

memmert

Operating Instructions

Self Drying Vacuum pump

PM 400 / PM 500

Operating Instructions PM 16527-860.3

Self Drying Pumps

Laboratory Vacuum Pumps
with Drying System

PM 16527-860.3

You have selected a high-quality KNF product; the following tips will help you operate it safely, and reliably over a long period of time.

Carefully study operating instructions before using the pumps and observe at all times the relevant instructions to avoid dangerous situations.

0. List of Contents

1. Description, Operating Conditions
2. Safety
3. Installation
4. Operation
5. Servicing
6. Trouble Shooting
7. Ordering Information
8. Specifications



1. Description, Operating Conditions

The pumps transfer, and evacuate 100 % oil-free. In operation they are gas-tight, and maintenance-free.

The self drying pumps make it possible during evacuation to blow the condensed liquid out of the pump heads at high speed, while maintaining the vacuum in the recipient at a constant level. After drying the pump heads the pumps achieve a greatly improved vacuum and evacuate much faster than pumps without a drying system.

The control for the drying system is effected via solenoid valve and three variables:



- The time between switching on the drying system and the first ventilation of the pump heads (t_1)
- The duration of the ventilation of the pump heads (t_2)
- The interval between pump head ventilation operations (t_3).

This pump model is equipped with the solenoid valve for ventilating the pump heads. The scope of delivery does not include control electronics.

1.1 Electrical Equipment

- See section 8 for full electrical data.
- The pumps are fitted with a thermal switch to protect against overloading.

1.2 Operating Conditions

-  The pumps and/or the drying system must not be used in areas where there is a danger of explosion.
-  These pumps must not be used if the entry of air into the pump during venting (drying system) could result in the creation of reactive, explosive or otherwise hazardous mixtures.
Prior to any use of the pump ensure that the creation of reactive, explosive or otherwise hazardous mixtures during the supply of air is prevented.


- For maximum permissible operating pressure, ultimate vacuum, and flow capacity: see chapter 8.
- The pumps must not be used for

liquids. You will find suitable liquid pumps in our Product Program.






If your potential application lies outside the above limits discuss it with our technical adviser (see last page for contact telephon number).

1.3 Ambient Condition

When the pumps are operating the following ambient conditions must be maintained:

-  The pumps and/or the drying system must not be used in areas where there is a danger of explosion.
- Ambient temperature during operation: between + 5 °C + 40 °C.
- During operation an adequate supply of air for cooling must be provided.

2. Safety

- Note that the pumps may only be used for their intended purpose.
-  The pumps and/or the drying system must not be used in areas where there is a danger of explosion.
-  These pumps must not be used if the entry of air into the pump during venting (drying system) could result in the creation of reactive, explosive or otherwise hazardous mixtures.
Prior to any use of the pump ensure that the creation of reactive, explosive or otherwise hazardous mixtures during the supply of air is prevented.
-  Components connected to the pumps must be designed to withstand the pneumatic performance of the pumps (see chapter 8).
- Plug the pump only into properly installed grounded outlets.
-  When the operation of the pump is interrupted by the thermal switch, it will re-start automatically after cooling down. Take all care necessary to prevent this leading to a dangerous situation.
-  Specific safety instructions and measures for the media being handled must be observed.
- Parts of the casing marked with the sign below are only allowed to be

opened after pulling out the plug (disconnecting the power source).






- Use only original KNF replacement parts.

3. Installation

- Choose a safe location (flat surface for the pump).
- Install the pump so as to ensure adequate flow of air cooling.
- Connect the suction and pressure lines (tube ID 10 mm).
 - ▶ Arrange the pressure line so that condensate can flow out of the the pump (falling pipe).
- The condensate is conducted out of the pump via the pressure line. A container is to be installed to catch the condensate.
- The solenoid valve must be connected to the drying system control electronics (not included in scope of delivery); see fig. 1.
- Plug the pump only into properly installed grounded outlets.
- Compare the supply data with the electrical data of the pump. The voltage must not vary by more than + 10 %, and - 10 % from that shown on the type-plate.

4. Operating Instructions

4.1 Operating Conditions

-  The pumps and/or the drying system must not be used in areas where there is a danger of explosion.
-  These pumps must not be used if the entry of air into the pump during venting (drying system) could result in the creation of reactive, explosive or otherwise hazardous mixtures.
Prior to any use of the pump ensure that the creation of reactive, explosive or otherwise hazardous mixtures during the supply of air is prevented.
-  Specific safety instructions for the media being handled must be observed.
- The pumps must not start against

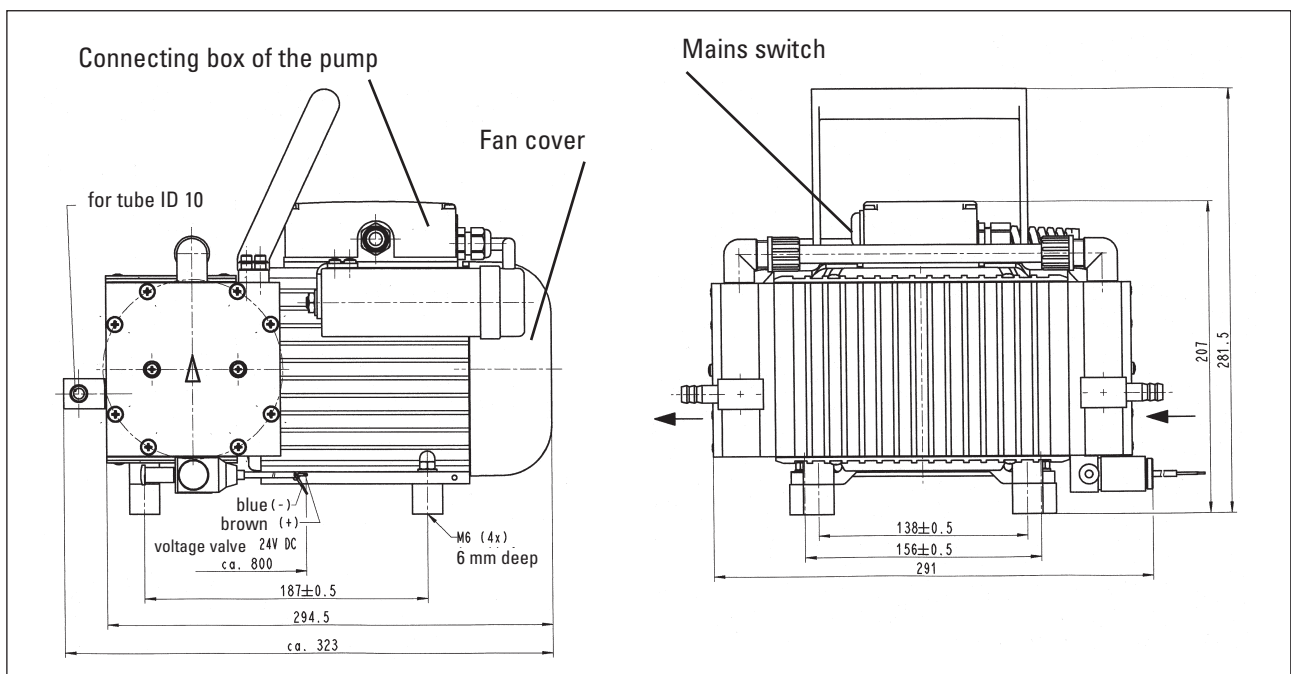


Fig. 1: Pump PM 16527-N 860.3-2.00

pressure. This also applies when the pump restarts after the power has been cut off for a short period.

⚠ The components to be connected to the pump must be designed to withstand the pneumatic data of the pumps (see Section 8).

⚠ The maximum permissible operating pressure (1 bar g) must not be exceeded.

- To prevent the maximum permissible operating pressure being exceeded, restriction or control of the air or gas flow should only be carried out in the suction line.

- If restriction or control of the air or gas flow is made on the pressure side ensure that the maximum permissible operating pressure is not exceeded.

- When the pump is at a standstill the inlet and the outlet must be at normal atmospheric pressure.

⚠ Ensure the pump outlet is not closed or restricted.

- Diaphragm and valve plates are the only parts subject to wear. Wear is usually indicated by a drastic reduction in the pneumatic performance. When replacing parts proceed as described in section 5.

- Ambient conditions: see chapter 1.3.

4.2 Operation

Taking the pump into operation

- 1 Plug the mains plug of the pump into a properly installed safety socket.
- 2 Switch the pump on at the pump mains switch (see fig. 1).
- 3 If cyclic drying of the pump heads is required in the current evacuation process, switch the drying system on at the mains switch of the control system (not included in scope of delivery).
 - ▶ The drying system should only be switched on if a container has been attached to the pressure line of the pump which will catch the condensate; otherwise the condensate will flow out uncontrolled.

Check:

- 1 Tubing for correct tubing.
- 2 Electrical connections for correct connection.

After the evacuation/process has been completed, **take the pump out of operation:**

- 1 Purge the pump including the connecting hoses with air at full flow rate for about 5 minutes.
- 2 If the drying system is switched on: Switch the drying system off at the mains switch of control system

(not included in scope of delivery).

- 3 Switch the pump off at the mains switch of the pump.
- 4 Pull the mains plug of the pump out of the socket.

5. Servicing: Changing Diaphragms and Valve Plates/Sealings

The diaphragms in both pump heads should be changed at the same time. When diaphragms are changed, valve plates/sealings should also be replaced. If the diaphragms are not changed in both heads at the same time or diaphragms and valve plates/sealings are not changed at the same time the nominal performance of the pump is not guaranteed after the service.

⚠ If a pump has been used for aggressive or toxic substances or other types of substances which are hazardous, hazardous to health, or injurious, the following points must be observed:

- 1.) Clean the pump and its components before servicing.
- 2.) Ensure that the service personnel is not subject to a health hazard. Apply the safety and protection measures that are necessary for the medium that has been handled by the pump (example: the use of protective gloves).
- 3.) Ensure that discarded parts and materials are safely and correctly

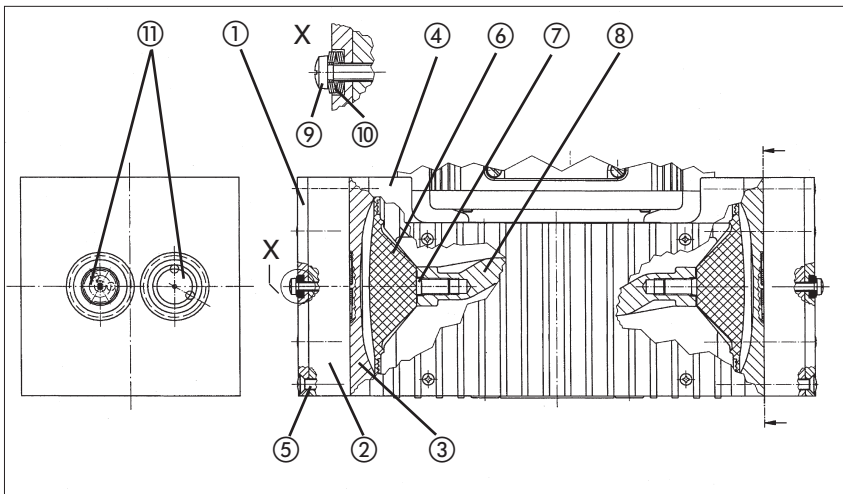


Fig. 2: Cross section of pump heads (symbolic)

disposed of.

- ▶ Use only original KNF replacement parts.

Parts and tools required:

- 1 Service Set (see section 7)
- Screwdriver blade width 2 mm
- Phillips screwdriver No. 2
- Felt-tip pen.

Change the diaphragms and valve plates/sealings in the following sequence:

- a) Preparatory steps
- b) Removing pump head
- c) Changing diaphragm
- d) Changing valve plates/ sealings
- e) Refitting pump head
- f) Final steps.

- ▶ The position numbers in the following text refer to fig. 2.

a.) Preparatory Steps

- 1 Shut down system (see section 4.2)
 - ⚠ including disconnecting the pump from the power source (pull out plug of pump).
- 2 Remove tubing from the inlet and outlet connectors of the pump.
- 3 On the pneumatic head connections, loosen one of the union nuts by hand. Then slightly loosen the angle-fitting in the pump head by turning it anticlockwise, so that the connecting tube can be pulled out
- 4 Undo the screws that hold the fan cover (see fig. 1) and remove the fan cover from the motor.

b) Removing pump head

(for each head separately)

- 1 Mark the position of top plate 1, head plate 2, intermediate plate 3, and housing 4 relative to each other with a felt-tip pen. This is to ensure that the parts will be re-assembled correctly at a later stage.
- 2 Undo the eight screws 5 and lift the pump head off the housing 4.
 - ▶ The solenoid valve of the drying system remains fitted in this situation.

c) Changing diaphragm

- 1 Position the pump so that the diaphragm surface is upwards.
- 2 Turn the fan to bring the structured diaphragm 6 to top dead centre.
- 3 Using a small screwdriver, between the housing and the outer edge of the structured diaphragm, carefully lift the edge of the diaphragm lightly upwards at one point (making sure not to damage the housing). Now grip the edge of the diaphragm on opposite sides, unscrew it by turning anti-clockwise.
- 4 Take the diaphragm spacer(s) 7 off the connecting rod 8 and retain them.
- 5 Check that all parts are free from dirt and clean them if necessary.
- 6 Put the diaphragm spacer(s) 7 on the thread of the new diaphragm.
- 7 Fit the new structured diaphragm 6: hold the connecting rod 8 with one finger, and gently screw in (clockwise) the structured diaphragm with diaphragm spacers.
- 8 Turn the fan until the structured

Specification

Pos Description

- | | |
|----|---|
| 1 | Top plate |
| 2 | Head plate |
| 3 | Intermediate plate |
| 4 | Housing |
| 5 | Cross recessed raised counter-sunk head screw |
| 6 | Structured diaphragm |
| 7 | Diaphragm spacer(s) |
| 8 | Connecting rod |
| 9 | Cross recessed raised cheese head screw |
| 10 | Disk spring |
| 11 | Valve plate/Sealing |

diaphragm is at the top dead centre. Using a small screwdriver, between the housing and the outer edge of the structured diaphragm, carefully lift the edge of the diaphragm lightly upwards at one point. Now grip the edge of the diaphragm on opposite sides (do not overstretch the diaphragm!) and tighten the structured diaphragm clock-wise.

d) Changing valve plates/sealings

- 1 Undo the two screws 9.
- 2 Separate the head plate 2 with top plate 1 from intermediate plate 3.
- 3 Remove the valve plates/sealings 11 from the intermediate plate.
- 4 Check that the valve seats, the head plate and intermediate plate are clean. If scratches, distortion, or corrosion are evident on these parts they should be replaced.
- 5 Lay the new valve plates/sealings 11 in the recesses in the intermediate plate. The valve plates/sealings for suction and pressure sides are identical, as are upper and lower sides of the plates/sealings.

e) Refitting pump head

- 1 Turn the fan to bring the structured diaphragm 6 to medium position.
- 2 Place the intermediate plate 3, with valve plates/sealings 11 on the housing, in the position indicated by the felt-tip pen marking.
- 3 Place the head plate 2 on the intermediate plate 3 in the position indicated by the felt-tip pen marking.
- 4 Place top plate 1 in position

and insert screws ⑨ with disk springs ⑩, and tighten them until the screw heads are just fully seated (do not completely tighten them!).

► The concave side of the first three disc springs must point away from the screw head, the next three towards it (see fig. 2, detail X).

- ⑤ Gently tighten the screws ⑤, evenly and diagonally.
- ⑥ Turn the fan to check that the pump rotates freely.
- ⑦ Now tighten screws ⑤ hand-tight.
- ⑧ Tighten each of the screws ⑨ a half-turn more.

Repeat operations b), c), d), and e) for the second pump head.

f) Final steps

- ① Refit the the pneumatic head connection:
Place tube onto the connecting part of the angle fitting, turn angle fitting to a straight position and tighten the nut.
 - ② Refit the fan cover.
 - ③ Reconnect the pump to the electricity supply.
- If you have any questions about servicing call our technical adviser (see last page for contact telephone number).

6. Troubleshooting

► Sufficient vacuum is not reached

Possible reasons:

- ① Tube connections are not tight
 - ② Condensate in the pump head
 - Switch the drying system on or reduce the interval between pump head ventilation operations.
 - ③ Diaphragms and/or valve plates/sealings are worn out
 - Changing diaphragms and valve plates/sealings: see section 5.
 - ④ If this problem occurs after changing of diaphragms and valve plates/sealings:
 - See information in section 5.
- **Pump is switched on, but does not**

run, the on/off-switch on the pump is not lit

Possible reasons:

- ① Pump is not connected with the power source.
- ② No voltage in the power source.
- ③ Fuse in the pump is defective (only authorized/qualified personnel should investigate this problem):
 - Disconnect the pump from the power source by pulling out plug.

Placement of fuse:

- Fuse accessible after opening the connecting box of the pump (see fig. 1 for the position of the connecting box).

Dimension of the fuse:
see section 8.

► Pump is switched on, but does not run, the on/off-switch on the pump is lit

Possible reason:

- ① The thermal switch has opened due to overheating
 - Disconnect the pump from the power source, let the pump cool down, investigate the reason for the overheating and irradiate it.

7. Ordering Information

Service Set

A Service Set contains all replacement parts needed for one complete service of the pump.

Service Set contains
2 diaphragms, 4 valve plates/sealings

Order No.
047499

8. Specifications

Capacity: max. 60 l/min

Ultimate vacuum: 4 mbar abs.

Permissible operating pressure:
max. 1 bar^g

Permissible ambient
temperature: + 5... + 40 °C

Hose connection for tube ID 10 mm

Voltage pump: 230 V

Frequency: 50 Hz

Power consumption pump: 220 W

Fuse pump
(2 x): 3.15 T [A]
IP 54

Voltage solenoid
valve 24 V DC

► CE - Safety Demands

- The pumps correspond to the safety regulations of the EU low voltage directive 73/23 EWG and of the EU directive concerning electromagnetic compatibility 89/336 EWG. The requirements of the following harmonised standards are fulfilled:
EN 55014
EN 61000-6-1
EN 61000-6-3
EN 61000-3-2/3
EN 61010-1
- The pumps correspond to IEC 664:
 - the overvoltage category II
 - the pollution degree 2.

**Appendix:
Customer statement for
repair order (sample
statement for copying)**

- ▶ In order for KNF to repair the pump, the customer must provide a statement on the media which were pumped and on pump cleaning. Please fill out the corresponding KNF form, and submit it together with the pump.

Statement/Certificate

We confirm that the pump model listed below (please specify)

.....
.....

Serial-No. (please specify)

.....
.....

was used to pump the following media:

.....
.....
.....
.....
.....
.....

and that the pump listed above was cleaned. There are no poisonous, aggressive, biological, radioactive or other dangerous media in the pump.

.....
Company

.....
Date/
Signature

**KNF Neuberger GmbH
Alter Weg 3
D-79112 Freiburg**

**Tel. ++49/7664/5909-0
Fax ++49/7664/5909-99**

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