ALLWEILER

Operating and Maintenance Instructions with Dismounting and Mounting Instructions

Eccentric Screw Pumps Series AE1E, AE2E, AE1N, AE2N, AED1E, AED2N, AE.H

ID type of construction

Operating data of the pump according to order data sheet

Order No.: Ident No. of pump:

Machine No.: Pump type:

Table of Contents

1. General

1.1 Application and range of utilization
1.2 Performance data
1.3 Abbreviation
1.4 Warranty
1.5 Testing

2. Safety

2.1 Marking of remarks in the operating instructions
2.2 Personnel qualification and personnel training
2.3 Dangers in case of non-compliance with the safety hints
2.4 Responsible working
2.5 Safety hints for the user/operator
2.6 Safety hints for maintenance, inspection and mounting operations
2.7 Independent reconstruction and spare parts construction
2.8 Inadmissible modes of operation

3. Transportation and intermediate storage

3.1 Packing
3.2 Transportation
3.3 Preservation and storage of eccentric screw pumps

4. Description

4.1 Structural design
4.1.1 Bearing and lubrication
4.1.2 Shaft seal
4.1.3 Dimensions/branch positions/flanges
4.2 Mode of operation
4.3 Aggregate construction
4.3.1 Drive
4.3.2 Shaft coupling and protection against accidental contact
4.3.3 Base plate

5. Installation/mounting

5.1 Installation
5.2 Foundation
5.3 Base plate
5.4 Coupling
5.5 Assembly of pump and drive
5.6 Drive by V-belt drive
5.7 Space required for maintenance and servicing
5.8 Laying of pipelines
5.8.1 Nominal widths
5.8.2 Supports and flange connections
5.8.3 Cleaning of pipelines prior to attachment
5.9 Laying of auxiliary pipelines for additional facilities
5.10 Safety and control facilities
5.10.1 Mano-vacuummeter
5.10.2 Safety element in the pressure pipeline
5.11 Electric connections

6. Starting/stopping

6.1 Preparation for starting
6.1.1 Filling the pump with fluid
6.1.2 Switching in the additional facilities for shaft seals (if provided)
6.1.3 Quality and properties of the flushing/blocking and quenching liquid
6.1.4 Switching in the additional facility for heating or cooling the shaft sealing housing and/or the suction casing (double shell casing)
6.1.5 Break-away of the pump
6.1.6 Control of the sense of rotation
6.2 Starting
6.2.1 Start-up
6.2.2 Drive
6.2.3 Checking the delivery values
6.2.4 Protection against dry running
6.3 Stopping
6.3.1 Shut-down
6.3.2 Measures in case of prolonged interruption

7. Maintenance/service

7.1 Maintenance
7.1.1 General control
7.1.2 Maintenance of components
7.1.2.1 Joints of the joint shaft
7.1.2.2 Bearing of the driving shaft and lubrication of the bearing
7.1.2.3 Shaft seal
7.1.2.4 V-belt drive
7.1.2.5 Driving motors and (control) gears
7.1.2.6 Packing ring dimensions (to Section 7.1.2.3), lubricant quantities for joints (to Section 7.1.2.1)
7.2 Servicing (Dismounting and Mounting Instructions)
7.2.1 Dismounting the eccentric screw pump
7.2.1.1 Dismounting the stator
7.2.1.2 Dismounting the rotor and rotor-side joint
7.2.1.3 Dismounting the joint shaft and the drive-side joint
7.2.1.4 Dismounting the shaft seal and driving shaft
7.2.1.5 Dismounting the angular-contact and groove ball bearings

7.2.2 Mounting the eccentric screw pump
7.2.2.1 Mounting the angular-contact and groove ball bearings
7.2.2.2 Mounting the shaft seal with the driving shaft dismounted
7.2.2.3 Mounting the driving shaft with shaft seal
7.2.2.4 Mounting the rotor and rotor-side joint
7.2.2.5 Mounting the joint shaft and the drive-side joint
7.2.2.6 Mounting the stator
7.3 Spare parts/Replacement parts
7.4 Parts list and recommended spare parts/replacement parts for Series AE1E, AE2E, AE1N, AE2N, AED1E, AED2N, AE.H; ID type of construction
Sectional drawing for series AE1E, AE2E, AE1N, AE2N, AED1E, AED2N; ID type of construction
7.5 Sectional drawing for series AE1+1 1H, AE2+2H; ID type of construction
7.6 Sectional drawing for series AE2H, AE4H; ID type of construction

8. **Troubles, causes and remedial actions**

1. General

1.1 Application and range of utilization

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

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

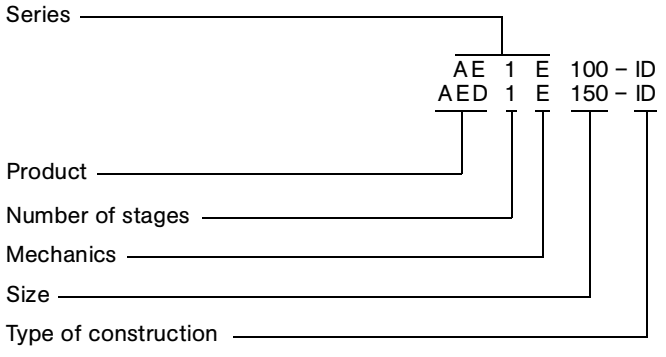
1.2 Performance data

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

1.3 Abbreviation

The abbreviation of the eccentric screw pumps is set up according to the following scheme.

Example:



This abbreviation is engraved on the type plate.

1.4 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 fluid 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.

1.5 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 during installation, operation and maintenance. Therefore, prior to mounting and commissioning, these operating instructions must be absolutely read by the fitter as well as the pertinent expert personnel/operator and must always be available at the place of installation of the machine/plant.

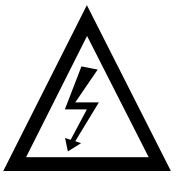
Not only are the general safety hints listed under this main item »Safety« to be observed, but also the special safety hints such as for private use inserted under the other main items.

2.1 Marking of remarks 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 of which may cause dangers to the machine and its functions, the word

ATTENTION

is inserted.

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 regulated by the operator. 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 operator. In addition, it must be ensured by the operator 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 both, danger to persons as well as 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 operator 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 the site.
- Protection against accidental contact for moving parts (e.g. coupling) 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 operator shall see to it that all maintenance, inspection and mounting operations will be performed by authorized and qualified expert personnel who have sufficiently informed themselves by thoroughly studying the operating instructions.
Basically, operations at the machine are to be performed during standstill only. The mode of operation for stopping the machine described in the operating instructions must be absolutely observed.
Pumps or aggregates handling noxious fluids must be decontaminated.
Prior to restarting, the items listed in section »Initial start-up« are to be observed.

2.7 Independent 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 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 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

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 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.

The crane installation and the sling ropes must be sufficiently sized. The sling ropes must not be fastened at the suspension eyes of the motor.

3.3 Preservation and storage of eccentric screw pumps

see our specifications VM 2102/...

4. Description

4.1 Structural design

Self-priming, single or two-stage eccentric screw pump. Rotor and stator are the conveying elements. The driving torque is transmitted onto the motor via the driving shaft and the joint shaft.
Pressure casing, stator and suction casing are held together by external casing connecting screws (clamp bolts).
The shaft sealing housing and the mechanical seal housing are arranged between suction casing and bearing bracket.

4.1.1 Bearing and lubrication

Joint shaft with liquid-tight encapsulated pin joints on both sides. Lubrication by joint oil
Bearing of the driving shaft is in the bearing bracket by grease-lubricated angular-contact and groove ball bearings. The bearings are hose-proof.

4.1.2 Shaft seal

By uncooled or cooled stuffing box or by uncooled or cooled maintenance-free, unbalanced, single or double-acting mechanical seal.

4.1.3 Dimensions/branch position/flanges

The dimensions of the pump and/or pump aggregate, the branch position and flange 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 (series AE1E, AE2E, AE1N, AE2N, AE.H) resp. three points (series AED1E, AED2N), regarded over the length of the conveying elements, and form two (series AE1E, AE2E, AE1N, AE2N, AE.H) resp. three (series AED1E, AED2N) sealing lines. The contents of the tight chambers formed as the rotor rotates are shifted axially and completely continuously from the suction to

the outlet side of the pump. There is no turbulence despite the rotor rotation. The constant chamber volume excludes squeezing thus ensuring an extremely gentle lowpulsation delivery.

4.3 Aggregate construction

4.3.1 Drive

By non-explosion-proof or explosion-proof electric motors, geared motors or variable-speed geared motors. Other driving variants (e.g. via V-belt) are possible.

4.3.2 Shaft coupling and protection against accidental contact

Shaft coupling according to DIN 740.
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 must be started only with a protection against accidental contact according to DIN 24 295.**

If a protection against accidental contact is not supplied, same is to be installed by the operator.

4.3.3 Base plate

The pumps of horizontal installation are, as a rule, mounted with the drive on a common base plate. Base plates are provided of the steel type of construction.

5. Installation/mounting

5.1 Installation

The pumps can be installed horizontally or vertically with the bearing upwards.

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 table of dimensions.
The foundation may be designed as a 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 driving 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 hexagon socket with cup point according to DIN 916, axially fix the coupling halves.
4. When assembling pump and motor, geared motor and/or variable-speed gear, see to it that the coupling halves are exactly aligned. Depending upon the coupling size, the distance between the coupling halves must be between 2 and 8 mm.

⚠

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

5.6 Drive by V-belt drive

In case of a V-belt reduction from drive to pump, make sure that the two V-belt pulleys are aligned in parallel.
The V-belt pulleys must be pushed onto the shaft ends as far as possible. It must be possible to regulate the tension of the V-belts by means of a motor rocker or by means of tensioning rails. They must be slightly retightened after a short running-in period.

ATTENTION **Excessive tensioning will destroy the rolling bearings of the pump.** Our separate instructions - V-belt drive - VM 706.0001E/Ident. No. 133 586 must be complied with.

5.7 Space required for maintenance and servicing

ATTENTION The pump aggregate must be accessible from all sides allowing necessary visual inspections to be performed.
For maintenance and service operations, sufficient space is to 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 mounted and dismounted without any difficulties.

5.8 Laying of pipelines

5.8.1 Nominal widths

The nominal widths of the suction and pressure pipelines should be designed according to the nominal pump branch widths. For coarse deviations, especially on the suction side, kindly contact the works.

5.8.2 Supports and flange connections

By way of the flange connections, 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 screws have been slackened, the flanges must neither be inclined nor springy nor rest on top of 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.

5.8.3 Cleaning of pipelines prior to attachment

Prior to mounting the pump, the suction-side pipelines, gate valves and valves must by all means be flushed and/or cleaned.
Mounting residues such as screws, nuts, welding beads, steel parts etc. will destroy the pump internals. Any claims under the warranty expire as soon as damages are caused by such residues.

5.9 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 pipelines for the quench liquid in case of single-acting mechanical seal with quench (designs: G0Q and G1Q) and the sealing liquid in case of double-

acting mechanical seal (design: G0D/G1D) are to be laid with a large 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 flushing, sealing and quench liquid is represented by arrows in the sectional drawings.
In order to ensure automatic ventilation, the pipelines 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 is to be connected at the highest connection of the double shell casing, if any.

5.10 Safety and control facilities

5.10.1 Manometer and vacuummeter
A manometer and vacuummeter are to be connected to the pressure and suction pipeline.

5.10.2 Safety element in the pressure pipeline
As soon as a stop valve is arranged in the pressure pipeline or if it is possible that the pressure pipeline will be clogged, a safety element must be provided, e.g.: by-pass line with installed excess pressure valve, bursting diaphragm, protective motor switch etc.

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

With the pressure pipeline 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 bursting of pipelines which must be absolutely avoided especially for dangerous products handled. Thus, appropriate safety devices must also be installed in the plant (e.g. pressure switches).

5.11 Electric connections
Clamping of the power supply cables of the coupled driving motor is to be effected by an electrical expert according to the switching diagram of the motor manufacturer. In doing so, the current VDE regulations and the regulations of the local energy and supply associations 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 fluid
ATTENTION **The pump must not run dry!** For initial start-up and after prolonged standstills, the pump must be filled with fluid.
Already a few rotations without fluid may damage the stator. Therefore, prior to starting, the suction casing must be filled with water or fluid to be handled to lubricate stator and rotor. After an extended standstill, i.e. if it must be assumed that the residual liquid in the pump has 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 easily be handled.

6.1.2 Switching in the additional facilities for shaft seals (if provided)
If the pumps are charged with a flushing/sealing or quench liquid, the existing stop valves, prior to initial start-up of the pump, must be opened and set to the pressures listed below.

- **Supply of the stuffing box with flushing or sealing liquid** (Designs P02, P12, P03, P13, P04 and P14).
  Note: For maintaining their function, stuffing boxes with flushing or sealing chamber rings require a flushing and/or sealing liquid.
  The required flushing and/or sealing liquid pressure in case of pumps with stuffing box is for stuffing box designs
  P02/P12 = 0.1 up to 0.5 bar above the respective internal suction casing pressure
  P03/P13 = 0.5 bar above the respective internal suction casing pressure
  P04/P14 = 0 up to 0.5 bar
  (for flushing and sealing liquid, please refer to Section 6.1.3 below).

- **Supply of the single-acting unbalanced mechanical seal with throttling ring** (Designs G0S/G1S and G0T-G1T)
  Note: For maintaining their function, these mechanical seals require a flushing liquid which dissipates the frictional heat and limits the penetration of the fluid to be pumped into the sealing chamber.
  The required flushing liquid pressure is 0.1 up to 0.5 bar above the internal suction casing pressure (for flushing liquid, please refer to Section 6.1.3 below).

- **Supply of the double-acting unbalanced mechanical seal** (Design G0D/G1D)
  Note: For maintaining their function, these mechanical seals require a sealing liquid which has to dissipate the generated frictional heat and to avoid the penetration of the fluid to be pumped into the sealing gap.
  ATTENTION Prior to each start-up, the circulation of the sealing liquid must be ensred. 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 G0Q and G1Q)
  The space between the stationary seal ring and shaft seal ring must be filled with quench liquid. Maximum admissible pressure difference between quench liquid pressure and pressure in the suction casing p = 0.5 bar.
  Maximum 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 flushing/sealing and quench liquid
ATTENTION Any liquid may be used as sealing/flushing or quench liquid in consideration of the corrosion resistance of all contacted parts and the consistency with the medium to be sealed. The fluid 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 shaft sealing housing and/or the suction casing (double shell casing)
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 shaft sealing housing and/or suction casing (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 6 bar.
The maximum heating temperature must not exceed 150°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

In case of any new start or after an extended standstill, make sure that the pump is easily raced by the prime mover. If this is not easily possible, e.g. because of the high adhesion between rotor and stator in new condition, boosting is possible by means of an appropriate tool within the key area of the driving shaft.
ATTENTION During this process, the driving shaft must not be damaged.

6.1.6 Control of the sense of rotation

The normal sense of pump rotation as viewed from the drive against the driving shaft is counterclockwise. With this type, the suction connection is on the shaft sealing side so that the shaft seal is relieved. In particular cases such as during suction from a vacuum or when handling fluids which cannot bear any gas inclusions, the pump is right-handed. Suction and outlet side are thus interchanged.
ATTENTION The sense of pump rotation must correspond to the directional marker „n“ in the pump type 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

Prior to start-up, all stop valves on the suction and outlet side are to be opened.

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 the pump outlet pressure must be checked via vacuummeter and manometer.
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 fluid 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.

6.3.2 Measures in case of prolonged interruption

If a prolonged interruption is projected and there is a danger of frost, the pump must be drained. For these purposes, screw screw plug (502) out of the suction casing (505). Thereafter, the pump must be preserved (please refer to Section 3.3 above).

7. Maintenance/Service

7.1 Maintenance

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

7.1.1 General control

1. The pump must not run dry.
2. The driving motor must not be overloaded.
3. Check suction and pressure pipelines for tightness.
4. During operation, an installed stuffing box must be slightly dripping.
   An installed mechanical seal must not have any heavy leakage.
5. Observe pressure and temperature monitoring instruments, and compare with the order data sheet and/or acceptance report.
6. Observe additional facilities such as flushing, sealing or quenching of the shaft seal, if provided.
7. Observe additional facilities for heating or cooling of the shaft sealing housing and/or the suction casing, if provided.

7.1.2 Maintenance of components

7.1.2.1 Joints of the joint shaft

The joints of the joint shaft are lubricated with Allweiler special joint oil Type B or oil ET 1510 ISO 460 of Messrs. Tribol Lubricants GmbH, Mönchengladbach, Germany; for the use of the pumps for foodstuffs, with ALLWEILER special joint oil Type BL or oil 1810/460 of Tribol Lubricants GmbH, Mönchengladbach, Germany
ATTENTION Other lubricants were not tested by us and can, therefore, not be recommended by us!

The joints are life-lubricated. However, if the pump must be opened for any other purposes, we recommend to check the joint collar for tightness and to change the joint oil after 8,000 working hours. The table under Section 7.1.2.6 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 driving shaft and lubrication of the bearing

The bearing of the driving shaft in the bearing bracket is by regreasable angular-contact and groove ball bearings.
Note: The groove ball bearing in case of vertical pump installation is lifetime-lubricated.

Rolling bearing greases
For the lubrication of the ball bearings, we recommend to use the below-listed rolling bearing greases or equivalent. The order of manufacturers is no quality ranking.

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

If the listed rolling bearing greases are not available, we recommend in any case a multi-purpose grease on lithium basis. Grease mixtures with grease grades of different basic oils and thickeners lead to a reduction of the lubricating properties and must therefore be avoided.
The table under Section 7.1.2.6 shows the allocation of the pump size to the grease quantity in grams.

Relubrication period
Every 4,000 operating hours, the bearings must be relubricated.

Relubrication
Relubrication is effected by means of the grease nipple (119) screwed in the bearing bracket (110). Relubrication must be repeated for such a period of time until the used grease emerges at the bearing cover (131). The used grease is to be wiped off.

7.1.2.3 Shaft seal
Shaft sealing is either effected via a stuffing box or a mechanical seal.

● **Stuffing box**
Increased leakages, if any, at the stuffing box during the first few hours of operation normally disappear automatically during the running-in period.
If necessary, slightly tighten hexagon nuts (202) at the gland (203).
Please note that the stuffing box must be slightly leaking. This causes dissipation of the frictional heat generated at the sealing surface.
If the leakage losses increase excessively, and if leakage cannot even be reduced by repeated slight tightening of the hexagon nuts (202), the packing rings have lost their elasticity of shape and must be replaced.

– **Dismounting the old packing rings and cleaning the shaft sealing housing**
Following the pressure relief of the pump and after removal of the gland, the old packing rings can be removed. A packing puller with flexible shaft serves as tool. Thereafter, the stuffing box chamber and the driving shaft must be carefully cleaned within the area of the packing rings. Worn driving shafts and/or shaft sleeves must be replaced (refer to the Dismounting and Mounting Instructions).

– **Mounting the packing rings**
ATTENTION In principle, only such packing rings are to be installed which correspond to the required operating conditions of the pump.
For the dimensions and necessary quantity of the pre-pressed packing rings and ring cuts or cutting lengths, please refer to the table Section 7.1.2.6 below.
For cutting purposes, we recommend the straight cut perpendicular to the shaft. In order to achieve a gap-free parallel location of the cut ends when closing the packing ring, the cutting angle should be approx. 20° to both cutting ends (please refer to Figure 1 below).

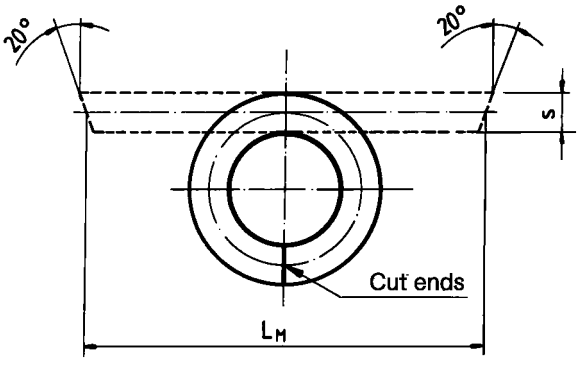


Figure 1: Cutting of packing rings

Pre-pressed packing rings or cut rings must be carefully untwisted axially and radially to such a degree only that they can just be pushed over the shaft. Bending-up the rings may result in damage by breaking.
During installation in the packing chamber, the packing rings must be carefully re-bent into angular shape. During this process, the kerfs must be set off by 90°. By means of the gland, each ring must be individually pushed into the stuffing box chamber with the cut ends foremost. Sealing chamber ring or flushing ring must be installed consistently.

ATTENTION Pointed items must never be used for these purposes as there is a danger of shaft damage and deformation of the packing materials.

– **Commissioning of the stuffing box after re-packing**
Prior to commissioning, the stuffing box must be only slightly tightened. During pump starting, 50 to 200 drops in a minute are admissible as seepage quantity.
During the starting process of approx. 30 minutes, a minimum leakage of 2 to 20 drops in a minute must be set by gradually and evenly tightening the gland (203) by means of the hexagon nuts (202).
ATTENTION During this process, the stuffing box temperature must not rise abnormally. Approx. 20 to 60°C above the temperature of the fluid pumped are admissible. In case of a sudden temperature rise, the gland must be immediately slackened and the running-in procedure repeated. The seepage may be drained through the tapped hole provided in the collecting trough of the bearing bracket.
Personal injuries and environmental damages resulting from the leakage of dangerous materials must be excluded.

● **Mechanical seal**

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 in (please refer to Section 6.1.2 above).

7.1.2.4 V-belt drive

Refer to our maintenance instructions for the V-belt drive with tensioning device VM 706.0001 – Ident No. 133586.

7.1.2.5 Driving motors and (control) gears

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

7.1.2.6 Packing ring dimensions (to Section 7.1.2.3) Lubricant quantities for joints (to Section 7.1.2.1)

		Pump size								
Pump size	AE1E	50	100	200	380 550	750 1000	1450	2700	5000	9500
	AED1E	75	150	300	560	1200	2300	4250	7800	15500
	AE2E	50	100	200	380	750	1450	–	–	–
	AE1N	25	50	100	200	380	750	1450	2700	5000
	AE2N	25	50	100	200	380	750	1450	–	–
	AED2N	38	75	150	300	560	1200	2300	4250	7800
	AE1+1H	–	–	–	–	–	–	–	–	2700
	AE2H	–	–	–	100	200	380	750	1450	–
	AE2+2H	–	–	–	100	200	380	750	1450	2700
	AE4H	12	25	50	100	200	380	750	1450	–
Number of packing rings for design P01/P11 ①		6	6	6	6	6	6	6	6	6
Dimensions of packing rings for cut rings		⌀37 / 25 x 6	⌀42 / 30 x 6	⌀51 / 35 x 8	⌀59 / 43 x 8	⌀73 / 53 x 10	⌀80 / 60 x 10	⌀99 / 75 x 12	⌀118 / 90 x 14	⌀142 / 110 x 16
Dimensions of packing rings as blank L_M x S		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	349,5 x 14	423,6 x 16
Oil quantity in cm^3 per joint		10	18	37	52	87	169	290	565	885
Grease quantity in grams per bearing		70	135	225	280	530	680	1270	2050	4070

① In case of shaft seal types P02/P12, P03/P13 and P04/P14, the number is reduced by 1 piece.

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 fluid 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 ①① and/or fluids 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 fluid 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:

- Pinch off power supply cable to the motor. Motor must not be capable of being started.
- All stop valves in the suction and pressure pipeline must be closed.
- Drain the fluid to be pumped from the suction casing. For these purposes, screw out screw plug (502). **Note:**Use collecting tank.
- Dismount protection against accidental contact.
- Dismount supply and pressure pipline as well as all auxiliary pipelines.
- Loosen screws at the pump feet, and screw out.

7.2.1.1 Dismounting the stator

- Remove hexagon nuts (609) and washers (610) from the clamp bolts (611).
- Withdraw pressure casing (504).
- Remove clamp bolts (611) and support (612), if provided.
- Withdraw stator (402) from the rotor (401). **Note:** In case of stiffness, simultaneously turn stator (402) by means of chain tongs. For these purposes, fix driving shaft (118).
- In case of stators of plastic material or metal, remove stator gaskets (403) and (404).
- Remove reducer flange (512) and O-ring (513), if available.

7.2.1.2 Dismounting the rotor and rotor-side joint

The 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 nuts (607) and fan-type lock washers (608) as well as hexagon screws (606).
- Withdraw suction casing (505) over the rotor (401). In doing so, see to it that the fine-machined rotor is not damaged.
- Remove gasket for suction casing (501).
- Cut lock at the joint clamp (306) by means of a metal cutting saw, and with a screw driver, press out to both sides. Remove joint clamp (306) from the joint collar (308) (please refer to Figure 2).

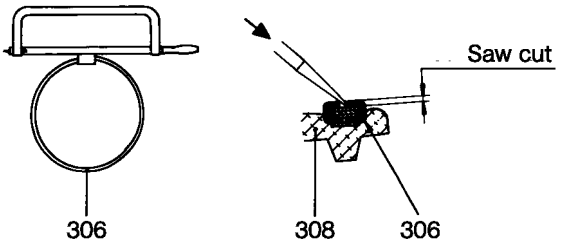


Figure 2: Removal of the joint clamp.

- By means of a screw driver, lift joint collar (308) and withdraw axially towards the joint shaft (307).
- Collect oil filing in a tank.
- Drive joint sleeve (304) over the collar of the joint shaft (307). In doing so, do not deflect joint shaft (307) (please refer to Figure 3 below).

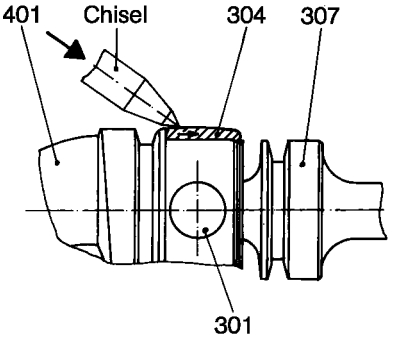


Figure 3: Dismounting the joint sleeve.

- Eject joint bolt (301).
- By means of a brass ejector, drive out half of the two bushes for joint bolt (303). For these purposes, incline joint shaft (307) (please refer to Figure 4 below).

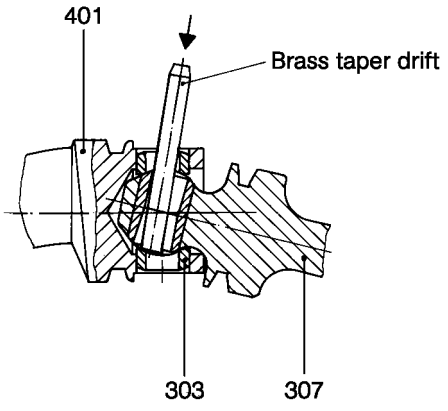


Figure 4: Dismounting the bushes for joint bolt.

- Remove rotor (401) from the joint shaft (307).
- Press joint bush (302) out of the joint shaft (307).
- By means of a brass mandrel, completely drive bush for joint bolt (303) out of the rotor (401).

7.2.1.3 Dismounting the joint shaft and the drive-side joint

Dismounting of the joint shaft 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.
- Withdraw joint shaft (307) from the driving shaft (118).
- Press joint bush (302) out of the joint shaft (307).
- By means of a brass mandrel, completely drive bush for joint bolt (303) out of the driving shaft (118).

7.2.1.4 Dismounting the shaft seal and driving shaft

Note: In case of pumps with shaft seal by stuffing box, the packing rings can be exchanged without dismounting the driving shaft, as described under Section 7.1.2.3 above. Dismounting of the driving shaft is required whenever the pump is equipped with a mechanical seal. In case of damages to the driving shaft or shaft sleeve within the area of the shaft seal, the pump must also be dismounted, as described hereinafter.

- Dismount stator (402) (please refer to Section 7.2.1.1 above).
- Remove hexagon nut (607) and fan-type lock washer (608) as well as hexagon screw (606).
- Withdraw suction casing (505) over the rotor (401). In doing so, see to that the fine-machined rotor is not damaged.
- Remove gasket for suction casing (501).
- Withdraw coupling half and/or belt pulley, and remove key (101).
- Screw out hexagon nuts (139), and remove bearing cover (131) with gasket (132).
- Unscrew bearing nut (116) from the driving shaft (118).
- Press driving shaft (118) with attached rotor (401), attached joint shaft (307) and mounted shaft seal out of the bearing bracket (110).
  For these purposes, apply pressing device at the bearing bracket (110) (please refer to Figure 5 below).
  Note: Guide sleeve and forcing cover serve as mounting aid and can be obtained from us.

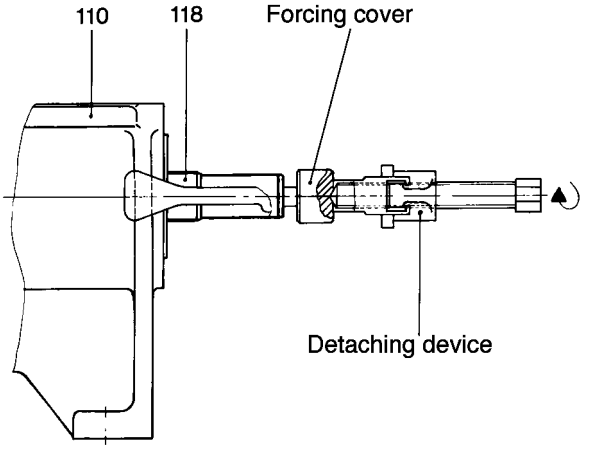


Figure 5: Pressing out of the driving shaft.

- Withdraw thrower (114) from the driving shaft (118).

● **Dismounting the stuffing box**

- Remove self-locking hexagon nut (202), and take off gland halves (203).
- Withdraw shaft sealing housing (204) from the driving shaft (118).
- Remove stuffing box packing (207) in case of design P02, P12 including flushing ring (208), and in case of design P03, P13 and P04, P14 including sealing chamber ring (209) from the shaft sealing housing (204).
- In case of design with shaft sleeve, withdraw shaft sleeve (206) and O-ring (115) from the driving shaft (118).

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

- Withdraw mechanical seal housing (214) with atmosphere-side stationary seal ring (219) from the driving shaft.
  Note: Particularly see to it that the casing with stationary seal ring is withdrawn concentrically and not canted to avoid damages to the stationary seal ring.
- Press stationary seal ring and O-ring out of the mechanical seal housing (214).
  See to uniform pressure distribution.
- Drive out locking pin (220).
- Loosen hexagon sockets with cup points, if provided, in the rotating part of the mechanical seal (219), and withdraw mechanical seal from the driving shaft (118).

ATTENTION Prior to loosening the hexagon sockets with cup points, mark and/or measure position of the mechanical seal on the shaft sleeve or driving shaft. Do not push O-rings over the screw pressure mark!

- In case of design with shaft sleeve, withdraw shaft sleeve (206) and O-ring (115) from the driving shaft (118).

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

- Withdraw mechanical seal housing (214) with atmosphere-side stationary seal ring (219) from the driving shaft (118).
  Note: Particularly see to it that the casing with stationary seal ring is withdrawn concentrically and not canted to avoid damages to the stationary seal ring.
- Press stationary seal ring and O-ring out of the mechanical seal housing (214).
  See to uniform pressure distribution.
- Drive out locking pin (220).
- Loosen hexagon sockets with cup points, if provided, in the rotating part of the mechanical seal (219), and withdraw mechanical seal from the driving shaft (118).
  ATTENTION Prior to loosening the hexagon sockets with cup points, mark and/or measure position of the mechanical seal on the shaft sleeve or driving shaft. Do not push O-rings over the screw pressure mark!
- In case of design with shaft sleeve, withdraw shaft sleeve (206) and O-ring (115) from the driving shaft (118).
- Press out shaft seal (232).

● **Dismounting the mechanical seal, single-acting with throttling ring**

- Remove hexagon screws (245).
- Withdraw mechanical seal housing (214) with atmosphere-side stationary seal ring (219) from the driving shaft (118).
  Note: Particularly see to it that the casing with stationary seal ring is withdrawn concentrically and not canted to avoid damages to the stationary seal ring.
- Withdraw O-ring (218).
- Press stationary seal ring and O-ring out of the mechanical seal housing (214).
  See to uniform pressure distribution.
- Drive out locking pin (220).
- Loosen hexagon sockets with cup points in the rotating part of the mechanical seal (219), and withdraw mechanical seal from the driving shaft (118).
  ATTENTION Prior to loosening the hexagon sockets with cup points, mark and/or measure position of the mechanical seal on the shaft sleeve or driving shaft. Do not push O-rings over the screw pressure mark!
- Withdraw mechanical seal cover (215) with throttling ring (234) from the driving shaft (118).
- Undo throttling ring (234), and remove with the O-ring (235).
- Pull locking pins (236) out of the mechanical seal cover (215).
- In case of design with shaft sleeve, withdraw shaft sleeve (206) and O-ring (115) from the driving shaft (118).

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

- Remove hexagon screws (245).
- Withdraw mechanical seal housing (214) with atmosphere-side stationary seal ring (219) from the driving shaft.
  Note: Particularly see to it that the casing with stationary seal ring is withdrawn concentrically and not canted to avoid damages to the stationary seal ring.
- Withdraw O-ring (218).
- Loosen hexagon sockets with cup points in the rotating part of the mechanical seal (219), and withdraw mechanical seal from the driving shaft (118).
  ATTENTION Prior to loosening the hexagon sockets with cup points, mark and/or measure position of the mechanical seal on the shaft sleeve or driving shaft. Do not push O-rings over the screw pressure mark!
- Withdraw mechanical seal cover (215) with product-side stationary seal ring (219) from the driving shaft (118).
  Note: Particularly see to it that the mechanical seal cover with stationary seal ring is withdrawn concentrically and not canted to avoid damages to the stationary seal ring
- Press stationary seal rings and O-rings out of the mechanical seal housing (214) and mechanical seal cover (215). See to uniform pressure distribution.
- Remove locking pins (220) and (236).
- In case of design with shaft sleeve, withdraw shaft sleeve (206) and O–ring (115) from the driving shaft (118).

7.2.1.5 Dismounting the angular-contact and groove ball bearings

Dismounting of the bearings is effected following the dismounting of the driving shaft. Please refer to Section 7.2.1.4 above.

- Radially displace spacer sleeve (102), and by means of an appropriate tool (ejector), drive groove ball bearing (103) out of the bearing bracket (110) (please refer to Figure 6 below).

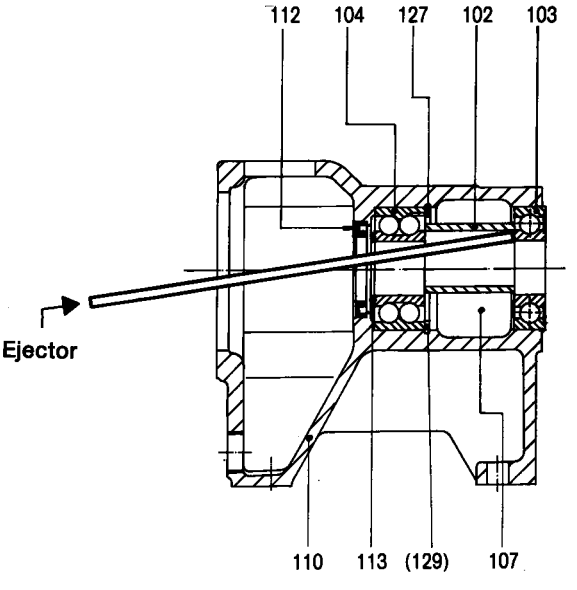


Figure 6: Dismounting the bearings.

- Remove spacer sleeve (102) and bearing grease (107).
- Dismount circlip (127) from the bearing bracket (110).
- Remove shim rings (129).
  Note: Applies to Sizes

AE1E	1450 / 2700 / 5000 / 9500
AED1E	2300 / 4250 / 7800 / 15500
AE2E	1450
AE1N	750 / 1450 / 2700 / 5000
AE2N	750 / 1450
AED2N	1200 / 2300 / 4250 / 7800
AE.H	380/ 750/ 1450/ 2700

  only.
- By means of an appropriate tool (ejector), drive angular-contact ball bearing (104) out of the bearing bracket (110).
- Remove spacer ring (113) from the bearing bracket(110).
- Press shaft seal ring (112) out of the bearing bracket (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 angular-contact and groove ball bearings

Note: The pumps are equipped with regreasable ball bearings. During remounting, the ball bearings must be provided with a sufficient grease filling.
In case of vertical pump design, the groove ball bearing is life-time lubricated.

- If required, carefully clean groove ball bearings with Diesel fuel. The bearing surfaces being blank and undamaged, the groove ball bearing (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 rolling bearing grease. The grease filling is applied as described below.
  1. Fill hollow spaces between the rolling bodies up to approx. 30 to 50% with grease.
  2. Scrape off excessive grease (most suitably with the fingers, do not use any metallic object). For rolling bearing greases recommended by us, please refer to Section 7.1.2.2 above.
- By means of a suitable pipe length, press double-row angular-contact ball bearing (104) from the driving side over the outer bearing ring into the bearing bracket (110). Slightly oil bearing seat surface previously.
  Note: The ball filling groove of the angular-contact ball bearing must point to the driving side.
  ATTENTION The following pump sizes are equipped with two single-row angular-contact ball bearings (104):

AE1E	1450 / 2700 / 5000 / 9500
AED1E	2300 / 4250 / 7800 / 15500
AE2E	1450
AE1N	750 / 1450 / 2700 / 5000
AE2N	750 / 1450
AED2N	1200 / 2300 / 4250 / 7800
AE.H	380/ 750/ 1450/ 2700

  The two bearings are to be pressed into the bearing bracket (110) **in O-type arrangement,** and adjusted over shim rings (129), without clearance (refer to Fig. 7 below).

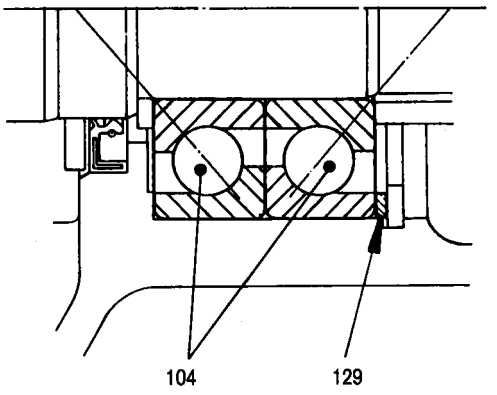


Figure 7: Two single-row angular–contact ball bearings with shim rings.

- Insert circlip (127) in the bearing bracket (110) in front of the ball bearing (104) and/or in front of the shim rings (129).
- Insert spacer sleeve (102) in the bearing bracket (110).
- Fill space between bearing bracket (110) and spacer sleeve (102) up to approx. 90% with rolling bearing grease.
  For rolling bearing greases recommended by us, please refer to Section 7.1.2.2 above. Filling quantity see table under Section 7.1.2.6.
- By means of a suitable pipe length, press greased groove ball bearing (103) from the driving side over the outer bearing ring into the bearing bracket (110). Slightly oil bearing seat surface previously.
  ATTENTION In case of pumps of horizontal installation, the sealing washer inserted in the groove ball bearing must point to the driving side. Pumps of vertical installation with bearing upwards have groove ball bearings with two sealing washers.
- Insert spacer ring (113) from the pump side in the bearing bracket (110).
  ATTENTION See to it that the installation must be effected before the shaft seal ring is pressed in.
- Fill space of the shaft sealing ring (112) with rolling bearing grease, and coat sealing lips.
- Press shaft seal ring (112) into the cleaned seat of the bearing bracket (110).
  Note: The sealing lip with hose spring of the shaft seal ring 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 shaft seal ring.

7.2.2.2 Mounting the shaft seal with the driving shaft dismounted

- In case of design with shaft sleeve , mount O-ring (115) in the groove of the driving shaft (118), and coat with sliding compound (e.g. silicon oil, Polydiol, soft soap).
  ATTENTION Do not use normal oil.
- Push shaft sleeve (206) with the inside chamfer pointing to the driving shaft head onto the driving shaft (118).

● **Mounting the stuffing box**

– Push shaft sealing housing (204) onto the shaft sleeve (206) and/or onto the driving shaft (118).

– In case of design P02, P12 including flushing ring (208), and in case of design P03, P13 and P04, P14 including sealing chamber ring (209), mount stuffing box packing (207) into the shaft sealing housing (204). Please also refer to Section 7.1.2.3 »Installation of new packing rings« above.

● **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-ring are sliding, may be lubricated with sliding compound such as silicon oil, Polydiol or soft soap.

ATTENTION Do not use normal 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 8 below).

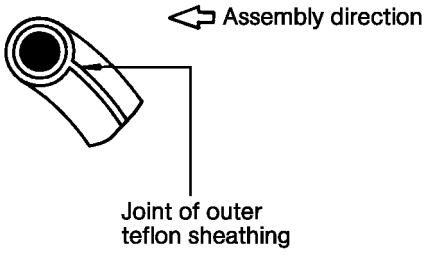


Figure 8: Joint of the outer coating points against the mounting direction.

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

– Drive locking pin (220) into the mechanical seal housing (214).

– Concentrically press stationary seal ring (219) with O-ring into the cleaned mechanical seal housing (214).
Note: Attend to uniform pressure distribution and to the locking pin. The locking pin (220) must not protrude to the inside.

– Push rotating part of the mechanical seal (219) onto the driving shaft (118).
Note: Exactly observe installation dimension and/or position of the mechanical seal, as marked for the dismounting.

– Together with the screw locking means Loctite No. 241 or equivalent, insert and tighten hexagon sockets with cup points, if provided, in the rotating part of the mechanical seal (219).

– Push mechanical seal housing (214) with stationary seal ring (219) over the driving shaft (118).
Note: When pushing the mechanical seal housing onto the driving shaft, see to it that the mechanical seal housing is not canted to avoid damages to the stationary seal ring.

● **Mounting of the mechanical seal, single-acting with quench**

Mounting of the mechanical seal is effected as described under Section – **Mounting the mechanical seal, single-acting.**

– In addition, drive in locking pin (220) with sealing compound (251) Loctite No. 640 or equivalent.

– Press shaft seal ring (232) into the cleaned mechanical seal housing (214). Do not grease sealing lip.
Note: The sealing lip of the shaft seal ring must always face the side to be sealed (pointing to the inside).
Pressing-in is effected by means of a suitable pressing stamp. Absolutely see to it that the pressing force is applied as close as possible to the outside diameter of the shaft seal ring.
ATTENTION The mechanical seal housing (214) with incorporated shaft seal ring (232) must first be pushed onto the driving shaft (118), laterally reversed, with the shaft seal ring foremost to expand the sealing lip of the shaft seal ring. Following the expansion, the mechanical seal housing (214) must be withdrawn from the driving shaft (118) and within a short period of time, properly pushed onto the driving shaft (118) with the flange side foremost.

● **Mounting the mechanical seal, single-acting with throttling ring**

– Concentrically press throttling ring (234) with O-ring (235) into the mechanical seal cover (215).
Note: Attend to uniform pressure distribution.

– Beat locking pin (236) with mandrel into the mechanical seal cover (215). Locking pin must not protrude to the inside.

– Push mechanical seal cover (215) over the driving shaft (118).

– Subsequent mounting of the mechanical seal is effected as described under Section - **Mounting the mechanical seal, single-acting.**

– Mount O-ring (218) on the mechanical seal housing (214).

– Push mechanical seal housing (214) with stationary seal ring (219) over the driving shaft (118), and by means of the hexagon screws (245), fasten to the mechanical seal cover (215).

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

– Beat locking pin (236) into the mechanical seal cover (215).

– Concentrically press stationary seal ring (219) with O-ring into the mechanical seal cover (215).
Note: Attend to uniform pressure distribution and to the locking pin. Locking pin must not protrude to the inside.

– Push mechanical seal cover (215) over the driving shaft (118).

– Subsequent mounting of the mechanical seal is effected as described under Section **- Mounting the mechanical seal, single-acting.**

– Mount O–ring (218) onto the mechanical seal housing (214).

– Push mechanical seal housing (214) with stationary seal ring (219) over the driving shaft (118), and by means of the hexagon screws (245), fasten to the mechanical seal cover (215).

7.2.2.3 Mounting the driving shaft with shaft seal

– Push thrower (114) onto the driving shaft (118).

– Press driving shaft (118) with mounted shaft sealing housing (204) or mechanical seal housing (214) and installed stuffing box packing (207) and/or mechanical seal (219) through the bearings (104) and (103) into the bearing bracket (110).
Note: Attend to mounting position of the spacer ring (113) and the spacer sleeve (102). During pressing, support and/or hold the **inner bearing ring** of the groove ball bearing (103) by means of an appropriate auxiliary tool.

Note: In case of pump sizes AE1N 380, AE2N 380, AE1E 750, AE2E 750, AED2N 560, AED1E 1200, AE.H 200 and with all greater pumps, the driving shaft (118) can also be pushed through the bearings (104) and (103) into the bearing bracket (110) by means of a mounting tool, consisting of guide sleeve, draw-in sleeve, threaded rod with washer and nut. The mounting tool can be obtained from us.

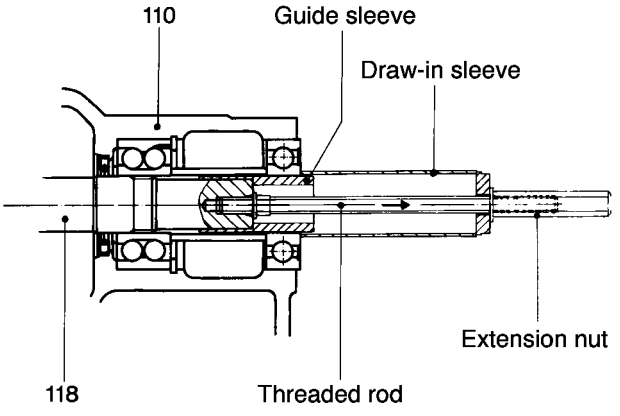


Figure 9: Drawing-in of the driving shaft.

– By means of a hook wrench, turn self-locking bearing nut (116) onto the driving shaft (118), and firmly tighten. In case of backlash-free fit of the bearing nut, retighten same by approx. 1/16 rotation.
Note: In order to ensure self locking of the bearing nut, same must be replaced after approx. 5 loosening and tightening operations.

– In case of pumps of horizontal installation, turn bearing cover (131) with gasket (132) prior to mounting so that the grease outlet bore hole in the bearing bracket (110) is closed.
In case of pumps of vertical installation with bearing upwards, turn bearing cover (131) with gasket (132) prior to mounting so that the grease outlet bore hole in the bearing bracket (110) coincides with the recess in the bearing cover (131) and gasket (132).

– By means of the hexagon screws (139) fasten bearing cover (131) with gasket (132) to the bearing bracket (110).

– Insert key (101) in the driving shaft (118) and secure with two center punch blows at the front side.

7.2.2.4 Mounting the rotor and rotor side joint

– By means of a brass mandrel, drive half of the bushes for joint bolt (303) into the rotor (401).

– Press joint bush (302) into the joint shaft (307) so that the longitudinal axis of the oval bore hole (marked by two notches) coincides with the longitudinal axis of the joint shaft and the joint bush equally protrudes from both sides of the joint shaft (please refer to Figure 10 below).

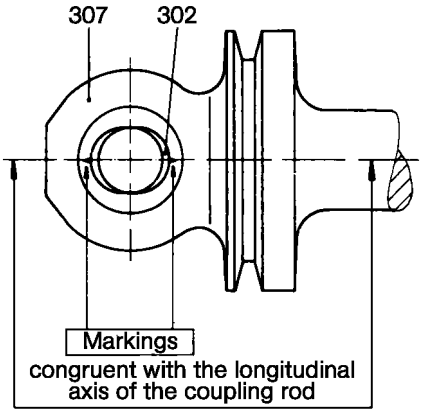


Figure 10: Pressing-in of the joint bush

– Push joint clamps (306), joint collars (308) and joint sleeve (304) onto the shank of the joint shaft (307).

– Push joint shaft (307) into the head of the rotor (401).

– Push joint bolt (301) into the joint bush (302), and completely drive in bushes for the joint bolt (303).

– Polish joint sleeve (304) at the outside diameter, if necessary, with emery, and mount on the head of the rotor (401).

– Following mounting of the joint sleeve (304), secure same against axial displacement on the head of the rotor (401).
ATTENTION For these purposes, drive face of the joint sleeve (304) into the groove at the head of the rotor (401) by means of a center punch blow (please refer to Figure 11 below).

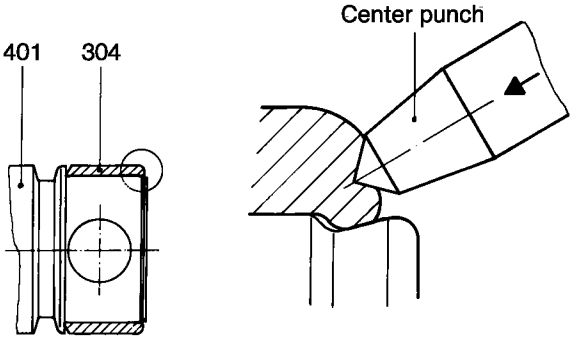


Figure 11: Securing the joint sleeve.

- By means of a screw driver, mount joint collar (308), lift top by means of a screw driver, run spray pipe of the oil bottle under the collar and fill joint chamber with Allweiler special joint oil Type B or oil ET 1510 ISO 460 of Messrs. Tribol Lubricants GmbH, Mönchengladbach, Germany. When used for foodstuffs, fill with ALLWEILER special joint oil Type BL or oil 1810/460 of Tribol Lubricants GmbH, Mönchengladbach, Germany. For the filling quantity, please refer to the table Section 7.1.2.6 above.
- Check whether bent loop of the joint clamp (306) rests against the joint clamp lock. If not, press against by means of commercial flat pliers (please refer to Figure 12 below).

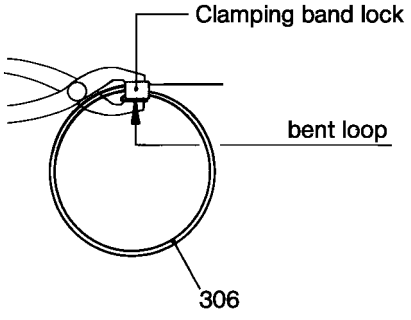


Figure 12: Press joint clamp loop against joint clamp lock.

- Place joint clamps (306) in the surrounding slots of the joint collar (308), and clamp.
  Note: For these purposes, the following clamping tools must be used:

  For pump sizes
  P AE1N 200, AE2N 200, AED2N 300,
  AE1E 380, AE2E 380, AED1E 560, AE.H 100
  the clamping tool bearing the designation PoK-It II.

  For pump sizes
  p AE1N 380, AE2N 380, AED2N 560,
  AE1E 750, AE2E 750, AED1E 1200, AE.H 200
  the clamping tool bearing the designation Band-It together with adapter J050.

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

- **Clamping with clamping tool Band-It and adapter J050.**
- Introduce band end of the joint clamp (306) to the joint clamp lock into the clamping tool with adapter.
- Hold clamp end with the eccentric lever of the clamping tool, and clamp joint clamp (306) by turning the crank (Figure 13).

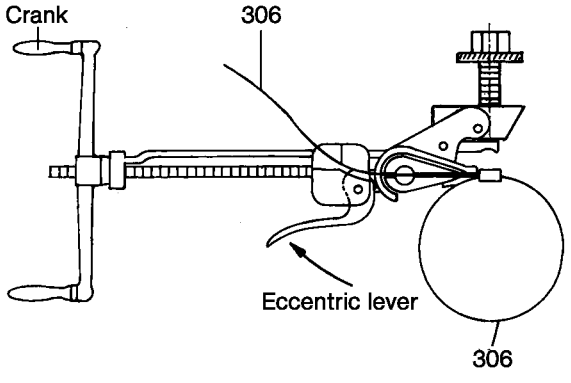


Figure 13. Clamping the joint clamp by means of clamping tool Band-It and adapter J050.

Note: Proper clamping of the joint clamps (306) is shown in Figure 14.

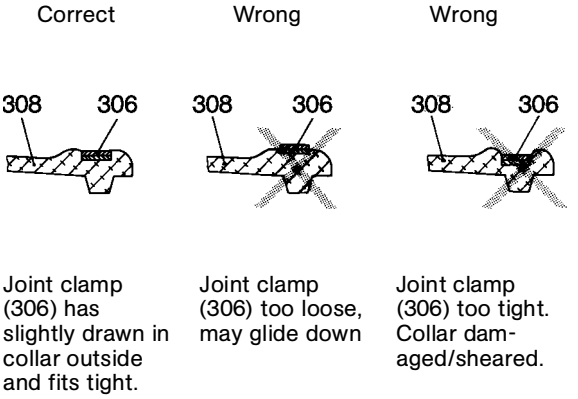


Figure 14: Clamping of joint clamps.

- Check whether on the entire circumference of the joint collar (308), the joint clamp (306) lies in the collar slot.
- Slowly turn clamping tool upwards through approx. 60° until the shearing hook grips behind the joint clamp lock (please refer to Figure 15 below).
- Tighten pressure screws by hand until the joint clamp is firmly clamped.

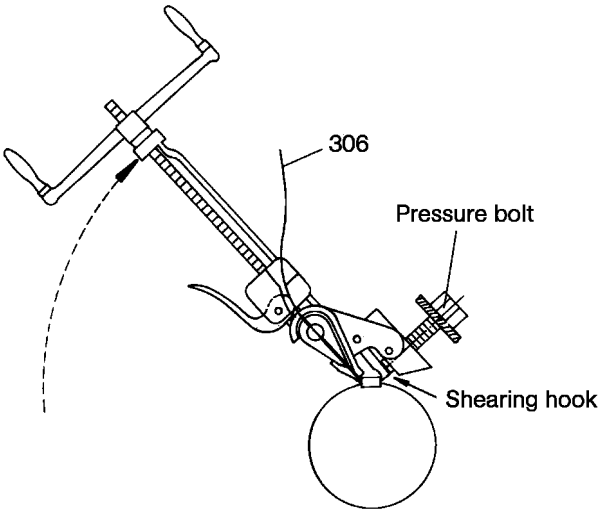


Figure 15: Shearing of the joint clamp.

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

ATTENTION If the joint clamp is slightly lifted on the sheared side, this must be compensated for by careful alignment. Hammering or beating against the joint clamp lock is not permitted as otherwise, there may be a danger of collar damage.

Note: In case of joint clamps of Hastelloy material, shearing with the clamping tool is not possible. After bending at the joint clamp lock, the joint clamp must be sheared by means of sheet metal shears and the cutting edges deburred (please refer to Figure 16 below).

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

– When using clamping tool PoK-It II, bend joint clamp (306) after clamping at the joint clamp lock by swinging the clamping tool so that the clamp cannot glide back through the lock. After bending at the joint clamp lock, the joint clamp must be sheared with sheet metal shears and the cutting edges deburred (please refer to Figure 16 below).

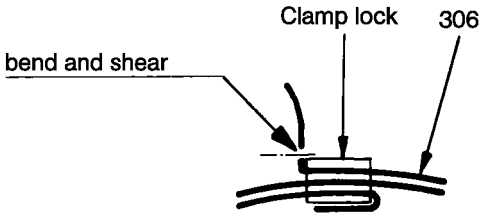


Figure 16: Bending and shearing of the joint clamp.

ATTENTION Check whether the joint clamp is bent so that it cannot glide back through the joint clamp lock (please refer to Figure 16 above). If this was not achieved, the joint clamp must be removed and replaced by a new one.

7.2.2.5 Installation of the joint shaft and the drive-side joint

– Mount drive-side joint as described under Section 7.2.2.4 above against the driving shaft (118).

– In doing so, push joint shaft into the joint head of the driving shaft (118).

– Secure joint sleeve (304) as depicted with center punch blow.

– Mount joint collar (308), fill joint chamber with joint oil and fix joint clamps as described.

– Insert gasket for suction casing (501).

– Push suction casing (505) over the rotor (401). In doing so, make sure that the fine-machined rotor is not damaged.

– Fix suction casing (505) with hexagon screws (606), fan-type lock washers (608) and hexagon nuts (607) to the bearing bracket (110).
Note: Prior to tightening the hexagon nuts (607), align connecting flange of the suction casing (505). Attend to proper position of the connections in the shaft sealing housing (204) and/or mechanical seal housing (214). Please refer to our tables of dimensions.

7.2.2.6 Mounting the stator

– Push O-ring (513) and reducer flange (513), if available, into inlet housing (505).

– Prior to bending-up, coat stator (402) and rotor (401) with a sliding compound (silicon oil, Polydiol, soft soap or the like).
ATTENTION Do not use normal oil.

– In case of stators of plastic material or metal, insert stator gaskets (403) and (404).
Note: In case of stators of plastic material, the stator gasket (403) with O-ring must always be on the outlet side.

– For multi-component stators (402) with a centering bore and centering groove for support (612), assemble stator (402) pointing towards the rotor (401).

Note: In case of stiffness, simultaneously turn stator (402) by means of chain tongs. For these purposes, fix driving shaft (118).

– For multi-component stators, rotate stators (402) until the fixing piece (631) projects into the groove and/or the bore of the stators (402).

– Push support (612), if provided, onto the clamp bolts (611).

– Screw up pressure casing (504), push support (612), if provided stator (402) and suction casing (505) with the clamp bolts (611) and hexagon nuts (609). In doing so, uniformly tighten hexagon screws.

– Tighten hexagon nuts (613).

7.3 Spare parts/replacement parts

In the following sectional drawings with parts list, all pumps mentioned are represented with the various shaft seal and bearing 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 are to be kept on stock and installed. In this connection, we refer to the statements made under Section 2.7 above.

In case of spare parts/replacement parts ordering, the following are to be stated:

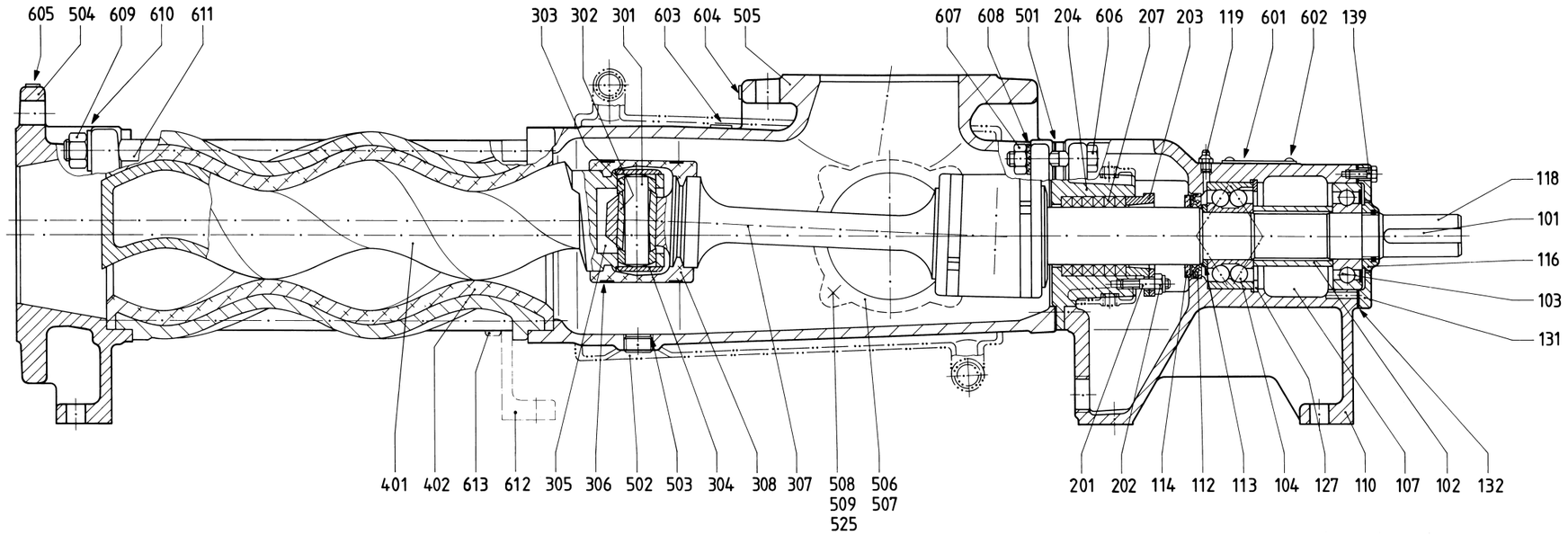
Machine numbers
Abbreviation of pump
Part number
Denomination and part quantity
or Ident No. and quantity

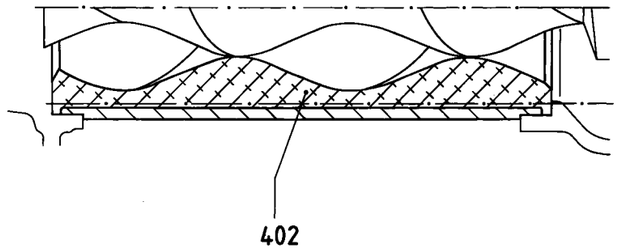
Note: The machine number and the abbreviation of the pump are engraved on the type plate.
Note: The Ident No. and quantity can be seen from the attached separate spare parts list.

Denomination	Part No.		Quantity	
Key	101		1	
Spacer sleeve	102		1	
Groove ball bearing	103	R	1	
Angular-contact ball bearing	104	R	1	①
Bearing grease	107	R		②
Bearing bracket	110		1	
Shaft seal ring	112	R	1	
Spacer ring	113		1	
Thrower	114		1	
O-ring	115	R	1	
Bearing nut	116	R	1	
Driving shaft	118	R	1	
Lubricating nipple	119		1	
Circlip	127		1	
Shim ring	129		4	
Bearing cover	131		1	
Gasket	132	R	1	
Hexagon screw	139		4	
Stud bolt	201		2	
Self-locking nut	202		2	
Gland half	203		2	
Shaft sealing housing	204		1	
Shaft sleeve	206	R	1	
Stuffing box packing	207	R, r		②
Flushing ring	208		1	
Sealing chamber ring	209		1	
Screw plug	212		1	
Joint tape	213		1	
Mechanical seal housing	214		1	
Mechanical seal cover	215		1	
O-ring	218	R	1	
Mechanical seal	219	R	1	
Locking pin	220		1	③
Shaft seal ring	232	R	1	
Throttling ring	234	R	1	
O-ring	235	R	1	
Locking pin	236	R	2	
Hexagon screw	245		3	
Sealing compound	251		1	
Joint bolt	301	R, r	2	
Joint bush	302	R, r	2	
Bush for joint bolt	303	R, r	4	
Joint sleeve	304	R, r	2	
Joint oil	305	R, r		②
Joint clamp	306	R, r	4	
Joint shaft	307	R, r	1	
Joint collar	308	R, r	2	
Rotor	401	R, r	1	
Stator	402	R, r	1	
Stator gasket outlet side	403	R, r	1	
Stator gasket suction side	404	R, r	1	
Gasket for suction casing	501	R, r	1	
Screw plug	502		1	
Sealing tape	503		1	
Pressure casing	504		1	
Suction casing	505		1	
Suction casing cover	506		2	
Gasket	507	R	2	
Stud bolt	508		8	
Hexagon nut	509		8	
Reducer flange	512		1	
O-ring	513		1	
Washer	525		8	
Type plate	601		1	
Round head grooved pin	602		4	
Information plate Commissioning	603		1	
Information plate Suction	604		1	
Information plate Pressure	605		1	
Hexagon screw	606		4	
Hexagon nut	607		4	
Fan-type lock washer	608		4	
Hexagon nut	609		4	
Washer	610		4	
Clamp bolt	611		4	
Support	612		1	
Hexagon screw	613		2	
Fixing piece	631		2	
Hexagon nut	632		2	
Spacer	633		4	

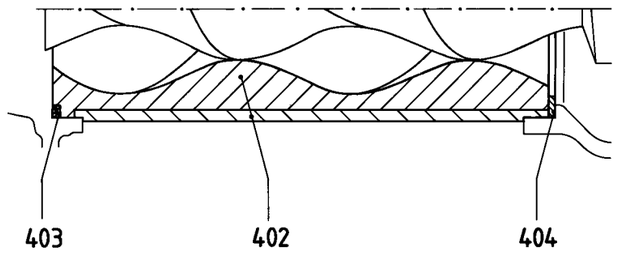
Recommended spare parts:
R = large repair set
r = small repair set
① 2 pieces with AE1E 1450/2700/5000/9500
AED1E 2300/4250/7800/15500
AE1N 750/1450/2700/5000
AE2N 750/1450
AED2N 1200/2300/4250/7800
AE.H 380/750/1450/2700
② see table on page 10
③ 2 pieces with shaft seal types G.D

7.4 Sectional drawing with list of components and recommended spare parts/replacement parts for Series AE1E, AE2E, AE1N, AE2N, AED1E, AED2N

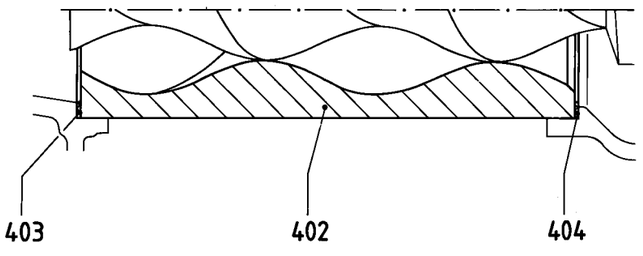




Stator with irregular elastomer wall thickness

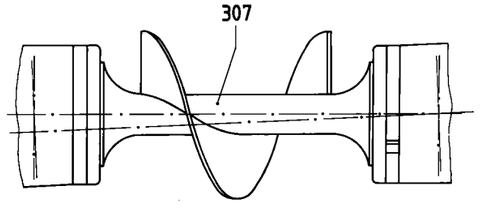


Stator of plastic material

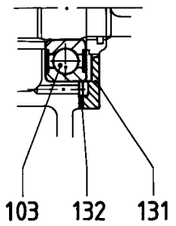


Stator of metal

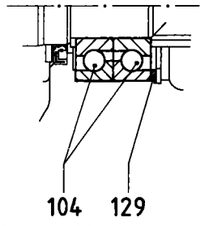
Winding protection on joint shaft



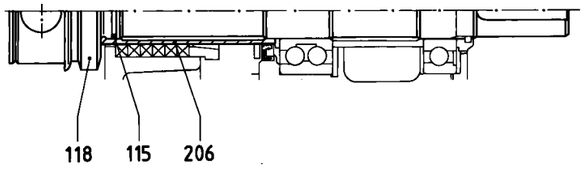
Worm on joint shaft



Groove ball bearing in case of vertical installation

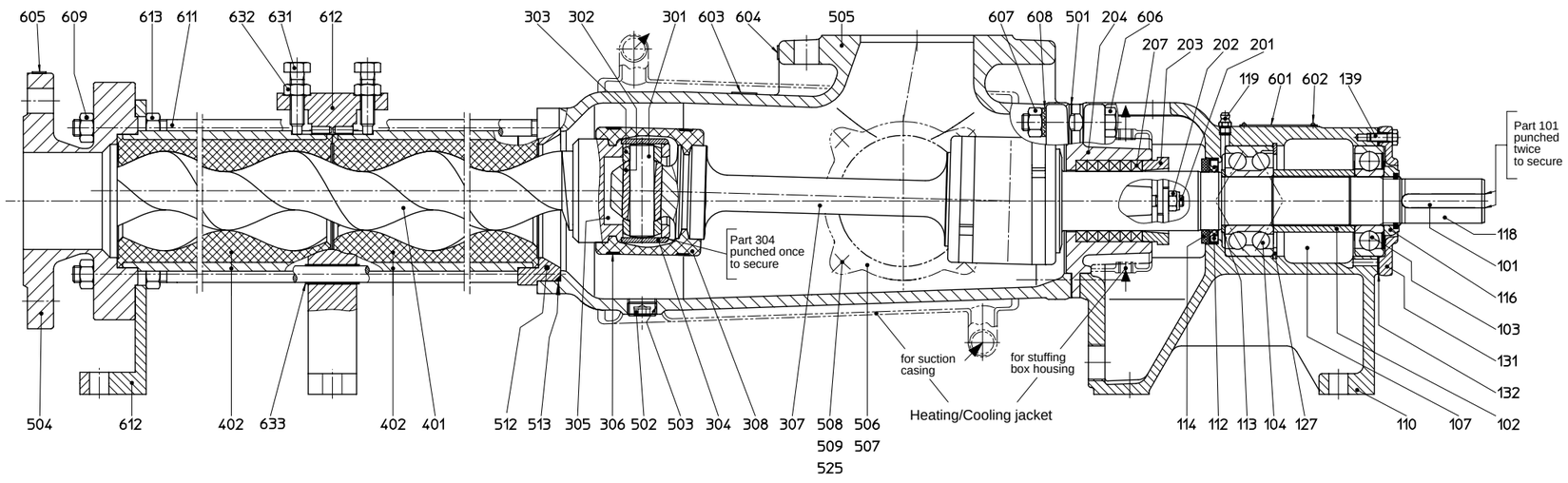


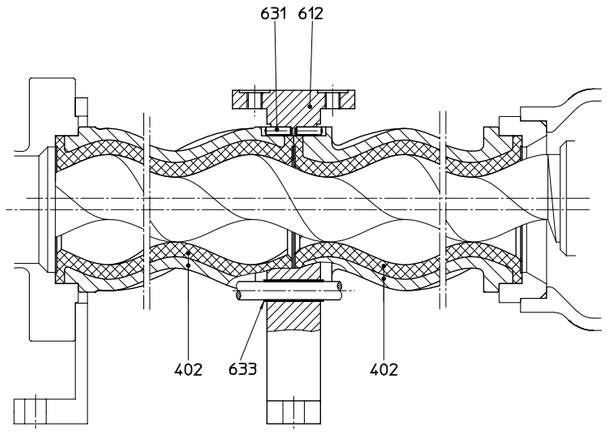
Design with two single-row angular-contact ball bearings



Shaft with shaft sleeve

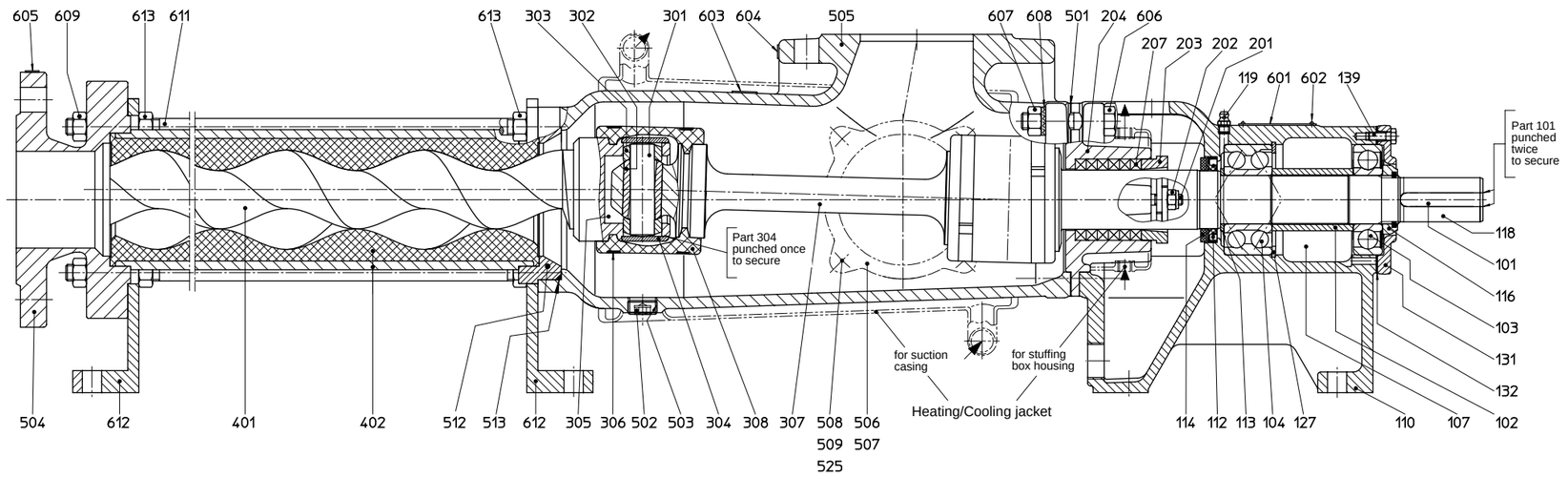
7.5 Sectional drawing for series AE1+1H, AE2+2H – ID type of construction

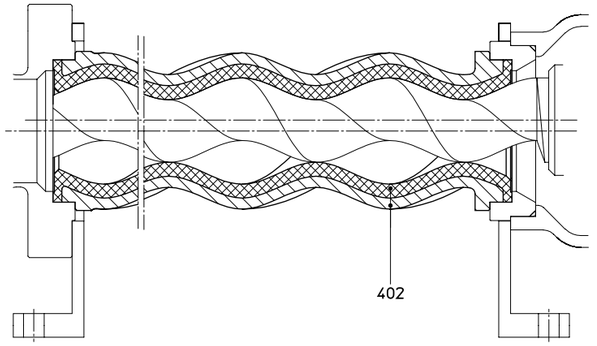




Stator with uniform rubber wall thickness

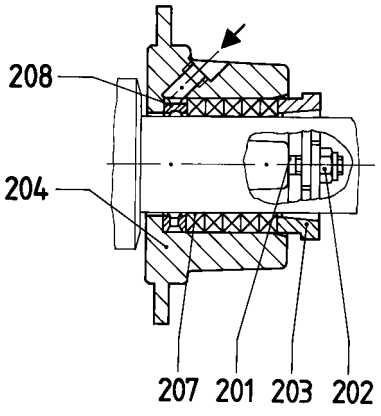
7.6 Sectional drawing for series AE2H, AE4H – ID type of construction



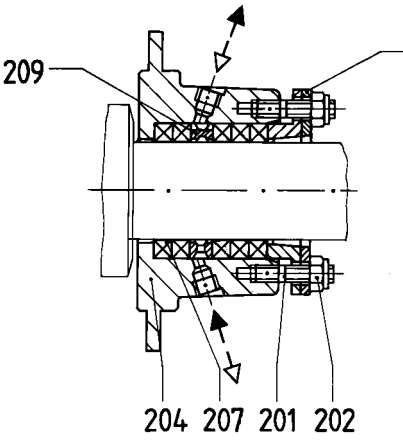


Stator with uniform rubber wall thickness

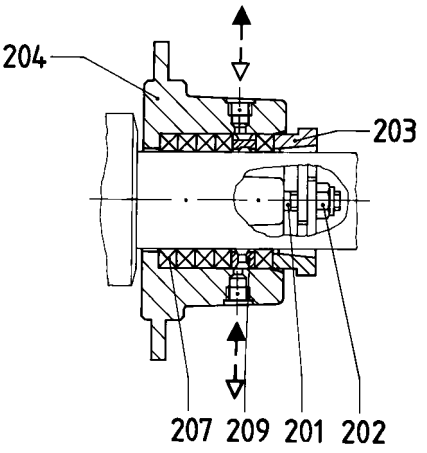
Sectional drawing Shaft seals



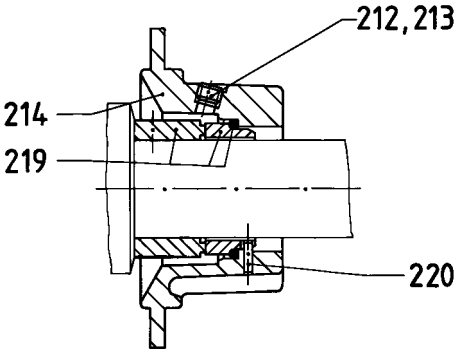
PO2 Stuffing box with flushing ring



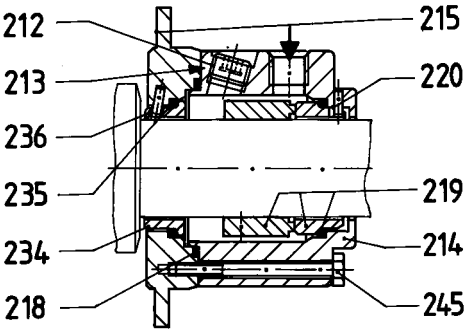
PO3 Stuffing box with internal sealing chamber ring



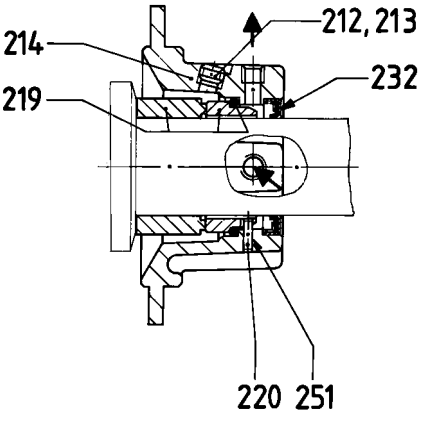
PO4 Stuffing box with external sealing chamber ring



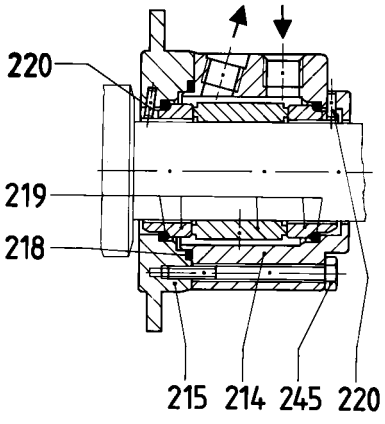
GOK and **GON** mechanical seal, single-acting



GOS and **GOT** mechanical seal, single-acting with throttling ring



GOQ mechanical seal, single-acting with quench



GOD mechanical seal, double-acting

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 achieved	Pressure head is not achieved	Irregular pump delivery	Pump operates noisily	Pump is seized or does not deliver	Motor gets too warm	Stator wears prematurely	Shaft seal leaky	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.
	a	b	c	d	e	f	g	h	i	k	
1	●							●			High adhesion between rotor and stator in new condition after extended standstill. Race 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 pipeline cross – section, if necessary – install greater filters – open suction valve completely.
5		●	●		●						Check viscosity of fluid pumped.
6	●		●					●			Check pump speed – control speed and power consumption of driving motor – check voltage and frequency.
7			●		●						Avoid air inclusions in the fluid to be pumped.
8	●		●				●	●	●		Check pressure head – open valve in pressure pipeline completely, remove obstruction in pressure pipeline.
9		●	●		●		●		●		Pump runs completely or partly dry. Check whether fluid pumped on suction side is sufficient.
10		●	●								Increase speed in case of fluid media and great suction volume.
11		●			●	●					Reduce speed in case of viscous media – cavitation hazard.
12						●					Check longitudinal play of joint bolts, joint bush perhaps improperly mounted.
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 (f, g) and/or driving shaft or shaft sleeve (b, c) worn: Disassemble pump, replace defective parts.
16		●	●				●		●		Suction pipeline completely or partly clogged.
17	●	●					●	●	●		Check temperature of fluid pumped – stator expansion too great – stator seized on rotor – stator perhaps burnt or swollen.
18	●	●	●					●		●	Stuffing box packing: Replace unserviceable rings (b, c, k), slacken gland (a, h), tighten gland (b, c, k).
19	●	●					●		●		Solids content and/or grain size too great – reduce speed: Install strainer with admissible mesh size in front of pump.
20	●	●							●	●	Solids settle during pump standstill and harden: Flush pump immediately, disassemble and clean, if necessary.
21	●	●					●		●	●	Medium hardens if a certain temperature limit is fallen below – heat pump.
22						●		●			Align coupling or belt pulleys exactly.

Subject to technical alterations.

ALLWEILER
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
Bahnstation: 45127 Essen

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