



# **Original Operating Manual**

## **VKI Inline Centrifugal Pump**

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# 1 General

## 1.1 About this operating manual

This operating manual contains important instructions that must be observed during installation, operation and maintenance. For this reason, ensure that it is read by specialist personnel and the responsible operator/owner prior to assembly and commissioning. The manual must be available at all times at the location where the system is used.

Please observe the safety instructions described in this operating manual, along with the relevant national accident prevention regulations and any internal work, operational and safety specifications of the operator. We assume no liability for damages and operational interruptions resulting from non-observance of this operating manual.



Pay particular attention to section 2 "Safety instructions" during commissioning and all maintenance work.

Section 2 also provides an explanation of the symbols used in this manual. Knowledge of this operating manual is essential to preventing errors and ensuring safe and uninterrupted operation.

The operating specification does not take local safety regulations into account. The owner bears full responsibility for compliance with these, including on the part of the assembly personnel used.

This operating manual:

- is part of the pump
- is valid for all type series mentioned
- describes safe and proper use in all phases of operation

## 1.2 Target groups

Target group	Task
System owner	<p>► Ensure that this manual is available at the location where the system is used, including for later reference.</p> <p>► Ensure that personnel read and observe this operating manual and the other valid documents, in particular the safety and warning information.</p> <p>► Observe additional system-related regulations and specifications.</p>
Specialist personnel, assembly staff	<p>► Read, observe and follow this operating manual and the other valid documents, in particular the safety and warning information.</p>

**Table 1: Target groups and their tasks**

## 1.3 Other valid documents

Document	Purpose
Installation diagram	Installation dimensions, connection dimensions, etc.
Spare parts list	Ordering spare parts
Clearance certificate	Returning the pump
Declaration of conformity	Conformity with standards, content of the declaration of conformity

**Table 2: Other valid documents and their purposes**

## 1.4 Warning notices and symbols




Warning notice	Hazard level	Consequences of non-observance
 <b>DANGER</b>	Immediate hazard	Death, severe physical injury
 <b>WARNING</b>	Potential hazard	Death, severe physical injury
 <b>CAUTION</b>	Potentially dangerous situation	Minor physical injury
<b>NOTICE</b>	Potentially dangerous situation	Material damage

Table 3: Warning notices and consequences of non-observance

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Symbol	Meaning
	Safety sign ► Follow all instructions identified with safety signs in order to avoid death or injuries.
►	Instruction
1. , 2. , ...	Instruction with multiple steps
✓	Condition
→	Reference
	Information, note

Table 4: Symbols and their meanings

## 2 Safety



The manufacturer shall not bear any liability for damages caused as a result of non-observance of this documentation.

### Avoiding obvious misuse (examples)

- Observe the operating limits of the pump for temperature, pressure, flow rate and speed.

### 2.1 Correct and proper use

#### The main areas of use are:

- Only use this pump for the purposes of conveying the agreed pumping media.
- Comply with operating limits.
- The pumping medium may not contain any abrasive or long-fibered components that may damage the pump materials. Consult the manufacturer if using other media.
- Ensure that the pump is only commissioned with pumping medium and is not operated without it.
- Open the suction-side fitting, and do not use it to control the flow rate.
- To avoid damaging the motor, observe the permitted number of times per hour that the motor can be switched on (→ Manufacturer information).
- Any other use must be agreed with the manufacturer.
- The temperature of the pumping medium must not exceed 80 °C.
- Pressure boosting systems, heating systems, hot and cooling water circulation, water supply systems, power stations, filtering systems, fire extinguisher and sprinkler systems, and processing machinery
- Fresh water, drinking water, boiler feed water, process water, sea and brackish water, hot water, condensate, lyes, drilling and cutting oils, and many media without aggressive components that do not chemically corrode the materials used in the pump

Do not operate the pump without pumping medium. Dry running can lead to damage to the pump.

Ensure that the foot valve is in the pumping medium at all times during suction.

**WARNING**

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**Any use that goes beyond the purposes described above shall be considered improper use. OSNA shall bear no liability for any resulting damages. The owner bears full risk for improper use.**

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## 2.2 General safety instructions



Please observe the following specifications before performing any activities.

### 2.2.1 Product safety

This pump is constructed according to the latest state of the art and accepted safety rules. Nevertheless, risks to life and limb for the user or third parties are still possible when using the pump, as are impairments to the pump and other material assets.

- Only use the pump in a technically perfect state and for the intended purpose. Ensure compliance with this operating manual and be aware of the hazards and safety issues during operation.
- Keep this operating manual and all other valid documents in a complete and legible state, and store in a location that is accessible at all times to personnel.
- Do not permit any activity that endangers personnel or uninvolved third parties.
- In the event of a safety-relevant fault, stop the pump immediately and have the fault rectified by responsible personnel.
- In addition to this documentation, ensure compliance with the statutory or other regulations for safety and accident prevention, as well as the relevant standards and specifications of the respective country.
- Do not remove any technical stickers.

### 2.2.2 Duties of the system owner

#### Safety-conscious work

Observe the safety specifications detailed in this operating manual, along with the occupational safety regulations and all additional internal safety regulations.

- Only use the pump in a technically perfect state and for the intended purpose. Ensure compliance with this operating manual and be aware of the hazards and safety issues during operation.
- Ensure compliance and monitoring:
  - correct and proper use
  - statutory or other safety and accident prevention regulations
  - safety specifications for handling hazardous substances
- Provide personal protective equipment.
- Do not remove contact protection during operation.
- Prevent any dangers from electrical energy (for details, please refer to the specifications of the VDE and the local energy supplier).
- Switch off the motor during all assembly and maintenance works, and secure against reactivation.
- Only work on the system when the pump is at a standstill.

### Personnel qualification

The owner of the system must ensure that the personnel tasked with working on the pump have read and understood this operating manual and all other valid documents before beginning work, in particular information on safety, maintenance and repair.

Work of any kind on the machine may only be performed when it has been completely de-commissioned. Reinstall and reactivate all safety mechanisms after work.

Before restarting the machine, ensure that all necessary commissioning steps have been completed (→ 6.1 Commissioning, pg 22).

- Determine responsibilities, tasks and monitoring for personnel.
- Only allow work of any kind to be performed by specialist technical personnel:
  - assembly, maintenance and repair work
  - work on the electrical systems
- Only allow personnel undergoing training to perform work on the pump under the supervision of specialist technical personnel.

### Safety mechanisms

- Provide the following safety mechanisms and ensure that they function correctly:
  - for moving components: contact protection for the pump, installed by the customer
  - for potential electrostatic charges: provide appropriate earthing

### Guarantee

- Please consult the manufacturer before carrying out any conversions, repairs or changes during the guarantee period.
- Only use original parts or parts approved by the manufacturer.

### 2.2.3 Duties of personnel

- Observe the information on the pump and ensure it is legible (e.g. direction of rotation arrow, fluid connection indicators).
- Do not remove the contact protection for moving parts during operation.
- Use personal protective equipment if necessary.
- Only work on the system when the pump is at a standstill.
- Switch off the motor during all assembly and maintenance works, and secure against reactivation.
- Reinstall the safety mechanisms after working on the pump according to specifications.

## 2.3 Dangers of non-observance of the safety instructions

- Non-observance of the safety instructions can lead to hazards to personnel, the machine and the environment.
- Non-observance of the safety instructions can also lead to the loss of any damage claims.
- In particular, non-observance can lead to the following dangers:
  - failure of important system functions
  - electrical and mechanical hazards to personnel

## 2.4 Unauthorized conversion and production of spare parts

Conversions or changes to the machine are only permitted following consultation with the manufacturer. Original spare parts and accessories authorized by the manufacturer help ensure safety. The manufacturer bears no liability for the consequences of the use of other parts.

## 2.5 Unauthorized modes of operation

The operational safety of the machine is only guaranteed when it is used for the intended purpose according to the operating manual (→ 2.1 Correct and proper use, pg 6). Never exceed the limit values indicated in the technical data (→ 3.4 Technical data, pg 12).

## 2.6 Special hazards

### 2.6.1 Explosion area

- Do not use the pump in areas where there is a risk of explosion.

### 2.6.2 Hazardous pumping media

- Observe the safety regulations for handling hazardous substances (e.g. toxic, hazardous to health).
- Use personal protective equipment when performing work on the pump.

### 2.6.3 Noise emissions

Conditions for measurement:

- Distance to pumping unit: 1 m
- Operation: Free of cavitation
- Motor: IEC standard motor

Tolerance:  $\pm 3$  dB(A)

Nominal motor power $P_N$ [kW]	Sound pressure level on measurement surface	
	$L_{pA}$ [dB] at speed	
	2900 min <sup>-1</sup>	3500 min <sup>-1</sup>
0.37	54	58
0.55	54	58
0.75	58	62
1.1	62	66
1.5	62	66
2.2	63	67
3.0	65	69
4.0	66	70
5.5	70	74
7.5	71	75
11.0	73	77
15.0	74	78

**Table 5: Sound pressure level**

Low-noise motors can be provided if the expected noise values exceed the permitted limits.

### 3 Layout and function

#### 3.1 Labeling

This operating manual applies for pumps of the VKI 4 / 8 / 16 series.

Model code:

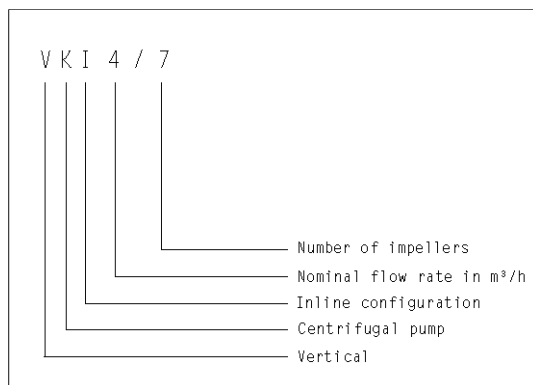


Figure 1: VKI model code

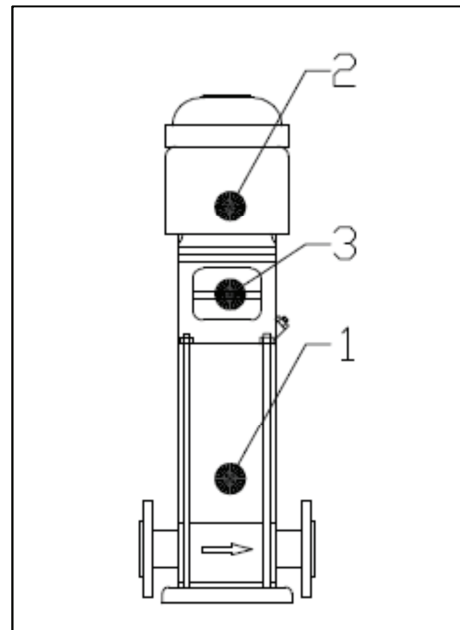


Figure 2: Scope of delivery for type VKI

- 1 Pump
- 2 Drive motor
- 3 Coupling guard

#### 3.2 Scope of delivery for a type-VKI inline centrifugal pump

The customer can order the pump:

- in a preassembled state, i.e. delivery without motor. The motor is installed by the customer.
- in a fully assembled state, i.e. the pump is fitted with motor ex-works.

The scope of delivery corresponds to the scope indicated in the order. Please check that the delivery is complete upon receipt. Notify the delivery company of any transport damage immediately. Please also refer to our conditions of sale and delivery.

#### 3.3 General information


The VKI is a non-self-priming, multi-stage inline centrifugal pump in a vertical configuration (staged centrifugal pump). The connection point is not variable on inline pumps. The pumps are fitted with mechanical seals. Fluid-lubricated plain bearings are used. The impellers, shaft, diffusers, wear plates, suction and delivery casings and stage casing are made from stainless steel.

Only drive VKI pumps with electric motors that have a fixed bearing and that cannot be shifted from the B side to the A side. The complete unit is fully assembled and includes the pump, drive motor, coupling and coupling guard.

Ensure a sufficient air supply to cool the motor.

The arrows on the base of the pump show the direction of flow for the pumping medium.

### 3.4 Technical data

 Please check the pump type on the type plate to determine the correct gap.

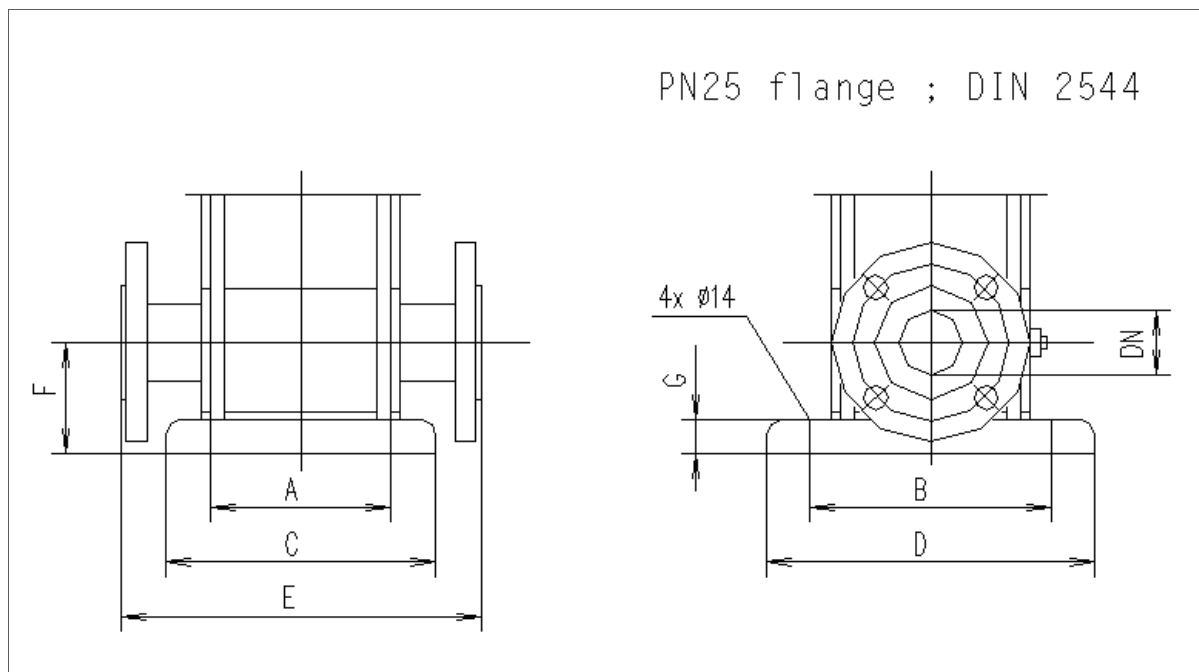


Figure 3: Connection dimensions on the VKI centrifugal pump

Connection dimension on the VKI centrifugal pump								
Pump type	A [mm]	B [mm]	C [mm]	D [mm]	E [mm]	F [mm]	G [mm]	NPS [mm]
VKI 4	100	180	150	210	250	75	32	32
VKI 8	130	215	199	247	280	80	25	40
VKI 16	130	215	199	247	300	90	35	50


Table 6: Connection dimensions on the VKI centrifugal pump

Pump type	Min. flow rate	
	Medium temperature	
	Up to 80°C	80°C to 120°C
VKI 4	0.4 m³/h	1.0 m³/h
VKI 8	0.8 m³/h	2.0 m³/h
VKI 16	1.6 m³/h	4.0 m³/h

Table 7: Min. flow rate

## 4 Transport and intermediate storage

### 4.1 Transport

 Weight information (→ Other valid documents)

#### 4.1.1 Unpacking and checking the delivery condition

1. Check that the delivery is complete upon receipt.
2. Unpack the pump/unit upon delivery and check for transport damage.
3. Notify the delivery company of any transport damage immediately.
4. Dispose of the packaging material in line with the applicable local regulations.

#### 4.1.2 Lifting



**Risk of death or crushed limbs from falling transported goods!**

► Choose lifting equipment that is suitable for the total weight to be transported.

► Do not stand under suspended loads.

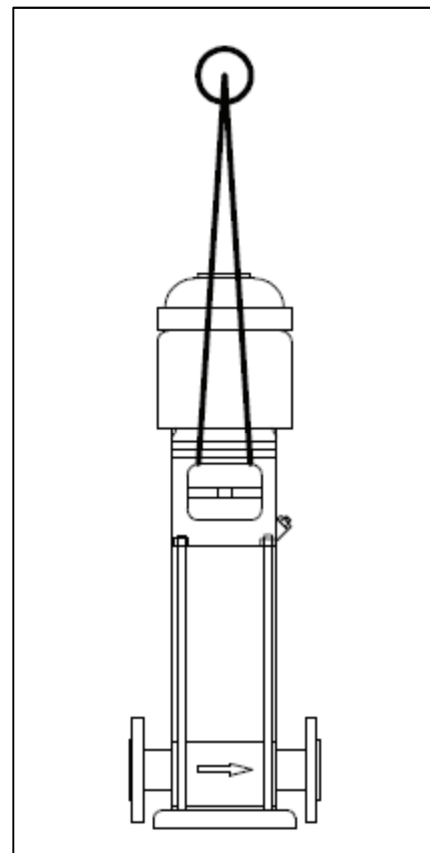


Figure 4: Lifting a VKI centrifugal pump

## 4.2 Intermediate storage

Ensure during intermediate storage that the pump is not exposed to any weather conditions for a long period of time. If the pump is de-commissioned for a longer period of time (approximately 2 to 3 months), ensure that it is fully drained. (→ 6.2 Decommissioning, pg 25)

## 4.3 Storage

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### NOTICE

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#### Material damage due to incorrect storage!

- Ensure that the pump is correctly stored.
- 

1. Close all openings with blank flanges, blind plugs or plastic covers.
2. Ensure that the storage area meets the following conditions:
  - dry
  - free of frost
  - free of vibrations
3. Rotate the shaft once per month by several rotations.

---

### NOTICE

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#### Damage to bearings due to high water pressure or splashing water!

- Do not use water jets or steam jet cleaners to clean the bearing areas and motor.
- 

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### NOTICE

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#### Damage to seals due to incorrect cleaning agent!

- Ensure that the cleaning agent does not corrode the seals.
- 

1. Choose the cleaning agent according to the area of use.
2. Dispose of preservatives in line with the applicable local regulations.
3. When storing for longer than 6 months:
  - Check all elastomers (round seals, shaft seal rings, gaskets and gland packing) for elasticity, and replace if necessary.



## 4.4 Disposal

 Plastic parts may be contaminated by toxic or radioactive pumping media. If this is the case, cleaning is not sufficient.



### **WARNING**

---

#### **Risk of poisoning and environmental damage from pumping medium!**

- ▶ Use personal protective equipment when performing work on the pump.
  - ▶ Before disposing of the pump:
    - Collect any remaining pumping medium in the pump, and dispose of it in line with the locally valid regulations.
    - Neutralize any pumping medium residues in the pump.
  - ▶ Dispose of the pump in line with the applicable local regulations.
-

## 5 Assembly and installation

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### NOTICE

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#### Material damage due to contamination!

- Only remove covers, transport caps and sealing caps immediately before connecting the pump to the pipelines.
- 
- 



### CAUTION

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Ensure compliance with all safety specifications during installation and operation.

---

1. Please consult the manufacturer when installing at altitudes over 1000 m above mean sea level.

#### 5.1.1 Preparing the installation location

- Ensure that the installation location meets the following conditions:
  - pump is freely accessible from all sides
  - sufficient space for installing/removing piping, as well as for maintenance and

repair work, in particular for installing/removing the pump and motor

- no effects from external vibrations on the pump (bearing damage)
- protection against frost

#### 5.1.2 Preparing the base surface and foundations

- Ensure that the base surface and foundations meet the following conditions:
  - level
  - clean (no oils, dust or other contaminations)
  - foundations can support the weight of the pump unit and all operating forces
  - stability of the pump unit ensured

### 5.2 Installation

#### 5.2.1 Installing the pump

Prior to installation, remove the packaging (if present) and check the pump for any transport damage. Ensure that the installation area is dry and free of frost.

---



### CAUTION

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**Do not operate the pump in areas where there is a risk of explosion. Ensure that the pump is installed and connected in line with the local regulations.**

---

**i** We recommend installing the pump on a noise-insulating base, in order to prevent transmission noises to parts of the building.

Provide an outlet for leakage fluid during maintenance work.

The pump's suction casing is shown as the base, and must be secured free of tension to a foundation using 4 M12 screws (→ Figure 3, pg 12).

---

**⚠ CAUTION**

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Install the pump in such a way that prevents flooding of building sections as the result of a leak or when performing maintenance work.

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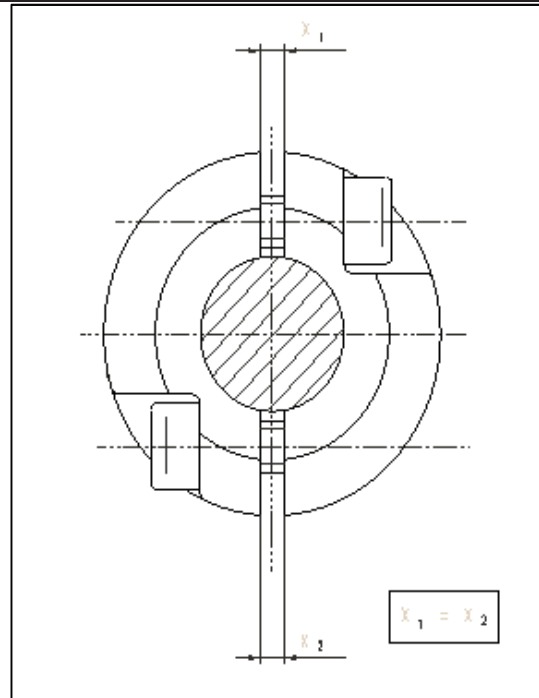


Figure 5: Overhead view of coupling

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**⚠ CAUTION**

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### 5.2.2 Assembling the motor

Clean the motor shaft of any anti-rust agent and remove the keys if present.

Remove the cap nuts (9) of the coupling shells (5), place the motor on the pump head (3 or 3c), and secure with screws (see Table 14, pg 35/Table 15, pg 37). Manually tighten the socket head cap screws on the coupling shells slightly, ensuring that the gap between the coupling shells is even (→ Figure 5, pg 17). Please also refer to 6.1.3 Checking direction of rotation, pg 23 for information on checking the direction of rotation.

**Incorrect direction of rotation on the pump can lead to damage to the mechanical seal and a reduction in performance. The pump shaft must rotate counterclockwise, as seen from the motor.**

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**⚠ DANGER**

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**Never operate the pump without the coupling guard.**

---

**DANGER**

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**Risk of death due to rotating parts!**

- ▶ Use personal protective equipment when performing work on the pump.
  - ▶ Prevent the keys from being slung away when checking the direction of rotation.
  - ▶ Ensure sufficient clearance to rotating parts.
- 

**5.2.3 Electrical connection**

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**CAUTION**

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**Electrical connection must be carried out by a specialist electrician, in line with the specifications of the local energy supplier or the VDE.**

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Install a motor protection switch to protect the motor.

**5.2.4 Adjusting the pump rotor**

The rotor is not set on pumps that are fitted with an electric motor ex-works.

Only drive VKI pumps with electric motors that have a fixed bearing and that cannot be shifted from the B side to the A side.

Loosen the socket head cap screws of the coupling halves, place the motor on the delivery casing, and secure with screws. Manually tighten the socket head cap screws on the coupling shells slightly, ensuring that the gap between the coupling shells is even.

The pump rotor has an axial play of approx. 4 mm. The pump rotor must be raised by approx. 2 mm before tightening the coupling screws. The impellers are now central in the diffuser channel (→ Figure 6, pg 19).

Evenly tighten the socket head cap screws in a crosswise pattern using a torque wrench.

Torque:	M6	:	16 Nm
	M8	:	22 Nm
	M10	:	70 Nm

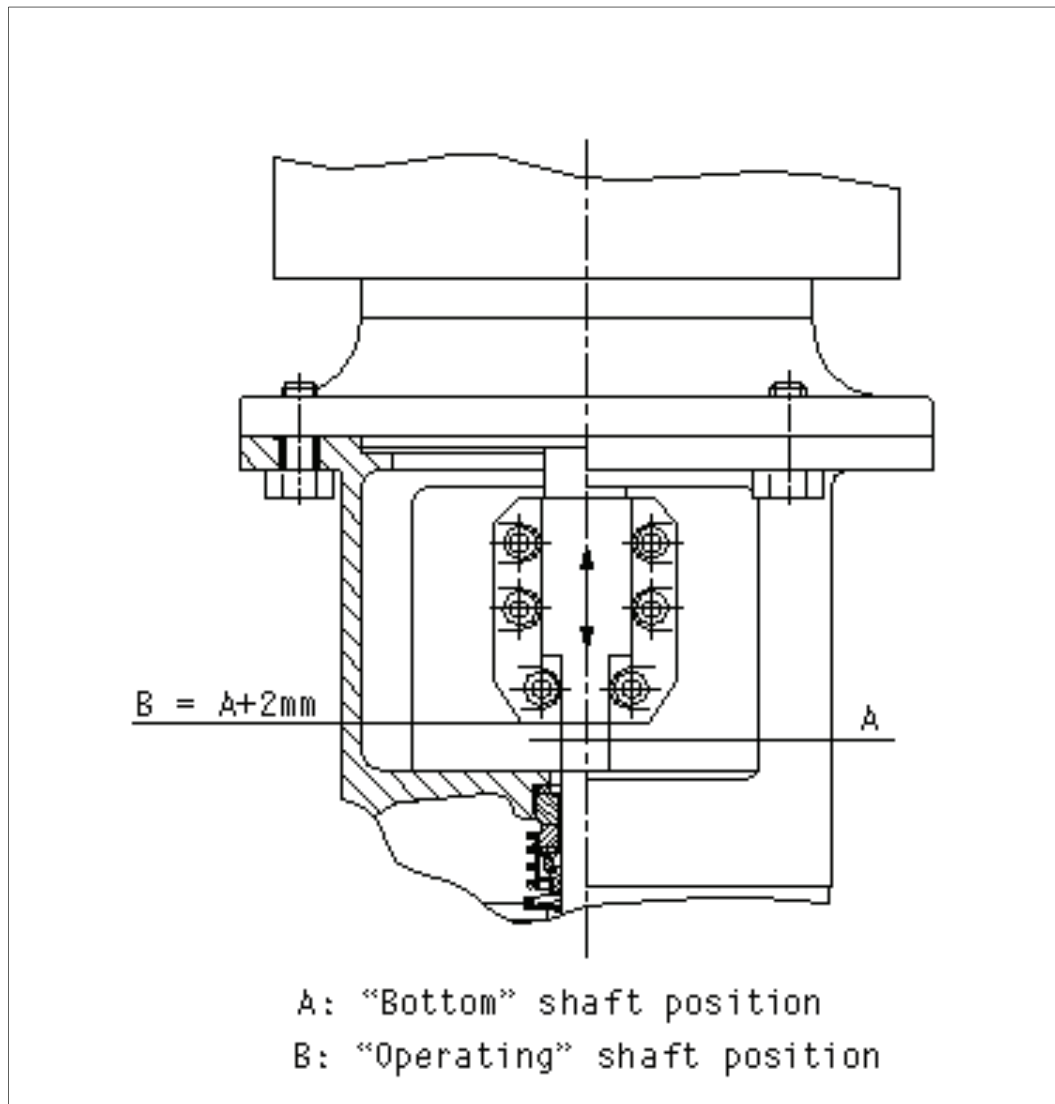


Figure 6: Adjusting the pump rotor

### 5.3 Pipelines

Determine the nominal widths of the pipelines, taking the local conditions into account. To keep flow losses to a minimum, avoid sudden constrictions and sharp bends. Route pipelines free of tension and pressure tight. Install them in a way that prevents forces and torques being transferred to the pump. Never use the pump as an anchor point for the pipeline.

Fit the suction pipe rising to the pump and the inlet pipe declining to the pump, in order to prevent the formation of air bubbles. Support the pipes immediately before the pump, and connect without tension. Ensure that the weight of the pipes does not strain the pump. If using short pipes, the nominal widths must be at least equal to those of the pump connections. If using long pipelines, determine the cost-effective nominal width on a case-by-case basis.

Taper pieces to larger nominal widths should have an extending angle of approx. 8° to prevent increased pressure losses. Install check valves and shut-off devices depending on the type of system and pump (→ Figure 7, pg 20).

Take appropriate measures to compensate any expansions of the pipelines caused by temperature influences, in order to avoid straining the pump with forces and torques.

### CAUTION

**Before commissioning new systems, the tanks, pipelines and connections must be thoroughly cleaned, flushed and blown through. Welding beads, scales and other contaminations often only fall off after a longer period of time. Ensure that they are kept away from the pump by fitting a strainer in the suction pipe.**

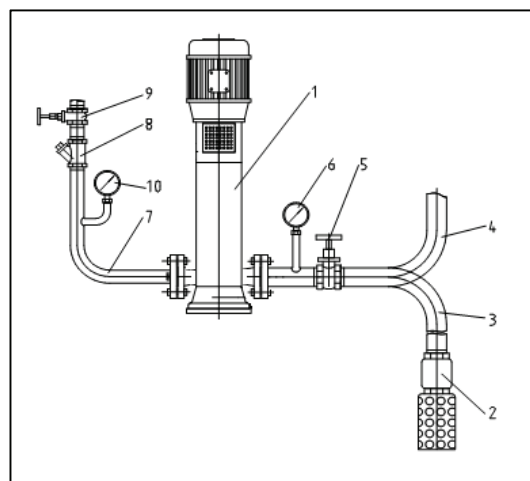


Figure 7: Functional and operating elements

Key:

- 1 Centrifugal pump
- 2\* Foot valve with suction/inlet strainer
- 3\* Suction pipe
- 4\* Inlet pipe
- 5\* Shut-off valve
- 6\* Pressure gauge
- 7\* Delivery pipe
- 8\* Check valve
- 9\* Control fitting
- 10\* Pressure gauge

\* not included in delivery

**Suction or inlet pipe**

(→ Figure 7, pg 20, 3 and 4)

Keep the suction pipe as short as possible, and route it in such a way that it is constantly rising to the pump. Route the inlet pipe constantly declining to the pump.

Provide a draining mechanism at the lowest point of the inlet pipe during inlet operation.



The VKI 16 requires a suction or inlet pipe of at least R 2".

**Foot valve**

(→ Figure 7, pg 20, 2)

The foot valve keeps the suction pipe filled with pumping medium.

**Inlet sieve or strainer**

(→ Figure 7, pg 20, 11)

An inlet sieve or strainer protects the pump against large-grain contaminations.

**Monitoring fitting**

(→ Figure 7, pg 20, 6)

Monitoring fittings are required to monitor the suction and inlet pressure. Monitoring valves help monitor the operating data.

**Shut-off valve**

(→ Figure 7, pg 20, 5)

A shut-off valve is used to block the pipe during assembly. The shut-off valve must be fully opened when the pump is in operation.

**Delivery pipe**

(→ Figure 7, pg 20, 7)

**Control fitting**

(→ Figure 7, pg 20, 9)

A control fitting is always required to regulate the pump power and block the pipeline during assembly work.

**Check valve**

(→ Figure 7, pg 20, 8)

A check valve is always required to protect the pump.

## 6 Commissioning/ decommissioning

### 6.1 Commissioning

#### 6.1.1 Determining the pump configuration

- Determine the pump configuration

#### 6.1.2 Filling the pump



**CAUTION**

Check that there is enough water in the well or feed tank.

Do not operate the pump without water. Dry running can lead to damage to the pump.



**WARNING**

**Risk of poisoning or injury due to hazardous pumping media!**

- Collect any escaping pumping medium safely and dispose of in an environmentally friendly way.

### NOTICE

**Material damage due to dry running!**

- Ensure that the pump is properly filled.

**Closed system or open system with inlet**

Close the shut-off valve on the suction side and open the vent plug on the pump head.



**CAUTION**

Observe the spray direction of the vent plug! Water spraying out of the pump may pose a hazard to persons, the electric motor or other devices in the vicinity.



---

**⚠ CAUTION**

---

**If pumping hot water, ensure special pre-cautionary measures are taken to prevent scalding.**

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Slowly open the shut-off valve on the suction side, and wait until there is a constant flow of pumping medium coming out of the vent hole. Now close the vent plug and open the shut-off valve on the suction side fully.

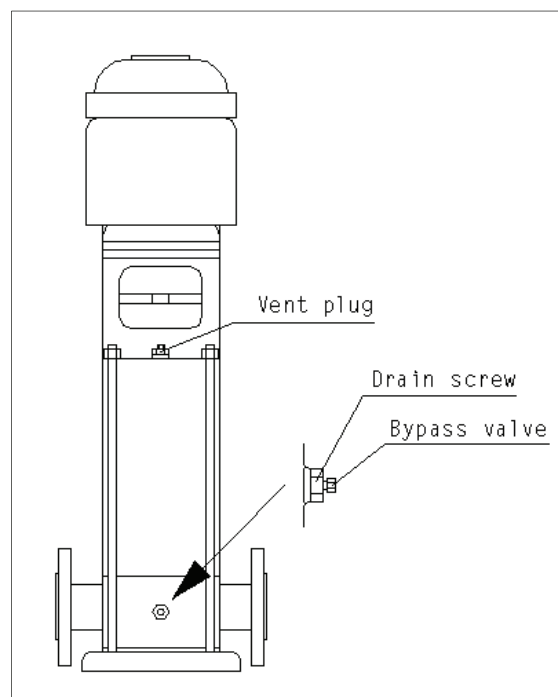


Figure 8: Venting the VKI

#### Open system without inlet

Ensure that the **suction pipe and pump** are filled with pumping medium before commissioning.

Ensure that the shut-off valve on the suction side is open. Remove the vent plug and open the bypass valve. Opening the bypass valve creates a connection between the suction and delivery chambers. Both chambers are filled simultaneously as a result. The pump is filled via the threaded borehole of the vent plug. Once the pump and suction pipe are completely filled, close the bypass valve and reinsert the vent plug.

#### 6.1.3 Checking direction of rotation

---

**⚠ CAUTION**

---

**Incorrect direction of rotation on the pump can lead to damage to the mechanical seal and a reduction in performance. The pump shaft must rotate counterclockwise, as seen from the motor.**

---

The cast direction of rotation arrow on the pump indicates the specified direction of rotation.

Before checking the direction of rotation, secure the pump against activation.



**DANGER**

#### **Risk of death due to rotating parts!**

- ▶ Use personal protective equipment when performing work on the pump.
- ▶ Prevent the keys from being slung away when checking the direction of rotation.
- ▶ Ensure sufficient clearance to rotating parts.

After checking the direction of rotation, ensure that all safety and protective mechanisms are reinstalled and reactivated.



**DANGER**

**Never operate the pump without the coupling guard.**

#### **6.1.4 Starting the pump**

- ✓ Pump correctly installed and connected
- ✓ Motor correctly installed and connected
- ✓ All connections established, sealed and free of tension

- ✓ All safety mechanisms installed and function tested

- ✓ Pump correctly prepared, filled and vented



**DANGER**

**All safety mechanisms must be installed and function tested.**



**DANGER**

#### **Risk of injury due to running pump!**

- ▶ Do not touch the running pump.
- ▶ Do not perform any work on the running pump.

Open the shut-off valves in the suction pipe and close those in the delivery pipe. After switching on the drive unit, the pumping pressure should increase constantly with increasing speed. If this is not the case, switch off the unit immediately and repeat the filling process. Once the operating speed has been reached, slowly open the shut-off valve on the delivery side and adjust according to the pumping data.

0.1 MPa = 1 bar ≈ 10 m

**DANGER**

**Risk of poisoning or injury due to spurting pumping medium!**

- Use personal protective equipment when performing work on the pump.

Never operate the pump when the fitting on the delivery side is closed. Observe the required minimum flow rate at all times (→ Table 7, pg 12).

**NOTICE**

**Material damage due to dry running!**

- Ensure that the pump is properly filled.

**NOTICE**

**Open the suction-side fitting, and do not use it to control the flow rate. Do not close the pressure-side fitting!**

**NOTICE**

**Material damage due to overheating!**

**6.2 Decommissioning****DANGER**

**Risk of injury from hazardous pumping media!**

- Collect any escaping pumping medium safely and dispose of in an environmentally friendly way.

- Take the following measures in the event of operating interruptions:

Pump to be	Measure
Shut down for longer period	► Take measures according to the pumping medium
Drained	► Close suction and delivery-side fittings.
Disassembled	► Deactivate motor and secure against unauthorized reactivation.
Put into storage	► Observe storage measures (→ 4.3 Storage, pg 14).

**Table 8: Measures in the event of operational interruption**

Flow medium behavior	Duration of operating interruption (depending on process)	
	short	long
Solid components settle	► Flush pump.	► Flush pump.
Solidified/frozen, non-corrosive	► Heat or drain pump and containers.	► Drain pump and containers.
Solidified/frozen, corrosive	► Heat or drain pump and containers.	► Drain pump and containers. ► Apply preservative to pump and containers.
Remains fluid, non-corrosive	–	–
Remains fluid, corrosive	–	► Drain pump and containers. ► Apply preservative to pump and containers

**Table 9: Measures depending on the behavior of the pumping medium**

Drain the pump completely if shutting down for a longer period (approx. 2 - 3 months), or if there is a danger of frost.

## CAUTION

**Disconnect the pump from the electricity supply if shutting down for a longer period.**

## NOTICE

**This work must be carried out by a specialist service provider.**

### 6.2.1 Draining the pump and protecting against frost

The pump must be drained if there is a danger of frost. A pump that remains empty over a longer period must be preserved.

### 6.3 Recommissioning



#### CAUTION

**The pump must move easily for recommissioning.**

Check that the pump moves easily before recommissioning.

If the pump was preserved after decommissioning, flush it thoroughly before recommissioning.

Perform all further work steps in line with 6.1 Commissioning, pg 22.

Take the following measures before recommissioning following operating interruptions of > 1 year:

Shut down time	Measure
> 1 year	► Check visually for leaks
> 2 years	► Replace elastomer seals (gaskets, round seals, shaft seal rings and gland packings). ► Replace anti-friction bearings.

**Table 10: Measures following longer shut down times**

### 6.4 Mechanical seal

Mechanical seals are self-adjusting mechanical shaft seals that require no maintenance. The mechanical seal must never run dry. Ensure therefore that the pump is filled.

Do not reinstall mechanical seals after removing them for inspection or maintenance. Replace them with new seals, or relap the contact surface.


### NOTICE

#### Material damage due to dry running!

- Ensure that the pump is properly filled.

## 7 Maintenance and repair

### 7.1 General information

 We can provide trained customer service technicians for assembly and repair work. Please present proof of the conveyed goods upon request.

(DIN safety data sheet or clearance certificate)



**DANGER**

#### Risk of injury due to running pump!

- ▶ Do not touch the running pump.
- ▶ Do not perform any work on the running pump.



**WARNING**

#### Risk of poisoning or injury due to hazardous pumping media!

- ▶ Use personal protective equipment when performing work on the pump.

Ensure that the pump runs smoothly and quietly at all times. Maximum permitted room temperature 40 °C.

The mechanical seal displays only limited or invisible leakage losses (in vapor form). It requires no maintenance.

The reserve pumps must be activated once per week in order to ensure operational readiness. To do so, switch the reserve pumps on and immediately off again. Monitor the function of the additional connections.

The pump shaft is supported in the suction casing in a zero-maintenance bearing shell made from PTFE graphite. The pump shaft and motor shaft are connected rigidly by means of a muff coupling.

Ensure that the socket head cap screws of the coupling shells are tightened at regular intervals. Perform an initial check after 50 operating hours, and further checks after every 1,000 operating hours.



**DANGER**

#### Risk of death from electric shock!

- ▶ Only allow work on the electrical systems to be carried out by a qualified electrician.
- ▶ Ensure that the supply of electricity is switched off and secured against reactivation when performing all maintenance work.


**DANGER**

**Only perform the inspection when the system is switched off and secured.**

Repair	Action for return
At customer	► Return defective component to manufacturer.
At manufacturer	► Flush pump. ► Send complete pump (not disassembled) to manufacturer.
At manufacturer, with guarantee claim	► Only if using hazardous pumping medium: flush pump. ► Send complete pump (not disassembled) to manufacturer.

**Table 11: Measures for return**

## 7.2 Sending the pump to the manufacturer

- ✓ Pump depressurized
  - ✓ Pump completely drained
  - ✓ Electrical connections disconnected and motor secured against reactivation
  - ✓ Manometer removed together with supply lines and holders
1. Only send pumps or individual components to the manufacturer together with a verifiable and completely filled out clearance certificate. Request a clearance certificate from the manufacturer if required.
  2. Using the following table, take the action required for returning the pump according to the necessary repair.

## 8 Faults and troubleshooting

Please consult the manufacturer should you experience any faults that are not described in the following table, or cannot be traced back to the described causes.

In the following table, each potential fault is given a number. Use this number to find the corresponding cause and remedy in the troubleshooting table.

Fault	Number
Pump does not deliver	1
Flow rate too low	2
Flow rate too high	3
Pumping pressure too low	4
Pumping pressure too high	5
Pump runs noisily	6
Temperature of the anti-friction bearings too high	7
Pump leaks	8
Motor power consumption too high	9

Table 12: Fault/number allocation

Fault number										Cause	Remedy
1	2	3	4	5	6	7	8	9			
X	-	-	-	-	-	-	-	-	-	Inlet/suction pipe and/or pressure pipe closed by fitting	► Open fitting.
-	X	-	X	-	-	-	-	-	-	Inlet/suction pipe not completely opened	► Open fitting.
X	X	-	X	-	X	-	-	-	-	Inlet/suction pipe, pump or suction strainer blocked or encrusted	► Clean inlet/suction pipe, pump or suction strainer.
-	X	-	X	-	X	-	-	-	-	Cross-section of the inlet/suction pipe too tight	► Enlarge cross-section. ► Clean suction pipe of encrustations. ► Fully open fitting.
X	-	-	-	-	-	-	-	-	-	Transport sealing cap not removed	► Remove transport sealing cap. ► Disassemble pump and check for dry running damage.
-	X	-	X	-	X	-	-	-	-	Suction head too high: $NPSH_{\text{pump}}$ is greater than $NPSH_{\text{system}}$	► Increase inlet pressure. ► Consult manufacturer.
X	-	-	-	-	X	-	-	-	-	Inlet/suction pipe and pump not correctly drained or not completely filled.	► Completely fill and drain pump and/or pipeline.
X	-	-	-	-	X	-	-	-	-	Air pockets in inlet/suction pipe	► Install fitting for venting. ► Correct pipeline routing.
X	X	-	X	-	X	-	-	-	-	Air sucked in	► Seal source of fault.
X	X	-	X	-	X	-	-	-	-	Gas component too high: pump cavitated	► Consult manufacturer.
-	X	-	X	-	X	-	-	-	-	Temperature of pumping medium too high: pump cavitated	► Increase inlet pressure. ► Reduce temperature. ► Consult manufacturer.



Fault number									Cause	Remedy
1	2	3	4	5	6	7	8	9		
-	X	-	X	-	-	-	-	-	Geodetic delivery head and/or pipeline resistance too high	► Remove deposits in pump and/or pressure pipe. ► Install larger impeller and consult manufacturer.
-	X	-	-	X	X	-	-	-	Pressure-side fitting not opened far enough	► Open pressure-side fitting.
X	X	-	-	X	X	-	-	-	Pressure line blocked	► Clean pressure line.
X	X	-	X	-	X	-	-	-	Incorrect direction of rotation on pump	► Swap any two phases on motor.
X	X	-	X	-	-	-	-	-	Speed too low	► Compare required motor speed with pump type plate. Replace motor if necessary. ► Increase speed if possible.
-	X	-	X	-	X	X	-	-	Pump components worn	► Replace worn pump components.
-	-	X	X	-	X	-	-	X	Pressure-side fitting opened too far	► Throttle with pressure-side fitting. ► Machine down impeller. Consult manufacturer and adjust impeller diameter.
-	-	X	-	-	X	-	-	X	Geodetic delivery head, pipeline resistance and/or other resistances lower than designed	► Throttle flow rate with pressure-side fitting. Observe minimum flow rate here. ► Machine down impeller. Consult manufacturer and adjust impeller diameter.
-	-	X	-	X	-	-	-	-	Viscosity lower than indicated	► Machine down impeller. Consult manufacturer and adjust impeller diameter.
-	-	X	-	X	X	X	-	X	Speed too high	► Compare required motor speed with pump type plate. Replace motor if necessary. ► Reduce speed if possible.
-	-	X	-	X	X	-	-	X	Number of stages too high	► Throttle flow rate with pressure-side fitting. Observe minimum flow rate here. ► Install pump with lower number of stages.
X	X	-	X	-	X	-	-	-	Impeller imbalanced or blocked	► Disassemble pump and check for dry running damage. ► Clean impeller.
-	X	-	X	-	X	-	-	-	Hydraulic pump components dirty, sticky or encrusted	► Disassemble pump. ► Clean components.

Fault number									Cause	Remedy
1	2	3	4	5	6	7	8	9		
-	-	-	-	-	-	X	-	X	Defective anti-friction bearing in motor	► Replace anti-friction bearing.
-	-	-	-	-	-	X	-	-	Lubricant: too much, too little or not suitable	► Reduce, increase or replace lubricant.
-	-	-	-	-	-	-	X	-	Tie bolts not tightened correctly	► Tighten tie bolts.
-	-	-	-	-	-	-	X	-	Mechanical seal worn	► Replace mechanical seal.
-	-	-	-	-	-	-	X	-	Defective casing seal	► Replace casing seal.
-	-	-	-	-	-	-	X	-	Shaft sleeve penetrated	► Replace shaft sleeve and round seal.
-	-	-	-	-	X	X	X	X	Pump under tension	► Check pipeline connections and pump fastening. ► Check coupling alignment. ► Check support foot fastening.
-	-	-	-	-	X	X	-	-	Coupling incorrectly aligned	► Align coupling.
-	X	-	X	-	X	-	-	X	Motor runs on 2 phases	► Check fuse and replace if necessary. ► Check wire connections and insulation.

Table 13: Troubleshooting table

## 9 Appendix

### 9.1 Service, spare parts, accessories

Please note in particular that spare parts and accessories not delivered by the manufacturer are also not checked and approved by the manufacturer. The installation and/or use of such products can therefore, under certain circumstances, have a negative effect on the properties of the centrifugal pump specified in the design. This can in turn jeopardize safety. Any liability and guarantee on the part of OSNA for damages resulting from the use of non-original spare parts and accessories is excluded.

Any faults that cannot be rectified by the owner may only be rectified by OSNA customer service or specialist service providers. Please provide a precise description of the fault, so that our service technician can prepare and bring the required spare parts. You can reach our customer service via the address on the last page.

Spare parts can be ordered via specialist retailers. Please refer to the type plate for the type designation.

In the event of any guarantee claims, please provide the machine number on the housing.

The following spare parts diagrams are intended solely to ease the process of finding and procuring the spare parts.



#### WARNING

**Do not use the spare parts diagrams as assembly instructions.**

#### Notes on ordering spare parts:

In order to prevent incorrect deliveries, please ensure that the information you provide when ordering is as precise as possible:

- Type designation
- Designation
- Required quantity
- Required shipping method (e.g. post, freight, express freight, courier delivery)
- Precise delivery address

## 9.2 Individual parts of the VKI centrifugal pump

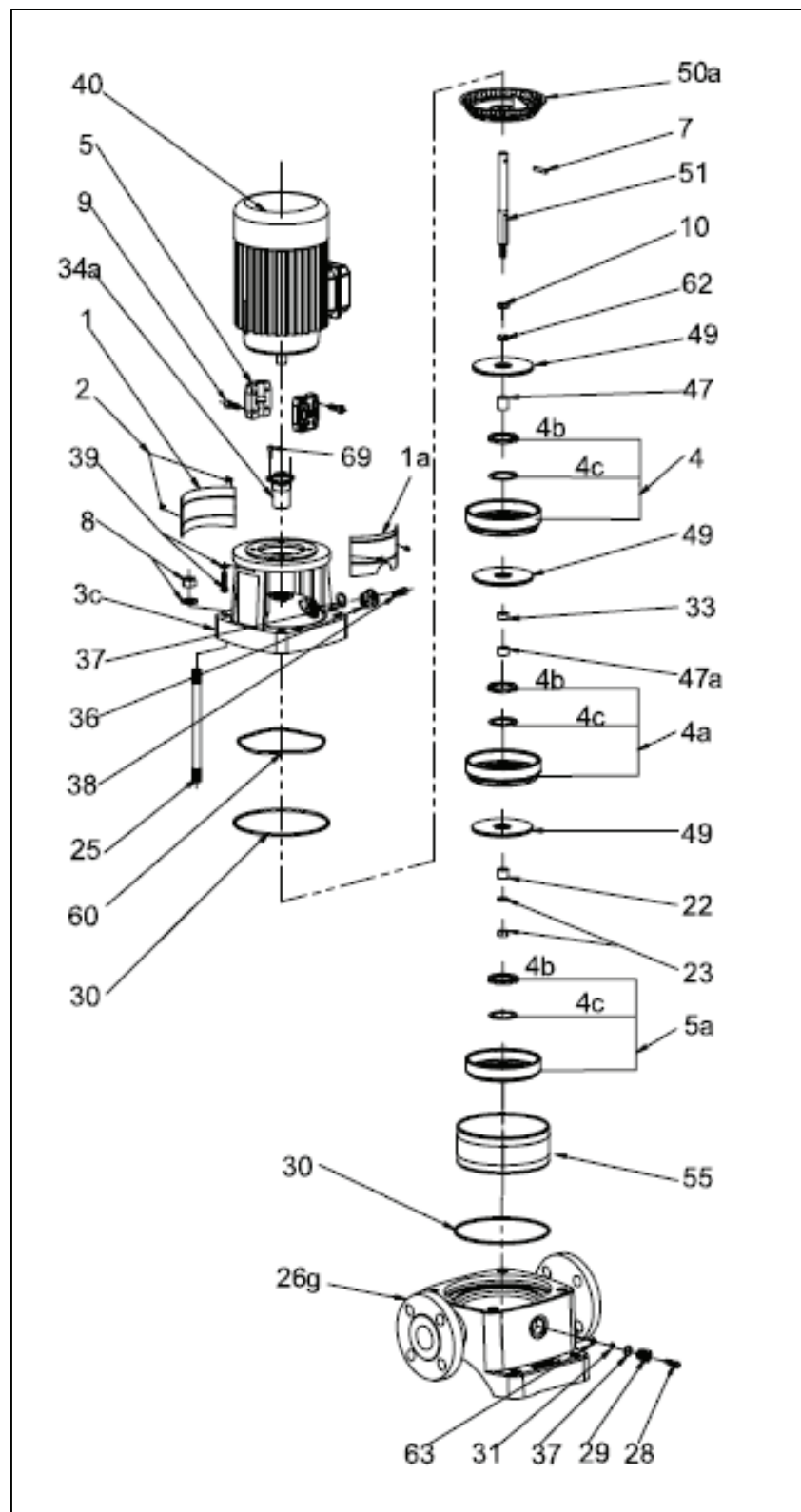


Figure 9: Explosion diagram of the VKI 4 centrifugal pump with fixed flange

Item	Designation	Item	Designation
1	Coupling guard	30	O-ring
2	M4 screw (8x)	31	O-ring
3c	Pump head	33	Impeller sleeve
4	Diffuser	34a	Mechanical seal
4a	Diffuser centering	36	Vent nut
4b	Retaining ring	37	O-ring
4c	Ring with neck	38	Vent plug
5	Coupling	39	Nut and washer
5a	Inductor	40	Motor
7	Shaft wearing sleeve	47	Impeller sleeve
8	M12 nut and washer	47a	Anti-friction bearing
9	Cap nut	49	Impeller
10	Cover circlip	50a	Top diffuser
22	Cover for first impeller	51	Shaft
23	M8 nut and washer	55	Cylinder
25	Pin	60	Shaft spring
26g	Inlet and outlet flange	62	Shaft wearing sleeve
28	Drainage screw	63	O-ring holder
29	Drainage nut		

Table 14: Parts list for the VKI 4 centrifugal pump with fixed flange

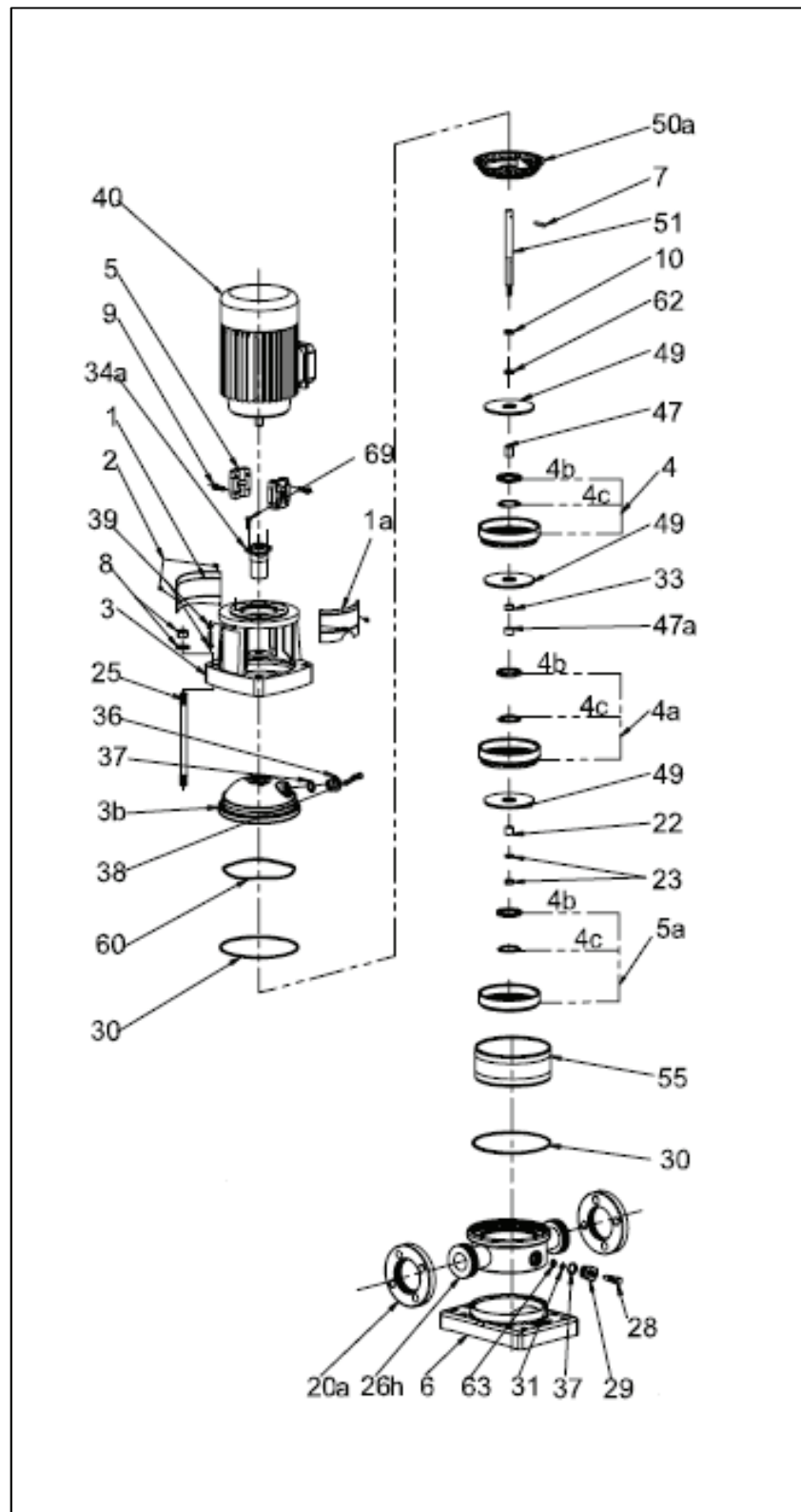


Figure 10: Explosion diagram of the VKI 4 C centrifugal pump with loose flange

Item	Designation	Item	Designation
1	Coupling guard	28	Drainage screw
2	M4 screw (8x)	29	Drainage nut
3	Pump head	30	O-ring
3b	Centering	31	O-ring
4	Diffuser	33	Impeller sleeve
4a	Diffuser centering	34a	Mechanical seal
4b	Retaining ring	36	Vent nut
4c	Ring with neck	37	O-ring
5	Coupling	38	Vent plug
5a	Inductor	39	Nut and washer
6	Pump base	40	Motor
7	Shaft wearing sleeve	47	Impeller sleeve
8	M12 nut and washer	47a	Anti-friction bearing
9	Cap nut	49	Impeller
10	Cover circlip	50a	Top diffuser
20a	Flange	51	Shaft
22	Cover for first impeller	55	Cylinder
23	M8 nut and washer	60	Shaft spring
25	Pin	62	Shaft wearing sleeve
26h	Inlet and outlet flange	63	O-ring holder

Table 15: Parts list for the VKI 4 C centrifugal pump with loose flange

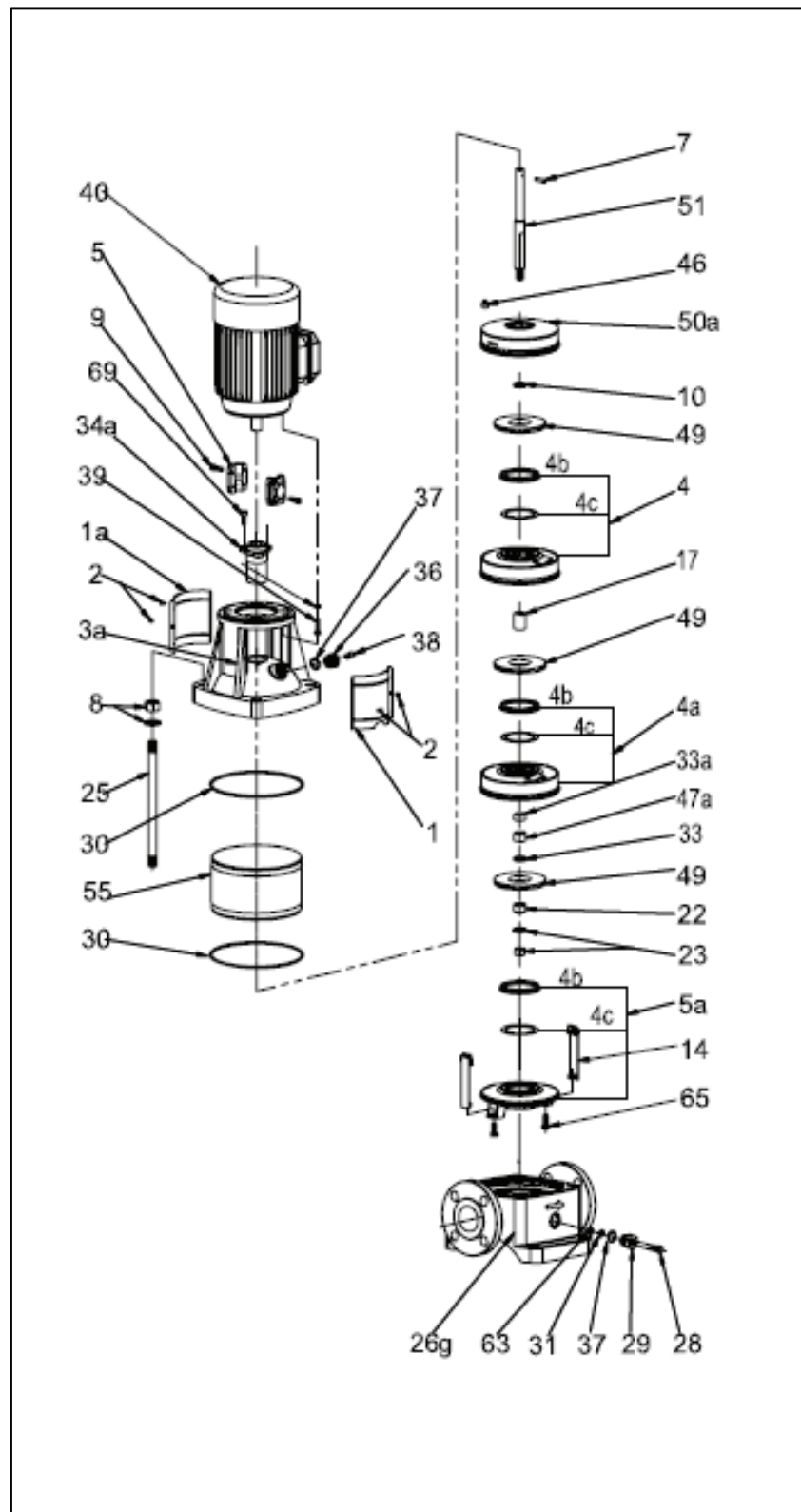


Figure 11: Explosion diagram of the VKI 8 and 16 centrifugal pumps with fixed flange



Item	Designation	Item	Designation
1	Coupling guard	30	O-ring
1a	Coupling guard without collar	31	O-ring
2	M4 screw (8x)	33	Impeller sleeve
3a	Pump head	33a	Impeller sleeve
4	Diffuser	34a	Mechanical seal
4a	Diffuser centering	36	Vent nut
4b	Retaining ring	37	O-ring
4c	Ring with neck	38	Vent plug
5	Coupling	39	Nut and washer
5a	Inductor	40	Motor
7	Shaft wearing sleeve	46	Rubber compensation ring
8	M12 nut and washer	47a	Anti-friction bearing
9	Cap nut	49	Impeller
10	Cover circlip	50a	Top diffuser
22	Cover for first impeller	51	Shaft
23	M8 nut and washer	55	Cylinder
25	Pin	63	O-ring holder
26g	Inlet and outlet flange	65	M8 screw (20x)
28	Drainage screw	69	Screw
29	Drainage nut		

Table 16: Parts list for the VKI 8 and 16 centrifugal pumps with fixed flange

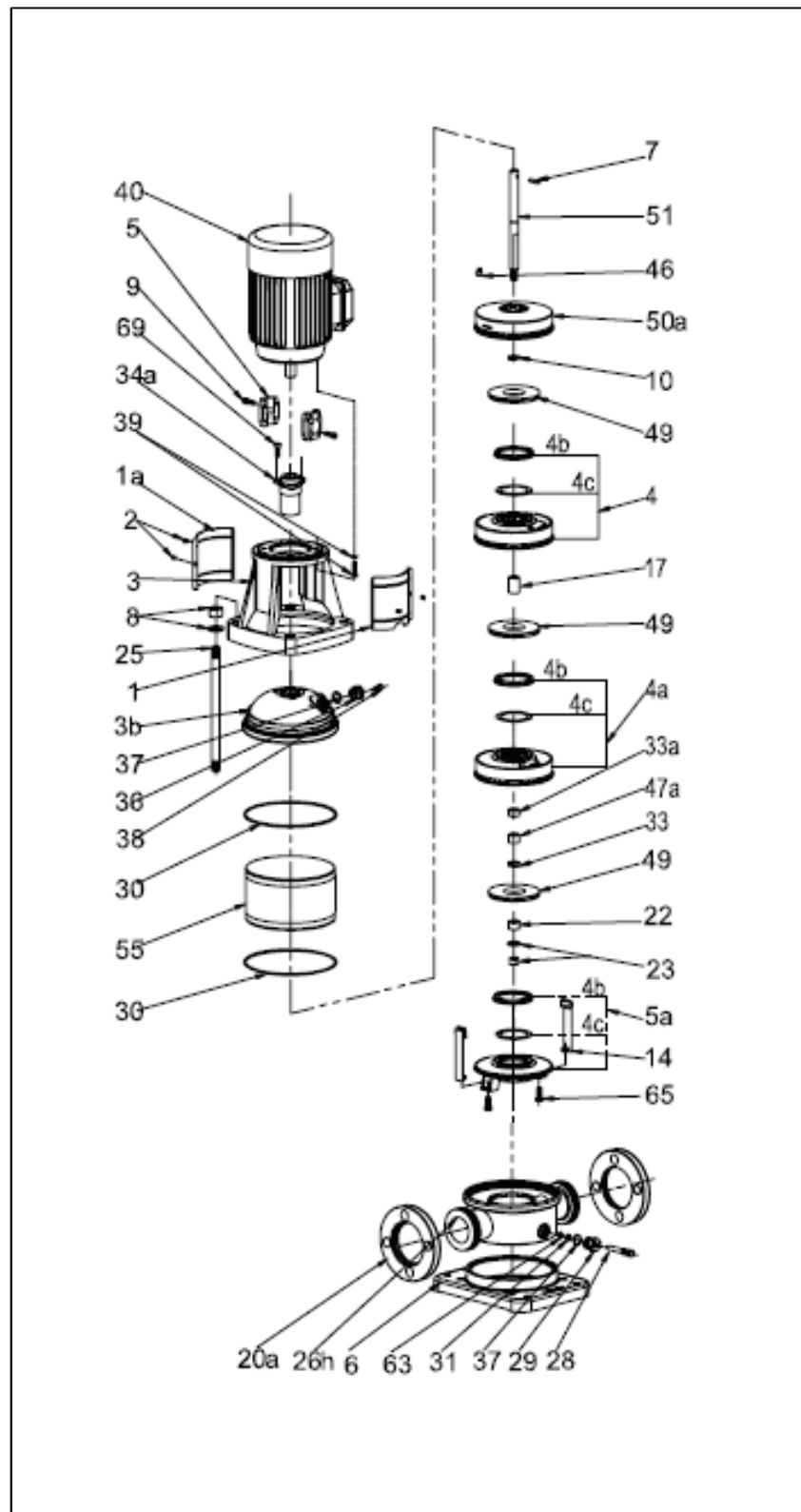


Figure 12: Explosion diagram of the VKI 8 C and 16 C centrifugal pumps with loose flange

Item	Designation	Item	Designation
1	Coupling guard	26h	Inlet and outlet flange
1a	Coupling guard without collar	28	Drainage screw
2	M4 screw (8x)	29	Drainage nut
3	Pump head	30	O-ring
3b	Centering	31	O-ring
4	Diffuser	33	Impeller sleeve
4a	Diffuser centering	33a	Impeller sleeve
4b	Retaining ring	34a	Mechanical seal
4c	Ring with neck	36	Vent nut
5	Coupling	37	O-ring
5a	Inductor	38	Vent plug
6	Pump base	39	Nut and washer
7	Shaft wearing sleeve	40	Motor
8	M12 nut and washer	46	Rubber compensation ring
9	Cap nut	47a	Anti-friction bearing
10	Cover circlip	49	Impeller
14	Bar	50a	Top diffuser
17	Impeller sleeve	51	Shaft
20a	Flange	55	Cylinder
22	Cover for first impeller	63	O-ring holder
23	M8 nut and washer	65	M8 screw (20x)
25	Pin	69	Screw

Table 17: Parts list for the VKI 8 C and 16 C centrifugal pumps with loose flange

### 9.3 Declaration of Conformity as per EG-Richtlinie 2006/42/EG, Annex IIA

We hereby declare under our sole responsibility as manufacturer that the following machine series of the type, as well as the configurations distributed by us, conform to the relevant specifications of the **EG-Maschinenrichtlinie 2006/42/EG**.

Designation: **VKI 4 / 8 / 16**

Pump number: 172000 - 210000

The machine also corresponds with the following directives published in the Official Journal of the European Union:

- Niederspannungsrichtlinie (2014/35/EU)
- EMV-Richtlinie (2014/30/EU)
- Ökodesignrichtlinie (2009/125/EG)

This declaration shall cease to be valid in the event of any modifications to the machine and/or its protective mechanisms not agreed with us and approved in writing.

Applied harmonized standards and their references in the Official Journal of the European Union:

- DIN EN 809 : 2012
- DIN EN ISO 12100 : 2011
- DIN EN ISO 13732 : 2008
- DIN EN ISO 13849-1 : 2008
- DIN EN ISO 13857-1 : 2008
- DIN EN 60034 : 2007
- DIN EN 60204-1 : 2009
- DIN EN 55024 : 2011

Authorized representative for the composition of technical documentation for OSNA-Pumpen GmbH:

Mr. Rik Arensmann  
Brückenstrasse 3  
49090 Osnabrück, Germany

Osnabrück, 12.01.2017



Rik Arensmann  
Technical Director/QM Officer

## 9.4 Clearance Certificate

*Please copy and send with the pump.*

### Clearance Certificate

Legal provisions oblige all businesses to protect their employees, other persons and the environment from damaging effects when handling hazardous substances. Products and their components may therefore only be repaired or inspected when the following declaration has been fully and correctly filled out and signed by an authorized and qualified specialist. Please provide the necessary information should safety measures on the part of the system owner still be required despite complete draining and cleaning. This clearance certificate is part of the repair or inspection order.

We hereby assure that the enclosed device

Type: \_\_\_\_\_

Serial no.: \_\_\_\_\_

is free of substances that are hazardous to health. No special safety measures are required for further handling. The device was fully drained and thoroughly cleaned inside and outside before dispatch.

Company/institute: \_\_\_\_\_

Address: \_\_\_\_\_

Town/city, ZIP code: \_\_\_\_\_

Phone: \_\_\_\_\_

Name: \_\_\_\_\_

Position: \_\_\_\_\_

Date: \_\_\_\_\_

Signature, company stamp: \_\_\_\_\_







**PUMPS  
SYSTEMS  
WATER TREATMENT  
ENGINEERING  
SERVICES**

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