

Operating and Maintenance Instructions with Dismounting and Mounting Instructions

Eccentric Screw Pumps Series ACNP, ACNBP

Operating data of the pump according to order data sheet

Job No.: Pump Ident No:

Machine No.: Pump type:

1. General

1.1 Application and range of utilization

The eccentric screw pumps are self-priming, rotary positive-displacement pumps for handling and dosing low to high-viscosity, neutral or aggressive, pure or abrasive, gaseous liquids or liquids which tend to froth, even with fibre and solids contents.

ATTENTION The range of utilization is to be taken from the order data sheet.

1.2 Performance data

The exact performance data applying to the pump are to be taken from the order data sheet and are engraved on the name plate.

1.3 Warranty

Our liability for shortcomings in the supply is laid down in our delivery conditions. No liability will be undertaken for any damages caused by non-compliance with the operating instructions and service conditions. If at any later date the operating conditions happen to change (e.g. different liquid pumped, speed, viscosity, temperature or pressure conditions), it must be checked by us from case to case and confirmed, if necessary, whether the pump is suited for these purposes. In case no special agreements were made, pumps supplied by us may, during the warranty period, be opened or varied only by us or our authorized contractual service stations; otherwise, our liability for any defects will cease.

1.4 Testing

Prior to leaving our factory, all pumps are subjected to a leakage and performance test. Only properly operating pumps leave the factory achieving the performances assured by us. Thus, compliance with the following operating instructions ensures proper operation.

2. Safety

These operating instructions contain basic hints to be observed in case of installation, operation and maintenance. Therefore, prior to mounting and commissioning, these operating instructions must by all means be read by the fitter as well as the pertinent expert personnel/customer and must always be available at the place of installation of the machine/plant. Not only are the general safety hints listed under this main item „Safety“ to be observed, but also the special safety hints such as for private use added to the other main items.

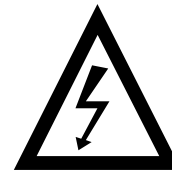
2.1 Marking of hints in the operating instructions

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



Safety sign according to DIN 4844-W9

in case of warning against electric voltage with



Safety sign according to DIN 4844-W8.

For safety hints, non-compliance with which may cause dangers to the machine and its functions, the word

ATTENTION

is added.

Hints directly attached to the machine such as

- Directional marker
- Sign for fluid connections

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

2.2 Personnel qualification and personnel training

The personnel for operation, maintenance, inspection and mounting must have the corresponding qualification for these operations. Range of liability, competence and the supervision of the personnel must be exactly controlled by the customer. If the personnel do not have the required knowledge, same must be trained and instructed. If required, this may be effected by the manufacturer/supplier on behalf of the machine customer. In addition, it must be ensured by the customer 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 persons, but also to environment and machine. Non-compliance with the safety hints may lead to the loss of any claims for damages.

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

- Failure of important functions of the machine/plant
- Failure of specified methods for maintenance and servicing
- Danger to persons by electrical, mechanical and chemical influences
- Danger to the environment by leakage of dangerous substances

2.4 Responsible working

The safety hints mentioned in these operating instructions, the current national rules for the prevention of accidents as well as any internal working, operating and safety regulations of the owner must 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 the site.
- Protection against accidental contact for moving parts must not be removed when the machine is in operation.
- Leakages (e.g. of the shaft seal) of dangerous materials to be handled (e.g. explosive, toxic, hot) must be discharged so as not to result in danger to persons and the environment. Legal stipulations are to be observed.
- Dangers by electrical energy are to be excluded (for details with regard hereto, please refer e.g. to the regulations of the VDE and the local energy supply associations).

2.6 Safety hints for maintenance, inspection and mounting operations

The customer shall see to it that all maintenance, inspection and mounting operations are performed by authorized and qualified expert personnel who have sufficiently informed themselves by thoroughly studying the operating instructions.

Basically, operations at the machine must be performed during standstill only. The mode of operation for stopping the machine described in the operating instructions must by all means be observed.

Pumps or aggregates handling noxious liquids must be decontaminated.

Immediately upon completion of the operations, all safety and protective devices must be mounted and made operational again.

Prior to restarting, the items listed in Section „6.1 Preparation for Starting“ are to be observed.

2.7 Arbitrary reconstruction and spare parts production

Reconstruction of or changes to the machine are only admissible after consultation with the manufacturer. Original spare parts and accessories authorized by the manufacturer serve safety purposes. The use of other parts may cancel the liability for the consequences resulting therefrom.

2.8 Inadmissible modes of operation

The operating safety of the machine supplied is only ensured with due application according to Section 1 – General – of the operating instructions. The limit values 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 must be observed. During transportation and storage, suction and discharge side and auxiliary connections of the pump must be closed with plugs. During installation of the pump aggregate, the plugs must be removed.

3.2 Transportation

Due to their weight, eccentric screw pumps and all pump aggregates are transported to the place of installation by means of a lifting appliance.

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 drive 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.



Crane installation and the sling ropes must be sufficiently sized. The sling ropes must not be fixed to the suspension eyes of the motor.

3.3 Preservation and storage of eccentric screw pumps

Please refer to our document VM 2102 GB

4. Description

4.1 Structural design

Self-priming, single or two-stage eccentric screw pump. Rotor and stator are the conveying elements. Via an easily dismountable retaining pin, the drive torque is transmitted by the drive shaft onto the stub shaft and from there, via the coupling rod onto the rotor.

Discharge casing, stator, suction casing and bearing housing and/or lantern are held together by corrosion-resistant, easily removable casing connecting screws (tie rods).

4.1.1 Bearing and lubrication

On both sides, the coupling rod ends in special pin joints which can be easily flushed and cleaned. As a special variant, pin-type hinge joints are possible which, by means of sleeves, are encapsulated liquid-tight and lubricated with joint oil.

Bearing of the drive shaft of series ACNP is in the bearing housing in a radial bearing (grooved ball bearing) and an axial bearing (double-row axial bearing) which are lubricated for life.

Bearing of the drive/hollow shaft of series ACNBP is in the reinforced bearings of the drive.

4.1.2 Shaft seal

By uncooled, maintenance-free, non-balanced or balanced, single or double-acting mechanical seal. The single-acting designs are supplied with or without quench.

4.1.3 Dimensions/branch position/flanges

The dimensions of the pump and/or pump aggregate, the branch position and mating dimensions are to be taken from the tables of dimensions.

4.2 Mode of operation

Self-priming, rotary, positive-displacement pump, the conveying elements of which are the rotating eccentric screw (rotor) and the fixed stator. Both meet in the cross-section at two points each which, regarded over the length of the conveying elements, form two sealing lines. The contents of the tight chambers formed as the rotor rotates are shifted axially and completely con-

tinuously from the suction to the discharge side of the pump. There is no turbulence despite the rotor rotation. The constant chamber volume excludes squeezing thus ensuring an extremely gentle low-pulsation delivery.

4.3 Aggregate construction

4.3.1 Drive

By non-explosion-proof or explosion-proof geared motors or variable-speed geared motors.

4.3.2 Shaft coupling and protection against accidental contact

Shaft coupling according to DIN 740 in case of series ACNP. A protection against accidental contact **according to DIN 24 295** is attached as soon as the scope of supply comprises pump, base plate, shaft coupling and drive.



According to the rules for the prevention of accidents, the pump may be operated only with a protection against accidental contact according to DIN 24 295.

If a protection against accidental contact is not supplied, it must be installed by the customer.

4.3.3 Base plate

The pumps of horizontal installation, together with the drive are, as a rule, mounted on concave feet or on a common base plate. Base plates are provided of stainless steel.

5. Installation/mounting

5.1 Installation

The pumps are installed horizontally. In case vertical arrangement is requested, please contact the factory.

5.2 Foundation

The foundation design depends on the size of the pump and/or the pump aggregate and the local installation conditions.

For exact data on the pump and aggregate dimensions, please refer to our tables of dimensions.

The foundation may be designed as concrete foundation or load-carrying foundation frame, for example of the steel type.

All foundation designs are subject to the following: The foundation must be designed so that it can take the weight of the pump aggregate on the entire surface.

5.3 Base plate

The base plate must be fixed on the foundation, stress-free.

5.4 Coupling

A pump aggregate supplied complete was carefully mounted at the factory. As the pump and the drive are fixed on the base plate, re-alignment of the coupling is not required.

5.5 Assembly of pump and drive

The aggregate being completed at the place of service only, the coupling must be assembled as follows:

1. Cover pump and drive shaft end with a filmy coat of molybdenum disulfite (e.g. Molykote), and insert keys.
2. By means of a mounting device, push pump and motor-side coupling halves on until the shaft end is flush with the coupling hub.
If no mounting device is available, heating of the coupling halves to approx. 100°C (without rubber buffers) facilitates mounting.

3. By means of a grub screw according to DIN 916, fix coupling halves axially.

4. When assembling the pump and geared motor or variable-speed gear it must be ensured that the coupling halves are accurately aligned. Depending on the size of coupling, the distance between the coupling halves must be 2–8 mm.



5. Mount protection against accidental contact according to DIN 24 295.

5.6 Space required for maintenance and servicing

ATTENTION The pump must be accessible from all sides allowing necessary visual inspections to be performed.

For maintenance and service operations, sufficient space must be provided, especially for the replacement of the conveying elements. Stator and rotor dismounting dimensions are given in the pump and/or pump aggregate table of dimensions. In addition, see to it that all pipelines can be readily mounted and dismantled.

5.7 Laying of pipelines

5.7.1 Nominal diameters

The nominal diameters of the suction and discharge lines should be designed according to the nominal pump branch diameters. In case of considerable deviations, especially on the suction side, please contact the factory.

5.7.2 Supports and flange connections

By way of the threaded branches, the pipelines must be connected to the pump, stress-free. They must be supported close to the pump and should allow of easy screwing to avoid deformations. After the union has been slackened, the pipelines must neither be inclined nor springy nor rest on one another under pressure. Any thermal stresses that may occur at the pipelines must be kept away from the pump by taking appropriate measures, e.g. by the installation of compensators.

5.7.3 Cleaning of pipelines prior to attachment

Prior to mounting the pump, the suction-side pipelines, slides and valves must by all means be flushed and/or cleaned.

Items left over from assembly operations, e.g. screws, nuts, welding beads, pieces of steel etc. will destroy the pump internals. Any guarantee claims will expire if and when damages are caused by such items.

5.8 Laying of auxiliary pipelines for additional facilities

All auxiliary pipelines for the supply of the shaft seal and the possible double shell casing for heating and cooling of the pump are to be connected, stress-free and sealing.

If possible, the lines for the quench liquid in case of single-acting mechanical seal with quench (design: GOB and GOD) and the sealing liquid in case of double-acting mechanical seal (design: GOE) are to be laid with the largest possible flow cross section. The quench and/or sealing liquid outlet is at the highest connection of the mechanical seal housing.

The flow direction of the sealing and quench liquid is shown by arrows in the sectional drawings.

In order to ensure automatic ventilation, the lines must be laid continuously ascending and short, promoting easy flow.

Air bag formation and gas bubble formation are to be avoided, if required, ventilation connections must be provided. The heating/cooling liquid outlet must be connected at the highest connection of the double shell casing, if any.

5.9 Safety and control devices

5.9.1 Pressure gauge and vacuum gauge

A pressure gauge and vacuum gauge must be connected to the discharge and suction line.

5.9.2 Safety element in the discharge line

If a shut-off element is fitted in the discharge line or if there is a possibility of the discharge line becoming blocked, a safety element must be provided. For example: by-pass with built-in relief valve, bursting disk, motor protection switch, etc.



Eccentric screw pumps are positive-displacement pumps and can theoretically generate an infinitely high pressure.

With the discharge line closed, e.g. by clogging or by incidental closing of a valve, the pressure generated by the pump may reach a multiple of the admissible pressure of the plant. This may, for example, lead to the bursting of lines which must be absolutely avoided especially when handling dangerous products. Thus, appropriate safety devices must also be installed in the plant (e.g. pressure switches).

5.10 Electric connections



Connection of the power supply cables of the drive motor must be effected by an electrical expert according to the switching diagram of the motor manufacturer. For these purposes, the current VDE regulations and the regulations of the local energy supply association are to be observed.

Danger by electrical energy must be excluded.

6. Starting/stopping

6.1 Preparation for starting

6.1.1 Filling the pump with liquid

ATTENTION Do not allow the pump to run when dry! For initial start-up and after prolonged shut-down periods, the pump must be filled with liquid. Even a few revolutions without liquid can damage the stator. It is for this reason that the suction casing must be filled with water or the medium to be pumped in order to lubricate the stator and rotor before start-up. After a long shut-down period, i.e. when it is to be assumed that the remaining liquid in the pump will have evaporated, or after a repair, the filling procedure must be repeated.

Once it has been filled, the pump is self-priming. Venting is unnecessary as a mixture of liquid and gas can be handled without any trouble.

6.1.2 Switching in the additional facilities for shaft seals (if provided)

If the pumps are charged with sealing/quench liquid, the stop valves, prior to initial start-up of the pump, must be opened and set to the pressures listed below.

- Supply of the double-acting non-balanced mechanical seal (Design GOE)

Note: For maintaining their function, these mechanical seals require a sealing liquid which serves to dissipate the generated frictional heat and avoid the penetration of the liquid to be pumped into the sealing gap.

ATTENTION Prior to each start-up, the circulation of the sealing liquid must be ensured. The sealing liquid pressure must be approx. 1.5 to 2 bar above the pressure in the suction casing. The flow rate must be regulated so that the outlet temperature of approx. 60°C is not exceeded and is at least 30 K below the boiling temperature at operating pressure (for sealing liquid, please refer to Section 6.1.3 below).

- Supply of the single-acting mechanical seal with quench (Designs GOB and GOD)

The chamber between the stationary seal ring of the mechanical seal and lip seal must be charged with quench liquid. Max. admissible pressure difference between quench liquid pressure and pressure in the suction casing $p = 0.5$ bar. Max. quench liquid pressure 3 bar.

(For the quench liquid, please refer to Section 6.1.3 below).

6.1.3 Quality and properties of the sealing and quench liquid

ATTENTION Any liquid may be used as sealing or quench liquid in consideration of the corrosion resistance of all contacted parts and the consistency with the medium to be sealed. The liquid must be free from solids, must not tend to sedimentations, should have the highest possible boiling point as well as a good heat conductivity and low viscosity. Clean water of low hardness meets these demands to a high degree.

6.1.4 Switching in the additional facility for heating or cooling the stator (double shell)

If the pumps are equipped with this additional facility, any and all stopping devices for heating or cooling systems must be opened. The below-mentioned pressure and temperature limits must be observed.

- Supply of the cooled or heated stator (double shell casing) with appropriate liquid medium



Only liquid media may be used as heating or cooling liquid in consideration of the corrosion resistance of all contacted parts.

The maximum heating or cooling liquid pressure is 0 bar (depressurized).

The maximum heating temperature must not exceed 60°C, and the cooling temperature not be fallen below -40°C.

Note: For the design temperature, please refer to the order data sheet.

6.1.5 Break-away of the pump

When starting up for the first time or after a long shut-down period, ensure that the pump can be turned easily by the drive motor. If this is not readily possible, e.g. due to a high degree of adhesion between the rotor and stator when brand new, movement can be assisted by using a suitable tool at the hollow shaft behind the shaft seal and/or in the key area of the drive shaft.

ATTENTION The hollow shaft or drive shaft must not be damaged when doing so.

6.1.6 Control of the sense of rotation

The normal sense of pump rotation is anti-clockwise, looking from the drive unit towards the hollow shaft and/or drive shaft. In this case, the suction connection is on the shaft seal side so that the shaft seal is relieved. In special cases, e.g. when drawing from a vacuum or when handling materials which cannot tolerate any gas inclusions, the pump rotates clockwise, with the suction and discharge sides reversed.

ATTENTION The sense of pump rotation must correspond to the directional marker „n“ in the pump name plate. Wrong sense of rotation may result in damages to the pump. For the control of the sense of rotation, the motor on/off switch is to be touched only briefly.

6.2 Starting

6.2.1 Start-up

All shut-off elements on the suction and discharge sides must be opened before starting up.

6.2.2 Drive

Switch motor in.

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

6.2.3 Checking the delivery values

After the drive has reached its operating speed, the inlet pressure and pump outlet pressure must be checked via the vacuum gauge and pressure gauge.

The motor must not be overloaded. The power consumption can be checked by means of an ammeter. In this connection, temperature and viscosity of the liquid to be handled must be checked. The values read must be checked against the order data sheet and/or acceptance report.

6.2.4 Protection against dry running

If no further fluid to be pumped arrives at the suction side, the thermal energy generated in the conveying elements of the eccentric screw pump due to dry friction and churning work is no more sufficiently dissipated as a result of which the stator elastomer is thermally destroyed already after a short period of time. For the conveying elements to be protected, various dry running protection systems are available, adapted to the respective operating conditions (please contact factory).

6.3 Stopping**6.3.1 Shut-down**

Switch motor off.

7. Maintenance/servicing**7.1 Maintenance**

– For maintenance and service operations, the details listed under Section 2. Safety are to be observed. Regular control and maintenance of the pump and drive will extend the service life.

– Cleaning of the pump interior is effected by means of a continuous flushing with the pump dismantled.

ATTENTION During the flushing process, the pump can be put into operation for a short period of time.

When using silicon stators with uniform elastomer wall thickness, the pump may remain in operation during the entire flushing process.

7.1.1 General control

1. Do not allow the pump to run when dry.
2. The drive motor must not be overloaded.
3. Check suction and discharge lines for tightness.
4. An installed mechanical seal must not have any heavy leakage.
5. Pressure and temperature monitoring instruments must be observed and checked against the order data sheet and/or acceptance report.
6. Observe additional facilities such as sealing or quenching of the shaft seal, if provided.
7. Observe additional facilities for heating or cooling of the double shell casings, if provided.

7.1.2 Maintenance of components**7.1.2.1 Joints of the coupling rod**

The liquid-tight encapsulated joints (special variants) are lubricated for life with ALLWEILER special joint oil Type B or oil ET 1510 ISO 460 of Tribol Lubricants GmbH,

Mönchengladbach, Germany or the like. If used for foodstuffs, with ALLWEILER Spezial Gelenköl Type BL or oil 1810/460 of Tribol Lubricants GmbH, Mönchengladbach, Germany or the like. For the lubricant quantity, please refer to table on page 6.

ATTENTION Other lubricants were not tested by us and can, therefore, not be recommended by us!

The joints are lubricated for life. However, if the pump must be opened for any other purposes, we recommend to check the cover sleeve for tightness and to change the joint oil after 8,000 working hours. The table under Section 7.1.2.5 below shows the allocation of the pump size to the oil quantity in cubic centimeters. For the change of the joint oil, please refer to the Dismounting and Mounting Instructions.

7.1.2.2 Bearing of the drive shaft and lubrication of the bearing

The anti-friction bearings of series ACNP are lubricated for life with grease „SKF Alfabub LGMT3“ or the like suited up to 120°C.

7.1.2.3 Shaft seal

Shaft sealing is via a mechanical seal.

● Mechanical seal

Mechanical seals are used in any material combinations and models. The mechanical seal is maintenance-free. In case of heavy leakage due to wear, the mechanical seal must be replaced (please refer to the Dismounting and Mounting Instructions).

ATTENTION As dry running of a mechanical seal must be avoided, the pump may only be started in a filled condition and, if provided, with the additional facilities switched on (please refer to Section 6.1.2 above).

7.1.2.4 Drive motors and (variable-speed) gears

Please refer to the manufacturers' operating and maintenance instructions.

7.1.2.5 Lubricant quantities for joints (to Section 7.1.2.1) and bearing (to Section 7.1.2.2)

Pump series		Pump size					
		25.1 25.2	50.1 50.2	100.1 100.2	200.1 200.2	380.1 380.2	550.1
Pump series	ACNP	25.1 25.2	50.1 50.2	100.1 100.2	200.1 200.2	380.1 380.2	550.1
	ACNBP	25.1 25.2	50.1 50.2	100.1 100.2	200.1 200.2	380.1 380.2	550.1
Oil quantity in cm ³ per joint		10	18	37	52	87	87
Grease quantity in grams per bearing (ACNP)		80	135	200	310	660	660

7.2 Servicing (Dismounting and Mounting Instructions)

General

On request, trained service engineers will be at your disposal for mountings and repairs.



In case of repairs performed by the customer's own personnel or our trained mechanics, it must be ensured that the pump is completely empty and clean.

This applies in particular to pumps which, in case of repair, are sent to our factory or to one of our contractual repair shops.

In protection of our staff and for reasons of environmental protection, we have to refuse to accept for repair any pumps filled with liquid pumped. Otherwise, we will have to charge the customer/operator with the costs for an ecologically acceptable waste disposal.

In case of repair of pumps operated with dangerous materials ① and/or liquids harmful to the environment, the customer/operator must advise hereof his own and/or our local mounting personnel or, in case of return, our factory and/or contractual service shop of his own accord. In such a case, evidence of the liquid handled, e.g. in the form of a DIN safety data sheet will have to be presented to us when requesting a service engineer.

① Dangerous materials are:

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

When working locally, the customer's own and/or our mounting personnel must be referred to dangers which may be caused in connection with repairs.

The most important dismounting and mounting operations are described in these instructions. The mounting steps described in the individual sections must be consistently observed.

7.2.1 Dismounting the eccentric screw pump

Prior to commencing the dismounting, the following operations must be performed:

- Disconnect power supply cable from the motor. Motor must not be capable of being started.
- All shut-off elements in the supply and discharge line must be closed.
- Drain the liquid to be pumped from the suction casing.
- Note:** Use collecting tank.
- Dismount protection against accidental contact.
- Dismount supply and discharge line as well as all auxiliary pipelines.
- Loosen screws at the pump feet, and screw out.

7.2.1.1 Dismounting the stator

- Remove nuts (609) and washers (610) from the tie rods (611).
- Withdraw discharge casing (504).
- Remove tie rods (611).

- Loosen grub screw (614) and withdraw supports, pump-side (612).
- Withdraw stator shell (516) and O-rings (517).
- Withdraw stator (402) from rotor (401). In case of stiffness, turn stator (402) simultaneously. For these purposes, fix drive shaft (118) and/or hollow shaft (125).

7.2.1.2 Dismounting the rotor and rotor-side joint

Dismounting of the rotor and the rotor-side joint is effected following the dismounting of the stator (402). Please refer to Section 7.2.1.1 above.

- Remove hexagon screw (606) and withdraw suction casing (505) over the rotor (401). In doing so, see to it that the precision-machined rotor and the mechanical seal are not damaged.
- Drive retaining sleeve (304) from the rotor head (401). Eject coupling rod pin (301) and withdraw rotor (401) from coupling rod (307). For these purposes, remove center punch fixations axially fixing the retaining sleeve, by means of a file.

● Special variant joints encapsulated liquid-tight

- Cut buckle on clamping band (306) with a metal saw, and with a screw driver, press out to both sides. Remove clamping band (306) from the cover sleeve (308) (please refer to Figure 1 below).

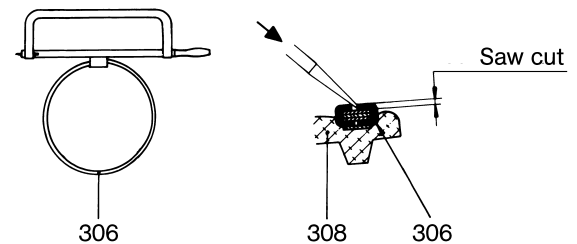


Figure 1: Removal of the clamping band.



- By means of a screw driver, lift cover sleeve (308) and withdraw axially towards the coupling rod (307).
- Collect oil filling in a tank.
- Drive retaining sleeve (304) over the collar of the coupling rod (307). In doing so, do not deflect coupling rod (307) (please refer to Figure 2 below).

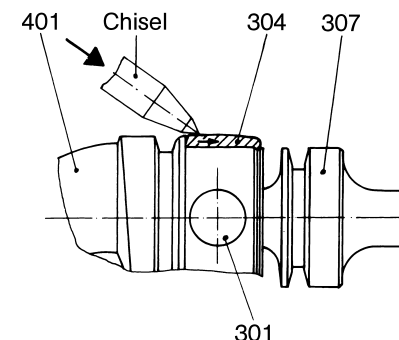


Figure 2: Dismounting the retaining sleeve.

- Eject coupling rod pin (301).
- By means of a brass ejector, drive out the two guide bushes (303) by one half. For these purposes, incline coupling rod (307) (please refer to Figure 3 below).

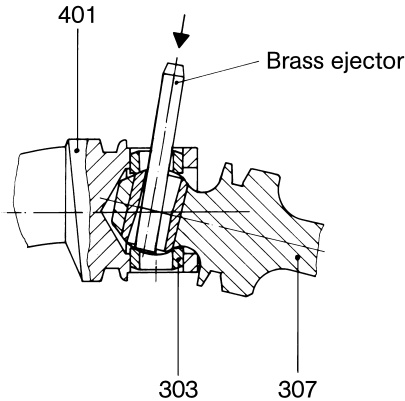


Figure 3: Dismounting the bushes for coupling rod pin.

- Remove rotor (401) from the coupling rod (307).
- Press coupling rod bush (302) out of the coupling rod (307).
- By means of a brass mandrel, completely drive guide bush (303) out of the rotor (401).

7.2.1.3 Dismounting the coupling rod and the drive-side joint

- Dismounting of the coupling rod and the drive-side joint is effected following the dismounting of the stator (402) and the rotor (401). Please refer to Sections 7.2.1.1 and 7.2.1.2 above.
- Dismount drive-side joint as described under Section 7.2.1.2 above.

7.2.1.4 Dismounting the shaft seal and hollow shaft

- Remove locking device for the retaining pin (124) and eject retaining pin (123) from the hollow shaft (125). Pull hollow shaft (125) with all parts of the shaft seal out of the lantern (122) and/or the bearing housing (110).

● **Dismounting the mechanical seal, single-acting**

- Loosen grub screws, if provided, in the rotating part of the mechanical seal (219), and withdraw mechanical seal from the hollow shaft (125).
- **ATTENTION** Prior to loosening the grub screws, mark or measure position of the mechanical seal on the hollow shaft. Do not push O-rings over the screw pressure mark!
- Press stationary seal ring of the mechanical seal and bearing ring out of the lantern (122) and/or bearing housing (110).

● **Dismounting the mechanical seal, single-acting with quench**

Dismounting as for mechanical seal, single-acting. Press lip seal (232) out of the lantern and/or bearing housing.

● **Dismounting the mechanical seal, double-acting**

Withdraw mechanical seal housing (214) with product-side stationary seal ring of the mechanical seal (219) and rotating part of the mechanical seal (219) from the hollow shaft (125). Press stationary seal ring and bearing ring out of the mechanical seal housing (214) and bearing housing (110).

7.2.1.5 Dismounting the drive shaft and bearing

- Remove key (101).
- Remove socket-head cap screw (133) and withdraw bearing cover (131) with sealing cord (132).
- Eject drive shaft (118) with all mounted parts from the bearing housing (110).
- Pull circlip (127) out of the groove.
- Pull axial bearing (104) over radial bearing (103) from the drive shaft (118).
- Pull circlip (121) out of the groove.
- Withdraw radial bearing (103) from the drive shaft (118).
- Press lip seal (112) out of the bearing housing (110).

7.2.2 Mounting the eccentric screw pump

General

Mounting of the individual pump components is effected after careful cleaning analogously in reverse order.

7.2.2.1 Mounting the drive shaft and bearing

Note: The pumps are provided with ball bearings lubricated for life. For re-mounting, the ball bearings must be provided with a sufficient grease filling.

- If required, carefully clean ball bearings with Diesel fuel. The contact faces being bright and undamaged, the ball bearings (103) and (104) can be re-used. If this is not the case, the ball bearings must be replaced.
- Fill ball bearings (103) and (104) with bearing grease. The grease filling is applied as described below.
 1. Fill hollow spaces between the rolling bodies up to approx. 30–50% with grease.
 2. Scrape off excessive grease (most suitably with your fingers, do not use any metallic object).

Bearing greases

For the lubrication of the ball bearings it is recommend to use the below-listed bearing greases or equivalent. The order of producers is no quality ranking.

Manufacturer	Brand name
ARAL	HL 3
BP	BP ENERGREASE LS 3
CALTEX	CALTEX MULTIFAX 2
ESSO	BEACON 3
GULF	GULFCROWN GREASE No. 2 GULFCROWN GREASE No. 3
MOBIL-OIL	MOBILUX GREASE FETT 3
SHELL	SHELL ALVANIA FETT 3
SKF	ALFALUB LGMT 3
VALVOLINE	VALVOLINE LB 2

If the listed bearing greases are not available, we recommend in any case a multi-purpose grease on lithium basis. Grease mixture with grease grades of different basic oils and thickeners leads to a reduction of the lubricating properties and must therefore be avoided.

- Fill chamber of the lip seal (112) with bearing grease, and coat sealing lips.
- Press lip seal (112) into the cleaned seat of the bearing bracket (110).
Note: The sealing lip with hose spring of the lip seal must always face the side to be sealed (pointing to the inside).
Pressing-in is effected with a suitable pressing stamp. Absolutely see to it that the pressing force is applied as close as possible to the outside diameter of the lip seal.
- By means of a suitable pipe length, press greased double-row axial bearing (104) over the inner bearing ring onto the drive shaft (118). Slightly oil bearing surface previously.
Note: The ball filling groove of the axial bearing must point to the drive side.
- Insert circlips (121) and (127).
- Mount spacer sleeve (102), and fill the chamber between spacer sleeve (102) and drive shaft (118) to approx. 90% with bearing grease.
- By means of a suitable pipe length, drive greased grooved ball bearing (103) over the inner bearing ring onto the drive shaft (118). Slightly oil bearing surface previously.
Note: The sealing washer of the grooved ball bearing (103) must point to the drive side.
- Insert spacer ring (113).
- By means of a suitable pipe length, press drive shaft (118) over the outer ring of the grooved ball bearing (103) into the bearing housing (110). Slightly oil bearing surface previously.
- Apply sealing cord (132), and fix bearing cover (131).
- Insert key (101).

7.2.2.2 Mounting the shaft seal and hollow shaft

● Mounting the mechanical seal, general

Mechanical seals are high-quality precision parts. The mounting instructions of the mechanical seal manufacturers are to be observed. Careful handling and extreme cleanliness during mounting are a condition of proper functioning. To facilitate mounting, surfaces on which O-rings are sliding, may be lubricated with lubricants such as silicon oil, Polydiol or soft soap.

ATTENTION Do not use ordinary oil.
Note: See to it that the parts sliding on each other are only exchanged in pairs. When using double PTFE-coated O-rings, see to it that the joint of the outer coating points against the mounting direction, as otherwise, opening and/or withdrawal of the coating may be effected (please refer to Figure 4 below).

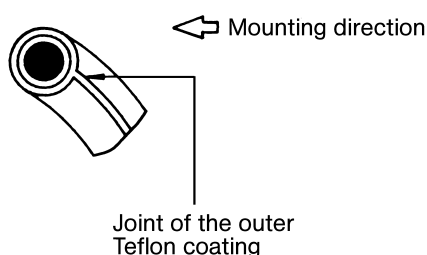


Figure 4: Joint of the outer coating points against the mounting direction.

● Mounting the mechanical seal, single-acting

- Concentrically press stationary seal ring of the mechanical seal (219) with O-ring into the cleaned bearing housing (110) and/or into the lantern (122).
Note: See to uniform pressure distribution and locking pin. Locking pin (220) must not protrude to the inside.
- Push rotating part of the mechanical seal (219) onto the hollow shaft (125).
Note: Exactly observe installation dimension and/or position of the mechanical seal as marked for dismounting.
- Insert grub screws, if provided, in the rotating part of the mechanical seal (219) with the screw locking agent Loctite No. 241 or similar, and tighten.

● Mounting the mechanical seal, single-acting with quench

- Press lip seal (232) into the cleaned bearing housing (110) and/or into the lantern (122). Do not grease sealing lip.
Note: The sealing lip of the lip seal must always face the side to be sealed (pointing to the inside).
Pressing-in is effected with a suitable pressing stamp. Absolutely see to it that the pressing force is applied as close as possible to the outside diameter of the lip seal.
- Mounting of the mechanical seal is effected as described under Section – **Mounting the mechanical seal, single-acting.**

● Mounting the mechanical seal, double-acting

- Concentrically press stationary seal ring of the mechanical seal (219) with O-ring into the mechanical seal housing (214) and bearing housing (110).
Note: See to uniform pressure distribution and locking pin. The locking pin must not protrude to the inside.
- Push mechanical seal housing (214) with stationary seal ring of the mechanical seal (219) over the hollow shaft (125).
Note: When pushing the mechanical seal housing onto the hollow shaft see to it that the mechanical seal housing is not canted to avoid any damages to the stationary seal ring of the mechanical seal.
- Push rotating part of the mechanical seal onto the hollow shaft (125) so that the snap-action carrier of the mechanical seal (219) projects into the groove of the hollow shaft.

● Mounting the hollow shaft

ATTENTION Prior to mounting the hollow shaft (125), coat the entire surface of the drive shaft (118) and/or shaft of the drive with Klüber paste 46 MR 401 of Klüber, Munich.

- Insert O-ring (142) into the hollow shaft (125).
- Push hollow shaft (125), insert retaining pin (123) and secure with locking device for retaining pin (124).
- In case of a double-acting mechanical seal, insert O-ring (501) and by means of the hexagon screw (606), fix mechanical seal housing (214) to the bearing housing (110).

7.2.2.3 Mounting the rotor and rotor-side joint

- Plug coupling rod pin (301) into the rotor (401) and coupling rod (307).
- Push retaining sleeve (304) onto the head of the rotor (401).

- Following mounting of the retaining sleeve (304), secure same against axial displacement on the rotor head (401).

ATTENTION For these purposes, drive face of the retaining sleeve (304) into the groove at the rotor head (401) with three punch marks offset by 120° (please refer to Figure 5 below).

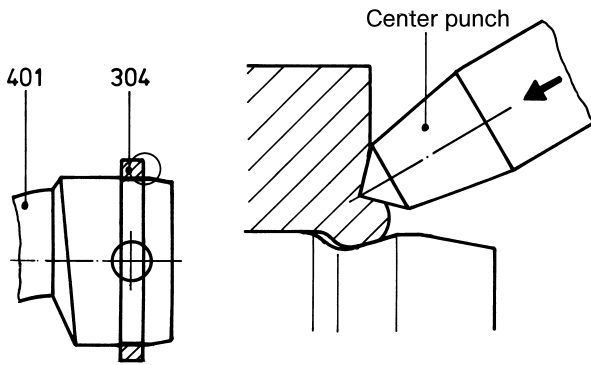


Figure 5: Locking the retaining sleeves

● **Special variant joints encapsulated liquid-tight**

- With a brass drift, drive guide bushes (303) half-way into the rotor (401).
- Press coupling rod bush (302) into the 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 bush protrudes symmetrically from both sides of the coupling rod (please refer to Figure 6 below).

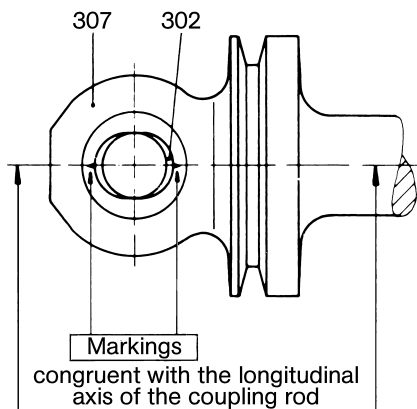


Figure 6: Pressing-in of the coupling rod bush

- Push clamping bands (306), cover sleeves (308) and retaining sleeve (304) onto the shank of the coupling rod (307).
- Push coupling rod (307) into the rotor head (401).
- Push coupling rod pin (301) into the coupling rod bush (302), and drive in guide bushes (303) completely.
- Polish retaining sleeve (304) at the outside diameter, if necessary, with emery, and mount on the rotor head (401).

- Following mounting of the retaining sleeve (304), secure same against axial displacement on the rotor head (401).

ATTENTION For these purposes, drive face of the retaining sleeve (304) into the groove at the rotor head (401) with one punch mark (please refer to Figure 7 below).

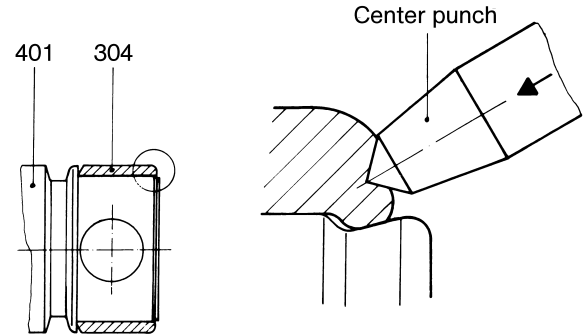


Figure 7: Locking the retaining sleeve.

- Mount cover sleeve (308) with screw driver, lift top with screw driver, run 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 15 10 ISO 460 of Tribol Lubricants GmbH, Mönchengladbach, Germany. When the pump is used for foodstuffs, fill with ALLWEILER Spezial Gelenköl Type BL or oil 1810/460 of Tribol Lubricants GmbH, Mönchengladbach, Germany. Lubricant quantities see table, Section 7.1.2.5 above.
- Check whether bent loop of the clamping band (306) rests against the clamping band buckle. If not, press against by means of commercial flat pliers (please refer to Figure 8 below).

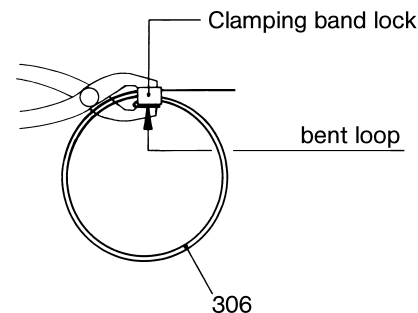


Figure 8: Press clamping band loop against clamping band buckle.

- Place clamping bands (306) in the surrounding grooves of the cover sleeve (308), and clamp.
Note: For these purposes, the following clamping tool must be used:

For pump sizes

ACNP 200
ACNBP 200
the clamping tool bearing the designation PoK-It II.

For pump sizes

ACNP 380
ACNBP 380
the clamping tool bearing the designation Band-It together with adapter J050.

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

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

- Introduce band end of the clamping band (306) to the clamping band buckle into the clamping tool with adapter.
- Hold clamp end with the eccentric lever of the clamping tool, and clamp clamping band (306) by turning the crank (Figure 9).

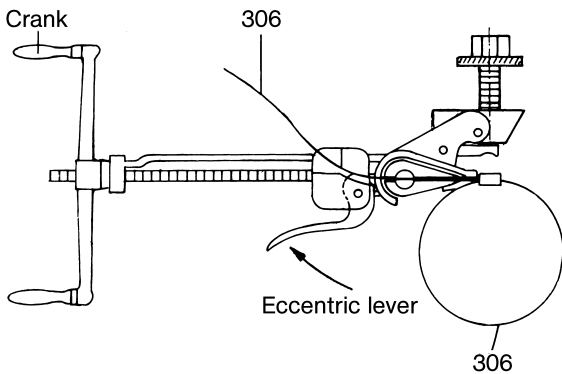


Figure 9: Clamping the clamping band by means of clamping tool Band-It and adapter J050.

Note: Proper clamping of the clamping bands (306) is shown in Figure 10.

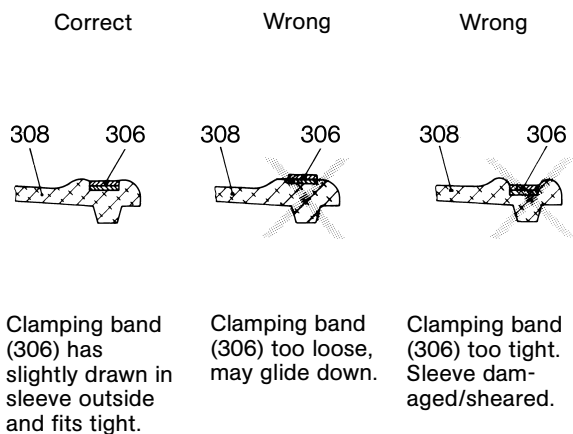


Figure 10: Clamping of clamping bands.

- Check whether on the entire circumference of the cover sleeve (308), the clamping band (306) lies in the sleeve groove.
- Slowly turn clamping tool upwards through approx. 60° until the shearing hook grips behind the clamping band buckle (please refer to Figure 11 below).
- Tighten pressure screws by hand until the clamping band is firmly clamped.

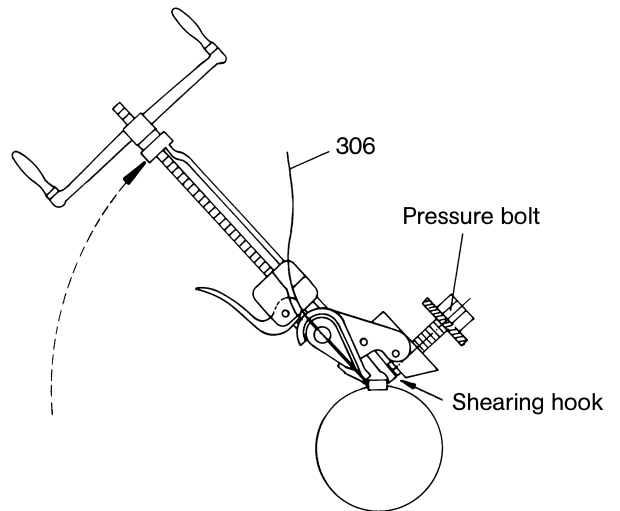


Figure 11: Shearing of the clamping band.

- By means of a spanner or ratchet, turn pressure screw clockwise until the clamping band is sheared.

ATTENTION If the clamping band is slightly lifted on the sheared side, this must be compensated for by careful realignment. Hammering or beating against the clamping band buckle is not permitted as otherwise, there may be a danger of sleeve damage.

Note: In case of clamping bands of Hastelloy material, shearing with the clamping tool is not possible. After bending at the clamping band buckle, the clamping band must be sheared by means of sheet metal shears and the cutting edges deburred (please refer to Figure 12 below).

● **Clamping with clamping tool Pok-It II**

- When using clamping tool PoK-It II, bend clamping band (306) after clamping at the clamping band buckle by swinging the clamping tool so that the band cannot glide back through the buckle. After bending at the clamping band buckle, the clamping band must be sheared with sheet metal shears and the cutting edges deburred (please refer to Figure 12 below).

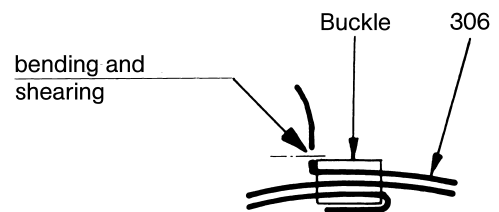


Figure 12: Bending and shearing of the clamping band.

ATTENTION Check whether the clamping band is bent so that it cannot glide back through the clamping band buckle (please refer to Figure 12 above). If this was not achieved, the clamping band must be removed and replaced by a new one.

7.2.2.4 Mounting the coupling rod and the drive-side joint

- Mount drive-side joint as described under Section 7.2.2.3 above against the drive shaft (118).
- Insert O-ring (501).
- Push suction casing (505) over the rotor (401). In doing so, make sure that the precision-machined rotor is not damaged.
- Screw suction casing (505) with hexagon screw (606) to the bearing housing (110), mechanical seal housing (214) or to the lantern (122).

7.2.2.5 Mounting the stator

- Prior to mounting, coat stator (402) and rotor (401) with lubricant (silicon oil, Polydiol, soft soap or the like).

ATTENTION Do not use ordinary oil.

- Mount stator (402) on the rotor (401).
Note: In case of stiffness, simultaneously turn stator (402) by means of chain tongs. For these purposes, fix drive shaft (118) and/or hollow shaft (125).
- In case of stators of plastic or metal, insert stator gaskets (403) and (404).
Note: In case of stators of plastic, the stator gasket (403) with O-ring must always be on the discharge side.
- Mount O-ring (517).
- Push stator shell (516) on.
- Push support (612) onto the pump side and fix by means of grub screw (614).
- Screw up discharge casing (504), stator (402), suction casing (505) and lantern (122) and/or support, drive side (612) with the tie rods (611) and hexagon nuts (609). In doing so, uniformly tighten hexagon screws.

7.3 Spare parts/replacement parts

In the following sectional drawings with parts lists, all pumps mentioned are represented with the various shaft seal designs. 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 reasons of operating safety, only original spare parts delivered by us may be kept on stock and installed. In this connection, we refer to the statements made under Section 2.7 above.

For spare parts/replacement parts orders, the following must be quoted:

- Machine numbers**
- Abbreviation of pump**
- Part number**
- Denomination and part quantity or Ident No. and quantity**

Note: The machine number and the abbreviation of the pump are engraved on the name plate.

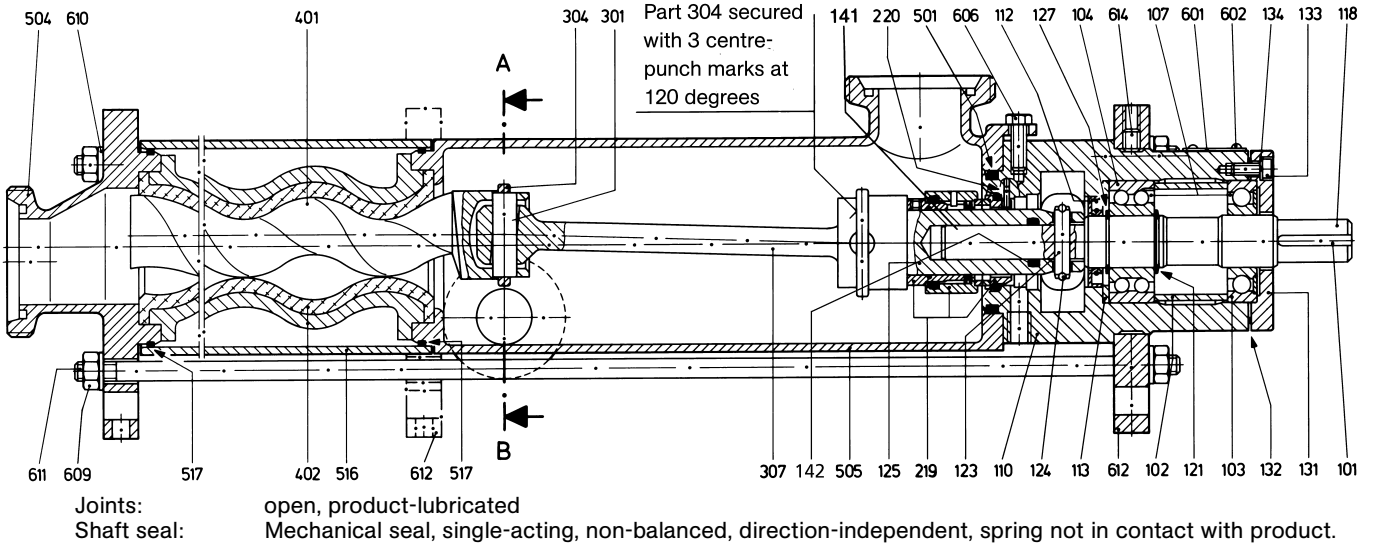
Note: The Ident No. and quantity can be seen from the attached separate spare parts list.

Part No.	Denomination	
101	Key	
102	Spacer sleeve	
103	Radial bearing	R
104	Axial bearing	R
107	Bearing grease	R
110	Bearing housing	
112	Lip seal	R
113	Spacer ring	
118	Drive shaft	
121	Circlip	
122	Lantern	
123	Retaining pin	R
124	Locking device for retaining pin	
125	Hollow shaft	R
127	Circlip	
131	Bearing cover, drive side	
132	Sealing cord	R
133	Socket-head cap screw	
134	Spring ring	
141	Lubricating paste	R, r
142	O-ring	R, r
214	Mechanical seal housing	
219	Mechanical seal	R
220	Locking pin	
232	Lip seal	R
301	Coupling rod pin	R, r
302	Coupling rod bush	R, r
303	Guide bush	R, r
304	Retaining sleeve	R, r
305	Joint oil	R, r
306	Clamping band	R, r
307	Coupling rod	R, r
308	Cover sleeve	R, r
401	Rotor	R, r
402	Stator	R, r
501	O-ring	R, r
504	Discharge casing	
505	Suction casing	
516	Stator shell	
517	O-ring	R, r
601	Name plate	
602	Round head grooved pin	
606	Hexagon screw	
609	Hexagon nut	
610	Washer	
611	Tie rod	
612	Support, pump-side	
	Support, drive-side	
614	Grub screw	

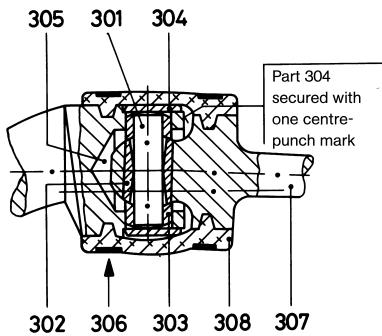
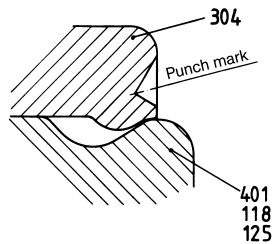
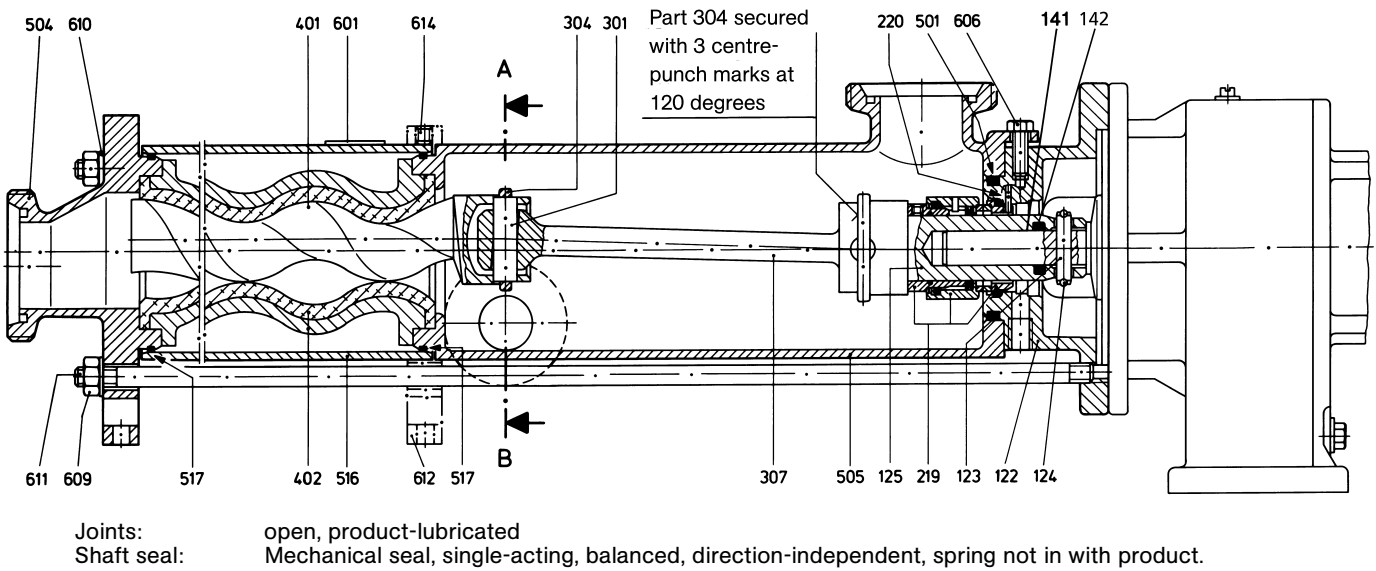
Recommended spare parts:

- R = large repair kit
- r = small repair kit

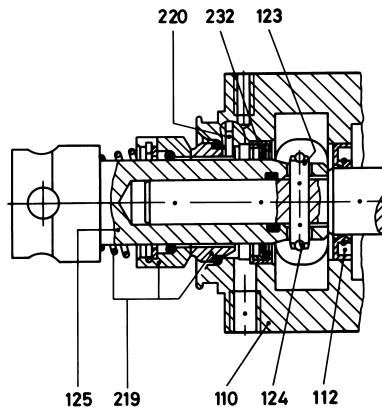
7.4 Sectional drawing for series ACNP



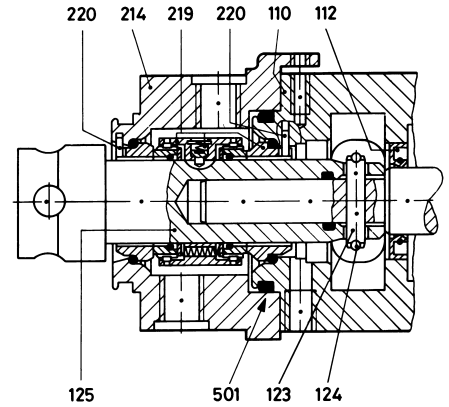
7.5 Sectional drawing for series ACNBP



Joints: encapsulated liquid-tight (special variant)



Shaft seal: Mechanical seal, single-acting, non-balanced, direction-dependent, single spring with additional quench.



Shaft seal: double-acting, non-balanced, direction-independent, multiple springs.

8. Operating troubles – causes and remedial action

No.	Operating troubles										Causes and remedial action
	Pump does not start	Pump does not prime	Delivery is not obtained	Pressure head is not obtained	Irregular pump delivery	Pump operates noisily	Pump is seized or does not deliver	Motor gets too warm	Stator wears prematurely	Shaft seal leaky	
	a	b	c	d	e	f	g	h	i	k	
											ALLWEILER eccentric screw pumps operate trouble-free at any time provided they are applied according to the operating conditions mentioned in our order confirmation and if the operation manual is complied with.
1	●							●			Pressing between stator/ rotor still too high (new condition) or stator too narrow. Crank pump by hand with auxiliary tool.
2		●									Check sense of rotation against arrow on pump, in case of wrong sense of rotation, change motor poles.
3		●	●		●	●	●				Check suction pipeline and shaft seal for tightness.
4		●	●		●	●					Check suction head – increase suction line cross section, if necessary – install greater filters – open suction valve completely.
5		●	●		●						Check viscosity of liquid pumped.
6	●		●					●			Check pump speed – control speed and power consumption of drive motor – check voltage and frequency.
7			●		●						Avoid air inclusions in the liquid to be pumped.
8	●		●				●	●	●		Check pressure head – open valve in discharge line completely, remove obstruction in discharge line.
9		●	●		●		●		●		Pump runs completely or partly dry. Check whether liquid pumped on suction side is sufficient.
10		●	●								Increase speed in case of liquid media and great suction volume.
11		●			●	●					Reduce speed in case of viscous media – cavitation hazard.
12						●					Check longitudinal play of coupling rod pins, joint bush perhaps improperly mounted (in case of joint encapsulated liquid-tight).
13	●	●	●				●		●		Check whether foreign bodies in pump. Disassemble pump, remove foreign bodies, replace defective parts.
14		●	●	●			●				Stator and rotor worn, disassemble pump, replace defective parts.
15		●	●			●	●				Joint parts worn: Disassemble pump, replace defective parts.
16		●	●				●		●		Suction line completely or partly clogged.
17	●	●					●	●	●		Check temperature of liquid pumped – stator expansion too great – stator seized on rotor – stator perhaps burnt.
18	●	●					●		●		Solids content and/or grain size too great – reduce speed: Install strainer with admissible mesh size in front of pump.
19	●	●							●	●	Solids settle during pump shut-down and harden. Flush pump immediately, disassemble and clean, if necessary.
20	●	●					●		●	●	Medium hardens if a certain temperature limit is fallen below – heat pump.
21						●		●			Align coupling accurately.

Subject to technical alterations.



A Member of the COLFAX PUMP GROUP
ALLWEILER AG · Werk Bottrop
 Postfach 200123 · 46223 Bottrop
 Kirchhellener Ring 77-79 · 46244 Bottrop
 Germany
 Tel. +49 (0)2045 966-60
 Fax +49 (0)2045 966-679
 E-mail: service-ge@allweiler.de
 Internet: http://www.allweiler.com
 Railway station: 45127 Essen