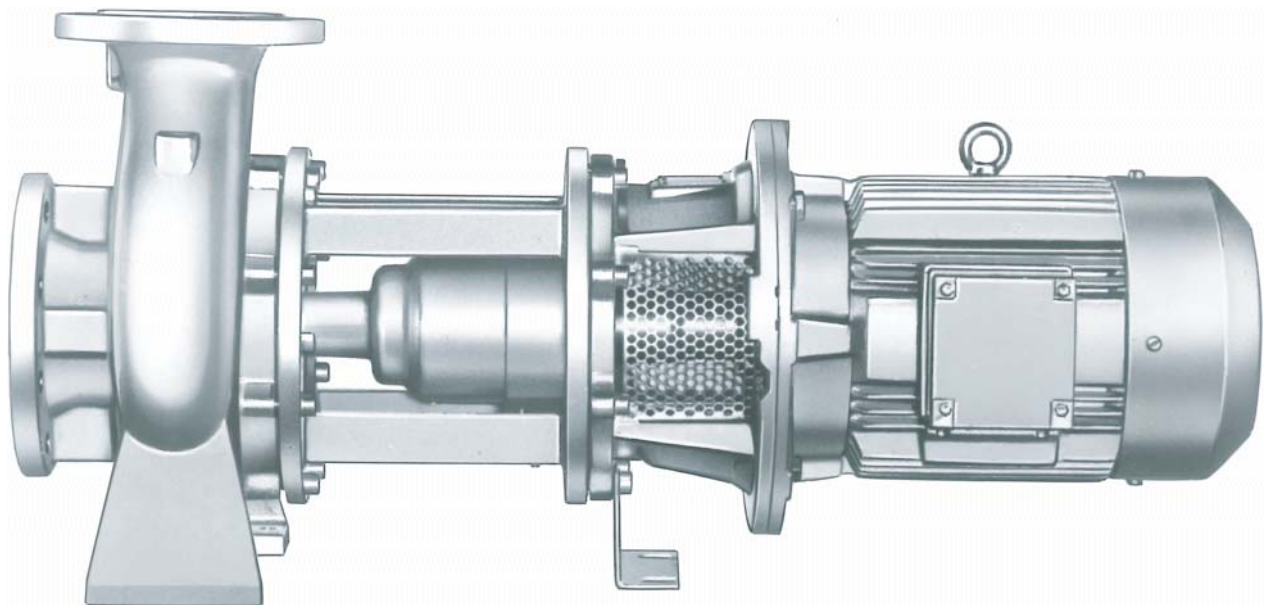


Centrifugal Pump with Volute Casing

Original Operating Manual

NBT series



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ALLWEILER GmbH
Postfach 1140
Allweilerstraße 1
78301 Radolfzell
Germany
Phone: +49 (0)7732-86-0
Fax: +49 (0)7732-86-436
E-mail: service@allweiler.de
Internet: <http://www.allweiler.com>

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1 About this document

This manual

- Is part of the pump
- Applies to the afore-mentioned pump series
- Describes safe and appropriate operation during all operating phases

1.1 Target groups

Target group	Duty
Operating company	<ul style="list-style-type: none"> ▶ Keep this manual accessible at the equipment operating site; it may be needed for later use. ▶ Make sure that personnel read and follow the instructions in this manual and all other applicable documents, especially the safety instructions and warnings. ▶ Observe any additional system-related rules and regulations.
Qualified personnel, fitter	<ul style="list-style-type: none"> ▶ Read, observe and follow this manual and all other applicable documents, especially the safety instructions and warnings.





Tab. 1 Target groups and their duties

1.2 Other applicable documents



Document	Purpose
ATEX additional instructions	Operation in explosion hazard areas
Order data sheet	Technical specifications, conditions of operation
Setup drawing	Setup dimensions, connection dimensions etc.
Technical description	Technical specifications, operating limits
Sectional drawing	Sectional drawing, part numbers, component designations
Supplier documentation	Technical documentation for parts supplied by subcontractors
Spare parts list	Ordering spare parts
Declaration of conformity	Conformity with standards Content of the declaration of conformity (→ 9.5 Declaration of conformity according to EC Machine Directive, Page 39).

Tab. 2 Other applicable documents and their purpose

1.3 Warnings and symbols

Warning	Risk level	Consequences of disregard
	Immediate acute risk	Death, serious bodily harm
	Potentially acute risk	Death, serious bodily harm
	Potentially hazardous situation	Minor bodily harm
	Potentially hazardous situation	Material damage

Tab. 3 Warnings and consequences of disregarding them

Symbol	Meaning
	Safety warning sign ▶ Take note of all information highlighted by the safety warning sign and follow the instructions to avoid injury or death.
▶	Instruction
1. , 2. , etc.	Multiple-step instructions
✓	Precondition
→	Cross reference
	Information, advice


Tab. 4 Symbols and their meaning

1.4 Technical terms

Term	Meaning
Sealing medium	Medium for blocking or quenching shaft seals
Auxiliary operating systems	Systems for operating the pump

Tab. 5 Technical terms and their meaning

2 Safety

 The manufacturer accepts no liability for damages caused by disregarding any of the documentation.

2.1 Intended use


- Only use the pump to pump the stipulated pumped liquids (→ order data sheet).
- Adhere to the operating limits and size-dependent minimum flow rate.
- Avoid dry running:
Damage such as destruction of the mechanical seal and plastic parts will occur within the first few seconds.
 - Make sure the pump is only operated with, and never without, pumped liquid.
- Avoid cavitation:
 - Fully open the suction-side armature and do not use it to adjust the flow rate.
 - Do not open the pressure-side armature beyond the specified operating point.
- Avoid overheating:
 - Do not operate the pump while the pressure-side armature is closed.
 - Observe the minimum flow rate (→ order data sheet).
- Avoid damage to the motor:
 - Do not open the pressure-side armature beyond the specified operating point.
 - Do not switch on the motor more than the maximum permissible number of times per hour (→ manufacturer's specifications).
- Consult the manufacturer about any other use of the pump.
- Pumps delivered without a motor must be assembled into a pump unit according to the provisions of EC Machine Directive 2006/42/EC.

Prevention of obvious misuse (examples)

- Note the operating limits of the pump concerning temperature, pressure, flow rate and motor speed (→ order data sheet).
- The power consumed by the pump will increase when the density of the pumped liquid is higher. To avoid overloading the pump or motor, comply with the specified density (→ order data sheet).
Lower densities are permissible. Adapt the auxiliary systems accordingly.
- When pumping liquids containing solids, ensure the limits for the proportion of solids and the grain size are maintained (→ order data sheet, technical description).
- When using auxiliary systems, ensure there is a continuous supply of the appropriate operating medium.

- Pumps used for pumping water must not be used for foodstuffs or drinking water. The use of the pump for foodstuffs or drinking water must be specified in the order data sheet.
- Only select an installation type specified in this operating manual. For example, the following are not allowed:
 - Hanging base plate pumps in the pipe
 - Overhead installation
 - Installation in the immediate vicinity of extreme heat or cold sources
 - Installation too close to the wall

2.2 General safety instructions

 Observe the following regulations before carrying out any work.

2.2.1 Product safety

The pump has been constructed using state-of-the-art technology and the applicable technical safety rules. Nevertheless, operation of the pump can still present a risk for the life and health of the user or third parties, or the pump or other property can be damaged.

- Only operate the pump if it is in perfect technical condition and only use it as intended, remaining aware of safety and risks, and adhere to the instructions in this manual.
- Ensure this manual and all other applicable documents remain complete, legible and accessible to personnel at all times.
- Refrain from any procedures and actions that would present a risk to personnel or third parties.
- In the event of any safety-relevant malfunctions, shut down the pump immediately and have the malfunction corrected by the personnel responsible.
- In addition to the entire documentation for the product, comply with statutory or other safety and accident-prevention regulations and the applicable standards and guidelines in the country where the system is operated.

2.2.2 Obligations of the operating company

Safety-conscious operation

- Only operate the pump if it is in perfect technical condition and only use it as intended, remaining aware of safety and risks, and adhere to the instructions in this manual.
- Ensure that the following safety aspects are observed and monitored:
 - Adherence to intended use
 - Statutory or other safety and accident-prevention regulations
 - Safety regulations governing the handling of hazardous substances
 - Applicable standards and guidelines in the country where the pump is operated
- Make sure personal protective equipment is available.

Qualified personnel

- Make sure all personnel assigned to work on the pump have read and understood this manual and all other applicable documents, especially the safety, maintenance and repair information, before they start any work.
- Organize responsibilities, areas of competence and the supervision of personnel.
- Ensure that all work is carried out by specialist technicians only:
 - Fitting, repair and maintenance work
 - Work on the electrical system
- Make sure that trainee personnel only work on the pump under the supervision of specialist technicians.

Safety equipment

- Provide the following safety equipment and verify its functionality:
 - For hot, cold and moving parts: on-site safety guards for the pump
 - For possible electrostatic charges: provide the necessary grounding

Warranty

- Obtain the manufacturer's approval prior to carrying out any modifications, repairs or alterations during the warranty period.
- Only use genuine parts or parts that have been approved by the manufacturer.

2.2.3 Obligations of personnel

- All directions given on the pump must be followed (and kept legible), e.g. the arrow indicating the sense of rotation and the markings for fluid connections.
- Pump, coupling guard and components:
 - Do not step on them or use as a climbing aid
 - Do not use them to support boards, ramps or beams
 - Do not use them as a fixing point for winches or supports
 - Do not use them for storing paper or similar materials
 - Do not use hot pump or motor components as a heating point
 - Do not de-ice using gas burners or similar tools
- Do not remove the safety guards for hot, cold or moving parts during operation.
- Use personal protective equipment whenever necessary.
- Only carry out work on the pump while it is not running.
- Disconnect the motor from its power supply and keep it locked when carrying out any installation or maintenance work.
- Reinstall the safety equipment on the pump as required by regulations after any work on the pump.

2.3 Specific hazards

2.3.1 Explosion hazard area

- (→ ATEX additional instructions).

2.3.2 Hazardous pumped media

- Observe the safety regulations for handling hazardous substances (e.g. hot, flammable, poisonous or potentially harmful) when handling hazardous pumped liquids.
- Use personal protective equipment when carrying out any work on the pump.

3 Layout and function

3.1 Labels

3.1.1 Type plate

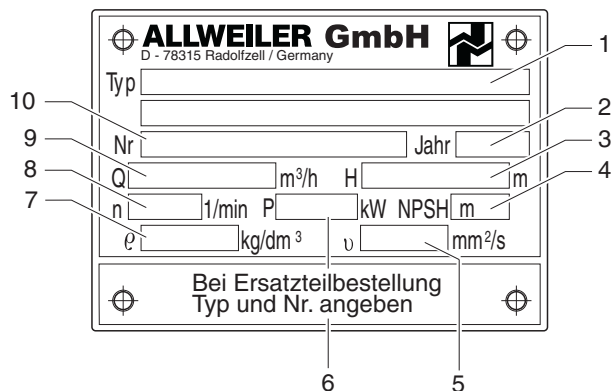


Fig. 1 Type plate (example)

- 1 Pump type
- 2 Year of manufacture
- 3 Differential head
- 4 Pump NPSH value
- 5 Kinematic viscosity
- 6 Power consumption
- 7 Density
- 8 Motor speed
- 9 Flow rate
- 10 Pump number

3.1.2 ATEX plate

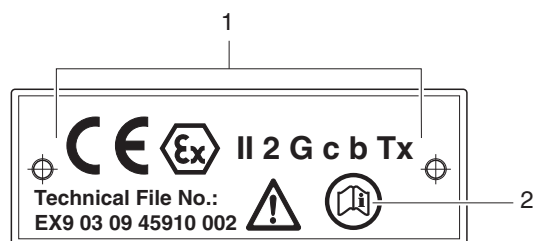


Fig. 2 ATEX plate (example)

- 1 Explosion protection mark
- 2 Reference to the supplementary ATEX instructions

3.1.3 Pump type code

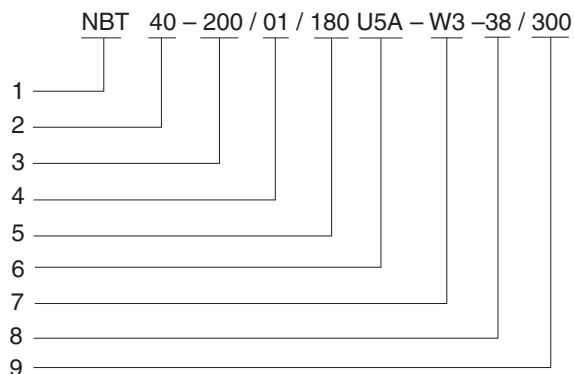


Fig. 3 Pump type code (example)

- 1 Series
- 2 Size (standard nominal diameter)
- 3 Nominal impeller diameter
- 4 Hydraulic number
- 5 Actual impeller diameter [mm]
- 6 Shaft seal (U5A)
- 7 Material key
- 8 Stub shaft bore hole diameter [mm]
- 9 Outer diameter of motor bell housing, or intermediate ring/flange size of the electric motor

3.2 Layout

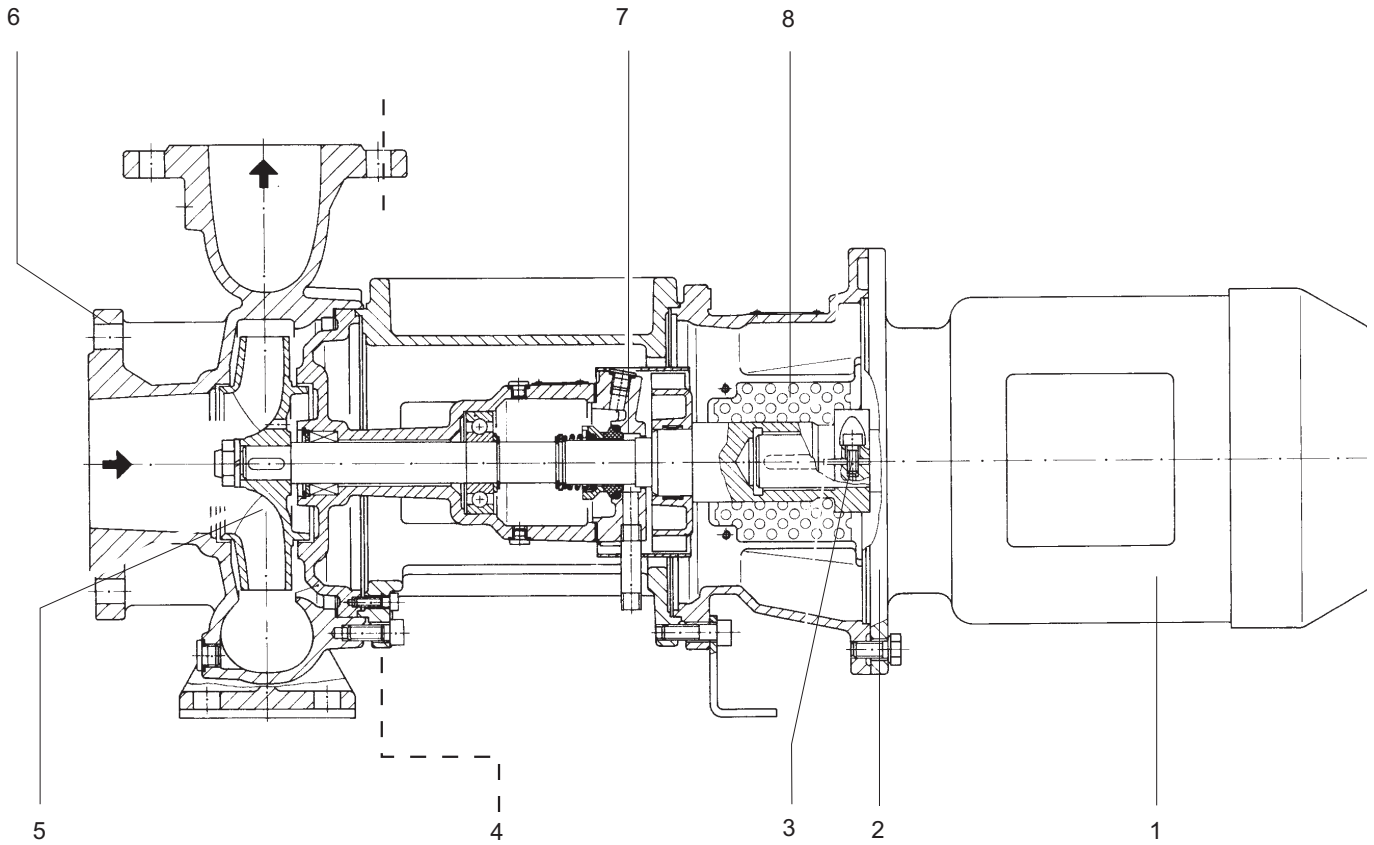




Fig. 4 Layout

- | | | |
|---|-----------------------------|---------------|
| 1 Motor with fixed bearing at drive end | 4 Limit for heat insulation | 7 Shaft seal |
| 2 Motor bell housing | 5 Impeller | 8 Guard sheet |
| 3 Stub shaft | 6 Volute casing | |

3.3 Shaft seals

 Only one of the following shaft seals can be used.


3.3.1 Mechanical seals

 Mechanical seals have functional leaks.

- Single mechanical seal

4 Transport, storage and disposal

4.1 Transport

 For weight specifications (→ documents for the particular order).

4.1.1 Unpacking and inspection on delivery

1. Unpack the pump/pump unit upon delivery and inspect it for transport damage.
2. Report any transport damage to the manufacturer immediately.
3. Dispose of packaging material according to local regulations.

4.1.2 Lifting

 **DANGER**

Death or crushing of limbs caused by falling or overturning loads!

- ▶ Use lifting gear appropriate for the total weight to be transported.
 - ▶ Fasten the lifting gear as shown in the following illustrations.
 - ▶ Never fasten the lifting gear onto the motor eyebolt (unless used as a safety device to prevent units with a high center of gravity from tipping over).
 - ▶ Do not stand under suspended loads.
 - ▶ Set the load down on a level surface.
-
- ▶ Lift the pump/pump unit properly.

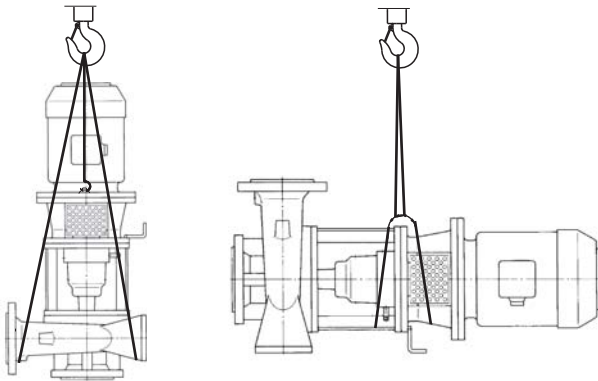



Fig. 5 Fastening the lifting gear to the pump aggregate

4.2 Preservation

 Not necessary for non-rusting materials

NOTE

Material damage due to inappropriate treatment for storage!

- ▶ Treat the pump properly, inside and outside, for storage.
-
1. Choose a preservative appropriate for the type and duration of storage. (→ 9.2.6 Preservatives, Page 35).
 2. Use the preservative specified by the manufacturer.
 3. All bare metal parts should be treated, inside and outside.


4.3 Storage

NOTE

Material damage due to inappropriate storage!

- ▶ Treat and store the pump properly.
-
1. Seal all openings with blank flanges, blind plugs or plastic covers.
 2. Make sure the storage room meets the following conditions:
 - Dry
 - Frost-free
 - Vibration-free
 3. Turn the shaft once a month.
 4. Make sure the shaft and bearing change their rotational position in the process.
 5. Every 6 months:
 - Replace the preservative if necessary.

4.4 Removing the preservative

 Only necessary for pumps treated for storage.

WARNING

Risk of poisoning from preservatives and cleaning agents in the foodstuffs and drinking water sector!

- ▶ Only use cleaning agents which are compatible with the pumped liquid (→ 9.2.5 Cleaning agents, Page 35).
- ▶ Completely remove all preservative.

NOTE

High water pressure or spray water can damage bearings!


- ▶ Do not clean bearing areas with a water or steam jet.

NOTE

Damage to seals due to wrong cleaning agents!


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

1. Choose the cleaning agent according to the application. (→ 9.2.5 Cleaning agents, Page 35).

 With Tectyl 506 EH: allow benzine to soak in for 10 minutes (recommended).

2. Dispose of cleaning agents in accordance with local regulations.
3. For storage times in excess of 6 months:
 - Replace the elastomer parts made of EP rubber (EPDM).
 - Check all elastomer parts (O-rings, shaft seals) for proper elasticity and replace them if necessary.

4.5 Disposal


 Plastic parts can be contaminated by poisonous or radioactive pumped liquids to such an extent that cleaning will be insufficient.

WARNING

Risk of poisoning and environmental damage from the pumped liquid or oil!

- ▶ Use personal protective equipment when carrying out any work on the pump.
 - ▶ Prior to the disposal of the pump:
 - Collect and dispose of any pumped liquid or oil which is escaping in accordance with local regulations.
 - Neutralize residues of pumped medium in the pump.
 - Removing the preservative (→ 4.4 Removing the preservative, Page 12).
 - ▶ Remove the plastic parts and dispose of them in accordance with local regulations.
-
- ▶ Dispose of the pump in accordance with local regulations.

5 Setup and connection

 For pumps in explosion-hazard areas (→ supplementary ATEX instructions).

NOTE

Material damage due to distortion, or electrical current flowing through the bearing!

- ▶ Do not make any structural modifications to the pump unit or pump casing.
- ▶ Do not carry out any welding work on the pump unit or pump casing.

NOTE

Material damage caused by dirt!

- ▶ Do not remove the transport seals until immediately prior to pump installation.
- ▶ Do not remove any covers or transport and sealing covers until immediately prior to connecting the pipes to the pump.

5.1 Preparing the setup

5.1.1 Checking the ambient conditions

- ▶ Make sure the required ambient conditions are fulfilled (→ 9.2.2 Ambient conditions, Page 34).


5.1.2 Preparing the installation site

- ▶ Ensure the installation site meets the following conditions:
 - Pump is freely accessible from all sides
 - Sufficient space for the installation/removal of the pipes and for maintenance and repair work, especially for the removal and installation of the pump and the motor
 - Pump not exposed to external vibrations (damage to bearings)
 - Frost protection

5.1.3 Removing the preservative

- ▶ If the pump is to be put into operation immediately after installation and connection:
 - Remove the preservative prior to installation (→ 4.4 Removing the preservative, Page 12).

5.1.4 Installing the heat insulation (optional)

 Only necessary to maintain the temperature of the pumped medium

NOTE

Material damage on the bearing or shaft seal due to overheating!

- ▶ Only install the heat insulation on the volute casing (→ Figure Layout, Page 10).
- ▶ Install the heat insulation properly.

5.2 Planning the pipes


5.2.1 Specifying supports and flange connections

NOTE

Material damage due to excessive forces and torques exerted by the piping on the pump!

- ▶ Do not exceed the permissible limits (→ 9.2.7 Flange loads, Page 36).
1. Calculate the pipe forces, taking every possible operating condition into account:
 - Cold/warm
 - Empty/full
 - Unpressurized/pressurized
 - Shift in position of flanges
 2. Ensure the pipe supports have consistently low-friction properties and do not seize up due to corrosion.

5.2.2 Specifying nominal diameters

 Keep the flow resistance in the pipes as low as possible.

1. Make sure the nominal suction pipe diameter is \geq as possible to the nominal suction flange diameter.
 - Recommended flow rate speed < 1 m/s
2. Make sure the nominal pressure pipe diameter is \geq as possible to the nominal outlet flange diameter.
 - Recommended flow rate speed < 3 m/s

5.2.3 Specifying pipe lengths

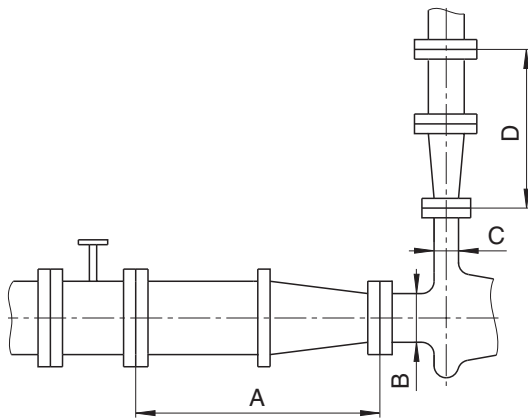



Fig. 6 Straight pipe lengths upstream and downstream of the pump (recommended)

- A > 5 x nominal suction pipe diameter
 B > 5 x nominal pressure pipe diameter

- Maintain the recommended minimum values when installing the pump.

 Suction side: Shorter pipes are possible, but may impair the hydraulic performance.
 Pressure side: Shorter pipes are possible, but can result in increased operating noise.

5.2.4 Optimizing cross-section and direction changes

1. Avoid radii of curvature of less than 1.5 times the nominal pipe diameter.
2. Avoid abrupt changes in cross-sections along the piping.

5.2.5 Discharging leaks

WARNING

Risk of injury and poisoning due to hazardous pumped liquids!

- Collect any leaking pumped liquid safely, then discharge and dispose of it in accordance with environmental regulations.

1. Provide equipment for collecting and discharging leaking liquids.
2. Ensure the free discharge of leaking liquids.

5.2.6 Providing safety and control devices (recommended)

Avoid impurities

1. Integrate a filter in the suction pipe.
2. To monitor impurities, install a differential pressure gauge with a contact manometer.

Avoid reverse running

- Install a non-return valve between the outlet flange and the stop valve to ensure the liquid does not flow back when the pump is switched off.


Enabling venting

- Provide a vent valve on the highest pressure line position.

Avoid running empty

- For suction operation: Install a foot valve in the suction pipe to prevent the pump and suction pipe from running empty during downtimes.

Make provisions for isolating and shutting off the pipes

 For maintenance and repair work.

- Provide shut-off devices in the suction and pressure pipes.

Allow measurements of the operating conditions

1. Provide manometers for pressure measurements in the suction and pressure pipes.
2. Provide load monitors (overload and underload) on the motor side.
3. Provide for pump-side temperature measurements.

5.3 Installing in the pipe

5.3.1 Keeping the piping clean

NOTE

Material damage due to impurities in the pump!

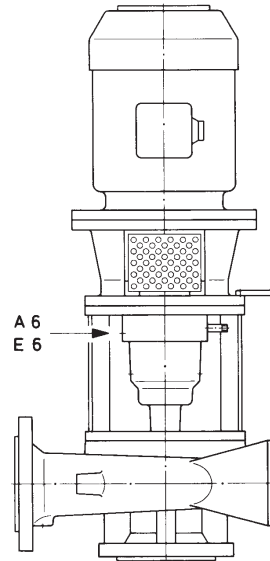
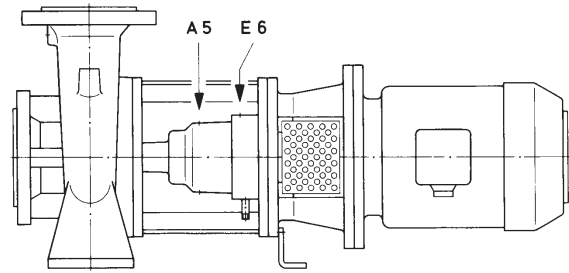
- ▶ Make sure no impurities can enter the pump.
1. Clean all piping parts and armatures prior to assembly.
 2. Ensure no flange seals protrude inwards.
 3. Remove any blank flanges, plugs, protective foils and/or protective paint from the flanges.

5.3.2 Installing the pump unit

NOTE


Material damage due to excessive forces!

- ▶ Make sure the pipe is able to bear the weight of the pump unit and all operating forces which occur.
- ▶ Make sure the distance and alignment of the pipe flanges comply with the pump dimensions (→ installation drawing).



1. Remove the transport and sealing covers from the pump.
2. Lift the pump unit (→ 4.1 Transport, Page 11).
3. Raise the pump unit between the pipe ends.
 - Observe the pumping direction of the pump.
 - Vertical installation: Motor at top.
 - Horizontal installation: Connections (A5, E6) at top.
4. Screw the suction flange and discharge flange to the pipe.
 - Adhere to the prescribed tightening torques (→ 9.2.4 Tightening torques, Page 35).

5.4 Installing the motor

 Only necessary if the pump aggregate is assembled on site

WARNING

Risk of injury due to overturning motor!


- ▶ Secure the motor to prevent overturning before working on the stub shaft.

NOTE

Damage due to incorrect installation!

- ▶ Ensure that no excessive axial forces are applied to the pump shaft.
- ▶ Ensure that the stub shaft rests flush against the collar of the motor shaft.

✓ Stub shaft, free from oil and grease

 The shaft key is not required for installation up to a stub shaft bore hole diameter of 55 mm.
Stub shaft bore hole diameter (→ 3.1.3 Pump type code, Page 9).

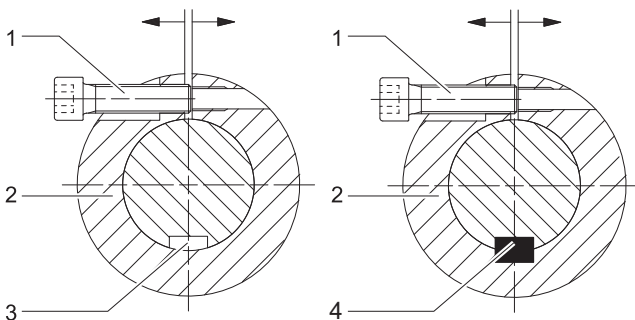




Fig. 7 Widening the stub shaft

- 1 Socket head cap screw
 - 2 Stub shaft
 - 3 Shaft key groove of motor shaft
 - 4 Shaft key (from stub shaft bore hole diameter 60 mm)
1. Observe the following during installation:
 - Adhere to the specified tightening torques (→ 9.2.4 Tightening torques, Page 35).
 2. Remove the retaining clamp for the stub shaft from the motor bell housing (341.01):
 - Undo the bolts/nuts (901.10) for this purpose (→ 9.1 Sectional drawings, Page 30).
 3. Undo the hexagon head bolts (901.07) and remove the washers (554.07).
 4. Remove one half of the guard sheet (686.01) from the motor bell housing (341.01).

 The Allen key required to undo the socket head cap screw (914.06) is inserted in one of the two cast-in recesses in the motor bell housing.

5. Undo the socket head cap screw (914.06) on the stub shaft (220.xx) and unscrew it completely (→ 9.1 Sectional drawings, Page 30).

 Tighten the jack screw with a screwdriver without applying any excessive force.

6. Widening the stub shaft (220.xx):
– Screw the M10 x 40 or M12 x 40 jack screw (not included in the scope of delivery) into the stub shaft.

7. From stub shaft bore hole diameter 60 mm: insert the shaft key.

8. Turn the motor shaft so that the slot of the stub shaft is opposite the shaft key groove of the motor shaft.

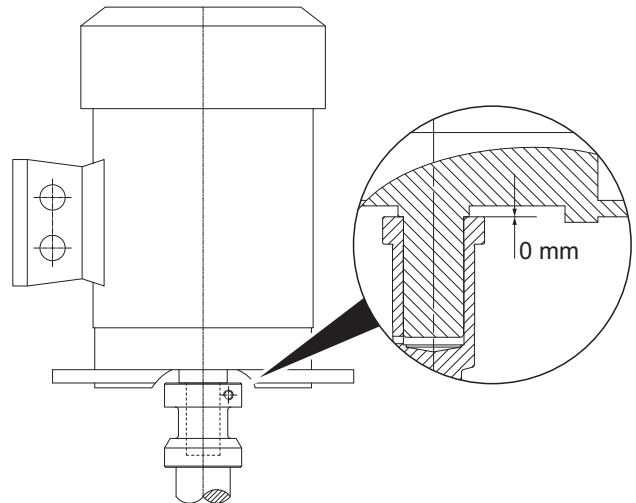


Fig. 8 Motor assembly

9. Carefully, slide on the motor until the stub shaft rests flush against the collar of the motor shaft.
 - Ensure that no excessive axial forces are applied to the pump shaft.
10. Screw in the motor bolts and tighten them.
 - Ensure that the stub shaft continues resting flush against the collar of the motor shaft.
11. Undo and unscrew the jack screw. Screw in the socket head cap screw (914.06) and tighten it with a torque wrench (→ 9.2.4 Tightening torques, Page 35).
12. Install the safety equipment:
 - Guard sheet for the motor bell housing
13. Install the auxiliary devices:
 - Manometer lines and holdings on the pump
 - Auxiliary piping
14. Turn the stub shaft by hand:
 - Ensure the stub shaft can be turned easily without pressure points.

5.5 Electrical connection



Risk of electrocution!


- ▶ Have all electrical work carried out by qualified electricians only.



Risk of fatal injury due to rotating parts!

- ▶ Disconnect the motor from its power supply and keep it locked when carrying out any installation or maintenance work.

5.5.1 Connecting the motor

 Follow the instructions of the motor manufacturer.

1. Connect the motor according to the connection diagram.
2. Make sure no danger arises due to electric power.
3. Install an EMERGENCY STOP switch.

5.5.2 Checking the direction of rotation


- ▶ This is only possible when the pump starts operation (→ 6.1 Preparations for the initial start-up, Page 18).

5.6 Installing the coupling guard

Flanged drive

1. Install the coupling guard (2 x 685.01) on the bell housing.

5.7 Performing the hydrostatic test

 Only required if the entire system is subject to a hydrostatic test.


NOTE

Damage to equipment through bursting of the pump casing

- ▶ The test pressure may not exceed the maximum permissible pump pressure (→ order data sheet).

1. Carry out the hydrostatic test using heat-transfer oil.
2. Ensure that the test pressure does not exceed the maximum permissible pump pressure.


6 Operation

 For pumps in explosion-hazard areas (→ supplementary ATEX instructions).


6.1 Preparations for the initial start-up

6.1.1 Identifying the pump type

- ▶ Identify the pump type (→ order data sheet).

 The pump types vary e.g. with regard to the shaft seal, auxiliary systems.

6.1.2 Removing the preservative

 Only necessary for pumps treated for storage.

- ▶ (→ 4.4 Removing the preservative, Page 12).

6.1.3 Filling and bleeding

- ✓ Auxiliary systems ready for operation

WARNING

Risk of injury and poisoning due to hazardous pumped liquids!

- ▶ Collect any leaking pumped liquid safely and dispose of it in accordance with environmental rules and requirements.

NOTE

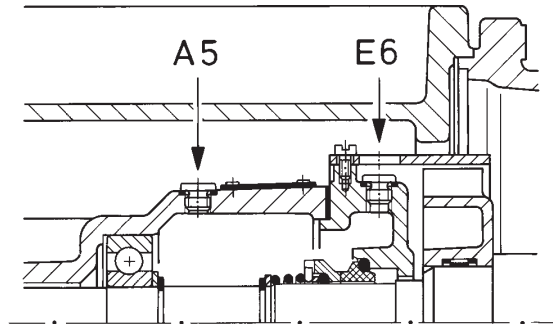
Material damage caused by dry running!

- ▶ Make sure the pump is filled properly.

Filling and venting the pump

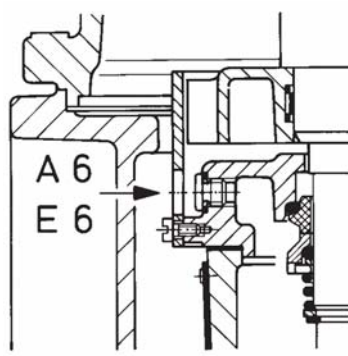
1. Fill the pump and the suction pipe with pumped medium.
2. Open the suction-side fitting.
3. Open the pressure-side fitting.
4. If available: open the auxiliary systems and check the flow rate.
5. Verify that no pipe connections are leaking.

Filling and venting the bearing housing (horizontal version)



1. Remove the screw plugs A5 and E6.
2. Fill the pumped liquid slowly into filling hole A5 until liquid escapes from vent opening E6.
3. Screw in and tighten screw plugs A5 and E6.

Filling and venting the bearing housing (vertical version)



1. Remove the screw plug A6/E6.
2. Fill slowly with pumped liquid up to the bottom edge of the filling hole.
 - Ensure that the air can escape from the bearing housing.
3. Screw in and tighten the screw plug A6/E6.

6.1.4 Checking the sense of rotation

 DANGER

Risk of fatal injury due to rotating parts!

- ▶ Use personal protective equipment when carrying out any work on the pump.
- ▶ Keep an adequate distance to rotating parts.

NOTE

Material damage due to incorrect direction of rotation!

- ▶ Make sure the sense of rotation of the motor corresponds to the arrow indicating the sense of rotation on the motor bell housing.

1. Switch the motor on and immediately off again.
2. Check whether the sense of rotation of the motor corresponds to the arrow indicating the sense of rotation on the pump.
3. If the direction of rotation is different: Swap two phases (→ 5.5 Electrical connection, Page 17).

6.2 Start-up

6.2.1 Switching on

- ✓ Pump aggregate set up and connected properly
- ✓ All connections stress-free and sealed
- ✓ Any available auxiliary systems are ready for operation
- ✓ All safety equipment installed and tested for functionality
- ✓ Pump prepared, filled and bled properly

 DANGER

Risk of injury due to running pump!

- ▶ Do not touch the running pump.
- ▶ Ensure that the coupling guard is attached.
- ▶ Do not carry out any work on the running pump.
- ▶ Allow the pump to cool down completely before starting any work.

 DANGER

Risk of injury and poisoning due to pumped liquid spurting out!

- ▶ Use personal protective equipment when carrying out any work on the pump.

NOTE

Material damage caused by dry running!

- ▶ Make sure the pump is filled properly.

NOTE

Risk of cavitation when throttling down the suction flow rate!

- ▶ Fully open the suction-side armature and do not use it to adjust the flow rate.
- ▶ Do not open the pressure-side armature beyond the operating point.

NOTE

Material damage caused by overheating!

- ▶ Do not operate the pump for long periods with the pressure-side armature closed.
- ▶ Observe the minimum flow rate (→ order data sheet).

1. Open the suction-side armature.
2. Close the pressure-side armature.
3. Switch on the motor and check it for smooth running.
4. Once the motor has reached its nominal speed, open the pressure-side armature slowly until the operating point is reached.
5. Make sure any temperature changes to pumps with hot pumped liquids are below 5 K/min.

6. Observe the following for use in high temperature systems:
 - Heat the pumped liquid and running pump slowly to 100 – 130 °C.
 - Vent the pump.
7. Heat the pumped liquid slowly to the operating temperature.
8. After the first load under pressure and at operating temperature, check that the pump is not leaking.

6.2.2 Switching off

- ✓ Pressure-side armature closed (recommended)

⚠ WARNING

Risk of injury due to hot pump parts!

- ▶ Use personal protective equipment when carrying out any work on the pump.

1. Switch off the motor.
2. Check all connecting bolts and tighten them if necessary.

6.3 Shutting down

⚠ WARNING

Risk of injury and poisoning due to hazardous pumped liquids!

- ▶ Collect any leaking pumped liquid safely and dispose of it in accordance with environmental rules and requirements.
- ▶ Take the following measures whenever the pump is shut down:

Pump is	Measure
...shut down for a prolonged period	▶ Perform measures according to the pumped liquid (→ Table 7 Measures will depend on the behavior of the pumped liquid, Page 20).
...emptied	▶ Close the suction-side and pressure-side armatures.
...dismounted	▶ Isolate the motor from its power supply and secure it against unauthorized switch-on.
...put into storage	▶ Observe the storage instructions (→ 4.3 Storage, Page 11).

Tab. 6 Measures to be taken if the pump is shut down

Behavior of pumped medium	Duration of shutdown (depending on process)	
	Short	Long
Solids sediment	▶ Flush the pump.	▶ Flush the pump.
Solidifying/ freezing, non-corrosive	▶ Heat up or empty the pump and containers.	▶ Empty the pump and containers.
Solidifying/ freezing, corrosive	▶ Heat up or empty the pump and containers.	▶ Empty the pump and containers. ▶ Treat the pump and containers with preservative.
Remains liquid, non-corrosive	–	–
Remains liquid, corrosive	–	▶ Empty the pump and containers. ▶ Treat the pump and containers with preservative.

Tab. 7 Measures will depend on the behavior of the pumped liquid

6.4 Start-up following a shutdown period

1. If the pump is shut down for more than 1 year, take the following measures before starting it up again:


Shutdown period	Measure
> 1 year	▶ For versions with roller bearings without lifetime lubrication: relubricate
> 2 years	▶ Replace the elastomer seals (O-rings, shaft seal rings). ▶ Replace antifriction bearings.

Tab. 8 Measures to be taken after prolonged shutdown periods

2. Carry out the same steps as for the initial start-up (→ 6.2 Start-up, Page 19).


6.5 Operating the stand-by pump


✓ Stand-by pump filled and bled

 Operate the stand-by pump at least once a week.


1. Completely open the suction-side armature.
2. Open the pressure-side armature far enough that the stand-by pump reaches its operating temperature and is heated uniformly. (→ 6.2.1 Switching on, Page 19).

7 Maintenance

 For pumps in explosion-hazard areas (→ supplementary ATEX instructions).

 Trained customer service technicians are available for fitting and repair work. A pumped liquid certificate (DIN safety data sheet or safety certificate) must be presented when requesting service.

7.1 Inspections

 The inspection intervals depend on the operational strain on the pump.

DANGER

Risk of injury due to running pump!

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


WARNING


Risk of injury and poisoning due to hazardous pumped liquids!


- ▶ Use personal protective equipment when carrying out any work on the pump.

1. Check at appropriate intervals:
 - Maintenance of minimum flow rate
 - Temperature of antifriction bearings < 120 °C
 - Normal operating conditions unchanged
 - No impermissible vibrations
2. For trouble-free operation, always ensure the following:
 - No dry running
 - No leaks
 - No cavitation
 - Suction-side gate valves open
 - Unclogged and clean filters
 - Sufficient supply pressure
 - No unusual running noises or vibrations
 - No overloading of the system
 - No excessive leakage at the shaft seal
 - Proper functioning of auxiliary systems
3. Put the installed stand-by pump into operation at least once a week

7.2 Maintenance

 The connection between the stub shaft of the pump and the motor shaft is rigid. Notes on bearing maintenance (→ operating manual provided by the motor manufacturer).

 Service life of the antifriction bearings for operation within the permissible operating range: > 2 years of intermittent operation, high temperatures, low viscosities and aggressive ambient and process conditions reduce the service life of antifriction bearings.

 Mechanical seals are subject to natural wear, which is largely determined by the respective operating conditions. Therefore, general statements regarding their service life cannot be made.

DANGER

Risk of injury due to running pump!

- ▶ Do not touch the running pump.
- ▶ Do not carry out any work on the running pump.
- ▶ Disconnect the motor from its power supply and keep it locked when carrying out any installation or maintenance work.

DANGER

Risk of electrocution!

- ▶ Have all electrical work carried out by qualified electricians only.

WARNING


Risk of injury and poisoning due to hazardous or hot pumped liquids!

- ▶ Use personal protective equipment when carrying out any work on the pump.
- ▶ Allow the pump to cool down before commencing any work.
- ▶ Make sure the pump is depressurized.
- ▶ Drain the pump, collect the pumped liquid safely and dispose of it in accordance with environmental regulations.

7.2.1 Antifriction bearings

- ▶ As a precaution, replace antifriction bearings with lifetime lubrication every 2 years (recommended).

7.2.2 Mechanical seals

 Mechanical seals have functional leaks (→ manufacturer's specifications).

- ▶ In the event of a larger leak: Replace the mechanical seal along with its auxiliary seals and check that the auxiliary systems are functioning.

7.2.3 Cleaning the pump

NOTE

High water pressure or spray water can damage bearings!

- ▶ Do not clean bearing areas with a water or steam jet.
- ▶ Clean large-scale grime from the pump.

7.3 Dismounting

 **DANGER**

Risk of injury due to running pump!

- ▶ Do not touch the running pump.
- ▶ Do not carry out any work on the running pump.
- ▶ Disconnect the motor from its power supply and keep it locked when carrying out any installation or maintenance work.

 **DANGER**

Risk of electrocution!

- ▶ Have all electrical work carried out by qualified electricians only.

 **WARNING**

Risk of injury and poisoning due to hazardous or hot pumped liquids!

- ▶ Use personal protective equipment when carrying out any work on the pump.
- ▶ Allow the pump to cool down before commencing any work.
- ▶ Make sure the pump is depressurized.
- ▶ Drain the pump, collect the pumped liquid safely and dispose of it in accordance with environmental regulations.

 **WARNING**

Risk of injury due to heavy components!

- ▶ Pay attention to the component weight. Lift and transport heavy components using suitable lifting gear.
- ▶ Set down structural components safely and secure them against overturning or rolling away.

 **WARNING**

Risk of injury during disassembly!

- ▶ Secure the pressure-side gate valve against accidental opening.
- ▶ Depressurize the blocking pressure system, if available.
- ▶ Wear protective gloves as wear or damage to components can make their edges very sharp.
- ▶ Remove spring-loaded components (e.g. mechanical seal, tensioned bearing, valves etc.) carefully, as components can be ejected by the spring tension.
- ▶ Observe the manufacturer's specifications (e.g. for the motor, coupling, mechanical seal, blocking pressure system, cardan shaft, gear boxes, belt drive etc.).

7.3.1 Returning the pump to the manufacturer


- ✓ Pump depressurized
- ✓ Pump completely empty
- ✓ Electrical connections disconnected and motor secured against being switched on again
- ✓ Pump cooled down
- ✓ Auxiliary systems shut down, depressurized and emptied
- ✓ Pressure gauge lines, pressure gauge and holdings dismantled
- ▶ Enclose a truthful, and fully completed, safety certificate when returning pumps or components to the manufacturer. (→ 9.4 Safety certificate, Page 38).

Repair carried out	Measure for return
...at the customer's premises	<ul style="list-style-type: none"> ▶ Return the defective component to the manufacturer.
...at the manufacturer's premises	<ul style="list-style-type: none"> ▶ Flush the pump and decontaminate it if it was used to pump hazardous media. ▶ Return the complete pump (not disassembled) to the manufacturer.
...at the manufacturer's premises for warranty repairs	<ul style="list-style-type: none"> ▶ Only in the event of hazardous pumped media: flush and decontaminate the pump. ▶ Return the complete pump (not disassembled) to the manufacturer.

Tab. 9 Measures for return

7.3.2 Preparations for dismantling

- ✓ Pump depressurized
- ✓ Pump completely empty, flushed and decontaminated
- ✓ Electrical connections disconnected and motor secured against being switched on again
- ✓ Pump cooled down
- ✓ Auxiliary systems shut down, depressurized and emptied
- ✓ Pressure gauge lines, pressure gauge and holdings dismantled
- ✓ Safety guarding removed

 In production, the pumps are constructed to a standard process. The complete insert unit can be removed without removing the volute casing and piping.

1. When dismantling, observe the following:
 - Mark the correct installation location and position of all components before dismantling them.
 - Dismantle components concentrically without canting.
2. Dismount the pump (→ sectional drawing).

7.3.3 Removal of the flanged motor

WARNING

Risk of injury due to overturning motor!

- ▶ Secure the motor to prevent overturning before working on the stub shaft.

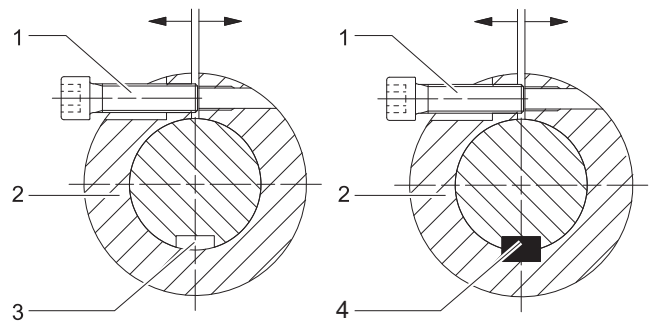




Fig. 9 Widening the stub shaft

- 1 Socket head cap screw
- 2 Stub shaft
- 3 Shaft key groove of motor shaft
- 4 Shaft key (from stub shaft bore hole diameter 60 mm)

1. Remove one half of the guard sheet (686.01) from the motor bell housing (341.01).

 The Allen key required to undo the socket head cap screw (914.06) is inserted in one of the two cast-in recesses in the motor bell housing.

2. Undo the socket head cap screw (914.06) on the stub shaft (220.xx) and unscrew it completely (→ 9.1 Sectional drawings, Page 30).

 Tighten the jack screw with a screwdriver without applying any excessive force.

3. Widening the stub shaft (220.xx):
 - Screw the M10 x 40 or M12 x 40 jack screw (not included in the scope of delivery) into the stub shaft.
4. Remove the flanged motor.


7.4 Installing

NOTE

Material damage caused by knocks and bumps!

- ▶ Do not knock or hit any components of the pump.

7.4.1 Installation of the pump

-  Reinstall the components concentrically, without canting, in accordance with the markings applied.

WARNING

Risk of injury due to heavy components!

- ▶ Pay attention to the component weight. Lift and transport heavy components using suitable lifting gear.
- ▶ Set down structural components safely and secure them against overturning or rolling away.

WARNING

Risk of injury during assembly!

- ▶ Install spring-loaded components (e.g. mechanical seal, tensioned bearing, valves etc.) carefully, as components can be ejected by the spring tension.
- ▶ Observe the manufacturer's specifications (e.g. for the motor, coupling, mechanical seal, blocking pressure system, cardan shaft, gear boxes, belt drive etc.).

NOTE

Material damage due to unsuitable components!

- ▶ Always replace any lost or damaged screws with screws of the same strength. (→ 9.2.4 Tightening torques, Page 35).
- ▶ Only replace seals with seals of the same material.

- Observe the following during installation:
 - Replace worn parts with genuine spare parts.
 - Replace seals, inserting them so that they cannot rotate.
 - Adhere to the prescribed tightening torques (→ 9.2.4 Tightening torques, Page 35).
- Clean all parts (→ 9.2.5 Cleaning agents, Page 35). Do not remove any markings which have been applied.
- Install the pump (→ sectional drawing).
- Installing the pump in the system (→ 5 Setup and connection, Page 13).


7.4.2 Installation of the flanged motor

NOTE

Damage due to incorrect installation!

- ▶ Ensure that no excessive axial forces are applied to the pump shaft.
- ▶ Ensure that the stub shaft rests flush against the collar of the motor shaft.

- ✓ Stub shaft, free from oil and grease

-  The shaft key is not required for installation up to a stub shaft bore hole diameter of 55 mm. Stub shaft bore hole diameter (→ 3.1.3 Pump type code, Page 9).

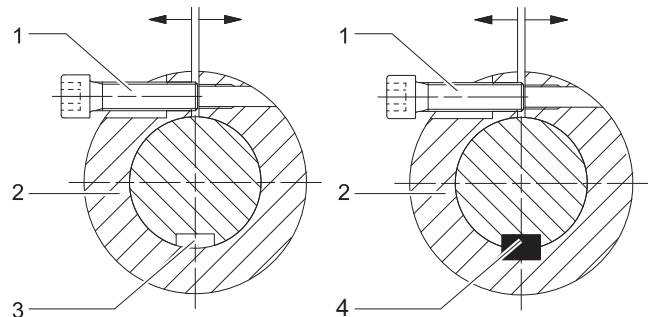



Fig. 10 Widening the stub shaft

- Socket head cap screw
- Stub shaft
- Shaft key groove of motor shaft
- Shaft key (from stub shaft bore hole diameter 60 mm)

-  Tighten the jack screw with a screwdriver without applying any excessive force.

- Widening the stub shaft (220.xx):
 - Screw the M10 x 40 or M12 x 40 jack screw (not included in the scope of delivery) into the stub shaft.
- From stub shaft bore hole diameter 60 mm: insert the shaft key.
- Turn the motor shaft so that the slot of the stub shaft is opposite the shaft key groove of the motor shaft.

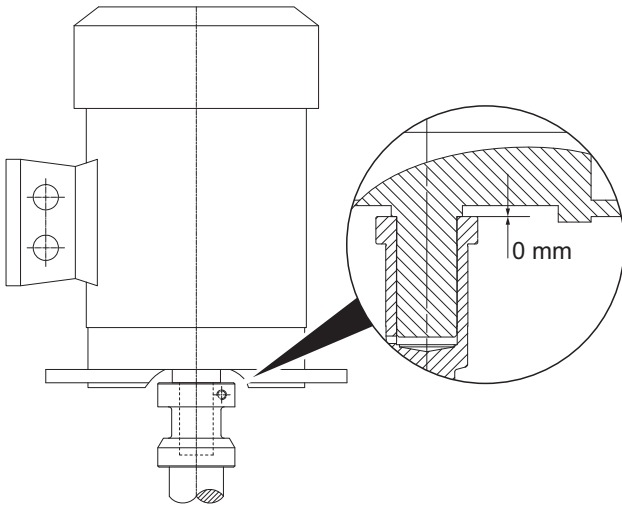


Fig. 11 Motor assembly

4. Carefully, slide on the motor until the stub shaft rests flush against the collar of the motor shaft.
 - Ensure that no excessive axial forces are applied to the pump shaft.
5. Screw in the motor bolts and tighten them.
 - Ensure that the stub shaft continues resting flush against the collar of the motor shaft.
6. Undo and unscrew the jack screw. Screw in the socket head cap screw (914.06) and tighten it with a torque wrench (→ 9.2.4 Tightening torques, Page 35).
7. Install the safety equipment:
 - Guard sheet for the motor bell housing
8. Install the auxiliary devices:
 - Manometer lines and holdings on the pump
 - Auxiliary piping
9. Turn the stub shaft by hand:
 - Ensure the stub shaft can be turned easily without pressure points.

7.5 Ordering spare parts

i To facilitate replacement in the event of faults, we recommend keeping complete insert units or spare pumps available on site.

The application guidelines described in DIN 24296 recommend provisions for two years of continuous use (→ 9.3 Spare parts for two years of continuous operation in compliance with DIN 24296, Page 37).

- ▶ Keep the following information ready to hand when ordering spare parts (→ type plate):
 - Pump type
 - Pump number
 - Year of manufacture
 - Part number
 - Designation
 - Quantity

8 Troubleshooting

If malfunctions occur which are not specified in the following table or cannot be traced back to the specified causes, please consult the manufacturer.

Possible malfunctions are identified by a number in the following table. This number identifies the respective cause and remedy in the troubleshooting list.

Fault	Number
Pump not pumping	1
Pumping rate insufficient	2
Pumping rate excessive	3
Pumping pressure insufficient	4
Pumping pressure excessive	5
Pump running roughly	6
Pump leaking	7
Motor power uptake excessive	8

Tab. 10 Fault number assignment

Fault number								Cause	Remedy
1	2	3	4	5	6	7	8		
X	-	-	-	-	-	-	-	Supply/suction pipe and/or pressure pipe closed by armature	▶ Open the fitting.
-	X	-	X	-	-	-	-	Supply/suction pipe not fully opened	▶ Open the fitting.
X	X	-	-	-	X	-	-	Stub shaft loose	▶ Tighten the stub shaft firmly (→ 7.4 Installing, Page 25).
X	X	-	X	-	X	-	-	Supply/suction pipe, pump or suction strainer blocked or encrusted	▶ Clean the supply/suction pipe, pump or suction strainer.
-	X	-	X	-	X	-	-	Supply/suction pipe cross-section too narrow	▶ Increase the cross-section. ▶ Remove any encrustations from the suction pipe. ▶ Open the armature completely.
X	-	-	-	-	-	-	-	Transport and sealing cover still in place	▶ Remove the transport and sealing cover. ▶ Dismantle the pump and inspect it for dry-running damage.
-	X	-	X	-	X	-	-	Differential head excessive: $NPSH_{pump}$ is larger than $NPSH_{system}$	▶ Increase the suction pressure. ▶ Consult the manufacturer.
X	-	-	-	-	X	-	-	Supply/suction pipe not bled properly or not filled up completely	▶ Fill up the pump and/or piping completely and bleed them.
X	-	-	-	-	X	-	-	Supply/suction pipe contains air pockets	▶ Install the armature for bleeding. ▶ Correct the piping layout.
X	X	-	X	-	X	-	-	Air is sucked in	▶ Seal the source of malfunction.
X	X	-	X	-	X	-	-	Excessive amount of gas: pump is cavitating	▶ Consult the manufacturer.
-	X	-	X	-	X	-	-	Pumped medium temperature too high: pump is cavitating	▶ Increase the suction pressure. ▶ Lower the temperature. ▶ Consult the manufacturer.

Fault number								Cause	Remedy
1	2	3	4	5	6	7	8		
-	X	-	X	-	-	-	X	Viscosity or specific gravity of the pumped liquid is outside the range specified for the pump	▶ Consult the manufacturer.
-	X	-	X	-	-	-	-	Geodetic differential head and/or pipe flow resistances too high	▶ Remove sediments from the pump and/or pressure pipe. ▶ Install a larger impeller and consult the manufacturer.
-	X	-	-	X	X	-	-	Pressure-side armature not opened wide enough	▶ Open the pressure-side fitting.
X	X	-	-	X	X	-	-	Pressure pipe blocked	▶ Clean the pressure pipe.
X	X	-	X	-	X	-	-	Pump running in the wrong direction	▶ Swap any two phases on the motor.
X	X	-	X	-	-	-	-	Motor speed too low	▶ Compare the required motor speed with the specifications on the pump type plate. Replace the motor if necessary. ▶ Increase the motor speed if speed control is available.
-	X	-	X	-	X	-	-	Pump parts worn	▶ Replace the worn pump parts.
-	-	X	X	-	X	-	X	Pressure-side armature opened too wide	▶ Throttle down at the pressure-side armature. ▶ Machine the impeller down. Consult the manufacturer and adapt impeller diameter accordingly.
-	-	X	-	-	X	-	X	Geodetic differential head, pipe flow resistances and/or other resistances are lower than specified	▶ Throttle down the flow rate at the pressure-side fitting. Observe the minimum flow rate. ▶ Machine the impeller down. Consult the manufacturer and adapt impeller diameter accordingly.
-	-	X	-	X	-	-	-	Viscosity lower than expected	▶ Machine the impeller down. Consult the manufacturer and adapt impeller diameter accordingly.
-	-	X	-	X	X	-	X	Motor speed too high	▶ Compare the required motor speed with the specifications on the pump type plate. Replace the motor if necessary. ▶ Reduce the motor speed if speed control is available.
-	-	X	-	X	X	-	X	Impeller diameter too large	▶ Throttle down the flow rate at the pressure-side fitting. Observe the minimum flow rate. ▶ Machine the impeller down. Consult the manufacturer and adapt impeller diameter accordingly.
X	X	-	X	-	X	-	-	Impeller out of balance or blocked	▶ Dismantle the pump and inspect it for dry-running damage. ▶ Clean the impeller.
-	X	-	X	-	X	-	-	Hydraulic parts of the pump dirty, clotted or encrusted	▶ Dismount the pump. ▶ Clean the parts.
-	-	-	-	-	-	-	X	Defective antifriction bearing in motor	▶ Replace the antifriction bearing (→ manufacturer's specifications).

Fault number								Cause	Remedy
1	2	3	4	5	6	7	8		
-	-	-	-	-	-	-	-	Lubricant: excessive, insufficient or unsuitable	▶ Reduce, top up or replace the lubricant.
-	-	-	-	-	-	X	-	Connecting bolts not tightened properly	▶ Tighten the connecting bolts.
-	-	-	-	-	-	X	-	Mechanical seal worn	▶ Replace the mechanical seal.
-	-	-	-	-	-	X	-	Housing seal defective	▶ Replace the housing seal.
-	-	-	-	-	-	X	-	Shaft sleeve is infiltrated	▶ Replace the shaft sleeve and/or O-ring.
-	-	-	-	-	X	X	X	Pump distorted	▶ Check the pipe connections and attachment of the pump.
-	X	-	X	-	X	-	X	Motor running on 2 phases	▶ Check the fuse and replace it if necessary. ▶ Check the cable connections and insulation.

Tab. 11 Troubleshooting list

9 Appendix

9.1 Sectional drawings

9.1.1 Auxiliary connections

Abbreviation	Connection
A5, A6	Filling
E6	Vent
FD, FD1	Drain
LO	Leakage

Tab. 12 Abbreviations of the connection designations

9.1.2 Part numbers and designations

Part no.	Designation
102.01	Volute casing
108.01	Stage casing
118.01	Fan casing
161.01	Housing cover
161.02	Housing cover
161.03	Housing cover
171.01	Impeller
183.01	Support foot
220.01	Stub shaft
220.02	Stub shaft
230.01	Impeller
230.02	Impeller 1st stage
230.03	Impeller 2nd stage
321.01	Groove ball bearing
341.01	Motor bell housing
346.01	Pump bracket
363.01	Bearing housing cover
400.01	Gasket
400.02	Gasket
400.03	Gasket
411.02	Seal ring
411.03	Seal ring
411.06	Seal ring
411.07	Seal ring
411.08	Seal ring
433.01	Mechanical seal
461.01	Gland packing

Part no.	Designation
509.01	Intermediate ring
514.01	Threaded ring
517.01	Tolerance ring
551.01	Spacer disc
551.02	Spacer disc
551.03	Spacer disc
565.01	Rivet
565.02	Rivet
686.01	Guard sheet
686.02	Guard sheet
710.01	Pipe
801.01	Flanged motor
831.01	Fan
901.10	Hexagon head bolt
903.02	Screw plug
903.06	Screw plug
903.07	Screw plug
903.08	Screw plug
904.05	Grub screw
914.01	Socket head cap screw
914.02	Socket head cap screw
914.03	Socket head cap screw
914.04	Socket head cap screw
914.05	Socket head cap screw
914.06	Socket head cap screw
914.07	Socket head cap screw
914.14	Socket head cap screw
922.01	Impeller nut
932.01	Snap ring
932.02	Snap ring
932.03	Snap ring
936.01	Spring ring
940.01	Shaft key
940.03	Shaft key
971.01	Type plate
972.01	Information plate

Tab. 13 Designation of components according to part numbers

9.1.3 Sectional drawings

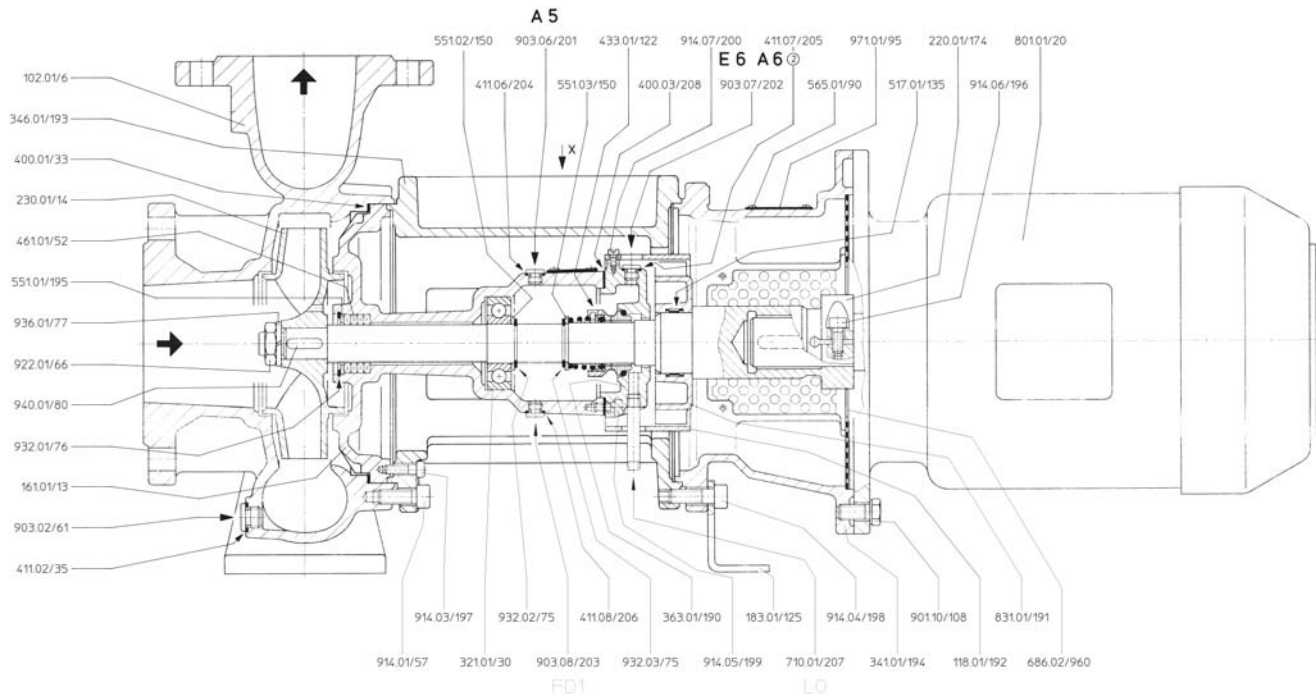


Fig. 12 **U5A** - Unbalanced mechanical seal, with safety stuffing box

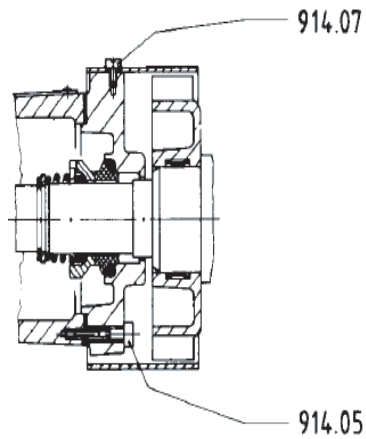


Fig. 13 Fastening of the bearing housing cover and fan casing

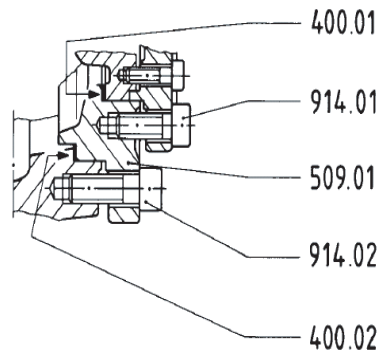


Fig. 14 Version with intermediate ring for size 40-250/01, 50-250/01, and 65-250/02

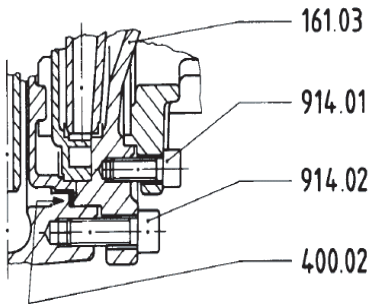


Fig. 15 Housing cover version for sizes 2/40-250/01 and 2/50-250/01

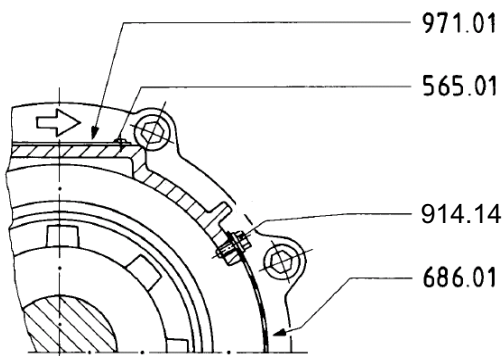


Fig. 16 Attachment of the guard sheet to the motor bell housing

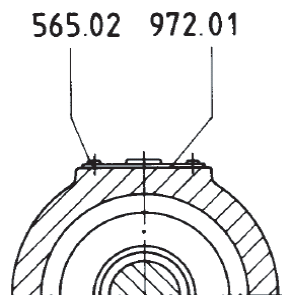


Fig. 17 Information plate (972.01), assignment of connections

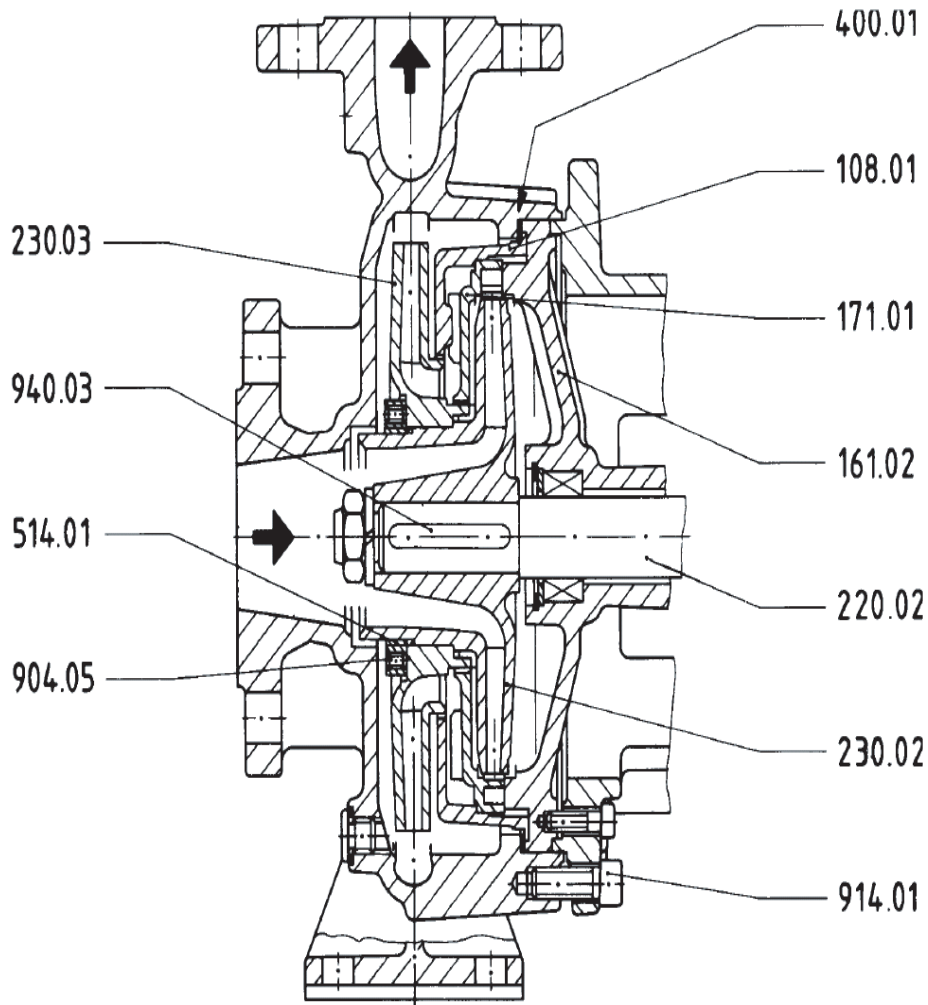



Fig. 18 Two-stage sizes, non-cooled, unbalanced mechanical seal **U5A**, with safety stuffing box

9.2 Technical specifications


 More technical specifications (→ order data sheet).

9.2.1 Stub shaft diameter at the shaft seal

Pump size	Diameter of the stub shaft at the shaft seal [mm]	
25-200	30 single stage	
32-160		
32-200		
40-160		
40-200		
40-250		
50-160		
50-200		
50-250		
65-160		
65-200		
80-160		
2/25-200		30 two stages
2/32-200		
2/40-250		
2/50-250		

Tab. 14 Assignment of the pump size to the stub shaft diameter

9.2.2 Ambient conditions

 Operation under any other ambient conditions requires the agreement of the manufacturer.

Temperature [°C]	Relative humidity [%]		Setup height above sea level [m]
	Long-term	Short-term	
-20 to +40	≤ 85	≤ 100	≤ 1000

Tab. 15 Ambient conditions

9.2.3 Sound pressure level

Measuring conditions:

- Distance to the pump: 1 m
- Operation: cavitation-free
- Motor: IEC standard motor
- Tolerance ±3 dB

Versions of the motors which produce less noise are available if the expected noise levels exceed the permissible limits.

Nominal motor power PM [kW]	Sound pressure level [dB] for pump with motor at speed [rpm]			
	1450	1750	2900	3500
1.5	58	58.5	63	64
2.2	60	60.5	66	67
3.0	62	62.5	68	69
4.0	63	63.5	69	70
5.5	65	65.5	71	72
7.5	66	66.5	72	73
11.0	68	68.5	74	75
15.0	69	69.5	75	76
18.5	70	70.5	76	77
22.0	71	71.5	77	78
30.0	72	72.5	78	79
37.0	73	73.5	79	80

Tab. 16 Sound pressure level

9.2.4 Tightening torques

Part no.	Thread size	Quality	Tightening torque [Nm]
901.10	M10	8.8	35
	M12	5.6	35
	M16	8.8	150
903.02	G ¼ G ¾	St	10
903.06			15
903.07			
903.08			
904.05	M8	A4	12
914.01	M10	8.8	35
914.02	M12	8.8	63
914.03	M6	8.8	9
914.04	M10	8.8	35
914.05	M6	8.8	9
914.06	M8	12.9	25
914.07	M 4	4.8	0.8
914.14	M6	8.8	9
922.01	M20 x 1.5	1.7139	112

Tab. 17 Tightening torques


9.2.5 Cleaning agents

Application area	Cleaning agents
Foodstuffs and drinking water sector	E.g. spirit, Ritzol 155, strong alkaline soapy solution, steam jet (for individual parts only)
Cold cleaning agent ¹⁾	Nikutex 304
Other	Benzine, wax solvents, diesel, paraffin, alkaline cleaners

Tab. 18 Cleaning agents

1) Recommendation


9.2.6 Preservatives

 Use Valvoline preservatives or similar (recommended).

Type of storage	Storage duration [months]	Preservative inside/ outside	Renew [months] inside/ outside
In closed, dry and dust-free room	<6	Tectyl 511 M	–
	6-12	Tectyl 511 M	–
	> 12	Tectyl 506 EH	48/48
In open air, central European climate	<6	Tectyl 542	–
	6-12	Tectyl 542/ Tectyl 506 EH	–
	> 12	Tectyl 506 EH	48/18
Outdoors, tropical climate, aggressive industrial atmosphere or close to sea	<6	Tectyl 542/ Tectyl 506 EH	–
	6-12	Tectyl 542/ Tectyl 506 EH	–
	> 12	Tectyl 506 EH	48/12

Tab. 19 Valvoline preservatives

9.2.7 Flange loads

 Definition of the pipe forces and torques based on EN ISO 5199.

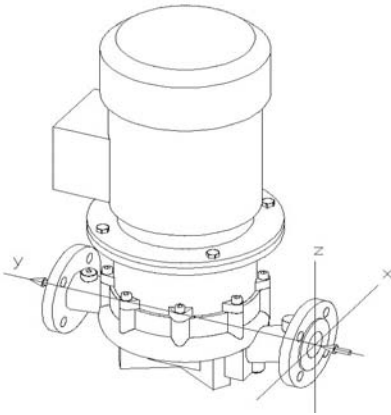


Fig. 19 Flange loads at the pump

Nominal flange diameter [mm]	Forces [N]				Torques [Nm]			
	$F_{\max}(x)$	$F_{\max}(y)$	$F_{\max}(z)$	ΣF	$M_{\max}(x)$	$M_{\max}(y)$	$M_{\max}(z)$	ΣM
25	375	425	350	666	450	300	350	644
32	450	525	425	812	550	375	425	790
40	550	625	500	971	650	450	525	949
50	750	825	675	1303	700	500	575	1035
65	925	1050	850	1637	750	550	600	1107
80	1125	1250	1025	1969	800	575	650	1180
100	1500	1675	1350	2623	875	625	725	1297
125	1775	1975	1600	3100	1050	750	950	1602
150	2250	2500	2025	3926	1250	875	1025	1838
200	3000	3350	2700	5245	1625	1150	1325	2391

Tab. 20 Maximum flange loads

9.3 Spare parts for two years of continuous operation in compliance with DIN 24296


Part no.	Part designation	Number of identical pumps (including stand-by pumps)						
		2	3	4	5	6 or 7	8 or 9	> 9
		Set/quantity of spare parts						
171.01	Impeller (all two-stage pump sizes)	1	1	1	2	2	3	30%
220.01 220.02 914... 922... 936... 940...	Stub shaft Stub shaft Socket head cap screw Impeller nut Spring ring Shaft key	1	1	2	2	2	3	30%
230.01	Impeller (all single-stage pump sizes)	1	1	1	2	2	3	30%
230.02 230.03 514.01 904.05	Impeller 1st stage Impeller 2nd stage Threaded ring Grub screws	1	1	1	2	2	3	30%
321.01	Groove ball bearing	1	1	2	2	3	4	50 %
	Drive unit	–	–	–	–	–	1	2
400.01 400.02 400.03	Gasket Gasket ²⁾ Gasket	4	6	8	8	9	12	150%
433.01	Mechanical seal, complete	2	3	4	5	6	7	90%
461.01	Gland packing (set)	2	2	2	3	3	4	50%

Tab. 21 Spare parts for two years of continuous operation


1) Delivered as a mechanical unit (BG) or sales unit (VG)

2) On versions with intermediate ring

9.4 Safety certificate


 Please copy this document and send it together with the pump.

The pump and accessories submitted for inspection / repairs together with the safety certificate by us, the signatory:	
Type: _____	Delivery date: _____
Part no.: _____	Order no.: _____
Reason for inspection / repair: _____	
<input type="checkbox"/> Was not used with liquids that are hazardous to health or the environment.	
<input type="checkbox"/> Was used for the following application: _____	
Came into contact with liquids that must be labeled for safety or are considered to be polluting.	
<input type="checkbox"/> Last pumped liquid: _____	
<input type="checkbox"/> The pump has been carefully bled and cleaned on the outside and inside prior to delivery or provision.	
<input type="checkbox"/> Special safety precautions are not necessary for subsequent handling.	
<input type="checkbox"/> The following safety precautions regarding rinsing liquids, liquid residue and disposal are necessary:	

 If the pump was used with critical liquids, please make sure you enclose a safety data sheet in the package.	
We hereby declare that the information given is correct and complete, and that the pump is being shipped in accordance with legal requirements.	
Company / address: _____	Phone: _____
	Fax: _____
Customer no.: _____	
Name of issuer: (capital letters) _____	Position: _____
Date: _____	Company stamp / signature: _____

Tab. 22 Safety certificate

9.5 Declaration of conformity according to EC Machine Directive

 The following declaration does not contain serial numbers or signatures. The original declaration is delivered with the respective pump.

<p>EC declaration of conformity according to machine directive, appendix II A</p> <p>We, ALLWEILER GmbH, Postfach 1140, 78301 Radolfzell, Germany; Tel. +49 (0)7732 86-0, Fax. +49 (0)7732 86-436, hereby declare that, when the conditions in the operating manual are observed, the pump unit / pump:</p>	
Designation	NBT _____
Equipment no.	_____
Order no.	_____
<p>complies with the following applicable EC directives :</p> <ul style="list-style-type: none"> • Machine directive (2006/42/EC) • The protection targets of the low-voltage directive 2006/95/EC were adhered according to appendix I no. 1.5.1 of the directive 2006/42/EC 	
<p>Applicable harmonized norms:</p> <ul style="list-style-type: none"> • EN 809:1998 + A1:2009 + AC:2010 • EN ISO 12100:2010 	
Person authorized to compile the technical file	ALLWEILER GmbH Allweilerstr. 1 78315 Radolfzell
Date: 06.02.2013	Company stamp / signature:
_____ Head of Development/Construction	

Tab. 23 Declaration of conformity according to EC machine directives

