

Volute Centrifugal Pump

Original Operating Manual

Series

NM

NMB

NMXH



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1 About this document

This manual

- Is part of the equipment
- Applies to the aforementioned pump series
- Describes safe and appropriate 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

Document/purpose/		Where found
ATEX additional manual (300 364) <ul style="list-style-type: none"> • Additional instructions for use in explosive atmospheres • http://www.asv-stuebbe.de/pdf_manuals/300364.pdf 		
Resistance lists <ul style="list-style-type: none"> • Resistance of materials used to chemicals • http://www.asv-stuebbe.de/pdf_resistance/300050.pdf 		
CE declaration of conformity <ul style="list-style-type: none"> • Conformity with standards 		(→ 9.3 Declaration of conformity in accordance with EC machinery directive, Page 40).
Data sheet (technical specifications, operating conditions, dimensions)		
NM	<ul style="list-style-type: none"> • Pump NM (340 021) • http://www.asv-stuebbe.de/pdf_datasheets/340021.pdf 	
NMB	<ul style="list-style-type: none"> • Pump NMB (340 022) • http://www.asv-stuebbe.de/pdf_datasheets/340022.pdf 	
NMXH	<ul style="list-style-type: none"> • Pump NMXH (300 416) • http://www.asv-stuebbe.de/pdf_datasheets/300416.pdf 	
Self-priming container	<ul style="list-style-type: none"> • Self priming container NM, NMB, NMXH (300 422) • http://www.asv-stuebbe.de/pdf_datasheets/300422.pdf 	
Supplier documentation <ul style="list-style-type: none"> • Technical documentation for supplier components (e.g mechanical seal) 		Documentation included

Tab. 1 Other applicable documents, purpose and where found

1.3 Warnings and symbols

Symbol	Meaning
 DANGER	<ul style="list-style-type: none"> • Immediate acute risk • Death, serious bodily harm
 WARNING	<ul style="list-style-type: none"> • Potentially acute risk • Death, serious bodily harm
 CAUTION	<ul style="list-style-type: none"> • Potentially hazardous situation • Minor injury
NOTE	<ul style="list-style-type: none"> • 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
i	Information, advice

Tab. 2 Warnings and symbols

2 General safety instructions



The manufacturer does not accept any liability for any damage caused by disregarding any sections of the entire documentation.

2.1 Intended use

- Only use the pump with suitable media (→ resistance lists).
- Do not use pump with solid particles or abrasive fluids.
If pumps are to be used for solid particles, then agree use in advance with the manufacturer.
- Do not use pump with combustible or explosive fluids.
- Adhere to the operating limits and size-dependent minimum flow rates.
- Avoid dry running:
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.
- Avoid cavitation:
 - Open suction-side fitting fully and do not use to regulate 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.
 - Note minimum flow (→ Data sheet).
- 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 (→ manufacturer's specifications).
- Consult the manufacturer about any other use of the pump.
- If pumps are delivered without motors, then final assembly as a pump assembly must take place in accordance with the provisions of machinery directive 2006/42/EC.

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 are 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 with food or drinking water must be specified in the data sheet.
- Type of installation should only be selected in accordance with these operating instructions. For example, the following are not allowed:
 - Hanging base plate pumps in the pipe
 - Overhead installation
 - Installation in the immediate vicinity of extreme heat or cold sources
 - Installation too close to the wall

2.2 General safety instructions



Observe of 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.

- Only operate the pump if it is in perfect technical condition and only use it 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 Operator's obligations

Safety-conscious operation

- Only operate the pump if it is in perfect technical condition and only use it 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:
 - Adherence to intended use
 - Statutory or other safety and accident-prevention regulations
 - Safety regulations governing the handling of hazardous substances
 - Applicable standards and guidelines in the country where the pump is operated
 - 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:
 - Fitting, 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 hot pump or motor components as a heating point
 - Do not de-ice 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 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.asv-stuebbe.de/pdf_manuals/300364.pdf



3 Layout and function

3.1 Labels

3.1.1 Type plate

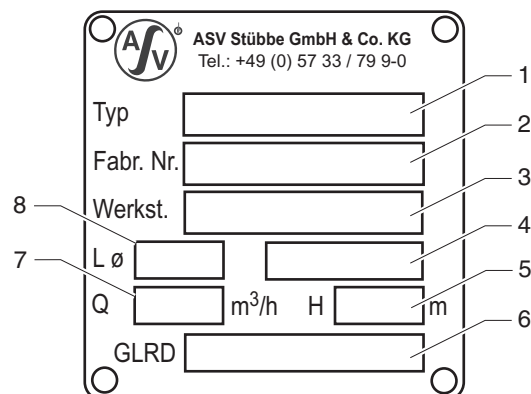


Fig. 1 Type plate (example)

- 1 Pump type
- 2 Serial number
- 3 Housing / sealing material
- 4 –
- 5 Differential head
- 6 Shaft seal information
- 7 Flow
- 8 Impeller diameter [mm]

3.1.2 ATEX nameplate

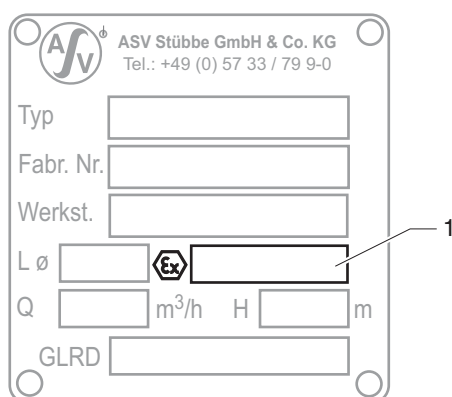


Fig. 2 ATEX nameplate (example)

- 1 Explosion protection label

3.2 Description

- NM: Standard pump
 - Horizontal, single-stage, non self-priming pump with single flow volute casing and free shaft end.
 - Optionally available complete with coupling and drive motor, mounted on a base plate.
- NMB: Close coupled pump
 - Horizontal, single-stage, non self-priming pump with single flow volute casing.
 - Drive motor is flanged on to the pump housing with wafer type flange (without coupling)
 - Torque is transmitted from the drive to the pump by an extended motor shaft.
- NMXH: Standard pump of modular concept
 - Horizontal, single-stage, non self-priming pump with single flow volute casing and free shaft end.
 - Slide-in unit can be dismantled without removing volute casing and piping.
 - Optionally available complete with coupling and drive motor, mounted on a base plate.

3.3 Layout

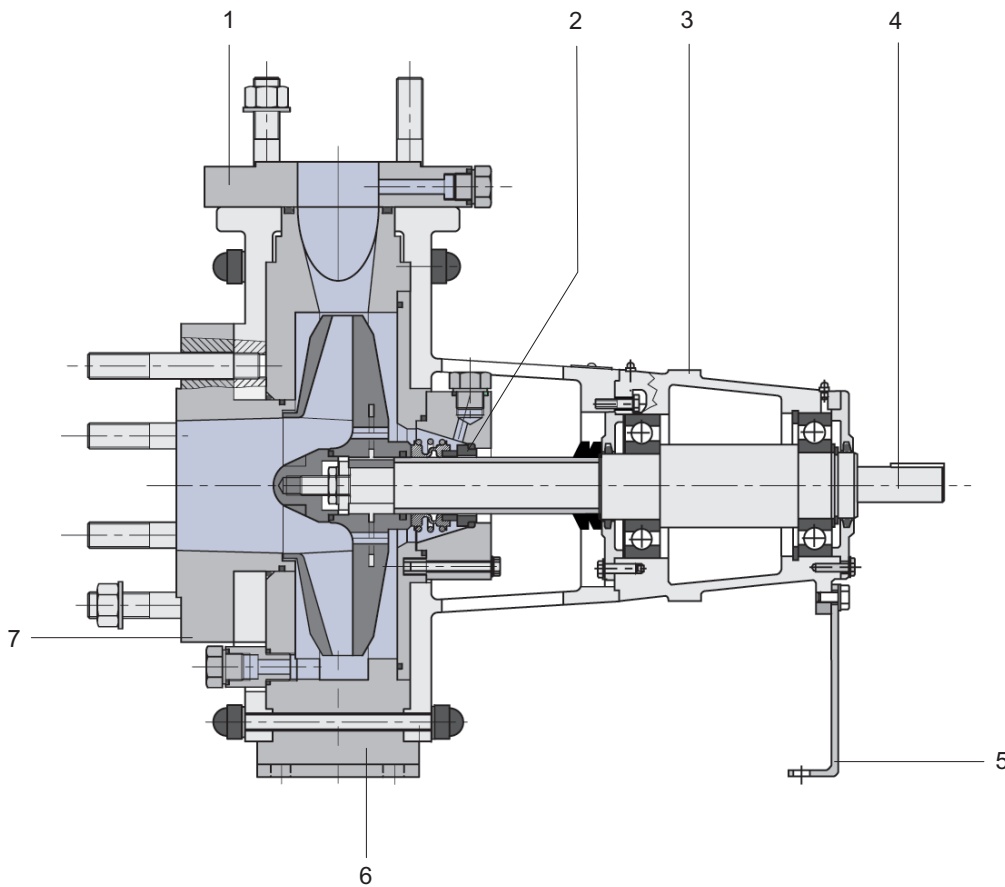




Fig. 3 Layout

- | | | |
|--------------------|----------------|------------------|
| 1 Discharge flange | 4 Shaft | 7 Suction branch |
| 2 Mechanical seal | 5 Support foot | |
| 3 Bearing casing | 6 Pump casing | |

3.4 Shaft seals

 Only one of the following shaft seals can be used.


3.4.1 Mechanical seals

 Mechanical seals have a function-related leak.

- Single acting mechanical seal
- Single acting, non-balanced mechanical seal
- Double acting mechanical seal
- Double acting, non-balanced mechanical seal

3.4.2 Auxiliary systems

Sealing systems

 Only one of the following sealing systems can be used.

Quenching

When quenching, the pressure of the pumped medium is greater than the pressure of the sealing medium. The seal surfaces are lubricated by the pumped medium.

Examples of use:

- Pumped media which reacts chemically with the air
- Prevention of offensive odors
- Cooling of seals
- Protection from icing

Variant	Features of sealing medium
With open flow	<ul style="list-style-type: none"> • Supplied and drained continuously • Unpressurized
In the closed system	<ul style="list-style-type: none"> • Circulating in a closed circuit • Unpressurized

Tab. 3 Quenching - variants and features

Blocking

When blocking, the pressure of the sealing medium is greater than the pressure of the pumped medium. The seal surfaces are lubricated by the sealing medium.

Examples of use:


- Pumped media which crystallizes or contains solids and therefore damages the seal in the long-term
- Toxic conveyed media
- Environmentally hazardous conveyed media

Variant	Features of sealing medium
With open flow	<ul style="list-style-type: none"> • Supplied and drained continuously • Impinged with pressure
In the closed system	<ul style="list-style-type: none"> • Circulating in a closed circuit • Impinged with pressure

Tab. 4 Blocking - variants and features

4 Transport, Storage and Disposal

4.1 Transport

 Weight specifications (→ documents for the particular order).

4.1.1 Unpacking and inspection upon delivery

1. Unpack the pump/pump assembly upon delivery and inspect it for transport damage.
2. Check completeness and accuracy of delivery.
3. Report any transport damage to the manufacturer immediately.
4. 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 attach the lifting gear to the lifting eye of the motor (other than for securing against knocking over for pump assemblies with a high center of gravity).
- ▶ Do not stand under suspended loads.

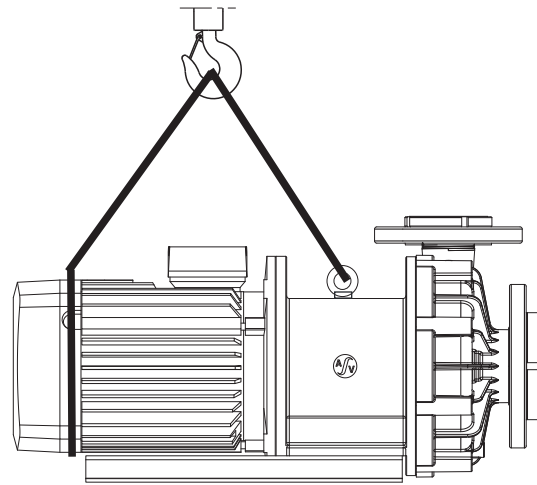


Fig. 4 Attach lifting gear to the pump unit

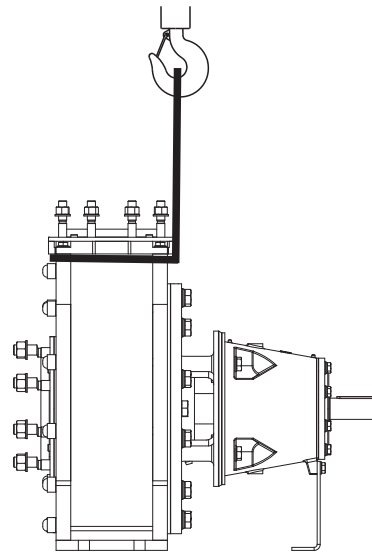


Fig. 5 Attach lifting gear to pump

1. Attach lifting gear in accordance with the following diagrams.
2. Lift 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 pump twice a month.
 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 dispose of any escaping pumped liquid or oil in accordance with local regulations.
 - Neutralize residues of pumped liquid in the pump.
 - ▶ Remove the plastic parts and dispose of 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 setting up the pump.
 - ▶ Do not remove any covers or transport and sealing covers until immediately before connecting the pipes to the pump.
-

5.1 Preparing the setup

5.1.1 Check operating conditions

- ▶ Ensure the required operating conditions are met:
 - Resistance of body and seal material to the medium (→ resistance lists).
 - Required ambient conditions (→ 9.2.1 Ambient conditions, Page 38).


5.1.2 Preparing the installation site

- ▶ Ensure the installation site meets the following conditions:
 - Pump is freely accessible from all sides
 - Sufficient space for the installation/removal of the pipes and for maintenance and repair work, especially for the removal and installation of the pump and the motor
 - Pump not exposed to external vibrations (damage to bearings)
 - 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 12).
 - 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.

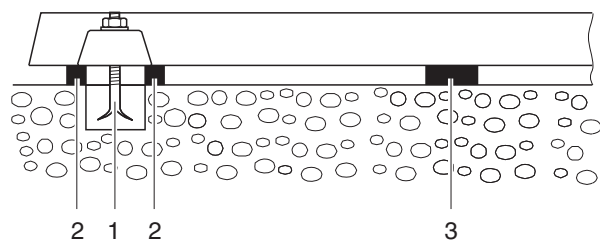



Fig. 6 Installation with foundation


- 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 (1 mm/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 motor


 Only necessary if the pump unit is first assembled on site.

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. Smear a very thin coat of molybdenum disulfide (e.g. Molykote) on the shaft ends of the pump and motor.
 2. Insert key.
 3. Without mounting rig: Remove rubber buffers and heat coupling halves to approx. 100 °C.
 4. Slide on the pump-side and motor-side coupling halves until the shaft end is flush with the coupling hub. When doing so, make sure the prescribed distance between the coupling halves is maintained (→ Other applicable documents, coupling installation instructions).
 5. Tighten the threaded pins on both coupling halves.
 6. Align the motor shaft end using appropriate shims on the motor with the height of the pump shaft end.
 7. Screw in motor bolts, but do not tighten yet (→ 5.9 Aligning motor, Page 19).

5.4 Planning the pipes

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


5.4.1 Specifying supports and flange connections

NOTE

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

- Ensure pipes are connected not under tension.
1. Support pipes in front of the pump.
 2. Ensure the pipe supports have permanent low-friction properties and do not seize up due to corrosion.

5.4.2 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 velocities in plastic pipes of more than 3 m/s.
 - 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.

5.4.3 Specifying pipe lengths

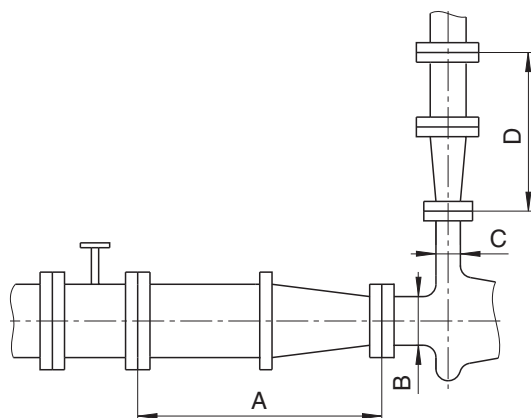




Fig. 7 Straight pipe lengths in front and after the pumps (recommended)

- A > 5x DN_s
- B DN_s
- C DN_d
- D > 5x DN_d

- 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.

5.4.4 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.

5.4.5 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.

5.4.6 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.

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

5.4.7 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. Ensure that the medium does not flow back after switching off the pump by using a non-return valve between discharge flange and stop valve.
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.

Providing dry run protection

- In order to protect the pump from dry running and resulting damage
 - Provide dry run protection
 - e.g. ASV 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.

5.5 Connecting the pipes

NOTE

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

- Ensure pipe connection without tension.

5.5.1 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.

5.5.2 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.

5.5.3 Installing suction pipe

1. Remove the transport and sealing covers from the pump.
2. Fit suction pipe stress-free and sealed. (→ 9.2.4 Flange tightening torques, Page 38).
3. Ensure no seals protrude inwards.
4. For the suction process: Install foot valve in the suction pipe in order to prevent the pump and suction pipe from dry running when pump is not running.

5.5.4 Installing the pressure pipe

1. Remove the transport and sealing covers from the pump.
2. Fit pressure line stress-free and sealed. (→ 9.2.4 Flange tightening torques, Page 38).
3. Ensure no seals protrude inwards.

5.5.5 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 tension.


5.6 Electrical connection

DANGER

Risk of death due to electric shock!


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

5.6.1 Connecting the motor


-  Follow the instructions of the motor manufacturer.

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

5.6.2 Checking the direction of rotation

-  Only possible when starting up (→ 6.2 Commissioning, Page 21).

5.7 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.

5.8 Aligning the coupling precisely

 Only necessary for versions with coupling.

DANGER

Danger to life from rotating parts.

- For all installation and maintenance work, disconnect the motor from the mains and secure against being switched back on again.

NOTE

Material damage due to incorrect alignment of coupling.

- Align the motor exactly to the pump if there is any vertical, lateral or angular misalignment.
- For more detailed information and for special couplings: (→ Manufacturer information).

Checking the coupling alignment

- ✓ Aids, tools, materials:
 - Feeler gauge
 - Straight edge
 - Dial gauge (possibly for couplings with spacer piece)
 - Other appropriate tools, e.g. laser alignment device

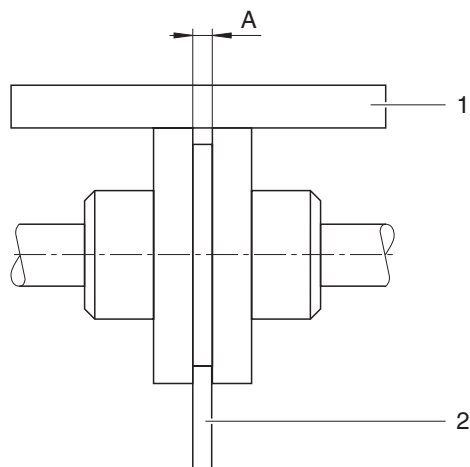


Fig. 8 Checking the coupling alignment

1. Measure the coupling in two planes on the circumference at an angle of 90°.
2. Check the light gap on the outer circumference with straight edge (1):
 - Lay straight edge across both coupling halves.
 - Align the motor if there is a visible gap on the outer circumference (→ 5.9 Aligning motor, Page 19).

3. Check the gap size with feeler gauge (2):
 - Permitted gap dimension (→ 9.2.6 Gap size, Page 38).
 - Measure size of the gap between the coupling halves using feeler gauge (A).
 - If the gap size is not permitted, align the motor (→ 5.9 Aligning motor, Page 19).

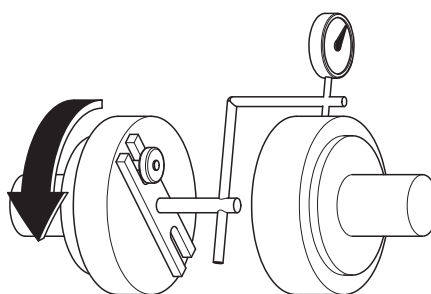


Fig. 9 Checking for lateral and vertical misalignment

4. Check for any lateral or vertical misalignment using the dial gauge:
 - Complete measurement as shown.
 - Align the motor if there is any lateral or vertical misalignment (→ 5.9 Aligning motor, Page 19).
 Permissible axial or radial deviation, measured on coupling front or circumference: < 0.05 mm

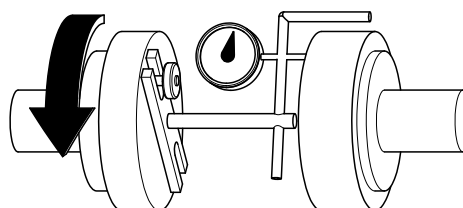



Fig. 10 Checking angular offset

5. Checking for angular displacement
 - Complete measurement as shown.
 - If there is any angular displacement: align the motor.
 Permissible angular offset < 0.03 mm

5.9 Aligning motor

1. Align the motor so that the coupling halves align exactly, if necessary place alignment plates underneath.
2. Check alignment.
3. Repeat alignment procedure if there is still a vertical misalignment.
4. After that, tighten the motor bolts.

6 Operation

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

6.1 Preparing for commissioning

6.1.1 Checking downtimes

- ▶ Check downtimes (→ 6.4 Restoring the pump to service, Page 23).

6.1.2 Filling and bleeding

WARNING

Risk of injury and poisoning due to hazardous fluid!

- ▶ 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.

6.1.3 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 (→ documents for the particular order)
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).

6.1.4 Check direction of rotation

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.

NOTE

Material damage as a result of dry running.

- ▶ Make sure the pump is filled properly.
1. Switch on motor for max. of 2 seconds and switch off again immediately.
 2. Check whether the sense of rotation of the motor matches the direction of rotation on the fan.
 3. If the sense of rotation is different: change over the two phases (→ 5.6 Electrical connection, Page 18).

6.2 Commissioning

6.2.1 Switching on

- ✓ Pump set up and connected properly
- ✓ 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

DANGER

Risk of injury from running pump!

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

DANGER

Risk of injury and poisoning due to pumped liquid 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 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 minimum flow (→ documents for the particular order).

NOTE

Material damage as a result of dry running

- ▶ Make sure the pump is filled properly.
1. Open the suction-side fitting.
 2. Close pressure-side fitting
 3. Switch on the motor and check it for smooth running.
 4. Once the motor has reached its nominal speed, open the pressure-side fitting slowly until the operating point is reached.

5. Make sure temperature change is smaller than 5 K/min for pumps with hot fluids.
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 if necessary (only after initial commissioning).

6.3 Shutting down the pump

DANGER

Risk of injury from running pump!

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

DANGER

Risk of electrocution!

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

- ▶ Use protective equipment for any work on the pump.
- ▶ Collect leaking liquid safely and dispose of 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 (→ Table 6 Measures depending on the behavior of the pumped liquid, Page 22).
...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.

Tab. 5 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. 6 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 21).
2. If the pump is shut down for over 1 year, replace elastomer seals (O-rings, shaft sealing rings).

6.5 Operating the stand-by pump


✓ Stand-by pump filled and bled




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


1. Fully open the suction-side fitting.
2. Open pressure-side fitting far enough so that the stand-by pump operating temperature is achieved and heating is even (→ 6.2.1 Switching on, Page 21).

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

WARNING

Risk of injury and poisoning due to hazardous pumped liquids!

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

1. Check at appropriate intervals:
 - Adherence to the minimum flow rate
 - 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
 - No parting of magnetic coupling

7.2 Maintenance

DANGER

Risk of injury from running pump!

- ▶ Do not touch the running pump.
- ▶ Do not carry out any work on the running pump.
- ▶ 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 by qualified electricians only.

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 unpressurized.
- ▶ Empty the pump, safely collect the pumped liquid and dispose of 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	<ul style="list-style-type: none"> ► 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 leaking pumped liquid. ► Replace defective components immediately in the event of leakage. <ul style="list-style-type: none"> – Mechanical seal (→ other applicable documents).
Self priming container (if present)	daily	<ul style="list-style-type: none"> ► Check filling level.
Sealing medium	daily	<ul style="list-style-type: none"> ► Check (→ 7.2.2 Check sealing medium, Page 25).
Undoable screwed connections	weekly	<ul style="list-style-type: none"> ► Check for tight fitting.
Pump unit	as required	<ul style="list-style-type: none"> ► Cleaning (→ 7.2.3 Cleaning the pump, Page 25).
Impeller Bearing bushes O-rings	quarterly	<ul style="list-style-type: none"> ► Dismount the pump (→ 7.3 Dismounting, Page 26). <ul style="list-style-type: none"> – Check components for wear and damage – Clean or replace impeller – Replace worn components
Roller bearing	after 2,000 operating hours	<ul style="list-style-type: none"> ► Regrease (→ 9.2.7 Lubricant, Page 39).
Mechanical seals	after 4,000 operating hours years at the latest	<ul style="list-style-type: none"> ► Replace (→ 7.3 Dismounting, Page 26).
Elastic intermediate ring coupling	after 5,000 operating hours	<ul style="list-style-type: none"> ► Replace.
Roller bearing	after 12,000 operating hours not later than after 18 months	<ul style="list-style-type: none"> ► Replace (→ 7.3 Dismounting, Page 26).

Tab. 7 Maintenance plan

7.2.2 Check sealing medium

 Only for version with quench.

1. Check filling level of sealing medium.
2. After 4000 operating hours or if the maximum filling level is reached, replace sealing medium:
 - Empty seal chamber and collect sealing medium safely when doing so.
 - Fill sealing chamber with sealing medium.

7.2.3 Cleaning the pump

NOTE

High water pressure or spray water can damage bearings!

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

- Clean large-scale grime from the pump.

7.3 Dismounting

DANGER

Risk of injury due to running pump!

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

DANGER

Risk of electrocution!

- ▶ All electrical work must be carried out by qualified electricians only.
- ▶ 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 unpressurized.
- ▶ Empty the pump, safely collect the pumped liquid and dispose of 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 be very sharp-edged due to wear or damage.
- ▶ Remove spring-loaded components carefully (e.g. mechanical seal, tensioned bearing, valves etc.), as components can be ejected by the spring tension.
- ▶ Observe the manufacturer's specifications (e.g. for the motor, coupling, mechanical seal, blocking pressure system, cardan shaft, 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 depressurised
- ✓ 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
- ✓ Manometer lines, manometer and fixtures dismounted


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.
 - Dismount pump (→ sectional drawing).

7.3.2 Disassembly NM NMB

 Impeller fastening: Clockwise thread.

 Shaft protection sleeves **with** locking pin can be pulled off the shaft by hand.

Shaft protection sleeves **without** locking pin are made of artificial carbon/ceramic and are glued with single component glue Sicomet 8400. Shaft protection sleeves made of artificial carbon/ceramic cannot be disassembled without breakage.

WARNING

Risk of injury due to shattering ceramic parts

- ▶ Wear protective equipment
- ▶ Disassemble ceramic parts carefully.

NOTE

Material damage, fragile components.

- ▶ Do not hit or knock plastic or ceramic Plastic/ceramic is sensitive to impact and will crack easily.

1. Remove protective cap (580.1).
2. Unscrew hexagon nut (920.1).
3. Remove washers (554.3).
4. Unscrew stud bolts (902.1).
5. Remove reinforced casing (155.1) from housing cover (161.1).
6. Undo impeller mounting (920.4, 550.1, 934.1).

Shaft protection sleeves with locking pin

1. Remove the impeller (230.1) from the shaft (210.1).
2. Remove the mechanical seal (433.1) from the shaft protection sleeve (→ other applicable documents, supplier documentation).
3. Remove shaft protection sleeve.

Shaft protection sleeves without locking pin

1. Remove the impeller (230.1) with shaft protection sleeve (524.1) and mechanical seal (433.1) from the pump shaft (210.1).
2. Remove the liquid splash ring (507.1) from the shaft protection sleeve (524.1).
3. Remove mechanical seal (433.1) from the shaft protection sleeve (524.1). (→ other applicable documents, supplier documentation)
4. Carefully remove shaft protection sleeve (524.1) from the shaft (210.1) by knocking gently with a hammer.
5. Remove all glue residue from the surface of the shaft using commercially available "thinner".

7.3.3 Disassemble NMXH


1. Unscrew hexagon head bolt (901.7).
2. Remove washers (554.11).
3. Remove spring rings (934.7).
4. Pull out impeller unit from the back of the volute casing.
5. Unscrew impeller cap (260).
6. Undo nut (922).
7. Remove spring ring (934.6).
8. Carefully remove the ceramic stationary seal ring (475.1) from the shaft (230).
9. Remove mechanical seal (472.1) from the shaft.
10. Pull out shaft protection sleeve (523).
11. Undo the screws (914.4).
12. Remove volute casing cover (161) together with
 - the mechanical seal bracket (487)
 - Support ring for sealing lid (471.2)
 - Sealing lid (471.1)
 - Locking pin (485)
 - Spring (477.1).

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.asv-stuebbe.de/pdf_DOC/300358.pdf).



7.5 Installing

 Install components concentrically and without tilting in accordance with the markings applied.

Apply graphite paste to metallic connections prior to assembly.

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 assembly!

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

NOTE

Material damage due to incorrect dismantling/installation of the pump.

- ▶ Only specialist mechanics should complete dismantling/installation work.

NOTE

Material damage due to unsuitable components!

- ▶ Always replace lost or damaged screws with screws of the same strength where required (→ 9.2.5 Tightening torques of casing screws, Page 38).
- ▶ Only replace seals with seals of the same material.

NOTE

Material damage, fragile components


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

1. When installing please observe:
 - Replace worn parts with genuine spare parts.
 - Replace seals, inserting them in such a way that they are unable to rotate.
 - Do not apply synthetic or mineral oil, grease or cleaning agents to elastomer components.
 - Adhere to the prescribed tightening torques. (→ 9.2.5 Tightening torques of casing screws, Page 38).
 - Shaft protection sleeve without locking pin (→ 7.6 Assembly instruction for shaft protection sleeve, Page 28).
2. Installing the pump:
 - in reverse order to the dismantling (→ 7.3 Dismounting, Page 26).
 - → sectional drawing
3. Installing the pump in the system

7.6 Assembly instruction for shaft protection sleeve

1. Apply a thin coat of Sicomet to the shaft.
 - Observe manufacturer safety data sheet.
2. Push on shaft protection sleeve (524.1) immediately with inner bevel facing the shaft (210.1).
 - Sicomet drying time approx. 30 s.

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	6
Pump leaks	7
Excessive motor power uptake	8

Tab. 8 Fault/number assignment

Fault number								Cause	Remedy
1	2	3	4	5	6	7	8		
X	–	–	–	–	–	–	–	Intake / suction pipe and/or pressure line closed by fitting	► Open fitting.
–	X	–	X	–	–	–	–	Intake / suction pipe not completely open	► Open the fitting.
X	X	–	X	–	X	–	–	Intake / suction pipe, pump or suction strainer blocked or encrusted	► Clean intake/suction pipe, pump or suction strainer
–	X	–	X	–	X	–	–	Cross section of intake / suction pipe too narrow	► Increase cross section. ► Clean encrustation from suction pipe. ► Fully open fitting.
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	–	X	–	X	–	–	Suction head too large: $NPSH_{\text{pump}}$ is larger than $NPSH_{\text{system}}$	► Increase pump inlet pressure. ► Consult with the manufacturer.
–	X	–	X	–	X	–	–	Counterpressure of system is too high, pump selected is too small.	► Consult with the manufacturer.
X	–	–	–	–	X	–	–	intake/suction pipe and pump not correctly vented or not completely filled	► Completely fill and vent pump and/or pipe.
X	–	–	–	–	X	–	–	Intake / suction pipe contains trapped air	► Install fitting for venting. ► Adjust piping installation.
X	X	–	X	–	X	–	–	Air is sucked in	► Seal source of problem.
X	X	–	X	–	X	–	–	Proportion of gas too high: pump is cavitating	► Consult with the manufacturer.

Fault number								Cause	Remedy
1	2	3	4	5	6	7	8		
–	X	–	X	–	X	–	–	Temperature of fluid is too high: pump is cavitating	<ul style="list-style-type: none"> ► Increase pump inlet pressure. ► Lower temperature. ► Contact the manufacturer.
–	X	–	X	–	–	–	X	Viscosity or specific gravity of the pumped liquid outside the range specified for the pump	<ul style="list-style-type: none"> ► Consult the manufacturer.
–	X	–	X	–	–	–	–	Geodetic differential head and/or pipe flow resistances too high	<ul style="list-style-type: none"> ► Remove sediments from the pump and/or pressure pipe. ► Install a larger impeller and consult the manufacturer.
–	X	–	–	X	X	–	–	Pressure-side fitting not opened wide enough	<ul style="list-style-type: none"> ► Open the pressure-side fitting.
X	X	–	–	X	X	–	–	Pressure pipe blocked	<ul style="list-style-type: none"> ► Clean the pressure pipe.
X	X	–	X	–	X	–	–	Pump running in the wrong direction	<ul style="list-style-type: none"> ► Change over any two phases in the motor.
X	X	–	X	–	–	–	–	Motor speed too low	<ul style="list-style-type: none"> ► Compare the required motor speed with the specifications on the pump type plate. Replace the motor if necessary. ► Increase the motor speed if speed control is available.
–	X	–	X	–	X	–	–	Pump parts worn	<ul style="list-style-type: none"> ► Replace the worn pump parts.
–	–	X	X	–	X	–	X	Pressure-side fitting opened too wide	<ul style="list-style-type: none"> ► Throttle down the flow rate at the pressure-side fitting. Observe the minimum flow rate. ► 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	<ul style="list-style-type: none"> ► Throttle down the flow rate at the pressure-side fitting. Observe the minimum flow rate. ► Machine the impeller down. Consult the manufacturer and adjust the impeller diameter.
–	–	X	–	X	–	–	–	Viscosity lower than expected	<ul style="list-style-type: none"> ► Machine the impeller down. Consult the manufacturer and adjust the impeller diameter.
–	–	X	–	X	X	–	X	Motor speed too high	<ul style="list-style-type: none"> ► 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	<ul style="list-style-type: none"> ► Throttle down the flow rate at the pressure-side fitting. Observe the minimum flow rate. ► Machine the impeller down. Consult the manufacturer and adjust the impeller diameter.

Fault number								Cause	Remedy
1	2	3	4	5	6	7	8		
X	X	–	X	–	X	–	–	Impeller out of balance or blocked	<ul style="list-style-type: none"> ► Dismount the pump and inspect it for dry-running damage. ► Clean the impeller.
–	X	–	X	–	X	–	–	Hydraulic parts of the pump dirty, clotted or encrusted	<ul style="list-style-type: none"> ► Dismount the pump. ► Clean the parts.
–	–	–	–	X	–	–	–	Flow falls below minimum	<ul style="list-style-type: none"> ► Increase flow to minimum flow.
–	–	–	–	X	–	–	–	Coupling packages worn	<ul style="list-style-type: none"> ► Replace coupling packages and realign.
–	–	–	–	X	X	–	X	Defective antifriction bearing in bearing carrier	<ul style="list-style-type: none"> ► Replace antifriction bearing
–	–	–	–	–	X	–	X	Plain bearing faulty	<ul style="list-style-type: none"> ► Replace plain bearing.
–	–	–	–	–	–	–	X	Defective antifriction bearing in motor	<ul style="list-style-type: none"> ► Replace the antifriction bearing (→ manufacturer's specifications).
–	–	–	–	–	X	–	–	Lubricant: too much, too little or unsuitable	<ul style="list-style-type: none"> ► Reduce, add to or replace lubricant.
–	–	–	–	–	–	X	–	Mechanical seal worn	<ul style="list-style-type: none"> ► Replace mechanical seal ► Check pumped medium.
–	–	–	–	–	–	X	–	Connecting bolts not correctly tightened	<ul style="list-style-type: none"> ► Tighten the connecting bolts.
–	–	–	–	–	–	X	–	Faulty housing seal	<ul style="list-style-type: none"> ► Replace housing seal
–	–	–	–	–	X	X	X	Pump distorted	<ul style="list-style-type: none"> ► Check the pipe connections and pump attachment. ► Check alignment of coupling. ► Check attachment of the support foot.
–	X	–	X	–	X	–	X	Motor running on 2 phases	<ul style="list-style-type: none"> ► Check the fuse and replace it if necessary. ► Check the cable connections and insulation.

Tab. 9 Troubleshooting list

9 Appendix

9.1 Replacement parts

9.1.1 Series NM

Part no.	Designation
102.1	Volute casing
153.1	Suction branch
155.1	Reinforced casing
156.1	Discharge flange
161.1	Housing cover
183.1	Support foot
210.1	Shaft
230.1	Impeller
260.1	Impeller cap
346.1	Groove ball bearing
321.2	Groove ball bearing
330.1	Bearing bracket
344.1	Bearing carrier support stand
360.1	Bearing cap
360.2	Bearing cap
412.1	O-ring
412.2	O-ring
412.3	O-ring
412.4	O-ring
412.5	O-ring
412.6	O-ring
412.7	O-ring
412.8	O-ring
422.1	felt ring
422.2	Felt ring
433.1	Mechanical seal
471.1	Sealing lid
507.1	Liquid splash ring
524.1	Shaft sleeve
550.1	Washer
551.1	Supporting disc
554.1	Disc
554.2	Disc
554.3	Disc

Part no.	Designation
554.4	Disc
554.5	Disc
554.6	Disc
554.7	Disc
566.1	Round head grooved pin
580.1	Hexagon protecting cap
636.1	Ball-type lubricating nipple
901.1	Hexagon head bolt
901.2	Hexagon head bolt
901.3	Hexagon head bolt
901.4	Hexagon head bolt
902.2	Stud bolt
902.3	Stud bolt
903.1	Plug screw
914.1	Cylinder screw
920.1	Hexagon nut
920.2	Hexagon nut
920.3	Hexagon nut
920.4	Hexagon nut
932.1	Circlip
932.2	Circlip
934.1	Spring ring
940.1	Key
940.2	Key
971.1	Rating plate

Tab. 10 Designation of components according to part numbers

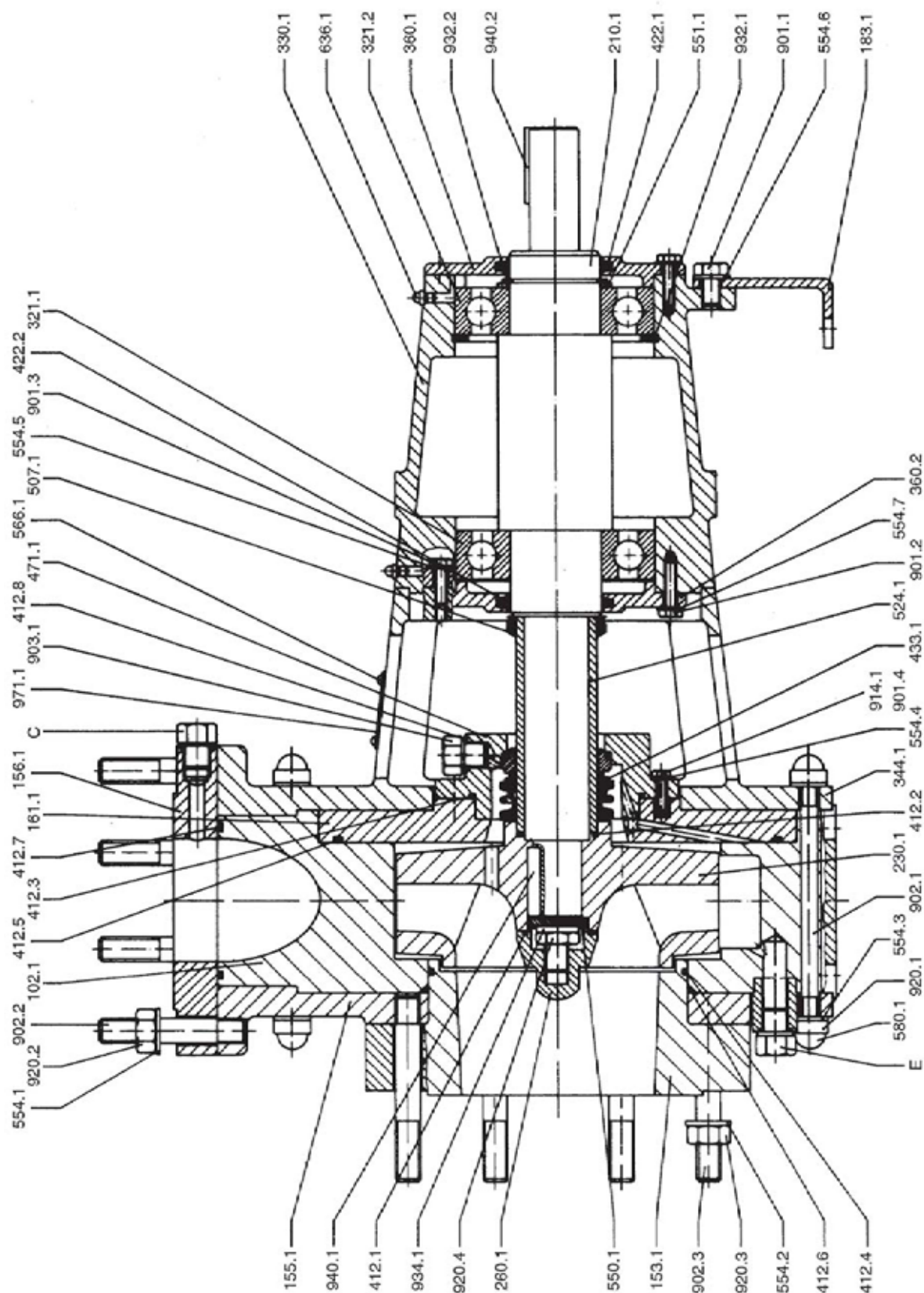


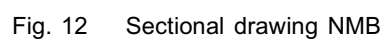
Fig. 11 Sectional drawing

9.1.2 Series NMB

Part no.	Designation
102.1	Volute casing
153.1	Suction branch
155.1	Reinforced casing
156.1	Discharge flange
161.1	Housing cover
183.1	Support foot
210.1	Shaft
230.1	Impeller
260.1	Impeller cap
346.1	Wafer type flange
344.1	Bearing carrier support stand
412.1	O-ring
412.2	O-ring
412.3	O-ring
412.4	O-ring
412.5	O-ring
412.6	O-ring
412.7	O-ring
412.8	O-ring
422.1	Felt ring
422.2	Felt ring
433.1	Mechanical seal
471.1	Sealing lid
504.1	Distance ring
507.1	Liquid splash ring
524.1	Shaft sleeve
551.1	Supporting disc
554.1	Disc
554.2	Disc
554.3	Disc
554.4	Disc
554.5	Disc
554.6	Disc
566.1	Round head grooved pin
580.1	Hexagon protecting cap
636.1	Ball-type lubricating nipple
801.1	Motor
901.1	Hexagon head bolt

Part no.	Designation
901.4	Hexagon head bolt
902.1	Stud bolt
902.2	Stud bolt
902.3	Stud bolt
903.1	Plug screw
914.1	Cylinder screw
914.3	Cylinder screw
914.4	Cylinder screw
920.1	Hexagon nut
920.2	Hexagon nut
920.4	Hexagon nut
934.1	Spring ring
940.1	Key
940.2	Key
971.1	Rating plate

Tab. 11 Designation of components according to part numbers



9.1.3 Series NMXH

Part no.	Designation
155.1	Reinforced casing
155.2	Reinforced casing
155.3	Reinforced casing
210	Drive shaft
230	Impeller
260	Impeller cap
321	Four point bearing
322.1	Cylindrical roller bearing
330	Bearing bracket
344	Bearing carrier support stand
360.1	Bearing cap
360.2	Bearing cap
412.13	O-ring
412.3	O-ring
412.4	O-ring
420.1	Radial shaft seal
420.2	Radial shaft seal
433.1	Mechanical seal
472.1	Rotating seal ring
475.1	Stationary seal ring
477.1	Spring
485	Locking pin
487	Rotating seal ring bracket
506.2	Support ring
554.1	Disc
554.10	Disc
554.12	Disc
554.2	Disc
554.3	Disc
554.4	Disc
554.8	Disc
580.1	Hexagon head protection cap
901.2	Hexagon head bolt
901.2	Hexagon head bolt
901.7	Hexagon head bolt
901.8	Hexagon head bolt
901.9	Hexagon head bolt
901.9	Hexagon head bolt

Part no.	Designation
902.1	Stud bolt
902.2	Stud bolt
902.3	Stud bolt
903.2	Screw plug
912.2	Drain set
914.2	Cylinder screw
914.4	Cylinder screw
920.1	Hexagon nut
920.2	Hexagon nut
923	Slotted nut
931	Locking plate
932.1	Circlip
934.1	Spring ring
934.2	Spring ring
934.6	Spring ring
934.7	Spring ring
934.7	Spring ring
940.1	Key
940.2	Key

Tab. 12 NMXH: Part numbers and component designations

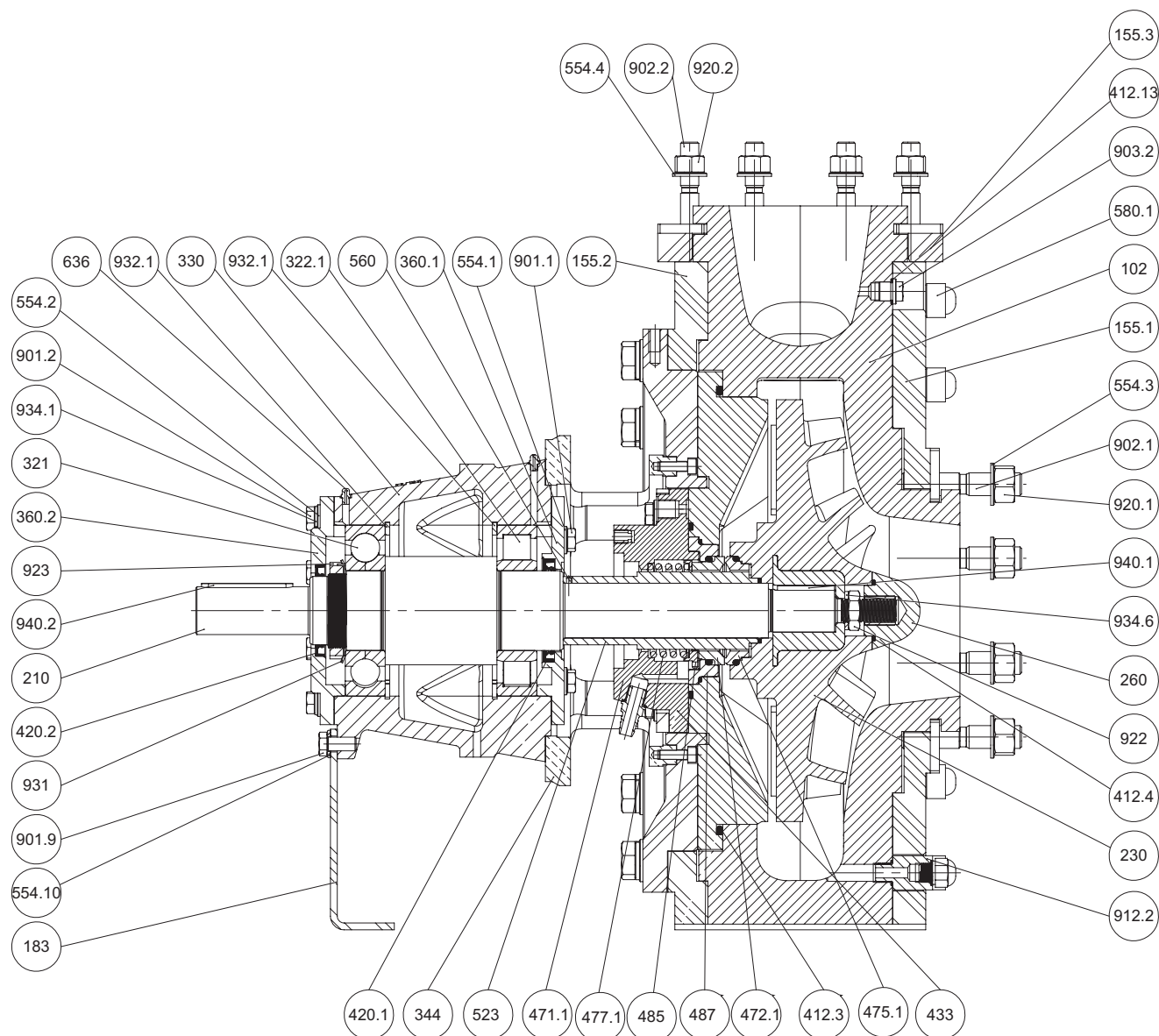




Fig. 13 Sectional drawing NMXH

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 [%]		Setup height above sea level [m]
	Long-term	Short-term	
–20 to +40 ¹⁾	≤ 85	≤ 100	≤ 1000

Tab. 13 Ambient conditions

1) material-dependent

9.2.2 Parameters for auxiliary systems

Blocking liquid	Parameter
Pressure [bar]	1.5 to 2 above the pressure at the mechanical seal
Outlet temperature [°C]	<ul style="list-style-type: none"> PP, DVDS: < 60 PE: < 40 At normal pressure: 40 (below the boiling point)

Tab. 14 Blocking liquid pressure and outlet temperature

9.2.3 Sound pressure level

Sound pressure level < 75 dB(A)

Measuring conditions:

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

9.2.4 Flange tightening torques

DN [mm]	Md [Nm]	DN [mm]	Md [Nm]
15	15	100	45
20	15	125	50
25	15	150	65
32	25	200	75
40	35	250	100
50	40	300	110
65	40	350	120
80	40	400	125

Tab. 15 Flange tightening torques

9.2.5 Tightening torques of casing screws

Size	Metal connections	Plastic connections	Plastic connections with metal inserts
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. 16 Tightening torques of casing screws

9.2.6 Gap size

Sizes	Gap dimension A [mm]
67	5 + 0.5
82	5 + 1.0
97	5 + 1.0
112	7 + 1.0
128	7 + 1.0
148	7 + 1.0
168	7 + 1.5
194	7 + 1.5
214	7 + 1.5
240	8 + 1.5
265	8 + 2.5
295	8 + 2.5
330	10 + 2.5
370	10 + 2.5
415	10 + 2.5

9.2.7 Lubricant

	Grease	Oil
Temperature range [°C]	-35 to 140	0 to 140
Viscosity [mm ² /s]	–	198 to 242
Product name	<ul style="list-style-type: none"> • Aralub HL3 • BP Energrease • Glissando FT3 • Glissando 30 • Mobilux, EP3 • Shell Alvania, Fett R3 	<ul style="list-style-type: none"> • Aralub, Degol BG 220 • BP Energol, GR-XP 220 • Falcon, CLP220 • Spartan, EP 220 • Mobilgear, 600 XP • Shell Oil 90 • Shell Omalla Oil 220

Tab. 17 Lubricant

Pump size	Grease quantity [g] per roller bearing/ lubricant point	Oil volume [l] in the bearing carrier
32 – 125 40 – 125	5.5	1.0
32 – 160 40 – 160 50 – 125	7.0	1.0
32 – 200 40 – 200 50 – 160 50 – 200 65 – 160	8.5	1.0
32 – 250 40 – 250 50 – 250 65 – 200 80 – 160 80 – 200	12.5	1.8
40 – 315 65 – 250	16.0	2.0
50 – 315 80 – 250	18.0	2.0
65 – 315 80 – 315	24.0	2.5
125 – 315	30.0	2.5
150 – 400	–	5.2

Tab. 18 Grease/oil lubricant quantity

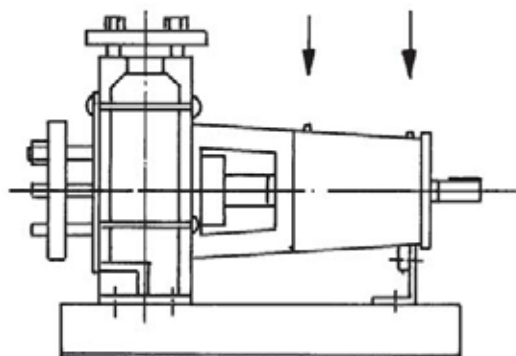


Fig. 14 Lubricating points with grease nipples

9.3 Declaration of conformity in accordance with EC machinery directive

CE declaration of conformity



We hereby declare under our sole responsibility that the products listed below
Description

Centrifugal pumps with mechanical seal
NM, NMB, NMXH, SHB

Solenoid pumps
SHM

Eccentric pumps
Type F, Type L

Sump pumps
ET, ETL, ETLB

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

Machinery Directive 2006/42/EC

EMV Directive 2004/108/EC

With regard to electrical risks, the protection objectives of the Low Voltage Directive 2006/95/EC have been complied with in accordance with appendix I no. 1.5.1 of the Machinery Directive 2006/42/EC.

Place and date

Vlotho, den 29.05.2015

Name and signature of authorized person

p.p. Achim Kaesberg,
Head of Electrical Engineering