

**Operating and Maintenance Instructions
with Disassembly and Assembly Instructions**

**Progressive Cavity Pumps
TECFLOW Series**

VM No.: 760.0005 GB
Edition: 10.01
Ident No.: 190 000

**Retain
for future
use!**

Operating data of the pump acc. to the order data sheet

Order No.:

Pump Ident No.:

Machine No.:

Pump Type:

Operating data, dimensions and other additional information can be found in the order-specific part of the documentation.



These Operating and Maintenance Instructions contain information from the pump manufacturer. They may need to be supplemented by instructions of the operator company for its personnel. These instructions do not take account of specific information relating to operation and maintenance of the process plant into which the pump is integrated. Such information can only be given by the persons responsible for construction and planning of the plant (plant manufacturer).

Such specific instructions relating to operation and maintenance of the process plant into which the pump is integrated have priority over the instructions of the pump manufacturer. The plant manufacturer must on principle observe the limits of use!

Refer to the operating instructions of the plant manufacturer!

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Important note:

This operating manual is to be supplemented by the order-related informations.

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1. General

1.1 Application and operating range

Progressive cavity pumps are rotary self-priming displacement pumps for pumping and metering low and high viscous liquids, neutral clean or abrasive liquids, liquids containing gases or which tend to froth, including liquids containing fibrous and solid material.

ATTENTION For the operating range please refer to the order data sheet.

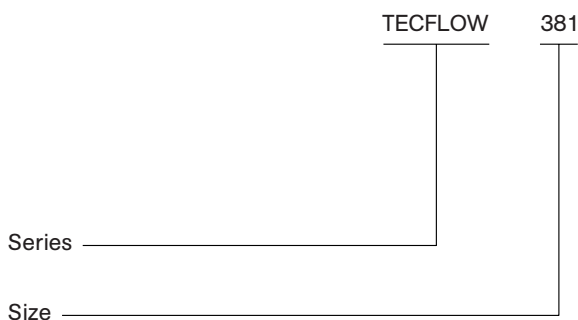
1.2 Performance data

The performance data of the pump can be taken from the order data sheet.

1.3 Abbreviated type coding

Following scheme is used for the abbreviated type coding of the progressive cavity pumps:

Example:



The abbreviated type coding is stamped on the nameplate of the pump.

1.4 Warranty

Our liability for shortcomings in the supply is determined in our delivery conditions. No liability will be accepted for any damage caused by non-compliance with the operating instructions and operating conditions. If at any later date the operating conditions are changed (e.g. different liquid pumped, speed, viscosity, temperature or pressure conditions), it must be checked and if necessary, confirmed by us in any particular case, whether the pump is suited for these purposes. In case no special agreements were made, pumps supplied by us may, during the warranty period, only be opened or modified by us or our authorized service stations. Otherwise, our liability for any defects will be invalidated.

1.5 Testing

Prior to leaving our factory, all pumps are subject to a combined leak test and performance test. Only properly operating pumps which achieve the guaranteed performance leave the factory. Thus, compliance with the following operating instructions ensures trouble-free operation.

2. Safety

These operating instructions contain basic hints to be observed during installation, operation and maintenance. Therefore, prior to final installation and commissioning, these operating instructions must by all means be read by the installation engineer as well as the supervising personnel/operator and must always be available at the place of installation of the machine/plant. Not only the the general safety hints listed under this main item "Safety" are to be observed, but also the special safety hints inserted in the other main items, e.g. for private use.

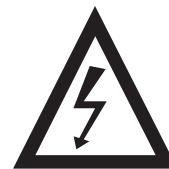
2.1 Marking of hints in the operating instructions

The safety hints contained in these operating instructions which in case of non-compliance, may cause danger to the personnel, are particularly marked with the general danger sign



Safety sign according to DIN 4844-W9

and in case of warning against electrical voltage



Safety sign according to DIN 4844-W8

The word



is inserted for safety hints where non-compliance may cause dangers to the machine and its functions.

Hints directly attached to the machine as:

- Rotation arrow
- Labels for fluid connections

must by all means be observed and kept in completely legible condition.

2.2 Qualification and training of personnel

The personnel for operation, maintenance, inspection and assembly must have appropriate qualifications for these duties. Responsibilities, competence and supervision must be exactly controlled by the user. Personnel with not sufficient knowledge must be trained and instructed. If required, the personnel can be trained on behalf of the user by the manufacturer/supplier. Furthermore, it must be ensured by the user that the contents of the operating instructions are fully understood by the personnel.

2.3 Dangers in case of non-compliance with the safety hints

Non-compliance with the safety hints may result in danger not only to the personnel, but also to the equipment and the environment. Non-compliance with the safety hints may also lead to the loss of any claims for indemnification.

In detail, non-compliance may, **for example**, result in the following dangers:

- Failure of important functions of the equipment or plant.
- Failure of specified procedures for maintenance and service.
- Danger to persons by electrical, mechanical or chemical influences.
- Danger to the environment by leakage of hazardous substances.

2.4 Safety conscious working

The safety hints mentioned in these operating instructions, the current national standards for the prevention of accidents as well as the internal labour regulations and the the operating and safety standards of the user are to be observed.

2.5 Safety hints for the user/operator

- If hot or cold machine parts lead to dangers, these parts must be protected against accidental contact at site.
- Guards for moving parts (e.g. the coupling) must not be removed when the equipment is in operation.
- When operating pump aggregates in a dust-laden environment (e.g. milling, chipboard manufacture, bakeries), the surfaces of the pumps and motors must be cleaned at regular intervals, depending on local conditions, in order to maintain the cooling effect and eliminate the possibility of spontaneous combustion. Please also see explosion protection regulations (BGR 104).
- Leakages (e.g. of the shaft seal) of hazardous liquids (e.g. explosive, toxic, hot) must be drained in a way, that no danger for persons and the environment is created. Legal regulations must be observed.
- Provisions against dangers by electrical energy must be taken (for details please refer to the regulations of the VDE or the local electricity board).

2.6 Safety hints for maintenance, inspection and assembly

The user must take care that all maintenance, inspection and assembly will be performed by authorized and qualified expert personnel, who have sufficiently informed themselves by thoroughly studying the operating instructions.

Work at the equipment must generally be performed during standstill only. The procedure for shut-down of the equipment as described in the operating instructions must be observed without fail. Pumps or units handling noxious liquids must be decontaminated. All safety and protective devices must immediately be refitted and made operational on completion on the work. Prior to re-starting, the items listed in Section 6.2 (Commissioning) must be observed.

2.7 Unauthorized modifications and spare parts production

Modifications or changes to the equipment are only permissible after consultation with the manufacturer. Genuine spare parts and accessories authorized by the manufacturer serve safety purposes. If other parts are used the manufacturer cannot be held liable for the consequences.

2.8 Unacceptable modes of operation

The reliability of operation is only guaranteed when the equipment is applied in acc. with Section 1 "General" of the operating instructions. The limitations given in the data sheet must by no means be exceeded.

3. Transportation and intermediate storage

3.1 Packing

The symbols applied to the packing are to be observed. During transportation and storage, suction and outlet side and auxiliary connections of the pump must be closed with plugs. During installation of the pump aggregate, the plugs are to be removed.

3.2 Transportation

The pump or pump aggregate is to be safely transported to the place of installation, if required by means of lifting gear.



The regulations for lifting loads in accordance with VBG 9a must be observed. Crane and sling equipment must not be secured to the lifting eyes of the motor, except as additional protection against overtuning in the event of nose-heaviness.

When transporting the pumps by means of a crane, the sling ropes must be placed safely around the suction casing.

In case of complete pump aggregates, a rope must be additionally fixed to the driving motor.

The sling ropes must be placed around the pump and/or the pump aggregate so that when being lifted, they are in exact balance.



Transportation to and at the installation site

Make sure that the unit is transported safely and in a stable position. Overtuning due to nose-heaviness must be prevented.

3.3 Preservation and intermediate storage of progressive cavity pumps

Please refer to our information sheet VM 2102/...

4. Description

4.1 Design features

Self priming, single stage progressive cavity pump. The pumping elements are formed by the rotor and the stator. The drive torque is transmitted to the rotor via a hollow shaft and a coupling rod.

The outlet section, stator and suction casing are held together by external tie rods.

Between the lantern and the suction housing is situated a gland housing or mechanical seal housing.

4.1.1 Bearings and lubrication

Coupling rod with liquid tight encapsulated universal joints on either side. Lubrication by joint oil.

The drive shaft/hollow shaft is carried in reinforced bearings in the drive.

4.1.2 Shaft seal

By uncooled gland packing or uncooled, non-balanced single acting mechanical seal.

4.1.3 Dimensions/branch positions/flanges

The dimensions of the pump or the pump unit, the branch position and the flange dimensions can be taken from the dimensional or general arrangement drawings.

4.2 Operation

Rotary self-priming positive displacement pump with new 2/3 lobe geometry of the pumping elements. The pumping elements are formed by a rotating eccentric screw (the rotor) and the fixed stator. In any cross-sectional plane, the elements are in contact with one another at three points and along the length of the ele-

ments these points form three lines of seal. The material contained in the sealed enclosed cavities which are formed as the rotor turns is displaced axially and with complete continuity from the suction to the delivery end of the pump. Despite the fact that the rotor rotates, no turbulence is produced. The constant volume of the enclosed cavities means that there are no pressurising forces and thus guarantees a low-surge pumping action which is not at all severe on the material being pumped.

4.3 Unit assembly

4.3.1 Drive

By explosion proof or non-explosion proof electric motors, geared motors or infinitely variable speed drives.

4.3.2 Baseplate

Pumps for horizontal installation are usually mounted on a common baseplate with the drive. Fabricated steel baseplates are provided.

5. Installation/Mounting

5.1 Installation

The pumps can be installed horizontally or vertically. Vertical installation with the motor down is not permitted.

5.2 Foundation

The design of the foundation depends on the size of the pump and/or the size of the unit and the local mounting conditions.

Dimensional details of the pumps or the pump units can be taken from our dimensional drawings or general arrangement drawings.

The foundation can be executed in concrete or as a stable frame e.g. a fabricated steel structure.

Requirement for all types of foundation: The foundation must be designed to accept the weight of the pump unit over the entire surface.

5.2.1 Arrangement of a steel foundation plate

A steel foundation plate must be designed in such a way that the base plate makes full contact and can be secured with bolts or by welding.

ATTENTION If only some of the areas of the base plate are supported, the plate sags in the center or the pump aggregate can be twisted. This influences the alignment of the pump aggregate and can cause high noise emission and damage.

5.2.2 Arrangement of concrete foundations

Concrete foundations must be horizontal, straight and clean and must fully absorb the load exerted on the foundations. Concrete foundations must be designed in such a way that the base plate makes full contact and can be secured with suitable bolts (see our aggregate drawing).

ATTENTION If only some of the areas of the base plate are supported, the plate sags in the center or the pump aggregate can be twisted. This influences the alignment of the pump aggregate and can cause high noise emission and damage.

5.2.3 Fastening of the pump aggregate on the concrete foundations

After aligning the pump aggregate on the concrete foundations the securing bolts are diagonally and evenly tightened.

5.2.4 Arrangement of concrete foundations for poured base plates

When shuttering the concrete foundations it must be observed that a gap for aligning the pump aggregate and applying the mortar compound remains between the top of the finished foundation block and the bottom of the base plate.

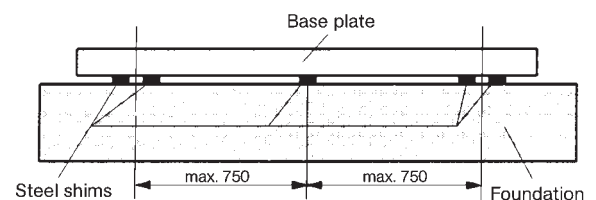
The set concrete foundations must be straight, even and clean. Any traces of oil must be removed from the foundations. The recessed anchor holes for the foundation bolts must be cleaned and removed and cleaned out with air. Prior to the installation of the pump aggregate the surface of the concrete foundations must be roughened and cleaned to ensure a good bonding between the foundation block and the mortar compound.

5.2.5 Alignment of the pump aggregate

The pump aggregate must be aligned to its pre-set height and system dimensions. This is done using suitable steel shims, arranged directly adjacent to each fixing bolt.

The total height of the steel shims is determined by the pre-set system dimensions of the plant. The steel shims and the base plate must sit flush.

If the fixing holes are more than 750 mm apart, we recommend fitting additional steel shims the distance respectively of 750 mm.



Alignment with steel shims

5.2.6 Pouring of base plate

After alignment on the concrete foundations, a low-shrinkage mortar compound must be poured over the entire length of the base plate, covering also the anchor holes with the connected foundation bolts.

Once the mortar compound has set on the base plate and in the anchor holes, the foundation bolts must be diagonally and evenly tightened.

Note: When pouring or adding the mortar compound it must be observed that the base plate makes full contact. Tap the plate to ensure that no cavities have formed underneath.

5.3 Baseplate

The baseplate must be fastened stress-free on the foundation.

5.4 Space requirements for maintenance and servicing

ATTENTION The pump must be accessible from all sides, allowing necessary inspections to be performed with ease.

Sufficient space must be provided for maintenance and servicing operations, especially for the replacement of the pumping elements. The space required for rotor and stator replacement can be taken from our dimensional or general arrangement drawings. Additionally it must be ensured that all piping can be removed or mounted without obstacle.

5.5 Installation of the pipework

5.5.1 Nominal diameters

The nominal diameters of the suction and discharge pipework should be designed corresponding to the

nominal diameters of the pump flanges. In case of severe deviations especially on the suction side, please consult the factory.

5.5.2 Supports and flange connetions

The pipework must be connected stress-free to the pump. Supports should be provided close to the pump. It should be easy to make the connections in order to prevent any distortion. After loosening the bolt connections, the flanges should neither be sloped or springy nor rest on each other under pressure. Appropriate measures (e.g. the installation of compensators) must be taken to keep possible thermal stress of the pipe-work away from the pump.

5.5.3 Cleaning of the pipework before connection

The suction side pipework, the gate valves and shut-off valves must by all means be flushed and or cleaned before installation of the pump.

Remainders from installation as bolts, nuts, welding beads, metal items etc. will destroy the pump internals. Any damages caused by such remainders are not covered by our warranty.

5.6 Installation of auxilliary pipework for accessories

All auxilliary pipework for charging the shaft seal must be connected stress-free and leakage-free.

The flow direction for the flushing liquid is indicated with arrows on the cross sectional drawing.

In order to guarantee self-venting, the auxilliary piping must be installed under a gradient with low flow resistance and kept as short as possible.

The formation of air pockets or gas bubbles must be prevented. If necessary, venting connections must be provided. Flange gaskets must not protrude inwards. Blanking flanges, plugs, protective film and/or protective paint on flanges and seals must be removed completely.

5.7 Safety and control devices

5.7.1 Pressure gauges and vacuum gauges

Pressure gauges and vacuum gauges must be fitted to the suction and discharge pipework.

5.7.2 Safety device in the discharge piping

When a shut-off valve is installed in the discharge pipeline or if it is possible that the discharge pipeline will be clogged, a safety device should be provided. Suitable safety devices are: bypass line with built-in pressure relief valve, bursting disc, motor protection switch etc.



Progressive cavity pumps are positive displacement pumps which, theoretically, can generate an infinitely high pressure.

With a closed discharge pipework, e.g. by clogging or incidental closing of a valve, the pressure developed by the pump may exceed the permissible pressure of the pump or the installation by far. This may, e.g. lead to bursting of the pipelines, which must be avoided under all circumstances and especially when dangerous products are handled. Thus, appropriate safety devices like pressure switches, must be installed.

5.8 Electrical connections



The connection of the power supply cable to the drive must be effected by a professional electrician according to the wiring diagram of the motor manufacturer. In doing so, the current regulations of the VDE or the local electricity board must be observed. Danger by electrical energy must be excluded.

6. Commissioning/decommissioning

6.1 Preparation for commissioning

6.1.1 Filling of the pump with liquid

ATTENTION The pump must not run dry! The pump must be filled with liquid for initial start-up and after prolonged standstills.

Only a few revolutions without liquid cause premature wear and may damage the stator. Therefore, prior to start-up, the suction casing must be filled with water or the liquid pumped to lubricate rotor and stator. After a prolonged standstill, i.e. if it must be assumed that the liquid residues in the pump have evaporated or after a repair, the filling process must be repeated.

After filling, the pump operates self-priming. Venting is not required as a liquid/gas mixture can be handled without problem.

6.1.2 Opening of the auxilliary seal systems (if provided)

If the pumps are charged with a flushing liquid, the existing shut-off valves must be opened and adjusted to the below listed pressures before the first start-up.

- Supply of flushing liquid to the gland packings

(shaft seal design P2, P3, P4).

Note: To maintain their function, gland packings with flushing ring or lantern ring require a flushing liquid.

The following flushing liquid pressure for the various shaft seal designs must be considered for pumps with gland packing:

P2 = 0,1...0,5 bar / 1,45...7,25 psi
(above suction pressure)

P3 = 0,5 bar / 7,25 psi
(above suction pressure)

P4 = 0...0,5 bar / 0...7,25 psi

(for the flushing liquid please refer to Section 6.1.3)

6.1.3 Quality and properties of the flushing liquid

ATTENTION Any liquid can be used as flushing liquid, however, the corrosion resistance of all wetted parts as well as the compatibility with the liquid pumped must be considered. The flushing liquid must be free from solids and must not tend to sedimentation. It should have the highest possible boiling point, an excellent thermal conductivity and a low viscosity. Clean water of low hardness meets these requirements to a high degree.

6.1.4 Break-away of the pump

In case of a re-start or after a prolonged standstill, please make sure that the pump is rotated easily by the drive unit. If this is not possible, e.g. because of the adhesion between a new rotor and stator, it is possible to assist with an appropriate tool in the area between the gland packing and the drive unit.

ATTENTION During this process, the hollow shaft must not be damaged.

6.1.5 Control of the sense of rotation

The sense of rotation of the pump is counterclockwise (ccw) looking from the drive towards the hollow shaft. Herewith, the suction connection is located on the side of the shaft seal and therefore, the shaft seal is balanced.

ATTENTION The sense of rotation of the pump must correspond with the rotation arrow "n" on the pump nameplate. A wrong sense of rotation may lead to damages of the pump. To control the sense of rotation, please briefly touch the on/off-switch of the drive.

6.2 Commissioning

6.2.1 Start-up

Prior to start-up of the pump, all shut-off devices installed in the suction and discharge pipework must be fully opened.

6.2.2 Drive

Switch motor on.

ATTENTION Please consider product-specific particularities of the drive. **Please refer to the operating instructions of the drive manufacturer.**

6.2.3 Checking the pump performance

When the motor reached its nominal speed, suction and discharge pressure must be checked by means of a vacuum gauge and a pressure gauge. The motor must not be overloaded.

The power consumption can be checked by means of an ammeter. Additionally, temperature and viscosity of the liquid pumped must be checked. The recorded values must be checked against the order data sheet and the performance test report.

6.2.4 Protection against dry running

In case of an interruption of the flow on the suction side of the progressive cavity pump, the thermal energy caused by dry friction and flexing work is not sufficiently transferred. This leads within a very short period of time to the thermal destruction of the stator elastomer. Depending on the application, a choice of particularly selected dry run protection devices are available (please consult the factory).

6.3 Decommissioning

6.3.1 Shut-down

Switch motor off.

6.3.2 Measures in case of prolonged shut-down periods

If a prolonged shut-down period is considered and there is the danger of frost, the pump must be drained. In order to do so, remove the plug (502) from the suction casing (505). Afterwards, the pump must be preserved as described in Section 3.3.

7. Maintenance/Service

7.1 Maintenance

For maintenance and service activities the statements under Section 2 "Safety" are to be observed. Regular control and maintenance of pump and drive will result in an increased lifetime of the equipment.

7.1..1 General Control

1. The pump must not run dry.
2. The driving motor must not be overloaded.
3. Check suction and discharge pipelines for leaks.
4. An installed gland packing must slightly leak during operation. An installed mechanical seal must have no substantial leakage.
5. Pressure and temperature monitoring devices must be observed and compared with the order data sheet and/or the performance test report.
6. Monitor the auxiliary seal systems for flushing (if provided).

7.1.2 Maintenance of components

7.1.2.1 Universal joints of the coupling rod

The universal joints of the coupling rod are lubricated with ALLWEILER special joint oil Type B or oil ET 1510 ISO 460 of Messrs. Tribol Lubricants GmbH, Mönchengladbach, Germany. Pumps used in food applications

are lubricated with ALLWEILER special joint oil Type BL or oil 1860/460 of Messrs. Tribol Lubricants GmbH, Mönchengladbach, Germany.

ATTENTION Other lubricants have not been tested by us and therefore, cannot be recommended!

The joints are lubricated for life. However, if the pump must be opened for other purposes we recommend to check the tightness of the cover sleeves and to change the joint oil after 8000 operating hours. The joint oil quantities in cubic centimeters, depending on the pump size, can be taken from the table under Section 7.1.2.4. For the change of the joint oil, please refer to the disassembly and assembly instructions.

7.1.2.2 Shaft seal

The shafts are either sealed by gland packing or mechanical seal.

● Gland Packing

Increased leakage during the initial operating hours usually diminishes during the running-in period.

If necessary, slightly tighten the hexagon nuts (202) at the gland (203).

Please consider that the gland packing must slightly leak. This guarantees the transfer of the frictional heat generated at the sealing surfaces.

If the leakage increases excessively and cannot even be reduced by repeated slight tightening of the hexagon nuts (202), the packing rings lost their elasticity and must be replaced.

- Removal of the old packing rings and cleaning of the gland housing

After reduction of the pressure in the pump and removal of the gland, the old packing rings can be removed by means of a packing puller tool with flexible shaft. Thereafter, the gland housing and the hollow shaft must be carefully cleaned in the area of the packing rings. Worn hollow shafts must be replaced (please refer to the disassembly and assembly instructions).

- Installation of the packing rings

ATTENTION Generally, before installation of the packing it must be checked that the correct packing has been selected with regard to the operating conditions.

The dimensions and the required quantity of pre-pressed packing rings, ring cuts or cutted-to-size sections can be taken from the table under Section 7.1.2.4.

With cutting to size we recommend a straight cut perpendicular to the shaft. In order to guarantee gap-free and parallel contact of the cut packing ring ends, the cutting angle should be approx. 20° to both cut ends (see Fig. 1).

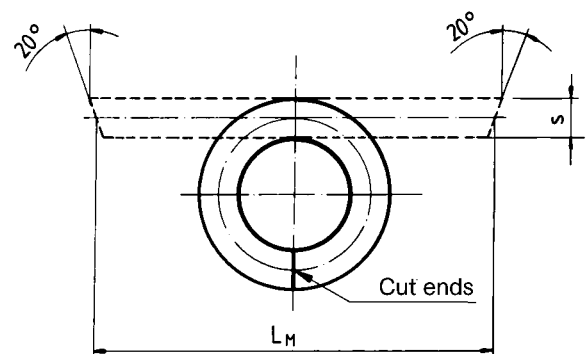


Fig. 1: Cutting to size of packing rings

Pre-pressed packing rings or cutted to size rings must be carefully opened axially and radially just sufficient for them be pushed over the the hollow shaft. Bending-up the rings may result in damage by breaking.

With installation in the gland housing, the packing rings must be carefully re-bent to their angular shape. The cut ends of each ring inserted must be staggered by 90°. Each ring must be pushed into the gland housing with the cut ends first with the assistance of the gland. Flushing rings or lantern rings are to be installed in the correct sequence.

ATTENTION Sharp or pointed tools may never be used for installation as there is a danger of damaging the hollow shaft and deforming the packing material.

– **Commissioning of the gland packing after re-packing**

The gland packing should only be slightly tightened before commissioning. During start-up of the pump, an initial leakage rate of 50 ... 200 drops per minute is permitted.

Within 30 minutes after start-up, the leakage must be gradually and uniformly reduced to a minimum of 2 ... 20 drops per minute by adjusting the gland (203) by means of the hexagon nuts (202).

ATTENTION During the adjustment, the temperature of the gland packing must not rise abnormal. Approx. 20 ... 60 °C above the temperature of the liquid pumped are permissible. In case of a sudden temperature rise, the gland must be slackened immediatly and the start-up procedure repeated. The leakage can be drained through a tapped hole in the drain pan of the motor bracket.

Personal injuries and environmental damages resulting from leakage of dangerous materials must be excluded.



● **Mechanical seal**

Non-balanced mechanical seals are installed. The mechanical seal is maintenance-free. In case of severe leakage due to wear, the mechanical seal must be replaced (please see the disassembly and assembly instructions).

ATTENTION As dry running of the mechanical seal must be avoided, the pump may only be started in filled condition.

7.1.2.3 Drives, gear reducers and variable speed gears

Please refer to the operating and maintenance instructions of the manufacturers.

7.1.2.4 Gland packing dimensions (re Section 7.1.2.2), joint lubricant quantities (re Section 7.1.2.1)

Pump size	51	101	201	381	551 751	1001 1451	2701	5001
Number of packing rings for design P1 ①	6	6	6	6	6	6	6	6
Dimensions of the packing rings for cut rings	Ø 37/ 25 x 6	Ø 37/ 25 x 6	Ø 42/ 30 x 6	Ø 51/ 35 x 8	Ø 59/ 43 x 8	Ø 73/ 53 x 10	Ø 80/ 60 x 10	Ø99/ 75 x 12
Dimensions of the packing rings for cutted-to-size sections L _M x S	104,2 x 6	104,2 x 6	121 x 6	144,5 x 8	171,4 x 8	211,8 x 10	235,3 x 10	292,5 x 12
Oil quantity in cm ³ per joint	10	10	18	37	52	87	169	290

① In case of shaft seal design P2, P3 and P4 the number is reduced by one off.

7.2 Service (disassembly and assembly instructions)

General

On request, trained service engineers will be available for installation and repairs.



When repairs are performed by the user's own personnel or our service engineers, it must be ensured that the pump is completely drained and cleaned.

This applies in particular to pumps which are returned to our factory or to one of our authorized service stations for repair.

To protect our staff and for reasons of environmental protection, repairs of any pumps filled with the liquid pumped will be refused. Otherwise, we will charge the customer/user with the costs for ecological waste disposal.

In case of repair of pumps handling dangerous materials ① and/or liquids harmful to the environment, the customer/user must advise hereof his own and/or our service personnel at site. If the pump is returned to our factory or to one of our authorized service stations, similar information must be given voluntarily. In such a case, evidence of the liquid pumped, e.g. in form of a DIN safety data sheet must be provided along with the request for a service engineer.

① **Dangerous materials are:**

- Toxic substances
- Substances detrimental to health
- Caustic substances
- Irritants
- Explosive materials
- Fire promoting, highly, easily and normal inflammable materials
- Carcinogenic substances
- Foetopathic substances
- Genes-changing substances
- Substances which are dangerous to human beings in any other way

For all work executed at site, the users own personnel and/or our service engineers must be alerted to dangers which may arise in connection with the repairs.

The most important disassembly and assembly operations are described in these instructions. The assembly steps described in the particular sections must be consequently followed.

7.2.1 Disassembly of the progressive cavity pump

Prior to disassembly, the following operations must be performed:

- Switch-off or remove the power supply of the motor. It must not be possible to start the motor.
- Close all shut-off devices in the suction and discharge line.
- Drain the pumped liquid from the suction casing. For this purpose, please remove plug (502).
Note: Please use a suitable container to collect the drained liquid.
- Disconnect the suction and discharge pipework as well as all auxiliary piping.
- Remove the bolts at the pump feet

7.2.1.1 Removal of the stator

- Remove hexagon nuts (609) and washers (610) from the tie rods (611).

- Pull-off the discharge housing (504).
- Remove the tie rods (611)
- Pull stator (402) from rotor (401)
Note: If difficulty is experienced rotate the stator (402) at the same time by means of a chain wrench. In order to do so, secure the hollow shaft (125).

7.2.1.2 Disassembly of the rotor and the rotor-side joint

The disassembly of the rotor and the rotor-side joint is effected after removal of the stator (402). Please refer to Section 7.2.1.1.

- Remove hexagon nuts (607) and serrated lock washers (608) as well as hexagon head bolts (606).
- Pull suction casing (505) over the rotor (401). Make sure the precision machined rotor surface is not damaged when doing so.
- Remove suction casing gasket (501).
- Cut buckles on clamping bands (306) with a metal saw and press-out to both sides by means of a screw driver. Remove clamping bands (306) from cover sleeves (308). Please see Fig. 2.

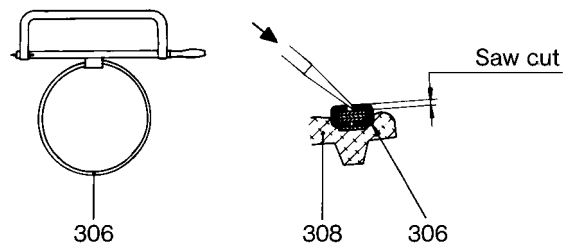


Fig. 2: Removal of the clamping band

- Lift cover sleeve (308) by means of a screw driver and pull-off axially in the direction of the coupling rod.
- Drain oil filling into a container
- Drive retaining sleeve (304) over the flange of the coupling rod (307). While doing so, do not twist the coupling rod (307). Please see Fig. 3.

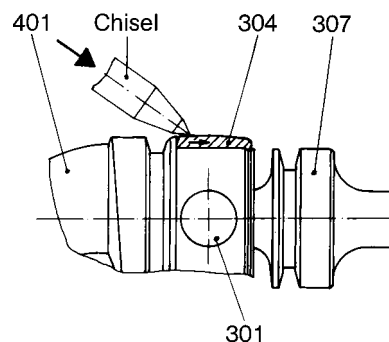


Fig. 3: Removal of the retaining sleeve

- Push out coupling rod pin (301)
- Drive guide bushes (303) half-way out by means of a brass taper drift. For this purpose, tilt coupling rod (307). Please see Fig. 4.

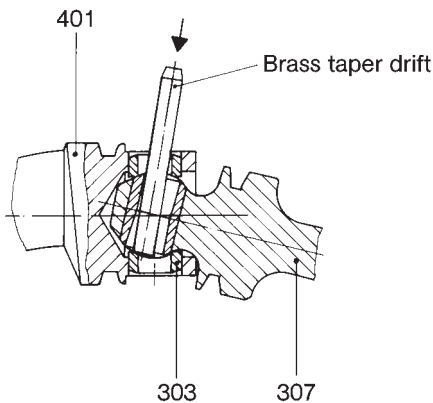


Fig. 4: Removal of guide bushes

- Pull rotor (401) from coupling rod (307).
- Press out coupling rod bush (302) from coupling rod (307).
- Note:** Not applicable to pump size 51, 101!
- Drive guide bushes (303) completely from rotor (401) by means of a brass taper drift.

7.2.1.3 Disassembly of the coupling rod and the drive-side joint

The disassembly of the coupling rod and the drive side joint is effected after the removal of the stator (402) and the rotor (401). Please refer to Sections 7.2.1.1 and 7.2.1.2.

- Disassemble drive-side joint as described under Section 7.2.1.2.
- Pull coupling rod (307) from hollow shaft (125).
- Press out coupling rod bush (302) from coupling rod (307).
- Note:** Not applicable to pump size 51!
- Drive guide bushes (303) completely from hollow shaft (125) by means of a brass taper drift.

7.2.1.4 Removal of the shaft seal and the hollow shaft

Note: In case of pumps with gland packing, the packing rings can be changed as described under Section 7.1.2.2 without removal of the hollow shaft. The removal of the hollow shaft is only required when the pump is equipped with mechanical seal. In case of hollow shafts damaged in the area of the shaft seal, the pumps must be disassembled as described below:

- Remove stator (402). Please refer to Section 7.2.1.1.
- Remove hexagon nuts (607), serrated lock washers (608) and hexagon head bolts (606).
- Pull suction casing (505) over the rotor (401). Make sure the precision machined rotor surface is not damaged when doing so.
- Remove suction casing gasket (501).
- Pull flinger ring (123) from clamp set (123).
- Undo clamp screws of clamp set (123) sequential and uniformly. If necessary turn hollow shaft (125). In case the outer ring of the clamp set is not automatically released from the inner ring, a few clamp screws may be removed and inserted in the adjacent pull-off threads. The release is now possible without problem.
- Never remove the clamp screws completely (danger of accidents).



- Pull hollow shaft (125) with all parts of the shaft seal and the clamp set (123) from the motor bracket (122).
- Pull clamp set (123) from hollow shaft (125).

● Disassembly of the gland packing

- Remove hexagon nut (202) and gland (203).
- Pull gland housing (204) from hollow shaft (125).
- Remove gland packing (207) from gland housing (204). In case of shaft seal design P2, P3 or P4 also remove the flushing ring (208) or the lantern ring (209).

● Disassembly of the single acting mechanical seal

- Pull mechanical seal housing (214) with the atmospheric side stationary seal face of the mechanical seal (219) from the hollow shaft (125).
- Note:** Please pay particular attention that the mechanical seal housing with the stationary seal face is pulled-off concentrically without tilting, in order to prevent any damages to the stationary seal face.
- Push the stationary seal face and the O-ring from the mechanical seal housing (214). See to uniform pressure distribution.
- Drive-out retaining pin (220).
- Undo grub screws in mechanical seal (219), if installed, and pull mechanical seal from hollow shaft (125).
- **ATTENTION** Before undoing the grub screws, mark the position of the mechanical seal on the hollow shaft. Do not push O-rings over the drag-marks caused by the grub screws.

7.2.2 Assembly of the progressive cavity pump

General

After careful cleaning, the particular pump parts are assembled accordingly in reverse order.

7.2.2.1 Installation of the shaft seal and the hollow shaft

● Installation of the gland packing

- Slide gland housing (204) onto hollow shaft (125)
- Instal gland packing (207) into gland housing (204). In case of shaft seal design P2, P3 or P4 also instal the flushing ring (208) or the lantern ring (209). Please refer also to Section 7.1.2.2 "Shaft seal".

● Installation of the mechanical seal (general)

Mechanical seals are precision machined high quality parts. The assembly instructions of the mechanical seal suppliers must be observed. Careful handling and extreme cleanliness during installation are a provision for proper functioning. Lubricate surfaces where O-rings must be fitted over. Suitable lubricants are silicon oil, Polydiol or soft soap.

ATTENTION

Do not use ordinary oil.

Note: Parts sliding on each others must only be exchanged in pairs.

● Installation of single acting mechanical seals

- Drive out retaining pin (220) from mechanical seal housing (214).
- Press stationary seal face (219) with the O-ring concentrically into the cleaned seal housing (214).
- Note:** Provide uniform pressure and watch the retaining pin. The retaining pin (220) must not project to the inside of the mechanical seal housing.

- Push the rotating part of the mechanical seal (219) over the hollow shaft (125).
Note: Observe the installation dimension and/or the position of the seal as marked during disassembly.
- Insert grub screws (if provided) with liquid retention agent Loctite No. 241 or similar into rotating seal part and secure.
- Push mechanical seal housing (214) with stationary seal face (219) over hollow shaft (125).
Note: Do not tilt the mechanical seal housing when pushing over the hollow shaft in order to prevent damages to the stationary seal face.

● Installation of the hollow shaft

- The clamp set (123) is supplied ready for installation.
- Removed clamp sets (123) must not be disassembled or lubricated before reinstallation.
- Contaminated clamp sets (123) must be cleaned and lubricated.
- A solid containing lubricant with a friction coefficient of $\mu = 0,04$ must be used.

Example:

Lubricant	Type/Manufacturer
Molykote 321 R (anti friction agent)	Spray/Dow Corning
Molykote Spray (powder-spray)	Spray/Dow Corning
Molykote G Rapid	Spray or paste/Dow Corning
Aemasol MO 19 R	Spray or paste/A.C. Matthes
Molykombin UMFT 1	Spray/Klüber Lubric
Unimoly P 5	Pulver/Klüber Lubric

- The clamp set must be replaced when the conical surfaces are damaged.
- Grease the thread and the contact surface of the hexagon head clamp set bolts and tighten by hand until the bolt head is in full contact with the inner ring of the clamp set.
ATTENTION Do not tighten the clamp set bolts until the hollow shaft is pushed over the shaft of the drive.
- **ATTENTION** Clean and **degrease** the shaft of the drive and the bore of the hollow shaft (125).
- Slide the flinger ring (123) over the hollow shaft (125).
- Slightly grease the seat of the clamp set (123) on the hollow shaft (125) and push the clamp set (123) until the stop over the hollow shaft (125).
- Push the hollow shaft (125) until the stop over the shaft of the drive.
- Tighten the bolts of the clamp set successively **in several turns**. In order to do so, turn hollow shaft if necessary.

- **ATTENTION** All clamp set bolts must be tightened until the front surfaces of the inner ring and the outer ring flush and the fastening torque of the bolts considerably increases (Please refer to Fig. 6 "Operational condition"). The max. permissible fastening torques are engraved on the clamp set (123).
- Check the correct position of the clamp set (123) on the hollow shaft (125) acc. to Fig. 5, detail X.
- Pull flinger ring (123) over clamp set (123).

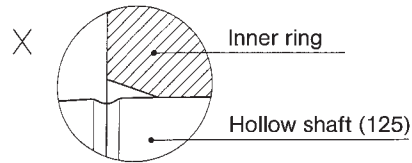
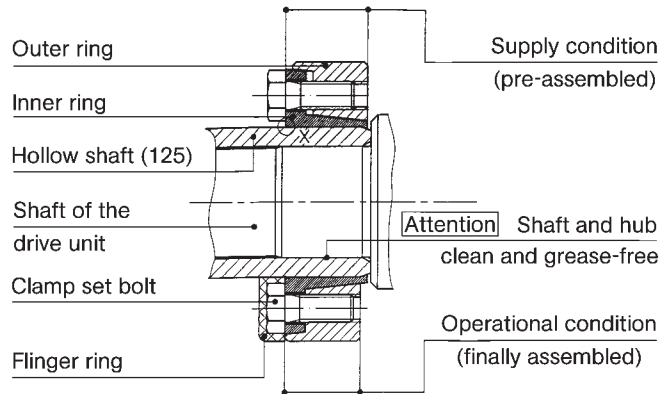


Fig. 5: Assembly of the clamp set

7.2.2.2 Assembly of the rotor and the joints

- Drive guide bushes (303) with brass taper drift half way into rotor (401) and hollow shaft (125).
- Press coupling rod bush (302) into coupling rod (307) so that the longitudinal axis of the oval hole (marked with two notches) coincides with the longitudinal axis of the coupling rod and the coupling rod bushes symmetrically extend on both sides of the coupling rod (not applicable to size 51, 101). Please refer to Fig. 6.

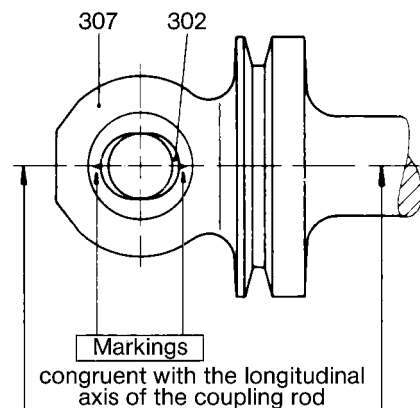


Fig. 6: Installation of the coupling

- Push clamping bands (306), cover sleeves (308) and retaining sleeve (304) onto the shaft of the coupling rod (307).
- Push coupling rod (307) into the head of the rotor (401) or the hollow shaft (125).
- Push coupling rod pin (301) into coupling rod bush (302) and drive in guide bushes (303) completely.
- If necessary, emery the outside of the retaining sleeve (304) and pull it over the head of the rotor (401) or hollow shaft (125).
- After installation on the head of the rotor (401) or hollow shaft (125) the retaining sleeve (304) must be secured against axial movement.

ATTENTION For this purpose drive the face of the retaining sleeve (304) with a center punch mark into the groove in the rotor head (401) or drive shaft head (125), Please refer to Fig. 7.

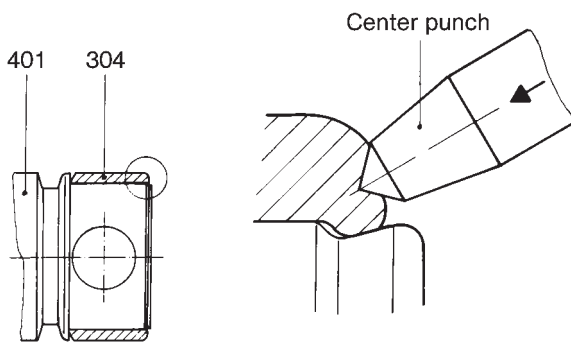


Fig. 7: Securing the retaining sleeve

- Wind up cover sleeve (308) with screw driver, lift on top with screw driver, lead spray pipe of the oil can under the sleeve and fill the space in the joint with ALLWEILER special joint oil type B or oil ET 1510 ISO 460 of Tribol Lubricants GmbH, Mönchengladbach, Germany. For applications in the food industry fill with ALLWEILER special joint oil type BL or oil 1810/460 of Tribol Lubricants GmbH, Mönchengladbach, Germany. For filling quantities please refer to the table in Section 7.1.2.4.
- Check whether the bent loop of the clamping band (306) rests against the lock of the clamping band. If not, press it against the same by means of commercially available flat pliers. Please see Fig. 8.

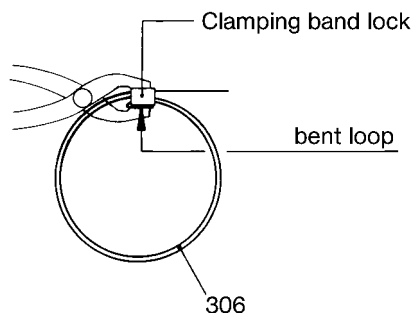


Fig. 8: Press bent loop of clamping band against clamping band lock

- Place the clamping bands (306) in the grooves of the cover sleeves (308) and tighten.
Note: For this purpose please use the below listed clamping tools:

For pump sizes 751 and smaller
clamping tool type PoK-It II

For pump sizes 1001 and larger
clamping tool type Band-It together with the adapter J050.

The said tools may be obtained from us. With clamping the clamping bands proceed as follows:

● **Clamping with clamping tool Band-It and adapter J050**

- Push the band end of the clamping band (306) up to the clamp lock into the clamping tool with adapter.
- Hold the band end with the eccentric lever of the clamping tool and tighten the clamping band (306) by turning the crank (Fig. 9).

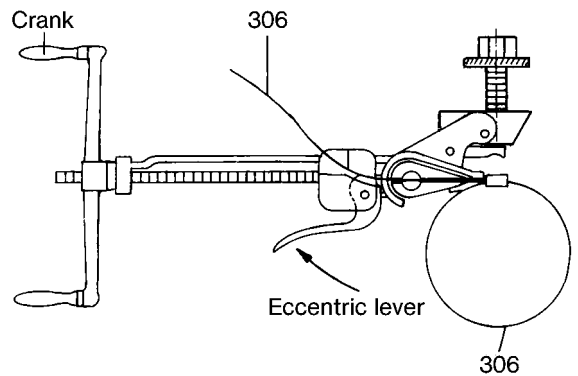


Fig. 9: Clamping the clamping band by means of clamping tool Band-It and adapter J050.

Note: The correct clamping procedure of the clamping bands (306) is shown

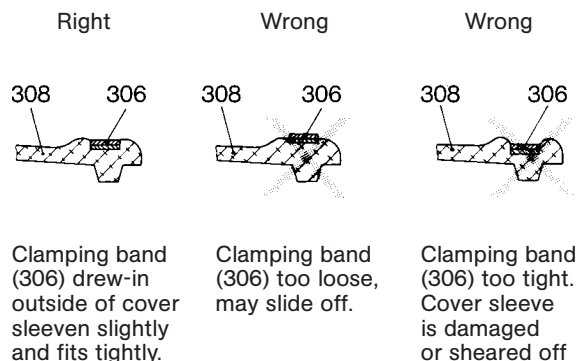


Fig. 10: Clamping of the clamping bands

- Check whether the clamping band (306) fits into the groove of the cover sleeve (308) over the entire circumference.
- Slowly turn the clamping tool upwards by approx. 60° until the shearing lock grips behind the clamping band lock (see Fig. 11).
- Tighten pressure bolt by hand until the clamping band is firmly clamped.

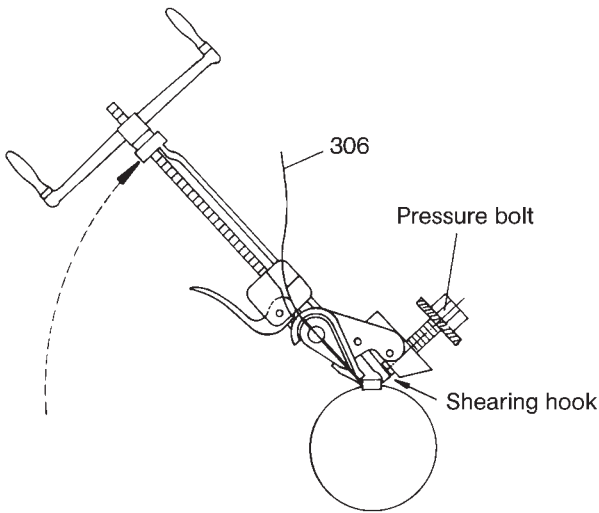


Fig. 11: Shearing off the clamping band

- Turn pressure bolt clockwise with a spanner or a ratchet until the clamping band is sheared off.

ATTENTION If the clamping band is slightly lifted on the sheared side, careful re-alignment is required. Hammering or beating on the clamp lock is not permitted in order to prevent the danger of damages to the cover sleeve.

● **Clamping with the clamping tool PoK-It II**

- When using the clamping tool PoK-It II bent the clamping band (306) at the clamp lock after tightening by turning the clamping tool upwards, in order to prevent that the clamping band slides back through the clamp lock. After bending at the clamp lock the clamping band must be cut by sheet metal shears and the edges deburred (see Fig. 12).

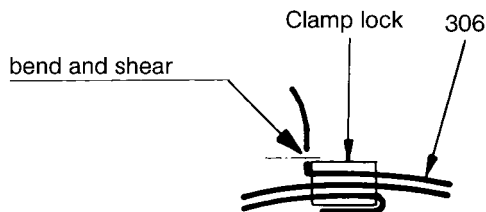


Fig. 12: Bending and shearing of the clamping band

ATTENTION Check whether the clamping band is sufficiently bent to prevent sliding back through the clamp lock (see Fig. 12). If this is not the case remove the clamping band and replace by a new one.

7.2.2.3 Installation of the stator

- Before installation of the stator lubricate stator (402) and/or rotor (401) with sliding agent (silicon oil, Polydiol, soft soap or similar).

ATTENTION Do not use ordinary oil.

- Slide the stator (402) over the rotor (401).
Note: If difficulty is experienced rotate the stator (402) at the same time by means of a chain wrench. In order to do so, secure the hollow shaft (125)
- Bolt together discharge casing (504), stator (402) and suction casing (505) by means of the tie rods (611) and hexagon nuts (609). In doing so, uniformly tighten all hexagon head bolts.

7.3 Spare part/replacement parts

The following cross sectional drawing with parts lists shows the pump with all shaft seal options. The parts marked in the parts list can be provided as spare parts/replacement parts.

Recommended spare parts/replacement parts:
R = large repair kit
r = small repair kit



For safety reasons, please stock and instal only genuine spare parts supplied by us. In this connection please also refer to the comments under Section 2.7.

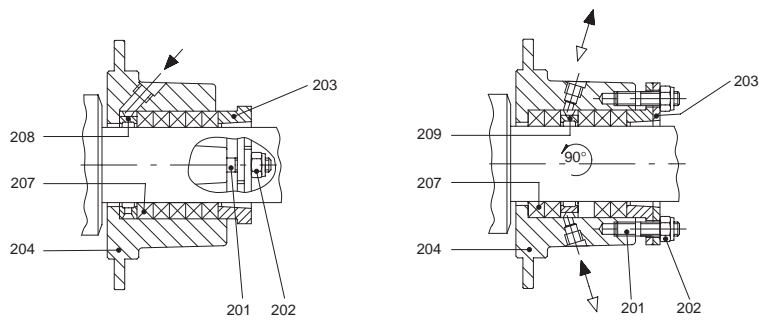
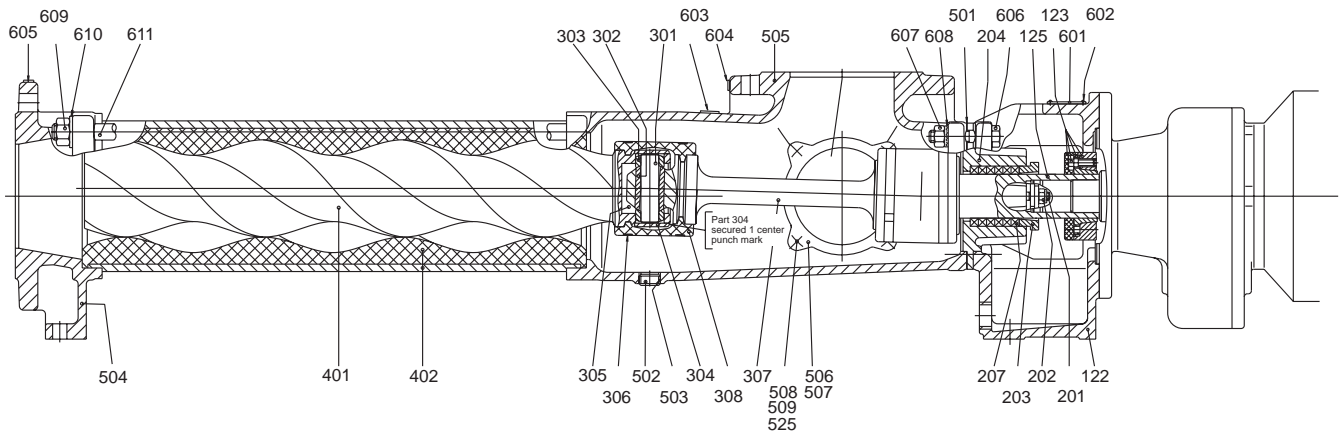
When ordering spare parts/replacement parts, please indicate the following:

- Serial No.**
- Abbreviated type coding**
- Part No.**
- Description and number of part or Ident No. and number of part**

Note: The Serial No. and the abbreviated type coding of the pump are stamped on the nameplate.

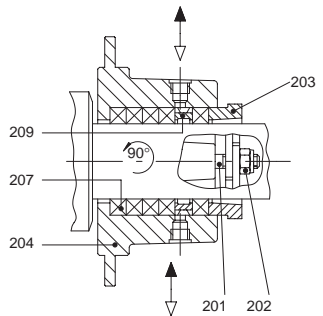
Note: The Ident No. and the number of parts can also be taken from the enclosed individual spare parts list of the pump.

7.4 Cross sectional drawing with parts list and recommended spare parts/replacement parts

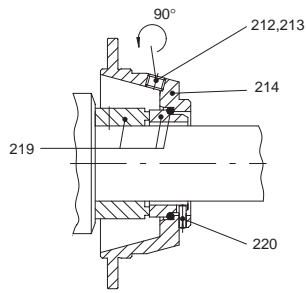


P2 Gland packing with flushing ring

P3 Gland packing with internal lantern ring



P4 Gland packing with external lantern ring



GK Single mechanical seal according to DIN 24960, design K, style U

Part No.	Description		Qty.
122	Motor bracket		1
123	Clamp set	R	1
125	Hollow shaft	R	1
201	T-head-bolt		2
202	Self locking nut		2
203	Gland half		2
204	Gland housing		1
207	Gland packing	R, r	①
208	Flushing ring		1
209	Lantern ring		1
212	Plug		1
213	Sealing tape		1
214	Mechanical seal housing		1
219	Mechanical seal	R	1
220	Retaining pin		1
301	Coupling rod pin	R, r	2
302	Coupling rod bush	R, r	2 ③
303	Guide bush	R, r	4
304	Retaining sleeve		2
305	Joint oil	R, r	①
306	Clamping band	R, r	4
307	Coupling rod	R, r	1
308	Cover sleeve	R, r	2
401	Rotor	R, r	1
402	Stator	R, r	1
501	Suction casing gasket	R, r	1
502	Plug		1 ②
503	Sealing tape		1 ②
504	Discharge casing		1
505	Suction casing		1
506	Suction casing cover		2 ④
507	Gasket	R	2 ④
508	Stud		8 ④
509	Hexagon nut		8 ④
525	Washer		8 ④
601	Nameplate		1
602	Dome headed grooved pin		4
603	Instruction label "COMMISSIONING"		1
604	Instruction label "SUCTION"		1
605	Instruction label "DISCHARGE"		1
606	Hexagon head bolt		4
607	Hexagon nut		4
608	Serrated lock washer		4
609	Hexagon nut		4
610	Washer		4
611	Tie rod		4

Recommended spare parts:
 R = large repair kit
 r = small repair kit

- ① See Section 7.1.2.4
- ② 2 off with branch position 2 and 4
- ③ Not applicable to model 51, 101
- ④ Not applicable to models 51, 101 and 201

8. Operating problems – causes and remedies

No.	Operating problems										Causes and remedies
	Pump does not start	Pump does not prime	Flow rate too low	Diff. head not reached	Flow rate fluctuates	Pump is noisy or does not discharge	Pump has seized	Motor over-heating	Stator wears too fast	Shaft seal leaks	
	a	b	c	d	e	f	g	h	i	k	
1	●							●			Too high adhesive forces between rotor and stator in new condition or after prolonged stand-still. Rotate pump by hand or appropriate tool.
2		●									Check sense of rotation against rotation arrow on pump. Change poles on the electric motor if necessary.
3		●	●		●	●	●				Check suction piping and shaft seal for leaks.
4		●	●		●	●					Check suction head – if necessary, increase diameter of suction pipe – instal larger filters – fully open suction valve.
5		●	●		●						Check viscosity of liquid pumped.
6	●		●					●			Check pump speed – check speed and amperage of the electric motor – check voltage and frequency.
7			●		●						Avoid airlocks in the liquid pumped.
8	●		●				●	●	●		Check differential head – open discharge valve – remove blockage in discharge pipeline.
9		●	●		●		●		●		Pump runs partially or completely dry. Check availability of liquid pumped on suction side.
10		●	●								Increase pump speed for low viscous liquids and high suction lift.
11		●			●	●					Reduce pump speed for high viscous liquids – danger of cavitation.
12						●					Check radial clearance of the coupling rod pins – coupling rod bush probably incorrectly installed.
13	●	●	●				●		●		Check pump for foreign matter, disassemble pump, remove foreign matter, replace damaged parts.
14		●	●	●			●				Stator and rotor excessively worn, disassemble pump, replace defective parts.
15		●	●			●	●				Joint internals (f, g) and/or hollow shaft worn, disassemble pump, replace defective parts.
16		●	●				●		●		Suction pipework partially or wholly blocked
17	●	●					●	●	●		Check temperature of liquid pumped – thermal stator expansion too high – stator seized on rotor – stator possibly burnt out.
18	●	●	●					●		●	Gland packing: Replace worn packing rings (b, c, k) – loosen gland (a, h) – tighten gland (b, c, k)
19	●	●					●		●		Solid content too high and/or too large solids – reduce speed – instal upstream strainer with appropriate mesh size.
20	●	●							●	●	Solids settle and harden after pump shut-down: Immediately rinse the pump – disassemble and clean if necessary.
21	●	●					●		●	●	Pumped liquid hardenes if temperature falls below a certain limit – heat trace the pump.

Subject to technical alterations.