Operating and Maintenance Instructions with Dismounting and Mounting Instructions

Eccentric Screw Pumps Series AFP

Operating data of 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 liquid to highly viscous, 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 type 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 warranted by us. Thus, compliance with the following operating instructions ensures proper operation.

2. Safety

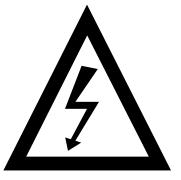
These operating instructions contain basic hints to be observed in case of installation, operation and maintenance. Therefore, prior to mounting and commissioning, these operating instructions must by all means be read by the fitter as well as the pertinent expert personnel/customer and must always be 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 the personnel, are particularly marked with the general danger symbol

Safety sign
according to DIN 4844–W9

bei Warnung vor elektrischer Spannung mit



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 owner. 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 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 customer must be observed.

2.5 Safety hints for the customer/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 owner 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. Start-Up” 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 the compact type of construction and the low weight, AFP pumps are easy to handle and transport.

3.3 Preservation and storage of eccentric screw pumps
Please refer to our document VM 2102GB

4. Description

4.1 Structural design
Pump and drive form a block aggregate. Drive and discharge casing are held together by a quick-acting clamping connection so that the drive motor can easily be exchanged within a short period of time. A separate sealing housing is arranged in the discharge casing. Subsequent conversion to other sealing variants is possible.
The torque of the drive is transmitted via a torque rod firmly connected with the rotor. This rotating unit runs on bearings in the drive. The stator of the elastomer design is vulcanized into a pipe, and that of the plastic design, pushed into a suction casing.
Discharge casing and stator/suction casing are screwed together.

4.1.2 Shaft seal
By uncooled or cooled (air flow cooling in case of compressed-air motor drive), maintenance-free, unbalanced single-acting mechanical seal.

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 continuously 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
Compressed-air motor with integrated planetary gear; by non-explosion-proof or explosion-proof geared motors or variable-speed geared motors.

5. Installation/Mounting

5.1 Installation

AFP pumps are installed vertically. The suction-side inlet is designed so that the pumps can be placed upright on the barrel/tank bottom.
Mounting residues such as screws, nuts, welding beads, steel particles etc. would destroy the pump internals. Any warranty claim will be rejected as soon as damages are caused by such residues.

5.2 Safety and control facilities

5.2.1 Pressure gauge

A pressure gauge must be connected to the discharge line.

5.2.2 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. E.g.: by-pass line with built-in relief valve, bursting disk, motor protection switch etc.
Pumps driven by compressed-air motors can be hydraulically braked down to a stop by closing a valve (discharge nozzle).

Eccentric screw pumps are positive-displacement pumps and can theoretically generate an infinitely high pressure.
With the discharge line closed, e.g. as a result of clogging or by the inadvertent 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 pipelines which must be avoided by all means especially when handling dangerous products. Thus, appropriate safety devices must also be installed in the plant (e.g. pressure switches).

5.3 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.
In case of danger by electrostatic charge, connect earthing cable to the discharge casing.

5.3.1 Sense of rotation

The sense of rotation of the three-phase geared motor is clockwise when looking on the fan.
The sense of rotation of the three-phase variable-speed geared motor is counterclockwise when looking on the fan.

ATTENTION Wrong sense of rotation will destroy the pump internals! The sense of rotation must be checked via the motor protection plug.
The following are integrated in the motor protection plug: The motor protection with thermal release and temperature compensation, an electronic display of the sense of rotation, a phase inverter and an operating switch designed as rotary starting toggle. The electronic display of the sense of rotation (phase control) is connected so that after inserting the motor protection plug into the socket and **prior to switching** the equipment on with the sense of rotation (phase sequence) being wrong, the warning signal (red lamp) lights up.

In this case, the motor protection plug must be pulled out of the socket and the phase inverter in the plug insert turned through 180° by means of a screw driver with a slight pressure thus activating the correct sense of rotation (phase sequence).

Thereafter, the motor protection plug is again inserted into the socket.
The pump can be started by means of the rotary starting toggle.

The motor protection plug is non-explosion-proof and must be installed outside the Ex zone.

5.4 Compressed-air connections

The air supply must be sufficiently dimensioned. For a hose length of up to 8 m, a nominal diameter of DN 15 or 1/2" is recommended. See to it that air of sufficient quantity with a sufficient flow pressure (according to the range charts in our brochure VM 623GB) and in a clean condition, enriched with oil will get into the air motor.
For the preparation of the compressed air, the commercially available compressed-air fittings consisting of air filter, pressure regulator and oil mist device are to be installed in the air supply line, however, they may only be 8 m away from the air motor as a maximum.

6. Starting/Stopping

6.1 Start-up

Prior to start-up, all shut-off valves on the discharge side must be opened.

ATTENTION The pump must not run dry. Even a few revolutions without liquid may damage stator and mechanical seal.

6.2 Drive

Switch motor in.

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

6.3 Shut-down

Switch motor off.

6.4 Measures in case of a longer shut-down period

Stator and mechanical seal are lubricated by the medium. In case of adhesive or hardening media, the pump must be cleaned upon termination of the work.

7. Maintenance/Servicing

7.1 Maintenance

The pump is maintenance-free.

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/mounting 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.
- Close compressed-air pipeline and screw off.
- Depressurize discharge pipeline and screw off.
- Drain the liquid to be pumped from the discharge casing.

● **Dismounting**

In case of pumps with a solid stator: Unscrew suction casing (505) from the discharge casing (504).

ATTENTION Left-hand thread!
Pull suction casing (505) together with stator (402) from rotor (401). In the event of stiffness, turn suction casing (505) simultaneously. To do so, seize the motor shaft with a screw driver or similar tool through the slots in the mechanical seal housing (214) and via the key face on the motor shaft. Press stator (402) out of the suction casing (505).

For pumps with elastomer stator:
Unscrew stator (402) from the discharge casing (504).

ATTENTION Left-hand thread!
Pull stator (402) from rotor (401). In the event of stiffness, turn stator (402) simultaneously. To this end, seize motor shaft as described under Section 2 of dismounting.

In case of drive by compressed-air motor, undo screw fitting (6) on pump side. Unscrew socket end (8) with taper nipple (9).

Via clamp (617), release quick-acting clamping connection with T-screw.

Withdraw discharge casing (504) over rotor (401).

Remove O-ring (511).

Grip rotor (401) with a pipe wrench on the shaft collar directly below the mechanical seal (219), and remove from the motor (1) while turning it. To do so, seize the motor shaft as described under Section 2 of dismounting.

Pull mechanical seal (219) from rotor (401).

Remove mechanical seal housing (214).

Push stationary seal ring with bearing ring of the mechanical seal (219) from the mechanical seal housing (214).

7.2.2 Mounting the eccentric screw pump

General
Mounting of the pump and its individual components is effected after careful cleaning in reverse sequence. Particular attention must be paid to the following:

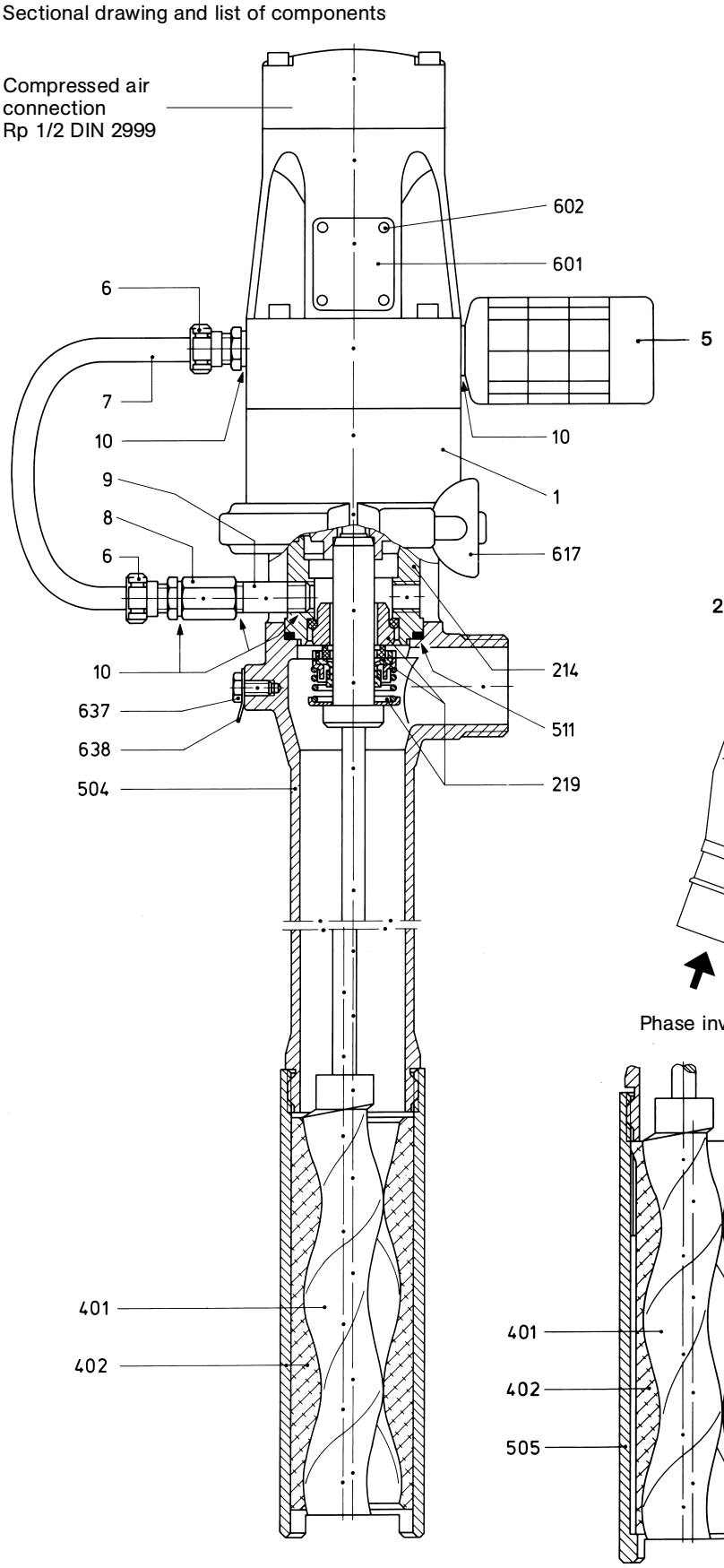
● **Mounting**

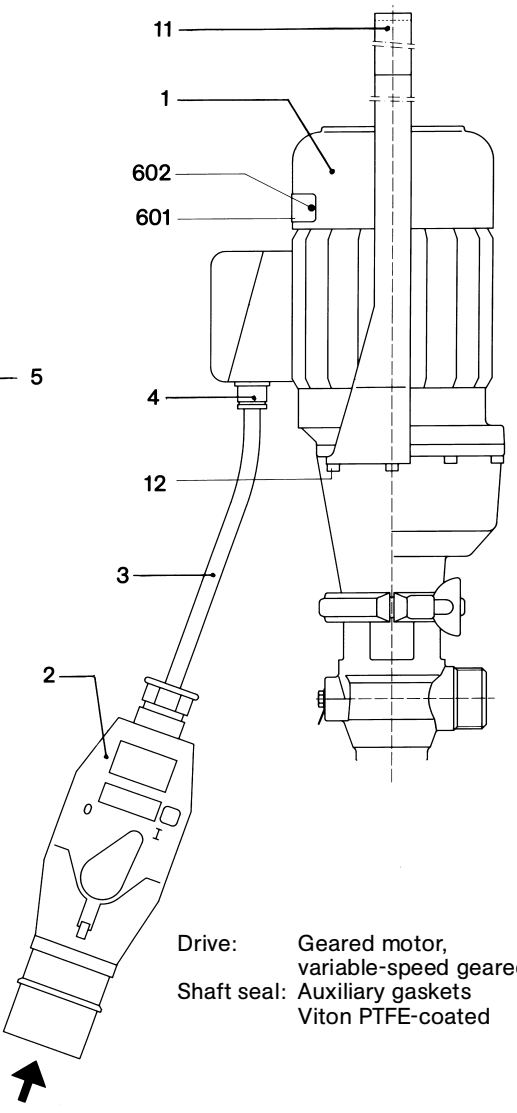
Prior to fixing clamp (617), turn mechanical seal housing (214) so that the threaded bores are arranged, turned through 90° to the discharge casing socket.

For pumps with elastomer stator:
Prior to mounting, coat stator (402) and rotor (401) with lubricant (silicone oil, polydiol, soft soap or equivalent).
ATTENTION Do not use ordinary oil! Before connecting it to the stator (402), coat the thread of the discharge casing (504) with flowers of sulphur or equivalent.

In case of pumps with solid stator:
Coat the thread of the discharge casing (504) with flowers of sulphur or equivalent before connecting it to the suction casing (505).

Sectional drawing and list of components





Drive: Geared motor, variable-speed geared motor
Shaft seal: Auxiliary gaskets Viton PTFE-coated

Phase inverter

Part No.	Denomination	Qty.	
1	Drive ①	1	
2	Motor protection plug	1	
3	Cable	1	
4	Cable fitting	1	
5	Sound absorber	1	
6	Screw fitting	2	
7	Compressed-air hose	1	
8	Sleeve	1	
9	Taper nipple	1	
10	Joint tape	1	
11	Distance piece for shaft	1	
12	Socket-head cap screw	4	
214	Mechanical seal housing	1	
219	Mechanical seal	1	r,R
401	Rotor	1	R
402	Stator	1	R
504	Discharge casing	1	
505	Suction casing	1	
511	O-ring	1	R
601	Name plate	1	
602	Round head grooved pin	4	
617	Clamp	1	
637	Hexagon screw	1	
638	Earthing plate	1	

Drive: Compressed-air motor
Shaft seal: Auxiliary gaskets Viton
Stator: Elastomer

Stator: Plastic

① depending upon design

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

When ordering spare parts, please quote machine number and/or complete pump type as shown on the name plate

Subject to technical alterations.

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