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FOR A GREEN WORLD

Operating instructions for completed machinery

HELIXDRIVE

553, 554, 556, 753, 756, 1103, 1106



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**Important basic information**

1 Important basic information

1.1 Scope of supply

Motor and pump from the HELIXDRIVE series will be delivered assembled on a pallet, unless the customer specifically requests otherwise. The standard scope of supply includes a base on which the pump and the drive motor are mounted.

1.2 General safety instructions

1.2.1 Symbols and signal words

Symbol / Signal word	Relevance
	Draws your attention to the impact of handling and safety information.
	Draws your attention to a dangerous situation, which results in serious injury or death, if not avoided.
	Draws your attention to a dangerous situation, which can result in serious injury or death, if not avoided.
	Draws your attention to a dangerous situation, which can result in mild to moderate injury, if not avoided.
<i>NOTE:</i>	<i>Draws your attention to possible property damage and other important information.</i>

1.2.2 General safety instructions

The operator of the progressing cavity pump should read the operating instructions before commissioning and observe the information during operation.

**Important basic information****1.3 Product liability**

For the purposes of the Product Liability Law, every farmer is a business.

According to §9 PHG liability for damages to property caused by product defects is specifically excluded. This disclaimer also applies to purchased parts not produced by BAUER itself.

Information obligation

If the machine is later transferred by the customer to a third party these operating instructions must accompany the machine and the new owner must then be instructed on the regulations referred to herein.

1.4 Intended use

The BAUER HELIXDRIVE Pump is designed for normal use in agricultural work, as well as industry and biogas plants (intended use).

Any other use is considered improper. The user alone shall bear the risk for damages resulting from improper use.

Intended use also includes compliance with the manufacturer's instructions for operation, maintenance and repair.

The operation and maintenance instructions do not consider local safety regulations.

BAUER HELIXDRIVE Pumps may be used only by persons who are familiar with and have been made aware of the dangers.

The relevant accident prevention regulations and other generally recognised safety, occupational health and road traffic rules are to be observed.

Any damages resulting from unauthorised changes to the machine exclude the manufacturer's liability.

1.5 Qualified personnel

Qualified personnel are people who, due to their training, experience and instruction as well as their knowledge of applicable standards, regulations, accident prevention regulations and operating conditions, can recognise and avoid potential hazards, and who have been authorised by those responsible for plant safety to perform necessary activities. Among other things, knowledge of first aid measures is required.

Warranty



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Important basic information

1.6 Warranty

Liability is assumed for defects in the delivery according to our delivery conditions.

BAUER assumes no liability for damages resulting from failure to follow the operating instructions and the service conditions.

When changing the operating conditions (feed medium, rotational speed, viscosity, temperature or pressure) it is necessary to determine whether the pump is suitable for this purpose.



2 Safety

These operating instructions contain important basic information for installation, operation and maintenance. Therefore, it is necessary that the operating instructions are read before installation by the fitter and the specialised personnel or operator, and must always be available at the machine.

Not only the general safety information listed under the main heading Safety is to be observed, but also specific health and safety information listed under other main headings.

2.1 Intended use of the machine

2.1.1 Application range

The pump series HELIXDRIVE has been designed and developed for agricultural and industrial use. It is suitable for pumping, metering and charging of thick and thin liquid media. Pumping acid or caustic media must be clarified with the manufacturer before use.

2.1.2 Personnel requirements

The personnel responsible for operation, maintenance, inspection and assembly must be fully qualified for this work. Responsibility, competence and supervision of the personnel must be clearly defined by the operating company. If the personnel do not have the necessary knowledge; teaching and training should be carried out.

Furthermore, it must be ensured by the operator that the personnel completely understand the operating instructions.

2.1.3 Local requirements

The service conditions, i.e. humidity, altitude, temperature, dust development, etc., must be clarified with the company in advance. These can vary from the standard with special accessories.

If danger exists from hot or cold machine components these parts must be secured against accidental contact.

Guards for moving parts must not be removed from in-service, operating machines.

Leakage (e.g. shaft seal) of hazardous substances must be contained so as to avoid any danger to people or the environment. Legal regulations must be observed.

Hazards from electrical energy must be excluded (see detail in the regulations of the VDE and the local electricity supply company)

2.1.4 Disposal



The machine must be disposed of according to local disposal guidelines.

2.2 Compliance with the assembly instructions and operating instructions

Non-compliance with the safety directions may result in a danger to people, the environment and the machine. Non-compliance with the safety instructions may lead to loss of any claims for damages.

In particular, non-compliance can for example entail the following risks:

- Failure of important functions of the machine/plant.
- Failure of specified methods for maintenance and repair.
- Hazard to persons by electrical, mechanical and chemical effects.
- Threat to the environment due to leakage of hazardous substances.

2.3 Unauthorised modification and manufacture of spare parts

Modifications of the machine are permitted only after consultation with the manufacturer. Original spare parts and accessories authorised by the manufacturer ensure safety. The use of other parts nullifies the liability for the consequences arising therefrom.



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Delivery, internal transport, unpacking

3 Design and function

As with all progressive cavity pumps, BAUER pumps belong to the family of rotary positive displacement pumps. A characteristic feature of these pumps is the particular construction and arrangement of the two conveyor elements, the rotor and the stator.

The different coefficient of rotor and stator produces a chamber, which alternately opens and closes due to the rotation of the rotor in an uninterrupted sequence, wherein the conveyed material is continuously transported from the suction side to the pressure side.

Sealing lines result from the geometric design and the constant contact between the two conveyor elements, which provides an absolute seal between the suction side and pressure side in every position of the progressive cavity, even at a standstill. The pump receives its high absorbency due to this closure between suction side and pressure side.



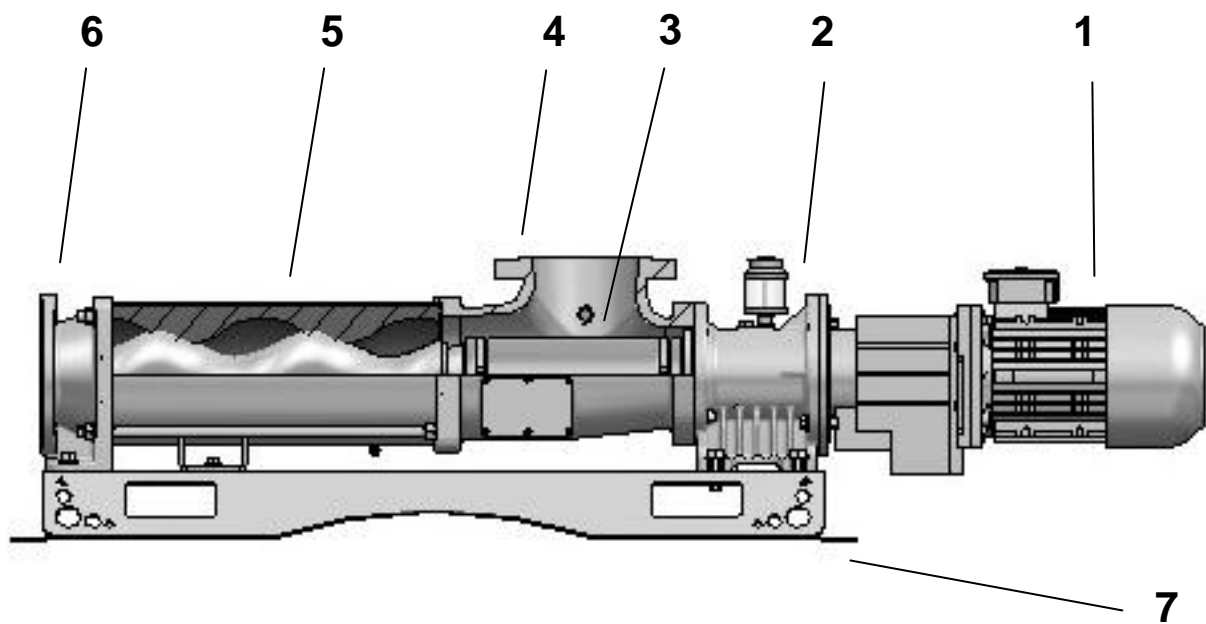
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Delivery, internal transport, unpacking

3.1 Design

3.1.1 Pump design HELIXDRIVE



1	Drive (gear motor)
2	Bearing block
3	Drive shaft
4	Suction housing
5	Rotor / stator
6	Pressure port
7	Base frame (assembly frame)

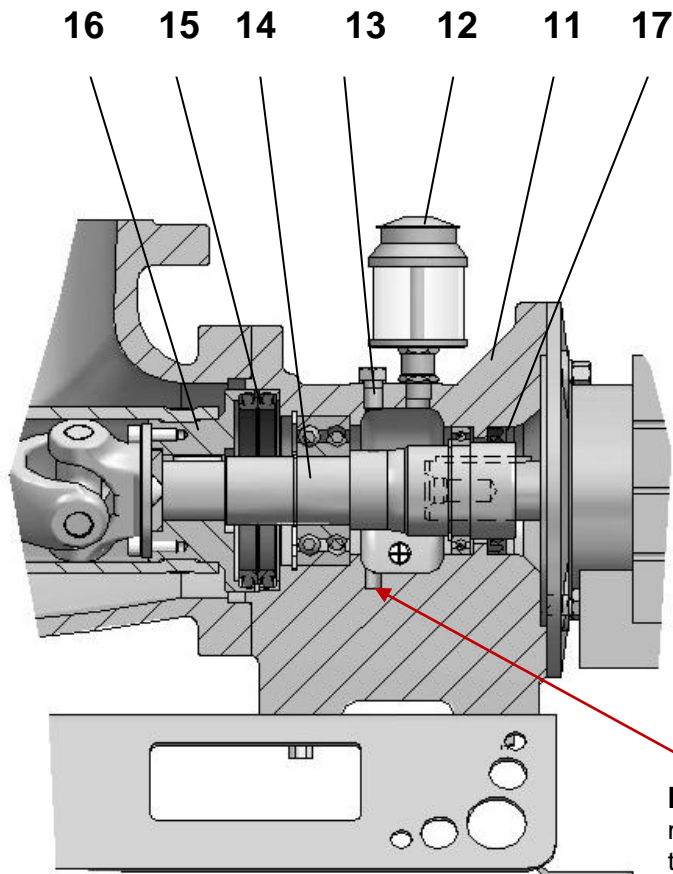


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Delivery, internal transport, unpacking

3.1.2 Design Bearing block M600 HELIXDRIVE



Important: Insert round material (locking piece) up to the stop



11	Housing
12	Oil level chamber (sight glass)
13	Locking hole (open screw => insert D=9.9 mm round material)
14	Shaft with bearing
15	Mechanical seal
16	Flange hub
17	Shaft sealing ring



4 Delivery, internal transport, unpacking

4.1 Packaging

The pump is delivered on a pallet. It is fixed with screws. This must be removed during assembly. The pump can then be removed from the pallet with suitable lifting gear and transported to its destination.

4.2 Transport

The transport of the unit is by means of hoist equipment. For transportation by a crane, the rope slings are to be attached as follows:

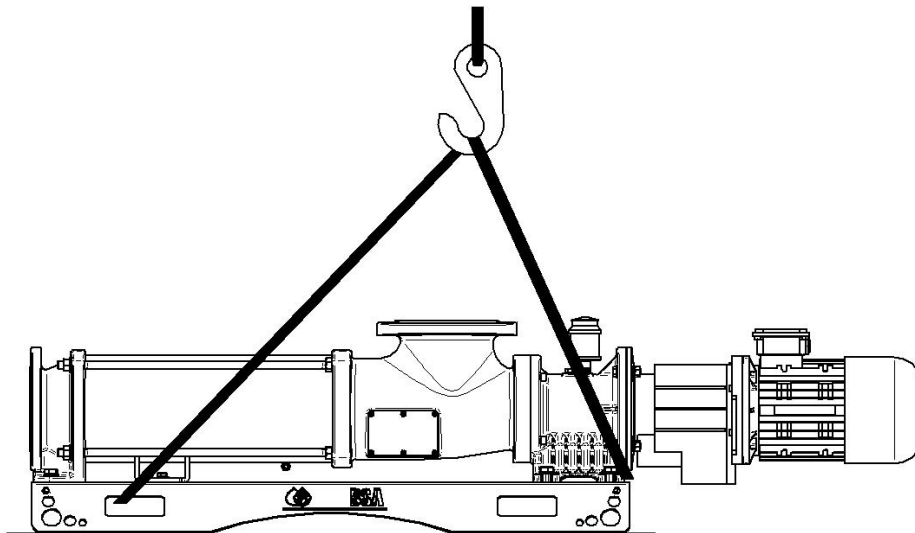


Figure 1: Transport of the pump

Crane device and rope slings must be of sufficient size.



Danger

Improper transport may cause the pump to fall or tip over. Possible consequences: Death or serious injury.

4.3 Interim storage of the pump (aggregate)

The pumps are to be stored in a clean, dry, well ventilated area. The relative humidity should not exceed 70%. Storage areas must be kept free of corrosion-promoting gases



5 Installation instructions

5.1 Mounting arrangement

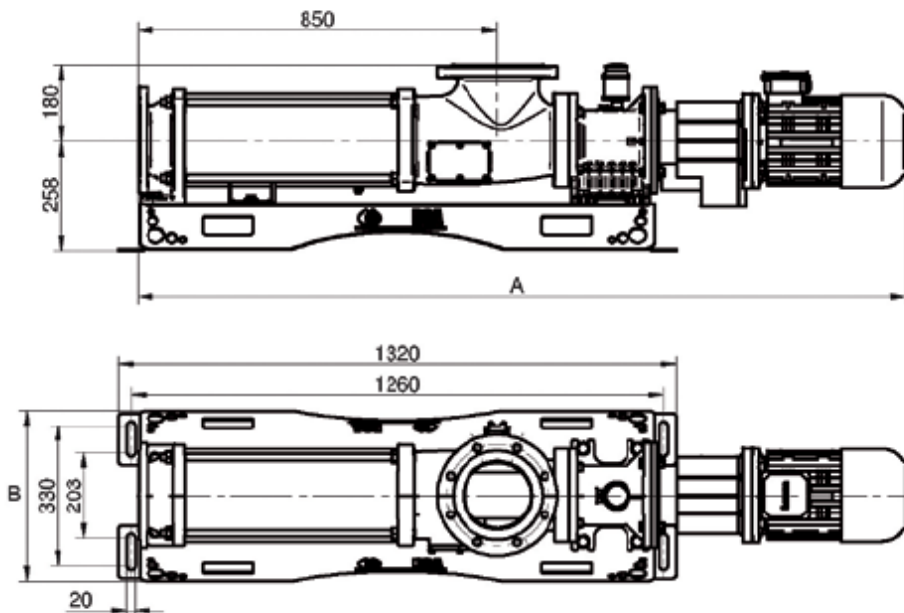
The pump / unit is basically only approved for horizontal mounting. The manufacturer must be consulted regarding any special requests.

Otherwise it can lead to loss of warranty.

The unit must be protected from frost.



5.2 Dimensions and weights



Type	Power	Dimensions A x B	Weight
553	5.5 kW	1850 x 400 mm	266.0 kg
554	5.5 kW	1745 x 400 mm	266.0 kg
556	5.5 kW	1745 x 400 mm	266.0 kg
753	7.5 kW	1873 x 400 mm	278.0 kg
756	7.5 kW	1850 x 400 mm	278.0 kg
1103	11.0 kW	1868 x 400 mm	295.0 kg
1106	11.0 kW	1950 x 400 mm	295.0 kg

For all models specified in the table the dimension of the flanges are as follows:

Pressure side: **DN 125 / PN10**

Suction side: **DN 150 / PN10**



5.3 Foundation and base

The foundation design is dependent on the size of the pump and the local conditions. For information on the pumps, see dimension sheet.

Foundation: Concrete
 Steel frame

For all foundation designs the weight of the pump unit must be distributed over the entire surface.

The base plate is to be attached to the foundation in a stress-free condition. This is ensured by uniform tightening of the screws and the precise adjustment of the piping work. The proper flatness of the foundation must also be ensured.

5.4 Installation equipment / lifting equipment

Special tools are not necessary for the installation and mounting of the pump.

The customer must check whether the available lifting equipment has sufficient lifting capacity for the safe installation considering the size and weight of the progressing cavity pump in question.

5.5 Space requirement

The determination of the required space is carried out by the customer under consideration of the following factors:

- Dimensions and weight of the machine
- Necessary transport and lifting devices and the possible piping layout, taking into account the easy replacement of the stator. (provide an intermediate section of pipe approximately 1.5 x stator size on the pressure side)
- Freedom of movement for: operating the drive motor, reading of speed and pressure displays and gauge, adjustment of a tensioning device (if fitted), operating a purging connection (if fitted).
- Space for lubrication / replacing lubricants
- Space required for handling assembly tools such as sufficient distance from an obstruction (e.g. a wall)

5.6 Laying of pipelines

5.6.1 Nominal sizes

**Installation instructions**

The choice of the sizes of suction and discharge piping shall be based on the pump nozzle sizes. The manufacturer must be consulted for any large deviations, particularly on the suction side.

5.6.2 Supporting of piping connections

The suction line should be kept as short as possible and rise steadily to the pump.

The pipelines must be supported near the pump and should be arranged to screw easily onto the pump connection in order to avoid tension.

5.6.3 Cleaning the pipes before installation

The suction pipes, taps and valves must be flushed and cleaned before installing the pump.

This is intended to remove installation materials such as screws, nuts, weld spatter and other metal parts that could damage or destroy the internal parts of the pump. If any damage is caused by such items the warranty is rendered invalid.

5.7 Safety and control devices**5.7.1 Pressure gauge and vacuum gauge**

Pressure gauge and vacuum gauge shall be connected to the pressure and suction lines.

5.7.2 Safety device in the pressure line

For stationary pumping equipment the operating company must install a safety relief valve in the immediate vicinity of the pump in the pressure line upstream of the shut-off valve.

Safety options:

- Electronic shut off (pressure switch)
- Shut off with bypass control (mechanical pressure relief valve)

Progressive cavity pumps are positive displacement pumps and can theoretically produce an infinitely high pressure.



If the pressure line is shut the pump pressure can reach many times the permitted system pressure. This can lead to the destruction of the pump, overloading of the motor or the bursting of pipes, which must be avoided particularly when pumping hazardous materials.



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Installation instructions

5.8 Electrical connections

The connection of the drive motor cable must be carried out by a qualified electrician in accordance with the motor manufacturer's wiring diagram. For this purpose the valid VDE regulations and the regulations of the energy supply company must be complied with.



Electrical



6 Commissioning / decommissioning

6.1 Preparation for commissioning

6.1.1 Filling the pump

For the initial start-up and if the pump has been idle for a long period, the pump (suction line) must be filled with liquid. This serves to lubricate the rotor and the stator. Serious damage can occur after only a few revolutions of the pump without liquid.

WARNING!

A progressing cavity pump must never be run dry.

After filling, the pump is self priming.

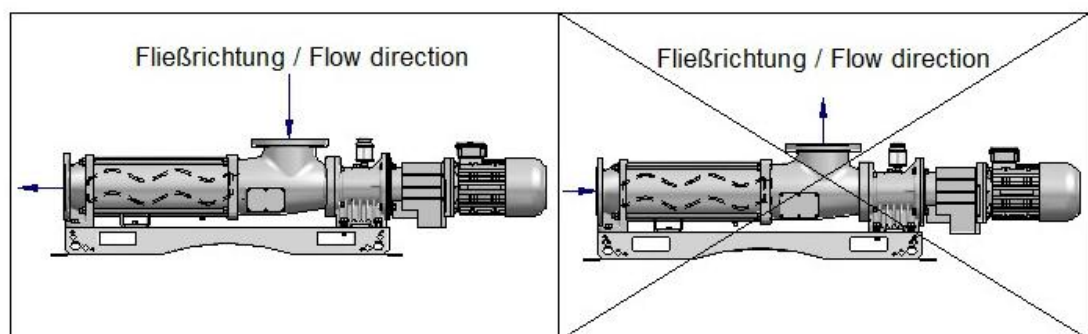
6.1.2 Breaking the pump free

Before the first start-up or after long idle periods it is advisable to turn the pump with a suitable tool. (for example by applying to the hollow shaft) to release any possible sticking of the rotor and stator.

When operating with frequency converters, it must always be ensured that the frequency converter is one design size larger than the drive. In this way the parameterization of the frequency converter guarantees a starting current of 200%. This is required for breaking the pump free.

6.1.3 Checking direction of rotation

The direction of rotation of the pump determines the flow direction of the fluid.



The correct direction of flow of the pump is from the suction housing to the discharge nozzle. (see diagram). For the removal of blockages the pump may be briefly be reversed (opposite direction of rotation).

Continuous operation in the reverse direction (pumping direction) causes damage to the drive and the seals for which the operating company (purchaser) is responsible. In this case the warranty is void.





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Commissioning / decommissioning

6.1.4 Commissioning of the drive unit

The commissioning of the drive unit is shown in the manufacturer's operating instruction (attached).

6.1.5 Stationary pump

If the system is taken out of service the pump and ancillary equipment must be protected from the following:

- from frost
- from deposition of solids
- from sedimentation of the medium
- corrosion (parts in contact with the media)

We recommend that the pump is emptied and preserved during any shutdown of the system.



7 Troubleshooting

Type of fault										Possible cause	Repair of the fault	
Pump does not start (any longer)	Pump has no suction (any longer)	Flow rate is too low	Pressure is too low	Conveyance varies	Pump runs loud	Pump is seized	Drive overloaded	Stator life is too low	Rotor life is too low			Mechanical seal leaking
X							X				With new pump or new rotor and stator: Static friction is too large	Fill pump, spin by hand, if necessary apply lubricant to the stator
X		X	X				X				Pump electrical data does not match with the network supply. E.G 2 phase operation	Check the pump order details, check wiring
X							X				When operating the pump with frequency converter: Starting current is too low	For new installations use the next larger frequency, the starting current at the pump can be up to two times greater than the nominal current
		X					X	X	X		The pressure is too high	Measure the pressure at the pressure gauge, compare with the order details
X						X	X				A foreign object is jammed in the pump	Remove foreign object and repair any damage
X						X	X	X	X		The temperature of the medium is too high, the stator expands too much	If the temperature of the medium cannot be reduced, use a rotor with a smaller diameter
X					X	X	X	X			The stator is swollen, the elastomer is unstable to the medium being pumped	Check the order details.
X					X	X	X	X	X		The solids content of the medium is too great, dry matter content is too high; blockages	Increase the liquid content of the medium
X					X	X	X	X	X	X	The pumped medium forms sediment or solidifies when stationary	Clean pump and flush after each use



Troubleshooting

	X	X	X	X	X					X	Air is entering the suction line	Increase the level of the liquid on the suction side; prevent intake vortices, prevent or bleed trapped air, check piping for leaks
X	X	X	X	X	X	X	X			X	The shaft seal is leaking; medium is entering the oil reservoirs, oil from the reservoir is low	Mechanical seal leaking
		X	X	X	X			X	X		The suction lift is too great or the suction head too low. (Cavitation)	Decrease the suction resistance; reduce the medium temperature; lower the position of the pump
		X	X		X	X	X	X			The pump runs dry	Refill the pump, provide dry running protection, modify piping
	X	X	X		X						The stator is worn	Replace the stator
	X	X	X		X			X			The rotor is worn out	Replace the rotor
	X	X	X		X			X	X		The stator is brittle	Replace the stator; check the resistance
					X						The cardan shaft joints are worn out	Replace the joints
X					X		X			X	The bearings in the bearing block have failed	Replace bearings and re-seal, ensure proper lubrication, fill with oil
							X				The viscosity is too high	Check the viscosity; check the order details
	X									X	The direction of rotation / flow direction is wrong	Check the wiring
					X					X	Rings in the mechanical seal are damaged, swollen or brittle	Replace mechanical seal



8 Maintenance

8.1 Pump inspection and maintenance plan

Activities	d	w	m	y
Check the oil level in the oil sight glass	x			
Check the noise level of the pump and drive	x			
Change the oil in the bearing housings (every 4000 operating hours)				x
Clean the pump and / or suction housing		x		
Change rotor, change stator	Depending on the medium being pumped			

t = daily, w = weekly, m = monthly, y = yearly

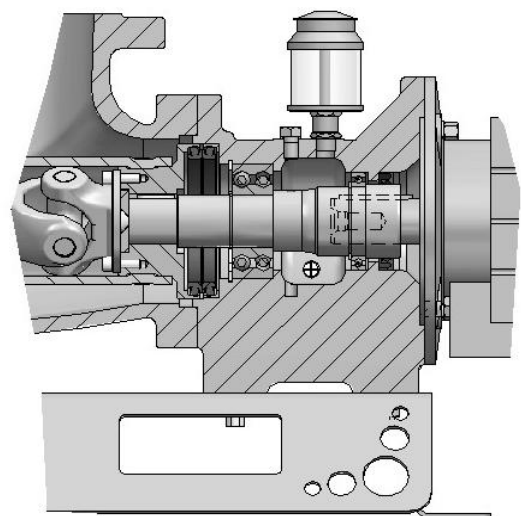
8.2 Lubricant in the bearing block

For the oil change and to refill the sight glass gear oil according to the **DIN 51517 Part 3** standard must be used.

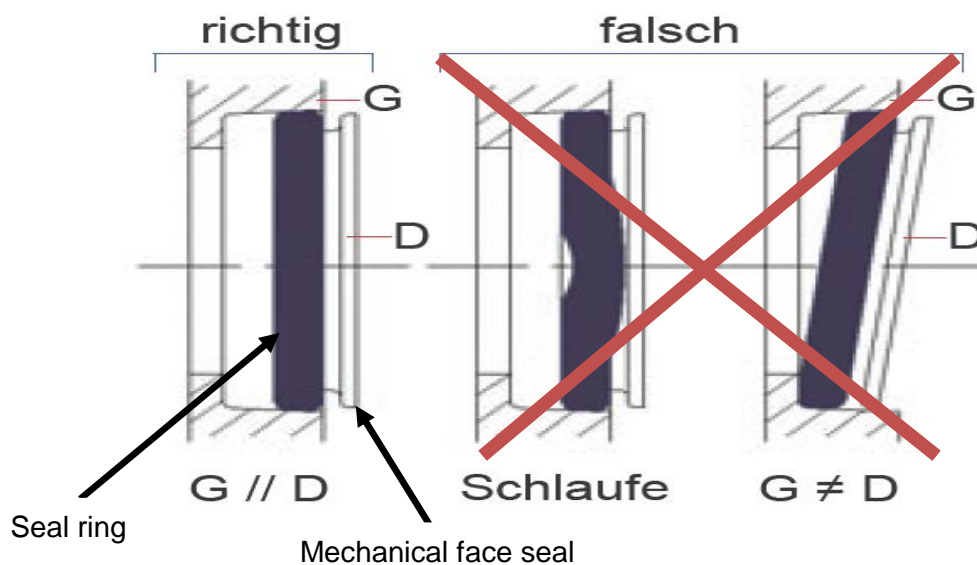
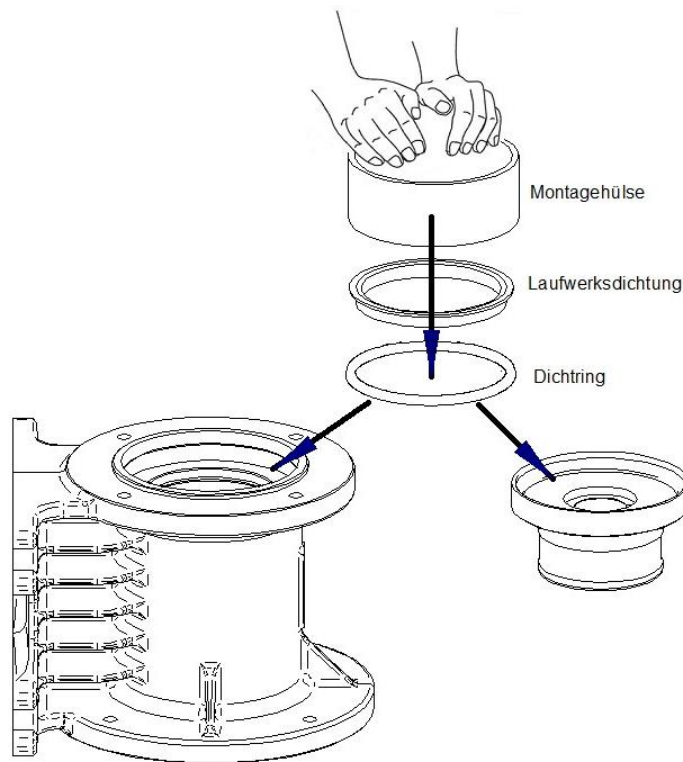
8.3 Replacement of the mechanical seals

As a first step all of the parts attached to the bearing housing must be removed.

1. Disconnect the pipelines
2. Disconnect the motor
3. Drain the oil from the bearing block
4. Remove the pressure port
5. Remove the stator
6. Remove the suction housing
7. Remove the protective tube
8. Remove the drive joint
9. Draw back the flange hub
10. Remove the seal
11. Clean the flange hub and the seal seat



12. Install the new mechanical face seal as shown in the sketch. **Important:** Grease the mechanical face seal and install using the fitting sleeve



13. Refit the flange hub and tighten with washers and bolts up to the end stop.
Important: Apply a medium-strength thread locker to the bolt (Loctite 243)

14. Refit the pump and fill with oil. **Important:** The drive shaft protective sleeve must be completely filled with grease. Surface sealant must be used when joining the bearing block to the suction housing.



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Maintenance

9 EC Declaration of Conformity according to EC Directive 2006/42/EC

The manufacturer

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herewith confirms that the machine mentioned below

Designation of machine	Eccentric Screw Pump HELIXDRIVE
Machine type / basic units	553, 556, 753, 756, 1103, 1106
Consists of	Positive displacement pump with gearbox and gear motor

corresponds analogously to the requirements of the Machinery Directive 2006/42/EC.

In case of a modification of the machine not accorded with BAUER GmbH, this declaration will cease to be valid.

The following standards as amended have been applied analogously:

DIN EN ISO 12100-1	Safety of machines – Basic concepts, general principles for design, Part 1: Basic terminology, methodology
DIN EN ISO 12100-2	Safety of machines – Basic concepts, general principles for design, Part 2: Technical principles and specifications
DIN EN 60204-1	Safety of machines - Electrical equipment of machines, Part 1: General requirements
EN ISO 14121-1	Safety of machines – Risk assessment

Norms related to products

EN ISO 13857	Safety of machines, safety clearance to secure no touching hazard area with upper extremities.
DIN EN 349	Safety of machine, minimum clearance to avoid crushing body parts
DIN EN 809	Pumps and pump units for liquids - Common safety requirements

The documents belonging to the machine according to annex VII, part B have been attached.

The machine component must not be put into operation unless it has been proven that the machine where the machine component shall be installed, corresponds to the regulations of the EC Machinery Directive (2006/42/EC). The CE mark is applied by the operator as final manufacturer.

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Gernot Pauger
Technical Designer in Charge

Andreas Schitter
Commercial Manager

HELIXDRIVE

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