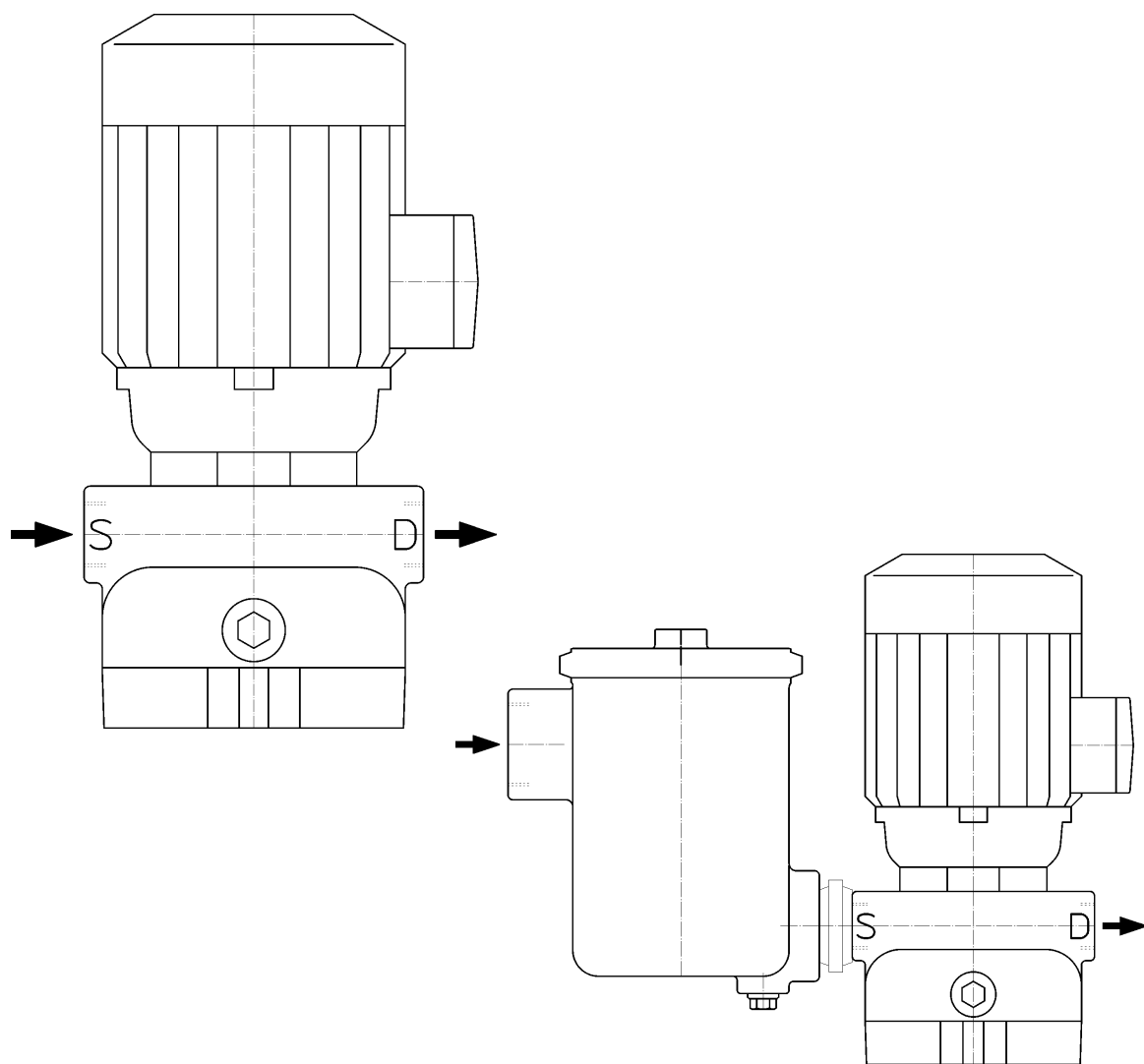


Circulating pumps

Typ S / SF / S-L

GB

Operator's manual



27229 - B.2

EG-Konformitätserklärung
Déclaration de conformité pour la CEE / EC-Declaration of Conformity /
CEE-Certificado de Conformidad / Dichiarazione CE di conformità

Hersteller / fabricant / manufacturer / fabricantee / fabrikant

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

Produkt / produit / product / producto / prodotto

Kreiselpumpen / Pompes centrifuges / Circulating pumps / Bombas centrifugas / Pompe centrifughe

Typ / modèle / model / modelo / tipo

S, SL, SF

Hiermit erklären wir, dass die spezifische Bauart in Übereinstimmung mit den folgenden Richtlinien hergestellt worden ist:
Par la présente, nous déclarons, que le type de est produit conforme aux dispositions des directives européenne sci après:
We hereby declare that the specific type has been produced in accordance with the following standards:
Por la presente les confirmamos que lo abajo especificado ha sido fabrico en conformidad con las siguientes normas:
Si dichiara che il modello della è stato in conformità alle sequenti norme:

EG - Richtlinien / Directives de la CEE / EEC Directives / Normativas de la CEE / Direttive CEE

- 2006/42/EG
- 2006/95/EG
- 2004/108/EG

Zur sachgerechten Umsetzung der in der EG-Richtlinie genannten Sicherheits- und Gesundheitsanforderungen wurde(n) folgende Norm(en) herangezogen:

Pour mettre en partique dans les règles de l'art les prescriptions en matière de sécurité et de santé stipulées dans les Directives de la CEE, il a été tenu compte de la /des norme(s):

For the relevant implementation of the safety and health requirements mentioned in the Directives, the following standard(s) must be required:

Con el fin de realizar de forma adecuada las exigencias referentes a la seguridad y a la snidad mencionadas en las normativas de la CEE fuè(ron) consultada(s) la(s) siguiente(s) normativa(s):

Per la verifica della Conformità di cui alle Direttive sopra menzionate, sono state consultate le sequenti, norme Armonizzate EN:

Harmonisierte Normen / Normes harmonisées / Harmonised Standards / Normas armonizadas / Norme armonizzate
EN ISO 12100-1, EN ISO 12100-2, EN 61000-6-2, EN 61000-6-3, EN 809, EN ISO 14121-1

Tübingen, den 21. Dezember 2009



Leiter Qualitätssicherung / Directeur d'assurance de la qualité /
Manager of quality assurance / Director del aseguramiento de calidad /
Direzioe qualità / Tel. +49(0)7071 7008-18

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 centrífuga, en caso de suministro sin accionamiento / La pompa centrifuga, se fornita senza trasmissione

Typ / modèle / model / modelo / tipo

S-L

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:

EN ISO 12100-1, EN ISO 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 exclusivamente 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 soddisfi 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 / Director del aseguramiento de calidad /
Direzione qualità / Tel. +49(0)7071 7008-18

Contents

1	General Details	5
1.1	User Information	5
1.2	Usage Instructions	5
1.3	Relevant Documentation	5
1.4	Technical Data / Specifications	5
1.5	Safety Instructions	5
1.6	Temperature	6
1.7	Safety Instructions for Maintenance and Repairs	6
2	Transport, Storage, Installation	6
2.1	Transport and Storage	6
2.2	Unpacking, Cleaning and Assembling	7
2.3	Installing and connecting	8
3	Pump operation	10
3.1	Initial start-up	10
3.2	Operating	10
3.3	Indications of faulty operation	11
3.4	Shutdown	11
3.5	Fault elimination	12
4	Maintenance / Repair	14
4.1	Maintenance / Service	14
4.2	Repair	14
4.3	Spare parts list / Drawing	17
5	Appendix	17
5.1	Shutdown / Storage / Conservation	17
5.2	Disposal	18
5.3	Supporting documents for pump operation	18
5.4	Data sheet	18
5.5	Important Instructions	19
6	Spare parts list and drawings	19

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
- Conformity statement / Declaration of incorporation
- 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

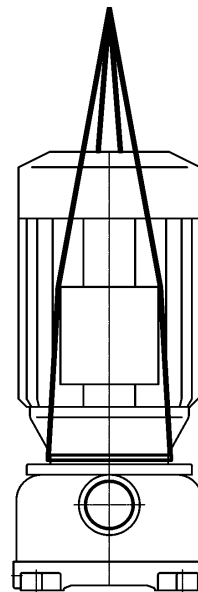
- Regardless of what nature they may be, repairs must only be carried out by qualified persons and the centrifugal pump must be emptied first.
- The attached pipework must be depressurized.
- Allow the pump to cool off.

Prior to carrying out repairs to the pump it must be isolated from the electrical supply and protected from unintentional switching on.

2 Transport, Storage, Installation

2.1 Transport and Storage

2.1.1 Transport



Lifting example

If necessary the centre of mass is indicated on the pump aggregate itself and on the packing material and places for applying hooks are marked.



Warning! Risk of injury!

Use only suitable and technically perfect lifting and load-bearing equipment with sufficient carrying power!
Never stand or work underneath swinging loads.

2.1.2 Storage

- Interim storage

Even for short periods of interim storage, store on a wooden base in a dry, well ventilated and vibration free environment at constant temperature.

- Unsuitable storage

If unsuitable storage conditions prevail (e.g. high humidity) or if the pump is to be stored for longer than 6 weeks, then the pump housing should be filled with oil (see 2.1.3).

- Long periods of storage

After a storage period of more than 2 years the motor roller bearings and bearing supports need to be re-greased or replaced entirely.

2.1.3 Conservation

The centrifugal pumps that we deliver are treated with a conservation material corresponding to the storage time quoted us by the purchaser. This conservation must be removed before start-up. See chapter 2.2.2 Cleaning. If the pump is to be taken out of service for a longer period of time or if the originally envisaged storage time is going to be considerably exceeded, then conservation must be undertaken as protection against corrosion. For a detailed description of how to proceed under these circumstances, see chapter 5.1 Shutdown / Storage / Conservation.

2.2 Unpacking, Cleaning and Assembling

2.2.1 Unpacking

For transportation purposes the pump is fastened to a palette by bands.

For transportation over long distances it is packed in crates or boxes. After removing the retaining bands extract the pump out of its packing with the help of suitable lifting equipment. Be sure to observe the instructions under 2.1.1 Transport.

2.2.2 Cleaning

A number of measures are taken for protection against transportation damage and corrosion. Check your pump for which measures have been taken.

1. Covering lid on the nozzles
2. Shaft protection for deliveries without the motor
3. Protective paint on exposed parts

These protective measures must be removed before the pump is set up or installed.

Under no circumstances must impurities be left inside the pump.



Important:

Depending on the delivery medium to be used, the interior of the pump should be cleaned of residual traces of oil. Use a cleaning agent that will not be harmful to the mechanical seal and the pump materials. Make sure that the pump is carefully dried after cleaning.

The cleaning agents that can be used include spirit, Ritzol 155 or a strongly alkaline soap solution, for example. If a steam jet cleaner is to be used, then let the solvent work itself in for a time first.

Please do not use a steam jet cleaner. If this is unavoidable, then please take care not to damage the electric motor and bearings.

2.2.3 Assembly

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

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



Important:

Before installation check that the pump runs freely and easily.

Other external accessories such as a blast tank or similar equipment that has not been pre-assembled with the pump at the factory, should

be fitted to the pump after it has been installed in the system or on the pump base.

2.3 Installing and connecting

2.3.1 Safety requirements



Explosion proof / safety instructions

Electrical appliances that are operated in areas where there is a danger of explosion, must comply with the explosion proof requirements. This is stated on the factory plate of the motor. For installations in areas where there is a danger of explosion, the local explosion regulations and those on the test certificate supplied with the delivery, and which was issued by the responsible inspection authority, must be observed. The test certificate supplied must be kept at the installation location (e.g. the master's office).



Important:

For areas where there is a danger of explosion, please observe the supplementary operating instructions.

2.3.2 Check before you start installing

- Have the machine, the system and the container nozzles been properly prepared in accordance with the figures on the dimensions sheet or installation plan?

2.3.3 Pump installation and assembly

Installation can take place on small concrete pedestals or consoles. Units with up to 3 kW driving power can be installed free in the pipe run. However, this method of installation means that the suction and/or pressure pipes must themselves be strong and stable enough and

appropriately fastened. Installation on an elastic base is recommended if the effect of vibrations (resonance) on the surroundings has to be largely eliminated.

Pumps of type S must be installed only in a vertical position.

Positioning them with the motor hanging downwards is not permitted.

When installed on a foundation the centrifugal pump must be set up with the aid of a spirit level.

2.3.4 Connecting the pipework



Warning!

Under no circumstances must the pump be used as anchor point for the pipework. No forces or moments (e.g. due to twisting or heat expansion) from the pipework must act on the pump.

Note the denomination on the housing: S = suction connection, D = pressure connection

The pipes must be supported as close as possible to the centrifugal pump and connected to it free of all tension. Their weight must not be supported by the pump.

The positioning must be undertaken with the greatest care as this is the prerequisite for trouble-free operation of the plant.

If these instructions are not observed, then any claims under guarantee will be void.



Warning!

In the case of hot, caustic or poisonous delivery media!

- If the pipe strength is exceeded leaks can occur in the pump or in the flange connections, for example, that could result in vast amounts of medium being expelled.
- In the case of short pipes the nominal bore should be at least the same as the centrifugal pump connections. For long pipes the most economic nominal bore should be determined on a case by case basis.
- Connection pieces to larger nominal bores should be carried out with approx. 8° expansion angle to avoid significant loss of pressure.

- In order to prevent the formation of air pockets, the suction pipe to the centrifugal pump must be installed to rise continuously, on the pressure side it must fall continuously. Depending on the type of system and centrifugal pump being used, it is recommended that backflow prevention and shut-off devices are installed.



Warning! Mortal danger!

Taps that close very suddenly (abruptly) must be avoided in the pipework. The resulting pressure surges can greatly exceed the maximum permitted housing pressure of the pump!

To prevent too strong pressure surges dampers or blast tanks should be installed.



Note:

At the end of installation, before starting up the system the tanks, pipes and connections must be thoroughly cleaned, rinsed and blown through.

- Often welding beads, scales and other impurities do not get dislodged for some period of time. They should be kept clear of the pump by inserting a sieve in the suction pipe.
- The free cross-section of the sieve must be 3 times the cross-section of the pipe so that there is not too large a resistance built up due to foreign bodies that flow in.

Hat-shaped sieves containing a mesh wire net having a mesh size of 2.0 mm and 0.5 mm wire diameter made of corrosion resistant material have proved useful in practice.

2.3.5 Electrical connections

The electrical connections to the pump must be carried out by a specialised company in the electrical engineering branch approved by the local energy provider, taking into account the technical connection requirements. The connections must be carried out by a qualified electrician. (see chapter 2.3.1)

The relevant DIN VDE (Association of German Engineers) regulations must be observed.

Compare the available mains voltage with the details on the motor's factory plate and select the appropriate switching.

We recommend the use of a motor protection facility.

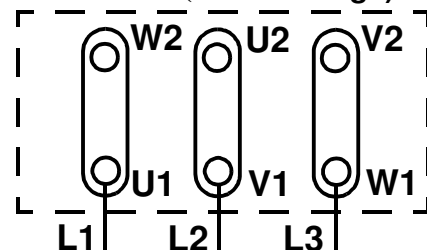


Risk of explosion!

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

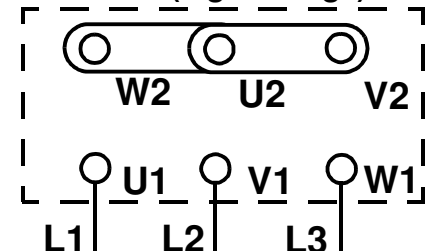
Connect the motor in accordance with the circuit diagram in the terminal box or according to the figures showing "delta" or "star" connections.

Delta connection Δ (lower voltage)



Connection diagram for 3-phase motors, Circuit arrangement Δ

Star connection Y (high voltage)



Connection diagram for 3-phase motors, Circuit arrangement 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 motor. Setting of the time relay for star-delta connection: < 3 sec.

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. 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.

Additional motor equipment

If particular control devices are to be used e.g. in connection with the installation of the pump in a process engineering facility, the instructions of the manufacturer of the control device must be strictly observed.

3 Pump operation

3.1 Initial start-up



Prior to initially starting up the centrifugal pump please make sure that the following prerequisites have been met:

1. The centrifugal pump has been connected properly electrically and with all requisite safety features.
2. If the pump is supplied with an inflow of medium, i.e. on the suction side the medium is above the level of the pump, then the suction and pressure shut-off devices must be open and the pump must be primed.
3. If the pump is used to deliver medium through suction, i.e. on the suction side the medium is below the level of the pump, then a foot-operated valve must be installed at the lowest point of the suction pipe and the pump and suction pipe must be filled with fluid.

Please observe: Dry running leads to increased wear and damage to the pump!

4. The rotating parts of the pump have been covered by a protective shield. (In accordance with UVV (Accident Prevention Regulations) the centrifugal pump may only be operated if a safety shield has been fitted).
5. It has been checked that the pump shaft rotates easily.
6. The direction of rotation has been checked.

3.1.1 Starting the pump

Start the pump only with the pressure pipe half-open! Only after the maximum rotation speed has been reached, slowly open the shut-off device and adjust to full operational level.

Warning! Do not overload the motor!

- An automatic backflow prevention device must constantly open once the operational value has been reached without the production of abnormal noises, vibrations or increased current consumption in the plant.
- Once the operating point has been reached, the power input to the motor and the bearing temperature must be monitored!

When first started up the ultimate bearing temperature is attained only after about 48 hours, depending on ambient conditions.

3.2 Operating

3.2.1 Operation monitoring

In most cases the centrifugal pump is controlled from the central point of the overall facility. A prerequisite for a perfectly functioning centrifugal pump is adherence to the data provided for its installation and use. See the chapter on specifications.



Pay particular attention to the following points for the manual operation of the centrifugal pump:

1. Temperature of the delivery fluid

Never operate the pump at temperatures in excess of those stated in the original specification.

2. Switching frequency

In order to avoid a large temperature increase in the motor and excessive strain on the pump, motor and bearings the switching frequency must not exceed the following guideline figures.

Motor power:	Max. no. switches / h
up to 3 kW	20
from 4 to 11 kW	15

3. Minimum amount

If the sort of facility includes the possibility of a run against closed shut-off device on the

pressure-end, a minimum delivery rate at $t -30$ to $+70^{\circ}\text{C}$ 15% of Q_{opt} . must be supplied during this time. Over $+70$ to $+110^{\circ}\text{C}$ it must be 25% of Q_{opt} .

4. Density of the delivery fluid

The power input of the pump changes in proportion to the density of the delivery fluid. To prevent the motor being overloaded, the density must correspond to the data in the specifications.

5. Mechanical seal

The sealing unit has been fitted and set at the factory. The gasket is maintenance free but should be checked for leaks from time to time. During initial start up there may be increased leakage for a brief time. If increased leakage persists then the plant should be switched off at once and the cause determined. The cause could be dirty medium or a prior period of dry running through incomplete venting of the pump, for example.

3.2.2 Miscellaneous

Installed reserve pumps must be run briefly once a week to ensure that they are always ready for operation. They should be run each time for approx. 15 minutes. This also applies to any pump that is not in use but must remain ready for operation.

3.3 Indications of faulty operation

3.3.1 General

When operated via a central control facility faulty operation can be largely ruled out.

In the case of manual operation, but also within a control complex, please make sure that:

- The pump always runs quietly and vibration free.
- The pump does not run dry.
- A longer period of operation with closed shut-off device is avoided to prevent heating up the delivery medium. For the requisite minimum delivery quantity see chapter 3.2.1 Operation monitoring.
- The maximum permitted room temperature of $+40^{\circ}\text{C}$ is not exceeded.

- The ball bearing temperature does not exceed the room temperature by more than $+50^{\circ}\text{C}$ and in any event does not exceed $+90^{\circ}\text{C}$ overall (measured at the exterior of the motor housing).
- During centrifugal pump operation the shut-off device in the supply line is not closed.

3.3.2 Faults

In case of faults in the operation of the centrifugal pump, that were not caused by the control facility or other foreign devices, proceed as follows:

1. Locate the site of the fault or defect.
2. Determine the cause.
3. Remedy the fault.

In chapter 3.5 Fault elimination there is a table listing the most frequent faults, their cause and the recommended way to eliminate them.

3.4 Shutdown

1. Close shut-off device in the pressure and suction pipes. If backflow prevention is fitted to the pressure pipe the shut-off device can remain open, provided that there is back pressure.
2. Switch motor off. Allow it to come to rest. Depending on the sort of facility, the pump should be allowed sufficient idle run time – with the heat source, if any, switched off to allow the delivery fluid temperature to reduce – to prevent an accumulation of heat within the pump.
3. Close the shut-off device in the suction pipe.



Warning! Risk of damage!

If there is a danger that the pump may freeze and / or for occasions where it is to be at a standstill for longer periods of time, the pump must be emptied or protected against freezing up (by auxiliary heating).

3.5 Fault elimination

Pump stationary	Pump delivery rate too low	Motor overload	Excessive pump pressure	Increased motor / bearing temperature	Pump leaks	Pump runs noisily, 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	System contaminated, reduce space between distributor and open impeller, install a new impeller (*)
	x					x	x	Pump / pipework not completely vented	Vent and fill with fluid
	x							Supply or impeller blocked	Eliminate the cause in pipework or pump
	x							Air pockets in the pipework	Change pipework, install venting valve
	x					x	x	Suction height too great / NPSH too low (supply)	Correct fluid level / level control, install pump lower down, fully open valves in the suction pipe, decrease resistance in the supply pipe, clean sieves and suction connections
	x							Non-return valve does not open	Check non-return valve
	x				x	x		Wrong direction of rotation	Change over 2 phases in the terminal box
	x							Speed of rotation too low	Increase the rpm (*), observe circuit diagram (if necessary, new motor)
	x		x			x		Worn internal parts (e.g. the impeller), foreign body in the pump	Remove foreign bodies from the pump housing, replace worn parts
		x				x		Pump back-pressure is less than stated in the specifications	Set operating point precisely, increase counter-pressure by throttling, turn off impeller if required (*), use larger motor (*)
		x	x					Higher density or higher viscosity of the delivery medium than specified	(*) (Re-adjust the pump)
					x			Shaft gasket worn or sealing ring defective, gasket old, dry running	Replace shaft gasket, change gasket, check installation and assembly dimensions

Pump stationary	Pump delivery rate too low	Motor overload	Excessive pump pressure	Increased motor / bearing temperature	Pump leaks	Pump runs noisily, operating noises	Pump temperature too high	Cause of the fault	Elimination of the fault
		x		x				Motor wrongly connected	Check circuit diagram, see chapter 2.3.5
				x	x	x		Pump wrongly adjusted	Adjust pump properly
				x	x	x		Pump distorted or resonance vibrations in the pipework	Check pump holder, individual installation
				x		x		Bearing defective, too little or too much or the wrong lubricant	Replace bearing, add or reduce or completely replace lubricant
				x				Coupling distance not observed	Set distance properly
	x	x						Motor runs on 2 phases	Check / repair fuse and conductor connections
				x		x		Impeller out of balance	Clean impeller, balance impeller (*)
x								Foreign body in the pump, motor bearings defective	Remove foreign bodies, clean or replace pump housing, renew motor bearings
x								Circuit breaker tripped due to motor overload, circuit breaker too small, winding defective	Check electrical connection (compare with motor rating plate), if the motor is overloaded: Throttle the pump, smaller impeller (*), larger motor (*) or replace stator (*)
	x					x		High level of air content in medium	De-gas the delivery medium
						x		Cavitation	Throttle pump on pressure side
	x	x		x		x		Impeller loose, clamping pieces loose	Tighten clamping pieces with impeller nut / screw (observe impeller gap)
					x			Impeller does not press enough on mechanical seal	Check installation / assembly dimensions

(*) Please consult the manufacturer.

4 Maintenance / Repair

General Instructions

The operator must ensure that all maintenance, service and repair work on the pump is carried out exclusively by authorised and specially trained persons. It must be established beyond doubt that the person has studied the operator's manual in detail.

We recommend the creation of and adherence to a maintenance schedule. That will enable you to avoid expensive repairs and have a reliable and trouble-free pump operation.

Only original spare parts must be used for repairs. This is particularly important for the mechanical seal (GLRD).

If work has to be carried out on the **motor** the instructions in the manual from the relevant motor manufacturer must be observed.



Warning! Mortal danger!

In order to prevent electric shocks, work on the terminal box and the machine controller must never be carried out before the electrical connections have been isolated or disconnected.



Warning!

Risk of injury and mortal danger!

The pump must be safeguarded against unintentional switching on (be disconnected) if checking or maintenance work is to be undertaken.

4.1 Maintenance / Service

Use the following information to create a maintenance schedule. These are recommendations of minimum requirements that must be adjusted to local conditions of use of the pump and may need amending accordingly.

4.1.1 Checks

Continuous checks:

- Centrifugal pump delivery data (pressure, amount)
- Power take-up

Daily checks:

- Pump running is quiet and vibration free
- Bearing temperature
- Leakage at the mechanical seal (GLRD)

4.1.2 Lubrication and changing lubricant

Centrifugal pumps type "S" in the standard models only run on bearings in the drive motors. The bearings in small motors are designed to last the useful life of the motor and are filled with a grease that cannot be replenished. In this case there are no lubrication nipples on the bearing supports.

4.2 Repair

General

Always carry out repair work on the removed centrifugal pump in an appropriate workshop.

Make sure that you observe the general instructions in the Safety Instructions manual (27228-A)!

The following instructions will enable you to dismantle the pump and to re-assemble it properly with the requisite spare parts in place.



Note:

Please also observe the drawing in the chapter "Spare parts / drawing" at the end of this operator's manual!

When a new mechanical seal is fitted special instructions must be observed.

The work can be undertaken with the usual workshop tools. No special tools are needed.

After dismantling thoroughly clean all the individual parts of the centrifugal pump.

Check the individual parts for wear and damage. Parts that are not perfect must be reworked or replaced.

4.2.1 Dismantling Preparations

Prior to starting to dismantle it the pump must be safeguarded against accidental switching on (it must be disconnected).



Warning! Mortal danger!

Fasten a warning on the switching cabinet.

When used in a facility, inform the shift leader or manager.



Important:

For the following work, please be sure to observe local regulations and conditions.

4.2.2 Dismantling / Removal of the pump

The pump must be allowed to reach room temperature.

- Disconnect the power supply.
- Close valves (on the suction and pressure sides).
- Empty the pump via the drainage screw 912.
- Disconnect motor.
- Remove existing additional connections.
- Release pressure and suction connections.
- If necessary, loosen the pump from the base plate and remove entirely.



Warning!

When emptying the centrifugal pump please observe the following instructions!

1. If the pump was used to deliver liquids that are hazardous to health, then great care must be taken in emptying the pump that neither persons nor the environment are placed at risk through the process.
2. If necessary, wear protective clothing and protective mask!
3. The rinsing liquid used and any residual fluid out of the pump must be caught and disposed of properly and without placing persons or the environment in any danger.
4. 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.
5. Legal requirements must be adhered to!

4.2.3 Dismantling / Dismantling the pump

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 position number is stated in your spare parts order.
- You have all the required tools and accessories for the work.



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.



Customer service:

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

4.2.4 Dismantling the pump (from the suction side)

Place the pump on its blower cover and secure against tipping over.

1st step:

Loosen the mounting screws 901/914 on the cover 160 and remove the cover. Remove clamp gasket 400 between cover and pump housing 101.

2nd step:

Loosen the impeller nut 922 or impeller screw 906 and screw it off the motor shaft 819.

Pull off impeller 233 including clamping pieces 859 and distance washers 525 from the motor shaft 819.

-> Remember the sequence of events for re-assembly!

3rd step:

If fitted, remove retaining ring 932. Pull off washer 550.02 or bush 525.02 from the shaft.

4th step:

Loosen screw 901/902 and, if necessary, nut 920.

4.2.5 Removal of the mechanical seal (GLRD)

Carefully pull pump housing 101 with GLRD 433 off the shaft. **Make sure that the shaft and GLRD are not damaged during removal.**

The mechanical seals used in the centrifugal pumps are not free of wear. When dismantling the pump check the mechanical seals for damage. Damaged mechanical seals must be completely replaced.

4.2.6 Bearing pedestal (S-L)

If your pump is equipped with an IEC Norm motor as drive, then there is a bearing pedestal for supporting the pump shaft and the coupling between the pump and the motor.

The bearings are enclosed and provided with grease that cannot be replenished. The coupling is designed to last for the service life of the motor under normal operating conditions.

To replace the coupling or one of the bearings, proceed as follows:

- Loosen the drive from the bearing pedestal. Remove the motor with the upper half of the coupling.
Now you can replace the inner coupling part.
- To replace the ball bearings the pump must be removed and dismantled as described in chapter 4.2.4 .
- Remove the locking rings from the shaft and out of the bearing pedestal. Take out the ball bearings.

4.2.7 Pump re-installation

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

Please observe by way of preparation:

- Thoroughly clean all the individual parts of all dirt.

- Check all parts for wear. Damaged parts must be replaced by new ones.
- Clamp gaskets and O-rings must always be replaced by new ones. Grease O-rings prior to installation.

Exception: Do not grease O-rings on the GLRD. See the special instructions for installing the GLRD.

- When fitting the screw connections always tighten alternately cross-wise.
Use a torque wrench for this.

The following table shows the recommended torque to be applied for standard DIN 13 thread.

Screw category:	5.6	6.9	8.8
Screw M8	10.8	21.6	25.5 NM
Screw M10	21.6	42.0	50.0 NM
Screw M12	38.2	73.5	87.2 NM
Screw M16	93.2	178	211 NM

The figures apply to new, ungreased screws. Use of the screw strain limit of 90%.

4.2.8 GLRD installation

Preparation:

Increased cleanliness must be observed in the immediate area where the GLRD installation is to take place.

Accessories:

- Propyl alcohol and cellulose cloths (no cleaning rags!)
- O-ring lifter
- Water and detergent

Work steps:

- Unpack the GLRD and check for any damage.



Warning! Risk of damage!

Never place sliding rings or their counterparts onto the plane of sliding without using a protective cover.

- Thoroughly clean all sliding surfaces with propyl alcohol and cellulose cloths.
- In the case of GLRD with elastomer coating, to avoid friction when fitting the gasket,

bellows and shaft should be moistened with water whose surface tension has been reduced by the addition of detergent, for example.



Warning!

Under no circumstances must oil or grease be used to assist with the assembly!

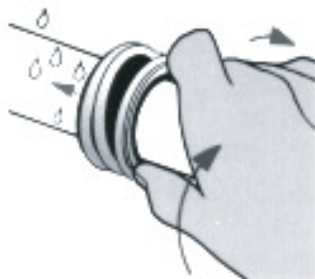
- Cover the sliding surface with a cardboard disc.
- Press the counter-ring slowly and steadily into the holding seat.
- Check that the counter-ring is seated at right-angles to the shaft axis.
- Clean the sliding surfaces to be striation free with propyl alcohol and cellulose cloths.



Important:

Do not touch the sliding surfaces with bare hands.

Push the rotating unit (bellows unit, sliding ring) onto the shaft by turning gently clockwise until the sliding ring lies against the counter-ring.



Installation of the mechanical seal



Important:

Use a suitable guide bush to push the GLRD over the keyways, etc. without damaging it.

You can order suitable guide bushes from Schmalenberger GmbH & Co. KG.

- Check that the thrust collar (spring collar), spring and sliding ring sit tightly.

Then continue with the assembly of the pump by fitting the impeller.

Observe the clearance in the gap on the impeller.

We recommend that you use our device for setting the gap clearance.

4.3 Spare parts list / Drawing

On pages 85 - 91 there are the spare parts list and the drawing of your pump.

Please take note of your pump type and the relevant model.

5 Appendix

5.1 Shutdown / Storage / Conservation

Every pump leaves the factory carefully assembled. If initial operation is predicted to be a long time after delivery we recommend the following measures for storage of the centrifugal pump.

5.1.1 Storage of New Pumps

When requested, new pumps receive a conservation protection corresponding to the storage time stated by the purchaser.

If this period of time is considerably exceeded the condition of the pump must be checked and, if required, re-conserved.

5.1.2 Long Periods of Shutdown > 3 months

1. Pump remains installed

To ensure that the pump is always ready for operation and to prevent the formation of deposits inside the pump and in its immediate vicinity, the pump aggregate should be run for a short time (approx. 15 minutes) monthly or quarterly during longer periods of inactivity. Prerequisite for this is that sufficient fluid is supplied to the pump.

2. Pump is removed and stored

To remove the pump proceed as outlined in chapter . 4 Maintenance / Repair .

Prior to storing the pump it must be thoroughly cleaned and conserved. Conservation must be done both internally and externally.

5.1.3 Restarting after Periods of Storage

De-conservation

Before the stored pump is re-installed the conservation agent (covering or filling) must be removed.

Proceed as described in chapter 2.2.2 Cleaning.



Warning!

After long periods of storage under conservation conditions check the shape stability and elasticity of the Elastomers (O-rings and mechanical seals). Brittle rings must be replaced. Elastomers made of EPDM should be replaced **in any event**.

Restarting

Re-install the pump according to the procedure described in chapter 2.3 Installing and connecting.

Immediately after completing the above work, all safety and protective measures must be properly installed and checked that they function.

Before the pump is re-started the checks and maintenance measures stated in chapter 4.1 Maintenance / Service must be carried out.

For the new re-start the points listed in section 3.1 Initial start-up must also be observed.

Particularities of the mechanical seal:

Prior to an initial start-up and after longer periods of standstill or after a new mechanical seal is installed it is important to check that the pump runs freely.

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 runs in the static seals and the driving spring, which leads to damage. Remove the blower cover and turn the blower wheel in the direction of the arrow. If there is resistance and the blower wheel feathers back then the mechanical seal has to 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 Disposal

If you want to take the pump completely out of service and never re-use it then please observe the local regulations for the disposal of industrial waste.



Warning! Mortal danger / poison!

Pumps that have delivered poisonous, caustic or other chemical substances which are a danger to people and the environment must be thoroughly cleaned and / or decontaminated prior to being disposed of.

The cleaning agents and rests of the delivery medium must also be handled in accordance with legal requirements.

If such legal regulations exist in the area where the pump is operated then the pump must be completely dismantled and sorted into the different materials so that they can be disposed of separately.

5.3 Supporting documents for pump operation

The following documents are enclosed:

- Operator's manual
- Dimensional sketch

In case of complaints regarding the pump motor, please contact us or the motor manufacturer.

5.4 Data sheet

The enclosed data sheet corresponds to the pump supplied.

You are not allowed to change the dimensions of the pump.



Important:

If changes have subsequently been made to the pump supplied then any claims under the guarantee will be void.

Please also be sure to observe the other documentation referred to in these operating instructions, see chapter 1.2 !

5.5 Important Instructions

5.5.1 Factory repair

Please observe the following instructions if the pump is sent back to the factory for repair:

1. 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.



Warning!

2. If the delivered media were poisonous, caustic, etc. then please be sure to enclose a copy of the safety sheet for the media!

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

5.5.2 Ordering Spare Parts

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

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

The pump serial number is on the type plate which is fastened to the blower cover of the motor.

The order confirmation or motor serial number may also be of assistance.

With this information you make it much easier for us to deliver the correct spare part for your pump!

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

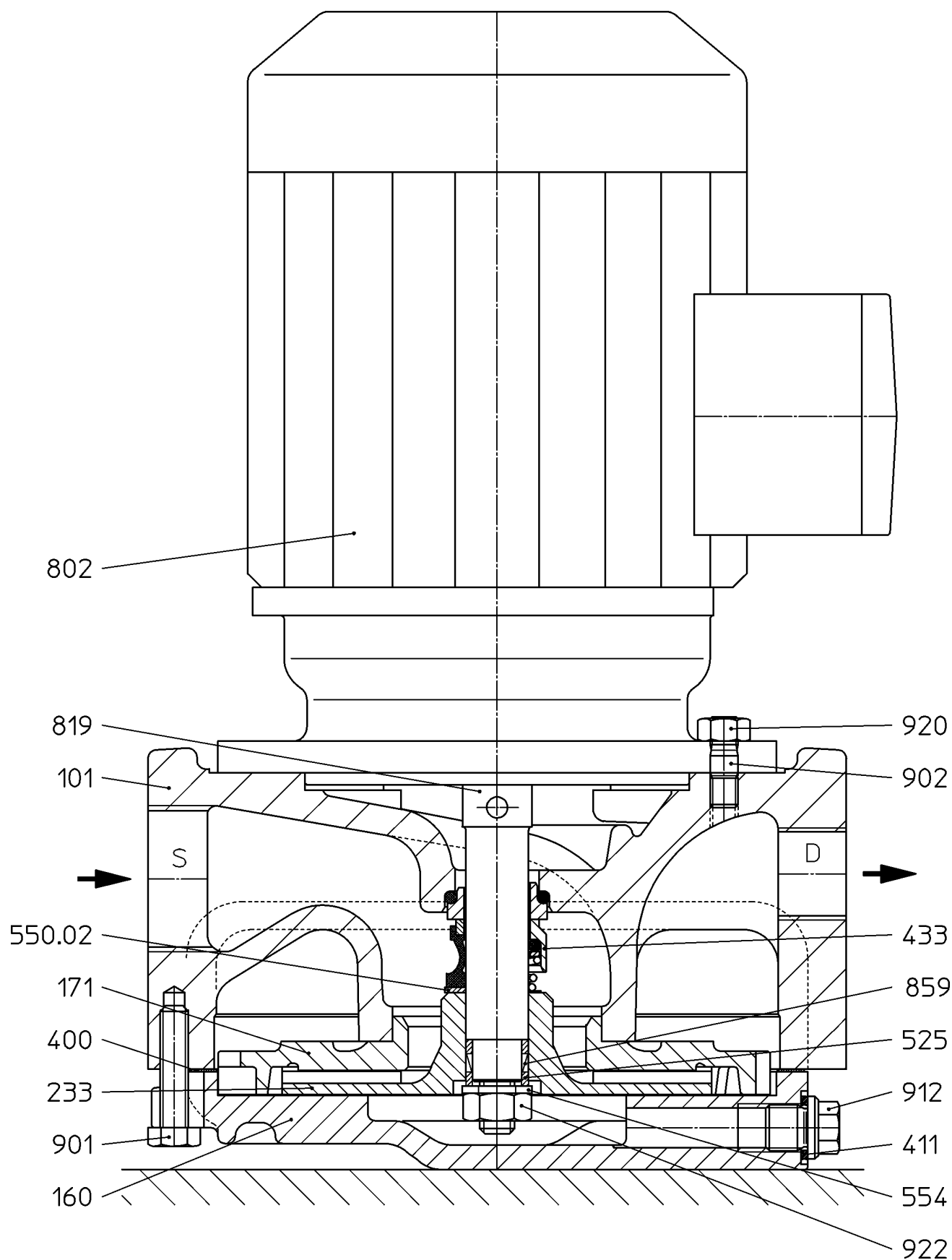
Fax: + 49 (0) 7071 - 7008-59

6 Spare parts list and drawings

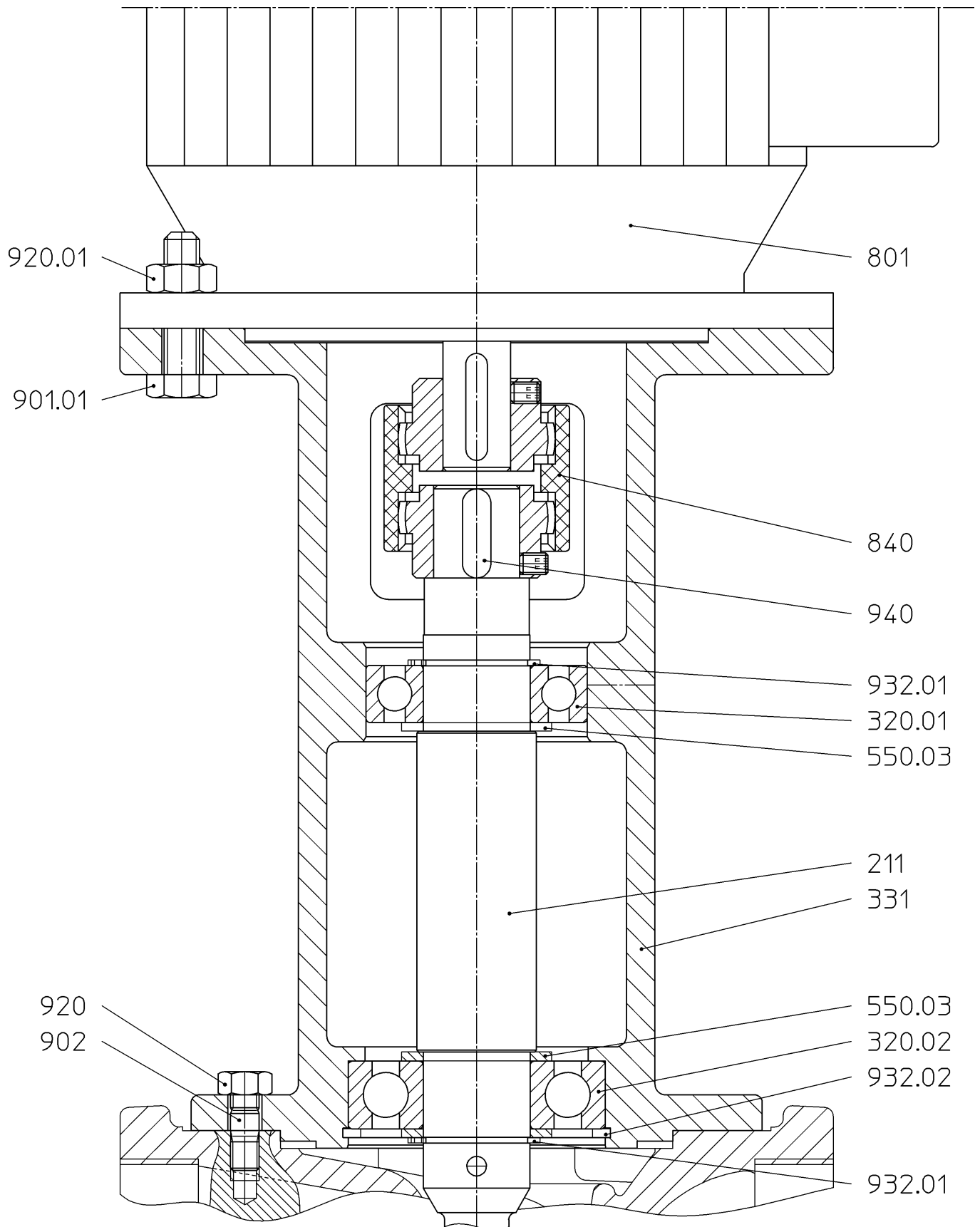


In the spare parts list (page 24 ff) all parts of the pump types are listed. Not all parts are built into every pump, however.

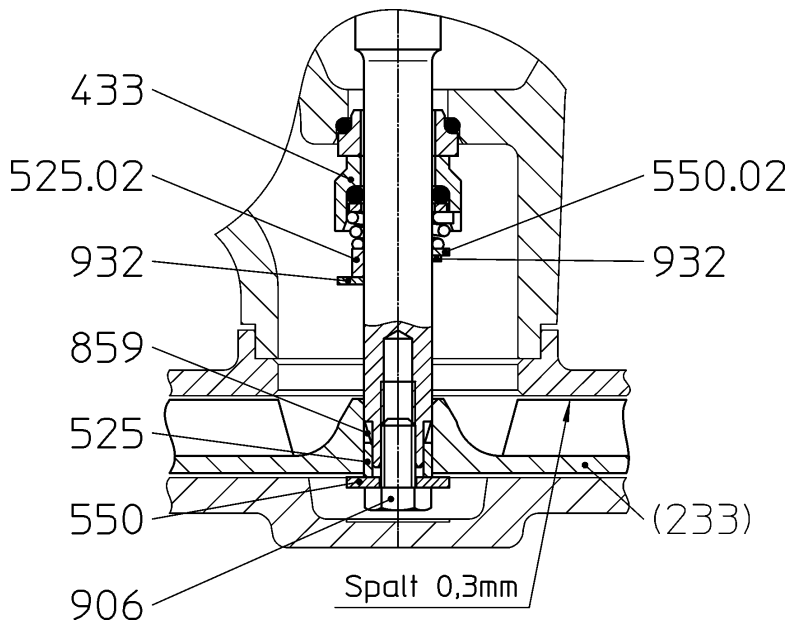
Typ S



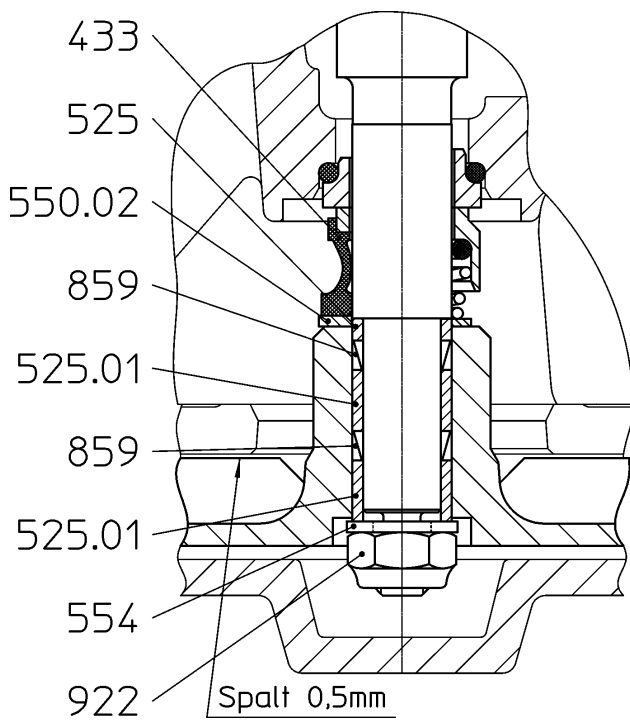
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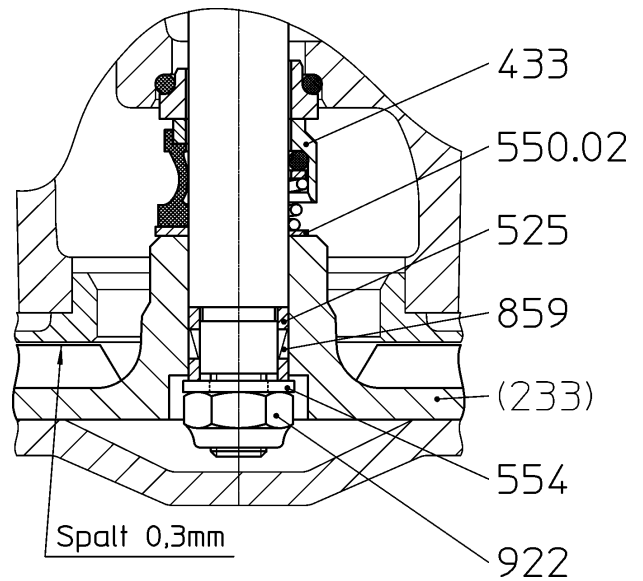
Impeller fixation



S 2008



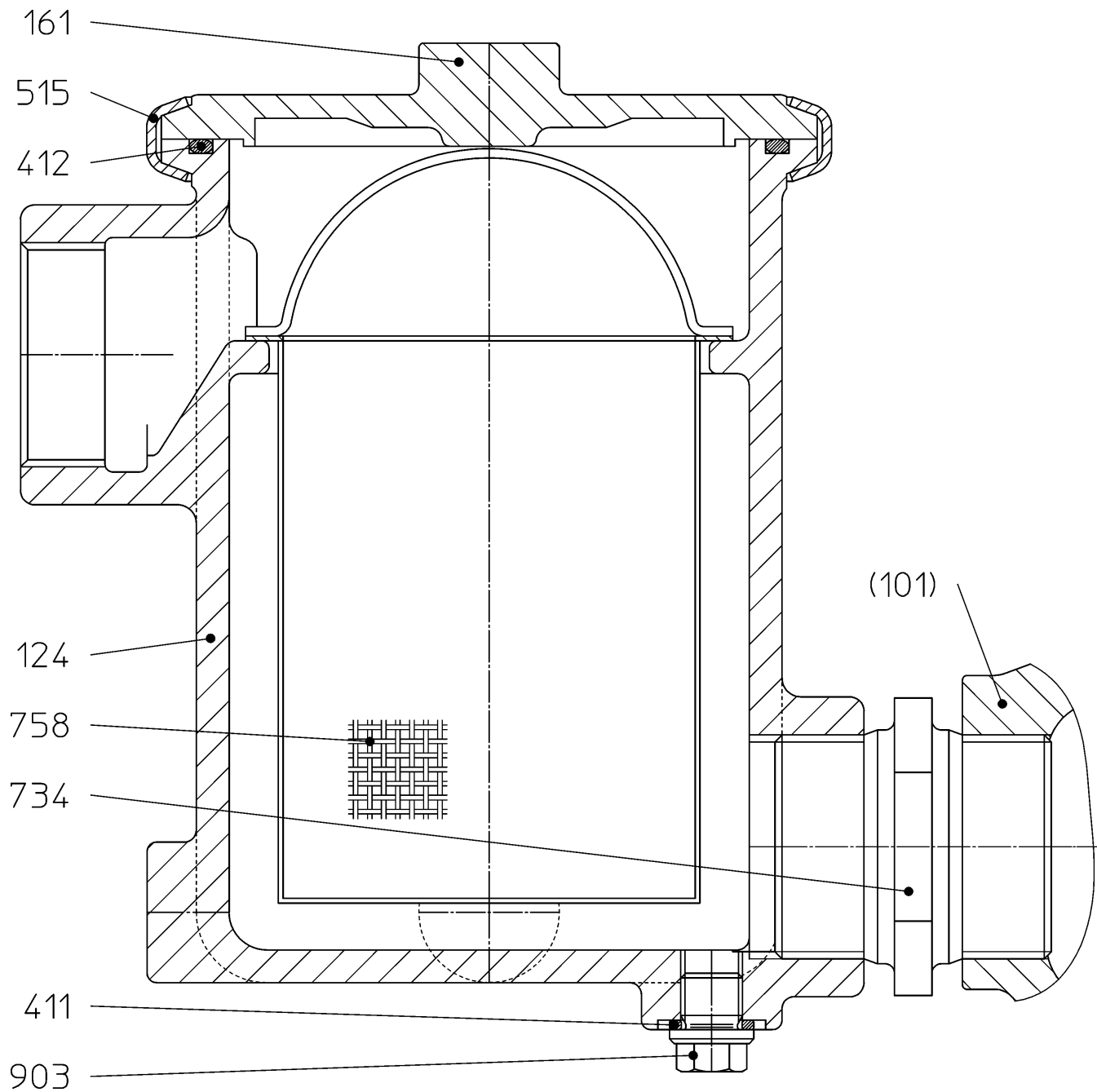
S 0014



S 0012

Spalt = Gap

Filter housing



6.1 Spare parts list

Pos.	Benennung	Denomination	Note
101	Pumpengehäuse	volute	
124	Filtergehäuse	filter housing	
160	Deckel	lid	
161	Gehäusedeckel	housing cover	
171	Leitrad	distributor	
211	Pumpenwelle	pump shaft	
233	Lauftrad	impeller	
320/.01/.02	Wälzlager	roller bearing	
331	Lagerbock	bearing pedestal	
400	Flachdichtung	clamp gasket	
411	CU-Ring	CU-ring	
412	O-Ring	O-ring	
433	Gleitringdichtung kpl.	mechanical seal	
515	Spannring	camping ring	
525/.01/.02	Abstandhülse	distance sleeve	
550/.01/.02/.03	Scheibe	distance washer	
554	Unterlegscheibe	distance washer	
734	Übergangsnippel	reducing pipe nipple	
758	Filtereinsatz	filter element	
801	Normmotor	Norm-motor	
802	Blockmotor	block motor	
819	Motorwelle	motor shaft	
840	Kupplung	coupling	
859	Spannelement	tensioning device	
901/.01	Sechskantschraube	hexagon screw	

Pos.	Benennung	Denomination	Note
902	Stiftschraube	locking screw	
903	Verschlußschraube	plug screw	
906	Laufadschraube	impeller screw	
912	Entleerungsstopfen	outfloor stopper	
920/.01	Sechskantmutter	hexagon nut	
922	Laufadmutter	impeller cap nut	
932/.01/.02	Gegenmutter	lock nut	
940	Paßfeder	key	

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Schmalenberger GmbH + Co. KG

Strömungstechnologie

Im Schelmen 9 - 11

D-72072 Tübingen / Germany

Telefon: +49 (0)7071 70 08 - 0

Telefax: +49 (0)7071 70 08 - 59

Internet: www.schmalenberger.de

E-Mail: info@schmalenberger.de

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Pump Type S / SF

Version: 27229 - B