STÜBBE

X-CLASS HEAVY DUTY PUMP

Standard chemical process pump NX in plastic DIN EN ISO 2858

Close-coupled chemical process pump BX in plastic DIN based on DIN EN ISO 2858

Original operating manual **NX /BX series**

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Subject to technical modifications.
Read carefully before use.
Save for future use.

CE

Table of contents

List of figures

List of tables

1 About this document

This manual:

- is part of the equipment
- applies to all series referred to
- describes safe and proper operation during all operating phases

1.1 Target groups

Operating company

- Responsibilities:
  - Always keep this manual accessible where the device is used on the system.
  - Ensure that employees read and observe this document, particularly the safety instructions and warnings, and the documents which also apply.
  - Observe any additional country-specific rules and regulations that relate to the system.

Qualified personnel, fitter

- Mechanics qualification:
  - Qualified employees with additional training for fitting the respective pipework
- Electrical qualification:
  - Qualified electrician
- Transport qualification:
  - Qualified transport specialist
- Responsibility:
  - Read, observe and follow this manual and the other applicable documents, especially all safety instructions and warnings.

1.2 Other applicable documents

To download: **ATEX additional manual (300 365)** Additional instructions for use in explosive atmospheres www.stuebbe.com/pdf/300365.pdf
To download: **Resistance lists** Resistance of materials used to chemicals www.stuebbe.com/pdf/300051.pdf
To download: **Data sheet** Technical data and conditions of operation www.stuebbe.com/pdf/300779.pdf
CE declaration of conformity Conformity with standards (→ 9.4 Declaration of conformity in accordance with EC machinery directive, Page 57).

Tab. 1 Other application documents, purpose and where found

1.3 Warnings and symbols

Symbol	Meaning
⚠ DANGER	• Immediate acute risk • Death, serious bodily harm
⚠ WARNING	• Potentially acute risk • Death, serious bodily harm
⚠ CAUTION	• Potentially hazardous situation • Minor injury
NOTE	• Potentially hazardous situation • Material damage
	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., ...	Multiple-step instructions
✓	Precondition
→	Cross reference
	Information, notes

Tab. 2 Warnings and symbols

2 General safety instructions

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

2.1 Intended use

- Only use the pump with suitable media (→ resistance lists).
- Do not use pump for combustible or explosive fluids.
- Adhere to the operating limits and size-dependent minimum flow rate (→ Tab. 26 Flow rate of the pumped medium, Page 54).
- Avoid running dry:
  Initial damage, such as destruction of bearings, seals and plastic parts, will occur within a few seconds.
  – Make sure the pump is only operated with, and never without, pumped liquid.
  – Ensure that the sealing chamber is sufficiently filled and ventilated.
  – Ensure that there are no excessively high amounts of gas in the pumping medium.
  – Only operate pump within the permissible operating range.
  – Ensure that the insertion of valves or filters does not make the pressure too low on the inlet side of the pump.
  – Ensure that high temperatures and/or low suction pressure at the suction side do not cause the pressure in the pump to fall below the vapor pressure of the pumped medium, and do not cause gas bubbles form at the mechanical seal.
  – Ensure that no air is being drawn in via the mechanical seal due to low supply pressure.
  – In case of doubt provide a double-acting mechanical seal.
- Avoid cavitation:
  – Open the suction-side fitting and do not use it to regulate the flow.
  – Do not open the pressure-side fitting beyond the agreed operating point.
- Avoid overheating:
  – Do not operate the pump while the pressure-side fitting is closed.
  – Observe the minimum flow rate (→ Tab. 26 Flow rate of the pumped medium, Page 54).
- Avoid damage to the motor:
  – Do not open the pressure-side fitting beyond the agreed operating point.
  – Note the maximum permissible number of times the motor can be switched on per hour (→ 9.2.13 Switching frequency, Page 56).
  – Do not exceed the maximum permissible speed
- Consult with the manufacturer regarding any other use of the device.
- If pumps are delivered without motors, then final assembly as a pump assembly must take place in accordance with the provisions of the Machinery Directive 2006/42/EC.
- Use the pump only as part of a large system/tool.

Operate the pump in an explosion hazard environment (ATEX)

- Do not use pump for combustible or explosive fluids.
- Do not operate the pump with the isolation devices (such as gate valves and stop valves) closed.
- Operate the pump at the permissible minimum volumetric flow rate (→ Tab. 26 Flow rate of the pumped medium, Page 54).
- Ensure the necessary pressure and volumetric flow rate at the auxiliary ports (quench liquid / blocking liquid).
- Comply with the maintenance intervals.
- The pump must be operated with two-way mechanical seals, in order to avoid exceeding the upper temperature limit in the event of dry running.

Prevention of obvious misuse (examples)

- Observe pump limits of use regarding temperature, pressure, flow and speed (→ data sheet).
- The power consumption of the pump increases as the specific gravity of the pumped fluid increases. Adhere to the permissible specific gravity in order to eliminate the possibility that the pump, coupling and motor become overloaded (→ data sheet).
  A lower specific gravity is permissible. Adapt the auxiliary systems accordingly.
- When conveying fluids containing solids, observe the limit values for proportions of solid particles and particle size (→ Data sheet, technical description).
- When using auxiliary plant systems:
  – Ensure compatibility of the operating medium with the product medium.
  – Ensure constant supply of the relevant operating medium.
- Pumps used with water as the pumped liquid must not be used for foodstuffs or drinking water. Use for food or drinking water only if specified in the data sheet.
- When drawing flushing water from the normal drinking water main:
  – Use system separator for drink water main
- The type of installation should be selected only in accordance with these operating instructions. For example, the following are not allowed:
  – Suspension within pipework runs of pumps mounted on base plates
  – Overhead installation
  – Installation in the immediate vicinity of extreme heat or cold sources
  – Installation too close to a wall

2.2 General safety instructions

Observe the following regulations before carrying out any work.

2.2.1 Product safety

The pump has been built according to state-of-the-art technology and the recognized technical safety regulations. Nevertheless, operation of the pump can still put the life and health of the user or third parties at risk or damage the pump or other property.

- Operate the pump only if it is in perfect technical condition and use it only as intended, staying aware of safety and risks, and in adherence to the instructions in this manual.
- Keep this manual and all other applicable documents complete, legible and accessible to personnel at all times.
- Refrain from any procedures and actions that would pose a risk to personnel or third parties.
- In the event of any safety-relevant faults, shut down the pump immediately and have the fault corrected by appropriate personnel.
- 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 pump is operated.

2.2.2 Obligations of the operating company

Safety-conscious operation

- Operate the pump only if it is in perfect technical condition and use it only as intended, staying aware of safety and risks, and in adherence to the instructions in this manual.
- Ensure that the following safety aspects are observed and monitored:
  - 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
  - Applicable guidelines of the operator
- Make personal protective equipment available.

Qualified personnel

- Make sure all personnel tasked with 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:
  - Installation, repair and maintenance work
  - Transportation
  - Work on the electrical system
- Make sure that trainee personnel only work on the pump under supervision of specialist technicians.

Safety equipment

- Provide the following safety equipment and verify its functionality:
  - For hot, cold and moving parts: pump safety guarding provided by the customer
  - For pumps without capability to run dry: Dry run protection
  - For potential electrostatic charging: provide suitable 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 the hot pump or motor components as a heating point
  - Do not de-ice the pump using gas burners or similar tools
- Do not remove the safety guarding for hot, cold or moving parts during operation.
- Use personal protective equipment if necessary.
- Only carry out work on the pump while it is not running.
- Before all installation and maintenance work, disconnect the motor from the mains and secure it against being switched back on again.
- Never reach into the suction or discharge flange.
- Following all work on the pump, refit safety devices in accordance with the instructions and bring into service.

2.3 Specific hazards

2.3.1 Hazardous pumped liquids

- When handling hazardous fluids, observe the safety regulations for the handling of hazardous substances.
- Use personal protective equipment when carrying out any work on the pump.
- Collect leaking pumped liquid and residues in a safe manner and dispose of in accordance with environmental regulations.

2.3.2 Potentially explosive atmospheres

Observe ATEX additional manual

- Additional instructions for use in explosive atmospheres
- www.stuebbe.com/pdf/300365.pdf

3 Layout and Function

3.1 Marking

3.1.1 Name plate

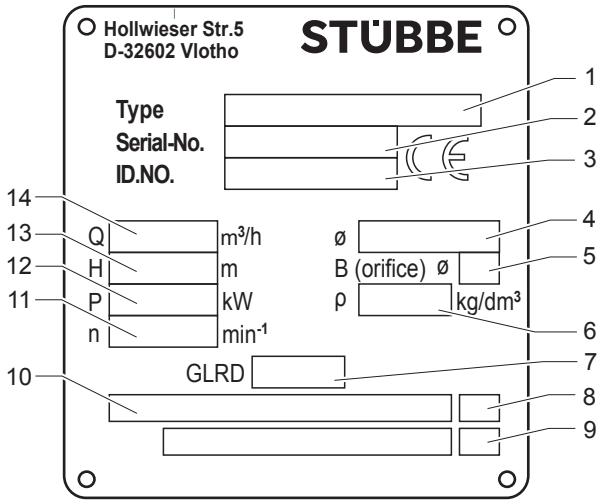


Fig. 1 Name plate (example)

1 Pump type
2 Serial number
3 Identification number
4 Impeller diameter (main vanes, back vanes) [mm]
5 Diaphragm diameter
6 Specific gravity
7 Mechanical seal code
8 Specifications for shaft sleeve
9 Auxiliary seal information
10 Shaft seal information
11 Rotational speed
12 Power consumption of pump / motor
13 Differential head
14 Flow rate

3.1.2 ATEX type plate

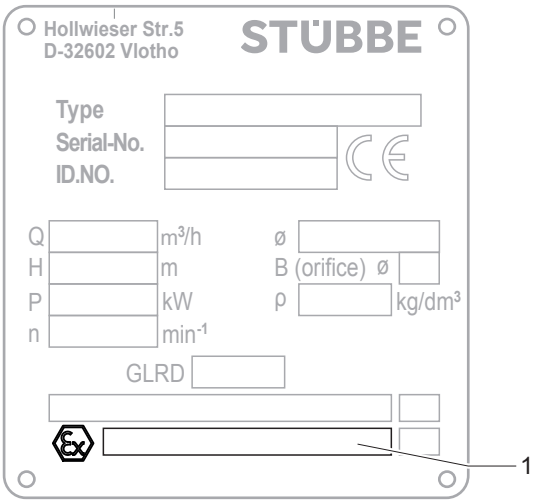


Fig. 2 ATEX type plate (example)

1 Explosion protection label

3.1.3 Pump type code

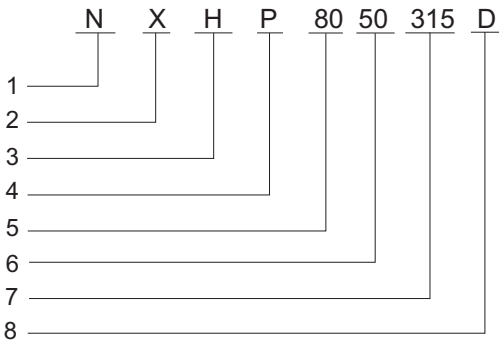


Fig. 3 Pump type code (example)

1 Design type
- **N** – Standard pump
- **B** – Close coupled pump

2 Pump series
- **X** – X-CLASS heavy-duty pump

3 Hydraulic system
- **H** – half-open impeller
- **G** – closed impeller
- **F** – 3-channel free-flow impeller
- **S** – closed impeller with front vanes and back vanes

4 Material of the volute casing
- **P** – PP (polypropylene)
- **E** – UHMW-PE ultra-high molecular weight low-pressure polyethylene)
- **D** – PVDF (polyvinylidene fluoride)
- **T** – PTFE/PFA (polytetrafluorethylene / perfluoralkoxy polymer)
- **H** – UHMW-PE (conductive)
- **I** – PVDF (conductive)
- **L** – PTFE/PFA (conductive)

5 Suction nozzle diameter

6 Discharge nozzle diameter

7 Impeller nominal diameter

8 Name affix (optional)
- **D** – Restricting orifice mounted directly on the discharge flange
- **V** – Vertical installation
- **S** – Special version

3.1.4 – Mechanical seal type code

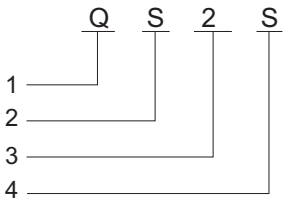


Fig. 4 Mechanical seal type code (example)

1 Version
- **E** – single acting mechanical seal
- **Q** – single acting mechanical seal with quench
- **D** – double acting mechanical seal

2 Manufacturer of the atmospheric side mechanical seal
- **S** – STÜBBE

3 Type
- **T** – PTFE bellows (standard)
- **E** – Bellows od UHMW-PE
- **2** – UV2 (high-pressure single acting mechanical seal)
- **3** – UV3 (high-pressure double acting mechanical seal)

4 Flushing connection
- **N** – Standard version (double-acting mechanical seal, single-acting mechanical seal without flushing)
- **D** – Permanent flushing
- **S** – Standstill flushing

3.2 Description

3.2.1 NX /BX pump

Fully metallic chambered standardized plastic pump for chemicals, in process design.

The NX pump corresponds to DIN ISO 2858 for pressure rating PN16. The sizes NX 40-25-160, NX 100-65-315 and NX 250-200-400 are based on the standard (transnorm pumps).

The close-coupled process pump BX is also fully metallic chambered and based on DIN EN ISO 2858.

- Horizontal single-stage non self-priming centrifugal pump
- Hydraulically efficient with half-open, closed and 3-channel free-flow impellers (dependent on size)
- Bearing unit can be removed with the impeller without having to dismantle the volute casing, pipework or motor.
- Thick-walled and replaceable plastic casing, metallic chambered
- Universal shaft for all available mechanical seals
- Proprietary mechanical seal module (single-acting and double-acting)
- Bearings sealed for life, alternatively heavy-duty bearing with grease or oil lubrication
- NX pump: Generously dimensioned fixed/loose bearings as standard
- BX pump:
  - Block design pump with connection port sizes to DIN EN ISO 2858
  - Integral shaft bearings and flanged motor
- Optional: Customer-specific hydraulics on request

Pump assembly:

- With clamped double Cardan shaft coupling as standard
- Sturdy coupling guard of PE or various metals
- Motor with integral motor plate adjustable for height flor easy alignment (size-dependent)
- Multi-coat epoxy resin paint finish with top coat RAL 2002 (blood orange)

3.2.2 NX / BX ATEX pump

Pumps and units with special approval can be used as devices for category 2G or 3G in explosion hazard environments (zone 1 and zone 2) (ATEX).

The ATEX conformity is shown on the name plate (→ Fig. 2 ATEX type plate (example), Page 10). A declaration of conformity to the EU - Explosion Protection Directive 2014/34/EU must also be provided.

3.3 Assembly

3.3.1 NX

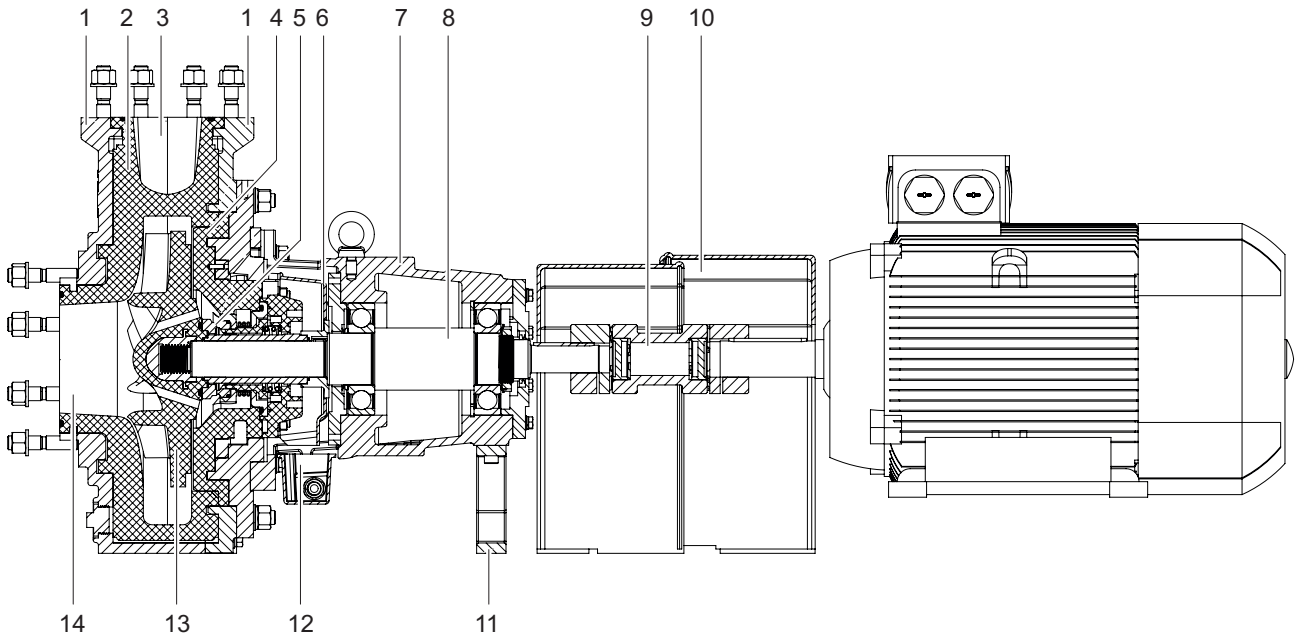


Fig. 5 Version NX

1 Armored casing of EN-GJS-400-15
2 Volute casing of plastic
3 Discharge flange
4 Sealing insert of plastic
5 Mechanical seal
6 Splash guard
7 Bearing casing of EN-GJS-400-15
8 Shaft of steel (1.7227)
9 Coupling
10 Coupling guard
11 Support foot
12 Leakage tray with drain connection
13 Impeller of plastic
14 Suction branch

3.3.2 BX

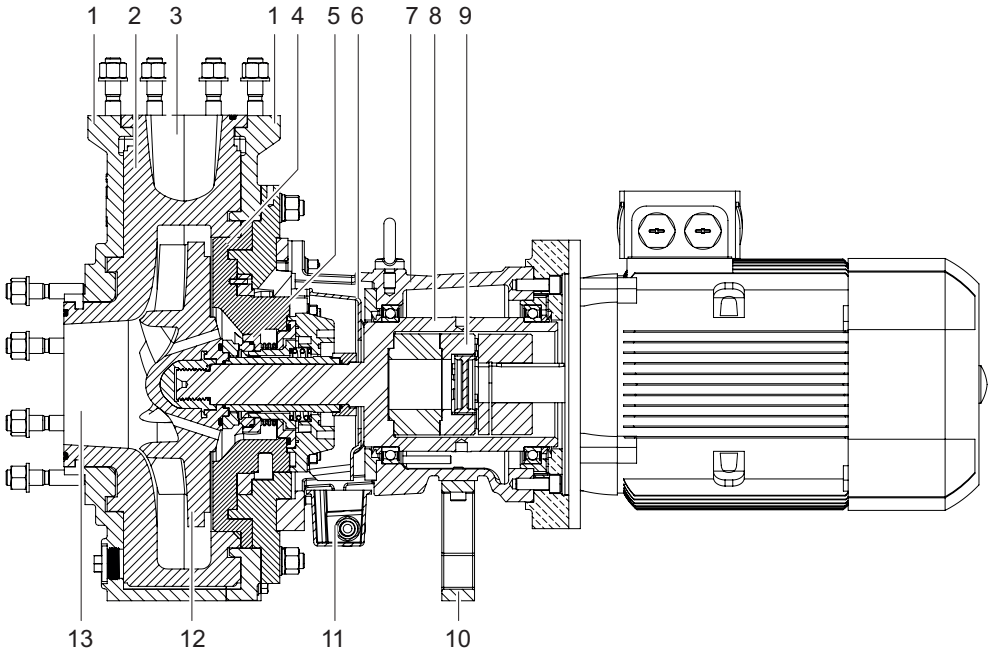


Fig. 6 Version BX

1 Armored casing of EN-GJS-400-15
2 Volute casing of plastic
3 Discharge flange
4 Sealing insert of plastic
5 Mechanical seal
6 Splash guard
7 Bearing casing of EN-GJS-400-15
8 Hollow shaft
9 Coupling
10 Support foot
11 Leakage tray with drain connection
12 Impeller of plastic
13 Suction branch

3.4 Shaft seals

Only one of the following shaft seals can be used (→ 3.1.4 – Mechanical seal type code, Page 11).

3.4.1 Single-acting STÜBBE PTFE bellows-type mechanical seal

- Spring-loaded (PTFE) bellows (481)
- General-purpose chemical resistance since the spring does not come into contact with the medium
- Up to 115 °C and up to 3 bar(g) inlet pressure
- Up to 8 bar(g) static pressure
- At the counter ring (rotating seal ring) and the sliding ring (stationary seal ring), torques are transmitted by extremely stable interlocking (and not by a clamp fit) (high break-away torque in the event of sticking and adhesive forces)
- Suitable for pumping media containing solids
- The following versions are available as required:
  – Internal flushing (A)
  – Internal flushing and quenching (B)
  – Permanent flushing (C)
  – Standstill flushing (D)

A) Version for internal flushing (product flushing) - API plan 01 type ESTN

- For non-critical applications
- Flushing of the mechanical seal with the pumped medium (product)

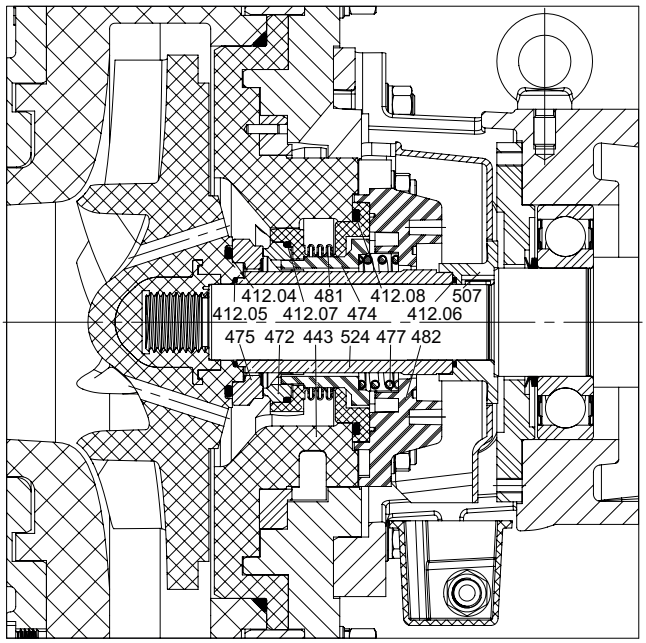


Fig. 7 Single-acting mechanical seal with PTFE bellows, version internal flushing

B) Version for internal flushing and quenching - API plan 62 type QSTN

- Atmosphere-side seal of the bellows carrier (482) by radial seal (421.3)
- The resulting cavity is filled with quenching medium (such as de-ionized water):
  – At pressures between 0.8 and 8 bar the integral flow restrictor limits the quenching medium flow is limited to 30 ltr / h (ensure free discharge of the quenching medium; the pressure in the quenching chamber is limited to a maximum of 0.5 bar(g))
  – This prevents formation of crystals within the mechanical seal
  – Protects against the mechanical seals running hot when there is a partial vacuum in the shaft seal cavity
  – Can be used even on versions with permanent quenching (with quenching vessel). Used here without a flow limiter

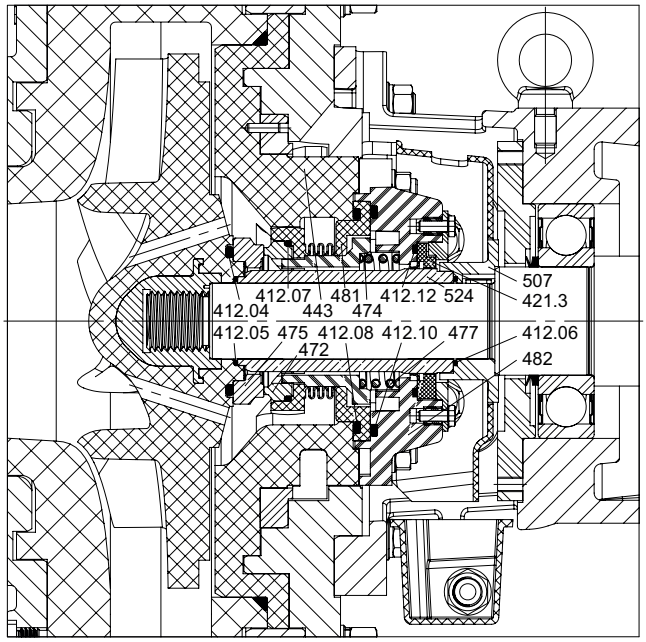


Fig. 8 Single-acting mechanical seal with PTFE bellows, version internal flushing and quenching

C) Version with permanent flushing – API plan 32 type ESTD

- Suitable for pumping media containing solids
- Flushes the mechanical seal with clean flushing medium (such as water)
- Limitation of the flushing medium by a throttle section (labyrinth seal) within the pump
- Flushing volume is dependent on the solids content and pump size 40 – 250 ltr/h (→ 9.2.10 Flush volume, Page 52).
- It is useful to install a flow meter and a valve for controlling the flushing flow
- The flushing medium will mix with the pumped medium. For certain processes, such as evaporation processes or applications involving sulfuric acid, the use of flushing media is prohibited.

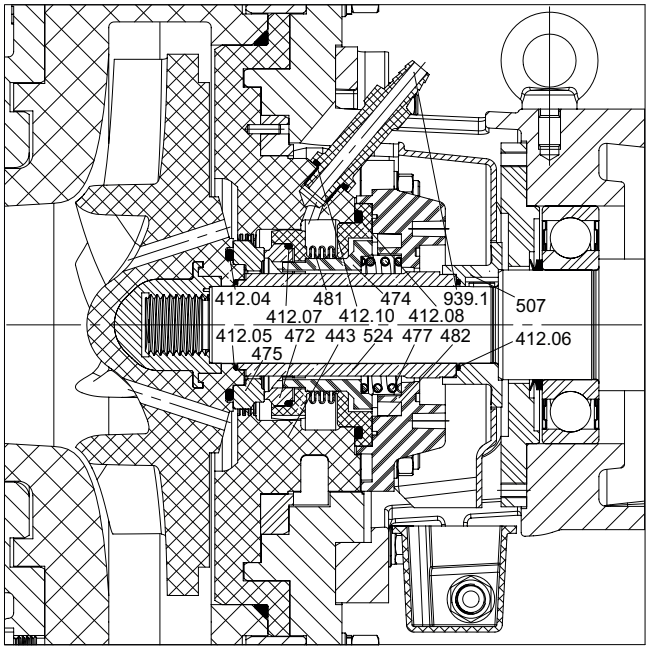


Fig. 9 Single-acting mechanical seal with PTFE bellows, version with permanent flushing

D) Version with standstill flushing – API plan 32 type ESTS

- For use with pumped media containing solids, where for process reasons the use of flushing media is prohibited
- Design similar to the permanent flushing (C) version, but without the throttle section
- Flushes the mechanical seal with clean flushing medium (such as water) immediately before the pump is switched off or immediately after it is switched off (approx. 50-100 ltr during the course of approx. 1-2 min flushing period)
- Prevents sedimentation when the pump is stationary, and crystallization within the pump in the area of the mechanical seal
- The flushing medium will mix with the pumped medium. For certain processes, such as evaporation processes or applications involving sulfuric acid, the use of flushing media is prohibited.

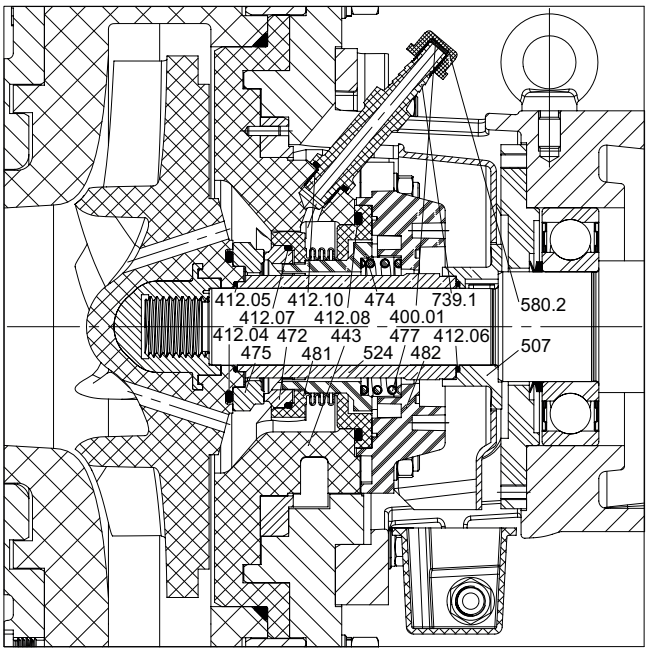


Fig. 10 Single-acting mechanical seal with PTFE bellows, version with internal flushing and quenching

3.4.2 Single-acting STÜBBE mechanical seal, type UV2 – API plans similar to section 3.4.1

- General-purpose chemical resistance
- Sturdy high-pressure spring single mechanical seal in REA version
- Up to 115 °C and up to 8 bar(g) inlet pressure
- Up to 16 bar(g) static pressure
- Sliding ring (stationary seal ring) made of SSiC
- Counter ring (rotating seal ring) made of SSiC
- For use with pumped media containing solids and applications with high inlet pressures
- At rotating seal rings and stationary seal rings, torques are transmitted by extremely stable interlocking
- Suitable for pumping media containing solids
- If required can be configured with quenching and/or permanent flushing or standstill flushing

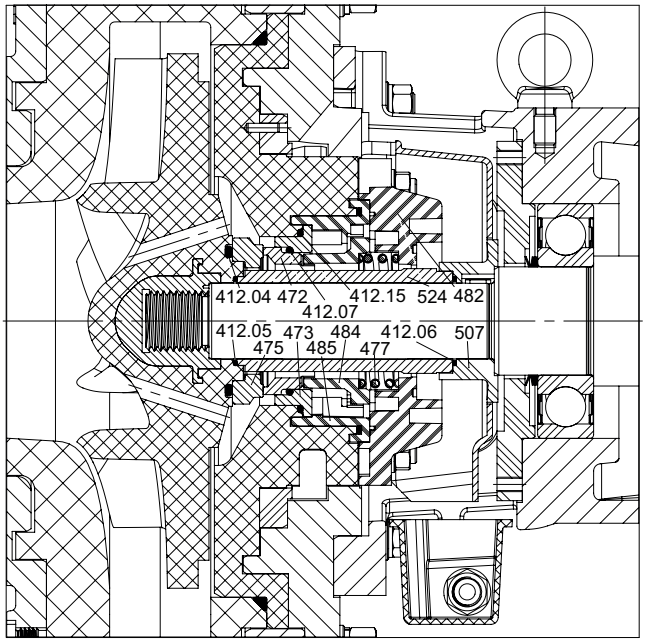


Fig. 11 Single-acting mechanical seal, type UV2

3.4.3 Double-acting mechanical seal STÜBBE UV3 - API plan 53A and 54 type DS3N

- General-purpose chemical resistance
- Sturdy high-pressure spring double mechanical seal in REA version
- Up to 160 °C and up to 8 bar(g) inlet pressure
- Up to 16 bar(g) static pressure
- Identical stationary seal on the product side as for the single mechanical seal (modular design principle)
- The high-end solution for highly critical applications (such as all cases where no blocking or flushing medium may mix with the pumped medium)
- Sealing medium with overpressure is necessary (comply with the manufacturer's specifications). Version of the auxiliary plant system with thermosiphon reservoir (circuit) or with free discharge. The discharge must be throttled to the required quantity and pressure.
  The sealing medium must not deposit any residues on the sliding faces. For example, the following are allowed:
  – Light-bodied oil without high-pressure additives
  – Water/ethylene glycol mixture without corrosion inhibitor additives
  – Steam condensate, de-ionized water

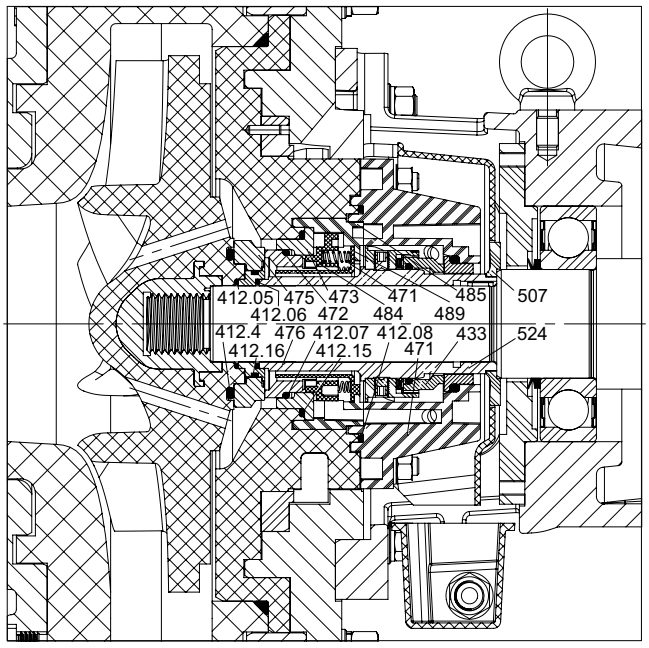


Fig. 12 Double-acting mechanical seal, type UV3

4 Transport, Storage and Disposal

4.1 Transport

The user/owner is responsible for the transport of the pump.

Weight specifications (→ documents for the particular order)

4.1.1 Unpacking and inspection on delivery

1. Unpack the pump/pump assembly upon delivery and inspect it for transport damage.
2. Check completeness and accuracy of delivery.
3. Ensure that the information on the name plate agrees with the order/design data.
4. Report any transport damage to the manufacturer immediately.
5. Dispose of packaging material according to local regulations.

4.1.2 Lifting

⚠ DANGER

Death or limbs crushed as a result transported items falling over!

- ► Use lifting gear appropriate for the total weight to be transported.
- ► Attach lifting gear in accordance with the following diagrams.
- ► Never use the lifting eye of the motor as the attachment point for lifting the entire pump (the lifting eye of the motor may be used for securing a pump assembly with a high center of gravity against being knocked over).
- ► Do not stand under suspended loads.
- ► Do not incline the pump more than 10°.

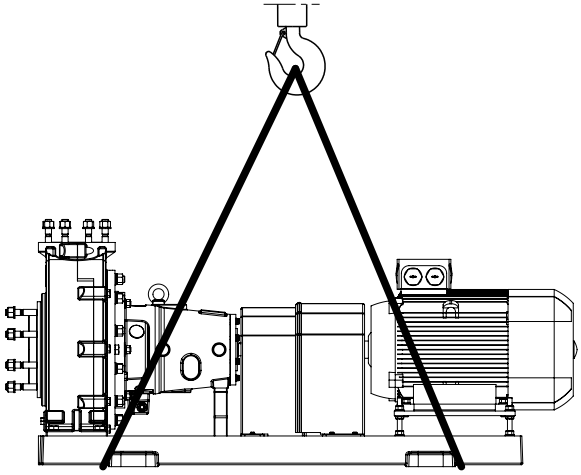


Fig. 13 Attaching lifting gear to the pump unit

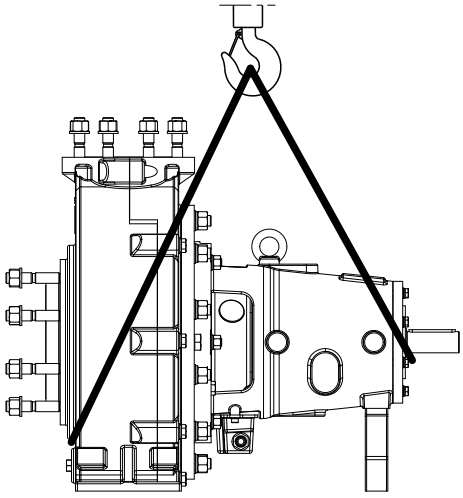


Fig. 14 Attach lifting gear to pump

1. Attach lifting gear in accordance with the following diagrams.
2. Lift the pump/pump assembly appropriately.

4.2 Storage

NOTE

Material damage due to inappropriate storage!

► Store the pump properly.

1. Seal all openings with blind flanges, blind plugs or plastic covers.
2. Make sure the storage room meets the following conditions:
   – Dry
   – Frost-free
   – Vibration-free
   – UV protected
3. Turn the shaft over every three months, but no later than directly before commissioning.
4. Make sure the shaft and bearing change their rotational position in the process.

4.3 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 by 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 damage any escaping pumped liquid or oil in accordance with local regulations.
   – Neutralize residues of pumped liquid in the pump.

► Remove plastic parts and damage them in accordance with local regulations.

► Dispose of the pump in accordance with local regulations.

5 Installation and connection

For pumps in potentially explosive atmospheres (→ ATEX additional manual).

NOTE

Material damage due to distortion or passage of electrical current in the bearing!

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

NOTE

Material damage caused by dirt!

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

5.1 Preparing for installation

5.1.1 Check operating conditions

- ▶ Ensure the required operating conditions are met:
  - Resistance of the materials of the housing and seals to the medium (→ resistance list).
  - Required ambient conditions (→ 9.2.1 Ambient conditions, Page 45).
  - Operational limits (→ 9.2.11 Operational limits, Page 54).

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 vibration (damage to bearings)
  - No corrosive exposure
  - Frost protection

5.1.3 Prepare foundation and surface

✓ Aids, tools, materials:
- Steel shims
- Spirit level

Installation options:
- With concrete foundation
- With steel foundation frames
- Without foundation

1. Ensure the foundation and surface meet the following conditions:
   - Level and horizontal
   - Clean (no oil, dust or other impurities)
   - Capable of bearing the weight of the pump assembly and all operating forces
   - Stability of the pump ensured
   - With concrete foundation: Normal concrete of strength class X0 in accordance with DIN EN 206
2. Clean pump sump carefully.

5.2 Installing with foundation

NOTE

Material damage due to distortion of base plate!

- ▶ Position the base plate as follows on the foundation and attach.

5.2.1 Place pump unit on the foundation

✓ Aids, tools, materials:
- Anchor bolts
- Steel shims
- Mortar casting compound, no shrinkage
- Spirit level

1. Lifting the pump unit (→ 4.1 Transport, Page 18).
2. Hook anchor bolts in the mounting holes on the base plate from below.

Observe manufacturers information when using the fixing material.

3. Position the pump unit on the foundation. When doing so lower the anchor bolts into the prepared anchoring holes.

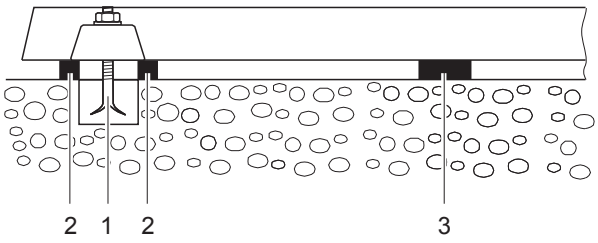


Fig. 15 Installation with foundation

4. Align the pump for height and system dimensions using steel shims as follows:
   – Arrange steel shims (2) to the left and right of each anchor bolt (1).
   – If the distance between the anchoring holes is > 750 mm, then arrange additional steel shims (3) on each side of the base plate in the center.
5. Ensure that the base plate lies flat against steel shims.
6. Check the permissible height deviation (1mm/m) using a mechanical spirit level in a longitudinal and a transverse direction.
7. Repeat the procedure until the base plate is correctly aligned.

5.2.2 Attaching pump unit

Filling the base plate with mortar casting compound improves dampening properties.

1. Fill the anchoring holes with mortar casting compound.
2. When the mortar casting compound has set, bolt the base plate at three points to the specified tightening torque.
3. Before tightening the remaining bolts, arrange shims next to every bolt to even out any irregularities in the mounting surface.

5.3 Installing without foundation

Only allowed if pump is provided for installation without foundation (→ order data sheet).

Attachment methods must be designed so that undesirable displacement of the pump is prevented.

When installed on machine feet, the operational stability is achieved by the weight of the pump itself and the rigidity of the attached pipework. Pipework must be installed so that it is not stressed.

For a pump unit set up insulated, such as for an installation without foundation, provide separate earthing.

✓ Aids, tools, materials:
– Impact wrench
– Spirit level

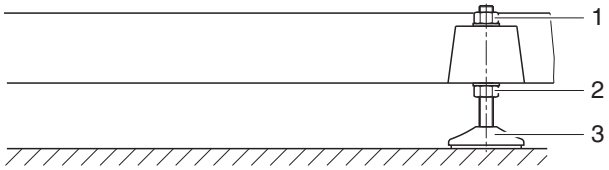


Fig. 16 Installation without foundation

1. Lifting the pump unit (→ 4.1.2 Lifting, Page 18).
2. Mount all leveling feet as illustrated.
3. Place pump unit on subsurface.
4. Set height of the base plate via leveling feet as illustrated above:
   – Use impact wrench to secure hexagonal bolt on leveling foot (3).
   – Undo the hexagon nut (1).
   – Set height by turning the hexagonal nut (2).
   – Tighten hexagonal nut (1).
   – Check the permissible height deviation (1mm/m) using a mechanical spirit level in a longitudinal and a transverse direction.
   – Repeat the procedure until the base plate is correctly aligned.

5.4 Planning the electrical system

► Ensure the following in the electrical supply to the pump unit:
  – Provide a device for isolating from the power supply.
  – The device for isolating from the power supply must be capable of their actuated during normal operation and also in an emergency (emergency stop switch). The emergency stop switch must satisfy ISO 13850.
  – If the pump unit stops due to a power failure it must be protected against automatic restarting (on restoration of power).
  – Install a motor protection switch to act as a cut-out in the event of overheating and adjust it in accordance with the particulars on the motor nameplate.
  – If a frequency inverter is to be used at low speeds, check whether an external cooler may be necessary.
  – The encapsulation of the control systems must satisfy the protection classes specified in EN 60529.

5.5 Connecting the NX pump

5.5.1 Preparing the connection (NX)

The sequence of operations for preparation of the connection differs depending on the installation situation.

1. If the pump unit is not completed until after it has been installed on site, first perform the following operations:
   – Installing motor (→ 5.5.2 Installing motor (NX), Page 22).
   – Installing the coupling guard (→ 5.5.3 Installing the coupling guard (NX), Page 22).
2. Once the pump unit has been completed: Making the electrical connections to the motor (→ 5.5.4 Making the electrical connections to the motor (NX), Page 23).

5.5.2 Installing motor (NX)

NOTE

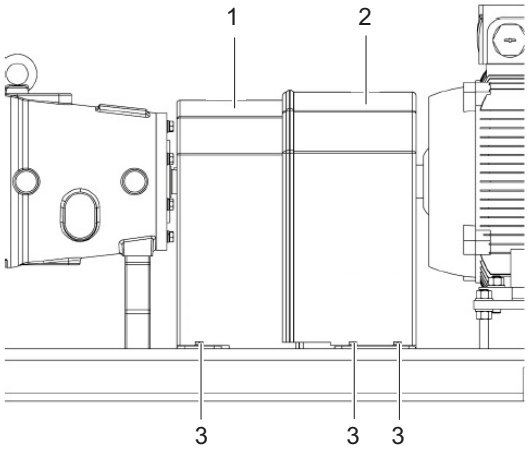
Material damage through bangs and knocks!

► Do not bang and knock pump components.

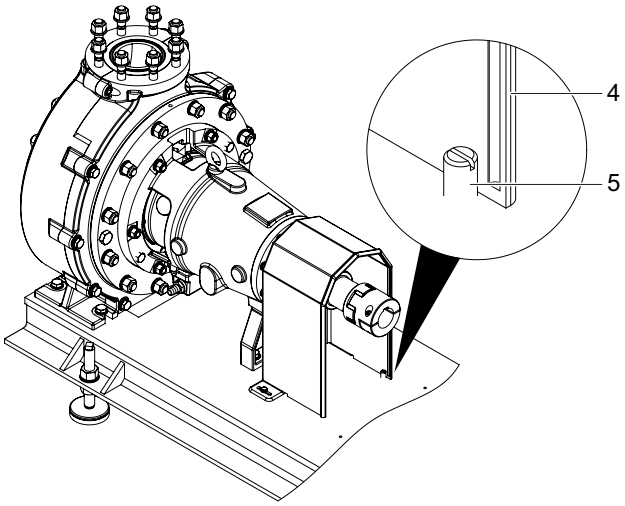
1. Lift the motor on to the prepared position on the base plate.
2. Bolt the motor to the base plate. Tighten the bolts finger-tight.

5.5.3 Installing the coupling guard (NX)

The (heavy-duty) coupling guard consists of the pump side coupling guard and the motor side coupling guard.



1. Remove the attachment screws (3).
2. Place the pump-side coupling guard (1) over the coupling.



   When doing so, make sure that the cheeks (4) of the coupling guard (open side) lie externally on the adjustment pins (5).
3. Place the motor-side coupling guard (2) over the coupling and install the pump-side coupling guard (1).
4. Align the two parts of the coupling guard so that area between the motor and the pump is completely covered by the coupling guard.
5. Screw in the attachment screws to a torque of 5 Nm.

5.5.4 Making the electrical connections to the motor (NX)

Follow the instructions of the motor manufacturer.

DANGER

Risk of electrocution!

- ► All electrical work must be carried out only by qualified electricians.
- ► Before all work on the electrical system, disconnect the motor from the mains and secure against being switched back on again.

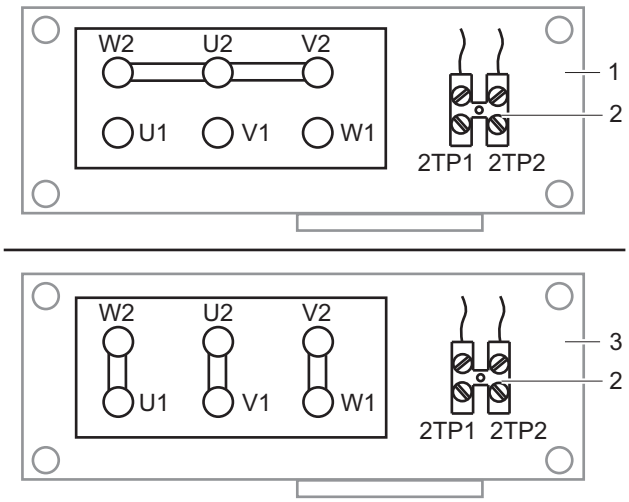
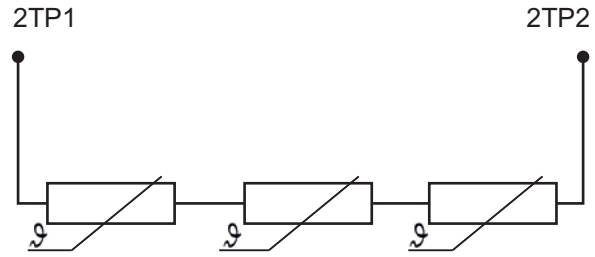


Fig. 17 Connecting the motor

1 Star connection
2 Connecting the PTC thermistor
3 Delta connection

1. Connect the motor as shown in the circuit diagram, as a delta connection (1) or a star connection (3).
2. Make sure no danger arises due to electric power.
3. Install an EMERGENCY STOP switch.



4. Connect the PTC thermistor (2) to the motor protector:
   – Test voltage 2.5 V
5. Connect the optional standstill heating for the motor. When making the electrical connections, make sure that the voltage matches that on the name plate (motor) and work to the terminal diagram provided.

5.5.5 Check direction of rotation (NX)

DANGER

Risk of electrocution!

- ► All electrical work must be carried out only by qualified electricians.
- ► Before all work on the electrical system, disconnect the motor from the mains and secure against being switched back on again.

DANGER

Danger to life from rotating parts!

- ► Use personal protective equipment when carrying out any work on the pump.
- ► Maintain an adequate distance from rotating parts.
- ► Check the direction of rotation only when the coupling guard is installed.
- ► After testing disconnect the motor and secure it against reconnection.

NOTE

Damage to the hydraulics as a result of the wrong direction of rotation!

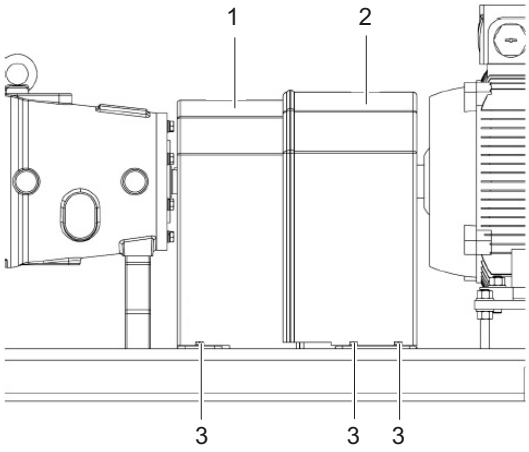
The impeller will become detached from the shaft.

- ► Make sure that the motor is disconnected from the pump.

1. Switch on motor for max. 2 seconds and switch it off again immediately.
2. Check whether the sense of rotation of the motor matches the direction of rotation on the fan impeller.
3. If the sense of rotation is different: Change over the two phases (→ 5.5.4 Making the electrical connections to the motor (NX), Page 23).
4. Disconnect the motor from the mains and secure it against being switched back on again.

5.5.6 Removing the coupling guard (NX)

The (heavy-duty) coupling guard consists of the pump side coupling guard and the motor side coupling guard.



1. Remove the attachment screws (3).
2. Left off the pump-side coupling guard (1) and the motor-side coupling guard (2), and put them aside.
3. Screw in the attachment screws (3).

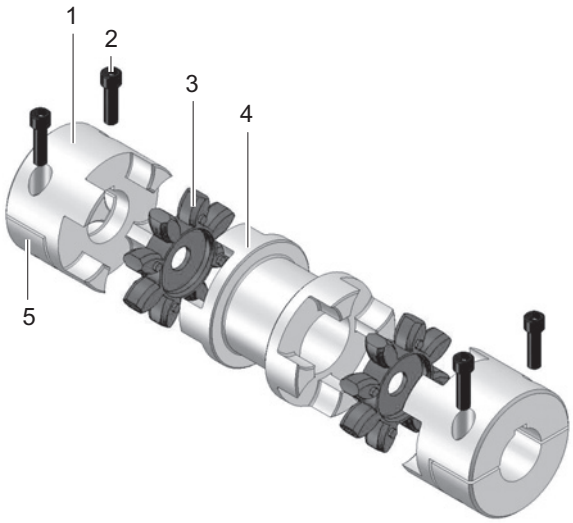
5.5.7 Install the coupling (NX)

The unit (motor/pump) is supplied with the coupling disassembled.

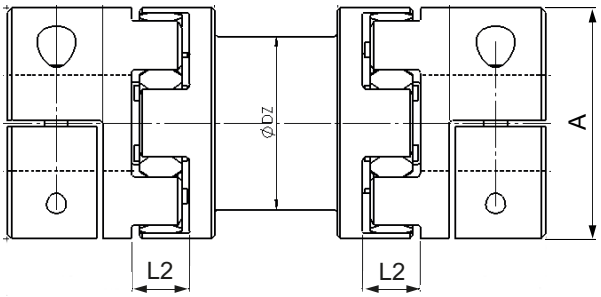
NOTE

Material damage through bangs and knocks!

- ▶ Do not tilt the coupling halves when slipping them on.
- ▶ Do not bang and knock pump components.



1. Remove the half shells (5) from the hub body (1).
2. Assemble together the hub body (1), gear ring (3) and intermediate piece (4).
3. Fit the assembly with the half shells (5) to the ends of the motor shaft and pump shaft.
4. Screw in the clamping screws (2) finger-tight until the hub (1) and half shells (5) lie on the shaft.



5. Move the clamping hub in the axial direction until the dimension L2 is reached (→ 9.2.4 Tolerance values for adjusting the coupling, Page 49).
6. Secure the clamping hub by tightening the clamping screws alternately. When doing so, comply with the correct torque TA (→ 9.2.4 Tolerance values for adjusting the coupling, Page 49).
7. Align the gear rings centrally between the clamp hubs and the intermediate piece.

5.5.8 Align the motor (NX)

The motor is aligned to the pump as delivered. Check this before commissioning, and correct it if necessary.

NOTE

Material damage due to incorrect alignment of the motor!

- ▶ Align the motor exactly to the pump if there is any axial, radial or angular misalignment. For detailed information and special couplings: (→ manufacturer's data).

1. Slacken the motor bolts.
2. Align the motor so that the coupling halves align exactly. If necessary, proceed as follows:
   - Insert adjustment shims.
   - Use adjustment screws to set the height of the motor plate.
3. Tighten the motor bolts.
4. Checking the coupling alignment (→ 5.5.9 Aligning the coupling precisely (NX), Page 25).
5. If there is still any axial, radial or angular misalignment, repeat the procedure for aligning the motor.
6. Complete the connection (→ 5.5.10 Complete the connection (NX), Page 25).

5.5.9 Aligning the coupling precisely (NX)

Comply with the tolerance values for fine adjustment of the coupling (→ 9.2.4 Tolerance values for adjusting the coupling, Page 49).

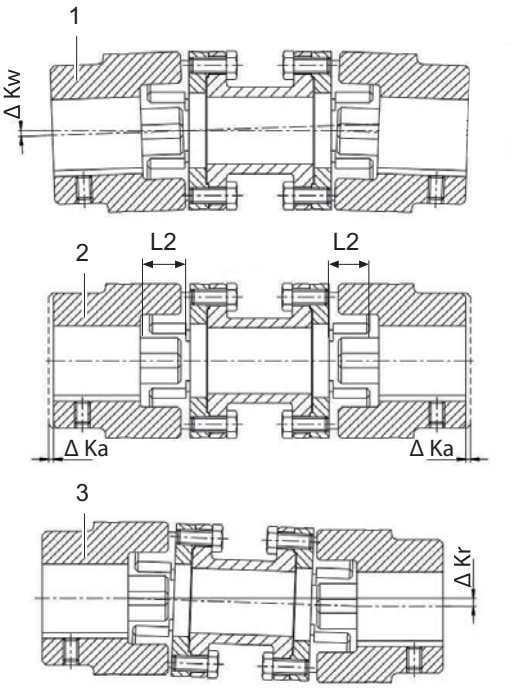


Fig. 18 Possible misalignments

1 Angular displacement
2 Axial displacement
3 Radial displacement

Angular misalignment

1. Use a suitable measurement instrument (such as a dial gauge) to determine the value of ΔKw.
2. Make sure that the determined value ΔKw does not exceed the value ΔKw_{zul}.

Axial misalignment

3. Set the axial misalignment ΔKa to a value within the permissible tolerance range of the dimension L2.

Radial misalignment

4. Determine the value ΔKr.
5. Make sure that the determined value Δkr does not exceed the value Δkr_{zul}.

5.5.10 Complete the connection (NX)

1. Installing the coupling guard (→ 5.5.3 Installing the coupling guard (NX), Page 22).
2. Restore the electrical connection of the motor.
3. Continue planning the pipework (→ 5.7 Planning pipelines, Page 27).

5.6 Connecting the BX pump

5.6.1 Preparing the connection (BX)

The sequence of operations for preparation of the connection differs depending on the installation situation.

1. Once the pump unit has been completed: Dismantle the motor and the motor-side coupling (→ 5.6.2 Dismantle the motor and the motor-side coupling (BX), Page 25).
2. If the pump unit had not been completed until the installation on site: Making the electrical connections to the motor (→ 5.6.3 Make the electrical connections to the motor (BX), Page 26).

5.6.2 Dismantle the motor and the motor-side coupling (BX)

NOTE

Material damage through bangs and knocks!

► Do not bang and knock pump components.

1. Unbolt the motor from the motor flange adapter.
2. Pull the motor together with the motor-side coupling half out of the motor flange adapter.
3. Secure the motor against uncontrolled movements when it starts up.
4. Dismantle the motor from the motor shaft.
5. Apply multiple turns of fabric tape to restrain the drive key on the motor shaft.

5.6.3 Make the electrical connections to the motor (BX)

Follow the instructions of the motor manufacturer.

DANGER

Risk of electrocution!

- ► All electrical work must be carried out only by qualified electricians.
- ► Before all work on the electrical system, disconnect the motor from the mains and secure against being switched back on again.

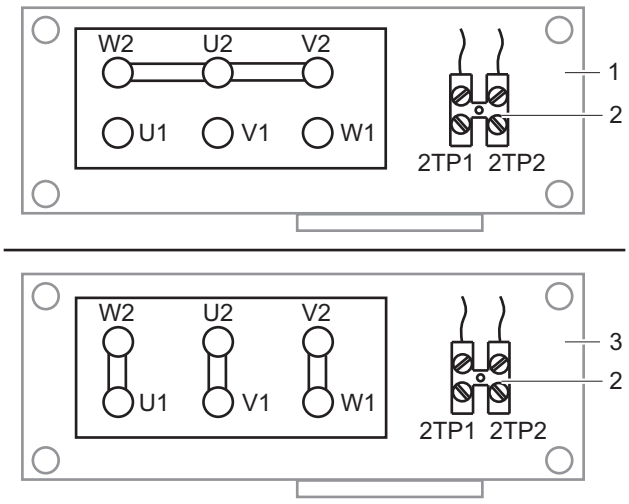
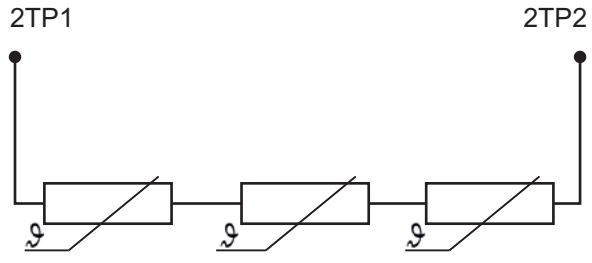


Fig. 19 Connecting the motor

1 Star connection
2 Connecting the PTC thermistor
3 Delta connection

1. Connect the motor as shown in the circuit diagram, as a delta connection (1) or a star connection (3).
2. Make sure no danger arises due to electric power.
3. Install an EMERGENCY STOP switch.



4. Connect the PTC thermistor (2) to the motor protector:
   – Test voltage 2.5 V
5. Connect the optional standstill heating for the motor. When making the electrical connections, make sure that the voltage matches that on the name plate (motor) and work to the terminal diagram provided.

5.6.4 Check direction of rotation (BX)

DANGER

Risk of electrocution!

- ► All electrical work must be carried out only by qualified electricians.
- ► Before all work on the electrical system, disconnect the motor from the mains and secure against being switched back on again.

DANGER

Danger to life from rotating parts!

- ► Use personal protective equipment when carrying out any work on the pump.
- ► Maintain an adequate distance from rotating parts.
- ► After testing disconnect the motor and secure it against reconnection.

NOTE

Damage to the hydraulics as a result of the wrong direction of rotation!

The impeller will become detached from the shaft.

- ► Make sure that the motor is disconnected from the pump.

1. Prepare as follows to check the direction of rotation:
   – Disconnect the motor from the mains and secure it against being switched back on again.
   – Apply multiple turns of fabric tape to restrain the drive key on the motor shaft.
   – Secure the motor against uncontrolled movements when it starts up.
   – Place barriers around an area radius 2 m around the motor shaft and prevent anyone entering that area.
2. Switch on motor for max. 2 seconds and switch it off again immediately.
3. If the sense of rotation is different: Change over the two phases (→ 5.6.3 Make the electrical connections to the motor (BX), Page 26).
4. Disconnect the motor from the mains and secure it against being switched back on again.

5.6.5 Install the coupling (BX)

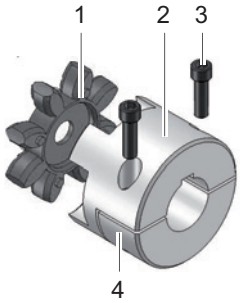
The coupling adapter is pre-installed on the hollow shaft of the pump.

NOTE

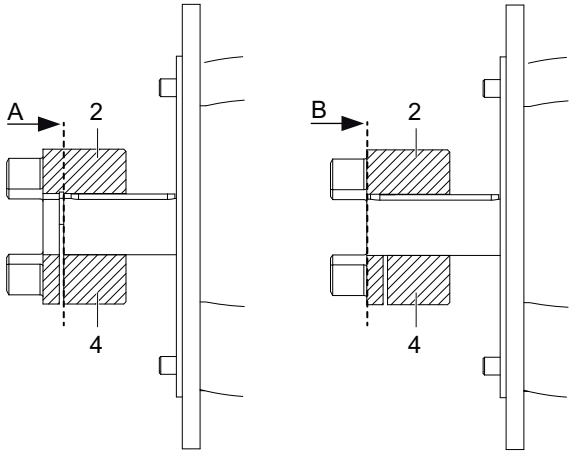
Material damage through bangs and knocks!

- ▶ When pushing the coupling half on, do not allow it to become skew.
- ▶ Do not bang and knock pump components.

1. Prepare as follows to install the coupling:
   - Determine the installation variant of the coupling, based on the bearing carrier size and motor size (→ 9.2.5 Coupling installation variant, Page 49).
   - Note whether it is installation variant A or B.



2. Remove the half shells (4) from the hub body (2).
3. Assemble the hub body (2) to the gear ring (1).
4. Fit the assembly with the half shells (4) on the end of the motor shaft.



5. Align the coupling to the shaft end as required for the installation variant:
   - A: Position the outer face of the half shells (4) flush with the end of the shaft.
   - – OR –
   - B: Position the flat face of the hub body (2) flush with the end of the shaft.
6. Screw in the clamping screws (3) finger-tight until the hub (2) and half shells (4) lie on the shaft.

5.6.6 Installing motor (BX)

NOTE

Material damage through bangs and knocks!

- ▶ Do not bang and knock pump components.

1. Mount the motor on the bearing carrier, ensuring that the coupling halves of the motor shaft are mated correctly with the coupling adapter in the pump hollow shaft.
2. Bolt the motor securely to the bearing carrier. Observe the correct torque (→ 9.2.7 Tightening torques of casing screws, Page 50).

5.6.7 Complete the connection (BX)

1. Restore the motor electrical connection.
2. Continue with planning the pipework connections (→ 5.7 Planning pipelines, Page 27).

5.7 Planning pipelines

Water hammer may damage the pump or the system. Plan the pipes and fittings as far as possible to prevent water hammer occurring.

In order to avoid pressure shocks, using slow-closing fittings and install expansion joints or pulsation dampers.

5.7.1 Specifying supports and flange connections

NOTE

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

- ▶ Ensure pipe connection without stress.

1. Plan pipes safely:
   - No pulling or thrusting forces
   - No bending moments
   - Adjust for changes in length due to temperature changes (compensators, expansion shanks)
2. Support pipes in front of the pump.
3. Ensure the pipe supports have permanent low-friction properties and do not seize up due to corrosion.

5.7.2 Specifying nominal widths

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

1. Ensure nominal suction pipe width is not smaller than the nominal suction flange width.
   – Avoid flow velocities > 2 m/s.
   – Recommended flow velocity < 1 m/s
   – Maximum flow velocity = 9 m/s
2. Ensure the nominal pressure line width is not smaller than the nominal pressure flange width.
   – Avoid flow rate > 3 m/s in plastic pipes.
   – Recommended flow velocity < 3 m/s
   – Maximum flow velocity = 12 m/s
   – Install a vent valve, check valve and pressure gauge in pressure line just behind the discharge flange.

5.7.3 Specifying pipe lengths

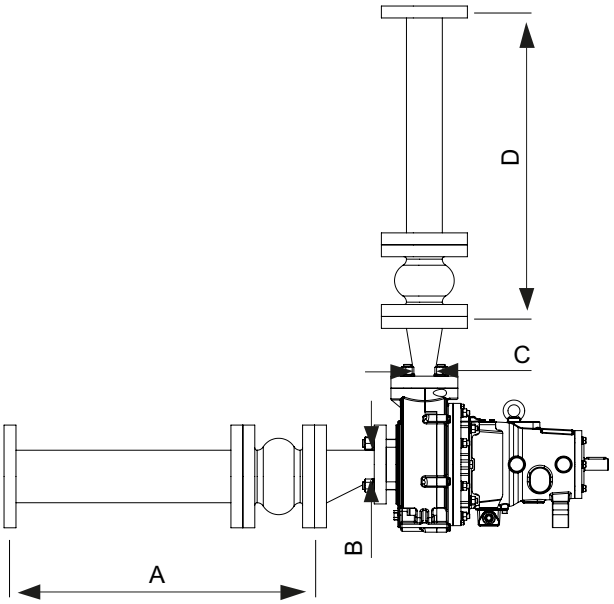


Fig. 20 Straight pipe lengths in front and after the pumps (recommended)

A > 5x DNs
B DNs
C DNd
D > 5x DNd

► Observe recommended minimum values when installing the pump.

Suction side: Shorter lengths are possible, but may limit hydraulic performance data.

Pressure side: Shorter lengths are possible, but may result in increased noise development.

5.7.4 Provide self-priming container

A self-priming container can be used to make the pump self-priming.

1. Select container volumes according to the size of the pump.
2. Clean containers carefully prior to commissioning or initial filling.

5.7.5 Optimizing changes of cross section and direction

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

5.7.6 Planning expansion joints

✓ Pipe diameter reducer installed with a smaller bore than the pump port

► Install expansion joints at the larger end of the pipe diameter reducer.

5.7.7 Planning a non-return valve

If the non-return valve is installed at a distance < 0.5 m from the discharge flange, air cushions can occur upstream of the non-return valve when the pump is being filled, which prevent a smooth start-up.

1. Install the non-return valve at a distance ≥ 0.5 m from the discharge flange, so that at start-up the pump can be correctly filled with the medium being conveyed.
2. To ensure suitable venting, install a bypass pipe with a shut-off valve at the non-return valve.

5.7.8 Planning venting facilities and pressure gauges

► Provide venting facilities and pressure gauges between the discharge flange of the pump and the first shut-off valve.

5.7.9 Discharging leaks

⚠ WARNING

Risk of injury and poisoning due to hazardous pumped liquids!

► Safely collect any leaking pumped liquid, then discharge and dispose of it in accordance with environmental regulations.

NOTE

Damage to the leakage tray by hazardous conveyed liquids!

► Make sure that the splash guard (clear PVC) and leakage tray (PE) are resistant to the conveyed liquids.

► If the splash guard (clear PVC) and leakage tray (PE) are not resistant to the conveyed liquids, reduce the maintenance intervals to suit the characteristics of the medium.

1. Connect the leakage tray to allow secure drainage of leaked medium.
2. Provide equipment for collecting and discharging leaking liquids.
3. Ensure the free discharge of leaking liquids.

5.7.10 Providing safety and control devices (recommended)

Avoid contamination

1. Install filters in the suction pipe.
2. Install a differential pressure gauge with contact manometer to monitor contamination.

Avoid reverse running

1. Install a non-return valve in the discharge pipework (close to the shut-off valve) to ensure that the pumped medium does not flow back after the pump is switched off.
2. In order to enable venting, include vent connection between discharge flanges and non-return valve.

Make provisions for isolating and shutting off the pipes

ⓘ For maintenance and repair work.

► Provide shut-off devices in the suction pipe and pressure line.

Allow measurements of the operating conditions

1. Provide pressure gauge in the suction pipe and pressure line for pressure measurement.
2. Provide motorside load monitors (over and underload).
3. Provide pressure measurement on the pump side.

Provide dry run protection

► In order to protect the pump from dry running and resulting damage
  – Provide dry run protection
  – e.g. STÜBBE PTM pressure and temperature monitoring sensor

Provide an overpressure protection

ⓘ Overpressure protection is required for operation in explosive areas (→ ATEX additional manual).

► Provide an overpressure protection.

5.8 Connecting the pipes

ⓘ Comply with the max. loads on the connection stubs (→ 9.2.12 Loads on the connection stubs and maximum speeds, Page 55).

NOTE

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

► Ensure pipe connection without stress.

5.8.1 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 fittings prior to assembly.
2. Flush all pipes carefully with neutral medium.
3. Ensure no flange seals protrude inwards.
4. Remove any blind flanges, plugs, protective foils and/or protective paint from the flanges.

5.8.2 Installing auxiliary pipes

ⓘ Observe manufacturer information for any auxiliary systems present.

1. Connect the auxiliary pipes to the auxiliary connections so that they are stress-free and do not leak.
2. Avoid formation of air pockets: Run the pipes with a continuous slope up to the pump.

5.8.3 Installing the suction pipework

1. Remove the transport and sealing covers from the pump.
2. Fit suction pipe stress-free and sealed (→ 9.2.6 Flange tightening torques, Page 50).
3. Ensure no seals protrude inwards.
4. During suction operation, proceed as follows:
   – As far as possible, avoid installing a foot valve in the suction pipework
   – Installation of a separate evacuation device or self-priming container with a non-return valve in the discharge pipework is recommended

5.8.4 Installing the pressure pipe

1. Remove the transport and sealing covers from the pump.
2. Fit the pressure line stress-free and sealed (→ 9.2.6 Flange tightening torques, Page 50).
3. Ensure no seals protrude inwards.

5.8.5 Inspection for stress-free pipe connections

✓ Piping installed and cooled down

1. Disconnect the pipe connecting flanges from the pump.
2. Check whether the pipes can be moved freely in all directions within the expected range of expansion:
   – Nominal width < 150 mm: by hand
   – Nominal width > 150 mm: with a small lever
3. Make sure the flange surfaces are parallel.
4. Reconnect the pipe connecting flanges to the pump.
5. If present, check support foot for stress.

5.9 Performing the hydrostatic test

Only necessary if the entire system needs to be tested under pressure.

NOTE

Material damage due to bursting of pump casing!

▶ Testing pressure must not exceed the permissible pump pressure (→ documents for the particular order).

▶ Make sure the testing pressure does not exceed the permissible pump pressure.
   – If necessary, do not perform pressure test on the pump.

Mechanical seal	Test pressure max.
Single-acting STÜBBE PTFE bellows-type mechanical seal	4 bar
UV2	8 bar
UV3	8 bar

Tab. 3 Pressure test

6 Operation

For pumps in potentially explosive atmospheres (→ ATEX additional manual).

6.1 Preparing for commissioning

6.1.1 Check downtimes

► Check downtimes (→ 6.4 Restoring the pump to service, Page 32).

6.1.2 Lubricate an oil-lubricated pump with oil

Oil-lubricated pumps are supplied from the manufacturer without a filling of oil.

► Fill the bearing housing with oil (→ Oil-lubricated bearings, Page 35).

6.1.3 Filling and bleeding

⚠ WARNING

Risk of injury and poisoning due to hazardous pumped liquids!

► Use protective equipment for any work on the pump.
► Safely collect the fluid and dispose of it in accordance with environmental regulations.

NOTE

Material damage as a result of dry running!

► Make sure the pump is filled properly.

1. If present, fill and vent self-priming container with fluid.
2. Open the suction-side fitting.
3. Open the pressure-side fitting.
4. Fill pump and suction pipe with fluid.
5. Verify that no pipe connections are leaking.

6.1.4 Preparing auxiliary systems (if present)

The manufacturer accepts no liability for damage arising due to the installation or use of a third party or non-approved auxiliary system.

Sealing systems

1. Ensure that the sealing medium is appropriate to mix with the pumped medium.
2. Ascertain the sealing system (→ order-specific documentation).
3. Install the sealing system (→ manufacturer information).
4. Ensure the necessary parameters for the sealing system (→ manufacturer information).
5. Ensure that the container pressure is not lower than that permitted for blocking pressure systems (→ manufacturer information).

6.2 Commissioning

6.2.1 Switching on

✓ Pump set up and connected properly
✓ Check direction of rotation
✓ Coupling and coupling guard installed
✓ Motor set up and connected properly
✓ Align motor precisely to the pump
✓ All connections stress-free and sealed
✓ All safety equipment installed and tested for functionality
✓ Pump prepared, filled and vented correctly
✓ Auxiliary systems switched on if present

⚠ DANGER

Risk of injury due to running pump!

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

⚠ DANGER

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

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

NOTE

Risk of cavitation if suction flow is restricted!

► Open the suction-side fitting and do not use it to regulate the flow.
► Do not open the pressure-side fitting beyond the operating point.

NOTE

Material damage due to overheating!

► Do not operate the pump for long periods with the pressure-side fitting closed.
► Observe the minimum flow rate (→ Tab. 26 Flow rate of the pumped medium, Page 54).

NOTE

Material damage as a result of dry running!

► Ensure that the pump is properly filled and ventilated.

1. Turn on auxiliary systems (if present).
2. Open the suction-side fitting.
3. Close the pressure-side fitting.

4. Switch on the motor and check it for smooth running.
5. Once the motor has reached its nominal speed, open the pressure-side fitting slowly until the operating point is reached.
6. After the initial stress due to the pressure and operating temperature, check that the pump is not leaking.

6.2.2 Switching off

✓ Pressure-side fitting 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 motor.
2. Check all connecting bolts and tighten them if necessary (only after initial commissioning).

6.3 Shutting down the pump

⚠ DANGER

Risk of injury due to running pump!

► Do not touch the pump when it is running.

► Do not carry out any work on the pump when it is running.

► Before all installation and maintenance work, disconnect the motor from the mains and secure it against being switched back on again.

⚠ DANGER

Risk of electrocution!

► All electrical work must be carried out only by qualified electricians.

► Before all work on the electrical system, disconnect the motor from the mains and secure against being switched back on again.

⚠ WARNING

Risk of injury and poisoning due to hazardous pumped liquids!

► Use protective equipment for any work on the pump.

► Collect leaking liquid safely and damage fitting in accordance with local regulations.

► Take the following measures whenever the pump is shut down:

Pump is	Action
shut down	► Take measures appropriate for the fluid (→ Tab. 5 Measures depending on the behavior of the pumped liquid, Page 32).
…emptied	► Close suction and pressure-side fitting.
…dismounted	► Isolate the motor from its power supply and secure it against unauthorized switch-on.
…put into storage	► Note measures for storage (→ 4.2 Storage, Page 19).

Tab. 4 Measures to be taken if the pump is shut down

Behavior of the pumped liquid	Duration of shutdown (depending on process)	
	Short	Long
Crystallized or polymerized, solids sedimenting	► 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.
Remains liquid, non-corrosive	–	–
Remains liquid, corrosive	–	► Empty the pump and containers.

Tab. 5 Measures depending on the behavior of the pumped liquid

6.4 Restoring the pump to service

1. Complete all steps as for commissioning (→ 6.2 Commissioning, Page 31).
2. If the pump is shut down for over 1 year, replace elastomer seals (O-rings, shaft sealing rings).
3. For breaks in operations > 2 years, replace bearing lubricant and check mechanical seal.
4. For breaks in operations > 2 years in dry climes change the elastomer bellows (if selected) because of deteriorating elasticity

7 Maintenance

For pumps in potentially explosive atmospheres (→ ATEX additional manual).

Trained service technicians are available for fitting and repair work. Submit evidence of conveyed medium on request (DIN safety data sheet or safety certificate).

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 pump when it is running.
- ▶ Do not carry out any work on the pump when it is running.

⚠ 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:
   - Adherence to the minimum flow rate (→ Tab. 26 Flow rate of the pumped medium, Page 54).
   - Normal operating conditions unchanged
   - Alignment of coupling and condition of elastic elements
2. For trouble-free operation, always ensure the following:
   - No dry running
   - No leaks
   - No cavitation
   - Suction side open gate valves
   - Free and clean filters
   - Sufficient pump inlet pressure
   - No unusual running noises or vibrations

7.2 Servicing

⚠ DANGER

Risk of injury due to running pump!

- ▶ Do not touch the pump when it is running.
- ▶ Do not carry out any work on the pump when it is running.
- ▶ For all installation and maintenance work, disconnect the motor from the mains and lock.

⚠ DANGER

Risk of electrocution!

- ▶ All electrical work must be carried out only by qualified electricians.

⚠ WARNING

Risk of injury and poisoning due to hazardous or hot fluid!

- ▶ Use protective equipment for any work on the pump.
- ▶ Allow the pump to cool down completely before commencing any work.
- ▶ Make sure the pump is depressurized.
- ▶ Empty the pump, safely collect the pumped liquid and damage it in accordance with environmental rules and requirements.

7.2.1 Maintenance in accordance with maintenance schedule

▶ Perform maintenance work in accordance with the maintenance schedule.

Designation	Interval	Maintenance
Pump assembly	daily	▶ Check for increased noise development. ▶ Check for vibration. ▶ Pay attention to increased current consumption of the motor. ▶ Check that the anchor bolts are correctly seated. ▶ Check for oxidation. ▶ Check for leakage and crystallization. ▶ Check the leakage tray and splash guard. ▶ If leakage occurs, exchange defective parts immediately. – Mechanical seal (→ other applicable documents).
Self priming container (if present)	daily	▶ Check filling level.
Blocking pressure system (if present)	daily	▶ Check the pressure, filling level and where appropriate the flow rate.
Leakage tray	daily	▶ If the splash guard and leakage tray are not resistant to the medium, check for leakage.
	weekly	▶ Check for leaking pumped liquid.
Oil (only for oil-lubricated bearings)	weekly	▶ Check the oil level at the sight glass.
Undoable screwed connections	weekly	▶ Check for tight fitting.
Gear ring (coupling)	3 months after commissioning	▶ Check the gear ring for wear and cracks; replace it if necessary.
	every 12 months	
Oil (only for oil-lubricated bearings)	Yearly	▶ Change the oil (→ Oil-lubricated bearings, Page 35).
Mechanical seals		▶ Check them for leakage and replace them if necessary.
Sealed-for-life roller bearings		▶ Check for increased noise and vibration, replace it necessary (→ 7.3 Dismounting, Page 36).
Pump assembly	as required	▶ Cleaning (→ 7.2.3 Cleaning the pump, Page 35).

Tab. 6 Maintenance schedule

7.2.2 Lubricate bearings

Lubrication of the bearings is required only for the pump type NX.

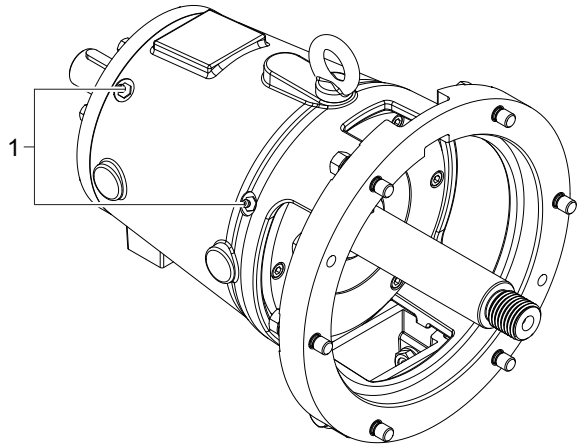
Use suitable lubricants (→ 9.2.9 Lubricant, Page 51).

Grease-lubricated bearings

NOTE

Over-greased bearings may overheat!

- ► Do not grease the bearings before commissioning. The bearings have been correctly greased by the manufacturer.
- ► Comply with the correct lubricant quantities and do not exceed the lubricant quantities (→ 9.2.8 Lubrication, Page 51).



- ► Fill the grease chambers one third with grease. When performing lubrication, apply the correct quantities (→ 9.2.8 Lubrication, Page 51).

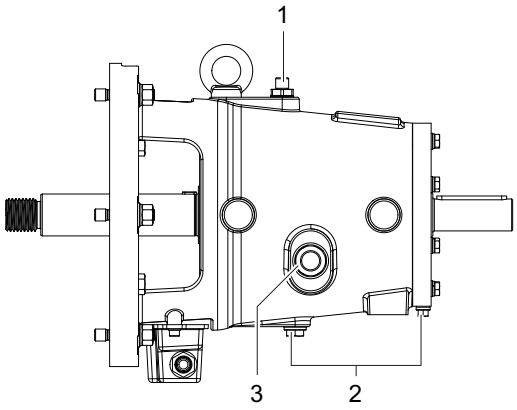
Oil-lubricated bearings

NOTE

The pump is delivered without a filling of oil!

Bearings may be damaged due to lack of oil lubrication or lubrication with the wrong oil.

- ► Before commissioning, fill the bearing housing with oil.
- ► Comply with the correct lubricant quantities and do not exceed the lubricant quantities (→ 9.2.8 Lubrication, Page 51).



1. Remove the screw (1) from the filler opening.
2. To change the oil, proceed as follows:
   – Remove the screw plugs (2) and fully drain the oil into a collection vessel.
   – Screw in the screw plugs.
3. Fill the bearing housing with oil until the oil level reaches the center of the oil sight glass (3). When performing lubrication, apply the correct quantities (→ 9.2.8 Lubrication, Page 51).
4. Screw the screw into the filler opening.

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 pump when it is running.
- ► Do not carry out any work on the pump when it is running.
- ► Before all installation and maintenance work, disconnect the motor from the mains and secure it against being switched back on again.

⚠ DANGER

Risk of electrocution!

- ► All electrical work must be carried out only by qualified electricians.
- ► Before all work on the electrical system, disconnect the motor from the mains and secure against being switched back on again.

⚠ WARNING

Risk of injury and poisoning due to hazardous or hot fluid!

- ► Use personal protective equipment when carrying out any work on the pump.
- ► Allow the pump to cool completely before commencing any work.
- ► Make sure the pump is depressurized.
- ► Empty the pump, safely collect the pumped liquid and damage it in accordance with environmental rules and requirements.

⚠ 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 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, components can become very sharp-edged due to wear or damage.
- ► Remove spring-loaded components carefully (e.g. mechanical seal, stressed bearing, valves etc.), as components can be ejected by the spring stress.
- ► Observe the manufacturer's specifications (e.g. for the motor, coupling, mechanical seal, blocking pressure system, cardan shaft, drives, belt drive etc.).

NOTE

Material damage due to incorrect dismounting/installation of the pump!

- ► Only specialist mechanics should complete dismounting/installation work.

7.3.1 Preparations for dismounting

- ✓ Pump is depressurized
- ✓ Pump completely empty, flushed and decontaminated
- ✓ Electrical connections disconnected and motor secured against switch-on
- ✓ Pump cooled down
- ✓ Coupling guard removed
- ✓ For a coupling with spacer piece: remove distance piece
- ✓ Pressure gauge lines, pressure gauge and fixtures dismounted
- ✓ Remove existing flushing supply or blocking pressure lines

NOTE

Material damage, fragile components!

- ► Dismount ceramic parts of the plain bearing with care, do not hit or knock.

1. Dismantle the pipes on the suction and pressure side.
2. Remove pump from the system.
3. When dismounting, observe the following:
   - – Mark the precise orientation and position of all components before dismounting them.
   - – Dismount components concentrically without canting.

7.4 Replacement parts and return

1. Have the following information ready to hand when ordering
   spare parts
   - – Device type
   - – ID number
   - – Nominal pressure and diameter
   - – Connection and gasket material
2. Please complete and enclose the document of compliance for returns
   (→ www.stuebbe.com/en/service/download).

8 Troubleshooting

For pumps in potentially explosive atmospheres (→ ATEX additional manual).

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

Possible faults are identified by a fault number in the table below. 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 / pump running noisily / high bearing temperature	6
Pump leaks	7
Excessive motor power uptake	8

Tab. 7 Fault/number assignment

Fault number								Possible cause	Remedy
1	2	3	4	5	6	7	8		
X	–	–	–	–	–	–	–	Intake / suction pipe and/or pressure line closed by fitting	▶ Open the fitting.
X	–	–	–	–	–	–	–	Pump shaft fractured	▶ Repair the pump. ▶ Check the operating conditions.
X	–	–	–	–	–	–	–	Transport and sealing cover still in place	▶ Remove the transport and sealing cover. ▶ Dismount the pump and inspect it for dry-running damage.
X	–	–	–	–	–	–	–	Self-priming container empty / fluid level below the suction pipe intake	▶ Fill the container. ▶ Dismount the pump and inspect it for dry-running damage. ▶ Install monitoring devices.
X	X	–	–	–	–	–	–	Fluid level at inlet too low (pump drawing in air / discontinuous flow)	▶ Dismount the pump and inspect it for dry-running damage. ▶ Install monitoring devices (level sensing cut-off).
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	–	X	–	–	Intake / suction pipe inlet, pump or coarse filter / filter clogged or encrusted	▶ Clean the intake / suction pipe inlet, pump or coarse filter / filter
X	X	–	X	–	X	–	–	Air is sucked in	▶ Seal the defective point in the pipework.

Fault number								Possible cause	Remedy
1	2	3	4	5	6	7	8		
X	X	–	X	–	X	–	–	Proportion of gas too high: pump is cavitating	► Consult the manufacturer.
X	X	–	X	–	X	–	–	Pump running in the wrong direction	► Change over any two phases in the motor.
X	X	–	X	–	X	–	–	Impeller out of balance or blocked	► Dismount the pump and inspect it for dry-running damage. ► Clean the impeller.
X	X	–	–	X	X	–	–	Pressure pipe blocked	► Clean the pressure pipe.
X	X	–	–	X	X	–	–	Discharge pipe not fully open	► Open the discharge pipe fitting further.
X	–	–	–	X	–	X	–	Damage due to accumulated medium in pump operation („stewing in its own juice)“	► Repair the pump. ► Check the discharge side (check valve) fittings and discharge pipework / filter for blockages, and resolve the defect.
X	–	–	–	X	–	X	–	Damage due to accumulated medium in pump operation („stewing in its own juice)“, because the static delivery height is not being achieved by the pump	► Adapt the pump to the operating conditions.
X	–	–	–	–	X	–	–	Intake/suction pipe and pump not correctly vented or not completely filled	► Completely fill and vent pump and/or pipe.
X	–	–	–	–	X	–	–	Inlet / suction pipe contains air inclusions (cessation of flow due to airlock)	► Install fitting for venting. ► Adjust piping installation.
–	X	–	X	–	–	–	–	Intake / suction pipe not completely open	► Open the fitting.
–	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	–	–	Cross section of intake / suction pipe too narrow	► Increase cross section. ► Clean encrustation from suction pipe. ► Fully open fitting.
–	X	–	X	–	X	–	–	Suction head too large: $NPSH_{pump}$ is larger than $NPSH_{system}$	► Increase pump inlet pressure. ► Consult the manufacturer.
–	X	–	X	–	X	–	–	Temperature of fluid is too high: pump is cavitating	► Increase pump inlet pressure. ► Lower temperature. ► Contact the manufacturer.
–	X	–	X	–	X	–	–	Pump parts worn	► Replace the worn pump parts.
–	X	–	X	–	X	–	–	Hydraulic parts of the pump dirty, clotted or encrusted	► Dismount the pump. ► Clean the parts.
–	X	–	X	–	X	–	X	Motor running on 2 phases	► Check the fuse and replace it if necessary. ► Check the cable connections and insulation.
–	X	–	X	–	–	–	X	Viscosity or specific gravity of the pumped liquid outside the range specified for the pump	► Consult the manufacturer.
–	X	–	–	X	X	–	–	Pressure-side fitting not opened wide enough	► Open the pressure-side fitting.

Fault number								Possible cause	Remedy
1	2	3	4	5	6	7	8		
–	–	X	X	–	X	–	X	Pressure-side fitting opened too wide	► Throttle down the flow rate at the pressure-side fitting. Observe the minimum flow rate (→ Tab. 26 Flow rate of the pumped medium, Page 54). ► Machine the impeller down. Consult the manufacturer and adjust the impeller diameter.
–	–	X	–	X	–	–	–	Viscosity lower than expected	► Machine the impeller down. Consult the manufacturer and adjust the impeller diameter.
–	–	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 (→ Tab. 26 Flow rate of the pumped medium, Page 54). ► Machine the impeller down. Consult the manufacturer and adjust the impeller diameter.
–	–	X	–	–	X	–	X	Geodetic differential head, pipe flow resistances and/or other resistances lower than specified	► Throttle down the flow rate at the pressure-side fitting. Observe the minimum flow rate (→ Tab. 26 Flow rate of the pumped medium, Page 54). ► Machine the impeller down. Consult the manufacturer and adjust the impeller diameter.
–	–	–	–	X	–	–	–	Flow falls below minimum	► Increase flow to minimum flow (→ Tab. 26 Flow rate of the pumped medium, Page 54).
–	–	–	–	X	X	–	X	Defective antifriction bearing in bearing carrier	► Replace antifriction bearing.
–	–	–	–	–	X	–	–	Pump is conveying in part-load or overload range (increased axial forces / radial forces)	► Operate the pump in the reliable operating range.
–	–	–	–	–	X	–	–	Coupling packages worn / motor misaligned	► Replace coupling packages and realign.
–	–	–	–	–	X	–	–	Lubricant: too much, too little or unsuitable	► Reduce, add to or replace lubricant.
–	–	–	–	–	X	X	X	Pump distorted	► Check the pipe connections and pump attachment. ► Check alignment of coupling. ► Check attachment of the support foot.
–	–	–	–	–	X	–	X	Increased friction due to damage to the pump (foreign bodies)	► Repair the pump.
–	–	–	–	–	–	X	–	Material-dependent temperature of the pumped medium is too high	► Repair the pump. ► Select the pump material in discussions with the manufacturer.

Fault number								Possible cause	Remedy
1	2	3	4	5	6	7	8		
–	–	–	–	–	–	X	–	Medium temperature too close to boiling point (single-acting mechanical seal running hot)	► Repair the pump. ► Modify the single-acting mechanical seal in consultation with the manufacturer so that it operates with permanent flushing/quenching, or convert it to a double-activing mechanical seal.
–	–	–	–	–	–	X	–	Mechanical seal worn	► Replace mechanical seal. ► Check pumped medium.
–	–	–	–	–	–	X	–	Connecting bolts not correctly tightened	► Tighten the connecting bolts.
–	–	–	–	–	–	X	–	Faulty housing seal	► Replace the housing seal.
–	–	–	–	–	–	–	X	Defective antifriction bearing in motor	► Replace the antifriction bearing (→ manufacturer's specifications).
–	–	–	–	–	–	–	X	Increase friction at a double-acting mechanical seal	► Check the locking pressure and agree it with the manufacturer. ► Check the seal for wear and correct installation.

Tab. 8 Troubleshooting list

9 Appendix

9.1 Replacement parts

9.1.1 Part no. and description

Part no.	Designation
102	Volute casing
132 [1)]	Motor flange adapter
155.1	Casing armor, front side
155.2	Casing armor, back side
183	Support foot
210	Drive shaft
233	Impeller
321	Radial ball bearing
330	Bearing carrier
344	Bearing carrier lantern
360	Bearing cover, non-drive end
361	Bearing cover, drive end
411.1 [1)]	Sealing ring
412.01	Radial rotary shaft seal
412.02	Radial rotary shaft seal
412.03	Radial rotary shaft seal
412.04	Radial rotary shaft seal
412.05	Radial rotary shaft seal
412.06	Radial rotary shaft seal
412.07	Radial rotary shaft seal
412.08	Radial rotary shaft seal
412.09	Radial rotary shaft seal
412.23	Radial rotary shaft seal
412.24	Radial rotary shaft seal
420.1 [2)]	Axial rotary shaft seal
420.2 [2)]	Axial rotary shaft seal
421.23	Radial rotary shaft seal
421.24	Radial rotary shaft seal
443	Seal insert
463	Splash guard
472	Sliding ring
474	Thrust ring
475	Counter ring
477	Spring

Part no.	Designation
481	Bellows
482	Bellows carrier
506.1	Retaining ring
506.2 [1)]	Retaining ring
507	Liquid splash ring
511.1 [1)]	Centering ring
513 [1)]	Insert ring
524	Shaft sleeve
554.1	Washer
554.2	Washer
554.4	Washer
554.5 [2)]	Washer
554.6 [2)]	Washer
554.7 [2)]	Washer
554.10 [1)]	Washer
554.26 [1)]	Washer
554.36 [1)]	Washer
558.4	Spring washer
558.5 [2)]	Spring washer
558.6 [2)]	Spring washer
558.8	Spring washer
580.1	Cap
591	Collection tray
739.2 [1)]	Hose nozzle
801 [1)]	Flange motor
840 [1)]	Coupling
900.14	Drain screw
900.35	Ring bolt
901.3	Hexagon head bolt
901.36 [1)]	Hexagon head bolt
901.41	Hexagon head bolt
901.51	Hexagon head bolt
902.1	Stud bolt
902.2	Stud bolt
902.4	Stud bolt
902.5 [2)]	Stud bolt
902.8	Stud bolt

Part no.	Designation
903.1 [1)]	Plug screw
903.25	Plug screw
912.3	Plug screw
914.3 [1)]	Cylinder screw
914.6 [1)]	Cylinder screw
914.7	Cylinder screw
914.9	Cylinder screw
914.10	Cylinder screw
914.12 [2)]	Cylinder screw
914.26	Cylinder screw
914.31 [2)]	Cylinder screw
914.37 [1)]	Cylinder screw
920.1	Hexagon nut
920.2	Hexagon nut
920.4	Hexagon nut
920.5 [2)]	Hexagon nut
920.6 [1)]	Hexagon nut
920.8 [1)]	Hexagon nut
920.25	Hexagon nut
921 [2)]	Groove nut
931 [2)]	Locking washer
932 [2)]	Circlip
940.1 [2)]	Key
940.2 [2)]	Key

Tab. 9 Designation of components according to part numbers

1) Only for BX

2) Only for NX

9.1.2 Sectional drawing NX

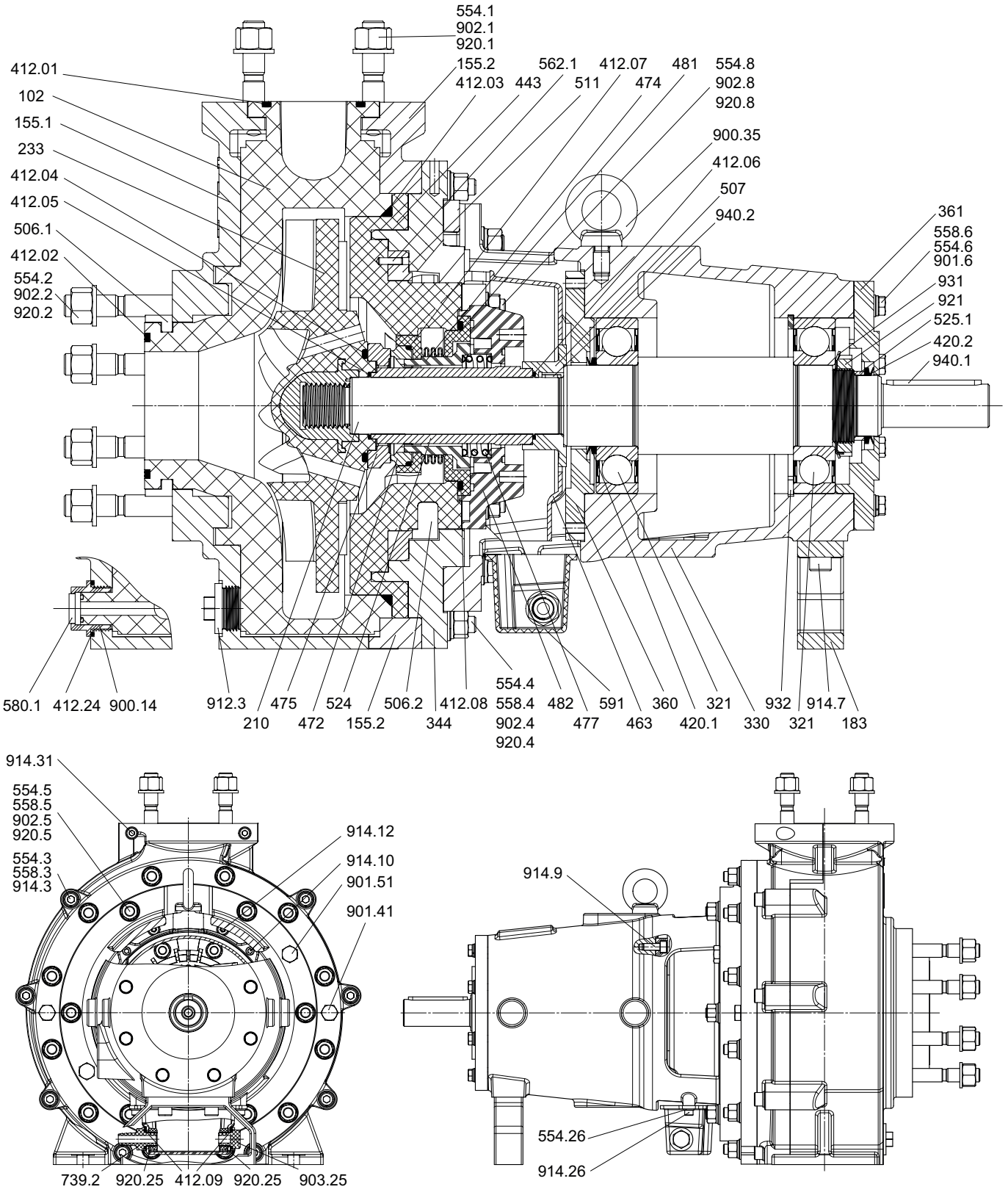


Fig. 21 Sectional drawing NX

9.1.3 Sectional drawing BX

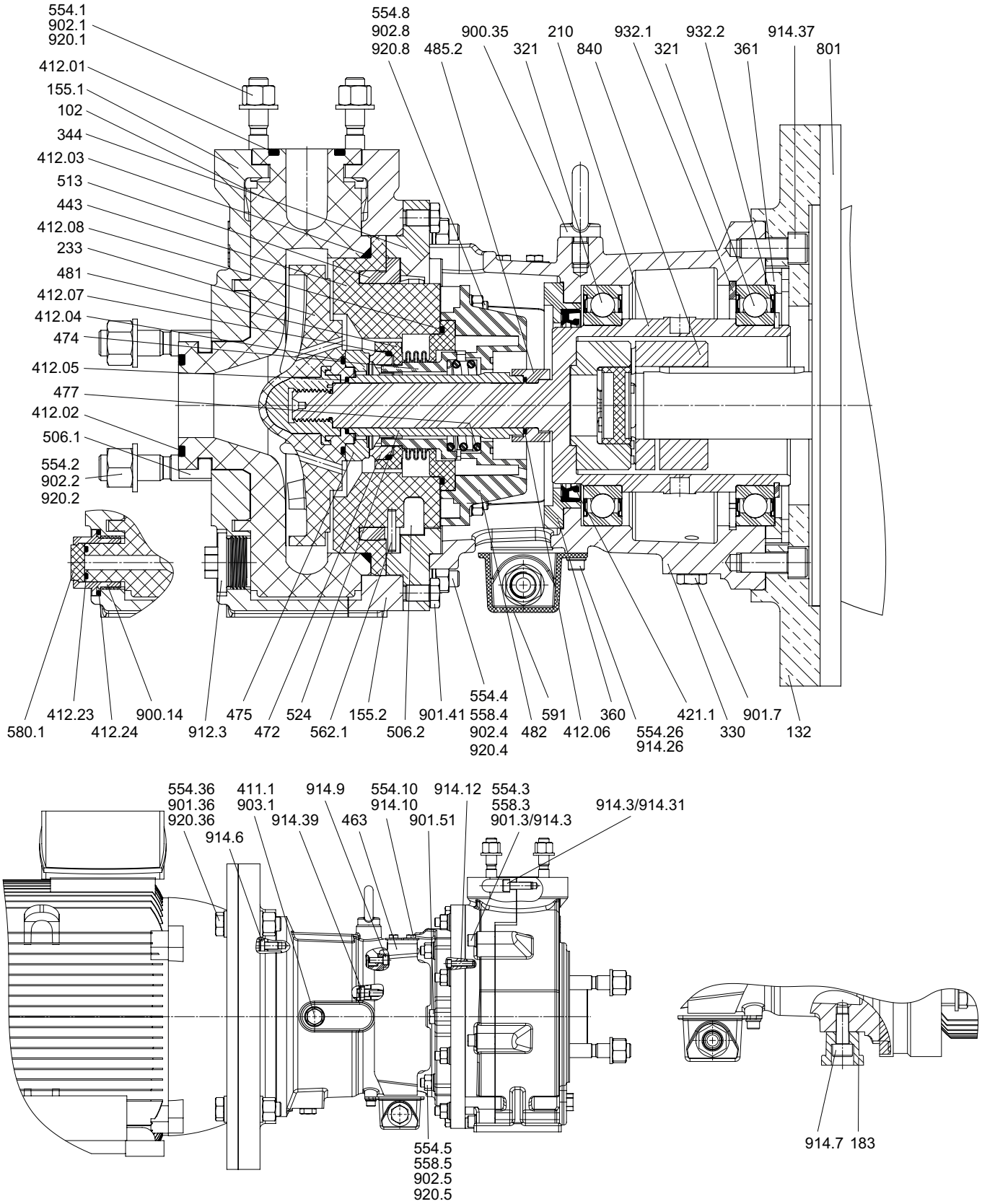


Fig. 22 Sectional drawing BX

9.2 Technical specifications

Further technical data (→ data sheet).

9.2.1 Ambient conditions

Operation under any other ambient conditions should be agreed with the manufacturer.

Temperature [°C]	Relative humidity [%]		Installation height above sea level [m]
	Long-term	Short-term	
–10 to +40[1)]	≤ 85	≤ 100	≤ 1000

Tab. 10 Ambient conditions

1) material-dependent

9.2.2 Parameters for auxiliary systems

Sealing liquid	Parameter
Pressure [bar]	1.5 to 2 bar above the pressure of the pumped medium at the mechanical seal

Tab. 11 Sealing medium pressure, will be specified by the manufacturer depending on the operating point

9.2.3 Sound pressure level

Sound pressure (LpA) / sound power level (LwA) of the motor in db(A) at the specified speed in rpm

P [kW]	Size	3550		2900		Size	1750		1450		Size	1180		960	
		LpA	LwA	LpA	LwA		LpA	LwA	LpA	LwA		LpA	LwA	LpA	LwA
0.37	–	–	–	–	–	–	–	–	–	–	80M	53	64	42	53
0.55	–	–	–	–	–	80M	55	66	53	64	80M	53	64	42	53
0.75	80M	64	75	60	71	80M	55	66	53	64	90S	55	66	43	54
1.1	80M	64	75	60	71	90S	58	70	56	68	90L	55	66	43	54
1.5	90S	69	81	65	77	90L	58	70	56	68	100L	63	75	59	71
2.2	90L	69	81	65	77	100L	62	74	60	72	112M	63	75	59	71
3	100L	71	83	67	79	100L	62	74	60	72	132S	67	79	63	75
4	112M	73	85	69	81	112M	62	74	58	70	132M	67	79	63	75
5.5	132S	72	84	68	80	132S	68	80	64	76	132M	67	79	63	75
7.5	132S	72	84	68	80	132M	68	80	64	76	160M	70	82	67	79
11	160M	77	89	70	82	160M	69	81	65	77	160M	67	79	67	79
15	160M	77	89	70	82	160L	69	81	65	77	160M	58	71	61	69
18.5	160L	77	89	70	82	180M	68	73	66	70	200L	59	72	64	70
22	180M	78	85	67	80	180L	70	73	68	70	200L	59	72	61	70
30	200L	78	86	67	80	200L	67	73	65	70	225M	59	72	64	70
37	200L	79	85	67	80	225S	68	73	65	70	250M	61	75	62	70
45	225M	75	85	67	80	225M	68	73	65	70	280S	64	77	59	71
55	250M	76	89	71	84	250M	68	74	66	70	280M	64	77	60	71
75	280S	78	91	73	87	280S	77	84	69	79	315S	63	76	63	73
90	280M	78	91	73	86	280M	79	78	70	79	315M	63	76	63	73
110	315S	78	91	73	87	315S	74	83	70	79	315L	62	76	63	74
132	315M	79	91	73	87	315M	78	84	73	79	315L	62	76	67	74
160	315L	82	95	76	90	315L	78	84	73	79	315L	66	81	67	77
200	315L	82	95	76	90	315L	78	83	73	79	–	–	–	–	–
250	315L	–	–	–	–	–	–	–	–	–	–	–	–	–	–

Tab. 12 Sound pressure (LpA) / sound power level (LwA) of the motor in db(A)

Sound pressure (LpA) / sound power level (LwA) of the pump without motor in db(A) at the specified speed in rpm

LTG	Type	3550[1]		2900[1]		1750[2]		1450[2]		1180[3]		960[3]	
		LpA	LwA	LpA	LwA	LpA	LwA	LpA	LwA	LpA	LwA	LpA	LwA
I	40-25-160	69	80	66	77	49	60	47	58	–	–	–	–
I	50-32-160	71	82	68	79	51	62	49	60	–	–	–	–
I	50-32-200	72	83	69	80	53	64	51	62	–	–	–	–
I	65-40-200	72	83	69	80	53	64	51	62	–	–	–	–
I	80-50-200	73	84	70	81	56	67	54	65	–	–	–	–
I	80-65-160	72	83	69	80	53	64	51	62	–	–	–	–
II	65-40-250	80	91	77	88	62	73	60	71	–	–	–	–
II	80-50-250	81	92	78	89	63	74	61	72	–	–	–	–
II	80-50-315	–	–	–	–	68	79	66	77	65	76	64	75
II	100-65-315	–	–	–	–	69	80	67	78	66	77	65	76
II	125-80-200	80	91	77	88	70	81	68	79	–	–	–	–
II	125-80-250	83	94	80	91	75	86	73	84	72	83	71	82
II	125-100-200	80	91	77	88	71	82	69	80	68	79	67	78
III	125-100-250	83	94	81	92	76	87	74	85	73	84	72	83
III	125-100-315	–	–	–	–	78	89	76	87	75	86	74	85
III	150-125-315	–	–	–	–	80	91	78	89	77	88	76	87
III	200-150-250	93	104	91	102	81	92	79	90	78	89	77	88
IV	200-150-400	–	–	–	–	83	94	81	92	80	91	79	90
IV	250-200-400	–	–	–	–	85	96	83	94	82	93	81	92

Tab. 13 Sound pressure (LpA) / sound power level (LwA) of the pump without motor in db(A)

LTG) Bearing carrier size

1) 2-pole motor
2) 4-pole motor
3) 6-pole motor

Measuring conditions:

- Distance to the pump: 1 m
- Operation: free of cavitation
- Motor: IEC standard motor
- Tolerance ±3 dB
- Determination of the sound power by the sound intensity measurement method (DIN EN ISO 9614-2) and Determination of the workplace-related emission value (sound pressure level) LpA to DIN EN ISO 11203

Depending on the noise emissions, the following measures must be taken at places where personnel may be present:

< 70 db(A)	no measures
> 70 db(A)	Personnel continuously exposed to this level of noise must be provided with suitable noise protection.
< 85 db(A)	No special measures are required for personnel who are occasionally exposed to this level of noise for short periods.
> 85 db(A)	This area must be considered a hazard zone. Attach clearly visible warning signs to all points of access. All personnel even if in the area for only a short period, must be compelled to wear ear protection.
> 105 db(A)	Special noise protection appropriate to the noise level and frequency spectrum must be installed. Attach clearly visible warning signs to all points of access. All personnel even if in the area for only a short period, must be compelled to wear a complete acoustic helmet. It must be ensured that the noise emitted via windows, doors and walls does not constitute a hazard to the environment.

Calculation of the total sound pressure level / sound power level

Use the following data for the calculation:

- Sound pressure level / sound power level of the motor being used (LA) (→ Tab. 12 Sound pressure (LpA) / sound power level (LwA) of the motor in db(A), Page 46).
- Sound pressure level / sound power level of the pump at the operating speed (LB) (→ Tab. 13 Sound pressure (LpA) / sound power level (LwA) of the pump without motor in db(A), Page 47).

Formula for calculation:
Total level = $10\lg (10^{LA/10} + 10^{LB/10})$ dB
Example calculation:
LA = 65 dB and LB = 75 dB
Total level = $10\lg (10^{65/10} + 10^{75/10})$ dB
Total level = $10\lg (10^{6.5} + 10^{7.5})$ dB
Total level = 75.4 dB

9.2.4 Tolerance values for adjusting the coupling

The specifications apply only to the pump type NX.

Max. permissible axial displacement

Type WK-E-H/DK	A	L2	TA	Max. axial displacement ΔKa [mm]
Size	mm	mm	Nm	
28	65	20	18	1.5
38	80	24	18	1.8
42	95	26	37	2
48	105	28	65	2.1
55	120	30	65	2.2
65	135	35	65	2.6
75	160	40	161	3

Tab. 14 Tolerance values for the max. permissible axial displacement of the coupling

Max. permissible angular displacement

Max. angular displacement ΔKw_{zul} at the following speeds:

- 1500 min^{-1}: 1 °
- 3000 min^{-1}: 0.75 °

Max. permissible radial displacement

Max. radial displacement ΔKr_{zul}: 0.2 mm

9.2.5 Coupling installation variant

The specifications apply only to the pump type BX.

LTG	Motor size	Installation variant
I	80	B
I	90	B
I	100	B
I	112	B
I	132	B
I	160	A
I	180	A
I	200	A
I	225	A
II	80	B
II	90	B
II	100	B
II	112	B
II	132	B
II	160	B
II	180	B
II	200	B
II (2–core)	225	B
II (4–core)	225	A
II	250	A

Tab. 15 Coupling installation variant for pump type BX

LTG) Bearing carrier size

9.2.6 Flange tightening torques

		Tightening torque[1] MD [Nm] for the versions		
d [mm]	DN [mm]	Flat sealing ring up to max 10 bar	Profile sealing ringup to max 16 bar	O-ring max. 16 bar
32	25	15	12	12
40	32	20	15	15
50	40	25	15	15
63	50	30	20	20
75	65	35	20	20
90	80	35	20	20
110	100	35	20	20
125	100	35	20	20
140	125	45	30	25
160	150	55	35	30
180	150	55	35	30
200	200	65	40	35
225	200	65	40	35
250	250	70	50	40
280	250	70	50	40
315	300	90	60	45
355	350	90	70	50
400	400	100	80	60

Tab. 16 Flange tightening torques

1) Use a torque wrench

9.2.7 Tightening torques of casing screws

Apply graphite paste to metallic connections prior to assembly.

Size	Metal / metal[1] [Nm]	Metal / plastic[2] [Nm]	Metal in metal inserts / plastic[3] [Nm]
M6	9	6	5
M8	21	7	6
M10	42	14	10
M12	73	24	25
M16	170	63	30
M20	340	113	32
M24	580	193	34

Tab. 17 Tightening torques of casing screws

1) Screws made of metal, screwed into nuts made of metal or metal housing parts.
2) Screws and nuts made of metal that tighten the plastic housing.
3) Screws made of metal, screwed into metal inserts in housing parts made of plastic. Inserts screwed-in or insert-molded.

9.2.8 Lubrication

The specified volumes of lubricant are guidance values issued by the manufacturer and should be complied with when lubricating the bearings of the pump type NX:

Bearing carrier size (LTG)	Size NX	Grease volume [ml] for free bearings (pump side)	Grease volume [ml] for fixed bearings (motor side)	Oil volume [ml] in the bearing mounting
I	40-25-160	34	51	232
I	50-32-160	34	51	232
I	50-32-200	34	51	232
I	65-40-200	34	51	232
II	65-40-250	101	133	665
I	80-50-200	34	51	232
I	80-65-160	34	51	232
II	80-50-250	101	133	665
II	80-50-315	101	133	665
II	100-65-315	101	133	665
II	125-80-200	101	133	665
II	125-80-250	101	133	665
II	125-100-200	101	133	665
III	125-100-250	141	181	708
III	125-100-315	141	181	708
III	150-125-315	141	181	708
III	200-150-250	141	181	708
IV	200-150-400	315	372	1141
IV+	250-200-400	315	372	2536

Tab. 18 Lubricant quantities

- Oil change every 10,000 operating hours, at least 1 x year
- Oil specification: Ambient temperature 0–40 °C
- When correctly operated and serviced the working life of the pump is at least 25,000 h (3 years)

9.2.9 Lubricant

The specifications apply only to the pump type NX.

	Grease	Oil
Temperature range [°C]	-35 to 140	0 to 140
Viscosity [mm^2/s]	–	68 to 150
Product name	• Aralub HL3 • BP Energrease • Glissando FT3 • Glissando 30 • Mobilux EP3 • Shell Alvania, Fett R3	• Aralub, Degol BG 150 • BP Energol, GR-XP 150 • Falcon, CLP150 • Mobilgear 600 XP 150 • Shell Omalla 150

Tab. 19 Lubricant

9.2.10 Flush volume

Flush volume for permanent flushing

LTG	Connection	Internal diameter of the hose [mm]	Minimum flush volume at speed (50 Hz) in ltr/h			Minimum flush volume at speed (60 Hz) in ltr/h		
			900-1000 min^{-1}	1400-1500 min^{-1}	2900-3000 min^{-1}	1100-1200 min^{-1}	1700-1800 min^{-1}	3500-3600 min^{-1}
I	G 1/4"	12	30	35	55	35	40	65
II	G 3/8"	12	35	45	70	40	50	80
III	G 3/8"	12	50	75	110	55	80	120

Tab. 20 Flush volume for permanent flushing, bearing carrier size (LTG) I to III

LTG	Connection	Internal diameter of the hose [mm]	Minimum flush volume at speed (50 Hz) in ltr/h			Minimum flush volume at speed (60 Hz) in ltr/h		
			700-750 min^{-1}	900-1000 min^{-1}	1400-1500 min^{-1}	850-900 min^{-1}	1100-1200 min^{-1}	1700-1800 min^{-1}
IV	G 1/2"	16	100	120	200	110	130	200

Tab. 21 Flush volume for permanent flushing, bearing carrier size (LTG) IV

Flush volume for quenching

Admission pressure when using a flow rate restrictor: 0.8 - 8 bar

LTG	Connection	Internal diameter of the hose [mm]	Quenching volume at speed (50 Hz) in ltr/h			Quenching volume at speed (60 Hz) in ltr/h		
			900-1000 min^{-1}	1400-1500 min^{-1}	2900-3000 min^{-1}	1100-1200 min^{-1}	1700-1800 min^{-1}	3500-3600 min^{-1}
I	G 1/4"	12	approx. 30	approx. 30	approx. 30	approx. 30	approx. 30	approx. 30
II	G 3/8"	12	approx. 30	approx. 30	approx. 30	approx. 30	approx. 30	approx. 30
III	G 3/8"	12	approx. 50	approx. 50	approx. 50	approx. 50	approx. 50	approx. 50

Tab. 22 Flush volume for quenching, bearing carrier size (LTG) I to III

LTG	Connection	Internal diameter of the hose [mm]	Quenching volume at speed (50 Hz) in ltr/h			Quenching volume at speed (60 Hz) in ltr/h		
			700-750 min^{-1}	900-1000 min^{-1}	1400-1500 min^{-1}	850-900 min^{-1}	1100-1200 min^{-1}	1700-1800 min^{-1}
IV	G 1/2"	16	approx. 70	approx. 70	approx. 70	approx. 70	approx. 70	approx. 70

Tab. 23 Flush volume for quenching, bearing carrier size (LTG) IV

Flush volume for double-acting mechanical seal

The barrier pressure is dependent on the zero differential head, the specific gravity and the infeed pressure
Calculation of the barrier pressure: P = (H_0 x density x 0.2 +15) / 10 [bar above infeed pressure]
H_0: Zero differential head
Specific gravity: Medium specific gravity

LTG	Connection	Internal diameter of the hose [mm]	Barrier liquid volume at speed (50 Hz) in ltr/h			Barrier liquid volume at speed (60 Hz) in ltr/h		
			900-1000 min^{-1}	1400-1500 min^{-1}	2900-3000 min^{-1}	1100-1200 min^{-1}	1700-1800 min^{-1}	3500-3600 min^{-1}
I	G 1/4"	12	approx. 25	approx. 30	approx. 50	approx. 30	approx. 35	approx. 55
II	G 3/8"	12	approx. 35	approx. 40	approx. 65	approx. 40	approx. 45	approx. 70
III	G 3/8"	12	approx. 45	approx. 70	approx. 100	approx. 50	approx. 75	approx. 110

Tab. 24 Flush volume for double-acting mechanical seal, bearing carrier size (LTG) I to III

LTG	Connection	Internal diameter of the hose [mm]	Barrier liquid volume at speed (50 Hz) in ltr/h			Barrier liquid volume at speed (60 Hz) in ltr/h		
			700-750 min^{-1}	900-1000 min^{-1}	1400-1500 min^{-1}	850-900 min^{-1}	1100-1200 min^{-1}	1700-1800 min^{-1}
IV	G 1/2"	16	approx. 70	approx. 80	approx. 100	approx. 80	approx. 90	approx. 120

Tab. 25 Flush volume for double-acting mechanical seal, bearing carrier size (LTG) IV

9.2.11 Operational limits

Volumetric flow of the pumped medium - minimum pumped flow

If operating point differs, consult the manufacturer.

Q_{min}	Short-time operation: 0.1 x Q_{opt} (approx. 5 min.) Continuous operation: 0.15 x Q_{opt}
Q_{max}	See pump capacity curve (→ data sheet)
Q_{opt}	Volumetric flow in pump capacity curve efficiency optimum

Tab. 26 Flow rate of the pumped medium

Run the pump for a maximum of 1 minute against the closed fittings

Discuss the performance with the manufacturer whilst the pump is running for periods > 1 minute against the closed fittings.

Amounts of gas in the pumped medium

Amounts of gas in the pumped medium reduce the pumping rate and reduce the differential head. Discuss the performance with the manufacturer.

Maximum dimension of solids in the pumped medium

The dimensions of occasional solids in the pumped medium must be less than half the height of the vane and smaller than half the nominal bore of the discharge flange.

Infeed pressure for single-acting STÜBBE PTFE bellows-type mechanical seal

The maximum permissible excess pressure at the pump suction branch is dependent upon the bellows material and the pump speed.

Bellows material	Speed up to 1800 1/min	Speed over 1800 1/min
PTFE	3 bar	3 bar

Tab. 27 Maximum supply pressure

Operating temperature and operating excess pressure of the pumped medium

Material	Temperature [°C]	maximum permissible operating pressure [bar(g)]
UHMW-PE	90	16
PP	95	16
PVDF	115	16
PFA	160	16

Tab. 28 Operating temperature and operating excess pressure of the pumped medium

9.2.12 Loads on the connection stubs and maximum speeds

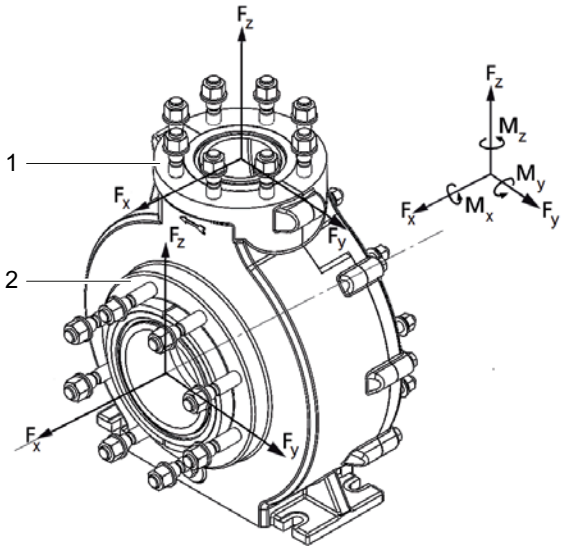


Fig. 23 Forces and torques on the pump flanges with housing material EN-GJS-400-15

The specifications for forces and torques on the suction branch (2) and discharge flange (1) only apply for static piping loads and are based on API 610.

The maximum permissible speed must not be exceeded by mechanical transmissions or use of a frequency converter. The maximum permissible speed for the respective pump size is described in the following 2 tables.

Suction branch

Pump size	Bearing carrier size	max. speed [1/min]	Nominal width [DN]	Forces and torques						
				Fx [N]	Fy [N]	Fz [N]	∑ F [N]	Mx [Nm]	My [Nm]	Mz [Nm]
40-25-160	I	3500	40	782	585	471	1084	370	178	273
50-32-160	I	3500	50	894	719	585	1288	464	231	355
50-32-200	I	3500	50	894	719	585	1288	464	231	355
65-40-200	I	3500	65	1120	894	719	1603	708	354	667
65-40-250	II	3500	65	1120	894	719	1603	708	354	667
80-50-200	I	3500	50	1341	1073	894	1936	952	477	721
80-65-160	I	3500	80	1341	1073	894	1936	952	477	721
80-50-250	II	3500	80	1341	1073	894	1936	952	477	721
80-50-315	II	1750	80	1341	1073	894	1936	952	477	721
100-65-315	II	1750	100	1786	1425	1162	2563	1330	680	1006
125-80-200	II	3500	125	2412	1897	1565	3445	1765	924	1358
125-80-250	II	3500	125	2412	1897	1565	3445	1765	924	1358
125-100-200	II	3500	125	2412	1897	1565	3445	1765	924	1358
125-100-250	III	3500	125	2412	1897	1565	3445	1765	924	1358
125-100-315	III	1750	125	2412	1897	1565	3445	1765	924	1358
150-125-315	III	1750	150	3121	2494	2053	4492	2309	1183	1766
200-150-250	III	3500	200	4898	3789	3121	6935	3531	1767	2580
200-150-400	IV	1750	200	4898	3789	3121	6935	3531	1767	2580
250-200-400	IV	1750	250	6680	5344	4458	9646	5020	2445	3800

Tab. 29 Forces and torques on the suction branch with housing material EN-GJS-400-15

Discharge flange

Pump size	Bearing carrier size	max. speed [1/min]	Nom-inal width [DN]	Forces and torques						
				Fx [N]	Fy [N]	Fz [N]	∑ F [N]	Mx [Nm]	My [Nm]	Mz [Nm]
40-25-160	I	3500	25	427	340	608	817	205	84	152
50-32-160	I	3500	32	515	404	696	955	273	130	211
50-32-200	I	3500	32	515	404	696	955	273	130	211
65-40-200	I	3500	40	585	471	782	1084	370	178	273
65-40-250	II	3500	40	585	471	782	1084	370	178	273
80-50-200	I	3500	50	719	585	894	1288	464	231	355
80-65-160	I	3500	65	719	585	894	1288	708	354	667
80-50-250	II	3500	50	719	585	894	1288	464	231	355
80-50-315	II	1750	50	719	585	894	1288	464	231	355
100-65-315	II	1750	65	894	719	1120	1603	708	354	667
125-80-200	II	3500	80	1073	894	1341	1936	952	477	721
125-80-250	II	3500	80	1073	894	1341	1936	952	477	721
125-100-200	II	3500	100	1425	1162	1786	2563	1330	680	1006
125-100-250	III	3500	100	1425	1162	1786	2563	1330	680	1006
125-100-315	III	1750	100	1425	1162	1786	2563	1330	680	1006
150-125-315	III	1750	125	1897	1565	2412	3445	1765	924	1358
200-150-250	III	3500	150	2494	2053	3121	4492	2309	1183	1766
200-150-400	IV	1750	150	2494	2053	3121	4492	2309	1183	1766
250-200-400	IV	1750	200	3789	3121	4898	6935	3531	1767	2580

Tab. 30 Forces and torques on the discharge flange with housing material EN-GJS-400-15

9.2.13 Switching frequency

Motor power rating [kW]	Switch on / switch off actions per hour
0.18 – 7.5	15
11 – 30	12
37 – 30	8
100 – 250	5

Tab. 31 Switching frequency

9.3 Special tool

Tool	Use
Impeller wrench	Disassembly / installation of the impellers
Installation aid for the mechanical seal	Removal / installation of the double-acting mechanical seal

Tab. 32 Special tool

9.4 Declaration of conformity in accordance with EC machinery directive

EU Declaration of Conformity

CE

Stübbe GmbH & Co. KG, Hollwieser Straße 5, 32602 Vlotho, Germany, declares on its own authority that the following products
Description

Centrifugal pumps with mechanical seal
BE, BX, NX, SHB

Magnetically-coupled pumps
SHM

Sump pumps
ETLB, ETLB-E, ETLB-S, ETLB-ST, ETLB-T, ETLBW

to which this declaration relates, are in conformity with the following standards:

Machinery Directive 2006/42/EC
EMC Directive 2014/30/EU
ROHS Directive 2011/65/EU
With regard to electrical hazards the protective aims of Low Voltage Directive 2014/35/EU have been complied with according to Appendix I no. 1.5.1 of the Machinery Directive 2006/42/EU.

Place and date	Name and signature of authorized person
Vlotho, 01.06.2021	pp Achim Kaesberg, Corporate Data