

Product designation

Centrifugal pump

Product series: PMS... / PMS-T / PSH...
ES... / PS... / PSL...

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

Version 03



**Spandau
pumpen**

Masthead

These 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 assembly instructions with associated operating instructions have been prepared in accordance with the established standards and rules for technical documentation, VDI 4500 and EN 292.

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Information concerning EC Declaration of Conformity and EC Declaration of Incorporation

The product

centrifugal pump

of the series:

PMS... / PMS-T... / PSH... / ES... / PS... / PSL...

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:

- **Machinery Directive 2006/42/EC**
- **Low-Voltage Directive 2006/95/EC**
- **Electromagnetic Compatibility 2004/108/EC**

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, Appendix 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 **EC Directive 97/23/EC 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 product is neither designed nor approved for use in conjunction with fluids of Group 1

(Dangerous Fluids) as defined in Article 2, Para. 2 of Directive 67/548/EEC of June 27, 1967.

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 Article 3, Para. 1, Clauses 1.1 to 1.3 and Para. 2 of Directive 97/23/EC. They are therefore not subject to the requirements of Annex 1 of the Directive. Consequently, they do not bear a CE marking in respect of Directive 97/23/EC. SKF Lubrication Systems Germany GmbH classifies them according to Article 3, Para. 3 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 safety and informational symbols and safety signal words

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
Slip 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.

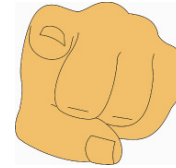
Safety signal words and their meaning

Signal word	Meaning
Danger!	Danger of bodily injury
Warning!	Danger of damage to property or the environment
Note	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

Product series: PMS... / PMS-T... / PSH...
ES... / PS... / PSL...

Assembly instructions acc. to EC Machinery Directive
2006/42/EC

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 described product 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, statutory regulations and other general 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.

Spandau's metal **PMS**, **PS/PSL** and **PSH** centrifugal immersion pumps are intended for pumping emulsions (including with chemical additives), oils, water with anti-rust additive, and heat-transfer oils.

Stainless steel **ES** centrifugal immersion pumps from Spandau Pumps are made of stainless steel and are intended for pumping inks, water-based paints, varnishes, emulsions, water (including deionized), oils, and cleaning fluids.

All pumps are designed for vertical installation.

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.



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



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.

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 fluids of Group 1 (Dangerous Fluids) as defined in Article 2, Para. 2 of Directive 67/548/EEC of June 27, 1967.

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 94/9/EC.

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 described product 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.

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

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 conditions for connections and local regulations (e.g., DIN, VDE). Serious injury or death and property damage may result from improperly connected products.



Performing work on an energized pump or product 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 described product 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

PMS... / PMS-T... / PSH...

ES... / PS... / PSL...



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 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.

2. Media

Pump type	PMS/PMS-T	PSH	ES	PS/PSL
Media	<ul style="list-style-type: none"> Emulsion, including with chemical additives Oils Water with anti-corrosion additive Water-based paints Heat-transfer oils 	<ul style="list-style-type: none"> Emulsions, including with chemical additives Oils Lubricants Water with anti-rust additive Heat-transfer oils 	<ul style="list-style-type: none"> Solvent-based inks Water-based paints Varnishes Water, including deionized Emulsions Oils Cleaning fluids 	<ul style="list-style-type: none"> Water emulsions, including with chemical additives Oils Lubricants Water with anti-rust additive Heat-transfer oils
Ambient temperature	max. 40°C	max. 40°C	max. 40°C	max. 40°C
Permissible contamination of medium	Please contact manufacturer	Please contact manufacturer	Please contact manufacturer	Please contact manufacturer PSL slurp design for heavily aerated fluids
Temperature range of medium	PMS standard design: 0°C to +80°C PMS-T material design: -70°C to +170°C	-30°C to +80°C	+5°C to +80°C	0°C to +80°C
Density/viscosity	Check motor output if using media with density or viscosity differing from that of water.	Check motor output if using media with density or viscosity differing from that of water.	Check motor output if using media with density or viscosity differing from that of water.	Check motor output if using media with density or viscosity differing from that of water.

Special pumps with slurp operation are available for aerated fluids. Their special design provides a constant flow rate even if the medium contains air pockets.

3. Assemblies and type designation

3.1 PMS/PMS-T PMS series

Highly wear-resistant metal **PMS/PMS-T** centrifugal pumps for a wide variety of industrial fluids are available in 13 different sizes. The sizes differ chiefly in terms of dimensions and delivery output, but offer the same functions.

See the rating plate for the size and designation of your pump, as well as other important data.

Series	PMS	Standard
	PMS-T	Expanded temperature range
Size (delivery head)	4-12, 15, 17, 20, 30, 38, 48	4 to 12 m, 15 m, 17 m, 20 m, 30 m, 38 m, 48 m
Immersion depth	90 to 560	90 to 560 mm

Table 1 Type code

Designation	PMS	7	B	350
Series				
Size				
Generation counter				
Immersion depth t in mm				

3.2 PSH series

Metal **PSH** centrifugal pumps for contaminated fluids are available in 14 different sizes. The sizes differ chiefly in terms of dimensions and delivery output, but offer the same functions.

See the rating plate for the size and designation of your pump, as well as other important data.

Series	PSH	
Size	6-9, 65;75;85;95, 630-670, 740	
Generation counter	B and C	
Immersion depth	300 to 550	300 to 550 mm

Table 2 Type code

Designation	PSH	740	B	300
Series				
Size				
Generation counter				
Immersion depth t in mm				

3.2 ES series

ES centrifugal immersion pumps made of welded stainless steel are available in one size with immersion depths of 170, 220 or 270 mm.

Table 3 Type code

Designation	ES	170
Pump type		
Immersion depth t in mm		

3.3 PS/PSL series

Metal **PS** and **PSL** centrifugal pumps for clean, contaminated and viscous fluids are available in 14 different sizes. The sizes differ chiefly in terms of dimensions and delivery output, but offer the same functions.

See the rating plate for the size and designation of your pump, as well as other important data.

Series	PS PSL	Standard Slurp design
Size	1 and 3	
Number of stages	1-7	1-7 stages
Pump code number	10-85	
Generation counter	A and C	
Immersion depth	250 to 670	250 to 670 mm

Table 4 Type code

Designation	PS	1	2	30	A	390
Series						
Size						
Number of stages						
Pump code number						
Generation counter						
Immersion depth t in mm						

4. Design and function

4.1 PMS/PMS-T

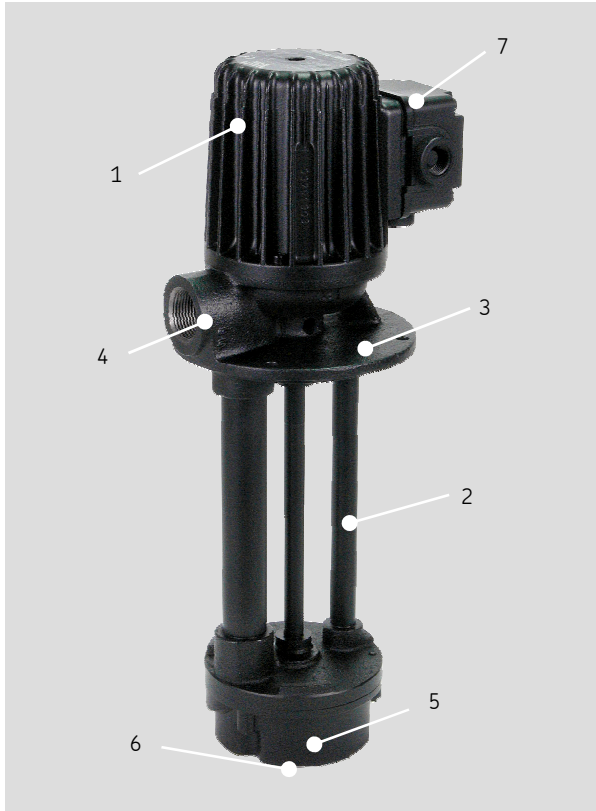


Figure 1. Design of the PMS/PMS-T pump

- 1 Drive
- 2 Pump port
- 3 Connecting flange
- 4 Pressure port
- 5 Pump bottom
- 6 Intake opening
- 7 Terminal box

PMS/PMS-T centrifugal immersion pumps are turbo pumps that transport fluids by means of rotating impellers utilizing centrifugal force. The pumps are utilized in suction operation. They are designed for vertical installation.

Figure 1 shows the basic structure of the centrifugal pumps.

The electric drive (1) is seated on the pump port (2).

The pump port contains the pump shaft bearing mounting, the seal, the connecting flange (3) for mounting on a reservoir, and the pressure port (4).

One or more impellers feed the medium to the pressure port (4) through the intake opening (6) located in the pump bottom (5).

The electrical connection is established in the terminal box (7).

The pumps can optionally be equipped with an intake pipe in case of non-standard immersion depths.

4.2 PSH

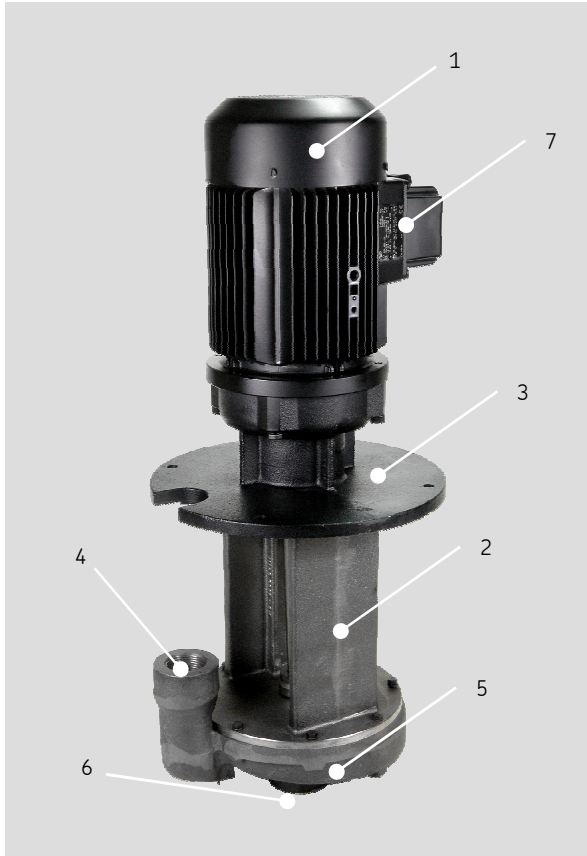


Figure 2 Design of the PSH pump

- 1 Drive
- 2 Pump port
- 3 Connecting flange
- 4 Pressure port
- 5 Pump bottom
- 6 Intake opening
- 7 Terminal box

PSH centrifugal immersion pumps are turbo pumps that transport fluids by means of rotating impellers utilizing centrifugal force. The pumps are utilized in suction operation. They are designed for vertical installation.

Figure 2 shows the basic structure of the centrifugal pumps.

The electric drive (1) is seated on the pump port (2).

The pump port contains the pump shaft bearing mounting, the seal, the connecting flange (3) for mounting on a reservoir, and the pressure port (4).

One or more impellers feed the medium to the pressure port (4) through the intake opening (6) located in the pump bottom (5).

The electrical connection is established in the terminal box (7).

4.1 ES

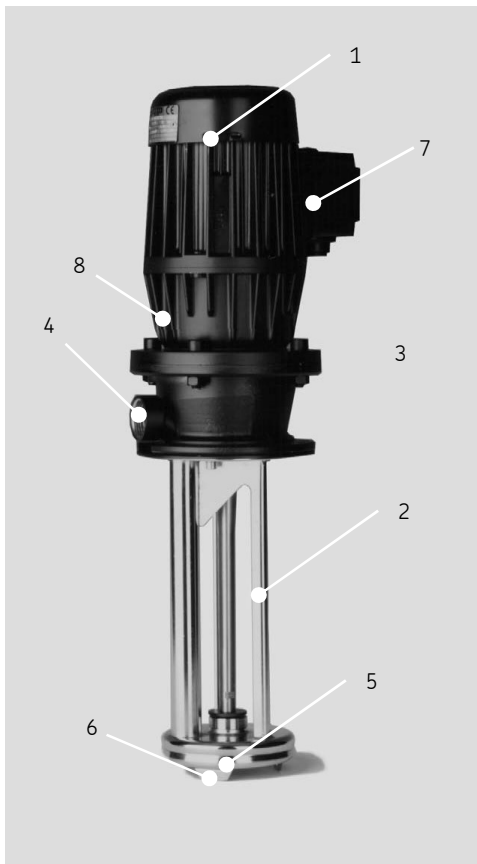


Figure 3 Design of ES pump

- 1 Drive
- 2 Pump port
- 3 Connecting flange
- 4 Pressure port
- 5 Pump bottom
- 6 Intake opening
- 7 Terminal box
- 8 End shield

ES stainless steel centrifugal pumps are turbo pumps that transport fluids by means of rotating impellers utilizing centrifugal force. The pumps are utilized in suction operation. They are designed for vertical installation.

Figure 3 shows the basic structure of the centrifugal pumps.

The electric drive (1) is screwed onto the end shield (8). The end shield is seated on the pump port (2) and contains the pump shaft bearing mounting and the seal.

The connecting flange (3) for mounting on a reservoir and the pressure port (4) are located on the pump port.

An impeller feeds the medium to the pressure port (4) through the intake opening (6) located in the pump bottom (5).

The electrical connection is established in the terminal box (7).

4.4 PS/PSL



Figure 4 Design of the PS/PSL pump

- 1 Drive
- 2 Pump port
- 3 Connecting flange
- 4 Pressure port
- 5 Pump bottom
- 6 Intake opening
- 7 Terminal box
- 8 End shield

PS/PSL centrifugal pumps are turbo pumps that transport fluids by means of rotating impellers utilizing centrifugal force. The pumps are utilized in suction operation. They are designed for vertical installation.

Figure 4 shows the basic structure of the centrifugal pumps.

The electric drive (1) and the end shield (8) are connected using a screw.

The end shield is seated on the pump port (2) and contains the pump shaft bearing mounting and the seal.

The connecting flange (3) for mounting on a reservoir and the pressure port (4) are located on the pump port.

An impeller feeds the medium to the pressure port (4) through the intake opening (6) located in the pump bottom (5).

On the **PSL** with slurp design, the intake opening (6) contains an additional axial impeller that ensures stable feeding of heavily aerated fluids.

The electrical connection is established in the terminal box (7).

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 described product 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). Keep the packaging material until any discrepancies have been 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

PMS/PMS-T, PSH, ES, PS/PSL immersion pumps are designed for vertical reservoir installation.

The pumps are equipped with a 4-hole connecting flange with standard port dimensions (see "Technical data") for assembly.

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 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."

An intake pipe can be ordered and included with the **PMS/PMS-T, PSH** and **PS** pump

series. Before assembling the pump, this pipe must be screwed tight into the suction housing using a tapered thread. Select the sealing material based on the operating conditions and temperature. When inserting the intake pipe, the sealing material must not enter the pump chamber or the inner area of the pipe.

When setting up the pump, observe the highest permissible fluid level and the minimum fluid level.

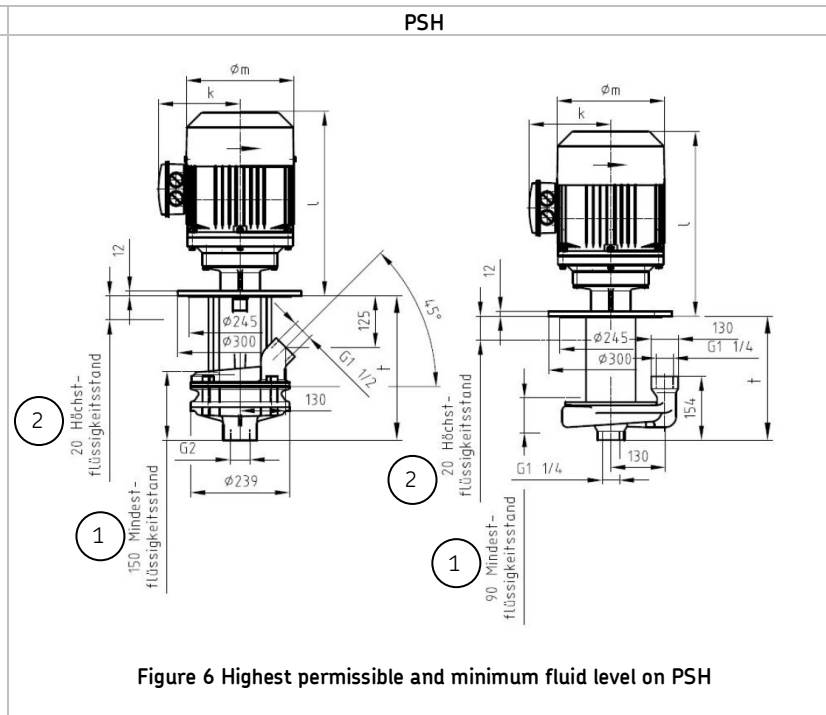
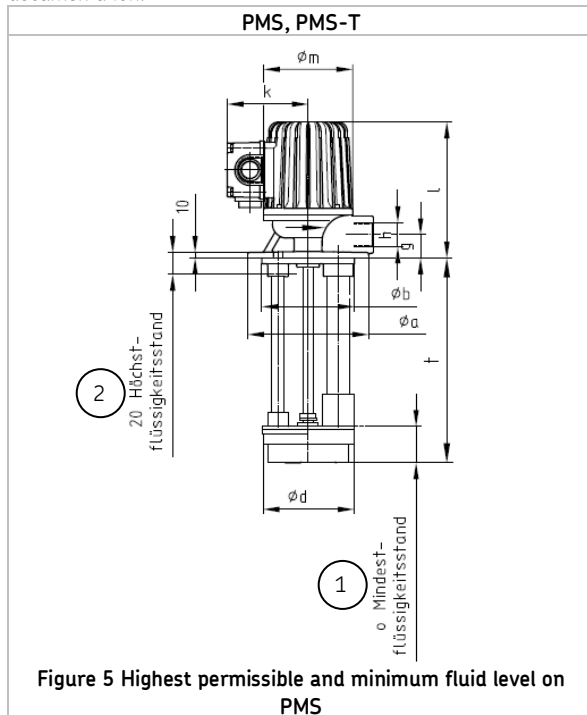
(see **Figures 5 and 6**)

The mounting position of the products is vertical as shown in the customer documentation.



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

When switching on the pump, the minimum fluid level must be above the lowest pump chamber $\textcircled{1}$ ($\textcircled{0}$ = see "Technical data"). The pump then feeds up to the intake opening in the chamber. The highest permissible fluid level is 20 mm below the reservoir cover $\textcircled{2}$.



5.2 Port dimensions

Flange and port dimensions depend on the pump series and their sizes. (see "Technical data" for further information)

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).
- 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.

- 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.
- It is recommended that a backflow preventer be integrated in case of high delivery heads, long pipes, and pumps in suction operation. The backflow preventer keeps the pump from running empty after the pump is switched off.

5.4 Pipe connection

When connecting the pressure line using a hose nozzle, ensure that the hose does not become kinked.

Connect the pipes to the provided connection port on the pump. In doing so, ensure that no forces are transferred to the pump.

It is recommended that a pressure gauge and a shutoff valve be installed directly on the pipe connection port, as the pipe resistance is not always known. The manometric delivery head can be read directly, or it can be set to the pipe resistances by gradually closing the shutoff valve while reading the fluid level.

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

Establish the connection in accordance with the relevant VDE standards, for example VDE 0100, VDE 0101 and VDE 0165, and the conditions for connections of the responsible power-supply companies.

The cables and lines must be fastened using a cable fitting with strain relief in the terminal box.

Implement the circuit according to the wiring diagram on the motor's terminal box.

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 1 kΩ per volt of rated voltage. 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.

5.6 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).

PMS, PMS-T, PSH, ES

Direction of rotation:



counterclockwise as viewed from above looking down on the vent side of motor. The pump will be damaged if the direction is incorrect.

PS, PSL



Direction of rotation: clockwise as viewed from above looking down on the vent side of motor. The pump will be damaged if the direction is incorrect.



The pump will be damaged if the direction of rotation is incorrect.



Short-term dry running is permitted.

Product designation

Centrifugal pump

Product series: PMS... / PMS-T / PSH...
ES... / PS... / PSL... /

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!".



Do not tilt or drop the product.

There are no restrictions for land, air or sea transport.

Upon receiving the shipment, please check the product(s) for possible damage, and ensure that the shipment is complete according to the shipping documents. Keep the packaging material until any discrepancies have been resolved.

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

6.1 Pump units

- The pump must be transported properly using the lifting eyes.
- Ensure that the storage environment is dry, dust-free and low-vibration ($v_{\text{eff}} \leq 0.2 \text{ mm/s}$). 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 $\leq 1 \text{ k}\Omega$ per volt of rated voltage.

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 $+40^\circ\text{C}$
- 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:

- | |
|---|
| <ul style="list-style-type: none"> • Completely open the pressure-side shutoff valve (if present) or ensure that the connection on the pressure side is free. |
| <ul style="list-style-type: none"> • Ensure that the pump chamber is filled with fluid. |
| <ul style="list-style-type: none"> • 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. |
| <ul style="list-style-type: none"> • Run the pump until the feeding process stabilizes and the medium no longer contains air bubbles. |
| <ul style="list-style-type: none"> • 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 specifics of the process, the constant flow from the pump can be regulated, for example using a control valve or similar.

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.



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.

8. Shutdown

8.1 Temporary shutdown

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.

If the pump will be shut down temporarily, oil preservation should be applied to prevent the parts in the pump housing from seizing due to rust.

If the product is to be shut down for an extended period of time, follow the instructions in the "Transport, delivery, and storage" chapter in these assembly instructions.

To recommission the product, follow the instructions in the "Assembly instructions" and "Operation 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.



Media can contaminate soil and bodies of water. Media must be used and disposed of properly. Observe the local regulations and laws regarding the disposal of media.

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



Performing work on an energized pump or product 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 described product 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.

PMS/PMS-T, PSH, ES, PS/PSL centrifugal pumps are largely maintenance-free. However, you should inspect the pump for external damage and leaks at regular intervals to ensure proper function.

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.

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.



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 refurbish 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. Faults



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.

Table 3, "Fault analysis and rectification," 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.

Table 3 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: <ul style="list-style-type: none"> • 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: <ul style="list-style-type: none"> • 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

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

Continuation of Table 3 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, and degree of contamination.

Continuation of Table 3 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 blocked	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 an energized pump or product 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. The pumps must therefore be depressurized before starting assembly, maintenance or repair work, or any system modifications or system repairs.

11. Technical data

11.1 Features of PMS/PMS-T

- Sealless
- Exposed pump shaft, mounted only in the motor
- Open impellers
- 1- to 4-stage designs
- Mounting dimensions as per DIN EN 12157
- Immersion depths up to 560 mm

11.2 Features of PSH

- Sealless
- Exposed pump shaft, mounted only in the motor
- Open impellers
- 1- to 2-stage designs
- Mounting dimensions as per DIN EN 12157
- Immersion depths up to 550 mm

11.3 Features of ES

- Sealless
- Open impeller
- 1-stage design
- Mounting dimensions as per DIN EN 12157
- Immersion depths up to 270 mm

11.4 Features of PS/PSL

- Sealless
- Closed impellers
- 1- to 7-stage designs
- Mounting dimensions as per DIN EN 12157
- Immersion depths up to 670 mm

11.5 Mechanical design of PMS/PMS-T

Component	Material on PMS	Material on PMS-T
Motor housing	Aluminum	Aluminum
Pump port	GCI and steel	GCI and steel
Pump bottom	POM	GCI
Intermediate chamber	GCI	GCI
Impeller	POM	GCI
Shaft	ETG	ETG
Rolling bearings	Deep groove ball bearings with permanent lubrication	Deep groove ball bearings with special lubricating grease
Splash ring	NBR	Steel

11.6 Mechanical design of PSH

Component	Material
Motor housing	Aluminum
Pump port	GCI
Pump bottom	GCI
Intermediate chamber	GCI
Impeller	GCI
Shaft	ETG up to 4 kW Free cutting steel at > 5.5 kW
Rolling bearings	Deep groove ball bearings and angular contact ball bearing (BEGP)

11.7 Mechanical design of ES

Component	Material
Motor housing	Aluminum
Uptake and support pipe	1.4301
Pump support	Aluminum
Pump bottom	1.4301
Impeller	1.4301
Shaft	Stainless steel 1,422
Rolling bearings	Deep groove ball bearings

$H_{\max}=105$ m

11.8 Mechanical design of PS/PSL

Component	Material
Motor housing	Aluminum
Pump port	GCI
Pump bottom	GCI
Intermediate chamber	GCI
Impeller	GCI
Shaft	ETG up to 4 kW Free cutting steel at > 5.5 kW
Rolling bearings	Deep groove ball bearings
Bushing	Sintered iron with copper

11.9 Electrical design

The drive motors meet VDE regulations and European motor standards (DIN EN 60034-1), as well as the requirements for the CE mark.

Designs are possible that conform to non-European regulations, e.g. **CSA**, **UL** or special requirements, e.g. for the USA or Japan.

	Standard	Option
Protection class (DIN EN 60034-5)	PMS IP54 PSH IP54 ES: IP54 PS/PSL: IP54	IP55
Insulation class	F.B	PMS F
Ambient temperature (DIN EN 60034-1)	max. 40°C	50°C and higher
Relative humidity (DIN 50015)	max. 92%	95% and higher
Site altitude (DIN EN 60034-1)	< 1000 m above sea level	on request
Power supply (standard)	230/400 V, 50 Hz 265/460 V, 60 Hz	on request

	PS/PSL, PSH >4 kW Δ400 V, 50 Hz Δ440 V, 60 Hz	
Mains operation	Three-phase	PMS Single-phase AC
Number of pins	2-pin	PMS 4-pin
Terminal box		
-Layout	Layout 1	Layout 2, 3, or 4
-Material	High-impact plastic	

	PS/PSL, PSH >4 kW Light alloy	
-Cable entry (DIN EN 50262)	M16x1.5 M25x1.5 M32x1.5	Industrial plug connector
Surface protection	Synthetic-resin varnish, RAL 9005	Special finishes on request
Special protection	Integrated thermistor-type motor protection, fan cowl with canopy	

11.10 Dimensions of PMS/PMS-T

Dimensions and weights

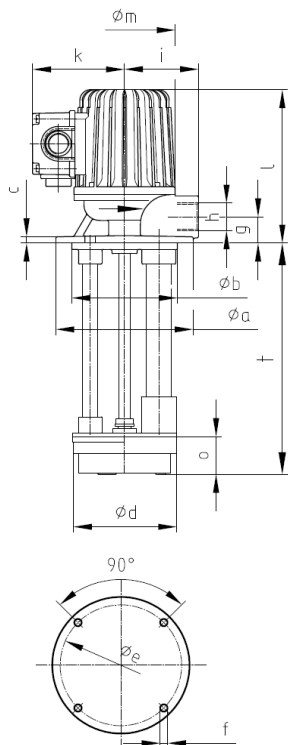
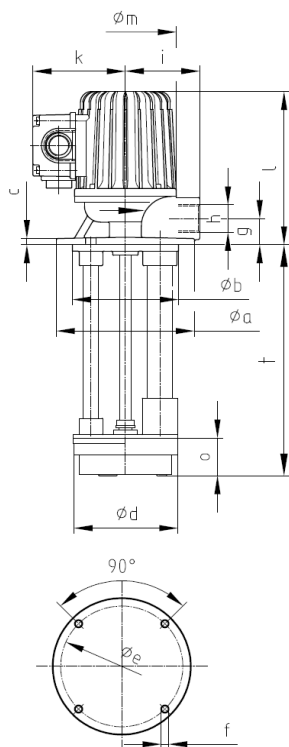


Figure 9 PMS, PMS-T

Model	t [mm]	Weigh ht [kg]	l	Øm	Øa	Øb -0.2	c	Ød	Øe	Øf	g	h	i	k*	o	Vented motors
PMS4C	90	4.4	150	96	130	100	6	99	115	7	25	G¾	70	88	45	-
	120															
	140															
	170															
	200															
PMS5B	220	5	150	96	130	100	6	99	115	7	25	G¾	70	88	45	-
	250															
	270															
	350															
PMS6C	120	4.4	168	96	130	100	6	99	115	7	25	G¾	70	88	45	-
	170															
	220															
	250															
	270															
PMS7B	350	7.3	162	120	130	100	6	99	115	7	25	G¾	70	98	45	-
	90															
	120															
	140															
	170															
PMS9C	170	13.2	241	140	180	140	9	140	160	7	30	G1¼	95	112	48	X
	200															
	270															
	350															
	440															
PMS11C	550	16.3														

* The terminal box is approx. 20 mm higher on CSA-USA designs, at high insulation classes, or when thermistors are used in the terminal boxes.

Dimensions and weights



Model	t [mm]	Weig ht [kg]	l	Øm	Øa	Øb -0.2	c	Ød	Øe	Øf	g	h	i	k*	o	Vented motors
PMS15D	210	23	291	176	180	140	9	140	160	7	32	G1¼	100	149	55	X
	240															
	280															
	320															
	360															
PMS17C	210	15.7	241	140	180	100	9	140	160	7	30	G1¼	95	112	88	X
	310															
	350															
	390															
	440															
PMS20D	270	24	291	176	180	140	9	140	160	7	32	G1¼	100	149	85	X
	310															
	350															
	390															
	480															
PMS20C	270	16.3	241	140	180	140	9	140	160	7	30	G1¼	95	112	88	X
	310															
	350															
	390															
	480															
PMS30D	280**	26.5	291	176	180	140	9	140	160	7	32	G1¼	100	149	125	X
	310															
	350															
	390															
	430															
PMS38D	350	29	317	176	180	140	9	140	160	7	32	G1¼	100	149	165	X
	390															
	430															
	470															
	470															
PMS48D	350	29	317	176	180	140	9	140	160	7	32	G1¼	100	149	165	X
	390															
	430															
	470															
	470															

* The terminal box is approx. 20 mm higher on CSA-USA designs, at high insulation classes, or when thermistors are used in the terminal boxes.

** Immersion depth is 280 mm only on PMS38D.

Figure 10 PMS, PMS-T

Dimensions and weights

Model	t [mm]	Weight [kg]	l	Øm	Øa	Øb -0.2	c	Ød	Øe	Øf	g	h	i	k*	o	Vented motors
PMS5BT	120	6	168	96	130	100	6	99	115	7	25	G¾	70	108	45	-
	170															
	220															
	270															
	350															
PMS6CT PMS7BT	120	9	180	120	130	100	6	99	115	7	25	G¾	70	118	45	-
	170															
	220															
	250															
	270															
350	11															

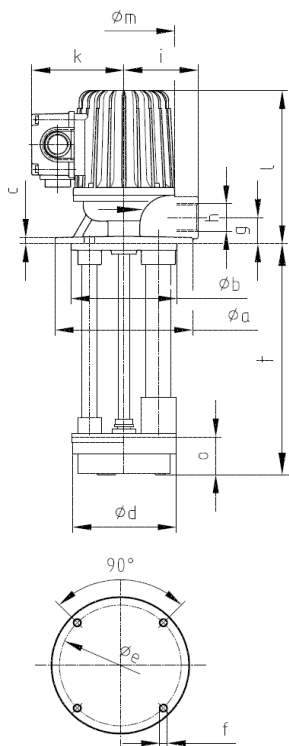


Figure 11 PMS, PMS-T

11.11 Dimensions of PSH

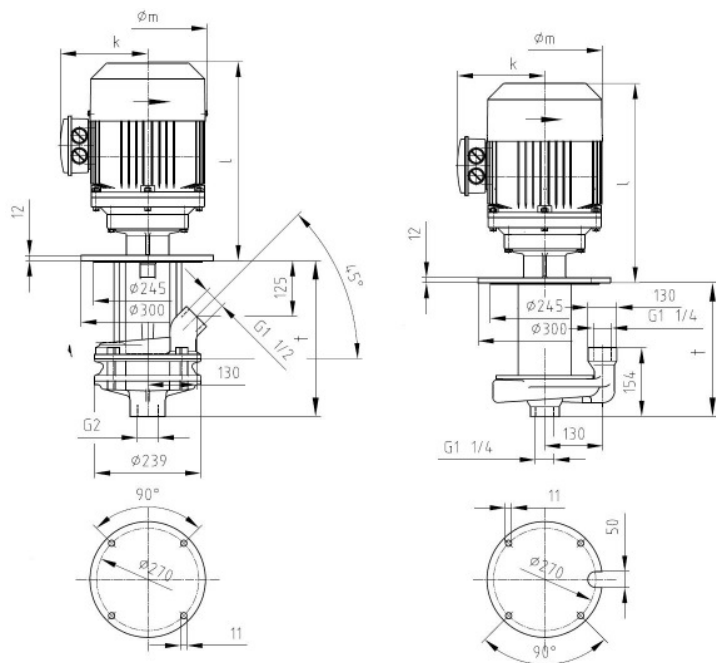


Figure 12 PSH, 2-stage and 1-stage

Dimensions and weights					
Model	t [mm]	Weight [kg]	Øm [mm]	k [mm]	l [mm]
PSH6B	300/500	49/62.5	176	149	362
PSH65C	300/500	52/62.5	260	182	488
PSH7B	300/500	49/62.5	176	149	362
PSH75C	300/500	72/85.5	260	149	488
PSH740B	300/500	49/62.5	176	155	362
PSH8B	350	66	196	182	412
PSH85C	350	83	260	182	488
PSH9C	350	84	260	182	488
PSH95C	350	84	260	182	526
PSH630B		43			337
PSH640B					377
PSH650B	300		176	149	362
PSH660B					362
PSH670B		44			362

11.12 Dimensions of ES

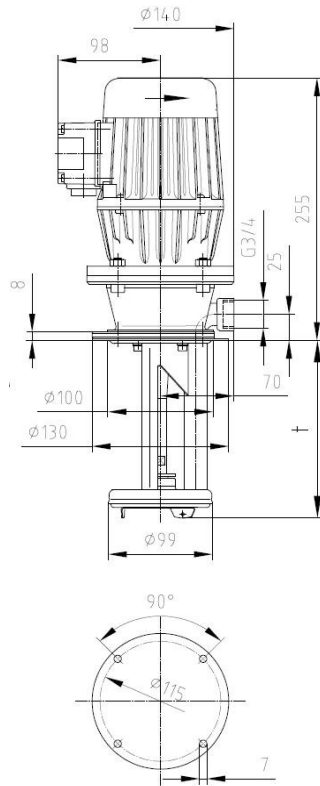


Figure 13 ES

Weight: approx. 10 kg

Immersion depth [t]: 170 mm, 220 mm and 270 mm

11.13 Dimensions of PS/PSL

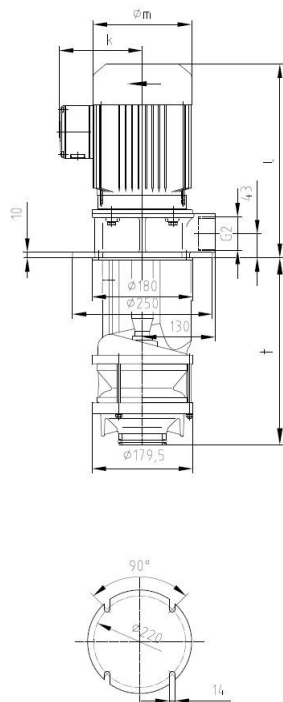


Figure 14 PS/PSL

Dimensions and weights					
Model	t [mm]	Weight [kg]	$\varnothing m$ [mm]	k [mm]	l [mm]
PS/PSL1110A	250	30	140	114	305
	320				
	450				
	550	36			
PS/PSL1230A	320	42	176	149	347.5
	390				
	520				
	620	48			
PS/PSL1340A	390	53	176	149	347.5
	460				
	590	56			
PS/PSL1450A	460	62	196	155	380
	530				
	660	65			
PS/PSL1556C	530	72	260	182	484
	600	74			
PS/PSL1664C	600	83	260	182	484
PS/PSL1770C	670	132	260	182	484

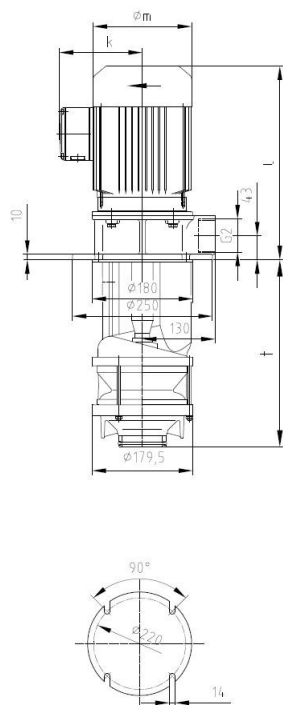


Figure 15 PS/PSL

Dimensions and weights					
Model	t [mm]	Weight [kg]	Øm [mm]	k [mm]	l [mm]
PS/PSL3123A 1-stage	250	34	176	149	347.5
	320				
	450				
	550	40			
PS/PSL3243A 2-stage	320	42	176	149	347.5
	390				
	520				
	620	48			
PS/PSL3357C 3-stage	390	54	260	182	484
	460				
	590	56			
PS/PSL3466C 4-stage	460	83	260	182	484
	530	85			
PS/PSL3574C 5-stage	530	113	260	182	522
	600	115			
PS/PSL3664C 6-stage	600	120	260	182	522
PS/PSL3785C 7-stage	670	136	260	182	580

Order number: 951-170-025

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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 67/548/EEC, Article 2, Para. 2, 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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