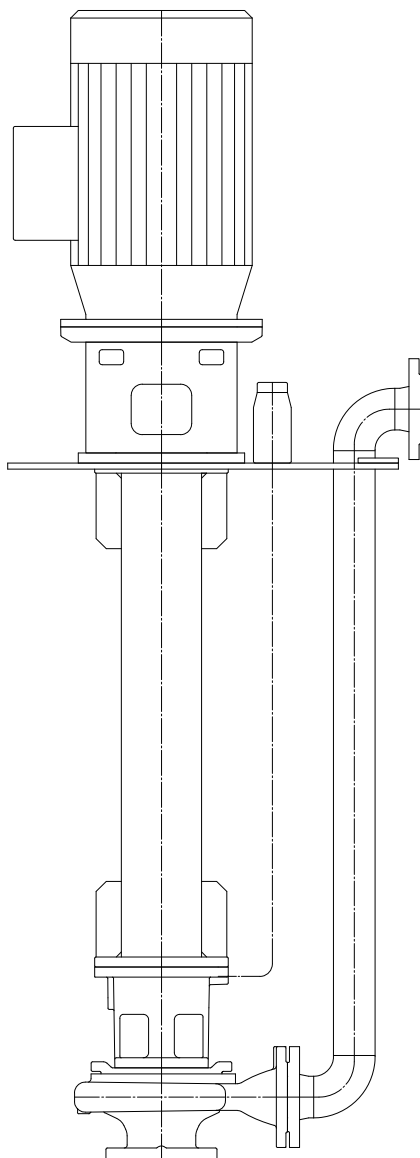


Circulating pumps

Model FV / NV / ZV / SV / ZHV

GB **Operator's manual**
Translation of the original



27233 - D

EU Declaration of Conformity

Manufacturer:
Schmalenberger GmbH + Co. KG
Strömungstechnologie
Im Schelmen 9-11
D-72072 Tübingen / Germany

The manufacturer hereby declares that the product:
Centrifugal pump type:
FV, NV, SV, ZV, ZHV (identification numbers: all)

Serial number range: 2018000001 - 2023999999

has been manufactured in accordance with the following directives:
Directive 2006/42/EC "Machinery"

Harmonised standards that were used:
EN 809+A1+AC, EN ISO 12100, EN 60034-1, EN 60034-5/A1, EN 60034-30-1

EU Declaration of Incorporation

Manufacturer:
Schmalenberger GmbH + Co. KG
Strömungstechnologie
Im Schelmen 9-11
D-72072 Tübingen / Germany

The manufacturer hereby declares that the product:
Centrifugal pump if delivered without drive, type:
FV, NV, SV, ZV, ZHV (identification numbers: all)

Serial number range: 2018000001 - 2023999999

an incomplete machine in accordance with Regulation 2006/42/EC Article 2g and provided exclusively for assembly with another machine which meets the following basic requirements of Regulation 2006/42/EC: Appendix I, Article 1.1.1, 1.1.2, 1.1.3, 1.1.5.

Harmonised standards that were used: EN 809+A1+AC, EN ISO 12100

The incomplete machine must not be placed in operation until it has been determined that the machine to be installed in the incomplete machine is in compliance with the requirements of the Machinery Directive (2006/42/EC).

Authorised representative for the compilation of the technical documentation:
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The EU Declaration of Conformity and the EU Declaration of Incorporation has been issued:
Tübingen, 10 April 2018



Thomas Merkle
Head of Development & Design
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1 General Details

1.1 User Information

This operator's manual makes it easier to get to know the centrifugal pump and to make full use of its facilities.

The operator's manual contains important instructions how to use the centrifugal pump safely, properly and economically.

The operator's manual does not take account of local regulations. The user is responsible for ensuring that they are complied with.

The label specifies the machine series, the frame size, the most important operating data and the serial number. We request that you always quote it in case of queries, when placing subsequent orders and especially when ordering spare parts.

1.2 Usage Instructions

The centrifugal pump must only be used in accordance with the original pump specifications and the operator's manual.

Any other usage or operation where these figures are exceeded is not permitted. The manufacturer is not liable for damage resulting from such improper use.

The pump must only be operated in applications that are described in the relevant documents.

- The pump must only be operated if it is in flawless technical condition.
- The pump must not be operated if it is only partially mounted.
- The pump may only be used to convey the media described in the data sheet or in the documentation for the relevant design.
- Never operate the pump without a pumping medium.
- Pay careful attention to the information in the data sheet or documentation regarding minimum delivery volume (to prevent damage from overheating, damage to the bearings, etc.).
- Pay careful attention to the information in the data sheet or documentation regarding maximum delivery volume (to prevent overheating, damage to the mechanical seal, cavitation damage, damage to the bearings, etc.).
- Do not throttle the pump on the suction end (to prevent cavitation damage).

- Coordinate other types of operation with the manufacturer if they are not cited in the documentation or data sheet.

Preventing foreseeable misuse

- Never open the pressure-end shut-off elements beyond the permissible range
 - Exceeding the maximum delivery volume cited in the data sheet or documentation is not permitted (possible cavitation damage)
- Never exceed the permissible operating limits cited in the data sheet or documentation in terms of pressure and temperature, etc.
- Comply with all safety instructions and directions in this operator's manual.

1.3 Relevant Documentation

Various documents are associated with every centrifugal pump that comprise the technical documentation of the pump. These are as follows:

- Operator's manual
- Drive operator's manual
- Manual for accessories listed in the specifications manual
- Acceptance report from the TÜV (Technical Certification Authority) etc.
- Pilot run report
- Performance run report
- Installation drawing (dimensions sheet)
- Declaration of conformity with supplement operator's manual for ATEX-model
- Conformity statement / manufacturer's declaration
- Specification with all data

Not all the above documentation has been produced and supplied in every case. For this please check the details in the specification.

1.4 Technical Data/Specifications

The specifications of the centrifugal pump is the most important document in every operator's manual. Contained therein are all the relevant and technical data relating to the centrifugal pump. It is the birth certificate of the centrifugal pump and should be treated accordingly.

As a substitute the order confirmation together with the delivery schedule may also be a source of technical data.




1.5 Safety Instructions

1.5.1 General

It is essential that the relevant safety regulations and laws that apply in the operating company and / or country where the pumps are to be used are observed .

In this operating manual the following symbols are used to draw your attention to sources of danger. The symbols are intended to attract your attention to these instructions!

Symbol Meaning:


	Attention! Danger of injury! This sign warns you of the danger of mechanical effects.
	Warning! Mortal danger! This sign warns you of the danger from electric shocks.
	Information: It also instructs you in the economic use of the pump.

Notices attached directly to the pump, e.g. arrows indicating direction of rotation and the marking for fluid connections, must always be observed and maintained in a clearly legible condition.


- Use the pump only if it is in perfect technical condition, in accordance with the regulations, observing safety requirements and danger conditions and strictly adhering to all the instructions in the operator's manual!
- Promptly remedy any faults that could influence safety.
- **Prior to starting up, make sure that the operators have read and understood the operator's manual.** Not the operator but the owner is responsible for safety!
- The centrifugal pump is designed to be built into a total machine or plant. The centrifugal pump is delivered without any protection against accidental contact. If necessary, the system supplier must fit appropriate protective covers in integrating the centrifugal pump into the plant (e.g. if hot liquids with a temperature over 60° C are delivered).
- Leaks of hazardous delivery media, (e.g. explosive, poisonous, hot) must be controlled

so that no danger occurs to persons or the environment. Comply with legal requirements.

- Danger from electric shocks must be completely excluded (for details see the country specific regulations and / or those of the local power supply company).
- Electrical equipment must be installed and maintained exclusively by qualified electricians in accordance with regulations VDE or IEC.
- Before switching on or starting up the centrifugal pump, make sure that no-one will be endangered by the start-up of the pump!

	Important: The centrifugal pump must be immediately stopped if abnormal electrical voltages, temperatures, noises, vibrations, leakages or other faults should arise.
---	---

1.6 Temperature

	Warning! / Danger of burns! The centrifugal pump housing gets hot during operation. If the temperature rises to over +50°C, the centrifugal pump must be protected from direct contact by the operator.
---	---

1.7 Safety Instructions for Maintenance and Repairs

- Regardless of what nature they may be, repairs must only be carried out by qualified persons and the centrifugal pump must be emptied first.
- The attached pipework must be depressurized.
- Allow the pump to cool off.
- Prior to carrying out repairs to the pump it must be isolated from the electrical supply and protected from unintentional switching on.

2 Transport, Interim storage

2.1 Transport



Warning! Risk of injury!

Use only suitable and technically perfect lifting and load-bearing equipment with sufficient carrying capacity!

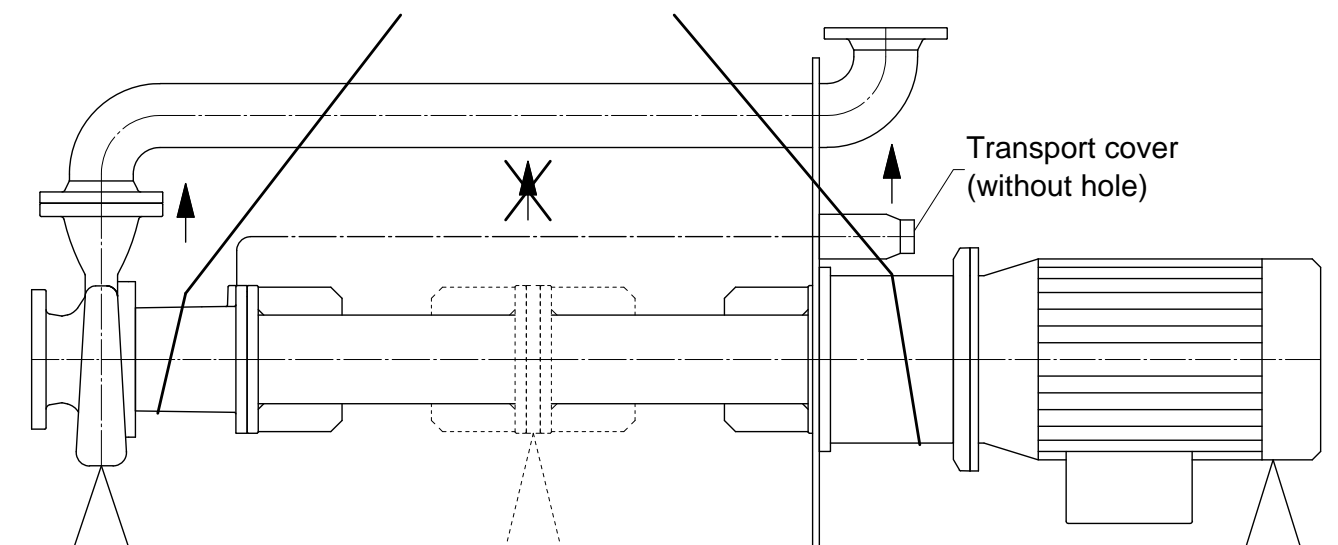
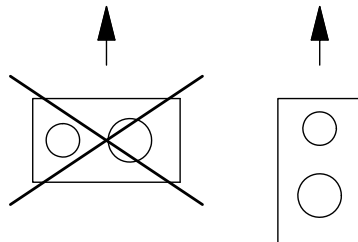
Never stand or work underneath swinging loads.

The transport of the unit must be properly carried out. Vertical pumps with a length of up to approx. 4 m are delivered already completely assembled.

When transporting and lifting horizontally lying pumps please ensure that the pipe kit is evenly supported, particularly at the bearing points. Bending stress and/or sagging should be avoided! The pipes in the pipe kit must be positioned over one another!



Horizontally lying pumps must be supported in the area of the bearing points!



Lifting example

2.2 Interim storage, Conservation

During interim storage only the low-alloy components that had contact with fluid need to be conserved. Commercially available conservation agents can be used for this. For the application / removal please observe the manufacturer's specific instructions.

The unit / pump should be stored in a dry place with as constant a humidity as possible.

2.3 Assembly

In general the pump is delivered fully assembled and can be installed directly.

Normally the pump is delivered without the drive motor. Prior to installing it in the plant, fit the drive to the pump.

3 Description of the product

3.1 Area of application

Vertical pumps from our V-range have been specially developed to deliver fluids which may also contain abrasive particles that may also cause wearing. Their use is specially recommended where, for example, cooling, rinsing, lubricating or other processing fluids, washing baths or solvents, that are contaminated with dirt or stripped materials resulting from any sort of manufacturing process, that have to be pumped to a filter station for filtering for the purpose of subsequent regeneration and which are then fed back into the production process in their cleaned state.

3.2 Constructional concept

Vertical centrifugal pumps from the V-range are submersible pumps with separate vertical pressure pipe for installation in pits and tanks. The support plate (cover plate) is rectangular and suitable for the tank; the pressure pipe rises vertically within the support plate. The maximum installation length is approx. 3000 mm. For immersion depths over 1500 mm the shaft has been produced in 2 sections, an additional intermediate bearing added, and the two shaft sections joined precisely to one another with the help of a straight shank coupling.

The pump shaft is basically supported only by roller bearings that are protected by an oil bath sealed off by mechanical seals. This design allows drive speeds, even in the upper performance range, up to approx.

3000 rpm at 50 Hz or 3600 rpm at 60 Hz.

3.3 Shaft bearing

The pump shaft is lodged in roller bearings on the drive and tank sides. The intermediate bearing, designed for installation lengths in excess of 1500 mm, is also a roller bearing. The internal bearings have been packed with lubricant to last their useful life; the addition of lubricant to these bearings is not necessary nor is any maintenance. The upper bearing is the supporting bearing; at the same time it takes the resulting axial thrust.

3.4 Sealing system

The sealing of the shaft passage to the pump housing is via a maintenance-free and contactfree throttling gap / friction bearing that is comprised of the shaft sleeve and throttling bush. The roller bearings are protected on the medium side by an upstream oil bath. An oilfilled chamber prevents the entry of contaminated tank fluids. The shaft passages of this oil chamber are sealed off with the help of mechanical seals. These mechanical seals are kept lubricated with clean oil from the bath. They are subject to a minimum of pressure. The two mechanical seals therefore work under optimum operating conditions, which is a prerequisite for perfect sealing, trouble-free operation and a long useful service life. Potential losses of oil, that should be scarcely perceptible during normal operations, are made up from the oil reservoir situated just above the support plate. Greater leakage is a sure sign of defects or worn mechanical seals.

3.5 Dry-run protection

- To seal the shaft passage into the pump housing a choke gap is employed.
- The mechanical seals of the oil bath are always covered by oil.

The oil bath is an effective protection against the mechanical seals running dry. There is practically no danger of the pump assembly ever failing due to it running dry.

3.6 Installation depth

From the minimum installation depth of 750 mm, the installation lengths for the suspensions and shafts are in steps of 250 mm. From 1500 mm the steps are 500 mm. Consequently within the immersion range from 750 to 3000 mm practically every desired depth can be precisely realised.

3.7 Materials - Selection options

For the flow-conducting cast parts:

»grey cast iron« and »stainless steel« .

For some pump sizes from the ZV and ZHV ranges there are also impellers or distributors and stage casings made of plastic available: »POM« and »PPS« .

For shafts, suspensions and pressure pipes:

»steel« and »stainless steel« .

3.8 Performance range

Flow-conducting parts from our Z, ZH, FB and NB range of pumps can be fitted to the available attachment systems.

From this the performance ranges summarised in the table below result:

Vertical pumps with flow-conducting parts from the range / hydraulic:	Z, SZ	FZ			NB	ZH
Range description	ZV SV	FV			NV	ZHV
Pump design	einstufige Spiralgehäuse-Tauchpumpen					mehrstufige Tauchpumpe in Gliederbauweise
Operating speed [rpm]	2900	1450	2900	1450	2900	2900
Delivery rates up to [m³/h]	60	100	130	500	300	40
Heads up to [m]	55	15	60	40	100	270
Max. driving power [kW]	11	11	37	37	37	37

4 Installation / fitting

The NV pump is designed exclusively for “wet installation”, i.e. for use in a tank!

Fitting the pump into a tank or pit:

Make sure that the pump is easily accessible and that above the tank or pit there is sufficient removal space available (observe the installation depth).



Warning!

Prior to installing the pump the support flange or plate must be carefully checked with a spirit level and adjusted if necessary.

Permissible positioning deviation 0.2 mm/m. Install the pump in a vibration-free and stable manner and firmly anchored! Lay the pressure pipe free of tension.

Under no circumstances must the pump be used as anchor point for the pipework. The nominal bores of the pipes should be at least the same as those of the pump connections.



Important

Pipe compensators must not be used to make up for inaccuracies in the pipelines, for example with a centre offset of the flange.

Make sure that the distance of the suction connection from the floor and wall is such that the delivery fluid can flow in evenly and unrestricted from all sides. The minimum distance of the suction connection from the floor must not be less than the single nominal diameter of the suction connection.

The suction connection should always be submerged deeply enough so that no air can be sucked in and the formation of air-drawing input eddy currents is avoided (it may be necessary to introduce special measures, e.g. a deflecting baffle or float). The inflow to the tank should basically and always be submerged. This simple measure will prevent air being drawn into the pump. Between the pump suction connection and the inflow junction there must always be a sufficiently large distance, in some cases it may be necessary to erect an impact or bulkhead wall between the two.

In the case of polluted fluids make sure that no solids can collect in the dead spaces on the floor. To prevent this the suction sump should have sloping walls with an angle of inclination of 45 degrees, or even better, 60 degrees.

4.1 Electrical Connections

If the pump is driven by an electrical motor, then the power supply connections must be carried out by a qualified electrician. The available mains voltage must be compared with the details on the motor's factory plate and the appropriate connection selected.

We recommend the use of a motor protection facility.



Risk of explosion!

Where there is a risk of explosion a motor protection device must be fitted!

In compliance with VDE 0530-8, three-phase motors are always wired for clockwise rotation (looking at the motor shaft stub).

The direction of rotation of the pump is anti-clockwise as standard (viewed from the suction flange).

Always note the arrow on the pump indicating the direction of rotation.

Connect the motor according to the circuit diagram in fig. 1 or fig. 2.

Delta connection Δ (low voltage)

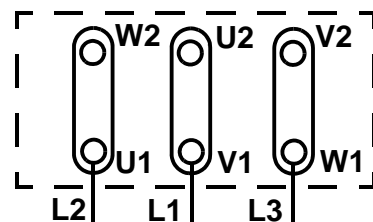


Fig. 1 Connection for 3-phase motors, connection Δ

Star connection Y (high voltage)

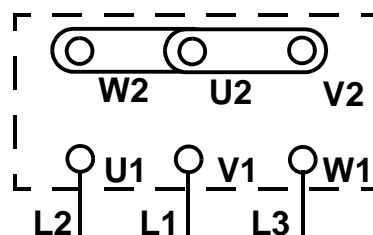


Fig. 2 Connection for 3-phase motors, connection Y

Time relay setting

For three-phase motors with star-delta connection it must be ensured that the switching points between star and delta follow each other very rapidly. Long switching times can result in damage to the pump. Setting of the time relay for star-delta connection:

Motor power:	Y time setting
up to 30 kW	3 sec. ± 30%
from 30 kW	5 sec. ± 30%

Direction of rotation check

The direction of rotation of the motor must agree with the direction of the rotation arrow on the motor housing of the pump (seen from the motor, in a clockwise direction). Check by rapidly switching on and off.

If the direction of rotation is wrong, change any two phases L1, L2 or L3 of the power supply in the motor terminal box over.

5 Start up / shutdown



Warning!

It is most important to ensure that the following requirements are complied with. Damage that results from ignoring them is excluded from any claims under warranty.



Warning!

Prior to starting up, the tank for catchment liquid must be filled with oil or other suitable fluid and the catchment liquid pipe carefully vented.

Observe the information in sections 6.3 to 6.5.


Prior to starting up check that the shaft rotates easily.


The pump must be filled with delivery fluid prior to start up. In the case of wet installation this requirement is met if upon start up at least the pump casing is fully submerged. During operation the pump casing and suction pipe must always be filled with the delivery fluid; e.g. install a foot-operated valve.

5.1 Switch on

- **The oil tank must be vented before commissioning!**
- If necessary, open available suction and pressure side shut-off devices.
- Fill the tank or pit so far that at least the spiral housing is completely flooded. (The required minimum cover must be attained – see measurement “r” in the dimension chart).
- Almost close pressure side shut-off device.
- Set motor protection switch to nominal motor current.
- Allow the drive motor to run up briefly to check that the direction of rotation is correct. The right direction is indicated by an arrow. To change the direction of rotation for 3-phase motors two of the phases can be changed over.
- Initially let the pump unit start up against an almost closed pressure pipe. Then use valves in the pressure pipe to regulate the desired delivery flow. At the same time check the current consumption of the motor. As the delivery flow increases so the power


requirement of the pump and current consumption of the motor increase!

 **Warning!**
The drive motor must not be verloaded! The current consumption must not exceed the nominal motor current stated on the motor rating plate!

 **Warning!**
Dry running will result in the friction bearing / throttling section and mechanical seal to fail and must be avoided!

The following information applies particularly to the mechanical seals:

In the case of newly installed mechanical seals, the sliding ring and its counterpart ring can stick together very firmly due to adhesive forces. The force of the driving spring is then not enough to break the sliding ring away. In this case the shaft then runs in the static auxiliary seals of the sliding ring and in the driving spring, which leads to damage to these parts.

 **Warning!**
Prior to initial start up or after a longer period of standstill or after fitting a new mechanical seal always check that the shaft rotates easily.

We recommend the removal of the motor ventilator cowl and then to try to turn the shaft via the motor ventilator wheel in the direction indicated by the arrow. If there is resistance felt and the ventilator wheel feathers back into the original position when it is released, then the mechanical seal must be removed and the sliding ring and its counterpart ring must be arefully separated.

Under no circumstances should the shaft be turned by force.

5.2 Switching frequency

The permitted number of starts per unit of time depends on the circumstances and operating conditions of the facility. In general, an overload of the motor may have the following consequences:

- An abnormal temperature increase which exceeds the limits set for the winding or the bearing grease.
- Premature wear of the coupling.
- A reduction in the useful service life of pump components.
- Irregularities or faults in the system.

In order to avoid an abnormal temperature increase in and overload of the motor, the coupling, the pump, the seals and bearings, the switching frequency (h) should not exceed the following guideline figures:

Motor power:	Max. switches / h
up to 3 kW	20
from 4 to 11 kW	15
from 11 to 45 kW	10
from 45 kW	5

6 Maintenance / Repair

6.1 General maintenance

Only a properly maintained unit in technically perfect condition will operate safely and reliably.

General Instructions

The user is responsible for ensuring that all maintenance, inspection and installation work is carried out exclusively by authorised and trained qualified staff who have carefully studied and understood the operating instructions. The creation of a maintenance schedule will enable you to avoid expensive repairs and to have a reliable and trouble-free pump operation with a minimum of maintenance effort and expense.



Warning! Mortal danger!

In principle, work on the machine must only ever be carried out once the electrical connections have been isolated or disconnected. The pump unit must be secured against unintentional switching on, otherwise there is mortal danger!

Pumps that deliver liquids that are hazardous to health must be decontaminated. In draining the delivery medium off care must be taken that neither persons nor the environment are placed in any danger. Legal requirements must be adhered to, otherwise there is mortal danger!

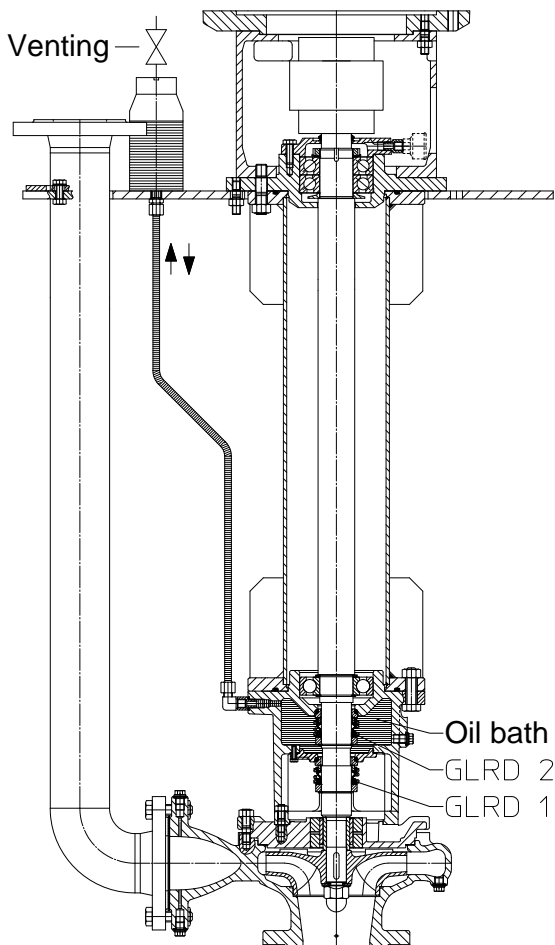
6.2 Operation monitoring



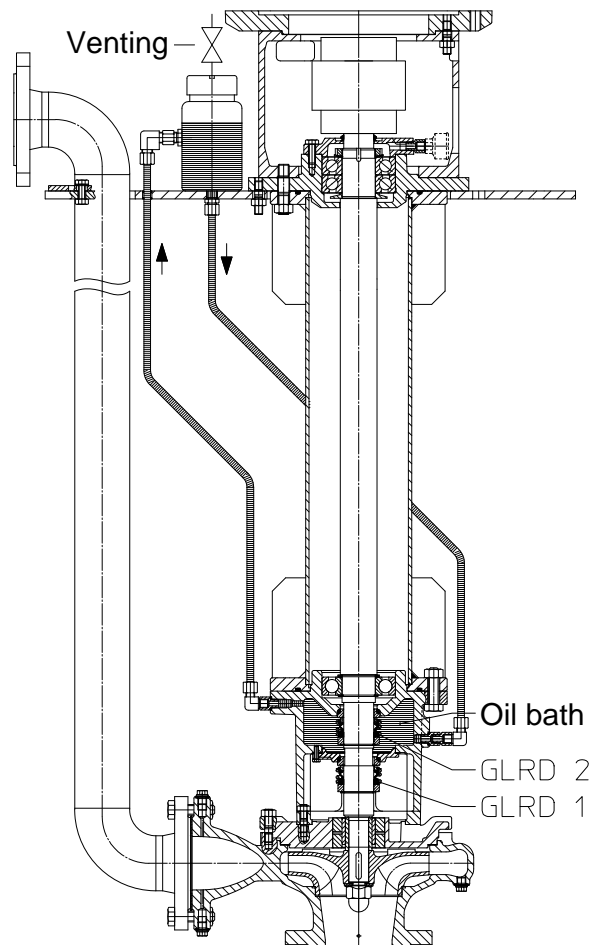
Warning!

The pump should always run quietly and vibration free. Irregular running can lead to damage to bearings and shaft seals. The pump must not run dry. The level of fluid must always be sufficient to cover the pump input. A longer period of operation with a closed shut-off device is prohibited. During short periods of operation against a slightly open shut-off device on the pressure side, the permitted pressure and temperature limits must not be exceeded.

6.3 Confining chamber system (SKS)



Version 1



Version 2

For this SKS the mechanical seals (GLRD) are placed in “tandem”.

The proper functioning of this dual GLRD is only assured if the confining chamber is filled with clean catchment medium.



Warning!

Replace the transport cover on the oil tank with the enclosed cover with vent hole.

Prior to starting up the pump unit make sure that the entire confining chamber system is filled with clean catchment fluid and has been carefully vented.

Keep the transport cover for any repairs.

Also observe instructions that are fitted directly to the unit. Always maintain in easily legible order.

6.4 Operating limits

These are determined primarily by the GLRD used.

Pressure to be withstood p max.: Depressurised

Catchment medium temperature: t max.: 60 °C

GLRD temperature: t max.: 80 °C



Warning!

The pump unit is delivered with a filled confining chamber. A lowalloy minearl oil is used as the catchment medium. No synthetic oils must be used. (Observe the pecifications on the pump plate and in the operating instructions).

Prior to starting up the pump unit make sure that the confining chamber / catchment vessel is filled with catchment medium. The **fluid level** is about 1/2 the contents of the plastic tank. Prior to starting up, the tank and the pipes for the catchment liquid must be carefully vented.

The level of the catchment medium will increase as it gets warmed through the operation of the pump. If the level is too high then the catchment liquid may run over. However, this does not affect the function of the SKS.

6.5 Catchment medium

- **For SKS without barrier pressure we recommend:**
 - Low-alloy minearl oils, i.e. without EP- (high pressure) additives that tend to form deposits, highly fluid (max. 46 according to ISO VG viscosity class). E.g. Total CIR-KAN RO 32

The catchment medium must not damage the sealing materials, neither chemically (e.g. corrosion, embrittlement) nor physically (e.g. deposits) and it must have adequate lubrication properties. If in doubt, please contact the manufacturer. Media such as DI / demineralised water must not be used as catchment medium.

6.6 GLRD materials

The mating of material for GLRD as standard equipment:

- In contact with delivery medium GLRD-1: SiC/SiC+Viton
- In the confining chamber GLRD-2: SiC/ carbon+Viton
- may deviate from that delivered!

Observe carefully your pump's specifications. As a rule the GLRD on the pump side is designed for the medium.

6.7 Maintenance / service GLRD

For SKS **without catchment pressure** the fluid level must be checked regularly (min. **once a week**), topped up and **changed every 6 months**. If the fluid is changed over then the mechanical seal must also be checked and replaced if necessary.

An inspection of the mechanical seal should be carried out within the scope of a system check after 8000 hours of operation.

If the GLRD is removed during a system check, then it must be replaced by a new one.

7 Storage and lubrication

Only a properly maintained unit in technically perfect condition will operate safely and reliably. Amongst others, this applies to the roller bearings. Their practical useful service life depends very directly on the style of operation and usage conditions.

Through regular checks of the lubricant, the housing temperature and watching out for irregular running the risk of excess temperatures arising due to bearings running hot or defective bearing seals can be largely prevented.



Note:

The greased bearings are filled with grease at the factory. "Model with grease nipples". For some models roller bearings that are lubricated for the length of their useful life are used. In such cases there are no grease nipples on the bearing brackets.

7.1 Model without grease nipples

Under normal operating conditions the motor bearings must be replaced after 15,000 hours of running or at the latest after 2 years. Under unfavourable operating conditions, e.g. a high ambient temperature, corrosive or very dusty conditions, the motor bearings must be checked and, if necessary, replaced much earlier.

Closed bearings with lifelong lubrication (2Z or 2RS bearings) cannot be washed out and regreased. In this case replace the bearings.

7.2 Bearings with grease nipples

The roller bearings must be re-greased at intervals specified on the motor rating plate.

7.2.1 Grease

7.2.1.1 Grease quality / grease change

The bearings are filled with a high quality lithium base saponification grease. Depending on the pump size and operating times the bearings should be re-greased or the grease in the bearings must be renewed.

	Rotation speed ~1.500 (rpm)	Rotation speed ~2.950 (rpm)	Rotation speed ~3.550 (rpm)
ZV, SV ZHV 3208	10.000 h	6.000 h	5.500 h
NV FV ZHV 3213 ZHV 4016	9.000 h	4.000 h	3.000 h

In the case of short re-grease intervals it is recommended to renew the grease once a year.

If that is not the case, then the complete renewal must occur at least every two years. Here the roller bearings must be taken out, cleaned and re-filled with grease.

Under unfavourable operating conditions, e.g. a high ambient temperature and high humidity, dust-laden air, aggressive industrial atmosphere, etc., the bearings should be checked and, if necessary, cleaned and re-filled with new grease much earlier. In such a case a lithium base saponification grease should be employed, it must be free of resin and acid, must not become brittle and should protect against rust. The grease should have a penetration number (NGLI class) between 2 and 3, corresponding to a Walk penetration of 220 to 295 mm/10. The dripping temperature should not be less than 175 °C. The bearing voids must only be approximately half filled with grease. If necessary, the bearings may also be lubricated with greases based on other soaps.

As greases with different soap bases must never be mixed, the bearings have to be thoroughly washed clean first. The requisite re-grease intervals must then be adjusted to the new greases.

7.2.1.2 Lubricant quantities

The quantity of lubricant depends on the size of the bearings and varies between 5 and 20 gm per bearing.

Maintenance / relubrication:

- Angular ball bearings 7212 and 7310 are installed in tandem on V-pumps and must be relubricated.
- For lubricating quantities, see the specifications on the pump rating plate
In general:
7212 tandem - after 4,000 hours, 15g per set
7310 tandem - after 4,000 hours, 25g per set

When replacing the ball bearings, the cavities of the bearings must only be filled with max. 30 to 40% grease.

7.2.1.3 Roller bearing temperature



Warning!

Roller bearings rotating at 3,000 rpm and more are designed to withstand a temperature of 90°C. A manual check of the temperature is inadequate in any circumstances.

- Bearings will attain their normal temperature only after several hours of operation.
- When a new pump is taken into service the temperature can climb to over 95°C. After 2 to 3 hours of running it will slowly decline and after about 1 week it will settle at a constant value.
- An increase in temperature can occur after a customer service if the bearings or hydraulics have been dismantled. However, if the temperature exceeds 100°C after starting up the pump, then switch it off and carry out the following checks:
 - Check the alignment of the unit.
 - Remove the bearings and check amount of grease. Too much grease will lead to excessive temperatures.
- Check the bearing type and alignment.
- Start the pump up again. Make sure the outer rings press properly through the cover (fixed bearing).

7.3 Norm motor

For norm motors the bearing type (with or without re-greasing) is specified in the manufacturer's documentation.

If the norm motor is exchanged and not replaced by the identical model from the same manufacturer then the new manufacturer's conditions and regulations must be observed.

8 Dismantling / re-assembly



Important:

Prior to starting to dismantle it the pump must be safeguarded against accidental switching on. The shut-off valves in suction and pressure pipes must be closed. The pump must have reached ambient temperature and be depressurised and empty. Dismantling and re-assembly must only take place in accordance with the associated sectional drawing.

Basic regulations / instructions

Repair and maintenance work on the pump must be carried out by specially trained staff and using only original spare parts (see Safety information). Always observe the safety precautions stated in **chap. 1** (Safety). If work has to be carried out on the motor then the provisions and requirements of the relevant motor manufacturer must be observed.

Dismantling and re-assembly must only take place in accordance with the associated sectional drawing. The overall sectional drawing and further supporting documents are contained in the appendix. The sequence of events for dismantling can be gleaned from the overall sectional drawing. In case of damage please contact our service department.

8.1 Dismantling - general

Before you begin

Begin the work only once you have checked that:

- The required spare parts are available and that they will fit this pump or your particular model thereof. Or that the suspected damaged parts can be obtained promptly. Make sure that the pump serial number is stated in your spare parts order.

**Note:**

Use only original spare parts for the repairs!

All the gaskets must be replaced when the pump is re-installed.

Observing these instructions is a prerequisite for trouble-free operation of the pump and for the acceptance of potential claims under guarantee.

Dismantling the pump (from the suction side):

1st step:

- Remove pump
- Empty the catchment fluid tank (633) and confining chamber /330.02)
- Reinstall the transport cover (without hole)
- Loosen pressure pipe (700/710)
- Loosen motor (801) from drive stool (341) and remove with coupling (840)

2nd step:

for FV, NV, ZV, SV:

- Unscrew spiral housing (102)
- Loosen impeller nut (922) and pull the impeller (233) off
- Pull off the key (940.02)
- Unscrew the pump cover (163/462) and remove with throttling bush (542)
-> for SiC/SiC model:
Request extra work instructions (contact Schmalenberger)
- Pull protective shaft sleeve (542) off the shaft

for ZHV:

- Unscrew suction housing / cover (106/162)
- Loosen impeller nut (922) and pull the impellers (233) off with stages (109/147)
- Pull off the keys (940.02)
- Remove shaft sealing ring (420.02) or mechanical seal (433.03) (see 8.2 Replace the GLRD)
- Unscrew spiral housing (102/107)

3rd step: (pump side bearing)

- Remove mechanical seal (433.03) (see 8.2 Replace the GLRD)
- Unscrew intermediate piece (132) and, if fitted, counter-ring carrier (476)
- Remove mechanical seal (433.01) (see 8.2 Replace the GLRD)
- Unscrew confining chamber (330.02)

4th step: (Intermediate bearing – if fitted)

- Unscrew lower delivery suspension tube (713.02) from bearing bracket (330.03)
- Loosen union nut (927.02) and pull shaft (211.02) out of the coupling bush (548)
- Remove bearing bracket (330.03)

5th step: (Motor side storage)

- Loosen screws (901.03) and unscrew delivery suspension tube (713.02)
- Remove bearing bracket (330.01) with shaft (211.01), bearing cover (360) and ball bearing (326)

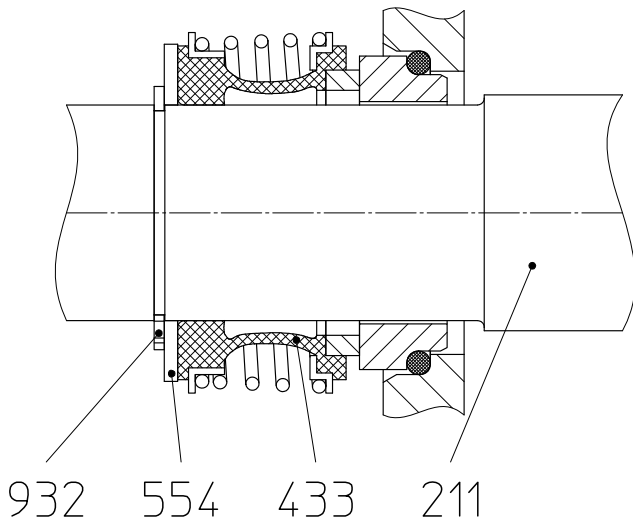
6th step: (Remove ball bearing)


- Unscrew bearing cover (360) from bearing bracket (330.01)
- Pull ball bearing (326) from shaft (211.01)
- Pull roller bearing (320) from shaft (211.02)
- Pull roller bearing (320.02) from coupling bush (548)

8.2 Replace mechanical seal

The mating of materials for the sliding surfaces are in accordance with the relevant operating conditions. The material used for the mechanical seal is stated in the pump specification or the order confirmation.

After loosening the locking ring (932) pull the sliding ring packet (433) off the shaft (211).



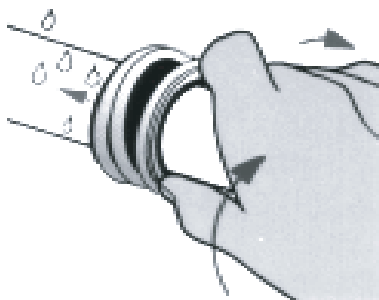


Warning!
The sliding surfaces of the mechanical seals are made with the greatest precision. They must be handled very carefully and be protected.

Sliding ring and counter-ring packet are precision ground to each other. They belong together. Therefore always renew the entire set (consisting of sliding ring and counter-ring) at the same time.

Prior to starting up observe the instructions for GLRD (under chap. 5.1 - Switching on)


To make it easier to slide the rings onto the shaft it is advisable to use a little soap solution.



8.3 Pump re-installation

In principle the re-installation is in the reverse order of dismantling.

Replace the transport cover on the oil tank with the enclosed cover with vent hole.



Warning!
The mechanical seal area / confining chamber must always be well vented.

8.4 Spare parts list / wearing parts

Parts that are basically subject to wear are:

- Impeller (233)
- Throttling section consisting of:
 - Throttling bush (542)
 - Protective shaft sleeve (524)
- Pump side mechanical seal (433)

9 Faults / causes



Warning!

In the event of a fault, switch pump of immediately!

Fault elimination must be carried out exclusively by suitably qualified personnel.

Pump stationary	Excessive pump pressure	Pump delivery rate too low	Motor overload	Pump does not deliver, no pump pressure	Increased motor / bearing temperature	Pump leaks	Pump runs irregularly, operating noises	Pump temperature too high	Cause of the fault	Elimination of the fault
		x							Pump has to work against too high a pressure	Readjust operating point
		x							Back pressure too high	Reset operating point, increase the rpm, install one or several larger impellers
		x					x	x	Pump / pipework not completely vented or filled up	Vent or fill up pump and pipework
		x							Supply or impeller blocked	Clean pipework and pump
		x							Air pockets in the pipework	Change pipework, install exhaust valve directly in front of the non-return valve
		x					x	x	NPSH system (supply too small)	Correct fluid level / level control, fully open valves in the suction pipe, decrease resistance in the supply pipe, clean sieves and suction connections
		x							Suction height too large / (or supply too small)	Increase fluid level, correct level control, clean sieves and suction connections, change suction
		x							Wrong direction of rotation	Swap over two of the power supply phases in the terminal box
		x							Speed of rotation too low	Increase the rpm (*) (if necessary, new motor)
		x					x		Worn internal parts (e.g. the impeller)	Remove foreign bodies out of the pump housing, replace worn parts

Pump stationary	Excessive pump pressure	Pump delivery rate too low	Motor overload	Pump does not deliver, no pump pressure	Increased motor / bearing temperature	Pump leaks	Pump runs irregularly, operating noises	Pump temperature too high	Cause of the fault	Elimination of the fault
			x				x		Pump back-pressure is less than stated in the specifications	Set operating point precisely, screw off impeller if required (*), increase counterpressure e.g. by throttling pump on pressure side, use larger motor (*)
			x						Higher density or higher viscosity of the delivery medium than specified	Re-adjust the pump (*)
	x		x						When operating with FC rpm too high	Decrease rpm (*)
						x	x		Shaft seal worn	Replace shaft seal, check catchment liquid, check coolant supply lines, check bypass for clear cross-section
x									Foreign body in the pump, motor bearings defective, circuit breaker tripped due to motor overload, circuit breaker too small, winding defective	Remove foreign body from pump housing, clean or replace pump housing, replace motor bearings, check electrical connection and compare with motor rating plate, if the motor is overloaded: Throttle the pump, smaller impeller (*), larger motor (*)
			x	x			x		Pump distorted or resonance vibrations in the pipework	Check pipework connections / pump holder, connect pipework via compensators
					x		x		Too little, too much or wrong lubricant	Add or reduce or completely replace the lubricant
		x	x						Motor runs on 2 phases	Check / repair fuse and conductor connections
						x			Connecting screws loose	Replace gaskets, tighten connecting screws
							x		Impeller out of balance	Clean impeller, balance impeller (*)
					x		x		Bearing defective	Replace bearing

Pump stationary	Excessive pump pressure	Pump delivery rate too low	Motor overload	Pump does not deliver, no pump pressure	Increased motor / bearing temperature	Pump leaks	Pump runs irregularly, operating noises	Pump temperature too high	Cause of the fault	Elimination of the fault
							x	x	Delivery rate too low	Re-adjust the pump, for low volumes provide a bypass
		x	x						Air being sucked in due to too little covering	Increase fluid level
		x	x				x	x	Gas production, high level of air content in medium	Vent the medium, fully open valves in the suction pipe
							x		Cavitation	Throttle the pump on the pressure side, correct the suction conditions, use larger pump (*)
							x		System induced oscillations	Check system (*)

(*) Please consult the manufacturer.

10 Appendix

10.1 Ordering Spare Parts

When ordering spare parts please do not fail to give us the following important information:

- Pump serial number and type description
- Delivery medium
- Position number and / or description from spare parts list
- Material data from the specifications or the order confirmation

10.2 Factory repair, customer service

If you send the pump back to the manufacturer for repair or an upgrade then please be sure to enclose precise details of the media that were delivered by the pump. (Copy of the safety sheet)

Only pumps that are completely empty and clean will be accepted for repair.

Customer service

Schmalenberger provides a 24 hour service for the delivery of spare parts!

See our homepage under:

www.schmalenberger.de

Head office address:

Schmalenberger GmbH & Co. KG

Im Schelmen 9 - 11

D-72072 Tübingen

Telephone: + 49 (0) 7071 - 7008-0

Fax: + 49 (0) 7071 - 7008-14

11 Spare parts list and drawings



In the spare parts list (page 30 ff) all parts of all the pump types are listed.
Not all parts are built into every pump, however.
Additional versions and appropriate hydraulic systems, see p. 25 - 29.
Structure, see chapter 3.8.

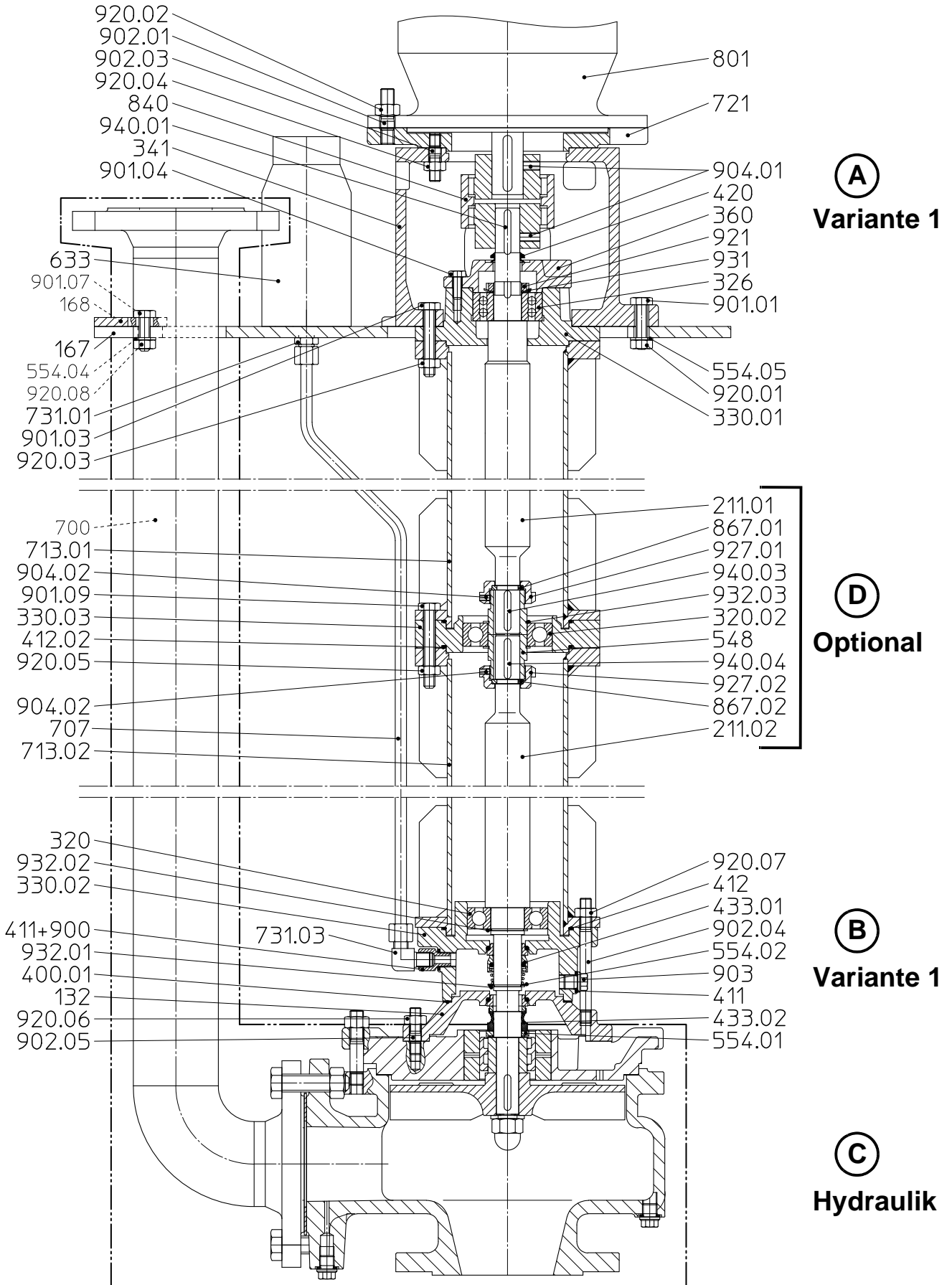
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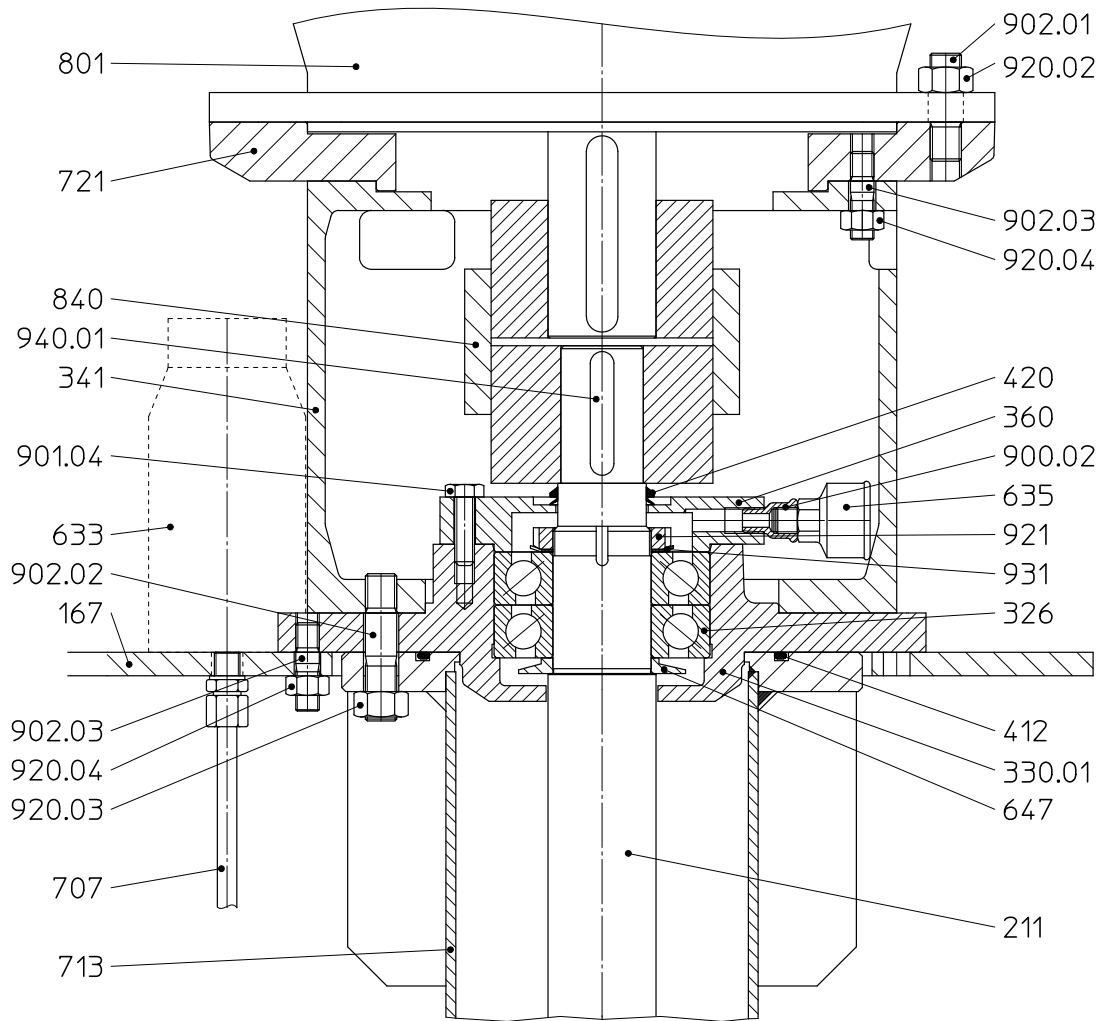
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Variante	Version
Optional	Depending on depth of immersion
Hydraulik	Hydraulic system
V-Reihe	V serie
Typ FV	Type FV
Typ NV	Type NV
Typ ZV/SV	Type ZV/SV
Typ ZHV	Type ZHV

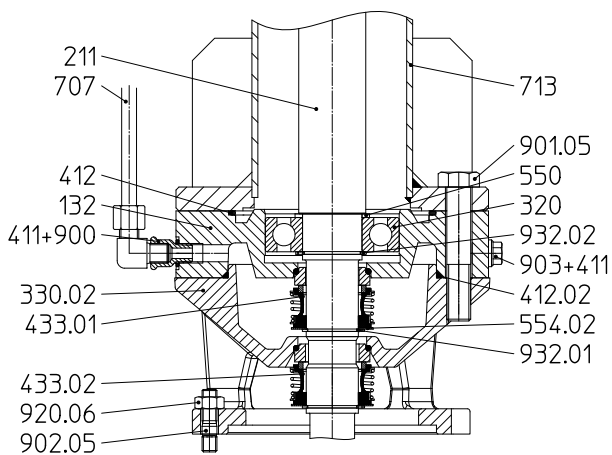
V serie



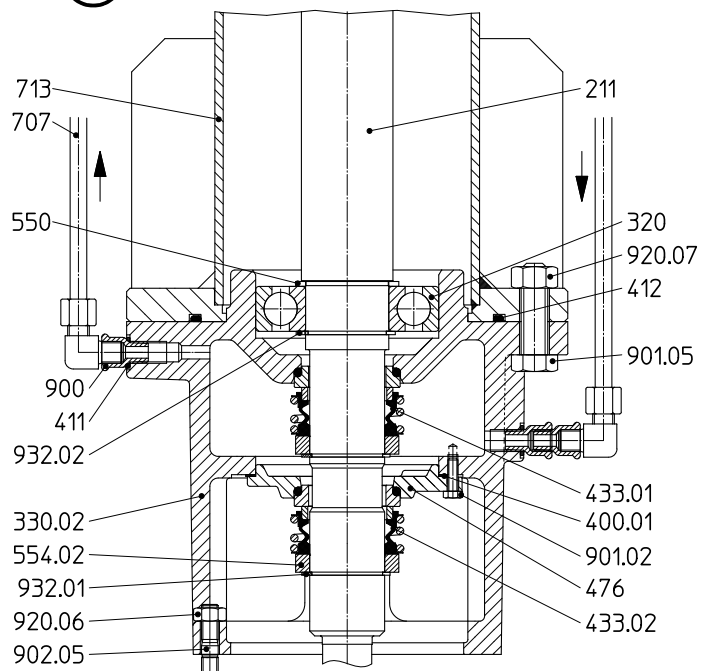
(A) Version 2



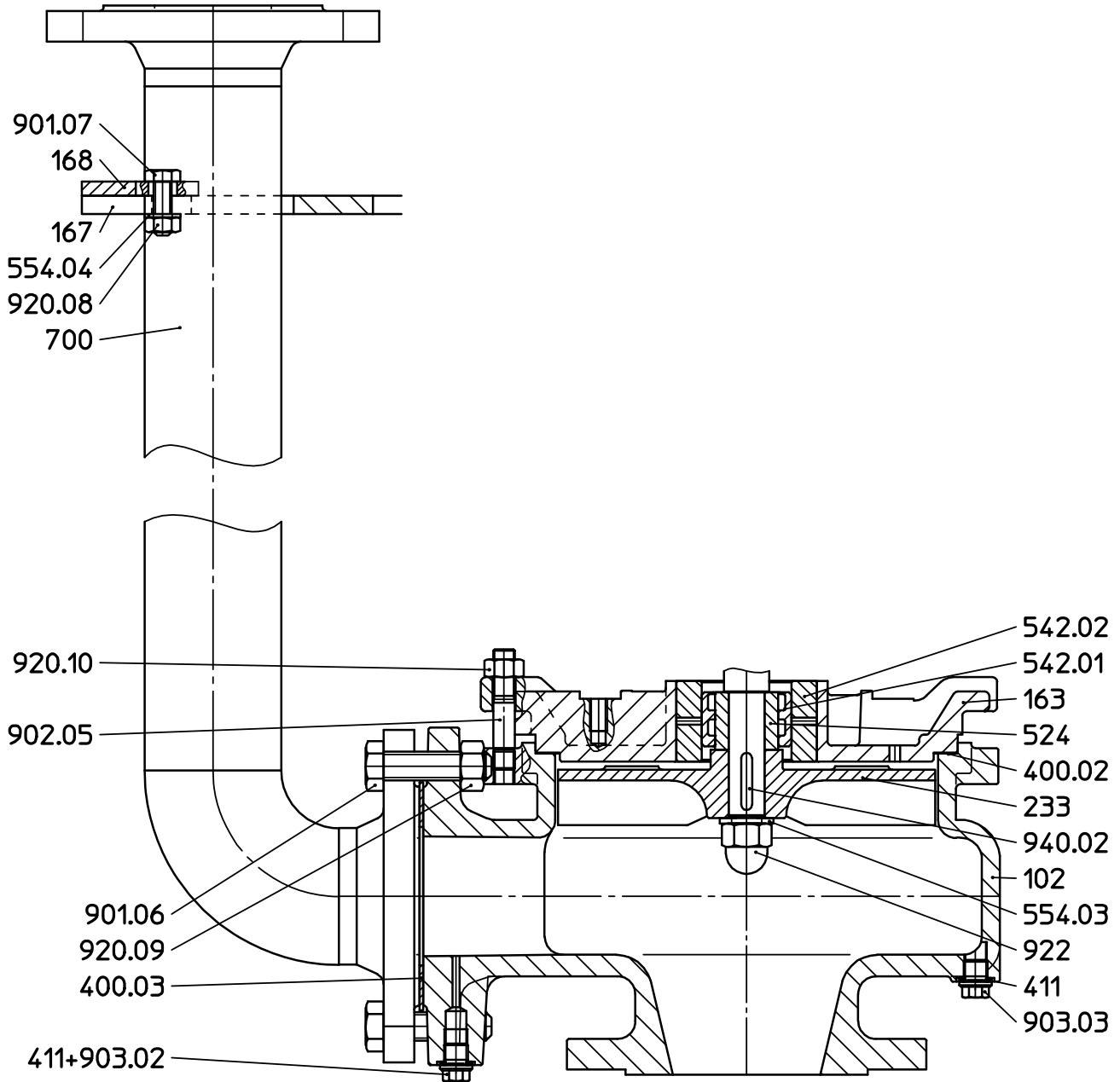
(B) Version 2



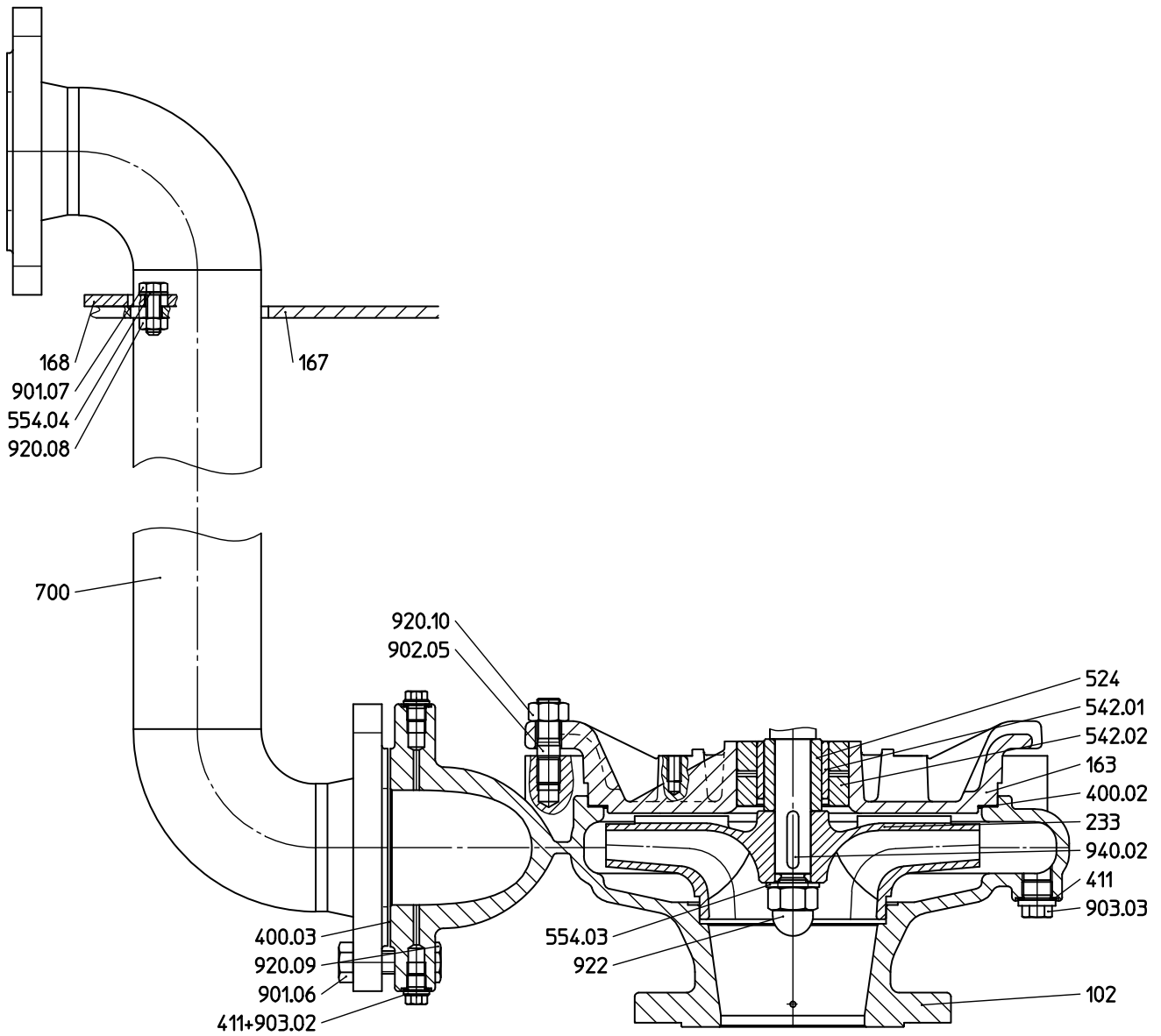
(B) Version 3



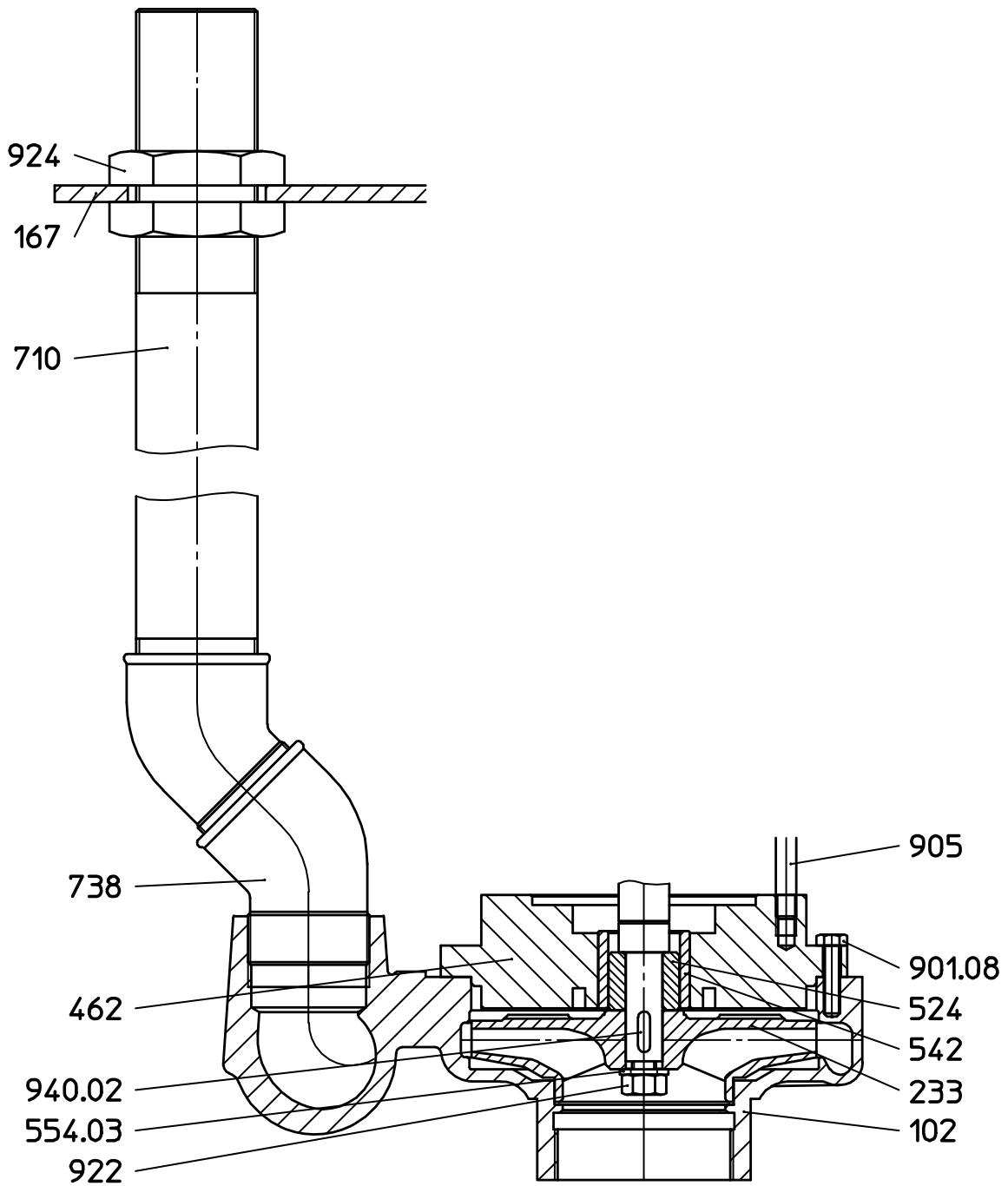
Hydraulic system Type FV



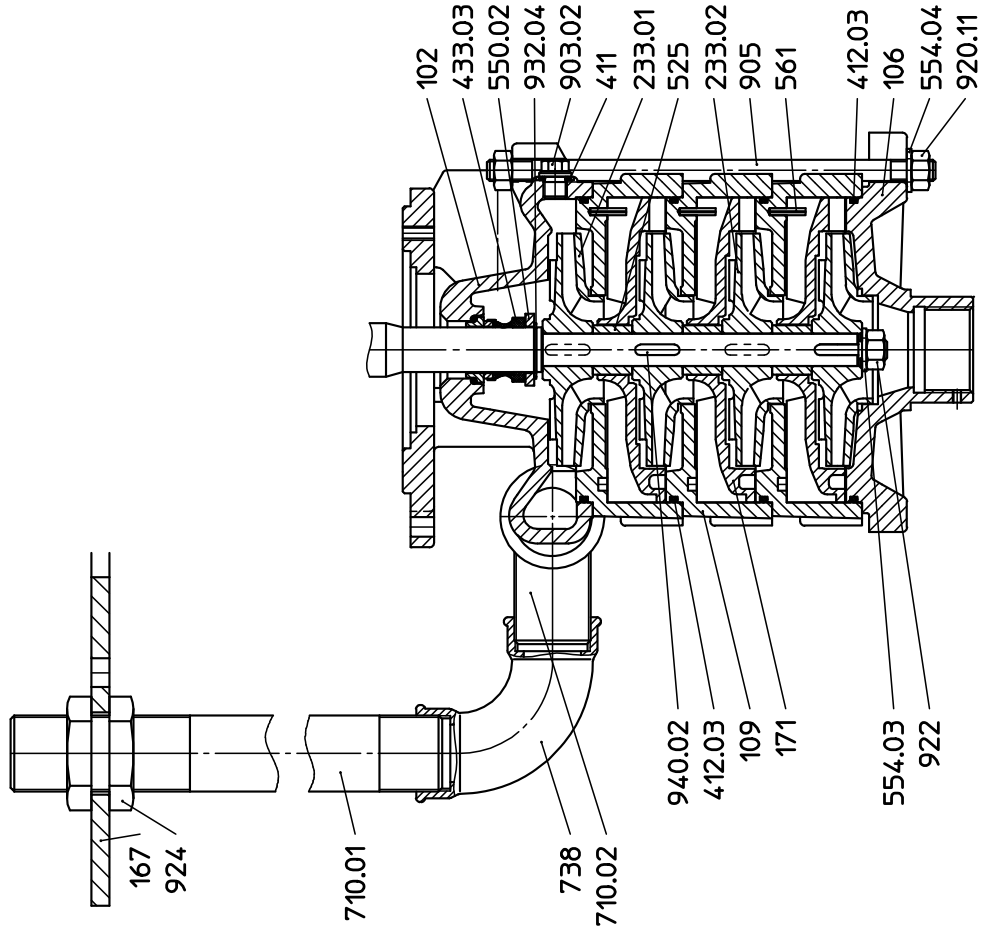
Hydraulic system Type NV



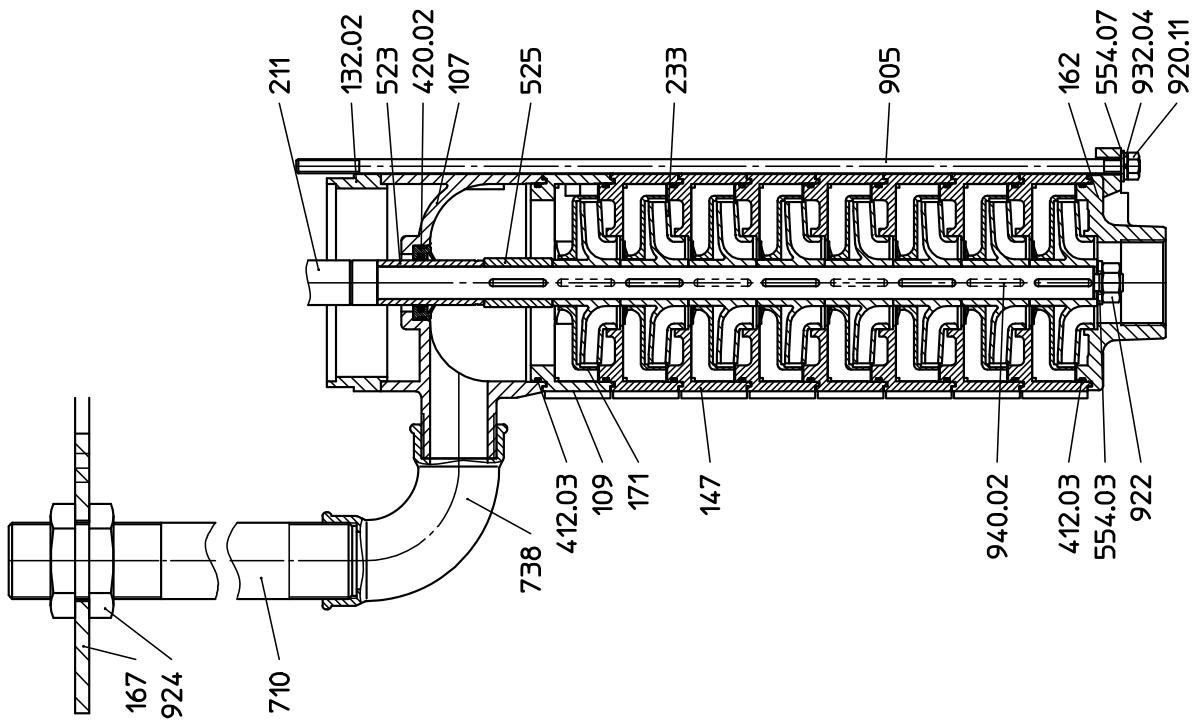
Hydraulic system Type ZV / SV



Hydraulic system Type ZHV 3213 + 4016



Hydraulic system Type ZHV 3208



Spare parts list

Pos.	Denomination	
102	spiral housing	
106	suction casing	
107	pressure casing	
109	stage casing	
132	intermediate piece	
147	stage casing complete with distributor (plastic)	
162	suction cover	
163	pressure cover	
167	cover plate	
168	sealing plate	
171	distributor	
211/.01/.02	pump shaft	
233/.01/.02	impeller	
320/.02	roller bearing	
326	angular ball bearing (2 x tandem)	
330.01/.02/.03	bearing bracket / confining chamber	
341	motor stool	
360	bearing cover	
400.01/.02/.03	clamp gasket	
411	CU-ring	
412.01/.02/.03	O-ring	
420/.02	shaft sealing ring	
433.01/.02/.03	mechanical seal	
462	throttling bush support	
476	counter-ring support	
523	shaft sleeve	
524	protective shaft sleeve	
525	distance sleeve	
542/.01/.02	throttling bush	
548	coupling bush	
550/.02	washer	
554.01/.02/...	distance washer	
561	straight grooved pin / locking pin	
633	oil cup / tank for barrierfluid + 2 covers	
635	grease cup	

Pos.	Denomination	
647	grease regulator	
700	pipework	
707	lubrication pipe	
710/.01/.02	pressure pipe	
713/.01/.02	delivery suspension tube	
721	transition piece	
731.01/.02/...	screwed pipe joint	
738	bend, angle	
801	norm-motor	
840	coupling	
867.01/.02	coupling bush	
900/.02	extension	
901.01/.02/...	hexagon screw	
902.01/.02/...	locking screw, (stud)	
903/.02	plug screw	
904.01/.02	threaded pin	
905	connecting screw	
914	cylinder screw with hexagon socket	
920/.01/.02/...	hexagon nut	
921	shaft nut	
922	impeller nut	
924	lock nut	
927.01/.02	union nut	
931	lock washer	
932.01/.02/...	retaining ring	
940.01/.02/...	key	

Not all parts are built into every pump, however.

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Pump model V

Version: 27233 - D