

Original Instruction Manual

HOMA Pumpenfabrik GmbH
Industriestr. 1
D-53819 Neunkirchen-Seelscheid

60 Hz
Baureihe / Serie
EMS...-A

Contents

Contents	Page
1. General Information	30
1.1. Declaration of Conformity	30
1.2. Preface	31
1.3. Proper Use	31
1.4. Copyright	31
1.5. Warranty	31
1.6. Technical terms	32
2. Safety	33
2.1. Instructions and safety information	33
2.2. Guidelines used and CE-certification	33
2.3. General safety	34
2.4. Operating personal	34
2.5. Electrical work	34
2.6. Operating procedure	35
2.7. Safety and control devices	35
2.8. Operation in an explosive atmosphere	35
2.9. Sound pressure	35
2.10. Pumped fluids	36
3. General description	36
3.1. Application	36
3.2. Types of Use	36
3.3. Construction	36
4. Package, Transport and Storage	39
4.1. Delivery	39
4.2. Transport	39
4.3. Storage	39
4.4. Returning to the supplier	40
5. Installation and Start-Up	41
5.1. General	41
5.2. Installation	42
5.3. Use of Chains	42
5.4. Start-Up	43
5.5. Preparatory work	43
5.6. Electrical system	44
5.7. Direction of rotation	44
5.8. Motor protection	44
5.9. Operation with a static frequency converter	44
5.10. Activation types	45
6. Maintenance	46
6.1. General	46
6.2. Maintenance intervals	46
6.3. Maintenance tasks	47
6.4. Sealing chamber	48
7. Repairs	49
7.1. General	49
7.2. Changing various parts of the pump	49
8. Shut down	50
8.1. Temporary shut down	50
8.2. Final shutdown / storage	50
8.3. Restarting after an extended period of storage	50
9. Troubleshooting	51
10. Additional for explosion-proofed submersible pumps	54
11. Declaration of contamination	56

1. General Information

1.1. Declaration of Conformity

EC Declaration of conformity in line with the EC Machinery Directive 2006/42/EEC, Appendix II Part 1 A

Manufacturer Name and Address:

**HOMA Pumpenfabrik GmbH
Industriestraße 1
53819 Neunkirchen – Seelscheid
Germany**

We hereby declare, that

EMS

are conform to the following relevant requirements:

Machinery Directive 2006/42/EC

Applied harmonized standards of which have been published in the official Journal of the EC

Responsible for compiling the technical documentation:

Vassilios Petridis
Director Research and Development / Production
HOMA Pumpenfabrik GmbH

This Declaration of Conformity was issued by:

Oberheister, 23.02.2016

A handwritten signature in black ink, appearing to read 'Vassilios Petridis', written over a horizontal line.

Vassilios Petridis
Director Research and Development / Production
HOMA Pumpenfabrik GmbH

1.2. Preface

Dear Customer,

Thank you for choosing one of our company's products. You have purchased a product which has been manufactured to the latest technical standards. Read this operating and maintenance manual carefully before you first use it. This is the only way to ensure that the product is safely and economically used.

The documentation contains all the necessary specifications for the product, allowing you to use it properly. In addition, you will also find information on how to recognize potential dangers, reduce repair costs and downtime, and increase the reliability and working life of the product.

All safety requirements and specific manufacturer's requirements must be fulfilled before the product is put into operation. This operating and maintenance manual supplements any existing national regulations on industrial safety and accident prevention. This manual must also be accessible to personnel at all times and also be made available where the product is used.

1.3. Proper use

The HOMA products comply with the valid safety regulations and meet the demands of state-of-the-art technology. In the event of improper use, there is a danger to life for the user as well as for third parties. Moreover, the product and/or attachments may be damaged or destroyed.

It is important to ensure that the product is only operated in technically perfect condition and as intended.

To do so, follow the operating instructions.

The pumps can be used in the range specified by us at any time, in accordance with the current HOP.SEL version.

We have selected the pump based on the data available to us. Please note that the offered pumps may only be used in the defined field of application. Operating the pump outside the range of application can lead to operational problems or significant damage to the unit. Particularly with long pipes, it may be necessary to start the pump slowly via a frequency converter to slowly speed up the mass at rest. This is the only way to ensure that the operation of the pump above the operating limit can be reliably ruled out. To select the frequency, we recommend our leaflet "Frequency Converter".

1.4. Copyright

This operation and maintenance manual has been copyrighted by the manufacturer. This operation and maintenance handbook is intended for the use by assembly, operating and maintenance personnel. It contains technical specifications and diagrams which may not be reproduced or distributed, either completely or in part, or used for any other purpose without the expressed consent of the manufacturer.

1.5. Warranty

Costs for removal and installation of the complained product at the installation place, costs for the ride of the mechanics to the location and from the installation place and costs for transport are not components of our warranty. Hereby arose costs, especially costs for checking and transport are bearing by the sender or operator of the pump. This is also valid for an asserted warranty claim if a check results that the unit works faultless and is free of defects. All products have a high quality standard. Each product is defeated by a strict technical end control before delivery. A warranty repair achieved by us does not extend the warranty period. Replaced spare parts give no reasons for a new warranty period. Extensive claims are excluded, especially such as diminution, change or compensation also for any kind of follow up damages.

In order to ensure that your guarantee claim is processed as efficiently as possible, please contact us or the appropriate sales representative. Once your claim for a return has been agreed, you will receive a return certificate. Please then send the rejected product, carriage prepaid, to the factory together with the return certificate, proof of purchase and an indication of the damage. Claims made on grounds of damage caused in transit must be established and confirmed on delivery of the product by the express company, the railway company or the postal service.

1.5.1. General information

This chapter contains the general information on the warranty. Contractual agreements have the highest priority and are not superseded by the information in this chapter!

The manufacturer is obliged to correct any defects found in the products it sells, provided that the following requirements have been fulfilled:

- The defects are caused by the materials used or the way the product was manufactured or designed.
- The defects were reported in writing to the manufacturer within the agreed warranty period.
- The product was used only as prescribed.
- All safety and control devices were connected and inspected by authorized personnel.

If no other provisions have been made, the warranty period applies to the first 12 months after initial start-up or to a max. of 24 months after the delivery date. Other agreements must be made in writing in the order confirmation. These agreements will remain valid at least until the agreed warranty period of the product has expired.

1.5.2. Spare parts, add-ons and conversions

Only original spare parts as supplied by the manufacturer may be used for repairs, replacements, add-ons and conversions. Only these parts guarantee a long working life and the highest level of safety. These parts have been specially designed for our products. Self-made add-ons and conversions or the use of non-original spare parts can seriously damage the product and/or injure personnel.

1.5.3. Maintenance

The prescribed maintenance and inspection work should be carried out regularly. This work may only be carried out by qualified, trained and authorized personnel. **The maintenance and inspection log supplied must be properly updated.** This enables you to monitor the status of inspections and maintenance work. Quick repairs not listed in this operation and maintenance manual and all types of repair work may only be performed by the manufacturer and its authorized service centres.

1.5.4. Damage to the product

Damage as well as malfunctions that endanger safety must be eliminated immediately by authorized personnel. The product should only be operated if it is in proper working order. During the agreed warranty period, the product may only be repaired by the manufacturer or an authorized service workshop! The manufacturer reserves the right to recall the damaged product to the factory for inspection!

1.5.5. Exclusion from liability

No liability will be assumed for product damage if one or more of the following points apply:

- Incorrect design on our part due to faulty and/or incorrect information provided by the operator or customer
- Non-compliance with the safety instructions, the regulations and the requirements set forth by German law and this operating and maintenance manual
- Incorrect storage and transport
- Improper assembly/dismantling
- Improper maintenance
- Unqualified repairs
- Faulty construction site and/or construction work
- Chemical, electrochemical and electrical influences
- Wear

In case of a power failure or another technical failure, by which a proper operation of the pump is no longer guaranteed, it is essential to take care that damages by an overflow of the pump sump are prevented securely, for example, by installing a mains-independent alarm or other appropriate protective measures.

This means the manufacturer's liability excludes all liability for personal, material or financial injury.

1.5.6. Manufacturer's address

HOMA Pumpenfabrik GmbH
Industriestrasse 1
D-53819 Neunkirchen-Seelscheid
Phone: +49 2247 / 7020
Fax: +49 2247 / 70244
Email: info@homa-pumpen.de
Homepage: www.homapumpen.de

1.6. Technical terms

Various technical terms are used in this operating and maintenance manual.

Dry run

The product is running at full speed, however, there is no liquid to be pumped. A dry run is to be strictly avoided. If necessary, a safety device must be installed.

“wet” installation type

This installation type requires the product to be immersed in the pumped fluid. It is completely surrounded by the pumped fluid. Please observe the values for the maximum submersion depth and the minimum water coverage.

“dry” installation type

In this installation type, the product is installed dry, i.e. the pumped fluid is delivered to and discharged via a pipeline system. The product is not immersed in the pumped fluid. Please note that the surfaces of the product become very hot!

“transportable” installation type

With this installation type the product is equipped with a pedestal. It can be installed and operated at any location. Please observe the values for the maximum submersion depth and the minimum water coverage, and remember that the surfaces of the product become very hot.

“S1” operating mode (continuous operation)

At the rated load, a constant temperature is reached that does not increase even in prolonged operation. The operating equipment can operate uninterruptedly at the rated load without exceeding the maximum permissible temperature.

“S2” operating mode (short-term operation)

The operating time is specified in minutes, for example, S2-20. That means, that the machine can work 20 minutes and should pauses after it, as long as the machine is cooled down to 2K over medium temperature.

Operating mode "S3" (intermittent operation):

For these operating modes, after the abbreviation, the duty cycle is displayed as well as the cycle duration if it deviates from 10 minutes. Example S3 30% means, that the machine can work 3 minutes and afterwards should pauses 7 minutes.

“Sip operation”

Siphoning operation is similar to dry running. The product operates at full speed, but only small amounts of liquid are pumped.

Sip operation is only possible with certain types; see the “Product description” chapter.

Dry-run protection

The dry-run protection is designed to automatically shut down the product if the water level falls below the minimum water coverage value of the product. This is made possible by installing a float switch.

Level control

The level control is designed to switch the product on or off depending on the filling level. This is made possible by installing a float switch.

2. Safety

This chapter lists all the generally applicable safety instructions and technical information. Furthermore, every other chapter contains specific safety instructions and technical information. All instructions and information must be observed and followed during the various phases of the product's lifecycle (installation, operation, maintenance, transport etc.). The operator is responsible for ensuring that personnel follow these instructions and guidelines.

2.1. Instructions and safety information

This manual uses instructions and safety information for preventing injury and damage to property. To make this clear for the personnel, the instructions and safety information are distinguished as follows:

Each safety instruction begins with one of the following signal words:

Danger: Serious or fatal injuries can occur!

Warning: Serious injuries can occur!

Caution: Injuries can occur!

Caution (Instruction without symbol): Serious damage to property can occur, including irreparable damage!

Safety instructions begin with a signal word and description of the hazard, followed by the hazard source and potential consequences, and end with information on preventing it.

2.2 Guidelines used and CE certification

Our products are subject to

- various EC directives
- various harmonized standards
- various national standards.

Please consult the EU Declaration of Conformity for the precise information and the guidelines and norms in effect. The EU Declaration of Conformity is issued in accordance with EU Directive 2006/42/EEC, Appendix II A.

Also, various national standards are also used as a basis for using, assembling and dismantling the product. These include the German accident prevention regulations, VDE regulations, German Equipment Safety Law etc.

The CE symbol is found either on the type plate or next to the type plate. The type plate is attached to the motor casing.

2.3 General safety

- Never work alone when installing or removing the product.
- The machine must always be switched off before any work is performed on it (assembly, dismantling, maintenance, installation). The machine must be disconnected from the electrical system and secured against being switched on again. All rotating parts must be at a standstill.
- The operator should inform his/her superior immediately should any defects or irregularities occur.
- It is of vital importance that the system is shut down immediately by the operator if any problems arise which may endanger safety of personnel. Problems of this kind include:
 - Failure of the safety and/or control devices
 - Damage to critical parts
 - Damage to electric installations, cables and insulation.
- Tools and other objects should be kept in a place reserved for them so that they can be found quickly.
- Sufficient ventilation must be provided in enclosed rooms.
- When welding or working with electronic devices, ensure that there is no danger of explosion.
- Only use fastening devices which are legally defined as such and officially approved.
- The fastening devices should be suitable for the conditions of use (weather, hooking system, load, etc). If these are separated from the machine after use, they should be expressly marked as fastening devices. Otherwise they should be carefully stored.
- Mobile working equipment for lifting loads should be used in a manner that ensures the stability of the working apparatus during operation.
- When using mobile working equipment for lifting non guided loads, measures should be taken to avoid tipping and sliding etc.
- Measures should be taken that no person is ever directly beneath a suspended load. Furthermore, it is also prohibited to move suspended loads over workplaces where people are present.
- If mobile working equipment is used for lifting loads, a second person should be present to coordinate the procedure if needed (for example if the operator's field of vision is blocked).
- The load to be lifted must be transported in such a manner that nobody can be injured in the case of a power cut. Additionally, when working outdoors, such procedures must be interrupted immediately if weather conditions worsen.



These instructions must be strictly observed. Non-observance can result in injury or serious damage to property.

2.4. Operating personnel

All personnel who work on or with the product must be qualified for such work; electrical work, for example may only be carried out by a qualified electrician. The entire personnel must be of age. Operating and maintenance personnel must also work according to local accident prevention regulations. It must be ensured that personnel have read and understood the instructions in this operating and maintenance handbook; if necessary this manual must be ordered from the manufacturer in the required language.

2.5. Electrical work

Our electrical products are operated with alternating or industrial high-voltage current. The local regulations (e.g. VDE 0100) must be adhered to. The "Electrical connection" data sheet must be observed when connecting the product. The technical specifications must be strictly adhered to. If the machine has been switched off by a protective device, it must not be switched on again until the error has been corrected.



Beware of electrical current!
Incorrectly performed electrical work can result in fatal injury!
This work may only be carried out by a qualified electrician.



Beware of damp!
Moisture penetrating cables can damage them and render them useless. Furthermore, water can penetrate into the terminal compartment or motor and cause damage to the terminals or the winding.
Never immerse cable ends in the pumped fluid or other liquids.

2.5.1. Electrical connection

When the machine is connected to the electrical control panel, especially when electronic devices such as soft startup control or frequency drives are used, the relay manufacturer's specifications must be followed in order to conform to EMC. Special separate shielding measures e.g. special cables may be necessary for the power supply and control cables.

The connections may only be made if the relays meet the harmonized EU standards. Mobile radio equipment may cause malfunctions.



Beware of electromagnetic radiation!

Electromagnetic radiation can pose a fatal risk for people with pacemakers. Put up appropriate signs and make sure anyone affected is aware of the danger.

2.5.2. Ground connection

Our products (machine including protective devices and operating position, auxiliary hoisting gear) must always be grounded. If there is a possibility that people can come into contact with the machine and the pumped liquid (e.g. at construction sites), the grounded connection must be additionally equipped with a fault current protection device. The electrical motors conform to motor protection class IP 68 in accordance with the valid norms.

2.6. Operating procedure

When operating the product, always follow the locally applicable laws and regulations for work safety, accident prevention and handling electrical machinery. To help to ensure safe working practice, the responsibilities of employees should be clearly set out by the owner. All personnel are responsible for ensuring that regulations are observed. Certain parts such as the rotor and propeller rotate during operation in order to pump the fluid. Certain materials can cause very sharp edges on these parts.



Beware of rotating parts!

The moving parts can crush and sever limbs. Never reach into the pump unit or the moving parts during operation. Switch off the machine and let the moving parts come to a rest before maintenance or repair work!

2.7. Safety and control devices

Our products are equipped with various safety and control devices. These include, for example suction strainers, thermo sensors, sealed room monitor etc. These devices must never be dismantled or disabled.

Equipment such as thermo sensors, float switches, etc. must be checked by an electrician for proper functioning before start-up (see the "Electrical Connection" data sheet). Please remember that certain equipment requires a decoder device or relay to function properly, e.g. posistor and PT100 sensor. This decoder can be obtained from the manufacturer or a specialist electronics dealer.

Personnel must be informed of the installations used and how they work.



Caution

Never operate the machine if the safety and monitoring devices have been removed or damaged, or if they do not work.

2.8. Operation in an explosive atmosphere

Products marked as explosion-proof are suitable for operation in an explosive atmosphere. The products must meet certain guidelines for this type of use. Certain rules of conduct and guidelines must be adhered to by the operator as well.

Products that have been approved for operation in an explosive atmosphere are marked as explosion-protected "Ex". In addition, an "Ex" symbol must be included on the type plate! When used in an explosive atmosphere, the additional chapter entitled "Explosion protection according to the ...standard" must be observed!

2.9. Sound pressure

Depending on the size and capacity (kW), the products produce a sound pressure of approximately 60 dB (A) and 110 dB (A).

The actual sound pressure, however, depends on several factors. These include, for example, the installation type (wet, dry, transportable), fastening of accessories (e.g. suspension unit) and pipeline, operating site, immersion depth, etc. Once the product has been installed, we recommend that the operator make additional measurements under all operating conditions.



Caution: Wear ear protectors!

In accordance with the laws in effect, guidelines, standards and regulations, ear protection must be worn if the sound pressure is greater than 85 dB (A)!

The operator is responsible for ensuring that this is observed!

2.10. Pumped fluids

Each pumped fluid differs in regard to composition, corrosiveness, abrasiveness, TS content and many other aspects. Generally, our products can be used for many applications. For more precise details, see chapter 3, the machine data sheet and the order confirmation. It should be remembered that if the density, viscosity or the general composition change, this can also alter many parameters of the product.

Different materials and impeller shapes are required for different pumped fluids. The more exact your specifications on your order, the more exactly we can modify our product to meet your requirements. If the area of application and/or the pumped fluid change, we will be happy to offer supportive advice.

When switching the product into another pumped fluid, observe the following points:

- Products which have been operated in sewage or waste water must be thoroughly cleaned with pure water or drinking water before use.
- Products which have pumped fluids which are hazardous to health must always be decontaminated before changing to a new fluid. Also clarify whether the product may be used in a different pumped fluid.
- With products which have been operated with a lubricant or cooling fluid (such as oil), this can escape into the pumped fluid if the mechanical shaft seal is defective.



Danger - explosive fluids!

It is absolutely prohibited to pump explosive liquids (e.g. gasoline, kerosene, etc.). The products are not designed for these liquids!

3. General description

3.1. Application

HOMA pumps convey domestic, communal and industrial wastewater, faeces and sludges, even those containing a high proportion of solids and fibres, and sewage of every kind. From a small residential or industrial building to large pump stations and sewage treatment plant.

These pumps are not suitable for conveying liquids containing seriously abrasive fractions (e.g. sand, gravel or stones). If the conveyed medium contains chemically aggressive fractions, the ability of the materials to withstand them is to be respected without fail. To suit this need, units made partially or completely of highly resistant materials (stainless steel, bronze) are also available.

Their use in slurp operation is not permitted. Depending on the type of installation and motor cooling, the minimum level of the conveyed medium must always lie above the upper edge of the pump housing.

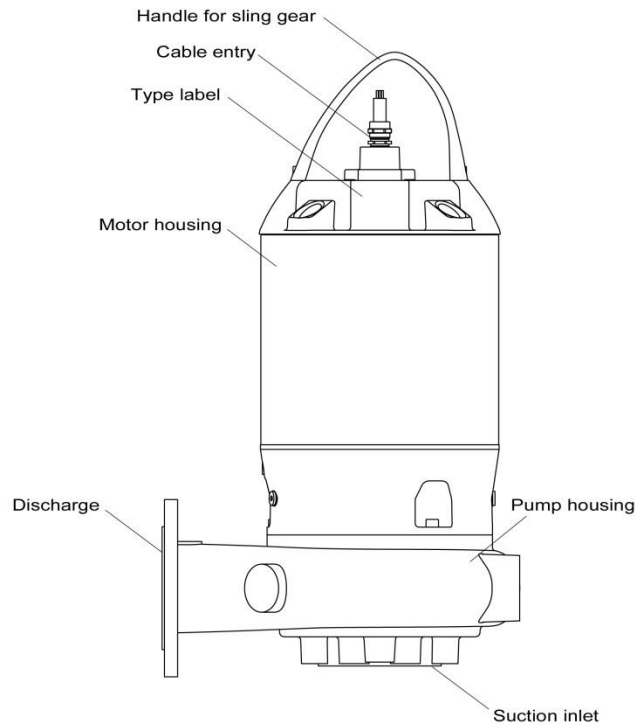
The temperature of the conveyed medium may go up to 40°C, or briefly up to a maximum of 60°C. The maximum density of the conveyed medium is 1100 kg/m³ and its pH value may be 6 - 11.

3.2. Types of use

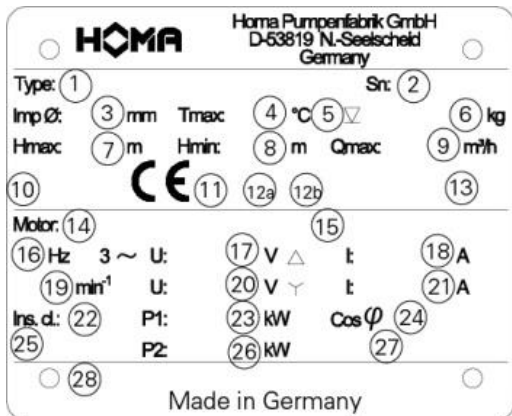
The motor is designed for the S1 (continuous) mode of operation, with a max. switching rate of 15 switching operations / hour. The hydraulics are suitable for constant continuous operation, e.g. for supplying industrial water.

3.3. Construction

The fully submersible unit consists of the motor, the pump housing and the appropriate blade wheel. All important components are generously dimensioned.



3.3.1. Type plate



No.	3 Ph
1	Type description
2	Serial number
3	Impeller diameter
4	Temperature of medium
5	Immersion depth
6	Weight
7	Hmax (delivery head max)
8	Hmin (delivery head min)
9	Qmax (delivery volume max)
10	Standard
11	Construction product regulations-test lab
12a	Year type test
12b	Declaration of performance
13	Build year
14	Motor type
15	IE-Marking
16	Frequency
17	Voltage – 3-phase
18	Nominal current 3-phase
19	Motor RPM
20	Voltage – Star connection
21	Nominal current Star connection
22	Insulation class
23	Power P1
24	Cos phi
25	Protection class
26	Power P2
27	Operating class
28	Text field sales

3.3.2. Motor

The three-phase asynchronous motor consists of a stator and the motor shaft with the impeller assembly. The power supply lead is designed for the maximum mechanical power complying with the characteristic curves or type plate of the pump. The cable entry points and the cable are water-tight sealed against the conveyed medium. The shaft bearings are robust, maintenance-free, and continuously lubricated roller bearings.

General motor data	
Operation mode when motor is submerged	S1
Permissible medium temperature	40°C/104°F
Insulation class	H (180°C/356°F)
Protection class	IP68
Standard cable length	10 m
Shaft seal Mechanical seal	Silicon carbide/silicon carbide (on the motor side), silicon carbide/silicon carbide (on the fluid side)
Storage	deep groove ball bearing (top) double-row angular contact bearing (bottom)

3.3.3. Monitoring device

The unit is fitted with various monitoring and safety devices. The following Table gives an overview of the available options.

Motor type	Motor version
A...	Immersed motor, thermal monitoring for coil, monitoring of the oil chamber sealing

Temperature sensor

All pumps are fitted with a set of temperature sensors in the motor coils.

In pumps of standard design, the connections of the temperature sensors are led out via the connecting cable, and must be connected via the T1 and T3 conductor ends of the connecting cable in the switch cabinet, so that the motor is switched on again automatically after it has cooled down.

The temperature sensor set must be connected to the switchgear so that it turns off when it overheats.

Activation temperature of the temperature monitoring/sensors:

Motor	Coil Normal T1+T3 Controller	Coil Ex T1+T2 Limiter
AM210...A-4pol	125°C / 257°F	125°C / 257°F

Rotational direction check

All motors have the correct rotational direction when connected to a clockwise rotating field (U, V, W → L1, L2, L3). The HOMA switchgear checks the mains for clockwise rotation. If there is no clockwise rotation, the red LED will light up. Two phases must be swapped at the input of the switching device. This can be monitored in a smaller pump monitored by observing the starting jolt. To do this, set the pump on the ground in a vertical position, slightly at an angle, and switch it on briefly. Seen from above, the pump will jerk slightly clockwise if the direction of rotation is correct.

The direction of rotation of the pump is correct if the pump moves counter clockwise because, seen from above, the motor starts in the clockwise direction.

ATTENTION!
The direction of rotation is correct if the impeller rotates in a clockwise manner when viewing down from the top of the placed unit.



ATTENTION!
The start reaction is anti clockwise.

In large pumps, the direction of rotation can also be identified by looking through the pressure port into the pump chamber. The impeller is visible and, after briefly switching on, its direction of rotation can be checked as it rolls to a stop.



Warning of rotating impeller!

Do not touch the rotating impeller or reach through the pressure port into the pump chamber.

During operation, never reach into the pump chamber or touch rotating parts. Before maintenance or repair work, switch off the machine and let the rotating parts come to a standstill.

It is also possible to check the direction of rotation with a "motor and phase rotation indicator". This instrument is held outside of the motor housing of the pump when switched on and shows the rotational direction via an LED.

Seal monitoring in pumps with oil barrier chamber:

If there is a leakage of the fluid side shaft seal, water may enter the oil chamber and change the resistance of the oil. The conductivity of the oil filling is monitored via 2 sensors. The sensors are connected via 2 wires (designated S1 and S2) from the pump connection cable in the switchgear to an evaluation instrument with a galvanically separated probe circuit (electrode relay e.g. HOMA Art.No.: 1610995). For Ex models, an electrode relay should be selected with an intrinsically safe circuit (HOMA Art.No.: 1416510). The response sensitivity should be adjustable from 0-100 k Ω , standard setting 50 k Ω .

Motor cooling

In all installation variations, the conveyed medium flows around the motor and cools it.

3.3.4. Seal/Seal housing

Sealing is achieved by two independently acting slide ring seals made of silicon carbide operating in tandem. The seal casing is located between the motor and the pump housing. It consists of the bearing housing and the pressure lid, which bind together with the sealing compartment filled with medicinal petroleum oil. Checking is possible by means of the inspection screw on the bearing housing and an optional electronic monitoring system.

3.3.5. Pump housing

Depending on its version and the motor version, the pump housing is available with various DIN and ANSI flanges. This enables an optimal connection to the greatest variety of types of piping. On the suction side, the pump housing is fitted with a split ring. This split ring determines the clearance between the blade wheel and the suction inlet. If this clearance becomes too large, the handling capacity of the pump falls and blockages can occur more frequently. It is therefore possible to exchange the split ring in order to cut the cost of replacement parts.

3.3.6. Blade wheel

The blade wheel is fastened on the motor shaft and is driven by it. The blade wheel is a closed single-channel impeller that is suitable for contaminated and muddy conveyed media containing solid and long-fibred fractions. It can, if necessary, be coated with ceramics.

4. Package, Transport, Storage

4.1. Delivery

On arrival, the delivered items must be inspected for damage and a check made that all parts are present. If any parts are damaged or missing, the transport company or the manufacturer must be informed on the day of delivery. Any claim made at a later date will be deemed invalid. Damage to parts must be noted on the delivery or freight documentation.

4.2. Transport

Only the appropriate and approved fastening devices, transportation means and lifting equipment may be used. These must have sufficient load bearing capacity to ensure that the product can be transported safely. If chains are used they must be secured against slipping.

The personnel must be qualified for the tasks and must follow all applicable national safety regulations during the work.

The product is delivered by the manufacturer/shipping agency in suitable packaging. This normally precludes the possibility of damage occurring during transport and storage. The packaging should be stored in a safe place if the location used is changed frequently.

4.3. Storage

Newly supplied products are prepared that they can be stored for 1 year. The product should be cleaned thoroughly before interim storage.

The following should be taken into consideration for storage:

- Place the product on a firm surface and secure it against falling over. Submersible mixers and auxiliary lifting devices should be stored horizontally, submersible sewage pumps and submersible motor pumps should be stored horizontally or vertically. It should be ensured that they cannot bend if stored horizontally.



Danger from falling over!

Never put down the product unsecured. If the product falls over, injury can occur!

- The product has to be stored at a place free from vibrations and agitation to avoid damage from the ball bearings.
- It is also necessary to pay attention to the storage. The device should be stored in dry rooms without temperature fluctuation.
- The product may not be stored in rooms where welding work is conducted as the resulting gases and radiation can damage the elastomer parts and coatings.
- It is responsible to take care that the corrosion coating will not be spoiled
- Any suction or pressure connections on products should be closed tightly before storage to prevent impurities.
- The power supply cables should be protected against kinking, damage and moisture.



Beware of electrical current!

Damaged power supply cables can cause fatal injury! Defective cables must be replaced by a qualified electrician immediately.



Beware of damp!

Moisture penetrating cables can damage them and render them useless. Therefore, never immerse cable ends in the pumped fluid or other liquids.

- The machine must be protected from direct sunlight, heat, dust, and frost. Heat and frost can cause considerable damage to propellers, rotors and coatings.
- The rotors or propellers must be turned at regular intervals. This prevents the bearing from locking and the film of lubricant on the mechanical shaft seal is renewed. This also prevents the gear pinions (if present on the product) from becoming fixed as they turn and also renews the lubricating film on the gear pinions (preventing rust film deposits).



Beware of sharp edges!

Sharp edges can form on rotors and propellers. There is a risk of injuries. Wear protective gloves.

- If the product has been stored for a long period of time it should be cleaned of impurities such as dust and oil deposits before start-up. Rotors and propellers should be checked for smooth running, housing coating and damage.
- After storage longer than one year the oil of motor and, if necessary the gear have to be changed. This is also necessary if the product never had run (natural deterioration of mineral oil).

Before start-up, the filling levels (oil, cooling fluid etc.) of the individual products should be checked and topped up if required. Please refer to the machine data sheet for specifications on filling. Damaged coatings should be repaired immediately. Only a coating that is completely intact fulfills the criteria for intended usage!

If these rules are observed, your product can be stored for a longer period. Please remember that elastomer parts and coatings become brittle naturally. If the product is to be stored for longer than 6 months, we recommend checking these parts and replacing them as necessary. Please consult the manufacturer.

4.4. Returning to the supplier

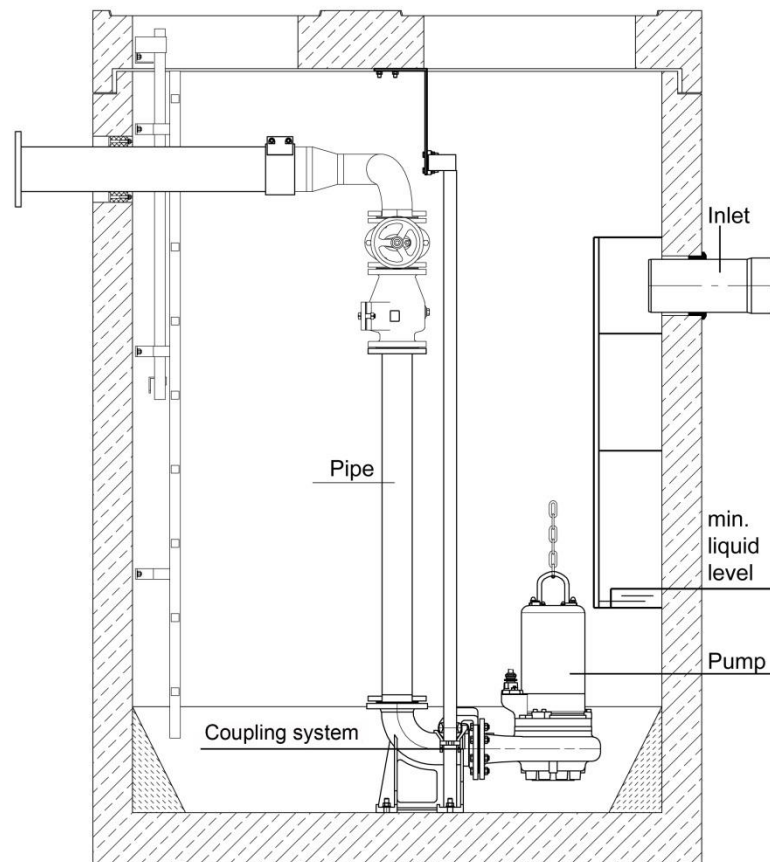
Products which are delivered to the plant must be clean and correctly packaged. In this context, clean means that impurities have been removed and decontaminated if it has been used with materials which are hazardous to health. The packaging must protect the product against damage. Please contact the manufacturer before returning!

5. Installation and Start-Up

5.1 General

In order to prevent damage to the pump or serious injury during installation the following points must be observed:

- Installation work may only be carried out by qualified persons. The safety instructions must be followed at all times.
- The pump must be inspected for damages before any installation work is carried out.
- If you are using level control, make sure that the minimum water coverage is present.
- Air pockets may not be allowed to enter the pump housing or the pipes and they must be removed with a suitable ventilation system or a small inclination of the pump.
- Protect the pump from frost.
- The operating area must be laid out for each machine. You must ensure that lifting gear can be fitted without any trouble, since this is required for assembly and removal of the machine.
- The maximum bearing capacity must be greater than the weight of the machine, add-on units and cable.
- Electric power cables must be laid out in such a way that safe operation and non-problematic assembly/dismantling are possible at all times.
- The electric power cables should be fastened properly to the pipes with cable holders or other suitable equipment. This should prevent loose hanging and damage to the electric power cables. Depending on the cable length and weight, a cable holder should be fitted every two or three meters.
- The structural components and foundations must be of sufficient stability to ensure safe and functional operation. The operator or supplier is responsible for the provision.
- Never let the unit run dry. Therefore, we recommend installing a level control unit.
- Use deflector plates for the pumped fluid intake that air cannot introduce into the pumped liquid. this will lead to that the pump will run smoothly and is subjected to higher wear and tear.



5.2 Installation



Danger of falling!

Installation work for the pump and its accessories is performed directly on the edge of the basin. Carelessness or wearing inappropriate clothing could result in a fall. There is a risk of fatal injury! Take all necessary safety precautions to prevent this.

Submerged Base Stand Installation

A separate ring base stand, which is available as an accessory must be fixed at the bottom of the pump. Fix a 90° elbow to the pump discharge. The pump may be installed with a flexible discharge hose or a rigid pipe, non-return valve and isolating valve. If a flexible hose is used, make sure that it does not buckle. Fix a chain to the pump handle and lower the pump into the liquid. If the pump is installed on muddy ground, support it on bricks to prevent it from sinking in.

Submerged Installation with auto-coupling

Permanent installation of the pumps can be done on a stationary auto-coupling. The following instructions refer to the use of the original HOMA system.

- Place the auto-coupling base unit on the bottom of the pit. Use a plumb line to fix the correct position of the guide rail bracket on the inside of the pit cover. Drill mounting holes and fasten the guide rail bracket provisionally with 2 screws.
- Put the auto-coupling base unit in the exact position and fasten with expansion bolts to the pit bottom. If the bottom is uneven, the base unit must be supported to be in horizontal position.
- Assemble the discharge pipe in accordance with the generally accepted procedures and without exposing the pipe to distortion or tension.
- Insert the guide rails in the ring of the auto-coupling base and adjust the length of the rails by cutting them accurately to the guide rail bracket.
- Unscrew the provisionally fastened guide rail bracket, fit it on top of the guide rails and fasten it to the pit cover. Make sure that the guide rails do not have any axial play, as this would cause noise during pump operation.
- Clean out debris from the pit before lowering the pump into operation position.
- Fit the coupling flange at the discharge of the pump. Make sure that the rubber profile-seal is properly fixed to the flange and will not fall off when the pump is lowered into the pit. Slide the guide bar of the coupling flange between the guide rails and lower the pump into the pit by means of a chain secured to the pump handle. When the pump reaches the auto-coupling base unit, it will automatically connect tightly.
- Hang up the end of the chain to a suitable hook at the top of the pit.
- Adjust the length of the motor cable, so that it is not damaged during the pump operation. Make sure that the cables are not sharply bent or pinched.

Dry Installation

For installation of the pump outside the collection sump, a suction pipe must be connected to the pump inlet. Only pumps with motor jacket cooling must be used for dry installation. The pump may be installed vertical or horizontal.

- Fit the bracket or the base stand to the pump.
- Mark and drill mounting holes in the concrete floor.
- Fasten the pump with expansion bolts.
- Connect the motor cable and the monitoring cable.
- Fit the suction and discharge pipes and isolating valves, if used, and ensure that the pump is not stressed by the pipe work.

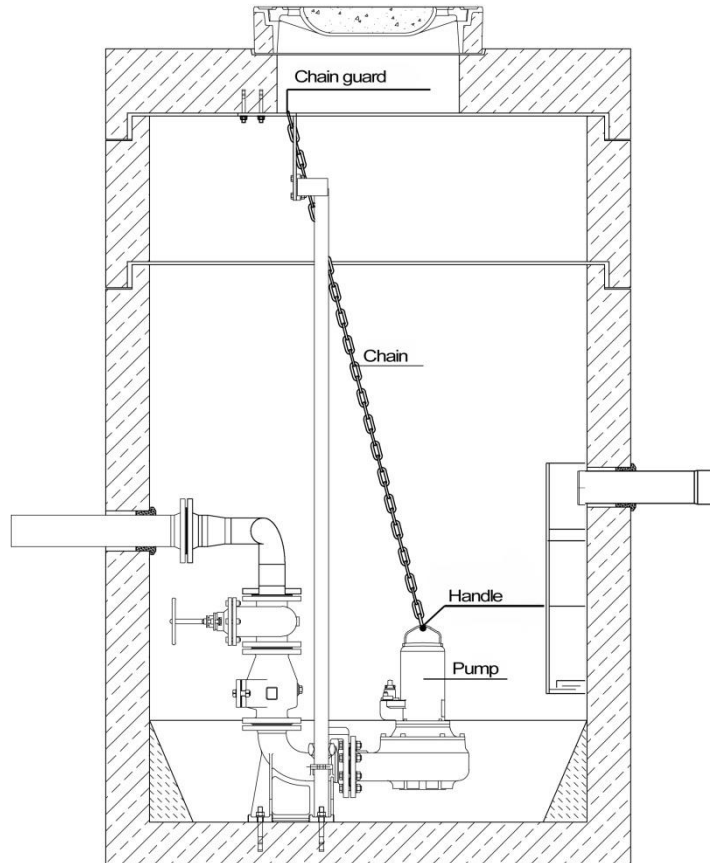


Pumps equipped with a cooling jacket must be vented! To do so, locking screw 903.02 must be loosened. After venting, the locking screw must be re-tightened.

5.3. Use of chains

Chains are used for lowering and raising the pump in the operating area. They are not used to safely suspend pumps. Use them as follows:

- Fix one end of the chain on the handle of the pump.
- Fix the other end of the chain on the lifting gear.
- Tighten the chain and lift the pump slowly.
- Swing the pump over the operating area and lower it carefully.
- Make sure if the pump stands secure or if the coupling system is connected tightly.
- Remove the chain from the lifting gear and safe it on the chain guard on the top of the operating area. Make sure that the chain cannot fall down.



5.4. Start-Up

The "Start-up" chapter contains all the important instructions for the operating personnel for starting up and operating the machine safely.

The following specifications must be adhered to and checked:

- Type of installation
- Operating mode
- Minimum water coverage / max. submersion

If the machine has not been operated for some time, check these specifications again and rectify any faults you find!

The operation and maintenance handbook must always be kept either by the machine or in a place specially reserved for it where it is accessible for operating personnel at all times.

In order to prevent damage or serious injury during start-up of the machine, the following points must be observed:

The machine may only be started up by qualified personnel. The safety advice must be followed at all times:

- Every person working on the machine must have received, read and understood this operating and maintenance manual. This must also be confirmed with a signature in the machine operator list.
- Activate all safety devices and emergency stop elements before start-up.
- Electrical and mechanical settings may only be made by specialists.
- This machine may only be used under the working conditions specified in this handbook.

5.5. Preparatory work

The machine has been designed and constructed using the very latest technology. Under normal working conditions it will operate reliably and for long periods. The one condition for this is that all instructions and advice are observed.

Minor oil leakage in the mechanical shaft seal on delivery is no cause for concern. However, it must be removed prior to submersion in the pumped liquid.

Please check the following:

- Cable guidance – no loops, slightly taut
- Check the temperature and submersion depth of the pumped liquid – see machine data sheet

- If a hose is used on the discharge side, it should be flushed out with clean water before use to prevent any sediment causing blockages
- The pump sump must be cleaned for wet installation
- Clean the discharge and intake side pipe system and open all sliders
- The pump housing must be flooded, i.e. it should be completely full of fluid, with no air in it at all. Bleeding can take place using a suitable bleeding device in the system, or, if available, with bleeder screws on the discharge port.
- Check that all accessories, the pipe system and suspension unit are properly fitted
- Check all level control and dry-run protection systems

An insulation test and filling level check must be carried out prior to start-up.

5.6. Electrical system

Observe the relevant local and national regulations when laying out and selecting the electric lines as well as when connecting the motor. The motor must be protected by a motor protection switch.

Have the motor connected in accordance with the "Wiring connection" data sheet. Pay attention to the direction of rotation. If the direction of rotation is incorrect, the machine will not perform as specified, and under certain circumstances, can become damaged. In accordance with the machine data sheet, check the operating voltage and make certain that the current consumption remains uniform during all phases.

Make sure that all temperature sensors and monitoring devices, such as the sealing chamber monitor, are connected and that their function is tested. For details on this, see the wiring diagram.



Beware of electrical current!
Incorrectly performed electrical work can result in fatal injury.
This work may only be carried out by a qualified electrician.

5.7. Direction of rotation

The machine must be connected in accordance with the wiring diagram. Rotation direction is controlled by a rotating field tester. This tester is switched on when the pump is connected and displays the rotation direction of the rotating field. There must be a clockwise rotating field for the machine to run correctly. If a counter-clockwise rotating field is displayed, two phases must be swapped.

The pump and performance data specified can only be achieved when there is a clockwise rotating field.
The machine is not designed for operation with a counter-clockwise rotating field.

5.8. Motor protection

The minimum requirement is a thermal relay / motor protection switch with temperature compensation, differential triggering and an anti-reactivation device in accordance with VDE 0660 or the appropriate national regulations. If the machines are connected to electrical systems in which faults frequently occur, we recommend installing additional protective devices (overvoltage, undervoltage or phase failure relays, lightning protection). Local and national regulations must be adhered to when connecting the machine.

5.9 Operation with a static frequency converter

The following points must be observed when operating the converter:

- The pump is suitable for operation with the frequency converter according to DIN EN 60034-17.
- Voltage peaks at the motor winding must be avoided and, where appropriate, suitable filters must be provided in the motor lead.
- The proper grounding of the entire system must be ensured.
- The specifications of the frequency converter manufacturer must be observed.
- Under certain circumstances, a shielded cable is necessary to comply with EMC directives.
- The information sheet "Using HOMA pumps with the frequency converter" must be observed.

Minimum speed for submersible pumps (wet-well pumps)

For submersible pumps a minimum speed is not required. Take care that the pump, especial at lower speed, will work hitch and vibration free. Otherwise the mechanical seals might be damaged and untight. In addition, the minimum flow velocity of 0.7 m/s must always be met or exceeded.

5.10. Activation types

Activation types for cables with free ends (without plugs)

Direct activation

Motor protection should be set to the rated current when fully loaded. At partial load, we recommend that motor protection is set 5% above the measured current at the operating point.

Star-delta activation

If the motor protection is installed in the line:

Set the motor protection to 0.58 x the rated current. The maximum start-up time in star-delta mode is 3 seconds. If the motor protection is not installed in the line, set the motor protection to the rated current when fully loaded.

Starting transformer/soft start

Motor protection should be set to the rated current when fully loaded. At partial load, we recommend that motor protection is set 5% above the measured current at the operating point. The maximum start-up time at reduced voltage (approx. 70%) is 3 seconds.

Operation with frequency transformers

The machine can be operated on frequency transformers. Observe chapter 5.9 of this manual.

Activation types with plugs / relays

Connect the plug to the socket provided and press the On/Off switch on the relay

5.10.1. After Start-Up

The rated current is briefly exceeded during the start-up procedure. Once this process has ended, the operating current should no longer exceed the rated current.

If the motor does not start immediately after the machine is switched on, it must be switched off immediately. The start pauses specified in the technical data must be adhered to before starting up again. If the fault recurs, the machine must be switched off again immediately. The machine may only be started again once the fault has been rectified.

The following items should be monitored:

- Operating voltage (permissible deviation +/- 5% of the rated voltage)
- Frequency (permissible deviation -2% of the rated frequency)
- Current consumption (permissible deviation between phases is a maximum of 5%)
- Voltage difference between the individual phases (max. 1%)
- Starts and stops per hour (see technical data)
- Air entry in the infeed, a deflector plate should be fitted if necessary
- Minimum water immersion level, level control unit, dry-run protection
- Smooth running
- Check for leaks, if need be, follow the necessary steps as set out in "Maintenance"

6. Maintenance

6.1. General

The pump and the entire plant must be checked and maintained at regular intervals. The maintenance period is specified by the manufacturer and applies to general service conditions. If aggressive and/or abrasive media are to be conveyed, the manufacturer must be consulted, since the period may be shortened in such cases.

The following points are to be attended to:

- The operating instructions must be available to the maintenance personnel and must be obeyed by them. Only the maintenance work and measures listed here may be carried out.
- All maintenance, inspection and cleaning work on the machine and the plant must be carried out with the greatest care by trained specialist personnel at a safe workplace. The necessary personal protective equipment must be worn. For all work, the machine must be isolated from the grid. Switching on unintentionally must be prevented. In addition, during work in basins and/or tanks, the appropriate protective measures in accordance with BGV/GUV are to be complied with without fail.
- Where weight exceeds 50kg, technically faultless and officially approved auxiliary hoisting gear must be used for raising and lowering the machine.

Convince yourself that sling gear, cables and the safety devices of the hand winch are technically flawless. Work must not be started until the auxiliary hoisting gear is technically in order. In the absence of these checks, a mortal danger exists!

- Electrical work on the machine and the plant must be carried out by a person skilled in the art. In the case of approved explosion-proof machines, you must also comply with the "explosion protection" section of the Appendix!
- When easily ignited solutions and cleaning materials are being used, open fires, naked flame and smoking are forbidden.
- Machines that circulate or come into contact with media hazardous to health must be decontaminated. It must also be ensured that no gases hazardous to health form or are present.
- Make sure that the required tools and materials are present. Order and cleanliness ensure safe and faultless work on the machine. After the work, remove used cleaning materials and tools from the machine. Keep all materials and tools in the place provided for that purpose.
- Process media (e.g. oils, lubricants etc.) are to be captured in suitable containers and are to be correctly disposed of (in accordance with Directive 75/439/EEC and subsections 5a, 5b of the German Waste Management Act). Appropriate protective clothing is to be worn during cleaning and maintenance work. This is to be disposed of in accordance with German Waste Code TA 524 02 and EC Directive 91/689/EEC. Only the lubricants recommended by the manufacturer may be used. Oils and lubricants must not be mixed. Use only the manufacturer's original parts.

A trial run or functional test of the machine may only take place in accordance with the general operating conditions!

Type of oil: Biodegradable HOMA ATOX. Used oil is to be disposed of correctly.

When white oil is used, the following is to be heeded:

- Only media from the same manufacturer may be used for refilling and/or filling from new.
- Before being operated with white oil, machines that have previously been operated with other media must first be thoroughly cleaned.

6.2. Maintenance intervals

Before commissioning or after lengthy storage:

- Testing insulation resistance
- Level checks on sealing space/chamber – media must reach the lower edge of the filler opening
- Slide ring seal is to be checked for damage.

Monthly:

- Checking current consumption and voltage
- Checking the switchgear used for temperature sensor, sealing chamber control etc.

Semi-annually:

- visual check on the power supply cable
- visual check on the cable support and the cable-tensioning system.
- visual check on accessories, e.g. suspension arrangement, hoists etc.

3,000 hours of operation:

- Visual check on pumps with oil barrier chamber
- Visual check on pumps without oil barrier chamber

8,000 hours of operation or after two years at the latest:

- Testing insulation resistance
- Exchanging operating service fluids sealing space/chamber
- Checking and if appropriate, repairing the coating
- Functional test on all safety- and monitoring systems.

15,000 hours of operation or after two years at the latest:

- General overhaul at the works

When used in seriously abrasive and/or aggressive media, the maintenance intervals are shortened.

6.3. Maintenance tasks

Checking current consumption and voltage

Current consumption and voltage on all 3 phases are to be checked regularly. In normal operation, these remain constant. Slight fluctuations depend on the nature of the conveyed medium. Observing current consumption enables damage and/or malfunctions of blade wheel/propeller, bearings and/or motor to be detected and eliminated at an early stage. This can largely prevent greater consequential damage and reduce the risk of a total failure.

Checking the switchgear used for temperature sensor, sealing chamber control etc.

Check the switchgear used for faultless function. Defective equipment must be exchanged immediately, for it does not guarantee protection for the machine. Information about testing procedure is to be strictly obeyed (operating instructions for the respective switchgear).

Testing insulation resistance

The power supply cable must be disconnected for the insulation resistance to be checked. The resistance can then be measured with an insulation tester (the measurement voltage is 1000 volts DC). The following values must be achieved:

On first being taken into use, the insulation resistance must be at least 20 MΩ. In further measurements, the value must be greater than 2 MΩ. Insulation resistance too low: Moisture may have penetrated the cable and/or motor.

Do not connect machine again but consult the manufacturer!

Visual check on the power supply cable

The power supply cable must be investigated for bubbles, cracks, scratches, chafe marks and/or pinching points. If damage is discovered, the damaged power supply cable must be exchanged immediately.

Only the manufacturer or an authorized or certified service workshop may exchange cables. The machine may not be put into operation again until the damage has been correctly eliminated!

Visual check on the cable support (snap hook) and cable-tensioning system)

When the machine is used in basins or shafts, the hoisting slings / cable support (snap hook) and the cable-tensioning system are exposed to constant wear. Regular tests are necessary in order to prevent hoisting slings / cable support (snap hook) and/or cable-tensioning system wearing out totally and the power cable being damaged.

The hoisting slings / cable support (snap hook) and the cable-tensioning system are to be exchanged immediately if they display minor indications of wear!

Visual check on accessories

Accessories such as suspension arrangements, hoists etc. are to be checked for correct seating. Loose and/or defective accessories are to be repaired or exchanged immediately.

Visual check on pumps with oil barrier chamber

Oil filling level and oil condition:

The condition of the slide ring seals can be checked by a visual check on the oil. Lay pump horizontally so that the oil chamber level checking screw located on the side of the motor housing (or, in larger pumps, one of the two oil chamber level checking screws) is on top.

Remove the screw and remove a small amount of oil. Cloudy or milky oil indicates a defective shaft seal. In this event, have the condition of the shaft seal checked by a HOMA specialist workshop or the HOMA works customer service.

Type of oil: biodegradable HOMA ATOX. Used oil is to be disposed of correctly in accordance with the current regulations on environmental protection.

Functional test on all safety and monitoring systems

Monitoring systems include temperature sensors in the motor, sealing chamber control etc. Motor protection relays, overvoltage relays and other tripping devices can generally be triggered manually for testing. For checks on the sealing chamber control or the temperature sensors, the machine must have cooled down to ambient temperature and the electrical connecting cable of the monitoring system must be disconnected in the switch cabinet. The monitoring system is then checked with an ohmmeter. The following values are to be measured:

Bimetal sensors: value equal to "0" - pass through

Thermocouples: A thermocouple has a cold resistance between 20 and 100 Ω . With 3 sensors in series, the resulting value would be from 60 - 300 Ω .

PT100 sensors: PT100 sensors have a value of 100 Ω at 0°C. Between 0°C and 100°C, this value increases by 0.385 Ω per 1°C. At an ambient temperature of 20°C, the calculated value is 107.7 Ω .

Sealing chamber control: the value must rise towards "infinity". If values are lower, there may be water in the oil. Please also note the indications of the evaluation relay, available as an option.

In the event of larger deviations, please consult the manufacturer!

The operating instructions for the auxiliary hoisting gear explain how to check its safety and monitoring systems.

General overhaul

In addition to the normal maintenance work, the motor bearings, shaft seals, O-rings and electrical power lines are checked and, if appropriate, exchanged during a general overhaul. This work may only be performed by the manufacturer or by an authorized service workshop.

Exchanging service fluids

When drained off, service fluids must be checked for contamination and admixtures of water. If the service fluids are heavily contaminated and contain more than a 1/3 water fraction, they must be exchanged once more after four weeks. If there is water in the service fluids again, there is a suspicion of a defective seal. Please consult your manufacturer. In the event of a defective seal, the display will again light up within four weeks following the exchange if a sealing chamber control or leakage monitoring is used.

In general, the following applies when exchanging service fluids:

Switch the machine off and let it cool down, disconnect it from the grid (have this done by a person skilled in the art!), clean it and place it in a vertical position on a firm surface. Warm or hot service fluids may be under pressure. Escaping service fluids may cause burns. So allow the machine first to cool down to the ambient temperature! Secure it against falling over and/or slipping away!

6.4. Sealing chamber

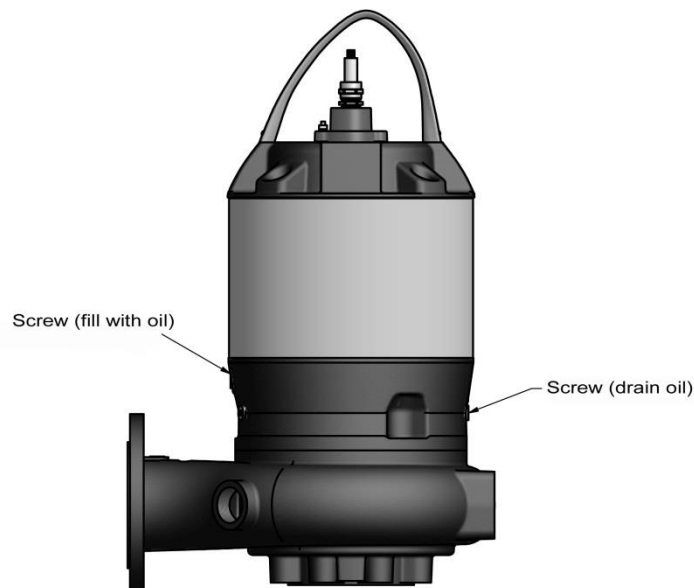
- Carefully and slowly unscrew the oil filler plug of the sealing space.

Caution: The service fluids may be under pressure!

- Unscrew the oil drain screw. Drain the service fluids and collect them in a suitable container. Clean the drain plug, fit a new sealing ring and reinsert it. The machine must be tipped slightly to one side to ensure it is completely emptied.

Ensure that the machine cannot fall over and/or slip away!

- Lay the machine horizontally and refill it with service fluids. Please use the prescribed service fluids and filling quantities. The filling quantity is 1.1 litre.
- Clean the filler plug, fit a new sealing ring and reinsert it.



7. Repairs

7.1. General

The following repair work may be done on this machine:

- Exchange of blade wheel and pump chamber
- Exchange of split ring

In general, the following should always be heeded when doing this work:

- O-ring seals and existing seals must always be replaced.
- Screw locking devices such as spring washers must always be exchanged.
- Torque values must be complied with.



The following applies in general to repair work:

Switch the machine off, disconnect it from the grid, clean it and lay it in a horizontal position on a firm supporting surface. Secure it against falling over and/or slipping away!

Unless stated otherwise, the torque values in the Tables should be used. Values for clean, lubricated screws. Tightening torque [Nm] for A2/A4 screws (friction coefficient = 0.2)

	A2/A4, strength 70	A2/A4, strength 80
	DIN912/DIN933	DIN912/DIN933
M6	7 Nm	11.8 Nm
M8	17 Nm	28.7 Nm
M10	33 Nm	58 Nm
M12	57 Nm	100 Nm
M16	140 Nm	245 Nm
M20	273 Nm	494 Nm

7.2. Changing various parts of the pump

Exchanging impeller and pump housing

- Loosen and unscrew the cylinder head screw on the sealing casing with a hexagon socket.
- Secure the pump housing with a suitable device, e.g. an auxiliary hoisting gear, and withdraw it from the sealing casing. Lay it on a secure surface.
- Fix the blade wheel firmly with a suitable device, loosen and unscrew the blade wheel mounting (cylinder head screw) with a hexagon socket.

Pay attention to the screw locking device!

- Withdraw the blade wheel from the shaft with a suitable extractor.
- Clean the shaft
- Mount the new blade wheel on the shaft.

Make sure that the mating surfaces are not damaged!

- Insert a new blade wheel mounting (cylinder head screw with a hexagon socket and a new screw locking device) into the shaft. Fix the blade wheel firmly and tighten cylinder head screw firmly.
- Place the pump part on the sealing casing and secure it with the hexagonal nuts.
- It must be possible to rotate the blade wheel by hand.

Exchanging the split ring

Split rings determine the clearance between the blade wheel and the suction inlet. If this clearance becomes too large, the handling capacity of the pump falls and/or clogging may occur. The ring is designed so that it can be exchanged. This reduces signs of wear at the suction inlet and blade wheel and minimizes the cost of replacement parts.

Exchanging the slide ring seal

Exchanging the slide ring seal requires basic knowledge and some specialist knowledge of these sensitive components. Furthermore, the machine must to a large extent be dismantled for this work.

Only original parts may be used as replacements!

Checking and exchanging these parts is done by the manufacturer during a general overhaul or by specially trained personnel.

In the case of Ex approved machines, please also note the "Explosion protection" section in the Appendix

8. Shutdown

8.1 Temporary shutdown

For this type of shutdown, the machine remains installed and is not cut off from the electricity supply. For temporary shutdown, the machine must remain completely submerged so that it is protected from frost and ice. Make sure the operating room and the pumped fluid cannot be covered by ice.

This ensures that the machine is always ready for operation. During longer shutdown periods, carry out a regular (monthly to quarterly) function run for a period of 5 minutes.



Caution!

Only carry out a function run under the proper conditions of operation and use (see “Product Description”). Never run the machine dry. This can result in irreparable damage!

8.2 Final shutdown / storage

Switch off the system, disconnect the machine from the electricity supply and dismantle and store it. Note the following information concerning storage:



Beware of hot parts!

When removing the machine, be careful of the temperature of the housing components. These can heat up to well above 40°C. Let the machine cool down to ambient temperature before you touch it.

- Clean the machine.
- Store it in a clean, dry place, protect the machine against frost.
- Place it down vertically onto a firm foundation and secure it against falling.
- Seal the intake and discharge ports of pumps with suitable material (such as foil).
- Support the electric connecting lead on the cable lead-in to help avoid a permanent deformation.
- Protect the ends of the electric power cable from moisture.
- Protect the machine from direct sunshine as a preventive measure against brittleness in elastomer parts and the propeller and casing coating.
- When storing the machine in a garage please remember: Radiation and gases which occur during electric welding destroy the elastomers of the seals.
- During lengthy periods of storage, regularly (for example every six months) turn the impeller or propeller by hand. This prevents indentations in the bearings and stops the rotor from rusting up.

8.3 Restarting after an extended period of storage

Before restarting the machine, clean it of dust and oil deposits. Then carry out the necessary maintenance actions (see “Maintenance”). Check that the mechanical shaft seal is in good order and working properly. Once this work has been completed, the machine can be installed (see “Installation”) and connected to the electricity supply by a specialist. See “Start-up” for instructions on restarting.

Only restart the machine if it is in perfect condition and ready for operation.

9. Troubleshooting

In order to prevent damage or serious injury while rectifying machine faults, the following points must be observed:

- Only attempt to rectify a fault if you have qualified personnel. This means each job must be carried out by trained specialist personnel, for example electrical work must be performed by a trained electrician.
- Always secure the machine against an accidental restart by disconnecting it from the electric system. Take appropriate safety precautions.
- Always have a second person make sure the machine is switched off in an emergency.
- Secure moving parts to prevent injury.
- Independent work on the machine is at one's own risk and releases the manufacturer from any warranty obligation.

The machine will not start

Cause	Remedy
Electricity supply interrupted – short circuit or earth connection in the cable or motor windings	Have the motor and wires checked by a specialist and replaced if necessary
Fuses, the motor protection switch and/or monitoring devices are triggered	Have a specialist inspect the connection and correct them as necessary Have the motor protection switch adjusted according to the technical specifications, and reset monitoring equipment. Check that the impeller/propeller runs smoothly. Clean it or free it as necessary
The moisture sensors (option) has interrupted the power circuit (operator-related)	See fault: Mechanical shaft seal leaks, sealing chamber monitor reports fault and switches the machine off

Machine runs but does not pump

Cause	Remedy
No pumped fluid	Open the container intake or sliders
Intake blocked	Clean the intake, slider, suction port or intake strainer
Impeller/propeller blocked or obstructed	Switch off the machine, secure it against being switched on again and free the impeller/ propeller
Defective hose or piping	Replace defective parts
Intermittent operation	Check the control panel

The motor starts, but the motor protection switch triggers shortly after start-up

Cause	Remedy
The thermal trigger on the motor protection switch is incorrectly set	Have a specialist compare the setting of the trigger with the technical specifications and adjust it if necessary
Increased power consumption due to major voltage drop	Have an electrician check the voltage on each phase and rewire if necessary
Excessive voltage differences on the three phases	Have a specialist inspect the connection and the switching system and correct it as necessary
Incorrect direction of rotation	Swap the 2 phases from the mains supply
Impeller/propeller impeded by adhesive material, blockages and/or solid matter, increased current consumption	Switch off the machine, secure it against being switched on again and free the impeller/ propeller or clean the suction port
The pumped fluid is too dense	Contact the manufacturer

The machine runs, but not at the stated operating levels

Cause	Remedy
Intake blocked	Clean the intake, slider, suction port or intake strainer
Slide in the discharge line closed	Fully open the slide
Impeller/propeller blocked or obstructed	Switch off the machine, secure it against being switched on again and free the impeller/ propeller
Incorrect direction of rotation	Replace 2 phases on the mains supply
Air in the system	Check the pipes, pressure shroud and/or pump unit, and bleed if necessary
Machine pumping against excessive pressure	Check the slide in the discharge line, if necessary open it completely
Signs of wear	Replace worn parts
Defective hose or piping	Replace defective parts
Inadmissible levels of gas in the pumped liquid	Contact the factory
Two-phase operation	Have a specialist inspect the connection and correct it as necessary

The machine does not run smoothly and is noisy

Cause	Remedy
Machine is running in an impermissible operation range	Check the operational data of the machine and correct if necessary and/or adjust the operating conditions
The suction port, strainer and/or impeller/propeller is blocked	Clean the suction port, strainer and/or impeller/ Propeller
The impeller is blocked	Switch off the machine, secure it against being switched on again and free the impeller
Inadmissible levels of gas in the pumped liquid	Contact the factory
Two-phase operation	Have a specialist inspect the connection and correct it as necessary
Incorrect direction of rotation	Incorrect direction of rotation
Signs of wear	Replace worn parts
Defective motor bearing	Contact the factory
The machine is installed with mechanical strain	Check the installation, use rubber spacers if necessary

Mechanical shaft seal leaks, sealing chamber monitor reports fault and switches the machine off

Cause	Remedy
Increased leakage when running in new mechanical shaft seals	Change the oil
Defective sealing chamber cables	Replace the moisture sensors
Mechanical shaft seal is defective	Replace the mechanical shaft seal after contacting the factory

Further steps for troubleshooting

If the items listed here do not help you rectify the fault, contact our customer service. They can help you as follows:

- Telephone or written help from customer service
- On-site support from customer service
- Checking and repairing the machine at the factory

Note that you may be charged for some services provided by our customer support. Customer service will provide you with details on this.

10.1. Anschluss von Pumpen und Rührwerken



Gefahr durch elektrischen Strom!

Durch unsachgemäßen Umgang mit Strom besteht Lebensgefahr! Alle Pumpen mit freien Kabelenden müssen durch einen Elektrofachmann angeschlossen werden.

10.1.1 Lastkabel

Pumpen in Stern-Dreieck Ausführung

Aderbezeichnung Motor	Klemme im Schaltschrank
U1	U1
V1	V1
W1	W1
U2	U2
V2	V2
W2	W2

Pumpen in Direktstart Ausführung

Aderbezeichnung Motor	Klemme im Schaltschrank
U	U1
V	V1
W	W1

10.1.2. Steuerkabel

Je nach Ausführung der Pumpe / des Rührwerkes kann es sein das kein separates Steuerkabel verwendet wird. Die Überwachungseinrichtungen sind dann mit dem Lastkabel ausgeführt.

Aderbezeichnung Motor	Überwachungseinrichtung
Überwachungen in der Wicklung	
T1 / T2	Temperaturbegrenzer (2 Schalter in Reihe)
T1 / T4	Temperaturregler (2 Schalter in Reihe)
T1 / T2 / T3	Temperaturbegrenzer und –regler
K1 / K2	PTC – Kaltleiter (3 Kaltleiter in Reihe)
PT1 / PT2	3 x PT100 einzeln ausgeführt
PT3 / PT4	
PT6 / PT6	
Lagerüberwachung	
P1 / P2	PT100 Lager oben
P3 / P4	PT100 Lager unten
Dichtungsüberwachung	
S1 / S2	Dichtungsüberwachung in der Ölkammer
S3 / S4	Dichtungsüberwachung im Anschlussraum
S5 / S6	Dichtungsüberwachung im Motorraum mit 2 Elektroden
S7 / S8	Dichtungsüberwachung im Motorraum mit Schwimmerschalter
S9 / S10	Dichtungsüberwachung im Getriebe (Rührwerk)
S11 / S12	Dichtungsüberwachung im Leckageraum (interne Kühlung)
Heizung	
H1 / H2	Heizungseinrichtung

10.1. Connection of pumps and mixers



Danger from electric current!

Incorrect working with electric current brings danger to life! All pumps with bare cable ends must be connected by a skilled electrician.

11.1.1 Power cables

Pumps in Star 3-phase version

Cable identification Motor	Terminal in control cabinet
U1	U1
V1	V1
W1	W1
U2	U2
V2	V2
W2	W2

Pumps in Direct start version

Cable identification Motor	Terminal in control cabinet
U	U1
V	V1
W	W1

10.1.2 Control cables

Depending on the design of the pump/agitator, it may be that no separate control cable is used. In this case monitoring devices are run from the power cable.

Cable identification Motor	Monitoring system
Monitoring in winding	
T1 / T2	Temperature limiter (2 switches in series)
T1 / T4	Temperature controller (2 switches in series)
T1 / T2 / T3	Temperature limiter and controller
K1 / K2	PTC – Thermistor (3 thermistors in series)
PT1 / PT2	3 x PT100 individually installed
PT3 / PT4	
PT6 / PT6	
Bearings monitoring	
P1 / P2	PT100 upper bearing
P3 / P4	PT100 lower bearing
Seal monitoring	
S1 / S2	Seal monitoring in oil chamber
S3 / S4	Seal monitoring in connection compartment
S5 / S6	Seal monitoring in Motor compartment with 2 Electrodes
S7 / S8	Seal monitoring in Motor compartment with float switch
S9 / S10	Seal monitoring in Gearbox (Agitator)
S11 / S12	Seal monitoring in Leakage compartment (internal cooling)
Heating	
H1 / H2	Heating system