Diffusion pump
with optional baffle
DIF 630
Product identification

In all communications with Balzers, please specify the information given on the product nameplate. For convenient reference transfer this information into the diagram below.

![Diagram of Balzers product with specifications]

Typ: DIF 630
No: BP D09 508
F-No: v kHz

Validity

This document applies to products with part number BP D09 508.
The part number can be taken from the product nameplate.

We reserve the right to make technical changes without prior notice.

Intended use

Diffusion pumps are used for generating high vacuum.
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1 Description

1.1 Overview

The thermostatic cut-out (option) prevents overheating of the diffusion pump.

The thermal switch (option) is used in conjunction with a pumping station control. It signals to the pumping station control that the pump has attained normal operating temperature. Depending on the pump fluid the operating temperature on the mounting base is between 150 °C and 180 °C.
1.2 Function

Pump fluid circuit

The pump fluid vapor stream is accelerated by the jet system and directed toward the cooled housing at a specific angle. The heater heats the pump fluid in the vaporating chamber up to the evaporation point. The pump fluid condenses at the cooled housing wall and flows as a thin oil film back to the evaporating chamber.

Flow direction of the gas molecules

Purification zone

Evaporating chamber

Pumping principle

The fore vacuum pressure ensures that the pump fluid vapor stream spreads within the diffusion pump. Gas molecules from the high vacuum flange area that enter the pump fluid stream receive an impulse in the direction of the vapor stream which results in a pump effect.

In the process gas molecules can diffuse into the pump fluid. When flowing back to the evaporating chamber the pump fluid passes through a zone of elevated temperature, the purification zone, so that light contamination and the pumped out gases are separated from the pump fluid by a temperature increase and are also conducted to the roughing pump.

1.3 Using a diffusion pump in a pumping station

Example of a vacuum diagram:
2 Safety

2.1 Symbols used

**DANGER**
Information on preventing any kind of physical injury.

**WARNING**
Information on preventing extensive equipment and environmental damage.

**Note**
Information on correct handling or use. Disregard can lead to malfunctions or minor equipment damage.

6.1 Dimensions in mm
→ See page ...

2.2 Personnel qualifications

**Skilled personnel**
All work described in this document may only be carried out by persons who have suitable technical training and the necessary experience or who have been instructed by the custodian of the product.
2.3 Safety information

- Adhere to the applicable regulations and take the necessary precautions for the process media used.
  Consider possible reactions between the materials (→ 8) and the process media.
  Consider possible reactions of the process media due to the heat generated by the product.
- Adhere to the applicable regulations and take the necessary precautions for all work you are going to do and consider the safety information in this document.
- Before you begin to work, find out whether any vacuum components are contaminated. Adhere to the relevant regulations and take the necessary precautions when handling contaminated parts.

Pass on the safety information to other users.

2.4 Liability and warranty

Balzers assumes no liability and the warranty becomes null and void if the custodian or third parties
  • disregard the information in this document
  • use the product in a non-conforming manner
  • make any kind of changes (modifications, alterations etc.) to the product
  • use the product with accessories not listed in the corresponding product documentation.

The custodian assumes the responsibility in conjunction with the process media used.
# 3 Technical data

<table>
<thead>
<tr>
<th>Diffusion pump</th>
<th>DIF 630</th>
</tr>
</thead>
</table>

## Vacuum connection

<table>
<thead>
<tr>
<th>High vacuum flange</th>
<th>Clamping flange</th>
</tr>
</thead>
<tbody>
<tr>
<td>DN 630 ISO-K</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Fore vacuum flange</th>
<th>Clamping flange</th>
</tr>
</thead>
<tbody>
<tr>
<td>DN 160 ISO-K</td>
<td></td>
</tr>
</tbody>
</table>

## Power input

<table>
<thead>
<tr>
<th>Line voltage</th>
<th>3×400 / 3×230 VAC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frequency</td>
<td>50 Hz</td>
</tr>
<tr>
<td>Power consumption</td>
<td>10.5 kW (7×1.5 kW)</td>
</tr>
</tbody>
</table>

## Characteristics

<table>
<thead>
<tr>
<th>Pumping speed for air</th>
<th>1)</th>
<th>at 1×10⁻⁴ mbar</th>
<th>15,000 l/s</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pumping speed for air</td>
<td>1)</td>
<td>at 1×10⁻² mbar</td>
<td>18 mbar l/s</td>
</tr>
<tr>
<td>Working range</td>
<td></td>
<td>10⁻⁷ ... 1×10⁻² mbar</td>
<td></td>
</tr>
<tr>
<td>Fore vacuum stability</td>
<td></td>
<td>0.5 mbar</td>
<td></td>
</tr>
</tbody>
</table>

## Pump fluid

<table>
<thead>
<tr>
<th>Pump fluid filling capacity</th>
<th>minimum</th>
<th>optimum</th>
<th>maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>6000 cm³</td>
<td>7000 cm³</td>
<td>8000 cm³</td>
</tr>
</tbody>
</table>

| Pump fluid consumption | 7.5×10⁻⁵ g/mbar l |

## Roughing pump

<table>
<thead>
<tr>
<th>Recommended pumping speed of the roughing pump</th>
<th>2) for an operating pressure</th>
<th>3)</th>
</tr>
</thead>
<tbody>
<tr>
<td>above 10⁻⁴ mbar</td>
<td>240 ... 1000 m³/h</td>
<td></td>
</tr>
<tr>
<td>below 10⁻⁷ mbar</td>
<td>170 ... 240 m³/h</td>
<td></td>
</tr>
</tbody>
</table>

## General

<table>
<thead>
<tr>
<th>Heating time</th>
<th>50 min.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cooling time</td>
<td>90 min.</td>
</tr>
<tr>
<td>Cooling water requirements</td>
<td>→ 20</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Materials</th>
</tr>
</thead>
<tbody>
<tr>
<td>Housing</td>
</tr>
<tr>
<td>Jet system</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Weight</th>
<th>250 kg</th>
</tr>
</thead>
</table>

1) Values measured with synthetic oil 71 A according to Pneurop or DIN 28427.
2) Two-stage rotary vane pumps or pump combinations of one- or two-stage rotary vane pumps and roots pumps are recommended as roughing pumps.
3) In continuous operation.
Dimensions

- High vacuum connection
- Fore vacuum connection
- Power connection
- Cooling water connection ø13 mm
- Sight glass
## 4 Installation

### Visual check

<table>
<thead>
<tr>
<th>DANGER</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Caution: damaged product</strong></td>
</tr>
<tr>
<td>Putting a damaged product into operation can be extremely dangerous.</td>
</tr>
<tr>
<td>Do not install the product if there is any visible damage.</td>
</tr>
</tbody>
</table>

### Protective screen

<table>
<thead>
<tr>
<th>DANGER</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Caution: hot surface</strong></td>
</tr>
<tr>
<td>In operation the diffusion pump is heated up to 220 °C. Touching the lower housing section can cause burns.</td>
</tr>
<tr>
<td>Install the diffusion pump in such a way that inadvertent contact with the pump is not possible (protective screen available on request).</td>
</tr>
</tbody>
</table>

| 220 °C |

### Transport

<table>
<thead>
<tr>
<th>DANGER</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Caution: heavy product (250 kg)</strong></td>
</tr>
<tr>
<td>Physical injury can result if the product is lifted and transported by only one person.</td>
</tr>
<tr>
<td>The product must be lifted and transported in accordance with the rules and guidelines applicable in the country of installation.</td>
</tr>
</tbody>
</table>

| 250 kg |

### Thermal radiation

<table>
<thead>
<tr>
<th>WARNING</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Caution: fire hazard</strong></td>
</tr>
<tr>
<td>Due to the thermal radiation of the heater, parts in close proximity can ignite.</td>
</tr>
<tr>
<td>If there is less than 150 mm of clearance between the bottom of the housing and the base plate, thermal insulation pads must be installed.</td>
</tr>
</tbody>
</table>

| > 150 mm |

---

**Visual check**

**Protective screen**

**Transport**

**Thermal radiation**
4.1 Removing the transport safety device

Caution: vacuum component
Dirt and damages impair the function of the vacuum component. When handling vacuum components, take appropriate measures to ensure cleanliness and prevent damages.

Caution: dirt sensitive area
Dirt prolongs the pumpdown process. Always wear clean, lint-free gloves and use clean tools when working in this area.

Protective cover and cap

Keep the protective cover and cap and put them in place again when the product is removed from the vacuum system.

Transport safety device

Keep the transport safety device and put it in place again when the product is transported.

Procedure

Remove the transport safety device as well as the protective cover and cap.
4.2 Installing the cold cap

**Procedure**

1. Unscrew the centering pin.
2 Mount the cold cap.

- O-ring, FPM (Viton), ø20.2 × 2.6
- Washer
- Hexagon socket screw M6 × 16
- Size 5

3 Mount the cooling tube.

- Washer
- Nut
- Counterhold
4 Screw in the centering pin until the mechanical stop is reached.

5 Check the position of the cold cap and adjust it if necessary.

![Diagram showing screwing in the centering pin and adjusting the cold cap. The centering pin must be flush with the upper surface of the cold cap.](image)

The centering pin must be flush with the upper surface of the cold cap.

Untighten the nut if necessary and adjust the position of the cold cap.
6 Mount the elbow.

Mount the hose nozzle.

Seal the thread.

Seal

Hose nozzle ø13

Union nut
4.3 Filling the pump fluid

**Note**

Caution: vacuum component
Dirt and damages impair the function of the vacuum component. When handling vacuum components, take appropriate measures to ensure cleanliness and prevent damages.

**Note**

Caution: dirt sensitive area
Dirt prolongs the pumpdown process. Always wear clean, lint-free gloves and use clean tools when working in this area.

Pump fluid

As the diffusion pump is supplied in cleaned condition, any of the pump fluids listed below can be chosen.

Pump fluid change

The diffusion pump must be cleaned whenever the pump fluid is changed (→ 42).

Selection criteria

The choice of pump fluid depends on the vacuum engineering application. The table below lists some of the relevant selection criteria.

<table>
<thead>
<tr>
<th></th>
<th>Mineral oil</th>
<th>Synthetic oil</th>
<th>Silicone oil</th>
<th>Pentaphenyl ether</th>
</tr>
</thead>
<tbody>
<tr>
<td>Preferred vacuum range</td>
<td>61 A</td>
<td>71 A</td>
<td>DC704</td>
<td>AN175</td>
</tr>
<tr>
<td></td>
<td>5×10⁻⁶ ... 10⁻² mbar</td>
<td>5×10⁻⁷ ... 10⁻³ mbar</td>
<td>10⁻⁷ ... 10⁻³ mbar</td>
<td>10⁻⁸ ... 10⁻³ mbar</td>
</tr>
<tr>
<td>Resistance to chemicals</td>
<td>good</td>
<td>good</td>
<td>superior</td>
<td>superior</td>
</tr>
<tr>
<td>Resistance to oxidation</td>
<td>good</td>
<td>good</td>
<td>superior</td>
<td>superior</td>
</tr>
<tr>
<td>Resistance to thermal decomposition</td>
<td>good</td>
<td>good</td>
<td>superior</td>
<td>excellent</td>
</tr>
<tr>
<td>Theor. vapor pressure at 20° C</td>
<td>5×10⁻⁷ mbar</td>
<td>2×10⁻⁸ mbar</td>
<td>2×10⁻⁸ mbar</td>
<td>4×10⁻¹⁰ mbar</td>
</tr>
</tbody>
</table>

Additional information can be found in the catalog. Ordering numbers → 55.
Filling

Fill in the pump fluid through the fore vacuum port until the optimum pump fluid level is attained.

**Note**

Make sure the diffusion pump is positioned upright when you fill in the fluid.

The pump fluid spreads only slowly within the diffusion pump. For this reason the actual pump fluid level can be read only after \( \approx 3 \) min.

Pump fluid filling capacities:
- maximum 8000 cm\(^3\)
- optimum 7000 cm\(^3\)
- minimum 6000 cm\(^3\)
4.4 Vacuum connection

Note
Caution: vacuum component
Dirt and damages impair the function of the vacuum component. When handling vacuum components, take appropriate measures to ensure cleanliness and prevent damages.

Note
Caution: dirt sensitive area
Dirt prolongs the pumpdown process. Always wear clean, lint-free gloves and use clean tools when working in this area.

Mounting plane

The diffusion must be installed perpendicularly. We recommend to support the diffusion pump using the welded nuts (e.g. screwing in M20 threaded rods and swiveling pressure disks).
4.4.1 High vacuum connection

The high vacuum connection is established via a DN 630 ISO-K clamping flange.

12 clamps:
- ordering number: BP 226 877 -T
- (1 set of 4 clamps)
- O-ring: FPM (Viton)
- DN 630 ISO-K
- ø 658.9 x 7 (included)

Wrench size 19

Additional information can be found in the catalog.

4.4.2 Fore vacuum connection

The fore vacuum connection is established via a DN 160 ISO-K clamping flange.

4 clamps:
- ordering number: BP 226 875 -T
- (1 set of 4 clamps)
- O-ring: FPM (Viton)
- DN 160 ISO-K
- ø 158.1 x 5.3 (included)

Wrench size 17

Additional information can be found in the catalog.
4.5 Cooling water connection

To achieve optimum cooling of the diffusion pump the following parameters are relevant:

- Required cooling water pressure in the feeder line
- Cooling water temperature in the return line

Cooling water circuits

The diffusion pump has two separate cooling water circuits:

Minimum cooling water requirements for the housing circuit

As the cooling water temperature in the return line can only be determined during operation we recommend a presetting based on the following diagram:

Pressure drop in the feeder and return lines

Note

Be aware of the pressure drop in the feeder and return lines of the cooling water circuits.

Cooling water specifications

According to document BB 800 851 BN
Shut-off valves must be installed in the feeder lines and flow monitors should be provided for the return lines in order for the diffusion pump heater to switch off when the cooling water flow is too low.

**Note**

Make sure the cooling water hoses do not touch the housing.

---

**Operation with Santovac 5**

For operation with Santovac 5, the cooling of the purification area must be bypassed. For doing so, the short tube must be removed.
4.6 Power connection

The power connection is established via the terminals in the terminal box. Before connection make sure that your local line voltage agrees with the ratings on the name plate (→ 2). If your line voltage differs please contact your nearest Balzers Service Center.

Personnel qualifications

Skilled personnel

The power connection may only be established by a skilled electrician.

Procedure

1. Open the terminal box.
Depending on the line voltage (3×400 VAC / 3×230 VAC) the jumper wires must be connected.

3×400 VAC star connection (factory setting)

3×230 VAC delta connection
Prepare the cable.
The cable must be flexible.

<table>
<thead>
<tr>
<th>Line voltage</th>
<th>Current</th>
<th>Cable cross-section</th>
<th>Cable</th>
</tr>
</thead>
<tbody>
<tr>
<td>3×400 VAC</td>
<td>15.2 A</td>
<td>5×4 mm²</td>
<td>3P+N+PE</td>
</tr>
<tr>
<td>3×230 VAC</td>
<td>26.4 A</td>
<td>4×6 mm²</td>
<td>3P+PE</td>
</tr>
</tbody>
</table>

*) Cable cross-section according to VDE 0113 A2

Prepare the cable (no neutral conductor required for delta connection).

1. Strip insulation.
2. Skin jacket and cut to length.
3. Twist strands, mount terminal sleeves and eyelet.
4. Crimp terminal sleeves and eyelet.
5. Pull the cable into the terminal box and clamp the conductors (no neutral conductor required for delta connection).
6 Tighten the cable gland.

7 Tighten the cable strain relief.

8 Close the terminal box.

9 Connect the power cable to the control system.

Note

Install the power cable in accordance with the national regulations. Make sure that the power lead does not touch the housing.
4.7 Mounting the thermostatic cut-out

The thermostatic cut-out is fastened to the mounting base with two M4 screws.

4.8 Mounting the thermal switch

The thermal switch is fastened to the mounting base with two M4 screws.
5 Initial start up

Preconditions

- Diffusion pump installed (→ 10).
- Thermostatic cut-out connected to the pumping station control.
- Thermal switch connected to the pumping station control.
- Pumping station ready for operation.

Procedure

First time operation

1. Check the pump fluid level (→ 41).
2. Pump down the vacuum system to ≤ 0.1 m bar.
3. Start the water coolings (open the shut-off valves).
4. Start the heater.
5. Wait for the pump to heat up (50 min.). Depending on the pump fluid, the pump heats up to an operating temperature of 150 °C ... 180 °C on the mounting base of the thermal switch.
6. Set the thermal switch (option) in accordance with the separate instructions.
7. Check the cooling water temperature in the return lines. Increase the cooling water flow if the cooling water temperature in either return line exceeds 30 °C.

Diffusion pump ready for use
6 Operation

**DANGER**
Caution: hot surface
Touching the hot surface (≈ 220 °C) can cause burns.
Wear protective gloves.

220 °C

**WARNING**
Caution: fire hazard
Easily ignitable materials near the diffusion pump can catch fire.
Do not store any easily ignitable material near the diffusion pump.

**WARNING**
Caution: fire hazard
Hot pump fluid can ignite under atmospheric conditions.
Never expose hot pump fluid to atmospheric pressure, that is, the diffusion pump must not be vented during operation.

Overview

Example of a vacuum diagram:

![Vacuum Diagram](image-url)
Switching on the diffusion pump

Switch on

1. Check the pump fluid level (→ § 41).

2. Pump down the vacuum system to ≤ 0.1 mbar.

3. Start the water coolings (open the shut-off valves).

4. Start the heater.

5. After expiration of the heat-up time (50 min.) the diffusion pump is ready for operation.

Diffusion pump ready for use

Conditions for a ready diffusion pump together with a pumping station

- During the heating time the high vacuum valve must be closed. When the diffusion pump is ready for operation the high vacuum valve may be opened only when the vacuum chamber has been pumped down to ≤ 0.1 mbar.

- When the high vacuum valve and the fore vacuum valve are closed the diffusion pump can be kept in ready condition as long as the fore vacuum pressure in the diffusion pump does not increase above the fore vacuum stability of 0.5 mbar.

Switching off the diffusion pump

Switch off

1. Switch off the heater.

2. Wait for the pump to cool down (90 min).

3. After expiration of the cooling time, switch off the water coolings (close the shut-off valves).

Diffusion pump shut down

Conditions for a shut down diffusion pump together with a pumping station

After the heater has been switched off the high vacuum and fore vacuum valve should immediately be closed.

Shutdown

The entire vacuum system should preferably be shut down in evacuated condition. Unnecessary venting increases the desorption rate of the internal walls and the pump fluid.
### 7 Deinstallation

#### Contamination

**DANGER**
Caution: contaminated parts
Contaminated parts can be detrimental to health. Before you begin to work, find out whether any parts are contaminated. Adhere to the relevant regulations and take the necessary precautions when handling contaminated parts.

#### Pump fluid

**DANGER**
Caution: pump fluid
Skin contact with the pump fluid can cause allergic reactions. Wear synthetic gloves.

#### Transport

**DANGER**
Caution: heavy product (250 kg)
Physical injury can result if the product is lifted and transported by only one person. The product must be lifted and transported in accordance with the rules and guidelines applicable in the country of installation.

#### Vacuum component

**Note**
Caution: vacuum component
Dirt and damages impair the function of the vacuum component. When handling vacuum components, take appropriate measures to ensure cleanliness and prevent damages.

**Note**
Caution: dirt sensitive area
Dirt prolongs the pumpdown process. Always wear clean, lint-free gloves and use clean tools when working in this area.

#### Preconditions

- Diffusion pump switched off (→ 29) and cooled down to room temperature.
- Vacuum system vented.
- Control system switched off.
7.1 Power connection

**DANGER**

Caution: mains voltage
Working on live parts is extremely hazardous.
The control must be switched off and protected against inadvertent power on before the terminal box is opened.

**Skilled personnel**

The power connection must be detached by a skilled electrician.

**Procedure**

1. Open the terminal box.

2. Unfasten the cable strain relief.
3 Unfasten the cable gland.

4 Detach the conductors and remove the cable.

5 Close the terminal box.
7.2 Cooling water connection

- Close the shut-off valves in the feeder lines.
- Detach the hoses and drain the cooling water circuits.

7.3 Vacuum connection

Detach the vacuum connections.
7.4 Deinstalling the cold cap

1. Remove the hose nozzle.

2. Remove the elbow.

3. Unscrew the centering pin.
4 Detach the cooling tube.

5 Detach the cold cap.
7.5 Draining the pump fluid

DANGER

Caution: pump fluid
Skin contact with the pump fluid can cause allergic reactions.
Wear synthetic gloves.

Note

Caution: deformation of parts
The thin-walled aluminum parts are susceptible to deformation.
The aluminum parts must be treated with special care.

Pull out the jet system.
Removing the fore vacuum baffle

2 Unscrew the upper part of the fore vacuum baffle.

3 Pull out the upper part of the fore vacuum baffle.

4 Pull out the lower part of the fore vacuum baffle.
5 Drain (or suck off) the pump fluid.

**WARNING**

Caution: substances detrimental to the environment
Products, operating materials etc. may have to be specially decommissioned.
For environmentally compatible disposal, please contact your nearest Balzers Service Center.

6 Reinstall the fore vacuum baffle, jet system, and cold cap.

7 Reinstall the protective cover and cap.
8 Troubleshooting

8.1 Resetting the thermostatic cut-out (option)

If the heater has been switched off by the thermostatic cut-out (option) proceed as follows:

1. Increase the cooling water flow
2. Allow the diff pump to cool down for ≈ 2 min.
3. Press the reset button
4. Section 8.1
9 Maintenance / Repair

Checking the pump fluid level

Cleaning the diffusion pump

Replacing a heating plate

Switch off the diffusion pump → 29

Remove the pump → 30

Check the pump fluid level and replenish, if necessary
→ 41

Clean the diffusion pump
→ 42

Replace the defective heating plate → 45

---

**DANGER**

Caution: contaminated parts
Contaminated parts can be detrimental to health.
Before you begin to work, find out whether any parts are contaminated. Adhere to the relevant regulations and take the necessary precautions when handling contaminated parts.

**DANGER**

Caution: pump fluid
Skin contact with the pump fluid can cause allergic reactions.
Wear synthetic gloves.

**Note**

Caution: vacuum component
Dirt and damages impair the function of the vacuum component.
When handling vacuum components, take appropriate measures to ensure cleanliness and prevent damages.
9.1 Checking the pump fluid level

Depending on the process conditions each diffusion pump has a pump fluid consumption, which is proportional to the pumped gas flow.

**Note**

The pump fluid level can only be checked when the diffusion pump is cold.

Pump fluid filling capacities:
- maximum 8000 cm³
- optimum 7000 cm³
- too low < 6000 cm³

9.2 Replenishing the pump fluid

The pump fluid should only be replenished if processes are performed in which the evolution of products that impair the quality of the pump fluid does not exceed the purification ability of the diffusion pump. In all other cases the pump fluid should be changed. The diffusion pump should always be cleaned when the pump fluid is changed.

**Preconditions**

- Diffusion pump switched off (→ 29) and cooled down to room temperature.
- Vacuum system vented.

**Procedure**

1. Detach the fore vacuum connection.

2. Fill in the pump fluid (→ 16).

3. Reestablish the fore vacuum connection.
9.3 Cleaning the diffusion pump, replacing the jet system

As the cleaning intervals depend strongly on the implemented vacuum process, no generally valid maintenance schedules can be prepared.
Under clean vacuum conditions and at operating pressures of $<10^{-4}$ mbar, diffusion pumps can be operated several 1000 hours without cleaning. When the diffusion pump is cleaned, the related components (valves, lines, etc.) should also be cleaned.

Precondition

- Diffusion pump removed and pump fluid drained ($\rightarrow$ 30).

Disassembling the jet system

1. Unfasten the lock nut.

2. Unfasten the hexagon nut.

For reassembly: Tighten the nut first using your fingers, then making 2½ turns with the wrench.
3 Disassemble the jet system.

Do not adjust the nozzle gap setting screws (→ § 44).

12 cup springs
Cleaning

4 Clean the jet system, fore vacuum baffle, cold cap and the inside of the diffusion pump.

DANGER

Caution: cleaning agents

Cleaning agents can be detrimental to health and environment. Adhere to the relevant regulations and take the necessary pre-cautions when handling and disposing of cleaning agents. Consider possible reactions with the product materials (→ 8).

- Clean the parts with a grease-cutting, non-scouring household cleaner. For removing resistant contamination (crack products) on the jet system also very fine steel wool can be used.
- The parts should preferably be rinsed with alcohol and subsequently be heated to ≈ 50 °C in an oven or with an industrial hot-air blower.
- Clean the sealing surfaces with a lint-free piece of cloth slightly moistened with alcohol. Allow them to dry.
- Wipe the sealing rings with a lint-free piece of cloth slightly moistened with vacuum oil.

Reassembly

5 Reassemble the diffusion pump by performing the above steps in reverse order.

Note

- Be careful to insert the sealing rings into the lining grooves without twisting them.
- Make sure the prescribed nozzle gaps exist.

Nozzle gap 1.5±0.2 mm adjustable with washers

Nozzle gap 1.3±0.2 mm adjustable with 3 setting screws

Nozzle gap 3±0.2 mm adjustable with 3 setting screws

Setting screws locked with washers
9.4 Replacing a heating plate

Personnel qualifications

- **Skilled personnel**
  
  Heating plates may be replaced only by a skilled electrician.

Precondition

- Diffusion pump removed and pump fluid drained (→ 30).

Procedure

1. Turn the diffusion pump upside down.

**DANGER**

Caution: heavy product (250 kg)

Physical injury can result if the product is lifted and transported by only one person.

The product must be lifted and transported in accordance with the rules and guidelines applicable in the country of installation.

![Diagram showing the process of replacing a heating plate with a focus on safety precautions and the use of protective covers.](image-url)
Removing the cover

2 Unfasten the hexagon head screws.

3 Remove the hexagon head screws, the washers, and the cover.
4. Open the terminal box.

5. Find the defective heating plate using the diagrams below.
   In the following example it is assumed that the heating plate between terminals 3 and 10 is defective.

3×400 VAC
center connection

3×230 VAC
delta connection
6 Disconnect the lead of the defective heating plate (assumption: the heater plate between terminals 3 and 10 is defective).

7 Pull the cable out of the metal tube.
8 Unfasten the insulating plate.

9 Remove the insulating plate.
Removing the pressure plate

10 Unfasten the nut.

24
Tightening torque = 100 Nm

11 Remove the nut, the washer, and the pressure plate.
Replacing the heating plate

12. Remove the heating plate.

13. Remove the encrusted heater contact paste.

14. Reassemble the product by performing the above steps in reverse order.

Note

- Coat the bottom of the housing with heater contact paste and immediately mount the heating plate.
- Make sure that the heating plate and pressure plate are seated absolutely flat.
- Coat the thread with heat-resistant grease.

Ordering number → 57
10 Options

10.1 Cooling water flow monitor

The flow monitor protects the diffusion pump from overheating by monitoring the flow rate of the cooling water.

<table>
<thead>
<tr>
<th>Description</th>
<th>Ordering number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flow monitor</td>
<td>B 4747 111 SE</td>
</tr>
<tr>
<td>Orifice 8-16 l/min for cooling water circuit for housing</td>
<td>B 4747 311 SE</td>
</tr>
<tr>
<td>Orifice 2-4 l/min for cooling water circuit for cold cap</td>
<td>B 4747 305 SE</td>
</tr>
</tbody>
</table>

10.2 Thermostatic cut-out

The thermostatic cut-out prevents overheating of the diffusion pump.

Ordering number
BP 336 514 -T
10.3 Thermal switch

The thermal switch signals to the pumping station control that the diffusion pump has attained normal operating temperature.

10.4 Baffle

Baffles are used to reduce pump fluid backstreaming from the diffusion pump into the process chamber.

<table>
<thead>
<tr>
<th>Baffle Type</th>
<th>Ordering number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water baffle</td>
<td>BP B07 001</td>
</tr>
<tr>
<td>Combi baffle</td>
<td>BP B07 004</td>
</tr>
</tbody>
</table>

Additional information can be found in the catalog.
10.5 Pump fluid replenishing device

The pump fluid replenishing device TN 101 is used for checking the pump fluid level and for replenishing the pump fluid without stopping the diffusion pump.

Ordering number
BP 336 076 -T

10.6 Protective screen

Ordering number
BP 336 574 -T
11 Consumables

When ordering consumables, always indicate:

- description and ordering number

### 11.1 Pump fluid

<table>
<thead>
<tr>
<th>Container size</th>
<th>Mineral oil 61 A</th>
</tr>
</thead>
<tbody>
<tr>
<td>500 cm³ = ½ l</td>
<td>BD 480 137 -T</td>
</tr>
<tr>
<td>2000 cm³ = 2 l</td>
<td>BD 480 138 -T</td>
</tr>
<tr>
<td>5000 cm³ = 5 l</td>
<td>BD 480 139 -T</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Container size</th>
<th>Synthetic oil 71 A</th>
</tr>
</thead>
<tbody>
<tr>
<td>500 cm³ = ½ l</td>
<td>BD 480 132 -T</td>
</tr>
<tr>
<td>2000 cm³ = 2 l</td>
<td>BD 480 133 -T</td>
</tr>
<tr>
<td>5000 cm³ = 5 l</td>
<td>BD 480 134 -T</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Container size</th>
<th>Silicone oil DC 704</th>
<th>Silicone oil AN 175</th>
</tr>
</thead>
<tbody>
<tr>
<td>50 cm³</td>
<td>BD 480 090 -T</td>
<td>-</td>
</tr>
<tr>
<td>200 cm³</td>
<td>BD 480 091 -T</td>
<td>BD 480 126 -T</td>
</tr>
<tr>
<td>500 cm³ = ½ l</td>
<td>BD 480 092 -T</td>
<td>BD 480 127 -T</td>
</tr>
<tr>
<td>2000 cm³ = 2 l</td>
<td>BD 480 093 -T</td>
<td>BD 480 128 -T</td>
</tr>
<tr>
<td>5000 cm³ = 5 l</td>
<td>BD 480 094 -T</td>
<td>BD 480 129 -T</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Container size</th>
<th>Pentaphenyl ether Santovac 5</th>
</tr>
</thead>
<tbody>
<tr>
<td>100 cm³</td>
<td>BD 480 558 -T</td>
</tr>
<tr>
<td>500 cm³ = ½ l</td>
<td>BD 480 559 -T</td>
</tr>
</tbody>
</table>

Additional information can be found in the catalog or on page 16.
12 Spare parts

When ordering spare parts, always indicate:
- all information on the product nameplate
- description and ordering number

12.1 Seals

Ordering number BN 841 077 -T
comprising:

- O-ring, Viton AN 475
  ø 658.9 × 7

- O-ring, Viton AN 362
  ø 158.1 × 5.3

- O-ring, Viton AN 007
  ø 3.7 × 1.8

- Lock washer seal

- Tightening torque = 80 Nm
12.2 Heating plate
Ordering number BP 336 542 -T
(Replacing a heating plate → 45)

12.3 Heater contact paste
Ordering number BN 845 295-T

12.4 Jet system
Available on request.
(Replacing the jet system → 42)
13 Returning the product

**WARNING**

Caution: forwarding contaminated products
Products returned to Balzers for service or repair should preferably be free of harmful substances (e.g. radioactive, toxic, caustic or micro-biological).
Adhere to the forwarding regulations of all involved countries and forwarding companies and enclose a completed declaration of contamination.

Products that are not clearly declared as “free of harmful substances” are de-contaminated at the expense of the customer.

14 Disposal

**DANGER**

Caution: contaminated parts
Contaminated parts can be detrimental to health.
Before you begin to work, find out whether any parts are contaminated. Adhere to the relevant regulations and take the necessary precautions when handling contaminated parts.

**WARNING**

Caution: substances detrimental to the environment
Products, operating materials etc. may require disposal in accordance with special regulations.
For information on environmentally compatible disposal, please contact your nearest Balzers Service Center.

**Separating the components**

After disassembling the product, separate its components according to the following criteria:

**Components exposed to process gases**

Components which have been exposed to radioactive, toxic, caustic, or micro-biological process gases must be disposed of in accordance with the relevant national regulations.
Components which have been exposed to other process gases must be separated according to their materials and recycled.

**Components not exposed to process gases**

Such components must be separated according to their materials and recycled.
# Declaration of Contamination

The repair and/or service of vacuum equipment and components will only be carried out if a correctly completed declaration has been submitted. Non-completion will result in delay. This declaration can only be completed and signed by authorised and qualified staff.

## 1. Description of product
- **Type**
- **Article No.**
- **Serial No.**

## 2. Reason for return

## 3. Operating fluid(s) used

## 4. Process related contamination of product:
- Toxic: no [ ] yes [ ]
- Corrosive: no [ ] yes [ ]
- Biological hazard: no [ ] yes [ ] *
- Explosive: no [ ] yes [ ] *
- Radioactive: no [ ] yes [ ] *
- Other harmful substances: no [ ] yes [ ]

*) Products thus contaminated will not be accepted without written evidence of decontamination!

## 5. Harmful substances, gases and/or by-products

Please list all substances, gases and by-products which may have come into contact with the product:

<table>
<thead>
<tr>
<th>Trade/Product name Manufacturer</th>
<th>Chemical name (or symbol)</th>
<th>Dangerous material class</th>
<th>Measures if spillage</th>
<th>First aid in case of human contact</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

## 6. Legally binding declaration:

I hereby declare that the information supplied on this form is complete and accurate. The dispatch of the contaminated product will be in accordance with the appropriate regulations covering packaging, transportation and labelling of dangerous substances.

Name of organisation or company

Address

Phone

E-Mail

Name

Date and legally binding signature

Company stamp

Copies: Original to manufacturer or representative - 1 copy attach to consignment packaging - 1 copy for file of sender
Manufacturer’s declaration

Product

Diffusion pump
with optional baffle

DIF 630

EU manufacturer’s declaration as defined by the listed Guidelines

We herewith declare that the above product is intended for installation into a machine and that the commissioning of said machine is not allowed until it has been ascertained that the machine into which this product is to be installed conforms to the specifications of the listed EU guidelines.

Guidelines, harmonised standards, national standards in languages and specifications which have been applied:

89/392/EEC version 93/68/EEC ........................................
EN 292-1+EN 292-2 / 9.91 .............................................
EN 60 204-1 / 10.92 ...................................................
73/23/EEC / 7.93 ...........................................................

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

Signatures

Product management:

25 February 1998   Max Brehse  .........................

Development:

25 February 1998   Hugo Frei  .............................

Original: German  BP 803 079 BD (M02)