

CombiPrime H

Horizontal self-priming centrifugal pump

CH/EN (1611) 5.5

Original instructions

Read and understand this manual prior to operating or servicing this product.



EC Declaration of conformity

(Directive 2006/42/EC, appendix II-A)

Manufacturer

SPX Flow Technology Assen B.V.
Dr. A.F. Philipsweg 51
9403 AD Assen
The Netherlands

hereby declares that all pumps member of productfamilies CombiBloc, CombiBlocHorti, CombiChem, CombiDirt, CombiFlex(U)(B), CombiPrime H, CombiLine, CombiLineBloc, CombiMag, CombiMagBloc, CombiNorm, CombiPro(L)(M)(V), CombiPrime V, CombiSump, CombiTherm, CombiWell, FRE, FRES, FREF, FREM, KGE(L), KGEF, HCR, MCH(W)(S), MCHZ(W)(S), MCV(S), PHA, MDR whether delivered without drive (last position of serial number = B), or delivered as an assembly with drive (last position of serial number = A), are in conformity with the provisions of Directive 2006/42/EC (as altered most recently) and where applicable the following directives and standards:

- EC directive 2014/35/EU, "Electric equipment for use within certain voltage limits"
- standards EN-ISO 12100 part 1 & 2, EN 809

The pumps to which this declaration refers may only be put into operation after they have been installed in the way prescribed by the manufacturer, and, as the case may be, after the complete system of which these pumps form part, has been made to fulfil the requirements of Directive 2006/42/EC (as altered most recently).

Declaration of incorporation

(Directive 2006/42/EC, appendix II-B)

Manufacturer

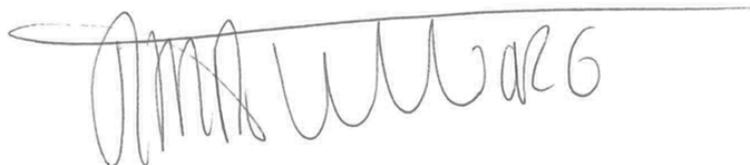
SPX Flow Technology Assen B.V.
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hereby declares that the partly completed pump (Back-Pull-Out unit), member of productfamilies CombiBloc, CombiBlocHorti, CombiChem, CombiDirt, CombiFlex(U)(B), CombiPrime H, CombiLine, CombiLineBloc, CombiMag, CombiMagBloc, CombiNorm, CombiPro(L)(M)(V), CombiTherm, CombiPrime V, FRE, FRES, FREF, FREM, KGE(L), KGEF, HCR, PHA, MDR is in conformity with the following standards:

- EN-ISO 12100 parts 1 & 2, EN 809

and that this partly completed pump is meant to be incorporated into the specified pump unit and may only be put into use after the complete machine of which the pump under consideration forms part has been made and declared to comply with that directive.

Assen, September 1st 2016



R. van Tilborg,
Managing Director

Instruction manual

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SPXFLOW is a global multi-industry manufacturing leader. The company's highly-specialized, engineered products and innovative technologies are helping to meet rising global demand for electricity and processed foods and beverages, particularly in emerging markets.

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1 Introduction

1.1 Preface

This manual is intended for technicians and maintenance staff and for those who are in charge of ordering spare parts.

This manual contains important and useful information for the proper operation and maintenance of this pump. It also contains important instructions to prevent potential accidents and damage, and to ensure safe and fault-free operation of this pump.



Read this manual carefully before commissioning the pump, familiarize yourself with the operation of the pump and strictly obey the instructions!

The data published here comply with the most recent information at the time of going to press. However they may be subject to later modifications.

SPXFLOW reserves the right to change the construction and design of the products at any time without being obliged to change earlier deliveries accordingly.

1.2 Safety

This manual contains instructions for working safely with the pump. Operators and maintenance staff must be familiar with these instructions.

Installation, operation and maintenance has to be done by qualified and well prepared personnel.

Below is a list of the symbols used for those instructions and their meaning:



Personal danger for the user. Strict and prompt observance of the corresponding instruction is imperative!



Risk of damage or poor operation of the pump. Follow the corresponding instruction to avoid this risk.



Useful instruction or tip for the user.

Items which require extra attention are shown in **bold print**.

This manual has been compiled by SPXFLOW with the utmost care. Nevertheless SPXFLOW cannot guarantee the completeness of this information and therefore assumes no liability for possible deficiencies in this manual. The buyer/user shall at all times be responsible for testing the information and for taking any additional and/or deviating safety measures. SPXFLOW reserves the right to change safety instructions.

1.3 Guarantee

SPXFLOW shall not be bound to any guarantee other than the guarantee accepted by SPXFLOW. In particular, SPXFLOW will not assume any liability for explicit and/or implicit guarantees such as but not limited to the marketability and/or suitability of the products supplied.

The guarantee will be cancelled immediately and legally if:

- Service and/or maintenance is not undertaken in strict accordance with the instructions.
- The pump is not installed and operated in accordance with the instructions.
- Necessary repairs are not undertaken by our personnel or are undertaken without our prior written permission.
- Modifications are made to the products supplied without our prior written permission.
- The spare parts used are not original SPXFLOW parts.
- Additives or lubricants used are other than those prescribed.
- The products supplied are not used in accordance with their nature and/or purpose.
- The products supplied have been used amateurishly, carelessly, improperly and/or negligently.
- The products supplied become defective due to external circumstances beyond our control.

All parts which are liable to wear are excluded from guarantee. Furthermore, all deliveries are subject to our "General conditions of delivery and payment", which will be forwarded to you free of charge on request.

1.4 Inspection of delivered items

Check the consignment immediately on arrival for damage and conformity with the advice note. In case of damage and/or missing parts, have a report drawn up by the carrier at once.

1.5 Instructions for transport and storage

1.5.1 Weight

A pump or a pump unit is generally too heavy to be moved by hand. Therefore, use the correct transport and lifting equipment. Weight of the pump or pump unit are shown on the label on the cover of this manual.

1.5.2 Use of pallets

Usually a pump or pump unit is shipped on a pallet. Leave it on the pallet as long as possible to avoid damages and to facilitate possible internal transport.



When using a forklift always set the forks as far apart as possible and lift the package with both forks to prevent it from toppling over! Avoid jolting the pump when moving it!

1.5.3 Hoisting

When hoisting a pump or complete pump units the straps must be fixed in accordance with figure 1 and figure 2.



When lifting a pump or a complete pump unit always use a proper and sound lifting device, approved to bear the total weight of the load!



Never go underneath a load that is being lifted!



If the electric motor is provided with a lifting eye, this lifting eye is intended only for the purpose of carrying out service activities to the electric motor! The lifting eye is designed to bear the weight of the electric motor only! It is NOT permitted to lift a complete pump unit at the lifting eye of an electric motor!

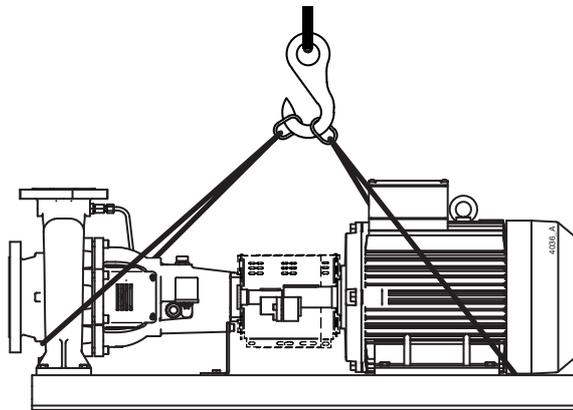


Figure 1: Lifting instructions for pump unit.

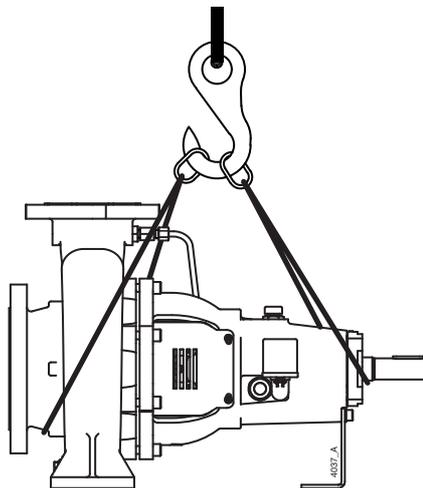


Figure 2: Lifting instructions for single pump.

1.5.4 Storage

If the pump is not to be used immediately the pump shaft must be turned by hand twice per week.

1.6 Ordering parts

This manual contains a survey of the spare parts recommended by SPXFLOW as well as the instructions for ordering them. A fax-order form is included in this manual.

You should always state all data stamped on the type plate when ordering parts and in any other correspondence regarding the pump.

➤ *This data is also printed on the label on the front of this manual.*

If you have any questions or require further information with regard to specific subjects, then do not hesitate to contact SPXFLOW.

2 General

2.1 Pump description

The CombiPrime H is a range of horizontal self-priming centrifugal pumps. Hydraulic application area complies with EN 733 (DIN 24255). Flange dimensions, bolt circle and number of holes comply with ISO 7005 PN10 (EN 1092-2 PN10). The CombiPrime H is characterized by the built-in vacuum pump.

Thus it is possible to pump fluids mixed with air (gas) or only air during the suction phase. The built-in vacuum pump is based on the liquid ring principle. The pump is driven by a standard IEC foot motor. The power is transmitted through a flexible coupling.

Because of their modular lay-out, constructional components are widely interchangeable, also with other pump types of the Combi system.

2.2 Type code

Pumps are available in various designs. The main characteristics of the pump are shown in the type code.

Example: **CH 40-250 B2 M2 TL**

| Pump family | |
|---------------------------------|---|
| CH | CombiPrime H |
| Pump size | |
| 40-250 | diameter discharge connection [mm] - nominal impeller diameter [mm] |
| Pump casing/pump cover material | |
| G | cast iron |
| B | bronze |
| Impeller material | |
| 1 | cast iron |
| 2 | bronze |
| 3 | aluminium bronze |
| Shaft sealing | |
| M2 | mechanical seals on shaft sleeves |
| M4 | tab ring seals on shaft sleeves |
| De-aerating unit | |
| TL | works liquid receiver + air inlet valve |
| VL | float de-aerator + air inlet valve |

2.3 Serial number

Serial number of the pump or pump unit are shown on the name plate off the pump and on the label on the cover of this manual

Example: **01-1000675A**

| | |
|--------|--------------------------|
| 01 | year of manufacture |
| 100067 | unique number |
| 5 | number of pumps |
| A | pump with motor |
| B | pump with free shaft end |

2.4 Application

- In general, this pump can be used for thin, clean or slightly polluted liquids. These liquids should not affect the pump materials.
- The maximum allowed system pressure and temperature and the maximum speed depend on the pump type and the pump construction. For relevant data see paragraph 2.6 "Application area".
- Further details about the application possibilities of your specific pump are mentioned in the order confirmation and/or in the data sheet enclosed with the delivery.
- Do not use the pump for purposes other than those for which it is delivered without prior consultation with your supplier.



Using a pump in a system or under system conditions (liquid, working pressure, temperature, etc.) for which it has not been designed may hazard the user!

2.5 Construction

The pump has a modular design. The main components:

- Pump casing/impeller/pump shaft
- Shaft seal
- Self-priming unit
- Bearing

The CombiPrime H pumps are available in 3 bearing bracket groups, meaning that bearing and shaft sealing are divided into 3 groups. Furthermore, the pumps have been standardized in 5 groups featuring the same connection for pump cover and bearing pedestal, depending on the nominal impeller diameters. The pump covers are clamped between the pump casing and bearing bracket.

2.5.1 Pump casing/impeller/pump shaft

These are the parts that get into contact with the pumped liquid. For each individual pump type there is only one design of the pump casing and the impeller. The pump casing is available in cast iron and in bronze, the impeller is available in cast iron, bronze and aluminium bronze. The pump shaft is available in alloyed and stainless steel. With the available materials the pumps can be supplied in a construction suitable to pump sea water.

2.5.2 Shaft sealing

On both sides of the self-priming part there is a mechanical seal or a number of lip seals. Both are mounted on shaft sleeves, which have been sealed in such a way that the pumped liquid cannot touch the pump shaft. The mechanical seals meet EN 12756 (DIN 24960), with the exception of the mounting length. The lip seals are mounted on stainless steel shaft sleeves which have been provided with a hard chromium oxide wearing layer.

2.5.3 Self-priming part

The self-priming part consists of a built-in vacuum pump which is working according to the liquid ring principle, an air-inlet valve with a check valve and a service liquid tank or float controlled air-relief valve. The vacuum pump part is mounted on the pump shaft, but works separately from the centrifugal pump. The service liquid which is supplied to the hub section of the vacuum pump has to maintain the liquid ring. Apart from that, it also serves for cooling and lubrication of the vacuum pump and the shaft seals.

2.5.4 Bearing construction

The bearing construction consists of 2 angular contact ball bearings combined with a cylindrical bearing. The bearings are grease lubricated. The angular contact bearings are mounted in an adjusting sleeve, with which the entire pump shaft can be shifted in order to adjust the axial tolerance of the pump wheel.

2.6 Application area

The application area globally looks as follows:

Table 1: Application area.

| | Maximum value |
|-----------------|-----------------------|
| Capacity | 500 m ³ /h |
| Discharge head | 100 m |
| System pressure | 10 bar |
| Temperature | 80°C |

However, the maximum allowable pressures and temperatures depend strongly on the selected materials and components. Also working conditions may cause differences.

2.7 Re-use

The pump may only be used for other applications after prior consultation with SPXFLOW or your supplier. Since the lastly pumped medium is not always known, the following instructions should be observed:

- Flush the pump properly
- Make sure the flushing liquid is discharged safely (environment!)



Take adequate precautions and use the appropriate personal protection means (rubber gloves, spectacles)!

2.8 Scrapping

If it has been decided to scrap a pump, the same procedure as for paragraph 2.7 "Re-use" should be followed.

3 Installation

3.1 Safety

- Read this manual carefully prior to installation and commissioning. Non-observance of these instructions can result in serious damage to the pump and this will not be covered under the terms of our guarantee. Follow the instructions given step by step.
- Ensure that the pump can not be started if work has to be undertaken to the pump during installation and the rotating parts are insufficiently guarded.
- Depending on the design the pumps are suitable for liquids with a temperature of up to 80°C. When installing the pump unit to work at 65°C and above the user should ensure that appropriate protection measures and warnings are fitted to prevent contact with the hot pump parts.
- If there is danger of static electricity, the entire pump unit must be earthed.
- If the pumped liquid is harmful to men or the environment, take appropriate measures to drain the pump safely. Possible leakage liquid from the shaft seal should also be discharged safely.

3.2 Preservation

In order to prevent corrosion, the inside of the pump is treated with a preserving agent before leaving the factory.

Before commissioning the pump remove any preserving agents and flush the pump thoroughly with hot water.

3.3 Environment

- The foundation must be hard, level and flat.
- The area in which the pump is installed must be sufficiently ventilated. An ambient temperature or air humidity which is too high, or a dusty environment, can have a detrimental effect on the operation of the electric motor.
- There should be sufficient space around the pump unit to operate and if necessary repair it.
- Behind the cooling air inlet of the motor there must be a free area of at least 1/4 of the electric motor diameter, to ensure unobstructed air supply.

3.4 Mounting

3.4.1 Installation of a pump unit

Pump and motor shafts of complete pump units are adjusted perfectly in line in the works.

- 1 In case of permanent arrangement place the base plate level on the foundation with the aid of shims.
- 2 Carefully tighten the nuts on the foundation bolts.
- 3 Check the alignment of pump and motor shafts and if necessary realign, see paragraph 3.4.3 "Alignment of the coupling".

3.4.2 Assembling a pump unit

If the pump and the electric motor still have to be assembled, do the following:

- 1 Fit both halves of the coupling to the pump shaft and the motor shaft respectively.
- 2 If size **db** of the pump, see figure 29, is not equal to the IEC size of the motor, level up the difference by placing properly sized spacers under the pump or under the motor feet.
- 3 Place the pump on the base plate. Fix the pump to the base plate.
- 4 Place the electric motor on the base plate. Move the motor to obtain a gap of 3 mm between both coupling halves.
- 5 Place copper shims under the feet of the electric motor. Fix the electric motor to the base plate.
- 6 Align the coupling in accordance with the following instructions.

3.4.3 Alignment of the coupling

- 1 Place a ruler (A) on the coupling. Place or remove as many copper shims as is necessary to bring the electric motor to the correct height so that the straight edge touches both coupling halves over the entire length, see figure 3.

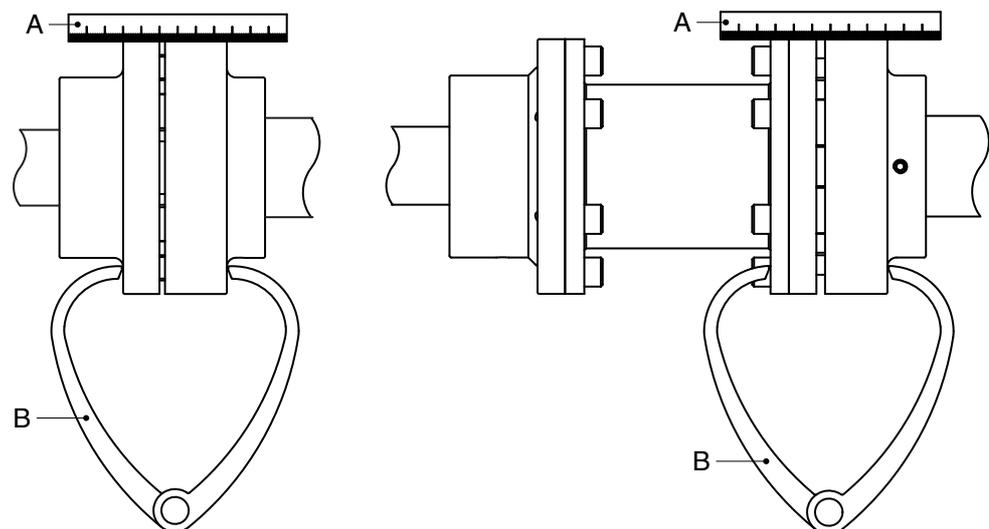


Figure 3: *Aligning the coupling by means of a ruler and a pair of outside calipers.*

- 2 Repeat the same check on both sides of the coupling at the height of the shaft. Move the electric motor so that the straight edge touches both coupling halves over the entire length.

- 3 Check the alignment once again using a pair of external callipers (B) at 2 diametrical opposite points on the sides of the coupling halves, see figure 3.
- 4 Fit the guard. See paragraph 7.6.4 "Assembling the guard".

3.4.4 Tolerances for aligning the coupling

The maximum allowable tolerances for the alignment of the coupling halves are shown in Table 2. See also figure 4.

Table 2: Alignment tolerances

| External diameter of coupling [mm] | V | | | | Va _{max} - Va _{min} [mm] | Vr _{max} [mm] |
|------------------------------------|----------|----|----------|----|--|------------------------|
| | min [mm] | | max [mm] | | | |
| 81-95 | 2 | 5* | 4 | 6* | 0,15 | 0,15 |
| 96-110 | 2 | 5* | 4 | 6* | 0,18 | 0,18 |
| 111-130 | 2 | 5* | 4 | 6* | 0,21 | 0,21 |
| 131-140 | 2 | 5* | 4 | 6* | 0,24 | 0,24 |
| 141-160 | 2 | 6* | 6 | 7* | 0,27 | 0,27 |
| 161-180 | 2 | 6* | 6 | 7* | 0,30 | 0,30 |
| 181-200 | 2 | 6* | 6 | 7* | 0,34 | 0,34 |
| 201-225 | 2 | 6* | 6 | 7* | 0,38 | 0,38 |

*) = coupling with spacer

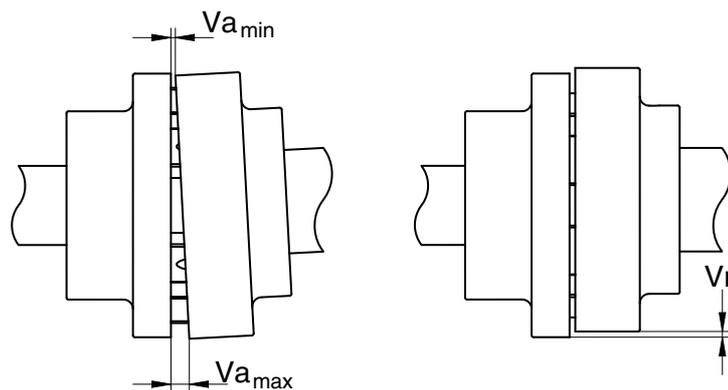


Figure 4: Alignment tolerances standard coupling.

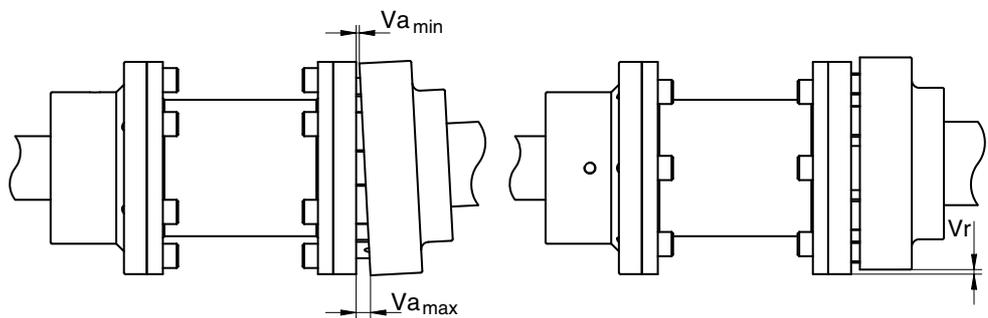


figure 5: Alignment tolerances spacer coupling.

3.5 Piping

- The piping to the suction and delivery connections must fit exactly and must not be subject to stress during operation. For the maximum allowable forces and moments on the pump flanges see paragraph 10.4 "Permissible forces and moments on the flanges".
- The passage of the suction pipe must be amply dimensioned. This pipe should be as short as possible and run towards the pump in such a way that no air pockets can arise. If this is not possible, a venting facility should be provided at the highest point of the pipe. If the inside diameter of the suction pipe is larger than the suction connection of the pump, an eccentric reducer should be applied to prevent air pockets and whirls. See figure 6.

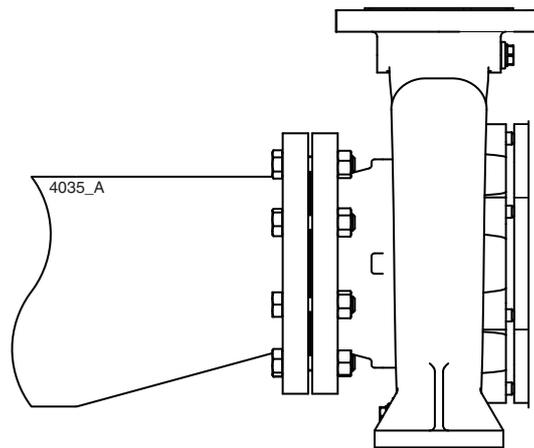


Figure 6: Eccentric reducer to suction flange.

- The maximum allowable system pressure is stated in paragraph 2.6 "Application area". If there is a risk that this pressure might be exceeded, for instance because of an excessive inlet pressure, appropriate measures should be taken by mounting a safety valve in the piping.
- Sudden changes in the rate of flow can lead to high pressure impulses in the pump and the piping (water shock). Therefore, do not use quick-acting closing devices, valves etc.

3.6 Accessories

- Fit any parts that may have been supplied separately.
- It is recommended to always mount a check valve and a shut-off valve in the suction pipe, as close as possible to the pump. If there is no check valve, the pump can only be started with closed delivery valve.
- In case of possible pre-pressure on the suction side, mount a shut-off valve in the suction pipe.
- If the liquid does not flow towards the pump, fit a foot valve at the bottom of the suction pipe. If necessary, combine this foot valve with a suction strainer to prevent impurities from being drawn in.
- When mounting, place temporarily (for the first 24 operating hours) a fine gauze between suction flange and suction pipe to prevent internal pump parts from being damaged by foreign matter. If the risk of damage continues to exist, fit a permanent filter.
- In case the pump is provided with an isolation, special attention has to be paid To temperature limits of shaft seal and bearing.

3.7 Vacuum pump with service liquid tank

3.7.1 Mounting of accessories

- Connect a pipe to the overflow of the service liquid tank to discharge excess service liquid and extracted air.
- The pump is supplied with the exhaust pipe connected to the pump cover.

3.7.2 Connection diagram with service liquid tank

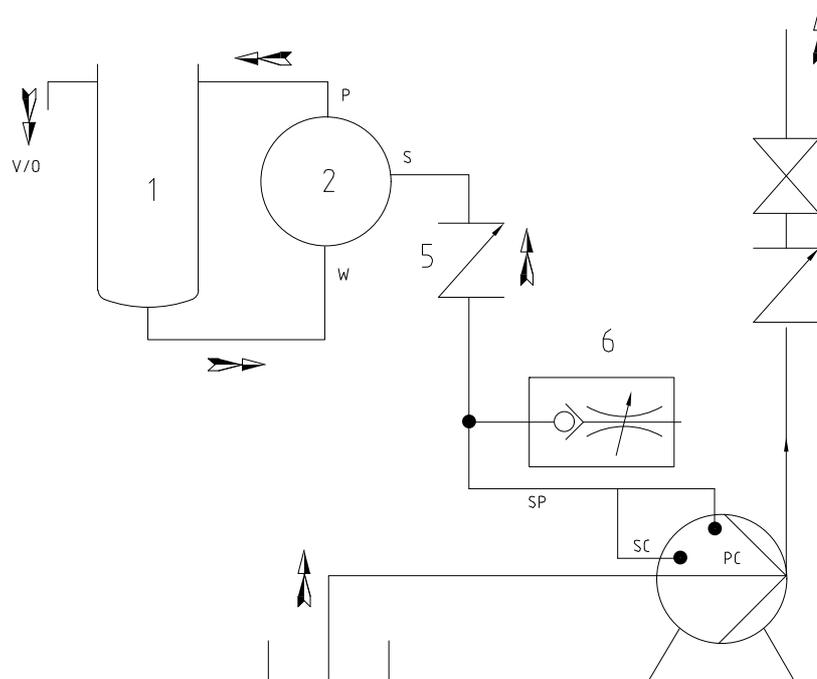


Figure 7: Connection diagram with service liquid tank.

3.7.3 Indication of connections

The suction, delivery and service liquid connections of the vacuum pump are indicated both on the drawings and on the vacuum pump by the letters **S**, **P** and **W**. Suction point **PC** is the connection to the space behind the impeller.

Indications used in figure 7 through figure 11:

| | |
|------------|---|
| V/O | De-aeration / Overflow |
| S | Inlet vacuum pump |
| SP | Exhaust pipe |
| P | Outlet vacuum pump |
| W | Service liquid |
| PC | Pump connection (=air-extraction connection centrifugal pump) |
| SF | Filter in suction pipe (only in figure 9) |
| SC | Suction flange connection |
| 1 | Service liquid tank |
| 2 | Vacuum pump |
| 5 | Check valve |
| 6 | Air inlet valve |

3.7.4 Installation examples with service liquid tank

For a few situations is shown how pumps with a service liquid tank can be installed.

! **Excess service liquid must always be discharged to the suction tank separately.**

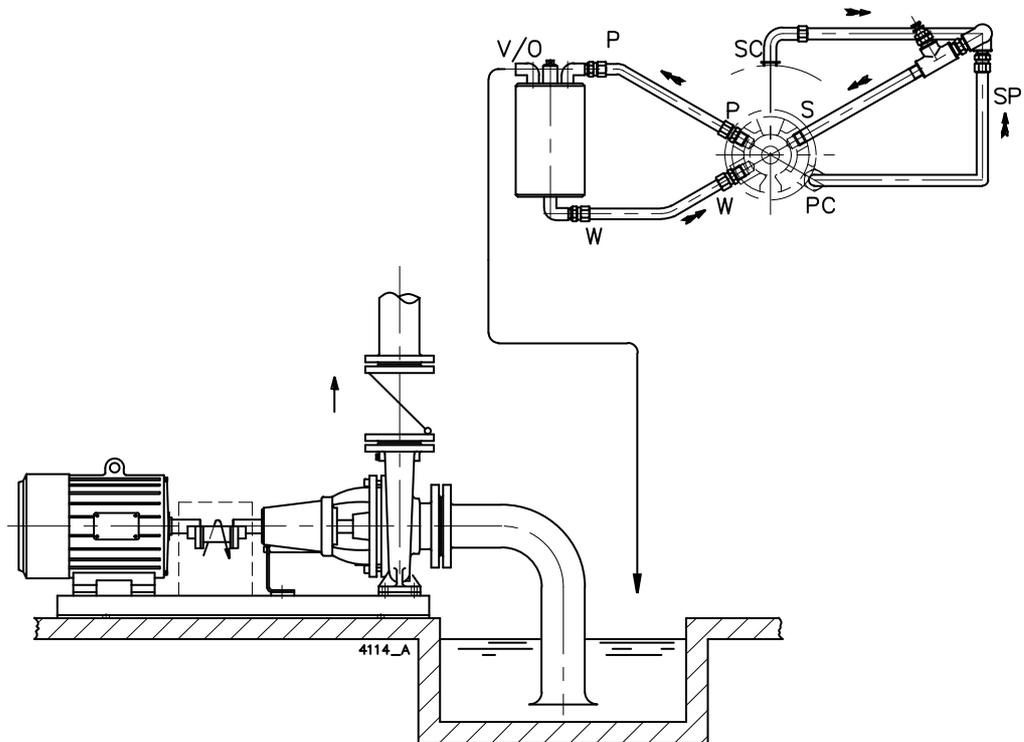


Figure 8: Medium: thin, clean and slightly polluted liquids.

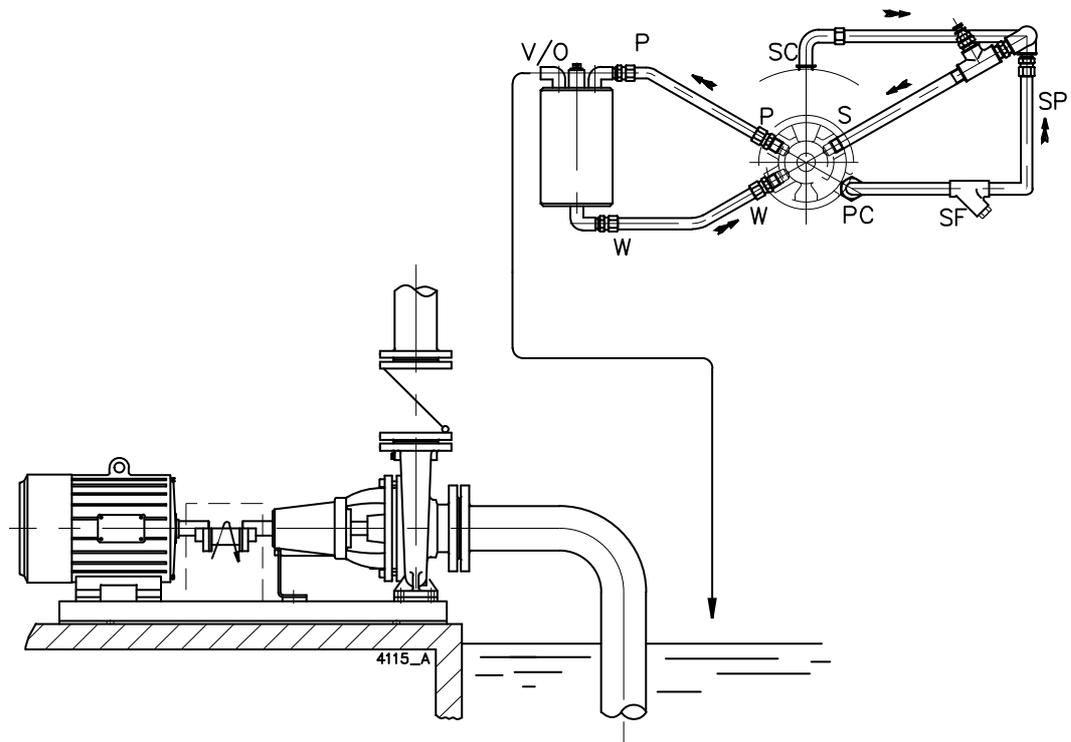


Figure 9: Medium: thin liquids, polluted with highly abrasive constituents. The back blades on the centrifugal impeller prevent heavy abrasive matter from getting into the suction space behind the impeller. To prevent floating abrasive matter from penetrating the pump, mount a filter in the suction pipe. The straining capacity of the filter should correspond with the nature of the pollutants. If necessary, mount several filters with different sieve sizes behind each other. Use at least one filter with Rp 3/4" connections and a sieve size of 0,6 mm.

! **Clean the filters regularly.**

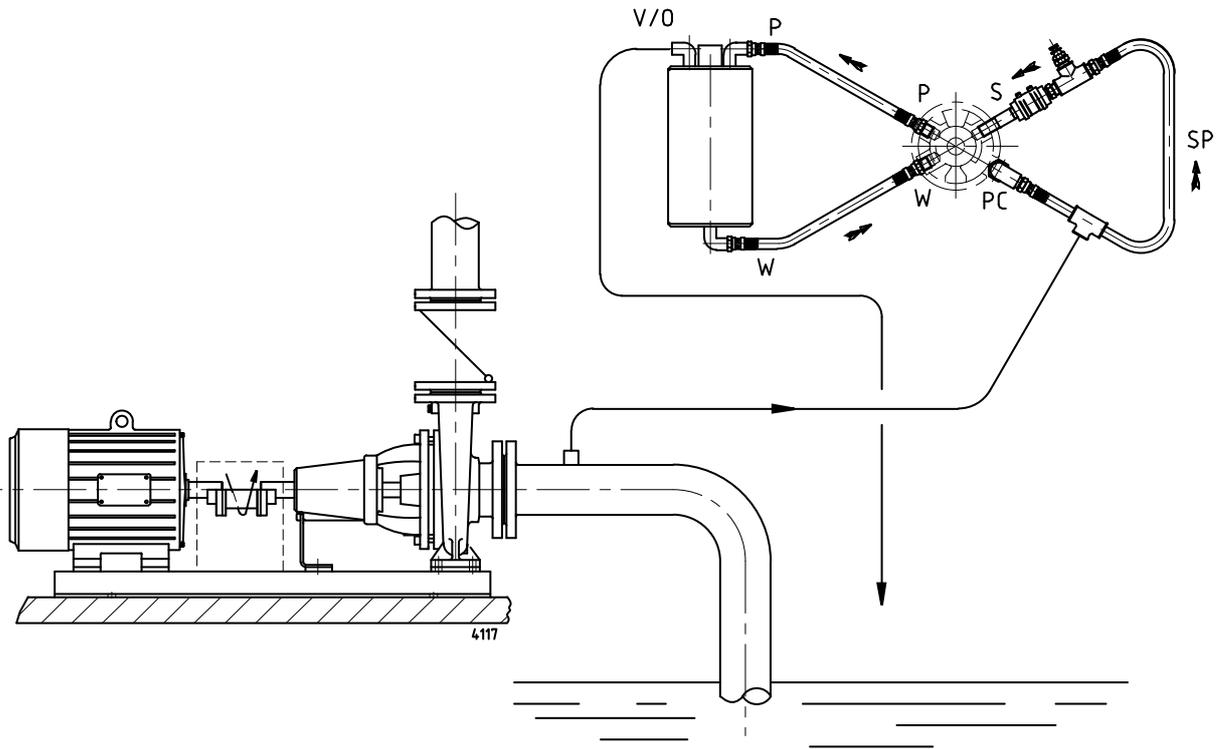


Figure 11: *Medium: thin, clean and slightly polluted liquids. In case of long suction pipes (10 m or more) and a high suction head (4-7 m), also the suction pipe must be vented.*

3.8 Vacuum pump with float-controlled de-aerator

3.8.1 Mounting of accessories

- Connect the exhaust pipe of the float-controlled de-aerator to the suction pipe. The passage of the exhaust pipe must be approx. 12 mm and the connection to the suction pipe at least G1/2".
- The pump is supplied with the exhaust pipe connected to the pump cover.

3.8.2 Connection diagram with float-controlled de-aerator

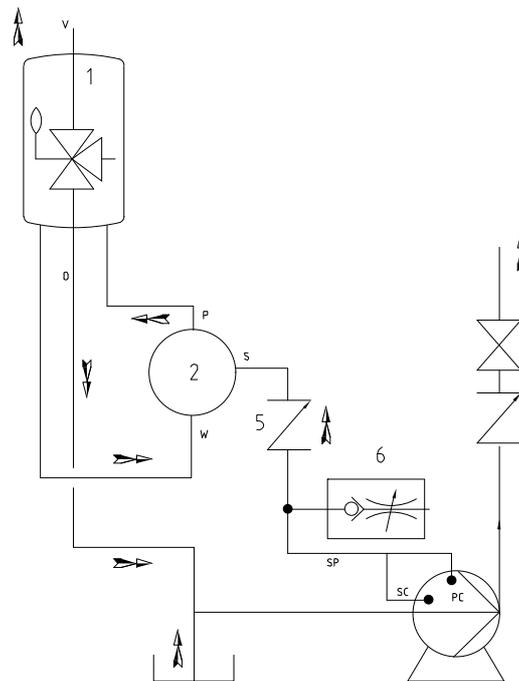


Figure 12: Connection diagram with float-controlled de-aerator.

3.8.3 Indication of connections

The suction, delivery and service liquid connections of the vacuum pump are indicated both on the drawings and on the vacuum pump by the letters **S**, **P** and **W**. Suction point **PC** is the connection to the space behind the impeller.

Indications used in figure 12 through figure 16:

| | |
|------------|---|
| V/O | De-aeration / Overflow |
| S | Inlet vacuum pump |
| SP | Exhaust pipe |
| P | Outlet vacuum pump |
| W | Service liquid |
| PC | Pump connection (=air-extraction connection centrifugal pump) |
| SF | Filter in exhaust pipe (only in figure 14) |
| SC | Suction flange connection |
| 1 | Float-controlled de-aerator |
| 2 | Vacuum pump |
| 5 | Check valve |
| 6 | Air inlet valve |

3.8.4 Installation examples with float-controlled de-aerator

For a few situations is shown how pumps with a float-controlled de-aerator can be installed.

! The excess service liquid is always returned to the suction pipe.

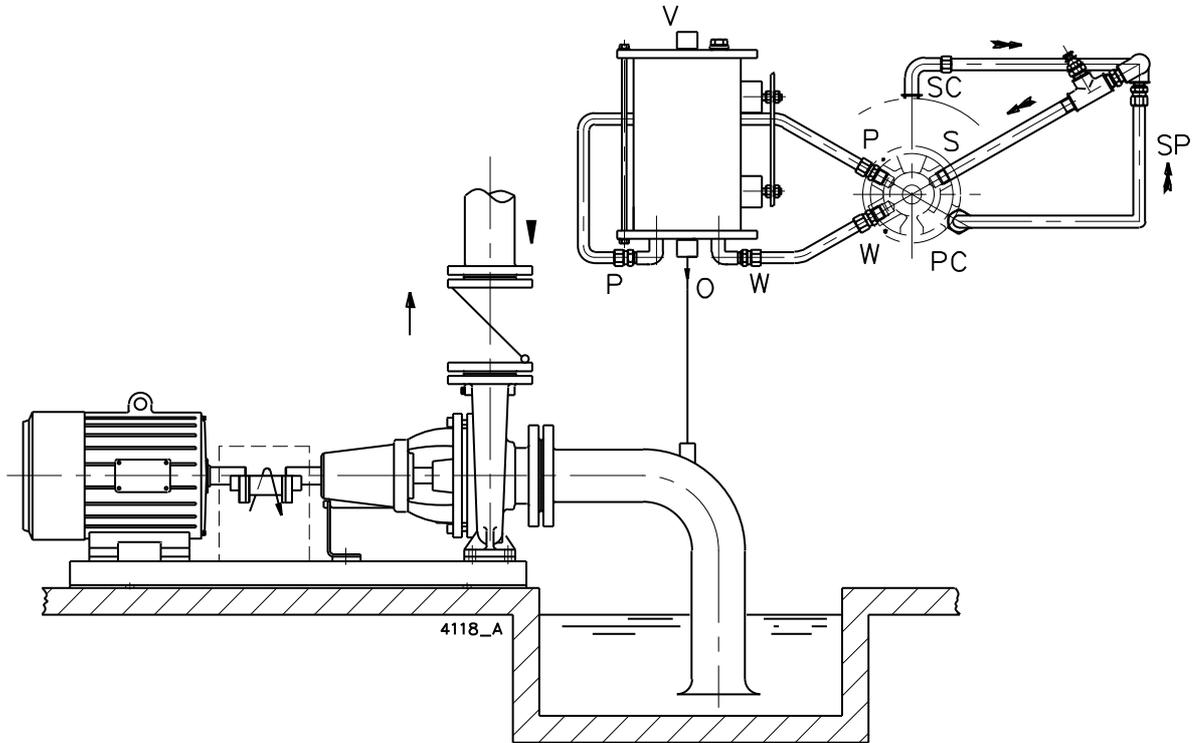


Figure 13: Medium: thin, clean and slightly polluted liquids.

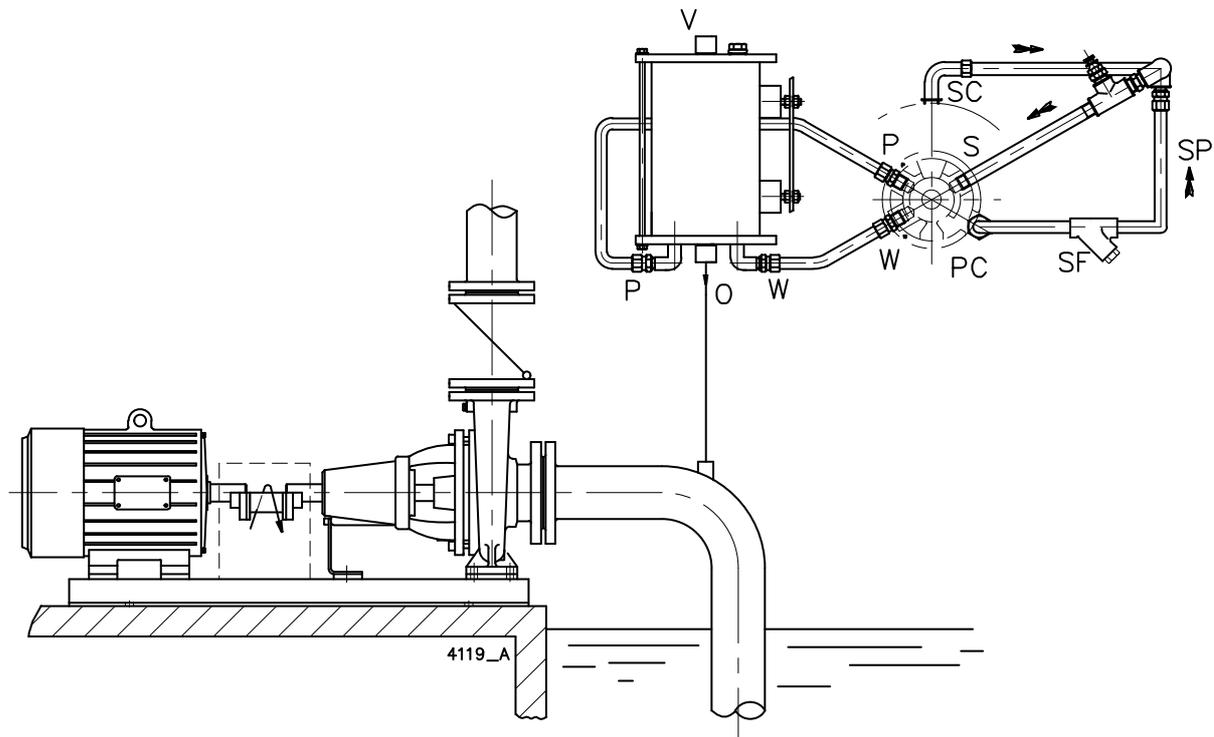


Figure 14: Medium: thin liquids polluted with highly abrasive matter. The back blades on the centrifugal impeller prevent heavy abrasive matter from getting into the suction space behind the impeller. To prevent floating abrasive matter from penetrating the pump, mount a filter in the suction pipe. The straining capacity of the filter should correspond with the nature of the pollutant. If necessary, mount several filters with different sieve sizes behind each other. Use at least one filter with Rp 3/4" connections and a sieve size of 0,6 mm.

! Clean the filters regularly.

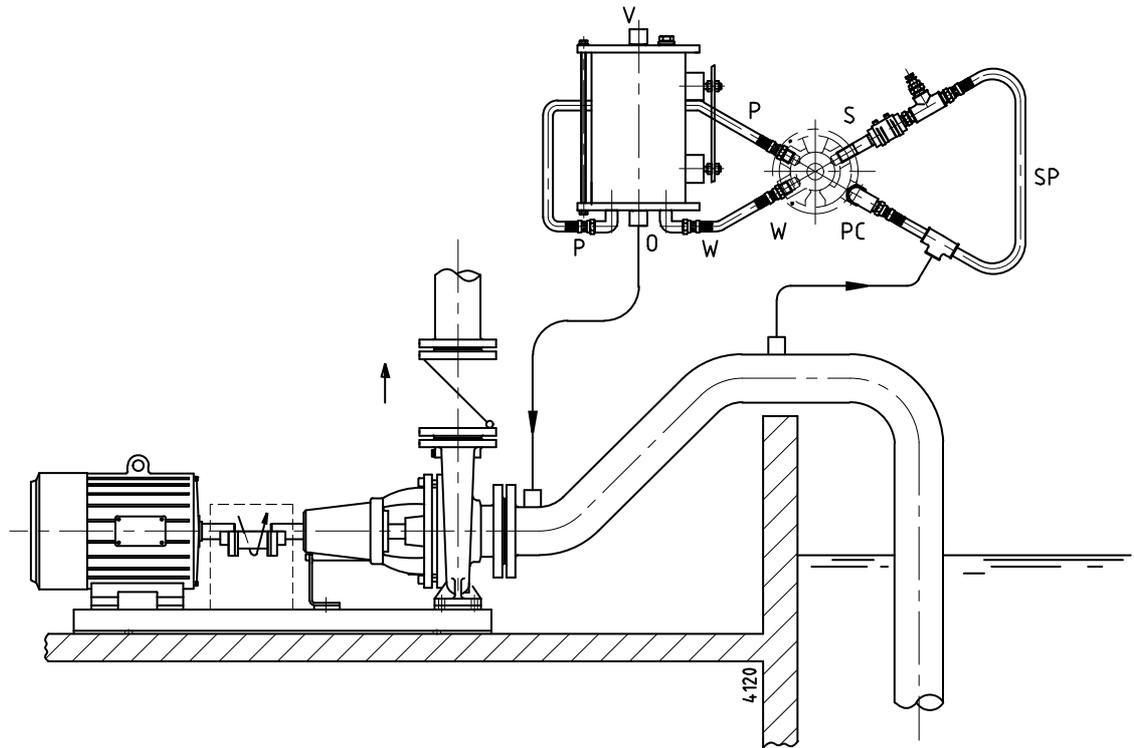


Figure 15: Medium: thin, clean and slightly polluted liquids. In case part of the suction pipe lies higher than the pump, venting should also be provided in this part. If the suction pipe is short, or the lift in the suction pipe small, venting at the highest point is not necessary. However, the suction time will be longer.

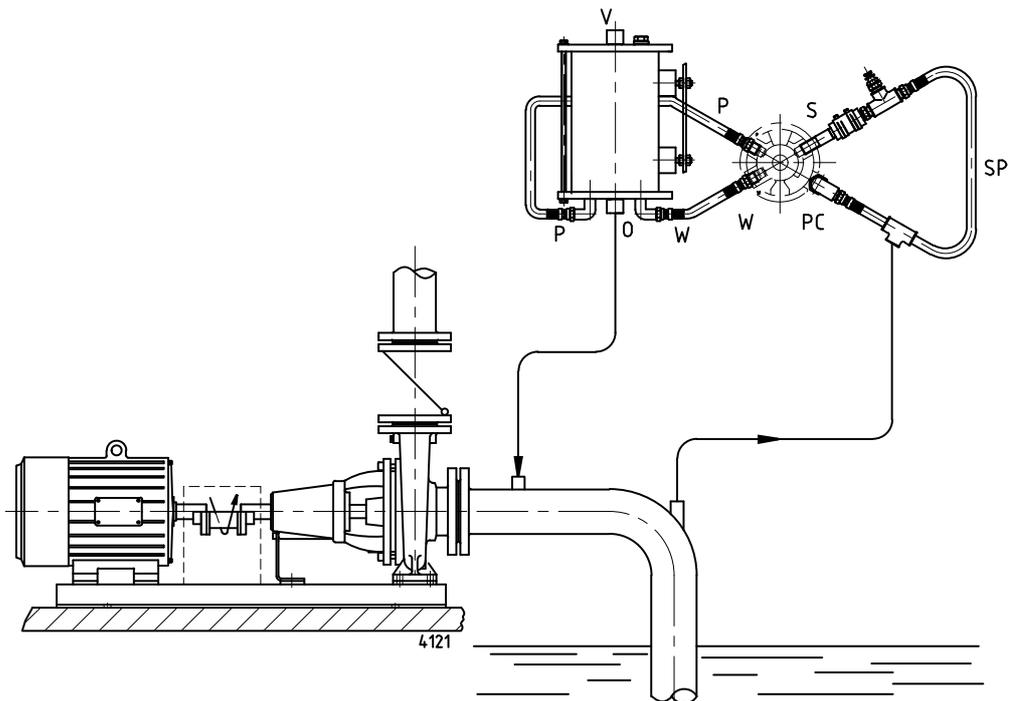


Figure 16: Medium: thin, clean and slightly polluted liquids. In case of long suction pipes (10 m or more) and a high suction head (4 -7 m), also the suction pipe must be vented.

3.9 Connection of the electric motor



The electric motor must be connected to the mains by an approved electrician, according to the locally prevailing regulations of the electricity company.

- Refer to the instruction manual belonging to the electric motor.
- If possible, fit a working switch as close as possible to the pump.

3.10 Combustion engine

3.10.1 Safety

If the pump set is designed with a combustion engine, the manual for the engine should be included in the delivery. If the manual is missing we urgently request you to contact us immediately. Irrespective of the manual, the following points should be observed for all combustion engines:

- Comply with the local safety regulations.
- The exhaust of combustion gases must be screened off to prevent incidental contact.
- The starting device should automatically be disengaged after the engine has been started.
- The maximum speed of the engine set by us should **not** be changed.
- Before starting the engine check the oil level.

3.10.2 Sense of rotation

The sense of rotation of combustion engine and pump is indicated by means of an arrow on the combustion engine and the pump casing. Verify whether the sense of rotation of the combustion engine is the same as that of the pump.

4 Commissioning

4.1 Inspection of the pump

Check whether the pump shaft turns freely. Do this by turning the shaft end at the coupling a few times by hand.

4.2 Inspection vacuum pump part

- 1 Check whether all piping between the pump wheel casing and the service liquid tank (version TL) or the float-controlled de-aerator (version VL) have been connected.
- 2 Fill the service liquid tank or the float-controlled de-aerator with liquid and close them with plug (1690) or (3013) respectively.

4.3 Inspection of the motor

Pump driven by an electric motor:

- Check whether the fuses have been mounted.

Pump driven by a combustion engine:

- Check whether the room in which the engine is placed is well ventilated.
- Check whether the exhaust of the engine is not obstructed.
- Before starting the engine check the oil level.
- **Never run the engine in a closed room.**

4.4 Checking the sense of rotation



Beware of possible non-screened rotating parts, when checking the sense of rotation!

- 1 The sense of rotation of the pump is indicated by an arrow. Check whether the sense of rotation of the motor corresponds with that of the pump.
- 2 Let the motor run for only a short time and check the sense of rotation.
- 3 If the sense of rotation is **not** correct, alter the sense of rotation. See the instructions in the user manual belonging to the electric motor.
- 4 Fit the guard.

4.5 Start-up

Proceed as follows, both when the pump is put into operation for the first time and when it is re-mounted after repairs.

- 1 Close the air-inlet valve (1650).
- 2 Fully open the stop valve in the suction pipe. Close the delivery stop valve.
- 3 Start the pump.
- 4 As soon as the pump is under pressure, slowly open the delivery stop valve until the working pressure is attained.



Make sure that when a pump is running, rotating parts are always properly screened off by the guard!

4.6 Adjusting the air-inlet valve

The air-inlet valve (1650) serves to admit small quantities of air into the self-priming system. The vacuum pump has been designed to pump a large quantity of air. After the suction phase, the vacuum pump functions as liquid pump. However, in principle it is not designed to only pump liquid. By adding a small quantity of air through the air-inlet valve, it is possible to avoid problems. After the pump has been started with closed air-inlet valve, the valve is adjusted as follows:

- 1 When the suction phase is over and the centrifugal pump maintains the liquid flow on its own, the pump will start making a crackling noise.
- 2 Slowly open the air-inlet valve until the crackling stops.
- 3 Leave the valve in this position and secure it with a lock nut. The valve is now properly adjusted. Provided the system conditions do not change, the pump can be reconnected after a break without having to readjust the valve.

4.7 Mechanical seal

A mechanical seal nor the lip seals may never show any visible leakage.

4.8 Pump in operation

When the pump is in operation, pay attention to the following:

- The pump may never run without liquid in the service liquid tank or the float-controlled de-aerator.
- Never use a stop valve in the suction line to control pump output. The stop valve should always be fully opened during operation.
- Check whether the absolute inlet pressure is sufficient, to prevent vaporization in the pump.
- Check whether the pressure difference between suction and delivery side corresponds with the specifications of the pump's duty point.

4.9 Noise

The noise production of a pump depends to a great extent on the operating conditions. The values stated in paragraph 10.7 "Noise data" are based on normal operation of the pump, driven by an electric motor. In case the pump is driven by a combustion engine, or in case it is used outside the normal operation area, as well as in case of cavitation, the noise level may exceed 85 dB(A). In that case precautions should be taken, like building a noise-barrier around the unit or wearing hearing protection.

5 Maintenance

5.1 Daily maintenance

Regularly check the outlet pressure.



No water should get into the terminal box of the electric motor when the pump room is sprayed clean! Never spray water on hot pump parts! The sudden cooling down may cause them to burst and hot water may flow out!



Flawed maintenance will result in shorter lifespan, possible break down and in any event loss of warranty.

5.2 Service liquid

After the pump has been put into operation once, the working-liquid tank and the float-controlled de-aerator don't have to be filled up again: there is constantly a sufficient quantity of pumped liquid in the working-liquid tank and the float-controlled de-aerator.

5.3 Shaft sealing

5.3.1 Mechanical seal

A mechanical seal generally requires no maintenance, however, **it should never be allowed to run dry**. If there are no problems, do not dismantle the mechanical seal. As the seal faces have run in on one another dismantling usually implicates replacement of the mechanical seal. If a mechanical seal shows any leakage it has to be replaced.

5.3.2 Lip seal

The lip seals generally require no maintenance. The lip seals run around stainless steel shaft sleeves which are provided with a hard wearing layer. The space between the lip seals is filled with grease when they are mounted, so as to limit wearing to a minimum. When the lip seals are leaking they have to be replaced.

5.4 Lubrication of the bearings

The bearings requires re-greasing after every 1000 hours of operation. The bearings are filled with grease during assembly. In case the pump is overhauled, the bearing bracket and the bearings have to be cleaned and provided with new grease. For recommended greases and quantities see paragraph 10.1 "Recommended greases"

5.5 Environmental influences

- Regularly clean the filter in the suction pipe or the suction strainer at the bottom of the suction pipe, as the inlet pressure may become too low if the filter or the suction strainer is fouled.
- If there is a risk that the pumped liquid expands during solidification or freezing, the pump has to be drained and, if necessary, flushed after it has been put out of service.
- If the pump is out of service for a long time, it has to be preserved.
- Check motor for accumulation of dust or dirt, which might influence motor temperature.

5.6 Noise

If a pump starts making noise, this may point to certain problems with the pump unit. A crackling noise can indicate cavitation or excessive motor noise can indicate deterioration of the bearings.

5.7 Motor

Check motor specifications for start-stop frequency.

5.8 Faults



The pump, of which you want to determine the fault, may be hot or under pressure. Take the appropriate precautions first and protect yourself with the proper safety devices (safety goggles, gloves, protective clothing)!

To determine the source of the malfunctioning of the pump, proceed as follows:

- 1 Switch off the power supply to the pump unit. Lock the working switch with a padlock or remove the fuse. In case of a combustion engine: switch off the engine and close the fuel supply to the engine.
- 2 Close the stop valves.
- 3 Determine the nature of the fault.
- 4 Try to determine the cause of the fault with chapter 6 "Problem solving" and take the appropriate measures or contact your installer.

6 Problem solving

Faults in a pump installation can have various causes. The fault may not be in the pump, it may also be caused by the pipe system or the operating conditions. Firstly, always check that installation has been executed in accordance with the instructions in this manual and that the operating conditions still correspond with the specifications for which the pump was purchased.

In general, breakdowns in a pump installation are attributable to the following causes:

- Faults with the pump.
- Breakdowns or faults in the pipe system.
- Faults due to incorrect installation or commissioning.
- Faults due to incorrect choice of pump.

A number of the most frequently occurring failures as well as their possible causes are shown in the table below.

Table 3: Most frequently occurring failures.

| Most common faults | Possible causes, see Table 4. |
|---|---|
| Pump delivers no liquid | 1 4 8 9 10 11 13 14 17 19 20 21 29 |
| Pump has insufficient volume flow | 2 3 4 8 9 10 11 13 14 15 17 19 20 21 28 29 44 |
| Pump has insufficient head | 2 4 13 14 17 19 28 29 |
| Pump stops after start up | 1 8 9 10 11 |
| Pump has higher power consumption than normal | 12 15 16 17 18 22 23 24 25 26 27 32 34 38 39 |
| Pump has lower power consumption than normal | 3 14 15 16 17 18 20 21 28 29 44 |
| Mechanical seals have to be replaced to often | 23 25 26 30 32 33 34 |
| Pump vibrates or is noisy | 9 10 11 15 18 19 20 22 23 24 25 26 27 29 37 38 39 40 43 |
| Bearings wear too much or become hot | 23 24 25 26 27 37 38 39 40 42 |
| Pump running rough hot or seizes | 23 24 25 26 27 34 37 38 39 40 42 |

Table 4: Possible causes of pump failures.

| | Possible causes |
|----|---|
| 1 | Service liquid tank or float de-aerator not filled with liquid |
| 2 | Gas or air coming from the liquid |
| 3 | Air lock in the suction pipe |
| 4 | Air leak in the suction pipe |
| 8 | The manometric suction head is too high |
| 9 | Suction pipe or suction strainer is blocked |
| 10 | Insufficient immersion of foot valve or suction pipe during operation of the pump |
| 11 | NPSH available too low |
| 12 | Speed too high |
| 13 | Speed too low |
| 14 | Wrong sense of rotation |
| 15 | Pump does not operate at the right duty point |
| 16 | Liquid density differs from the calculated liquid density |
| 17 | Liquid viscosity differs from the calculated liquid viscosity |
| 18 | Pump operates when the liquid flow is too low |
| 19 | Wrong pump selection |
| 20 | Obstruction in impeller or pump casing |
| 21 | Obstruction in the piping |
| 22 | Wrong installation of the pump unit |
| 23 | Pump and motor not well aligned |
| 24 | Rotating part running out of true |
| 25 | Imbalance in rotating parts (for instance: impeller or coupling) |
| 26 | Pump shaft is running out of true |
| 27 | Bearings faulty or worn out |
| 28 | Wear ring faulty or worn out |
| 29 | Damaged impeller |
| 30 | Seal faces of the mechanical seal are worn out or damaged |
| 32 | Bad mounting of the mechanical seals or of the lip seals |
| 33 | Mechanical seals or lip seals not suitable for the pumped liquid or operation circumstances |
| 34 | Pump wheel cover not perpendicularly mounted |
| 37 | Axial retaining of impeller or pump shaft is defective |
| 38 | The bearings have been mounted wrongly |
| 39 | Too much or too little bearing lubrication |
| 40 | Wrong or polluted lubricant |
| 42 | Too high axial force because of worn dorsal blades or excessive inlet pressure |
| 43 | Air-inlet valve closed |
| 44 | Air-inlet valve opened too much |

7 Disassembly and assembly

7.1 Precautionary measures



Take adequate measures to avoid that the motor is started while you are working on the pump. This is especially important for electric motors with remote control:

- Switch the operating switch near the pump (if available) to "OFF".
- Switch off the pump switch on the switchboard.
- If necessary remove the fuses.
- Hang a danger board near the switchboard cabinet.

7.2 Special tools

Assembly and disassembly work requires no special tools. However, such tools can make certain jobs easier, for instance replacing the shaft seal. If such is the case it will be indicated in the text.

7.3 Liquid draining



Make sure no liquid or oil gets into the environment!

Before starting any disassembly the pump should be drained.

- 1 If necessary, close the valves in the suction and delivery pipe and in the flushing or cooling supply lines to the shaft seal. Also drain the self-priming section by disconnecting the piping P, S and W.
- 2 Remove the drain plug (0310).
- 3 If harmful liquids are pumped wear protective gloves, shoes, glasses, etc., and thoroughly flush the pump.
- 4 Refit the drain plug.



If possible, wear protective gloves. Regular contact with oil products may result in allergic reactions.

7.4 Item numbers

If no specific figure numbers are stated, then the item numbers used in these instructions refer to the cross section drawings and parts lists, which can be found in chapter 9 "Parts".

The connection markings P, S and W on the self-priming section are explained in paragraph 3.7.3 "Indication of connections" for the Service liquid tank configuration TL or paragraph 3.8.3 "Indication of connections" for the Float Deaerator configuration VL.

7.5 Constructive variants

The pumps can be supplied in 2 constructive variants and with 2 processing liquid devices. The variants have a special code, which is stated in the type designation on the type plate on the pump.

| | |
|----|---|
| M2 | Mechanical seal, unbalanced, shaft sleeve |
| M4 | Lip seals, hardened shaft sleeves |
| TL | Processing liquid tank and air-inlet valve |
| VL | Float-operated de-aerator and air-inlet valve |

7.6 Back-Pull-Out system

The pumps are designed with a Back-Pull-Out system. If the pump unit is designed with a spacer-coupling, just remove the spacer. After that the bearing bracket with the entire rotating part can be removed. This means that almost the whole pump can be dismantled without having to detach the suction and delivery piping. The motor remains in its position.

If the pump unit does not have a spacer coupling, the motor has to be removed from the foundation before disassembly.

7.6.1 Disassembling the guard

- 1 Loosen bolts (0960). See figure 20.
- 2 Remove both jackets (0270). See figure 18.

7.6.2 Disassembling the Back-Pull-Out unit

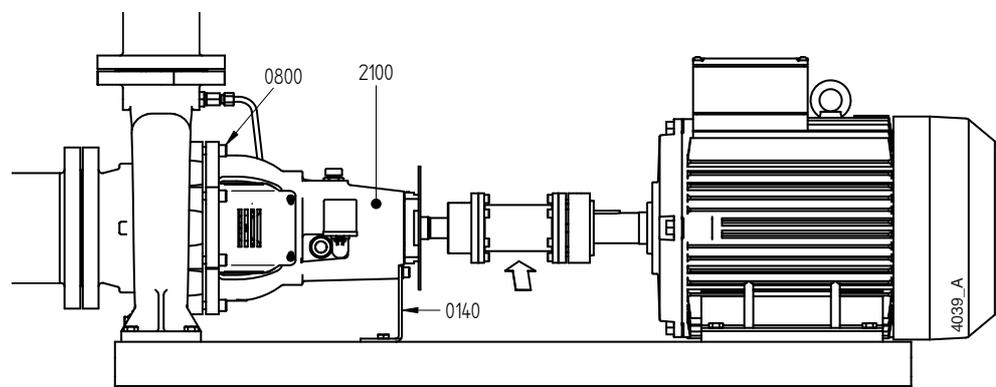


Figure 17: Back-Pull-Out principle.

- 1 Mounted with spacer coupling: Remove the spacer. Else: Remove the electric motor.
- 2 Disconnect the connections S, P and W from the pump wheel casing.
- 3 Loosen the bracket support (0140) from the base plate, see figure 17.
- 4 Remove the Allen screws (0800).
- 5 Pull the entire bearing bracket (2100) from the pump casing. The entire bearing bracket of large pumps is very heavy. Support it with a beam or hang it in a pulley sling.
- 6 Remove the coupling half from the pump shaft and remove the coupling key (2210).
- 7 Unscrew bolts (0940) and remove the assembly plate (0275) from the adjusting bush (2240). See figure 21.

7.6.3 Assembling Back-Pull-Out unit

- 1 Fit a new gasket (0300) into the pump casing and fit the entire bearing bracket back into the pump casing. Tighten the Allen screws (0800) crosswise.
- 2 Reconnect the connections S, P and W to the pump wheel casing.
- 3 Fix the bearing support (0140) on the base plate.
- 4 Fit the assembly plate (0275) to the adjusting bush (2240) with bolts (0940). See figure 21.
- 5 Fit the coupling key (2210) and fit the coupling half onto the pump shaft.
- 6 Place the motor back in its place or fit the spacer of the spacer coupling.
- 7 Check the alignment of pump and motor shaft, see paragraph 3.4.3 "Alignment of the coupling". If necessary, realign.

7.6.4 Assembling the guard

- 1 Fit the jacket (0270) at motor side. The annular groove must be located at motor side.

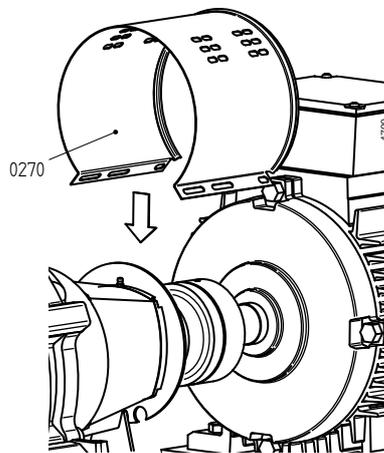


Figure 18: Fitting the jacket at motor side.

- 2 Place the assembly plate (0280) over the motor shaft and fit it into the annular groove of the jacket.

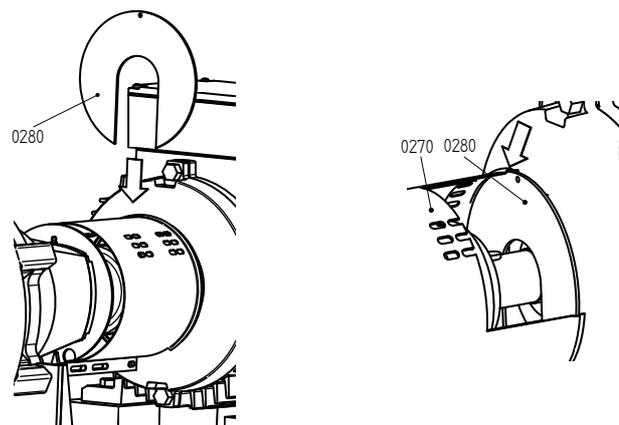


Figure 19: Fitting the assembly plate at motor side.

- 3 Close the jacket and fit bolt (0960). See figure 20.

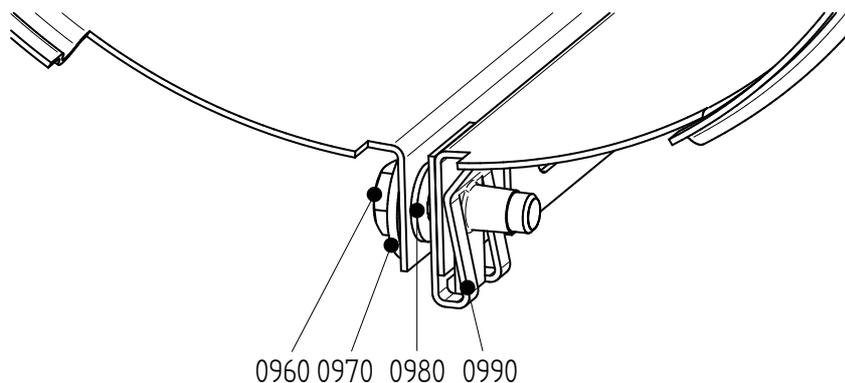


Figure 20: Fitting jacket.

- 4 Fit the jacket (0270) at pump side. Place it over the present jacket at motor side. The annular groove must be located at pump side.

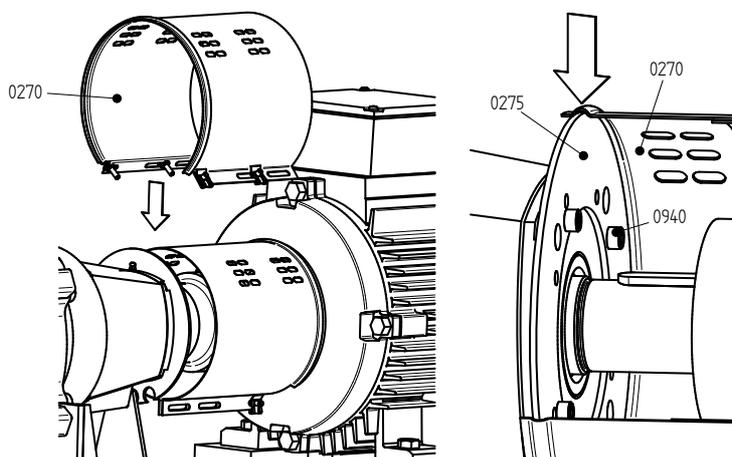


Figure 21: Fitting the jacket at pump side.

- 5 Close the jacket and fit bolt (0960). See figure 20.
- 6 Slide the jacket at motor side towards the motor as far as possible. Fix both jackets with bolt (0960).

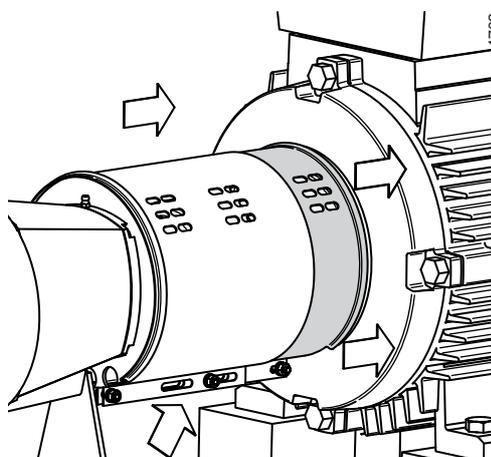
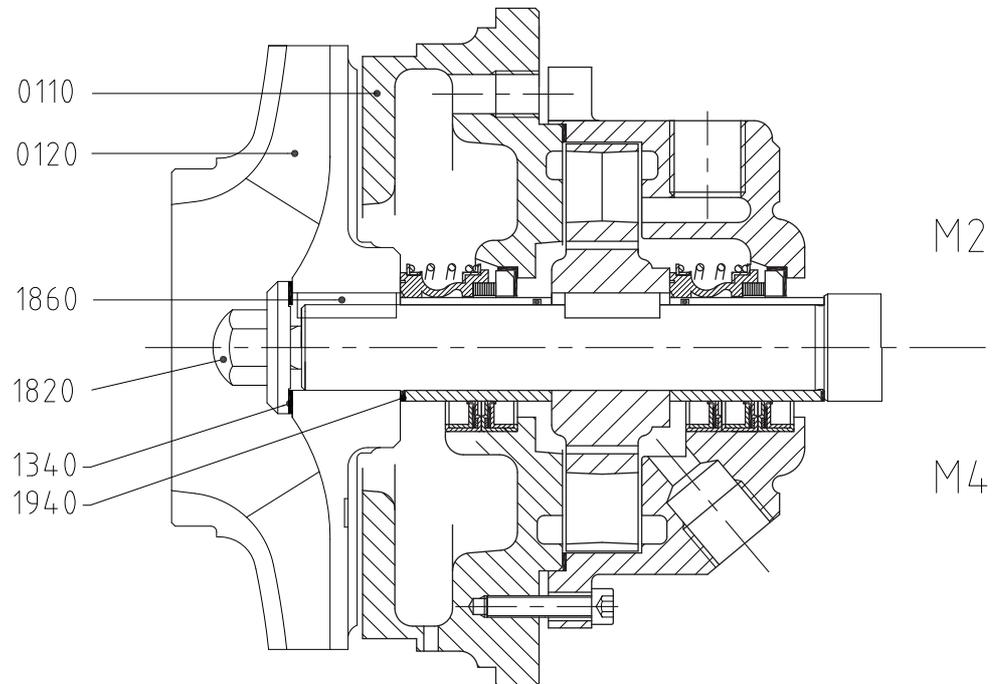


Figure 22: Adjusting the jacket at motor side.

7.7 Replacing the impeller and the wear ring

The play between the impeller and the wear ring is 0,3 mm to the diameter at delivery. In case the play has increased to 0,5-0,7 mm due to wear, the impeller and the wear ring should be replaced.

7.7.1 Disassembling the impeller



Figur 23: Disassembling the impeller.

The item numbers used are referring to figure 23.

- 1 Remove the Back-Pull-Out unit, see paragraph 7.6.2 "Disassembling the Back-Pull-Out unit".
- 2 Remove the cap nut (1820) and the gasket (1340). Sometimes the nut has to be heated to break the Loctite-contact.
- 3 Remove the impeller (0120) with a pulley puller, or wrest the impeller by inserting for instance 2 big screwdrivers between the impeller and the stuffing box cover (0110).
- 4 Remove the impeller key (1860).
- 5 Remove the gasket (1940).

7.7.2 Mounting the impeller

- 1 Fit the gasket (1940).
- 2 Place the impeller key (1860) in the key way of the pump shaft.
- 3 Push the impeller onto the pump shaft.
- 4 Degrease the thread on the pump shaft and the thread in the cap nut.
- 5 Fit the gasket (1340).
- 6 Put a drop of Loctite 243 on the thread and fit the cap nut. For tightening moment of the nut see paragraph 10.3.2 "Tightening moments for cap nut".
- 7 Fit the Back-Pull-Out unit, see paragraph 7.6.3 "Assembling Back-Pull-Out unit".

7.7.3 Disassembling the wear ring

This only concerns bearing groups 2 and 3, except for types 40-250 and 50-250.

After removing the Back-Pull-Out unit (see paragraph 7.6.2 "Disassembling the Back-Pull-Out unit") the wear ring can be removed. In most cases the ring has been fixed so tightly that it cannot be removed undamaged.

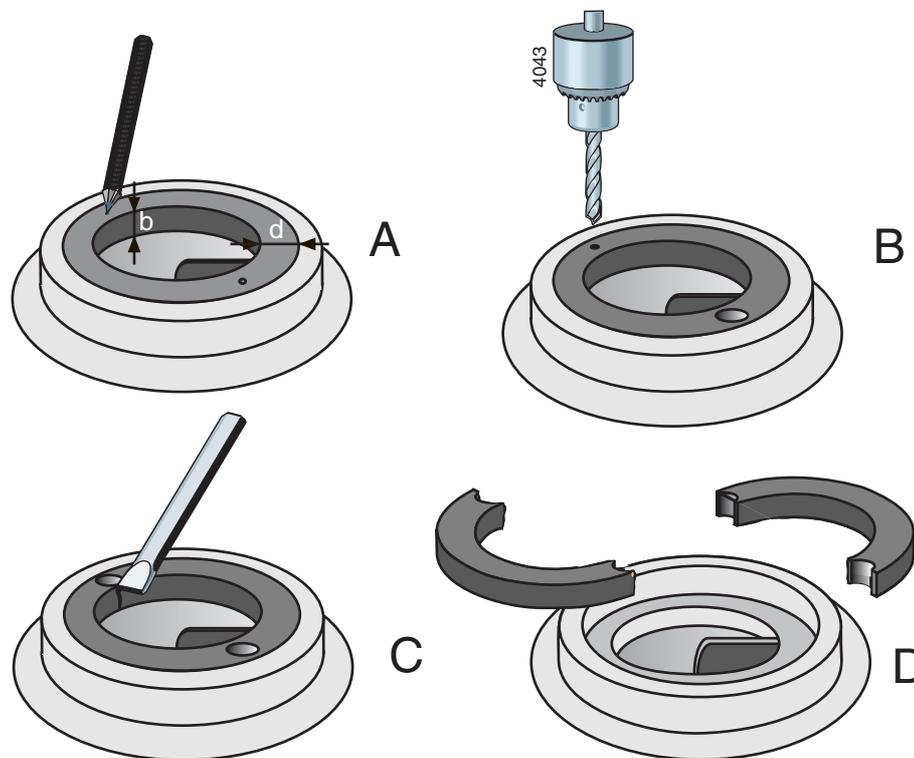


Figure 24: Removal of wear ring.

- 1 Measure the thickness (d) and the width (b) of the ring, see figure 24 A.
- 2 Make a centre hole in the middle of the edge of the ring at two opposite points, see figure 24 B.
- 3 Use a drill with a diameter just a little bit smaller than the thickness (d) of the ring and drill two holes in the ring, see figure 24 C. Don't drill deeper than the width (b) of the ring. Take care not to damage the fitting edge of the pump casing.
- 4 Use a chisel to cut the remaining part of the ring thickness. Now you can remove the ring in two parts from the pump casing, see figure 24 D.
- 5 Clean the pump casing and carefully remove all bore dust and metal splinters.

7.7.4 Assembling the wear ring

- 1 Clean and degrease the fitting edge of the pump casing where the wear ring is to be mounted.
- 2 Degrease the outer edge of the wear ring and put a few drops of Loctite 641 on it.
- 3 Fit the wear ring in the pump casing. **Take care it is not pushed out of alignment!**

7.8 Shaft sealing

7.8.1 Instructions for mounting a mechanical seal

➤ *First read the following instructions regarding the mounting of a mechanical seal. Follow these instructions closely when mounting a mechanical seal.*

- A mechanical seal is a fragile precision instrument. Leave the seal in its original packing until you are ready to fit it!
- Clean all receiving parts properly. Make sure your hands and working environment are clean!
- **Never touch the sliding surfaces with ones fingers!**
- Take care not to damage the seal during assembly. Never put the rings down on their sliding surfaces!

7.8.2 Disassembling a mechanical seal M2

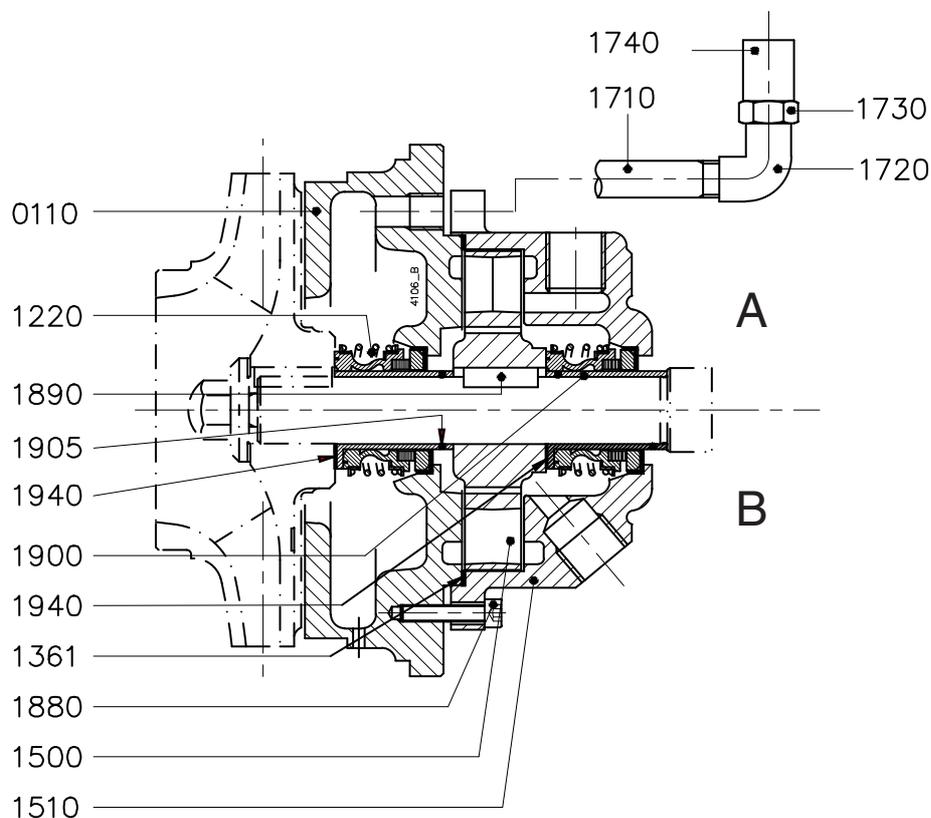


Figure 25: Mechanical seal M2 (A = bearing group 1 and 2, B = bearing group 3).

The item numbers used are referring to figure 25.

- 1 Remove the impeller, see paragraph 7.7.1 "Disassembling the impeller".
- 2 Pull the shaft sleeve (1900) off the pump shaft and remove the rotating part of the mechanical seal from the shaft sleeve.
Bearing group 3 only: Remove gasket (1940).
- 3 Mark the position of the pump cover (0110) in relation to the bearing bracket (2100).
- 4 Loosen the Allen screws (1880).
- 5 Push the cover of the pump wheel casing (1510) backward.

- 6 Knock the pump cover loose and push it off the pump shaft. Press the counter-ring of the mechanical seal out of it.
- 7 Pull the pump wheel (1500) from the pump shaft and remove the key (1890).
- 8 Pull the shaft sleeve (1900) from the pump shaft and remove the rotating part of the mechanical seal from the shaft sleeve.
Bearing group 3 only: Remove gasket (1940).
- 9 Push the cover of the pump wheel casing (1510) off the pump shaft and press the counter-ring out.
- 10 Remove gasket (1361).
- 11 Remove O-rings (1905) out of the shaft sleeves (1900).

7.8.3 Assembling of the mechanical seals M2

- 1 Ensure the shaft sleeve (1900) and the splash ring (2220) are undamaged. The splash ring should also clasp the pump shaft properly. If necessary, replace these parts.
- 2 Place the bearing bracket with the shaft upright.
- 3 Put the cover of the pump wheel casing (1510) and the pump cover (0110) flat down and press the counter-ring of the seal straight into it. If necessary, use a plastic pressure piece. **Never hammer it inside!** The maximum axial turn of the counter-ring is 0,1 mm.
- 4 Put some glycerine or silicon spray on the O-rings and mount the O-rings into the shaft sleeves.
- 5 Push the cover of the pump wheel casing (1510) over the pump shaft.
- 6 Wet the clean shaft sleeve with some low-surface-tension water (add detergent), feed the bellows with a slight twist in clockwise direction onto the shaft sleeve. **Use no oil or grease!** Apply pressure only on the corner rings.
- 7 Push a shaft sleeve (1900) on the pump shaft.
- 8 Bearing group 3 only: Fit a new gasket (1940).
- 9 Place the key (1890) in the pump shaft and push the pump wheel (1500) over the pump shaft.
- 10 Mount the gasket (1361).
- 11 Mount the pump cover (0110) in the right position into the fitting edge of the bearing bracket. Check whether the pump cover is at right angles to the pump shaft.
- 12 Mount the cover of the pump wheel casing (1510) against the pump cover. Watch its position in view of the connections. Tighten the Allen screws (1880) crosswise.
The cover should not be oblique.
- 13 Push the other shaft sleeve (1900) on the pump shaft.
- 14 Bearing group 3 only: Fit a new gasket (1940).
- 15 Fit the impeller and other parts, see paragraph 7.7.2 "Mounting the impeller".

7.8.4 Instructions for mounting a lip seal

- A lip seal is a fragile precision instrument. Leave the seal in its original packing until you are ready to fit it!
- Clean all receiving parts properly. Make sure your hands and working environment are clean!

7.8.5 Disassembling of the lip seals M4

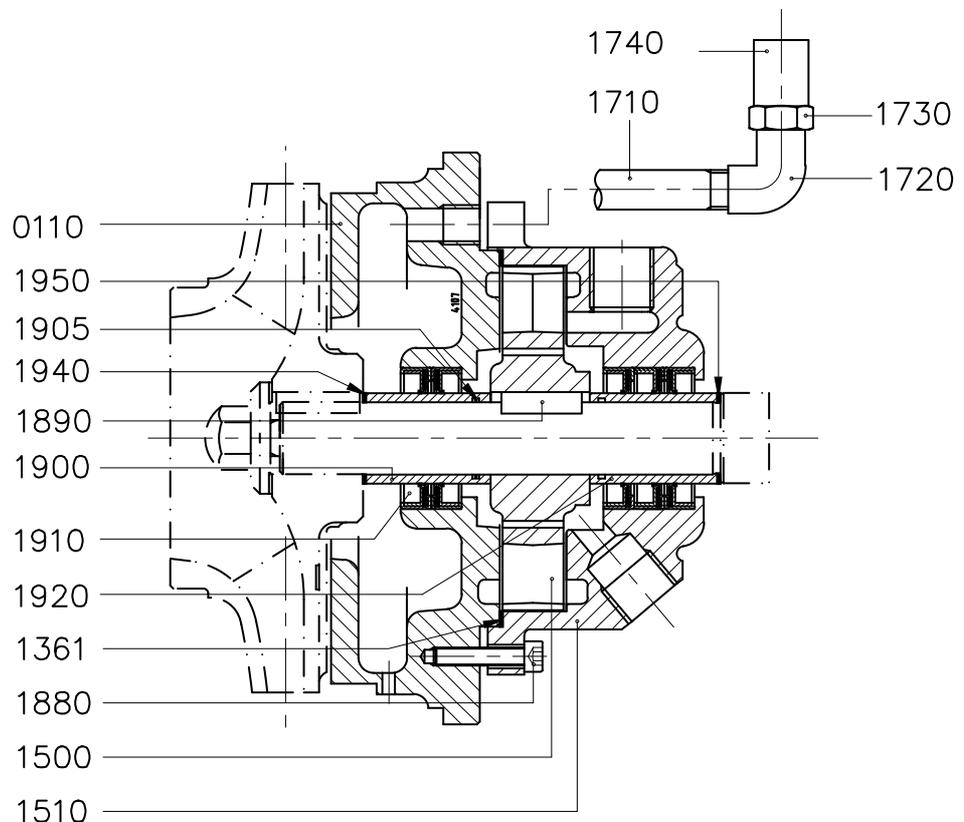


Figure 26: Lip seal M4.

The item numbers used are referring to figure 26.

- 1 Remove the impeller, see paragraph 7.7.1 "Disassembling the impeller".
- 2 Mark the position of the pump cover (0110) in relation to the bearing bracket (2100).
- 3 Loosen the Allen screws (1880).
- 4 Push the cover of the pump wheel casing (1510) backward.
- 5 Knock the pump cover loose and push it off the pump shaft. Remove the tabbed sealing rings (1910).
- 6 Pull the shaft sleeve (1900) from the pump shaft and remove the O-ring (1905).
- 7 Pull the pump wheel (1500) from the pump shaft and remove the sunk key (1890).
- 8 Slide the cover of the pump wheel casing (1510) off the pump shaft and remove the tabbed sealing rings.
- 9 Remove the gasket (1361).
- 10 Pull the shaft sleeve (1920) from the pump shaft.
- 11 Remove the gasket (1950) from the pump shaft.

7.8.6 Assembling of the lip seals M4

- 1 Check the shaft sleeves (1900 and 1920) and the splash ring (2220) for damages. Also, the splash ring should clasp the shaft properly. If necessary, replace these parts.
- 2 Place the bearing bracket with the shaft upright.
- 3 Mount the gasket (1950) around the pump shaft.
- 4 Slide the cover of the pump wheel casing (1510) onto the pump shaft.
- 5 Mount a lip seal on both ends of the shaft sleeve. The pointing direction of the tab should be opposite to the sliding direction. Shaft sleeve (1900) will have 2 lip seals, shaft sleeve (1920) will have 3. **When being mounted, the lip seals and the space between them both must be filled with grease.**
- 6 Slide the shaft sleeve (1920) onto the pump shaft.
- 7 Mount the sunk key (1890) in the pump shaft and slide the pump wheel casing (1500) onto the pump shaft.
- 8 Mount the pump cover (0110) in the right position in the fitting edge of the bearing bracket. Check the position of the pump cover. It should be at right angles to the pump shaft.
- 9 Mount the gasket (1361) between the pump cover and the pump wheel casing.
- 10 Mount the cover of the pump wheel casing (1510) against the pump cover. Watch the position in view of the place for the connections. Tighten the Allen screws (1880) crosswise. The cover should not be oblique.
- 11 Mount the O-ring (1905) into the shaft sleeve (1900) and slide the shaft sleeve onto the pump shaft.
- 12 Fit the impeller and the other parts, see paragraph 7.7.2 "Mounting the impeller".

7.9 Bearing

7.9.1 Disassembly of bearings and pump shaft

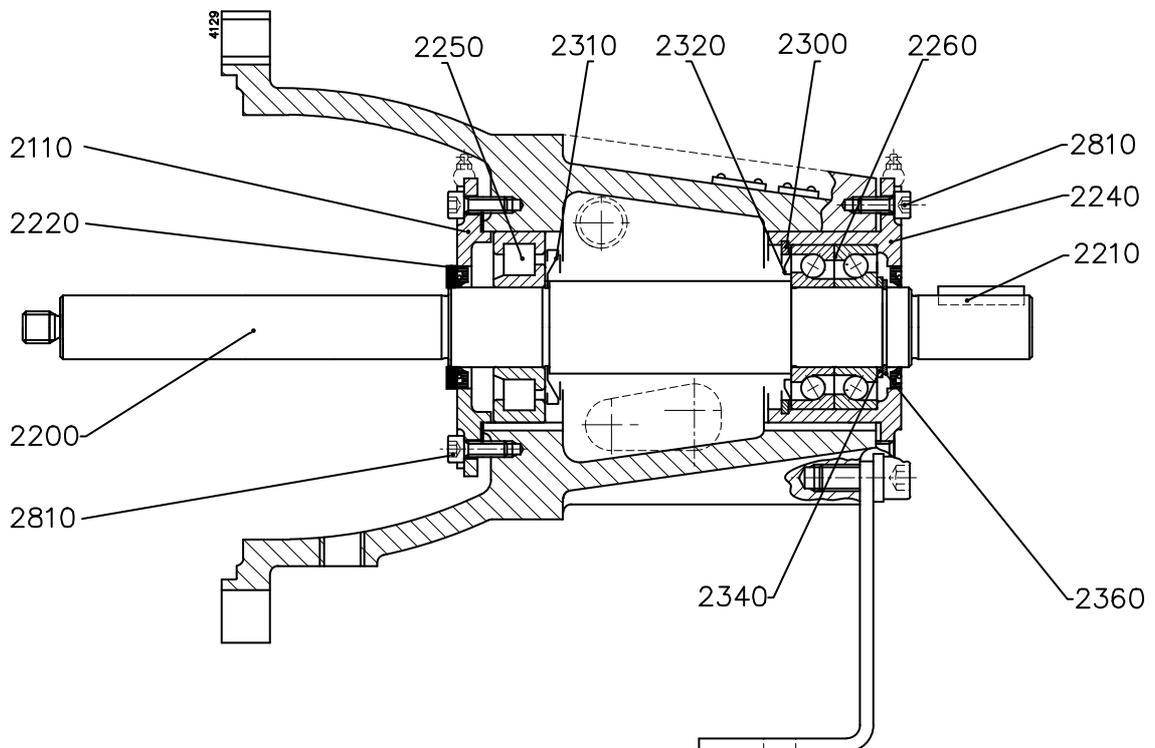


Figure 27: Bearing.

The item numbers used are referring to figure 27.

- 1 Remove the impeller and the shaft seal, see paragraph 7.7.1 "Disassembling the impeller" and paragraph 7.8.2 "Disassembling a mechanical seal M2" / paragraph 7.8.5 "Disassembling of the lip seals M4".
- 2 Remove the coupling guard, see paragraph 7.6.1 "Disassembling the guard".
- 3 Remove the splash ring (2220).
- 4 Remove the Allen screws (2810) and the bearing cover (2110).
- 5 Knock at the impeller side of the pump shaft (2200), until the adjusting bush (2240) with the bearings (2260) comes out of the bearing bracket. Use a plastic hammer so as to avoid damage to the thread. Remove the pump shaft with the bearings from the bearing bracket.
- 6 Remove the coupling with a coupling puller and remove the coupling key (2210).
- 7 Loosen bolts (0940) and remove the assembly plate (0275).
- 8 Remove the inner circlip (2300) and pull the adjusting bush (2240) off the bearings.
- 9 Remove the outer circlip (2360) and the adjusting ring (2340) and pull the bearings from the pump shaft with a suitable puller. If such a puller is not available, knock the inner raceway of the bearing carefully. Use a normal hammer and a soft-metal drift.
Never knock with a hammer directly on the bearing!
- 10 Remove the Nilos rings (2310 and 2320).

7.9.2 Assembly of bearings and pump shaft



Make sure your working environment is clean and leave the bearings in their original packing until you are ready to mount them.

- 1 Clean the interior of the bearing bracket properly.
- 2 Mount the Nilos rings (2310 and 2320) on the pump shaft.



Make sure the Nilos rings are positioned properly!

- 3 If possible, preheat the bearings to 90°C before mounting them on the pump shaft. The cylindrical bearing (2250) is to be mounted on the impeller side. The two angular contact bearings are mounted on the driving side **in O-arrangement**. Make sure all bearings are mounted straight on the pump shaft.



If preheating is not possible: never knock directly on the bearing! Use a mounting bush which is positioned against the inner raceway of the bearing and a normal hammer. A soft hammer may loose splinters which might damage the bearing.

- 4 Mount the adjusting ring (2340) and mount the outer circlip (2360).
- 5 Grease the bearings. See paragraph 10.1 "Recommended greases" for recommended grease types.
- 6 Press the adjusting bush (2240) over the two angular contact bearings and place the inner circlip (2300) in the adjusting bush. Make sure the inner circlip falls into the groove.
- 7 Mount the shaft with the bearings into the bearing bracket from the motor side. Knock the shaft end on the coupling side until the first bearing (2250) slides through the bearing boring.
- 8 Carefully knock the shaft further into the bearing bracket until the adjusting bush (2240) is completely inside the bearing block. The shaft with the bearings should enter straight into the bearing bracket.
- 9 Mount the bearing cover (2110) and the splash ring (2220).
- 10 Mount the set screws (1930) and the Allen screws (2810) and adjust the axial play as described in paragraph 7.10 "Adjustment of the axial play".
- 11 Mount the self-priming part and the impeller as described in paragraph 7.8 "Shaft sealing" and paragraph 7.7.2 "Mounting the impeller".

7.10 Adjustment of the axial play

After repairs to the pump, the axial play of the pump wheel has to be adjusted. This play should be the same on both sides. To adjust the play proceed as follows, see figure 28:

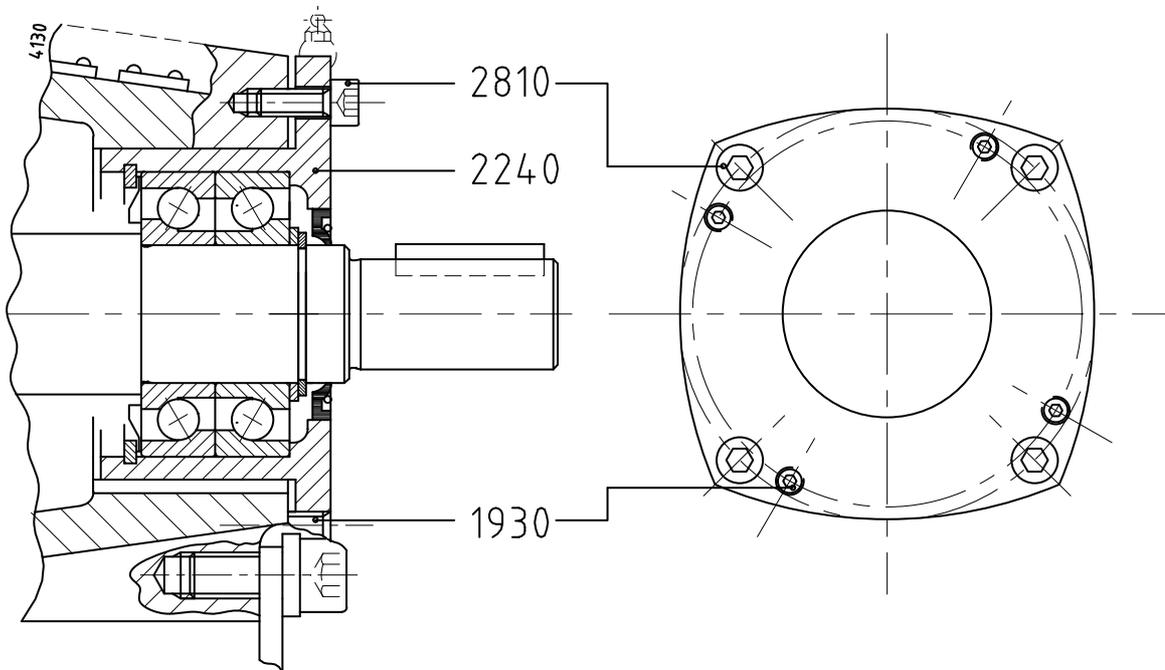


Figure 28: Adjustment of the axial play.

- 1 Loosen the set screws (1930).
- 2 Tighten the Allen screws (2810) crosswise. The adjusting bush (2240) with the bearing, pump shaft and pump wheel is shifting to the left. Turn the pump shaft by hand whilst tightening the screws. Tighten the Allen screws until you feel that the pump wheel starts to drag.
- 3 Screw the set screws (1930) so far into the adjusting bush (2240) until they are just touching the bearing bracket.
- 4 Then loosen the Allen screws (2810) again.
- 5 Re-tighten the set screws (1930) crosswise, whilst turning the pump shaft by hand. Count the number of turns you can give the set screws until the pump wheel starts to turn.
- 6 Then loosen the set screws again by half of the number of tightening turns.
- 7 Now tighten the Allen screws (2810) properly, crosswise.
- 8 Verify that all 4 set screws are fixed tightly.
- 9 Verify that the pump shaft can be turned easily.

➤ *If you wish you can use a clock gauge instead of counting the number of tightening turns of the screws. Determine the position of the shaft end in the two extreme positions of the shaft. Then adjust the shaft end right in the middle of the measured values.*

8 Dimensions

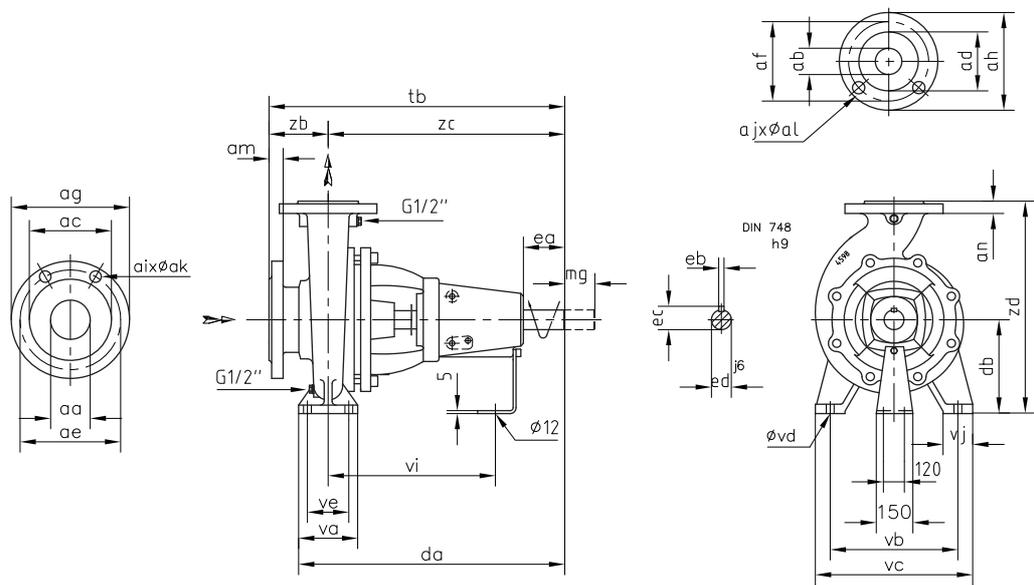


Figure 29: Pump dimensions.

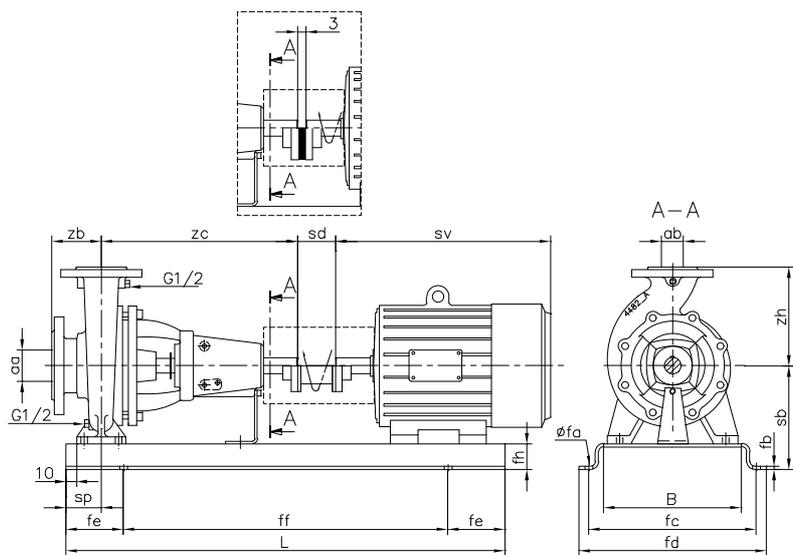


Figure 30: Dimensions pump + electric motor, with spacer-coupling or standard coupling (insert)

8.1 Dimensions pump

See figure 29

| ISO 7005 PN16 | | | | | | | | | | | |
|---------------|-----|-----|-----|-----|-----|-----|-----|---------|---------|----|----|
| aa | ab | ac | ad | ae | af | ag | ah | ai x ak | aj x al | am | an |
| 50 | 32 | 102 | 78 | 125 | 100 | 165 | 140 | 4 x 18 | 4 x 18 | 20 | 18 |
| 65 | 40 | 122 | 88 | 145 | 110 | 185 | 150 | 4 x 18 | 4 x 18 | 20 | 18 |
| 65 | 50 | 122 | 102 | 145 | 125 | 185 | 165 | 4 x 18 | 4 x 18 | 20 | 20 |
| 80 | 65 | 138 | 122 | 160 | 145 | 200 | 185 | 8 x 18 | 4 x 18 | 22 | 20 |
| 100 | 80 | 158 | 138 | 180 | 160 | 220 | 200 | 8 x 18 | 8 x 18 | 22 | 22 |
| 125 | 80 | 188 | 138 | 210 | 160 | 250 | 200 | 8 x 18 | 8 x 18 | 24 | 22 |
| 100 | 100 | 158 | 158 | 180 | 180 | 220 | 220 | 8 x 18 | 8 x 18 | 22 | 22 |
| 125 | 100 | 188 | 158 | 210 | 180 | 250 | 220 | 8 x 18 | 8 x 18 | 24 | 22 |
| 150 | 125 | 212 | 188 | 240 | 210 | 285 | 250 | 8 x 23 | 8 x 18 | 24 | 24 |

ISO 7005 \cong EN 1092-2

| ISO 7005 PN10 | | | | | | | | | | | |
|---------------|-----|-----|-----|-----|-----|-----|-----|---------|---------|----|----|
| aa | ab | ac | ad | ae | af | ag | ah | ai x ak | aj x al | am | an |
| 200 | 150 | 268 | 212 | 295 | 240 | 340 | 285 | 8 x 23 | 8 x 23 | 26 | 24 |
| 200 | 200 | 268 | 268 | 295 | 295 | 340 | 340 | 8 x 23 | 8 x 23 | 26 | 26 |

ISO 7005 \cong EN 1092-2

| CH | aa | ab | da | db | ea | eb | ec | ed | mg | tb | va | vb | vc | vd | ve | vf | vi | vj | zb | zc | zd | [kg] |
|----------|-----|-----|-----|-----|-----|----|----|----|-----|-----|-----|-----|-----|----|-----|----|-----|-----|-----|-----|-----|------|
| 32-160 | 50 | 32 | 410 | 132 | 45 | 8 | 27 | 24 | 100 | 440 | 100 | 190 | 240 | 14 | 70 | 12 | 268 | 50 | 80 | 360 | 292 | 34 |
| 32C-160 | | | 410 | 132 | 45 | 8 | 27 | 24 | 100 | 440 | 100 | 190 | 240 | 14 | 70 | 12 | 268 | 50 | 80 | 360 | 292 | 34 |
| 32-200 | | | 410 | 160 | 45 | 8 | 27 | 24 | 100 | 440 | 100 | 190 | 240 | 14 | 70 | 12 | 268 | 50 | 80 | 360 | 340 | 35 |
| 32C-200 | | | 410 | 160 | 45 | 8 | 27 | 24 | 100 | 440 | 100 | 190 | 240 | 14 | 70 | 12 | 268 | 50 | 80 | 360 | 340 | 35 |
| 32-250 | | | 533 | 180 | 75 | 10 | 35 | 32 | 100 | 570 | 125 | 250 | 320 | 14 | 95 | 14 | 346 | 65 | 100 | 470 | 405 | 50 |
| 40C-160 | 65 | 40 | 410 | 132 | 45 | 8 | 27 | 24 | 100 | 440 | 100 | 190 | 240 | 14 | 70 | 12 | 268 | 50 | 80 | 360 | 292 | 38 |
| 40C-200 | | | 410 | 160 | 45 | 8 | 27 | 24 | 100 | 460 | 100 | 212 | 265 | 14 | 70 | 12 | 268 | 50 | 100 | 360 | 340 | 46 |
| 40-250 | | | 533 | 180 | 75 | 10 | 35 | 32 | 100 | 570 | 125 | 250 | 320 | 14 | 95 | 14 | 346 | 65 | 100 | 470 | 405 | 60 |
| 50C-160 | 65 | 50 | 410 | 160 | 45 | 8 | 27 | 24 | 100 | 460 | 100 | 212 | 265 | 14 | 70 | 12 | 268 | 50 | 100 | 360 | 340 | 40 |
| 50C-200 | | | 410 | 160 | 45 | 8 | 27 | 24 | 100 | 460 | 100 | 212 | 265 | 14 | 70 | 12 | 268 | 50 | 100 | 360 | 360 | 55 |
| 50-250 | | | 533 | 180 | 75 | 10 | 35 | 32 | 100 | 570 | 125 | 250 | 320 | 14 | 95 | 14 | 346 | 65 | 100 | 470 | 405 | 70 |
| 65C-160 | 80 | 65 | 423 | 160 | 45 | 8 | 27 | 24 | 100 | 460 | 125 | 212 | 280 | 14 | 95 | 12 | 268 | 65 | 100 | 360 | 360 | 50 |
| 65C-200 | | | 423 | 180 | 45 | 8 | 27 | 24 | 140 | 460 | 125 | 250 | 320 | 14 | 95 | 14 | 268 | 65 | 100 | 360 | 405 | 65 |
| 65A-250 | | | 550 | 200 | 75 | 10 | 35 | 32 | 140 | 570 | 160 | 280 | 360 | 18 | 120 | 14 | 346 | 80 | 100 | 470 | 450 | 85 |
| 65-315 | | | 610 | 225 | 110 | 12 | 45 | 42 | 140 | 655 | 160 | 315 | 400 | 18 | 120 | 16 | 368 | 80 | 125 | 530 | 505 | 100 |
| 80C-160 | 100 | 80 | 423 | 180 | 45 | 8 | 27 | 24 | 140 | 485 | 125 | 250 | 320 | 14 | 95 | 14 | 268 | 65 | 125 | 360 | 405 | 50 |
| 80C-200 | | | 533 | 180 | 75 | 10 | 35 | 32 | 140 | 595 | 125 | 280 | 345 | 14 | 95 | 14 | 346 | 65 | 125 | 470 | 430 | 75 |
| 80-250 | | | 550 | 200 | 75 | 10 | 35 | 32 | 140 | 595 | 160 | 315 | 400 | 18 | 120 | 15 | 346 | 80 | 125 | 470 | 480 | 88 |
| 80A-250 | | | 550 | 200 | 75 | 10 | 35 | 32 | 140 | 595 | 160 | 315 | 400 | 18 | 120 | 15 | 346 | 80 | 125 | 470 | 480 | 88 |
| 80-315 | | | 610 | 250 | 110 | 12 | 45 | 42 | 140 | 655 | 160 | 315 | 400 | 18 | 120 | 16 | 368 | 80 | 125 | 530 | 565 | 120 |
| 80-400 | | | 610 | 280 | 110 | 12 | 45 | 42 | 140 | 655 | 160 | 355 | 435 | 18 | 120 | 18 | 368 | 80 | 125 | 530 | 635 | 150 |
| 100-160 | 125 | 100 | 550 | 200 | 75 | 10 | 35 | 32 | 100 | 595 | 160 | 280 | 360 | 18 | 120 | 15 | 346 | 80 | 125 | 470 | 515 | 85 |
| 100C-200 | | | 550 | 200 | 75 | 10 | 35 | 32 | 140 | 595 | 160 | 280 | 360 | 18 | 120 | 15 | 346 | 80 | 125 | 470 | 480 | 90 |
| 100C-250 | | | 550 | 225 | 75 | 10 | 35 | 32 | 140 | 610 | 160 | 315 | 400 | 18 | 120 | 16 | 346 | 80 | 140 | 470 | 505 | 110 |
| 100-315 | | | 610 | 250 | 110 | 12 | 45 | 42 | 140 | 670 | 160 | 315 | 400 | 18 | 120 | 18 | 368 | 80 | 140 | 530 | 565 | 140 |
| 100-400 | | | 630 | 280 | 110 | 12 | 45 | 42 | 140 | 670 | 200 | 400 | 500 | 23 | 150 | 20 | 368 | 100 | 140 | 530 | 635 | 185 |
| 125-250 | 150 | 125 | 550 | 250 | 75 | 10 | 35 | 32 | 140 | 610 | 160 | 315 | 400 | 18 | 120 | 18 | 346 | 80 | 140 | 470 | 605 | 130 |
| 125-315 | | | 630 | 280 | 110 | 12 | 45 | 42 | 140 | 670 | 200 | 400 | 500 | 23 | 150 | 20 | 368 | 100 | 140 | 530 | 635 | 185 |
| 125-400 | | | 630 | 315 | 110 | 12 | 45 | 42 | 140 | 670 | 200 | 400 | 500 | 23 | 150 | 20 | 368 | 100 | 140 | 530 | 715 | 200 |
| 150-315 | 200 | 150 | 630 | 280 | 110 | 12 | 45 | 42 | 140 | 690 | 200 | 450 | 550 | 23 | 150 | 22 | 368 | 100 | 160 | 530 | 680 | 185 |
| 150-400 | | | 630 | 315 | 110 | 12 | 45 | 42 | 140 | 690 | 200 | 450 | 550 | 23 | 150 | 22 | 368 | 100 | 160 | 530 | 765 | 220 |
| 200-200 | 200 | 200 | 570 | 280 | 75 | 10 | 35 | 32 | 100 | 670 | 200 | 400 | 500 | 23 | 150 | 20 | 346 | 100 | 200 | 470 | 680 | 170 |

8.2 Dimensions pump and motor with standard coupling

See figure 30.

| Type CH | aa ab sp zb zc zh sv(*) | | | | | | | IEC Motor IP55 | | | | | | | | | | | | | | | | | | | | | | |
|---------|-------------------------|-----|----|-----|-----|-----|-----|----------------|------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|--|--|--|--|--|--|--|
| | | | | | | | | 90 S | 90 L | 100 L | 112 M | 132 S | 132 M | 160 M | 160 L | 180 M | 180 L | 200 L | 225 S | 225 M | 250 M | 280 S | 280 M | | | | | | | |
| | | | | | | | | 336 | 348 | 402 | 432 | 486 | 520 | 652 | 672 | 712 | 742 | 790 | 904 | 904 | 1014 | 1124 | 1176 | | | | | | | |
| 32-160 | 50 | 32 | 60 | 80 | 360 | 160 | sb | 177 | 177 | 177 | 177 | 177 | | | | | | | | | | | | | | | | | | |
| | | | x | 1 | 1 | 1 | 1 | 1 | | | | | | | | | | | | | | | | | | | | | | |
| 32C-160 | | | 60 | 80 | 360 | 160 | sb | 177 | 177 | 177 | 177 | 177 | | | | | | | | | | | | | | | | | | |
| | | | x | 1 | 1 | 1 | 1 | 1 | | | | | | | | | | | | | | | | | | | | | | |
| 32-200 | | | 60 | 80 | 360 | 180 | sb | | | 205 | 205 | 205 | | 223 | | | | | | | | | | | | | | | | |
| | | | x | | | | | | | | 1 | 1 | 1 | | 2 | | | | | | | | | | | | | | | |
| 32C-200 | | | 60 | 80 | 360 | 180 | sb | | | 205 | 205 | 205 | | 223 | | | | | | | | | | | | | | | | |
| | | | x | | | | | | | | 1 | 1 | 1 | | 2 | | | | | | | | | | | | | | | |
| 32-250 | 50 | 32 | 72 | 100 | 470 | 225 | sb | | | 243 | 243 | 243 | | 260 | 260 | | | | | | | | | | | | | | | |
| | | | x | | | | | | | | 2 | | 2 | | 3 | 3 | | | | | | | | | | | | | | |
| 40C-160 | | | 65 | 40 | 60 | 80 | 360 | 160 | sb | | 177 | 177 | 177 | 177 | | 223 | | | | | | | | | | | | | | |
| | | | | | x | | | | | | | 1 | 1 | 1 | 1 | | 2 | | | | | | | | | | | | | |
| 40C-200 | | | | | 60 | 100 | 360 | 180 | sb | | | | 205 | 205 | | 223 | 223 | | | | | | | | | | | | | |
| | | | | | x | | | | | | | | | 1 | 1 | | 2 | 2 | | | | | | | | | | | | |
| 40-250 | | | | | 72 | 100 | 470 | 225 | sb | | | 243 | 243 | 243 | | 260 | 260 | 260 | | | | | | | | | | | | |
| | | | | | x | | | | | | | | 2 | 2 | 2 | | 3 | 3 | 3 | | | | | | | | | | | |
| 50C-160 | 65 | 50 | | | 60 | 100 | 360 | 180 | sb | | 205 | 205 | 205 | 205 | | 223 | | | | | | | | | | | | | | |
| | | | | | x | | | | | | | 1 | 1 | 1 | 1 | | 2 | | | | | | | | | | | | | |
| 50C-200 | | | 60 | 100 | 360 | 200 | sb | | | 205 | 205 | 205 | | 223 | 223 | 260 | | 290 | | | | | | | | | | | | |
| | | | x | | | | | | | | 1 | 1 | 1 | | 2 | 2 | 3 | | 4 | | | | | | | | | | | |
| 50-250 | | | 72 | 100 | 470 | 225 | sb | | | 243 | 243 | 243 | 243 | 260 | 260 | 260 | | 290 | | | | | | | | | | | | |
| | | | x | | | | | | | | 2 | 2 | 2 | 2 | 3 | 3 | 3 | | 4 | | | | | | | | | | | |
| 65C-160 | | | 80 | 65 | 72 | 100 | 360 | 200 | sb | | | | | 205 | | 223 | 223 | 260 | | 290 | | | | | | | | | | |
| | | | | | x | | | | | | | | | | 1 | | 2 | 2 | 3 | | 4 | | | | | | | | | |
| 65C-200 | 72 | 100 | | | 360 | 225 | sb | | | | | 243 | | 243 | 243 | 260 | | 290 | | | | | | | | | | | | |
| | x | | | | | | | | | | | | 2 | | 2 | 2 | 3 | | 4 | | | | | | | | | | | |
| 65A-250 | 90 | 100 | | | 470 | 250 | sb | | | 280 | 280 | 280 | 280 | 280 | 280 | 280 | 280 | | 290 | | 315 | | | | | | | | | |
| | x | | | | | | | | | | 3 | 3 | 3 | 3 | 3 | 3 | 3 | | 4 | | 4 | | | | | | | | | |
| 65-315 | 90 | 125 | | | 530 | 280 | sb | | | | 315 | 315 | 315 | 315 | 315 | 315 | 315 | | | | | | | | | | | | | |
| | x | | | | | | | | | | | 4 | 4 | 4 | 4 | 4 | 4 | | | | | | | | | | | | | |

| Type CH | IEC Motor IP55 | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----------------|-----|-----|-----|-----|-----|-------|------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|------|-----|--|
| | | | | | | | 90 S | 90 L | 100 L | 112 M | 132 S | 132 M | 160 M | 160 L | 180 M | 180 L | 200 L | 225 S | 225 M | 250 M | 280 S | 280 M | | | |
| | aa | ab | sp | zb | zc | zh | sv(*) | 336 | 348 | 402 | 432 | 486 | 520 | 652 | 672 | 712 | 742 | 790 | 904 | 904 | 1014 | 1124 | 1176 | | |
| 80C-160 | 100 | 80 | 72 | 125 | 360 | 225 | sb | | | | | 243 | | 243 | 243 | 260 | | 290 | | | | | | | |
| | | | | | | | | x | | | | | 2 | | 2 | 2 | 3 | | 4 | | | | | | |
| 80C-200 | | | | | 72 | 125 | 470 | 250 | sb | | | | | 260 | | 260 | 260 | 260 | | 290 | | 315 | 380 | 410 | |
| | | | | | | | | | x | | | | | 3 | | 3 | 3 | 3 | | 4 | | 4 | 6 | 6 | |
| 80-250 | | | | | 72 | 125 | 470 | 280 | sb | | | | 290 | 290 | 290 | 290 | 290 | 290 | | 290 | | 315 | 380 | 410 | |
| | | | | | | | | | x | | | | 4 | 4 | 4 | 4 | 4 | 4 | | 4 | | 4 | 6 | 6 | |
| 80A-250 | | | | | 72 | 125 | 470 | 280 | sb | | | | 290 | 290 | 290 | 290 | 290 | 290 | | 290 | | 315 | 380 | 410 | |
| | | | | | | | | | x | | | | 4 | 4 | 4 | 4 | 4 | 4 | | 4 | | 4 | 6 | 6 | |
| 80-315 | | | | | 90 | 125 | 530 | 315 | sb | | | | 340 | 340 | 340 | 340 | 340 | 340 | 340 | 340 | | | | | |
| | | | | | | | | | x | | | | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | | | | | |
| 80-400 | 125 | 80 | 90 | 125 | 530 | 355 | sb | | | | | 370 | 370 | 370 | 370 | 370 | 370 | 370 | | | | | | | |
| | | | | | | | | x | | | | | 4 | 4 | 4 | 4 | 4 | 4 | 4 | | | | | | |
| 100-160 | 125 | 100 | 90 | 125 | 470 | 315 | sb | | | | | | 280 | 280 | 280 | | 290 | | 315 | 380 | | | | | |
| | | | | | | | | x | | | | | | 3 | 3 | 3 | | 4 | | 4 | 6 | | | | |
| 100C-200 | | | | | 90 | 125 | 470 | 280 | sb | | | | | | 280 | 280 | | 290 | | 315 | 380 | 410 | | | |
| | | | | | | | | | x | | | | | | 3 | 3 | | 4 | | 4 | 6 | 6 | | | |
| 100C-250 | | | | | 90 | 140 | 470 | 280 | sb | | | 315 | 315 | 315 | 315 | 315 | 315 | | 315 | | 315 | 380 | 410 | 410 | |
| | | | | | | | | | x | | | 4 | 4 | 4 | 4 | 4 | 4 | | 4 | | 4 | 6 | 6 | 6 | |
| 100-315 | | | | | 90 | 140 | 530 | 315 | sb | | | | 340 | 340 | 340 | 340 | 340 | 340 | 340 | | | | | | |
| | | | | | | | | | x | | | | 4 | 4 | 4 | 4 | 4 | 4 | 4 | | | | | | |
| 100-400 | | | | | 110 | 140 | 530 | 355 | sb | | | | 370 | 370 | 370 | 370 | 370 | 370 | 370 | 370 | 410 | 410 | 410 | | |
| | | | | | | | | | x | | | | 4 | 4 | 4 | 4 | | 4 | 4 | 6 | 6 | 6 | | | |
| 125-250 | 150 | 125 | 90 | 140 | 470 | 355 | sb | | | | 340 | 340 | 340 | 340 | 340 | 340 | 340 | | | | | | | | |
| | | | | | | | | x | | | | 4 | 4 | 4 | 4 | 4 | 4 | 4 | | | | | | | |
| 125-315 | | | | | 110 | 140 | 530 | 355 | sb | | | | 370 | 370 | 370 | 370 | 370 | 370 | 370 | 410 | 410 | 410 | | | |
| | | | | | | | | | x | | | | 4 | 4 | 4 | 4 | 4 | 4 | 6 | 6 | 6 | | | | |
| 125-400 | | | | | 110 | 140 | 530 | 400 | sb | | | | 405 | 405 | 405 | 405 | 405 | 405 | 445 | 445 | 445 | 445 | 445 | | |
| | | | | | | | | | x | | | | 4 | 4 | 4 | 4 | 4 | 6 | 6 | 6 | 6 | 6 | 6 | | |
| 150-315 | 200 | 150 | 110 | 160 | 530 | 400 | sb | | | | | | 410 | 410 | 410 | 410 | 410 | 410 | 410 | 410 | 410 | | | | |
| | | | | | | | | x | | | | | | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | | | |
| 150-400 | | | | | 110 | 160 | 530 | 450 | sb | | | | | | 445 | 445 | 445 | 445 | 445 | 445 | 445 | 445 | | | |
| | | | | | | | | | x | | | | | | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | | | |
| 200-200 | 200 | 200 | 110 | 200 | 470 | 400 | sb | | | | | | 370 | 370 | 370 | 370 | | | | | | | | | |
| | | | | | | | | x | | | | | | 4 | 4 | 4 | 4 | | | | | | | | |

x = Base plate number

(*) Motor length based on DIN 42673, could be different due to applied motor make

8.3 Dimensions pump and motor with spacer coupling

See figure 30.

| Type CH | IEC Motor IP55 | | | | | | | | IEC Motor IP55 | | | | | | | | | | | | | | | | |
|---------|----------------|-----|-----|-----|-----|-----|-------------------|-----|----------------|------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|--|
| | | | | | | | | | 90 S | 90 L | 100 L | 112 M | 132 S | 132 M | 160 M | 160 L | 180 M | 180 L | 200 L | 225 S | 225 M | 250 M | 280 S | 280 M | |
| | | | | | | | | | 336 | 348 | 402 | 432 | 486 | 520 | 652 | 672 | 712 | 742 | 790 | 904 | 904 | 1014 | 1124 | 1176 | |
| aa | ab | sd | sp | zb | zc | zh | sv ^(*) | 336 | 348 | 402 | 432 | 486 | 520 | 652 | 672 | 712 | 742 | 790 | 904 | 904 | 1014 | 1124 | 1176 | | |
| 32-160 | 50 | 32 | 100 | 60 | 80 | 360 | 160 | sb | 177 | 177 | 195 | 195 | 195 | | | | | | | | | | | | |
| | | | | | | | | x | 1 | 1 | 2 | 2 | 2 | | | | | | | | | | | | |
| 32-200 | | | 100 | 60 | 80 | 360 | 180 | sb | | | 223 | 223 | 223 | | 223 | | | | | | | | | | |
| | | | | | | | | x | | | 2 | 2 | 2 | | 2 | | | | | | | | | | |
| 32-250 | | | 100 | 72 | 100 | 470 | 225 | sb | | | 243 | 243 | 243 | | 260 | 260 | | | | | | | | | |
| | | | | | | | | x | | | 2 | | 2 | | 3 | 3 | | | | | | | | | |
| 40-160 | 65 | 40 | 100 | 60 | 80 | 360 | 160 | sb | | 177 | 195 | 195 | 195 | | 223 | | | | | | | | | | |
| | | | | | | | | x | | 1 | 2 | 2 | 2 | | 2 | | | | | | | | | | |
| 40-200 | | | 100 | 60 | 100 | 360 | 180 | sb | | | | 223 | 223 | | 223 | 240 | | | | | | | | | |
| | | | | | | | | x | | | | 2 | 2 | | 2 | 3 | | | | | | | | | |
| 40-250 | | | 100 | 72 | 100 | 470 | 225 | sb | | | 243 | 243 | 243 | | 260 | 260 | 260 | | | | | | | | |
| | | | | | | | | x | | | 2 | 2 | 2 | | 3 | 3 | 3 | | | | | | | | |
| 50-160 | 65 | 50 | 100 | 60 | 100 | 360 | 180 | sb | | 205 | 223 | 223 | 223 | | 223 | | | | | | | | | | |
| | | | | | | | | x | | 1 | 2 | 2 | 2 | | 2 | | | | | | | | | | |
| 50-200 | | | 100 | 60 | 100 | 360 | 200 | sb | | | 223 | 223 | 223 | | 223 | 240 | 260 | | 290 | | | | | | |
| | | | | | | | | x | | | 2 | 2 | 2 | | 2 | 3 | 3 | | 4 | | | | | | |
| 50-250 | | | 100 | 72 | 100 | 470 | 225 | sb | | | 243 | 243 | 243 | 260 | 260 | 260 | 260 | | 290 | | | | | | |
| | | | | | | | | x | | | 2 | 2 | 2 | 3 | 3 | 3 | 3 | | 4 | | | | | | |
| 65-160 | 80 | 65 | 100 | 72 | 100 | 360 | 200 | sb | | | | | 223 | | 240 | 240 | 260 | | 290 | | | | | | |
| | | | | | | | | x | | | | | 2 | | 3 | 3 | 3 | | 4 | | | | | | |
| 65-200 | | | 140 | 72 | 100 | 360 | 225 | sb | | | | 243 | | 260 | 260 | 260 | | 290 | | | | | | | |
| | | | | | | | | x | | | | | 2 | | 3 | 3 | 3 | | 4 | | | | | | |
| 65-250 | | | 140 | 90 | 100 | 470 | 250 | sb | | | 280 | 280 | 280 | 280 | 280 | 280 | 280 | | 300 | | 325 | | | | |
| | | | | | | | | x | | | 3 | 3 | 3 | 3 | 3 | 3 | 3 | | 5 | | 5 | | | | |
| 65-315 | 140 | 90 | 125 | 530 | 280 | sb | | | | 315 | 315 | 315 | 315 | 325 | 325 | | | | | | | | | | |
| | | | | | | x | | | | 4 | 4 | 4 | 4 | 5 | 5 | | | | | | | | | | |
| 80-160 | 100 | 80 | 140 | 72 | 125 | 360 | 225 | sb | | | | | 243 | | 260 | 260 | 260 | | 290 | | | | | | |
| | | | | | | | | x | | | | | 2 | | 3 | 3 | 3 | | 4 | | | | | | |
| 80-200 | | | 140 | 72 | 125 | 470 | 250 | sb | | | | | 260 | | 260 | 260 | 260 | | 300 | | 325 | 380 | 410 | | |
| | | | | | | | | x | | | | | 3 | | 3 | 3 | 3 | | 5 | | 5 | 6 | 6 | | |
| 80-250 | | | 140 | 72 | 125 | 470 | 280 | sb | | | | | 290 | 290 | 290 | 290 | 290 | | 300 | | 325 | 380 | 410 | | |
| | | | | | | | | x | | | | | 4 | 4 | 4 | 4 | 4 | | 5 | | 5 | 6 | 6 | | |
| 80-315 | 140 | 90 | 125 | 530 | 315 | sb | | | | | 340 | 340 | 340 | 340 | 350 | 350 | 350 | | | | | | | | |
| | | | | | | x | | | | | 4 | 4 | 4 | 4 | 5 | 5 | 5 | | | | | | | | |
| 80-400 | 125 | 80 | 140 | 90 | 125 | 530 | 355 | sb | | | | | | 370 | 370 | 380 | 380 | 380 | 380 | | | | | | |
| | | | | | | x | | | | | | | 4 | 4 | 5 | 5 | 5 | | | | | | | | |
| 100-125 | 100 | 100 | 100 | 72 | 125 | 360 | 250 | sb | | | | | 243 | | 260 | 260 | 260 | | 290 | | | | | | |
| | | | | | | | | x | | | | | 2 | | 3 | 3 | 3 | | 4 | | | | | | |

| Type CH | IEC Motor IP55 | | | | | | | | | | | | | | | | | | | | | | | | | |
|---------|----------------|-----|-----|-----|-----|-----|-----|-------|------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|------|-----|-----|
| | | | | | | | | 90 S | 90 L | 100 L | 112 M | 132 S | 132 M | 160 M | 160 L | 180 M | 180 L | 200 L | 225 S | 225 M | 250 M | 280 S | 280 M | | | |
| | aa | ab | sd | sp | zb | zc | zh | sv(*) | 336 | 348 | 402 | 432 | 486 | 520 | 652 | 672 | 712 | 742 | 790 | 904 | 904 | 1014 | 1124 | 1176 | | |
| 100-160 | 125 | 100 | 100 | 90 | 125 | 470 | 315 | sb | | | | | | | 280 | 280 | 280 | | 300 | | 325 | 380 | | | | |
| | | | | | | | | x | | | | | | | | 3 | 3 | 3 | | 5 | | 5 | 6 | | | |
| 100-200 | | | | | 140 | 90 | 125 | 470 | 280 | sb | | | | | | | 280 | 280 | | 300 | | 325 | 380 | 410 | | |
| | | | | | | | | | x | | | | | | | | 3 | 3 | | 5 | | 5 | 6 | 6 | | |
| 100-250 | | | | | 140 | 90 | 140 | 470 | 280 | sb | | | | 315 | 315 | 315 | 315 | 315 | 315 | | 325 | | 325 | 380 | 410 | 410 |
| | | | | | | | | | x | | | | 4 | 4 | 4 | 4 | 4 | 4 | | 5 | | 5 | 6 | 6 | 6 | |
| 100-315 | | | | | 140 | 90 | 140 | 530 | 315 | sb | | | | | 340 | 340 | 340 | 350 | 350 | 350 | 350 | | | | | |
| | | | | | | | | | x | | | | | | 4 | 4 | 4 | 5 | 5 | 5 | 5 | | | | | |
| 100-400 | | | 140 | 110 | 140 | 530 | 355 | sb | | | | | 370 | 370 | 410 | 410 | 410 | 410 | 410 | 410 | 410 | 410 | 410 | | | |
| | | | | | | | x | | | | | | 4 | 4 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | | | |
| 125-250 | 150 | 125 | 140 | 90 | 140 | 470 | 355 | sb | | | | | 340 | 340 | 340 | 340 | 340 | 350 | 350 | | | | | | | |
| | | | | | | | | x | | | | | | 4 | 4 | 4 | 4 | 4 | 5 | 5 | | | | | | |
| 125-315 | | | | | 140 | 110 | 140 | 530 | 355 | sb | | | | | 370 | 410 | 410 | 410 | 410 | 410 | 410 | 410 | 410 | 410 | | |
| | | | | | | | | | x | | | | | | 4 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | | |
| 125-400 | | | | | 140 | 110 | 140 | 530 | 400 | sb | | | | | 405 | 445 | 445 | 445 | 445 | 445 | 445 | 445 | 445 | 445 | 445 | 445 |
| | | | | | | | | | x | | | | | | 4 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 |
| 150-315 | 200 | 150 | 140 | 110 | 160 | 530 | 400 | sb | | | | | | | 410 | 410 | 410 | 410 | 410 | 410 | 410 | 410 | 410 | 410 | | |
| | | | | | | | | x | | | | | | | | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | |
| 150-400 | | | | | 140 | 110 | 160 | 530 | 450 | sb | | | | | | | 445 | 445 | 445 | 445 | 445 | 445 | 445 | 445 | 445 | 445 |
| | | | | | | | | | x | | | | | | | | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 |
| 200-200 | 200 | 200 | 140 | 110 | 200 | 470 | 400 | sb | | | | | | | 370 | 410 | 410 | 410 | | | | | | | | |
| | | | | | | | x | | | | | | | | 4 | 6 | 6 | 6 | | | | | | | | |

x = Base plate number

(*) Motor length based on DIN 42673, could be different due to applied motor make

8.4 Dimensions base plate

| Base plate number | [mm] | | | | | | | | | Weight [kg] |
|-------------------|------|-----|----|----|-----|-----|-----|------|-----|-------------|
| | L | B | fa | fb | fc | fd | fe | ff | fh | |
| 1 | 800 | 305 | 19 | 6 | 385 | 433 | 120 | 560 | 45 | 20 |
| 2 | 1000 | 335 | 19 | 8 | 425 | 473 | 145 | 710 | 63 | 38 |
| 3 | 1250 | 375 | 24 | 10 | 485 | 545 | 175 | 900 | 80 | 69 |
| 4 | 1250 | 500 | 24 | 10 | 610 | 678 | 175 | 900 | 90 | 79 |
| 5 | 1600 | 480 | 24 | 10 | 590 | 658 | 240 | 1120 | 100 | 107 |
| 6 | 1650 | 600 | 24 | 10 | 720 | 788 | 240 | 1170 | 130 | 129 |

8.5 Dimensions pump with service liquid tank

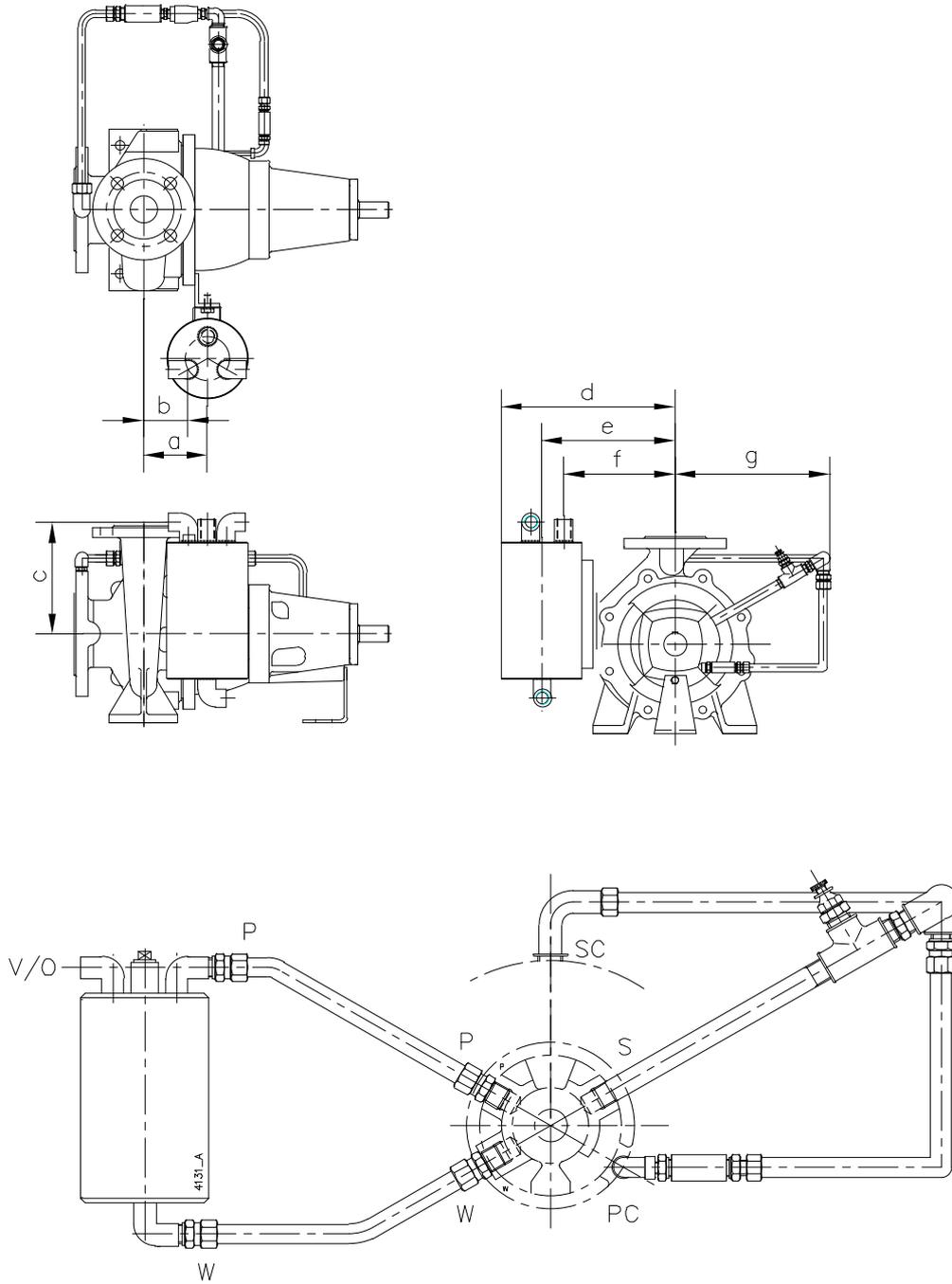


Figure 31: Dimensions pump with service liquid tank.

| CH | a | b | c | d | e | f | g* | g** |
|----------|-----|-----|-----|-----|-----|-----|-----|-----|
| 32-160 | 94 | 66 | 165 | 275 | 215 | 183 | 200 | - |
| 32C-160 | 94 | 66 | 165 | 275 | 215 | 183 | 200 | - |
| 32-200 | 94 | 66 | 155 | 300 | 240 | 208 | 200 | - |
| 32C-200 | 94 | 66 | 155 | 300 | 240 | 208 | 200 | - |
| 32-250 | 109 | 81 | 165 | 330 | 270 | 238 | 200 | 235 |
| 40C-160 | 94 | 66 | 165 | 275 | 215 | 183 | 200 | - |
| 40C-200 | 94 | 66 | 155 | 300 | 240 | 208 | 200 | - |
| 40-250 | 109 | 81 | 165 | 330 | 270 | 238 | 200 | 235 |
| 50C-160 | 94 | 66 | 165 | 275 | 215 | 183 | 200 | - |
| 50C-200 | 94 | 66 | 155 | 300 | 240 | 208 | 200 | - |
| 50-250 | 109 | 81 | 165 | 330 | 270 | 238 | 200 | 235 |
| 65C-160 | 94 | 66 | 165 | 275 | 215 | 183 | 200 | - |
| 65C-200 | 94 | 66 | 155 | 300 | 240 | 208 | 200 | - |
| 65A-250 | 109 | 81 | 165 | 330 | 270 | 238 | 200 | 235 |
| 65-315 | 140 | 112 | 130 | 345 | 285 | 253 | - | 305 |
| 80C-160 | 94 | 66 | 165 | 275 | 215 | 183 | 200 | - |
| 80C-200 | 109 | 81 | 155 | 300 | 240 | 208 | 200 | - |
| 80-250 | 109 | 81 | 165 | 330 | 270 | 238 | 200 | 235 |
| 80A-250 | 109 | 81 | 165 | 330 | 270 | 238 | 200 | 235 |
| 80-315 | 140 | 112 | 130 | 345 | 285 | 253 | - | 305 |
| 80-400 | 132 | 104 | 130 | 395 | 335 | 303 | - | 305 |
| 100-160 | 109 | 81 | 155 | 300 | 240 | 208 | 200 | - |
| 100C-200 | 109 | 81 | 155 | 300 | 240 | 208 | 200 | - |
| 100C-250 | 109 | 81 | 165 | 330 | 270 | 238 | 200 | 235 |
| 100-315 | 140 | 112 | 130 | 345 | 285 | 253 | - | 305 |
| 100-400 | 132 | 104 | 130 | 395 | 335 | 303 | - | 305 |
| 125-250 | 109 | 81 | 165 | 330 | 270 | 238 | - | 305 |
| 125-315 | 140 | 112 | 130 | 345 | 285 | 253 | - | 305 |
| 125-400 | 132 | 104 | 130 | 395 | 335 | 303 | - | 305 |
| 150-315 | 140 | 112 | 130 | 345 | 285 | 253 | - | 305 |
| 150-400 | 132 | 104 | 130 | 395 | 335 | 303 | - | 305 |
| 200-200 | 109 | 81 | 165 | 330 | 270 | 238 | - | 305 |

* $n = 2400 - 3600 \text{ min}^{-1}$

** $n = 1450 - 2400 \text{ min}^{-1}$

Connections

| V/O | De-aeration / Overflow | Rp $\frac{1}{2}$ |
|-----|---------------------------|------------------|
| S | Inlet self-priming pump | Rp $\frac{1}{2}$ |
| SP | Air-intake line | Rp $\frac{1}{2}$ |
| P | Outlet self-priming pump | Rp $\frac{1}{2}$ |
| W | Inlet service liquid | Rp $\frac{1}{2}$ |
| SC | Suction flange connection | Rp $\frac{1}{2}$ |

8.6 Dimensions pump with float de-aerator

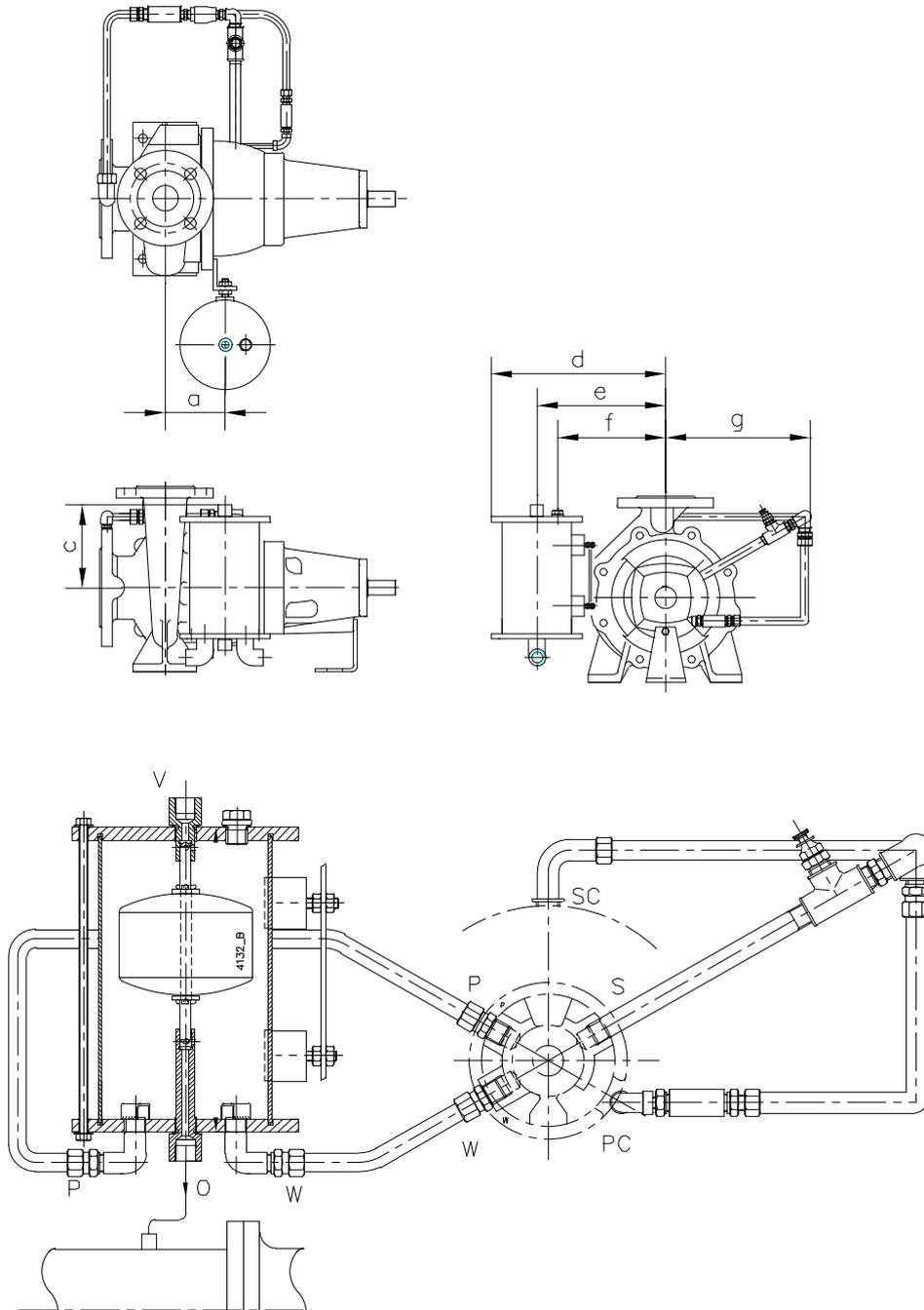


Figure 32: Dimensions pump with float de-aerator.

| CH | a | c | d | e | f | g* | g** |
|----------|-----|-----|-----|-----|-----|-----|-----|
| 32-160 | 94 | 243 | 378 | 268 | 268 | 200 | - |
| 32C-160 | 94 | 243 | 378 | 268 | 268 | 200 | - |
| 32-200 | 94 | 233 | 402 | 292 | 292 | 200 | - |
| 32C-200 | 94 | 233 | 402 | 292 | 292 | 200 | - |
| 32-250 | 109 | 243 | 432 | 322 | 322 | 200 | 235 |
| 40C-160 | 94 | 243 | 378 | 268 | 268 | 200 | - |
| 40C-200 | 94 | 233 | 402 | 292 | 292 | 200 | - |
| 40-250 | 109 | 243 | 432 | 322 | 322 | 200 | 235 |
| 50C-160 | 94 | 243 | 378 | 268 | 268 | 200 | - |
| 50C-200 | 94 | 233 | 402 | 292 | 292 | 200 | - |
| 50-250 | 109 | 243 | 432 | 322 | 322 | 200 | 235 |
| 65C-160 | 94 | 243 | 378 | 268 | 268 | 200 | - |
| 65C-200 | 94 | 233 | 402 | 292 | 292 | 200 | - |
| 65A-250 | 109 | 243 | 432 | 322 | 322 | 200 | 235 |
| 65-315 | 140 | 209 | 447 | 337 | 337 | - | 305 |
| 80C-160 | 94 | 243 | 378 | 268 | 268 | 200 | - |
| 80C-200 | 109 | 233 | 402 | 292 | 292 | 200 | - |
| 80-250 | 109 | 243 | 432 | 322 | 322 | 200 | 235 |
| 80A-250 | 109 | 243 | 432 | 322 | 322 | 200 | 235 |
| 80-315 | 140 | 209 | 447 | 337 | 337 | - | 305 |
| 80-400 | 132 | 209 | 449 | 389 | 389 | - | 305 |
| 100-160 | 109 | 233 | 402 | 292 | 292 | 200 | - |
| 100C-200 | 109 | 233 | 402 | 292 | 292 | 200 | - |
| 100C-250 | 109 | 243 | 432 | 322 | 322 | 200 | 235 |
| 100-315 | 140 | 209 | 447 | 337 | 337 | - | 305 |
| 100-400 | 132 | 209 | 449 | 389 | 289 | - | 305 |
| 125-250 | 109 | 243 | 432 | 322 | 322 | - | 305 |
| 125-315 | 140 | 209 | 447 | 337 | 337 | - | 305 |
| 125-400 | 132 | 209 | 449 | 389 | 389 | - | 305 |
| 150-315 | 140 | 209 | 447 | 337 | 337 | - | 305 |
| 150-400 | 132 | 209 | 449 | 389 | 389 | - | 305 |
| 200-200 | 109 | 243 | 432 | 322 | 322 | - | 305 |

* $n = 2400 - 3600 \text{ min}^{-1}$

** $n = 1450 - 2400 \text{ min}^{-1}$

Connections

| | | |
|----|---------------------------|------------------|
| V | De-aeration | Rp $\frac{1}{2}$ |
| O | Waste water drain | Rp $\frac{1}{2}$ |
| S | Inlet self-priming pump | Rp $\frac{1}{2}$ |
| SP | Air-intake line | Rp $\frac{1}{2}$ |
| P | Outlet self-priming pump | Rp $\frac{1}{2}$ |
| W | Inlet service liquid | Rp $\frac{1}{2}$ |
| SC | Suction flange connection | Rp $\frac{1}{2}$ |

9 Parts

9.1 Ordering parts

9.1.1 Order form

You can use the order form included in this manual for ordering parts.

When ordering parts always quote the following data:

- 1 Your **address**.
- 2 The **quantity, the item number and the description** of the part.
- 3 The **pump number**. The pump number is stated on the label on the cover of this manual and on the type plate of the pump.
- 4 In the event of different electric motor voltage you should state the correct voltage.

9.1.2 Recommended spare parts

Parts marked with a * are recommended spare parts.

9.2 Pump parts

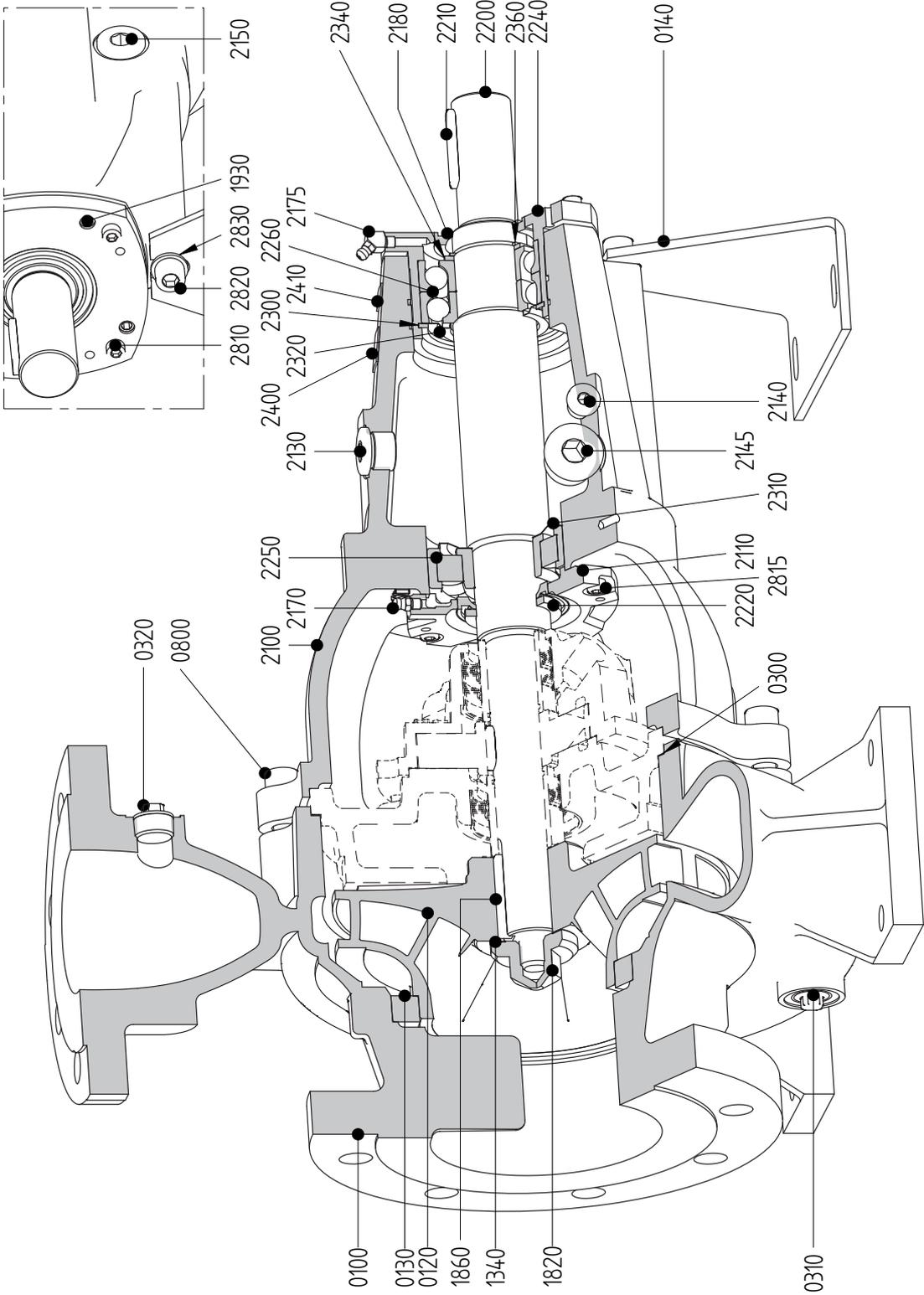


Figure 33: CombiPrime H.

| Item | Quantity | Description | Material | | | | |
|-------|----------|------------------------------|------------------|--------|------------------|-----------------|------------------|
| | | | G1 | G2 | G3 | B2 | B3 |
| 0100 | 1 | pump casing | cast iron | | | bronze | |
| 0120* | 1 | impeller | cast iron | bronze | aluminium bronze | bronze | aluminium bronze |
| 0130* | 1 | wear ring ¹⁾ | cast iron | bronze | | | |
| 0140 | 1 | bracket support | steel | | | | |
| 0300* | 1 | gasket | -- | | | | |
| 0310 | 1 | plug | cast iron | | | bronze | |
| 0320 | 1 | plug | cast iron | | | bronze | |
| 0800 | ** | Allen screw | steel | | | stainless steel | |
| 1340* | 1 | gasket | -- | | | | |
| 1820* | 1 | cap nut | stainless steel | | | | |
| 1860* | 1 | impeller key | stainless steel | | | | |
| 1930 | 4 | set screw | stainless steel | | | | |
| 2100 | 1 | bearing bracket | cast iron | | | | |
| 2110 | 1 | bearing cover | cast iron | | | | |
| 2170 | 1 | grease nipple | steel | | | | |
| 2175 | 1 | grease nipple | steel | | | | |
| 2180 | 2 | oil baffle | NBR/spring steel | | | | |
| 2200* | 1 | pump shaft | steel alloy | | | stainless steel | |
| 2210* | 1 | coupling key | steel | | | | |
| 2220* | 1 | deflector | rubber | | | | |
| 2240* | 1 | adjusting bush | cast iron | | | | |
| 2250* | 1 | cylindrical roller bearings | - | | | | |
| 2260* | 2 | angular contact ball bearing | - | | | | |
| 2300* | 1 | inner circlip | spring steel | | | | |
| 2310* | 1 | Nilos ring | steel | | | | |
| 2320 | 1 | Nilos ring | steel | | | | |
| 2340 | 1 | adjusting ring | steel | | | | |
| 2360* | 1 | outer circlip | spring steel | | | | |
| 2400 | 1 | name plate | stainless steel | | | | |
| 2410 | 1 | arrow plate | aluminium | | | | |
| 2810 | 4 | Allen screw | steel | | | | |
| 2815 | 4 | Allen screw | steel | | | | |
| 2820 | 1 | Allen screw | steel | | | | |
| 2830 | 1 | washer | steel | | | | |

** Number dependent on pump type 8 or 12

¹⁾ Item 0130 not for the pump types of bearing bracket 1 and for 40-250 and 50-250

9.3 Parts of shaft sealing group M2

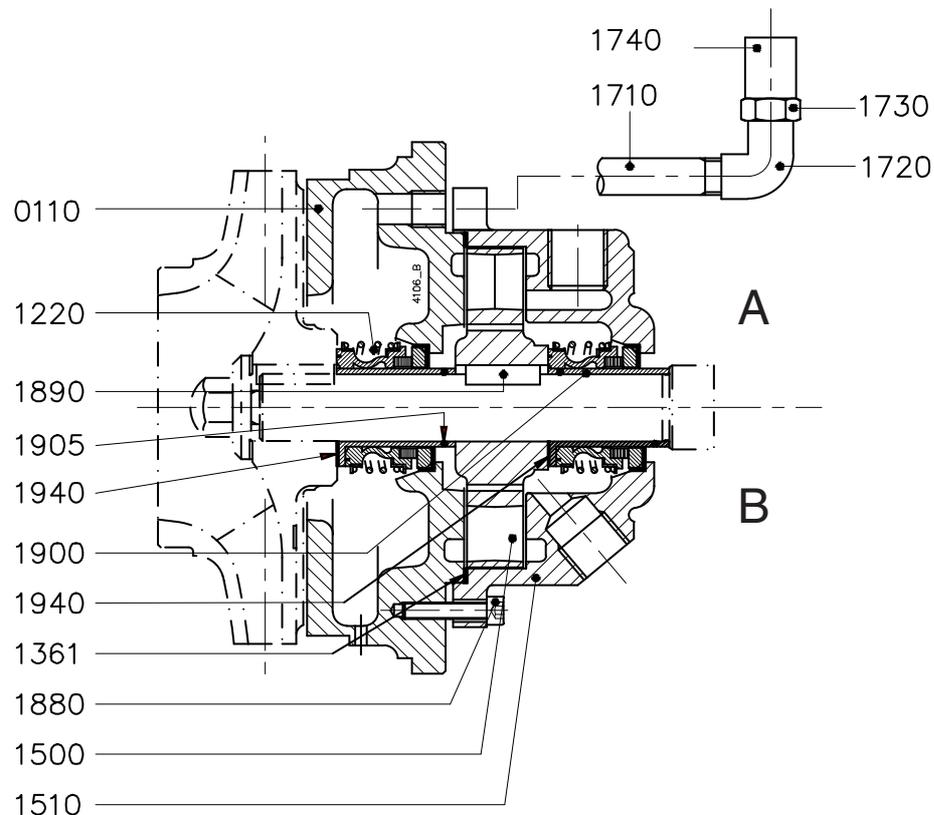


Figure 34: Parts of shaft sealing group M2
(A = bearing group 1 and 2, B = bearing group 3).

| Item | Quantity | Description | Material | | | | |
|--------|----------|-------------------------------|-------------------|----|----|-----------------|----|
| | | | G1 | G2 | G3 | B2 | B3 |
| 0110 | 1 | pump cover | cast iron | | | bronze | |
| 1220* | 2 | mechanical seal | -- | | | | |
| 1361* | 1 | gasket | -- | | | | |
| 1500* | 1 | air-wheel | bronze | | | | |
| 1510 | 1 | self-priming casing | cast iron | | | bronze | |
| 1710 | 1 | pipe nipple ¹⁾ | steel | | | stainless steel | |
| 1720 | 1 | elbow ¹⁾ | ductile cast iron | | | stainless steel | |
| 1730 | 1 | reducing nipple ¹⁾ | stainless steel | | | | |
| 1740 | 1 | socket ¹⁾ | steel | | | stainless steel | |
| 1880 | 8 | Allen screw | steel | | | stainless steel | |
| 1890 | 1 | key | stainless steel | | | | |
| 1900* | 2 | shaft sleeve | stainless steel | | | | |
| 1905* | 2 | O-ring | viton | | | | |
| 1940** | 2 | gasket | -- | | | | |

¹⁾ Items 1710, 1720, 1730 and 1740 only for the pump types with a nominal impeller diameter of 160 and 250 mm ($n = 1500 / 1800 \text{ min}^{-1}$)

** only for bearing bracket group 3

9.4 Parts of shaft sealing group M4

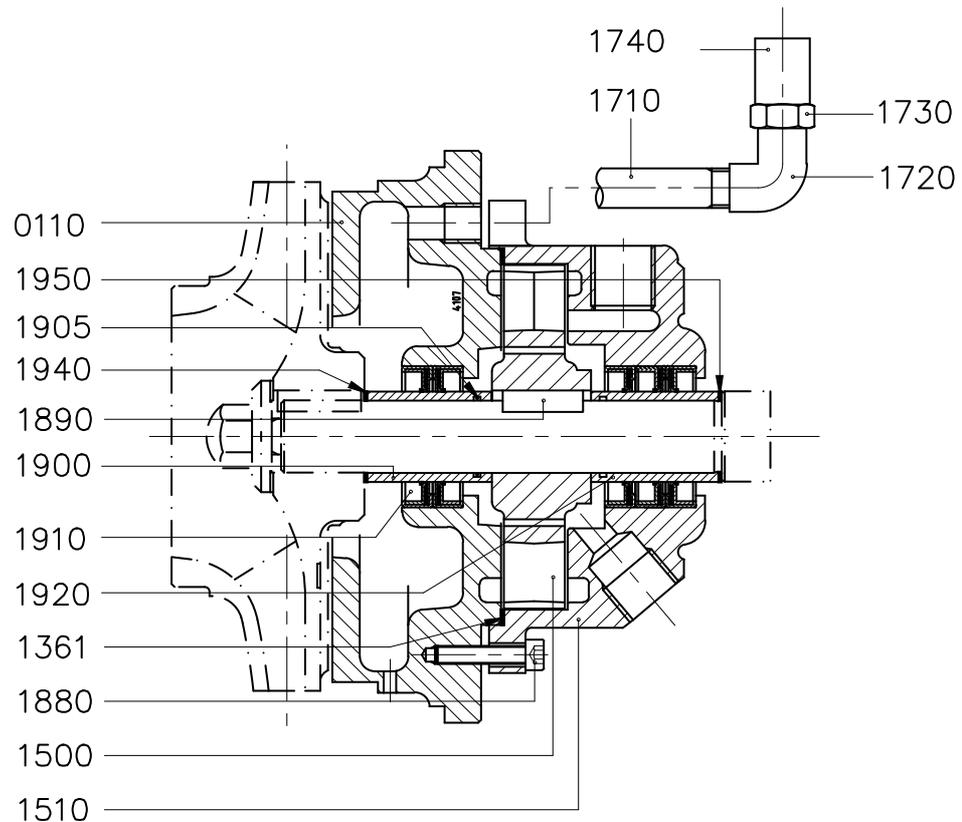


Figure 35: Parts of shaft sealing group M4.

| Item | Quantity | Description | Material | | | | |
|-------|----------|-------------------------------|------------------------------------|----|----|-----------------|----|
| | | | G1 | G2 | G3 | B2 | B3 |
| 0110 | 1 | pump cover | cast iron | | | bronze | |
| 1361* | 1 | gasket | -- | | | | |
| 1500* | 1 | air-wheel | bronze | | | | |
| 1510 | 1 | self-priming casing | cast iron | | | bronze | |
| 1710 | 1 | pipe nipple ¹⁾ | steel | | | stainless steel | |
| 1720 | 1 | elbow ¹⁾ | ductile cast iron | | | stainless steel | |
| 1730 | 1 | reducing nipple ¹⁾ | stainless steel | | | | |
| 1740 | 1 | socket ¹⁾ | steel | | | stainless steel | |
| 1880 | 5 | Allen screw | steel | | | stainless steel | |
| 1890 | 1 | key | stainless steel | | | | |
| 1900* | 1 | shaft sleeve | stainless steel with wearing layer | | | | |
| 1905* | 1 | O-ring | viton | | | | |
| 1910* | 5 | lip seal | PTFE | | | | |
| 1920* | 1 | shaft sleeve | stainless steel with wearing layer | | | | |
| 1940* | 1 | gasket | -- | | | | |
| 1950* | 1 | gasket | -- | | | | |

¹⁾ Items 1710, 1720, 1730 and 1740 only for the pump types with a nominal impeller diameter of 160 and 250 mm ($n = 1500 / 1800 \text{ min}^{-1}$)

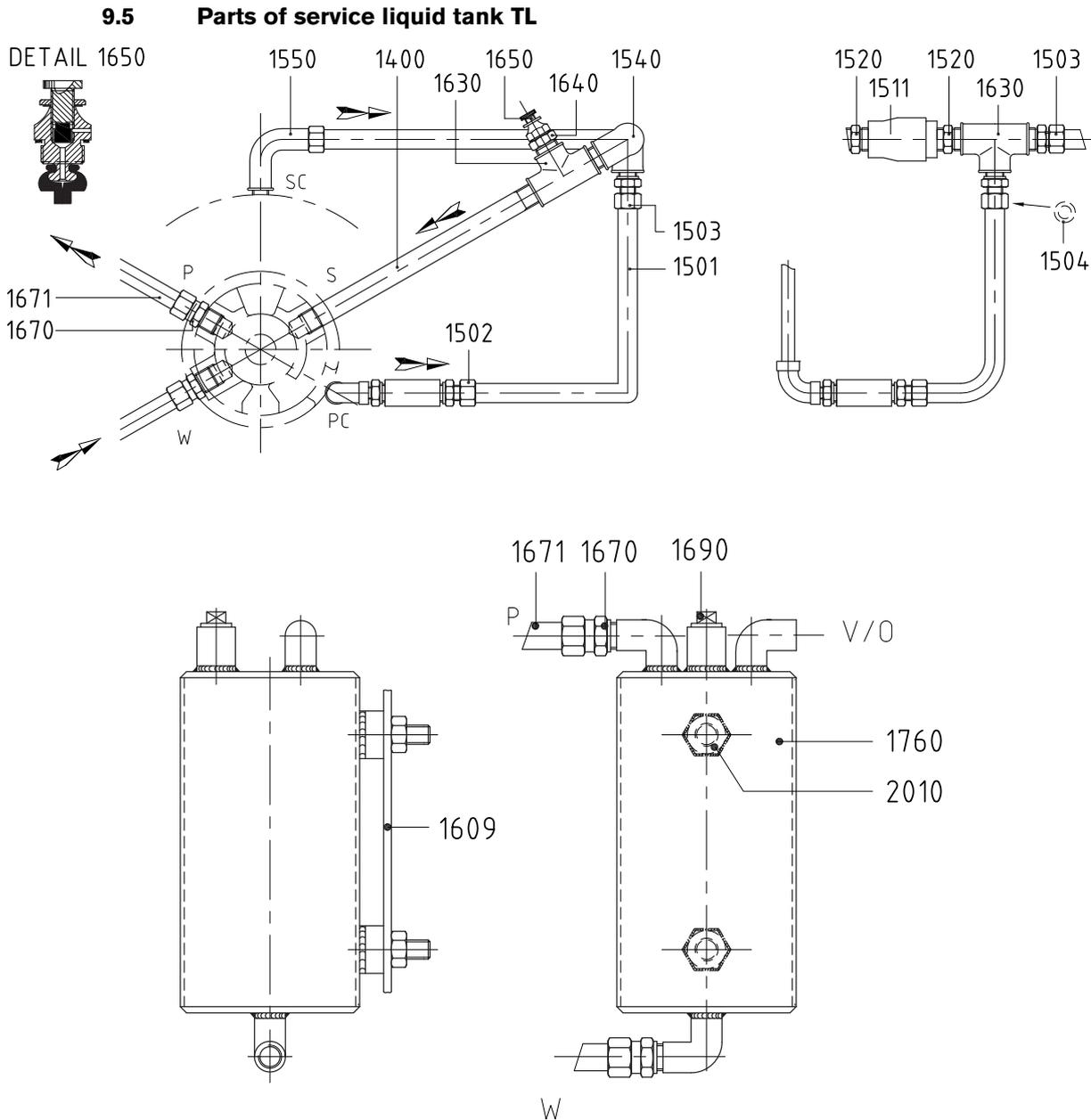


Figure 36: Parts of service liquid tank TL.

| Item | Quantity | Description | Material | | | | |
|-------|----------|------------------|-----------------|----|-----------------|----|----|
| | | | G1 | G2 | G3 | B2 | B3 |
| 1400 | 1 | pipe nipple | stainless steel | | | | |
| 1501 | 1 | pipe | stainless steel | | | | |
| 1502 | 1 | male connector | stainless steel | | | | |
| 1503 | 1 | male connector | steel | | stainless steel | | |
| 1504* | 1 | washer | stainless steel | | | | |
| 1511 | 1 | non-return valve | NBR/brass | | stainless steel | | |
| 1520 | 1 | double nipple | ductile iron | | stainless steel | | |
| 1540 | 1 | elbow | steel | | stainless steel | | |
| 1550 | 1 | elbow | steel | | stainless steel | | |
| 1609 | 1 | tank support | steel | | | | |
| 1630 | 1 | tee | ductile iron | | stainless steel | | |
| 1640 | 1 | reducing ring | ductile iron | | stainless steel | | |
| 1650 | 1 | air inlet valve | brass | | | | |
| 1670 | 4 | male connector | steel | | stainless steel | | |
| 1671 | 1 | pipe | stainless steel | | | | |
| 1690 | 1 | plug | ductile iron | | bronze | | |
| 1760 | 1 | tank | stainless steel | | | | |
| 2010 | 2 | nut | steel | | stainless steel | | |

* If the delivery head is over 30 m throttling is applied in order to create a vacuum behind the air inlet valve.

9.6 Parts of float de-aerator VL

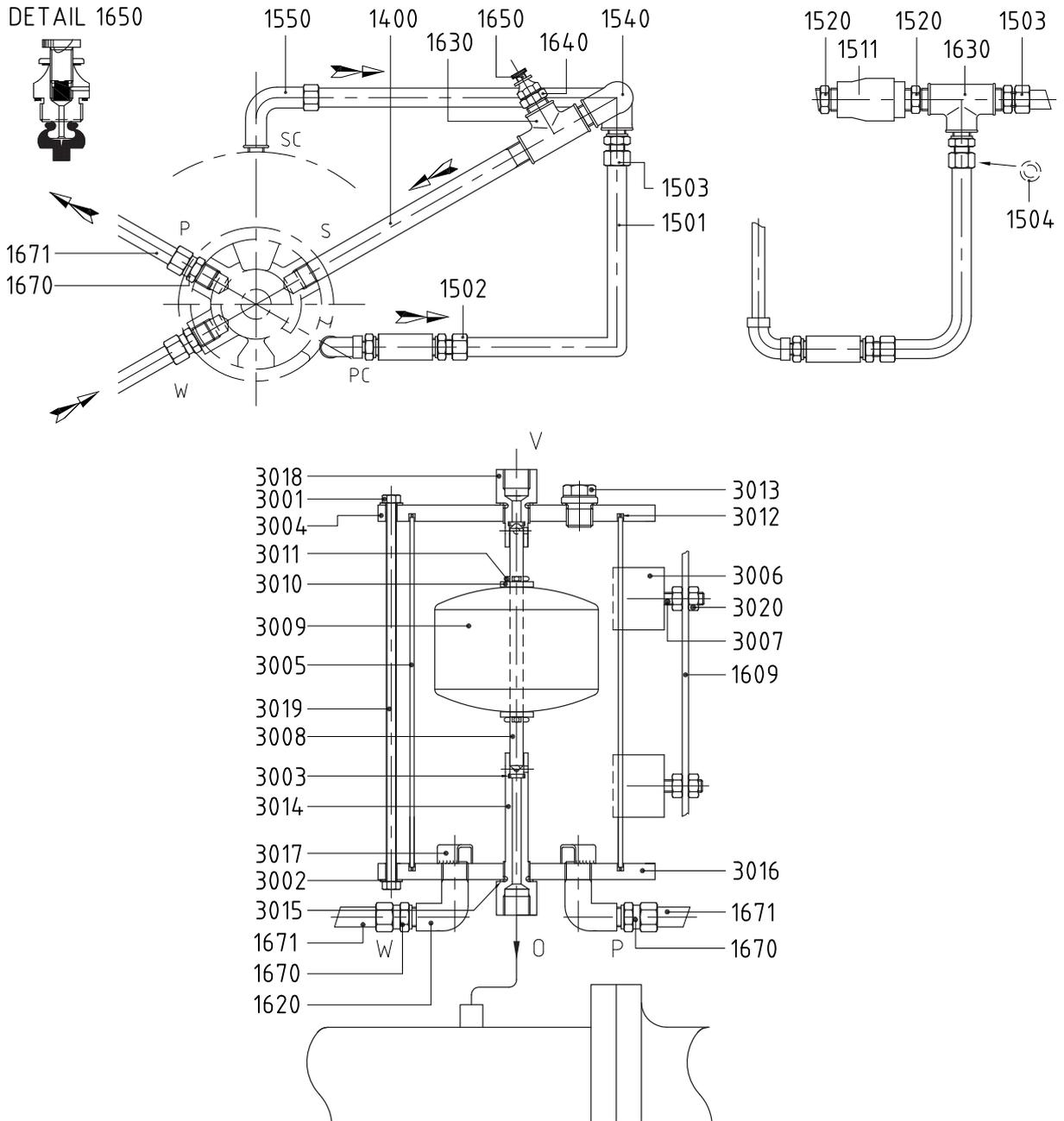


Figure 37: Parts of float de-aerator VL.

| Item | Quantity | Description | Material | | | | |
|--------|----------|------------------|-----------------|----|-----------------|----|----|
| | | | G1 | G2 | G3 | B2 | B3 |
| 1400 | 1 | pipe nipple | stainless steel | | | | |
| 1501 | 1 | pipe | stainless steel | | | | |
| 1502 | 1 | male connector | stainless steel | | | | |
| 1503 | 2 | male connector | steel | | stainless steel | | |
| 1504** | 1 | washer | stainless steel | | | | |
| 1511 | 1 | non-return valve | NBR/brass | | stainless steel | | |
| 1520 | 1 | double nipple | ductile iron | | stainless steel | | |
| 1540 | 1 | elbow | steel | | stainless steel | | |
| 1550 | 1 | elbow connector | steel | | stainless steel | | |
| 1609 | 1 | tank support | steel | | | | |
| 1630 | 1 | T-piece | ductile iron | | stainless steel | | |
| 1640 | 1 | reducing ring | ductile iron | | stainless steel | | |
| 1650 | 1 | air-inlet valve | brass | | | | |
| 1670 | 4 | male connector | steel | | stainless steel | | |
| 1671 | 1 | pipe | stainless steel | | | | |
| 2010 | 2 | nut | steel | | stainless steel | | |
| 3001 | 8 | nut | stainless steel | | | | |
| 3002 | 8 | washer | stainless steel | | | | |
| 3003* | 2 | O-ring | NBR | | | | |
| 3004 | 1 | cover | stainless steel | | | | |
| 3005 | 1 | jacket | stainless steel | | | | |
| 3006 | 2 | bow | stainless steel | | | | |
| 3007 | 2 | bolt | stainless steel | | | | |
| 3008* | 1 | float needle | POM | | | | |
| 3009* | 1 | float | stainless steel | | | | |
| 3010* | 2 | washer | stainless steel | | | | |
| 3011* | 2 | split pin | stainless steel | | | | |
| 3012* | 2 | O-ring | Viton | | | | |
| 3013 | 1 | plug | stainless steel | | | | |
| 3014 | 1 | long valve seat | stainless steel | | | | |
| 3015 | 3 | sealing ring | nylon | | | | |
| 3016 | 1 | bottom | stainless steel | | | | |
| 3017 | 2 | bow | stainless steel | | | | |
| 3018 | 1 | short valve seat | stainless steel | | | | |
| 3019 | 4 | tie rod | stainless steel | | | | |
| 3020 | 4 | nut | stainless steel | | | | |

** If the delivery head is over 30 m throttling is applied in order to create a vacuum behind the air inlet valve.

10 Technical data

10.1 Recommended greases

Recommended greases according to classification NLGI-2.

| | |
|--|-------------------------|
| BP | Energrease LS-EP 2 |
| CHEVRON | Black Pearl Grease EP 2 |
| CHEVRON | MultifaK EP-2 |
| EXXONMOBIL | Beacon EP 2 (Moly) |
| EXXONMOBIL | Mobilux EP 2 (Moly) |
| SHELL | Gadus S2 V100 2 |
| SKF | LGMT 2 |
| TOTAL | Total Lical EP 2 |
| Quantity/bearing [gr] = 0,005 * Outer diameter [mm] * bearing width [mm] | |

10.2 Recommended locking liquids

| Description | Locking liquid |
|------------------|----------------|
| cap nut (1820) | Loctite 243 |
| wear ring (0130) | Loctite 641 |

10.3 Tightening moments

10.3.1 Tightening moments for bolts and nuts

| Materials | 8.8 | A2, A4 |
|-----------|------------------------|--------|
| Thread | Tightening moment [Nm] | |
| M6 | 9 | 6 |
| M8 | 20 | 14 |
| M10 | 40 | 25 |
| M12 | 69 | 43 |
| M16 | 168 | 105 |

10.3.2 Tightening moments for cap nut

| Size | Tightening moment [Nm] |
|-----------------------|------------------------|
| M12 (bearing group 1) | 43 |
| M16 (bearing group 2) | 105 |
| M24 (bearing group 3) | 220 |

10.4 Permissible forces and moments on the flanges

Forces and moments acting on the pump flanges due to pipe loads can cause misalignment of the pump and driver shafts, deformation and overstressing of the pump casing, or overstressing of the fixing bolts between the pump and the base plate.

The maximum allowable forces and moments on the flanges should be based on the following maximum values for the lateral displacement of the shaft end, relative to the fixed point in space:

- pumps of bearing group 1: 0,15 mm,
- pumps of bearing group 2: 0,20 mm,
- pumps of bearing group 3: 0,25 mm,

The values can be applied simultaneously in all directions with positive or negative signs, or separately on each flange (suction and discharge).

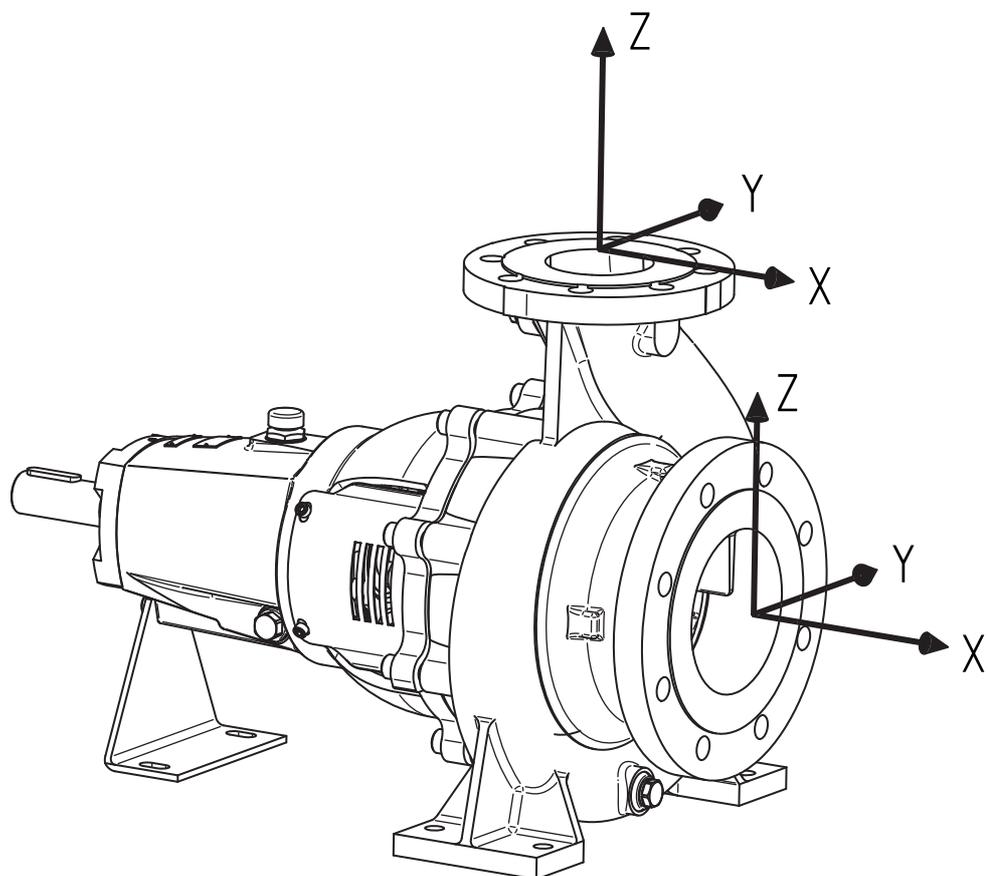


Figure 38: Coordinate system.

Table 5: Permissible forces and moments on the flanges, based on EN-ISO 5199

| CH | Pump unit with a non-grouted base plate | | | | | | | | | | | | | | | |
|----------|---|------|------|------|--------------|-----|------|------|-------------------------------------|------|------|------|--------------|-----|------|------|
| | Horizontal Pump, End branch, x-Axis | | | | | | | | Horizontal Pump, Top branch, z-Axis | | | | | | | |
| | Force [N] | | | | Moment [N.m] | | | | Force [N] | | | | Moment [N.m] | | | |
| | Fy | Fz | Fx | ΣF | My | Mz | Mx | ΣM | Fy | Fz | Fx | ΣF | My | Mz | Mx | ΣM |
| 32-160 | 525 | 473 | 578 | 910 | 350 | 403 | 490 | 718 | 298 | 368 | 315 | 578 | 263 | 298 | 385 | 560 |
| 32C-160 | 525 | 473 | 578 | 910 | 350 | 403 | 490 | 718 | 298 | 368 | 315 | 578 | 263 | 298 | 385 | 560 |
| 32-200 | 525 | 473 | 578 | 910 | 350 | 403 | 490 | 718 | 298 | 368 | 315 | 578 | 263 | 298 | 385 | 560 |
| 32C-200 | 525 | 473 | 578 | 910 | 350 | 403 | 490 | 718 | 298 | 368 | 315 | 578 | 263 | 298 | 385 | 560 |
| 32-250 | 525 | 473 | 578 | 910 | 350 | 403 | 490 | 718 | 298 | 368 | 315 | 578 | 263 | 298 | 385 | 560 |
| 40C-160 | 648 | 595 | 735 | 1155 | 385 | 420 | 525 | 770 | 350 | 438 | 385 | 683 | 315 | 368 | 455 | 665 |
| 40C-200 | 648 | 595 | 735 | 1155 | 385 | 420 | 525 | 770 | 350 | 438 | 385 | 683 | 315 | 368 | 455 | 665 |
| 40-250 | 648 | 595 | 735 | 1155 | 385 | 420 | 525 | 770 | 350 | 438 | 385 | 683 | 315 | 368 | 455 | 665 |
| 50C-160 | 648 | 595 | 735 | 1155 | 385 | 420 | 525 | 770 | 473 | 578 | 525 | 910 | 350 | 403 | 490 | 718 |
| 50C-200 | 648 | 595 | 735 | 1155 | 385 | 420 | 525 | 770 | 473 | 578 | 525 | 910 | 350 | 403 | 490 | 718 |
| 50-250 | 648 | 595 | 735 | 1155 | 385 | 420 | 525 | 770 | 473 | 578 | 525 | 910 | 350 | 403 | 490 | 718 |
| 65C-160 | 788 | 718 | 875 | 1383 | 403 | 455 | 560 | 823 | 595 | 735 | 648 | 1155 | 385 | 420 | 525 | 770 |
| 65C-200 | 788 | 718 | 875 | 1383 | 403 | 455 | 560 | 823 | 595 | 735 | 648 | 1155 | 385 | 420 | 525 | 770 |
| 65-250 | 788 | 718 | 875 | 1383 | 403 | 455 | 560 | 823 | 595 | 735 | 648 | 1155 | 385 | 420 | 525 | 770 |
| 65-315 | 788 | 718 | 875 | 1383 | 403 | 455 | 560 | 823 | 595 | 735 | 648 | 1155 | 385 | 420 | 525 | 770 |
| 80C-160 | 1050 | 945 | 1173 | 1838 | 438 | 508 | 613 | 910 | 718 | 875 | 788 | 1383 | 403 | 455 | 560 | 823 |
| 80C-200 | 1050 | 945 | 1173 | 1838 | 438 | 508 | 613 | 910 | 718 | 875 | 788 | 1383 | 403 | 455 | 560 | 823 |
| 80-250 | 1050 | 945 | 1173 | 1838 | 438 | 508 | 613 | 910 | 718 | 875 | 788 | 1383 | 403 | 455 | 560 | 823 |
| 80A-250 | 1050 | 945 | 1173 | 1838 | 438 | 508 | 613 | 910 | 718 | 875 | 788 | 1383 | 403 | 455 | 560 | 823 |
| 80-315 | 1050 | 945 | 1173 | 1838 | 438 | 508 | 613 | 910 | 718 | 875 | 788 | 1383 | 403 | 455 | 560 | 823 |
| 80-400 | 1243 | 1120 | 1383 | 2170 | 525 | 665 | 735 | 1068 | 718 | 875 | 788 | 1383 | 403 | 455 | 560 | 823 |
| 100-160 | 1243 | 1120 | 1383 | 2170 | 525 | 665 | 735 | 1068 | 945 | 1173 | 1050 | 1838 | 438 | 508 | 613 | 910 |
| 100C-200 | 1243 | 1120 | 1383 | 2170 | 525 | 665 | 735 | 1068 | 945 | 1173 | 1050 | 1838 | 438 | 508 | 613 | 910 |
| 100C-250 | 1243 | 1120 | 1383 | 2170 | 525 | 665 | 735 | 1068 | 945 | 1173 | 1050 | 1838 | 438 | 508 | 613 | 910 |
| 100-315 | 1243 | 1120 | 1383 | 2170 | 525 | 665 | 735 | 1068 | 945 | 1173 | 1050 | 1838 | 438 | 508 | 613 | 910 |
| 100-400 | 1243 | 1120 | 1383 | 2170 | 525 | 665 | 735 | 1068 | 945 | 1173 | 1050 | 1838 | 438 | 508 | 613 | 910 |
| 125-250 | 1575 | 1418 | 1750 | 2748 | 613 | 718 | 875 | 1278 | 1120 | 1383 | 1243 | 2170 | 525 | 665 | 735 | 1068 |
| 125-315 | 1575 | 1418 | 1750 | 2748 | 613 | 718 | 875 | 1278 | 1120 | 1383 | 1243 | 2170 | 525 | 665 | 735 | 1068 |
| 125-400 | 1575 | 1418 | 1750 | 2748 | 613 | 718 | 875 | 1278 | 1120 | 1383 | 1243 | 2170 | 525 | 665 | 735 | 1068 |
| 150-315 | 2100 | 1890 | 2345 | 3658 | 805 | 928 | 1138 | 1680 | 1418 | 1750 | 1575 | 2748 | 613 | 718 | 875 | 1278 |
| 150-400 | 2100 | 1890 | 2345 | 3658 | 805 | 928 | 1138 | 1680 | 1418 | 1750 | 1575 | 2748 | 613 | 718 | 875 | 1278 |
| 200-200 | 2100 | 1890 | 2345 | 3658 | 805 | 928 | 1138 | 1680 | 1890 | 2345 | 2100 | 3658 | 805 | 928 | 1138 | 1680 |

The basic values mentioned in the table above are related to the pump casing materials cast iron and bronze.

10.5 Maximum allowable working pressures

Table 6: Maximum allowable working pressure [bar]

| Materials | [bar] |
|-----------|-------|
| 100-160 | 6 |
| 200-200 | |
| all other | 10 |

Test pressure: 1,5 x max. working pressure.

10.6 Hydraulic performance

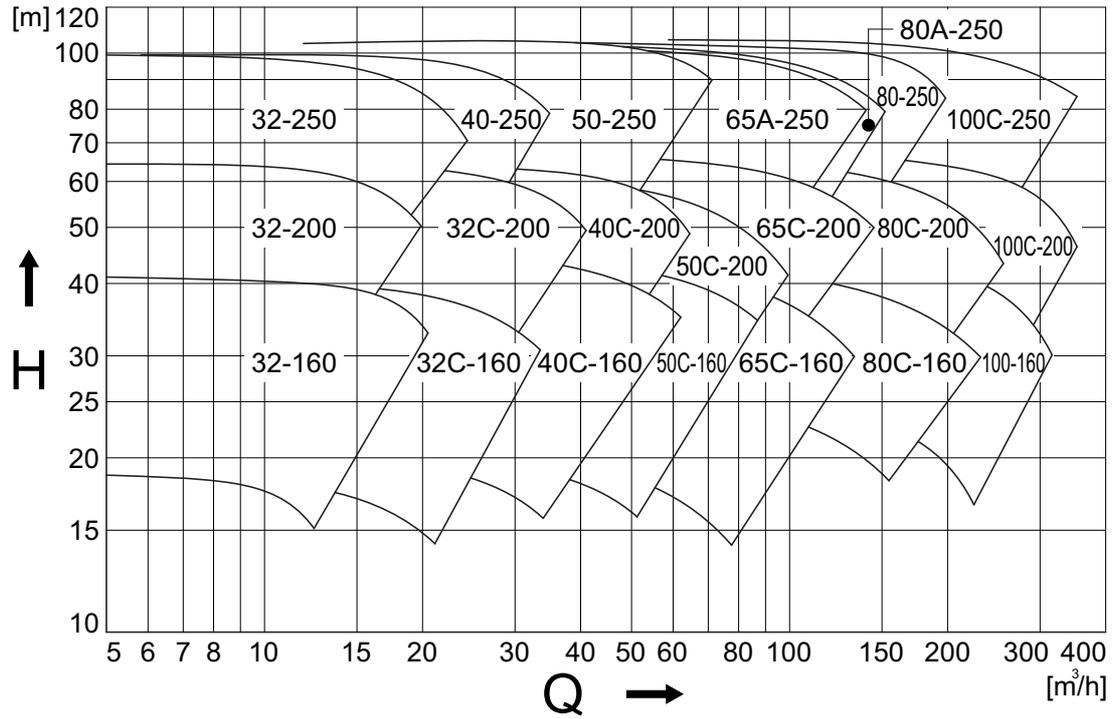


Figure 39: Performance overview 3000 min⁻¹.

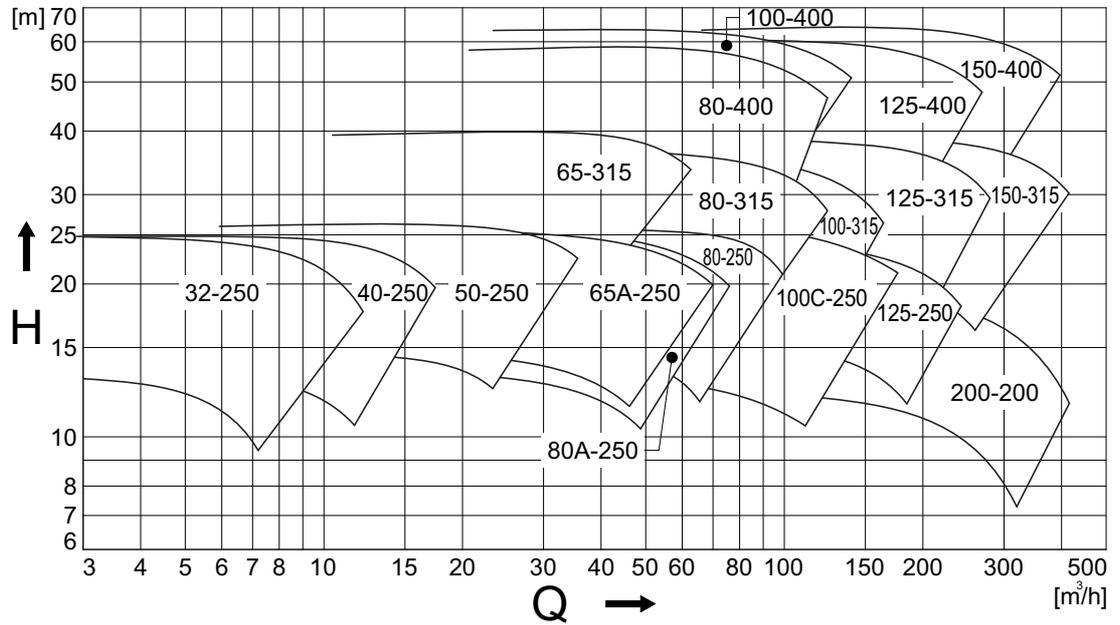


Figure 40: Performance overview 1500 min⁻¹.

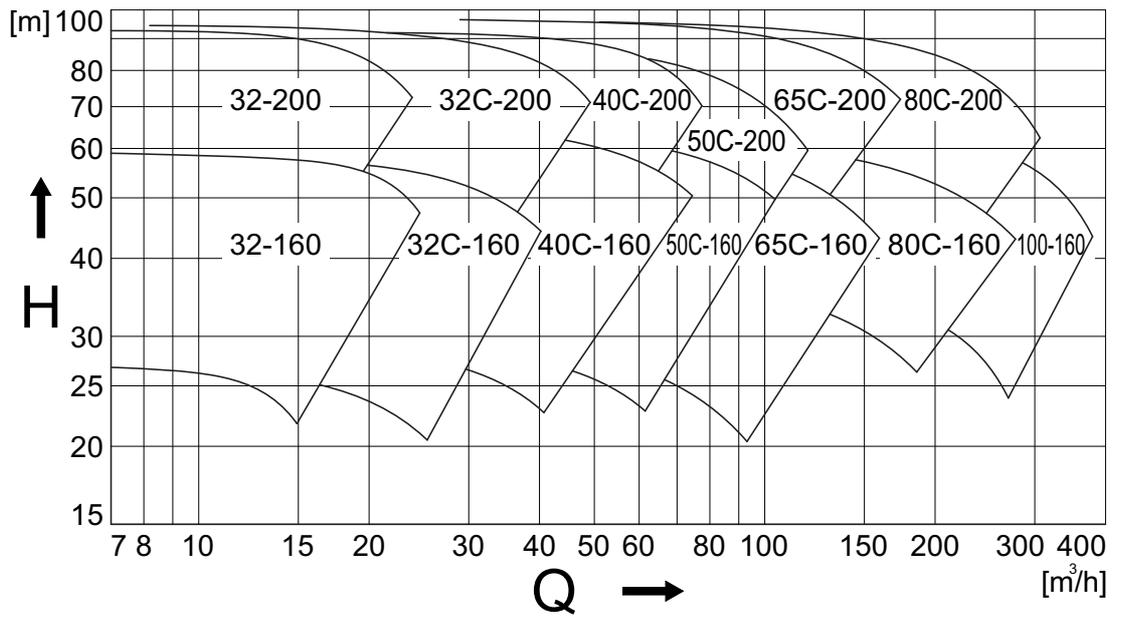


Figure 41: Performance overview 3600 min⁻¹.

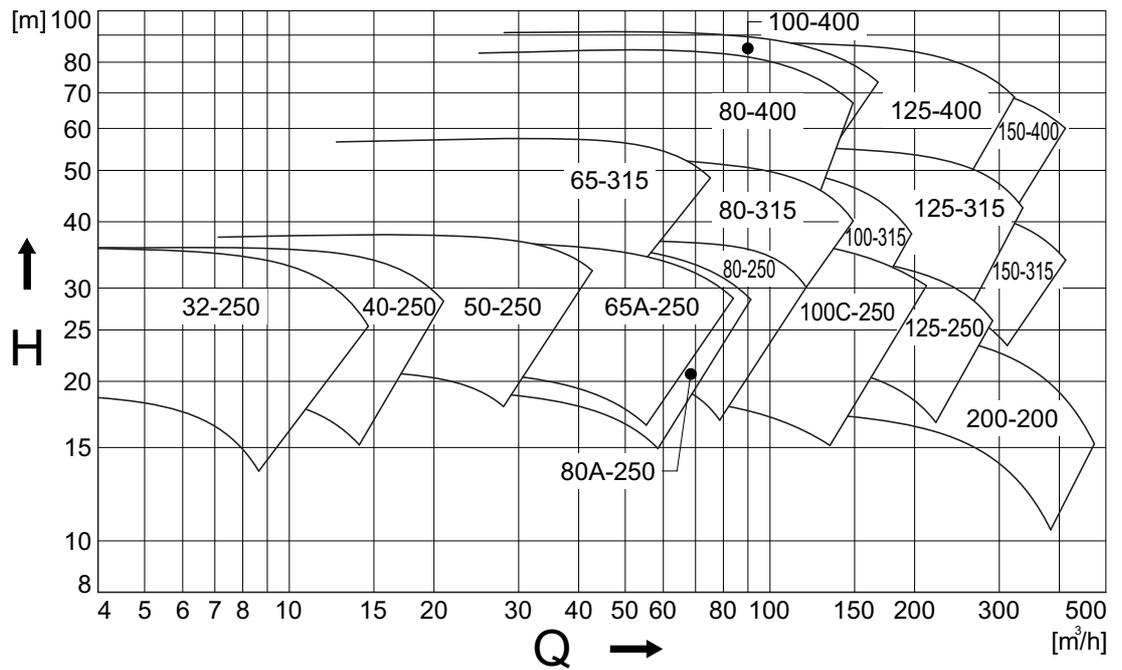


Figure 42: Performance overview 1800 min⁻¹.

10.7 Noise data

10.7.1 Pump noise as a function of pump power

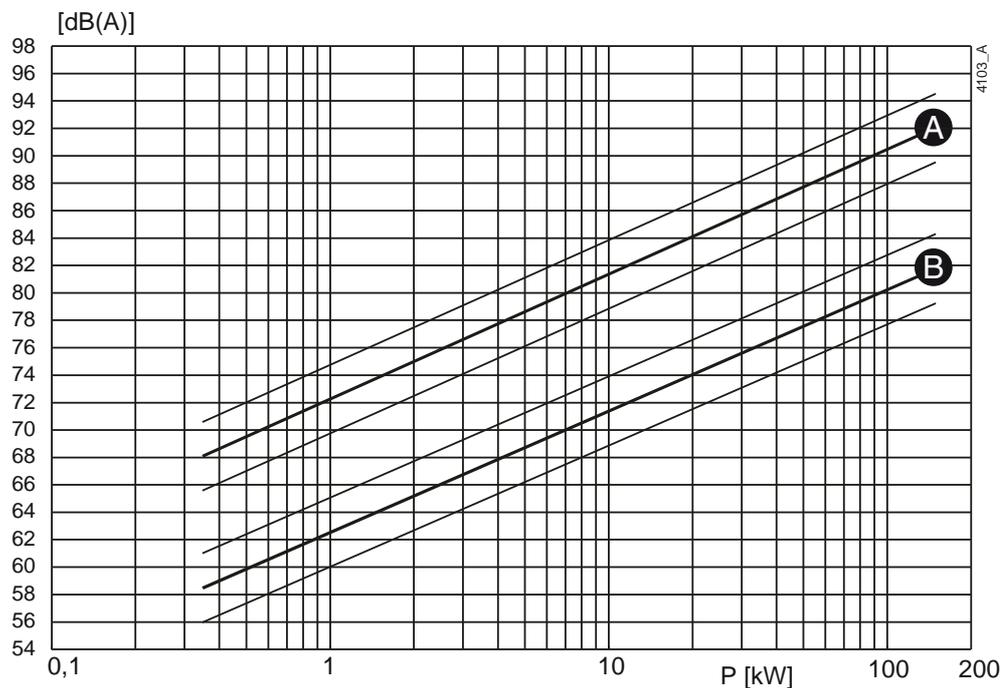


Figure 43: Noise level as function of pump power [kW] at 1450 min⁻¹
A = sound power level, B = sound pressure level.

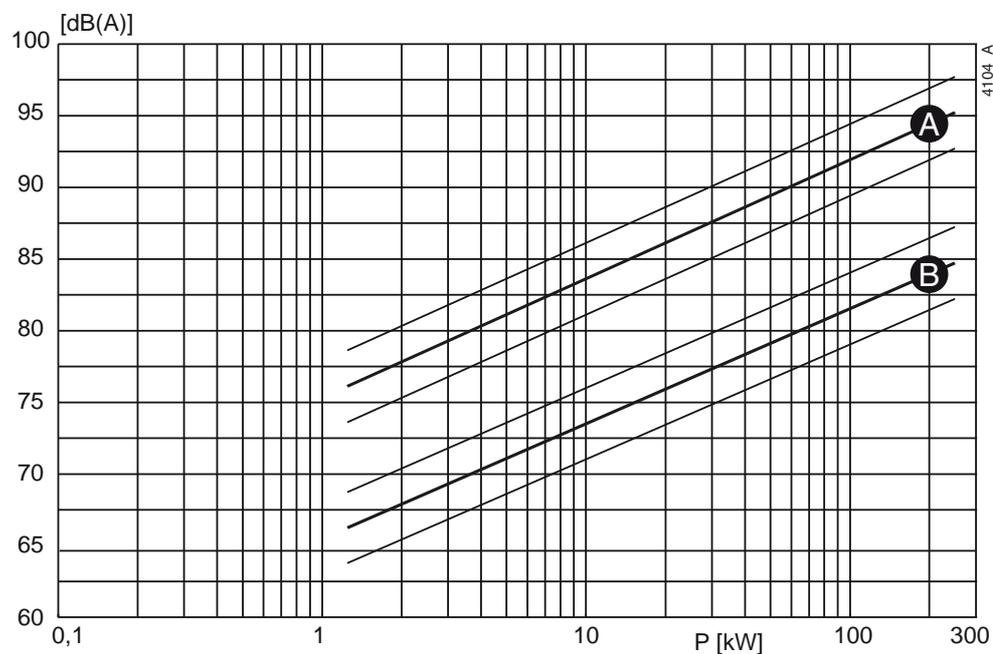


Figure 44: Noise level as function of pump power [kW] at 2900 min⁻¹
A = sound power level, B = sound pressure level.

10.7.2 Noise level of entire pump unit

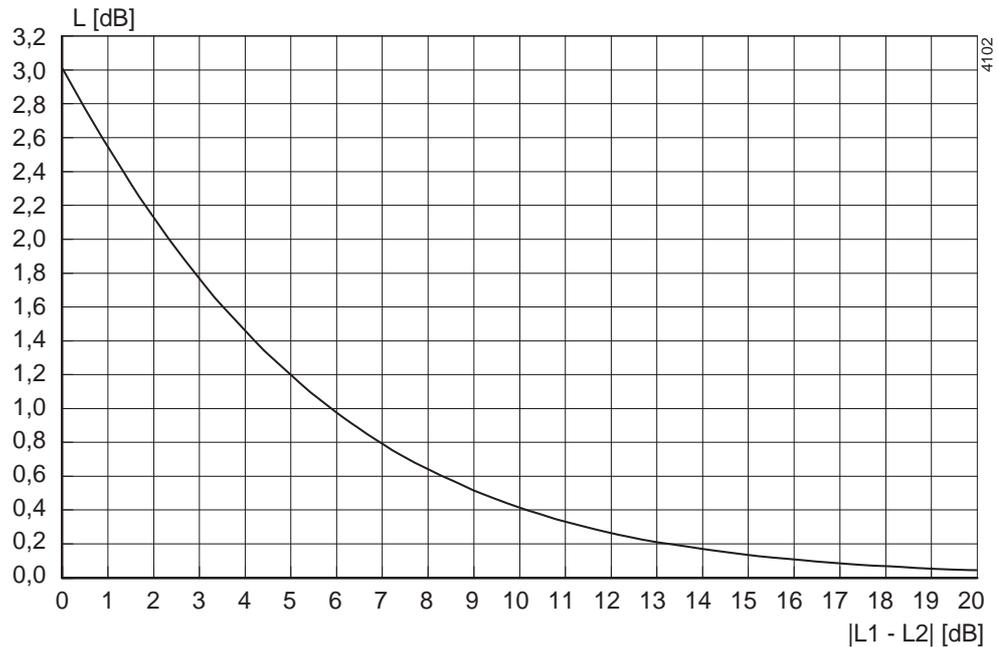


Figure 45: Noise level of entire pump unit.

In order to determine the total noise level of the entire pump unit, the noise level of the motor must be added to that of the pump. This can be easily done by using the graph above.

- 1 Determine the noise level (L1) of the pump, see figure 43 or figure 44.
- 2 Determine the noise level (L2) of the motor, see documentation of the motor.
- 3 Determine the difference between both levels $|L1 - L2|$.
- 4 Find the differential value on the $|L1 - L2|$ -axis and go up to the curve.
- 5 From the curve go left to the L[dB] -axis and read out the value.
- 6 Add this value to the highest value of both noise levels (L1 or L2).

Example:

- 1 Pump 75 dB; motor 78 dB.
- 2 $|75-78| = 3$ dB.
- 3 3 dB on the X-axis = 1,75 dB on the Y-axis.
- 4 Highest noise level + 1,75 dB = $78 + 1,75 = 79,75$ dB.

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CombiPrime H

Horizontal self-priming centrifugal pump

SPXFLOW

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