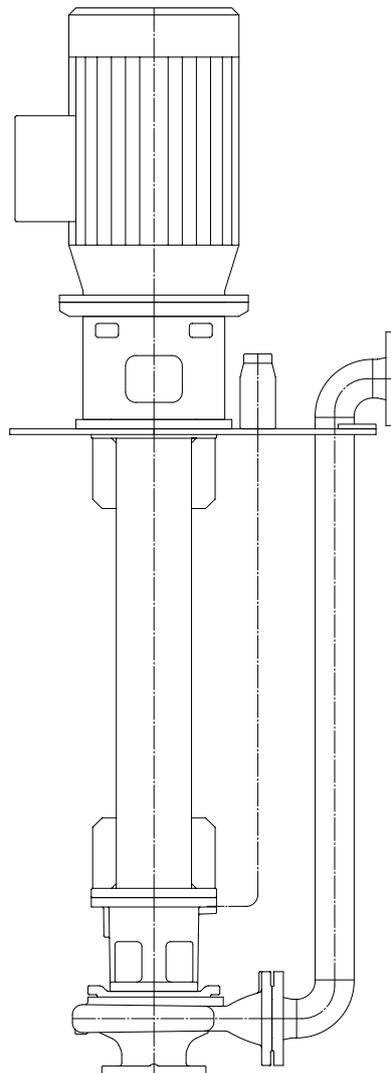


## Circulating pumps

**Model FV / NV / ZV / SV / ZHV**

**GB**

**Operators´ manual**



**27233 - B.1**

**EG-Einbauerklärung**  
**Déclaration d'incorporation CE / EC Declaration of Incorporation /**  
**Declaración de incorporación CE / Dichiarazione di incorporazione CE**

**Hersteller / fabricant / manufacturer / fabricante / produttore**

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

**Produkt / produit / product / producto / prodotto**

Kreiselpumpe falls geliefert ohne Antrieb / Pompe centrifuge, si livrée sans entraînement / Centrifugal pump if delivered without drive / Bomba centrifuga, en caso de suministro sin accionamiento / La pompa centrifuga, se fornita senza trasmissione

**Typ / modèle / model / modelo / tipo**

FV, NV, SV, ZV, ZHV

ist eine unvollständige Maschine nach Richtlinie 2006/42/EG Artikel 2g und ausschließlich zum Zusammenbau mit einer anderen Maschine vorgesehen,

est une machine incomplète au sens de la directive 2006/42/CE Article 2g) laquelle est uniquement destinée à être assemblée à une autre machine,

is an incomplete machine in accordance with Regulation 2006/42/EC Article 2g and is provided exclusively for assembly with another machine,

es una máquina incompleta según la directiva 2006/42/CE artículo 2g y ha sido concebida exclusivamente para el ensamblaje con otra máquina,

è una macchina non completa, in accordo alla Direttiva 2006/42/CE, articolo 2g, e prevista esclusivamente per l'assemblaggio con un'altra macchina,

den folgenden grundlegenden Anforderungen der Richtlinie 2006/42/EG entspricht:

correspond aux exigences fondamentales requises par la directive 2006/42/CE :

which meets the following basic requirements of Regulation 2006/42/EC:

que cumple con los siguientes requerimientos básicos de la directiva 2006/42/CE:

che rispetti i seguenti requisiti basilari della Direttiva 2006/42/CE:

Anhang I, Artikel 1.1.1, 1.1.2, 1.1.3, 1.1.5.

Annexe I, articles 1.1.1, 1.1.2, 1.1.3, 1.1.5.

Appendix I, Article 1.1.1, 1.1.2, 1.1.3, 1.1.5.

Anexo I, Artículos 1.1.1, 1.1.2, 1.1.3, 1.1.5.

Appendice I, articoli 1.1.1, 1.1.2, 1.1.3, 1.1.5.

**Harmonisierte Normen die verwendet wurden / Normes harmonisées appliquées / Harmonised standards that were used / Normas armonizadas aplicadas / Con l'applicazione delle normative armonizzate:**

DIN EN 12100-1, DIN EN 12100-2, EN 809, EN ISO 14121-1

Die unvollständige Maschine entspricht weiterhin Bestimmungen der Richtlinien:

La machine incomplète est également conforme aux stipulations des directives suivantes :

The incomplete machine further more meets the requirements of Regulations:

La máquina incompleta cumple además con las prescripciones de las directivas:

La macchina non completa rispetta ancora le prescrizioni delle direttive:

- 94/9/EG - gilt nur für Produkte mit ATEX-Kennzeichnung 3G oder 3D auf dem Pumpenleistungsschild .
- 94/9/CE - est uniquement valable pour des produits avec marquage ATEX 3G ou 3D sur la plaque signalétique de la pompe.
- 94/9/EC - applies only to products with ATEX mark 3G or 3D on the pump rating plate
- 94/9/CE - Rige esclusivamente para productos con marca ATEX de tipo 3G ó 3D en la placa indicadora de potencia de la bomba.
- 94/9/CE - valida solo per prodotti con contrassegno ATEX 3G o 3D sulla targhetta della pompa.

Normen die verwendet wurden / Normes appliquées / Standards that were used / Normas aplicadas / Norme applicate:  
EN 13463-1, EN 13463-5

Die zur Maschine gehörenden speziellen technischen Unterlagen nach Anhang VII Teil B wurden erstellt.

Les documents spéciaux correspondant à la machine conformément à l'annexe VII Partie B ont été établis.

The special technical documentation that belongs to the machine has been created in accordance with Appendix VII Part B.

Sobre la base del anexo VII Parte B se ha elaborado la documentación técnica especial que pertenece a la máquina.

La documentazione tecnica speciale facente parte della macchina è stata redatta, in accordo all'appendice VII, parte B.

Die unvollständige Maschine darf erst dann in Betrieb genommen werden, wenn festgestellt wurde, dass die Maschine, die in die unvollständige Maschine eingebaut werden soll, den Bestimmungen der Richtlinie Maschinen (2006/42/EG) entspricht.

La machine incomplète ne doit être mise en service qu'après avoir constaté que la machine devant être montée dans la

machine incomplète correspond aux stipulations de la Directive Machines (2006/42/CE).

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).

La máquina incompleta puede iniciar su servicio sólo y cuando se ha determinado que la máquina que debe ser incorporada en la

máquina incompleta, cumpla con las prescripciones de la directiva de máquinas (2006/42/CE).

La macchina non completa può essere fatta funzionare solo dopo aver accertato che la macchina da assemblare alla macchina non completa soddisfa i requisiti e le prescrizioni della Direttiva sulle macchine (2006/42/CE).

Tübingen, den 21. Dezember 2009



Leiter Qualitätssicherung / Directeur d'assurance de la qualité / Manager of quality assurance  
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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.

### 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 BA for Ex-model in accordance with the directive 94 / 9 / EG (Atex 95)
- 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:

	<b>Attention! Danger of injury!</b> This sign warns you of the danger of mechanical effects.
	<b>Warning! Mortal danger!</b> This sign warns you of the danger from electric shocks.
	<b>Information:</b> 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!

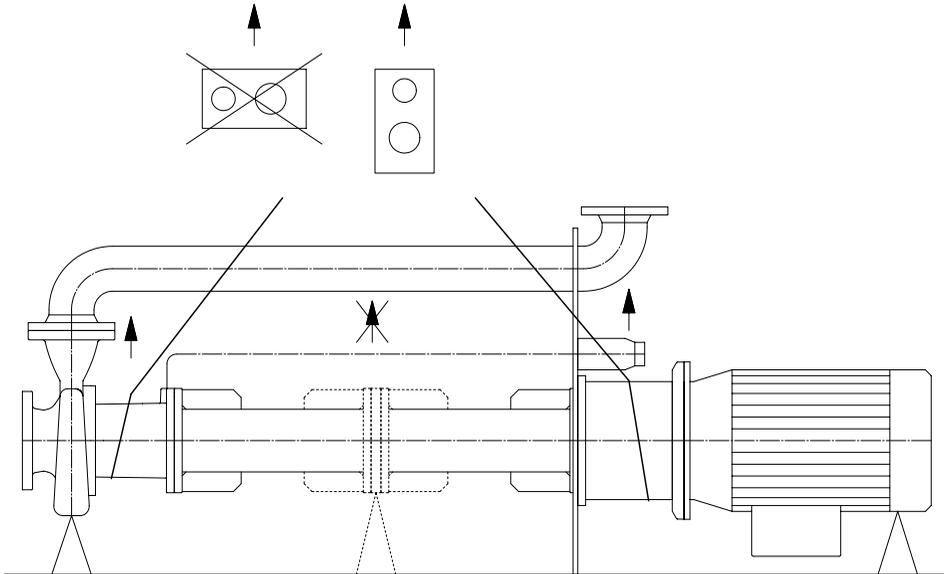
Never stand or work underneath swinging loads.

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!**



## 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 contact-free 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 oil-filled 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

r 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:

<b>Vertical pumps with flow-conducting parts from the range / hydraulic:</b>	Z	FZ	NB			ZH
<b>Range description</b>	ZV,SV	FV	NV			ZHV
<b>Pump design</b>	Single-stage spiral housing submersible pumps					Multi-stage submersible pump
<b>Operating speed [rpm]</b>	2900	1450	2900	1450	2900	2900
<b>Delivery rates up to [m3/h]</b>	60	100	130	500	300	40
<b>Heads up to [m]</b>	55	15	60	40	100	270
<b>Max. driving power [kW]</b>	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.

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.

**It is strongly recommended that a motor protection device is used.**

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:

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

#### 4.2 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.

Recommended setting of the time relay for star-delta connection: 3 to 5 seconds depending on the motor performance.

### 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 instructions given under point 6.5 (catchment medium). 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

- 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 overloaded! 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 carefully 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:

<b>Motor power:</b>	<b>Max. switches / h</b>
<b>up to 3 kW</b>	20
<b>from 4 to 11 kW</b>	15
<b>from 11 to 45 kW</b>	10
<b>from 45 kW</b>	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**

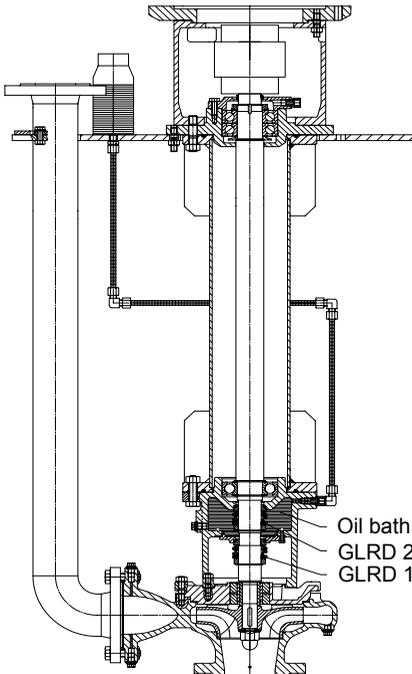


**Warning!**

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)



For this SKS the GLRDs 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!**

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.

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.

<b>Pressure to be withstood max.:</b>	Depressurised
<b>Catchment medium temperature:</b>	t max.: 60 °C
<b>GLRD temperature:</b>	t max.: 80 °C



**Warning!**

The pump unit is delivered with a filled confining chamber. A low-alloy minearl oil is used as the catchment medium. No synthetic oils must be used. (Observe the specifications 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 CIRKAN 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 re-greased. 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)
<b>ZV,SV ZHV 3208</b>	10,000 h	6,000 h	5,500 h
<b>NV FV ZHV 3213 ZHV 4016</b>	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.

Acronym	Grease (gm)
2x7212; 7310-Tandem for V-pumps	15 per set

When renewing the bearing voids must only be approximately half filled with 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 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 **Pt. 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)
- 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)

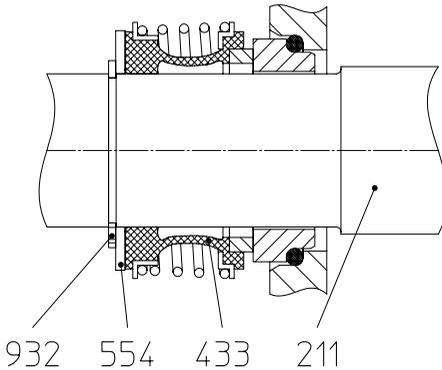
#### 6th step: (Remove ball bearing)

- 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 Pt. 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.



**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
			x				x		Pump back-pressure is less than stated in the specifications	Set operating point precisely, screw off impeller if required (*), increase counter-pressure 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 (*)

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		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
							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](http://www.schmalenberger.de)

Head office address:

**Schmalenberger GmbH & Co. KG**

Im Schelmen 9 - 11

D-72072 Tübingen

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

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## 11 Spare parts list and drawings

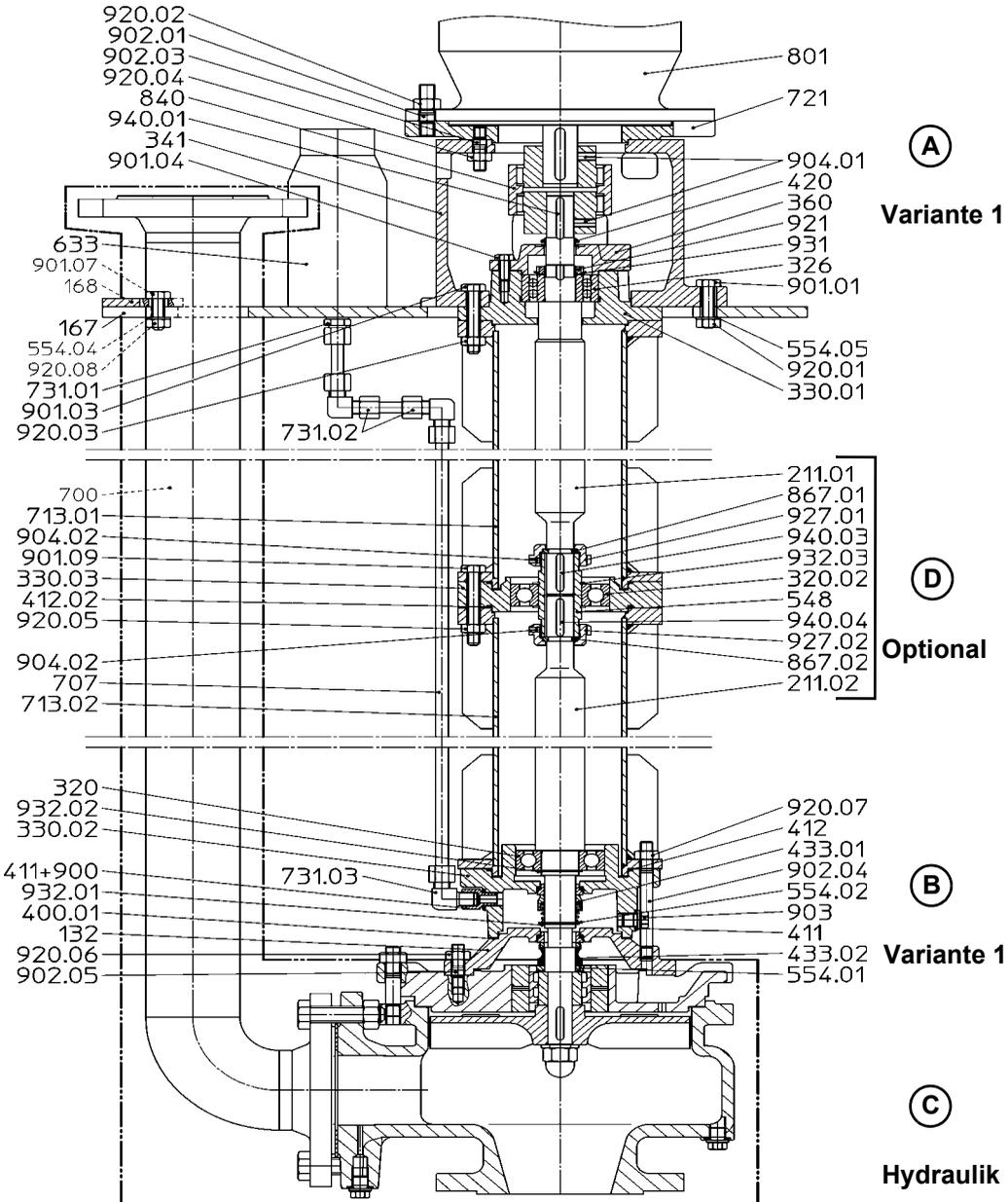


In the spare parts list (page 92 ff) all parts of all the pump types are listed. Not all parts are built into every pump, however. Additional versions and appropriate hydraulic systems, see p. 87 - 91. Structure, see chapter 3.8.

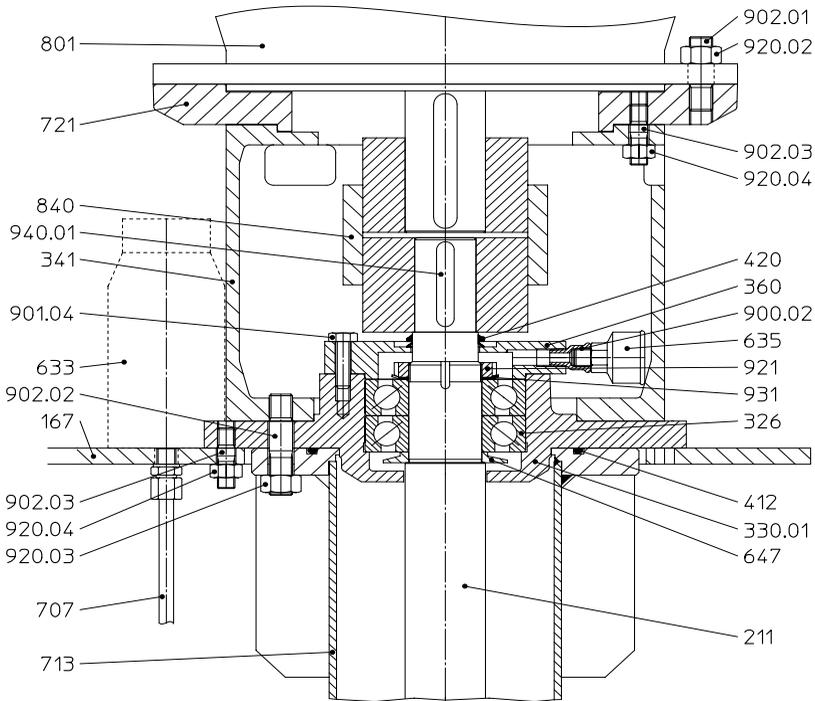
### Legende:

<b>D</b>	<b>F</b>	<b>GB</b>	<b>E</b>	<b>I</b>
Variante	Variante	Version	Versión	Variante
Optional	Selon la profondeur d'immersion	Depending on depth of immersion	Opcional	Secondo la profondità d'immersione
Hydraulik	Gr. hydraulique	Hydraulic system	Sistema hidráulico	Gruppo idraulico
V-Reihe	Série V	V serie	Serie V	Serie V
Typ FV	Type FV	Type FV	Tipo FV	Tipo FV
Typ NV	Type NV	Type NV	Tipo NV	Tipo NV
Typ ZV	Type ZV	Type ZV	Tipo ZV	Tipo ZV
Typ ZHV	Type ZHV	Type ZHV	Tipo ZHV	Tipo ZHV

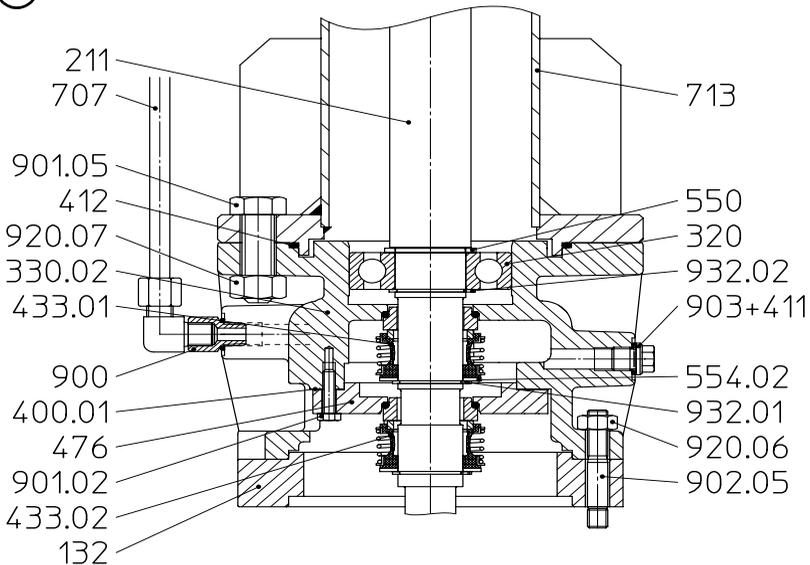
**V-Reihe**



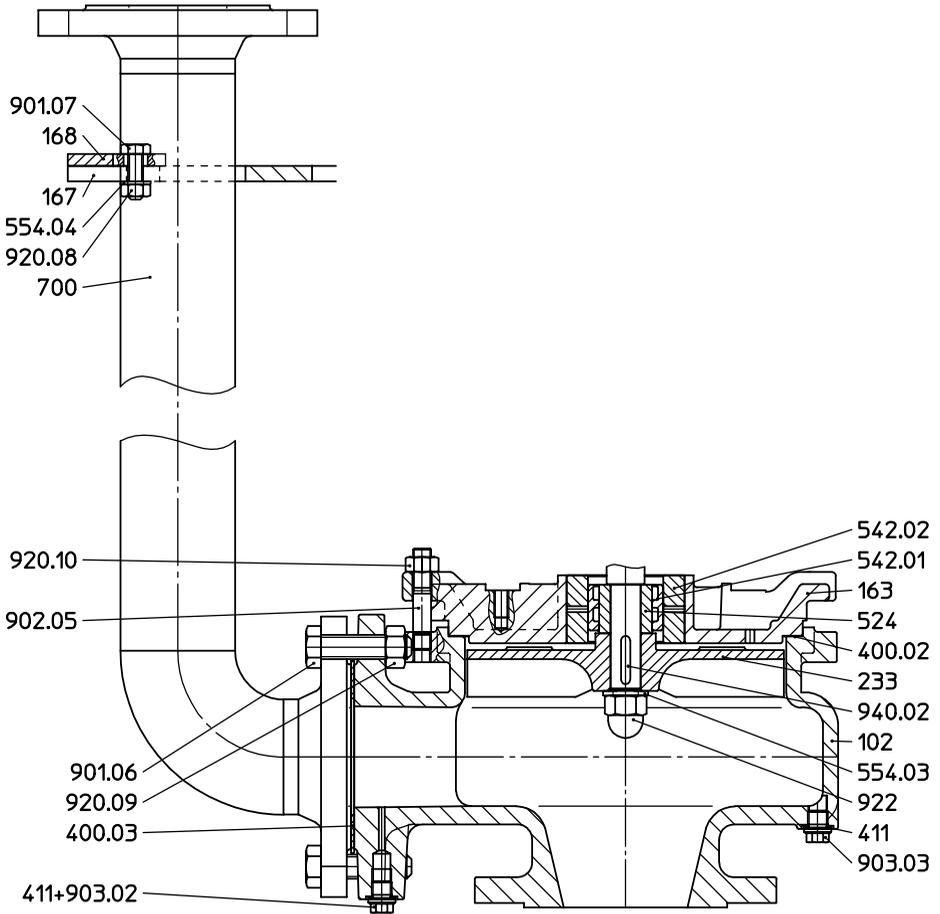
**(A) Variante 2**



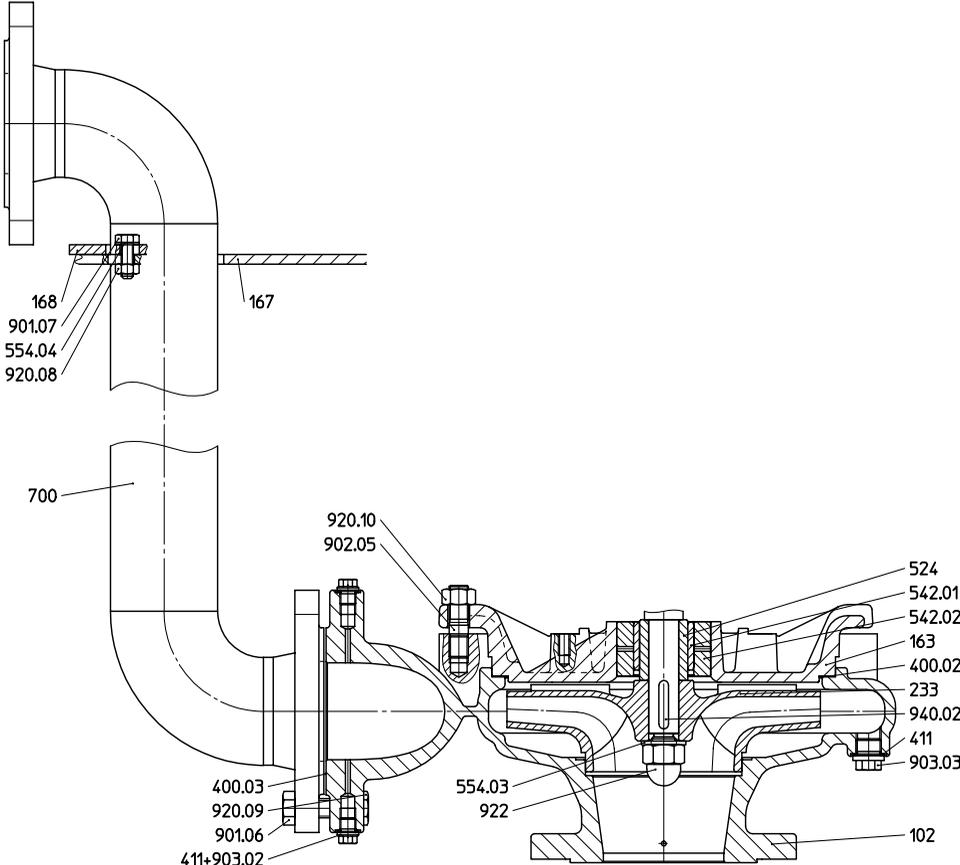
**(B) Variante 2**



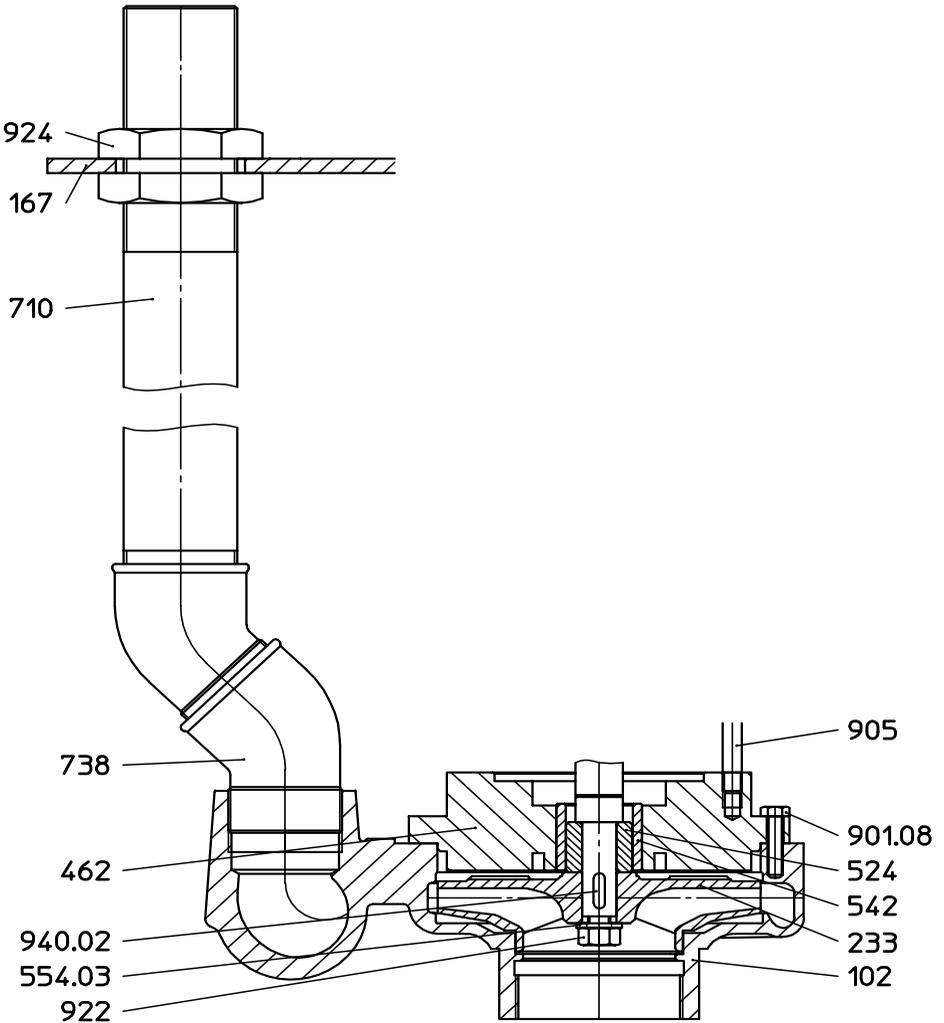
**Typ FV**



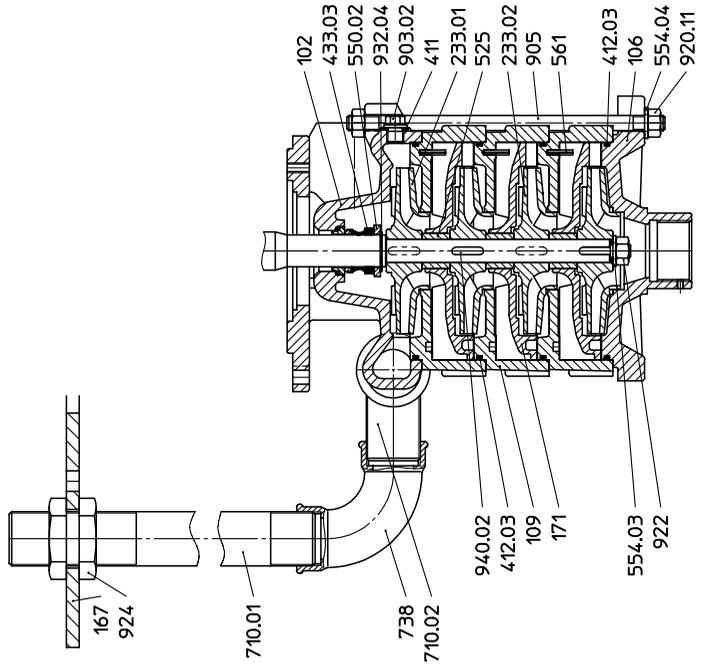
**Typ NV**



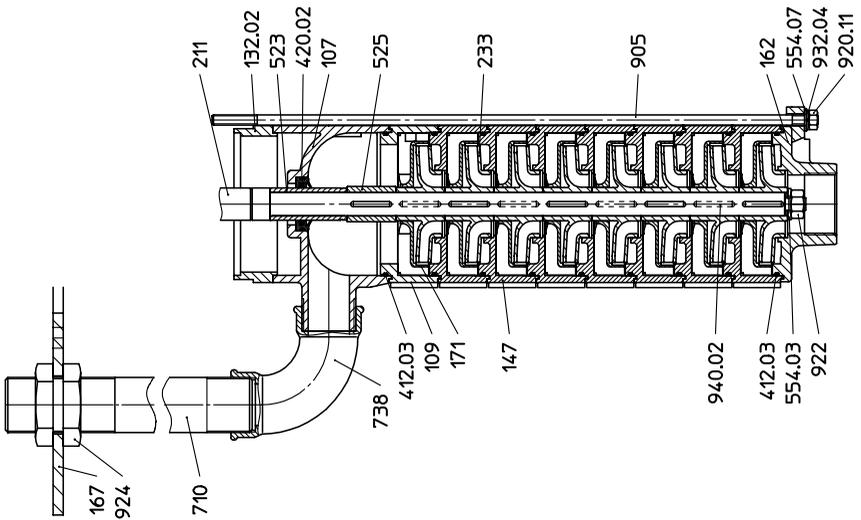
Typ ZV / SV



**Typ ZHV 3213 + 4016**



**Typ ZHV 3208**



11.1 Ersatzteilliste / Liste des pièces détachées / Spare parts list / Listado de piezas de repuesto /  
Lista dei pezzi di ricambio

Pos.	D	F	GB	E	I
	Benennung	Désignation	Denomination	Denominación	Descrizione
102	Spiralgehäuse	carter spirale	spiral housing	carter espiralido	chiocciola
106	Sauggehäuse	carter aspiration	suction casing	carcasa de succión	alloggiamento aspirante
107	Druckgehäuse	carter refoulement	pressure casing	carcasa de presión	carcasa
109	Stufenmantel	carter d'étage	stage casing	envoltura escalonada	rivestimento stadi
132	Zwischenstück	pièce intermédiaire	intermediate piece	pieza intermedia	pezzo intermedio
147	Stufenmantel mit Leitrad komplett (Kunststoff)	carter d'étage avec distributeur complet (plastique)	stage casing complete with distributor (plastic)	envoltura escalonada con rueda guía, completo (plástico)	rivestimento stadi con distributore, completo (plastica)
162	Saugdeckel	carter aspiration	suction cover	tapa de succión	coperchio aspirante
163	Druckdeckel	Couvercle de pression	pressure cover	Tapa de presión	coperchio di pressione
167	Abdeckplatte	plaque couverture	cover plate	tapa covertora	piastra di copertura
168	Verschlussplatte	plaque de fermeture	sealing plate	placa de cierre	piastra di chiusura
171	Leitrad	distributeur	distributor	distribuidor	distributore
211/01/02	Pumpenwelle	arbre de la pompe	pump shaft	eje de la bomba	albero della pompa
233/01/02	Laufrad	turbine	impeller	turbina	girante
320/02	Wälzlager	roulement	roller bearing	rodamiento	cuscinetto a rullo
326	Schräggugellager (2x Tandem)	roulement à billes à contact oblique (2 rangées en tandem)	angular ball bearing (2 x tandem)	rodamiento de bolas de contacto angular (2 en tandem)	cuscinetto obliquo (2 x tandem)
330.01/02/03	Lagerträger / Sperrkammer	chaise de palier / chambre de barrage	bearing bracket / confining chamber	portarodamiento/ camera de bloquero	supporto del cuscinetto / camera di bloccaggio
341	Antriebslaterne	lanterne d'entraînement	motor stool	laterna de accionamiento	supporto azionamento
360	Lagerdeckel	chapeau de palier	bearing cover	cubierta de rodamiento	cappello del cuscinetto
400.01/02/03	Flachdichtung	joint plat	clamp gasket	empaquetadura plana	tenuta piastra
411	CU-Ring	bague CU	CU-ring	anillo-CU	anello-CU

Pos.	D	F	GB	E	I
	Benennung	Désignation	Denomination	Denominación	Descrizione
412.01/02/03	O-Ring	joint torique	O-ring	anillo-O	anello O
420/02	Wellendichtring	bage garniture étanche de l'arbre	shaft sealing ring	anillo-retén	anello guarnizione dell'albero
433.01/02/03	Gleitringdichtung kpl.	joint mécanique compl	mechanical seal	retén frontal	tenuta ad anello scorrevole kpl.
462	Drosselbuchsensträger	porte-douille de laminage	throttling bush support	portador del casquillo estrangulador	supporto bussola della farfalla
476	Gegenringträger	support de contre-anneau	counter-ring support	portador de contra-anillo	supporto contro anello
523	Wellenhülse	douille d'arbre	shaft sleeve	manguito del árbol	manicotto albero
524	Wellenschutzhülse	chemise d'arbre	protective shaft sleeve	tubo protector del árbol	boccola protezione albero
525	Abstandshülse	douille d'écartement	distance sleeve	mango de distancia	manicotto distanziale
542/01/02	Drosselbuchse	douille de laminage	throttling bush	casquillo estrangulador	boccola di strozzamento
548	Kupplungsbuchse	raccord femelle	coupling bush	manguito de acoplamiento	bussola del giunto
550/02	Scheibe	rondelle	washer	disco	disco
554.01/02/...	Unterlegscheibe	rondelle	distance washer	arandela	rondella distanziatrice
561	Zylinderkerbstift / Spannstift	goupille encochée cylindrique / goupille de serrage	straight grooved pin / locking pin	manguito de selección / pasador de sujeción	spina cilindrica scanalata / coppia di serraggio
633	Öler / Behälter für Sperrflüssigkeit	huileur / réservoir pour liquide de barrage	oil cup / tank for barrierfluid	lubricador / recipiente para liquido obturant	oliatore / serbatoio del liquido di tenuta
635	Fettbüchse	lubrificateur	grease cup	engrasador	ingrassatore
647	Fettmengenregler	Régulateur de quantité de graisse	grease regulator	regulador de cantidad de grasa	regolatore della quantità di grasso
700	Rohrleitung	tuyauterie	pipework	tubería	tubatura
707	Schmierleitung	conduite de graissage	lubrication pipe	tubería de lubricación	canale di lubrificazione
710/01/02	Druckrohr	tuyau pression	pressure pipe	tubo de presión	tubo di pressione
713/01/02	Aufhängerohr	tuyau de suspension	delivery suspension tube	tubo de suspensión	tubo di agganciamento
721	Übergangsstück	raccord	transition piece	pieza de acoplamiento	pezzo di giunzione

Pos.	D	F	GB	E	I
	Benennung	Désignation	Denomination	Denominación	Descrizione
731.01/02/...	Rohrverschraubung	raccord fileté pour tube	screwed pipe joint	union roscada de tubos	raccordo a vite per tubi
738	Bogen, Winkel	coude, angle	bend, angle	curva, ángulo	arco, angolare
801	Normmotor	moteur à normes	norm-motor	motor normal	motore normale
840	Kupplung	accouplement	coupling	acoplamiento	giunto
867.01/02	Kupplungspuffer	palet d'accouplement	coupling bush	tope de acoplamiento	ammortizzatore frizione
900/02	Verlängerung	allonge	extension	prolongacion	prolunga
901.01/02/...	Sechskantschraube	vis six pans	hexagon screw	vite esagonale	vite esagonale
902.01/02/...	Stiftschraube	bouillon fileté	locking screw, (stud)	tornillo de cierre	perno filettato
903/02	Verschlußschraube	bouchon	plug screw	tornillo de cierre	tappo otturatore
904.01/02	Gewindestift	vis sans tête	threaded pin	pasador roscada	perno filettato
905	Verbindungsschraube	vis raccord	connecting screw	tornillo de coneccion	vite di connessione
914	Zylinderschraube mit Innensechskant	vis à tête cylindrique à six pans creux	cylinder screw with hexagon socket	tornillo cilíndrico con hexágona interior	vite a testa cilindrica con esagona cavo
920/01/02/...	Sechskantmutter	écrou six pans	hexagon nut	tuercia hexagonal	dado esagonale
921	Wellenmutter	ecrou d'arbre	shaft nut	tuercia de árbol	dado dell'albero
922	Laufmutter	écrou turbine	impeller nut	tuercia turbina	dado girante
924	Gegenmutter	contre-écrou	lock nut	contratuercia	controddado
927.01/02	Überwurfmutter	ecrou-raccord	union nut	tuercia de racor	dado di accoppiamento
931	Sicherungsblech	tôle de sécurité	lock washer	chapa de seguridad	rondella di sicurezza
932.01/02/...	Sicherungsring	circlip	retaining ring	anillo de empaquetadura	anello di sicurezza
940.01/02/...	Paßfeder	ressort d'ajustage	key	lengueta	lingueta







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