately. Perform maintenance of the remaining pump heads according to the description above.

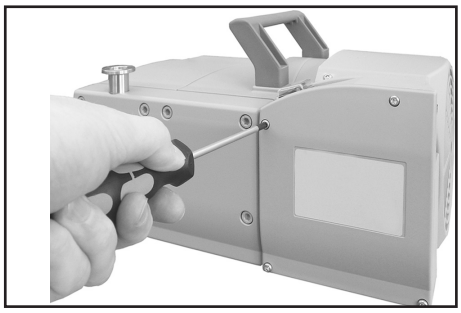
If the pump does not achieve the ultimate vacuum:
☞ In case the diaphragms and valves have been replaced, a run-in period of several hours is required before the pump achieves its ultimate vacuum.
☞ In case of unusual noise switch off pump immediately and check clamping disc positions

If the pump does not achieve the ultimate total vacuum:
Check hose connectors between pump heads and manifolds for leaks. If necessary recheck pump chamber.

Replacing the device fuse

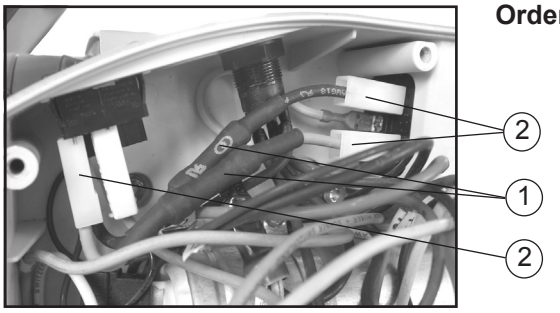
⚠WARNING

The replacing of the device fuse has to be carried out by an **electrician**. Switch off the pump and disconnect it from mains before opening the terminal box. After disconnecting from mains 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 (slow blow fuse 6.3A) is built in in a wire (1, black and blue) inside the terminal box. To replace the fuses it is necessary to replace the whole wires (fixed with flat pin bushes (2)).

➨ Open the terminal box. Unscrew the four screws with a Torx screw driver TX20 and remove the terminal box cover. Remove the wire with the blown fuse (fixed with flat pin bushes (2), see figure). Mount the new wire (flat pin bushes) and close the terminal box. Fasten the cover with the four screws.



Order-no. Set of fuses NT.....20636542

⚠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.

Notes on return to the factory

Repair - return

NOTICE

Safety and health of our staff, laws and regulations regarding the handling of dangerous goods, occupational health and safety regulations and regulations regarding safe disposal of waste require that for all pumps and other products the **"Check sheet for repair"** must be send to our office duly completed and signed before any equipment is dispatched to our premises.
Fax or post a completed copy of the check sheet for repair to us in advance. The declaration must arrive before the equipment. Enclose a second completed copy with the product. If the equipment is contaminated you must notify the carrier.
No repair is possible unless the correctly completed form is returned. Inevitably, there will be a delay in processing the equipment if information is missing or if this procedure is not obeyed.

⚠CAUTION

If the product has come in contact with chemicals, radioactive substances or other substances dangerous to health or environment, the product must be decontaminated **prior to sending it back to the factory.**

- Return the product to us **disassembled and cleaned** and accompanied by a certificate verifying decontamination or
- Contact an industrial cleaning and **decontamination service** directly or
- Authorize us to send the product to an industrial cleaning facility **at your expense.**

To expedite repair and to reduce costs, please enclose a detailed description of the problem and the product's operating conditions with every product returned for repair.
We submit **quotations** only on request and always at the customer's expense. If an order is given, the costs incurred are offset from the costs for repair or from the purchase price, if the customer prefers to buy a new product instead of repairing the defective one.

- **If you do not wish a repair on the basis of our quotation, the equipment might be returned to you disassembled and at your charge!**

In many cases, the **components must be cleaned in the factory** prior to repair.
For cleaning we use an environmentally responsible water based process. Unfortunately the combined attack of elevated temperature, cleaning agent, ultrasonic treatment and mechanical stress (from pressurised water) may result in damage to the paint. Please mark in the check sheet for repair if you wish a **repaint at your expense** just in case such a damage should occur.
We also replace parts due to optical aspects upon your request.

NOTICE

Before returning the equipment ensure that (if applicable):

- Equipment has been cleaned and/or decontaminated.
- All inlet and outlet ports have been sealed.
- Equipment has been properly packed, if necessary, please order an original packaging (costs will be charged), marked as appropriate and the carrier has been notified.
- Ensure that the completed check sheet for repair is enclosed.

We hope for your understanding for these measures, which are beyond our control.

Scrapping and waste disposal:
Dispose of the equipment and any components removed from it safely in accordance with all local and national safety and environmental requirements. Particular care must be taken with components and waste oil which have been contaminated with dangerous substances from the process. Do not incinerate fluoroelastomer seals and O-rings.

ULVAC

Vacuum Pump Check Sheet For Repair

(for disassembly, inspection and repair)

※ Please inform the following items completely for safety precautions against our maintenance staff. Fill in the item below and attached to the repair pump.

Date of issue : Year Month Date

Customer's name :

Person in charge :

ＴＥＬ : ＦＡＸ :

Representative Distributor :

Person in charge :

ＴＥＬ : ＦＡＸ :

Product Name : Serial No. (ＭＦＧ. Ｎｏ) :

Purchased Date : Year Month

1. Request item

☐ Repair order during the warranty period (No Charge)

☐ Evaluation pump disassembly inspection required or inspection for pump required (No charge)

☐ Immediate repairing is required、 (Charge)

☐ Periodical inspection or over haul (Charge)

☐ Repair order is required and estimation is required before start repairing、

2. Trouble situation

☐ Unusual sound ☐ Pressure degradation ☐ Irregular action ☐ Others

3. Purpose of the usage (Device's name if necessary)

4. Evacuated gas (Type of the gas)

(1) Hazardous situations for injury ☐Yes ☐No

(2) Type of the gas・Name of the gas

5. Operational situation

(1) Operational elapsed time : hr ☐ 24hrs consecutive operation

☐ On Off operation

(2) Installation place :

(3) Ambient temperature :

(4) Operational pressure :

6. Miserenious information. Please describe any information if necessary.

7. Send to

Ulvac Kiko, Inc. CS Center. Service Dep. 【Address】 1-10-4, Kita-shinyokohama, Kohoku-ku, Yokohama, Kanagawa-ken, 223-0059, JAPAN TEL:045-533-0509 FAX:045-533-0512

※Use this paper by recopying for every information. When sending your information without this check sheet, repairing may not be acceptable.

EC Declaration of Conformity

We, ULVAC KIKO,Inc.

of 291-7 Chausubaru, Saito-city, Miyazaki, 881-0037. Japan

In accordance with the following Directive:

2006/42/EC Machinery Directive
2014/30/EU Electromagnetic Compatibility Directive
2011/65/EU RoHS

declare under our sole responsibility that the product,

Type of Product : Diaphragm Type Dry Vacuum Pump
Model Name : MD4UNT（100-230V ; 736035）

to which this declaration related is in conformity with the following standards:

DIN EN 1012-2:2011
Compressors and vacuum pumps - Safety requirements, Part2. Vacuum pumps
DIN EN 61010-1:2011 , IEC 61010-1:2010(Ed.3)
Safety requirement for electrical equipment for measurement, control and laboratory use.General requirement
EN 61326-1:2013
Electrical equipment for measurement, control and laboratory use - EMC Requirements - Part 1: General requirements
DIN EN ISO 12100:2011
Safety of machinery – general principles for design – Risk assessment and risk reduction

following the provisions of

The person stated below will keep the following technical documentation:

- operating and maintenance instructions
- technical drawings
- description of measures designed to ensure conformity
- other technical documentation, e.g. quality assurance measures for design and production

Person authorized to compile the technical file:

(Name and address) Chris Goebel
ULVAC Gmbh
Parkring11,85748,Garching,Germany

12.Jan, 2018
Miyazaki , Japan
(date & place)

Tsuneo Osaka/ T. Osaka
(name & signature)

Sales, service agency, and the where to make contact

＜Sales Office＞

Sales Division & Overseas Division & Yokohama Branch
1-10-4, Kitashinyokohama, Kohoku-ku, Yokohama-shi, Kanagawa Prf. Japan

Yokohama branch: TEL (81) 45-533-0203 FAX (81) 45-533-0204
Overseas Division: TEL (81) 45-533-0206 FAX (81) 45-533-0204

Osaka Branch
3-3-31 Miyahara, Yodogawa-ku, Osaka-shi, Osaka-fu Japan
TEL(81)6-6350-2166 FAX(81)6-6350-2169

Nagoya Branch
3-11-31 Sakae, Naka-ku, Nagoya-shi, Aichi Prf. Japan
TEL(81)52-249-5121 FAX(81)52-249-5122

<Service Office>

Yokohama Branch
1-10-4, Kitashinyokohama, Kohoku-ku, Yokohama-shi, Kanagawa Prf. Japan
TEL(81)45-533-0509 FAX(81)45-533-0512

Miyazaki Branch
291-7 Chausubaru, Saito-shi, Miyazaki Prf. Japan
TEL(81)983-42-4135 FAX(81)983-43-2159

ULVAC GmbH
Parkring 11, 85748, Garching, Germany
TEL(49)89-96-0909-0 FAX(49)89-96-0909-96

ULVAC KIKO,Inc.
www.ulvac-kiko.com

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FAX : (81) 983-42-1422