Product designation

Centrifugal pump

Product series: PAB... / PNB...

Original assembly instructions with associated operating instructions acc. to EC Machinery Directive 2006/42/EC

Version 02

Spandau pumpen

Masthead

These original assembly instructions with associated operating instructions pursuant to EC Machinery Directive 2006/42/EC are an integral part of the described product and must be kept for future use.
These original assembly instructions with associated operating instructions have been prepared in accordance with the established standards and rules for technical documentation, VDI 4500.

Service

If you have technical questions, please contact the following addresses:

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Information concerning EC Declaration of Conformity and EC Declaration of Incorporation

The product

Centrifugal pump

of the series:
PAB... / PNB...

is hereby confirmed to comply with the essential protection requirements stipulated by the following Directive(s) of the Council on the approximation of laws of the Member States concerning:

- **Machinery Directive 2006/42/EC**
- **Low Voltage Devices 2014/35/EU**
- **Electromagnetic Compatibility 2014/30/EU**
- **Equipment for Potentially Explosive Atmospheres 2014/34/EU**
- **Directive RoHS 2014/65/EU**

Notes:

(a) This declaration certifies compliance with the aforementioned Directives, but does not constitute a guarantee of characteristics.

(b) The safety instructions in the documentation included with the product must be observed.

(c) The commissioning of the products here certified is prohibited until the machine, vehicle or similar in which the product is installed conforms with the provisions and requirements of the applicable Directives.

(d) The operation of the products at non-standard supply voltage, as well as non-adherence to the installation instructions, can negatively impact the EMC characteristics and electrical safety.

We further declare:

- The aforementioned product is, **according to EC Machinery Directive 2006/42/EC, Annex II Part B, designed for installation in** machinery / for incorporation with other machinery to form a machine. Within the scope of application of the EC Directive, commissioning shall be prohibited until the machinery in which this part is installed conforms with the provisions of this Directive.

- The aforementioned product may, with reference to **EU Directive 2014/68/EU concerning pressure equipment**, only be used in accordance with its intended use and in conformity with the instructions provided in the documentation. The following must be observed in this regard:

The products are neither designed nor approved for use in conjunction with fluids of the CLP Regulation 1272/2008.

The product is neither designed nor approved for use in conjunction with gases, liquefied gases, pressurized gases in solution, vapors, or such fluids whose vapor pressure exceeds normal atmospheric pressure (1013 mbar) by more than 0.5 bar at their maximum permissible temperature.

When used in conformity with their intended use, the products supplied by SKF Lubrication Systems Germany GmbH do not reach the limit values listed in Directive 2014/68/EU. They are therefore not subject to the requirements of this Directive. Consequently, they do not bear a CE marking in respect of Directive 2014/68/EU. SKF Lubrication Systems Germany GmbH classifies them according to Whereas clause 38 of the Directive.

The Declaration of Conformity and Incorporation forms part of the product documentation and is supplied together with the product.

General information

Explanation of symbols and signs

You will find these symbols, which warn of specific dangers to persons, material assets, or the environment, next to all safety instructions in these assembly instructions.
Please heed these instructions and proceed with special care in such cases. Please pass all safety instructions to other users.

Hazard symbols

	**DIN 4844-2 W000**	**General hazard**
	**DIN 4844-2 W008**	**Electricity**
	**DIN 4844-2 W026**	**Hot surface**
	**DIN 4844-2 W028**	**Slipping hazard**
	**DIN 4844-2 W002**	**Explosion hazard**

Instructions attached directly to the equipment, such as rotational direction arrows and fluid connection labels, must be followed. Replace such signs if they become illegible.

- Rotation arrow
- Fluid connection labels

must be followed and kept in fully legible condition.

Indicators used with safety instructions, and their significance

Signal word	Application
Danger!	danger of bodily injury
Warning!	Danger of damage to property and the environment
Note!	Provides additional information

Prohibition signs

	**DIN 4844-2 D-P008**	**Do not touch**

You are responsible!

Please read the assembly instructions thoroughly and follow the safety instructions.

Informational symbols

	Note
⇒	Prompts an action
•	Used for itemizing
>	Refers to other facts, causes, or consequences
*	Provides additional information

Product designation

Centrifugal pump

Original assembly instructions acc. to EC Machinery Directive 2006/42/EC

Product series: PAB... / PNB...

1. Safety instructions

Please observe the following safety instructions to ensure trouble-free functioning of the pump and to prevent damage.

The operator of the described product must ensure that the assembly instructions are read and understood by all persons tasked with the assembly, operation, maintenance, and repair of the product. The assembly instructions must be kept readily available.

Note that the assembly instructions form part of the product and must accompany the product if sold to a new owner.

The product described here is manufactured in accordance with the generally accepted rules and standards of industry practice and with occupational safety and accident prevention regulations. Risks may, however, arise from its usage and may result in physical harm to persons or damage to other material assets. Therefore the product may only be used in proper technical condition and in observance of the assembly instructions.
In particular, any malfunctions which may affect safety must be remedied immediately.

Appropriate safety measures must be taken according to the parameters of the media being supplied.

Safety mechanisms on the device must not be damaged, deactivated, rendered inoperable, or replaced by parts that have not been expressly approved by SKF Lubrication Systems Germany GmbH.

In addition to the assembly instructions, general statutory regulations and other regulations for accident prevention and environmental protection must be observed and applied.

1.1 Intended use

All products from SKF Lubrication Systems Germany GmbH may be used only for their intended purpose and in accordance with the information in the product's assembly instructions.

The pumps may only be used in accordance with the technical documentation and the specifications on the rating plates. In particular, the pumps are prohibited from use in areas requiring devices of Equipment Group I.

Spandau PAB and PNB immersion pumps are single-stage or multi-stage centrifugal pumps for feeding non-aerated fluids without abrasive or long-fibered components.

They are designed for vertical installation.

Continuous operation of the immersion pumps without a medium (dry running) is not permitted.

Pumps of the PAB and PNB series are designed for operation at a maximum speed of 3600 rpm with a corresponding impeller configuration. Please consult the shipping documents or the rating plates on the drive motors for the exact rated frequencies. Operation on a frequency converter is not permitted. Deviations from the abovementioned must be clarified with the supplier or are noted in the shipping documents and on the pump's rating plates.

Any other use is deemed non-compliant with the intended use and could result in damage, malfunction, or even injury.

Only media approved for the type of pump may be fed. Unsuitable media may result in pump failure and potentially severe injury or death and property damage.

Only media whose thermal conductivity is at least 60% of that of water may be fed.

If feeding a fluid whose density and/or viscosity deviates from that of approved media, ensure that energy requirements are met in consideration of the hydraulic output.

The unit must not be operated if the non-metallic materials in the unit are incompatible with the medium.

All instructions placed directly on the pump regarding direction of rotation, dry running, bypass connection, and the rating plate must be followed and kept in fully legible condition.

Unauthorized alterations to the pump and the use of unapproved spare parts and accessories are prohibited and nullify the warranty.

The unit must not be operated if damaged, e.g. deformed.

Any influence by foreign substances must be prevented.

Worn-out units must be rendered inoperable and then disposed of properly.

In particular, the described product is neither designed nor approved for use in conjunction with dangerous fluids as defined in the CLP Regulation 1272.

The described product is neither designed nor approved for use in conjunction with gases, liquefied gases, pressurized gases in solution, vapors, or such fluids whose vapor pressure exceeds normal atmospheric pressure (1013 mbar) by more than 0.5 bar at their maximum permissible temperature.

Unless specially indicated otherwise, products from SKF Lubrication Systems Germany GmbH are not approved for use in potentially explosive areas as defined in the ATEX Directive 2014/34/EU.

1.2 Authorized personnel

Only qualified technical personnel may install, operate, maintain, and repair the products described in the assembly instructions.

Qualified technical personnel are persons who have been trained, assigned, and instructed by the operator of the final product into which the product described here is incorporated.
Such persons are familiar with the relevant standards, rules, accident prevention regulations, and assembly conditions as a result of their training, experience, and instruction. They are qualified to carry out the required activities and in doing so recognize and avoid potential hazards.

Serious injury or death and property damage may result from improperly connected units.

Alteration and repair work may only be performed by persons possessing the knowledge and certifications required for the potentially explosive atmosphere.

The definition of qualified personnel and the prohibition against employing non-qualified personnel are laid down in DIN VDE 0105 and IEC 364.
The requirements of the Organizational Safety Ordinance and the Technical Implementation of the Company Safety and Health Provisions must be complied with.

1.3 Electric shock hazard

Electrical connections for the described product may only be established by qualified and trained personnel authorized to do so by the operator, and in observance of the local electrical operating conditions and local regulations (e.g., DIN, VDE). Serious injury or death and property damage may result from improperly connected products.

Performing work on products that have not been de-energized may result in serious injury or death. Assembly, maintenance, and repair work may only be performed on products that have been de-energized by qualified technical personnel. The supply voltage must be switched off before opening any of the product's components.

1.4 Hydraulic pressure hazard

The product described here is pressurized during operation. The product must therefore be depressurized before starting assembly, maintenance or repair work, or any system modifications or system repairs.

1.5 Hazard from rotating components

Touching the rotating impeller during startup, shutdown, trial run, setup, fault-finding, fault resolution, maintenance, or inspection can result in severe injury.

Touching the pump in the area of the intake opening is prohibited during operation.

1.6 Warranty and liability

SKF Lubrication Systems Germany GmbH assumes no warranty or liability for the following:

- Non-compliant usage
- Improper assembly/disassembly or improper operation
- Use of unsuitable or contaminated lubricants
- Maintenance and repair work performed improperly or not performed at all
- Use of non-original SKF spare parts
- Alterations or modifications performed without written approval from SKF Lubrication Systems Germany GmbH
- Non-compliance with the instructions for transport and storage

1.7 Hazard from hazardous or dangerous substances

Safety measures must be taken according to the parameters of the media in use, especially in the case of hazardous or dangerous substances.

Leakage occurring during the feeding of hazardous or dangerous substances must be removed in such a way that it presents no risk to persons or the environment and in observation of statutory provisions.

The entire pump may be used only in potentially explosive atmospheres that require category 2 (zone 1).

However, in accordance with the zone classification, at least the drive shaft must pass through zone 0. Provided that the area requiring category 1 is confined solely to the drive shaft and it is also ensured that no impact sparks can occur, there are no safety concerns for the described use of the pumps.

The requirements specified above must be met by level monitoring that is configured so as to ensure that the bottom shaft leadthrough and the pump bottom, including impeller, are covered and that (if present) an inspection door is kept closed during operation.

Please note that the pump may be used only in unmodified form. In particular, the part outside the reservoir must not be equipped with an additional housing or a closed cover.

2. Pumped media

- Solvent-based inks
- Varnishes and oil-based paints
- Water-based paints
- Cleaning fluids
- Others

PAB and PNB centrifugal pumps are especially well suited for feeding inks because they feed fluids evenly and without pulsations.

Their open impeller design allows for small particles in the return flow.

Viscosity: max. 20 mm^2/s
> 20 mm^2/s on request

Ambient temperature: max. 40°C

Temperature range of medium:
0°C to +60°C

The operational limits such as the temperature of the medium depend on the respective operating and usage conditions and may differ. Beyond the defined field of application, additional specifications apply to the PAB and PNB series when used in potentially explosive atmospheres.

3. Assemblies and type designation

Explosion protection class

Beyond the defined field of application, additional specifications apply to the PAB and PNB series when used in potentially explosive atmospheres. The electric drive motors rated for use in explosive atmospheres comply with the applicable standards of the series EN 60034-1,
EN 60079-0, EN 60079-1: and
EN 60079-7. Their use in potentially explosive atmospheres is permitted only as specified by the competent regulatory authority in compliance with the standard EN 1127-1. The regulatory authority and/or the user are responsible for determining the explosion hazard and zone classification.

Use of the standard motors on a frequency converter is not permitted.

Pumps of the PAB and PNB series comply with the harmonized standards EN 13463-1 and EN 13463-5. Their use in potentially explosive atmospheres is permitted only as specified by the competent regulatory authority. The regulatory authority and/or the user are responsible for determining
the explosion hazard and zone classification in compliance with the standard EN 1127-1. The PAB and PNB pump series come standard with markings for the following explosion protection class. Differing ignition protection ratings, temperature classes and any special requirements must be indicated on the rating plate and/or in the supplied EC type certificate.

PNB		
Motor:		II 2 G Ex de IIC T4 Gb
Pump:		II 2 G c Ex de IIB T4
PAB		
Motor:		II 2 G Ex de IIC T4 Gb
Pump component:		II 2 G c IIB T4

Spandau immersion pumps of the PAB and PNB series are available in various sizes which differ chiefly in terms of dimensions and delivery output. All sizes function in the same way. See the rating plate for the size and designation of your pump, as well as other important data.

The entire pump may be used only in potentially explosive atmospheres that require category 2 (zone 1).

3.1 PAB series

The PAB pump series has a design allowing the pump and the motor component to be separated for better handling. PAB pump components can only be operated with PAB motor components. The use of coupling elements other than those supplied is not permitted. The order reference for the pumps is structured based on the type code. When assembling the motor components, ensure that the letters for motor output in the designation are identical for the motor component and the pump component. The letters for motor output must be identical in the motor component and the pump component. See the shipping documents for any deviations.

3.2 PNB series

The PNB pump series has a design in which the pump component and the motor component are firmly connected together. The motors are separately type-tested with protection class EEx de. The order reference for the pumps is structured based on the type code. See the rating plates for the specific specifications for the explosion protection of the pumps or motors.

Type code

Designation	PAB	05	01	G	AA	170	E	01	XD

Group
PAB
PNB

Size
PAB 05/07/08/11/20
PNB 05/07/08/34

Number of stages
01 = 1 stage
02 = 2 stages

Material
C = GCI, chemically nickel-plated (standard)

Pump design
AA = standard design

Immersion depth [mm]
170...550

Motor index
E = 0.37kW G = 0.75kW K = 2.2kW
F = 0.55kW H = 1.1kW

Electrical supply [1)]
01 = 230/400 V, 50 Hz / 265/460 V, 60 Hz
05 = 230/400 V, 50 Hz

Motor design
XK = Motor with protection class "explosion-proof enclosure" Ex de, with PTC thermistor

[1)] Other designs available on request

4. Design and function

Pumps of the PAB and PNB series have the same basic design, the only difference being that the pump port on the PAB series can be separated from the drive motor. In this series, both shaft ends (pump/motor) are connected via a coupling (Figure 1, right). In the other series, the motor shaft is rigidly connected with the pump shaft (Figure 1, left). The pumps are utilized in suction operation. They are designed for vertical installation. The electric drive is seated on the pump port or flange-type end shield. The individual impellers run in the pump chambers that are fastened to the lower part of the pump port. This port, the electric drive or the pump port/flange-type end shield contain the bearing mounting of the pump shaft. The sealing is contained in the pump port. The pump port also contains the pressure connection and a connecting flange for mounting on a reservoir. A variable number of pump impellers determined based on the design feeds the medium that is suctioned through the intake opening in the bottom area of the pump.

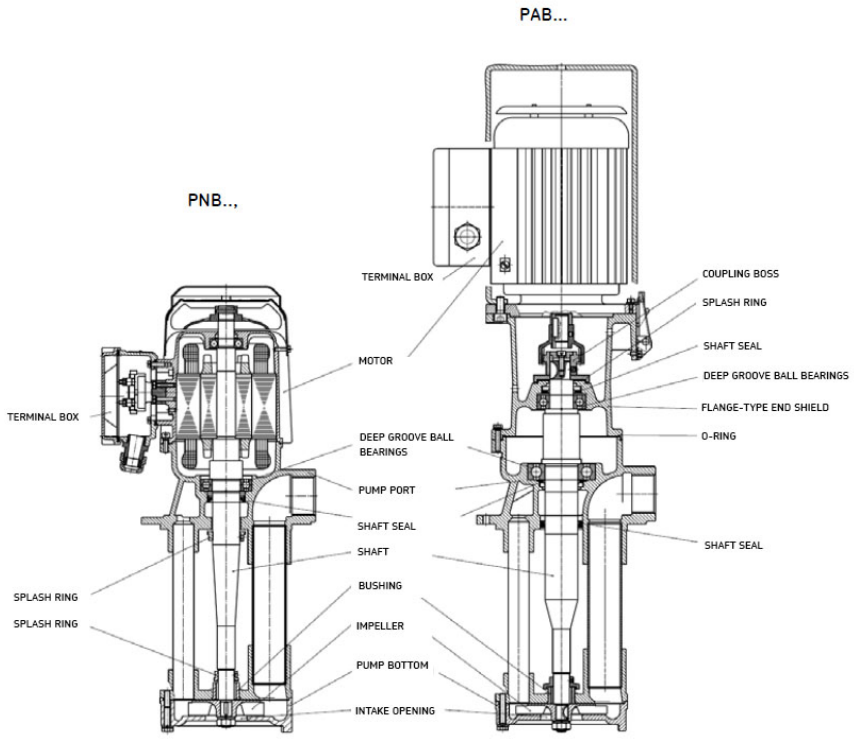


Figure 1 Design of PAB and PNB pumps

5. Assembly instructions

Only qualified technical personnel may install, operate, maintain, and repair the products described in the assembly instructions. Qualified technical personnel are persons who have been trained, assigned, and instructed by the operator of the final product into which the product described here is incorporated. Such persons are familiar with the relevant standards, rules, accident prevention regulations, and operating conditions as a result of their training, experience, and instruction. They are qualified to carry out the required activities and in doing so recognize and avoid potential hazards.

The definition of qualified personnel and the prohibition against employing non-qualified personnel are laid down in DIN VDE 0105 and IEC 364.

Before assembling/setting up the product, remove the packaging material and any shipping braces (e.g., plugs on suction or pressure port). The packaging material must be preserved until any discrepancies are resolved.

Do not tilt or drop the product.

During all assembly work on machinery, observe the local accident prevention regulations as well as the applicable operating and maintenance specifications.

5.1 Setup

Spandau immersion pumps of the PAB and PNB series are designed for vertical reservoir installation. Please contact your pump supplier if you need a pump for installation in a different position. Before installing the pump, remove the packaging material and shipping braces (e.g., plugs on suction or pressure connection).

When setting up the pump, observe the highest and the lowest permissible fluid level and the minimum fluid level
(see Figure 2).

When operating the pump, it must be ensured that the lowest permissible fluid level is above the lowest pump chamber.

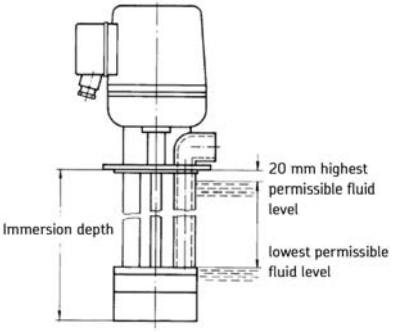


Figure 2 Fluid level

The requirements specified above must be met by level monitoring that is configured so as to ensure that the bottom shaft leadthrough and the pump bottom, including impeller, are covered and that (if present) an inspection door is kept closed during operation.

The product should be protected from humidity and vibration, and should be mounted so that it is easily accessible, allowing all further installation work to be done without difficulty. Ensure that there is sufficient air circulation to prevent excessive heating of the product. For the maximum permissible ambient temperature, see "Technical data."

The pump is equipped with a 4-hole connecting flange with standard port dimensions (see "Technical data") for assembly. The screw connections must be permanently secured against loosening.

Equipotential bonding is required for systems in potentially explosive areas.
Observe EN 60079-14 with regard to conductor cross-section, screw connections, and corrosion risk.

When selecting the installation location, ensure sufficient space for installation, cabling, inspection, and venting. The distance between the air inlet on the motor and the walls, components, etc. must be at least $\frac{1}{4}$ of the diameter of the air inlet opening. The direction of the air flow is from the air inlet opening to the pump.

The reservoir must be equipped with equipotential bonding and be integrated into the equipotential bonding system.

If no customer documentation is available, you can request the customer documentation directly from SKF Lubrication Systems Germany GmbH.

5.2 Port dimensions

See the "Technical data" chapter.

5.3 Pipe arrangement

When arranging the lines, observe the following instructions to ensure that the supply circuit functions smoothly.

- All line components such as pipes, shut-off devices, valves, etc. that come into contact with the medium must be cleaned thoroughly. No seals in the lines may protrude inwards so that contaminants cannot enter the pump and damage or destroy the pump.
- Only use pipes or hoses suitable for the operating pressure of the specific pump, the prevailing temperatures, and the media that will be fed.
- The lines must be connected in such a way that no forces are transferred to the pump (stress-free connection). It is therefore recommended that delivery lines be connected to the pump before the pump is fastened to the reservoir cover.
- The flow of medium in the lines should not be impeded by the incorporation of sharp bends, angle valves, or flap valves. Unavoidable changes in the cross-section in the feed paths must have smooth transitions. Sudden changes of direction should always be avoided.
- The lines must always be free of leaks and arranged so that air pockets cannot form anywhere.
- The pipes should always rise upward. Delivery lines should be ventable at the highest point.
- The cross-section of the delivery line should be sized at least as large as the cross-section of the pressure connection port.

5.4 Pipe connection

Connect the pipes to the provided connection port on the pump port. In doing so, ensure that no forces are transferred to the pump. Connect the pipe to the face surface using a cylindrical thread to form a flat seal. In case of tapered threads, use a suitable sealing material. The tightening torque must not exceed 70 Nm, as higher torque may incur a risk of the pump port cracking or breaking off.

5.5 Screw union on reservoir

After the delivery line is installed, the pump can be screwed onto the reservoir with a maximum of 15 Nm.

5.6 Electrical connection

Electrical connections for the pump may only be established by qualified and trained personnel. The instructions in these operating instructions must be observed.

The reservoir must be equipped with equipotential bonding and be integrated into the equipotential bonding system.

The pump motor must be connected according to the specifications on the rating plate and the mains voltage.

Equipotential bonding is required for systems in potentially explosive areas.
Observe EN 60079-14 with regard to conductor cross-section, screw connections, and corrosion risk.

Establish the connection in accordance with the relevant regulations and standards as well as the conditions for connections contained in international regulations for the setup and operation of electrical equipment in potentially explosive atmospheres. The cables and lines must be fastened using a cable fitting with strain relief in the terminal box. Only cable fittings with type certification may be used. Implement the circuit according to the wiring diagram on the motor's terminal box. In the standard circuit, the motors are connected as shown in Figure 3.
When connecting the motors, pay special attention that connections in the terminal box are established correctly and completely. Tighten the nuts on the connecting screws firmly without applying excessive force. A secure protective earth connection must also be established.

The terminal box must always be closed during operation.

If a pump/motor has been stored unused for an extended time, it is recommended that the insulation resistance of the winding against the housing be measured before startup. On low-voltage motors, the minimum value at a winding temperature of approx. 20°C is 1 kΩ per volt of rated voltage. If the value falls below this, the motor must be dried in a warm area or using heaters until the required insulation value is attained.

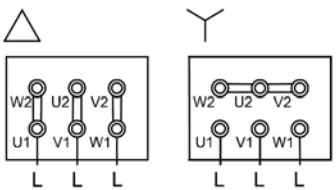


Figure 3 Delta/star connection

5.7 Motor protection

Electrical machines must be protected against excessive heating resulting from overload.

Only type-certified triggering devices can be used as safety
devices:

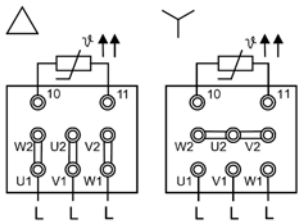


Figure 4 Delta/star connection with thermistor (e.g., PTC)

a) Devices for direct temperature monitoring using thermistors (Figure 4).

b) Other devices providing required protection against excessive heating equivalent to the aforementioned safety devices.

Additional requirements apply to machines with an ignition protection rating of "Increased Safety" "e" in zone 1.

5.8 Direction of rotation

The direction of motor rotation must match the arrow on the pump. To check the direction of rotation, open the valves in the delivery and intake lines and switch on the motor briefly (approx. 1 s).
When switching on the system, the pump chamber must be filled with fluid.

The pump will be damaged if the direction is incorrect.

Product designation

Centrifugal pump

Product series: PAB... / PNB...

Operating instructions

6. Transport, delivery, and storage

SKF Lubrication Systems Germany GmbH products are packaged in accordance with standard commercial practice according to the regulations of the recipient's country and DIN ISO 9001. Safe handling must be ensured during transport. The product must be protected from mechanical effects such as impacts. The transport packaging must be marked "Do not drop!"

The pump must be transported properly.
. Use the lifting eyes on the product.

Do not tilt or drop the product.

After receipt of the shipment, the product(s) must be inspected for damage and for completeness according to the shipping documents. The packaging material must be preserved until any discrepancies are resolved.

SKF Lubrication Systems Germany GmbH products are subject to the following storage conditions:

6.1 Pump units

- *Ensure that the storage environment is dry, dust-free and low-vibration* (v_{eff} ≤ 0.2 mm/s). The grease service life of the bearings is reduced over an extended period of storage.
- If the product is stored for more than 12 months, inspect the condition of the grease before recommissioning. The insulation resistance of the motor winding against the housing must also be measured. Dry the motor winding if the values are ≤ 1 kΩ per volt of rated voltage.
- The grease service life of the bearings is reduced over an extended period of storage.

6.2 Electronic and electrical devices

- Ambient conditions: dry and dust-free surroundings, storage in well ventilated dry area
- Storage time: Max. 24 months
- Permissible humidity: < 65%
- Storage temperature: +10 to + 40°C
- Light: Avoid direct sun or UV exposure and shield nearby sources of heat

6.3 General notes

- The product(s) can be enveloped in plastic film to provide low-dust storage.
- Protect against ground moisture by storing on a shelf or wooden pallet.
- Bright-finished metallic surfaces, especially wearing parts and assembly surfaces, must be protected using long-term anti-corrosive agents before storage.
- At approx. 6-month intervals: Check for corrosion. If there are signs of corrosion, reapply anti-corrosive agents.
- Drives must be protected from mechanical damage.

7. Operation and commissioning

Inspect all connections before commissioning the pump. It is imperative that the suction port and pressure port of the pump be open.

The pump must run smoothly and evenly. To inspect, you can remove the fan cowl and manually turn the pump shaft on the fan impeller several times. Reinstall the fan cowl after inspection.

Check the direction of pump rotation during startup. The direction of rotation must match the arrow on the pump housing or fan cowl.

The pump must always be filled with fluid for pumping to maintain its self-priming capability. Before startup, fill the pump with fluid for pumping.

The pump must not run dry. An incorrect direction of rotation and/or dry running can damage the pump.

Ensure that there is no excessive dirt/contamination in the reservoir or pipe system and that the upstream filter functions properly.

Bring the pump into operation as follows:

- Completely open the pressure-side shutoff valve (if present) or ensure that the connection on the pressure side is free.
- Ensure that the pump chamber is filled with fluid.
- Switch on the pump and check the direction of rotation. The direction of rotation must match the arrow on the pump housing or fan cowl.
- Run the pump until the feeding process stabilizes and the medium no longer contains air bubbles.
- You can now set the desired delivery rate by adjusting the pressure-side shutoff valve.

The pumps should be used in continuous operation to the extent possible. If this is not possible due to the process, then the pump's constant flow rate should be regulated using a regulating valve for example.

Please consult your supplier if the pump will run in intermittent operation with short intervals.

The pump may only operate within the specified delivery range. See the rating plate on the pump for the relevant key data.

When the pump operates without interruption, the minimum fluid level can fall to the intake opening. It must be ensured that the fluid level does not fall further during pump operation to prevent the pump from running dry.
A backflow preventer is recommended for high delivery heads, long pipes, and pumps in suction operation. This prevents the pump from running empty after it is switched off.

The pump must not run dry, as it may otherwise be damaged.

Touching the rotating impeller during startup, shutdown, trial run, setup, fault-finding, fault resolution, maintenance, or inspection can result in severe injury.

Touching the pump in the area of the intake opening is prohibited during operation.

Opening the terminal box in an explosive atmosphere is prohibited.

8. Shutdown

8.1 Temporary shutdown

If the pump will be shut down temporarily, anti-rust preservation should be applied.

The described product can be shut down temporarily by disconnecting the electrical and hydraulic supply connections. The instructions in the "General information" chapter in these assembly instructions must be observed when doing so.

To recommission the product, follow the instructions in the "Assembly instructions" and "Commissioning" chapters in these assembly instructions.

8.2 Permanent shutdown

If the product will be permanently shut down, the local regulations and laws regarding the disposal of contaminated equipment must be observed.

Lubricants can contaminate soil and waterways. Lubricants must be used and disposed of properly. Observe the local regulations and laws regarding the disposal of lubricants.

The product can also be returned to SKF Lubrication Systems Germany GmbH for disposal, in which case the customer is responsible for reimbursing the costs incurred.

9. Maintenance

9.1 General notes

Spandau immersion pumps of the PAB and PNB series are largely maintenance-free.
However, you should inspect the pump for external damage and leaks at regular intervals to ensure proper function. Maintenance and repair work can only be performed in non-explosive atmospheres. When performing assembly and disassembly work, ensure that effective equipotential bonding is installed.

Performing work on products that have not been de-energized may result in serious injury or death. Assembly, maintenance, and repair work may only be performed on products that have been de-energized by qualified technical personnel. The supply voltage must be switched off before opening any of the product's components.

The product described here is pressurized during operation. The product must therefore be depressurized before starting assembly, maintenance or repair work, or any system modifications or system repairs.

Touching the rotating impeller during startup, shutdown, trial run, setup, fault-finding, fault resolution, maintenance, or inspection can result in severe injury.

Touching the pump in the area of the intake opening is prohibited during operation.

Opening the terminal box in an explosive atmosphere is prohibited.

Inspect media and pre-filters or strainers for contamination at regular intervals and clean or replace as necessary.

Ensure that the housing of the pump motor is kept free of dust, foreign substances, etc. to provide good heat exchange between the motor and the ambient air and maintain proper surface cooling.

Insulating deposits on the pump or motor that are thicker than a normal film thickness from varnish present a potential ignition hazard.

Any corrosion that forms on the pump must be removed immediately.

Cables and lines must be inspected for damage and secure electrical connection at regular intervals.

If a pump has been stored unused in a humid area for an extended time, it is recommended that the insulation resistance of the winding against the housing be measured before startup. On low-voltage motors, the minimum value at a winding temperature of approx. 20 °C is 2 megaohm. If the resistance is lower than this, the motor must be dried in a warm area or using heaters until the required insulation value is attained.

Any faults found must be properly rectified before the pump is restarted.

9.2 Bearings and lubrication

The pumps contain bearings with lifetime lubrication. These bearings and the rotary shaft seals must, at the latest, be replaced after 15,000 hours or 2 years. These maintenance intervals may be shorter in unfavorable operating conditions. Inspection for abnormal noise generation must be performed at regular intervals.

9.3 Spare parts

Only original parts may be used on the PAB and PNB series. The use of other parts voids the certification for use in potentially explosive atmospheres.

Replacement must be performed by qualified personnel (see the "General notes" section).

Explosion protection is voided if replacement is performed improperly.

9.4 Modifications and rework

All warranties become void if modifications or rework are performed without prior consent of the manufacturer. Modifications and rework may only be performed by the manufacturer or service partners authorized by the manufacturer. Improper drilling of holes, machining of parts, installation of seals, etc. may violate applicable safety standards.

Dismantling of the product or individual parts thereof within the statutory warranty period is not permitted and voids any claims.

Only original spare parts from SKF Lubrication Systems Germany GmbH may be used. Unauthorized alterations to products and the use of non-original spare parts and accessories are prohibited and nullify the statutory warranty.

SKF Lubrication Systems Germany GmbH shall not be held liable for damages resulting from improperly performed assembly, maintenance or repair work on the product.

All parts must be handled with utmost care during assembly and disassembly. Jolts and impacts must be avoided.

Thoroughly clean all parts and furbish or replace them with spare parts as necessary.

Unauthorized alterations to the pump and the use of unapproved spare parts and accessories are prohibited and nullify the warranty.

10. Malfunctions

Dismantling of the motor and pump functional assemblies within the statutory warranty period is not permitted and voids any claims.

Only original spare parts from SKF Lubrication Systems Germany GmbH may be used. Unauthorized alterations to products and the use of non-original spare parts and accessories are not permitted.

All actions such as repairs, part replacement, etc. may only be performed by qualified and trained personnel.

Repair work may only be performed on units that have been de-energized by qualified and trained personnel. Performing work on energized units may result in serious injury or death.

The feeding system may be under pressure. It must be depressurized before starting installation, repair, or maintenance work.

The "Fault analysis and rectification" table provides an overview of possible malfunctions and their causes. Contact the Service department of SKF Lubrication Systems Germany GmbH if you cannot remedy the malfunction.

Fault analysis and rectification

Malfunction	Possible cause	Rectification
Motor does not start	Power connection defective	Check the power connection
	Fuse tripped	Check the fuse or the motor circuit breaker
	Motor circuit breaker tripped	Ensure that: • The pump shaft runs smoothly and evenly • The values on the rating plate match the power supply • The resistance of the winding against the housing is at least 2 megaohm Then switch the motor circuit breaker on again.
	PTC thermistor upper temperature exceeded	Ensure that: • Surface cooling is not impeded • The ambient temperature is below the maximum permissible value • The pump is not overloaded1) Then switch the motor circuit breaker on again
	Switching contacts or motor coil defective	Replace defective parts
Motor circuit breaker is triggered immediately after being switched on	Fuse is tripped because a phase is absent	Check the connection of the terminal board Check the fuse and replace it if necessary
	Motor circuit breaker defective	Replace motor circuit breaker
	Cable connection loose or defective	Fasten the cable connections or replace the cable
	Motor winding defective	Replace motor
	Motor circuit breaker set too low	Set the motor circuit breaker to the value specified on the rating plate and ensure that the pump is not overloaded [1)]
	Motor shaft jammed	Remedy the jam Ensure that the pump shaft runs smoothly and evenly
	Pump overloaded [1)]	Check the pump and voltage parameters

Continuation of Fault analysis and rectification

Malfunction	Possible cause	Rectification
Motor circuit breaker is triggered occasionally	Motor circuit breaker set too low	Set the motor circuit breaker to the value specified on the rating plate and ensure that the pump is not overloaded [1)]
	Power supply not constant	Check the connection of the terminal board Check the fuse and replace it if necessary
	Mains voltage temporarily too low	Ensure that the values on the rating plate match the power supply Select a power supply with constant voltage
Pump output unstable	Intake partially clogged	Check the intake opening and clean it if necessary
	Pump draws air	Check the fill level of the pump and correct if necessary
	Incorrect installation	See the "Assembly instructions" chapter
Pump runs but does not deliver medium	Intake opening clogged	Check the intake opening and clean it if necessary The medium may be heavily contaminated and need to be replaced.
	Pipe extension leaky	Check the pipe extension and remedy any leaks.
	Pump lacks medium for pumping	Check fill level and correct if necessary
	Air pockets in the pump	Vent the pump
	Wrong direction of rotation	Change direction of rotation according to wiring diagram
	Shutoff valve closed	Open the shutoff valve
Noises, vibrations, or leaks	Pump draws air	Check the fill level of the pump and correct if necessary
	Suction head too low	Increase fluid level or suction head
	Shaft bearing mounting defective	Replace shaft bearing mounting

1) Among that factors that can result in pump overload are: viscosity and temperature of the medium, delivery rate, delivery head, ambient temperature, installation height and degree of contamination.

Continuation of Fault analysis and rectification

Malfunction	Possible cause	Rectification
Noises, vibrations, or leaks	Shaft seal defective	Replace shaft seal
	Endplay of pump incorrect	Set endplay
	Pump not mounted securely	Fasten connecting flange
Pump shaft rotates with difficulty	Pump jammed	Check the intake opening and clean it if necessary
	Impeller scrapes/rubs	Ensure that the impeller is properly fastened and that the pump shaft is not bent or off-center
	Shaft bearing mounting defective	Replace shaft bearing mounting

Performing work on products that have not been de-energized may result in serious injury or death. Assembly, maintenance, and repair work may only be performed on products that have been de-energized by qualified technical personnel. The supply voltage must be switched off before opening any of the product's components.

The hot surface of a motor may cause burns. Motor surfaces may only be touched with appropriate gloves or after the motor has been shut off for an extended time.

Feeding systems are pressurized during operation. Centralized lubrication systems must therefore be depressurized before starting assembly, maintenance, or repair work, or any system modifications or system repairs.

11. Technical data

11.1 Features

- Pulsation-free centrifugal pump
- Wear-resistant design
- 1- to 2-stage design
- Open impellers
- Connector dimensions as per DIN EN 12157
- Variable immersion depths

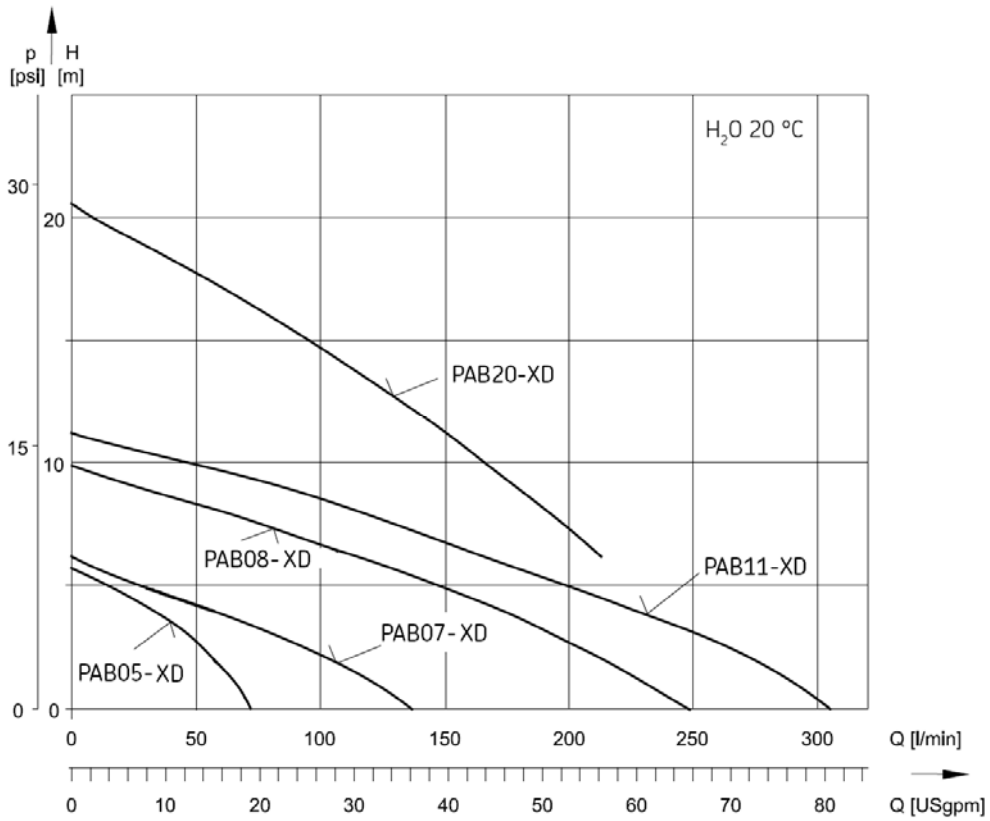
11.2 Special design features of the PAB series

The pump section – consisting of the pump housing and flange-type end shield – is connected to the drive only by quick-release locks. The drive can therefore be separated from the pump component without having to be electrically disconnected. Cleaning is simpler and faster as a result. All components of the PAB series are machine-washable.

11.3 Mechanical design

Component	**PAB model**	**PNB-XD model**
Motor housing	Aluminum	Aluminum
Pump port	GCI chemically nickel-plated	GCI
Flange-type end shield	Aluminum	-
Pump bottom	GCI chemically nickel-plated	GCI
Intermediate chamber	GCI chemically nickel-plated	-
Impeller	Bronze	Bronze
Shaft	ETG	ETG
Gasket		
Rotary shaft seal	PTFE (Teflon) in pump flange -flange-type end shield below bottom ball bearing -flange-type end shield above top ball bearing	PTFE (Teflon) in pump flange

11.4 Characteristic curves for 50Hz or 60Hz with impeller change - PAB



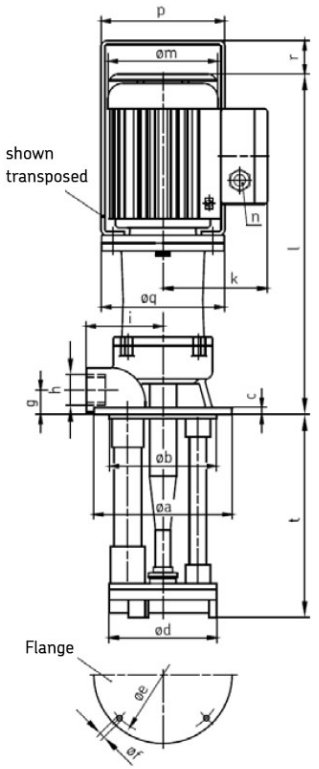
11.5 Electrical values for PAB

Type	Frequency [Hz]	Motor index	P_2 [kW]	Rated speed [min^{-1}]	Motor Type	Rated current [A] at 230V 265V	Rated current [A] at 400V 460V	Starting factor I_S/I_R	Power factor cosφ
PAB05-XD	50	E	0.37	2830	ADCF71	1.6	0.93	5.3	0.84
PAB07-XD	60		0.44	3380			0.95	5.8	0.85
PAB08-XD	50	F	0.55	2830	ADCF71	2.25	1.3	6	0.83
	60		0.66	3380		2.3		6.5	0.8
PAB11-XD	50	G	0.75	2780	ADCF71	3	1.7	6	0.85
	60		0.9	3360				6.6	
PAB20-XD*	50	H	1.1	2840	ADCF71	3.95	2.3	6.1	0.85
	60		1.33	3440				6.9	

* 2-stage

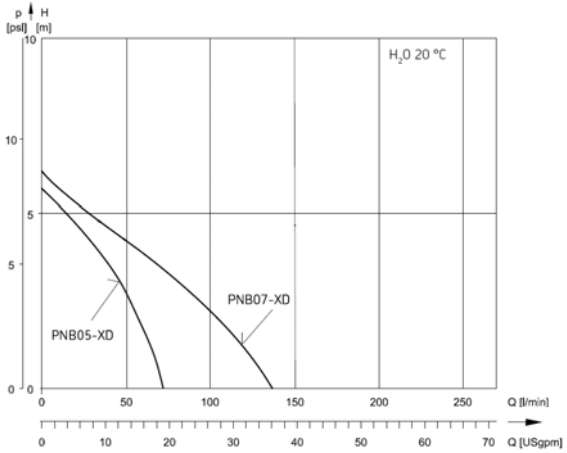
11.6 Dimensions and weights for

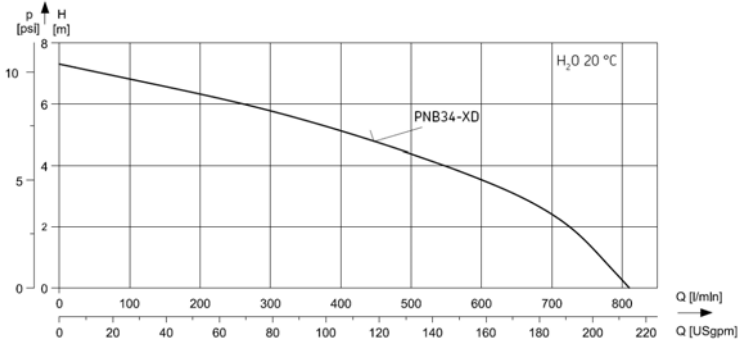
PAB



Type	Immers. depth t[mm]	Weight approx. [kg]	Dimensions [mm]														
			l	Øm	Øa	Øb -0.2	c	Ød	Øe	Øf	g	h	i	k	n	Øq	r
PAB05-XD PAB07-XD	170 220 250 350	13 14	397	143	130	100	7.5	99	115	7	25	G1	70	136	M25 x1.5	140	28
PAB08-XD PAB11-XD	230 270 350 440	21 23	448	143	180	140	9	140	160	7	32	G1¼	100	136	M25 x1.5	160	48
PAB20-XD	270	28	475	143	180	140	9	140	160	7	32	G1¼	100	136	M25 x1.5	160	48

11.7 Characteristic curves for 50Hz or 60Hz with impeller change - PNB



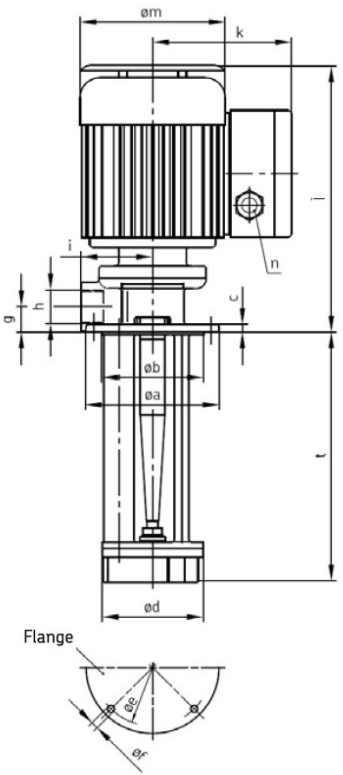


11.8 Electrical values for PNB

Type	Frequency [Hz]	Motor index	P_2 [kW]	Rated speed [min^{-1}]	Motor Type	Rated current [A] at 230V 265V	Rated current [A] at 400V 460V	Starting factor I_S/I_R	Power factor cosφ
PNB05-XD	50	E	0.37	2830	ADCF71	1.6	0.93	5.3	0.84
PNB07-XD	60		0.44	3380			0.95	5.8	0.85
PNB34-XD	50	K	2.2	1435	FLSD100	8.3	4.8	6.4	0.85
	60			1745		7.5	4.8	6.6	0.8

11.9 Dimensions and weights for

PNB



Type	Immers. depth t[mm]	Weight approx. [kg]	Dimensions [mm]												
			l	Øm	Øa	Øb$_{-0.2}$	c	Ød	Øe	Øf	g	h	i	k	n
PNB05-XD PNB07-XD	220 250 350	10 12	245	142	130	100	7.5	99	115	7	25	G1	70	136	M25x1.5
PNB34-XD	445 620	83 88	446	198	300	240	12	239	270	14	42	G2	152	206	M25x1.5

12. Notes

Order number: 951-170-023

Subject to change without notice.

All SKF Lubrication Systems Germany GmbH products may be used only for their intended purpose as described in these assembly instructions with associated operating instructions. If assembly/operating instructions are supplied together with the products, they must be read and followed.

Pump units manufactured by SKF Lubrication Systems Germany GmbH are not approved for use in conjunction with gases, liquefied gases, pressurized gases in solution, vapors, or such fluids whose vapor pressure exceeds normal atmospheric pressure (1013 mbar) by more than 0.5 bar at their maximum permissible temperature.
Particular attention is called to the fact that hazardous materials of any kind, especially those materials classified as hazardous by EC Directive 1272/2008/EC may only be filled into SKF Lubrication Systems Germany GmbH centralized lubrication systems and components and delivered and/or distributed with such systems and components after consulting with and obtaining written approval from SKF Lubrication Systems Germany GmbH.

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