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# Operating Manual 201 e

# Self Drying Pumps

## Laboratory Vacuum Pumps with Drying System

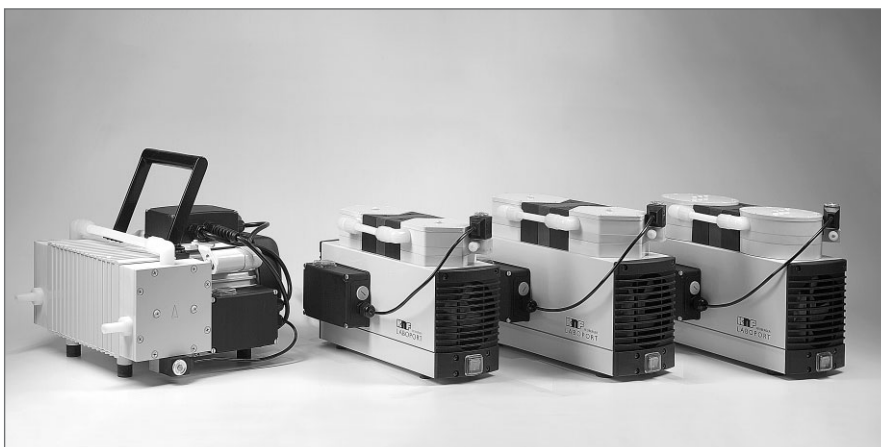
Type ranges

**N 820.3 FT.40.18**

**N 840.3 FT.40.18**

**N 842.3 FT.40.18**

**N 860.3 FT.40.18**



*Fig. 1*  
*Self Drying Pumps*

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.

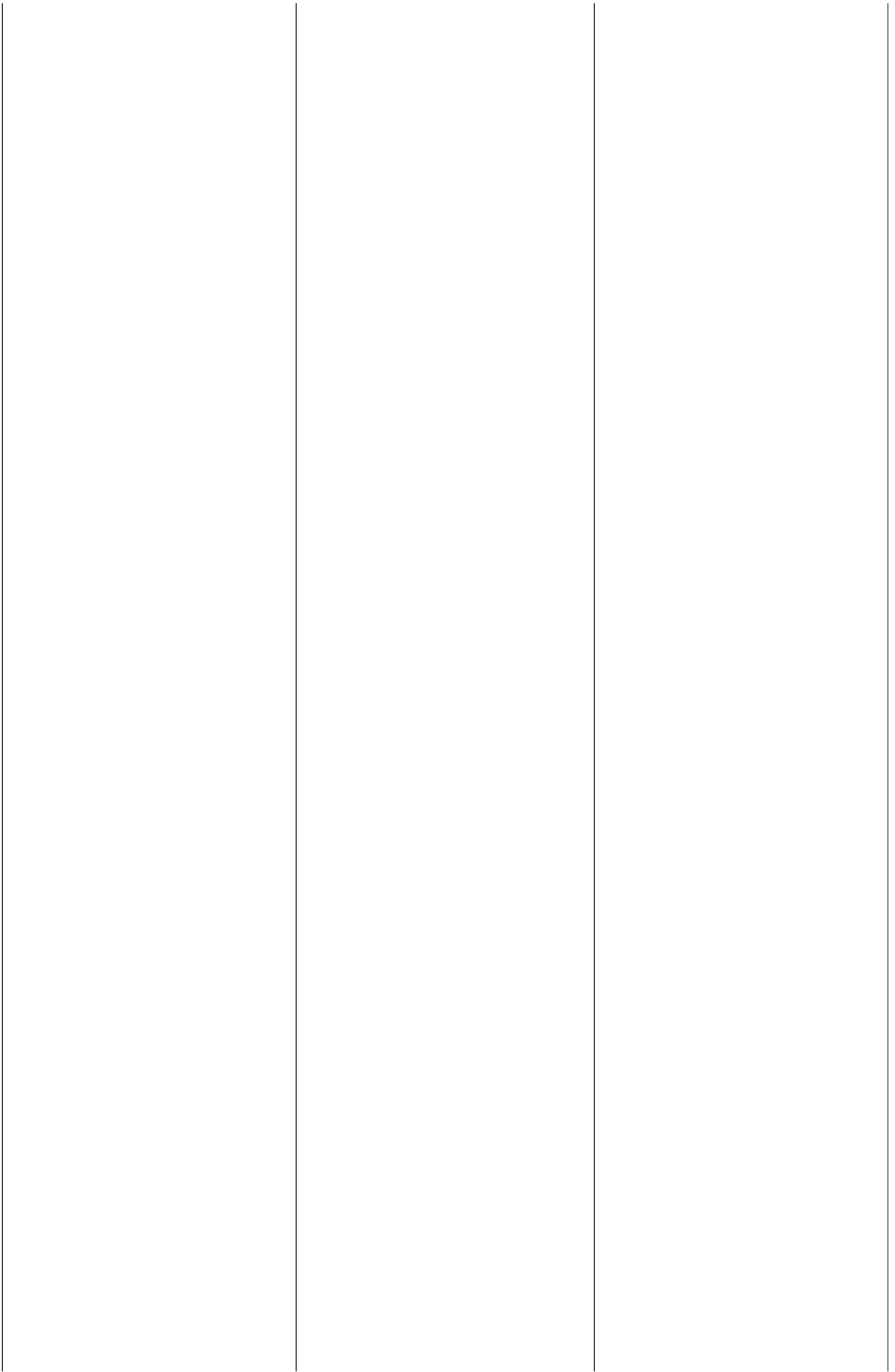
**Carefully study operating instructions before using the pumps and observe at all times the relevant instructions to avoid dangerous situations.**

The manual was produced for the serial pumps stated above. Within customer-specified projects (pump types starting with „PJ“ or „PM“) there could be differences in detail. Please therefore take into account the agreed technical specifications, as well as these instructions.

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## 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.

Pumps can operate with or without the drying system. The drying system is activated by a switch on the control box. If the drying system remains switched off the pumps operate in the conventional way.

The control for the drying system is effected via 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 ( $t_3$ ).

For  $t_1$  to  $t_3$  standard values are set in the factory.

- $t_1 = 210$  sec
- $t_2 = 2.0$  sec
- $t_3 = 40$  sec

In addition to this, the drying process can also be individually adapted to a process sequence. To do this, the values for  $t_1$ ,  $t_2$ , and  $t_3$  can be altered (see Section 5). The pump must be disconnected from the electricity mains beforehand.

### 1.1 Electrical Equipment

- See section 9 for full electrical data.
- The pumps are fitted with a thermal-switch to protect against overloading.

### 1.2 Operating Conditions

⚠ These 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.

- Handling air, gases, and vapours at temperatures between + 5 °C... + 40 °C.
- For maximum permissible operating pressure, ultimate vacuum, and flow capacity: see chapter 9.
- 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 (see section 1).

⚠ 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.

- The discharge of gas on the pressure side of the pump must be safely disposed.

⚠ Components connected to the pumps must be designed to withstand the pneumatic performance of the pumps (see chapter 9).

- 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; N 860.3 FT.40.18: ID 12 mm).
  - ▶ Arrange the pressure line so that condensate cannot run into the pump (sloping lines).

- The discharge of gas on the pressure side of the pump must be safely disposed.

- The condensate is conducted out of the pump via the pressure line. A container is to be installed to catch the condensate.

- 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 pressure. When the pump is switched on the pressure in the suction and pressure lines must be atmospheric. This also applies when the pump restarts after the power has been cut off for a short period. If a pump starts against pressure, then the thermal switch will be activated and switch the pump off.

- When the operation of the pump is interrupted by the thermal switch, the pump will re-start automatically after cooling down. Take all care necessary to prevent this leading to a dangerous situation.

⚠ The components to be connected to the pump must be designed to withstand the pneumatic data of the pumps (see Section 9).

⚠ 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 (vacuum, pressure, deli-

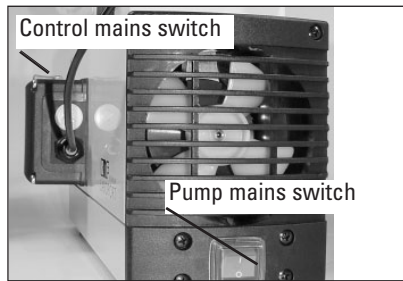


Fig. 2:  
Mains switch of pump and control  
(all pumps except N 860.3 FT.40.18)

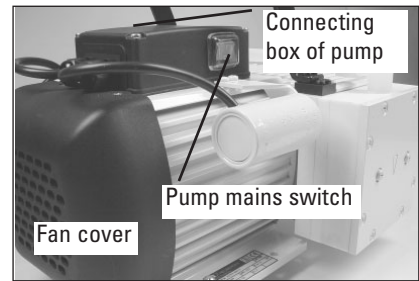


Fig. 3:  
Pump mains switch;  
N 860.3 FT.40.18

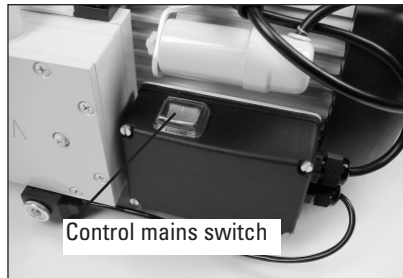


Fig. 4:  
Control mains switch  
for pump N 860.3 FT.40.18

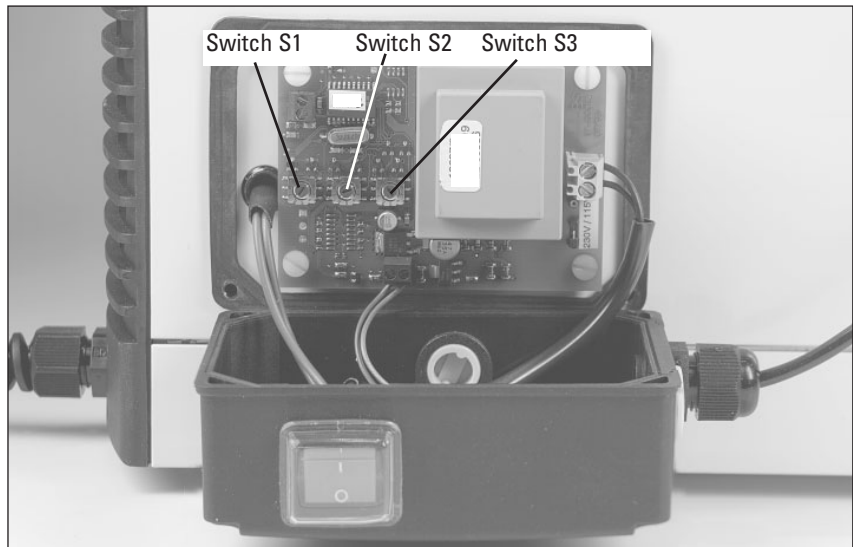


Fig. 5:  
Control box (opened) of drying system with switches S1, S2, S3

very). When replacing parts proceed as described in section 6.

- Ambient conditions: see chapter 1.3.

## 4.2 Operation

### Taking the pump into operation

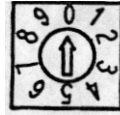
- 1 Plug the mains plug of the pump into a properly installed safety socket.
- 2 Switch the pump on at the pump mains switch (see fig. 2; for pump N 860.3 FT.40.18, see fig. 3).
- 3 If cyclic drying of the pump heads is required in the current evacuation process, switch the drying

system on at the mains switch of the control box (see fig. 2; for pump N 860.3 FT.40.18, see fig. 4).

- ▶ The drying system will only work with the pump switched on.
- ▶ 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.
- ▶ When the drying system is switched on, the time period  $t_1$  (time until the first venting of the pumps heads) will begin. If it is intended that  $t_1$  should run

**Table 1: Drying system control box: Variables and values**

- $t_1$ :  
Time between switching on the drying system and the first ventilation of the pump heads.
- $t_2$ :  
Duration of the ventilation of the pump heads.
- $t_3$ :  
The interval between pump head ventilation operations.



Switch

| Switch setting | Switch 1:<br>$t_1$ in sec | Switch 2<br>$t_2$ in sec | Switch 3<br>$t_3$ in sec |
|----------------|---------------------------|--------------------------|--------------------------|
| 0              | $t_3$                     | 1.0                      | 10                       |
| 1              | 60                        | 1.5                      | 15                       |
| 2              | 90                        | 2.0                      | 25                       |
| 3              | 120                       | 2.5                      | 40                       |
| 4              | 150                       | 3.0                      | 60                       |
| 5              | 180                       | 3.5                      | 120                      |
| 6              | 210                       | 4.0                      | 180                      |
| 7              | 240                       | 5.0                      | 300                      |
| 8              | 300                       | 7.5                      | 600                      |
| 9              | 360                       | 10.0                     | 900                      |

Works setting:

| Switch | Switch setting | Time in sec |
|--------|----------------|-------------|
| 1      | 6              | 210         |
| 2      | 2              | 2.0         |
| 3      | 3              | 40          |

from the pump starting, the drying system should be switched on before the pump.

- ▶ For the variables  $t_1$  to  $t_3$  of the drying system, see Section 5.

**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 main switch of the control box.
- 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. Drying system:  
Changing settings**

The variables of the drying system can be adapted to a process sequence.

- ⚠ Before changing the variables, it is essential that the pump be disconnected from the electricity mains supply: The pump plug is to

be pulled out of the socket.

- ① Disconnect the pump from the mains by pulling the plug out of the socket.
- ② Check that the pump and the drying system are dead and secure them.
- ③ At the control box, loosen the collar nut of the cable inlet. Use a slotted screwdriver to release the four screws, then fold the cover forwards and lay it down (see fig. 5).
  - ▶ The control box may only be opened if there is no risk of moisture precipitating on the control unit.
- ④ Set the desired values at switches S1, S2, and S3 (see fig. 5). See Table 1 for an explanation of the switches and for the values which can be set.
- ⑤ Replace the cover on the control box. Take care to ensure that the seal is properly in place. Tighten the four screws of the cover to finger tightness. Then tighten the collar nut of the cable inlet.

**6. Servicing:  
Changing Diaphragms and Valve Plates/Sealings**

- 6.1 Pump types**  
**N 820.3 FT.40.18**  
**N 840.3 FT.40.18**  
**N 842.3 FT.40.18**

The structured diaphragms in both pump heads should be changed at the same time. When structured diaphragms are changed, valve plates/sealings should also be replaced. If the structured diaphragms are not changed in both heads at the same time or structured 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 disposed of.
  - ▶ Use only original KNF replacement parts.

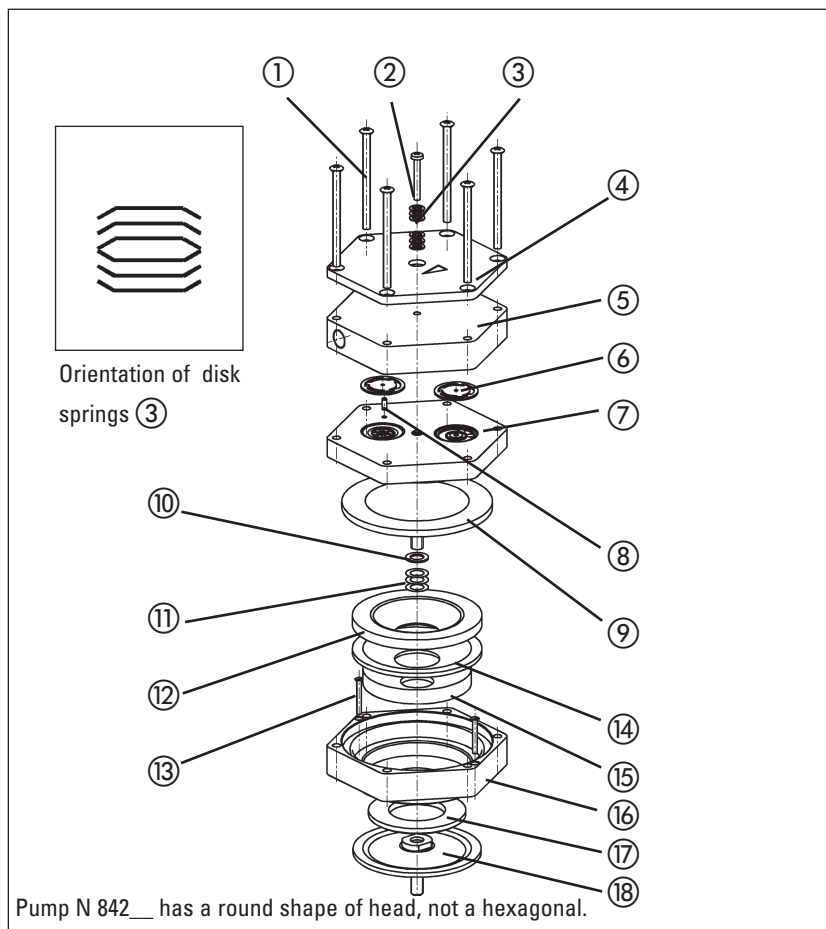
**Required tools and material:**

- Service Set (see section 8.1);
- Philips-head screwdriver No. 2;
- Soft pencil.

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

- a.) Preparatory steps
- b.) Remove pump heads
- c.) Change structured diaphragms
- d.) Change valve plates/sealings
- e.) Refit pump heads
- f.) Final steps

- ▶ The position numbers in the following text refer to fig. 6.



### Specification

|                        |                                   |                                      |
|------------------------|-----------------------------------|--------------------------------------|
| ① Screw <sup>(1)</sup> | ⑨ Structured diaphragm            | ⑱ Dampening diaphragm <sup>(4)</sup> |
| ② Screw <sup>(2)</sup> | ⑩ Spacer (thick)                  |                                      |
| ③ Disk spring          | ⑪ Spacer (thin)                   | (1) 6 x; N 842_: 12 x                |
| ④ Top plate            | ⑫ Dampening ring A                | (2) 1 x; N 842_: 3 x                 |
| ⑤ Head plate           | ⑬ Screw                           | (3) N 810_: 0 x                      |
| ⑥ Valve plate/sealing  | ⑭ Dampening felt <sup>(3)</sup>   | N 820_: 2 x                          |
| ⑦ Intermediate plate   | ⑮ Dampening ring B <sup>(4)</sup> | N 840_: 1 x                          |
| ⑧ Guide pin            | ⑯ Adapter                         | N 842_: 1 x                          |
|                        | ⑰ Dampening ring C <sup>(4)</sup> | (4) only for pump types              |
|                        |                                   | N 840__ and N 842__                  |

Fig. 6: Pump head for N 820.3\_, N 840.3\_, N 842.3\_ (exploded drawing, symbolic)

#### a.) Preparatory Steps

- ① Shut down system (see section 4.2)
  - ⚠ including disconnecting the pump from the power source (pull out plug of electrical supply unit).
- ② Remove tubing from the inlet and outlet connectors of the pump.
- ③ Mark the position of top plate ④, head plate ⑤, intermediate plate ⑦, and adapter ⑯ relative to each other by a drawing line with a pencil. This is to ensure that the parts will be reassembled in correct position at a later stage.

#### b.) Removing the pump heads

- ① 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.

- ② Loosen the outer screws ① on each pump head.
- ③ Carefully remove both pump heads (top plate ④, head plate ⑤ and intermediate plate ⑦).
  - ▶ The magnetic valve of the drying system remains fitted in this situation.

#### c.) Change structured diaphragms

- ① Push down one structured diaphragm ⑨ until other structured diaphragm is pushed upwards to its highest position.
- ② Carefully unscrew the higher structured diaphragm anti-clockwise using both hands.
- ③ Replace all spacers ⑩/⑪ onto the screw thread of the new structured diaphragm (same number and

order)

- ④ Screw in the new structured diaphragm ⑨ and tighten it by hand; you do not need any tool.
  - ⑤ Change the second structured diaphragm as described above (step ① to ④) for the first.
- ▶ Changing the two structured diaphragms one after the other ensures that the same number of diaphragm spacers are refitted as were removed. This is essential to maintain the pneumatic performance of the pump.

#### d.) Change valve plates/sealings

- ① At one pump head:
  - Unscrew the single screw ② (N 842.3 FT.40.18: three screws) in the top plate ④.
- ② Carefully remove top plate ④ and head plate ⑤ from intermediate plate ⑦; exposing the valve plates/sealings ⑥.
- ③ Remove old valve plate/sealings ⑥.
- ④ If there should be deposits in the recesses in the intermediate plate ⑦, clean them until the deposits have been completely removed.
- ⑤ Insert new valve plates/sealings ⑥ in the recesses in the intermediate plate ⑦ (upper and lower sides of the valve plates/sealings are identical).
- ⑥ Carry out the steps ① to ⑤ for the second pump head.

#### e.) Refitting the pump heads

- ① At one pump head:
  - Press the lip on the edge of the structured diaphragm ⑨ into the groove in the housing.
- ② Place the intermediate plate ⑦, with the valve plates/sealings on the adapter ⑯, in the position indicated by the pencil marking.
- ③ Place the head plate ⑤ on the intermediate plate ⑦ in the position indicated by the guide pin ⑧.
- ④ Place the top plate ④ on the head plate ⑤ in the right position.
- ⑤ Gently tighten screws ① in diagonal order.
- ⑥ Screw in the single screw ② (N 842.3 FT.40.18: three screws) in the centre of the pump top plate ④ until it is flush with the top plate (they are flush with the top plate); then screw one final half turn to

tighten.

- ▶ For orientation of disk springs  
③ see fig. 6.

- 7 Carry out steps ① to ⑥ for the second pump head.
- 8 Refit the pneumatic head connection:  
Place tube onto the connecting part of the angle fitting, turn angle fitting to a straight position and tighten the union nut.

#### f.) Final steps

- 1 Reconnect system tubing.
- 2 Reconnect pump to the electricity supply.

▶ **If the pump does not reach the desired vacuum after changing diaphragms and valve plates/sealings:**

- 1 Check whether the spacers have been replaced onto the structured diaphragm screw thread.
  - 2 Check the interconnecting pipe-work connection between both pump heads as well as the tubing for leaks.
  - 3 Possibly the screws on one of the pump heads (or both heads) are insufficiently tightened (carefully tighten them again crosswise).
- ▶ If you have any questions about servicing call our technical adviser (see last page for contact telephone number).

## 6.2 Pump type N 860.3 FT.40.18

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 disposed of.
  - ▶ Use only original KNF replacement parts.

#### Parts and tools required:

- 1 Service Set (see section 8.1)
- 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. 7.

#### 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. 3) and remove the fan cover from the motor.

#### b) Removing pump head (for each head separately)

- 1 Make a mark (M) on the top plate ①, head plate ②, intermediate plate ③, and housing ④ with a felt-tip pen. This is to ensure that the parts will be reassembled correctly at a later stage.
- 2 Undo the eight screws ⑤ and lift the pump head off the housing ④.
  - ▶ The magnetic 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 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 ⑩ 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 ⑩ 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 valve plates/sealings.

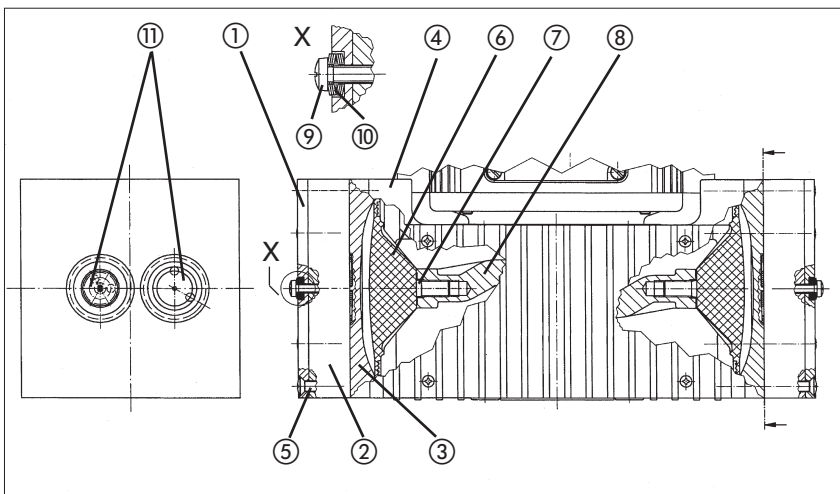


Fig. 7: Cross section of pump heads for pump N 860.3 FT.40.18 (symbolic)

### e) Refitting pump head

- ➊ Turn the fan to bring the structured diaphragm ⑥ to medium position.
- ➋ Place the intermediate plate ③, with valve plates/sealings ⑪, on the housing, in the position indicated by the marking (M).
- ➌ Place the head plate ② on the intermediate plate ③ in the position indicated by the marking (M).
- ➍ 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. 7, detail X).
- ➎ Gently tighten the screws ⑤, evenly and diagonally.
- ➏ Turn the fan to check that the pump rotates freely.
- ➐ Now tighten screws ⑤ hand-tight.
- ➑ 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

- ➊ 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.
  - ➋ Refit the fan cover.
  - ➌ 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).

## 7. Troubleshooting

### ▶ Sufficient vacuum is not reached

#### Possible reasons:

- ➊ Tube connections are not tight
- ➋ Condensate in the pump head
  - ▶ Switch the drying system on or reduce  $t_3$  respectively (see section 5 with regard to changing the value which has been set).
- ➌ Diaphragms and/or valve plates/sealings are worn out
  - ▶ Changing diaphragms and valve plates/sealings: see section 6.
- ➍ If this problem occurs after changing of diaphragms and valve plates/sealings:
  - ▶ See information in section 7.

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

#### Possible reasons:

- ➊ Pump is not connected with the power source.
- ➋ No voltage in the power source.
- ➌ 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:

- ▶ All pumps except for N 860.3 FT.40.18:  
Fuse accessible after releas-

## 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                           |

ing the marked cover on the underside of the pump.

- ▶ Pump N 860.3 FT.40.18:  
Fuse accessible after opening the connecting box of the pump (see fig. 3 for the position of the connecting box).

Dimension of the fuse:  
see section 9.

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

#### Possible reason:

- ➊ 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.

## 8. Ordering Information

### 8.1 Replacement Parts Service Set

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

Service Set contains  
2 diaphragms and 4 valve plates/sealings

|                  |            |
|------------------|------------|
| for pump:        | Order No.: |
| N 820.3 FT.40.18 | 057358     |
| N 840.3 FT.40.18 | 057359     |
| N 842.3 FT.40.18 | 057359     |
| N 860.3 FT.40.18 | 047499     |

## 9. Specifications

### N 820.3 FT.40.18

Maximum capacity: 20 l/min  
 Ultimate vacuum: 10 mbar abs  
 Max. permissible operating pressure: 1 bar<sup>g</sup>  
 Weight: 9.6 kg  
 Permissible ambient temperature: + 5... + 40 °C  
 Permissible temperature of gas to be pumped: + 5... + 40 °C  
 Hose connection for tube ID 10 mm

|                |       |     |     |
|----------------|-------|-----|-----|
| Voltage [V]    | 100   | 115 | 230 |
| Frequency [Hz] | 50/60 | 60  | 50  |

|                            |     |     |     |
|----------------------------|-----|-----|-----|
| Power Consumption Pump [W] | 130 | 130 | 120 |
|----------------------------|-----|-----|-----|

|                      |      |     |     |
|----------------------|------|-----|-----|
| Fuse Pump (2x) T [A] | 3.15 | 2.5 | 1.6 |
|----------------------|------|-----|-----|

IP 44

### N 840.3 FT.40.18

Maximum capacity: 34 l/min  
 Ultimate vacuum: 10 mbar abs  
 Max. permissible operating pressure: 1 bar<sup>g</sup>  
 Weight: 12.9 kg  
 Permissible ambient temperature: + 5... + 40 °C  
 Permissible temperature of gas to be pumped: + 5... + 40 °C  
 Hose connection for tube ID 10 mm

|                |       |     |     |
|----------------|-------|-----|-----|
| Voltage [V]    | 100   | 115 | 230 |
| Frequency [Hz] | 50/60 | 60  | 50  |

|                            |     |     |     |
|----------------------------|-----|-----|-----|
| Power Consumption Pump [W] | 220 | 250 | 200 |
|----------------------------|-----|-----|-----|

|                      |     |     |      |
|----------------------|-----|-----|------|
| Fuse Pump (2x) T [A] | 6.3 | 6.3 | 3.15 |
|----------------------|-----|-----|------|

IP 44

### N 842.3 FT.40.18

Maximum capacity: 34 l/min  
 Ultimate vacuum: 4 mbar abs  
 Max. permissible operating pressure: 1 bar<sup>g</sup>  
 Weight: 13.7 kg  
 Permissible ambient temperature: + 5... + 40 °C  
 Permissible temperature of gas to be pumped: + 5... + 40 °C  
 Hose connection for tube ID 10 mm

|                |       |     |     |
|----------------|-------|-----|-----|
| Voltage [V]    | 100   | 115 | 230 |
| Frequency [Hz] | 50/60 | 60  | 50  |

|                            |     |     |     |
|----------------------------|-----|-----|-----|
| Power Consumption Pump [W] | 260 | 290 | 220 |
|----------------------------|-----|-----|-----|

|                      |     |     |      |
|----------------------|-----|-----|------|
| Fuse Pump (2x) T [A] | 6.3 | 6.3 | 3.15 |
|----------------------|-----|-----|------|

IP 44

### N 860.3 FT.40.18

Maximum capacity: 60 l/min  
 Ultimate vacuum: 4 mbar abs  
 Max. permissible operating pressure: 1 bar<sup>g</sup>  
 Weight: 14.8 kg  
 Permissible ambient temperature: + 5... + 40 °C  
 Permissible temperature of gas to be pumped: + 5... + 40 °C  
 Hose connection for tube ID 12 mm

|                |       |     |     |
|----------------|-------|-----|-----|
| Voltage [V]    | 100   | 115 | 230 |
| Frequency [Hz] | 50/60 | 60  | 50  |

|                            |     |     |     |
|----------------------------|-----|-----|-----|
| Power Consumption Pump [W] | 250 | 240 | 220 |
|----------------------------|-----|-----|-----|

|                      |     |     |      |
|----------------------|-----|-----|------|
| Fuse Pump (2x) T [A] | 6.3 | 6.3 | 3.15 |
|----------------------|-----|-----|------|

IP 54

## ► 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.

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