Lockout Tagout

⚠CAUTION!

DETERMINING WHEN TO LOCKOUT

Having performed a hazard analysis on your company's equipment, you can now determine when machines must be locked out – i.e., when employees are exposed to injury from each (or any) of a machine's hazardous energy sources during servicing or maintenance activities. To do this, use your Hazard Analysis Checklist and the "Four Key Questions for Lockout Implementation."

---

i NOTE!

OSHA Requirements
OSHA rules state that equipment must be locked out during equipment servicing and maintenance whenever employees are exposed to injury from unintentional machine movement or startup. According to OSHA's regulations, servicing or maintenance procedures that require lockout include:

"Workplace activities such as construction, installing, setting up, inspecting, modifying, and maintaining and/or servicing machines or equipment. These activities include lubrication, cleaning, or un-jamming of machines or equipment and making adjustments or tool changes, where the employee may be exposed to the unexpected energization or startup of the equipment or release of hazardous energy."

In addition, lockout is required during any machine service or maintenance that requires an employee to:

- ► Remove or bypass a safety device; or
- ► Place any part of his or her body into a point of operation or similar danger zone during a machine's operating cycle.

---

i NOTE!

Routine, Repetitive Activities
Routing and repetitive servicing procedures that take place during normal production operations, such as minor tool changes and adjustments, do not require lockout tagout, as long as the work is performed using "alternative measures which provide effective protection."

These "alternative measures" include safeguarding methods approved by OSHA and ANSI (American Standards Institute) to protect operators, such as:

- ► Presence sensing devices
- ► Interlocking barrier guards

Remember, the factor that determines whether these or any other safeguarding methods eliminate the need for lockout tagout during routine, repetitive activities is whether the employee is protected from injury. If lockout is not required, you MUST have clearly written procedure that describe the alternative safeguarding measures used and the tasks that may be performed. Refer to OSHA and ANSI standards for approved safeguarding methods

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Safety precautions

⚠WARNING!

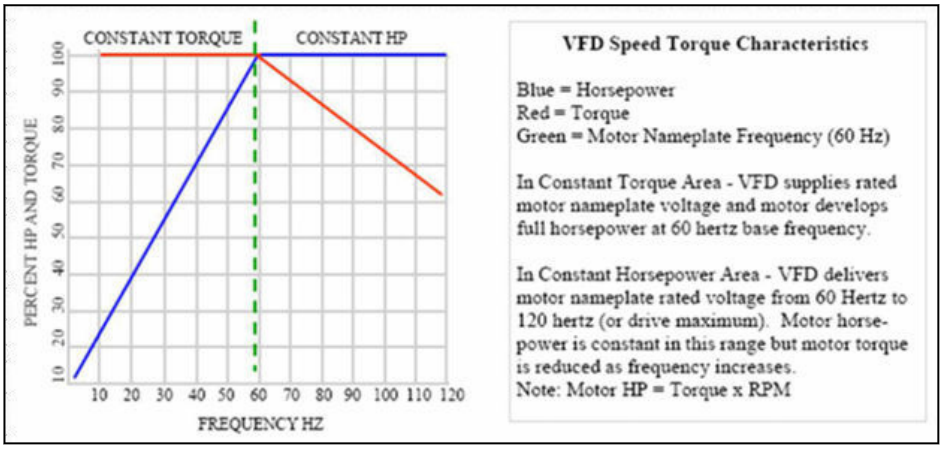
When Variable Frequency Drives (VFD's) are being used to vary the speed of the NETZSCH Progressing Cavity Pumps, then they MUST be CONSTANT TORQUE VFD's.

How the pump works

NETZSCH Progressing Cavity Pumps operate at a constant torque requirement for a specific operating pressure.
The speed of the pump does NOT affect the torque requirement.
For example: a pump running at 60psi output pressure at a speed of 200 revolutions per minute requires the same toque input as if it were running at 60psi output pressure at a speed of 600 revolutions per minute. The only exception to this rule is during pump startup; at the moment the pump starts the motor must provide more torque than the pump requires when it is running. This is due to the force of static friction that the motor must overcome in order to begin rotation. Although this is only a momentary force, enough torque has to be available to break the static load.

How the VFD works

Variable Frequency Drives work by taking the supplied power and modulating the supplied power frequency in linear proportion to the supplied voltage. This proportional modulation allows the motors speed to be altered without the motor drawing too many amps and burning out.
A VFD can be built to perform this modulation in one of two ways. The VFD can be set to modulate the frequency above the normal supplied 60HZ frequency allowing the output to provide a constant amount of power but the torque will drop off as speed is increased **(THIS IS A CONSTANT HP VFD)** or it can modulate the frequency below the normal supplied60HZ frequency allowing the output to provide constant Torque but the power will decrease as the speed is reduced **(THIS IS A CONSTANT TORQUE VFD)**. This relationship is shown in the detail below. The manufacturers of VFD's typically offer two service factors.
Normal Duty; which has an overload capacity of the VFD's full load ampere rating times 110% - 120% for one minute and Heavy Duty; which has an overload capacity of the VFD's full load ampere rating times 150% for one minute. Typically, constant Hp VFD's are sold with a Normal duty rating since the applications don't call for high starting torque which causes amp draw to spike. Constant torque VFD's are usually sold with heavy duty ratings so that they can supply elevated startup amp draws for high starting torque applications.



Application

Because while running a progressing cavity pump the torque value required by the pump is fixed; any reduction in supplied torque as a result of operational speed could cause the pump to fail. Also, depending on the running speed required, a constant HP VFD may not be capable of supplying the torque needed for pump startup. This is the reason a **Constant Torque** VFD **MUST** be used to operate a progressing cavity pump.

⚠CAUTION!

SAFETY PRECAUSIONS

Always bear in mind your safety during operation, maintainance and installation. Please adhere to the EC-Directive of machinerie including the national regulations and follow the US OSHA regulation #1910.219 & 1910.147 titled Mechanical Power transmission apperatus as well as the European Standard EN 292 with the accidents prevention rules laid down by the trade unions and other appropriate technical institutions.

This manual shows personnel how to safely and efficiently operate the N.MAC® macerator, channel variant model series with drive (hereafter referred to as “machine”). This manual is part of the machine and must be kept near it so personnel can access it at any time.

Before beginning any work, personnel must read this manual carefully and understand it. Compliance with all the safety instructions and procedural instructions presented in this manual is an essential requirement for safe work. Furthermore, the local accident prevention regulations and general safety regulations for the area of application apply to the machine.

Illustrations in this manual are intended for basic understanding and may deviate from the actual design.

Other applicable documents

Along with this manual, the instructions found in the appendix and the following supplemental documents apply:

- Data sheet
- Scale drawings
- Declaration of conformity/Declaration of incorporation
- Supplier documentation
- Certificate of Ex usage (ATEX)*
- Spare parts lists*

* Only included with delivery if the machine is ordered accordingly. Can be ordered subsequently as needed.

Copyright

Rua Hermann Weege, 2383

89107-000 Pomerode/SC

Brazil

Warranty conditions

The warranty period for the N.MAC® macerator is 24 months, unless otherwise contractually agreed. Wear parts are excluded from the warranty.

The warranty is voided if:

- Damage results from noncompliance with this manual
- Operating conditions are changed (such as rotational speed, size and material of the solids, fluid composition)
- The machine is not installed or removed by NETZSCH customer service or personnel authorized by NETZSCH or with express written permission and specific instruction by NETZSCH.

Customer service

Our central office or the NETZSCH sales companies are available for questions about the machine, ordering spare parts and technical information.

See section 14 in appendix.

Table of contents

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1 Overview

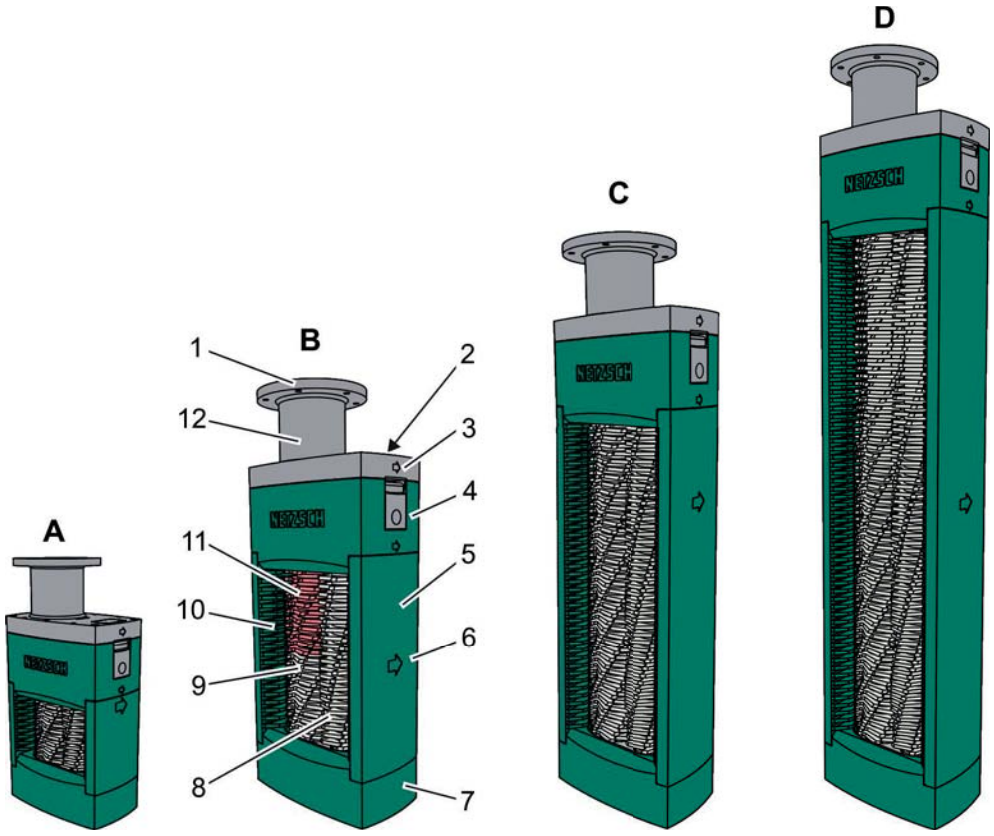

Fig. 1: Overview of channel variant, examples 50C, 120C, 250C, 400C

A	Channel variant, 50C
B	Channel variant, 120C
C	Channel variant, 250C
D	Channel variant, 400C
1	Connection flange of drive
2	Rating plate
3, 6	Flow direction
4	Gearbox housing
5, 10	Side wall
7	Base
8	Rotating axle, clockwise rotation
9	Rotating axle, counter-clockwise rotation
11	Cutter block
12	Coupling housing

Accessories

The following accessories are available as options:

- Cleaning comb
- Drive extension
- Reception structure
- Gear motor
- Control cabinet

Drive

The drive is a supplier component and is described in a separate manual. This manual is included in the scope of delivery.

2 General remarks

2.1 Information on this manual

This manual shows personnel how to safely and efficiently operate the machine. This manual is part of the machine and must be kept near it so personnel can access it at any time.

Before beginning any work, personnel must read this manual carefully and understand it. Compliance with all the safety instructions and procedural instructions presented in this manual is an essential requirement for safe work.

Furthermore, the local occupational health and safety regulations and general safety regulations for the area of application apply to the machine.

2.2 Symbols used in this manual

Safety instructions

Safety instructions are indicated by symbols in this manual. The safety instructions are prefaced by signal words indicating the extent of the hazard.

⚠ DANGER	**This combination of symbol and signal word indicates a situation of immediate danger that will lead to death or severe injuries if not avoided.**
⚠ WARNING	**This combination of symbol and signal word indicates a possibly dangerous situation that could lead to death or severe injuries if not avoided.**
⚠ CAUTION	**This combination of symbol and signal word indicates a possibly dangerous situation that could lead to minor injuries if not avoided.**
NOTICE	**This signal word indicates a situation which, if not avoided, could result in damage to property or the environment.**

Safety instructions in procedural instructions

Safety instructions can refer to particular individual procedural instructions. Such safety instructions are included in the procedural instructions so the flow of reading is not interrupted while performing the action. The signal words described above are used.

For example:

1. Remove the screw.
2. ⚠ **CAUTION! Risk of entrapment by the cover!**
   Close the cover carefully.
3. Tighten the screw.

Tips and recommendations

This symbol emphasizes useful tips and recommendations, as well as information for more efficient, trouble-free operation.

Other symbols

The following symbols are used in this manual to emphasize procedural instructions, results, lists, references, and other elements:

Symbol	Explanation
	Step-by-step procedural instructions
⇨	Results of steps
↯	References to sections of this manual and to other applicable documents
■	List without a defined sequence
[Buttons]	Operating elements (e.g. buttons, switches), display elements (e.g. signal lamps)

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3 Safety

3.1 Responsibility of the operating company

Operating company

The operating company is the company that operates the machine for commercial or economic purposes or authorizes a third party to use the machine and bears all legal product responsibility during operation to protect the user, personnel or others.

Duties of the operating company

The machine is for industrial use. Therefore the company operating the machine must comply with the statutory duties for occupational safety.

In addition to the safety instructions in this manual, the applicable regulations for safety, occupational health and environmental protection for the area of application of the machine must be adhered to.

The following applies in particular:

- The operating company must know the applicable occupational health and safety regulations and conduct an additional risk assessment to determine risks resulting from the particular working conditions at the location where the machine is used. This information must be used to create operating instructions for the machine.
- During the entire period of machine use, the operating company must check whether the operating instructions reflect the current status of the body of rules and regulations and make corresponding updates as needed.
- The operating company must clearly define and manage the responsibilities for installation, operation, troubleshooting, maintenance and cleaning.
- The operating company must ensure that all persons working with the machine have read and understood this manual. Furthermore, personnel must be trained at regular intervals and informed of risks.
- The operating company must provide personnel with the required protective equipment. Binding instructions must be given to wear the required protective equipment.
- If surface temperatures above 50 °C (122 °F) or below 0 °C (32 °F) are produced by the liquid flow, the operating company must place warning signage to this effect near the machine.
- If no separating safety devices are included in the scope of delivery, the operating company must protect the power-transmitting parts from accidental contact using separating protective devices.
- The operating company must ensure that the signals necessary for personnel safety (such as buzzers) can be heard despite the noise created by the machine.

Furthermore, the operating company is responsible for ensuring that the machine remains in good technical condition. Therefore, the following applies:

- The operating company must ensure compliance with the maintenance intervals described in this manual.
- The operating company must install a safety device to detect short-circuits and cut off all connection phases.
- The operating company must ensure that the machine is grounded with sufficiently low grounding resistance.
- The operating company must integrate the machine into its superordinate control system such that safe operation is assured, taking into account the conditions of operation and the environment.
- The operating company must have all safety devices checked periodically to ensure that they are operable and complete.

Additional responsibilities of the operating company for explosion protection

The operating company must fulfill further measures (e.g. for Europe, directive 99/92/EC on improvement of health and safety protection for workers) to combat hazards from an explosive atmosphere.

This includes adherence to further organizational measures such as:

- Labeling of the Ex zones
- Creation of an explosion protection document for every zone
- Enactment of an access denial for unauthorized persons
- Clear signposting of all bans

3.2 Intended use

The N.MAC® macerator, channel variant model series with drive, thereafter referred to as machine, is exclusively used to cut up solids in the liquid flow of a channel/shaft to a defined grain size and not for dry maceration, unless the manufacturer has authorized this through an express written approval and specific instructions. The solids are cut up between vertically rotating cutter blocks.

The channel variant, regardless whether it is the small or the large model series, may only be operated after it has been firmly installed in a channel (upper channel duct) or shaft.

A further condition is to comply with the requirements specified in the technical data.

Only machinery with a corresponding authorization for the Ex zone is permitted to be installed in a potentially explosive environment.

Intended use includes compliance with all specifications in this manual.

Any use which goes beyond or differs from the intended use is considered misuse.

⚠ WARNING

Danger from misuse!

- **Operate the machine only under the specified installation conditions listed under intended use.**
- **Operate the machine only in the liquid flow of the channel or shaft.**
- **Operate the machine only with the solid contents described in the technical data.**
- **Do not use the machine for dry maceration.**
- **Operate the machine only in fully assembled condition.**
- **Use only specified cutter blocks for permissible grain sizes.**
- **Only use specified drives.**
- **In areas at risk of explosions, only operate machines with authorization for the Ex zone.**

Misuse of the machine can lead to dangerous situations.

3.3 Personnel requirements

⚠ WARNING

Risk of injury with insufficiently qualified personnel!

- **All procedures must be performed only by appropriately qualified personnel.**
- **Keep unqualified personnel away from the danger zones.**

If unqualified personnel perform work on the machine or remain in the machine's danger zone, risks arise which can lead to severe injuries and considerable property damage.

The qualifications required for personnel in various areas of activity are described in this manual below:

Qualified electrician
The qualified electrician is trained to carry out installation, test, maintenance and repair work to electrical installations. He/she is capable of reading, evaluating and utilizing manuals, circuit diagrams and technical specifications to correctly carry out work.

A qualified electrician is specially trained for the field of work and knows the relevant standards and regulations.

Because of the area of application, it may be necessary to have additional knowledge about work in the Ex zone and the use of special tools.

Specialist mechanic
The specialist mechanic is trained to carry out installation, test, maintenance and repair work to hydraulic and mechanic machines and systems. He/she is capable of reading, evaluating and utilizing manuals and technical specifications to correctly carry out work.

A specialist mechanic is specially trained for the field of work and knows the relevant standards and regulations. He/she has been trained to handle the product and can safely carry out the delegated tasks without damaging the product. In addition, he/she has knowledge in the fields of pneumatics and hydraulics that allow him/her to evaluate the reactions and dangers of the pneumatic and hydraulic systems and avoid said dangers.

The specialist mechanic is aware of the dangers of the medium to be pumped as well as the prescribed measures required to avoid these dangers.

Because of the area of application, it may be necessary to have additional knowledge about work in the Ex zone and the use of special tools.

Trained, qualified personnel
Qualified personnel are able, based on their specialist training, knowledge and experience as well as knowledge of the relevant standards and regulations, to perform the assigned tasks and recognize and avoid possible risks independently.

Qualified personnel are specially trained for this machine and can perform assigned maintenance and troubleshooting tasks safely and without damaging property.

Because of the area of application, it may be necessary to have additional knowledge about work in the Ex zone and the use of special tools.

Transport specialists
The transport specialists are trained to carry out transportation with a crane or forklift. They are capable of selecting and correctly using suitable lifting equipment in accordance with transportation requirements. For transport with a forklift, the transport specialists are trained in the use of the machine and are capable of operating it.

Transport specialists are specially trained for the field of work and know the relevant regulations.

Because of the area of application, it may be necessary to have additional knowledge about work in the Ex zone and the use of special tools.

Basic requirements

Only persons from whom reliable work can be expected are permitted to work with the equipment. Persons whose ability to react is impaired, for example by drugs, alcohol or medications, must not perform work.

In the selection of personnel, comply with the specific regulations regarding age and employment that apply at the place of use.

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Unauthorized persons

⚠ WARNING

Unauthorized persons are subject to risk of death in the danger zone and work area!

- **Unauthorized persons must be kept out of the danger zone and work area.**
- **When in doubt, approach persons in the danger zone and work area and ask them to leave.**
- **Stop working as long as there are unauthorized persons in the danger zone and work area.**

Unauthorized persons who do not meet the requirements described herein are not aware of the risks in the work area. Therefore, unauthorized persons are at risk of severe injuries or even death.

Training

The operating company must provide periodic instruction to personnel. A training record must be kept with at least the following content to ensure better traceability.

- Date of training
- Name of person trained
- Training content
- Name of instructor
- Signatures of the person trained and the instructor

3.4 Specific dangers

3.4.1 Dangers from electric current

Electric current

⚠ DANGER

Risk of severe injury or death from electric current!

- **Only have work at the electrical system carried out by qualified electricians.**
- **If there is damage to the insulation, immediately disconnect the power supply and have repairs carried out.**
- **Before beginning work at live parts of the electrical system and equipment, disconnect the power supply and ensure that it remains disconnected for the duration of the work. When doing so, observe these 3 safety rules:**
  - **Switch off.**
  - **Secure against reactivation.**
  - **Ensure that there is no voltage.**
- **Never bridge fuses or remove them from operation. When replacing fuses, adhere to the correct data on current.**
- **Keep current-carrying parts dry. Moisture could cause a short circuit.**

There is an immediate risk of severe injury or death from electric shock upon contact with parts carrying voltage. Damage to the insulation or individual components can be life-threatening.

3.4.2 Dangers from hazardous liquid flow

Hazardous liquid flow

⚠ WARNING

Risk of injury from contact with hazardous liquid flow!

- **Refrain from touching the liquid flow or use mechanical aids.**
- **Avoid breathing vapors by wearing suitable respiratory protection.**
- **Avoid contact by wearing personal protective equipment.**

Contact with the liquid flow can be toxic and carcinogenic due to hazardous components and cause mechanical injuries. Vapors can lead to respiratory problems and suffocation symptoms due to oxygen displacement.

3.4.3 Dangers from hazardous gases

Hazardous gases

⚠ DANGER

Danger of suffocation from heavy gases in shafts!

- **Ensure adequate fresh air supply.**
- **Assign a 2nd person outside the canal to monitor the installation personnel.**
- **As an alternative, wear self-contained respiratory protection.**

Danger of suffocation from heavy gases when entering shafts.

3.4.4 Dangers from high temperatures

Hot surfaces

⚠ WARNING

Risk of injury from hot surfaces!

- **Protective clothing and safety gloves must be worn for all work near hot surfaces.**
- **When working on the machine: Turn the machine off, close the shut-off and wait until the machine has cooled.**

The liquid flow, parts that carry medium and the drive may have high temperatures. Skin contact with hot surfaces causes severe burns.

Hot liquid flow

⚠ WARNING

Risk of scalding from hot liquid flow!

- **Protective clothing, protective goggles and safety gloves must be worn for all work.**
- **When working on the machine: Turn the machine off, close the shut-off and wait until the machine has cooled.**

Liquid flow could have a high temperature. Contact with liquid flow could cause severe scalding.

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3.4.5 Dangers from moving parts

Moving parts

⚠ WARNING

Risk of injury from moving parts!

- **Never reach into moving parts during operation and do not work in the vicinity of moving parts.**
- **Before working on moving parts, turn the equipment off and secure it against being restarted.**
- **Keep covers closed during operation.**
- **Observe the overrun time: Before opening the covers, ensure that all parts have stopped moving.**

Working near moving parts could result in hair being caught and drawn in, body parts being crushed, ripped off, or other serious injuries.

Sharp edges and pointed corners

⚠ WARNING

Risk of injury from sharp edges and pointed corners!

- **Always work with care near the cutter blocks.**
- **Wear personal protective equipment.**

Working near the cutter blocks can result in injury on sharp edges and pointed corners.

3.4.6 Dangers from noise

Noise

⚠ WARNING

Risk of injury from noise!

- **Hearing protection should always be worn for work in the direct vicinity.**

In the machine area, the noise level may exceed the permissible limit value and cause permanent hearing damage.

3.4.7 Dangers from fire and explosions

Potentially explosive atmospheres

⚠ DANGER

Risk of explosion resulting from use of unauthorized machines and add-on components in the Ex zone!

- **In areas at risk of explosions, only operate machine and add-on components that are permitted for use in the Ex zone.**
- **Obtain written work approval before starting work in the Ex zone (in the EU, observe the explosion protection document).**
- **Perform work only with the potentially explosive atmosphere excluded.**
- **Only use tools that are permitted for use in the Ex zone.**

The introduction of ignition sources such as sparks, open flames and hot surfaces could lead to explosions in a potentially explosive atmosphere. Ignoring these instructions leads to a loss of explosion protection.

Fire hazard

⚠ WARNING

Fire hazard from the liquid flow!

- **Use the machine for designated liquid flows only.**
- **Keep sources of ignition away from the danger zone.**

Liquid flow could form ignitable mixtures or mechanical processing could form dust and burn if heated to temperatures above the flash point.

3.4.8 Danger of property damage

Wrong or oversized solids in the liquid flow

NOTICE

Reduced service life due to incorrect or oversized solids in the liquid flow!

- **Prevent the supply of solids with incorrect material properties.**
- **Prevent the supply of oversized solids by screening it beforehand.**
- **Ensure that the supply is inspected at regular intervals for signs of deposits and cleaned.**

The service life of the machine is mainly determined by the size and the material properties of the solids in the liquid flow.

Improper disposal

NOTICE

Damage to the environment as a result of incorrect disposal of lubricating media, binding agent and seals!

– **Dispose of leaked lubricating media, used binding agent and seals according to local regulations.**

Improper disposal of lubricating media, binding agent and seals could damage the environment.

3.5 Personal protective equipment

Personal protective equipment is used to protect persons from safety and health risks during work.

During various tasks working on or with the machinery, personnel must wear the personal protective equipment indicated separately in the individual sections of this manual.

Description of personal protective equipment

The personal protective equipment is described below:

Chemically resistant safety gloves
Chemically resistant safety gloves are used to protect the hands from corrosive chemicals or bacteria.

Industrial hard hat
Industrial hard hats protect the head against falling objects, swinging loads and impact with stationary objects.

Protective clothing
Protective work clothing is closely fitting work clothing with low tear resistance, narrow sleeves and no protruding parts.

For work in the Ex zone, the protective clothing must be electrically conductive.

Protective goggles
The protective goggles protect the eyes from flying parts and liquid splashes.

Safety gloves
Safety gloves are for protecting hands against abrasions, punctures, or deeper injuries as well against contact with hot surfaces.

Safety harness
The purpose of the safety harness is to protect against falling if there is an increased danger of falling. The danger exists once certain height differences are exceeded and the job location is not secured by a railing.

Wear the safety harness such that the safety rope is connected to the safety harness as well as with a fixed suspension point. Provide an impact absorber, if necessary.

Safety harnesses may only be used by persons specifically trained for this purpose.

Safety shoes
Safety shoes protect the feet from crushing, falling parts and slipping on slippery ground.

For work in the Ex zone, the safety shoes must be electrically conductive.

3.6 Safety devices

Emergency stop

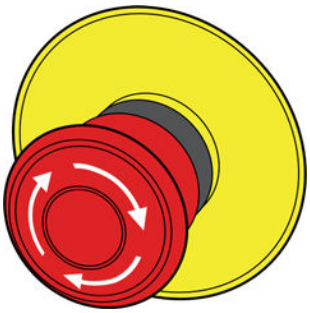

Fig. 2: Emergency stop button, example

The *[emergency stop button]* is used to immediately switch off the machine. The *[emergency stop buttons]* are located on the control cabinet as well as in the vicinity of the machine.

Coupling protection

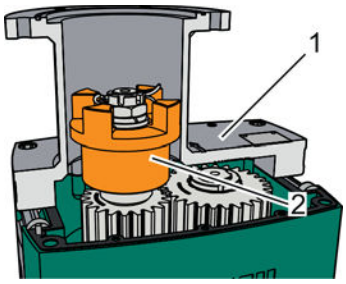

Fig. 3: Coupling protection in open position, example

1 Coupling protection (gear cover)
2 Coupling half

The machine is equipped with a coupling protection (Fig. 3/1) that prevents contact with/drawing into the rotating component.

When an extension pipe is used, the drive lantern is another coupling protection.

Channel/shaft cover

With shaft or channel operation, the operating company is required to protect the area around the machine by means of a channel or shaft cover in order to prevent access to the machine.

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3.7 Securing against reactivation

⚠ WARNING

Risk of death from unauthorized or uncontrolled reactivation!

- **Ensure that all safety devices are in place and fully functional and there is no danger to persons before switching on again.**
- **Always follow the sequence described below to secure against reactivation.**

Unauthorized or uncontrolled reactivation of the machine could lead to severe injuries or even death.

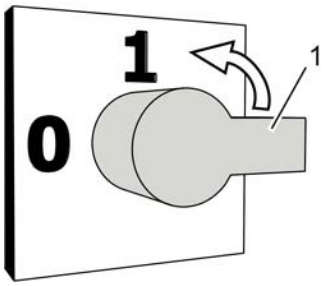

Fig. 4: Switching off the main switch

1 ON/OFF switch
Arrow Rotation direction to switch off

1. Switch off the power supply with the ON/OFF switch (Fig. 4/1) at the *[main switch]* of the control cabinet in the direction of the arrow (Fig. 4/arrow).
2. Inform supervisors of work in the danger zone.
3. Obtain work approval (in the EU, observe the explosion protection document).

With lock protection

Fig. 5: Sign "Switch secured with a lock"

4. Switch off the power supply.
5. If possible, secure the switch with a lock and attach a sign as shown in Fig. 5 on the switch so that is clearly visible.
6. Have an employee listed on the sign keep the key in a safe place.
7. Once all work has been completed, ensure that there are no more persons in the danger zone.
8. Ensure that all safety and protective devices are installed and fully functional.
9. Remove the sign only once this has been confirmed.

Without lock protection

Fig. 6: Sign "Switched off"

10. If it is not possible to secure a switch with a lock, set up a sign as shown in Fig. 6.
11. Once all work has been completed, ensure that there are no more persons in the danger zone.
12. Ensure that all protective devices are installed and fully functional.
13. Remove the sign only once this has been confirmed.

3.8 Signage

⚠ WARNING

Risk of death from illegible signage!

- **Maintain all labels and signs in legible condition at all times.**
- **Replace damaged labels and signs immediately.**

Over time, labels and signs may become dirty or unrecognizable in other ways. As a result, dangers may not be recognized and necessary operating instructions cannot be followed. There is a risk of death.

3.8.1 Signage and symbols on the machine

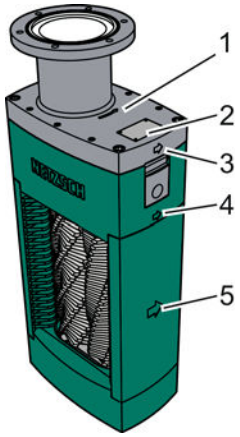

Fig. 7: Signage on housing, example

1 Drive rotation direction
2 Rating plate
3, 5 Flow direction of liquid flow

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Ex symbol

Fig. 8: Ex symbol, component of the rating plate, example

Data	Description
II	Device group II: all areas except mining
3G	Device category 3 for gas
c	“Constructive safety” ignition protection type
b	“Monitoring of ignition source” ignition protection type
IIB	Explosion group B for gas atmospheres (II)
Tx	Tx temperature class: Information on temperature in the machine product data sheet in the appendix

3.8.2 Signage in the machine area

No unauthorized persons beyond this point

Only persons authorized by the operating company may enter the danger zone.

Electric voltage

Only electricians may work in the working areas with this label.

Unauthorized persons may not access these working areas or may not open the labeled cabinet.

Potentially explosive atmosphere

Warning of explosive atmosphere in working areas as well as in storage areas for gas bottles.

An explosive atmosphere could also occur as a result of evaporation of flammable liquids (e.g. gasoline) and fine dust in the air.

Keep all ignition sources (e.g. open flames, heat sources, electric devices without explosion protection) out of the explosive range. Welding, cutting or grinding work may not be carried out.

In an explosive atmosphere, only equipment with the appropriate scope of protection may be operated.

Hot surface

Hot surfaces, such as hot machinery parts, tanks or materials, including hot liquids, are not always recognizable. Do not touch these without protective gloves.

3.9 Environmental protection

NOTICE

Danger to the environment from incorrect handling of environmentally hazardous materials!

- **Always follow the instructions given below for the handling and disposal of environmentally hazardous materials.**
- **If environmentally hazardous materials are accidentally released into the environment, take appropriate action immediately. In case of doubt, notify the responsible local authority about the incident and asked about suitable action to take.**

Incorrect handling of environmentally hazardous materials, especially incorrect disposal, could cause considerable harm to the environment.

Lubricants

Lubricants such as grease and oil contain toxic substances. They may not be released into the environment. They must be disposed of by a special disposal service company.

Cleaning agents

Cleaning agents are irritants and contain toxic substances. They may not be released into the environment.

To ensure correct disposal, the local applicable requirements in the form of regulations, laws, technical rules, etc, as well as the safety data sheet for the substance in question, must be observed.

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4 Design and function

4.1 Overview

Machine

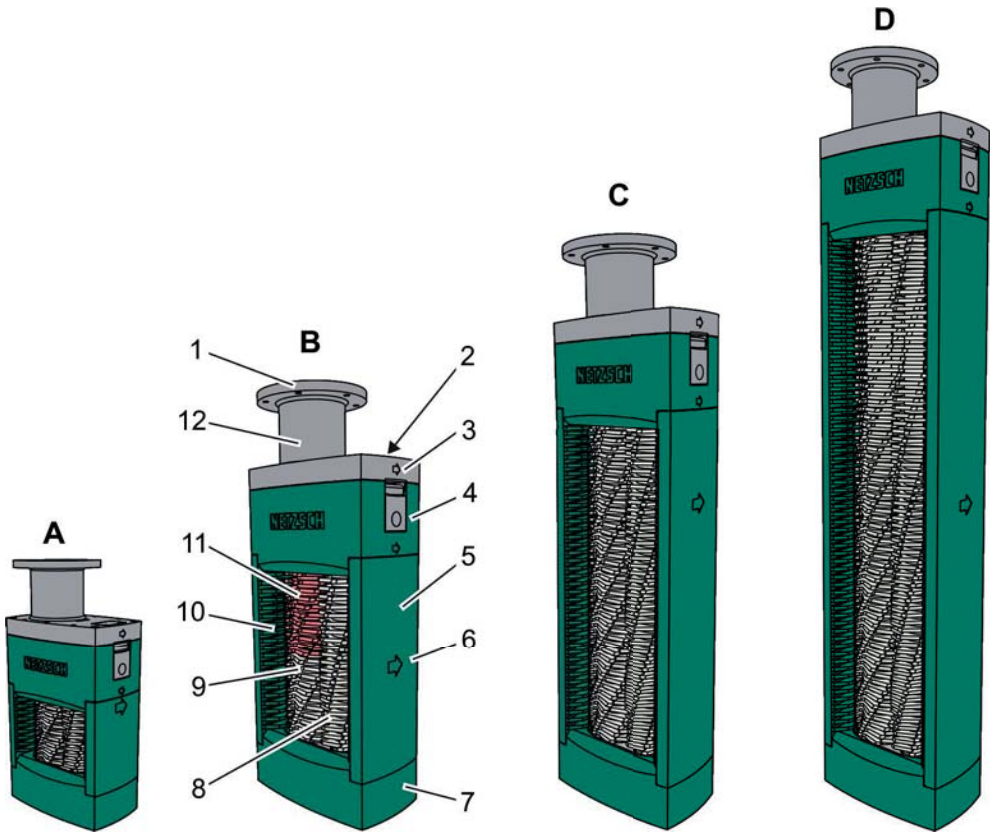

Fig. 9: Overview of channel variants, examples 50C, 120C, 250C, 400C

A	Channel variant, 50C
B	Channel variant, 120C
C	Channel variant, 250C
D	Channel variant, 400C
1	Connection flange of drive
2	Rating plate
3, 6	Flow direction
4	Gearbox housing
5, 10	Side wall
7	Base
8	Rotating axle, clockwise rotation
9	Rotating axle, counter-clockwise rotation
11	Cutter block
12	Coupling housing

Cleaning combs, optional

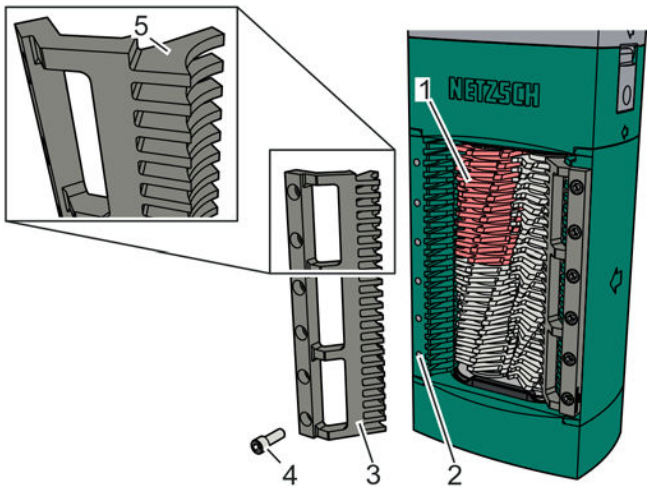

Fig. 10: Cleaning combs, (example) optional

1 Groove in cutter block
2 Borehole in side wall
3 Cleaning comb
4 Attachment bolt
5 Tooth profile

Interior view

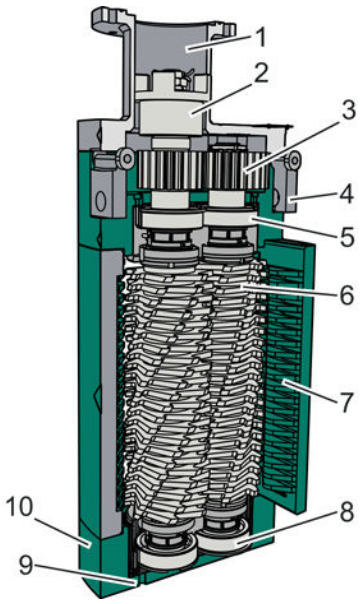

Fig. 11: Interior view of channel variant, example

1 Coupling housing
2 Coupling
3 Pinion gear
4 Transport eye, folding
5 Upper bearing of rotating axle
6 Cutter block
7 Ribbed bars
8 Lower bearing of rotating axle
9 Housing drainage
10 Base

4.2 Functional description

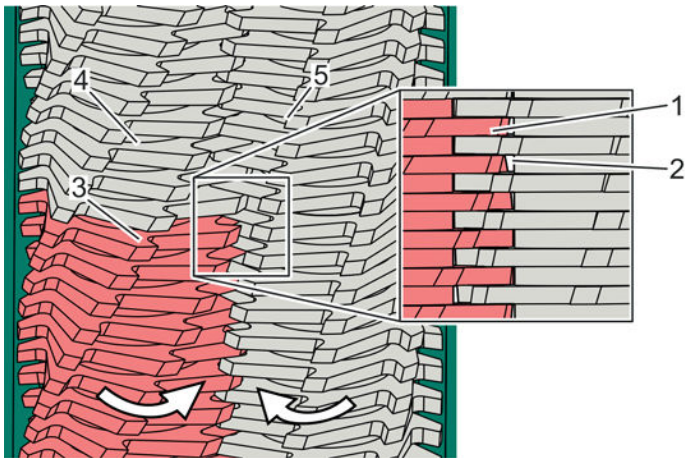

Fig. 12: Function illustration of cutter blocks

1 Blade in cutter block
2 Groove in cutter block
3 Cutter block
4 Rotating axle, counter-clockwise rotation
5 Rotating axle, clockwise rotation

The macerator (Fig. 9) is used to cut up solids in a liquid flow.

The liquid with its solid contents continuously flows through the machine, which uses cutter blocks (Fig. 12/3) on opposing rotating axles (Fig. 12/arrows) to cut up the solids between the rotating axles to a grain size that is predefined due to design. The liquid portion in the liquid flow can flow past the cutter blocks on the left and right without restriction and is transported through the cutter blocks.

To ensure that the blades of the cutter blocks (Fig. 12/1) can optimally catch the solids to be expected in the delivered flow, there are cutter blocks with different numbers of blades, which can be changed in pairs as needed. Cutter blocks that have the same groove and blade width must engage into each other. Changing the cutter blocks on the other hand influences the grain size of the cut up solid. The higher the number of blades, the finer the grain size of the solids.

Housing gaskets

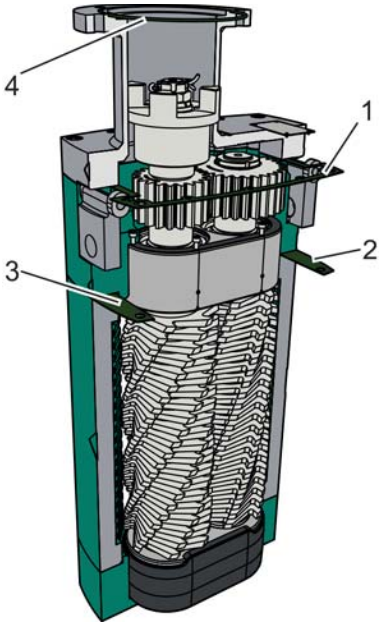

Fig. 13: Housing gaskets

1 Flat seal of gear cover
2, 3 Flat seal of housing
4 O-ring connection flange

4.3 Components

4.3.1 Housing

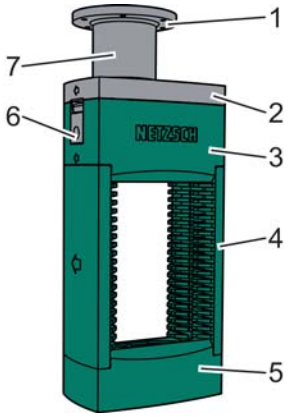

Fig. 14: Housing of channel variant, example

1 Connection flange of drive
2 Gear unit cover
3 Gearbox housing
4 Side wall
5 Base
6 Transport eye, folding
7 Coupling, inner

The channel variant housing is used to hold the cutter blocks and the respective bearings and to be mounted within a channel. On the drive connection flange (Fig. 14/1), it is connected for example to the electric motor through the coupling (Fig. 14/7) located in the gear unit cover (Fig. 14/2).

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4.3.2 Cutter block

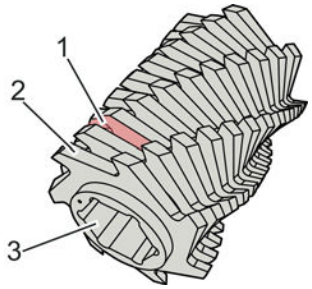

Fig. 15: Cutter block

1 Groove
2 Blade tip
3 Rotating axle mount

The cutter block is placed onto a rotating axle with the rotating axle mount (Fig. 15/3) and aligned in the rotation direction. The blade tip (Fig. 15/2) points into the rotation direction. The groove (Fig. 15/1) forms a space for the blade tips of the cutter block of the opposite side. The blade tip and the groove engage into each another without making contact.

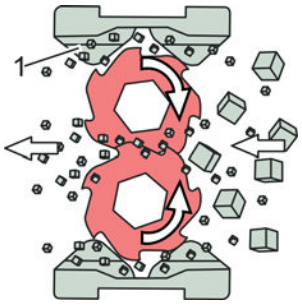

Fig. 16: Cutter blocks, schematic diagram

1 Deflector comb

The channel system delivers the liquid flow to the cutter blocks. The side walls have deflector combs that were designed to prevent larger solids from entering without unnecessarily restricting the flow of the fluid. Smaller solid contents with sizes smaller than the gap width of the deflector combs can flow around the cutter blocks on both sides with the fluid content through the grooves (Fig. 16/1). The solid contents that are too large are pushed towards the rotating cutter blocks where they are collected and then cut by the engaging blades and transported through.

Cutter block (number of blades, vertically)	Grain size [mm] (in)
3	15 x 25 x 50 (0.59 x 0.98 x 1.97)
5	8 x 15 x 35 (0.31 x 0.59 x 1.38)
7*	8 x 15 x 25 (0.31 x 0.59 x 0.98)
9	8 x 11 x 18 (0.31 x 0.43 x 0.71)
11	8 x 7 x 15 (0.31 x 0.28 x 0.59)
*** = Standard version**	

4.3.3 Gear motor, optional

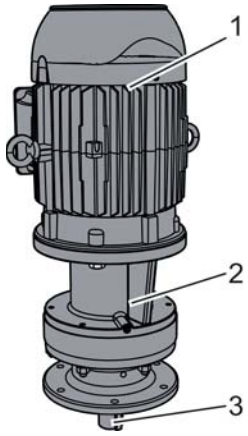

Fig. 17: Gear motor, example

1 Electric motor
2 Gear
3 Drive shaft

The gear motor (Fig. 17) consists of the components electric motor (Fig. 17/1) and gear (Fig. 17/2). The gear reduces the rotational speed of the electric motor and increases the transmissible torque. The drive shaft is used to either transmit the rotary motion directly with a coupling to the machine or, for low-lying installations, via a drive shaft extension.

4.3.4 Cleaning comb, optional

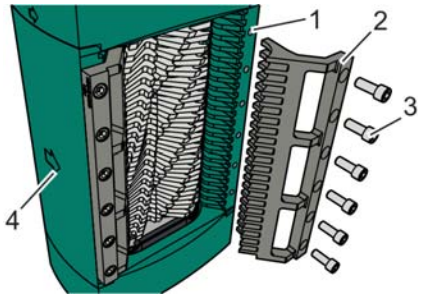

Fig. 18: Cleaning comb

1 Borehole in side wall
2 Cleaning comb
3 Attachment bolt
4 Flow direction

The cleaning comb (Fig. 18/2) is used to clean the cutter blocks from residual foils and fiber materials that collect in the spaces between the blades and restrict the liquid flow.

The cleaning combs are installed on the back side of the machine where the liquid flow exits.

Periodically checking and cleaning the cleaning combs increases the functionality of the machine (*Chapter 8.3.4 “Cleaning the cleaning combs, optional” on page 74*).

4.3.5 Drive extension with a lantern, optional

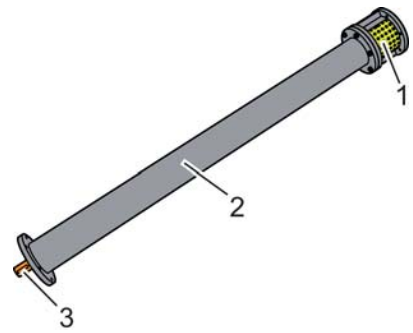

Fig. 19: Drive extension with a lantern

1 Lantern
2 Drive extension
3 Drive shaft

The drive extension (Fig. 19/2) with a lantern (Fig. 19/1) is used to transfer the rotary motion of the drive for low-lying machine installations. The coupling d in the lantern, which is secured by a protective grille. The drive is put onto the lantern from above and attached. The drive shaft (Fig. 19/3) is connected to the gear of the machine with the help of another coupling.

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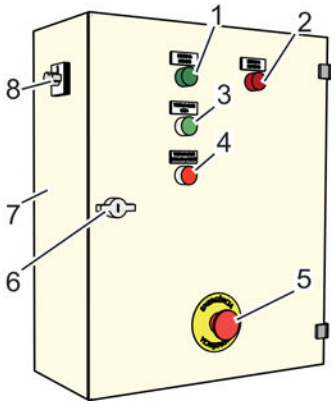
4.3.6 Control cabinet



1 Light display, operating
2 Light display, stop
3 Switching on
4 Switching off
5 Emergency stop
6 Locking mechanism
7 Control cabinet
8 Main switch

The control cabinet (Fig. 20/7) is used to supply power to the machine and contains the controls for switching the light displays (Fig. 20/1, 2) and the main switch (Fig. 20/8, *Chapter 4.5 "Control elements" on page 33*) on (Fig. 20/3) and off (Fig. 20/4).

Fig. 20: Control cabinet

4.4 Connections

Drive

The machine can be driven with an electric motor or electric gear motor, included in the scope of delivery, which is connected directly to the drive shaft with a shaft coupling.

4.5 Control elements

4.5.1 Main switch

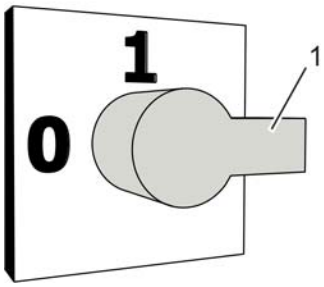


Fig. 21: Main switch, switched off in example

The *[main switch]* is used to switch the system into which the machine is integrated on and off. The *[main switch]* is on the left side of the control cabinet.

4.5.2 Emergency stop button

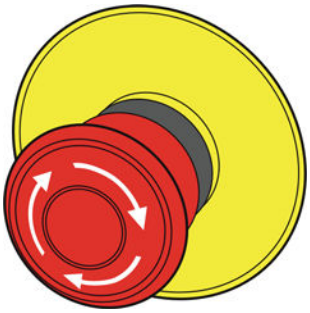


Fig. 22: Emergency stop button, example

The *[emergency stop button]* is used to immediately switch off the system in which the machine is integrated in the event of a fault. The *[emergency stop button]* is located on the control cabinet as well as in the vicinity of the machine.

4.5.3 Switch on button

Fig. 23: Switch on button (green), example

The *[switch on button]* at the control cabinet switches the machine on. The *[H1 light display]* lights up to confirm that the machine has been switched on.

4.5.4 Switch off button

Fig. 24: Switch off button (red), example

The *[switch off button]* at the control cabinet switches the machine off. The *[H2 light display]* lights up to confirm that the machine has been switched off.

Pressing the *[switch off pushbutton]* twice in a row on the control cabinet is used to reset the control after an emergency stop or malfunction. The *[H3 light display]* lights up to confirm the emergency stop or malfunction.

The machine cannot be started without a reset.

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4.5.5 Light displays

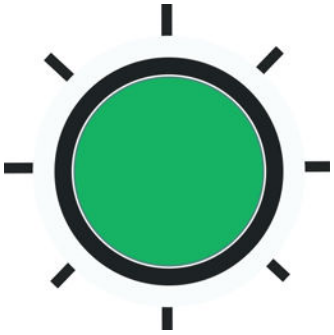

Fig. 25: Green light display, example

The *[H1 light display]* indicates that the machine is operating.

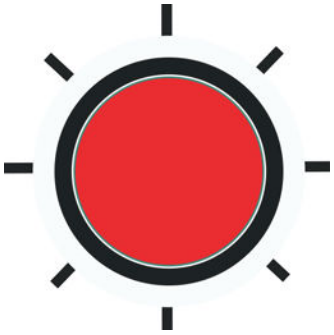

Fig. 26: Red light display, example

The *[H2 light display]* indicates the following conditions:

- Power supply on the control cabinet is on.
- The *[emergency stop button]* was pressed.
- The motor protection switch was triggered, e.g. as a result of overload.

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5 Transport, packaging and storage

5.1 Safety instructions for transport

Potentially explosive atmospheres

⚠ DANGER

Risk of explosion from electrostatic discharges from statically charged components!

- **Remove the packaging outside the potentially explosive area.**
- **Obtain written work approval before beginning transportation in the Ex zone (in the EU, observe the explosion protection document).**
- **Transport may only be carried out by transport specialists.**
- **Carry out transport only with the potentially explosive atmosphere excluded. If this is not possible, ensure that the item to be transported is sufficiently grounded during transportation.**
- **Use only tools that are permitted for use in the Ex zone.**

Electrostatic charging of the machine and add-on components could cause sparks to form. In potentially explosive atmospheres, this could trigger explosions, resulting in severe or fatal injuries and considerable property damage. Ignoring these instructions leads to a loss of explosion protection.

Suspended loads

⚠ WARNING

There is a risk of severe injury or death from suspended loads!

- **Ensure that no persons, objects or obstacles are in the swing range of the packed unit while it is being transported.**
- **Use only approved lifting equipment and accessories with sufficient load-bearing capacity.**
- **Do not attach to installed components.**
- **Check that the lifting equipment is situated securely.**
- **Do not use torn or abraded ropes and belts.**
- **Do not place ropes and belts on sharp edges and corners, and do not knot or twist them.**

When lifting loads, there is a risk of severe injury or death from falling parts or uncontrolled swinging parts.

Excentric center of gravity

⚠ WARNING

Risk of injury from falling or tipping packages!

- **Pay attention to markings and information on the center of gravity on the packed units.**
- **When using a crane for transport, attach the crane hook so it is over the center of gravity of the package.**
- **Lift the package carefully and watch to see if it tips. Change the attachment as necessary.**

Packed units can have an excentric center of gravity. Incorrect attachment can cause the packed unit to tip and fall. Falling or tipping packages can cause severe injuries.

Unauthorized transport

NOTICE

Property damage from unauthorized transport by untrained personnel!

- **Unloading the packed units during delivery and moving them within the facility should only be carried out by transport specialists.**
- **Refrain from all unauthorized transport or attachment/ removal of transport aids.**
- **Do not remove packaging without authorization.**

Unauthorized transport by untrained personnel could result in the packed units falling or tipping over. This could result in considerable property damage.

Improper transport

NOTICE

Property damage from improper transport!

- **When unloading the packed units during delivery or transporting them in-house, proceed carefully and pay attention to the symbols and instructions on the packaging.**
- **Use only the suspension points provided.**
- **Remove the packaging only shortly before installation.**

Improper transport could result in the packed units falling or tipping over. This could result in considerable property damage.

5.2 Delivery

5.2.1 Type of delivery

The machine is delivered in a wooden crate. The packaging size depends on the size of the machine.

Inspection of delivery

Check the delivery without delay to ensure that it is undamaged.

Proceed as follows if transport damage is apparent externally:

- Do not accept the delivery, or do so only conditionally.
- Make a note of the extent of the damage on the transport documentation or bill of delivery of the shipping company.
- File a complaint.

File a complaint for each deficiency as soon as it is found. If damage is detected during later unpacking, a complaint can also be filed for this. Claims for damage can only be made within the applicable complaint period.

Regarding the packaging

The individual packages are packed appropriately for the transport conditions expected. Only environmentally friendly materials are used for the packaging.

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The packaging should protect the individual components from transport damage, corrosion and other damage until installation. Therefore, do not destroy the packaging and remove it only shortly before installation.

Keep the packaging for return transport to the manufacturer. This may, for example, be necessary for manufacturer maintenance.

Handling the packaging materials

Dispose of packaging materials in compliance with the applicable statutory provisions and local regulations.

NOTICE

Danger to the environment from incorrect disposal!

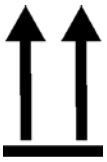
- **Always dispose of packaging materials in an environmentally appropriate manner.**
- **Comply with local regulations for disposal. Hire a service company for disposal if necessary.**

Packaging materials are valuable raw materials and in many cases can be re-used or usefully processed and recycled. Incorrect disposal of packaging materials can endanger the environment.

5.2.2 Symbols on the packaging

The following symbols are on the packaging. Always pay attention to the symbols during transport.

This end up



The arrows of the symbol indicate the top side of the package. This end must always be kept on top to avoid damaging the contents.

Center of gravity

Indicates the center of gravity of packages.

Observe the position of the center of gravity when lifting and transporting.

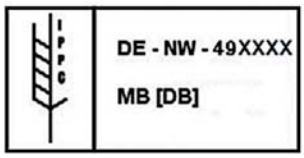
Attach here

Only place lifting equipment (chain sling, lifting straps) at positions with this symbol.

Keep dry

Protect the packages from moisture, and keep them dry.

IPPC symbol



International symbol for handling status of wooden packaging material:

- **DE** Country ID (e.g. Germany)
- **NW** Region ID (e.g. NW for North Rhine-Westphalia)
- **49XXX** Registration no. of the wood supplier
- **HT** Heat Treatment
- **MB** Methylbromide (gas treated)
- **DB** debarked

5.2.3 Transport of packed units

Transport with a crane

Transported units can be moved directly with a crane under the following conditions:

- The crane and lifting gear must be dimensioned for the weight of the transported units.
- The lifting equipment must be dimensioned for the weight of the transported units.
- The operator must be authorized to operate the crane.
- Transport personnel must be trained for the specific characteristics of the Ex zone.

Personnel:
- Transport specialists

Protective equipment:
- Protective clothing
- Safety gloves
- Safety shoes
- Industrial hard hat

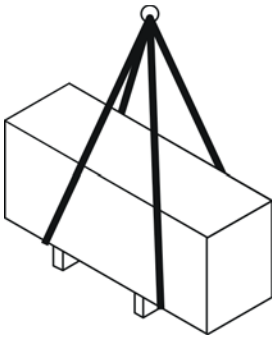


Fig. 27: Transport with a crane

1. Attach ropes, belts or multi-point suspension gear as shown in Fig. 27.
2. Ensure that the packed unit hangs straight; correct an excentric center of gravity as necessary.
3. ⚠ **DANGER! Explosion hazard from electrostatic discharges from statically charged packed units!**

   Lift the packed unit and begin transport.

   If the packed unit is being transported in an Ex zone, it must be unpacked before transport and potential equalization must be mounted for transport.

Transport with a forklift

Packed units can be moved with a forklift under the following conditions:

- The forklift must be designed to handle the weight of the transported units.
- The forklift operator must meet the local regulations for driving ground conveyors with a driver's seat or cab.
- Transport personnel must be trained for the specific characteristics of the Ex zone.

Personnel:
- Transport specialists

Protective equipment:
- Protective clothing
- Safety gloves
- Safety shoes
- Industrial hard hat

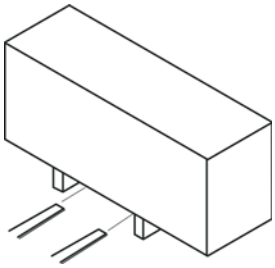


Fig. 28: Transport with a forklift

1. Run the forks of the forklift between the beams of the transported unit.
2. Drive the forks in far enough that they protrude from the opposite side.
3. Ensure that the transported unit cannot tip if the center of gravity is excentric.
4. ⚠ **DANGER! Explosion hazard from electrostatic discharges from statically charged packed units!**

   Lift the packed unit and begin transporting it.

   If the packed unit is being transported in an Ex zone, it must be unpacked before transport and potential equalization must be mounted for transport.

5.2.4 Storage of the packages

Store packages under the following conditions:

- Store in a well-ventilated room or under a protective roof.
- Do not store in the open.
- Store in a dry, dust-free environment.
- Protect from rising damp: Store on a shelf or pallet.
- Do not expose to aggressive media.
- Protect from sunlight.
- Avoid mechanical vibrations.
- Storage temperature: 0 to +25 °C (32 to 77 °F).
- Relative humidity: max. 50%.
- Move the drive shaft by hand each month.
- Check the general condition of all parts and packaging each month.

In some cases there are instructions for storage on the packages that go beyond the requirements listed here. Follow these instructions accordingly.

NOTICE

Property damage from improper storage!

- **Always store the machine in the original packaging.**
- **If the packaging is opened, for example, for receiving inspection, restore it to its original condition.**

5.2.5 Unpacking

Inspection of delivery

Check the delivery without delay to ensure that it is complete.

Proceed as follows in the event of deviations from the scope of delivery:

- List the missing parts of the scope of delivery.
- File a complaint.

File a complaint for each deficiency as soon as it is found. Claims for damage can only be made within the applicable complaint period.

Unpacking

Personnel:
- Transport specialists

Protective equipment:
- Protective clothing
- Safety gloves
- Safety shoes
- Industrial hard hat

Keep the packaging for return transport to the manufacturer. This may be needed, for example, in the case of manufacturer-performed maintenance.

1. **⚠ DANGER! Risk of explosion from electrostatic discharges from statically charged packed units!**

   Transport the machine in its packaging as close as possible to the operating site.

   If the packed unit is being transported in an Ex zone, it must be unpacked before transport and a means of potential equalization installed for the transport.

2. Secure the machine at the specified attachment points with suitable lifting equipment and transport to the installation location (↳ *Chapter 5.2.6 "Transporting to the installation location" on page 43*).

3. Remove the wooden crate and packaging material and dispose of these in an environmentally appropriate manner, or store for reuse when maintenance-related return transport is required.

NOTICE! **Danger to the environment from incorrect disposal!**

- **Always dispose of packaging materials in an environmentally appropriate manner.**
- **Comply with local regulations for disposal. Hire a specialist company for disposal, if necessary.**

Packaging materials are valuable raw materials and in many cases can be reused or usefully processed and recycled. Incorrect disposal of packaging materials could pose a danger to the environment.

5.2.6 Transporting to the installation location

Personnel:
- Transport specialists

Protective equipment:
- Protective clothing
- Safety gloves
- Safety shoes
- Industrial hard hat

DANGER

Risk of explosion from electrostatic discharges during transport in the Ex zone!

- **Connect the machine to potential equalization during transport.**

During transport in the Ex zone, there is a risk of explosion from electrostatic discharges.

WARNING

Risk of injury from heavy and top-heavy components and machines!

- **Always work with care and foresight during the disassembly and assembly of heavy or top-heavy components and machines.**
- **If necessary, use a crane for heavy components.**
- **If components and machines are top-heavy, secure them from tipping over.**
- **Request the assistance of a second person to secure the passive components, if necessary.**

There is the risk of injury from heavy and top-heavy components and machines.

Requirements:

- The machine and add-on components have been unpacked.
- Lifting gear is available with greater load-bearing capacity than the total weight of the machine.
- When transporting into the potentially explosive zone, equip the machine and add-on components with potential equalization until they are permanently connected.
- Only use non-sparking tools.

The following activities are described and illustrated as examples and may deviate from the actual design. Bear in mind that the machine, depending on its model and design, may be very heavy and transport must therefore be carried out very carefully.

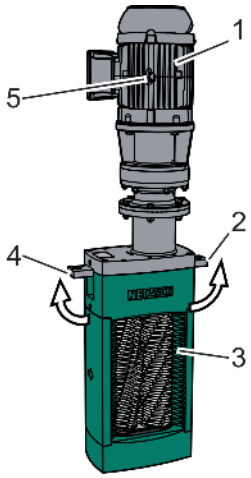


Fig. 29: Attaching the machine, example with drive

1 Drive
2, 4 Transport eye, folding
3 Machine
5 Transport eye of drive

1. *The transport eyes of the drive are designed for the weight of the drive and **not** for the weight of the entire machine. When transporting the entire machine, always use the folding transport eyes. The transport eyes of the drive may be used for securing the drive against tipping over if it is top-heavy.*

   Fold out the transport eyes (Fig. 29/2, 4) on the machine (Fig. 29/3).
2. Attach suitable lifting equipment to the transport eyes (Fig. 29/2, 4).
3. Attach lifting equipment to the transport eyes (Fig. 29/5) over at a suitable location to secure the drive (Fig. 29/1) against tipping.
4. **⚠ DANGER! Risk of explosion from electrostatic discharges from statically charged packed units!**

   Attach potential equalization to the machine, if necessary.
5. **⚠ WARNING! Risk of injury from heavy and top-heavy components and machines!**

   Carefully lift the machine and transport it to the installation location.

5.3 Storage

⚠ WARNING

Risk of injury when removing residues from cutter heads!
- **Perform work only with personal protective equipment.**
- **Work with care.**

There is the risk of injury when removing residues from cutter heads.

NOTICE

Property damage on the drive from contact with water!
- **Before cleaning, make sure that the drive does not come into contact with water.**

Property damage may occur on the drive from contact with water!

NOTICE

Property damage from corrosion due to improper storage!
- **Preserve and store the machine properly.**

Improper storage could result in property damage due to corrosion on the machine.

Storage of new machines

No measures must be taken for preservation if storing new machines.

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Personnel: ■ Specialist mechanic

Protective equipment: ■ Protective clothing
■ Safety gloves
■ Safety shoes

The machine is sufficiently preserved after it leaves the factory.

→ Ensure that the storage space meets the following requirements:
- Dry
- Free of dust
- Free of shock and vibrations

Restocking

Personnel: ■ Specialist mechanic

Protective equipment: ■ Protective clothing
■ Safety gloves
■ Safety shoes

Special tool: ■ Brush

Materials: ■ Machine lubricant

1. → ***NOTICE!* Property damage on the drive from contact with water!**

   Protect the drive with an operator-side protective film from water spray.
2. → Clean contamination from machine using a stream of water.
3. → **⚠ WARNING! Risk of injury when removing residues from cutter heads!**

   Remove fiber residues and film residues etc. with suitable aids.
4. → Let the machine dry.
5. → Preserve all metallic surfaces with machine grease and a brush.
6. → Ensure that the storage space meets the following requirements:
   - Dry
   - Free of dust
   - Free of shock and vibrations

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6 Assembly and connection

6.1 Safety instructions on assembly and connection

Potentially explosive atmosphere

If the machine is to be set up in potentially explosive areas:

⚠ DANGER

Risk of explosion from electrostatic discharges from statically charged components!

- **Remove the packaging outside the potentially explosive area.**
- **Obtain written work approval before starting work in the Ex zone (in the EU, observe the explosion protection document).**
- **In areas at risk of explosions, only install machine and add-on components that are permitted for use in the Ex zone.**
- **Equip the machine with potential equalization during transport into the potentially explosive zone until it is permanently connected.**
- **Perform work only with the potentially explosive atmosphere excluded. If this is not possible, ensure that the item to be transported is sufficiently grounded during transportation.**
- **Only use non-sparking tools.**

Electrostatic charging of the machine and add-on components could cause sparks to form. In potentially explosive atmospheres, this could trigger explosions, resulting in severe or fatal injuries and considerable property damage. Ignoring these instructions leads to a loss of explosion protection.

Improper setup and connection

⚠ WARNING

Risk of injury from improper setup and connection!

- **Before starting work, ensure that there is sufficient space for installation.**
- **Secure the work area against liquid flow coming in through the piping/channel.**
- **Be careful with components that have sharp edges.**
- **Keep the place of installation orderly and clean! Parts and tools that are stacked or lying around loose are potential accident sources.**
- **Install components correctly. Comply with the specified screw tightening torques.**
- **Secure parts so that they cannot fall or tip over.**

Improper setup and connection could lead to severe injuries and considerable property damage.

6.2 Mounting the machine in the channel

The operating company can insert the machine into a concrete foundation (groove guides in the channel walls) for attachment. The machine is prevented from floating up by its own weight.

6.2.1 Mounting the reception structure (optional)

Assembly is only required if the reception structure is included in the scope of delivery. Otherwise, the reception structure is provided by the operating company.

Personnel:
- Transport specialists
- Specialist mechanic

Protective equipment:
- Industrial hard hat
- Protective clothing
- Safety gloves
- Safety shoes
- Safety harness

⚠ DANGER

Danger of suffocation from heavy gases in shafts!

– Ensure adequate fresh air supply.

– Assign a 2nd person outside the canal to monitor the installation personnel.

– As an alternative, wear self-contained respiratory protection.

Danger of suffocation from heavy gases when entering shafts.

Requirements:

- The assembly location is cleaned from contamination.
- Lifting gear and lifting equipment is available with greater load-bearing capacity than the total weight of the machine.
- The reception structure is ready at the installation location.
- Only use non-sparking tools in the Ex zone.

The reception structure is optionally equipped for the operating site. It can be anchored using floor or wall mounts. The reception structure must be securely installed. It may not be moved or displaced. The assembly below is only an example.

1. **⚠ DANGER! Danger of suffocation from heavy gases in shafts!**

   Provide safe access to the low-lying assembly location.

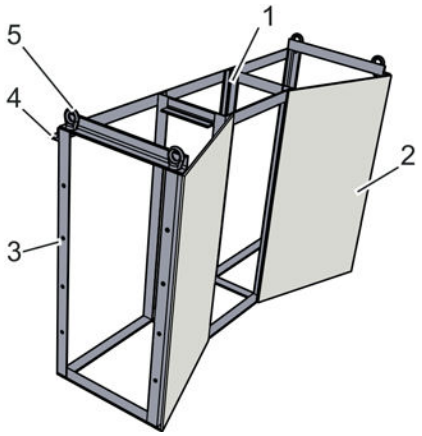

Fig. 30: Lifting the reception structure

1 Insert
2 Funnel surface
3 Borehole
4 Support bracket
5 Transport eye

2. **⚠ DANGER! Risk of explosion from electrostatic discharges during transport of components in the Ex zone!**

   Attach the lifting equipment to the transport eyes (Fig. 30/5). Attach potential equalization for the transport.

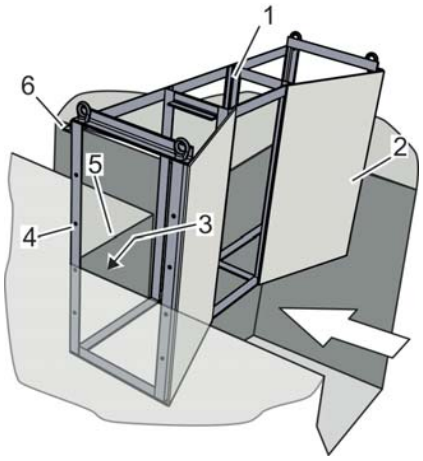

Fig. 31: Lowering the reception structure into the channel, example

1 Insert
2 Funnel surface
3 Channel wall
4 Borehole
5 Support edge
6 Support bracket
Arrow Flow direction

3. **⚠ WARNING! Risk of injury from heavy and top-heavy components and machines!**

   Carefully lift the reception structure (Fig. 31), swing it over the channel and slowly lower it, aligned with the funnel surfaces (Fig. 31/2) opposite the flow direction of the liquid flow, down to the ground or until the support bracket (Fig. 31/6) makes contact with the support edge (Fig. 31/5).

4. Release the lifting equipment and place to the side.

5. Attach the reception structure through the boreholes (Fig. 31/4) against the channel wall using suitable fastening materials.

   Use at least half of the boreholes available for the attachment, distributed evenly, in the reception structure.

   ⇨ The reception structure for the machine is mounted.

6.2.2 Mounting the machine

Personnel:
- Transport specialists
- Specialist mechanic

Protective equipment:
- Industrial hard hat
- Protective clothing
- Safety gloves
- Safety shoes
- Safety harness

Requirements:
- The assembly location is cleaned from contamination caused by the liquid flow in the channel/shaft.
- Adequately dimensioned lifting gear and lifting equipment is laid ready.
- The reception structure is mounted, if necessary.
- Macerators are ready at the installation location.
- Only use non-sparking tools in the Ex zone.

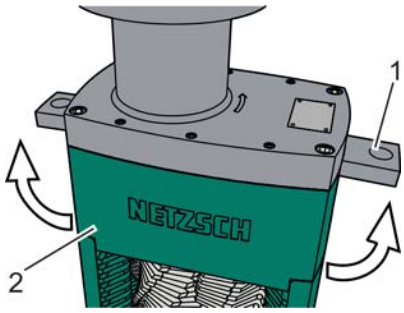

Fig. 32: Folding out the transport eyes

1 Transport eye
2 Gearbox housing

1. *The transport eyes of the drive are designed for the weight of the drive and **not** for the weight of the entire machine. When transporting the entire machine, always use the folding transport eyes. The transport eyes of the drive may be used for securing the drive against tipping over if it is top-heavy.*

   Fold out the transport eyes (Fig. 32/1) from the gearbox housing (Fig. 32/2) on both sides of the machine.

2. **⚠ DANGER! Risk of explosion from electrostatic discharges during transport of components in the Ex zone!**

   ⚠ WARNING! Risk of injury from heavy and top-heavy components and machines!

   To prevent the machine from tipping if it is top-heavy, also use lifting equipment to attach the transport eyes of the drive.

   Attach the lifting equipment to the folding transport eyes (Fig. 32/1) and attach potential equalization for the transport eye, if necessary.

3. Provide safe access to the low-lying assembly location.

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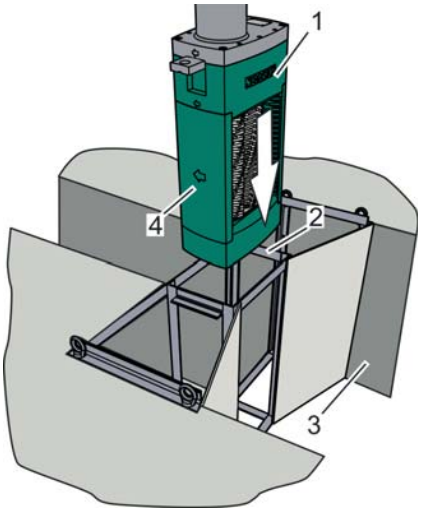

Fig. 33: Lowering the machine into the reception structure, example

1 Machine
2 Reception structure
3 Channel
4 Flow direction

Only for low-lying installations

4. Lift machine (Fig. 33/1) with suitable lifting gear and swing over the reception structure (Fig. 33/2) of the machine.
5. Carefully lower the machine (Fig. 33/1), aligned with the flow direction (Fig. 33/4), into the reception structure (Fig. 33/2) of the channel (Fig. 33/3) all the way.

   ⇨ The assembly of the reception structure is complete.

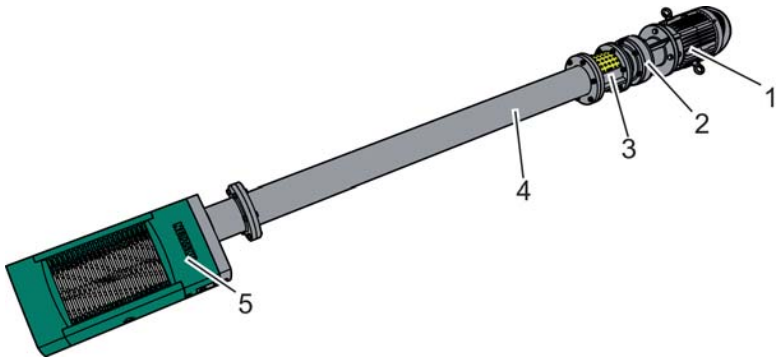

Fig. 34: Machine with drive extension, shown in horizontal position

1 Drive
2 Gear
3 Lantern
4 Drive extension
5 Machine

6. *For low-lying installations, the machine is equipped with a drive extension which is secured to a drive attachment below the drive. Fasten the lifting equipment for lifting in the entire machine directly below the upper connection flange of the drive extension (Fig. 34/4) and attach potential equalization for the transport, if necessary.*

   Unless it is already integrated into the reception structure, attach a separate operator-side drive attachment vertically above the machine and fasten the drive.

6.3 Mounting the drive with coupling

Necessary only if the machine is completed at the installation location.

Personnel:
- Specialist mechanic

Protective equipment:
- Industrial hard hat
- Protective clothing
- Safety gloves
- Safety shoes

Requirements:
- The machine is attached on the subsurface.
- The drive is ready at the installation location.
- Lifting gear and lifting equipment is available with greater load-bearing capacity than the total weight of the machine.
- If a drive extension for low-lying installations is installed, the assembly should preferably take place horizontally.
- There is sufficient space for installation.
- Only use non-sparking tools in the Ex zone.

Standard installation

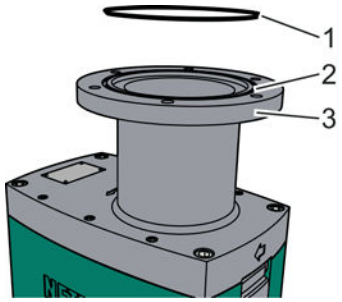

Fig. 35: Inserting the O-ring into the connection flange, example

1 O-ring
2 Groove
3 Connection flange

1. Place the lightly lubricated O-ring (Fig. 35/1) into the groove (Fig. 35/2) of the connection flange (Fig. 35/3).

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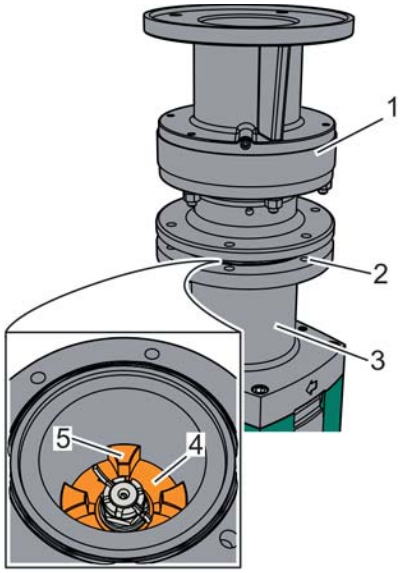

Fig. 36: Positioning the gear, example

1 Gear
2 Borehole
3 Coupling housing
4 Coupling half
5 Coupling claw

2. *When positioning the coupling halves, make sure that the elastomeric coupling element is correctly seated between the claws.*

   Carefully place the gear (Fig. 36/1) with the coupling half, aligned with the coupling half (Fig. 36/4) in the coupling housing (Fig. 36/3) and the boreholes (Fig. 36/2) onto the connection flange of the coupling housing.

Low-lying installations, for channel variant only

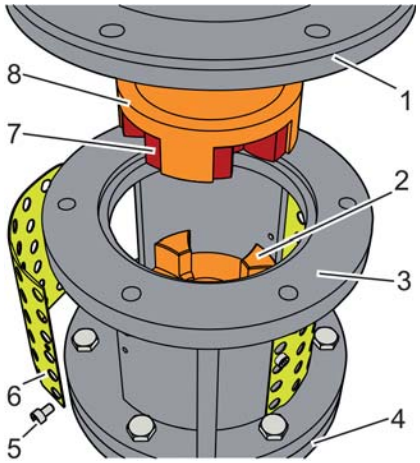

Fig. 37: Positioning the gear

1 Gear
2, 8 Coupling half
3 Drive lantern
4 Extension pipe
5 Attachment bolt
6 Cover
7 Elastomeric coupling element

3. Unscrew the attachment bolts (Fig. 37/5) of the covers (Fig. 37/6) and place to the side.

4. *When positioning the coupling halves, make sure that the elastomeric coupling element (Fig. 37/7) is correctly seated between the claws.*

   Carefully place the gear (Fig. 37/1) with the coupling half (Fig. 37/8), aligned with the coupling half (Fig. 37/2) in the drive lantern (Fig. 37/3) and the boreholes, onto the drive lantern.

5. Correctly attach the covers (Fig. 37/6) with the attachment bolts (Fig. 37/5) on the drive lantern.

For all installation variants

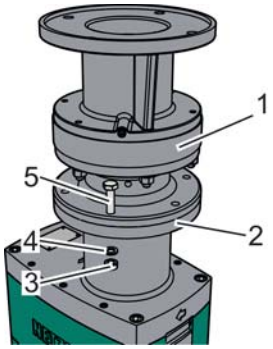

Fig. 38: Attaching the gear, example

1 Gear
2 Connection flange
3 Nut
4 Retaining ring
5 Attachment bolt

6. Insert the attachment bolts (Fig. 38/5) into the boreholes of the gear (Fig. 38/1) and tighten them by hand with retaining rings (Fig. 38/4) and nuts (Fig. 38/3).
7. Tighten the attachment bolts (Fig. 38/5) crosswise with the prescribed torque (↬ *Appendix "Screw tightening torques" on page 131*).

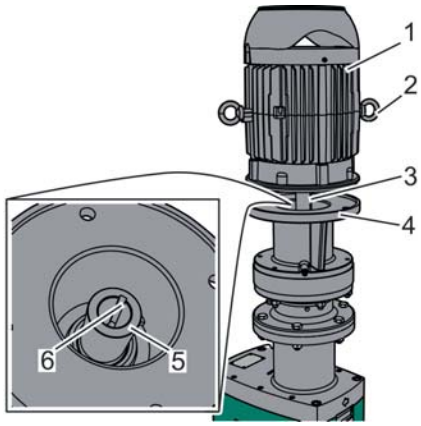

Fig. 39: Positioning the drive on the gear, example

1 Drive (e.g. electric motor)
2 Transport eye
3 Key
4 Gear flange
5 Gear mount
6 Groove

8. Attach the drive (Fig. 39/1) with suitable lifting equipment on the transport eyes (Fig. 39/2), lift up and lift over the gear.
9. Carefully lower the drive (Fig. 39/1) with the drive journal facing forward, aligned with the key (Fig. 39/3) with the groove (Fig. 39/6) of the gear mount (Fig. 39/5), down to the gear flange (Fig. 39/4).

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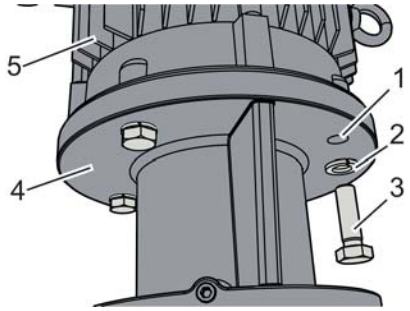

Fig. 40: Attaching the drive

1 Borehole
2 Retaining ring
3 Attachment bolt
4 Gear flange
5 Drive

10. Tighten the attachment bolts (Fig. 40/3) by hand with the retaining rings (Fig. 40/2) through the boreholes (Fig. 40/1) of the gear flange (Fig. 40/4) in the drive (Fig. 40/5).

11. Tighten the attachment bolts (Fig. 40/3) crosswise with the prescribed torque (↳ *Appendix “Screw tightening torques” on page 131*).

⇨ The assembly is complete.

6.4 Electrical connection

Connecting the electric motor

Personnel: ■ Qualified electrician

Protective equipment: ■ Protective clothing
■ Safety shoes

⚠ DANGER

Risk of severe injury or death from electric current!

- **Only have work at the electrical system carried out by qualified electricians.**
- **If there is damage to the insulation, immediately disconnect the power supply and have repairs carried out.**
- **Before beginning work at live parts of the electrical system and equipment, disconnect the power supply and ensure that it remains disconnected for the duration of the work. When doing so, observe these 3 safety rules:**
  - **Switch off.**
  - **Secure against reactivation.**
  - **Ensure that there is no voltage.**
- **Never bridge fuses or remove them from operation. When replacing fuses, adhere to the correct data on current.**
- **Keep current-carrying parts dry. Moisture could cause a short circuit.**

There is an immediate risk of severe injury or death from electric shock upon contact with parts carrying voltage. Damage to the insulation or individual components can be life-threatening.

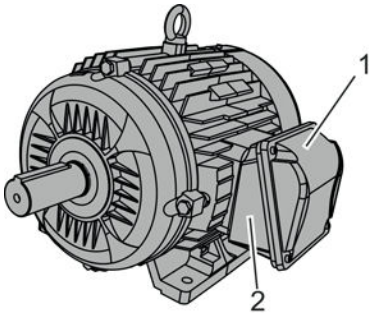

Fig. 41: Connecting the electric motor, example

1 Connection box cover
2 Connection box

1. Disassemble the connection box cover (Fig. 41/1) from the connection box (Fig. 41/2).
2. Adjust the cable bushing on the underside of the connection box (Fig. 41/2) to the cable diameter.
3. **⚠ DANGER! Risk of explosion from electrostatic discharges from statically charged components!**

   Connect the electric motor as per the wiring diagram (in the EU, observe the explosion protection document).
4. Sufficiently ground the machine, if necessary, with an operator-side drive.
5. Ensure that no hazard from electrical power occurs.
6. Install an emergency stop switch, if necessary.

Checking the direction of rotation

⚠ DANGER

Risk of death from rotating parts!

- **Use personal protective equipment for all work on the machine.**
- **Maintain sufficient distance from rotating parts.**

Working near moving parts such as the drive spindle can result in hair or body parts being caught and drawn in or crushed. This could cause severe injuries or even death.

NOTICE

Property damage from wrong direction of rotation!

- **Check the direction of rotation with a rotating field gauge.**
- **Decouple the drive from the machine.**

The wrong direction of rotation could cause significant property damage to the machine.

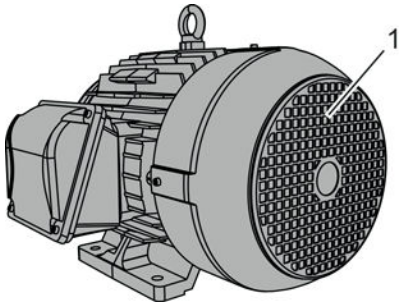

Fig. 42: Checking the rotation direction of the electric motor, example

1 Ventilation grid

1. Switch the electric motor on and then immediately back off.
2. Check that the direction of rotation for the electric motor (vent behind the ventilation grid, Fig. 42/1) matches the arrow for the direction of rotation of the machine.
3. If the direction of rotation is not correct, switch 2 phases (*“Connecting the electric motor” on page 56*).

   ⇨ The drive is connected.

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7 Operation

7.1 Connecting the power supply

Personnel:
- Trained, qualified personnel

Protective equipment:
- Protective clothing
- Safety gloves
- Safety shoes

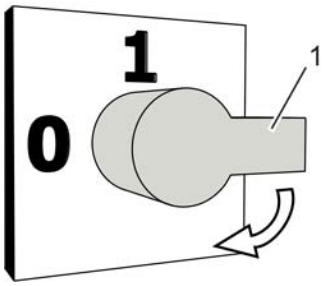

Fig. 43: Switching on the main switch

1 ON/OFF switch
Arrow Rotation direction

→ Switch on the *[main switch]* by turning the ON/OFF switch (Fig. 43/1) clockwise (Fig. 43/arrow).

⇨ The power supply is switched on.

7.2 Interrupting the power supply

Personnel:
- Trained, qualified personnel

Protective equipment:
- Protective clothing
- Safety gloves
- Safety shoes

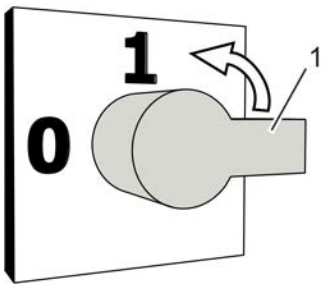

Fig. 44: Switching off the main switch

1 ON/OFF switch
Arrow Rotation direction

→ Switch off the *[main switch]* by turning the ON/OFF switch (Fig. 44/1) counter-clockwise (Fig. 44/arrow).

⇨ The power supply is interrupted.

7.3 Switching on the machine

Personnel:
- Trained, qualified personnel

Protective equipment:
- Protective clothing
- Safety gloves
- Safety shoes

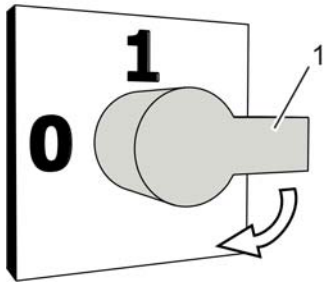

Fig. 45: Switching on the main switch

1. Switching on the *[main switch]*.

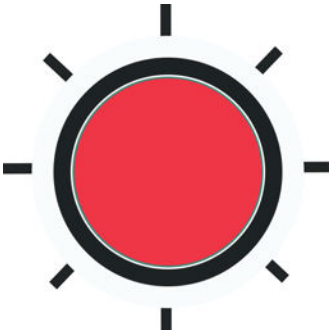

Fig. 46: Red light display

⇨ *[Light display H2]* lights up red.

2. Make sure that nobody is in the proximity of the machine.

Fig. 47: Switch-off button (red)

3. Press the *[switch-off button]* 2x in a row for acknowledgement.

⇨ *[Light display H2]* goes out.

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Fig. 48: Switch-on button (green)

4. Press the *[switch-on button]*.

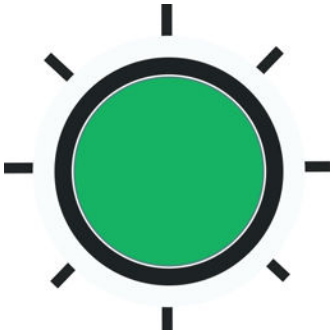

Fig. 49: Green light display

⇨ The machine starts up and *[light display H1]* lights up green.

7.4 Switching off the machine

Personnel:
- Trained, qualified personnel

Protective equipment:
- Protective clothing
- Safety gloves
- Safety shoes

Fig. 50: Switch-off button (red)

Press the *[switch-off button]*.

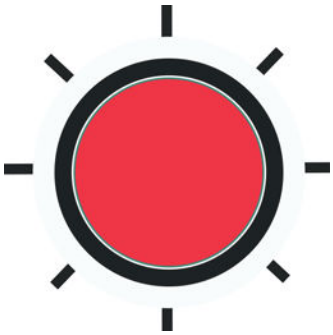

Fig. 51: Red light display

⇨ *[Light display H2]* lights up red.

7.5 Carrying out an emergency stop

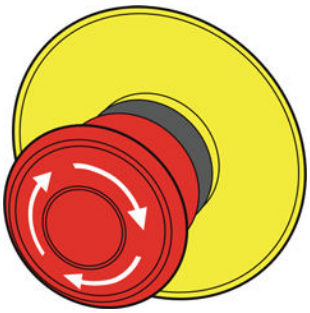

Fig. 52: Emergency stop button, example

→ *[Push in the emergency stop button].*

7.6 Switching on the machine after an emergency stop

Personnel:
- Trained, qualified personnel

Protective equipment:
- Protective clothing
- Safety gloves
- Safety shoes

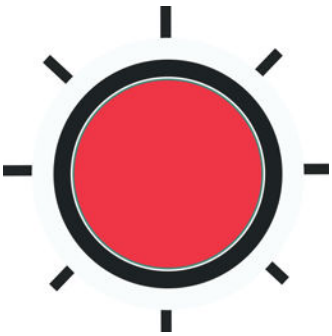

Fig. 53: Red light display

[Light display H2] lights up red on the control cabinet after pressing the emergency stop.

⚠ WARNING

Risk of death from unauthorized or uncontrolled reactivation!

– Ensure that all safety devices are in place and fully functional and there is no danger to persons before switching on again.

Unauthorized or uncontrolled reactivation of the power supply could lead to severe injuries or even death.

1. → Eliminate the cause that lead to the activation of the emergency stop.
2. → Make sure that nobody is in the proximity of the machine.

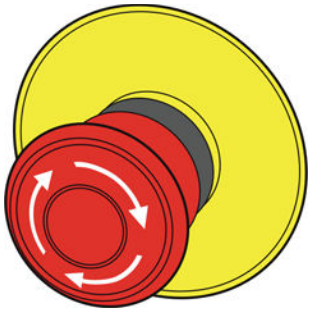

Fig. 54: Emergency stop button, example

3. Turn the *[emergency stop button]* in the direction of the arrow indicated and release.

Fig. 55: Switch-off button (red)

4. Press the *[switch-off button]* 2x in a row for acknowledgement.
   ⇨ *[Light display H2]* goes out.

Fig. 56: Switch-on button (green)

5. Press the *[switch-on button]*.

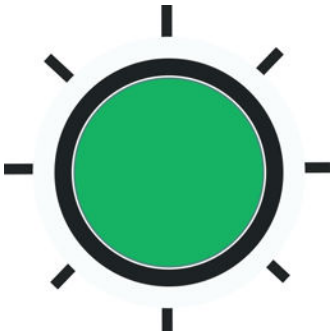

Fig. 57: Green light display

⇨ The machine starts up and *[light display H1]* lights up green.

7.7 Switching on the machine after a power outage

Personnel:
- Trained, qualified personnel

Protective equipment:
- Protective clothing
- Safety gloves
- Safety shoes

[Light display H2] lights up red after power comes back on.

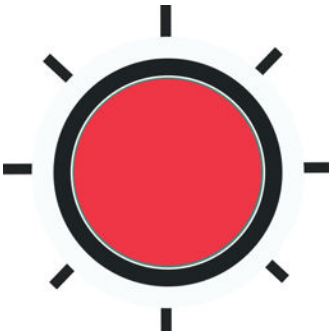

Fig. 58: Red light display

Fig. 59: Switch-off button (red)

1. Press the *[switch-off button]* 2x in a row for acknowledgement.
   ⇨ *[Light display H2]* goes out.

Fig. 60: Switch-on button (green)

2. Press the *[switch-on button]*.

⇨ The machine starts up and *[light display H1]* lights up green.

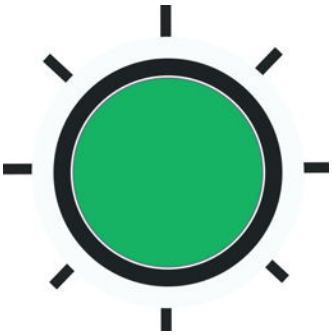

Fig. 61: Green light display

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7.8 Performing a check

Personnel:
- Trained, qualified personnel

Protective equipment:
- Protective clothing
- Safety gloves
- Safety shoes

→ Periodically check the machine for proper operation, noise development, leaks on the gear and fluid level in the channel (backed up liquid flow).

 *To protect the cutter blocks from contamination, optional cleaning combs can be installed. You clean the cutter blocks from fiber and film residues. Unobstructed cutter blocks prevent solids from backing up the liquid flow.*

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8 Maintenance

8.1 Safety instructions for maintenance

Potentially explosive atmospheres

DANGER

Risk of explosion from electrostatic discharges!

- **Obtain written work approval before starting work in the Ex zone (in the EU, observe the explosion protection document).**
- **Equip the machine with potential equalization during transport into and out of the potentially explosive zone until it is permanently connected.**
- **Perform work only with the potentially explosive atmosphere excluded.**
- **Only use non-sparking tools.**

Electrostatic charging of the machine could cause sparks to form. In potentially explosive atmospheres, this could trigger explosions, resulting in severe or fatal injuries and considerable property damage.

Operating a damaged machine

DANGER

Risk of explosion from damage to the machine!

- **Operate the machine only in undamaged, proper technical condition.**
- **Check and maintain the machine regularly.**
- **If damage to the machine is suspected, switch it off and inspect it (*Chapter 9.3 "Table of malfunctions" on page 115*).**

Operating a damaged machine could lead to an explosion in the Ex zone and further property damage.

Securing against reactivation

WARNING

Risk of death from unauthorized reactivation!

- **Before performing maintenance work that requires accessing the machine interior, switch off the energy supply and secure it against reactivation.**

Unauthorized reactivation of the power supply during maintenance poses a risk of severe injury or death to those in the danger zone.

Improperly performed maintenance work

⚠ WARNING

Risk of injury from improperly performed maintenance work!

- **Before starting work, ensure that there is sufficient space for installation.**
- **Keep the place of installation orderly and clean! Parts and tools that are stacked or lying around loose are potential accident sources.**
- **If components were removed, check for correct installation, re-install all attachment elements and use the correct tightening torque for screws (*Appendix "Screw tightening torques" on page 131*).**
- **Before putting the system back into service, observe the following:**
  - **Ensure that all maintenance work has been performed and completed according to the information and instructions in this manual.**
  - **Ensure that no persons are in the danger zone.**
  - **Ensure that all covers and safety devices are installed and working properly.**

Incorrect maintenance can lead to severe injuries and considerable property damage.

Sharp edges and pointed corners

⚠ WARNING

Risk of injury from sharp edges and pointed corners!

- **Always work with care near the cutter blocks.**
- **Wear personal protective equipment.**

Working near the cutter blocks can result in injury on sharp edges and pointed corners.

Hazardous liquid flow

⚠ WARNING

Risk of injury from contact with hazardous liquid flow!

- **Refrain from touching the liquid flow or use mechanical aids.**
- **Avoid contact by wearing personal protective equipment.**

Contact with the liquid flow can be toxic and carcinogenic due to hazardous components and cause mechanical injuries.

Hot liquid flow

⚠ WARNING

Risk of scalding from hot liquid flow!

- **Protective clothing, protective goggles and safety gloves must be worn for all work.**
- **When working on the machine: Turn the machine off, close the shut-off and wait until the machine has cooled.**

Liquid flow could have a high temperature. Contact with liquid flow could cause severe scalding.

Hot surfaces

⚠ WARNING

Risk of injury from hot surfaces!

- **Protective clothing and safety gloves must be worn for all work near hot surfaces.**
- **When working on the machine: Turn the machine off, close the shut-off and wait until the machine has cooled.**

The liquid flow, parts that carry medium and the drive may have high temperatures. Skin contact with hot surfaces causes severe burns.

8.2 Maintenance schedule

The sections below describe the maintenance work necessary for optimal, trouble-free operation of the machine.

If periodic inspections reveal higher levels of wear than expected, shorten the required maintenance intervals appropriately for the actual rate of wear observed. For questions regarding maintenance work and intervals, contact the customer service (↪ *"Customer service" on page 4*).

Interval	Maintenance work	Personnel
Monthly	**Intervals:** As part of an inspection, but no later than monthly. Check machine and drive: ■ Function ■ Assembly condition ■ Operating noise ■ Leak on gear ■ Fill level in the channel in front of the machine (backed up liquid flow)	Trained, qualified personnel
	Check blades of the cutter blocks and replace, if necessary (↳ *Chapter 8.3.5 "Replacing cutter blocks" on page 75*).	Specialist mechanic
	Check lubrication of gears.	Specialist mechanic
	Check screws to ensure they are tight.	Specialist mechanic
Annually	Maintain entire macerator. Inspect the following components and replace, if necessary: ■ Rotating mechanical seals (↳ *Chapter 8.3.7 "Dismantling the machine" on page 87*, ↳ *Chapter 8.3.8 "Assembling the machine" on page 99*) ■ Shaft seals ■ Transfer elements ■ Cutter blocks Apply fresh lubricant.	Specialist mechanic
2 times per year	Replace the seals of the gear motor.	Specialist mechanic
	Grease bearings and transfer elements (↳ *Chapter 8.3.7 "Dismantling the machine" on page 87*, ↳ *Chapter 8.3.8 "Assembling the machine" on page 99*).	Specialist mechanic
If necessary	Clean cleaning combs (↳ *Chapter 8.3.4 "Cleaning the cleaning combs, optional" on page 74*).	Specialist mechanic

8.3 Maintenance work

8.3.1 Before performing maintenance work with manual intervention

Protective equipment:
- Industrial hard hat
- Protective clothing
- Chemically resistant safety gloves
- Safety gloves
- Safety shoes

1. Interrupt and secure the liquid flow on the operator side.
   ⇨ Wait until the liquid has drained from the channel.
2. Thoroughly clean the machine using a stream of water.

3. Switch off the machine (*Chapter 7.4 "Switching off the machine" on page 61*).
4. Secure the machine against reactivation (*Chapter 3.7 "Securing against reactivation" on page 23*).

8.3.2 Checking the drive to ensure tight seating

Protective equipment:
- Industrial hard hat
- Protective clothing
- Safety gloves
- Safety shoes

Requirements:
- The liquid flow is interrupted and secured on the operator side.
- The machine is switched off and secured against reactivation.
- The machine has cooled down to ambient temperature.
- Only use non-sparking tools in the Ex zone.

Attachment elements can come loose due to vibrations during operation and alternating loads.

Standard installation

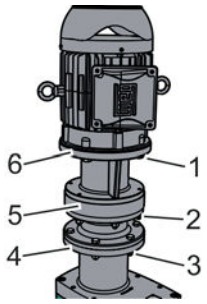

Fig. 62: Checking the attachment bolts

1 Attachment bolt
2, 3 Nut
4 Connection flange
5 Gear
6 Drive

1. **⚠ WARNING! Risk of injury from hot surfaces!**

   Check drive connectors (Fig. 62/1–3) on drive (Fig. 62/6), gear (Fig. 62/5) and connection flange (Fig. 62/4) for tight seating.

Low-lying installations, for channel variant only

⚠ DANGER! Danger of suffocation from heavy gases in shafts!
- **Ensure adequate fresh air supply.**
- **Assign a 2nd person outside the canal to monitor the installation personnel.**
- **As an alternative, wear self-contained respiratory protection.**

Danger of suffocation from heavy gases when entering shafts.

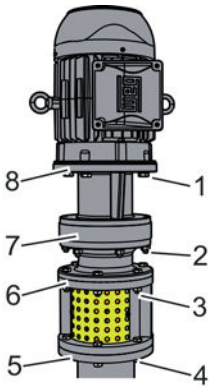

Fig. 63: Checking the attachment bolts

1 Attachment bolt
2–4 Nut
5 Extension pipe
6 Drive lantern
7 Gear
8 Drive

2. **⚠ WARNING! Risk of injury from hot surfaces!**

   Check drive connectors (Fig. 63/1–4) on drive (Fig. 63/8), gear (Fig. 63/7), drive lantern (Fig. 63/6), extension pipe (Fig. 63/5) and the additional operator-side attachment of the drive for tight seating, if necessary.

8.3.3 Disassembling the machine from the channel

Personnel:
- Transport specialists
- Specialist mechanic

Protective equipment:
- Industrial hard hat
- Protective clothing
- Safety gloves
- Safety shoes
- Safety harness

⚠ DANGER

Danger of suffocation from heavy gases in shafts!
- **Ensure adequate fresh air supply.**
- **Assign a 2nd person outside the canal to monitor the installation personnel.**
- **As an alternative, wear self-contained respiratory protection.**

Danger of suffocation from heavy gases when entering shafts.

Requirements:
- Lifting gear and lifting equipment is available with greater load-bearing capacity than the total weight of the machine.
- There is sufficient space for installation.
- Liquid flow is shut off and secured against reopening.

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- The drive connection is physically disconnected from the power supply.
- No potentially explosive atmosphere is present.

The reception structure can be optimally designed for the operating site and is anchored by floor or wall attachments. The machine can be anchored by securely fitting it into the channel/shaft.

1. **⚠ WARNING! Danger of suffocation from heavy gases in shafts!**

   Always provide safe access to the low-lying assembly location.

2. *The transport eyes of the drive are designed for the weight of the drive and **not** for the weight of the entire machine. When transporting the entire machine, always use the folding transport eyes. The transport eyes of the drive may be used for securing the drive against tipping over if it is top-heavy.*

   Fold out the transport eyes (Fig. 64/1) from the gearbox housing (Fig. 64/2) on both sides of the machine.

3. **⚠ DANGER! Risk of explosion from electrostatic discharges during transport of components in the Ex zone!**

   ⚠ WARNING! Risk of injury from heavy and top-heavy components and machines!

   To prevent the machine from tipping if it is top-heavy, also use lifting equipment to attach the transport eyes of the drive.

   Attach the lifting equipment to the transport eyes (Fig. 64/1) and attach potential equalization for the transport, if necessary.

4. Carefully lift machine (Fig. 65/1) out of the reception structure (Fig. 65/2) of the channel/shaft (Fig. 65/3) and transport it to the mounting surface.

   ⇨ Disassembly is complete.

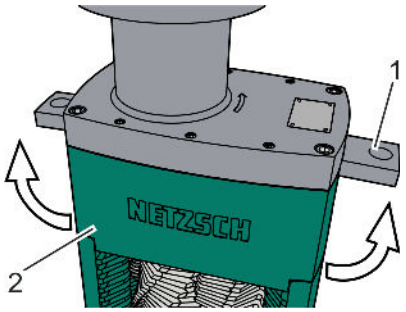

Fig. 64: Folding out the transport eyes, example

1 Transport eye
2 Gearbox housing

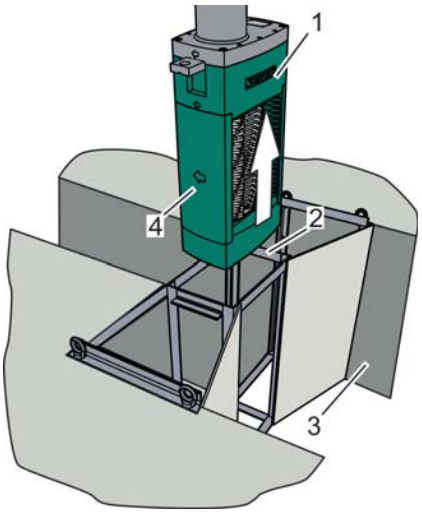

Fig. 65: Lifting the machine from the reception structure, example

1 Machine
2 Reception structure
3 Channel
4 Flow direction

Only for low-lying installations

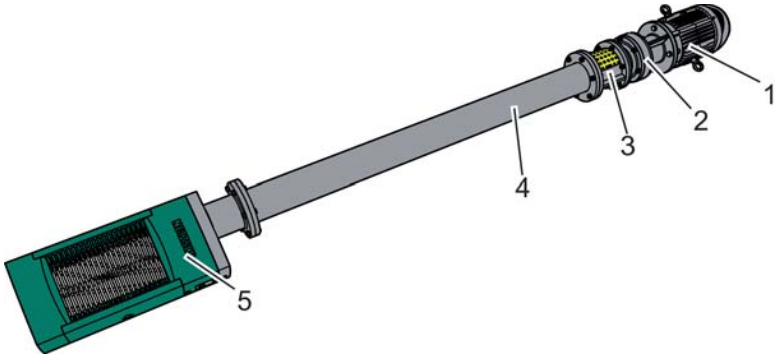

Fig. 66: Machine with drive extension, shown in horizontal position

1 Drive
2 Gear
3 Lantern
4 Drive extension
5 Machine

5. *For low-lying installations, the machine is equipped with a drive extension which is secured to a drive attachment below the drive.*

   If necessary, detach the drive from the separate operator-side drive attachment that is located above the channel and lift it out together with the machine. Fasten the lifting equipment for lifting out the entire machine directly below the upper connection flange of the drive extension (Fig. 66/4) and attach potential equalization for the transport, if necessary.

8.3.4 Cleaning the cleaning combs, optional

Protective equipment:
- Industrial hard hat
- Protective clothing
- Chemically resistant safety gloves
- Safety gloves
- Safety shoes
- Safety harness

Requirements:
- The liquid flow is interrupted and secured on the operator side.
- The drive connection is physically disconnected from the power supply.
- The machine has cooled down to ambient temperature.
- The machine is disassembled from the channel of the reception structure (*Chapter 8.3.3 “Disassembling the machine from the channel” on page 72*).

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- The machine has been cleaned with a stream of water.
- No potentially explosive atmosphere is present.

1. Provide safe access to the machine.

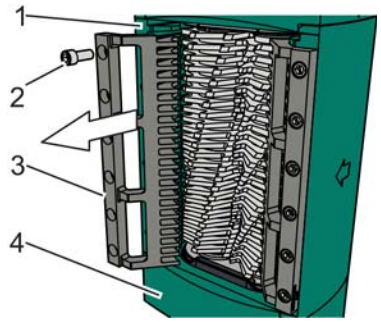

Fig. 67: Releasing the cleaning comb, example

1 Side wall
2 Attachment bolt
3 Cleaning comb
4 Outlet side

2. ⚠ **WARNING! Risk of injury from sharp edges and pointed corners!**

   Unscrew the attachment bolts (Fig. 67/2) on the outlet side (Fig. 67/4) of the machine and place to the side.

3. Carefully remove the cleaning comb (Fig. 67/3) in the direction of the arrow (Fig. 67/arrow) from the side wall (Fig. 67/1) and place to the side.

4. Clean contamination from cleaning comb (Fig. 67/3) and check for burrs. Remove burrs using suitable tools, if necessary.

5. Carefully insert the cleaning comb (Fig. 67/3), aligned with the boreholes in the side wall (Fig. 67/1) of the machine, in the proper position between the grooves of the cutter blocks and tighten by hand with the attachment bolts (Fig. 67/2).

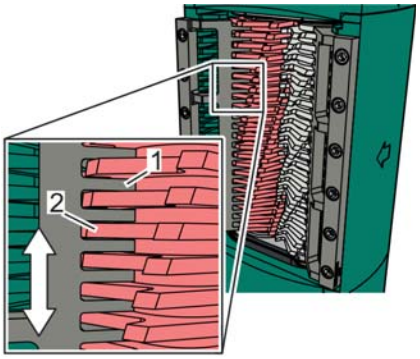

Fig. 68: Aligning the cleaning comb, example

1 Cleaning comb

6. Align the pins of the cleaning comb (Fig. 68/1) vertically (Fig. 68/ double arrow) between the blades (Fig. 68/2) of the cutter blocks so that the cutter blocks can rotate without touching.

7. Tighten the attachment bolts (Fig. 67/2) of the cleaning comb (Fig. 67/3) one by one with the prescribed torque (↳ *Appendix "Screw tightening torques" on page 131*).

8. Carry out work steps 2 – 7 on the opposite side.

   ⇨ Cleaning is complete.

8.3.5 Replacing cutter blocks

Protective equipment:
- Industrial hard hat
- Protective clothing
- Chemically resistant safety gloves
- Safety gloves
- Safety shoes

Requirements:
- The liquid flow is interrupted and secured on the operator side.
- The drive connection is physically disconnected from the power supply.
- The machine has cooled down to ambient temperature.
- No potentially explosive atmosphere is present.

- The machine is disassembled from the channel of the reception structure (*Chapter 8.3.3 "Disassembling the machine from the channel" on page 72*).
- The machine has been cleaned with a stream of water.
- Optional cleaning combs are disassembled (*Chapter 8.3.4 "Cleaning the cleaning combs, optional" on page 74*).

Disassembling the cutter block drive unit

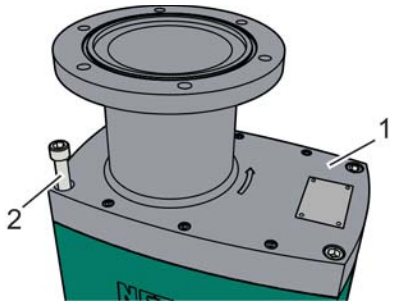

Fig. 69: Releasing the gear

1 Gear of the cutter block drive
2 Attachment bolt

1. Unscrew the attachment bolts (Fig. 69/2) at the corners of the gear (Fig. 69/1) and place to the side.

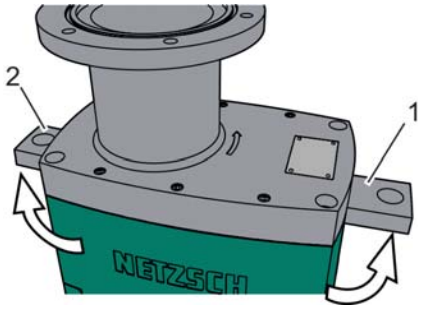

Fig. 70: Folding out the transport eyes, example

1, 2 Transport eyes

2. Fold out the transport eyes (Fig. 70/1, 2) at the sides.
3. Attach lifting equipment of suitable lifting capacity to the transport eyes.

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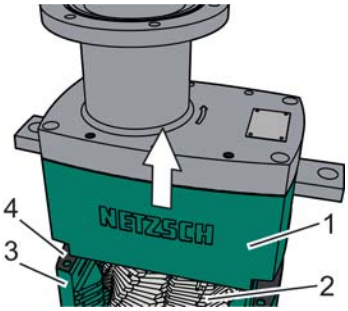

Fig. 71: Lifting out the cutter block drive unit

1 Cutter block drive
2 Cutter block
3 Machine housing
4 Flat seal

4. **⚠ WARNING! Risk of injury from suspended loads!**

⚠ WARNING! Risk of injury from sharp edges and pointed corners!

Carefully lift up the cutter block drive unit (Fig. 71/1) from the machine housing (Fig. 71/3) vertically in the upward direction. When doing so, ensure that the cutter blocks (Fig. 71/2) do not get caught.

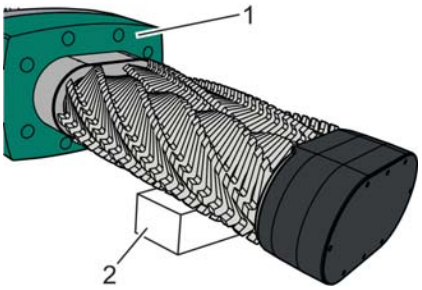

Fig. 72: Placing down the cutter block drive, example

1 Cutter block
2 Assembly support

5. Place the cutter block drive unit (Fig. 72/1) onto a suitable mounting surface with an appropriate load-bearing capacity with an assembly support (Fig. 72/2) as shown.

6. Remove the flat seals (Fig. 71/4) from the machine housing (Fig. 71/3) and place to the side.

Disassemble the bearing housing

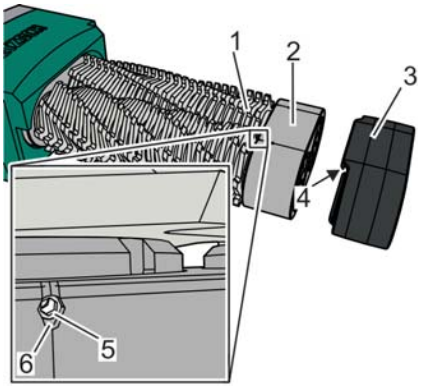

Fig. 73: Disassembling the rubber cover, example

1 Cutter block
2 Bearing housing
3 Rubber cover
4 Retention edge
5 Locking screw
6 Recess

7. Cover the cutter blocks (Fig. 73/1) in the lower section with a mechanically solid base and use a suitable tool to pry open the retention edge (Fig. 73/4) of the rubber cover (Fig. 73/3) and slide the rubber cover downward.

8. *The rubber cover is made from flexible material and is easy to bend.*

   Remove the rubber cover (Fig. 73/3) from the bearing housing (Fig. 73/2) and place to the side.

9. Screw in all locking screws (Fig. 73/5) of the bearing housing until they engage in the grooves of the hold-down edges of the rotating slide ring sealing parts and secure them in this position

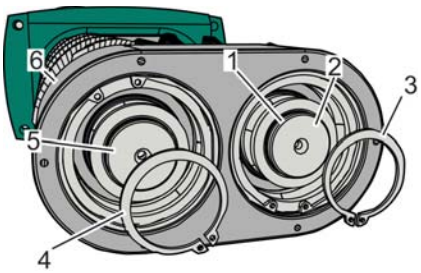

Fig. 74: Disassembling the outer retaining ring from the drive shaft, example

1 Groove
2, 5 Drive shafts
3, 4 Outer retaining rings
6 Bearing housing

10. Remove the outer retaining rings (Fig. 74/3, 4) from the drive shafts (Fig. 74/2, 5) and place to the side.

11. ⚠ **WARNING! Risk of injury from sharp edges and pointed corners!**

    Carefully pull down the bearing housings (Fig. 74/7) from the drive shafts (Fig. 74/2, 5) and place to the side.

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Removing the cutter blocks

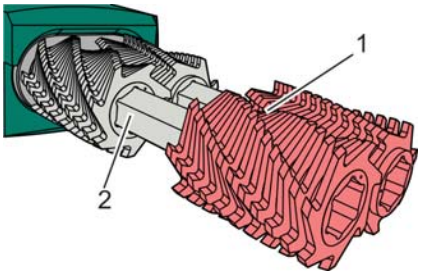

Fig. 75: Removing the cutter block, example

1 Cutter block
2 Drive shaft

12. Carefully take off the cutter blocks (Fig. 75/1) in pairs from the drive shafts (Fig. 75/2) and place to the side, secured against rolling away.

⇨ The disassembly of the cutter blocks is complete.

Mounting the cutter block drive unit

Materials: ■ Machine lubricant

Cutter block (number of blades, vertically)	Grain size [mm] (in)
3	15 x 25 x 50 (0.59 x 0.98 x 1.97)
5	8 x 15 x 35 (0.31 x 0.59 x 1.38)
7*	8 x 15 x 25 (0.31 x 0.59 x 0.98)
9	8 x 11 x 18 (0.31 x 0.43 x 0.71)
11	8 x 7 x 15 (0.31 x 0.28 x 0.59)
*** = Standard version**	

Mounting the cutter blocks

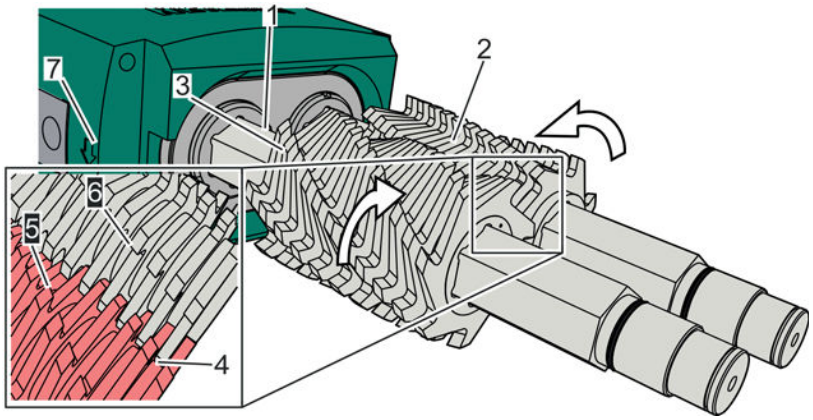

Fig. 76: Sliding on the cutter blocks in pairs, example

1 Drive shaft
2 Cutter block, right
3 Cutter block, left
4 Groove
5 Blade tip, left cutter block
6 Blade tip, right cutter block
7 Direction of flow

1. Lightly grease drive shafts (Fig. 76/1).
2. ⚠ **WARNING! Risk of injury from sharp edges and pointed corners!**

   The blade tips of the cutter blocks must point towards each other on the inlet side of the machine.

   Slide on the cutter blocks (Fig. 76/2, 3) in pairs, with the blade tips (Fig. 76/5, 6) pointing towards each other and the blade tip and the groove (Fig. 76/4) engaging in the correct position onto the drive shafts (Fig. 76/1) up to the stop.
3. Repeat work step 2 depending on the size of the machine.

   In channel variants 120C and 400C, repeat this work step 1x or 5x with the cutter block pairs.

The points marked on the respective fronts of the cutter blocks must align with the position of the other cutter blocks (Fig. 75) on the same cutter block shaft.

Mounting the bearing housing

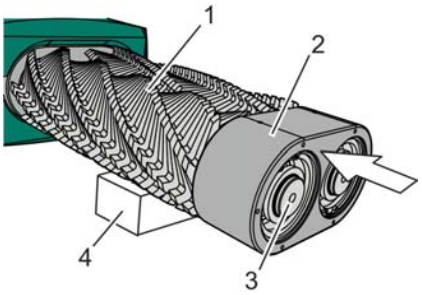

Fig. 77: Mounting the bearing housing, example

1 Cutter block
2 Bearing housing
3 Drive shaft
4 Assembly support

4. ⚠ **WARNING! Risk of injury from sharp edges and pointed corners!**

   Carefully lift the cutter blocks (Fig. 77/1) on the drive shafts from the mounting surface and slide under a suitable operator-side assembly support (Fig. 77/4).

5. Slide on the bearing housing (Fig. 77/2) in the correct position onto the bearing ends of the drive shafts (Fig. 77/3) up to the stop.

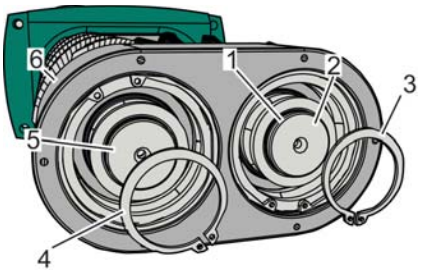

Fig. 78: Mounting the bearing housing, example

1 Groove
2, 5 Drive shafts
3, 4 Outer retaining rings
6 Bearing housing

6. Insert the outer retaining rings (Fig. 78/3, 4) into the grooves (Fig. 78/1) of the drive shafts (Fig. 78/2, 5).

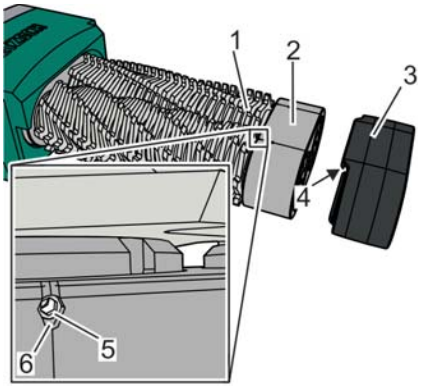

Fig. 79: Mounting the rubber cover, example

1 Cutter block
2 Bearing housing
3 Rubber cover
4 Retention edge
5 Locking screw
6 Recess

7. Unscrew all locking screws (Fig. 79/5) of the two rotating slide ring sealing parts until they are flush on the outside with the reference surface of the adjacent recess (Fig. 79/6) of the lower bearing housing (Fig. 79/2).

8. *The rubber cover is made from flexible material and is easy to bend.*

   Put on rubber seal (Fig. 79/3) with the retention edge (Fig. 79/4) onto one side of the bearing housing (Fig. 79/2) and push down lightly. Slide the retention edge of the opposite side onto the bearing housing as well.

9. Slide the rubber seal (Fig. 79/3) all the way onto the bearing housing (Fig. 79/2) until the retention edges (Fig. 79/4) make contact with the top of the bearing housing without any tension.

Mounting the cutter block drive unit

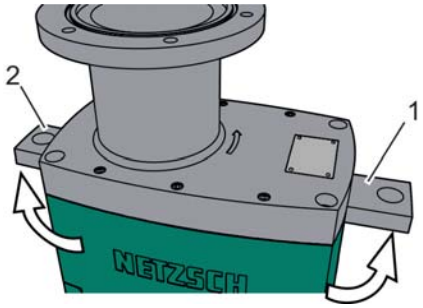

Fig. 80: Folding out the transport eyes, example

1, 2 Transport eyes

10. For vertical assembly, fold out the transport eyes (Fig. 80/1, 2) at the sides.

11. For horizontal assembly, attach the transport eyes at the side walls of the machine housing.

12. Attach lifting equipment of suitable lifting capacity to the transport eyes.

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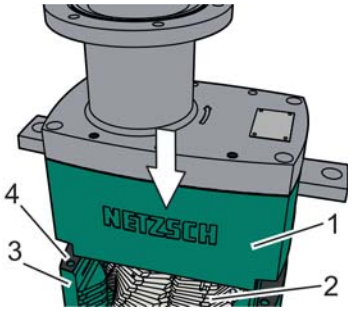

Fig. 81: Mounting the cutter block drive unit

1 Cutter block drive
2 Cutter block
3 Machine housing
4 Flat seal

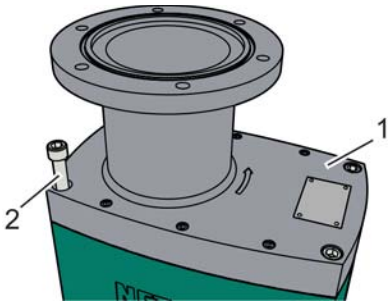

Fig. 82: Attaching the gear

1 Gear of the cutter block drive
2 Attachment bolt

13. ⚠ **WARNING! Risk of injury from suspended loads!**

⚠ **WARNING! Risk of injury from sharp edges and pointed corners!**

For vertical assembly, lift up the cutter block drive unit (Fig. 81/1) and swing it over the machine housing (Fig. 81/3).

14. For horizontal assembly, separate the machine housing (Fig. 81/3) on the side from the cutter block drive unit (Fig. 81/1).

15. Fit the flat seals (Fig. 81/4), aligned with the outer contour and the boreholes, on the contact surface of the machine housing (Fig. 81/3).

16. *During inserting, make sure that the markings showing the flow direction on the cutter block drive unit and the machine housing are pointing into the same direction.*

Carefully lower the cutter block drive (Fig. 81/1) in the correct position into the machine housing (Fig. 81/3) and attach the machine housing to the cutter block drive unit. When doing so, ensure that the cutter blocks (Fig. 81/2) do not get caught on the components.

17. Insert the attachment bolts (Fig. 82/2) at the corners of the gear (Fig. 82/1) and tighten by hand.

18. Tighten the attachment bolts (Fig. 82/2) crosswise with the prescribed torque (↳ *Appendix "Screw tightening torques" on page 131*).

⇨ The assembly of the cutter blocks is complete.

8.3.6 Disassembling the drive

Protective equipment:
- Industrial hard hat
- Protective clothing
- Chemically resistant safety gloves
- Safety gloves
- Safety shoes

Special tool:
- Removal tool

Materials:
- Lint-free cleaning cloth

Requirement:
- No potentially explosive atmosphere is present.
- The drive is physically disconnected from the power supply.

- Suitable lifting equipment and accessories with sufficient load-bearing capacity is available.
- The machine variant with the drive extension for low-lying installations is uninstalled from the channel shaft and placed on the floor.

For all installation variants

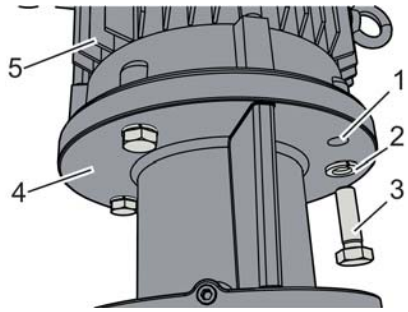

Fig. 83: Releasing the drive, example

1 Borehole
2 Retaining ring
3 Attachment bolt
4 Gear flange
5 Drive

1. Attach the drive (Fig. 83/5) with suitable lifting equipment on the transport eyes and tension slightly.
2. Unscrew the attachment bolts (Fig. 83/3) from the gear flange (Fig. 83/4) and place to the side with the retaining rings (Fig. 83/2).

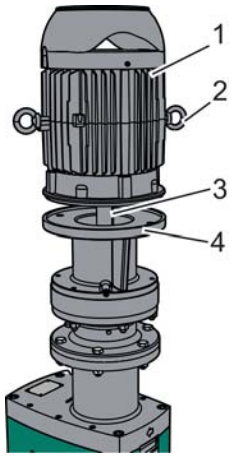

Fig. 84: Removing the drive from the gear, example

1 Drive (e.g. electric motor)
2 Transport eye
3 Key
4 Gear flange

3. Disconnect the drive (Fig. 84/1) from the gear flange (Fig. 84/4) and carefully place to the side with the key (Fig. 84/3).

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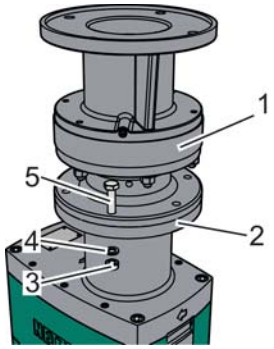

Fig. 85: Releasing the gear, example

1 Gear
2 Connection flange
3 Nut
4 Retaining ring
5 Attachment bolt

4. Secure the gear (Fig. 85/1) with suitable lifting equipment.

   If lifting equipment is attached to the gear above the attachment bolts (Fig. 85/5), an additional securing element must be used to prevent the gear (Fig. 85/1) from tipping over. As an alternative, operator-side transport eyes can be inserted into the attachment boreholes of the drive.

5. Release the attachment bolts (Fig. 85/5) of the gear (Fig. 85/1).
6. Place the nuts (Fig. 85/3), retaining rings (Fig. 85/4) and attachment bolts (Fig. 85/5) to the side.
7. Carefully separate the gear (Fig. 85/1) from the connection flange (Fig. 85/2) of the machine and place to the side, secured against rolling away.

   Take care that the coupling elements in the connection flange are not damaged when they are separated.

Only for low-lying installations

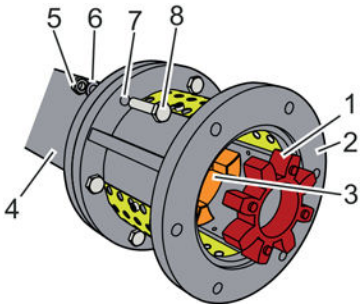

Fig. 86: Disassembling the drive lantern

1 Elastomeric coupling element
2 Drive lantern
3 Coupling half
4 Extension pipe
5 Nut
6 Retaining ring
7 Borehole
8 Attachment bolt

8. Remove the elastomeric coupling element (Fig. 86/1) from the coupling half (Fig. 86/3) and place to the side.
9. Secure the drive lantern (Fig. 86/2) with suitable lifting equipment so that it cannot fall.

   It makes sense to disassemble the drive extension in the horizontal position.

10. Release the attachment bolts (Fig. 86/8) of the drive lantern (Fig. 86/2).
11. Place the nuts (Fig. 86/5), retaining rings (Fig. 86/6) and attachment bolts (Fig. 86/8) to the side.
12. Carefully disconnect the drive lantern (Fig. 86/2) over the coupling half (Fig. 86/3) from the extension pipe (Fig. 86/4) and place to the side, secured against rolling away.

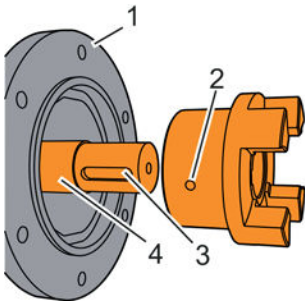

Fig. 87: Releasing the coupling half from the drive shaft

1 Coupling half
2 Attachment bolt
3 Keyway
4 Drive shaft

13. Unscrew the attachment bolt (Fig. 87/2) of the coupling half (Fig. 87/1) until the coupling half can be detached using a removal tool.

14. Pull the coupling half (Fig. 87/1) off the drive shaft (Fig. 87/4) of the extension pipe and place to the side.

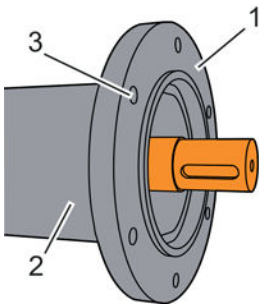

Fig. 88: Attaching the extension pipe

1 Fastening flange
2 Extension pipe
3 Borehole

15. Secure the extension pipe (Fig. 88/2) with suitable lifting equipment or assembly supports so that it cannot fall.

Operator-side transport eyes can be inserted into the boreholes (Fig. 88/3) of the fastening flange (Fig. 88/1).

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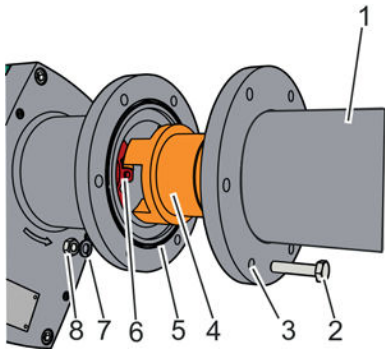

Fig. 89: Releasing the extension pipe from the machine

1 Extension pipe
2 Attachment bolt
3 Borehole
4 Coupling half
5 O-ring
6 Elastomeric coupling element
7 Retaining ring
8 Nut

16. Release the attachment bolts (Fig. 89/2) of the extension pipe (Fig. 89/1).
17. Place the nuts (Fig. 89/8), retaining rings (Fig. 89/7) and attachment bolts (Fig. 89/2) to the side.
18. Carefully separate the extension pipe (Fig. 89/1) from the connection flange of the machine and place to the side, secured against rolling away.

   Take care that the coupling elements in the connection flange are not damaged when they are separated.
19. Remove the O-ring (Fig. 89/5) from the groove of the connection flange, clean with a lint-free cleaning cloth, check for damage and place to the side.

   ***NOTICE!* Damage to the environment as a result of incorrect disposal of cleaning agents and seals!**

   ⇨ The disassembly of the drive is complete.

8.3.7 Dismantling the machine

Protective equipment:
- Industrial hard hat
- Protective clothing
- Protective goggles
- Safety gloves
- Safety shoes

Materials:
- Lint-free cleaning cloth

⚠ WARNING

Risk of injury from transporting or moving heavy components!
- **Depending on the weight, move heavy components only with the assistance of a second person or using suitable aids.**
- **Wear personal protective equipment.**

There is risk of injury when transporting or moving heavy components.

Requirements:
- The machine has been cleaned with a stream of water.
- The machine is disassembled from the reception structure.
- The mounting surface is not in the Ex zone.
- The mounting surface is clean and has a suitable lifting capacity.
- The drive is uninstalled (*Chapter 8.3.6 “Disassembling the drive” on page 83*).
- Suitable lifting equipment and accessories with sufficient load-bearing capacity is available.

Disassembling the cutter block drive unit

Disassemble the cutter block drive unit from the machine housing (*“Disassembling the cutter block drive unit” on page 76*).

Dismantling the cutter block drive

Special tool: ■ Removal tool

⚠ WARNING

Risk of injury from transporting or moving heavy components!

- **Depending on the weight, move heavy components only with the assistance of a second person or using suitable aids.**
- **Wear personal protective equipment.**

There is risk of injury when transporting or moving heavy components.

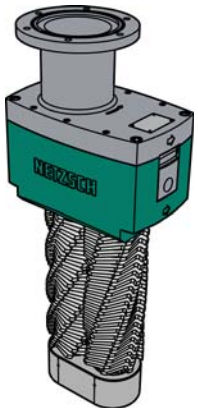

Fig. 90: Cutter block drive unit with cutter blocks

Requirements:

- The cutter block drive unit is uninstalled (*“Disassembling the cutter block drive unit” on page 76*).
- The rubber cover of the bearing housing is removed.
- The cutter block drive unit is securely standing on a mounting surface with the front side of the bearing housing.

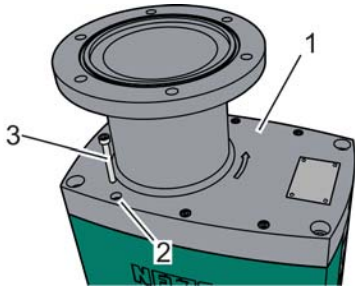

Fig. 91: Releasing the gear cover

1 Gear cover
2 Borehole
3 Attachment bolt

1. Unscrew the attachment bolts (Fig. 91/3) from the boreholes (Fig. 91/2) of the gear cover (Fig. 91/1) and place to the side.

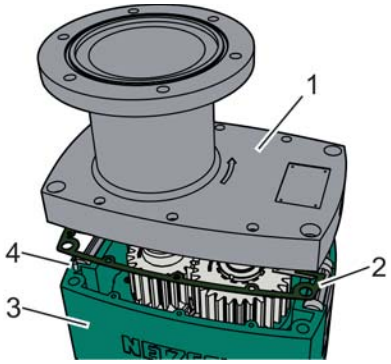

Fig. 92: Lifting off the gear cover, example

1 Gear cover
2 Flat seal
3 Gearbox housing
4 Positioning pin

2. ⚠ **WARNING! Risk of injury from transporting or moving heavy components!**

   Lift the gear cover (Fig. 92/1) from the gearbox housing (Fig. 92/3) with the assistance of a second person and place to the side.

3. Remove the flat seal (Fig. 92/2) from the positioning pins (Fig. 92/4), clean with a lint-free cleaning cloth, check for damage and place to the side.

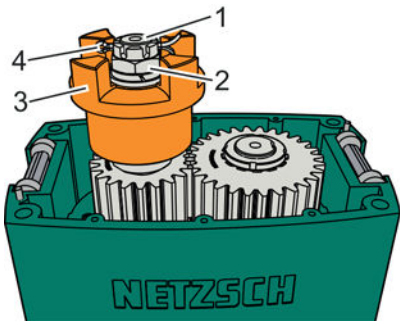

Fig. 93: Pulling the safety splint of the hexagon castle nut

1 Drive shaft
2 Hexagon castle nut
3 Coupling half
4 Safety splint

4. Bend the ends of the safety splint (Fig. 93/4) together, pull out of the hexagon castle nut (Fig. 93/2) of the drive shaft (Fig. 93/1) and place to the side.

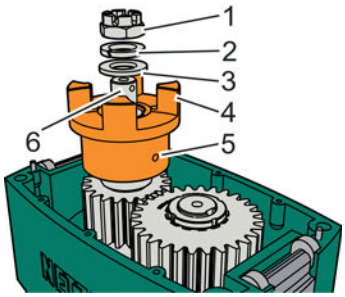

Fig. 94: Releasing the coupling half

1 Hexagon castle nut
2 Retaining ring
3 Washer
4 Coupling half
5 Hexagon socket set screw
6 Drive shaft

5. Unscrew the hexagon castle nut (Fig. 94/1) from the drive shaft (Fig. 94/6) and place to the side with the retaining ring (Fig. 94/2) and the washer (Fig. 94/3).

6. Release the hexagon socket set screw (Fig. 94/5) and pull the coupling half (Fig. 94/4) off the drive shaft (Fig. 94/6) using a removal tool, if necessary.

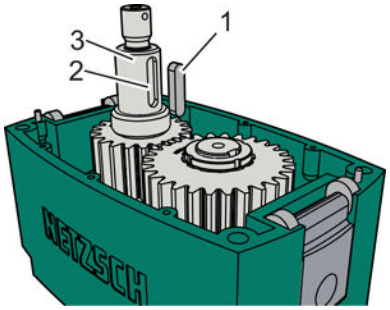

Fig. 95: Removing the key from the coupling half

1 Key
2 Keyway
3 Drive shaft

7. Remove the key (Fig. 95/1) from the keyway (Fig. 95/2) of the drive shaft (Fig. 95/3) and place to the side.

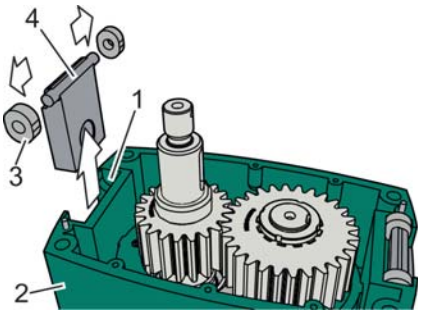

Fig. 96: Disassembling the transport eye, example

1 Bearing pocket
2 Gearbox housing
3 Pivot bearing
4 Transport eye

8. Remove the transport eye (Fig. 96/4) on both sides with the pivot bearings (Fig. 96/3) from the bearing pockets (Fig. 96/1) of the gearbox housing (Fig. 96/2).

9. Remove the pivot bearing (Fig. 96/3) from the transport eye (Fig. 96/4) and place to the side with the transport eye.

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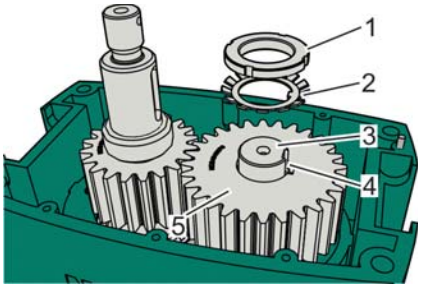

Fig. 97: Releasing the groove nut from the toothed wheel, example

1 Groove nut
2 Locking plate
3 Cutter block shaft
4 Keyway
5 Toothed wheel

10. Bend the tongue of the locking plate (Fig. 97/2) out of the groove of the groove nut (Fig. 97/1).

11. Release the groove nut (Fig. 97/1) with a hook spanner.

12. Twist the groove nut (Fig. 97/1) off the cutter block shaft (Fig. 97/3) and place to the side with the locking plate (Fig. 97/2).

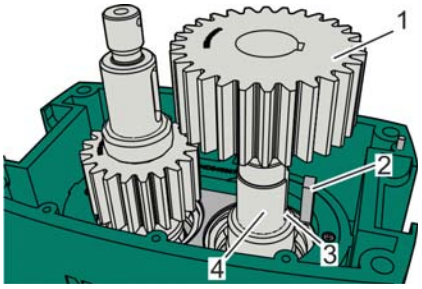

Fig. 98: Lifting the toothed wheel from the cutter block shaft, example

1 Toothed wheel
2 Key
3 Keyway
4 Cutter block shaft

13. Remove the toothed wheel (Fig. 98/1) from the cutter block shaft (Fig. 98/4) and place to the side with the key (Fig. 98/2).

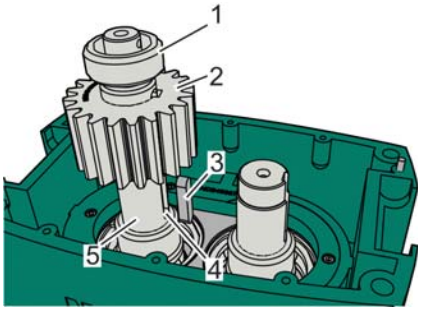

Fig. 99: Lifting the toothed wheel off the drive shaft, example

1 Distance ring
2 Toothed wheel
3 Key
4 Keyway
5 Drive shaft

14. Remove the distance ring (Fig. 99/1) and the toothed wheel (Fig. 99/2) from the drive shaft (Fig. 99/5) and place to the side with the key (Fig. 99/3).

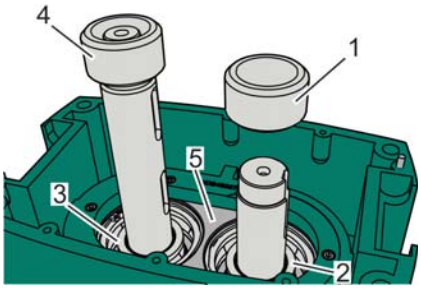

Fig. 100: Lifting the distance rings off the ball bearings, example

1, 4 Distance rings
2, 3 Ball bearings
5 Upper bearing housing

15. Lift the distance rings (Fig. 100/1, 4) off the inner rings of the ball bearings (Fig. 100/2, 3) of the upper bearing housing (Fig. 100/5) and place to the side.

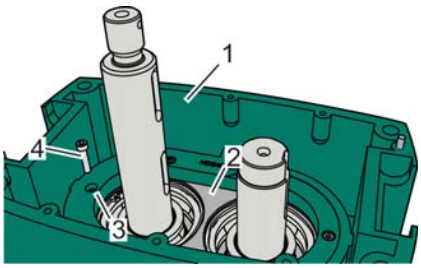

Fig. 101: Releasing the upper bearing housing from the gearbox housing, example

1 Gearbox housing
2 Upper bearing housing
3 Borehole
4 Attachment bolt

16. Unscrew the attachment bolt (Fig. 101/4) from the borehole (Fig. 101/3) of the gearbox housing (Fig. 101/1) and place to the side.

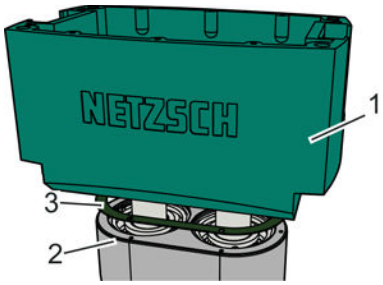

Fig. 102: Lifting off the gearbox housing, example

1 Gearbox housing
2 Bearing housing
3 Flat seal

17. ⚠ **WARNING! Risk of injury from transporting or moving heavy components!**

Lift off the gearbox housing (Fig. 102/1) from the upper bearing housing (Fig. 102/2) with the assistance of a second person and place to the side.

18. Remove the flat seal (Fig. 102/3) from the bearing housing (Fig. 102/2), clean with a lint-free cleaning cloth, check for damage and place to the side.

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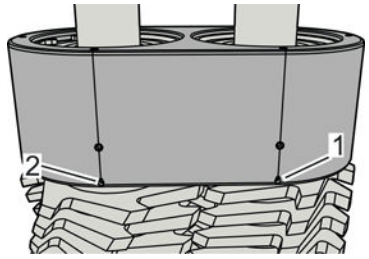

Fig. 103: Releasing the locking screws

19. Screw in all locking screws (Fig. 103/1, 2) of the upper and lower bearing housing until they engage in the grooves of the hold-down edges of the rotating slide ring sealing parts and secure them in this position

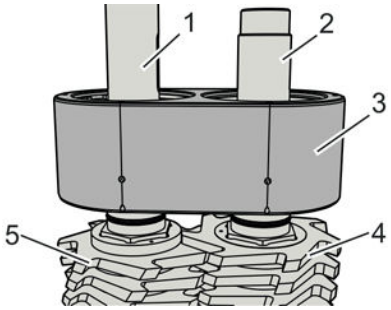

Fig. 104: Lifting off the upper bearing housing

1, 2 Cutter block shaft
3 Bearing housing
4, 5 Cutter blocks

20. Pull down the upper bearing housing (Fig. 104/3) from the cutter block shafts (Fig. 104/1, 2) over the drive shaft and place to the side.

21. Carefully take off the cutter blocks (Fig. 104/4, 5) in pairs from the cutter block shafts (Fig. 104/1, 2) and place to the side, secured against rolling away.

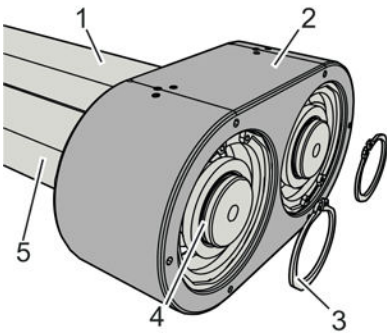

Fig. 105: Placing down the lower bearing housing

1, 5 Cutter block shaft
2 Bearing housing
3 Outer retaining ring
4 Groove

22. Place down the lower bearing housingFig. 105/2) with cutter block shafts (Fig. 105/1, 5).

23. Take off the outer retaining rings (Fig. 105/3) from the grooves (Fig. 105/4) of the cutter block shafts (Fig. 105/1, 5) and place to the side.

24. Pull out the cutter block shafts (Fig. 105/1, 5) from the bearing housing (Fig. 105/2).

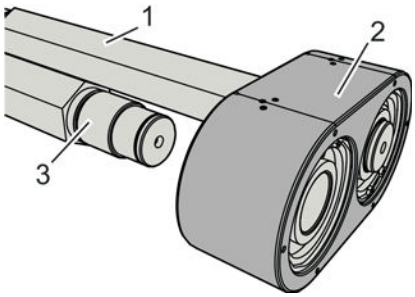

Fig. 106: Disassembling the cutter block shafts

1, 3 Cutter block shaft
2 Bearing housing

25. Pull out the cutter block shafts (Fig. 106/1, 3) from the bearing housing (Fig. 106/2).

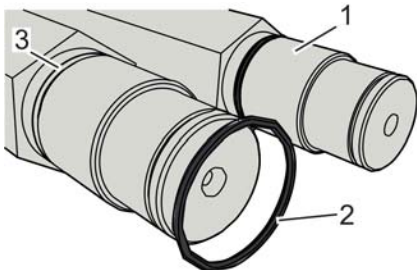

Fig. 107: Removing the O-rings

1 Cutter block shaft
2 O-ring
3 Groove

26. Remove the O-rings (Fig. 107/2) on both ends of the cutter block shafts (Fig. 107/1) from the grooves (Fig. 107/3), clean with a lint-free cleaning cloth, check for damage and place to the side.

***NOTICE!* Damage to the environment as a result of incorrect disposal of replacement parts, cleaning cloths and seals!**

⇨ Dismantling of the cutter block drive is complete.

Dismantling the lower bearing housing

The bearing housing has a bearing and a sealing unit for each shaft that are considered one unit.

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In case of damage, e.g. when the sealing unit is damaged, the bearing unit must also be replaced at the same time. Due to the weight proportion of the spring forces, it is recommended to use the assistance of a second person for the replacement work.

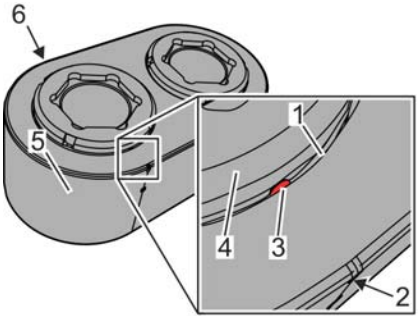

Fig. 108: Releasing the hexagon socket set screws of the rotating slide ring sealing parts

1 Hold-down edges
2, 6 Threaded borehole
3 Locking screw
4 Rotating slide ring sealing part
5 Bearing housing

1. **⚠ CAUTION! Risk of impact from spring-loaded components!**

   The rotating slide ring sealing part is spring-loaded and will pop up when the locking screw is unscrewed.

   Carefully unscrew the locking screw (Fig. 108/3) of both rotating slide ring sealing parts (Fig. 108/4) in the threaded boreholes (Fig. 108/2, 6) from the hold-down edge (Fig. 108/1) until the rotating slide ring sealing parts can be removed upwards out of the bearing housing (Fig. 108/5).

2. Place the bearing housing (Fig. 108/5) in the collecting tray to dismantle so that any leaking glycerine can be disposed of in an environmentally appropriate manner.

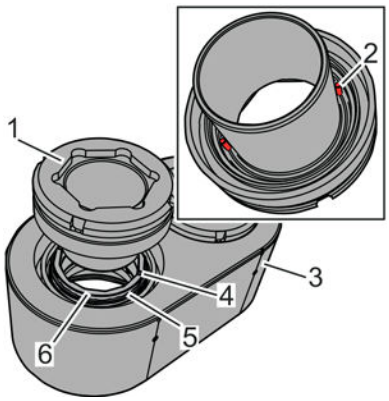

Fig. 109: Releasing the rotating slide ring sealing part

1 Rotating slide ring sealing part
2 Driving pin
3 Bearing housing
4 Driving slot
5 O-ring
6 Slide ring

3. Remove the slide ring sealing parts (Fig. 109/1) on both sides from the bearing housing (Fig. 109/2) and place to the side. Ensure that the driving pins (Fig. 109/2) remain in the rotating slide ring sealing parts.
4. Remove the slide ring (Fig. 109/6) with the O-ring (Fig. 109/5) on both sides.
5. Remove the O-ring (Fig. 109/5) from the slide ring (Fig. 109/6), clean with a lint-free cleaning cloth, check for damage and place to the side.

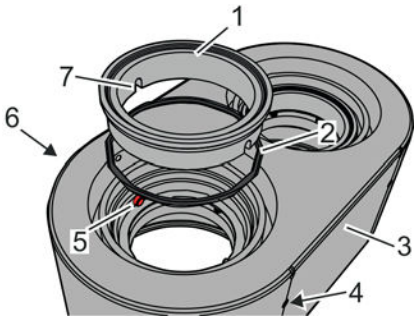

Fig. 110: Removing the counter ring

1 Counter ring
2 O-ring
3 Bearing housing
4, 6 Threaded borehole
5 Hold-down pin
7 Groove

6. Remove the counter ring (Fig. 110/1) with the O-ring (Fig. 110/2) on both sides from the bearing housing (Fig. 110/3).

The counter rings (Fig. 110/1) are secured with hold-down pins (Fig. 110/5) in the grooves (Fig. 110/7) to prevent them from turning.

7. Remove the O-ring (Fig. 110/2) from the counter ring (Fig. 110/1), clean with a lint-free cleaning cloth, check for damage and place to the side.

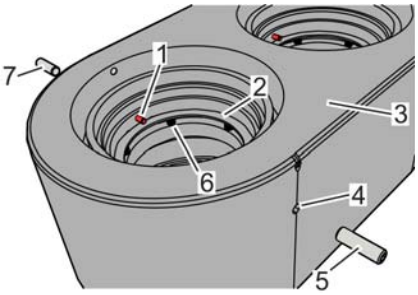

Fig. 111: Releasing the support ring

1 Hold-down pin
2 Support ring
3 Bearing housing
4 Threaded borehole
5, 7 Hexagon socket set screw
6 Compression spring

8. Unscrew the hexagon socket set screws (Fig. 111/5, 7) from the threaded boreholes (Fig. 111/4) and place to the side.

9. ⚠ **WARNING! Risk of injury to eyes and limbs from spring-loaded components!**

Ensure that (Fig. 111/1) the support ring (Fig. 111/2) is relieved by pushing back the hold-down pins and that the compression springs (Fig. 111/6) can pop out on all sides.

Carefully push back the hold-down pins (Fig. 111/1) on both sides above the support ring (Fig. 111/2) using a suitable tool until they are flush with the walls.

10. Carefully remove the support ring (Fig. 111/2) from the compression springs (Fig. 111/6) and place to the side.

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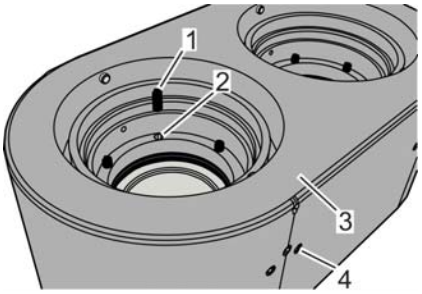

Fig. 112: Removing the compression springs

1 Compression spring
2 Borehole
3 Bearing housing
4 Screw plug

11. Remove the compression springs (Fig. 112/1) from the boreholes (Fig. 112/2) of the bearing housing (Fig. 112/3) and place to the side.

12. Unscrew the screw plugs (Fig. 112/4) from the bearing housing and place to the side.

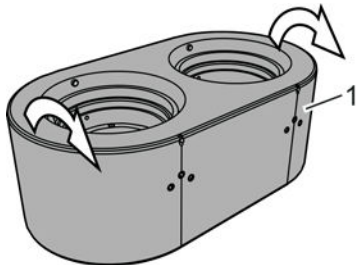

Fig. 113: Turning the bearing housing

1 Bearing housing

13. Turn the bearing housing (Fig. 113/1) by 180° along the longitudinal axis.

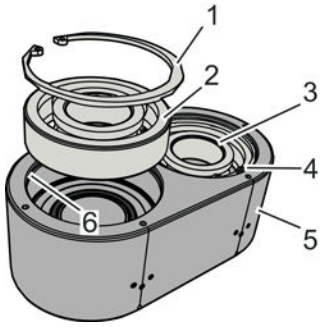

Fig. 114: Disassembling the bearing

1, 4 Inner retaining ring
2, 3 Bearing
5 Bearing housing
6 Groove

14. Remove the inner retaining rings (Fig. 114/1, 4) from the grooves (Fig. 114/6) of the bearing housing (Fig. 114/5) and place to the side.

15. Pull out or push out the bearing (Fig. 114/2, 3) from the bearing housing (Fig. 114/5) with the removal tool and place to the side.

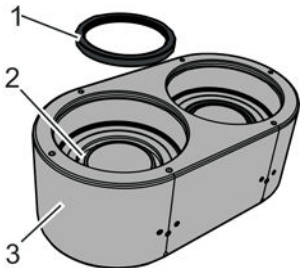

Fig. 115: Removing the shaft seal

1 Shaft seal
2 Seal seat
3 Bearing housing

16. Remove the shaft seal (Fig. 115/1) from the seal seat (Fig. 115/2) of the bearing housing (Fig. 115/3), clean with a lint-free cleaning cloth, check for damage and place to the side.

17. Before reinstalling the components, clean them, check their function and replace them, if necessary.

NOTICE! **Damage to the environment as a result of incorrect disposal of replacement parts, cleaning cloths and seals!**

⇨ Disassembly is complete.

Dismantling the upper bearing housing

The upper bearing housing has the identical layout as the lower bearing housing. This is why the procedure is the same as (↯ "Dismantling the lower bearing housing" on page 94).

Dismantling the machine housing

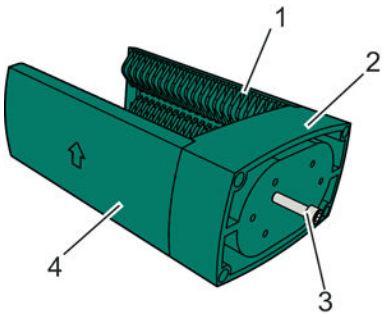

Fig. 116: Detaching the side wall

1, 4 Side walls
2 Base
3 Attachment bolt

1. Unscrew the attachment bolts (Fig. 116/3) from the base (Fig. 116/2) and place to the side.

2. Place the side walls (Fig. 116/1, 4) and the base (Fig. 116/2) to the side with the assistance of a second person, if necessary.

⇨ The machine housing is dismantled.

8.3.8 Assembling the machine

Protective equipment:
- Industrial hard hat
- Protective clothing
- Protective goggles
- Safety gloves
- Safety shoes

Materials:
- Lint-free cleaning cloth

⚠ WARNING

Risk of injury from transporting or moving heavy components!
- **Depending on the weight, move heavy components only with the assistance of a second person or using suitable aids.**
- **Wear personal protective equipment.**

There is risk of injury when transporting or moving heavy components.

Requirements:
- Perform assembly work only outside the Ex zone.
- The components are ready for assembly.
- Suitable lifting equipment and accessories with sufficient load-bearing capacity is available.

Assembling the machine housing

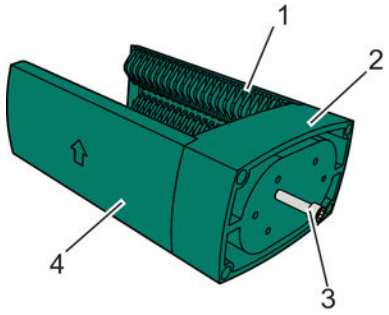

Fig. 117: Detaching the side wall

1, 4 Side walls
2 Base
3 Attachment bolt

1. Place the base (Fig. 117/2), onto the mounting surface in the position shown with the assistance of a second person, if necessary.
2. Place side walls (Fig. 117/1, 4), with the assistance of a second person in the correct position onto the mounting surface of the base (Fig. 117/2) and tighten by hand with attachment bolts (Fig. 117/3).
3. Tighten the attachment bolts (Fig. 117/3) crosswise with the prescribed torque (↬ *Appendix “Screw tightening torques” on page 131*).

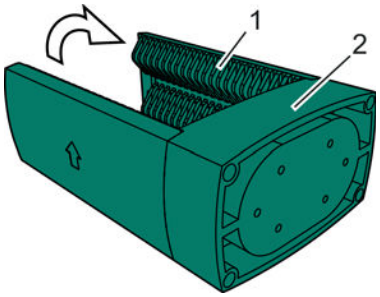

Fig. 118: Setting the machine housing upright

1 Side wall
2 Base

4. Set the machine housing upright on the side walls (Fig. 118/1) with the assistance of a second person and place it onto the base (Fig. 118/2).

   ⇨ The machine housing is pre-assembled. Additional assembly will continue after the assembly of the gearbox housing.

Assembling the lower bearing housing

Materials: ■ Glycerine

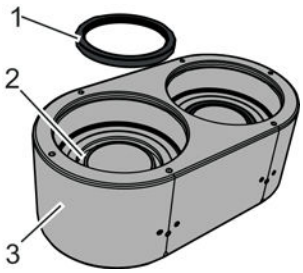

Fig. 119: Inserting the shaft seal

1 Shaft seal
2 Seal seat
3 Bearing housing

1. Insert the shaft seal (Fig. 119/1), the interior filled with Mobilux EP2 grease, starting from the bearing seat with the open side facing downward, into the seal seat (Fig. 119/2) of the bearing housing (Fig. 119/3).

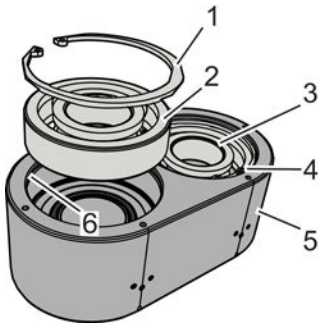

Fig. 120: Mounting the bearing

1, 4 Inner retaining ring
2, 3 Bearing
5 Bearing housing
6 Groove

2. Press the bearing (Fig. 120/2, 3) into the bearing housing (Fig. 120/5) up to the stop.

3. Insert the inner retaining rings (Fig. 120/1, 4) into the grooves (Fig. 120/6) of the bearing housing (Fig. 120/5).

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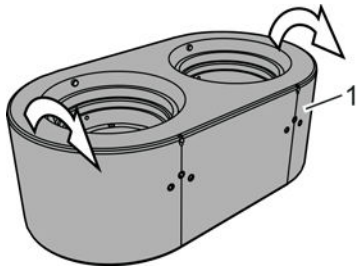

Fig. 121: Turning the bearing housing

1 Bearing housing

4. Turn the bearing housing (Fig. 121/1) by 180° along the longitudinal axis.

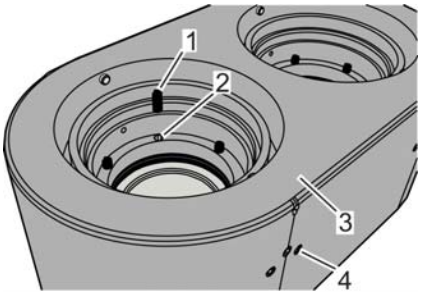

Fig. 122: Inserting the compression springs

1 Compression spring
2 Borehole
3 Bearing housing
4 Screw plug

5. Insert the compression springs (Fig. 122/1) into the boreholes (Fig. 122/2) of the bearing housing (Fig. 122/3).

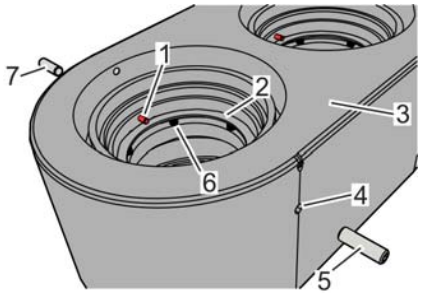

Fig. 123: Installing the support ring

1 Hold-down pin
2 Support ring
3 Bearing housing
4 Threaded borehole
5, 7 Hexagon socket set screw
6 Compression spring

6. Fit the support ring (Fig. 123/2) onto the compression springs (Fig. 123/6).

7. Insert the hold-down pins (Fig. 123/1) into the threaded boreholes (Fig. 123/4) and only drive through on the inner side at first until they are flush.

8. ⚠ **WARNING! Risk of injury to eyes and limbs from spring-loaded components!**

   Press down the support ring (Fig. 123/2) against the spring force of the compression springs (Fig. 123/6) and drive in the hold-down pins (Fig. 123/1) using a punch (4 mm) until their front end is flush with the inside diameter of the support ring (Fig. 123/2).

   ⇨ The support ring (Fig. 123/2) is protected against popping out.

9. Screw in hexagon socket set screws (Fig. 123/5, 7) into the boreholes (Fig. 123/4) until they are flush with the bearing housing (Fig. 123/3) on the outside.

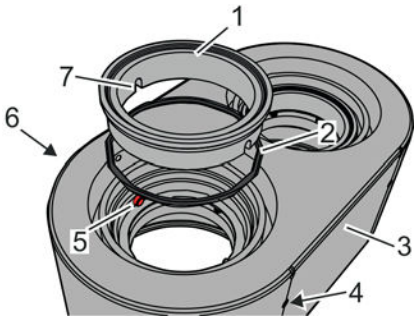

Fig. 124: Inserting the counter ring

1 Counter ring
2 O-ring
3 Bearing housing
4, 6 Threaded borehole
5 Hold-down pin
7 Groove

10. Slide on the lightly lubricated O-rings (Fig. 124/2) onto the counter rings (Fig. 124/1) up to the collar.

The counter rings (Fig. 124/1) are secured with the hold-down pins (Fig. 124/5) in the grooves (Fig. 124/7) to prevent them from turning.

11. Insert the counter rings (Fig. 124/1) with the O-ring (Fig. 124/2) on both sides into the bearing housing (Fig. 124/3).

12. Turn the counter rings (Fig. 124/1) until they engage in the grooves (Fig. 124/7).

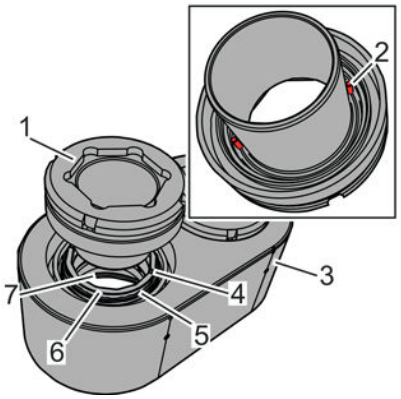

Fig. 125: Inserting the rotating slide ring sealing part, detailed bottom view

1 Rotating slide ring sealing part
2 Driving pin
3 Bearing housing
4 Groove
5 O-ring
6 Slide ring
7 Shaft seal

13. Slide on the lightly lubricated O-ring (Fig. 125/5) onto the slide ring (Fig. 125/6) up to the collar.

14. Place the slide ring (Fig. 125/6) with the O-ring (Fig. 125/5) on both sides onto the counter rings in the bearing housing (Fig. 125/3).

15. Check the rotating slide ring sealing parts (Fig. 125/1) to make sure that the driving pins (Fig. 125/2) are in the correct position.

16. Clean any dirt from all sliding surfaces of the seals with a lint-free cleaning cloth and lightly coat them with glycerine as lubricant.

17. Place the rotating slide ring sealing parts (Fig. 125/1) on both sides, with the inner sleeve facing forward, into the slide rings (Fig. 125/6) while carefully inserting them into the shaft seals (Fig. 125/7).

18. Turn the rotating slide ring sealing parts (Fig. 125/1) until the inner driving pins (Fig. 125/2) engage in the grooves (Fig. 125/4) of the slide rings (Fig. 125/6).

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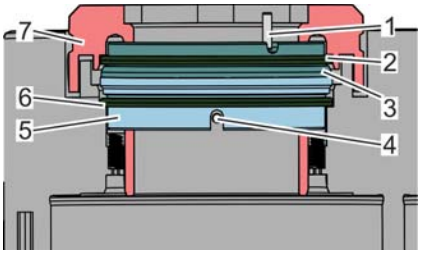

Fig. 126: Rotating slide ring sealing part, sectional view

1 Driving pin
2, 6 O-rings
3 Slide ring
4 Hold-down pin
5 Counter ring
7 Rotating slide ring sealing part

19. Insert the rotating slide ring sealing parts (Fig. 126/7) with slide rings (Fig. 126/3) until there is a noticeable counterpressure.

The O-ring (Fig. 126/2) will sit between the rotating slide ring sealing part (Fig. 126/7) and the slide ring (Fig. 126/3). The force needed for this must be overcome. The mentioned counterpressure is then generated by the counter ring (Fig. 126/5); it is not possible to press any further.

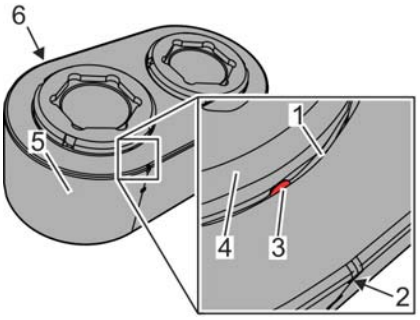

Fig. 127: Screwing in the hexagon socket set screws of the rotating slide ring sealing parts

1 Hold-down edges
2, 6 Threaded borehole of locking screws
3 Hexagon socket set screw
4 Rotating slide ring sealing part
5 Bearing housing

20. **⚠ CAUTION! Risk of impact from spring-loaded components!**

Push down the rotating slide ring sealing parts (Fig. 127/4) and screw in the hexagon socket set screws (Fig. 127/3) in the threaded boreholes (Fig. 127/2, 6) until they secure the rotating slide ring sealing parts on the hold-down edges (Fig. 127/1) against falling out.

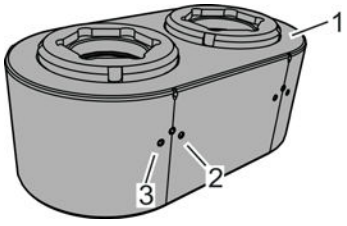

Fig. 128: Filling in glycerine

1 Bearing housing
2, 3 Threaded boreholes of screw plugs

21. Insert glycerine into one of the threaded boreholes (Fig. 128/2) until it emerges again at the second threaded borehole (Fig. 128/3).

22. Seal the threaded boreholes (Fig. 128/2, 3) with screw plugs.

23. Repeat work steps 21 + 22 on the other bearing.

⇨ The bearing housing is assembled.

Assembling the upper bearing housing

The upper bearing housing has the identical layout as the lower bearing housing. This is why the procedure is the same as (“Assembling the lower bearing housing” on page 100).

Assembling the cutter block drive unit

⚠ WARNING

Risk of injury from transporting or moving heavy components!

- **Depending on the weight, move heavy components only with the assistance of a second person or using suitable aids.**
- **Wear personal protective equipment.**

There is risk of injury when transporting or moving heavy components.

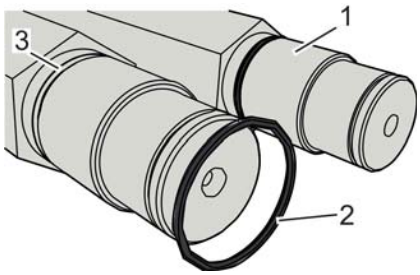

Fig. 129: Positioning the O-rings

1 Cutter block shaft
2 O-ring
3 Groove

1. Insert the lightly lubricated O-rings (Fig. 129/2) into the grooves (Fig. 129/3) on both ends of the cutter block shafts.

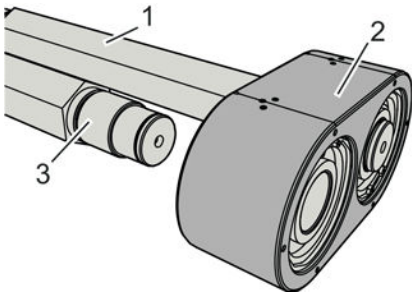

Fig. 130: Mounting the cutter block shafts

1, 3 Cutter block shaft
2 Bearing housing

2. Insert the cutter block shafts (Fig. 130/1, 3) in the correct position into the lower bearing housing (Fig. 130/2) until the hexagon portions are positively locked in the rotating slide ring sealing parts.

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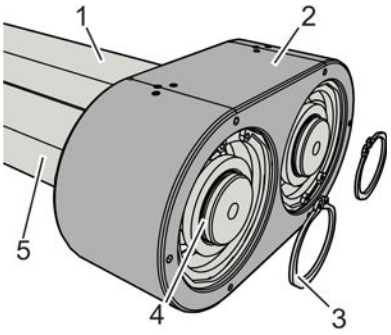

Fig. 131: Positioning the outer retaining rings

1, 5 Cutter block shaft
2 Bearing housing
3 Outer retaining ring
4 Groove

3. Insert the outer retaining rings (Fig. 131/3) into the grooves (Fig. 131/4) of the cutter block shafts (Fig. 131/1, 5).
4. Set the lower bearing housing (Fig. 131/2) with the cutter block shafts (Fig. 131/1, 5) upright so that is securely standing on a level subsurface.

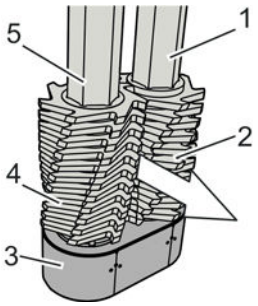

Fig. 132: Positioning the cutter blocks in pairs

1, 5 Cutter block shafts
2, 4 Cutter blocks
3 Bearing housing
Arrow Direction of flow

5. **⚠ WARNING! Risk of injury from sharp edges and pointed corners!**

   Carefully position the cutter blocks (Fig. 132/2, 4) in pairs and aligned with the future direction of flow (Fig. 132/arrow) onto the cutter block shafts (Fig. 132/1, 5) (↬ *Chapter 8.3.5 "Replacing cutter blocks" on page 75*).

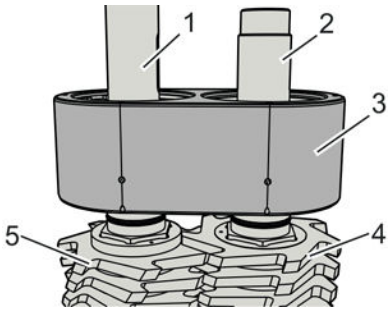

Fig. 133: Positioning the upper bearing housing

1, 2 Cutter block shaft
3 Bearing housing
4, 5 Cutter blocks

6. Position the upper bearing housing (Fig. 133/3) in the correct position onto the cutter block shafts (Fig. 133/1, 2) and align the hexagon portions of the rotating slide ring sealing parts so they are positively locked.

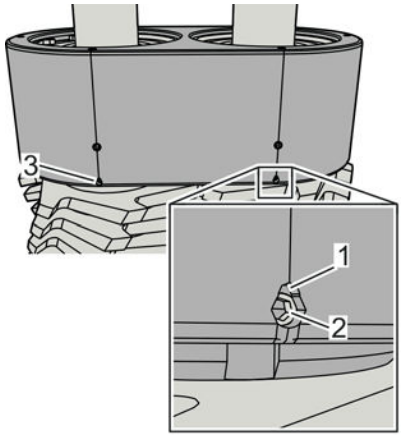

Fig. 134: Screwing in the locking screws

1 Recess
2, 3 Locking screws

7. Unscrew all locking screws (Fig. 134/2, 3) of the upper and lower bearing housing until they are flush on the outside with the reference surface of the adjacent recess (Fig. 134/1).

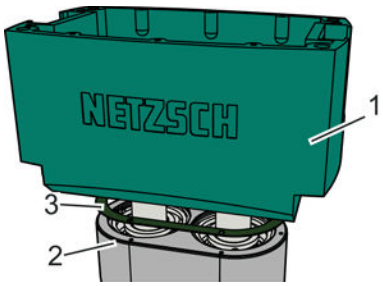

Fig. 135: Positioning the gearbox housing, example

1 Gearbox housing
2 Bearing housing
3 Flat seal

8. Fit the lightly lubricated flat seal (Fig. 135/3) in the correct position so they are aligned with the boreholes in the bearing housing (Fig. 135/2).

9. ⚠ **WARNING! Risk of injury from transporting or moving heavy components!**

   Position the gearbox housing (Fig. 135/1) in the correct position on the upper bearing housing (Fig. 135/2) with the assistance of a second person.

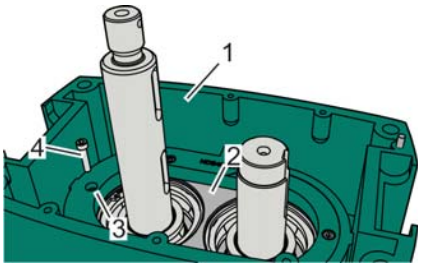

Fig. 136: Attaching the upper bearing housing of the gearbox housing, example

1 Gearbox housing
2 Upper bearing housing
3 Borehole
4 Attachment bolt

10. Tighten the attachment bolts (Fig. 136/4) by hand through the boreholes (Fig. 136/3) of the gearbox housing (Fig. 136/1) in the bearing housing.

11. Tighten the attachment bolts (Fig. 136/4) crosswise with the prescribed torque (↳ *Appendix “Screw tightening torques” on page 131*).

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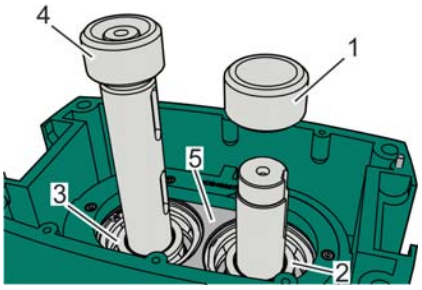

Fig. 137: Positioning the distance rings on the bearings, example

1, 4 Distance rings
2, 3 Bearing
5 Upper bearing housing

12. Position the distance rings (Fig. 137/1, 4) on the inner rings of the bearings (Fig. 137/2, 3) of the upper bearing housing (Fig. 137/5).

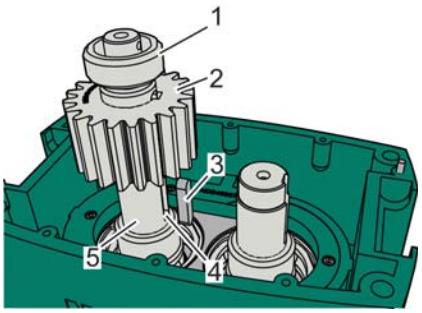

Fig. 138: Sliding the toothed wheel onto the drive shaft, example

1 Distance ring
2 Toothed wheel
3 Key
4 Keyway
5 Drive shaft

13. Insert the lightly lubricated key (Fig. 138/3) into the keyway (Fig. 138/4) of the drive shaft (Fig. 138/5).
14. Slide the smaller toothed wheel (Fig. 138/2), with the part number facing up, onto the drive shaft (Fig. 138/5), aligned with the keyway on the key, onto the distance ring.
15. Slide the distance ring (Fig. 138/1) onto the drive shaft (Fig. 138/5).

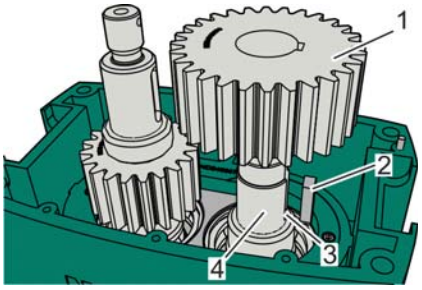

Fig. 139: Sliding the toothed wheel onto the cutter block shaft, example

1 Toothed wheel
2 Key
3 Keyway
4 Cutter block shaft

16. Insert the lightly lubricated key (Fig. 139/2) into the keyway (Fig. 139/3) of the cutter block shaft (Fig. 139/4).
17. Slide the larger toothed wheel (Fig. 139/1), with the part number facing up, onto the cutter block shaft (Fig. 139/4).

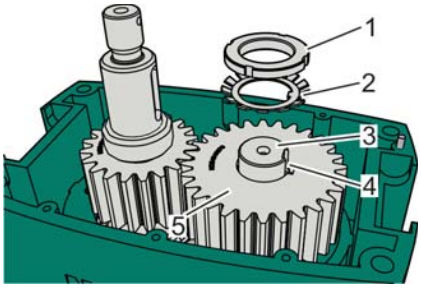

Fig. 140: Tightening the groove nut on the toothed wheel, example

1 Groove nut
2 Locking plate
3 Cutter block shaft
4 Keyway
5 Toothed wheel

18. Slide the locking plate (Fig. 140/2), aligned with the tab on the keyway (Fig. 140/4), in the correct position onto the cutter block shaft (Fig. 140/3).

19. Screw the groove nut (Fig. 140/1), with the chamfered side facing down, by hand onto the motor block shaft (Fig. 140/3).

20. Tighten the groove nut (Fig. 140/1) with the prescribed torque (*Appendix "Screw tightening torques" on page 131*) using a hook spanner only until a tongue of the locking plate (Fig. 140/2) can be bent into a groove of the groove nut (Fig. 140/1).

To counterhold, place a piece of wood between the cutter blocks during tightening.

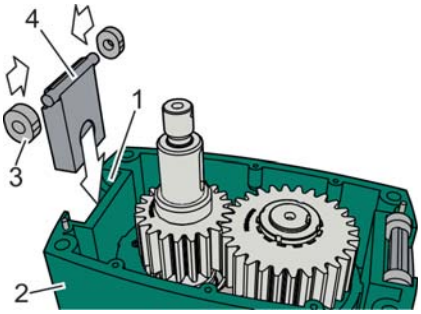

Fig. 141: Installing the transport eye, example

1 Bearing pocket
2 Gearbox housing
3 Pivot bearing
4 Transport eye

21. Slide the pivot bearing (Fig. 141/3) onto the journals of the transport eyes (Fig. 141/4).

22. Insert the transport eye (Fig. 141/4) in the correct position on both sides, with the pivot bearings (Fig. 141/3) into the bearing pockets (Fig. 141/1) of the gearbox housing (Fig. 141/2).

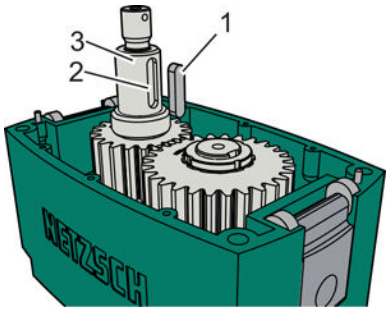

Fig. 142: Inserting the key of the coupling half, example

1 Key
2 Keyway
3 Drive shaft

23. Insert the lightly lubricated key (Fig. 142/1) into the keyway (Fig. 142/2) of the drive shaft (Fig. 142/3).

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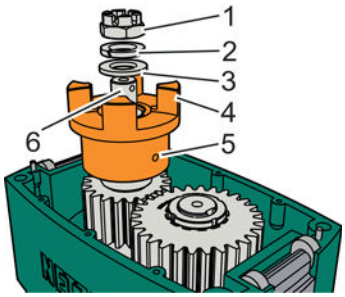

Fig. 143: Attaching the coupling half

1 Hexagon castle nut
2 Retaining ring
3 Washer
4 Coupling half
5 Hexagon socket set screw
6 Drive shaft

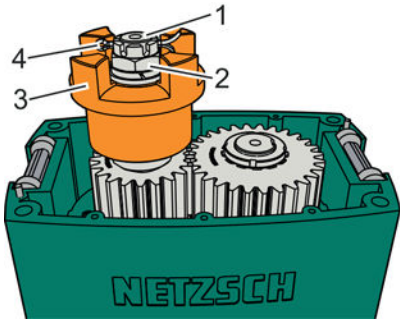

Fig. 144: Inserting the safety splint of the hexagon castle nut

1 Drive shaft
2 Hexagon castle nut
3 Coupling half
4 Safety splint

24. Slide the coupling half (Fig. 143/4) in the correct position onto the drive shaft (Fig. 143/6), aligned with the keyway to the key, up to the distance ring.

25. Slide on the washer (Fig. 143/3) and the retaining ring (Fig. 143/2).

26. Screw the hexagon castle nut (Fig. 143/1) by hand onto the drive shaft (Fig. 143/6).

27. Tighten the hexagon castle nut (Fig. 143/1), aligned with the borehole of the safety splint.

28. Screw the hexagon socket set screw (Fig. 143/5) into the coupling half (Fig. 143/4) and tighten with the prescribed torque (*Appendix "Screw tightening torques" on page 131*).

29. Slide the safety splint (Fig. 144/4) of the hexagon castle nut (Fig. 144/2) into the borehole of the drive shaft (Fig. 144/1) and then bend open the ends.

It is sufficient if it is bent 3x the splint diameter.

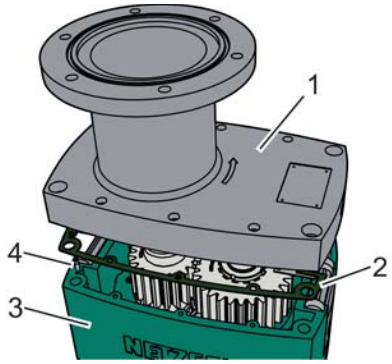

Fig. 145: Positioning the gear cover

1 Gear cover
2 Flat seal
3 Gearbox housing
4 Positioning pin

30. Fit the lightly lubricated flat seal (Fig. 145/2) in the correct position onto the positioning pins (Fig. 145/4).

31. ⚠ **WARNING! Risk of injury from transporting or moving heavy components!**

Fit the gearbox housing (Fig. 145/1) on the gear cover (Fig. 145/3) in the correct position and aligned with the positioning pins (Fig. 145/4) with the assistance of a second person as shown.

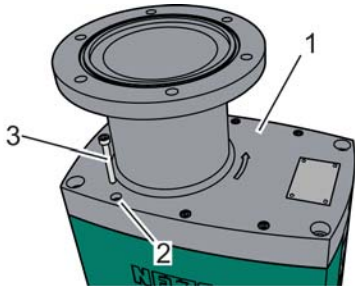

Fig. 146: Attaching the gear cover

1 Gear cover
2 Borehole
3 Attachment bolt

32. Screw the attachment bolts (Fig. 146/3) into the boreholes (Fig. 146/2) of the gear cover (Fig. 146/1) by hand.

33. Tighten the attachment bolts (Fig. 146/3) crosswise with the prescribed torque (↬ *Appendix "Screw tightening torques" on page 131*).

⇨ The assembly of the cutter block drive unit is complete. Other assembly steps ↬ *"Mounting the cutter block drive unit" on page 80*.

8.3.9 Mounting the machine after maintenance

The procedure is the same as the assembly in ↬ Chapter 6.2 "Mounting the machine in the channel" on page 47.

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8.4 After maintenance

Operating a damaged machine

Protective equipment:
- Protective clothing
- Safety gloves
- Safety shoes

DANGER

Risk of explosion from damage to the machine!

- **Operate the machine only in undamaged, proper technical condition.**
- **Check and maintain the machine regularly.**
- **If damage to the machine is suspected, switch it off and inspect it (↯ *Chapter 9 "Troubleshooting" on page 113*).**

Operating a damaged machine could lead to an explosion in the Ex zone and further property damage.

After finishing the maintenance work, perform the following steps before switching the machine on:

1. Check all previously loosened screw connections to ensure they are tight (↯ *Appendix "Screw tightening torques" on page 131*).
2. Check whether all safety equipment and coverings that were removed are properly back in place.
3. Ensure that all tools, materials and other equipment used have been removed from the work area.
4. Clean the work area and remove any leaked material or waste, such as fluids, processing material, or similar.

9 Troubleshooting

9.1 Safety instructions for troubleshooting

Potentially explosive atmospheres

⚠ DANGER

Risk of explosion from electrostatic discharges!

- **Obtain written work approval before starting work in the Ex zone (in the EU, observe the explosion protection document).**
- **Equip the machine with potential equalization during transport into and out of the potentially explosive zone until it is permanently connected.**
- **Perform work only with the potentially explosive atmosphere excluded.**
- **Only use non-sparking tools.**

Electrostatic charging of the machine could cause sparks to form. In potentially explosive atmospheres, this could trigger explosions, resulting in severe or fatal injuries and considerable property damage.

Moving parts

⚠ WARNING

Risk of injury from moving parts!

- **Never reach into moving parts during operation and do not work in the vicinity of moving parts.**
- **Keep covers closed during operation.**
- **Before working on moving parts, turn the equipment off and secure it against being restarted.**
- **Observe the overrun time: Before opening the covers, ensure that all parts have stopped moving.**

Working near moving parts could result in hair being caught and drawn in, body parts being crushed, ripped off, or other serious injuries.

Improperly performed trouble-shooting work

⚠ WARNING

Risk of injury from improper troubleshooting!

- **Do not attempt to correct malfunctions requiring intervention until you are certain that the machine has stopped and has been secured against being turned on again.**
- **When working on the machine: Turn the machine off, close the shut-off and wait until the machine has cooled.**
- **Keep the place of installation orderly and clean! Parts and tools that are stacked or lying around loose are potential accident sources.**
- **If components were removed, check for correct installation, re-install all attachment elements and use the correct tightening torque for screws.**
- **If in doubt, consult experienced colleagues or customer service.**
- **Before putting the system back into service, observe the following:**
  - **Ensure that all troubleshooting work has been performed and completed according to the information and instructions in this manual.**
  - **Ensure that no persons are in the danger zone.**
  - **Ensure that all covers and safety devices are installed and working properly.**

Improperly performed troubleshooting work could lead to severe injuries and considerable property damage.

Securing against reactivation

⚠ WARNING

Risk of death from unauthorized reactivation!

- **Before starting the work, turn off all power supplies and secure them against reactivation.**

Unauthorized reactivation of the power supply during trouble-shooting poses a risk of severe injury or death to those in the danger zone.

Hazardous liquid flow

⚠ WARNING

Risk of injury from contact with hazardous liquid flow!

- **Refrain from touching the liquid flow or use mechanical aids.**
- **Avoid contact by wearing personal protective equipment.**

Contact with the liquid flow can be toxic and carcinogenic due to hazardous components and cause mechanical injuries.

Danger of suffocation

DANGER

Danger of suffocation from heavy gases in shafts!

- **Ensure adequate fresh air supply.**
- **Assign a 2nd person outside the canal to monitor the installation personnel.**
- **As an alternative, wear self-contained respiratory protection.**

Danger of suffocation from heavy gases when entering shafts.

Hot liquid flow

WARNING

Risk of scalding from hot liquid flow!

- **Protective clothing, protective goggles and safety gloves must be worn for all work.**
- **When working on the machine: Turn the machine off, close the shut-off and wait until the machine has cooled.**

Liquid flow could have a high temperature. Contact with liquid flow could cause severe scalding.

Hot surfaces

WARNING

Risk of injury from hot surfaces!

- **Protective clothing and safety gloves must be worn for all work near hot surfaces.**
- **When working on the machine: Turn the machine off, close the shut-off and wait until the machine has cooled.**

The liquid flow, parts that carry medium and the drive may have high temperatures. Skin contact with hot surfaces causes severe burns.

9.2 Malfunction indication

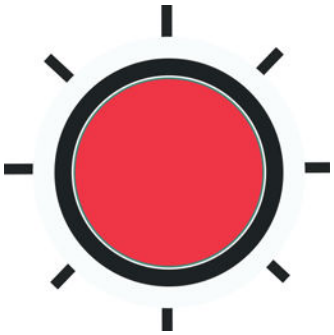

Fig. 147: Red light display

If there is a malfunction, the red *[light display H2]* on the control cabinet lights up.

Pressing the *[switch-off pushbutton]* twice in a row on the control cabinet (*Chapter 4.5.4 “Switch off button” on page 34*) is used to reset the control after an emergency stop or malfunction.

9.3 Table of malfunctions

Contact the customer service for what to do in the event of malfunctions not listed in the following table or not attributable to the specified causes (*“Customer service” on page 4*).

Fault description	Cause	Remedy	Personnel
The red LED on the switch box is flashing	Number of permissible blockages exceeded	Clean the cutter blocks and lateral ribbed bars in the side walls (↪ *Chapter 8.3.4 "Cleaning the cleaning combs, optional" on page 74*).	Trained, qualified personnel
	Electrical failure	Perform a reset and switch the machine back on (↪ *Chapter 7.3 "Switching on the machine" on page 60*).	Trained, qualified personnel
The macerator does not start up	The electrical connection does not meet the specifications	Check wiring diagram and required input voltage of electrical connections.	Qualified electrician
	There are foreign bodies in the macerator	Clean the cutter blocks and lateral ribbed bars in the side walls (↪ *Chapter 8.3.4 "Cleaning the cleaning combs, optional" on page 74*).	Trained, qualified personnel
	Accumulation of solids	Clean the cutter blocks and lateral ribbed bars in the side walls (↪ *Chapter 8.3.4 "Cleaning the cleaning combs, optional" on page 74*).	Trained, qualified personnel
	Damaged rotating mechanical seal	Replace the rotating mechanical seal: ■ ↪ *Chapter 8.3.7 "Dismantling the machine" on page 87* ■ ↪ *Chapter 8.3.8 "Assembling the machine" on page 99*	Specialist mechanic
	Different or changed settings in the control cabinet	Operate the control cabinet corresponding to the manufacturer's default settings.	Qualified electrician
The flow quantity is lower than required	Accumulation of solids	Clean the cutter blocks and lateral ribbed bars in the side walls (↪ *Chapter 8.3.4 "Cleaning the cleaning combs, optional" on page 74*).	Trained, qualified personnel
	The blades of the cutter blocks are dull due to chemical corrosion or abrasion	Replace the cutter blocks (↪ *Chapter 8.3.5 "Replacing cutter blocks" on page 75*).	Specialist mechanic
Abnormal operating noise	There are foreign bodies in the macerator	Clean the cutter blocks and lateral ribbed bars in the side walls (↪ *Chapter 8.3.4 "Cleaning the cleaning combs, optional" on page 74*).	Trained, qualified personnel
	Failure of a transfer element	■ Check the lubrication and check whether mechanical components are intact. Replace them, if necessary. ■ Perform maintenance on the entire macerator; check keys, couplings, bearings and toothed wheels. Replace them, if necessary: – ↪ *Chapter 8.3.7 "Dismantling the machine" on page 87* – ↪ *Chapter 8.3.8 "Assembling the machine" on page 99*	Trained, qualified personnel

Fault description	Cause	Remedy	Personnel
			Specialist mechanic
	Damaged rotating mechanical seal	Replace the rotating mechanical seal: ■ *Chapter 8.3.7 "Dismantling the machine" on page 87* ■ *Chapter 8.3.8 "Assembling the machine" on page 99*	Specialist mechanic
Macerator seized up	There are foreign bodies in the macerator	Clean the cutter blocks and lateral ribbed bars in the side walls (*Chapter 8.3.4 "Cleaning the cleaning combs, optional" on page 74*).	Trained, qualified personnel
	Accumulation of solids	Clean the cutter blocks and lateral ribbed bars in the side walls (*Chapter 8.3.4 "Cleaning the cleaning combs, optional" on page 74*).	Trained, qualified personnel
	Failure of a transfer element	■ Check the lubrication and check whether mechanical components are intact. Replace them, if necessary. ■ Perform maintenance on the entire macerator; check keys, couplings, bearings and toothed wheels. Replace them, if necessary: – *Chapter 8.3.7 "Dismantling the machine" on page 87* – *Chapter 8.3.8 "Assembling the machine" on page 99*	Trained, qualified personnel Specialist mechanic
	Different or changed settings in the control cabinet	Operate the control cabinet corresponding to the manufacturer's default settings.	Qualified electrician
Reduced service life of the cutter blades	Accumulation of solids	Clean the cutter blocks and lateral ribbed bars in the side walls (*Chapter 8.3.4 "Cleaning the cleaning combs, optional" on page 74*).	Trained, qualified personnel
	The blades of the cutter blocks are dull	Replace the cutter blocks (*Chapter 8.3.5 "Replacing cutter blocks" on page 75*).	Specialist mechanic
	Cutter blocks not suitable for the application	Contact customer service (*"Customer service" on page 4*).	Trained, qualified personnel
Macerator does not collect any solids	Accumulation of solids	Clean the cutter blocks and lateral ribbed bars in the side walls (*Chapter 8.3.4 "Cleaning the cleaning combs, optional" on page 74*).	Trained, qualified personnel

Fault description	Cause	Remedy	Personnel
	The blades of the cutter blocks are dull	Replace the cutter blocks (↪ *Chapter 8.3.5 "Replacing cutter blocks" on page 75*).	Specialist mechanic
	The macerator is installed opposite the direction of flow	Install the macerator corresponding to the direction of the arrow on the side components (↪ *Chapter 6.2 "Mounting the machine in the channel" on page 47*).	Specialist mechanic
	Incorrect direction of rotation of the drive	Check the direction of rotation corresponding to the direction of rotation indicated on the macerator. Change it, if necessary.	Qualified electrician
	Cutter blocks not suitable for the application	Contact customer service (↪ *"Customer service" on page 4*).	Trained, qualified personnel
Drive shaft does not rotate after switching on	Failure of a transfer element	■ Check the lubrication and check whether mechanical components are intact. Replace them, if necessary. ■ Perform maintenance on the entire macerator; check keys, couplings, bearings and toothed wheels. Replace them, if necessary: – ↪ *Chapter 8.3.7 "Dismantling the machine" on page 87* – ↪ *Chapter 8.3.8 "Assembling the machine" on page 99*	Trained, qualified personnel Specialist mechanic
Macerated product does not meet the expectations	The blades of the cutter blocks are dull	Replace the cutter blocks (↪ *Chapter 8.3.5 "Replacing cutter blocks" on page 75*).	Specialist mechanic
	Cutter blocks not suitable for the application	Contact customer service (↪ *"Customer service" on page 4*).	Trained, qualified personnel

9.4 What to do in case of malfunctions

Protective equipment:
- Protective clothing
- Safety gloves
- Safety shoes

In general, the following applies:

1. ⚠ **DANGER! Risk of explosion from warming up from friction!**

   ⚠ **WARNING! Risk of injury from rotating parts!**

   For malfunctions that pose an immediate risk to persons or property, use the emergency stop immediately.

2. If there a malfunction is indicated or if there is an abnormal situation (e.g. backup), interrupt or redirect the liquid flow on the operator side.
3. If unusual noises and/or strong vibrations occur, switch off the machine.
4. Determine the cause of the problem.
5. If troubleshooting requires work in the danger zone, secure the machine against reactivation and secure the liquid flow on the operator side against being opened up.
6. Depending on the type of problem, have it handled by authorized, qualified personnel, or resolve it yourself.
7. Return the machine to operation only after the cause of the problem has been corrected.

9.5 After troubleshooting

Protective equipment:
- Protective clothing
- Safety gloves
- Safety shoes

1. Check all previously loosened screw connections used to assemble the machine to ensure they are tight.
2. Check whether all safety equipment, components and coverings that were removed are properly back in place.
3. Ensure that all tools, materials and other equipment used have been removed from the work area.
4. Clean the work area and remove any processing material or similar.
5. Make sure that all safety devices of the machine are working properly.

10 Spare parts

⚠ WARNING

Risk of injury from the use of incorrect spare parts!

- **Use only original NETZSCH spare parts or spare parts approved by NETZSCH.**
- **When in doubt, always contact NETZSCH customer service.**

The use of incorrect or defective spare parts can cause risks for personnel and damage, malfunctions, or total failure.

NETZSCH recommends to keep a complete set of replacement parts on hand for the machine. It is also possible to put together individual sets of spare parts adapted for a customer.

Please specify the following when ordering individual sets of spare parts adapted for a customer:

- Machine type
- Machine size
- NETZSCH serial number
- Section drawing number
- Symbol of the machine's component number
- Customer
- Name of the contact responsible
- Address and telephone number

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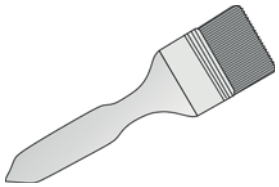
11 Tools and materials

11.1 Tools

The following tools are required for the work described in the operating manual:

Brush
The brush is a cleaning and/or application tool. The bristles are suitably strong and are chemically suitable for the application of substances.



Brush

Removal tool
For removing the coupling from the drive shaft.

Removal tool

11.2 Materials

The following materials are required for the work described in the operation manual:

Glycerine
Lubricant for the rotating mechanical seals.

Lint-free cleaning cloth
The cleaning cloth is made of non-fuzzing material that is either appropriately disposed of immediately after use or is cleaned for further use.

Machine lubricant
Machine lubricant is temperature-stable, creates a stable lubrication film even at high impact loads and is resistant to water and weak acidic and alkaline solutions.

12 Technical data

12.1 Dimensions and weight

Machine

Data	Value	Unit
Length	210 (8.267)	mm (in)
Width	428 (16.850)	mm (in)
Height (400)	1,482 (58.346)	mm (in)
Height (120)	787 (30.984)	mm (in)
Height (50)	609 (23.976)	mm (in)
Weight (400)	350 (771)	kg (lb)
Weight (120)	190 (419)	kg (lb)
Weight (50)	160 (353)	kg (lb)

Height and weight information of the machine is without the drive.

Control cabinet

Data	Value	Unit
Length	480 (18.897)	mm (in)
Width	220 (8.661)	mm (in)
Height	600 (23.622)	mm (in)
Weight	60 (132)	kg (lb)

12.2 Electrical connection values

Data	Value	Unit
Supply voltage, 3~	220/380	VAC
Supply frequency	50/60	Hz
Control voltage, 1~	220/24	VAC/VDC
Power consumption depends on the design, maximum	2.2/3.7	kW
Protection type/class	IP54	–

12.3 Operating conditions

Environment

Data	Value	Unit
Temperature range	-20 – 60 (-4 – 140)	°C (°F)

Liquid flow

Data	Value	Unit
Maximum temperature	60 (140)	°C (°F)

Transport

Data	Value	Unit
Temperature range	-20 – 40 (-4 – 104)	°C (°F)
Relative humidity	70	%

Storage

Data	Value	Unit
Temperature range	0 – 25 (32 – 77)	°C (°F)
Relative humidity	50	%

12.4 Additional technical data

Further technical data can be found on the product data sheet of this machine in the appendix of this manual (↪ Appendix "Product data sheet" on page 183).

12.5 Rating plate

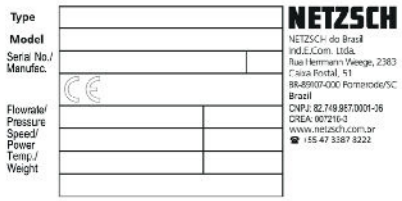


Fig. 148: Rating plate, example

The rating plate is found on the top side of the machine and contains the following information:

- Manufacturer
- Type
- Model
- Machine number
- Year built
- CE conformity marking
- Throughput/pressure
- Speed/output
- Temperature/weight
- Ex symbol, if necessary

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Appendix

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A Screw tightening torques

⚠ WARNING

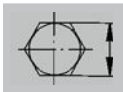
Danger from incorrect screw tightening torques!

- **Never exceed the maximum permitted tightening torque for screws.**
- **Check the screw tightening torques periodically.**
- **Always observe the relevant regulations and design criteria for screw connections.**

If screws are tightened with the wrong torque, parts could detach and cause personal injury and property damage.

The table shows the maximum permitted tightening torques for achieving the most reliable pretension for screws with a standard metric thread.

Metric thread

Diameter	 [mm] (in)	 [mm] (in)	Strength category	Maximum permissible screw tightening torque [Nm] (lbf ft)
M 5	8 (0.315)	4 (0.157)	A4-70	5 (3.69)
M 6	10 (0.393)	5 (0.196)	A4-70	11 (8.11)
M 8	13 (0.511)	6 (0.236)	8.8	15 (11.06)
M 10	17 (0.669)	8 (0.314)	A4-70	30 (22.13)
M 12	19 (0.748)	10 (0.393)	A4-70	35 (25.81)
M 16	24 (0.944)	14 (0.551)	A4-70	45 (33.20)
M 24	36 (1.417)	19 (0.748)	8.8	5–25 (3.69–18.44)
KM7	–	–	8.8	7–35 (5.16–25.82)
M 36 x 1.5	55 (2.165)	27 (1.063)	8.8	40 (29.50)

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Spare parts list

Pos.	Qty	Description	Ident. No.
10	2	Mechanical seal kit	
20	1	Driven shaft	
30	4	O-ring	
40	2	Retaining ring	
50	1	Drive shaft	
60	1	Casing	
70	2	Cutter cartridge	
80	2	Cutter cartridge	
90	1	Seal	
100	1	Upper housing	
110	6	Screw	
120	2	Spacer	
130	3	Key	
140	1	Driven gear	
150	1	Drive gear	
160	1	Spacer	
170	1	Elastic coupling	
180	1	Plain washer	
190	1	Spring washer	
200	1	Hex slotted nut	
210	1	Cotter pin	
220	1	Lock washer	
230	1	Lock nut	
240	2	Cylindrical pin	
250	1	Seal	
260	4	Sleeve	
270	2	Eye bolt	
280	1	Cover	
290	1	O-ring	
300	6	Screw	
310	1	Bottom housing	
320	4	Screw	
330	2	Side rail	
340	2	Seal	
350	4	Screw	

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Indicaciones de seguridad

Este manual de instrucciones contiene aquellas indicaciones básicas que se deberán cumplir durante el montaje, funcionamiento y mantenimiento. Por consiguiente, es indispensable que, antes del montaje, tanto el montador como el personal técnico responsable/el jefe de la planta lean este manual de instrucciones y que éste esté disponible permanentemente junto a la máquina o instalación correspondiente.

Además de las indicaciones de seguridad generales incluidas en este apartado principal sobre seguridad, deben tenerse en cuenta también las indicaciones de seguridad especiales incluidas en los demás apartados principales.

Símbolos utilizados

Las instrucciones de seguridad contenidas en este manual, cuyo incumplimiento puede acarrear un riesgo para las personas o para la máquina y su funcionamiento, vienen expresadas mediante los símbolos que se indican a continuación:

Peligro para las personas en general

Peligro por voltaje eléctrico

Peligro de lesiones causadas por la máquina

Peligro por cargas suspendidas

Peligro para la máquina y su funcionamiento

Riesgo de daño en los ojos; usar gafas de protección

Las instrucciones pegadas o fijadas directamente sobre la máquina, p.e

- flecha indicadora del sentido de giro
- símbolo indicador de las tomas de fluido

tienen que respetarse incondicionalmente y deben mantenerse en un estado perfectamente legible.

Cualificación del personal

Personal mecánico especializado

El personal mecánico especializado tiene la formación necesaria para llevar a cabo trabajos de instalación, revisión, mantenimiento y reparación en máquinas e instalaciones mecánicas e hidráulicas. Está capacitado para leer, evaluar y utilizar las instrucciones y las especificaciones técnicas, a fin de realizar debidamente los trabajos.
El personal mecánico especializado ha sido formado especialmente para el entorno laboral en el que trabaja y conoce las normas y disposiciones relevantes. Ha recibido formación sobre la manipulación del producto y puede ejecutar las tareas encargadas con seguridad y sin dañar el producto. También cuenta con conocimientos sobre sistemas neumáticos e hidráulicos para poder evaluar y evitar los peligros derivados de dichos sistemas neumáticos e hidráulicos así como las reacciones de los mismos.
El personal mecánico especializado ha sido informado sobre los peligros del medio transportado y sobre las normas de comportamiento prescritas con el fin de evitar dichos peligros.
Debido al área de uso puede ser necesario disponer de conocimientos adicionales sobre trabajos en atmósferas potencialmente explosivas y sobre el uso de herramientas especiales.

Técnico electricista

El técnico electricista tiene la formación necesaria para llevar a cabo trabajos de instalación, revisión, mantenimiento y reparación en instalaciones eléctricas. Está capacitado para leer, evaluar y utilizar las instrucciones, los diagramas de conexión y las especificaciones técnicas, a fin de realizar debidamente los trabajos.
El técnico electricista ha sido formado especialmente para el entorno laboral en el que trabaja y conoce las normas y disposiciones relevantes.
Debido al área de uso puede ser necesario disponer de conocimientos adicionales sobre trabajos en atmósferas potencialmente explosivas y sobre el uso de herramientas especiales.

Técnico de transporte

El técnico de transporte tiene la formación necesaria para llevar a cabo trabajos de transporte con grúa o carretilla elevadora. Está capacitado para elegir y emplear debidamente los enganches adecuados según los requisitos del transporte. Para el transporte con la carretilla elevadora el técnico de transporte ha recibido la formación correspondiente y está capacitado para manipularla.
El técnico de transporte ha sido formado especialmente para el entorno laboral en el que trabaja y conoce las disposiciones relevantes.
Debido al área de uso puede ser necesario disponer de conocimientos adicionales sobre trabajos en atmósferas potencialmente explosivas y sobre el uso de herramientas especiales y útiles auxiliares.

Personal especializado y cualificado

Debido a su formación técnica, sus conocimientos y experiencia, así como al conocimiento de las normas y disposiciones pertinentes, el personal técnico está capacitado para realizar los trabajos que le han sido encargados, para detectar por cuenta propia los posibles peligros y evitar los riesgos.
El personal técnico encargado ha sido formado para la máquina descrita en este manual y puede realizar de forma segura y evitando daños materiales las tareas transmitidas durante el mantenimiento y la eliminación de averías.

Peligro por incumplimiento de las indicaciones de seguridad

El incumplimiento de las indicaciones de seguridad puede suponer un peligro tanto para las personas como para el medio ambiente y causar daños en la máquina.
El incumplimiento de las indicaciones de seguridad puede resultar en la pérdida de cualquier derecho a indemnización por daños y perjuicios.

En particular, el incumplimiento puede tener, por ejemplo, las siguientes consecuencias:

- Riesgo para las personas a causa de impactos eléctricos, mecánicos y químicos.
- Riesgo para el medio ambiente a causa del derrame de sustancias contaminantes.
- Fallo de funciones importantes de la máquina.
- Fallo de métodos reglamentarios para el mantenimiento y la reparación.

Indicaciones de seguridad para la empresa explotadora/operario

▲ Si las partes calientes o frías de la máquina entrañan peligro, tendrán que dotarse de protección que evite el contacto (según norma EN ISO 13732-1).

▲ La protección que evita el contacto (p.ej. del acoplamiento elástico) no deberá quitarse cuando la máquina esté funcionando.

▲ Las fugas o derrames (p.ej. del cierre del eje) de productos peligrosos (p.ej. explosivos, tóxicos, calientes) tienen que evacuarse de tal manera que no constituyan un peligro para las personas ni para el medio ambiente. Deben cumplirse las disposiciones legales al respecto.

▲ Hay que poner todos los medios para descartar los peligros derivados del uso de la energía eléctrica (para más detalles ver p.ej. las normas de la Asociación Alemana de Electrotécnicos, VDE, y de las empresas eléctricas locales).

- La empresa explotadora deberá realizar una evaluación de riesgos de los puestos de trabajo en la máquina en su área de responsabilidad y decretar las indicaciones de servicio que resulten de ello.
- La empresa explotadora deberá nombrar a una persona que será responsable del servicio seguro de la máquina y de la coordinación de todos los trabajos en la máquina.
- El personal deberá:
  - Respetar todas las disposiciones de protección laboral y las indicaciones de servicio
  - Conocer debidamente las competencias
  - Leer y comprender el manual de servicio
  - Utilizar un equipo de protección personal
- El equipo de protección personal se compone de:
  - Ropa de trabajo protectora
  - Calzado de seguridad
  - Guantes protectores
  - En la instalación por encima de la cabeza: Casco protector industrial
- La empresa explotadora deberá proporcionar este equipo de protección personal. Para ello será necesario respetar las condiciones de servicio de la máquina (p. ej. temperatura de servicio, productos peligrosos). La empresa explotadora deberá decretar además indicaciones para el servicio, instruir regularmente al personal y controlar el cumplimiento.
- La empresa explotadora deberá instalar en la máquina o en las inmediaciones de la misma, las señales de prohibición correspondientes, que deberán ser legibles en todo momento y estar en buen estado.
- La empresa explotadora debe informar al personal sobre los riesgos derivados del producto bombeado y sobre las medidas de protección.

Indicaciones de seguridad para los trabajos de mantenimiento, inspección y montaje

- La empresa explotadora es responsable de garantizar que todos los trabajos de mantenimiento, inspección y montaje son realizados por personal cualificado autorizado que haya comprendido el manual de servicio y haya sido formado correspondientemente.
- Los trabajos en la máquina únicamente deben ser realizados cuando la máquina está completamente parada y el suministro eléctrico ha sido desconectado y asegurado frente a una reconexión accidental (p. ej. retirando el fusible o colocando una bloqueo en el interruptor principal).
- La máquina debe estar despresurizada y vacía. Es imprescindible cumplir las instrucciones de trabajo descritas en el manual de servicio sobre la parada de la máquina.
- Enfriar la máquina por debajo de 50 °C/calentarla por encima de 0 °C o utilizar un equipo de protección personal.
- Limpiar inmediatamente y de forma respetuosa con el medio ambiente los productos y lubricantes derramados durante los trabajos de conservación. ¡Usar para esta tarea calzado que no resbale!
- Inmediatamente después de finalizar los trabajos de mantenimiento, deberán volver a instalarse, o conectarse y probarse, todos los dispositivos de seguridad y protección.
- Antes de la nueva puesta en servicio deben tenerse en cuenta los puntos contenidos en el apartado "Puesta en marcha".
- Puesto que los intervalos de tiempo necesarios para los trabajos de limpieza y mantenimiento depende mucho del producto bombeado y de otras condiciones de servicio, la mayoría de las veces no es posible indicar intervalos fijos.
  Es el propietario de la instalación el que debe determinar y fijar los intervalos necesarios para la limpieza y el mantenimiento.

Modificación por cuenta propia, uso de piezas originales

- Las modificaciones en la máquina únicamente están permitidas tras consulta previa y autorización por escrito de NETZSCH.
- Por motivos de seguridad para el servicio y el aparato, las máquinas suministradas únicamente podrán ser operadas con piezas de repuesto originales, accesorios y sustancias de servicio autorizados que cumplan las prescripciones de NETZSCH.
- Si se emplean otras piezas o materiales, ¡la garantía pierde su validez!

Uso previsto; formas de servicio no permitidas

Esta bomba sirve exclusivamente para transportar el producto indicado en la hoja de datos debajo de las condiciones de servicio descritas también en ella.

Cualquier otro uso diferente deberá consultarse previamente con NETZSCH y solo será posible tras autorización escrita de NETZSCH.

INSTRUCCIONES DE SEGURIDAD

La seguridad del servicio de la máquina suministrada únicamente está garantizada con un uso previsto de la máquina.

Esta máquina ha sido diseñada conforme a las condiciones de servicio dadas. Los valores límite de las condiciones de servicio están establecidos en la hoja de datos y no deberán ser sobrepasados en ningún caso.

Como resultado de la aplicación del derecho europeo actual sobre responsabilidad de la empresa operadora de instalaciones y las cuestiones relativas sobre licitud de la operación de la instalación, queremos recordarle una condición de operación indispensable para nuestros productos:

Las piezas de repuesto y desgaste de otros fabricantes no han sido autorizadas para ser utilizadas en nuestros productos e infringen las indicaciones de los manuales de servicio que le han sido proporcionados.

Al utilizar piezas de repuesto de otros fabricantes no pueden descartarse efectos en la seguridad laboral y del servicio, por lo que no está permitido operar nuestros productos.

Los efectos en la autorización de servicio de todo el equipo completo, así como las consecuencias de responsabilidad legal serán de su responsabilidad exclusiva.

Normas específicas para el funcionamiento de las bombas NEMO®

Utilice, por favor, las bombas NEMO® únicamente bajo las condiciones especificadas, es decir, sólo para aquella aplicación para la que se suministró la bomba.

Si usted desea cambiar de producto a bombear, debe aclarar primero, mediante consulta al suministrador o fabricante, si la bomba es adecuada para el trasiego del nuevo producto. Lo dicho se aplica sobre todo al caso de medios agresivos, tóxicos o peligrosos.

Los criterios de idoneidad de la bomba son, entre otros:

1. La compatibilidad entre los materiales de las partes de la bomba en contacto con el medio transportado y dicho medio
2. El modelo o tipo de las juntas y sobre todo del cierre del eje
3. La resistencia de los materiales de la bomba a la presión y a la temperatura del producto bombeado

Tenga en cuenta que la bomba NEMO® es una bomba volumétrica y, como tal, **puede generar una alta presión inadmisible**.

Si se cierra la tubería de impulsión, p.ej. por taponamiento o por el cierre fortuito de una válvula, la presión generada por la bomba puede alcanzar **un valor superior al de la presión admisible por la instalación**. Esto puede acarrear, p.ej., el reventamiento de las tuberías, lo cual debe ser evitado a toda costa, sobre todo si se transportan líquidos peligrosos.

Por consiguiente, en la planta deberán instalarse los dispositivos de seguridad adecuados, p.ej. interruptores de presión, discos de rotura con tuberías de retorno.

Para realizar trabajos de mantenimiento o reparación de la bomba, tenga en cuenta lo siguiente:

1. Durante el período completo de ejecución de los trabajos asegúrese que el motor que acciona la bomba está sin tensión, para impedir cualquier puesta en marcha, ya sea fortuita, ya sea no autorizada.
2. En el momento de abrir la bomba, tenga en cuenta todas las normas referentes a la manipulación del líquido transportado (p.ej. ropa de seguridad, prohibición de fumar, etc).
3. Antes de arrancar de nuevo, asegúrese de que están colocadas en el sitio debido todas las protecciones mecánicas y de otros tipos (p.ej. la protección de la correa trapezoidal, la protección del acoplamiento).

Siempre para su seguridad y, por lo tanto, para trabajos de mantenimiento y reparación tenga en cuenta la normativa de la CE para máquinas, las correspondientes normas nacionales, la norma europea EN ISO 12100-1, las prescripciones para la seguridad en el trabajo y las demás reglas técnicas.

Indicaciones para las tareas de inspección y reparación

Las disposiciones legales sobre protección laboral, las disposiciones sobre prevención de accidentes y las disposiciones sobre protección medioambiental obligan a todas las empresas industriales, a proteger a sus empleados o a las personas y el medio ambiente de los efectos dañinos durante la manipulación de sustancias peligrosas.

Importante:

Una inspección/reparación de máquinas y de sus piezas únicamente se realizará cuando exista un **"Certificado de no objeción (Technical Declaration)"** completado debidamente por el personal técnico autorizado y cualificado.

Podrá descargar el "Certificado de no objeción (Technical Declaration)" en nuestra página web: "https://pumpen.netzsch.com/" o bien consulte a nuestro Servicio de Atención.

Si fueran necesarias medidas de precaución especiales durante el vaciado y la limpieza de la máquina, las informaciones necesarias deberán indicarse en el certificado.

El "Certificado de no objeción (Technical Declaration)" es parte del encargo de inspección y reparación y debe rellenarse y firmarse siempre cuando NETZSCH vaya a realizar la inspección/reparación. Independientemente de ello, NETZSCH se reserva el derecho a rechazar el encargo.

Esta página se ha dejado vacía a propósito.

Instrucciones concernientes a protección antiexplosiva

Estas instrucciones son para ser consideradas y cumplidas cuando se estén usando bombas en áreas potencialmente explosivas y tienen como objeto garantizar una protección antiexplosiva de las bombas que sea duradera, y evitar además cualquier peligro de ignición.

Área de aplicación permitida, de acuerdo con la Directiva 2014/34/UE (ATEX).

Debe tenerse en cuenta que en caso de suministros de bomba completa, los componentes (por ejemplo, reductores, acoplamientos) montados deben cumplir con la normativa 2014/34/UE. Debe considerarse toda la documentación concerniente a estos componentes.
El área de aplicación de los componentes viene determinada por el área de aplicación del componente montado con el grado de aprobación más bajo, por lo que automáticamente éste grado se extiende al área de aplicación de la bomba.

Categoria de temperatura	max. temperatura superficial para polvo	max. temperatura de bombeo del producto
T4	130 °C	100 °C
T3	195 °C	165 °C
T2	295 °C	265 °C
T1	445 °C	415 °C

La declaración de conformidad conforme a la Directiva ATEX 2014/34/UE queda anulada si se montan piezas de repuesto que no han sido fabricadas o autorizadas por NETZSCH.
La garantía del fabricante conforme a la documentación del pedido perderá también su validez debido a que ya no puede garantizarse más la seguridad del operario y/o de la máquina.

Las máximas temperaturas de bombeo únicamente aplican cuando se usan cierres mecánicos Burgmann con **carburo - carburo** / **carburo - carbón** como combinaciones.

En el caso de otros fabricantes de cierres ó de otras combinaciones de materiales, es necesario consultar.

INSTRUCCIONES DE SEGURIDAD

1. Montaje y reparación en áreas potencialmente explosivas

Cuando se realicen trabajos de montaje y reparación de la bomba debe procurarse que, en especial, durante el calentamiento de las diferentes partes de la misma, no haya peligro de ignición.Esto significa, por ejemplo, que el calentamiento se realice mediante dispositivos anti-explosivos ó en áreas no explosivas. Debe ser considerado el peligro de explosión que puedan causar las partes sometidas a temperatura, y la temperatura de ignición de los materiales.

2. Protección contra marcha en seco

Bajo ninguna circunstancia la bomba puede marchar en seco. La bomba debe estar dotada con un dispositivo contra marcha en seco apropiado. Este dispositivo debería ser autoregulable.

Esto significa que puede proporcionar señales de alarma y/o desconectar la bomba también en caso de fallos en su propio sistema de control.

Protección contra marcha en seco para bombas sumergibles fijas (con bancada)

La operación se recomienda con dispositivos redundantes ó automáticos autoregulables para garantizar tanto la protección contra marcha en seco como la regulación del caudal de la bomba.

Protección contra marcha en seco para bombas sumergibles portátiles (bombas de bidón)

Deben observarse una serie de requerimientos durante el llenado con líquido de la bomba:

- Las bombas de bidón solamente pueden ser introducidas y extraídas del contenedor estando desconectadas.
- Las bombas de bidón después de haber sido introducidas en el contenedor, sólo pueden ser puestas en marcha una vez han sido sumergidas en el fluido.
- Las bombas de bidón deben ser desconectadas antes de que se produzca marcha en seco, ó de inmediato, cuando ruidos específicos ("sorbido" ó incremento de velocidad) sugieran que puede presentarse.

3. Protección contra sobrepresión

La bomba no debe funcionar por encima de la presión máxima teórica. La bomba debe estar equipada con un dispositivo contra sobrepresión apropiado. La bomba no debe funcionar contra válvula cerrada.

El dispositivo de protección contra sobrepresión debe ser autoregulable.

4. Accionamientos

Los accionamientos deben ajustarse a las condiciones de trabajo de cada bomba. En caso de bloqueo de la bomba, dichos accionamientos deben ser desconectados automáticamente mediante una unidad de protección del motor.

5. Alineamiento del accionamiento (para los tipos SY / SH / SA / SO / SF / SP)

Es absolutamente necesario que la alineación del accionamiento esté dentro de las tolerancias máximas permitidas.Un alineamiento incorrecto causa daños a juntas y a rodamientos del eje.

6. Ecualización del potencial para bombas sumergibles

Las bombas sumergibles deben respetar la ecualización de potencial de la instalación.
Las bombas sumergibles portátiles con operación manual estarán conectadas a tierra antes de ser introducidas en el contenedor. La conexión a tierra debe mantenerse hasta que la bomba haya sido extraída completamente del container. No debe haber ninguna diferencia de potencial entre la bomba y el container.
Esto significa que el container y la bomba deben estar conectados a un punto de tierra común, y así, de esta manera estarán conductivamente conectados uno con el otro
(vean folleto de información "Statische Elektrizität, Zündgefahren und Schutzmaßnahmen" (Electricidad estática, peligros de ignición y medidas preventivas); Editorial: "Internationale Sektion für die Verhütung von Arbeitsunfällen und Berufskrankheiten in der chemischen Industrie der IVSS" (Sección internacional para la prevención de accidentes de trabajo y malestares ocupacionales en la industria química de la ISSA (Asociación para la Seguridad Social Internacional) , Heidelberg 1995).
Las bombas sumergibles portátiles estarán equipadas con una indicación de la conexión a tierra (prestar atención a la toma de tierra).

7. Ecualización del potencial para el resto de bombas (no sumergibles)

Todas las partes conductivas de la bomba estarán integradas en la ecualización de potencial durante el bombeo, a menos que la conexión conductiva al potencial de tierra esté garantizada por el accionamiento ó el eje del motor u otra parte.

8. Estator

El estator debe ser revisado regularmente para vigilar su desgaste.
Cuando se llega al máximo desgaste permitido, el estator debe ser reemplazado.
Antes de cambiar el medio de bombeo, el operario consultará al fabricante acerca de la duración del estator a menos que el material de éste ya haya sido confirmado para la aplicación en cuestión.

Inspección e intervalo de mantenimiento del estator:

- Para un tiempo de operación de > 16 h/día, al menos dos veces al año
- Para un tiempo de operación de < 16 h/día, al menos una vez al año.

9. Articulaciones/lubricación de las articulaciones

El cierre y la lubricación de las articulaciones se revisarán con regularidad. Si es necesario, se procederá a su reemplazo.

Inspección e intervalo de mantenimiento de las articulaciones:

- Para un tiempo de operación de > 16 h/día, al menos dos veces al año
- Para un tiempo de operación de < 16 h/día, al menos una vez al año.

10. Inspección después de la primera puesta en marcha

Los aspectos relevantes para asegurar la protección antiexplosiva (tales como lubricación y desgaste) serán revisados como muy tarde seis meses después de la primera puesta en marcha.

11. Rodamientos del eje (para bombas del tipo SY / SH / SA / SO / SF / SP)

Cambio de los rodamientos después de 14,500 horas de trabajo (de acuerdo con el prEN 13463-5: cambio después de transcurrido el 90 % de su vida de servicio).

12. Materiales

Aunque haya sido designado como material de construcción de las bombas, el aluminio se evitará en áreas potencialmente explosivas.
Las bombas solamente podrán ser utilizadas si, bajo particulares condiciones de operación, sus materiales de construcción son resistentes a las influencias mecánicas y/o químicas ó son resistentes a la corrosión, de manera que en ambos casos la protección antiexplosiva se mantenga.

13. Cambios de sonido (para los tipos de bomba SO / BO / SF / BF / SP / BP)

En el momento en que se detecten sonidos inusuales (tales como golpes ó frotamiento), la bomba debe ser desconectada. Se eliminará la causa que produzca dicho ruido anormal antes de poner en marcha de nuevo la bomba.
Revise regularmente el conjunto de las paletas.

14. Dirección del flujo en bombas sumergibles

La dirección del flujo en bombas sumergibles siempre se debe realizar desde el extremo de la pieza de conexión hasta la brida de impulsión en la parte superior. No puede hacerse en sentido inverso.

15. Cierre mecánico de las bombas sumergibles

Antes de la primera puesta en marcha y después de una parada prolongada, siempre antes de arrancar la bomba, el cierre mecánico se lubricará desde fuera. Para ello, se tendrá en cuenta la compatibilidad del lubricante con el material de sellado.

16. Impurezas en las bombas sumergibles

No pueden entrar bajo ningún concepto impurezas en el interior de la bomba, y especialmente en el caso de bombas sumergibles portátiles de operación manual. Las bombas sólo pueden ser depositadas en una superfície sólida y límpia ó quedar suspendidas mediante un dispositivo a tal efecto.
En caso de ruidos anormales ó pérdidas de potencia, las bombas sumergibles deben desconectarse de inmediato.

17. Empaquetadura

Si se montan empaquetaduras debe tenerse en cuenta que la temperatura de trabajo no exceda la categoría de temperatura. Recomendación: apriete con par no muy alto (aprox. 5 Nm) las tuercas del prensaestopas.

18. Acumulación de polvo

En las bombas no deben acumularse capas de polvo con un grosor superior a 5 mm. Las piezas giratorias de la bomba (p. ej. los árboles de accionamiento, y en el caso de las bombas de tolva el soporte del motor y el soporte de cojinete de las paletas para la ruptura de puentes) no deben funcionar con una capa de polvo. Debe comprobarse de manera periódica que las bombas no presenten polvo, y en caso necesario deberá limpiarse la acumulación del mismo.

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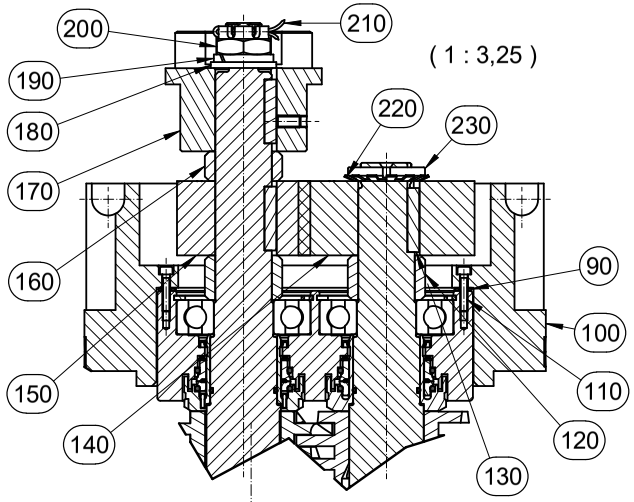
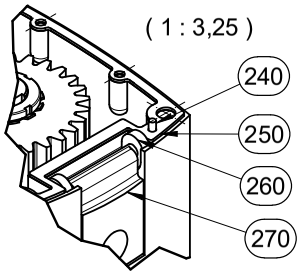
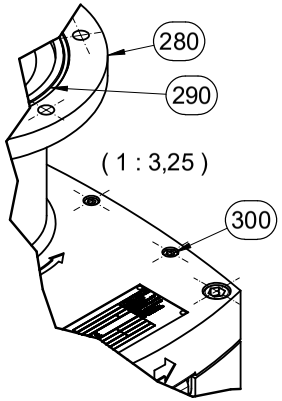
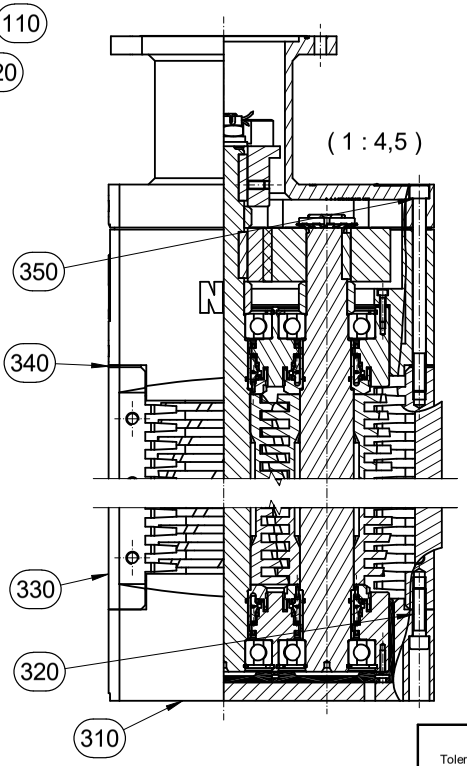
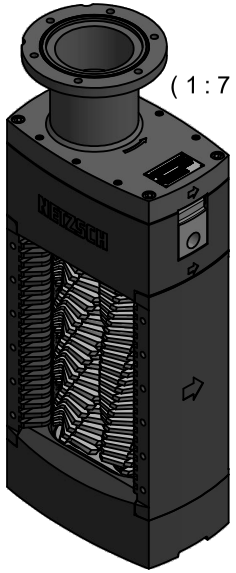
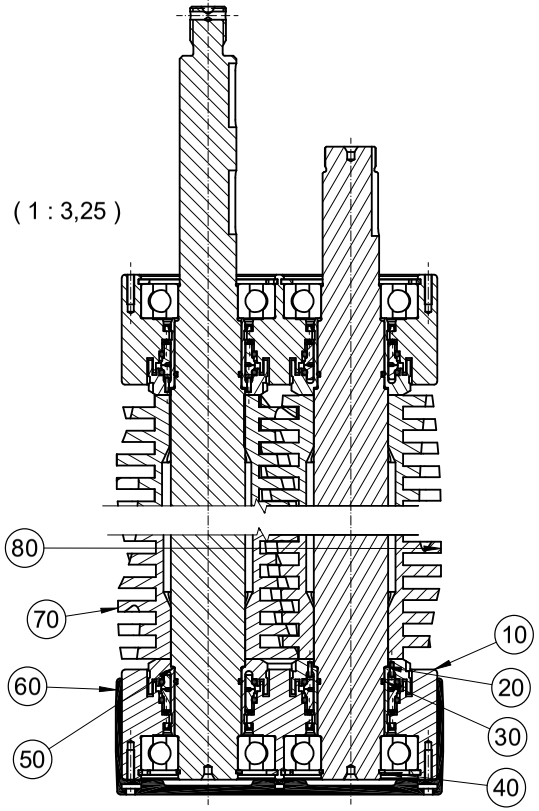












100

Pos.	Qtd / Qty	Descrição / Description
350	4	Parafuso / Screw
340	2	Vedação / Seal
330	2	Lateral / Side rail
320	4	Parafuso / Screw
310	1	Carcaça inferior / Bottom housing
300	6	Parafuso / Screw
290	1	Anel-O / O-ring
280	1	Tampa flange / Cover
270	2	Olhal de içamento / Eye bolt
260	4	Bucha / Sleeve
250	1	Vedação / Seal
240	2	Pino cilíndrico / Cylindrical pin
230	1	Porca trava / Lock nut
220	1	Arruela trava / Lock washer
210	1	Contrapino / Cotter pin
200	1	Porca castelo / Hex slotted nut
190	1	Arruela de pressão / Spring washer
180	1	Arruela lisa / Plain washer
170	1	Acoplamento elástico / Elastic coupling
160	1	Distanciador / Spacer
150	1	Engrenagem motora / Drive gear
140	1	Engrenagem movida / Driven gear
130	3	Chaveta / Key
120	2	Distanciador / Spacer
110	6	Parafuso / Screw
100	1	Carcaça superior / Upper housing
90	1	Vedação / Seal
80	2	Bloco de facas / Cutter cartridge
70	2	Bloco de facas / Cutter cartridge
60	1	Invólucro / Casing
50	1	Eixo motor / Drive shaft
40	2	Anel de retenção / Retaining ring
30	4	Anel-O / O-ring
20	1	Eixo movido / Driven shaft
10	2	Caixa de selagem / Mechanical seal kit

Lista de peças / Part list

Tolerâncias Gerais
General Tolerance
ISO 2768-mK

NETZSCH

	Data/Date	Nome/Name
Desenhado / Designer	10/03/2017	thiago.vicznevski
Verificado/Checked Aprovado/Approved	10/03/2017	luan.prüss

Figura/Type: N.Mac
Escala / Scale: 1 : 3,25

Título/Title:

Triturador canal N.Mac 120C

Channel grinder N.Mac 120C

2E-4B / 2S-4C

Nr. Desenho/Drawing Nr.: NDB4991189
Folha/Sheet: 1 / 1
Rev.: 05

A3

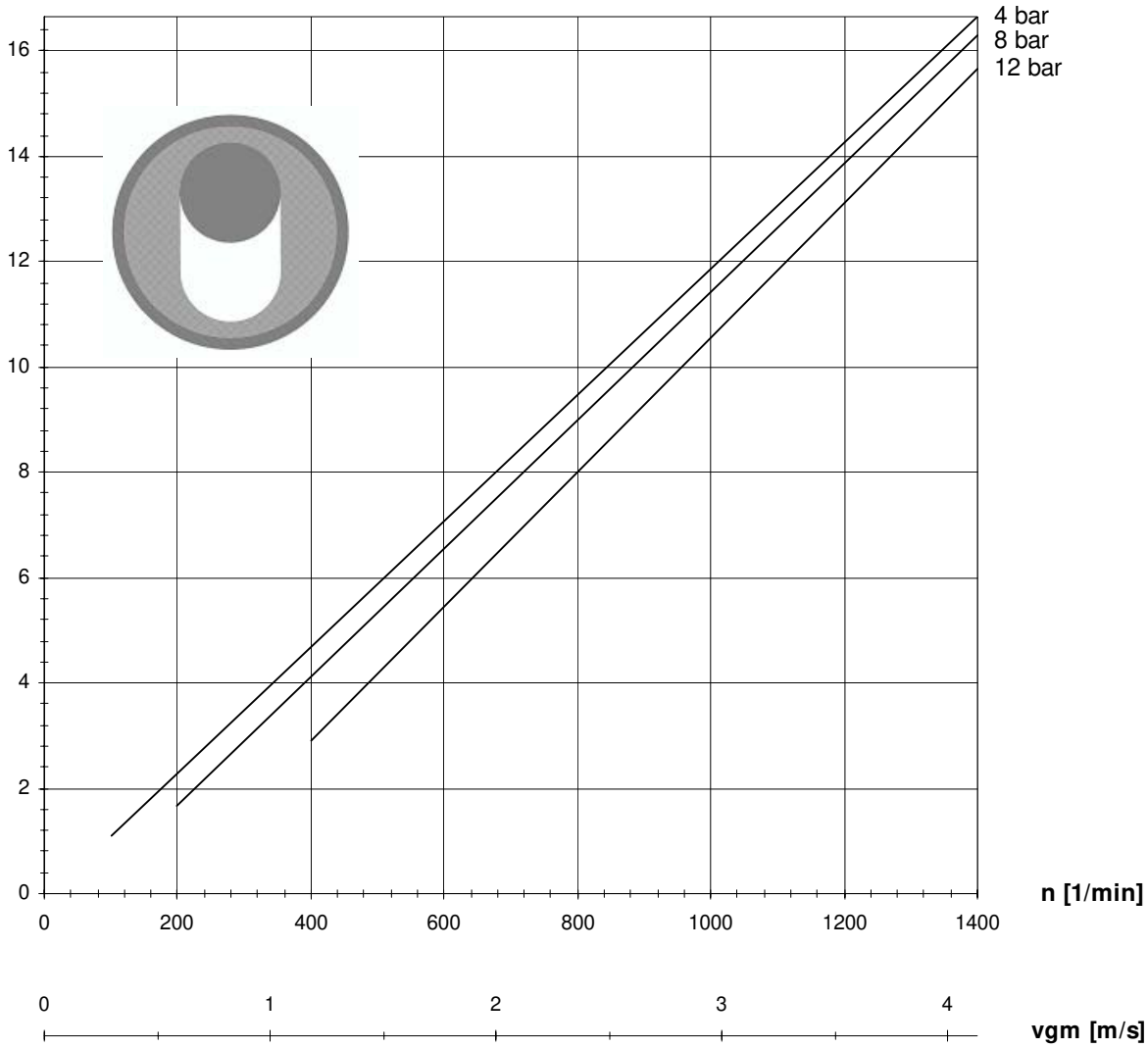
NM038--02S

Förderkennlinie / Performance Curve

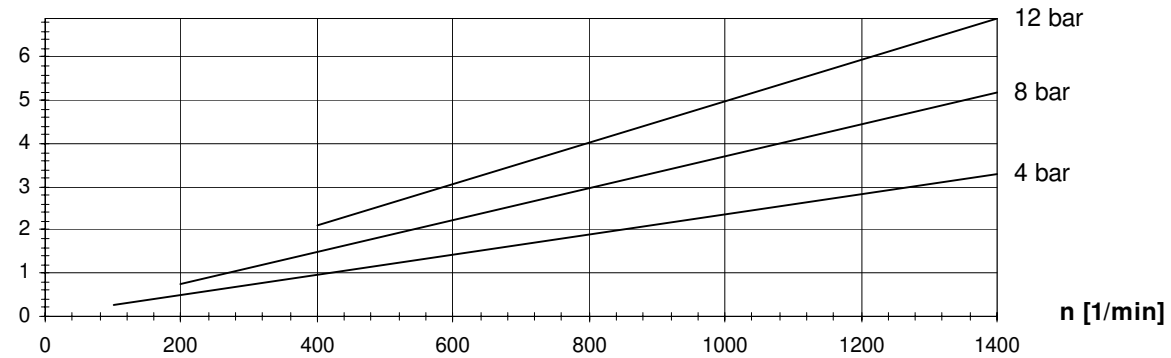
Statorwerkstoff / elastomer quality: standard

NETZSCH

Q [m³/h]



P [kW]



Losbrechmoment / starting torque T(L) = 49 Nm

Druck / pressure	T
4 bar	25 Nm
8 bar	38 Nm
12 bar	49 Nm

Gültigkeit für Wasser (1 cP) bei 20 °C. Toleranzen nach VDMA 24284 Toleranzgruppe II.
Valid for water (1 cP) at 20 °C (70 °F). Tolerances are in accordance with VDMA 24284 tolerance group II.

Contacts

NETZSCH Pumpen & Systeme GmbH
Geretsrieder Str. 1
84478 Waldkraiburg
Germany
+49 8638 63-0
+49 8638 67981
info.nps@netzsch.com
https://pumps-systems.netzsch.com

Advisers team:
During our German business hours, from Monday to Thursday between 08:00 and 17:00 and on Friday between 08:00 and 15:00, you can reach your personal contact via the standard telephone number, fax or email:

Business Field Environmental & Energy
+49 8638 63-1010
+49 8638 63-2333
info.nps@netzsch.com

Business Field Food & Pharmaceutical
+49 8638 63-1030
+49 8638 63-2358
info.nps@netzsch.com

Business Field Chemical, Pulp & Paper
+49 8638 63-1020
+49 8638 63-2327
info.nps@netzsch.com

Business Field Oil & Gas
+49 8638 63-1024
+49 8638 63-2333
info.nps@netzsch.com

Spare parts service
+49 8638 63-1050
+49 8638 67999
info.nps@netzsch.com

Technical service
+49 8638 63-1040
+49 8638 63-67999
service.nps@netzsch.com

Technical training:
We can train your employees from maintenance and production as well as planners and other interested parties at NETZSCH or at your facilities.
In our 2-day training courses, we focus on practice, individually tailored to your processes.
Our detailed product knowledge enables us to show you how to avoid or rectify mistakes during commissioning, maintenance and repair.
To schedule a training, please visit our website at https://pumps-systems.netzsch.com.

In **emergencies**, you can reach us **outside of our business hours** and on weekends and German bank holidays at:

+49 8638 63 63 63

More information can be found on the reverse.

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Direct contact details for your adviser and our service points worldwide are available on our website at «Service & Support»:

https://pumps-systems.netzsch.com

This also contains information on the **returns process** for sending machines or parts to our service.
This includes the required **“Technical Declaration”**.

Certificates / Attachments

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