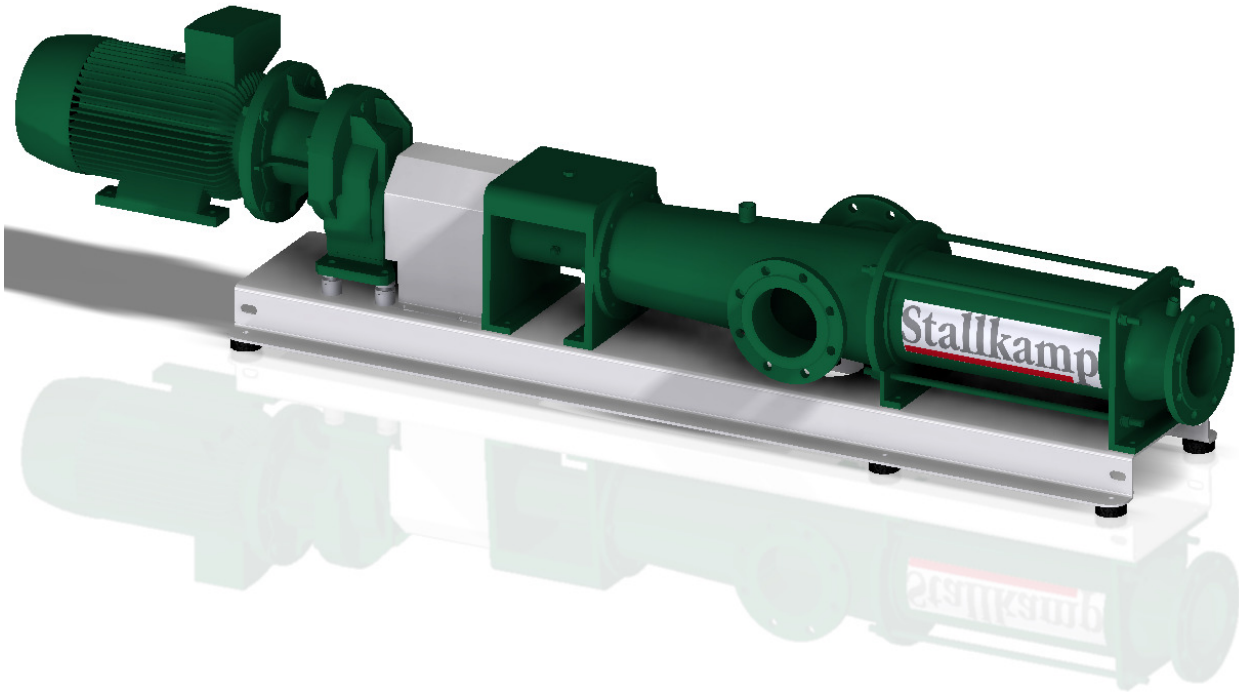
Stallkamp

OPERATING MANUAL

Eccentric screw pump

HEX type 80-110 M1610



Document no.: 8130312 Version: July 2016

Space for notes:

General information

- **The technical specifications, weights and measures are to be considered approximate and not binding.**
- **Pictures are for illustration purposes and can deviate from the actual product.**

Date saved: 05.04.2018 12:36:00
Date printed 16/04/2018
BA_HEX Exzenterschneckenpumpe BG80-100 M1601_englischV2_8130312_EN(UK).DOC

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2 DECLARATION OF CONFORMITY PURSUANT TO MACHINERY DIRECTIVE 2006/42/EC (ORIGINAL, GERMAN VERSION)

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Product name: Eccentric screw pump HEX type 90-110

Type: HEX 80-1/2 M1610 HEX 90-1/2 M1610, HEX 100-1/2 M1610 and HEX 110-1/2 M1610 (-1=single-stage,-2=two-stage)

We hereby declare that the products listed above conform to the pertinent regulations of the EC Directive:

Machinery Directive 2006/42/EC

Including all amendments and compliant with the pertinent regulations of the directive on electromagnetic compatibility:

EMC Directive 2004/108/EC

The following harmonised standards have been applied:

EN ISO 12100: 2010, Safety of machinery – General principles for design

EN 809:2002-06-01, Pumps and pump units for liquids – Common safety requirements

EN 60204-1:2007-06, Safety of machinery – Electrical equipment of machines; Part 1: General requirements

EN 61000-6-1:2007, Electromagnetic compatibility (EMC) Part 6-1: Generic standards – Immunity for commercial environments

EN 61000-6-2:2005, Electromagnetic compatibility (EMC) Part 6-2: Generic standards – Immunity for industrial environments

Dinklage, dated 16 April 2018 14:34:09

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This declaration is not an assurance of characteristics in the sense of the German law on product liability. The safety instructions provided in the product documentation must be observed. If any conversions or modifications are made to the product, this declaration shall lose its validity with immediate effect.

3 GENERAL INFORMATION

Our devices are developed according to the current state of technology, manufactured with great care and subject to a continual quality control. This operating manual should help you to get to know the device and to employ its proper operational possibilities.

The operating manual contains important notices in order to operate the device safely, appropriately and cost-effectively. It is necessary to observe the operating manual to ensure the reliability and long lifespan of the device and to avoid hazards.

The operating manual does not take local, on-site requirements into consideration; the operator is solely responsible for ensuring that these are observed, including by external installers.

3.1 Designation of notices in the operating manual

In the operating manual, safety instructions warning of dangers to persons are identified with the general hazard symbol according to DIN 4844-W9.

In the operating manual, warnings about electrical voltage are identified with the safety signs according to DIN 4844-W8.

All other notices which might restrict the functional reliability of the device or represent a danger for the machine if not observed are marked with the word:

ATTENTION!

This machine unit may not be operated beyond the values defined in the technical documentation with respect to pumped liquid, delivery flow rate, rotational speed, density, pressure, temperature as well as motor power output or other instructions contained in the operating manual or contract documentation. If you have any queries, please consult the manufacturer.

The rating plate displays the most important operating data and the machine serial number. We request that this always be specified in the event of enquiries, subsequent orders and when purchasing spare parts.

Provided that additional information or notices are required or in case of damage, please contact our local field sales employee or contact us directly.

3.2 Unauthorised conversion and spare part manufacture

Conversions and modifications to the devices and their machine units are only permissible with the explicit approval of the manufacturer. The use of non-"genuine spare parts" abrogates all liability.

4 SAFETY

This operating manual contains fundamental information which must be observed during installation and operation as well as when performing maintenance work on the device.

It is therefore absolutely necessary that the installer as well as the responsible specialist personnel and operator read these instructions before installation and commissioning, and that they are continually available at the location where the machine is operated.

Not only the safety instructions in this operating manual must be observed, but also the warning signs and regulations of the respective professional association in the latest version.

4.1 Qualification of the personnel

The personnel performing the operation, maintenance, inspection and installation must be appropriately qualified for this work.

Area of responsibility, competence and the monitoring of the personnel must be precisely regulated by the operator. If the necessary skills are not available to the personnel, then they should be appropriately trained and instructed.

Furthermore, the operator must ensure that the personnel fully understands the contents of the operating manual.

4.2 Dangers if the safety instructions are not observed

Failure to observe the safety instructions can endanger persons as well as the environment and the machine. Failure to observe the safety instructions results in the loss of all claims for damages.

Specifically, failure to observe instructions can, for example, result in the following dangers:

- Failure of important functions of the device or system.
- Endangerment of persons due to electrical, mechanical, chemical or other exposure.
- Endangerment of the environment due to leakage of hazardous materials.

WARNING SIGNS

Observe all notice and warning signs. Dangerous gases can escape when stirring the manure.

DANGER OF POISONING!

If the manure is stored below slatted floors, the presence of persons in buildings during agitation is only permissible with sufficient ventilation. Therefore, windows and doors must be open and the ventilator set to full power.

4.3 Safety-conscious work

Observe all safety instructions presented in this operating manual, the existing national regulations for accident prevention as well as possible internal work, operation and safety regulations of the company at all times.

Safety instructions for the operator and attendant:

- ✓ If hot or cold machine parts can pose a hazard, then these parts must be protected on site against contact.
- ✓ Contact protection for moving parts may not be removed while the machine is in operation.
- ✓ Any leakage of dangerous materials must be conducted away so that there is no endangerment to persons and environment. Observe statutory provisions.

4.4 Safety instructions for maintenance, inspection and assembly work

The operator has to ensure that all maintenance, inspection and installation work is carried out by authorised and qualified specialist personnel.

Fundamentally, all work on the machine can only be carried out when the machine is at a standstill.

Directly after completion of the work, all safety and protection equipment must be reattached or made functional.

5 GUARANTEE

This section contains the general particulars for the guarantee. Contractual agreements are always treated with priority and are hereby not rescinded. The period of guarantee is a component of Stallkamp's general terms and conditions. Agreements deviating from this must be specified in writing in the order confirmation.

5.1 General

Stallkamp is obligated to repair every defect to products sold by Stallkamp under the condition:

- ✓ that it is a quality defect of the material, manufacture or design;
- ✓ that the defect is reported in writing to Stallkamp or the Stallkamp representative within the period of the guarantee;
- ✓ that the product is employed exclusively in the specified operating conditions described in the operating manual and employed for the intended purpose;
- ✓ that the monitoring device integrated in the product is correctly connected (temperature protection);
- ✓ that only genuine Stallkamp spare parts are used.

5.2 Exclusion of liability

No guarantee or liability is assumed for damage to the device if one or several of the following points are applicable:

- A faulty configuration of the device on our part because of inadequate or incorrect information from the ordering party or operator.
- Failure to observe the safety instructions, regulations or the necessary requirements in this operating manual which apply according to German law.
- Installation, disassembly or repair of the device not in keeping with the regulations.
- Inadequate maintenance.
- Possible chemical, electrical or electrochemical influences.
- Wear and tear.

Since maintenance has an influence on the safety and functional capability of the device, it is an integral component of the guarantee. The operator of the device is obligated to have the manufacturer himself or a service approved by the manufacturer perform maintenance work according to the regulations of the manufacturer, including the necessary changing of oil and the repair and replacement of wearing parts. The operator is thus obligated to maintain a maintenance and revision list, which facilitates monitoring of the mandatory inspection and maintenance work (see Point 16 Maintenance and revision list).

We expressly emphasise that this device is a fluid flow engine in which the protective coating is exposed to constant wear from the abrasive contents of the medium being pumped and should consequently be classed as a wearing part. Wear, damage and secondary damages which result from external influences on the protective coating are expressly excluded from the guarantee. The use of devices and/or the field of application and reliability for the application must be verified by the operator and does not form part of the guarantee.

The liability of Stallkamp thereby excludes any liability for personal damages, material damages or financial losses.

The manufacturer reserves the right to modify the performance, specifications or configuration data without prior information.

6 PRODUCT DESCRIPTION

6.1 General description

The pumps are generally powered by tractors or electrical motors. Of course, however, operation with petrol or diesel engines is also possible. If you are performing the installation, please ensure the flowing, precise connection of the output and drive, and avoid axial forces under all circumstances. The forces should be transferred via couplings, which should be able to transfer the calculable loads.

This operating manual applies to the standard model of the Stallkamp eccentric screw pump.

These pumps are available in the following versions:

- Eccentric screw pump type HEX standard pump for tractor or electric drives
- Eccentric screw pump type HEXe with electric drive on the same console

6.2 Intended use

The eccentric screw pumps are intended for the pumping of agricultural manure and biomass, and must not be operated in explosive atmospheres. The pumps are used to pump low-viscosity to high-viscosity liquids including pure/contaminated liquids. When pumping liquid-gas mixtures (foams), care must be taken to ensure that the liquid matter provides adequate lubrication of the conveying elements. These pumps are equipped in such a way that a high flow rate at high flow pressure is achieved proportional to the power consumption. The pump performance is dependent on the density and viscosity of the liquid as well as on the size of the delivery pipelines. Foreign bodies such as stones, chains, collars etc. must be kept away from the pump by means of suitable safeguards, otherwise they might destroy the pump. The eccentric screw pumps can be used for various applications including the following:

- In agriculture for manure, biomass and pig feed
- In sewage and sewage treatment technology for waste water with and without solid matter, and for municipal sludge
- In breweries for sewage, mash and spent grains
- In construction for waste water and lime sludge
- In mining for sludge and pit water

The eccentric screw pump:

- Is self-priming with positive displacement,
- Generates low pulsation and turbulence pumping with high efficiency
- Has variable speed and is self-sealing, therefore requires no valves

Always follow the instructions in the operating manual concerning the avoidance of dry running and the compliance with the prescribed maintenance intervals.

6.3 Type plate for HEX M1610

The type plate displays the most important power and specification data:

Classification:	(e.g. HEX 100-1)
Motor number:	(e.g. 1202/000000)
Year of manufacture:	(e.g. 2016)
Test number:	(e.g. 4007)

Fig. 1: Type plate

In case of technical queries about the device, the above type plate data must be specified!

7 PERFORMANCE DATA AND DIMENSIONS OF THE HEX M1610

Technical data:

Maximum drive speed: The speeds for eccentric screw pumps type HEXe with electrical drive motors were adapted to optimised gear transmissions (see Table 1).

Maximum operating pressure: 6 bar for single-stage pumps, according to the performance data in Table 1

7.1 Performance data for pumps of the type HEXe M1610 with gear motor

TYPE HEXe	Maximum pressure in bar	Rotational speed in rpm	Flow rate in m³/h	Capacity in kW
80-1	2	386	36	5.5
90-1	2	234	32	5.5
100-1	2	234	47	7.5
110-1	2	234	68	11
80-1	4	386	31	7.5
90-1	4	234	27	7.5
100-1	4	234	40	11
110-1	4	234	63	15
80-1	6	386	27	11
90-1	6	234	16	11
100-1	6	234	26	15
110-1	6	234	46	18.5

Table 1: Performance data

7.2 Dimensions of HEX M1610

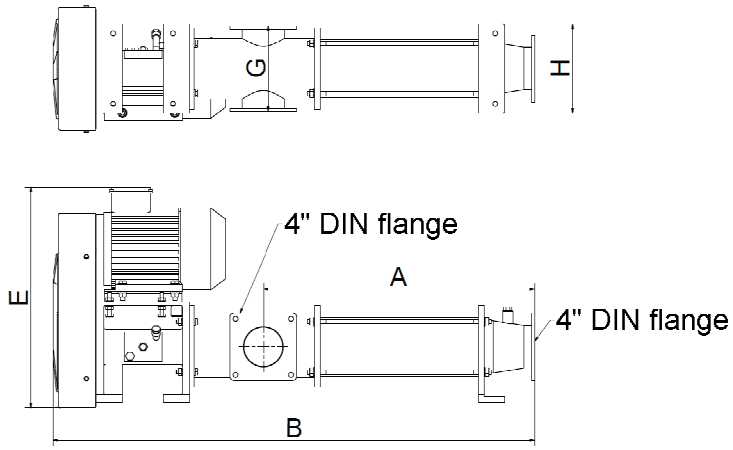

Fig. 2: Dimensions 80-1 with belt drive and motor

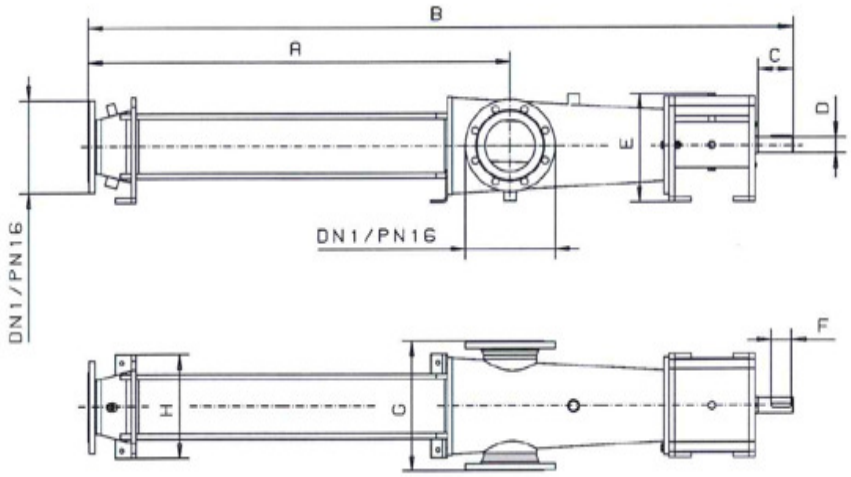

Fig. 3: Dimensions 90-1,100-1,110-1

TYPE	Dimensions, specifications in mm									
	A	B	C	D	E	F	G	H	DN1	DN2
80-1	730	1290	-	-	590	-	230	240	4"	4"
90-1	825	1735	110	48	335	14x62	400	320	150	150
100-1	912	1922	100	48	335	14x62	400	320	150	150
110-1	912	1922	100	48	335	14x62	400	320	150	150

Table 2: Dimensions

7.3 HEX M1610 components

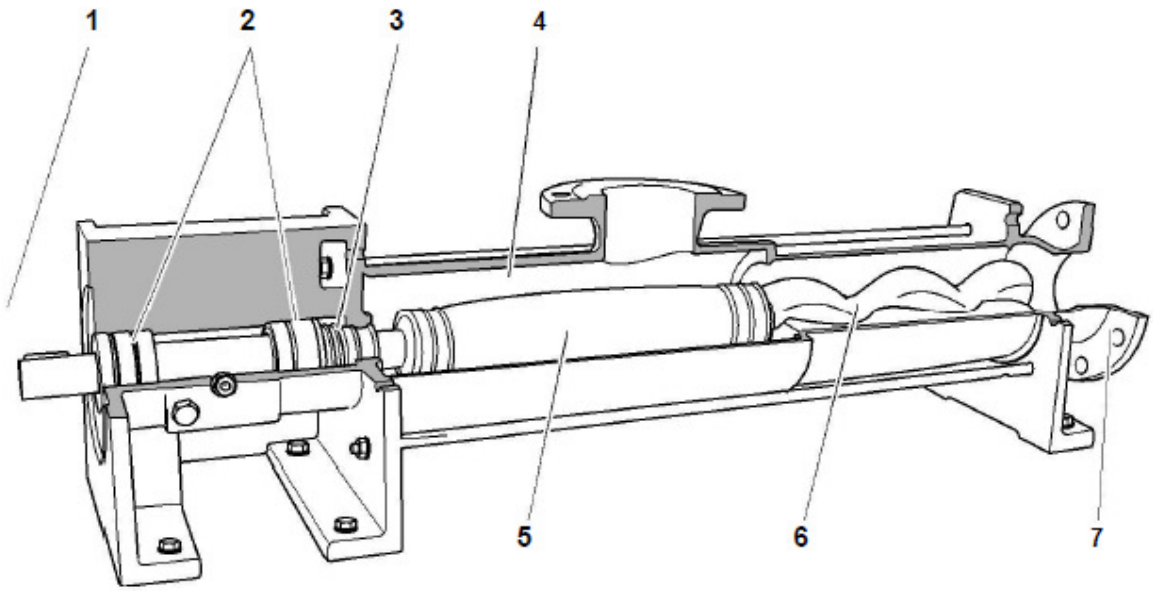

Fig. 4: Components

(1) Gear (not illustrated), e.g. gear motors

(2) Bearing in oil bath for absorbing axial forces

(3) Seal unit – pump-side by means of slide ring seal, drive-side by means of shaft seal ring

(4) Suction or hopper-based housing for connecting the suction-side piping

(5) Articulated shaft with hose sleeve and maintenance-free grease filling for connecting concentric drive shaft and eccentric rotor shaft

(6) The conveying elements (rotor and stator), which can be one or two-way

(7) Pressure port or outlet port for connecting the pressure-side piping.

8 PUMPS IN SUCTION-PRESSURE OPERATION

8.1 Eccentric screw pump HEX M1610

In optimal application conditions, the eccentric screw pump you have purchased achieves the physically possible vacuum and sets a maximum suction height of 8 m. The highest and lowest point of the suction line are taken as the height difference. An important feature for optimal suction are suction lines with a sufficient cross-section which should not be less than 150 internal diameter and, where applicable, having a larger suction housing equipped on the lower suction head. Stationary suction lines laid in accordance with the specifications have an interior width of approx. 200mm. This minimises the flow pressure losses. The physically logical structure in suction-pressure operation is still the shorter suction path and the consequently longer pressure line. An additionally fundamental and important optimisation is achieved by the fact that the respective suction and pressure connection on the pump is superordinate to the level of the pump input and output openings.

Important:

The suction and pressure connections to the pumps must be routed sloping upwards so that when the system is turned off, fluid remains in the pump, avoiding dry running. In addition, long suction lines in the flow direction must include drops of at least 2x tube diameters to ensure the tubes never run dry.

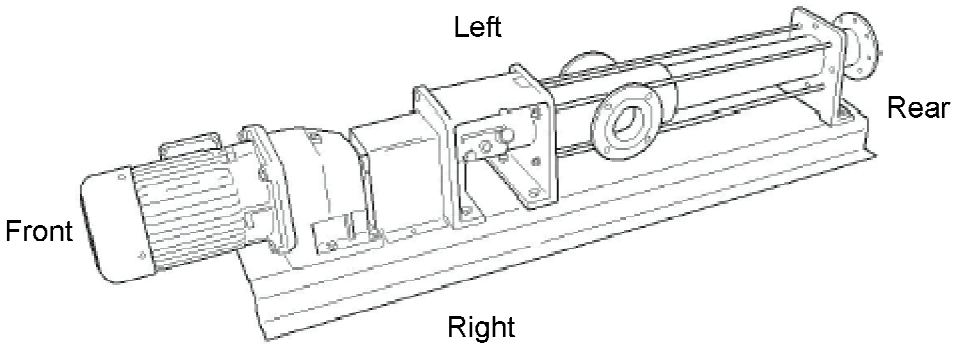

Fig. 5: Direction markings

All directions (right, left, front, rear) should be understood in the flow direction of the eccentric screw pump.

These pumps are principally intended for installation in a pump system. They may only be operated within the piping systems installed for them and not without corresponding safety equipment.

The suction intake should be primed with water prior to the first use. This measure is also recommended or required if you experience any suction difficulties.

8.2 Winter use

To avoid the rotor from freezing solid when there is a danger of frost, the medium remaining in the pump should be removed in both directions by suctioning air by pumps without pumping medium. Avoid extended periods of dry running.

8.3 Suction and pressure lines

As a fundamental rule, it must be ensured that only high-quality materials are used on the suction and pressure sides, especially in the area of the tubes. This is an important contribution to the perfect functioning of your pump. Only use high-pressure lines (ND 10/16) on the pressure side. If you have any planning problems, please feel free to contact us. We recommend the use of compensators/vibration dampers to isolate mechanical vibrations between pump and piping system.

8.4 Media which are difficult to pump

Thick and viscous media follow the generated vacuum correspondingly slowly. For this reason, it is essential to ensure that the rotation speed is maintained correspondingly low. This procedure guarantees continuity in the intake flow. The suction flow will break in the case of unnecessarily caused acceleration.

9 ELECTRICAL CONNECTION OF TYPE HEXE WITH MOTOR

9.1 Electrical connection and protection of the electrical motor

The electrical connection may only be carried out by a certified electrician. The VDE regulations (German Association for Electrical, Electronic & Information Technologies) must be observed. Compare the existing voltage with the specifications on the motor's manufacturer's plate and select the appropriate circuit.

The manual switch box and the plastic housing of the automatic delta-wye start are splash-proof according to IP54.

The technical connection conditions of the local energy authorities must be observed during connection.

A motor protection device is a prerequisite.

The electrical motor of the eccentric screw pump must be properly connected to the mains supply (pay attention to serviceable protective conductors) and check whether the feed cable is properly protected. The respective power consumption of the motor in amperes is shown on the motor's type plate. See Point "7.

Performance data and dimensions "

ATTENTION!

The switch box must be protected from moisture at all times!

9.2 Direction test

The direction of rotation is anticlockwise from the perspective of the drive side (front), whereby the pumping medium is sucked in from the left or right and pushed backwards.

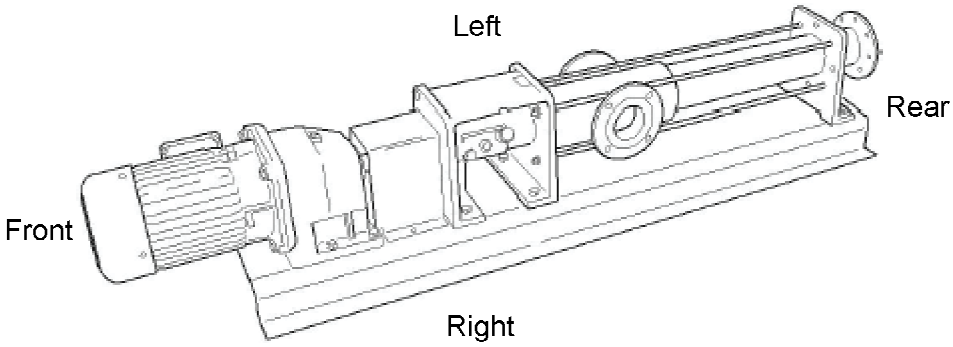

Fig. 6: Direction markings / direction test

The direction can be tested by turning the device on and off again rapidly.

If the direction is incorrect, swap any two of the phases L1, L2 and L3 of the feeder in the switch box!

The electrical installation may only be carried out by a certified electrician.

(As per VDE regulation.)

IMPORTANT!!

The electric cable must ***never*** be subjected to tensile loads, as this can cause damage to the unit.

10 COMMISSIONING

10.1 Prior to commissioning: safety instructions

The following rules should fundamentally be observed to prevent accidents during maintenance and installation work:

(8) Never work alone. The danger of drowning and suffocation must not be underestimated.

(9) Check whether sufficient oxygen is available and that no poisonous gases exist.

(10) Before welding work or using electrical tools, check whether there is a danger of explosion.

(11) Pay attention to the danger of electrical accidents.

(12) Examine lifting gear to ensure its fully satisfactory condition.

(13) Ensure an adequate shutoff at the place of work, e.g., cordoning trellis.

(14) Wear a hardhat, safety glasses and safety footwear.

(15) Keep a first-aid kit ready.

Otherwise, observe the health and safety regulations as well as the prevailing governmental regulations.

The rotary pumps can only be operated installed on suitable consoles or coupler heads.

10.2 Commissioning the eccentric screw pump type HEXe

(1) The type HEX pump is factory-fitted with connection flanges according to DIN2576 ND150. We recommend the use of compensators/vibration dampers to isolate mechanical vibrations between pump and piping system.

(2) The HEXe pump is factory-fitted with a gear motor and coupling on a console shared with the pump.

(3) Install the console as close to the suction point as possible on a suitable concrete foundation, connect the suction and pressure lines, connect the motor to the electricity.

(4) To avoid dry running, prime the suction intake with water. This measure should be repeated if you experience any suction difficulties.

(5) Protect pit openings with covers or barriers to prevent persons from falling in.

(6) Connect the suction and pressure lines **ATTENTION:** Direction test, see Point 9.2. The secure positioning of all screws and connections must be verified.

(7) The pump must always be switched on with an open pressure valve, as otherwise the pressure might rise to an unacceptable level, thus destroying the pump, motor, gear or system components.

(8) Commission the pump with the delta-wye motor protection switch. Attention: Turn through to "Delta"! **ATTENTION:** Direction test, see Point 9.2.

(9) As standard, the electrical motor is protected by an overload protection in the switch box.

In case of an overload, the pump is switched off by a motor protection switch. If the motor of the pump was switched off as a result of overloading, under no circumstances should you try to restart the motor by pressing the switch repeatedly. The cause of the error must be identified (foreign bodies, etc.).

11 TRANSPORT AND STORAGE REGULATIONS FOR HEX M1610

The pump must be emptied after use. Do not use pressure washers to clean the pump. The pump must be transported in a horizontal position. Ensure that the machine is not able to topple over. If the pump is not used for a long period of time, it must be protected against moisture and frost. The pump must be inspected before being recommissioned after not being used for a long period of time.

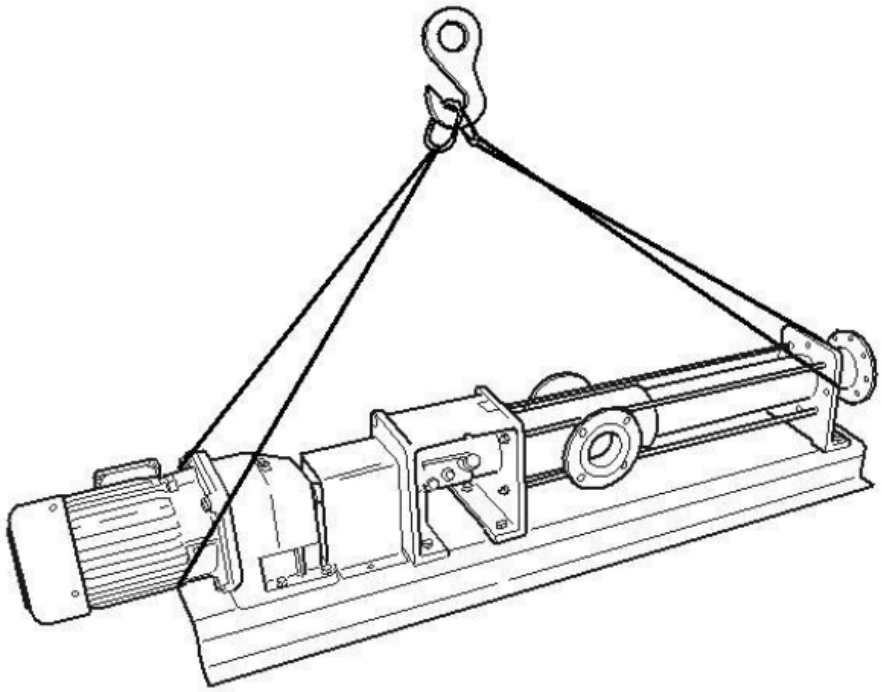

Fig. 7: Transport

The pump must be transported using secure transport and lifting equipment. Hoists and transport slings must be sufficiently dimensioned. Transport damages must be reported immediately upon receipt of the delivery. Damaged products must not be commissioned.

The instructions under Point *"4. Safety"* must be observed.

In case of standstill periods of more than 6 months, the pump stator must be dismantled to avoid pressure marks. These pressure marks would lead to an increased start torque when recommissioning.

12 TROUBLESHOOTING AND FAULT DESCRIPTION FOR THE HEX M1610

The pump consists of different components which might be subject to wear and tear or become faulty over time. This section provides help for troubleshooting and remedial action.

12.1 Pump does not pump

Possible cause	Troubleshooting
Rotor is jammed in stator	If possible, fill in with glycerine or similar. Then turn the pump from the coupling using a suitable tool.
Stator turns as well	Tighten the nuts on the pump housing or pressure port. Replace stator, if necessary.
Universal joints are broken	Replace faulty parts.
Blocked suction line, filter or pump	Clean parts.
Worn stator	Insert new stator.
Suction height is too high	Place pump lower.
Wrong direction of rotation	Change direction of rotation.
Rotational speed is too low	Increase rotational speed.
Pump sucks up air	Check suction line, pump, ball valves and three-way valve for leaks.
Pump is jammed after a long standstill	Add water and soft soap to the front housing and turn twice in running direction using a crowbar.
Foreign body is stuck in the pump	Turn backwards with a crowbar on the articulated shaft and remove foreign body.
Rear outflow port is blocked	Unscrew rear outflow flange and remove blockage.

Table 3: Pump does not pump

12.2 Flow rate is too low

Possible cause	Troubleshooting
Stator or rotor is heavily worn.	Replace stator/rotor or both.
Pump does not run at operating speed.	Bring pump to operating speed.
Suction line is leaking.	Seal suction line.
Operating pressure is higher than rated pressure.	Remove any blockages from pressure line. Otherwise the pump is not suitable for the application.

Table 4: Flow rate is too low

12.3 Power consumption is too high

Possible cause	Troubleshooting
Kinematic viscosity is too high.	Warm up or thin medium, reduce rotational speed.
Pump unit under excess tension due to bad mounting on base plate or foundation.	Align pump unit.

Table 5: Power consumption is too high

12.4 Abnormal noise

Possible cause	Troubleshooting
Cavitation due too high pressure difference between suction or inlet pressure.	Reduce the pressure difference, possibly by changing the pipeline.
Foundation is not solid or too weak.	Cast a new, stronger foundation.
Universal joint knocked out.	Replace faulty parts.

Table 6: Abnormal noise

13 MAINTENANCE

The specified maintenance and inspection work must be performed regularly. These tasks may only be carried out by trained, qualified and authorised personnel. The operator of the device is obligated to have the manufacturer himself or a service approved by the manufacturer perform maintenance work according to the regulations of the manufacturer, including the necessary changing of oil and the repair and replacement of wearing parts. The operator is thus obligated to maintain a maintenance and revision list, which facilitates monitoring of the mandatory inspection and maintenance work (see Point 16 Maintenance and revision list).

13.1 Maintenance intervals

The pump must be inspected for damage before every commissioning. It is especially important that the motor, coupling, pump, switch and cable are not damaged. In addition, the secure positioning of all screws and other fastening devices must be verified.

13.1.1 Recommendation: After every use

Empty and clean the pump after pumping perishable material or if there is a possible risk of sticking.

13.1.2 Recommendation: every 3 months

13.1.2.1 Check the oil level at the bearing head

The inspection glass (2) must always be covered halfway. You might need to top up the oil level from the filler plug (1).

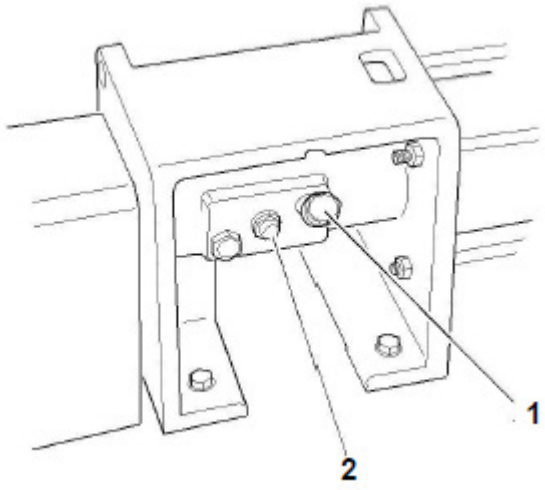

Fig. 8: Bearing head oil level check

13.1.2.2 Check the power consumption with an amperemeter

Power consumption is constant during normal operation. Occasional current fluctuations are caused by the consistency of the medium being conveyed. If a constantly increased power consumption is measured, you should contact our sales representative.

13.1.3 Recommendation: every 6 months

Check ball bearings, stator, rotor and joint parts for proper functioning, damages and leakages and replace them if necessary. Check temperature of pump and gear motor bearings and listen for abnormal noise. Check pump suction and pressure height.

13.1.4 Recommendation: every 12 months

13.1.4.1 Changing the bearing head oil

To change bearing head oil, drain the used oil through the drain plug (3). The required amount of fresh oil must be filled in through the filler plug (1). The inspection glass (2) must always be covered halfway. The used oil must be disposed of properly.

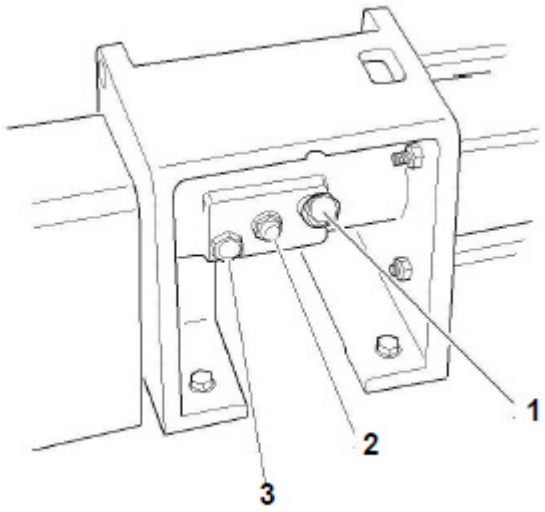

Fig. 9: Changing the bearing head oil

13.1.4.2 Checking the general state of the pump

Remove dust deposits from the motor, gear and pump. Remove ball bearings, clean them and reapply grease. 1/3 of the entire clearance around the bearing must be filled with grease.

13.1.4.3 Checking the gear oil in the intermediate drive on type HEXe with gear motor

Insofar as the electrical motor pumps are equipped with intermediate gears (reduction gears), the maintenance concerning oil filling and quantity must also be performed. The annual oil change must also be performed here (see special operating manual for gear motor).

13.1.4.4 Check the functioning of the monitoring device

We recommend checking the monitoring devices in the scope of maintenance work at least once a year. For these functional checks, the device must be cooled down to ambient temperature. The electrical power cords of the monitoring devices must be disconnected in the switch box. If you identify any defects, please contact our sales representative.

13.1.4.5 Check the tightening torque of all screw connections

Every 9,000 operating hours or at least once annually, we recommend checking the secure positioning of the screw connections in the scope of maintenance work. The tightening torques for stainless steel screws in Nm for different thread sizes are shown below:

(M8 = 18Nm, M10 = 33Nm, M12 = 57Nm, M16 = 135Nm, M20 = 150Nm)

For your own safety, please always ensure that the protective cover of the motor drive is correctly fastened and the protective equipment of the articulated shaft is undamaged. The supplied articulated shafts should be maintained in accordance with the separately included instructions.

13.1.4.6 Visual inspection and cleaning of the connection cable and lifting gears

Every 24 months, we recommend checking the connection cable, shackles and lifting gear for damage and soiling in the scope of maintenance work. Deposits, blockages and adhering fibrous materials must be removed. In addition, the insulation on the connection cable must be inspected for damage, such as scratches, tears, blistering or crushed areas. Damaged components must be exchanged immediately. Please contact our sales representative.

13.1.5 Recommendation: after a drop in performance due to worn rotor or stator

13.1.5.1 General repair

If the performance drops too much (in continuous operation earlier than in periodic operation), the pump must undergo a general repair. In this general repair, all wearing parts of the pump are replaced. Please contact our sales representative.

13.1.5.2 Replacing the stator

Signs of wear appear at the contact surfaces between the rotor and the stator after a prolonged period of use. This can be identified from a noticeable loss of performance. Sucked up foreign bodies can also cause damage, usually to the rubber stator.

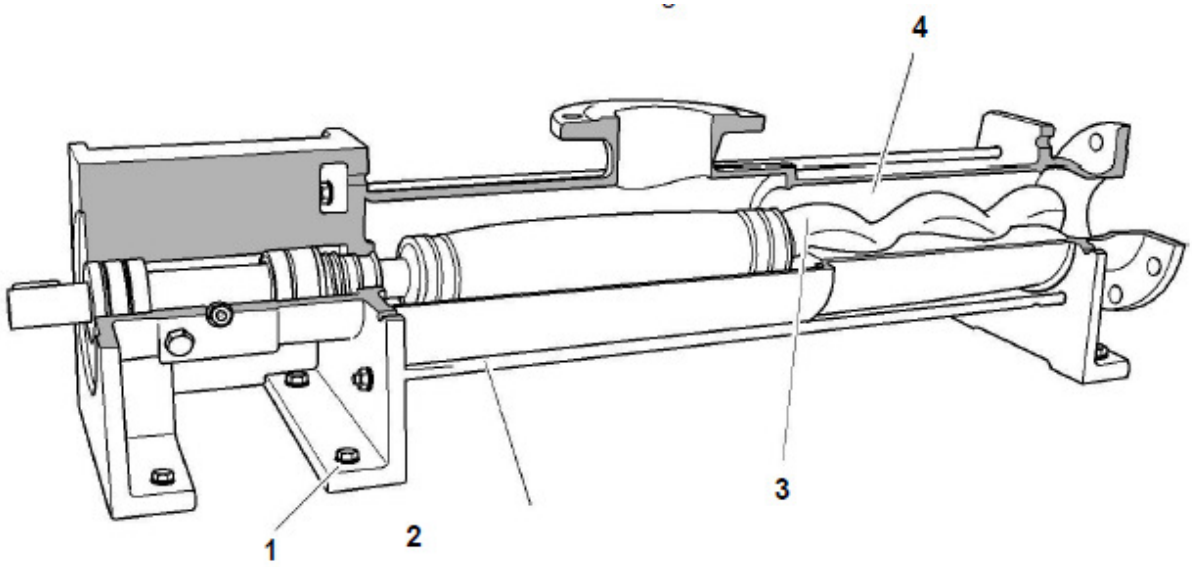

Fig. 10: Replacing the stator

(1) Unplug from mains and connect shut-off valve to the suction and pressure line.

(2) Drain off the pumped liquid from the suction and pressure line.

(3) Remove supply and pressure line as well as auxiliary pipes.

(4) Remove fastening screws (1) between pump and console.

(5) Remove the nuts of the four threaded rods on pump pressure side, which connect the stator housing to the suction and pressure port.

(6) Lock rotor (3) and pull stator (4) backwards while turning clockwise from the perspective of the drive.

(7) Select new stator depending on operating conditions.

(8) Spray rotor and the inner side of the new stator with silicone grease or soapy water (no machine oil or grease).

(9) Carefully place the new stator (4) on the locked rotor shaft so that the oval rotor orifice is perpendicular to the pump (mark position with felt-tip pen).

(10) Slide the stator while simultaneously turning anticlockwise from the perspective of the drive.

(11) Remove the rotor lock and align the stator vertically, according to the marking in position (9).

(12) Re-insert the four threaded rods (2) into the stator housing and fix them with the nuts.

(13) Re-install the fastening screws on the pump foot (1).

(14) Re-install the supply and pressure line as well as the shut-off valve and have the electrical supply reconnected.

(15) Re-open all shut-off valves and check the system for leakages.

(16) Switch on the pump and carry out a functional and tightness test.

13.1.6 Recommendation: after reaching the end of the lifespan

At the end of its lifespan, the pump can be disposed of normally as scrap. The oils should be removed in advance and disposed of as waste oil. The pump is composed of various metals: steel, aluminium, copper and stainless steel. Dismantling it into the metal groups considerably increases returns.

14 NOTICES

14.1 Regulation of the professional association

The following accident prevention regulations of the Agricultural Professional Association can be found in Paragraph 2.8 under "Special Provisions for Pits and Canals":

Paragraph 2.8

§ 1 Protection against falling in

(1) Pits, ditches, canals, wells and other similar pits in the house and courtyard area must be protected with fences or coverings to prevent persons falling in. If these are not deeper than 100cm, other safety precautions suffice.

§ 2 Openings

(1) If removal and entries openings, etc., are opened, it must be guaranteed that persons and objects cannot fall in.

(2) Pits and canals that are customarily entered must have facilities which permit risk-free entry. The openings of these pits and canals must be dimensioned in such a way to allow the rescue of any accident victims.

§ 3 Entry

(1) Before entry and during the presence in pits and canals, ensure that sufficient respiratory air is present and that plant facilities are reliably protected against being switched on. The handling of naked flames is not permitted.

(2) Entry for the recovery of an accident victim is only permissible if two other persons secure the entering person with a rope which is firmly anchored outside the tank.

§ 4 Tanks and canals for animal faeces

(1) For tanks and canals in the open air, it must be guaranteed by suitable measures that fermentation gas cannot flow into the buildings.

(2) Closed tanks in the open air must have vent openings on opposite lying sides.

(3) If tanks and canals are found in the buildings – also under slatted floors – it must be guaranteed that fermentation gases are conducted away from the buildings.

(4) If tanks and canals in the buildings are furnished with agitating, pumping and rinsing plants, facilities for the removal of fermentation gases must be present which automatically switch on when the agitator and rinsing works are operating. They may only be switched off after conclusion of the work process. The gases conducted away must not endanger persons.

(5) Canals must be designed so as to avoid any unnecessary whirling up of the faeces.

(6) Operating stations for agitating, pumping and rinsing, etc., equipment must be built up over the floor.

(7) Closed rooms in which there are operating stations may not have openings to the tanks and canals.

(8) Operation instructions must be permanently attached to the operating stands.

§ 5 Removal of animal faeces from tanks and canals

(1) No smoking and no naked flames are allowed in the immediate proximity of removal openings during the agitating and removal of faeces.

(2) In the buildings in which there are open tanks and canals, the presence of persons and animals during agitation and removal is only permissible with sufficient ventilation.

§ 6 Warning signs

(1) Easily visible warning signs must be attached to openings of tanks and canals which indicate the danger of gases.

(2) Refer to the "Information Sheet with Notice, Warning, Prohibition and Rescue Signs" of the Federal Association of Agricultural Professional Associations.

15 SPARE PARTS LISTS AND DRAWINGS FOR THE HEX M1601

15.1 Spare parts list HEX M1610 type 80-1, type 90-1, type 100-1 and type 110-1

The person carrying out repairs on the eccentric screw pump must have undertaken certified manufacturer training by Erich Stallkamp ESTA-GmbH. The required documentation will be supplied – please contact the responsible sales representative.

15.2 Exploded drawing for HEX M1610 type 80-1, type 90-1, type 100-1 and type 110-1

The person carrying out repairs on the eccentric screw pump must have undertaken certified manufacturer training by Erich Stallkamp ESTA-GmbH. The required documentation will be supplied – please contact the responsible sales representative.

16 MAINTENANCE AND REVISION LIST

Each person must properly enter all maintenance and revision work in the list and confirm it with his or her own signature and that of the person responsible.

This list must be submitted to the supervisory bodies of the professional association, the TÜV and the manufacturer on request.

Maintenance/revision on device with the machine no.	Notes	Date	Signature of installer	Signature of person responsible

Maintenance/revision on device with the machine no.	Notes	Date	Signature of installer	Signature of person responsible

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