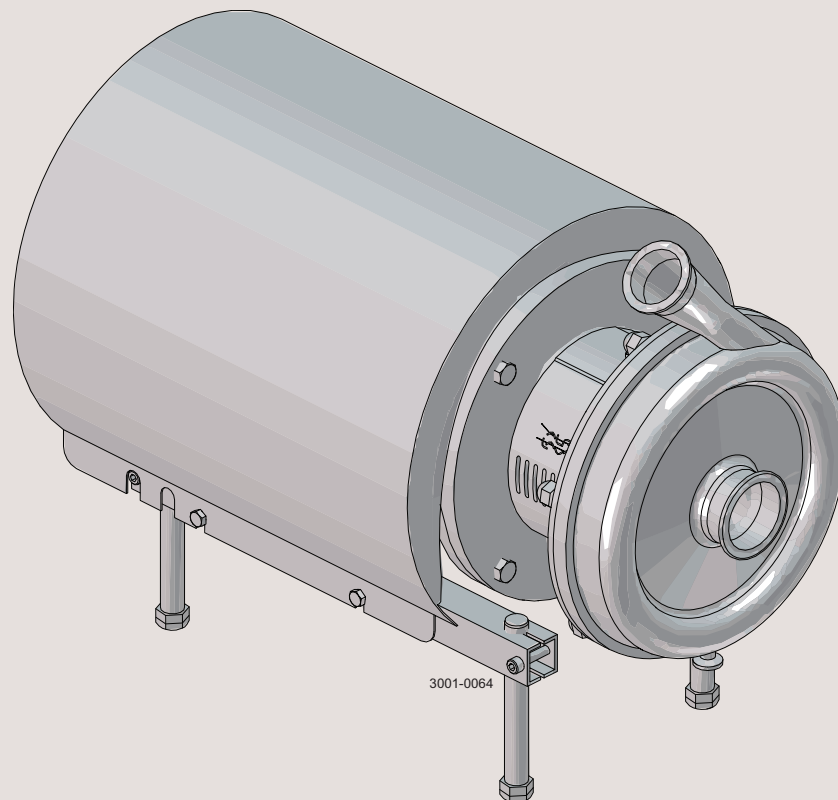




# Instruction Manual

## LKHex UltraPure Centrifugal Pump



100000157-EN2

2018-04

Original manual



The information herein is correct at the time of issue but may be subject to change without prior notice

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# 1 EU Declaration of Conformity

Alfa Laval certificate no.: 9612-9609-01 X

This declaration of conformity is issued under sole responsibility of the manufacturer:

Alfa Laval Kolding A/S  
Company Name

Albuen 31, 6000 Kolding,  
Denmark  
Address

+45 79 32 22 00  
Phone No.

Equipment covered by this declaration of conformity:

Pump  
Designation


LKHex UP-10, LKHex UP-20, LKHex UP-25, LKHex UP-35, LKHex UP-40, LKHex UP-45, LKHex UP-60, LKHex UP-70  
Type


From serial number 212.000 to 1.000.000


is in conformity with the requirements of the following directives:  
2006/42/EC Machinery Directive  
2014/34/EU Equipment Explosive Atmospheres (ATEX)

Pump Marking Options:

For specific marking see pump name plate and refer to "Special Conditions for Safe Use" in instruction manual.

 II 2 G  
Ex h IIB T4 Gb Ta -20C to +35C

 II 2 G  
Ex h IIB T4 Gb

 II 2 G  
Ex h IIB T3 Gb

For ATEX directive 2014/34/EU the following harmonized standards EN 80079-36:2016 and EN 80079-37:2016 for none electrical equipment have been applied.

ATEX directive 2014/34/EU conformity for the motor is covered by the relevant EU Type examination certificate and declaration supplied by the manufacturer.

The Pump Technical file is stored with: Teknologisk Institut, Kongsvang Allé 29, 8000 Aarhus C, Denmark


Notified Body no.: 0396

Archive no.: 2018-1-0276A

The person authorized to compile the technical file is the signer of this document

Global Product Quality Manager  
Pumps, Valves, Fittings and Tank Equipment  
Title  
Alfa Laval Kolding, Albuen 31, DK 6000 Kolding  
Place

Lars Kruse Andersen  
Name  
2018-02-05  
Date

  
Signature



## 1.1 ATEX Directive 2014/34/EU

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### ATEX Directive 2014/34/EU

The ATEX Directive 2014/34/EU covers equipment and protective systems that will be used in areas endangered by potentially explosive atmospheres created by the presence of flammable gases, vapours and dusts. Centrifugal pumps supplied with an ATEX symbol are classified for use in potentially explosive atmospheres under ATEX Directive 2014/34/EU Group II, Categories 2 and 3.

Technical File Ref: **LKHex UltraPure - Document reference no. 9612-9609-01.**

Equipment Group and Category: **Group II category 2 G (zone 1)**

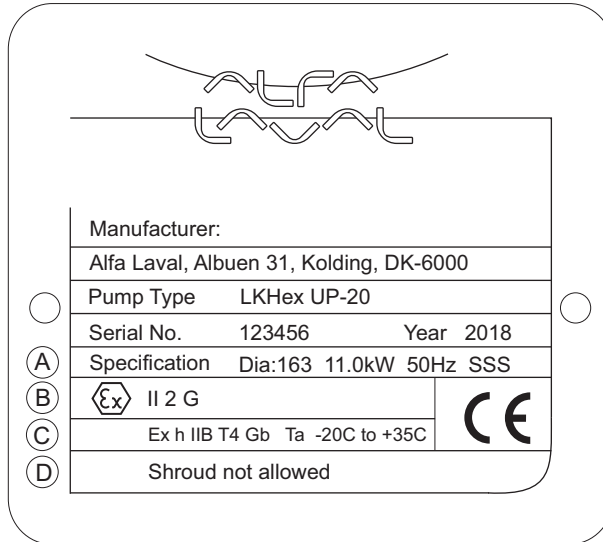
Standards used: **EN 80079-36:2016, EN 80079-37:2016**

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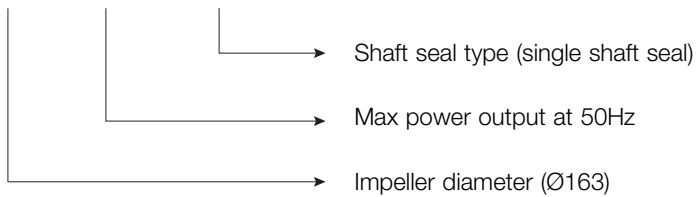
# 1 EU Declaration of Conformity

## 1.2 ATEX Marking

Name plate example:



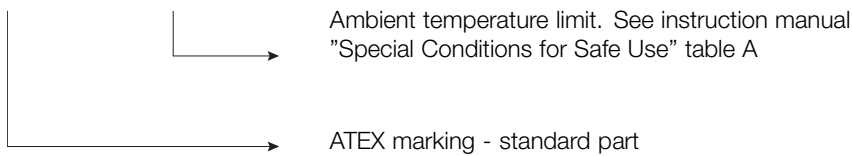
(A) 163 11.0kW 50Hz SSS



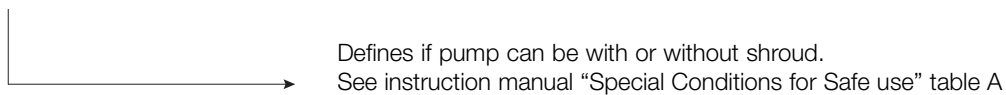
(B) II 2 G



(C) Ex h IIB T4 Gb Ta -20C to +35C

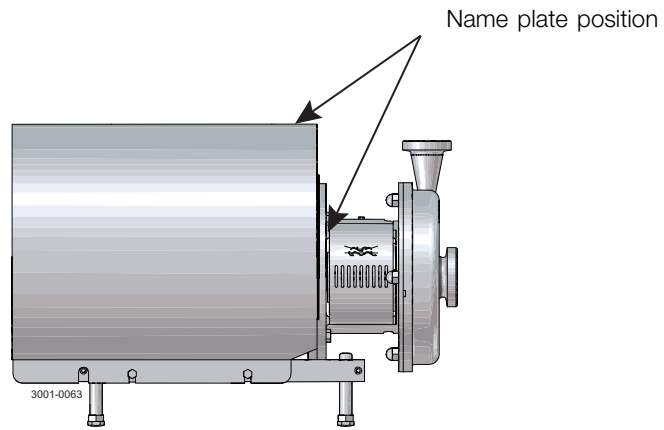


(D) Shroud not allowed



# 1 EU Declaration of Conformity

---



See marking options in chapter 2.3 Special conditions for safe use , table A.

---

## 2 Safety

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*Unsafe practices and other important information are emphasised in this manual.  
Warnings are emphasised by means of special signs.  
Always read the manual before using the pump!*

---

### 2.1 Important information

---

#### **WARNING**

Indicates that special procedures must be followed to avoid serious personal injury.

#### **CAUTION**

Indicates that special procedures must be followed to avoid damage to the pump.

#### **NOTE**

Indicates important information to simplify or clarify procedures.

---

### 2.2 Warning signs

---

General warning:



Dangerous electrical voltage:



Caustic agents:





All warnings in the manual are summarised in this section.

Pay special attention to the instructions below so that severe personal injury and/or damage to the pump are avoided.

### 2.3 Special conditions for safe use

#### General warnings.

**Always** read chapter 4.2 Operating conditions.

**Never** run the pump with neither the suction side nor the pressure side blocked.

**Always** ensure that the pump is liquid filled when operating, unless a doubled mechanical seal is fitted (See table C).

**Always** ensure that the pump is liquid filled if the process media is flammable.

**Never** mount shroud on the pump if the name plate states "shroud not allowed".

**Always** stop the pump if




- operating outside the given limits of the process media temperature or flow rate (See table A and B).
- operating outside the given limits of the flush media temperature or flow rate (See table C).
- **Note** it must be ensured that the flow and temperature limits for the process media or flush media are maintained when the pump is operating. If this cannot be ensured in any other way, the flow and temperature should be continuously monitored.

**Note** In case of seal failure, leakage may occur. If this can lead to hazardous situations, the risk must be evaluated and necessary precautions must be taken. (See chapter 6.2 Technical information and description of mechanical shaft seals).

**Note** the motor is a separate certified ATEX product and covered by EU-type examination certificate and must be handled according to the specifications in the motor instruction manual.

#### Safety critical limitations for specific ATEX markings.

Table A

Pump marking options	Ambient temperature	Critical temperature range of process media
 II 2 G Ex h IIB T4 Gb Ta -20C to +35C	-20°C to +35°C (Shroud allowed) *3	-10°C to 100°C *1&2
 II 2 G Ex h IIB T4 Gb	-20°C to +40°C (Shroud NOT allowed)	
 II 2 G Ex h IIB T3 Gb	-20°C to +40°C (Shroud allowed)	-10°C to 140°C *1&2

\*1 See table B for position of temperature sensor and min. flow rates.

\*2 "b1" ignition control is used, see details in section below "b1 control system requirements".

\*3 For pumps with temperature class T4 and with 18,5kW motors or larger, shroud is not allowed (independent of ambient temperature).

**Note** For T4 applications the pump casing and seal housing can be sterilized to max 125°C when the pump is NOT operating.

**Note** Ensure that the chosen elastomer is compatible with the process media and the media temperature (see chapter 4.2 for more information).

**Note** The LKHex UltraPure can only be marked for category 2G but can be used for 3G applications also.

## 2 Safety

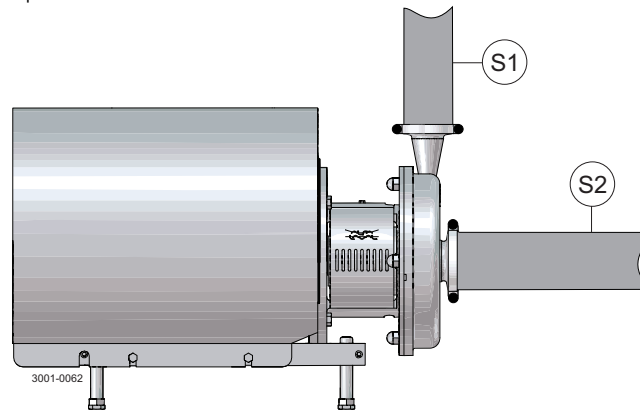
All warnings in the manual are summarised in this section.

Pay special attention to the instructions below so that severe personal injury and/or damage to the pump are avoided.

### Requirements for measurements on the process media

There are two principles of temperature measurements of the process media:

- A. Temperature is measured on the pump outlet side (S1). No equipment with cooling effect on the process media is allowed between pump and sensor.
- B. Temperature is measured somewhere on the pump inlet side (S2). No heat generating equipment is allowed between the temperature sensor and the pump.



**Table B** Measurements on process media

Temperature sensor position	Model	Min. flow [m <sup>3</sup> /h]	Max. distance to outlet [m]
S1 (outlet side)	LKHex UP 10-70	0,5	0,5
	LKHex UP 10-60	1	10
	LKHex UP 70	5	10
S2 (inlet side)	LKHex UP 10-60	1	Anywhere on inlet side
	LKHex UP 70	5	

### Requirements for measurements on the flush media (double mechanical shaft seal)

**Table C** Flush media limitations

Max. temperature	100°C
Min. flow rate	30 l/h
Max. pressure	5 bar

**Note:** Flush media temperature must be measured no more than 2m away from the flush housing outlet.

Pumps mounted with double mechanical shaft seals can operate without the pump casing being liquid filled at all times since the seal faces are lubricated and cooled by the flush media.

*All warnings in the manual are summarised in this section.*

*Pay special attention to the instructions below so that severe personal injury and/or damage to the pump are avoided.*

---

### **"b1" control system requirements**

Measurement system shall be chosen according to EN-ISO 80079-37.

**Always** test and validate the control system before production start-up.

The ignition protection system performance requirements:

#### **Temperatures:**

- +/-2°C
- 30s reaction time

#### **Flow:**

- +/- 10%
- 30s reaction time

The demand for the ignition protection system b1 must be according to ISO 13849-1 PL c cat. 2 or IEC 61508 SIL 1 and must be calibrated and functionally tested on a yearly basis.

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## 2 Safety

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### 2.4 Safety precautions

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#### General considerations

To prevent hazardous reactions between the processed fluid and the materials of construction, the materials of construction must be suitable for the application.

The auxiliary equipment chosen for the application must be suitable. |

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#### Education

Personnel installing, operating or carrying out maintenance on the pump or any sub-component must have the necessary knowledge about the LKHex UltraPure pump range. Necessary knowledge includes the understanding of:

- Function of the pump, motor and shaft seal.
  - Maintenance/service of the pump unit, motor and shaft seal.
  - Operational limits for the LKHex UltraPure pump range.
  - Safety instructions.
- 

#### Installation

**Always** read chapter 3 regarding installation carefully before installing the pump unit.

**Always** ensure that the pump unit is suitable for the application and will stay within the specifications in chapter 4.2

Operating conditions during normal operation.

**Always** read the technical data thoroughly. (See chapter 6 Technical data.)

**Always** use a lifting crane when handling the pump.

**Always** design the process system in a way so pressure shocks or over pressure is avoided.



#### Pump with Impeller screw:

**Never** start in the wrong direction of rotation with liquid in the pump.

**Always** have the pump electrically connected by authorised personnel. (See the motor instruction)

**Never** start the pump if the impeller is fitted and the pump casing is removed.



#### Operation

**Always** read the chapter 4 Operation before the pump is started.

**Always** ensure that the pump is operated within the specifications given in chapter 4.2 Operating conditions.

**Never** touch the pump or the pipelines when pumping hot liquids or when sterilising.

**Never** run the pump with both the suction side and the pressure side blocked.

**Never** run the pump when partially installed or not completely assembled.

**Necessary** precautions must be taken if leakage occurs as this can lead to hazardous situations.



**Always** handle lye and acid with great care.

**Never** use the pump for products not mentioned in the Alfa Laval pump selection program.

**Never** restart the pump automatically after a system lockout. At restart, it must be ensured that the pump is running within the specifications given in chapter 4.2 Operating conditions.



The Alfa Laval pump selection program can be acquired from your local Alfa Laval sales company.

---

### Maintenance

**Always** read the chapter 5 Maintenance before servicing the pump.

**Always** make sure that the specifications in chapter 4 Operation are met before the pump is put back into operation.

**Always** refer to the pump serial no. on the name plate when ordering spare parts to ensure correct spares.

**Always** read the technical data thoroughly. (See chapter 6 Technical data)

**Never** service the pump when it is hot.

**Never** service the pump if pressurised.

**Always** check for any abnormal sounds or running behaviors when starting up the pump after maintenance.

**Always** use Alfa Laval genuine spare parts.



### Motors with grease nipples:

**Always** re-lubricate the motor according to the intervals specified on the motor name plate, see also 6 Technical data for relubrication intervals.

**Always** disconnect the power supply when servicing the pump.



### Transportation

#### Transportation of the pump or the pump unit:

**Never** lift or elevate in any way other than described in this manual

**Always** drain the pump head and accessories of any liquid

**Always** ensure that no leakage of lubricants can occur

**Always** transport the pump in its upright position

**Always** ensure that the unit is securely fixed during transportation

**Always** use original packaging or similar during transportation

## 3 Installation

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### 3.1 Unpacking/delivery

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#### Step 1



Always use a lifting crane when handling the pump (see 6 Technical data).

#### CAUTION

Alfa Laval cannot be held responsible for incorrect unpacking.

#### WARNING

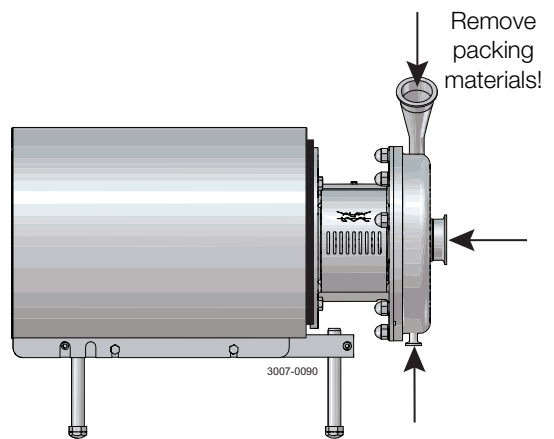
Be aware that certain pump configurations can tilt, and therefore cause injuries to feet or fingers. The pump should be supported underneath the adaptor, when not installed in the process line.

#### Check the delivery for:

1. Complete pump.
2. Delivery note.
3. Motor instructions.
4. Instructions for flushing set, IF ORDERED!

#### Step 2

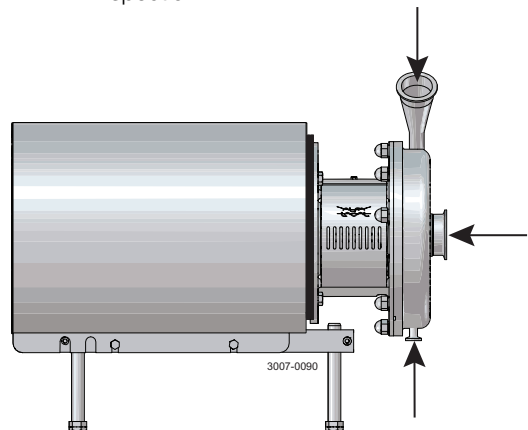
Remove any packing materials from the inlet and the outlet.  
Avoid damaging the inlet and the outlet.  
Avoid damaging the connections for flushing liquid, if supplied.



#### Step 3

Inspect the pump for visible transport damage.

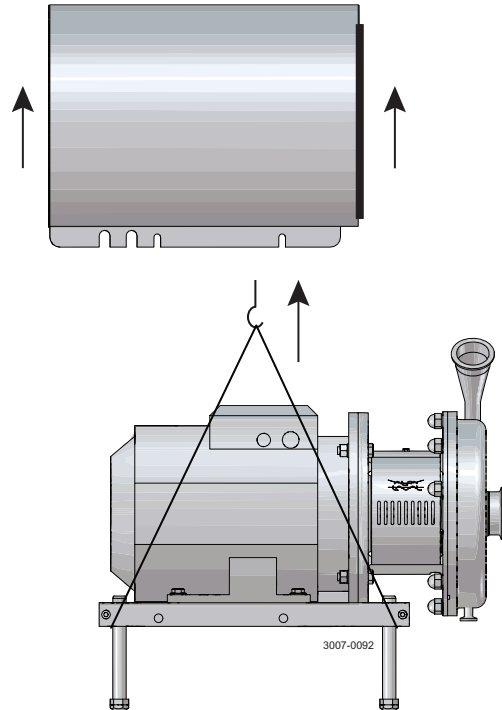
Inspection!



#### Step 4

Always remove the shroud, if fitted, before lifting the pump.

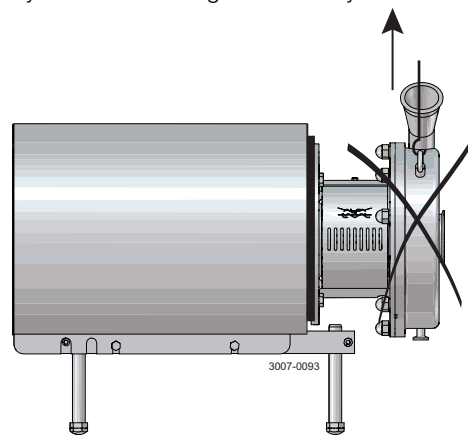
Remove the shroud before lifting!



#### Step 5

ONLY LKH UltraPure-60 and LKH UltraPure-70

Do **NOT** use eyebolt in casing to lift the pump. The eyebolt is for casing removal only.



## 3 Installation

Read the instructions carefully and pay special attention to the warnings! Always check the pump before operation.  
- See pre-use check in section 3.3 Pre-use check. The large pump sizes are very heavy. Alfa Laval therefore recommends the use of a lifting crane when handling the pump.

### 3.2 Installation

#### Step 1



**Always** read the technical data thoroughly. (See chapter 6 Technical data)

**Always** use a lifting crane when handling the pump.

**Always** check the nameplate and make sure that the pump is labelled according to the particular application where it is going to be used.

**Always** ensure that an ATEX-compliant protection system is installed, in order to prevent the pump from operating under abnormal conditions. The system must comply with EN ISO 80079-37:2016 or similar standards.

**Always** use ATEX-compliant installation material.



**Always** have the pump electrically connected by authorised personnel. (see the motor instructions).

#### CAUTION

Alfa Laval cannot be held responsible for incorrect installation.

#### WARNING

Alfa Laval recommends the installation of lockable repair breaker. If the repair breaker is to be used as an emergency stop, the colours of the repair breaker must be red and yellow.

#### CAUTION

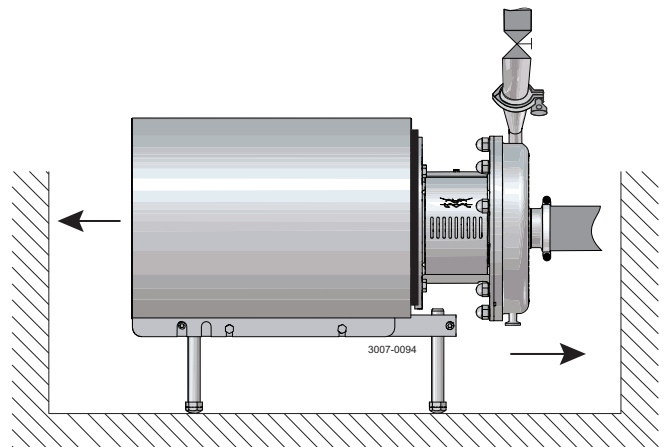
The pump does not prevent back flow when intentionally or unintentionally stopped. If back flow can cause any hazardous situations precautions must be taken e.g. check valve to be installed in the system to prevent the problem described above.

#### Note

The 3A standard requires minimum clearance between the lowest part of the base, pump, motor or drive and for the floor to be no less than 4 inch. (100mm)

#### Step 2

Ensure at least 0.5m (1.6 ft) clearance around the pump.





### 3 Installation

Read the instructions carefully and pay special attention to the warnings! Always check the pump before operation.

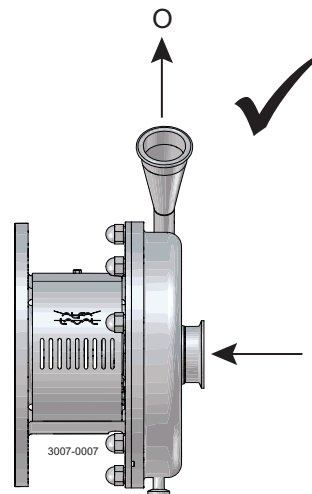
- See pre-use check in section 3.3 Pre-use check. The large pump sizes are very heavy. Alfa Laval therefore recommends the use of a lifting crane when handling the pump.

#### Step 3

Check that the flow direction is correct.

O: Outlet

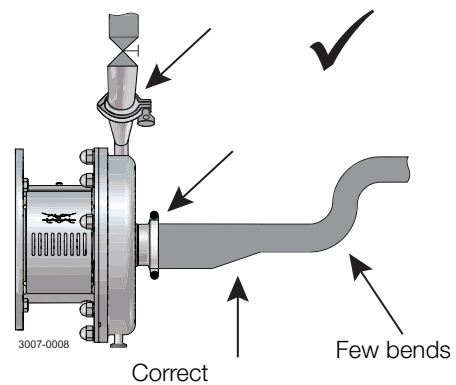
I: Inlet



#### Step 4

1. Ensure that the pipelines are routed correctly.
2. Ensure that the connections are tight.

Remember seal rings!

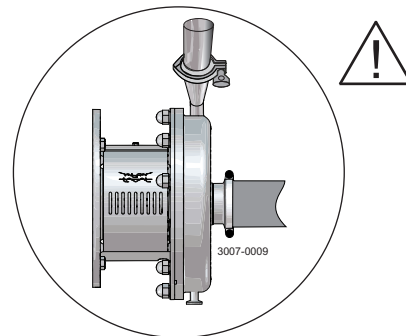


#### Step 5

Avoid stress on the pump.

Pay special attention to:

- Vibrations.
- Thermal expansion of the tubes.
- Excessive welding.
- Overloading of the pipelines.
- Piping system must be self-supported.



#### Note

In the event of leakage at the shaft seal, the medium will drip from the slot into the bottom of the adapter. In the instance, Alfa Laval recommends placing a drip tray underneath the slot to collect the liquid.

### 3 Installation

---

Read the instructions carefully and pay special attention to the warnings!

LKH UltraPure is not supplied with an impeller screw as standard but can be supplied with one.

Check the direction of rotation of the impeller before operation.

- See the indication label on the pump.

---

#### 3.3 Pre-use check

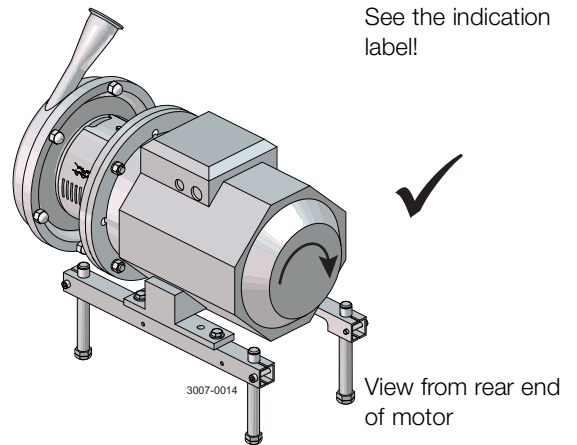
---

##### Step 1



**Never** start in the wrong direction of rotation with liquid in the pump.

1. Start and stop the motor momentarily.
2. Ensure that the direction of rotation of the motor fan is **clockwise** as viewed from the rear end of the motor.



### 3.4 Recycling information

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- **Unpacking**

- Packing material consists of wood, plastics, cardboard boxes and in some cases metal straps.
- Wood and cardboard boxes can be reused, recycled or used for energy recovery.
- Plastics should be recycled or burnt at a licensed waste incineration plant.
- Metal straps should be sent for material recycling.

- **Maintenance**

- During maintenance, oil and wear parts in the machine are replaced.
- All metal parts should be sent for material recycling.
- Worn out or defective electronic parts should be sent to a licensed handler for material recycling.
- Oil and all non-metal wear parts must be taken care of in accordance with local regulations.

- **Scrapping**

- At end of use, the equipment must be recycled according to relevant, local regulations. Beside the equipment itself, any hazardous residues from the process liquid must be considered and dealt with in a proper manner. When in doubt, or in the absence of local regulations, please contact your local Alfa Laval sales company.
-

## 4 Operation

---

*Read the instructions carefully and pay special attention to the warnings!*

---

### 4.1 Important check and monitoring during operation

---

#### Daily checks

- Shaft seal (SSS and DMS)  
If leakage from the shaft seal can lead to dangerous situations, daily visual inspection for leakage is recommended.
- If leakage is detected the risk should be evaluated and maintenance of the seal should be planned accordingly.

#### Other checks

##### Motor

- The bearing life is heavily dependent on the operating condition of the pump i.e. pressure, ambient temperature, motor load and pressure variations.
- The motor should be serviced according to the guidelines in the motor instruction manual
- The motor should be relubricated with the intervals given in chapter 6.6 "Relubrication intervals".

In order to detect motor bearing failure, the condition of the bearings must be monitored regularly.

It is recommended that the condition of the bearings is checked every 2000 hours of operation.

The condition of the bearings can be monitored in several ways eg. by means of vibration analysis (shock pulse measurements).

After checking the bearing condition, it must be evaluated if it is OK to continue or else maintenance of the bearings must be planned accordingly.

---

Read the instructions carefully and pay special attention to the warnings!

## 4.2 Operating conditions

<b>General:</b>			
Maximum ambient temperature:		-10°C to +35°C for T4, motor with shroud -10°C to +40°C for T4, motor without shroud -10°C to +40°C for T3	
Maximum pump speed:		3600 rpm	
Only Exd and Exde motors are designed to run with a variable speed drive (VDF). If VFD is used, the motor should be oversized by 10 % with regards to power output.			
<b>Pump unit:</b>			
Maximum inlet pressure	LKHex UltraPure 10-70, 50/60 Hz	500 kPa	(5 bar) (72 psi)
<b>Maximum product media temperature during normal operation for specific elastomers</b>			
	<b>Type of elastomer</b>	<b>Temperature class T4</b>	<b>Temperature class T3</b>
	EPDM	100°C / 212°F	130°C / 266°F
	FPM	100°C / 212°F	140°C / 284°F
	FEP encapsulated	100°C / 212°F	140°C / 284°F
Minimum product temperature:		-10°C / 14°F	
Maximum product viscosity:		800 cP	
<b>Shaft seal:</b>			
Always read chapter 6 Technical data and ensure understanding of mechanical seal working principle			
<b>Single shaft seal (SSS)</b>			
- The SSS is lubricated and cooled by the processed media. It is therefore important to pay special attention to the operating limits of the pump unit.			
<b>Double mechanical shaft seal (DMS)</b>			
The DMS is lubricated by the product media and/or the flush media and the buffer or barrier flushing principle can be used			
		<b>Minimum pressure of buffer/barrier fluid</b>	<b>Maximum pressure of buffer/barrier fluid</b>
	Buffer fluid*	> 0 bar / psi	5 bar / 72.5 psi**
	Barrier fluid*	Pump inlet pressure plus 1 bar / 14.5 psi	5 bar / 72.5 psi
* Description of the two systems can be found in chapter 6 Technical data			
** Pressure must be lower than the pump inlet pressure.			
If the viscosity of the processed media is less than 1 cP when using silicon carbide vs. silicon carbide, ONLY barrier fluid is applicable.			
Minimum flow rate of buffer/barrier fluid:		30 l/h (8 gal/h)	
Minimum temperature of buffer/barrier fluid:		-10°C / 14°F	
Maximum temperature of buffer/barrier fluid:		70°C (158°F) during operation ***	
*** When the pump is not in operation the flush system can be sterilized up to 125°C (260°F)			
For ATEX applications the pump should be stopped if the flush temperature measured at the outlet of the seal housing reaches 100°C (212°F)			

## 4 Operation

Read the instructions carefully and pay special attention to the warnings!

### 4.3 Operation/control

#### Step 1



**Always** read the technical data thoroughly. See chapter 6 Technical data

#### CAUTION

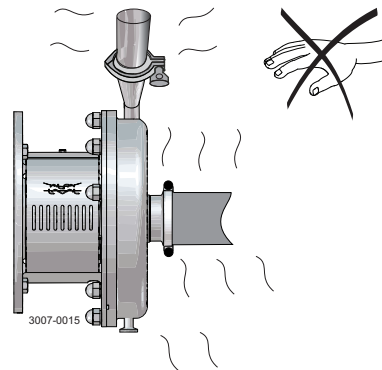
Alfa Laval cannot be held responsible for incorrect operation/control.

#### Step 2



**Never** touch the pump or the pipelines when pumping hot liquids or when sterilising.

Danger of burns!

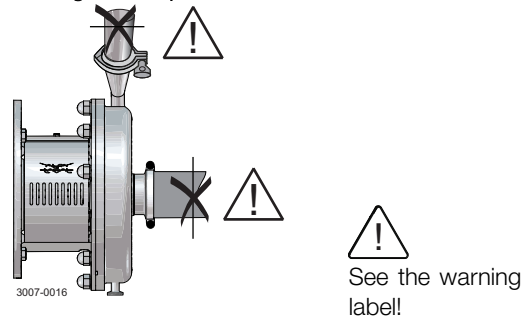


#### Step 3



**Never** run the pump with both the suction side and the pressure side blocked.

Danger of explosion!



#### Step 4

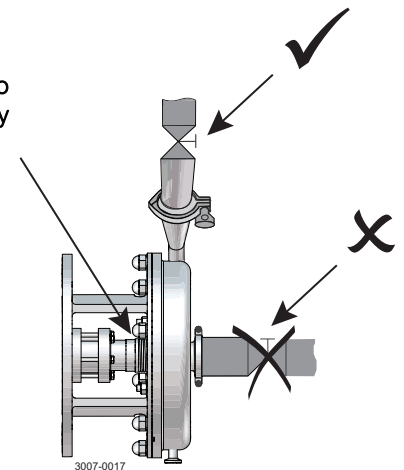
#### CAUTION

The shaft seal must not run dry.

#### CAUTION

**Never** throttle the inlet side.

Do not allow to run dry



Read the instructions carefully and pay special attention to the warnings!

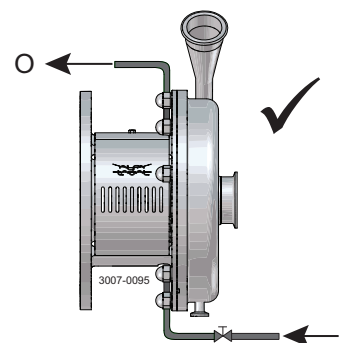
### Step 5

#### Double mechanical shaft seal:

1. Connect the inlet of the flushing liquid correctly. (R1/8" BSP)
2. Read instructions for pressure, temperature and flow limitations, in 4.2 Operating conditions.
3. Regulate the water supply correctly.

O: Outlet

I: Inlet

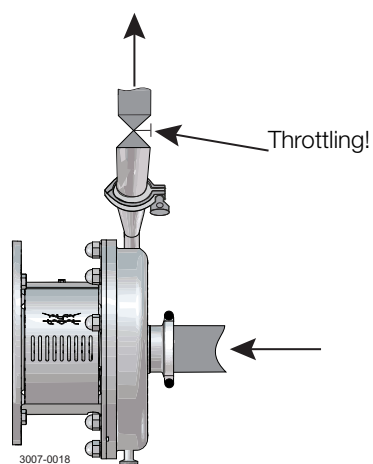


### Step 6

#### Control:

Reduce the capacity and the power consumption by means of:

- Throttling the pressure side of the pump.
- Reducing the impeller diameter.
- Reducing the speed of the motor.



## 4 Operation

*Pay attention to possible faults.  
Study the instructions carefully.*

### 4.4 Trouble shooting

#### NOTE!

Study the maintenance instructions carefully before replacing worn parts.

Problem	Cause/result	Remedy
Overloaded motor	<ul style="list-style-type: none"><li>- Pumping of viscous liquids</li><li>- Pumping of high density liquids</li><li>- Low outlet pressure (counter pressure)</li><li>- Lamination of precipitates from the liquid</li></ul>	<ul style="list-style-type: none"><li>- Larger motor or smaller impeller</li><li>- Higher counter pressure (throttling)</li><li>- Frequent cleaning</li></ul>
Cavitation: <ul style="list-style-type: none"><li>- Damage</li><li>- Pressure reduction (sometimes to zero)</li><li>- Increasing of the noise level</li></ul>	<ul style="list-style-type: none"><li>- Low inlet pressure</li><li>- High liquid temperature</li></ul>	<ul style="list-style-type: none"><li>- Increase the inlet pressure</li><li>- Reduce the liquid temperature</li><li>- Reduce the pressure drop before the pump</li><li>- Reduce speed</li></ul>
Leaking shaft seal	<ul style="list-style-type: none"><li>- Dry run</li><li>- Incorrect rubber grade</li><li>- Abrasive particles in the liquid</li></ul>	Replace: All wearing parts  If necessary: <ul style="list-style-type: none"><li>- Change rubber grade</li><li>- Select stationary and rotating seal ring in silicon carbide/silicon carbide</li></ul>
Leaking O-ring seals	Incorrect rubber grade	Change rubber grade



The pump is designed for cleaning in place (CIP). CIP = Cleaning In Place.  
Study the instructions carefully and pay special attention to the warnings!  
NaOH = Caustic soda.  
HNO<sub>3</sub> = Nitric acid.

### 4.5 Recommended cleaning

#### Step 1



**Always** handle lye and acid with great care.

**Caustic danger!**



Always use rubber gloves!



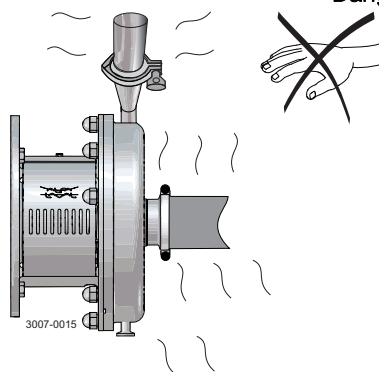
Always use protective goggles!

#### Step 2



**Never** touch the pump or the pipelines when sterilising.

**Danger of burns!**



#### Step 3

**Examples of cleaning agents:** Use clean water, free from chlorides.

1. 1% by weight NaOH at 70°C (158°F).

1 kg (2.2 lb) NaOH	+	100 l (26.4 gal) water	= Cleaning agent.
-----------------------	---	---------------------------	-------------------

2.2 l (0.6 gal) 33% NaOH	+	100 l (26.4 gal) water	= Cleaning agent.
-----------------------------	---	---------------------------	-------------------

2. 0.5% by weight HNO<sub>3</sub> at 70°C (158°F).

0.7 l (0.2 gal) 53% HNO <sub>3</sub>	+	100 l (26.4 gal) water	= Cleaning agent.
---	---	---------------------------	-------------------

1. Avoid excessive concentration of the cleaning agent  
=> Dose gradually!
2. Adjust the cleaning flow to the process.  
Sterilisation of milk/viscous liquids  
=> Increase the cleaning flow!

#### Step 4



**Always** rinse well with clean water after using a cleaning agent.

**Always rinse!**



Water      Cleaning agent

#### NOTE

The cleaning agents must be stored/disposed of in accordance with current regulations/directives.

#### NOTE

If pumps are sterilised using steam, standard 3A requires the process system to be designed to automatically shut down if the product pressure in the system becomes less than of the atmosphere and it cannot be started until the system is re-sterilised.

## 5 Maintenance

Maintain the pump carefully. Study the instructions carefully and pay special attention to the warnings!  
Always keep spare shaft seals and rubber seals in stock.  
See separate motor instructions.

### 5.1 General maintenance

#### Step 1



**Always** read the technical data thoroughly. (See chapter 6 Technical data)  
**Always** use Alfa Laval genuine spare parts.  
**Always** refer to the pump serial no. on the name plate when ordering spare parts to ensure correct spares.



**Always** disconnect the power supply when servicing the pump.

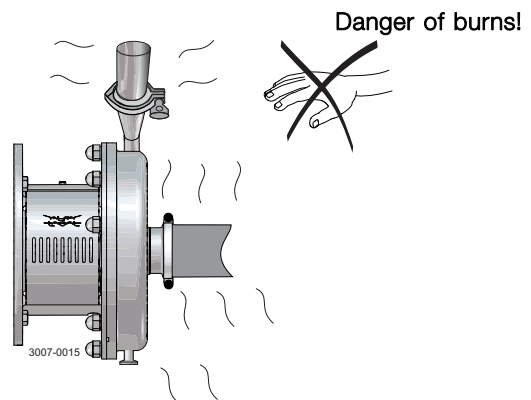
#### NOTE

All scrap must be stored/disposed of in accordance with current rules/directives.

#### Step 2



**Never** service the pump when it is hot.



#### Step 3

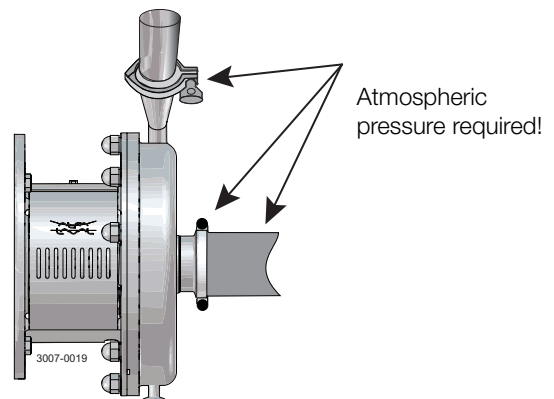


**Never** service the pump with pump and pipelines under pressure.

#### CAUTION

Fit the electrical connections correctly if they have been removed from the motor during service.

**Pay special attention to the warnings!**



#### Step 4

##### Recommended spare parts:

Order service kits from the service kits list (see chapter ).

##### Ordering spare parts

Contact your local Alfa Laval sales company.

#### Note:

If the pump is supplied with FEP O-rings. Alfa Laval recommends that the casing O-ring is replaced during pump maintenance.

## 5 Maintenance

Maintain the pump carefully. Study the instructions carefully and pay special attention to the warnings!  
 Always keep spare shaft seals and rubber seals in stock.  
 See separate motor instructions.

	Shaft seal	Rubber seals	Motor bearings
Preventive maintenance	<b>Replace after 12 months:</b> (one-shift) Complete shaft seal	Replace when replacing the shaft seal	
Maintenance after leakage (leakage normally starts slowly)	<b>Replace at the end of the day:</b> Complete shaft seal	Replace when replacing the shaft seal	
Planned maintenance	<ul style="list-style-type: none"> <li>- Regular inspection for leakage and smooth operation</li> <li>- Keep a record of the pump</li> <li>- Use the statistics for planning of inspections</li> </ul> <b>Replace after leakage:</b> Complete shaft seal	Replace when replacing the shaft seal	Yearly inspection is recommended <ul style="list-style-type: none"> <li>- Replace complete bearing if worn</li> <li>- Ensure that the bearing is axially locked (See motor instructions)</li> </ul>
Lubrication	<b>Before fitting</b> Lubricate the Quad-/O-rings with silicone grease or silicone oil	<b>Before fitting</b> Silicone grease or silicone oil	See section 6.6 Relubrication intervals

### Pre-use check

#### CAUTION!

Fit the electrical connections correctly if they have been removed from the motor during service. (See 3.3 Pre-use check).

#### Pay special attention to warnings!

1. Start and stop the motor momentarily.
2. Ensure that the pump operates smoothly.

## 5 Maintenance

Read the instructions carefully. The items refer to the parts list and service kits section.

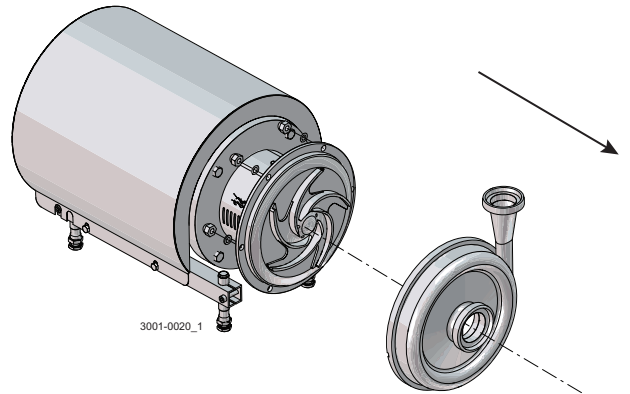
Handle scrap correctly.

\* : Relates to the shaft seal.

### 5.2 Dismantling of pump/shaft seals

#### Step 1

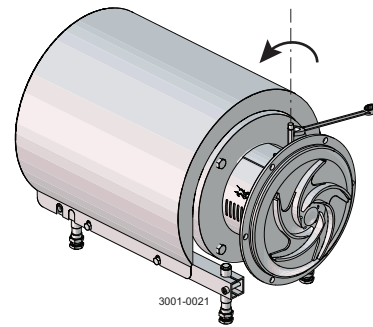
Unscrew cap nuts (24) and remove washers (24a) and pump casing (29).



#### Step 2

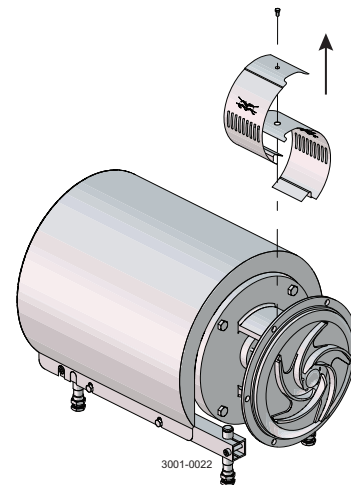
##### Double mechanical shaft seal:

Unscrew tubes (42) using a spanner.



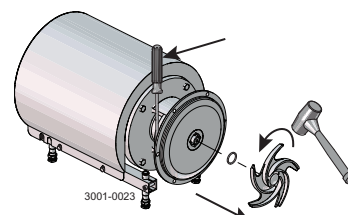
#### Step 3

Remove screw (23) and safety guard (22).



#### Step 4

1. Remove impeller screw (36).
2. Remove impeller (37). If necessary, loosen the impeller by tapping gently on the impeller vanes.
3. Remove the O-ring (38) from the impeller.



Counterhold with a screwdriver!

If necessary!

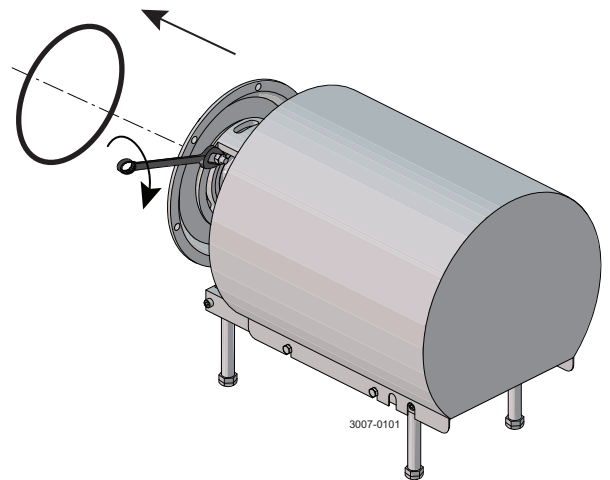
Read the instructions carefully. The items refer to the parts list and service kits section.

Handle scrap correctly.

\* : Relates to the shaft seal.

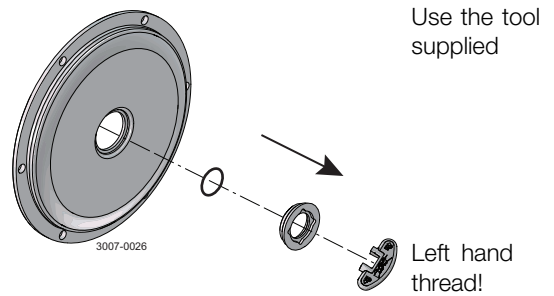
### Step 5

1. Pull off the O-ring (26) from back plate (25).
2. Unscrew nuts (20) and remove washers (21) and the back plate.



### Step 6

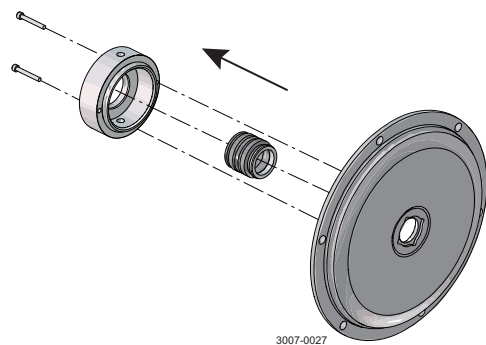
1. Remove the stationary seal ring (11).
2. Remove the O-ring (12) from back plate (25).



### Step 7

#### Double mechanical shaft seal:

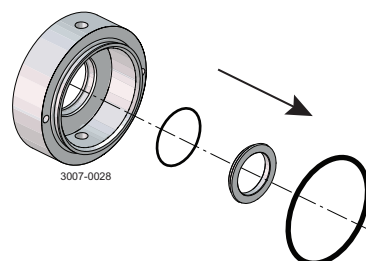
1. Remove screws (41) and seal housing (40a).
2. Remove rotating seal rings (14) and drive ring (52) from spring (13).
3. Remove O-rings (15) from rotating seal rings (14).



### Step 8

#### Double mechanical shaft seal:

1. Remove stationary seal ring (51) from seal housing (40a/40b).
2. Remove O-ring (50) from stationary seal ring (51).
3. Remove O-ring (44) from seal housing (40a/40b).



## 5 Maintenance

---

Read the instructions carefully. The items refer to the parts list and service kits section.

Handle scrap correctly.

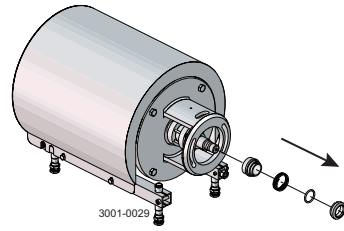
\* : Relates to the shaft seal.

---

### Step 9

#### Single shaft seal:

1. Remove the complete shaft seal from stub shaft (7).
2. Remove spring (13) and rotating seal ring (14) from the drive ring (10).



Read the instructions carefully. The items refer to the parts list and service kits section.  
 Handle scrap correctly.  
 \* : Relates to the shaft seal.

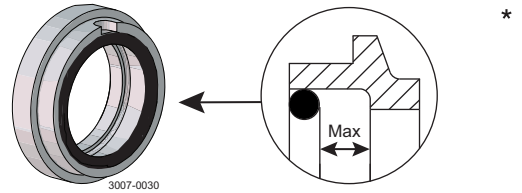
### 5.3 Assembly of pump/single shaft seal

#### Step 1

1. Remove spring (13).

#### NOTE!

Make sure that O-ring (15) has max. clearance from the sealing surface.

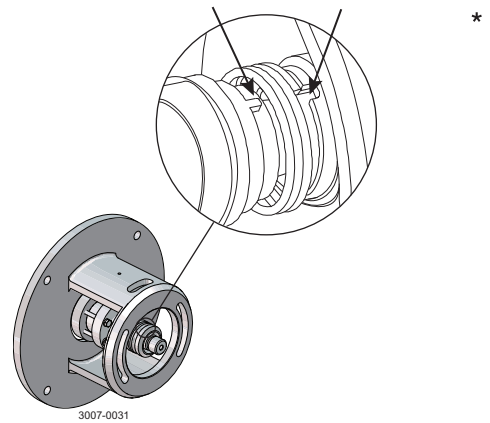


#### Step 2

1. Refit spring (13) on rotating seal ring (14).
2. Fit the spring and the rotating seal ring on drive ring (10).

#### CAUTION

Ensure that the driver on the drive ring enters the notch in the rotating seal ring.

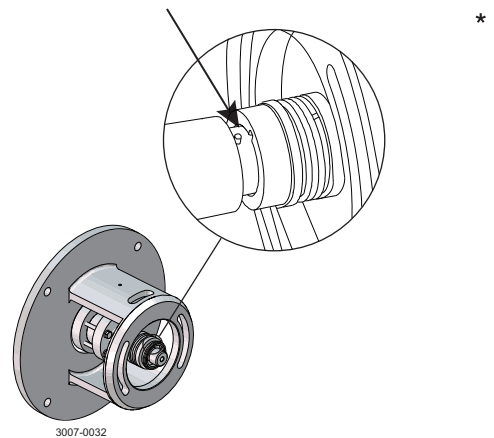


#### Step 3

- Fit the complete shaft seal on stub shaft (7).

#### CAUTION!

Make sure that connex pin (8) on the stub shaft enters the notch in drive ring (10).

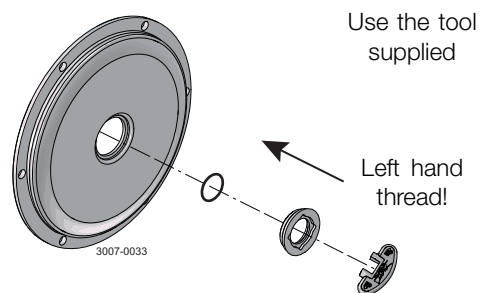


#### Step 4

1. Fit O-ring (12) on stationary seal ring (11) and lubricate.
2. Screw the stationary seal ring into back plate (25).

#### CAUTION

Must be tightened by hand to avoid deforming the stationary seal ring. (Max. 7Nm/5 lbf-ft)



## 5 Maintenance

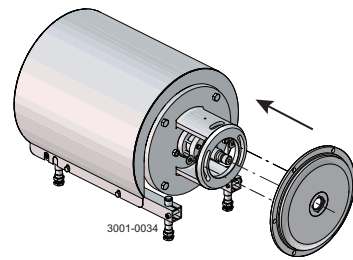
Read the instructions carefully. The items refer to the parts list and service kits section.

Handle scrap correctly.

\* : Relates to the shaft seal.

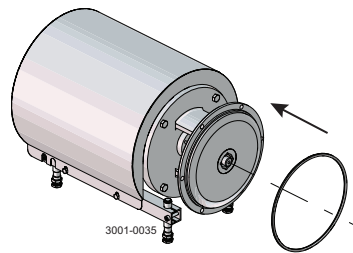
### Step 5

1. Clean the sealing surfaces with contact cleaner before fitting back plate (25).
2. Carefully guide the back plate onto adaptor (16).
3. Fit washers (21) and nuts (20).



### Step 6

Lubricate O-ring (26) and slide it onto back plate (25).



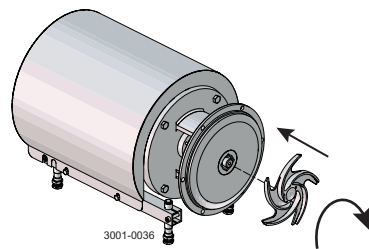
### Step 7

1. Lubricate O-ring (38) and fit it in impeller (37).
2. Lubricate impeller hub with silicone grease or oil.
3. Screw the impeller onto stub shaft (7).
4. Fit impeller screw (39) and tighten.

Tightening torque for impeller screw:

LKHex UP 10-60: 20 Nm (15 lbf-ft)

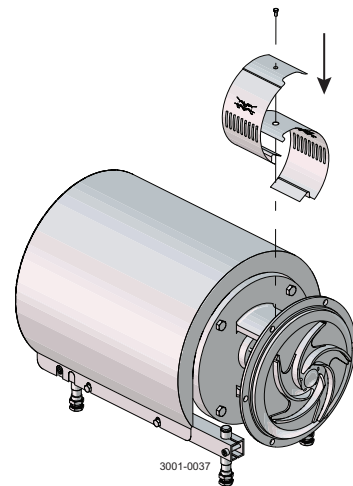
LKHex UP 70: 50 Nm (37 lbf-ft)



### Step 8

Fit safety guards (22) and screw (23) and tighten.

If pump is not supplied with flush connections, the holes in the adaptor must be covered by the guard.



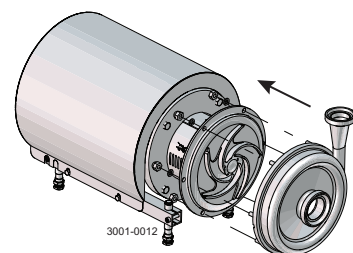
### Step 9

1. Fit pump casing (29), washers (24a) and cap nuts (24).
2. Adjust pump casing to the right position.
3. Tighten nuts (20) for back plate (25) and tighten cap nuts (24).

Torque values:

LKHex UP 10-20 = 20 Nm/14.8 lbf-ft

LKHex UP 25-70 = 40 Nm/29.5 lbf-ft





Read the instructions carefully. The items refer to the parts list and service kits section.

Lubricate the rubber seals before fitting them.

\* : Relates to the shaft seal.

### 5.4 Assembly of pump/double mechanical shaft seal

#### Step 1

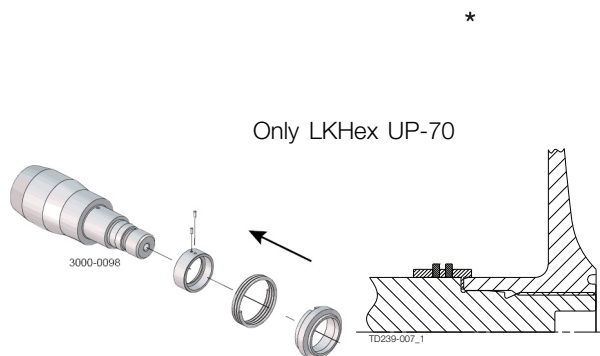
1. Fit O-rings (15) in rotating seal rings (14).
  2. Fit spring (13) on one of the rotating seal rings (14) and place the drive ring (52) in between.
  3. Fit the second rotating seal ring (14) on the other end of the spring.
- Note:** Ensure that both drive pins on the drive ring enter the notches in rotating seal rings.
4. Place the parts on the stationary seal ring fitted in back plate (25).

#### Step 2

1. LKHex UP-70: Turn the drive ring (52) in order to place it correctly on the pump shaft (7).
2. Fit the second rotating ring (14) on the other end of the spring.
3. Place the parts on the stationary seal ring fitted in back plate (25).

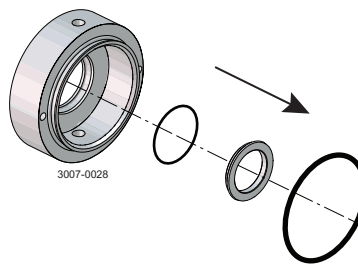
#### NOTE

Ensure that both drive pins on the drive ring enter the notches in rotating seal rings.



#### Step 3

1. Lubricate O-ring (44) and slide onto seal housing (40a).
2. Lubricate O-ring (50) and fit on stationary seal ring (51) and fit this in the seal housing.

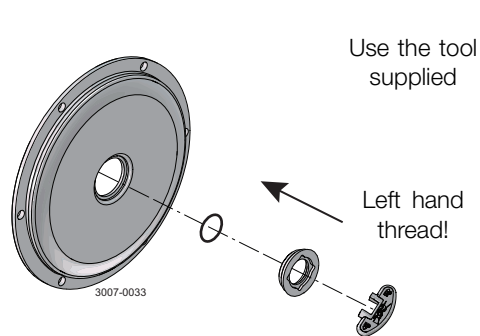


#### Step 4

1. Fit O-ring (12) on stationary seal ring (11) and lubricate.
2. Screw the stationary seal ring into back plate (25).

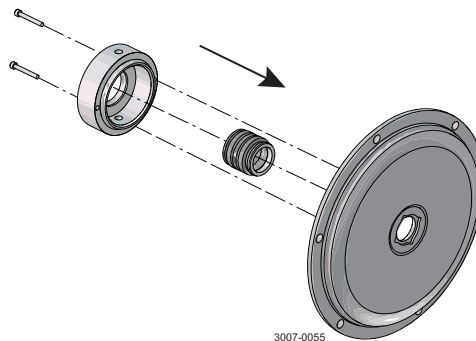
#### CAUTION

Must be tightened by hand to avoid deforming the stationary seal ring. (Max. 7Nm / 5 lbf-ft)



#### Step 5

1. Clean the sealing surfaces with contact cleaner.
2. Fit seal housing (40a) on the back plate (25) and tighten screws (41).

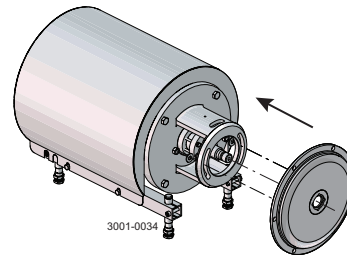


## 5 Maintenance

Read the instructions carefully. The items refer to the parts list and service kits section.  
Lubricate the rubber seals before fitting them.  
\* : Relates to the shaft seal.

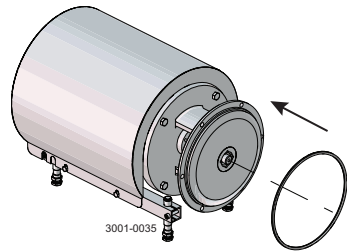
### Step 6

1. To enable fitting of the back plate (25) with the shaft seal, remove connex pin (8) from stub shaft (7) (if fitted).
2. Carefully guide back plate (25) onto adaptor (16).
3. Fit washers (21) and nuts (20).



### Step 7

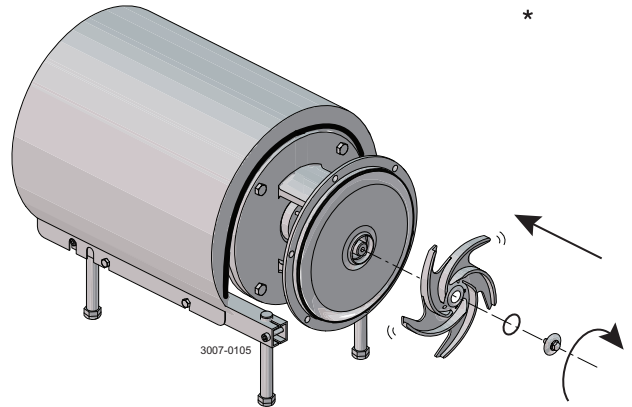
Lubricate O-ring (26) and slide it onto back plate (25).



### Step 8

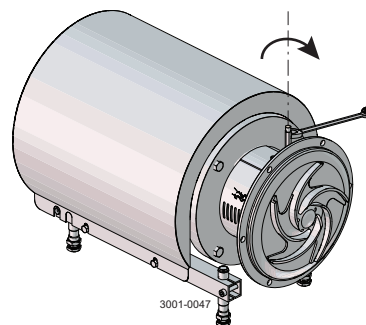
1. Lubricate O-ring (38) and fit it in impeller (37).
2. Lubricate the impeller hub with silicone grease or oil.
3. Screw impeller (27) onto stub shaft (7).
4. Fit impeller screw (36) and tighten.

Tightening torque for impeller screw:  
LKHex UP 10-60: 20 Nm (15 lbf-ft)  
LKHex UP 70: 50 Nm (37 lbf-ft)



### Step 9

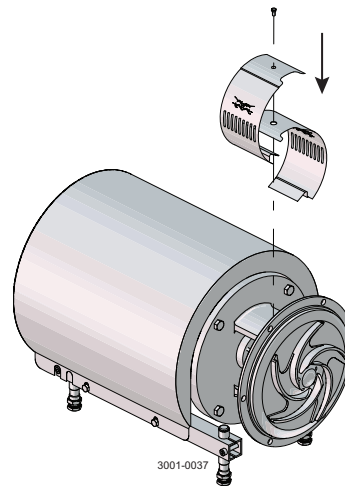
1. Wind Teflon tape on the thread end of tubes (42).
2. Screw tube ends into seal housing (40a).
3. Tighten using a spanner.



Read the instructions carefully. The items refer to the parts list and service kits section.  
Lubricate the rubber seals before fitting them.  
\* : Relates to the shaft seal.

### Step 10

Fit safety guard (22) and screw (23) and tighten.  
If the pump is not supplied with flush connections, the holes in the adaptor must be covered by the guard.



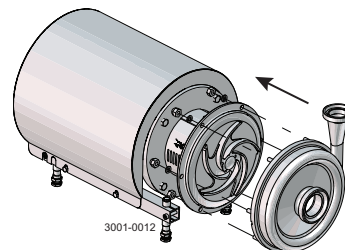
### Step 11

1. Fit pump casing (29), washers (24a) and cap nuts (24).
2. Tighten nuts (20) for back plate (25).
3. Tighten nuts (20) for back plate (25) and tighten cap nuts (24).

Torque values:

LKHex UP 10-20 = 20 Nm/14.8 lbf-ft

LKHex UP 25-70 = 40 Nm/29.5 lbf-ft



## 5 Maintenance

Study the instructions carefully. The items refer to the parts list and service kits section.

Lubricate the rubber seals before fitting them.

\* : Relates to the shaft seal.

### 5.5 Adjustment of shaft

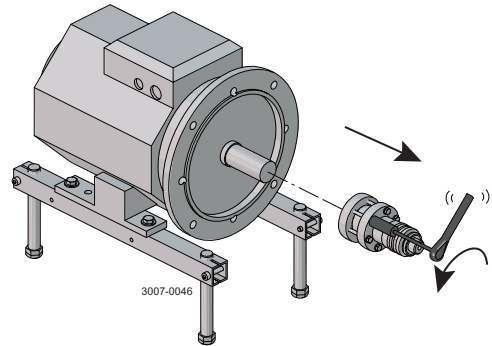
#### Step 1

1. Loosen screws (6).
2. Pull off stub shaft (7) together with compression rings (5a, 5b).

LKHex UP-70:

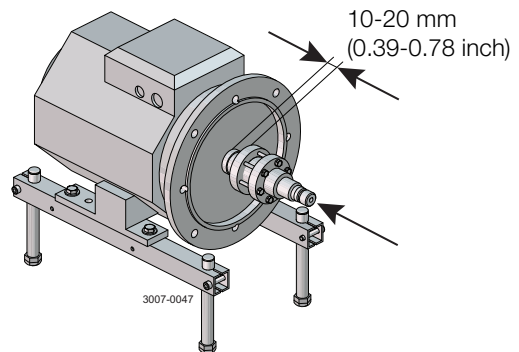
For securing the best fixture to the motor shaft ensure the following:

- Conical surfaces on the pump shaft and compression rings are applied with grease.
- No grease on the motor shaft.
- No grease on the inside diameter of the pump shaft.
- Screws for the compression rings are applied with grease.



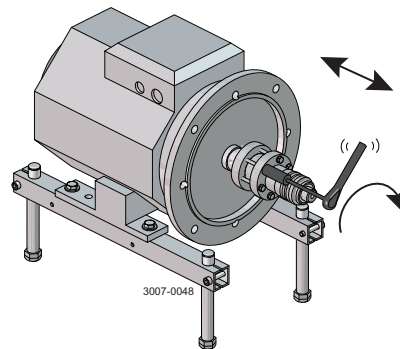
#### Step 2

1. Push stub shaft (7) together with compression rings (5a, 5b) onto the motor shaft.
2. Check that the clearance between the end of the stub shaft and the motor flange is 10-20 mm (0.39-0.78 inch).



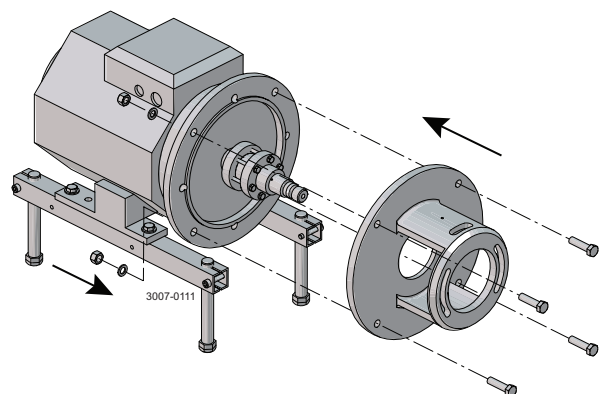
#### Step 3

1. Tighten screws (6) lightly and evenly.
2. Ensure that stub shaft (7) can be moved on the motor shaft.



#### Step 4

Fit adaptor (18), screws (19), washers (8) and nuts (7).



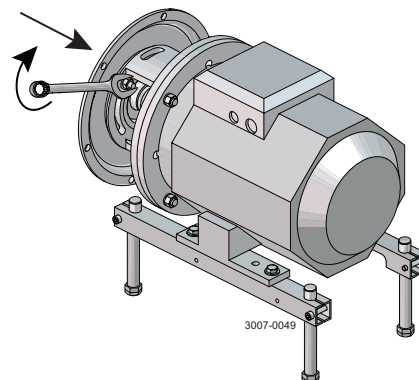
Study the instructions carefully. The items refer to the parts list and service kits section.

Lubricate the rubber seals before fitting them.

\* : Relates to the shaft seal.

### Step 5

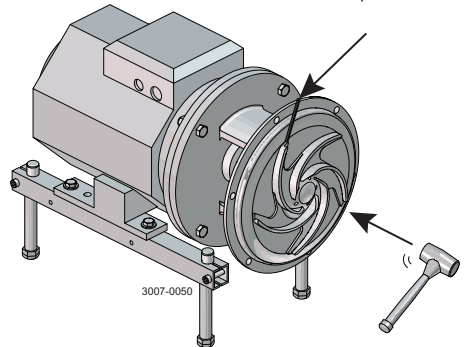
1. For double mechanical shaft seal: Fit drive ring (52) on stub shaft (7).
2. Fit back plate (25), washers (21) and nuts (20) and tighten.



### Step 6

1. Fit impeller (37) on stub shaft (7).
2. Ensure that the clearance between the impeller and back plate (25) is correct: 0.5 mm (0.02 inch) for LKHex UP-10 to 60 and 1.0 mm (0.039 inch) for LKHex UP-70.
3. Tighten screws (6) evenly until the stub shaft (7) cannot move on the motor shaft.

LKHex UP-10 to -60 = 0.5 mm (0.02 inch)  
LKHex UP-70 = 1.0 mm (0.039 inch)

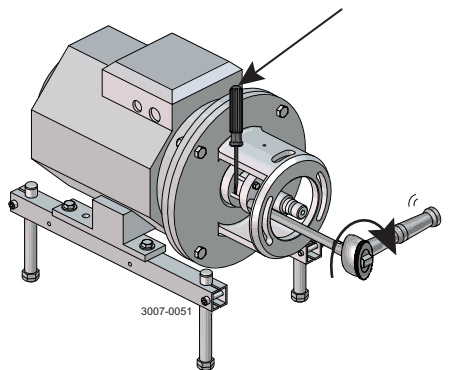


### Step 7

1. Remove impeller (37), back plate (25) and drive ring (52).
2. Tighten screws (6) evenly to 15 Nm (11 lbf-ft).

Counterhold with a screwdriver

15Nm  
(11 lbf-ft)



## 6 Technical data

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*It is important to observe the technical data during installation, operation and maintenance.  
Inform personnel about the technical data.*

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### 6.1 Technical data

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The LKHex UltraPure pump is a highly efficient and economical centrifugal pump, which meets the requirements of the pharmaceutical industries. It provides gentle product treatment and is chemically resistant. LKHex UltraPure is available in the following sizes, LKHex UltraPure-10 , -20, -25, -35, -40, -45, -60 and -70. The instruction manual is part of the delivery. Study the instructions carefully.

#### Materials

Product wetted steel parts	AISI 316L
Other steel parts	Stainless steel
Finish	Polished
Product wetted seals	EPDM (standard)
Other O-rings	EPDM (standard)
Alternative material, O-rings	FPM and FEP

#### Motor

Foot-flanged motor acc. to IEC metric standard 2 poles = 3000/3600 rpm at 50/60 Hz IP55

Motor sizes (kW), 50/60 Hz            1.5 - 75 kW

For further information - see PD sheet.

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*It is important to observe the technical data during installation, operation and maintenance.  
Inform personnel about the technical data.*

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### 6.2 Technical information and description of mechanical shaft seals

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#### **General considerations regarding mechanical shaft seals**

The basic working principle of a mechanical seal is that the seal faces are cooled and lubricated by the process media or the flush media.

If the seal faces are not cooled and lubricated, the temperature of the faces will increase to be above the temperature at normal running conditions. This is referred to as "dry running".

Dry running will shorten the lifetime of the seal and eventually cause the seal to fail. Dry running is not allowed in ATEX applications.

Due to this working principle, there will be a small controlled leakage from the seal during normal operation. This leakage will increase if seal failure occurs. When a seal is failing the degree of leakage can go from a drop leakage to a flush leakage depending on the type of failure.

**Note:** The risk of leakage from a failing seal must be considered if pumping flammable products or other products where leakage can lead to hazardous situations.

#### **Single mechanical shaft seal (SSS)**

The SSS is cooled and lubricated by the process media.

The process media must always be present during operation to avoid dry running.

The Critical temperature range and the minimum flow rate of the process media are stated in chapter "2 Special conditions for safe use".

#### **Double mechanical shaft seal (DMS)**

If continuous presence of process media cannot be guaranteed or leakage of the process media is unacceptable, a DMS should be applied.

The DMS is cooled and lubricated by the process media and/or the flush media.

Flush media must always be present during operation of the pump to avoid dry running.

Requirements for minimum flows and max temperatures of the flush media are stated in chapter "2 Special conditions for safe use".

There are two basic flush principles for DMS:

- Buffer fluid system having a pressure lower than the pumped media.  
This principle will flush away possible solidifications and residues from the primary seal. It is the product media which lubricates the primary seal faces and the flush media lubricating the secondary seal faces.
- Barrier fluid system having a pressure of minimum 1bar above the pump inlet pressure.  
This principle will cool and lubricate both the primary and secondary seal.  
The barrier principle can be used in many applications but should be used if the seal configuration is SiC/SiC and the process media viscosity is less than 1cP.

## 6 Technical data

*It is important to observe the technical data during installation, operation and maintenance.  
Inform personnel about the technical data.*

### 6.3 Torque specifications

The table below specifies the tightening torques for the screws, bolts and nuts in this pump.  
Always use the following torques if no other values are stated. This can be a matter of personal safety.

Size	Spanner width	Torque values	
		Nm	lbf-ft
M8	13mm/0.51"	20	15
M10	17mm/0.67"	40	30
M12	19mm/0.75"	67	49
M14	22mm/0.87"	110	81

### 6.4 Weight (kg)

Pump Type: LKHex UltraPure

Size	90		100	112	132		160		180	200			250		
	1.5 kW	2.2 kW	3 kW	4 kW	5.5 kW	7.5 kW	11 kW	15 kW	18.5 kW	22 kW	30 kW	37 kW	45 kW	55 kW	75 kW
10	53	55	70	75											
20	55	57	72	77	94	108									
25				81	98	112	171	185							
35				81	98	112	171	185							
40						115	174	188	206	225					
45				82	99	113	172	186							
60					102	116	175	189	207	226	334				
70					138	152	196	210	228	259	365	380	396	522	557

Weight can vary depending of configuration. Weight is only to be seen as a reference value during handling, transporting and packaging.



*It is important to observe the technical data during installation, operation and maintenance.  
Inform personnel about the technical data.*

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### 6.5 Noise emission

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Pump type	Sound pressure level (dBA)
LKHex UP-10	69
LKHex UP-15	72
LKHex UP-20	70
LKHex UP-25	74
LKHex UP-35	71
LKHex UP-40	75
LKHex UP-45	70
LKHex UP-50	75
LKHex UP-60	77
LKHex UP-70	88

The noise measurements are carried out using the original motor and shroud, at the approximate Best Efficiency Point (BEP) with water at ambient temperature and at 50Hz.

Very often, the noise level generated by the flow through the process system (e.g. valves, pipes, tanks etc.) is much higher than that generated by the pump itself. Therefore, it is important to consider the noise level from the total system and take the necessary precautions with regard to personal safety if required.

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## 6 Technical data

*It is important to observe the technical data during installation, operation and maintenance.  
Inform personnel about the technical data.*

### 6.6 Relubrication intervals

The table is for an internal bearing temperature of 100°C. An increase in temperature of 15°C (ambient or internal in bearings), will reduce the greasing interval and bearing lifetime by 50%. The lubrication interval for vertically mounted pumps is half the value stated in the table.

#### WEG IEC Motors

Motor Power (kW)	LKHex (Exd/Exde)	Motor power (kW)	LKHex (Exe)
50/60 Hz			50/60 Hz
1.5	Permanently lubricated	1.85	Permanently lubricated
2.2	Permanently lubricated	2.5	Permanently lubricated
3.0	Permanently lubricated	3.3	Permanently lubricated
4.0	Permanently lubricated	4.6	Permanently lubricated
5.5	Permanently lubricated	5.5	Permanently lubricated
7.5	Permanently lubricated	7.5	10000/10000h - DE/NDE: 13g
11	Permanently lubricated	12.5	10000/10000h - DE/NDE: 13g
15	Permanently lubricated	15	10000/10000h - DE/NDE: 18g
18.5	Permanently lubricated	20	10000/10000h - DE/NDE: 21g
22	10000/10000h - DE/NDE: 18g	24	10000/10000h - DE/NDE: 21g
30	10000/10000h - DE/NDE: 21g	36	4500/4500h - DE/NDE: 27g
37	10000/10000h - DE/NDE: 21g	47	4500/4500h - DE/NDE: 27g
45	Not available	58	4500/4500h - DE/NDE: 27g
55	4500/4500h - DE/NDE: 27g		
75	4500/4500h - DE/NDE: 27g		

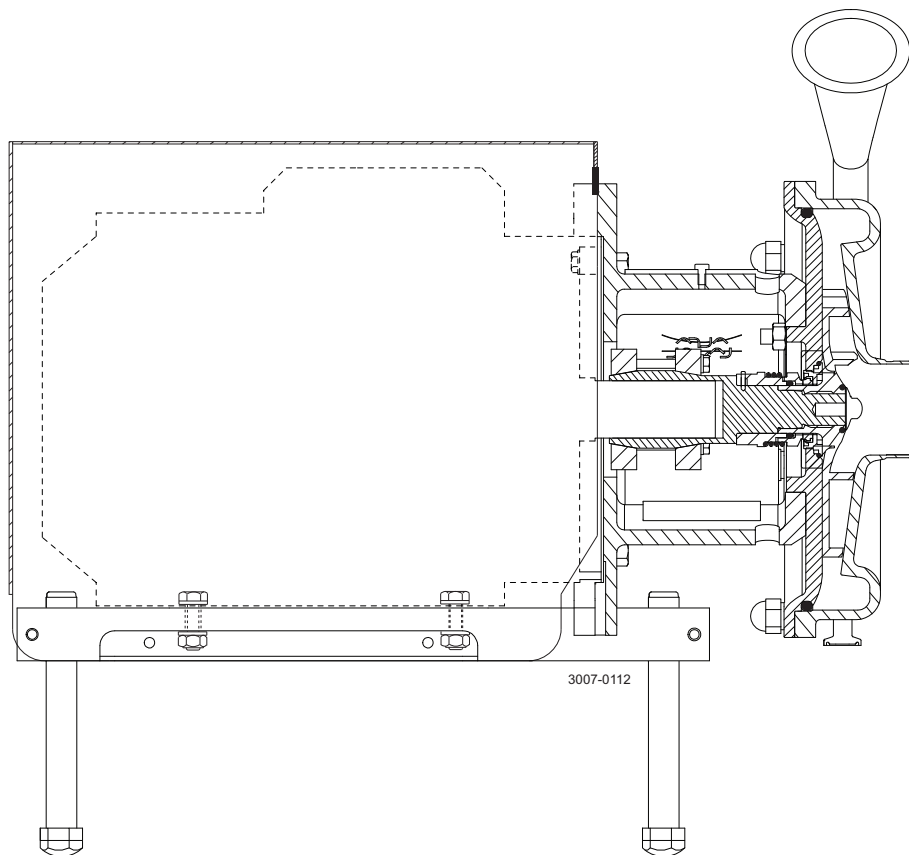
#### Recommended grease types:

POLYREX EM 103

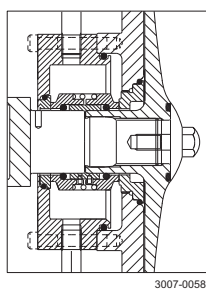
The drawing shows the LKHex UltraPure, sanitary version.

The items refer to the parts lists in the following sections 7.2 LKHex UltraPure - Product wetted parts.

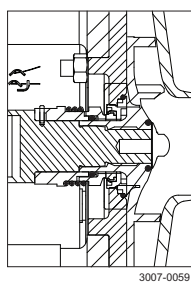
7.1 Drawing LKHex UltraPure -10, -20, -25, -35, -40, -45, -60, -70



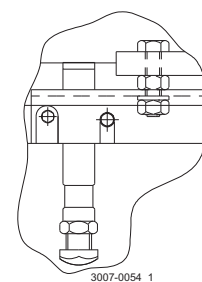
US legs are different to the ones shown. For further information see US spare parts.



Double mechanical shaft seal



Single shaft seal



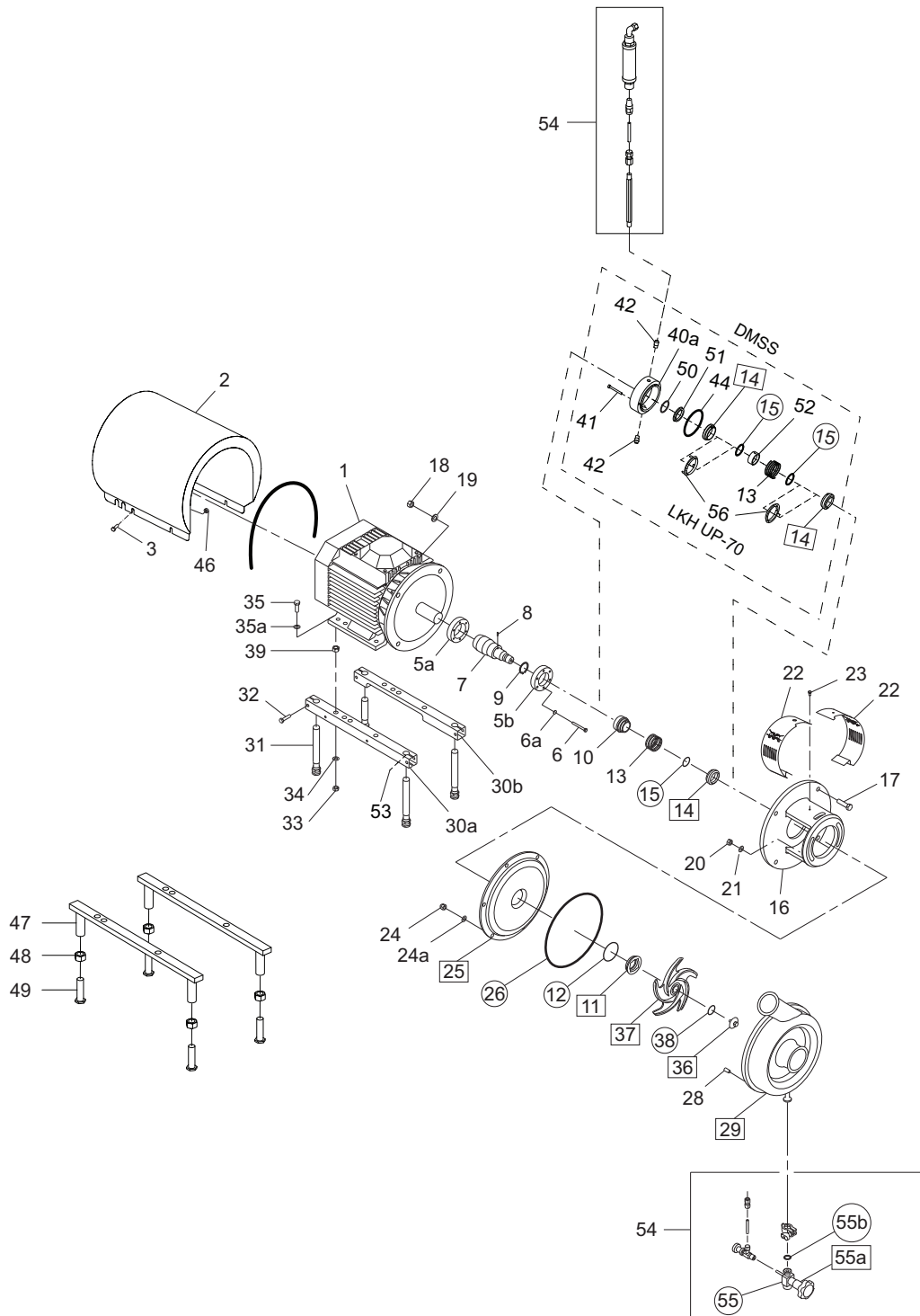
Only used for 3 kW  
Fitting of legs

## 7 Parts list

The drawing shows the LKHex UltraPure, sanitary version.

The items refer to the parts lists in the following sections 7.2 LKHex UltraPure - Product wetted parts.

### 7.2 LKHex UltraPure - Product wetted parts



3007-0088

- Product wetted steel parts
- Product wetted elastomer parts

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The drawing shows the LKHex UltraPure, sanitary version.

The items refer to the parts lists in the following sections 7.2 LKHex UltraPure - Product wetted parts.

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**Parts list**

Pos.	Qty	Denomination
20	2	Nut
21	2	Washer
24	6	Cap nut
24a	6	Washer
25	1	Backplate compl
26 ♦♦	1	Pumcasing O-ring
28	6	Bolt
29	1	Connections and drain
36	1	Impeller screw
37	1	Impeller
38 ♦♦	1	O-ring impeller screw

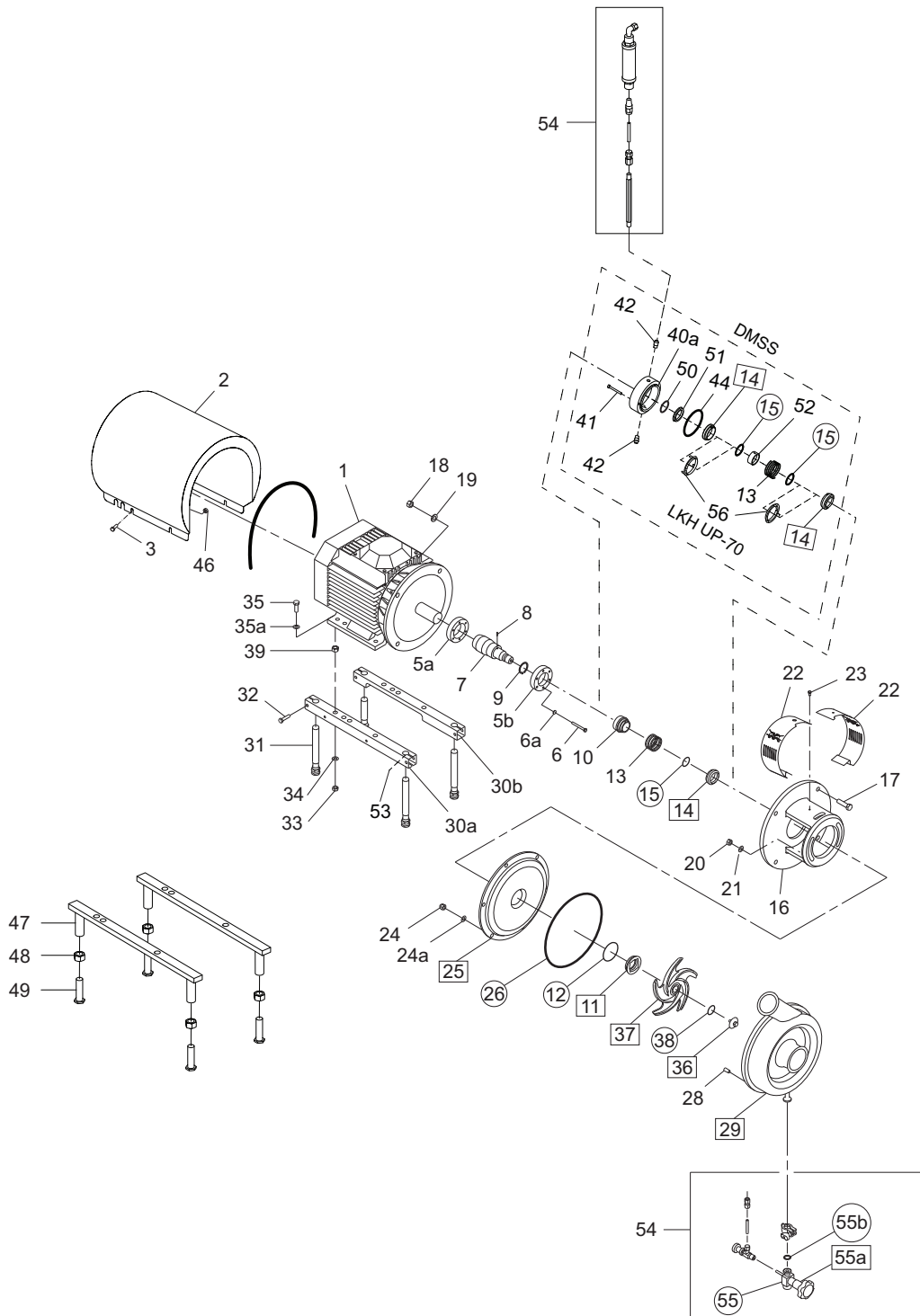
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## 7 Parts list

The drawing shows the LKHex UltraPure, sanitary version.

The items refer to the parts lists in the following sections 7.2 LKHex UltraPure - Product wetted parts.

### 7.3 LKHex UltraPure - Motor dependent parts



3007-0088

- Product wetted steel parts
- Product wetted elastomer parts

The drawing shows the LKHex UltraPure, sanitary version.

The items refer to the parts lists in the following sections 7.2 LKHex UltraPure - Product wetted parts.

### Parts list

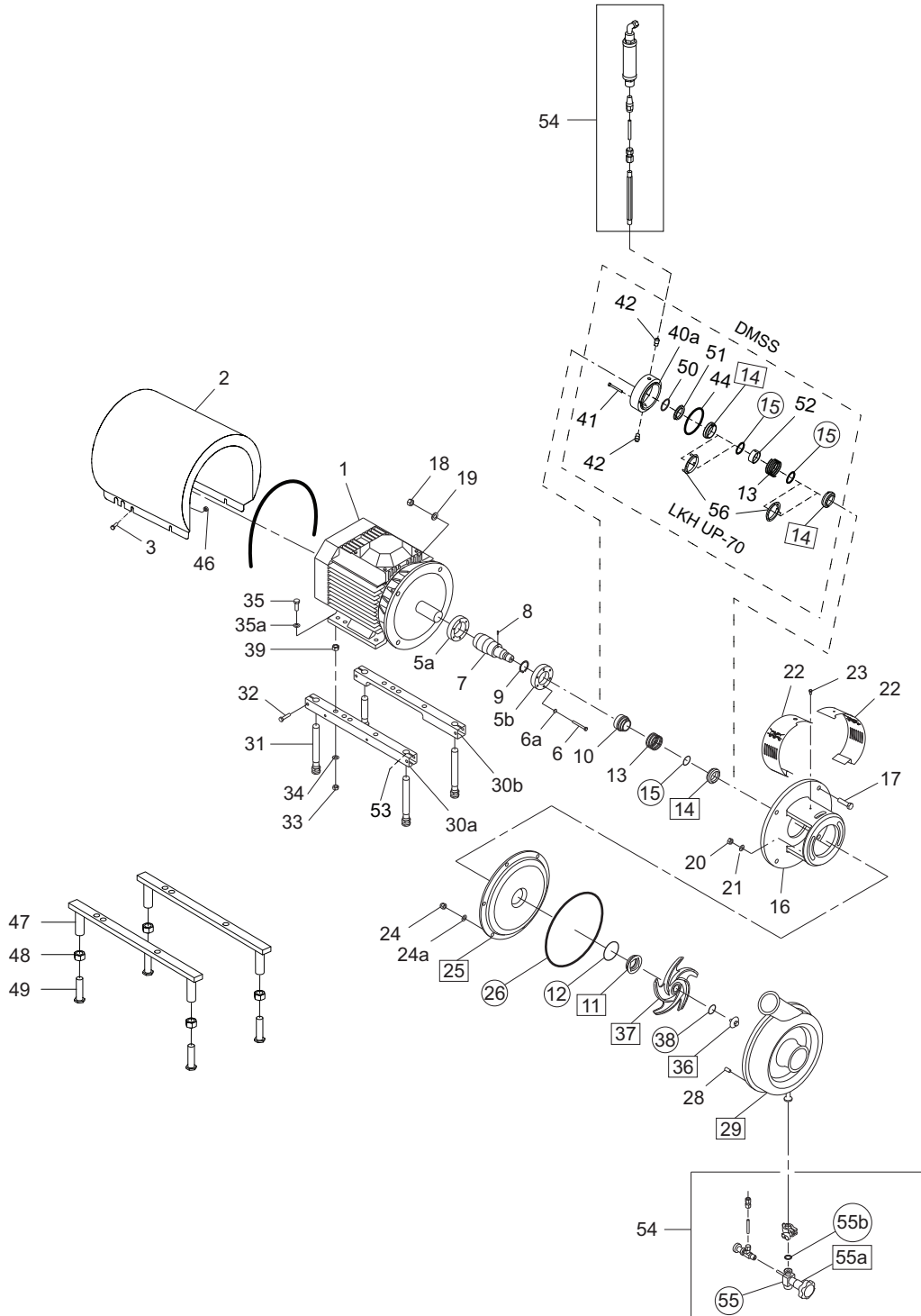
Pos.	Qty	Denomination
1	1	Motor
2	1	Shroud
3	4	Screw
5a	1	Compression ring
5b	1	Compression ring
6	6	Screw
6a	6	Washer
7	1	Shaft incl. pin
8	1	Connex pin
9	1	Retaining ring
16	1	Apaptor
17	4	Screw for adaptor
18	4	Nut for adaptor
19	4	Washer for adaptor
22	1	Safety guard set
23	1	Screw for safety guard
30a	1	Support bar, right
30b	1	Support bar, left
31	4	Legs
32	4	Screw
33	4	Nut
34	4	Spring washer
35	4	Screw
35a	4	Washer
39	4	Spacer for Leg
46	4	Distance sleeve
47	2	Leg bracket
48	4	Nut for leg
49	4	Screw for leg
53	4	Pivot screw

## 7 Parts list

The drawing shows the LKHex UltraPure, sanitary version.

The items refer to the parts lists in the following sections 7.2 LKHex UltraPure - Product wetted parts.

### 7.4 LKHex UltraPure - Shaft seal



3007-0088

- Product wetted steel parts
- Product wetted elastomer parts



The drawing shows the LKHex UltraPure, sanitary version.

The items refer to the parts lists in the following sections 7.2 LKHex UltraPure - Product wetted parts.

### Parts list

Pos.	Qty	Denomination
♦		Single shaft seal
•		Double mechanical shaft seal
10	1	Drive ring
11	1	Stationary seal ring
12	1	O-ring
13	1	Spring
14	1	Rotating seal ring
15	1	O-ring
40a	1	Seal housing
41	2	Screw for seal housing
42	2	Fittings
44	1	O-ring for seal housing
50	1	O-ring
51	1	Sec. stationary seal ring
52	1	Drive ring

### Service kits

Denomination	EPDM	FPM	FEP
<b>Service kit for single shaft seal</b>			
♦ Service kit LKHex UP-10 .....	9611922339	9611922338	9611922340
Service kit LKHex UP-20 .....	9611922357	9611922356	9611922358
Service kit LKHex UP-25/35/45 .....	9611922375	9611922374	9611922376
Service kit LKHex UP-40/60 .....	9611922393	9611922392	9611922394
Service kit LKHex UP-70 .....	9611920549	9611920550	9611920551
<b>Service kit for double mechanical shaft</b>			
• Service kit LKHex UP-10 .....	9611922345	9611922344	9611922346
Service kit LKHex UP-20 .....	9611922363	9611922362	9611922364
Service kit LKHex UP-25/35/45 .....	9611922381	9611922380	9611922382
Service kit LKHex UP-40/60 .....	9611922399	9611922398	9611922400
Service kit LKHex UP-70 .....	9611920552	9611920553	9611920554

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